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**Irradiation Effects for the
Pulsed Fast Neutron Analysis
(PFNA) Cargo Interrogation
System**

**C. O. Slater
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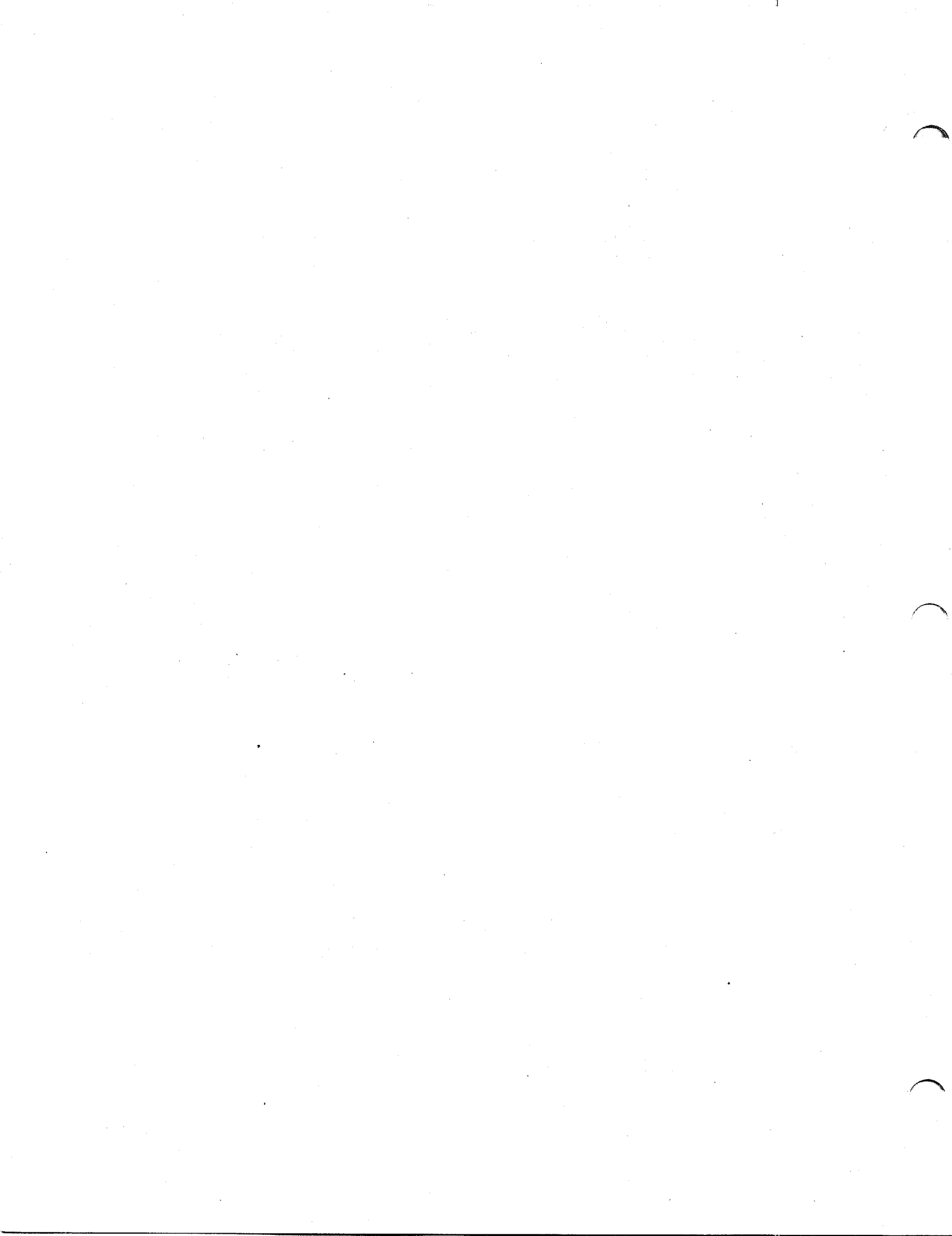
Computational Physics and Engineering Division

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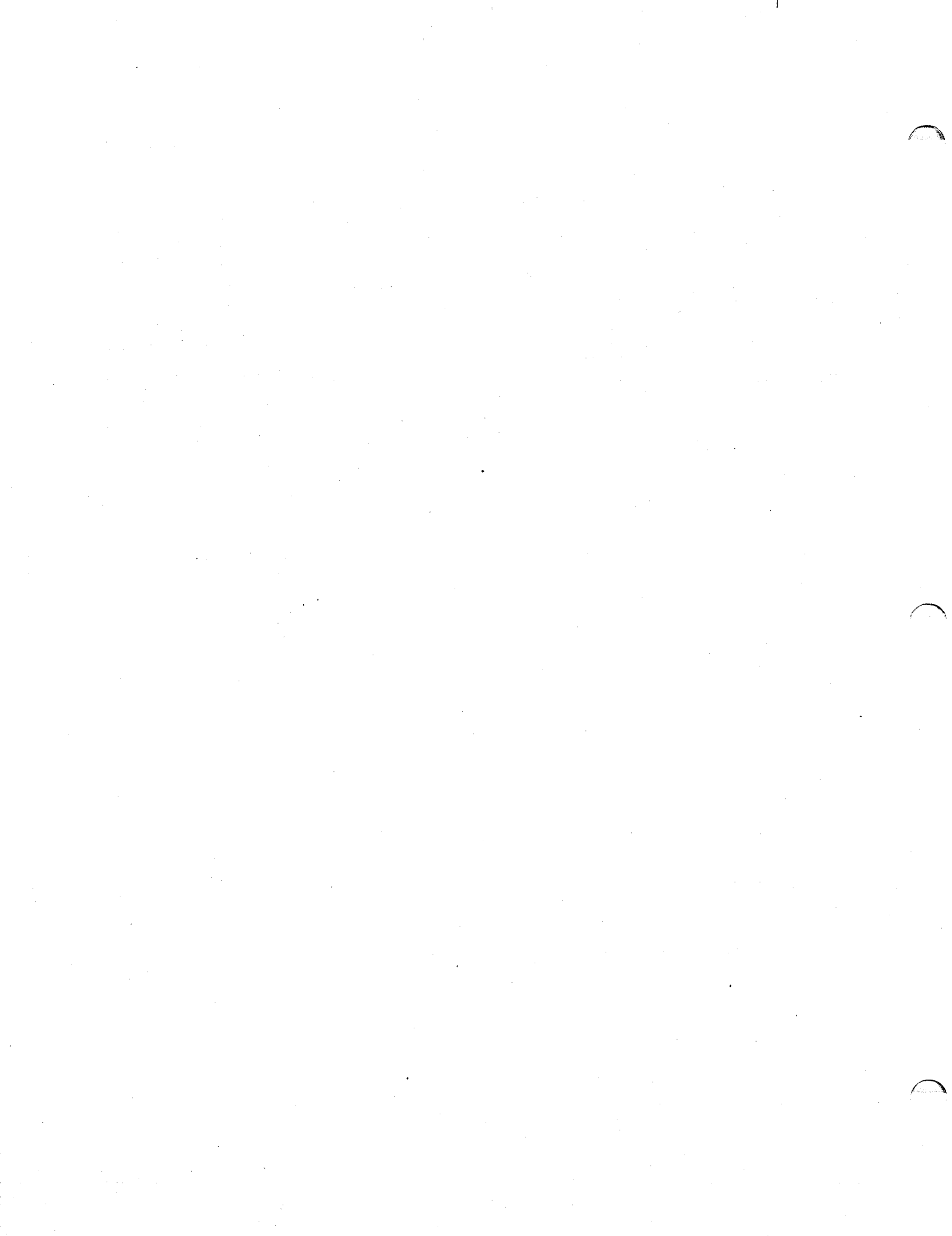
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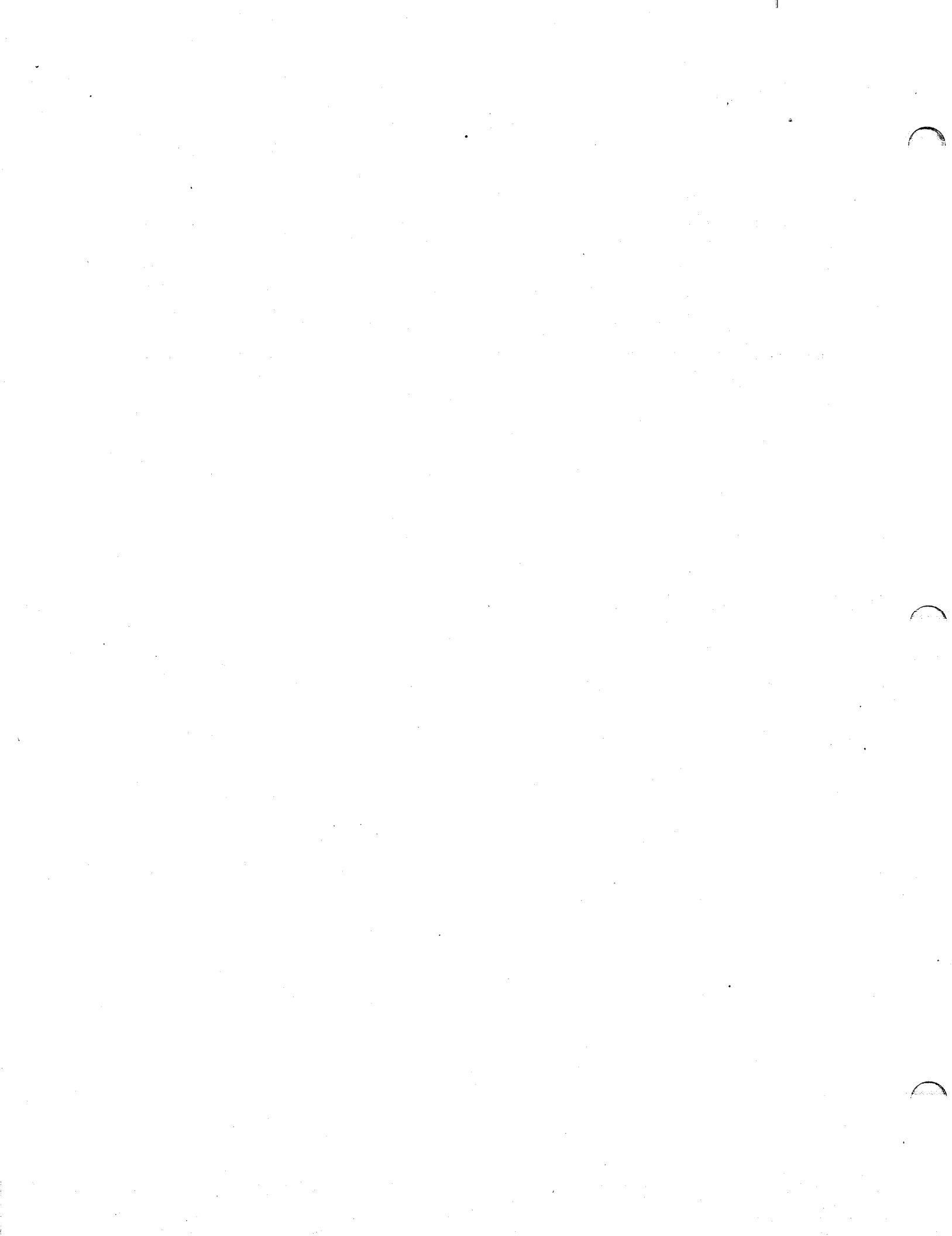
ABSTRACT

At the request of Safety and Ecology Corporation of Tennessee, radiation effects of the proposed Pulsed Fast Neutron Analysis (PFNA) Cargo Interrogation System have been examined. First, fissile cargo were examined to determine if a significant neutron signal would be observable during interrogation. Results indicated that ample multiplication would be seen for near critical bare targets. The water-reflected sphere showed relatively little multiplication. By implication, a fissile target shielded by hydrogenous cargo might not be detectable by neutron interrogation, particularly if reliance is placed on the neutron signal. The cargo may be detectable if use can be made of the ample increase in the photon signal. Second, dose rates were calculated at various locations within and just outside the facility building. These results showed that some dose rates may be higher than the target dose rate of 0.05 mrem/h. However, with limited exposure time, the total dose may be well below the allowed total dose. Lastly, estimates were made of the activation of structures and typical cargo. Most cargo will not be exposed long enough to be activated to levels of concern. On the other hand, portions of the structure may experience buildup of some radionuclides to levels of concern.



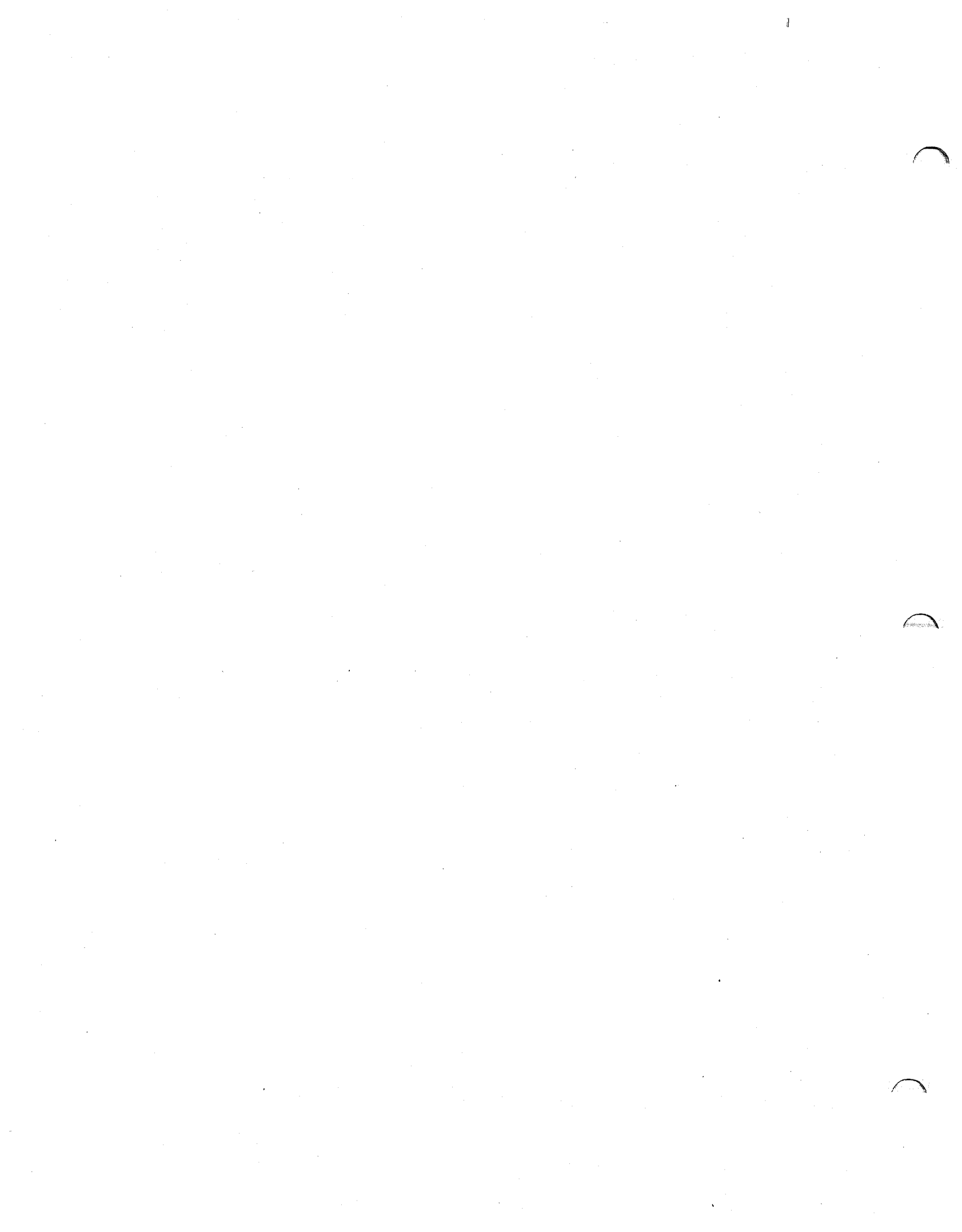
1.0 INTRODUCTION

The proposed Pulsed Fast Neutron Analysis (PFNA) Cargo Interrogation System is designed to scan large transport vehicles to determine if the vehicles are transporting illegal cargo (such as personnel and special nuclear materials) across U. S. borders. The scanning is accomplished by sweeping the towed, slow-moving vehicle with a fast-neutron beam (having a nominal energy of 9 MeV in the forward cone) and analyzing the emerging radiation signatures to ascertain the cargo. ORNL analysts at the request of Safety and Ecology Corporation (SEC) of Tennessee have analyzed the facility for (1) neutron multiplication in fissile cargo, (2) dose rates at various locations within and around the facility, and (3) neutron activation of the facility structure and selected cargoes. The facility, the calculational models, and the calculational procedures are described and the calculational results are presented.



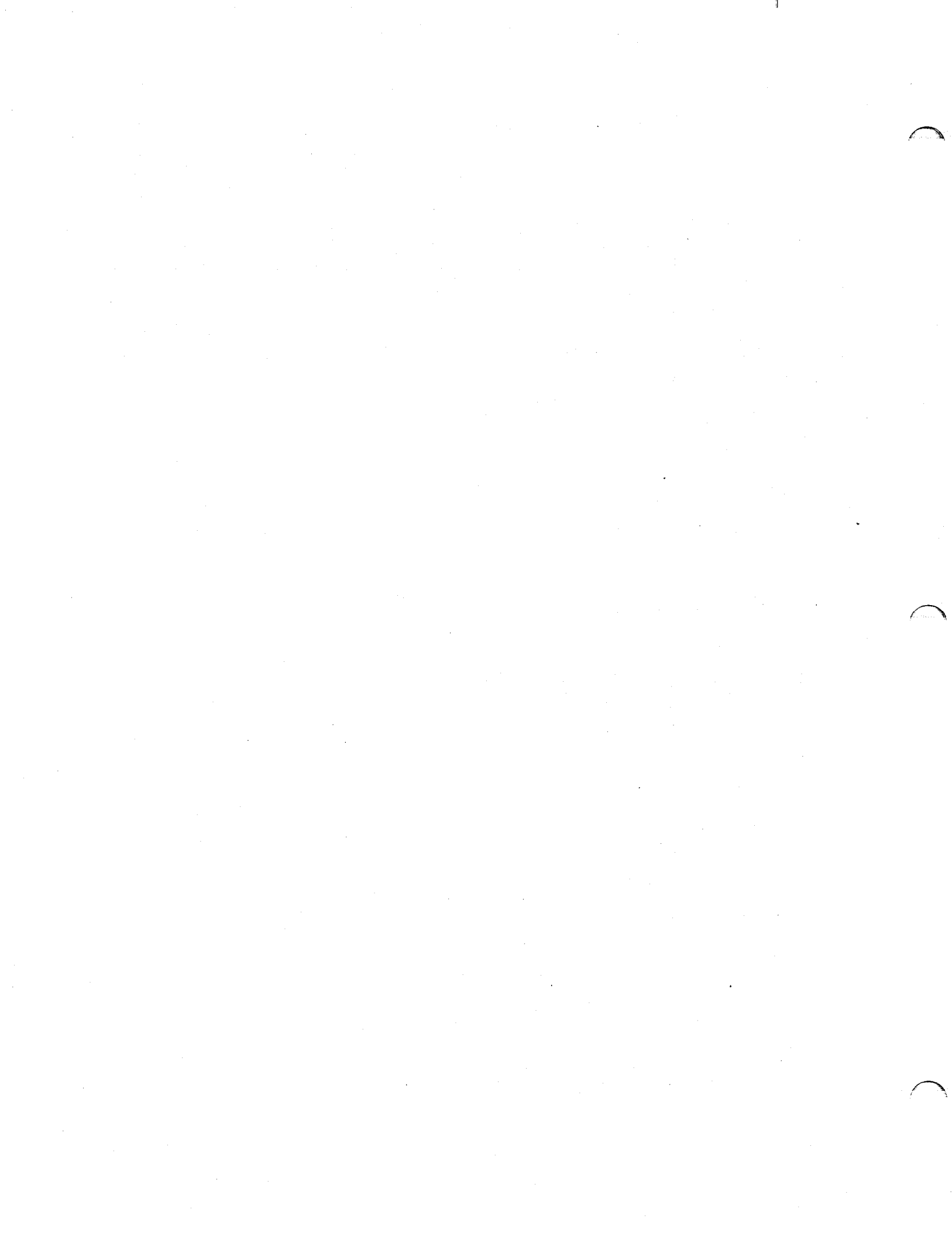
2.0 THE FACILITY

The PFNA facility consists of a source, a source collimator, several banks of radiation detectors, a vehicle lane, overhead shielding, and concrete walls for structural support and shielding. Plan and elevation views of the facility are shown in Figures 1 and 2. Figures 3 and 4 show details of the vertical and overhead horizontal beam stops, and Figures 5-7 show details of the source collimator.



3.0 THE SOURCE

The neutron source consisting of nominally 9-MeV neutrons in the forward cone is produced by an accelerator via a D-D reaction in a target material. The resulting angle- and energy-dependent source spectrum is presented in Table 1. The source is collimated such that the illuminated area of the beam at the center of the interrogation region measures 45 cm by 45 cm in terms of full width at half maximum. A travelling vertical collimator allows the movement of the source in a vertical arc to allow full vertical interrogation of the cargo. The mechanics of the collimator movement are such that the rate of movement is about the same for all angles in the sweep, thus uniformly irradiating the cargo vertically. Calculations must be performed on snapshots of the facility at selected angles of the sweep, since the sweep alters the geometry and present calculational procedures only allow for fixed geometries throughout a given calculation. Along with the geometry change, one must also change the source emission location and the reference vector for defining the source angular emission.



4.0 COMPUTER CALCULATIONS

4.1 Neutron Multiplication in Fissile Material in Cargo

It is expected that fissile material in the cargo can be detected because of the increased radiation signal generated by neutron multiplication. Therefore, the first calculational task was the determination of the dose-rate multiplication for several near critical plutonium spheres, including bare and tungsten- and water-reflected spheres. Data on the critical radii and the compositions of the plutonium spheres were supplied by SEC. These were based on data from Ref. 1. Compositions of the plutonium spheres are given in Table 2.

For these calculations, only the plutonium sphere and the source collimator were modeled. The distance from the source to the plutonium sphere was supplied by SEC. Figures 5-7, which show some dimensions, were used to model the collimator. The collimator includes a stationary part and a moving vertical part (or vertical collimator). The vertical collimator is a half-cylinder disk with regions of two different thicknesses and a tapered slot to allow desired portions of the neutron beam to pass through. It is made of borated polyethylene. The stationary portion of the collimator consists of borated polyethylene, borated paraffin, aluminum, and lead in two mirror-image, shaped aluminum containers resting on a steel plate and a raised concrete block. The small regions of regular polyethylene in the stationary collimator were missed because of the similar shading to the borated paraffin and because they were not labeled on each drawing. These regions were modeled as borated paraffin. Compositions of the collimator materials, the plutonium sphere reflector materials, and of materials used in other PFNA facility calculations are given in Tables 3 and 4. While some dimensions were given on the drawings, some of the missing dimensions were determined by scaling from dimensions given on the drawings. An attempt was made to size the openings through the collimators by extrapolating from the specified 45-cm by 45-cm beam at the center of the interrogation region. However, the taper so computed for the stationary collimator was inconsistent with that shown in Figure 5 and 6. Therefore, the taper for the stationary collimator was determined by measurements of the starting and ending points of the taper on Figure 5 or 6. For the vertical collimator, the 4° overtravel shown on Figure 2 was mistakenly assumed to be the angle of the opening in the vertical collimator, since the lines appeared to follow the taper of the collimator opening. A later design was based on measurements on Figure 7. The differences between the two models didn't appear to be too great and should not have a big impact on the calculated results obtained using the first model. Calculations were performed using the MCNP-4B Monte Carlo radiation transport code² and ENDF/B-IV cross-section data. The calculations were run in parallel mode to condense the duration of each calculation from days to a few hours.

Because the plutonium spheres were supposed to be critical and calculations using a fixed source would be impossible to perform, we opted to perform the calculations with slightly subcritical spheres. Since the measured critical radii might be different from the calculated ones, it was necessary that the effective multiplication factor (k_{eff}) of the critical spheres be calculated in order to assure configurations would be subcritical for the codes and data used. Therefore, criticality calculations were performed using the MCNP-X Monte Carlo radiation transport code.³ While this

code is designed to perform calculations for many species of particles with energies in the very high to very low range, it performs calculations the same as MCNP-4B for low-energy ($E < 20$ MeV) neutron, photon, and electron transport. MCNP-X was used because the k_{eff} calculations could be run within a reasonable time on a single computer node and several calculations could be run simultaneously on different single nodes without competing for parallel resources with other parallel calculations. The calculated k_{eff} values for the plutonium spheres having the specified critical radii and compositions and for two subcritical bare plutonium spheres are shown in Table 5 along with the standard deviations of the results. For the critical spheres (the last three in the table), the k_{eff} values vary from 0.3% below critical to 1.05% above critical. Even the 6.35-cm-radius bare sphere at 99.4% of the critical radius and 98.4% of the critical volume has a k_{eff} that is only 0.7% below critical or only 0.4% more subcritical than the critical sphere. Listings of input files for the MCNP-X criticality calculations are given in Appendix A.

After the k_{eff} values were determined, dose rates were then calculated for subcritical spheres irradiated by the neutron source. The calculations were performed using the MCNP-4B computer code. Calculations were performed without a target sphere in the mockup (void replaces plutonium in the spheres) to get a background dose rate due to direct beam and scattering from the collimator. No consideration was given to scattering from the concrete floor and the walls of the facility. Dose rates with the sphere present are compared to the background dose rates to give an indication of the multiplication of the detector signal when fissile material is present. Because of the large multiplication that results for a near-critical sphere and the calculational difficulties that would result, the calculations were performed initially for spheres having about 97% of the critical mass or about 99% of the critical radius. The values used for the radii of the plutonium spheres and their reflectors if any are shown in Table 6. For the bare sphere, dose rates were calculated at detectors 10 cm in front of, behind, to the side of, and above the center of the sphere. Since initial calculations seemed to indicate excessive computer time when point detectors were used^a, dose rates were computed using surface detectors around the spheres. Figure 8 shows a vertical slice through the collimator and the bare plutonium sphere mockup, and Figure 9 shows a horizontal slice through the collimator and the bare plutonium sphere mockup along with several surfaces around the sphere. Figures 10-12 are closeup views of respectively the bare, tungsten-reflected, and water-reflected spheres and the surface detectors surrounding them. One can also see that the spheres are subdivided into two or three regions, mainly in anticipation of the reflected sphere calculations, but also to allow for different importance regions for the bare sphere. Some calculations were also performed using point detectors. The flux-to-dose conversion factors used were obtained from the tissue dose response function in the VELM61 cross-section library⁴ and are shown in Tables 7 and 8. Only source in the forward directions (Table 1) was used because the backward-directed particles could not contribute to the dose since there was no material to scatter the beam back toward the detectors. These particles would simply escape the system, increasing the computing time per contributing particle and reducing the calculational efficiency.

^aIn reality, the code for unknown reasons ceased to run in parallel mode and began to run on a single node, thus greatly increasing the calculation time.

The calculated dose rates and the dose multiplication are shown in Tables 9-13. These results were obtained from calculations that each followed 400,000 neutron histories. The statistical uncertainties on the foreground results (with a plutonium sphere in the model) are larger than desired for reliable results. While these results may change considerably with large increases in the number of histories, the background results should change less since most statistics are reasonable. The results show large increases in the neutron dose rate in the presence of the bare spheres and a significant increase for the tungsten-reflected sphere. Little multiplication is seen for the water-reflected sphere. All cases show substantial increases in the photon dose rate above the background levels, with factors above 20 for the water-reflected sphere and factors of hundreds and thousands for the others. Finally, calculations were performed using many more histories. Dose rates calculated for a 6.38-cm-radius bare plutonium sphere with 400,000 histories are compared in Table 14 to those calculated using 16,000,000 histories for both point and surface detectors. The statistics for the 16-million-history results are reasonable. Note that the point detector results start out low and increase with the number of histories while the surface detector results start out high and decrease with the number of histories. The point and surface detector results for the 16-million-history cases are essentially in agreement. One might expect the dose rate to be higher at the center of the 10-cm \times 10-cm surface detectors and an average over the surface to be somewhat lower as the Table 14 results indicate. Listings of input files for the MCNP-4B calculations of dose rates may be found in Appendix B.

4.2 Dose Rates Within and Around the Facility

The facility was modeled from the views shown in Figures 1-7. Except for the use of borated polyethylene instead of regular polyethylene in the hut surrounding the source and the small region of regular polyethylene in the stationary collimator (previously mentioned), the materials were modeled as specified. The use of borated polyethylene should result in lower calculated dose rates in regions to the side of or behind the hut than one would calculate using regular polyethylene. While no material was included for the NaI detectors and their associated shielding, the shielding preceding the regions should be sufficient enough that dose rates behind these regions will be due mainly to source coming through the center of the collimator and scattering from walls surrounding the truck lane. Material compositions are given in Tables 3 and 4. While Figure 1 shows possibly two different concrete shield walls, an August 29, 2000 memorandum from Peter Ryge of Ancore Corporation stated in reference to Concrete-2 that "no specific composition data has been available for earth blocks or other materials, so the same concrete is assumed as a conservative approach." Therefore, a density of 2.0 g/cm³ was used for both Concrete-1 and Concrete-2. Because the end walls of the facility measured about 20 cm, the outer facility walls were assumed to be composed of masonry block at half the concrete shield wall density and were assumed to be stacked 609.6 cm (20 ft) high. In addition, a thin steel roof (0.318 cm or 0.125 in.) was assumed. Plots of plan and elevation plane slices through the PFNA facility calculational geometry are given in Appendix C.

Neutron and photon dose rates were calculated using the point detector estimator in the MCNP-4B computer code, first for locations around the facility and then for locations along the centerline of the truck lane and across the truck lane along the centerline of the neutron beam. All

these dose rates were calculated for three source positions: (a) a maximum down position of 8.6° below the horizontal, (b) a horizontal position of 0° , and (c) a maximum up position of 34.8° above the horizontal, and all were calculated at a height of $z=0.0$ cm, which in the calculational model is 125.095 cm above the floor and at the horizontal source elevation. Two million neutron source histories were followed in all calculations, resulting in reasonable statistics for most detector positions. Total dose rates were obtained by summing the neutron and photon dose rates. Then the neutron, photon, and total dose rates were averaged for the vertical sweep by assuming exponential variation of the dose rate between the three angles at which the dose rate was calculated as given in the equations below. Listings of the simple Fortran computer codes used to do the averaging and the input files for the codes are given in Appendix D. The calculated dose rates for the three source angles as well as the average dose rates are shown in Tables 15-19. The dose rates are specified per

$$\bar{f} = \frac{\sum_{i=1}^2 \int_{\mu_i}^{\mu_{i+1}} f(\mu) e^{\lambda_i(\mu - \mu_i)} d\mu}{(\mu_3 - \mu_1)}$$

$$\bar{f} = \frac{\sum_{i=1}^2 \frac{f(\mu_i)}{\lambda_i} (e^{\lambda_i(\mu_{i+1} - \mu_i)} - 1)}{(\mu_3 - \mu_1)}$$

where $\mu_i = \theta_i$ was used here, but one might also consider $\mu_i = \sin \theta_i$. In addition,

$$\lambda_i = \frac{\ln\left(\frac{f(\mu_{i+1})}{f(\mu_i)}\right)}{\mu_{i+1} - \mu_i}$$

Now since

$$f(\mu_{i+1}) = f(\mu_i) e^{\lambda_i(\mu_{i+1} - \mu_i)}$$

then

$$\bar{f} = \sum_{i=1}^2 \frac{f(\mu_{i+1}) - f(\mu_i)}{\lambda_i}$$

hour, while dose limits may be time-integrated. Therefore, these calculated dose rates must be multiplied by the exposure time to determine if the dose limit is exceeded at a given location. Additionally, dose rates were calculated below and above the top source shield at a range of

locations across the truck lane with the source in its maximum up position. These results are presented in Table 20. Note that for the X locations, the center of the truck lane is at $X=298.958$ cm. The $Z=0$ cm location is about 125 cm above the floor. For the lower elevation (374 cm) in the table, a detector X location (332.7 cm) that corresponds to the intersection of the source vector with the bottom surface of the source top shield was included as the possible location for the maximum dose rate at that height in the plane of the source sweep. A detector with the same X coordinate was included for the upper elevation. No maximum dose location is evident for the lower elevation (beneath the source top shield bottom surface). In fact, the slope of a dose-rate curve plotted through the calculated points would indicate further increases in the dose rate toward the source. These locations are probably receiving uncollided dose from the relatively large and reasonably energetic neutron source emitted at angles outside the forward source cone even though they may have to pass through part of the vertical collimator. The dose rate above the shield does peak closer to the X coordinate (484.3 cm) that is along the straight-ahead source vector. The dose rate doesn't peak there because (1) the particles have to travel through 35.6 cm of polyethylene travelling straight but through as little as 20.3 cm if scattered and (2) the localized source created by scattering in the shield is closer to the source and thus shifts the peak dose rate position toward the source. The overhead dose rates were calculated mainly as an indicator of skyshine dose rates. Based on the maximum calculated roof dose rate from the table (1020 mrem/h) and a rule-of-thumb skyshine dose rate estimate of 2% of the roof dose rate, one would anticipate a maximum skyshine dose rate of about 20 mrem/h if the source were stuck at its maximum up position. Photons should contribute less than 10% additional to the dose rate. Input files for the calculations are in Appendix E.

4.3. Neutron Activation of Structural Materials and Stream-of-Commerce Cargoes

The presence of certain elements (such as cobalt, iron, nitrogen, nickel, etc.) in materials undergoing neutron irradiation can be of concern due to the possible activation of certain isotopes and the nontrivial residual activity minutes, hours, or even days following irradiation. Therefore, an attempt was made to quantify the activity levels in selected stream-of-commerce cargoes that pass through the main beam in less than eight seconds and in structural materials that are irradiated for hours day after day. First, flux levels in the regions of interest had to be determined. These flux levels were calculated in a broad three-energy-group structure by the MCNP-4B computer code. The three-group structure is that used for ascii cross-section data in the ORIGEN⁵ isotope generation and depletion code. Three flux spectra were used in the calculations: (a) one at the center of the truck lane that was used for activation calculations for cargo and structural materials, (b) one within the stationary collimator that was used for activation calculations for structural materials, and (c) one at the front of the beam stop concrete that was used for activation calculations for the beam stop concrete. In addition to the three-group flux spectra, with user input flux factors, MCNP-4B calculated the integral of $1/v$ times the thermal-neutron flux over the interval from 0 to 0.5 eV. This value along with the other flux data were used to produce spectral parameters (THERM, RES, and FAST) used by ORIGEN.

For the cargoes, the cargo material was irradiated for 8, 16, and 24 s time periods and the induced activity was allowed to decay for up to 1200 s. The 8-s irradiation period was based on a point being in the main beam area about 8 s. The other two irradiation times attempt to account for

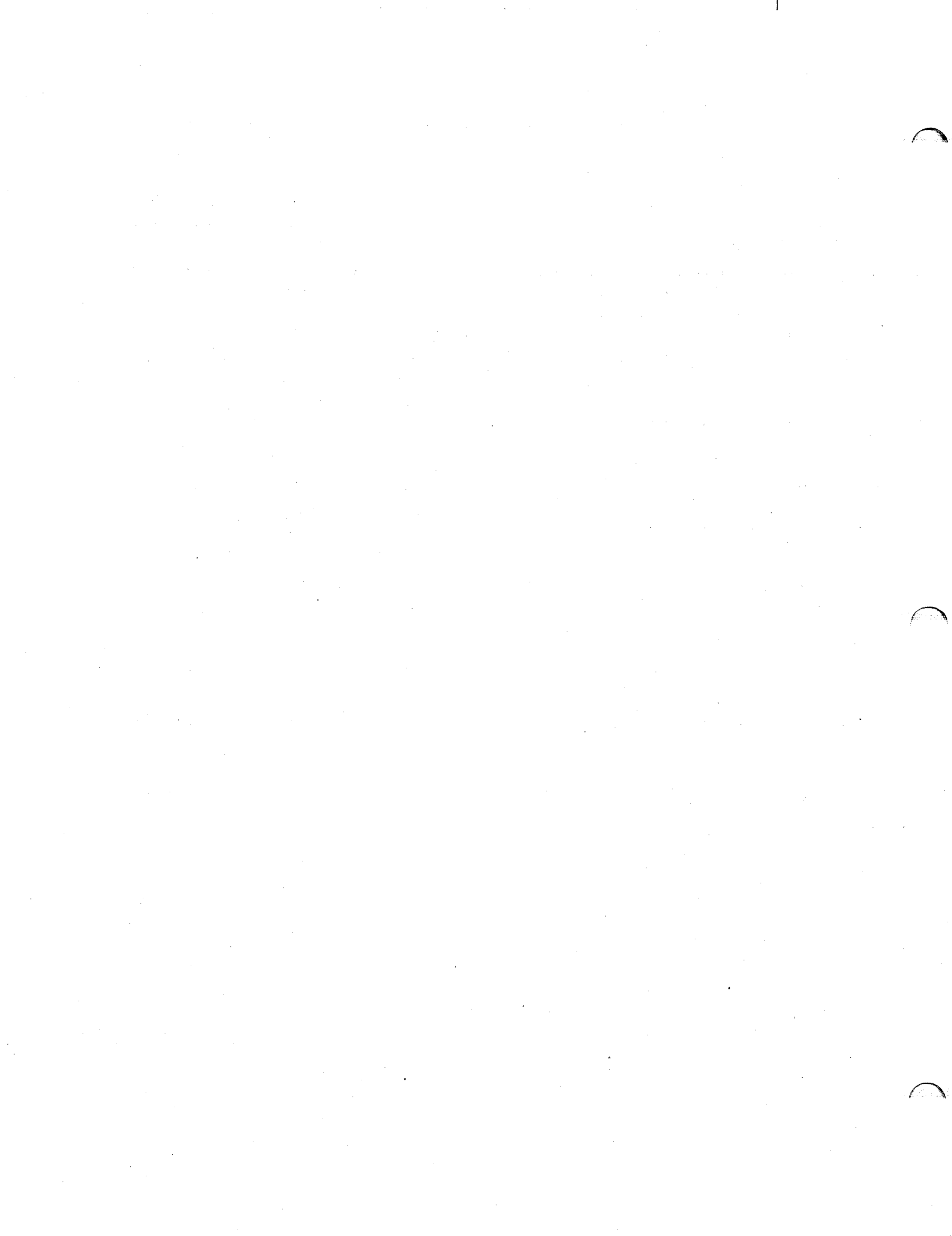
the point being in a higher flux field for a longer period of time because of neutron scattering within the cargo material. Table 21 shows the neutron and photon dose rate distribution at the center of the truck lane and perpendicular to the beam line for detectors in salted beef cargo. While the statistics on the neutron dose rates are large and make the results inconclusive, the results do tend to indicate that the main beam is confined to the 45-cm \times 45-cm square mentioned earlier. The photon dose rates with their acceptable statistics indicate a significant thermal-neutron flux 50 cm either side of the beam line (the dose rate is 1/4 to 1/3 of the centerline value). Thus a particular cargo location may be exposed to significant thermal-neutron flux for up to 16 s, although at lower flux levels than those calculated in the absence of the nonfissile cargo. The dose distribution may be different near the source edge of the cargo from that calculated at the center of the cargo, and the flux levels should be much higher. Compositions of the cargoes by weight percent are given in Table 22.

For the structural materials, since twenty trucks per day can be processed through the facility and each truck would be allotted about 24 minutes per 8-h workday, it was assumed that the structural material would be irradiated continuously for eight hours each day. The facility would then be shut down 16 hours each day. Therefore, ORIGEN calculations were performed for ten days in cycles consisting of eight hours irradiation followed by 16 hours decay. Compositions of the structural materials per kilogram are given in Table 23.

Results obtained from the ORIGEN calculations are tables of the radioactivity of various radionuclides at various times following irradiation and the corresponding decay photon spectra. For the radioactivities, results for a given radionuclide were printed only if the radioactivity at the initial decay time step were greater than 10^{-20} Ci/kg. A lower 10^{-12} Ci/kg cutoff caused results for some long-lived species such as ^{60}Co and ^{59}Fe not to be printed. Table 24 shows along with their definitions the ORIGEN parameters (THERM, RES, FAST, and the thermal-neutron flux) that were used in the various calculations. The associated tabular radioactivity results are presented in tables in Appendix F and the decay photon spectra are presented in tables in Appendix G. The activities presented are probably conservative, and even then most are not at levels of concern. Thermal-neutron flux levels are too low to produce significant activity over short irradiation periods. There may be some activity buildup in regions of structural materials that are irradiated for much longer periods of time. Listings of the MCNP-4B input files used to calculate the ORIGEN flux spectra are given in Appendix H, while listings of the input files for the ORIGEN calculations are given in Appendix I.

5.0 SUMMARY

MCNP-4B calculations have been performed on models of the PFNA facility to analyze (1) dose signal increase in the presence of fissile cargo, (2) dose rates in and around the facility absent any cargo, and (3) neutron activation of cargo and structures as a result of interrogation with a neutron beam. The results indicate first that there could be detectable enhancement of the dose rate or some other detector signal in the presence of some near-critical fissile cargo. Other fissile cargo may escape detection if shielded by hydrogenous cargo or if the cargo is too subcritical. Second, the dose rates at some peripheral locations may be at levels of concern for long periods of operation because the accumulated dose may exceed regulatory limits. Third, cargo will generally be irradiated over too short a time period to experience appreciable buildup of radioactivity. Structures, however, may become activated because of the many irradiation/decay cycles experienced over long periods of time. Portions of the structure lying within the path swept by the vertical collimator will experience the highest activation levels.



6.0 REFERENCES

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Table 1. Angle- and Energy-Dependent Neutron Source Spectrum^a for the PFNA Facility.

Angle Range (degrees)	Cross Section (mb)	Neutron Yield (s ⁻¹)	Mean Energy (MeV)
0 to 5	1.83	1.09+09 ^b	8.537
5 to 30	24.72	1.47+10	8.105
30 to 60	14.88	8.82+09	6.668
60 to 90	20.36	1.21+10	4.682
90 to 135	14.51	8.60+09	2.847
135 to 180	19.67	1.17+10	1.872

^a The values were calculated using the tabulated cross sections and energies for the D(d,n)³He reaction given in the article by H. Liskien and A. Paulsen, "Neutron Production Cross Sections and Energies for the Reactions T(p,n)³He, D(d,n)³He, and T(d,n)⁴He in *Nuclear Data Tables* **11**, 569-619 (1973).

^b Read as 1.09×10^9 .

Table 2. Compositions for the Plutonium Critical Spheres.

Nuclide	Atomic Density ($\text{b}^{-1} \cdot \text{cm}^{-1}$)		
	Bare	Tungsten-Reflected	Water-Reflected
Ga	1.3752-3 ^a	1.3628-3	
²³⁹ Pu	3.7047-2	3.7291-2	4.6982-2
²⁴⁰ Pu	1.7512-3	1.9277-3	2.5852-3
²⁴¹ Pu	1.1674-4	1.2196-4	1.4915-4
²⁴² Pu			9.9432-6

^a Read as 1.3752×10^{-3} .

Table 3. Compositions of hydrogenous materials used in the PFNA calculations.

Nuclide	Composition ($b^{-1} \cdot \text{cm}^{-1}$ unless otherwise noted)			
	borated polyethylene	borated paraffin	concrete ^a	water
H	6.5800-2 ^b	7.83500-2	1.0	6.6766-2
¹⁰ B	5.1940-4	4.34260-4		
¹¹ B	2.1306-3	1.78134-3		
C	2.9100-2	3.82300-2	0.1	
O	7.9400-3		52.9	3.3383-2
Na			1.6	
Mg			0.2	
Al			3.4	
Si			33.7	
K			1.3	
Ca			4.4	
⁵⁴ Fe			7.91056-2	
⁵⁶ Fe			1.28657	
⁵⁷ Fe			3.02595-2	
⁵⁸ Fe			4.06658-3	

^a Weight percent (Concretes 1 and 2 are 2.0 g/cm³ and block walls are 1.0 g/cm³).

^b Read as 6.5800 × 10⁻².

Table 4. Compositions of metal materials used in the PFNA calculations.

Nuclide	Composition ($\text{b}^{-1} \cdot \text{cm}^{-1}$ unless otherwise noted)				
	Lead	Al 6061-T6	Steel	Tungsten	Iron ^a
C			3.16929-4		
N			5.43529-4		
Mg		6.68900-4			
Al		5.82700-2			
Si		3.47400-4	1.27063-3		
P			6.91287-5		
S			4.45160-5		
Ti		5.09300-5			
⁵⁰ Cr		2.72300-6	7.96600-4		
⁵² Cr		5.24440-5	1.53441-2		
⁵³ Cr		5.94600-6	1.73970-3		
⁵⁴ Cr		1.47700-6	4.32200-4		
⁵⁵ Mn		4.44000-5	1.73219-3		
⁵⁴ Fe		1.19200-5	3.23670-3		5.85
⁵⁶ Fe		1.86990-4	5.07622-2		91.75
⁵⁷ Fe		4.32100-6	1.17290-3		2.12
⁵⁸ Fe		5.07600-7	1.54900-4		0.28
⁵⁸ Ni			6.62295-3	6.61220-3	
⁶⁰ Ni			2.55073-3	2.54659-3	
⁶¹ Ni			1.10900-4	1.10721-4	
⁶² Ni			3.53130-4	3.52560-4	
⁶⁴ Ni			9.04600-5	9.03250-5	
⁶³ Cu		9.08133-5		2.82034-3	
⁶⁵ Cu		4.04767-5		1.25706-3	
Zr				7.95280-4	
¹⁸² W				1.36998-2	
¹⁸³ W				7.36713-3	
¹⁸⁴ W				1.57708-2	
¹⁸⁶ W				1.46303-2	
²⁰⁶ Pb	8.37420-3 ^b				
²⁰⁷ Pb	7.25764-3				
²⁰⁸ Pb	1.72082-2				

^a Composition by atom percent. The density used was 7.86 g/cm³.

^b Read as 8.37420×10^{-3} . The atom density includes that for ²⁰⁴Pb for which no cross sections are available.

Table 5. k_{eff} Values for Plutonium Spheres

Sphere	Radius (cm)	k_{eff}	Standard Deviation
Bare	6.32	0.98902	0.00057
Bare	6.35	0.99319	0.00059
Bare	6.3849 ^a	0.99699	0.00058
Tungsten Reflected	5.0419 ^a	1.01053	0.00065
Water Reflected	4.1217 ^a	0.99830	0.00075

^a Specified critical radii.

Table 6. Radii Used for Target Spheres.

Sphere	Critical Radius (cm)	Reflector Radius (cm)	Radius Used (cm)	Reflector Radius Used (cm)
Bare	6.3849	6.3849	6.32	6.32
Tungsten-Reflected	5.0419	9.7409	4.9910	9.69
Water-Reflected	4.1217	29.5217	4.0801	29.4801

Table 7. Neutron Dose Factors^a from the VELM61 Cross-Section Library.

Group	Avg. Energy ^b	Dose Factor	Group	Avg. Energy ^b	Dose Factor
1	2.07002-7 ^c	3.70370-3	32	1.36365-1	2.86610-2
2	7.69672-7	4.37060-3	33	1.66556-1	3.43150-2
3	1.75386-6	4.52500-3	34	2.03432-1	4.10860-2
4	3.71293-6	4.57410-3	35	2.48472-1	4.92110-2
5	7.86024-6	4.55830-3	36	2.83877-1	5.56070-2
6	1.66401-5	4.48970-3	37	2.95864-1	5.77300-2
7	3.52273-5	4.38170-3	38	2.97851-1	5.80800-2
8	7.45761-5	4.24920-3	39	3.00232-1	5.84980-2
9	1.34159-4	4.12890-3	40	3.44858-1	6.59980-2
10	2.21191-4	4.03110-3	41	4.42806-1	8.26560-2
11	3.64682-4	3.93550-3	42	5.10634-1	9.04890-2
12	6.01258-4	3.84530-3	43	5.65749-1	9.54810-2
13	9.91309-4	3.76290-3	44	6.75418-1	1.05360-1
14	1.63439-3	3.69080-3	45	8.24957-1	1.17860-1
15	2.14167-3	3.65280-3	46	1.00760+0	1.29670-1
16	2.43063-3	3.63870-3	47	1.23069+0	1.30100-1
17	2.82399-3	3.62290-3	48	1.50317+0	1.28650-1
18	3.37141-3	3.60620-3	49	1.83598+0	1.27220-1
19	4.61914-3	3.58250-3	50	2.12513+0	1.26160-1
20	7.32483-3	3.55850-3	51	2.28850+0	1.25620-1
21	1.20766-2	4.08750-3	52	2.40583+0	1.25270-1
22	1.93065-2	5.89750-3	53	2.73896+0	1.28500-1
23	2.41830-2	7.13870-3	54	3.34537+0	1.36960-1
24	2.54229-2	7.42410-3	55	4.08604+0	1.45980-1
25	2.65293-2	7.67700-3	56	4.99070+0	1.54120-1
26	2.77506-2	7.95180-3	57	6.09565+0	1.51160-1
27	3.14039-2	8.74210-3	58	7.44525+0	1.47220-1
28	4.33909-2	1.11490-2	59	9.09365+0	1.47060-1
29	5.45187-2	1.35030-2	60	1.11070+1	1.63200-1
30	7.15396-2	1.65080-2	61	1.35661+1	2.00340-1
31	1.04645-1	2.25270-2			

^a mrem/h per unit flux.

^b MeV.

^c Read as 2.07002×10^{-7} .

Table 8. Photon Dose Factors^a from the VELM61 Cross-Section Library.

Group	Avg. Energy ^b	Dose Factor	Group	Avg. Energy ^a	Dose Factor
1	1.50000-2 ^c	2.14390-3	13	1.75000+0	2.92700-3
2	3.25000-2	5.77600-4	14	2.25000+0	3.46860-3
3	5.75000-2	2.71850-4	15	2.75000+0	3.95960-3
4	8.50000-2	2.68170-4	16	3.50000+0	4.62210-3
5	1.25000-1	3.27670-4	17	4.50000+0	5.41370-3
6	2.25000-1	5.66760-4	18	5.50000+0	6.19090-3
7	3.50000-1	8.75940-4	19	6.50000+0	6.92650-3
8	4.55000-1	1.08450-3	20	7.25000+0	7.47830-3
9	5.55000-1	1.27970-3	21	7.75000+0	7.84680-3
10	6.50000-1	1.44170-3	22	9.00000+0	8.77160-3
11	8.50000-1	1.75630-3	23	1.20000+1	1.10200-2
12	1.25000+0	2.31560-3			

^a mrem/h per unit flux.

^b MeV.

^c Read as 1.50000×10^{-2} .

Table 9. Comparison of Target Dose Rates with Background Dose Rates for a 6.32-cm-Radius Bare Pu Sphere.

Detector ^a	Neutron Dose Rate (mrem/h)			Photon Dose Rate (mrem/h)		
	Background	With Target	Ratio ^b	Background	With Target	Ratio ^b
1	8.5821+4 (.0177) ^c	6.1555+5 (.261)	7.17	1.0877+1 (.208)	3.2786+3 (.276)	301.
2	7.5584+4 (.0189)	5.4393+5 (.293)	7.20	8.3045+0 (.210)	3.3571+3 (.306)	404.
3	5.6137+4 (.0981)	5.7529+5 (.267)	10.2	2.7385+0 (.708)	3.1099+3 (.267)	1136.
4	5.9108+4 (.0954)	5.7128+5 (.269)	9.67	2.6507+0 (.499)	3.5566+3 (.291)	1342.

^a These are 10-cm × 10-cm surface detectors located 10 cm in front of (detector 1), behind (detector 2), to the side of (detector 3) and above (detector 4) the target.

^b Dose rate with target to dose rate without target (background).

^c Read as 8.5821×10^4 with a fractional standard deviation of 0.0177.

Table 10. Comparison of Target Dose Rates with Background Dose Rates for a Bare Pu Sphere (r=6.35 cm).

Detector ^a	Neutron Dose Rate (mrem/h)			Photon Dose Rate (mrem/h)		
	Background	With Target	Ratio ^b	Background	With Target	Ratio ^b
1	8.5821+4 (.0177) ^c	1.0163+6 (.0517)	11.8	1.0877+1 (.208)	5.8412+3 (.0560)	537.0
2	7.5584+4 (.0189)	9.2495+5 (.0572)	12.2	8.3045+0 (.210)	5.7662+3 (.0646)	694.3
3	5.6137+4 (.0981)	1.0037+6 (.0526)	17.9	2.7385+0 (.708)	5.7923+3 (.0597)	2115.

^a For background, these are 10-cm × 10-cm surface detectors located 10 cm in front of (detector 1), behind (detector 2), and to the side of (detector 3). Dose rates with the target present were obtained using point detectors at the center of the 10-cm × 10-cm surface detectors.

^b Dose rate with target to dose rate without target (background).

^c Read as 8.5821×10^4 with a fractional standard deviation of 0.0177.

Table 11. Comparison of Target Dose Rates with Background Dose Rates for a Bare Pu Sphere (r=6.38 cm).

Detector ^a	Neutron Dose Rate (mrem/h)			Photon Dose Rate (mrem/h)		
	Background	With Target	Ratio ^b	Background	With Target	Ratio ^b
1	8.5821+4 (.0177) ^c	2.2441+6 (.405)	26.1	1.0877+1 (.208)	1.3301+4 (.419)	1223.
2	7.5584+4 (.0189)	2.1332+6 (.415)	28.2	8.3045+0 (.210)	1.3372+4 (.419)	1610.
3	5.6137+4 (.0981)	2.1870+6 (.404)	39.0	2.7385+0 (.708)	1.3023+4 (.413)	4756.
4	5.9108+4 (.0954)	2.2000+6 (.412)	37.2	2.6507+0 (.499)	1.3426+4 (.420)	5065.

^a These are 10-cm × 10-cm surface detectors located 10 cm in front of (detector 1), behind (detector 2), to the side of (detector 3) and above (detector 4) the target.

^b Dose rate with target to dose rate without target (background).

^c Read as 8.5821×10^4 with a fractional standard deviation of 0.0177.

Table 12. Comparison of Target Dose Rates with Background Dose Rates for a Tungsten-Reflected Pu Sphere.

Detector ^a	Neutron Dose Rate (mrem/h)			Photon Dose Rate (mrem/h)		
	Background	With Target	Ratio ^b	Background	With Target	Ratio ^b
1	8.9557+4 (.0173) ^c	5.3636+5 (.414)	5.99	1.0864+1 (.207)	1.0560+3 (.464)	97.2
2	7.2801+4 (.0192)	4.4615+5 (.497)	6.13	7.8226+0 (.209)	9.2852+2 (.500)	118.7
3	7.9935+4 (.0822)	5.1176+5 (.436)	6.40	0.0	9.8202+2 (.445)	-
4	8.0522+4 (.0817)	5.2799+5 (.418)	6.56	3.3315+0 (.648)	9.3721+2 (.480)	281.3

^a These are 10-cm × 10-cm surface detectors located 15 cm in front of (detector 1), behind (detector 2), to the side of (detector 3) and above (detector 4) the target.

^b Dose rate with target to dose rate without target (background).

^c Read as 8.9557×10^4 with a fractional standard deviation of 0.0173.

Table 13. Comparison of Target Dose Rates with Background Dose Rates for a Water-Reflected Pu Sphere.

Detector ^a	Neutron Dose Rate (mrem/h)			Photon Dose Rate (mrem/h)		
	Background	With Target	Ratio ^b	Background	With Target	Ratio ^b
1	1.0371+5 (.0081) ^c	1.0962+5 (.0178)	1.057	1.3880+1 (.102)	5.0402+2 (.0898)	36.3
2	6.3409+4 (.0103)	8.3543+2 (.137)	0.0132	8.6057+0 (.134)	2.2645+2 (.178)	26.3
3	1.1727+3 (.185)	2.8291+3 (.172)	2.412	1.3205+1 (.309)	3.0421+2 (.135)	23.0
4	3.1183+4 (.0428)	4.3438+4 (.0790)	1.393	1.1609+1 (.354)	2.9943+2 (.137)	25.8

^a These are 20-cm × 20-cm surface detectors located 35 cm in front of (detector 1), behind (detector 2), to the side of (detector 3) and above (detector 4) the target.

^b Dose rate with target to dose rate without target (background).

^c Read as 1.0371×10^5 with a fractional standard deviation of 0.0081.

Table 14. Changes in the Bare Pu Sphere (r=6.38 cm) Detector Dose Rates with Changes in the Number of Histories.

Detector	Surface Detectors		Point Detectors		
	400,000 histories	16,000,000 histories	400,000 histories	2,000,000 histories	16,000,000 histories
Neutron Dose Rates (mrem/h)					
1	2.2441+6 (.405) ^a	1.5660+6 (.0615)	1.1536+6 (.313)	1.4986+6 (.159)	1.6645+6 (.0639)
2	2.1332+6 (.415)	1.4798+6 (.0651)	1.0834+6 (.333)	1.4133+6 (.169)	1.5770+6 (.0676)
3	2.1870+6 (.404)	1.5308+6 (.0629)	1.1592+6 (.316)	1.4993+6 (.160)	1.6509+6 (.0641)
Photon Dose Rates (mrem/h)					
1	1.3301+4 (.419)	9.2353+3 (.0648)	6.8100+3 (.326)	8.7138+3 (.166)	9.6998+3 (.0662)
2	1.3372+4 (.419)	8.9836+3 (.0661)	6.6875+3 (.333)	8.5810+3 (.171)	9.5791+3 (.0685)
3	1.3023+4 (.413)	9.1137+3 (.0654)	6.6108+3 (.344)	8.7588+3 (.171)	9.6407+3 (.0669)

^a Read as 2.2441×10^6 with a fractional standard deviation of 0.405.

Table 15. Dose Rates Within and Around the PFNA Facility.

Detector	Dose Rates (mrem/h)			
	Max. Down	Horizontal	Max. Up	Average ^a
Neutron				
1	5.58024-1 ^b	4.70220+0	2.39937-1	1.58782+0
2	6.10697-1	5.47704-1	1.25419-1	3.44367-1
3	5.87105+2	1.49350+4	7.00707+1	3.10147+3
4	1.81381+0	3.90125-1	4.05931-1	5.02696-1
5	2.28500+0	8.29166-1	9.49863+0	3.13535+0
6	1.16587+3	7.67914+4	1.63541+2	1.35665+4
7	6.21285+0	4.34500+0	7.28572+0	5.59694+0
8	2.26431-5	4.08722-3	2.34775-4	1.23624-3
9	1.46130-1	5.60654-1	8.76999-2	2.65508-1
10	1.99241-1	2.23255-1	4.66521-1	3.06488-1
Photons				
1	5.56058-2	1.30955+0	9.76129-3	2.91395-1
2	1.62714-1	1.45858-1	2.94213-2	8.88615-2
3	1.25930+1	8.43161+1	2.27785+0	2.56899+1
4	3.56180-2	1.43302-2	2.55025-2	2.01749-2
5	9.11276-2	3.90251-2	5.37723-2	4.90634-2
6	1.70391+1	1.39578+1	5.39429+0	1.02837+1
7	1.83418+0	1.67950+0	2.31934+0	1.93735+0
8	1.14903-2	4.35777-2	1.36479-2	2.54415-2
9	5.30021-2	1.11127-1	7.83837-3	4.67914-2
10	6.01096+0	5.54711+0	6.62591+0	6.01216+0
Total				
1	6.13630-1	6.01175+0	2.49698-1	1.92108+0
2	7.73411-1	6.93562-1	1.54840-1	4.33288-1
3	5.99698+2	1.50193+4	7.23485+1	3.13345+3
4	1.84943+0	4.04455-1	4.31433-1	5.23374-1
5	2.37613+0	8.68191-1	9.55240+0	3.20045+0
6	1.18291+3	7.68054+4	1.68935+2	1.36324+4
7	8.04703+0	6.02450+0	9.60506+0	7.53956+0
8	1.15129-2	4.76649-2	1.38827-2	2.70017-2
9	1.99132-1	6.71781-1	9.55383-2	3.13927-1
10	6.21020+0	5.77037+0	7.09243+0	6.32524+0

^aAveraged by assuming exponential variation of the dose rate with the collimator angle.

^bRead as 5.58024×10^{-1} .

Table 16. Neutron Dose Rates Along the Centerline of the Vehicle Lane of the PFNA Facility.

Detector	Location (cm)	Dose Rates (mrem/h)			
		Maximum Down Source Position	Horizontal Source Position	Maximum Up Source Position	Average ^a
1	-1710.0	1.81381+0 ^b	3.90125-1	4.05931-1	5.02696-1
2	-1524.0	1.45005+0	5.09248-1	6.68034-1	6.47278-1
3	-1371.6	1.84981+0	6.24773-1	7.66245-1	7.79400-1
4	-1219.2	2.51946+0	8.40224-1	1.08589+0	1.07103+0
5	-1066.8	3.58813+0	1.22390+0	1.50473+0	1.52566+0
6	-914.4	5.30024+0	1.83703+0	2.28986+0	2.29555+0
7	-762.0	8.48255+0	3.05426+0	3.77451+0	3.78066+0
8	-609.6	1.48590+1	5.49383+0	6.45836+0	6.64661+0
9	-457.2	2.91353+1	1.06697+1	1.76760+1	1.47716+1
10	-304.8	7.20955+1	3.57631+1	2.99380+1	3.65411+1
11	-152.4	1.77789+2	9.28149+1	5.16757+1	8.22340+1
12	-76.2	3.20803+2	2.13007+2	7.27455+1	1.56846+2
13	-30.5	8.00332+2	1.15811+3	1.36333+2	5.74813+2
14	0.0	1.16687+3	7.67914+4	1.63541+2	1.35672+4
15	30.5	8.00332+2	1.15811+3	1.36333+2	5.74813+2
16	76.2	3.20803+2	2.13007+2	7.27455+1	1.56846+2
17	152.4	1.81242+2	9.43788+1	5.21843+1	8.34781+1
18	304.8	7.28867+1	3.59743+1	3.02640+1	3.68494+1
19	457.2	2.95375+1	1.08823+1	1.77131+1	1.49452+1
20	609.6	1.53587+1	5.56264+0	6.13926+0	6.59906+0
21	762.0	8.95194+0	3.29045+0	3.34407+0	3.78079+0
22	914.4	5.68971+0	2.08403+0	2.12947+0	2.40061+0
23	1066.8	3.93217+0	1.44988+0	1.48254+0	1.66863+0
24	1296.0	2.28500+0	8.29166-1	9.49863+0	3.13535+0

^aAveraged by assuming exponential variation of the dose rate with the collimator angle.

^bRead as 1.81381×10^0 .

Table 17. Photon Dose Rates Along the Centerline of the Vehicle Lane of the PFNA Facility.

Detector	Location (cm)	Dose Rates (mrem/h)			
		Maximum Down Source Position	Horizontal Source Position	Maximum Up Source Position	Average ^a
1	-1710.0	3.56180-2 ^b	1.43302-2	2.55025-2	2.01749-2
2	-1524.0	5.39488-2	2.43626-2	3.71394-2	3.16732-2
3	-1371.6	6.46439-2	2.74815-2	4.31652-2	3.64612-2
4	-1219.2	8.69921-2	3.69437-2	5.14859-2	4.67115-2
5	-1066.8	1.25492-1	4.82811-2	7.10139-2	6.32607-2
6	-914.4	1.84925-1	6.76465-2	1.01122-1	8.98749-2
7	-762.0	2.88393-1	1.07229-1	1.61069-1	1.42392-1
8	-609.6	4.83245-1	1.73985-1	2.32722-1	2.21906-1
9	-457.2	9.01676-1	3.19502-1	4.74318-1	4.25376-1
10	-304.8	2.17521+0	1.12029+0	7.88501-1	1.07254+0
11	-152.4	4.72385+0	2.50499+0	1.38074+0	2.20652+0
12	-76.2	7.33929+0	4.02129+0	2.08345+0	3.45580+0
13	-30.5	1.37813+1	1.08577+1	3.52223+0	7.65442+0
14	0.0	1.70391+1	1.39578+1	5.39429+0	1.02837+1
15	30.5	1.37813+1	1.08577+1	3.52223+0	7.65442+0
16	76.2	7.33929+0	4.02129+0	2.08345+0	3.45580+0
17	152.4	4.76635+0	2.39828+0	1.46280+0	2.20042+0
18	304.8	2.25568+0	1.19457+0	9.42471-1	1.18358+0
19	457.2	9.48638-1	3.53345-1	5.41115-1	4.72722-1
20	609.6	4.94655-1	1.85464-1	2.59925-1	2.39345-1
21	762.0	3.00849-1	1.22278-1	1.61437-1	1.52325-1
22	914.4	2.01295-1	8.19611-2	1.15803-1	1.04825-1
23	1066.8	1.52244-1	5.45651-2	8.09399-2	7.24973-2
24	1296.0	9.11276-2	3.90251-2	5.37723-2	4.90634-2

^aAveraged by assuming exponential variation of the dose rate with the collimator angle.

^bRead as 3.56180×10^{-2} .

Table 18. Total Dose Rates Along the Centerline of the Vehicle Lane of the PFNA Facility.

Detector	Location (cm)	Dose Rates (mrem/h)			
		Maximum Down Source Position	Horizontal Source Position	Maximum Up Source Position	Average ^a
1	-1710.0	1.84943+0 ^b	4.04455-1	4.31433-1	5.23374-1
2	-1524.0	1.50400+0	5.33611-1	7.05173-1	6.79032-1
3	-1371.6	1.91445+0	6.52255-1	8.09410-1	8.16033-1
4	-1219.2	2.60645+0	8.77168-1	1.13738+0	1.11781+0
5	-1066.8	3.71362+0	1.27218+0	1.57574+0	1.58906+0
6	-914.4	5.48517+0	1.90468+0	2.39098+0	2.38561+0
7	-762.0	8.77094+0	3.16149+0	3.93558+0	3.92338+0
8	-609.6	1.53422+1	5.66782+0	6.69108+0	6.86873+0
9	-457.2	3.00370+1	1.09892+1	1.81503+1	1.51973+1
10	-304.8	7.42707+1	3.68834+1	3.07265+1	3.76155+1
11	-152.4	1.82513+2	9.53199+1	5.30564+1	8.44405+1
12	-76.2	3.28142+2	2.17028+2	7.48289+1	1.60339+2
13	-30.5	8.14113+2	1.16897+3	1.39855+2	5.83005+2
14	0.0	1.18391+3	7.68054+4	1.68935+2	1.36331+4
15	30.5	8.14113+2	1.16897+3	1.39855+2	5.83005+2
16	76.2	3.28142+2	2.17028+2	7.48289+1	1.60339+2
17	152.4	1.86008+2	9.67771+1	5.36471+1	8.56797+1
18	304.8	7.51424+1	3.71689+1	3.12065+1	3.80333+1
19	457.2	3.04861+1	1.12356+1	1.82542+1	1.54180+1
20	609.6	1.58534+1	5.74810+0	6.39918+0	6.83923+0
21	762.0	9.25279+0	3.41273+0	3.50551+0	3.93375+0
22	914.4	5.89101+0	2.16599+0	2.24527+0	2.50611+0
23	1066.8	4.08441+0	1.50445+0	1.56348+0	1.74172+0
24	1296.0	2.37613+0	8.68191-1	9.55240+0	3.20045+0

^aAveraged by assuming exponential variation of the dose rate with the collimator angle.

^bRead as 1.84943×10^0 .

Table 19. Dose Rates in Beam Line at Various Distances from the PFNA Truck Lane Centerline.

Detector	Distance ^a from Center of Truck Lane (cm)	Dose Rates (mrem/h)			
		Maximum Down Source Position	Horizontal Source Position	Maximum Up Source Position	Average ^b
Neutrons					
1	-182.88	5.27242+3 ^c	5.38063+5	8.05332+2	8.90556+4
2	-121.92	2.64372+3	2.21584+5	2.96955+2	3.66200+4
3	-60.96	1.57531+3	1.21564+5	2.17530+2	2.08524+4
4	60.96	9.88388+2	5.28997+4	1.31665+2	9.64130+3
5	121.92	9.24120+2	3.86709+4	1.11483+2	7.28932+3
6	182.88	8.85173+2	2.95280+4	9.70457+1	5.74548+3
Photons					
1	-182.88	1.61237+2	2.94997+2	2.00615+1	1.25886+2
2	-121.92	4.49017+1	5.27021+1	1.03627+1	3.05233+1
3	-60.96	2.36999+1	2.33104+1	7.18505+0	1.56441+1
4	60.96	1.48370+1	9.98272+0	4.26452+0	7.81832+0
5	121.92	1.47948+1	8.24923+0	3.49869+0	6.66139+0
6	182.88	1.50075+1	7.79060+0	2.96020+0	6.18388+0
Total					
1	-182.88	5.43366+3	5.38358+5	8.25393+2	8.94882+4
2	-121.92	2.68862+3	2.21637+5	3.07318+2	3.68012+4
3	-60.96	1.59901+3	1.21587+5	2.24715+2	2.09520+4
4	60.96	1.00322+3	5.29097+4	1.35930+2	9.68890+3
5	121.92	9.38915+2	3.86791+4	1.14982+2	7.32594+3
6	182.88	9.00180+2	2.95358+4	1.00006+2	5.77503+3

^aNegative distances are toward the source.

^bAveraged by assuming exponential variation of the dose rate with the collimator angle.

^cRead as 5.27242×10^3 .

Table 20. Neutron Dose Rates at Locations Below the Source Overhead Shield and Slightly Below the Roof.

Detector Coordinates (cm) ^a		Dose Rate (mrem/h)	Fractional Standard Deviation
X ^b	Z ^c		
275.0	374.0	4.5358+4 ^d	0.0076
300.0	374.0	4.4357+4	0.0115
315.0	374.0	4.2029+4	0.0102
332.7	374.0	3.9848+4	0.0106
345.0	374.0	3.8785+4	0.0153
360.0	374.0	3.6839+4	0.0142
375.0	374.0	3.4177+4	0.0111
400.0	374.0	3.2073+4	0.0120
332.7	480.0	3.9278+2	0.0227
350.0	480.0	4.3514+2	0.0178
400.0	480.0	1.0195+3	0.0294
450.0	480.0	7.2460+2	0.0241
485.0	480.0	5.0524+2	0.0189

^aThe Y coordinate of all detector locations is 0 cm (i.e. along the beam line).

^bThe centerline of the truck lane is at X=298.958 cm.

^cThe Z=0 cm location is 125.095 cm (49.25 in.) above the concrete floor. The top of the roof is at Z=484.23 cm or about 5 cm above the detector locations (thus the dose is not attenuated by the roof, the thickness and composition of which was assumed).

^dRead as 4.5358×10^4 .

Table 21. Distribution of the Neutron and Photon Dose Rates Along the Centerline of the Truck Lane and Perpendicular to the Beam for Detectors Inside a Salted Beef Cargo.

Detector Coordinates (cm) ^a		Dose Rate (mrem/h) and f.s.d. ^b	
X	Y	Neutron	Photon
298.958	-200.0	3.748-3 ^c (0.3933)	3.2154-1 (0.1767)
298.958	-100.0	8.445-1 (0.4777)	4.0864+0 (0.0578)
298.958	-50.0	4.532+1 (0.1547)	2.6093+1 (0.0520)
298.958	-25.0	8.956+2 (0.2095)	6.3449+1 (0.0535)
298.958	0.0	1.972+3 (0.1012)	9.4700+1 (0.0548)
298.958	25.0	2.128+3 (0.4463)	6.8711+1 (0.0758)
298.958	50.0	9.320+1 (0.2339)	3.0167+1 (0.1148)
298.958	100.0	1.5366+0 (0.7563)	4.6223+0 (0.1108)
298.958	200.0	3.0223-3 (0.2878)	4.4565-1 (0.3352)
298.958	250.0	5.4126-4 (0.1351)	1.7967-1 (0.4295)

^aDetectors are centered in the cargo at the center of the truck lane about 125 cm above the floor.

^bFractional standard deviations in parentheses.

^cRead as 3.748×10^{-3} with a fractional standard deviation of 0.3933.

Table 22. Compositions (weight percent) of Cargo Materials Irradiated.

Element	Cargo Material				
	Salted Beef ^a	Ball Bearings ^b	Surgical Implant A	Surgical Implant B	16-16-16 Fertilizer
H	10.11				3.81
B			0.01		
C	26.02	0.98	0.35		6.363
N	1.22		0.25		17.247
O	56.54	0.0015			30.915
F	0.0036				
Na	1.76				0.203
Mg	0.0164				
Al	0.0086	0.05	0.3		
Si	0.0273	0.25	1.0		
P	0.157	0.025	0.02		8.167
S		0.015	0.01		
Cl					12.662
K	0.2				13.619
Ca					7.014
Cr		1.5	30.0	27.0	
Mn		0.35	1.0		
Fe		96.1785	0.75		
Co			58.11	68.0	
Ni		0.25	1.0		
Cu		0.3			
Zn					
Mo		0.1	7.0	5.0	
W			0.2		

^aSums to 96.0629%.

^bASTM A295 (52100).

^cCompositions from Material Safety Data Sheets for 19-19-19 fertilizer with N-P-K component fractions scaled by 16/19 and the remaining fraction allocated CaCO₃. Note that the N-P-K percentages are not equal at 16% (the P percentage is about half this value).

Table 23. Compositions (weight percent) of the Structural Materials Irradiated.

Element	Structural Material			
	Concrete	Al 6061-T6	Steel Plate	Havar Foil
H	1.0			
C	0.1		0.08	0.2
N			0.16	
O	52.9			
Na	1.6			
Mg	0.2	1.0		
Al	3.4	96.68		
Si	33.7	0.6	0.75	
P			0.045	
S			0.03	
K	1.3			
Ca	4.4			
Ti		0.15		
Cr		0.2	20.0	19.5
Mn		0.15	2.0	1.6
Fe	1.4	0.7	64.935	19.1
Co				42.0
Ni			12.0	12.7
Cu		0.27		
Zn		0.25		
Mo				2.2
W				2.7

Table 24. ORIGEN Flux Parameters for the PFNA Facility Activation Calculations.

Tables	Thermal-Neutron Flux ($\text{cm}^{-2} \cdot \text{s}^{-1}$)	THERM	RES	FAST
F1-F17, F20, F21, F24, F25, F28, F29 G1-G17, G20, G21, G24, G25, G28, G29	451.24 ^a	0.7171	0.3522	1675.8
F22, F23, F26, F27, F30, F31 G22, G23, G26 G27, G30, G31	3227.31 ^b	0.5089	1.4711	1637.5
F32, F33, G32, G33	2801.82 ^c	0.6192	0.56447	23.505

^aAt centerline of truck lane.

^bInside the collimator 182.88 cm from the centerline of the truck lane.

^cAt inside face of backstop concrete.

$$THERM = \frac{\int_0^{0.5 \text{ eV}} \phi(E) \sqrt{\frac{E_0}{E}} dE}{\phi_{th}}$$

$$RES = \frac{\int_{0.5 \text{ eV}}^{1.0 \text{ MeV}} \phi(E) dE}{\ln\left(\frac{10^6}{0.5}\right) \phi_{th}}$$

$$FAST = \frac{1.45}{\phi_{th}} \int_{1.0 \text{ MeV}}^{\infty} \phi(E) dE$$

$$\phi_{th} = \int_0^{0.5 \text{ eV}} \phi(E) dE$$

PFNA NOTIONAL BUILDING - PLAN VIEW

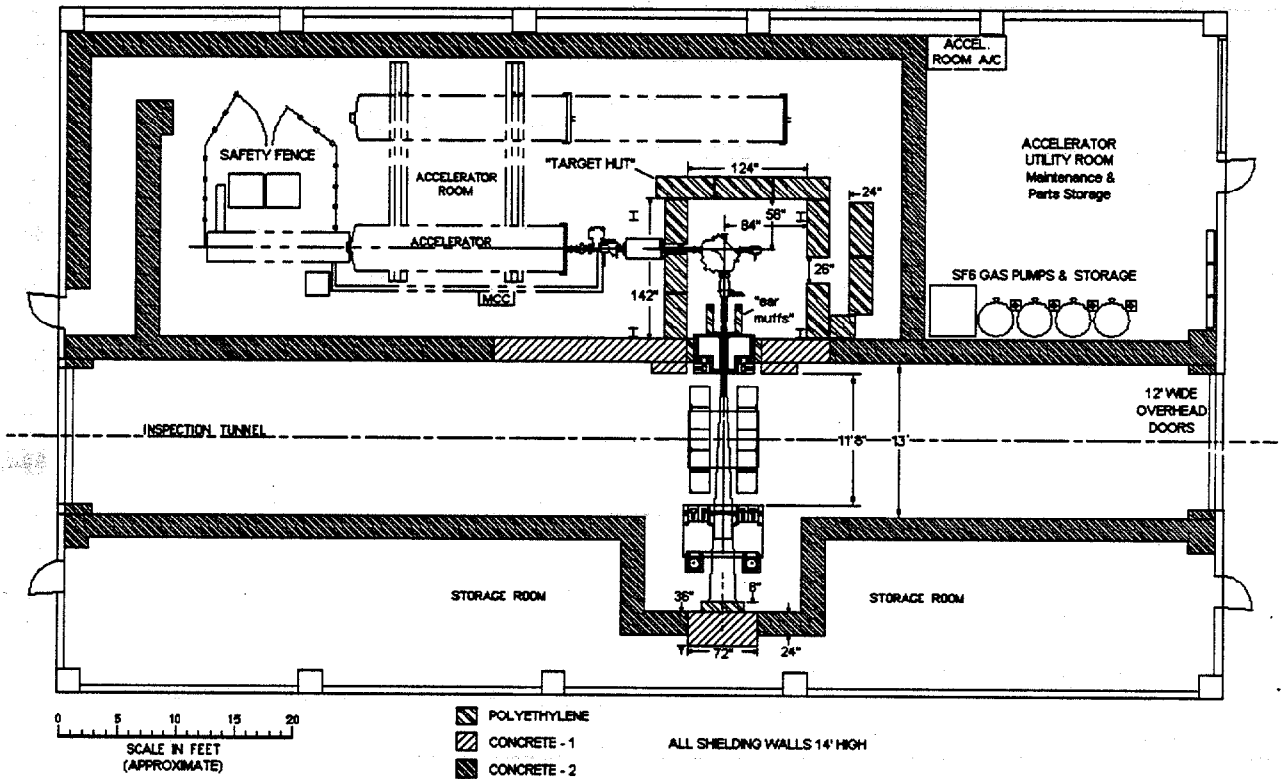


Figure 1. Plan view of the PFNA Facility.

PFNA INSPECTION ZONE
SECTION VIEW AT NEUTRON BEAM

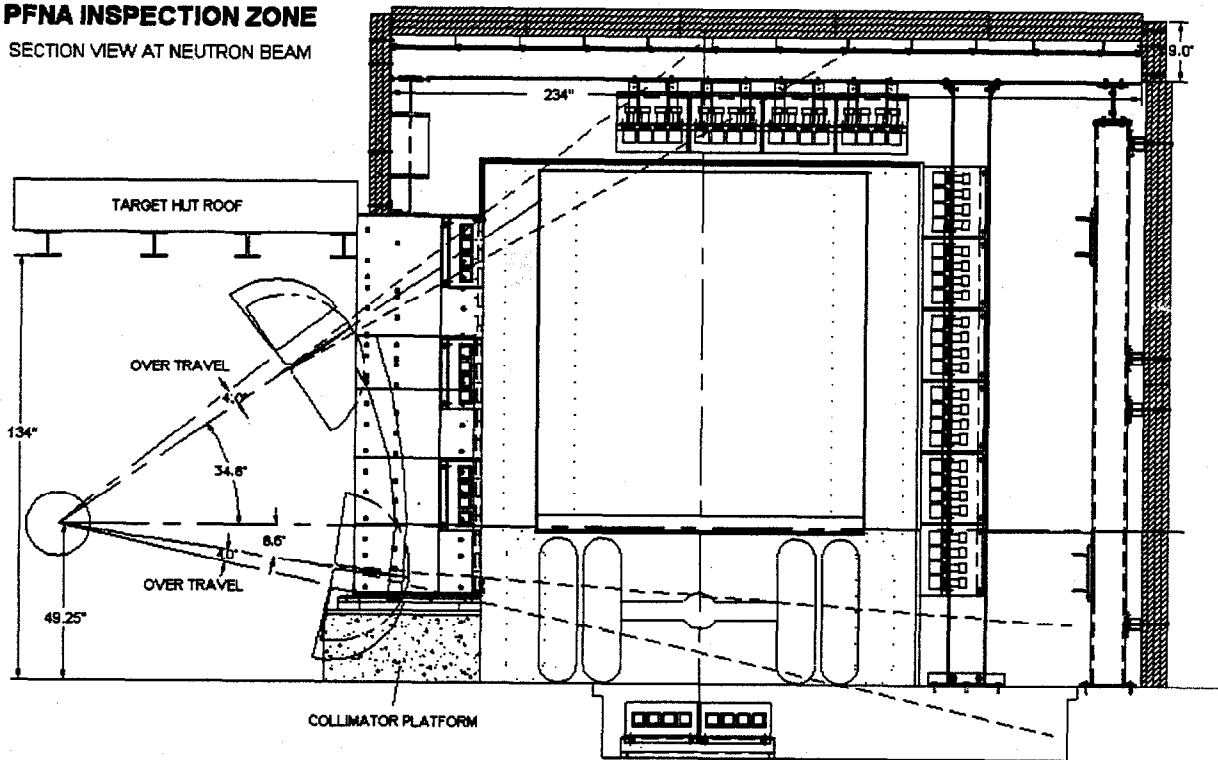


Figure 2. Elevation view of the PFNA Facility at the beam line plane.

**INSPECTION ZONE
TOP SHIELDING
AND BEAM STOP**

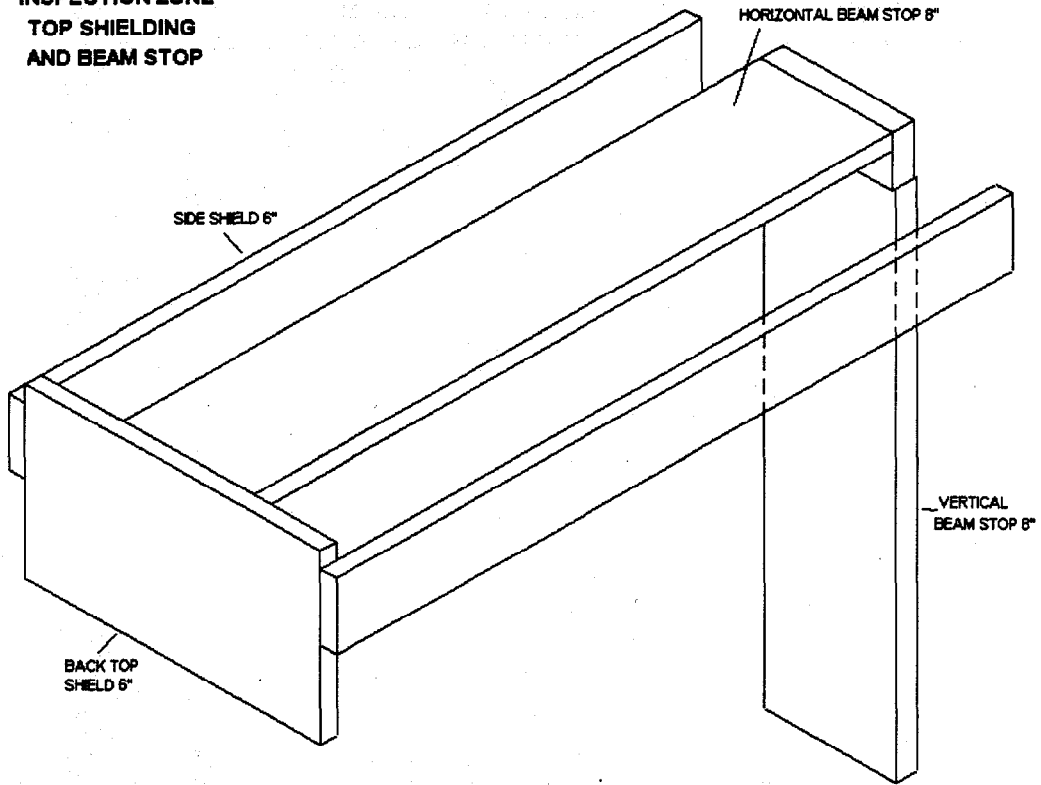


Figure 3. Sketch of the vertical and horizontal polyethylene beam stops.

BEAM STOP DETAIL

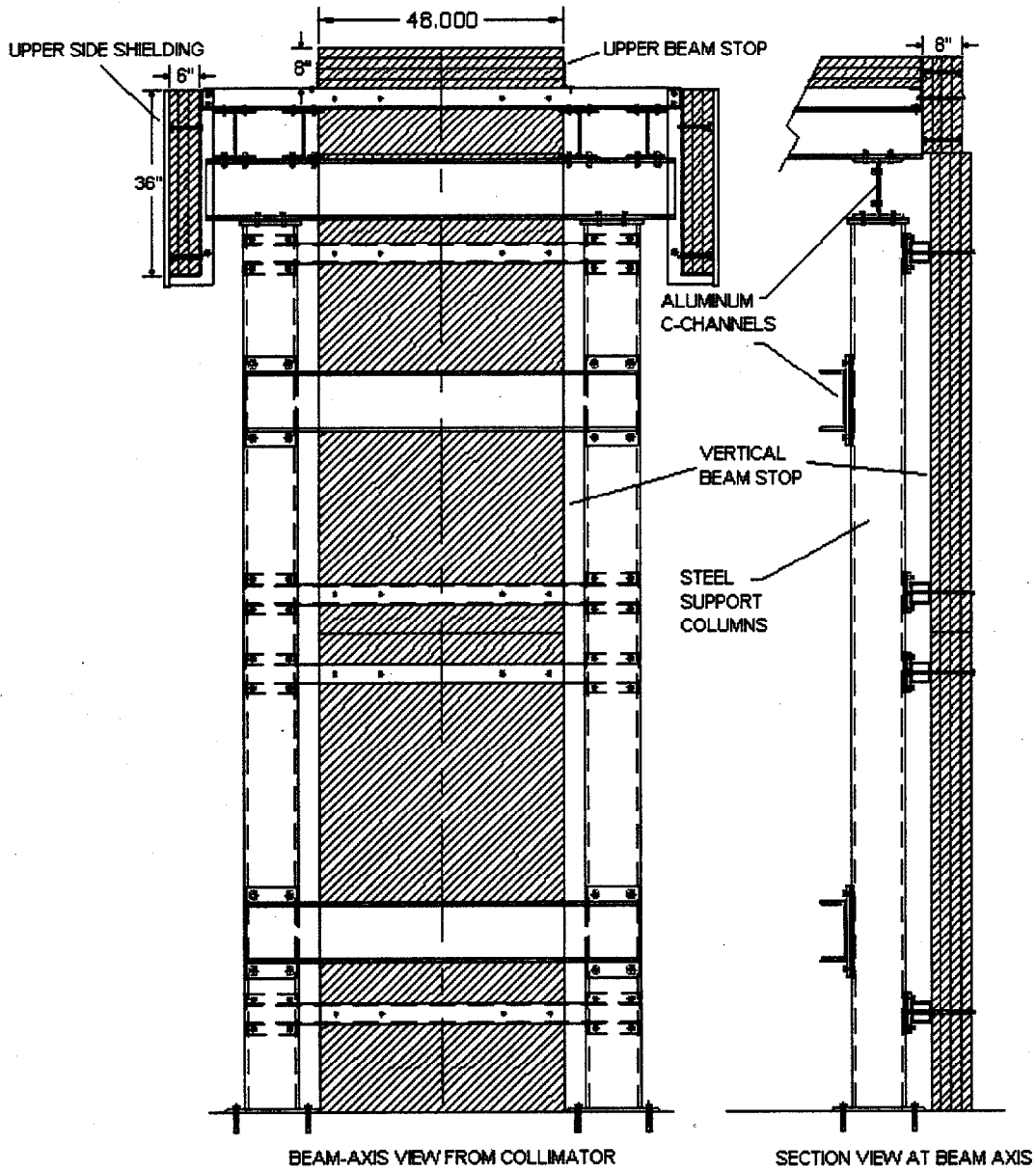


Figure 4. Head-on and side views of the polyethylene beam stop.

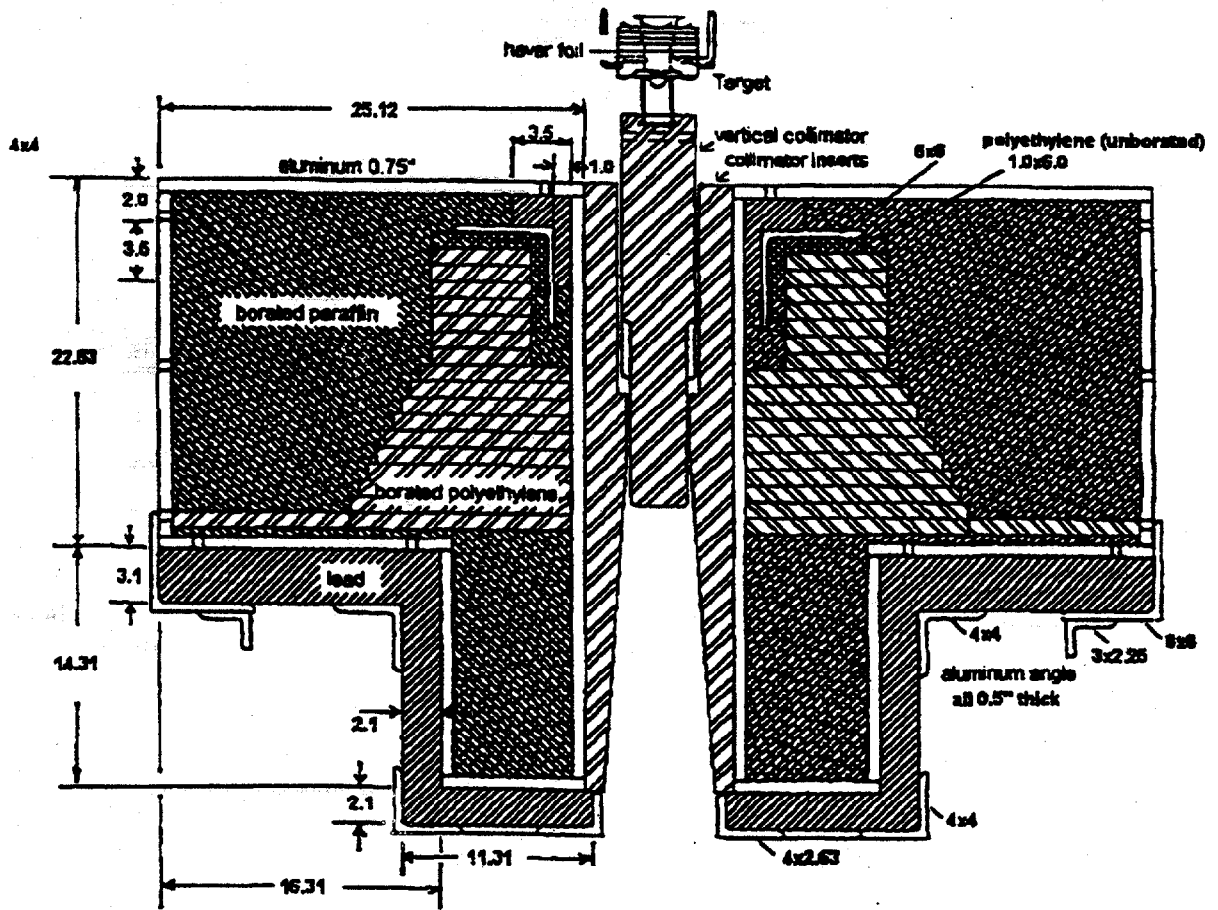


Figure 5. Plan view of the stationary collimator and vertical collimator detailing most exterior dimensions.

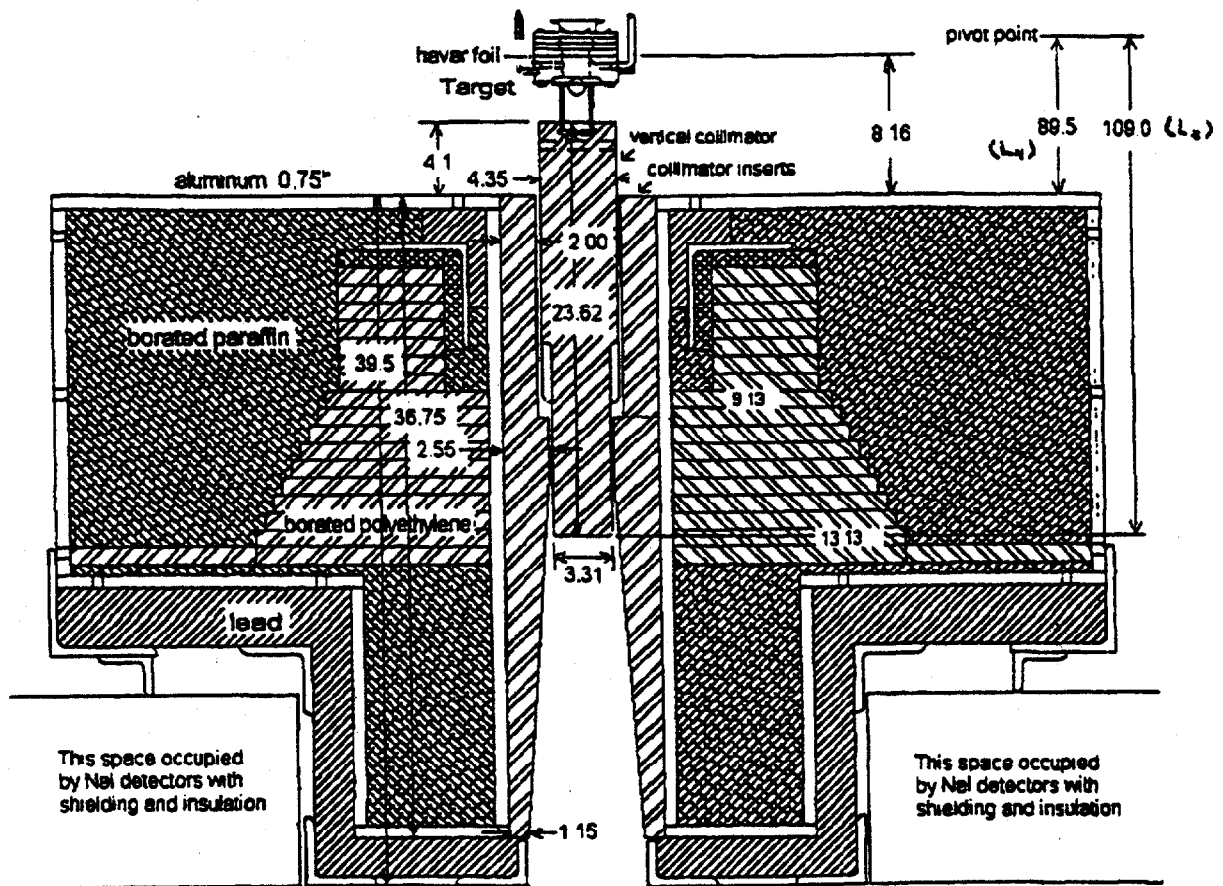


Figure 6. Plan view of the stationary collimator and vertical collimator detailing most interior dimensions.

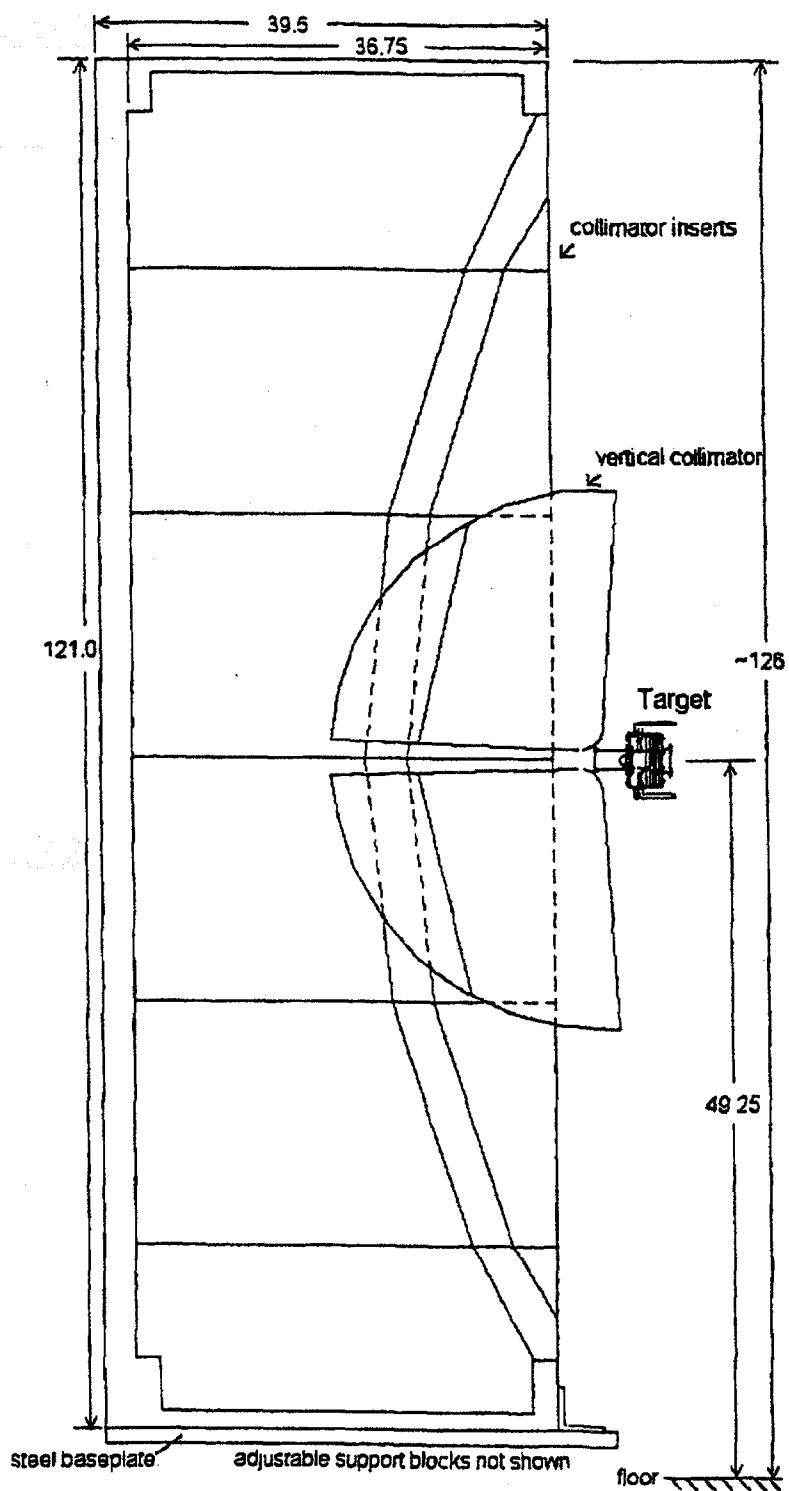


Figure 7. Elevation view of the vertical and stationary collimators with the vertical collimator at its horizontal position.

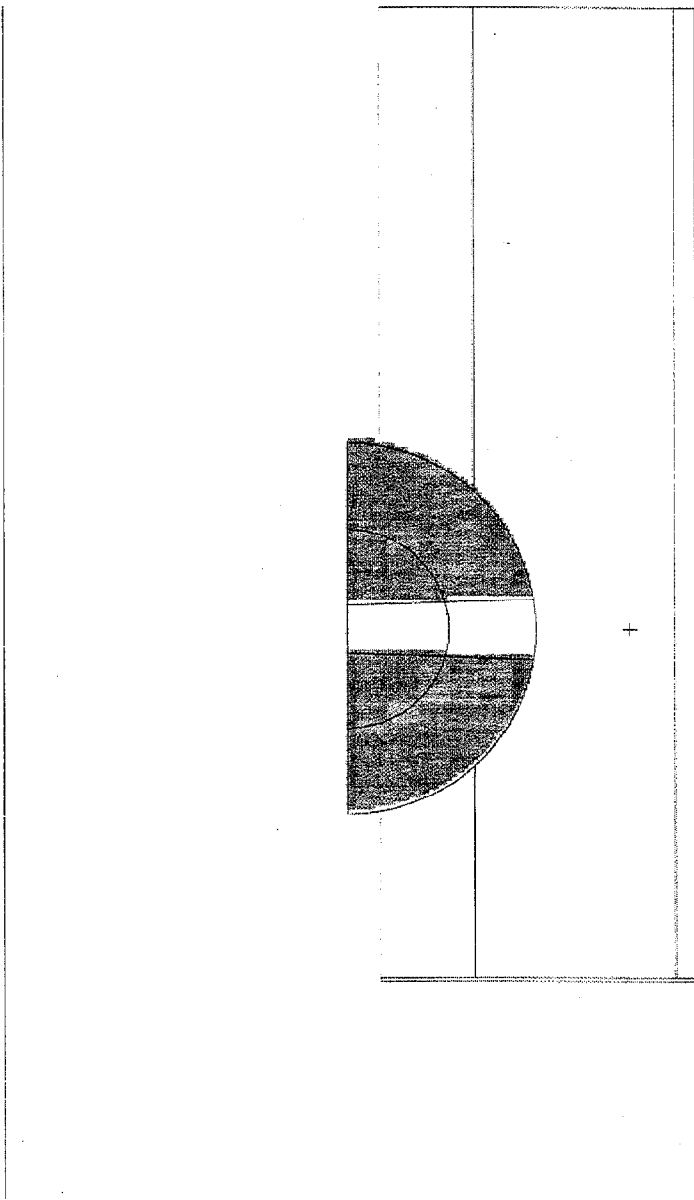


Figure 8. Vertical slice through the collimator and the bare plutonium sphere mockup used in the MCNP-4B calculations of dose multiplication by fissile targets.

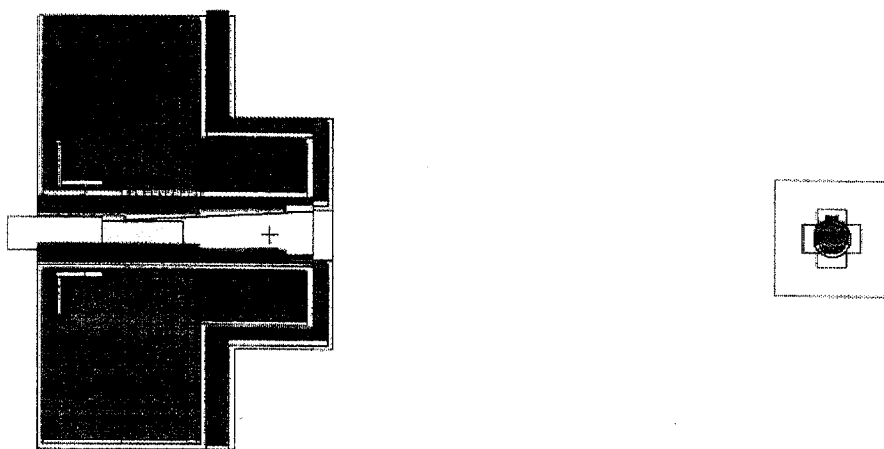


Figure 9. Horizontal slice through the collimator and the bare plutonium sphere mockup used in the MCNP-4B calculations of dose multiplication by fissile targets.

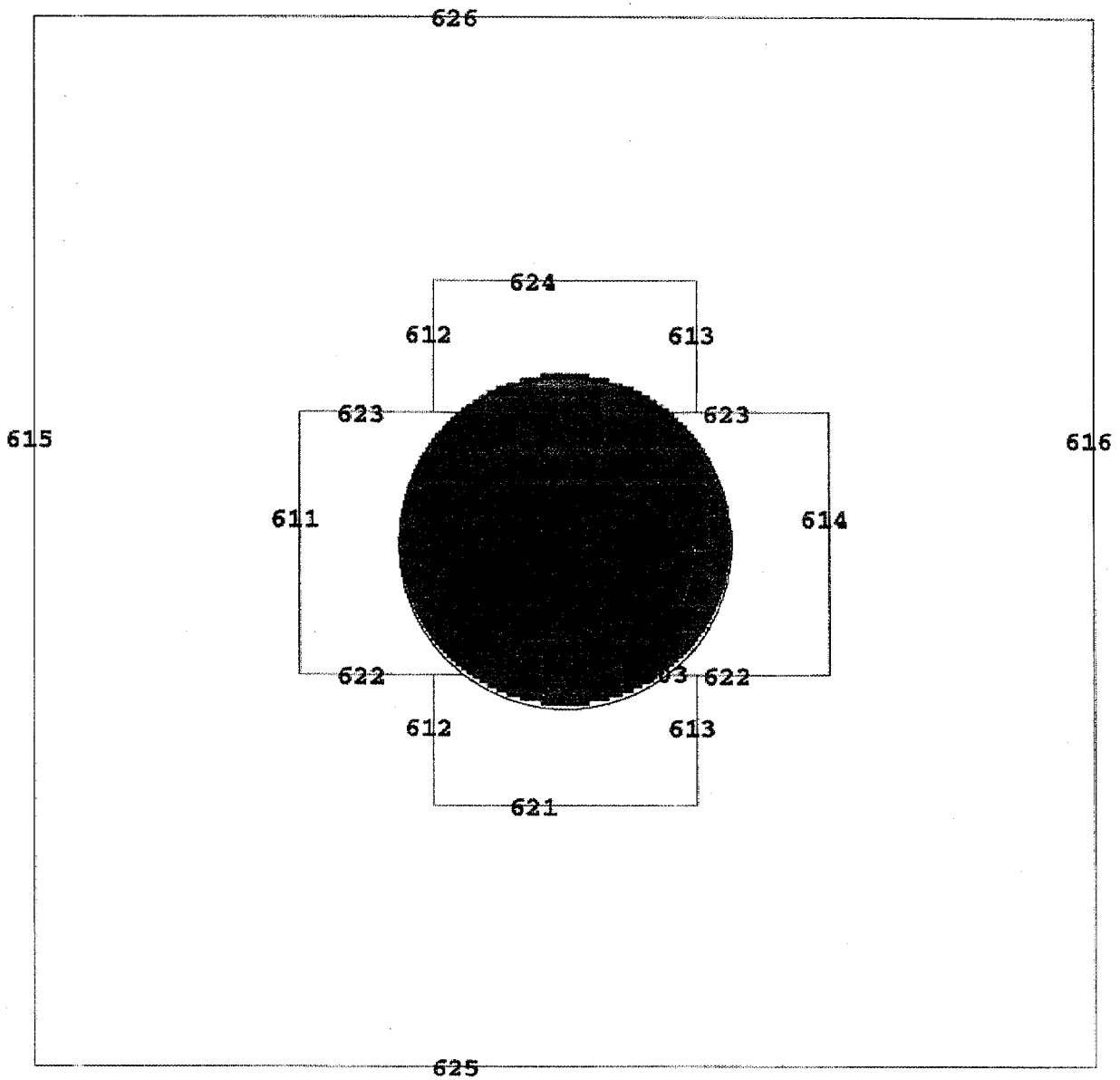


Figure 10. Closeup horizontal slice through the bare plutonium sphere mockup used in the MCNP-4B calculations of dose multiplication by fissile targets. The numbered planes 611, 614, and 624 are three of the surface flux detectors used in the problem. The fourth surface, 634, is above the sphere.

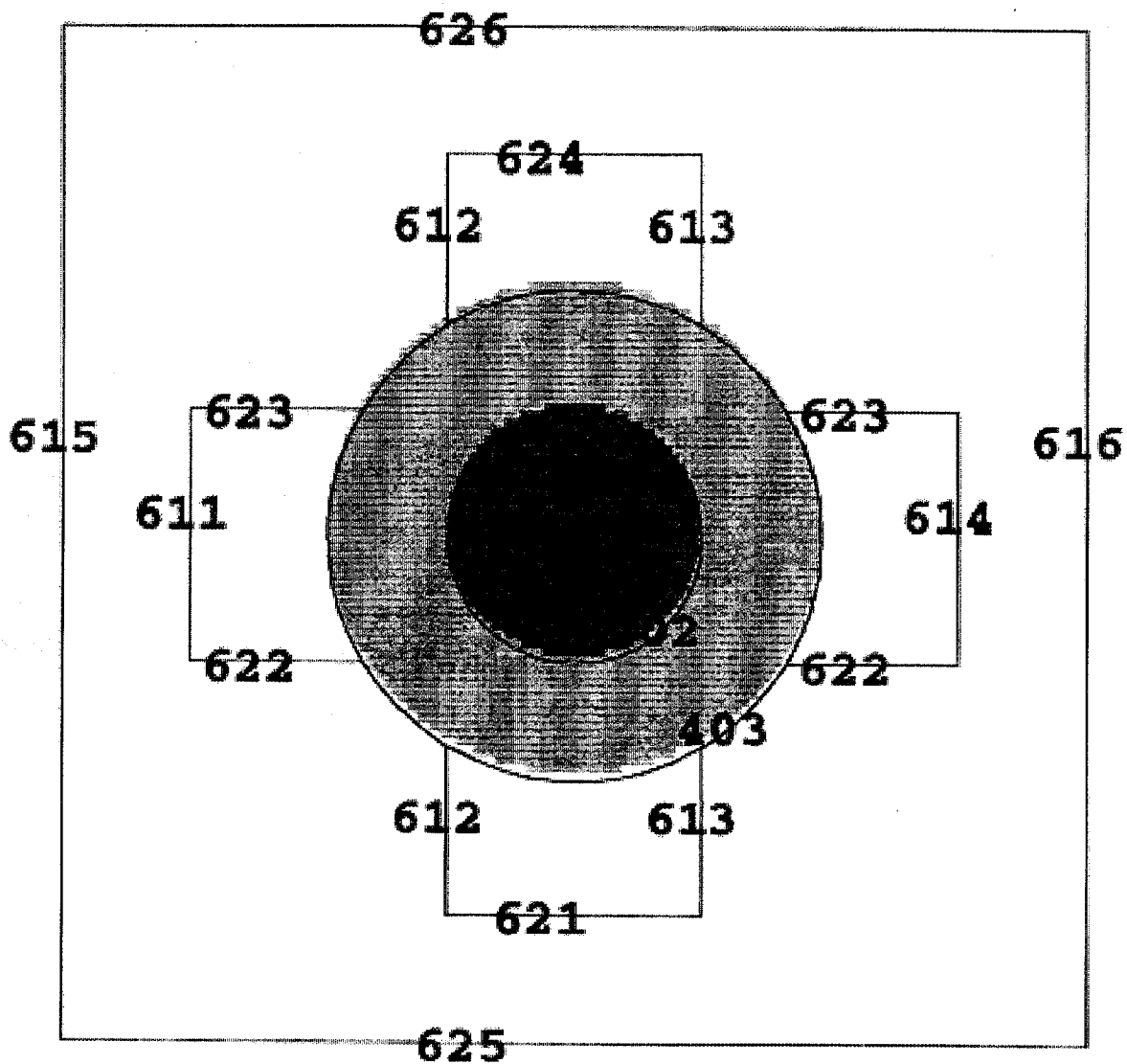


Figure 11. Closeup horizontal slice through the tungsten-reflected plutonium sphere mockup used in the MCNP-4B calculations of dose multiplication by fissile targets. The numbered planes 611, 614, and 624 are three of the surface flux detectors used in the problem. The fourth surface, 634, is above the sphere.

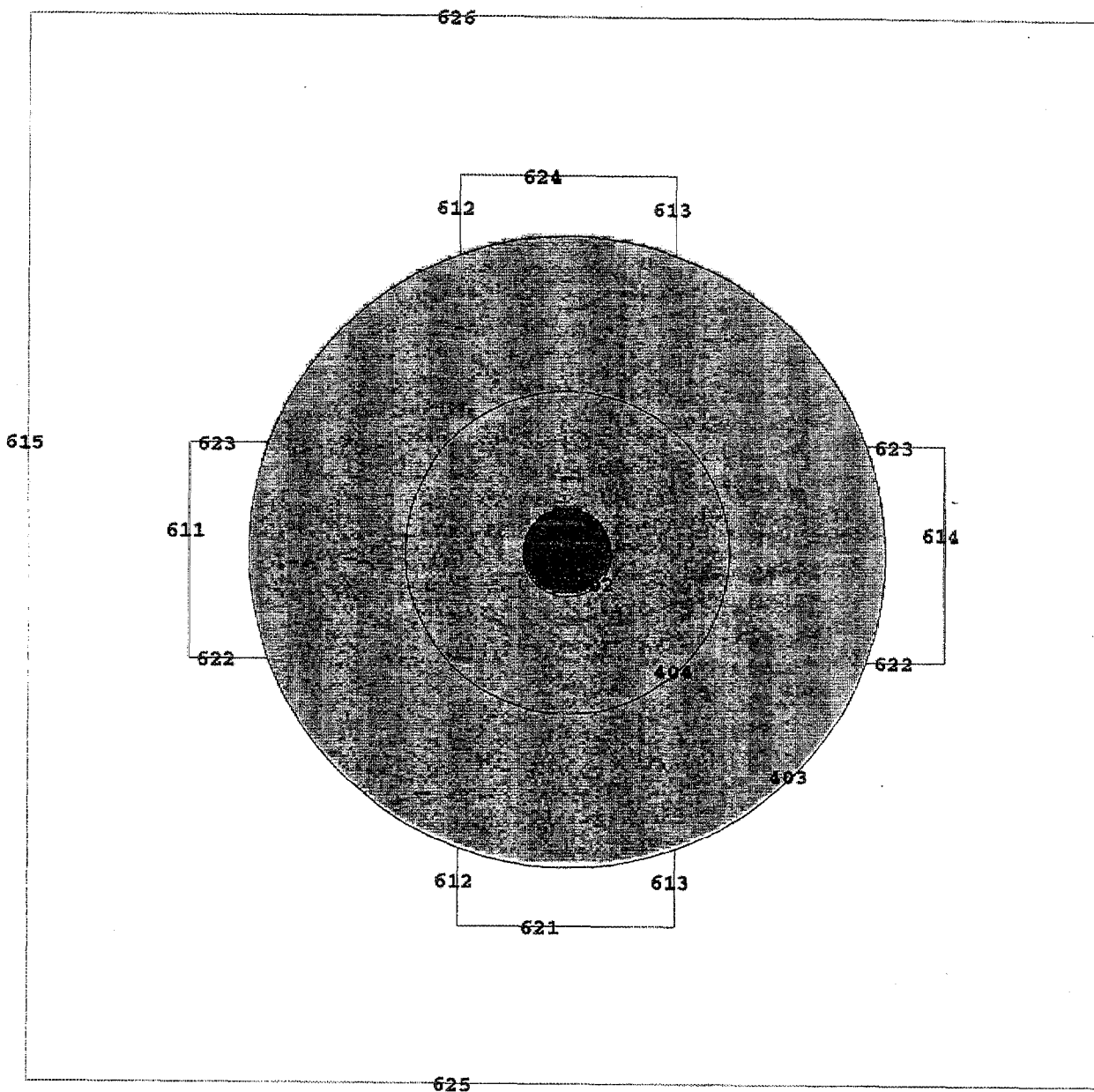


Figure 12. Closeup horizontal slice through the water-reflected plutonium sphere mockup used in the MCNP-4B calculations of dose multiplication by fissile targets. The numbered planes 611, 614, and 624 are three of the surface flux detectors used in the problem. The fourth surface, 634, is above the sphere.

Detectors at z=0.0 or 1.25 m above floor

PFNA NOTIONAL BUILDING - PLAN VIEW

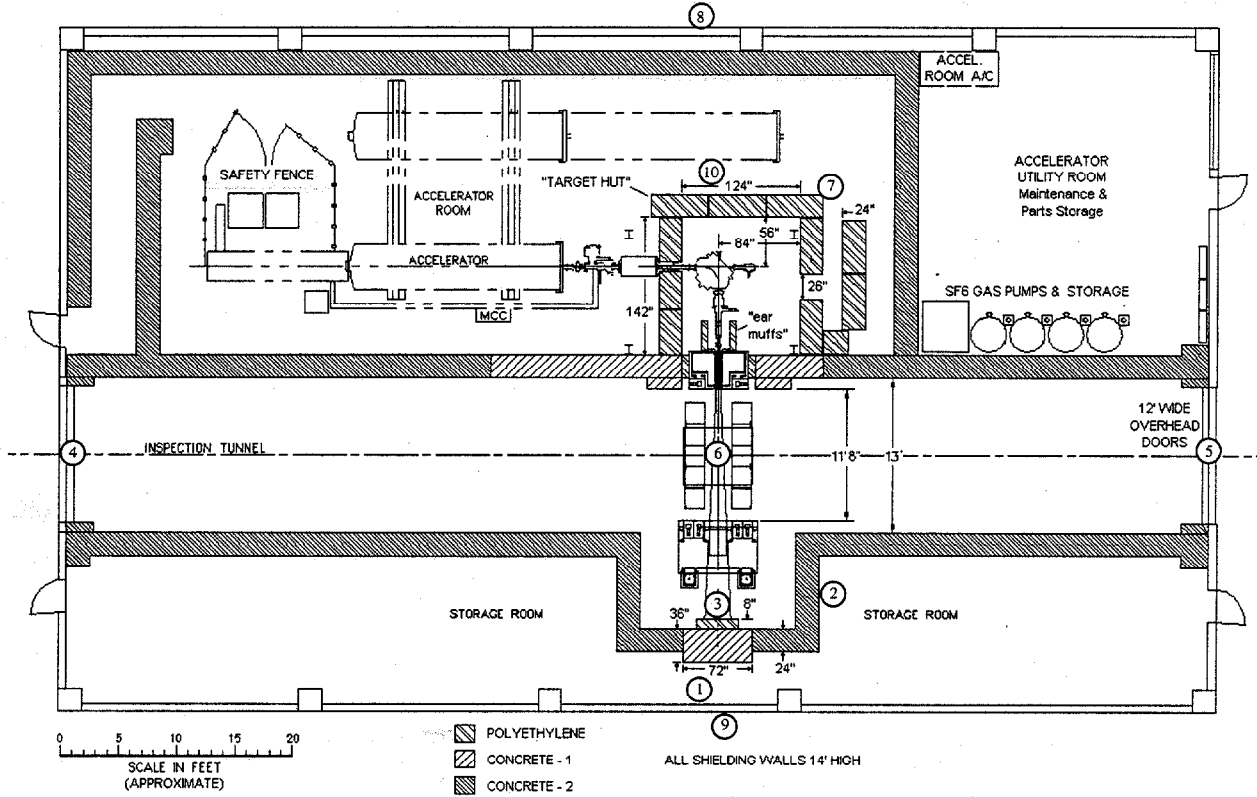
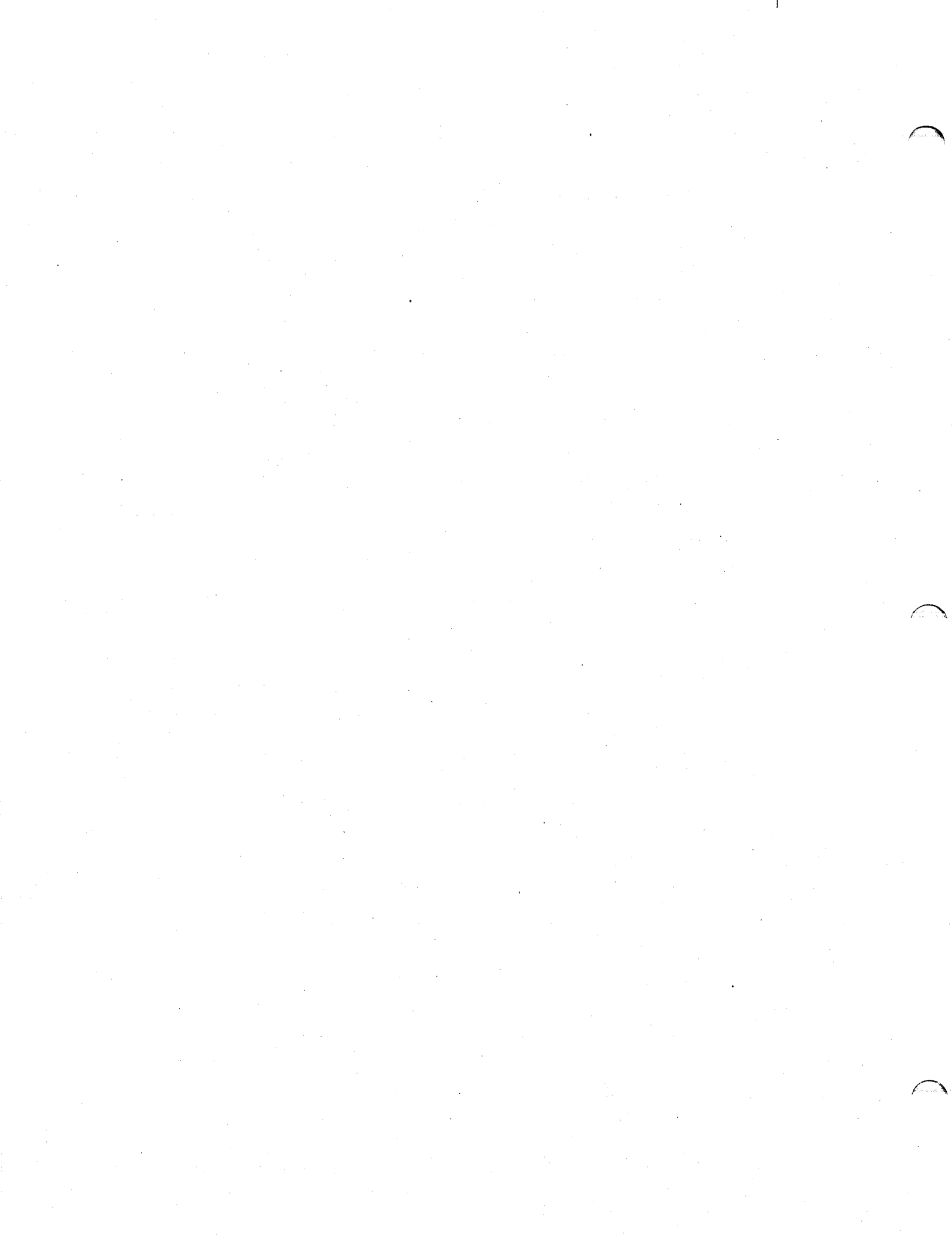
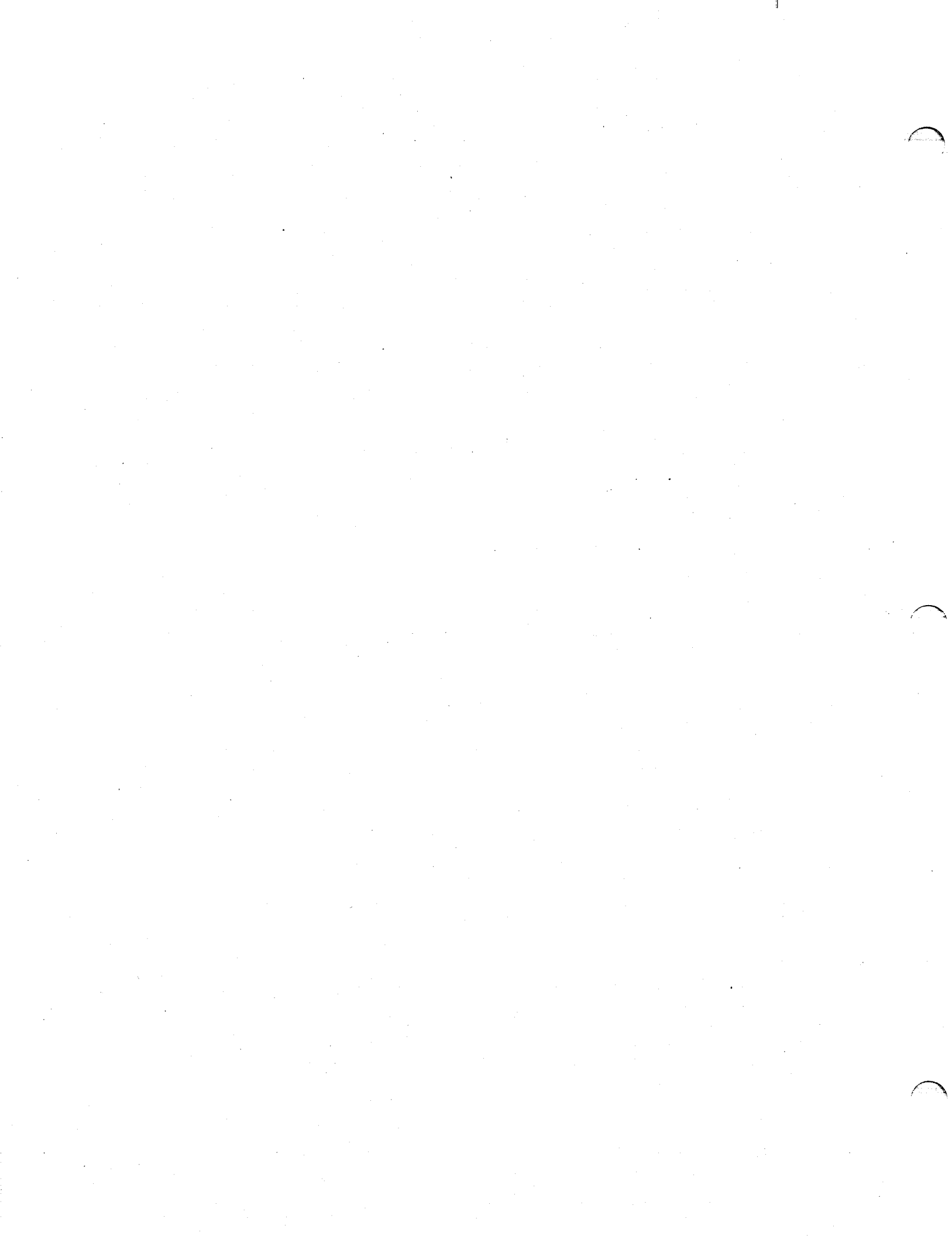


Figure 13. Approximate detector locations for dose rates shown in Table 15.



APPENDIX A

LISTINGS OF INPUT FILES MCNP-X CRITICALITY CALCULATIONS



APPENDIX A

LISTINGS OF INPUT FILES MCNP-X CRITICALITY CALCULATIONS

File for k-eff calculation for a 6.32-cm-radius bare Pu sphere

```
#!/bin/sh
# @ output = /u/sco/pfna/joblog/lpfnmcx1
# @ error = /u/sco/pfna/joblog/lpfnmcx1
# # @ requirements = (Machine == "sp2212")
# @ class = scalar
# # @ startdate = 04/01/00 17:01
# @ notification = error
# @ checkpoint = no
# @ restart = no
# @ wall_clock_limit = unlimited
# @ queue
set -xv
date
hostname
sco=/u/sco/pfna
sco2=/tmp1/sco
sco4=/work1/sco/pfna
mkdir $sco2/xdir$$
cd $sco2/xdir$$
set -
cat > ised1 << 'EOF'
1,$s/^STOP/ STOP/
EOF
cat > ised2 << 'EOF'
1,$s/^/ /
EOF
cat > imcx1 << 'EOF'
message: outp=omcx1 runtpe=rmcx1

k-calculation for bare Pu sphere -- r=6.32 cm
1      0 +1
2      1 4.029014-2 -1

1      so 6.32

mode   n
imp:n   0 1
c       m1=Plutonium (Asum=4.029014-2)
m1      94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
        31000.60c 1.3752-3
kcode   1000 1.0 100 1100 4500 2000
ksrc    0 0 0
print
EOF
set -xv
time mcnp_xnox inp=imcx1
date
ls -l
cp omcx1 q1234
sed -f ised1 q1234 > zprntz
cp $sco/joblog/lpfnmcx1 q1234
sed -f ised2 q1234 > opfnmcx1
cat zprntz >> opfnmcx1
asa opfnmcx1 > npfnmcx1
# hp4pcl npfnmcx1
mv npfnmcx1 $sco/output/npfnmcx1
mv opfnmcx1 $sco/output/opfnmcx1
cd $sco2
rm -rf $sco2/xdir$$
exit
```

File for k-eff calculation for a 6.35-cm-radius bare Pu sphere

```
#!/bin/sh
# @ output = /u/sco/pfna/joblog/lpfnmcx2
# @ error = /u/sco/pfna/joblog/lpfnmcx2
# # @ requirements = (Machine == "sp2212")
# @ class = scalar
# # @ startdate = 04/01/00 17:01
# @ notification = error
# @ checkpoint = no
# @ restart = no
# @ wall_clock_limit = unlimited
# @ queue
set -xv
date
hostname
sco=/u/sco/pfna
sco2=/tmp1/sco
sco4=/work1/sco/pfna
mkdir $sco2/xdir$$
cd $sco2/xdir$$
set -
cat > ised1 << 'EOF'
1,$s/^STOP/ STOP/
EOF
cat > ised2 << 'EOF'
1,$s/^/ /
EOF
cat > imcx2 << 'EOF'
message: outp=omcx2 runtpe=rmcx2

k-calculation for bare Pu sphere -- r=6.35
1      0 +1
2      1 4.029014-2 -1

1      so 6.35

mode    n
imp:n   0 1
c       m1=Plutonium (Asum=4.029014-2)
m1      94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
        31000.60c 1.3752-3
kcode   1000 1.0 100 1100 4500 2000
ksrc    0 0 0
print
EOF
set -xv
time mcnp_xnox inp=imcx2
date
ls -l
cp omcx2 q1234
sed -f ised1 q1234 > zprntz
cp $sco/joblog/lpfnmcx2 q1234
sed -f ised2 q1234 > opfnmcx2
cat zprntz >> opfnmcx2
asa opfnmcx2 > npfnmcx2
# hp4pcl npfnmcx2
mv npfnmcx2 $sco/output/npfnmcx2
mv opfnmcx2 $sco/output/opfnmcx2
cd $sco
rm -rf $sco2/xdir$$
exit
```

File for k-eff calculation for a 6.3849-cm-radius critical bare Pu sphere

```
#!/bin/sh
# @ output = /u/sco/pfna/joblog/lpfnmcx3
# @ error = /u/sco/pfna/joblog/lpfnmcx3
# # @ requirements = (Machine == "sp2212")
# @ class = scalar
# # @ startdate = 04/01/00 17:01
# @ notification = error
# @ checkpoint = no
# @ restart = no
# @ wall_clock_limit = unlimited
# @ queue
set -xv
date
hostname
sco=/u/sco/pfna
sco2=/tmp1/sco
sco4=/work1/sco/pfna
mkdir $sco2/xdir$$
cd $sco2/xdir$$
set -
cat > ised1 << 'EOF'
1,$s/^STOP/ STOP/
EOF
cat > ised2 << 'EOF'
1,$s/^/ /
EOF
cat > imcx3 << 'EOF'
message: outp=omcx3 runtpe=rmcx3

k-calculation for bare Pu sphere -- r=6.3849
1      0 +1
2      1 4.029014-2 -1

1      so 6.3849

mode   n
imp:n  0 1
c      m1=Plutonium (Asum=4.029014-2)
m1     94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
       31000.60c 1.3752-3
kcode  1000 1.0 100 1100 4500 2000
ksrc   0 0 0
print
EOF
set -xv
time mcnp_xnox inp=imcx3
date
ls -l
cp omcx3 q1234
sed -f ised1 q1234 > zprntz
cp $sco/joblog/lpfnmcx3 q1234
sed -f ised2 q1234 > opfnmcx3
cat zprntz >> opfnmcx3
asa opfnmcx3 > npfnmcx3
# hp4pcl npfnmcx3
mv npfnmcx3 $sco/output/npfnmcx3
mv opfnmcx3 $sco/output/opfnmcx3
cd $sco
rm -rf $sco2/xdir$$
exit
```

File for k-eff calculation for a tungsten-reflected critical Pu sphere

```
#!/bin/sh
# @ output = /u/sco/pfna/joblog/lpfnmcx4
# @ error = /u/sco/pfna/joblog/lpfnmcx4
# # @ requirements = (Machine == "sp2212")
# @ class = scalar
# # @ startdate = 04/01/00 17:01
# @ notification = error
# @ checkpoint = no
# @ restart = no
# @ wall_clock_limit = unlimited
# @ queue
set -xv
date
hostname
sco=/u/sco/pfna
sco2=/tmp/sco
sco4=/work1/sco/pfna
mkdir $sco2/xdir$$
cd $sco2/xdir$$
set -
cat > ised1 << 'EOF'
1,$s/^STOP/ STOP/
EOF
cat > ised2 << 'EOF'
1,$s/^/ /
EOF
cat > imcx4 << 'EOF'
message: outp=omcx4 runtpe=rmcx4

k-calculation for W-reflected Pu sphere -- r=5.0419/9.7409
1      0 +2
2      1 4.070346-2 -1
3      2 6.605306-2 -2 +1

1      so 5.0419
2      so 9.7409

mode   n
imp:n   0 1 1
c      m1=Plutonium (Asum=4.070346-2)
m1     94239.60c 3.7291-2 94240.60c 1.9277-3 94241.60c 1.2196-4
       31000.60c 1.3628-3
c      m2=Tungsten (Asum=6.605306-2)
m2     28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
       28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
       29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
       74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2

kcode  1000 1.0 100 1100 4500 2000
ksrc   0 0 0
print
EOF
set -xv
time mcnp_xnox inp=imcx4
date
ls -l
cp omcx4 q1234
sed -f ised1 q1234 > zprntz
cp $sco/joblog/lpfnmcx4 q1234
sed -f ised2 q1234 > opfnmcx4
cat zprntz >> opfnmcx4
asa opfnmcx4 > npfnmcx4
# hp4pcl npfnmcx4
mv npfnmcx4 $sco/output/npfnmcx4
mv opfnmcx4 $sco/output/opfnmcx4
cd $sco2
rm -rf $sco2/xdir$$
exit
```

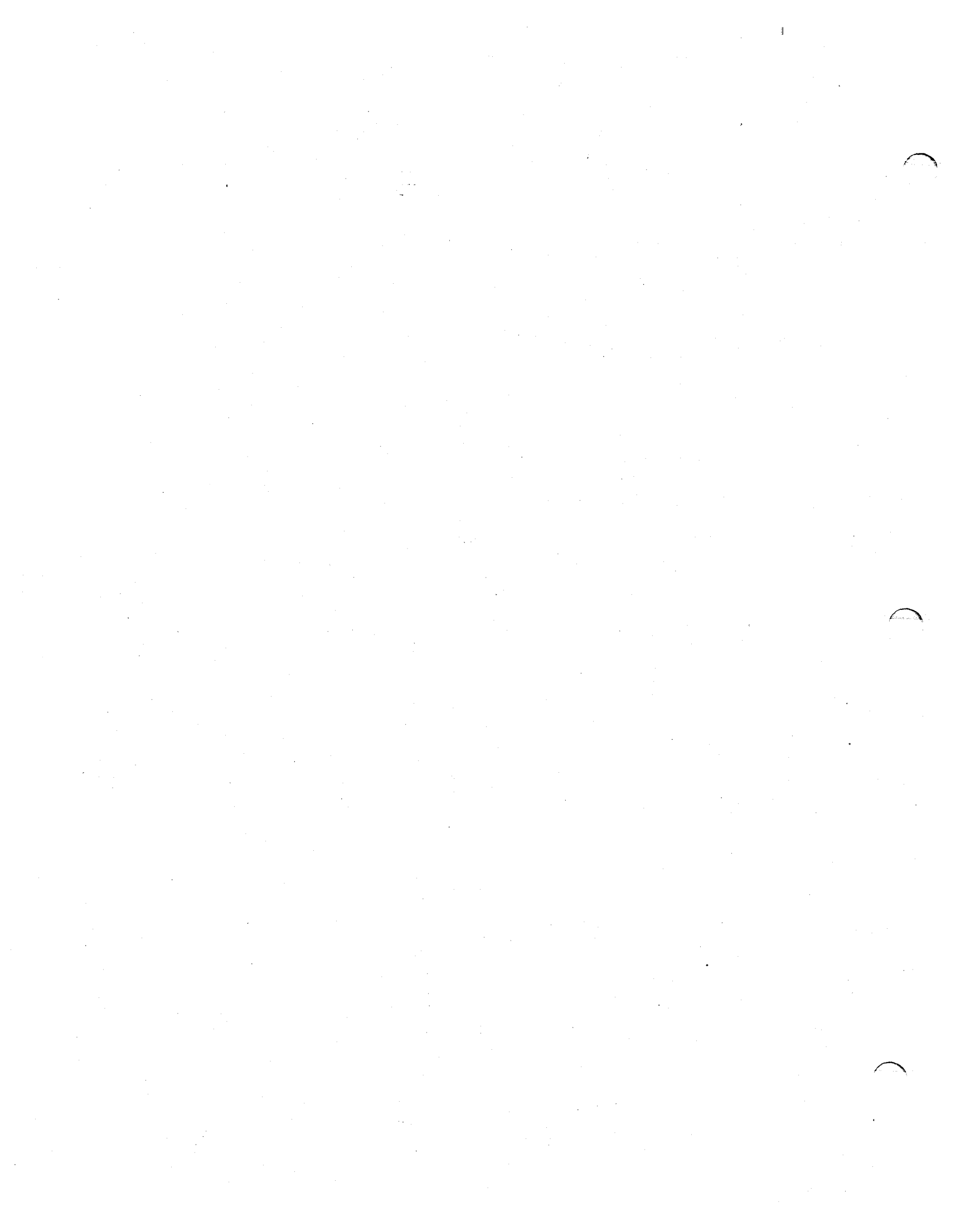

File for k-eff calculation for a water-reflected critical Pu shpere

```
#!/bin/sh
# @ output = /u/sco/pfna/joblog/lpfnmcx5
# @ error = /u/sco/pfna/joblog/lpfnmcx5
# # @ requirements = (Machine == "sp2212")
# @ class = scalar
# # @ startdate = 04/01/00 17:01
# @ notification = error
# @ checkpoint = no
# @ restart = no
# @ wall_clock_limit = unlimited
# @ queue
set -xv
date
hostname
sco=/u/sco/pfna
sco2=/tmp1/sco
sco4=/work1/sco/pfna
mkdir $sco2/xdir$$
cd $sco2/xdir$$
set -
cat > ised1 << 'EOF'
1,$s/^STOP/ STOP/
EOF
cat > ised2 << 'EOF'
1,$s/^/ /
EOF
cat > imcx5 << 'EOF'
message: outp=omcx5 runtpe=rmcx5

k-calculation for H2O-reflected Pu sphere -- r=4.1217/29.5217
1      0 +3
2      1 4.9726293-2 -1
3      2 1.001490-1 -2 +1
4      2 1.001490-1 -3 +2

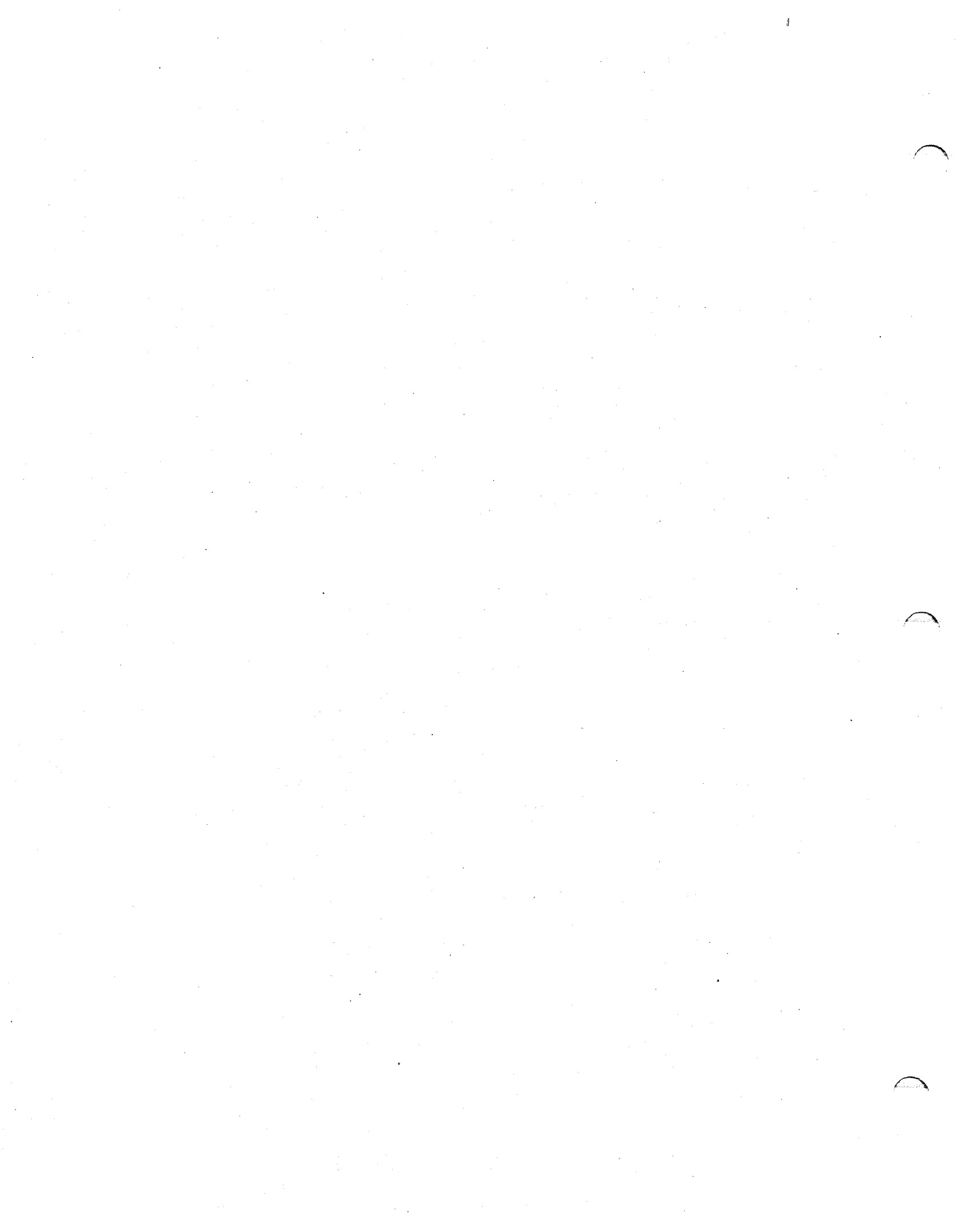
1      so 4.1217
2      so 15.0000
3      so 29.5217

mode   n
imp:n   0 2 2 1
c      m1=Plutonium (Asum=4.9726293-2)
m1     94239.60c 4.6982-2 94240.60c 2.5852-3 94241.60c 1.4915-4
       94242.60c 9.9432-6
c      m2=Water (Asum=1.001490-1)
m2     1001.60c 6.6766-2 8016.60c 3.3383-2
mt2    lwtr.01t
kcode  1000 1.0 100 1100 4500 2000
ksrc   0 0 0
print
EOF
set -xv
time mcnp_xnox inp=imcx5
date
ls -l
cp omcx5 q1234
sed -f ised1 q1234 > zprntz
cp $sco/joblog/lpfnmcx5 q1234
sed -f ised2 q1234 > opfnmcx5
cat zprntz >> opfnmcx5
asa opfnmcx5 > npfnmcx5
# hp4pcl npfnmcx5
mv npfnmcx5 $sco/output/npfnmcx5
mv opfnmcx5 $sco/output/opfnmcx5
cd $sco2
rm -rf $sco2/xdir$$
exit
```



APPENDIX B

**LISTINGS OF INPUT FILES MCNP-4B FISSILE MATERIAL
DOSE-RATE CALCULATIONS**



APPENDIX B

LISTINGS OF INPUT FILES MCNP-4B FISSILE MATERIAL DOSE-RATE CALCULATIONS

File for MCNP-4B point-detector dose-rate calculations for a 6.38-cm-radius
bare Pu sphere in the PFNA beam at the center of the truck lane

(2,000,000 histories)

message: outp=pfnalb.o mctal=pfnalb.m

```
mcnp file for PFNA project bare PU sphere calculation (r=6.38)
1      0      -100:128:-200:251:-300:305
2      0      100 -128 200 -251 300 -305 +403
          #(-400 +101 +224 -227)
          #(-401 +400 +101 +225 -226)
          #(102 -129 +201 -250 +301 -304)
          #(129 -126 +252 -257 +301 -304)
          #(102 -126 +201 -250 +306 -301)
3      1 0.10549 -400 +101 +224 -227 #(503 -504)
4      1 0.10549 -401 +400 +101 +225 -226 #(503 -504)
5      0      102 -127 +223 -228 +301 -304
          #(-400 +224 -227) #(-401 +400 +225 -226)
6      0      127 -124 +501 -502 +301 -304
          #(-401 +400 +225 -226)
7      0      124 -126 +254 -255 +301 -304
8      5 8.734441-2 102 -126 +201 -250 +306 -301
9      1 0.10549 102 -124 +222 -229 +301 -304
          #(127 +501 -502) #(-127 +223 -228)
10     1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11     1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12     1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13     1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14     1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15     1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16     1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17     1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18     1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19     1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20     1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21     2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22     2 0.1187956 103 -109 +202 -249 +302 -303
          #(221 -230)
          #(103 -104 +217 -234)
          #(104 -105 +216 -235)
          #(105 -107 +219 -232)
          #(107 -108 +219 -220) #(107 -108 +231 -232)
          #(106 -109 +212 -218) #(106 -109 +233 -236)
23     2 0.1187956 109 -120 +202 -249 +302 -303
          #(221 -230)
          #(109 -110 +211 -237)
          #(110 -111 +210 -238)
          #(111 -112 +209 -239)
          #(112 -113 +208 -240)
          #(113 -114 +207 -241)
          #(114 -115 +206 -242)
          #(115 -116 +205 -243)
          #(116 -117 +204 -244)
          #(117 -118 +203 -245)
          #(118 -119)
24     3 3.284-2 121 -125 +201 -250 +301 -304
          #(-124 +214 -247) #(124 +253 -256)
          #(122 +248) #(122 -213)
```

```

25   3 3.284-2   103 -107 +217 -234 +302 -303
      # (221 -230) # (104 -220) # (104 +231)
26   4 5.977931-2 104 -108 +216 -220 +302 -303 # (105 -219)
27   4 5.977931-2 104 -108 +231 -235 +302 -303 # (105 +232)
28   4 5.977931-2 102 -124 +201 -222 +301 -304
      # (103 -120 202 -221 302 -303)
      # (120 -123 215 -221 302 -303)
      # (121 -214)
29   4 5.977931-2 102 -124 +229 -250 +301 -304
      # (103 -120 230 -249 302 -303)
      # (120 -123 230 -246 302 -303)
      # (121 +247)
30   4 5.977931-2 124 -126 +252 -254 +301 -304
      # (-125 +213 -253)
31   4 5.977931-2 124 -126 +255 -257 +301 -304
      # (-125 +256 -248)
32   6 4.029014-2 -402
33   6 4.029014-2 -403 +402
34   0
      -400 +101 +224 -227 +503 -504
35   0
      -401 +400 +101 +225 -226 +503 -504
36   4 5.977931-2 122 -124 +201 -250 +301 -304
      # (213 -248)
      # (129 -252)
      # (129 +257)

```

c end cells

```

c
c surfaces
100 px -100.0
101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 500.0
129 px 87.9856
200 py -500.0
201 py -74.7056
202 py -72.8006
203 py -47.0958
204 py -45.8258
205 py -44.5558
206 py -43.2858
207 py -42.0158
208 py -40.7458
209 py -39.4758
210 py -38.2058
211 py -36.9358
212 py -34.3958
213 py -38.6122

```

214	py	-33.2782			
215	py	-31.3732			
216	py	-30.5858			
217	py	-24.2358			
218	py	-19.1558			
219	py	-16.6158			
220	py	-15.3458			
221	py	-12.8058			
222	py	-10.9008			
223	py	-5.8208			
224	py	-5.5245			
225	py	-4.2037			
226	py	4.2037			
227	py	5.5245			
228	py	5.8208			
229	py	10.9008			
230	py	12.8058			
231	py	15.3458			
232	py	16.6158			
233	py	19.1558			
234	py	24.2358			
235	py	30.5858			
236	py	34.3958			
237	py	36.9358			
238	py	38.2058			
239	py	39.4758			
240	py	40.7458			
241	py	42.0158			
242	py	43.2858			
243	py	44.5558			
244	py	45.8258			
245	py	47.0958			
246	py	31.3732			
247	py	33.2782			
248	py	38.6122			
249	py	72.8006			
250	py	74.7056			
251	py	500.0			
252	py	-39.8822			
253	py	-9.8848			
254	py	-8.6148			
255	py	8.6148			
256	py	9.8848			
257	py	39.8822			
300	pz	-500.0			
301	pz	-112.395			
302	pz	-110.49			
303	pz	193.04			
304	pz	199.945			
305	pz	500.0			
306	pz	-113.665			
400	c/y	10.3124	0.0	32.2120	
401	c/y	10.3124	0.0	59.9948	
402	sx	292.2524		5.0	
403	sx	292.2524		6.38	
501	p	0.05557761	1.0	0.0	-1.613162
502	p	-0.05557761	1.0	0.0	1.613162
503	p	0.03492076	0.0	1.0	-7.209883
504	p	-0.03492076	0.0	1.0	7.209883

c end surfaces

mode n p

imp:n,p 0 1 34r

c m1=borated polyethylene (Asum=0.10549)

m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3

mt1 poly.01t

c m2=borated paraffin (Asum=0.1187956)

m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2

mt2 poly.01t

c m3=Lead (Asum=3.284-2)

m3	82206.60c	8.3742-3	82207.60c	7.25764-3	82208.60c	1.720816-2
c	m4=Aluminum 6061-T6 (Asum=5.977988-2)					
m4	12000.60c	6.6890-4	13027.60c	5.8270-2	14000.60c	3.4740-4
	22000.60c	5.0930-5	24050.60c	2.7230-6	24052.60c	5.2444-5
	24053.60c	5.9460-6	24054.60c	1.4770-6	26054.60c	1.1920-5
	26056.60c	1.8699-4	26057.60c	4.3210-6	26058.60c	5.7060-7
	29063.60c	9.08133-5	29065.60c	4.04767-5	25055.60c	4.4400-5
c	m5=Steel (Asum=8.734441-2)					
m5	26054.60c	3.2367-3	26056.60c	5.07622-2	26057.60c	1.1729-3
	26058.60c	1.5490-4	24050.60c	7.9660-4	24052.60c	1.53441-2
	24053.60c	1.7397-3	24054.60c	4.3220-4	28058.60c	6.62295-3
	28060.60c	2.55073-3	28061.60c	1.1090-4	28062.60c	3.5313-4
	28064.60c	9.0460-5	6000.60c	3.16929-4	14000.60c	1.27063-3
	25055.60c	1.73219-3	15031.60c	6.91287-5	16032.60c	4.4516-5
	7014.60c	5.43529-4				
c	m6=Plutonium (Asum=4.029014-2)					
m6	94239.60c	3.7047-2	94240.60c	1.7512-3	94241.60c	1.1674-4
	31000.60c	1.3752-3				
c	m7=Tungsten (Asum=6.605306-2)					
m7	28058.60c	6.6122-3	28060.60c	2.54659-3	28061.60c	1.10721-4
	28062.60c	3.5256-4	28064.60c	9.0325-5	29063.60c	2.82034-3
	29065.60c	1.25706-3	40000.60c	7.9528-4	74182.60c	1.369975-2
	74183.60c	7.36713-3	74184.60c	1.577082-2	74186.60c	1.463029-2
f105:n	282.25	0.0	0.0	0.0		
de105		2.07002-7	7.69672-7	1.75386-6	3.71293-6	
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4	
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3	
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3	
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2	
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2	
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1	
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1	
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1	
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0	
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0	
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0	
	1.11070+1	1.35661+1				
df105		3.70370-3	4.37060-3	4.52500-3	4.57410-3	
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3	
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3	
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3	
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3	
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2	
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2	
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2	
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1	
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1	
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1	
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1	
	1.63200-1	2.00340-1				
fm105	3.671+10					
f115:n	302.25	0.0	0.0	0.0		
de115		2.07002-7	7.69672-7	1.75386-6	3.71293-6	
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4	
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3	
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3	
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2	
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2	
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1	
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1	
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1	
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0	
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0	
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0	
	1.11070+1	1.35661+1				
df115		3.70370-3	4.37060-3	4.52500-3	4.57410-3	
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3	
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3	
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3	
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3	
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2	
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2	


```

4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm115 3.671+10
f125:n 292.25 10.0 0.0 0.0
de125 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df125 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm125 3.671+10
f205:p 282.25 0.0 0.0 0.0
de205 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df205 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm205 3.671+10
f215:p 302.25 0.0 0.0 0.0
de215 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df215 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm215 3.671+10
f225:p 292.25 10.0 0.0 0.0
de225 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df225 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm225 3.671+10
sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2

```

```
c      sil      0.0 0.5 0.8660254 0.9961946 1.0
c      sp1      0 1.21+10 8.82+9 1.47+9 1.09+9
sil    s      11 12 13 14
sp1    l      1.21+10 8.82+9 1.47+10 1.09+9
sil11  h      0.0 0.5
sil12  h      0.5 0.8660254
sil13  h      0.8660254 0.9961946
sil14  h      0.9961946 1.0
sp11   0      1
sp12   0      1
sp13   0      1
sp14   0      1
ds2    s      21 22 23 24
si21   h      3.7645 5.675
si22   h      5.675 7.3865
si23   h      7.3865 8.321
si24   h      8.321 8.753
sp21   0      1
sp22   0      1
sp23   0      1
sp24   0      1
nps    2000000
prtmp  2j 1
print
```

File for MCNP-4B point-detector dose-rate calculations for a 6.38-cm-radius
bare Pu sphere in the PFNA beam at the center of the truck lane
(16,000,000 histories)

message: outp=pfnal.c.o mctal=pfnal.c.m

```
mcnp file for PFNA project bare PU sphere calculation (r=6.38)
1      0      -100:128:-200:251:-300:305
2      0      100 -128 200 -251 300 -305 +403
          #(-400 +101 +224 -227)
          #(-401 +400 +101 +225 -226)
          #(102 -129 +201 -250 +301 -304)
          #(129 -126 +252 -257 +301 -304)
          #(102 -126 +201 -250 +306 -301)
3      1 0.10549 -400 +101 +224 -227 #(503 -504)
4      1 0.10549 -401 +400 +101 +225 -226 #(503 -504)
5      0      102 -127 +223 -228 +301 -304
          #(-400 +224 -227) #(-401 +400 +225 -226)
6      0      127 -124 +501 -502 +301 -304
          #(-401 +400 +225 -226)
7      0      124 -126 +254 -255 +301 -304
8      5 8.734441-2 102 -126 +201 -250 +306 -301
9      1 0.10549 102 -124 +222 -229 +301 -304
          #(127 +501 -502) #(-127 +223 -228)
10     1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11     1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12     1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13     1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14     1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15     1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16     1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17     1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18     1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19     1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20     1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21     2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22     2 0.1187956 103 -109 +202 -249 +302 -303
          #(221 -230)
          #(103 -104 +217 -234)
          #(104 -105 +216 -235)
          #(105 -107 +219 -232)
          #(107 -108 +219 -220) #(107 -108 +231 -232)
          #(106 -109 +212 -218) #(106 -109 +233 -236)
23     2 0.1187956 109 -120 +202 -249 +302 -303
          #(221 -230)
          #(109 -110 +211 -237)
          #(110 -111 +210 -238)
          #(111 -112 +209 -239)
          #(112 -113 +208 -240)
          #(113 -114 +207 -241)
          #(114 -115 +206 -242)
          #(115 -116 +205 -243)
          #(116 -117 +204 -244)
          #(117 -118 +203 -245)
          #(118 -119)
24     3 3.284-2 121 -125 +201 -250 +301 -304
          #(-124 +214 -247) #(124 +253 -256)
          #(122 +248) #(122 -213)
25     3 3.284-2 103 -107 +217 -234 +302 -303
          #(221 -230) #(104 -220) #(104 +231)
26     4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27     4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28     4 5.977931-2 102 -124 +201 -222 +301 -304
          #(103 -120 202 -221 302 -303)
          #(120 -123 215 -221 302 -303)
          #(121 -214)
29     4 5.977931-2 102 -124 +229 -250 +301 -304
          #(103 -120 230 -249 302 -303)
          #(120 -123 230 -246 302 -303)
```

```

30      4 5.977931-2 124 -126 +252 -254 +301 -304
          #(-125 +213 -253)
31      4 5.977931-2 124 -126 +255 -257 +301 -304
          #(-125 +255 -248)
32      6 4.029014-2 -402
33      6 4.029014-2 -403 +402
34      0 -400 +101 +224 -227 +503 -504
35      0 -401 +400 +101 +225 -226 +503 -504
36      4 5.977931-2 122 -124 +201 -250 +301 -304
          #(213 -248)
          #(129 -252)
          #(129 +257)

```

c end cells

c

c surfaces

```

100 px -100.0
101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.819
124 px 114.854
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 500.0
129 px 87.9856
200 py -500.0
201 py -74.7056
202 py -72.8006
203 py -47.0958
204 py -45.8258
205 py -44.5558
206 py -43.2858
207 py -42.0158
208 py -40.7458
209 py -39.4758
210 py -38.2058
211 py -36.9358
212 py -34.3958
213 py -38.6122
214 py -33.2782
215 py -31.3732
216 py -30.5858
217 py -24.2358
218 py -19.1558
219 py -16.6158
220 py -15.3458
221 py -12.8058
222 py -10.9008
223 py -5.8208
224 py -5.5245

```

225	py	-4.2037				
226	py	4.2037				
227	py	5.5245				
228	py	5.8208				
229	py	10.9008				
230	py	12.8058				
231	py	15.3458				
232	py	16.6158				
233	py	19.1558				
234	py	24.2358				
235	py	30.5858				
236	py	34.3958				
237	py	36.9358				
238	py	38.2058				
239	py	39.4758				
240	py	40.7458				
241	py	42.0158				
242	py	43.2858				
243	py	44.5558				
244	py	45.8258				
245	py	47.0958				
246	py	31.3732				
247	py	33.2782				
248	py	38.6122				
249	py	72.8006				
250	py	74.7056				
251	py	500.0				
252	py	-39.8822				
253	py	-9.8848				
254	py	-8.6148				
255	py	8.6148				
256	py	9.8848				
257	py	39.8822				
300	pz	-500.0				
301	pz	-112.395				
302	pz	-110.49				
303	pz	193.04				
304	pz	199.945				
305	pz	500.0				
306	pz	-113.665				
400	c/y	10.3124	0.0	32.2120		
401	c/y	10.3124	0.0	59.9948		
402	sx	292.2524		5.0		
403	sx	292.2524		6.38		
501	p	0.05557761	1.0	0.0	-1.613162	
502	p	-0.05557761	1.0	0.0	1.613162	
503	p	0.03492076	0.0	1.0	-7.209883	
504	p	-0.03492076	0.0	1.0	7.209883	

c end surfaces

mode n p

imp:n,p 0 1 34r

c m1=borated polyethylene (Asum=0.10549)

m1	1001.60c	6.5800-2	5010.60c	5.1940-4	5011.60c	2.1306-3
	6000.60c	2.9100-2	8016.60c	7.9400-3		

mt1 poly.01t

c m2=borated paraffin (Asum=0.1187956)

m2	1001.60c	7.8350-2	5010.60c	4.3426-4	5011.60c	1.78134-3
	6000.60c	3.8230-2				

mt2 poly.01t

c m3=Lead (Asum=3.284-2)

m3	82206.60c	8.3742-3	82207.60c	7.25764-3	82208.60c	1.720816-2
----	-----------	----------	-----------	-----------	-----------	------------

c m4=Aluminum 6061-T6 (Asum=5.977988-2)

m4	12000.60c	6.6890-4	13027.60c	5.8270-2	14000.60c	3.4740-4
	22000.60c	5.0930-5	24050.60c	2.7230-6	24052.60c	5.2444-5
	24053.60c	5.9460-6	24054.60c	1.4770-6	26054.60c	1.1920-5
	26056.60c	1.8699-4	26057.60c	4.3210-6	26058.60c	5.7060-7
	29063.60c	9.08133-5	29065.60c	4.04767-5	25055.60c	4.4400-5

c m5=Steel (Asum=8.734441-2)

m5	26054.60c	3.2367-3	26056.60c	5.07622-2	26057.60c	1.1729-3
	26058.60c	1.5490-4	24050.60c	7.9660-4	24052.60c	1.53441-2
	24053.60c	1.7397-3	24054.60c	4.3220-4	28058.60c	6.62295-3

	28060.60c	2.55073-3	28061.60c	1.1090-4	28062.60c	3.5313-4
	28064.60c	9.0460-5	6000.60c	3.16929-4	14000.60c	1.27063-3
	25055.60c	1.73219-3	15031.60c	6.91287-5	16032.60c	4.4516-5
	7014.60c	5.43529-4				
c	m6=Plutonium (Asum=4.029014-2)					
m6	94239.60c	3.7047-2	94240.60c	1.7512-3	94241.60c	1.1674-4
	31000.60c	1.3752-3				
c	m7=Tungsten (Asum=6.605306-2)					
m7	28058.60c	6.6122-3	28060.60c	2.54659-3	28061.60c	1.10721-4
	28062.60c	3.5256-4	28064.60c	9.0325-5	29063.60c	2.82034-3
	29065.60c	1.25706-3	40000.60c	7.9528-4	74182.60c	1.369975-2
	74183.60c	7.36713-3	74184.60c	1.577082-2	74186.60c	1.463029-2
f105:n	282.25	0.0	0.0	0.0		
de105		2.07002-7	7.69672-7	1.75386-6	3.71293-6	
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4	
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3	
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3	
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2	
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2	
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1	
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1	
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1	
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0	
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0	
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0	
	1.11070+1	1.35661+1				
df105		3.70370-3	4.37060-3	4.52500-3	4.57410-3	
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3	
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3	
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3	
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3	
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2	
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2	
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2	
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1	
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1	
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1	
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1	
	1.63200-1	2.00340-1				
fm105	3.671+10					
f115:n	302.25	0.0	0.0	0.0		
de115		2.07002-7	7.69672-7	1.75386-6	3.71293-6	
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4	
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3	
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3	
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2	
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2	
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1	
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1	
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1	
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0	
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0	
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0	
	1.11070+1	1.35661+1				
df115		3.70370-3	4.37060-3	4.52500-3	4.57410-3	
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3	
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3	
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3	
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3	
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2	
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2	
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2	
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1	
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1	
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1	
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1	
	1.63200-1	2.00340-1				
fm115	3.671+10					
f125:n	292.25	10.0	0.0	0.0		
de125		2.07002-7	7.69672-7	1.75386-6	3.71293-6	
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4	
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3	

```

2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df125 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm125 3.671+10
f205:p 282.25 0.0 0.0 0.0
de205 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df205 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm205 3.671+10
f215:p 302.25 0.0 0.0 0.0
de215 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df215 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm215 3.671+10
f225:p 292.25 10.0 0.0 0.0
de225 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df225 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm225 3.671+10
sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2
c si1 0.0 0.5 0.8660254 0.9961946 1.0
c sp1 0 1.21+10 8.82+9 1.47+9 1.09+9
si1 s 11 12 13 14
sp1 1.21+10 8.82+9 1.47+10 1.09+9
si11 h 0.0 0.5
si12 h 0.5 0.8660254
si13 h 0.8660254 0.9961946
si14 h 0.9961946 1.0
sp11 0 1
sp12 0 1
sp13 0 1

```

```
sp14 0 1
ds2   s 21 22 23 24
si21  h 3.7645 5.675
si22  h 5.675 7.3865
si23  h 7.3865 8.321
si24  h 8.321 8.753
sp21  0 1
sp22  0 1
sp23  0 1
sp24  0 1
nps   16000000
prtmp 2j 1
print
```


File for MCNP-4B point-detector dose-rate calculations for a 6.35-cm-radius
bare Pu sphere in the PFNA beam at the center of the truck lane
(16,000,000 histories)

message: outp=pfnale.o mctal=pfnale.m

```
mcnp file for PFNA project bare PU sphere calculation (r=6.38)
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305 +403
#(-400 +101 +224 -227)
#(-401 +400 +101 +225 -226)
#(102 -129 +201 -250 +301 -304)
#(129 -126 +252 -257 +301 -304)
#(102 -126 +201 -250 +306 -301)
3 1 0.10549 -400 +101 +224 -227 #(503 -504)
4 1 0.10549 -401 +400 +101 +225 -226 #(503 -504)
5 0 102 -127 +223 -228 +301 -304
#(-400 +224 -227) #(-401 +400 +225 -226)
6 0 127 -124 +501 -502 +301 -304
#(-401 +400 +225 -226)
7 0 124 -126 +254 -255 +301 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
9 1 0.10549 102 -124 +222 -229 +301 -304
#(127 +501 -502) #(-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
#(221 -230)
#(103 -104 +217 -234)
#(104 -105 +216 -235)
#(105 -107 +219 -232)
#(107 -108 +219 -220) #(107 -108 +231 -232)
#(106 -109 +212 -218) #(106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
#(221 -230)
#(109 -110 +211 -237)
#(110 -111 +210 -238)
#(111 -112 +209 -239)
#(112 -113 +208 -240)
#(113 -114 +207 -241)
#(114 -115 +206 -242)
#(115 -116 +205 -243)
#(116 -117 +204 -244)
#(117 -118 +203 -245)
#(118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
#(-124 +214 -247) #(124 +253 -256)
#(122 +248) #(122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
#(221 -230) #(104 -220) #(104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
#(103 -120 202 -221 302 -303)
#(120 -123 215 -221 302 -303)
#(121 -214)
29 4 5.977931-2 102 -124 +229 -250 +301 -304
#(103 -120 230 -249 302 -303)
#(120 -123 230 -246 302 -303)
```

```

#(121 +247)
30 4 5.977931-2 124 -126 +252 -254 +301 -304
#(-125 +213 -253)
31 4 5.977931-2 124 -126 +255 -257 +301 -304
#(-125 +256 -248)
32 6 4.029014-2 -402
33 6 4.029014-2 -403 +402
34 0 -400 +101 +224 -227 +503 -504
35 0 -401 +400 +101 +225 -226 +503 -504
36 4 5.977931-2 122 -124 +201 -250 +301 -304
#(213 -248)
#(129 -252)
#(129 +257)

```

c end cells

```

c
c surfaces
100 px -100.0
101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 500.0
129 px 87.9856
200 py -500.0
201 py -74.7056
202 py -72.8006
203 py -47.0958
204 py -45.8258
205 py -44.5558
206 py -43.2858
207 py -42.0158
208 py -40.7458
209 py -39.4758
210 py -38.2058
211 py -36.9358
212 py -34.3958
213 py -38.6122
214 py -33.2782
215 py -31.3732
216 py -30.5858
217 py -24.2358
218 py -19.1558
219 py -16.6158
220 py -15.3458
221 py -12.8058
222 py -10.9008
223 py -5.8208
224 py -5.5245

```

225	py	-4.2037			
226	py	4.2037			
227	py	5.5245			
228	py	5.8208			
229	py	10.9008			
230	py	12.8058			
231	py	15.3458			
232	py	16.6158			
233	py	19.1558			
234	py	24.2358			
235	py	30.5858			
236	py	34.3958			
237	py	36.9358			
238	py	38.2058			
239	py	39.4758			
240	py	40.7458			
241	py	42.0158			
242	py	43.2858			
243	py	44.5558			
244	py	45.8258			
245	py	47.0958			
246	py	31.3732			
247	py	33.2782			
248	py	38.6122			
249	py	72.8006			
250	py	74.7056			
251	py	500.0			
252	py	-39.8822			
253	py	-9.8848			
254	py	-8.6148			
255	py	8.6148			
256	py	9.8848			
257	py	39.8822			
300	pz	-500.0			
301	pz	-112.395			
302	pz	-110.49			
303	pz	193.04			
304	pz	199.945			
305	pz	500.0			
306	pz	-113.665			
400	c/y	10.3124	0.0	32.2120	
401	c/y	10.3124	0.0	59.9948	
402	sx	292.2524		5.0	
403	sx	292.2524		6.35	
501	p	0.05557761	1.0	0.0	-1.613162
502	p	-0.05557761	1.0	0.0	1.613162
503	p	0.03492076	0.0	1.0	-7.209883
504	p	-0.03492076	0.0	1.0	7.209883

c end surfaces

```

mode n p
imp:n,p 0 1 34r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3

```

	28060.60c	2.55073-3	28061.60c	1.1090-4	28062.60c	3.5313-4
	28064.60c	9.0460-5	6000.60c	3.16929-4	14000.60c	1.27063-3
	25055.60c	1.73219-3	15031.60c	6.91287-5	16032.60c	4.4516-5
	7014.60c	5.43529-4				
c	m6=Plutonium (Asum=4.029014-2)					
m6	94239.60c	3.7047-2	94240.60c	1.7512-3	94241.60c	1.1674-4
	31000.60c	1.3752-3				
c	m7=Tungsten (Asum=6.605306-2)					
m7	28058.60c	6.6122-3	28060.60c	2.54659-3	28061.60c	1.10721-4
	28062.60c	3.5256-4	28064.60c	9.0325-5	29063.60c	2.82034-3
	29065.60c	1.25706-3	40000.60c	7.9528-4	74182.60c	1.369975-2

	74183.60c	7.36713-3	74184.60c	1.577082-2	74186.60c	1.463029-2
f105:n	282.25	0.0	0.0	0.0		
de105		2.07002-7	7.69672-7	1.75386-6	3.71293-6	
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4	
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3	
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3	
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2	
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2	
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1	
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1	
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1	
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0	
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0	
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0	
	1.11070+1	1.35661+1				
df105		3.70370-3	4.37060-3	4.52500-3	4.57410-3	
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3	
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3	
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3	
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3	
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2	
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2	
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2	
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1	
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1	
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1	
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1	
	1.63200-1	2.00340-1				
fm105		3.671+10				
f115:n	302.25	0.0	0.0	0.0		
de115		2.07002-7	7.69672-7	1.75386-6	3.71293-6	
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4	
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3	
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3	
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2	
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2	
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1	
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1	
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1	
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0	
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0	
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0	
	1.11070+1	1.35661+1				
df115		3.70370-3	4.37060-3	4.52500-3	4.57410-3	
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3	
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3	
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3	
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3	
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2	
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2	
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2	
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1	
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1	
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1	
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1	
	1.63200-1	2.00340-1				
fm115		3.671+10				
f125:n	292.25	10.0	0.0	0.0		
de125		2.07002-7	7.69672-7	1.75386-6	3.71293-6	
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4	
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3	
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3	
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2	
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2	
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1	
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1	
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1	
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0	
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0	
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0	
	1.11070+1	1.35661+1				
df125		3.70370-3	4.37060-3	4.52500-3	4.57410-3	

```

4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm125 3.671+10
f205:p 282.25 0.0 0.0 0.0
de205 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df205 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm205 3.671+10
f215:p 302.25 0.0 0.0 0.0
de215 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df215 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm215 3.671+10
f225:p 292.25 10.0 0.0 0.0
de225 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df225 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm225 3.671+10
sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2
c sil 0.0 0.5 0.8660254 0.9961946 1.0
c sp1 0 1.21+10 8.82+9 1.47+9 1.09+9
sil s 11 12 13 14
sp1 1.21+10 8.82+9 1.47+10 1.09+9
sil1 h 0.0 0.5
sil2 h 0.5 0.8660254
sil3 h 0.8660254 0.9961946
sil4 h 0.9961946 1.0
sp11 0 1
sp12 0 1
sp13 0 1
sp14 0 1
ds2 s 21 22 23 24
si21 h 3.7645 5.675
si22 h 5.675 7.3865
si23 h 7.3865 8.321
si24 h 8.321 8.753
sp21 0 1
sp22 0 1
sp23 0 1
sp24 0 1
nps 16000000

```

prtmp 2j 1
print

File for MCNP-4B point-detector dose-rate background calculations for the bare
Pu spheres in the PFNA beam at the center of the truck lane (400,000 histories)

message: outp=pfna2.o mctal=pfna2.m

```
mcnp file for PFNA project bare PU sphere calculation -- no Pu
1      0      -100:128:-200:251:-300:305
2      0      100 -128 200 -251 300 -305 +403
          #(-400 +101 +224 -227)
          #(-401 +400 +101 +225 -226)
          #(102 -129 +201 -250 +301 -304)
          #(129 -126 +252 -257 +301 -304)
          #(102 -126 +201 -250 +306 -301)
3      1 0.10549 -400 +101 +224 -227 #(503 -504)
4      1 0.10549 -401 +400 +101 +225 -226 #(503 -504)
5      0      102 -127 +223 -228 +301 -304
          #(-400 +224 -227) #(-401 +400 +225 -226)
6      0      127 -124 +501 -502 +301 -304
          #(-401 +400 +225 -226)
7      0      124 -126 +254 -255 +301 -304
8      5 8.734441-2 102 -126 +201 -250 +306 -301
9      1 0.10549 102 -124 +222 -229 +301 -304
          #(127 +501 -502) #(-127 +223 -228)
10     1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11     1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12     1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13     1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14     1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15     1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16     1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17     1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18     1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19     1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20     1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21     2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22     2 0.1187956 103 -109 +202 -249 +302 -303
          #(221 -230)
          #(103 -104 +217 -234)
          #(104 -105 +216 -235)
          #(105 -107 +219 -232)
          #(107 -108 +219 -220) #(107 -108 +231 -232)
          #(106 -109 +212 -218) #(106 -109 +233 -236)
23     2 0.1187956 109 -120 +202 -249 +302 -303
          #(221 -230)
          #(109 -110 +211 -237)
          #(110 -111 +210 -238)
          #(111 -112 +209 -239)
          #(112 -113 +208 -240)
          #(113 -114 +207 -241)
          #(114 -115 +206 -242)
          #(115 -116 +205 -243)
          #(116 -117 +204 -244)
          #(117 -118 +203 -245)
          #(118 -119)
24     3 3.284-2 121 -125 +201 -250 +301 -304
          #(-124 +214 -247) #(124 +253 -256)
          #(122 +248) #(122 -213)
25     3 3.284-2 103 -107 +217 -234 +302 -303
          #(221 -230) #(104 -220) #(104 +231)
26     4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27     4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28     4 5.977931-2 102 -124 +201 -222 +301 -304
          #(103 -120 202 -221 302 -303)
          #(120 -123 215 -221 302 -303)
          #(121 -214)
29     4 5.977931-2 102 -124 +229 -250 +301 -304
          #(103 -120 230 -249 302 -303)
          #(120 -123 230 -246 302 -303)
          #(121 +247)
30     4 5.977931-2 124 -126 +252 -254 +301 -304
```



```

#(-125 +213 -253)
31 4 5.977931-2 124 -126 +255 -257 +301 -304
#(-125 +256 -248)
32 0 -402
33 0 -403 +402
34 0 -400 +101 +224 -227 +503 -504
35 0 -401 +400 +101 +225 -226 +503 -504
36 4 5.977931-2 122 -124 +201 -250 +301 -304
#(213 -248)
#(129 -252)
#(129 +257)

```

c end cells

```

c
c surfaces
100 px -100.0
101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 500.0
129 px 87.9856
200 py -500.0
201 py -74.7056
202 py -72.8006
203 py -47.0958
204 py -45.8258
205 py -44.5558
206 py -43.2858
207 py -42.0158
208 py -40.7458
209 py -39.4758
210 py -38.2058
211 py -36.9358
212 py -34.3958
213 py -38.6122
214 py -33.2782
215 py -31.3732
216 py -30.5858
217 py -24.2358
218 py -19.1558
219 py -16.6158
220 py -15.3458
221 py -12.8058
222 py -10.9008
223 py -5.8208
224 py -5.5245
225 py -4.2037

```

226	py	4.2037			
227	py	5.5245			
228	py	5.8208			
229	py	10.9008			
230	py	12.8058			
231	py	15.3458			
232	py	16.6158			
233	py	19.1558			
234	py	24.2358			
235	py	30.5858			
236	py	34.3958			
237	py	36.9358			
238	py	38.2058			
239	py	39.4758			
240	py	40.7458			
241	py	42.0158			
242	py	43.2858			
243	py	44.5558			
244	py	45.8258			
245	py	47.0958			
246	py	31.3732			
247	py	33.2782			
248	py	38.6122			
249	py	72.8006			
250	py	74.7056			
251	py	500.0			
252	py	-39.8822			
253	py	-9.8848			
254	py	-8.6148			
255	py	8.6148			
256	py	9.8848			
257	py	39.8822			
300	pz	-500.0			
301	pz	-112.395			
302	pz	-110.49			
303	pz	193.04			
304	pz	199.945			
305	pz	500.0			
306	pz	-113.665			
400	c/y	10.3124	0.0	32.2120	
401	c/y	10.3124	0.0	59.9948	
402	sx	292.2524	5.0		
403	sx	292.2524	6.3635		
501	p	0.05557761	1.0	0.0	-1.613162
502	p	-0.05557761	1.0	0.0	1.613162
503	p	0.03492076	0.0	1.0	-7.209883
504	p	-0.03492076	0.0	1.0	7.209883

c end surfaces

```

mode n p
imp:n,p 0 1 34r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5

```

```

7014.60c 5.43529-4
c m6=Plutonium (Asum=4.070346-2)
m6 94239.60c 3.7291-2 94240.60c 1.9277-3 94241.60c 1.2196-4
31000.60c 1.3628-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
f105:n
del105 282.25 0.0 0.0 0.0
2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df105 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
2.348+10
fm105 302.25 0.0 0.0 0.0
f115:n
del115 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df115 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
2.348+10
fm115 292.25 10.0 0.0 0.0
f125:n
del125 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2

```

```

7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83898+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df125 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm125 2.348+10
f205:p 282.25 0.0 0.0 0.0
de205 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df205 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm205 2.348+10
f215:p 302.25 0.0 0.0 0.0
de215 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df215 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm215 2.348+10
f225:p 292.25 10.0 0.0 0.0
de225 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df225 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm225 2.348+10
sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2
c sil 0.0 0.5 0.8660254 0.9961946 1.0
c spl 0 1.21+10 8.82+9 1.47+9 1.09+9
sil s 11 12 13 14
spl 1.21+10 2.092+10 2.239+10 2.348+10
sil1 h 0.0 0.5
sil2 h 0.5 0.8660254
sil3 h 0.8660254 0.9961946
sil4 h 0.9961946 1.0
spl1 0 1
spl2 0 1
spl3 0 1
spl4 0 1
ds2 s 21 22 23 24
si21 h 3.7645 5.675

```

```
si22 h 5.675 7.3865
si23 h 7.3865 8.321
si24 h 8.321 8.753
sp21 0 1
sp22 0 1
sp23 0 1
sp24 0 1
nps 400000
prcnp 2j 1
print
```

File for MCNP-4B surface-detector dose-rate calculations for a 6.32-cm-radius
bare Pu sphere in the PFNA beam at the center of the truck lane
(400,000 histories)

message: outp=pfna5.o mctal=pfna5.m

```

mcnp file for PFNA project bare PU sphere calculation
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
#(-400 +101 +224 -227)
#(-401 +400 +101 +225 -226)
#(102 -129 +201 -250 +301 -304)
#(129 -126 +252 -257 +301 -304)
#(102 -126 +201 -250 +306 -301)
#(615 -616 +625 -626 +635 -636)
3 1 0.10549 -400 +101 +224 -227 #(503 -504)
4 1 0.10549 -401 +400 +101 +225 -226 #(503 -504)
5 0 102 -127 +223 -228 +301 -304
#(-400 +224 -227) #(-401 +400 +225 -226)
6 0 127 -124 +501 -502 +301 -304
#(-401 +400 +225 -226)
7 0 124 -126 +254 -255 +301 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
9 1 0.10549 102 -124 +222 -229 +301 -304
#(127 +501 -502) #(-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
#(221 -230)
#(103 -104 +217 -234)
#(104 -105 +216 -235)
#(105 -107 +219 -232)
#(107 -108 +219 -220) #(107 -108 +231 -232)
#(106 -109 +212 -218) #(106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
#(221 -230)
#(109 -110 +211 -237)
#(110 -111 +210 -238)
#(111 -112 +209 -239)
#(112 -113 +208 -240)
#(113 -114 +207 -241)
#(114 -115 +206 -242)
#(115 -116 +205 -243)
#(116 -117 +204 -244)
#(117 -118 +203 -245)
#(118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
#(-124 +214 -247) #(124 +253 -256)
#(122 +248) #(122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
#(221 -230) #(104 -220) #(104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
#(103 -120 202 -221 302 -303)
#(120 -123 215 -221 302 -303)
#(121 -214)
29 4 5.977931-2 102 -124 +229 -250 +301 -304
#(103 -120 230 -249 302 -303)

```

```

#(120 -123 230 -246 302 -303)
#(121 +247)
30 4 5.977931-2 124 -126 +252 -254 +301 -304
#(-125 +213 -253)
31 4 5.977931-2 124 -126 +255 -257 +301 -304
#(-125 +256 -248)
32 6 4.029014-2 -402
33 6 4.029014-2 -403 +402
34 0 -400 +101 +224 -227 +503 -504
35 0 -401 +400 +101 +225 -226 +503 -504
36 4 5.977931-2 122 -124 +201 -250 +301 -304
#(213 -248)
#(129 -252)
#(129 +257)
37 0 615 -616 +625 -626 +635 -636 +403
#(611 -614 622 -623 +632 -633)
#(612 -613 +621 -624 +632 -633)
#(612 -613 +622 -623 +631 -634)
38 0 611 -614 +622 -623 +632 -633 +403
39 0 612 -613 +621 -624 +632 -633 +403 #(622 -623)
40 0 612 -613 +622 -623 +631 -634 +403 #(632 -633)

```

c end cells

```

c
c surfaces
100 px -100.0
101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 500.0
129 px 87.9856
200 py -500.0
201 py -74.7056
202 py -72.8006
203 py -47.0958
204 py -45.8258
205 py -44.5558
206 py -43.2858
207 py -42.0158
208 py -40.7458
209 py -39.4758
210 py -38.2058
211 py -36.9358
212 py -34.3958
213 py -38.6122
214 py -33.2782
215 py -31.3732
216 py -30.5858

```

217	py	-24.2358			
218	py	-19.1558			
219	py	-16.6158			
220	py	-15.3458			
221	py	-12.8058			
222	py	-10.9008			
223	py	-5.8208			
224	py	-5.5245			
225	py	-4.2037			
226	py	4.2037			
227	py	5.5245			
228	py	5.8208			
229	py	10.9008			
230	py	12.8058			
231	py	15.3458			
232	py	16.6158			
233	py	19.1558			
234	py	24.2358			
235	py	30.5858			
236	py	34.3958			
237	py	36.9358			
238	py	38.2058			
239	py	39.4758			
240	py	40.7458			
241	py	42.0158			
242	py	43.2858			
243	py	44.5558			
244	py	45.8258			
245	py	47.0958			
246	py	31.3732			
247	py	33.2782			
248	py	38.6122			
249	py	72.8006			
250	py	74.7056			
251	py	500.0			
252	py	-39.8822			
253	py	-9.8848			
254	py	-8.6148			
255	py	8.6148			
256	py	9.8848			
257	py	39.8822			
300	pz	-500.0			
301	pz	-112.395			
302	pz	-110.49			
303	pz	193.04			
304	pz	199.945			
305	pz	500.0			
306	pz	-113.665			
400	c/y	10.3124	0.0	32.2120	
401	c/y	10.3124	0.0	59.9948	
402	sx	292.2524	5.0		
403	sx	292.2524	6.32		
501	p	0.05557761	1.0	0.0	-1.613162
502	p	-0.05557761	1.0	0.0	1.613162
503	p	0.03492076	0.0	1.0	-7.209883
504	p	-0.03492076	0.0	1.0	7.209883
611	px	282.25			
612	px	287.25			
613	px	297.25			
614	px	302.25			
615	px	272.25			
616	px	312.25			
621	py	-10.0			
622	py	-5.0			
623	py	5.0			
624	py	10.0			
625	py	-20.0			
626	py	20.0			
631	pz	-10.0			
632	pz	-5.0			
633	pz	5.0			
634	pz	10.0			


```

635 pz -20.0
636 pz 20.0

c end surfaces
mode n p
imp:n,p 0 1 38r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2

f102:n 611
de102 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1

df102 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1

fm102 3.671+10
f112:n 614
de112 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2

```

	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df112		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm112	3.671+10				
fl22:n	624				
del22		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df122		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm122	3.671+10				
fl32:n	634				
del32		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df132		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2

	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm132	3.671+10				
f202:p	611				
de202		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df202		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm202	3.671+10				
f212:p	614				
de212		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df212		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm212	3.671+10				
f222:p	624				
de222		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df222		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm222	3.671+10				
f232:p	634				
de232		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df232		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm232	3.671+10				
e102		4.13994-7	1.12535-6	2.38237-6	5.04348-6
		2.26033-5	4.78512-5	1.01301-4	1.67017-4
		4.53999-4	7.48518-4	1.23410-3	2.03468-3
		2.61259-3	3.03539-3	3.70744-3	5.53084-3
		1.50344-2	2.35786-2	2.47875-2	2.60584-2
		2.85011-2	3.43067-2	5.24752-2	5.65622-2
		1.22773-1	1.49956-1	1.83156-1	2.23708-1
		2.94518-1	2.97211-1	2.98491-1	3.01974-1
		4.97870-1	5.23397-1	6.08101-1	7.42735-1
		1.10803+0	1.35335+0	1.65299+0	2.01897+0
		2.34570+0	2.46597+0	3.01194+0	3.67879+0
		5.48811+0	6.70320+0	8.18730+0	1.00000+1
		1.49183+1			1.22140+1
e202		2.00000-2	4.50000-2	7.00000-2	1.00000-1
		3.00000-1	4.00000-1	5.10000-1	6.00000-1
		1.00000+0	1.50000+0	2.00000+0	2.50000+0
					3.00000+0

```

4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.40000+1 1.40000+1
e112
4.13994-7 1.12535-6 2.38237-6 5.04348-6 1.06770-5
2.26033-5 4.78512-5 1.01301-4 1.67017-4 2.75364-4
4.53999-4 7.48518-4 1.23410-3 2.03468-3 2.24867-3
2.61259-3 3.03539-3 3.70744-3 5.53084-3 9.11882-3
1.50344-2 2.35786-2 2.47875-2 2.60584-2 2.70001-2
2.85011-2 3.43067-2 5.24752-2 5.65622-2 8.65169-2
1.22773-1 1.49956-1 1.83156-1 2.23708-1 2.73237-1
2.94518-1 2.97211-1 2.98491-1 3.01974-1 3.87742-1
4.97870-1 5.23397-1 6.08101-1 7.42735-1 9.07180-1
1.10803+0 1.35335+0 1.65299+0 2.01897+0 2.23130+0
2.34570+0 2.46597+0 3.01194+0 3.67879+0 4.49329+0
5.48811+0 6.70320+0 8.18730+0 1.00000+1 1.22140+1
1.49183+1
e212
2.00000-2 4.50000-2 7.00000-2 1.00000-1 1.50000-1
3.00000-1 4.00000-1 5.10000-1 6.00000-1 7.00000-1
1.00000+0 1.50000+0 2.00000+0 2.50000+0 3.00000+0
4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1
e122
4.13994-7 1.12535-6 2.38237-6 5.04348-6 1.06770-5
2.26033-5 4.78512-5 1.01301-4 1.67017-4 2.75364-4
4.53999-4 7.48518-4 1.23410-3 2.03468-3 2.24867-3
2.61259-3 3.03539-3 3.70744-3 5.53084-3 9.11882-3
1.50344-2 2.35786-2 2.47875-2 2.60584-2 2.70001-2
2.85011-2 3.43067-2 5.24752-2 5.65622-2 8.65169-2
1.22773-1 1.49956-1 1.83156-1 2.23708-1 2.73237-1
2.94518-1 2.97211-1 2.98491-1 3.01974-1 3.87742-1
4.97870-1 5.23397-1 6.08101-1 7.42735-1 9.07180-1
1.10803+0 1.35335+0 1.65299+0 2.01897+0 2.23130+0
2.34570+0 2.46597+0 3.01194+0 3.67879+0 4.49329+0
5.48811+0 6.70320+0 8.18730+0 1.00000+1 1.22140+1
1.49183+1
e222
2.00000-2 4.50000-2 7.00000-2 1.00000-1 1.50000-1
3.00000-1 4.00000-1 5.10000-1 6.00000-1 7.00000-1
1.00000+0 1.50000+0 2.00000+0 2.50000+0 3.00000+0
4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1
e132
4.13994-7 1.12535-6 2.38237-6 5.04348-6 1.06770-5
2.26033-5 4.78512-5 1.01301-4 1.67017-4 2.75364-4
4.53999-4 7.48518-4 1.23410-3 2.03468-3 2.24867-3
2.61259-3 3.03539-3 3.70744-3 5.53084-3 9.11882-3
1.50344-2 2.35786-2 2.47875-2 2.60584-2 2.70001-2
2.85011-2 3.43067-2 5.24752-2 5.65622-2 8.65169-2
1.22773-1 1.49956-1 1.83156-1 2.23708-1 2.73237-1
2.94518-1 2.97211-1 2.98491-1 3.01974-1 3.87742-1
4.97870-1 5.23397-1 6.08101-1 7.42735-1 9.07180-1
1.10803+0 1.35335+0 1.65299+0 2.01897+0 2.23130+0
2.34570+0 2.46597+0 3.01194+0 3.67879+0 4.49329+0
5.48811+0 6.70320+0 8.18730+0 1.00000+1 1.22140+1
1.49183+1
e232
2.00000-2 4.50000-2 7.00000-2 1.00000-1 1.50000-1
3.00000-1 4.00000-1 5.10000-1 6.00000-1 7.00000-1
1.00000+0 1.50000+0 2.00000+0 2.50000+0 3.00000+0
4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1
sd102 100.0
sd112 100.0
sd122 100.0
sd132 100.0
sd202 100.0
sd212 100.0
sd222 100.0
sd232 100.0
sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2
c sil 0.0 0.5 0.8660254 0.9961946 1.0

```

```
c      spl      0 1.21+10 8.82+9 1.47+10 1.09+9
si1    s 11 12 13 14
spl    1.21+10 8.82+9 1.47+10 1.09+9
si11   h 0.0 0.5
si12   h 0.5 0.8660254
si13   h 0.8660254 0.9961946
si14   h 0.9961946 1.0
sp11   0 1
sp12   0 1
sp13   0 1
sp14   0 1
ds2    s 21 22 23 24
si21   h 3.7645 5.675
si22   h 5.675 7.3865
si23   h 7.3865 8.321
si24   h 8.321 8.753
sp21   0 1
sp22   0 1
sp23   0 1
sp24   0 1
nps    400000
prdump 2j 1
print
```

File for MCNP-4B surface-detector dose-rate background calculations for
the bare Pu spheres in the PFNA beam at the center of the truck lane
(2,000,000 histories)

message: outp=pfna6.o mctal=pfna6.m

```

mcnp file for PFNA project bare PU sphere calculation--no Pu
1      0      -100:128:-200:251:-300:305
2      0      100 -128 200 -251 300 -305
          #(-400 +101 +224 -227)
          #(-401 +400 +101 +225 -226)
          #(102 -129 +201 -250 +301 -304)
          #(129 -126 +252 -257 +301 -304)
          #(102 -126 +201 -250 +306 -301)
          #(615 -616 +625 -626 +635 -636)
3      1 0.10549 -400 +101 +224 -227 #(503 -504)
4      1 0.10549 -401 +400 +101 +225 -226 #(503 -504)
5      0      102 -127 +223 -228 +301 -304
          #(-400 +224 -227) #(-401 +400 +225 -226)
6      0      127 -124 +501 -502 +301 -304
          #(-401 +400 +225 -226)
7      0      124 -126 +254 -255 +301 -304
8      5 8.734441-2 102 -126 +201 -250 +306 -301
9      1 0.10549 102 -124 +222 -229 +301 -304
          #(127 +501 -502) #(-127 +223 -228)
10     1 0.10549 106 -109 +200 -236 +302 -303 #(218 -233)
11     1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12     1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13     1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14     1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15     1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16     1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17     1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18     1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19     1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20     1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21     2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22     2 0.1187956 103 -109 +202 -249 +302 -303
          #(221 -230)
          #(103 -104 +217 -234)
          #(104 -105 +216 -235)
          #(105 -107 +219 -232)
          #(107 -108 +219 -220) #(107 -108 +231 -232)
          #(106 -109 +212 -218) #(106 -109 +233 -236)
23     2 0.1187956 109 -120 +202 -249 +302 -303
          #(221 -230)
          #(109 -110 +211 -237)
          #(110 -111 +210 -238)
          #(111 -112 +209 -239)
          #(112 -113 +208 -240)
          #(113 -114 +207 -241)
          #(114 -115 +206 -242)
          #(115 -116 +205 -243)
          #(116 -117 +204 -244)
          #(117 -118 +203 -245)
          #(118 -119)
24     3 3.284-2 121 -125 +201 -250 +301 -304
          #(-124 +214 -247) #(124 +253 -256)
          #(122 +248) #(122 -213)
25     3 3.284-2 103 -107 +217 -234 +302 -303
          #(221 -230) #(104 -220) #(104 +231)
26     4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27     4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28     4 5.977931-2 102 -124 +201 -222 +301 -304
          #(103 -120 202 -221 302 -303)
          #(120 -123 215 -221 302 -303)
          #(121 -214)
29     4 5.977931-2 102 -124 +229 -250 +301 -304
          #(103 -120 230 -249 302 -303)

```

```

#(120 -123 230 -246 302 -303)
#(121 +247)
30 4 5.977931-2 124 -126 +252 -254 +301 -304
#(-125 +213 -253)
31 4 5.977931-2 124 -126 +255 -257 +301 -304
#(-125 +256 -248)
32 0 -402
33 0 -403 +402
34 0 -400 +101 +224 -227 +503 -504
35 0 -401 +400 +101 +225 -226 +503 -504
36 4 5.977931-2 122 -124 +201 -250 +301 -304
#(213 -248)
#(129 -252)
#(129 +257)
37 0 615 -616 +625 -626 +635 -636 +403
#(611 -614 622 -623 +632 -633)
#(612 -613 +621 -624 +632 -633)
#(612 -613 +622 -623 +631 -634)
38 0 611 -614 +622 -623 +632 -633 +403
39 0 612 -613 +621 -624 +632 -633 +403 #(622 -623)
40 0 612 -613 +622 -623 +631 -634 +403 #(632 -633)

```

c end cells

c

c

```

surfaces
100 px -100.0
101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 500.0
129 px 87.9856
200 py -500.0
201 py -74.7056
202 py -72.8006
203 py -47.0958
204 py -45.8258
205 py -44.5558
206 py -43.2858
207 py -42.0158
208 py -40.7458
209 py -39.4758
210 py -38.2058
211 py -36.9358
212 py -34.3958
213 py -38.6122
214 py -33.2782
215 py -31.3732
216 py -30.5858

```

217	py	-24.2358			
218	py	-19.1558			
219	py	-16.6158			
220	py	-15.3458			
221	py	-12.8058			
222	py	-10.9008			
223	py	-5.8208			
224	py	-5.5245			
225	py	-4.2037			
226	py	4.2037			
227	py	5.5245			
228	py	5.8208			
229	py	10.9008			
230	py	12.8058			
231	py	15.3458			
232	py	16.6158			
233	py	19.1558			
234	py	24.2358			
235	py	30.5858			
236	py	34.3958			
237	py	36.9358			
238	py	38.2058			
239	py	39.4758			
240	py	40.7458			
241	py	42.0158			
242	py	43.2858			
243	py	44.5558			
244	py	45.8258			
245	py	47.0958			
246	py	31.3732			
247	py	33.2782			
248	py	38.6122			
249	py	72.8006			
250	py	74.7056			
251	py	500.0			
252	py	-39.8822			
253	py	-9.8848			
254	py	-8.6148			
255	py	8.6148			
256	py	9.8848			
257	py	39.8822			
300	pz	-500.0			
301	pz	-112.395			
302	pz	-110.49			
303	pz	193.04			
304	pz	199.945			
305	pz	500.0			
306	pz	-113.665			
400	c/y	10.3124	0.0	32.2120	
401	c/y	10.3124	0.0	59.9948	
402	sx	292.2524		5.0	
403	sx	292.2524		6.32	
501	p	0.05557761	1.0	0.0	-1.613162
502	p	-0.05557761	1.0	0.0	1.613162
503	p	0.03492076	0.0	1.0	-7.209883
504	p	-0.03492076	0.0	1.0	7.209883
611	px	282.25			
612	px	287.25			
613	px	297.25			
614	px	302.25			
615	px	272.25			
616	px	312.25			
621	py	-10.0			
622	py	-5.0			
623	py	5.0			
624	py	10.0			
625	py	-20.0			
626	py	20.0			
631	pz	-10.0			
632	pz	-5.0			
633	pz	5.0			
634	pz	10.0			


```

635 pz -20.0
636 pz 20.0

c end surfaces
mode n p
imp:n,p 0 1 38r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
    6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
    6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
    22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
    24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
    26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
    29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
    26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
    24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
    28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
    28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
    25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
    7014.60c 5.43529-4
c m6=Plutonium (Asum=4.070346-2)
m6 94239.60c 3.7291-2 94240.60c 1.9277-3 94241.60c 1.2196-4
    31000.60c 1.3628-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
    28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
    29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
    74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2

f102:n
del102
    2.07002-7 7.69672-7 1.75386-6 3.71293-6
    7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
    2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
    2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
    7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
    2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
    7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
    2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
    3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
    8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
    2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
    4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
    1.11070+1 1.35661+1
df102
    3.70370-3 4.37060-3 4.52500-3 4.57410-3
    4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
    4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
    3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
    3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
    7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
    1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
    4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
    6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
    1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
    1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
    1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
    1.63200-1 2.00340-1
fm102
f112:n
del112
    2.07002-7 7.69672-7 1.75386-6 3.71293-6
    7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
    2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
    2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
    7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2

```

	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df112		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm112	3.671+10				
f122:n	624				
de122		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df122		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm122	3.671+10				
f132:n	634				
de132		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df132		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2

6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1

fm132
f202:p
de202

3.671+10
611

1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2

df202

```

fm202      3.671+10
f212:p     614
de212      1.50000-2 3.25000-2 5.75000-2 8.50000-2
           1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
           6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
           2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
           7.25000+0 7.75000+0 9.00000+0 1.20000+1
df212      2.14390-3 5.77600-4 2.71850-4 2.68170-4
           3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
           1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
           3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
           7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm212      3.671+10
f222:p     624
de222      1.50000-2 3.25000-2 5.75000-2 8.50000-2
           1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
           6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
           2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
           7.25000+0 7.75000+0 9.00000+0 1.20000+1
df222      2.14390-3 5.77600-4 2.71850-4 2.68170-4
           3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
           1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
           3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
           7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm222      3.671+10
f232:p     634
de232      1.50000-2 3.25000-2 5.75000-2 8.50000-2
           1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
           6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
           2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
           7.25000+0 7.75000+0 9.00000+0 1.20000+1
df232      2.14390-3 5.77600-4 2.71850-4 2.68170-4
           3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
           1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
           3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
           7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm232      3.671+10
e102      4.13994-7 1.12535-6 2.38237-6 5.04348-6 1.06770-5
           2.26033-5 4.78512-5 1.01301-4 1.67017-4 2.75364-4
           4.53999-4 7.48518-4 1.23410-3 2.03468-3 2.24867-3
           2.61259-3 3.03539-3 3.70744-3 5.53084-3 9.11882-3
           1.50344-2 2.35786-2 2.47875-2 2.60584-2 2.70001-2
           2.85011-2 3.43067-2 5.24752-2 5.65622-2 8.65169-2
           1.22773-1 1.49956-1 1.83156-1 2.23708-1 2.73237-1
           2.94518-1 2.97211-1 2.98491-1 3.01974-1 3.87742-1
           4.97870-1 5.23397-1 6.08101-1 7.42735-1 9.07180-1
           1.10803+0 1.35335+0 1.65299+0 2.01897+0 2.23130+0
           2.34570+0 2.46597+0 3.01194+0 3.67879+0 4.49329+0
           5.48811+0 6.70320+0 8.18730+0 1.00000+1 1.22140+1
           1.49183+1
e202      2.00000-2 4.50000-2 7.00000-2 1.00000-1 1.50000-1
           3.00000-1 4.00000-1 5.10000-1 6.00000-1 7.00000-1
           1.00000+0 1.50000+0 2.00000+0 2.50000+0 3.00000+0
           4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
           8.00000+0 1.00000+1 1.40000+1
e112      4.13994-7 1.12535-6 2.38237-6 5.04348-6 1.06770-5
           2.26033-5 4.78512-5 1.01301-4 1.67017-4 2.75364-4
           4.53999-4 7.48518-4 1.23410-3 2.03468-3 2.24867-3
           2.61259-3 3.03539-3 3.70744-3 5.53084-3 9.11882-3
           1.50344-2 2.35786-2 2.47875-2 2.60584-2 2.70001-2
           2.85011-2 3.43067-2 5.24752-2 5.65622-2 8.65169-2
           1.22773-1 1.49956-1 1.83156-1 2.23708-1 2.73237-1
           2.94518-1 2.97211-1 2.98491-1 3.01974-1 3.87742-1
           4.97870-1 5.23397-1 6.08101-1 7.42735-1 9.07180-1
           1.10803+0 1.35335+0 1.65299+0 2.01897+0 2.23130+0
           2.34570+0 2.46597+0 3.01194+0 3.67879+0 4.49329+0
           5.48811+0 6.70320+0 8.18730+0 1.00000+1 1.22140+1
           1.49183+1
e212

```

```

2.00000-2 4.50000-2 7.00000-2 1.00000-1 1.50000-1
3.00000-1 4.00000-1 5.10000-1 6.00000-1 7.00000-1
1.00000+0 1.50000+0 2.00000+0 2.50000+0 3.00000+0
4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1

```

e122

```

4.13994-7 1.12535-6 2.38237-6 5.04348-6 1.06770-5
2.26033-5 4.78512-5 1.01301-4 1.67017-4 2.75364-4
4.53999-4 7.48518-4 1.23410-3 2.03468-3 2.24867-3
2.61259-3 3.03539-3 3.70744-3 5.53084-3 9.11882-3
1.50344-2 2.35786-2 2.47875-2 2.60584-2 2.70001-2
2.85011-2 3.43067-2 5.24752-2 5.65622-2 8.65169-2
1.22773-1 1.49956-1 1.83156-1 2.23708-1 2.73237-1
2.94518-1 2.97211-1 2.98491-1 3.01974-1 3.87742-1
4.97870-1 5.23397-1 6.08101-1 7.42735-1 9.07180-1
1.10803+0 1.35335+0 1.65299+0 2.01897+0 2.23130+0
2.34570+0 2.46597+0 3.01194+0 3.67879+0 4.49329+0
5.48811+0 6.70320+0 8.18730+0 1.00000+1 1.22140+1
1.49183+1

```

e222

```

2.00000-2 4.50000-2 7.00000-2 1.00000-1 1.50000-1
3.00000-1 4.00000-1 5.10000-1 6.00000-1 7.00000-1
1.00000+0 1.50000+0 2.00000+0 2.50000+0 3.00000+0
4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1

```

e132

```

4.13994-7 1.12535-6 2.38237-6 5.04348-6 1.06770-5
2.26033-5 4.78512-5 1.01301-4 1.67017-4 2.75364-4
4.53999-4 7.48518-4 1.23410-3 2.03468-3 2.24867-3
2.61259-3 3.03539-3 3.70744-3 5.53084-3 9.11882-3
1.50344-2 2.35786-2 2.47875-2 2.60584-2 2.70001-2
2.85011-2 3.43067-2 5.24752-2 5.65622-2 8.65169-2
1.22773-1 1.49956-1 1.83156-1 2.23708-1 2.73237-1
2.94518-1 2.97211-1 2.98491-1 3.01974-1 3.87742-1
4.97870-1 5.23397-1 6.08101-1 7.42735-1 9.07180-1
1.10803+0 1.35335+0 1.65299+0 2.01897+0 2.23130+0
2.34570+0 2.46597+0 3.01194+0 3.67879+0 4.49329+0
5.48811+0 6.70320+0 8.18730+0 1.00000+1 1.22140+1
1.49183+1

```

e232

```

2.00000-2 4.50000-2 7.00000-2 1.00000-1 1.50000-1
3.00000-1 4.00000-1 5.10000-1 6.00000-1 7.00000-1
1.00000+0 1.50000+0 2.00000+0 2.50000+0 3.00000+0
4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1

```

```

sd102 100.0
sd112 100.0
sd122 100.0
sd132 100.0
sd202 100.0
sd212 100.0
sd222 100.0
sd232 100.0

```

```

sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2
c sil 0.0 0.5 0.8660254 0.9961946 1.0
c sp1 0 1.21+10 8.82+9 1.47+10 1.09+9
sil s 11 12 13 14
sp1 1.21+10 8.82+9 1.47+10 1.09+9
sil1 h 0.0 0.5
sil2 h 0.5 0.8660254
sil3 h 0.8660254 0.9961946
sil4 h 0.9961946 1.0
sp11 0 1
sp12 0 1
sp13 0 1
sp14 0 1
ds2 s 21 22 23 24
si21 h 3.7645 5.675
si22 h 5.675 7.3865
si23 h 7.3865 8.321
si24 h 8.321 8.753
sp21 0 1

```

sp22 0 1
sp23 0 1
sp24 0 1
nps 2000000
prtmp 2j 1
print

File for MCNP-4B surface-detector dose-rate calculations for a tungsten-
reflected Pu sphere in the PFNA beam at the center of the truck lane
(400,000 histories)

message: outp=pfna7.o mctal=pfna7.m

```
mcnp file for PFNA project Tungsten-reflected PU sphere calculation
1      0      -100:128:-200:251:-300:305
2      0      100 -128 200 -251 300 -305
          #(-400 +101 +224 -227)
          #(-401 +400 +101 +225 -226)
          #(102 -129 +201 -250 +301 -304)
          #(129 -126 +252 -257 +301 -304)
          #(102 -126 +201 -250 +306 -301)
          #(615 -616 +625 -626 +635 -636)
3      1 0.10549 -400 +101 +224 -227 #(503 -504)
4      1 0.10549 -401 +400 +101 +225 -226 #(503 -504)
5      0      102 -127 +223 -228 +301 -304
          #(-400 +224 -227) #(-401 +400 +225 -226)
6      0      127 -124 +501 -502 +301 -304
          #(-401 +400 +225 -226)
7      0      124 -126 +254 -255 +301 -304
8      5 8.734441-2 102 -126 +201 -250 +306 -301
9      1 0.10549 102 -124 +222 -229 +301 -304
          #(127 +501 -502) #(-127 +223 -228)
10     1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11     1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12     1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13     1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14     1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15     1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16     1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17     1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18     1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19     1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20     1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21     2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22     2 0.1187956 103 -109 +202 -249 +302 -303
          #(221 -230)
          #(103 -104 +217 -234)
          #(104 -105 +216 -235)
          #(105 -107 +219 -232)
          #(107 -108 +219 -220) #(107 -108 +231 -232)
          #(106 -109 +212 -218) #(106 -109 +233 -236)
23     2 0.1187956 109 -120 +202 -249 +302 -303
          #(221 -230)
          #(109 -110 +211 -237)
          #(110 -111 +210 -238)
          #(111 -112 +209 -239)
          #(112 -113 +208 -240)
          #(113 -114 +207 -241)
          #(114 -115 +206 -242)
          #(115 -116 +205 -243)
          #(116 -117 +204 -244)
          #(117 -118 +203 -245)
          #(118 -119)
24     3 3.284-2 121 -125 +201 -250 +301 -304
          #(-124 +214 -247) #(124 +253 -256)
          #(122 +248) #(122 -213)
25     3 3.284-2 103 -107 +217 -234 +302 -303
          #(221 -230) #(104 -220) #(104 +231)
26     4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27     4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28     4 5.977931-2 102 -124 +201 -222 +301 -304
          #(103 -120 202 -221 302 -303)
          #(120 -123 215 -221 302 -303)
          #(121 -214)
29     4 5.977931-2 102 -124 +229 -250 +301 -304
          #(103 -120 230 -249 302 -303)
```

```

#(120 -123 230 -246 302 -303)
#(121 +247)
30 4 5.977931-2 124 -126 +252 -254 +301 -304
#(-125 +213 -253)
31 4 5.977931-2 124 -126 +255 -257 +301 -304
#(-125 +256 -248)
32 6 4.070346-2 -402
33 7 6.605306-2 -403 +402
34 0 -400 +101 +224 -227 +503 -504
35 0 -401 +400 +101 +225 -226 +503 -504
36 4 5.977931-2 122 -124 +201 -250 +301 -304
#(213 -248)
#(129 -252)
#(129 +257)
37 0 615 -616 +625 -626 +635 -636 +403
#(611 -614 622 -623 +632 -633)
#(612 -613 +621 -624 +632 -633)
#(612 -613 +622 -623 +631 -634)
38 0 611 -614 +622 -623 +632 -633 +403
39 0 612 -613 +621 -624 +632 -633 +403
40 0 612 -613 +622 -623 +631 -634 +403

```

c end cells

```

c
c
c surfaces
100 px -100.0
101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 500.0
129 px 87.9856
200 py -500.0
201 py -74.7056
202 py -72.8006
203 py -47.0958
204 py -45.8258
205 py -44.5558
206 py -43.2858
207 py -42.0158
208 py -40.7458
209 py -39.4758
210 py -38.2058
211 py -36.9358
212 py -34.3958
213 py -38.6122
214 py -33.2782
215 py -31.3732
216 py -30.5858

```


217	py	-24.2358			
218	py	-19.1558			
219	py	-16.6158			
220	py	-15.3458			
221	py	-12.8058			
222	py	-10.9008			
223	py	-5.8208			
224	py	-5.5245			
225	py	-4.2037			
226	py	4.2037			
227	py	5.5245			
228	py	5.8208			
229	py	10.9008			
230	py	12.8058			
231	py	15.3458			
232	py	16.6158			
233	py	19.1558			
234	py	24.2358			
235	py	30.5858			
236	py	34.3958			
237	py	36.9358			
238	py	38.2058			
239	py	39.4758			
240	py	40.7458			
241	py	42.0158			
242	py	43.2858			
243	py	44.5558			
244	py	45.8258			
245	py	47.0958			
246	py	31.3732			
247	py	33.2782			
248	py	38.6122			
249	py	72.8006			
250	py	74.7056			
251	py	500.0			
252	py	-39.8822			
253	py	-9.8848			
254	py	-8.6148			
255	py	8.6148			
256	py	9.8848			
257	py	39.8822			
300	pz	-500.0			
301	pz	-112.395			
302	pz	-110.49			
303	pz	193.04			
304	pz	199.945			
305	pz	500.0			
306	pz	-113.665			
400	c/y	10.3124	0.0	32.2120	
401	c/y	10.3124	0.0	59.9948	
402	sx	292.2524		4.9910	
403	sx	292.2524		9.6900	
501	p	0.05557761	1.0	0.0	-1.613162
502	p	-0.05557761	1.0	0.0	1.613162
503	p	0.03492076	0.0	1.0	-7.209883
504	p	-0.03492076	0.0	1.0	7.209883
611	px	277.25			
612	px	287.25			
613	px	297.25			
614	px	307.25			
615	px	272.25			
616	px	312.25			
621	py	-15.0			
622	py	-5.0			
623	py	5.0			
624	py	15.0			
625	py	-20.0			
626	py	20.0			
631	pz	-15.0			
632	pz	-5.0			
633	pz	5.0			
634	pz	15.0			

```

635 pz -20.0
636 pz 20.0

c end surfaces
mode n p
imp:n,p 0 1 29r 4 2 1 6r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.070346-2)
m6 94239.60c 3.7291-2 94240.60c 1.9277-3 94241.60c 1.2196-4
31000.60c 1.3628-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2

f102:n 611
de102 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1

df102 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.63290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1

fm102 3.671+10
f112:n 614
de112 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2

```

	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df112		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm112		3.671+10			
f122:n		624			
del122			2.07002-7	7.69672-7	1.75386-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df122		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm122		3.671+10			
f132:n		634			
del132			2.07002-7	7.69672-7	1.75386-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df132		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2

	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm132	3.671+10				
f202:p	611				
de202		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df202		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm202	3.671+10				
f212:p	614				
de212		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df212		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm212	3.671+10				
f222:p	624				
de222		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df222		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm222	3.671+10				
f232:p	634				
de232		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df232		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm232	3.671+10				
e102		4.13994-7	1.12535-6	2.38237-6	5.04348-6
		2.26033-5	4.78512-5	1.01301-4	1.67017-4
		4.53999-4	7.48518-4	1.23410-3	2.03468-3
		2.61259-3	3.03539-3	3.70744-3	5.53084-3
		1.50344-2	2.35786-2	2.47875-2	2.60584-2
		2.85011-2	3.43067-2	5.24752-2	5.65622-2
		1.22773-1	1.49956-1	1.83156-1	2.23708-1
		2.94518-1	2.97211-1	2.98491-1	3.01974-1
		4.97870-1	5.23397-1	6.08101-1	7.42735-1
		1.10803+0	1.35335+0	1.65299+0	2.01897+0
		2.34570+0	2.46597+0	3.01194+0	3.67879+0
		5.48811+0	6.70320+0	8.18730+0	1.00000+1
		1.49183+1			
e202		2.00000-2	4.50000-2	7.00000-2	1.00000-1
		3.00000-1	4.00000-1	5.10000-1	6.00000-1
		1.00000+0	1.50000+0	2.00000+0	2.50000+0
					3.00000+0

```

4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1
e112
4.13994-7 1.12535-6 2.38237-6 5.04348-6 1.06770-5
2.26033-5 4.78512-5 1.01301-4 1.67017-4 2.75364-4
4.53999-4 7.48518-4 1.23410-3 2.03468-3 2.24867-3
2.61259-3 3.03539-3 3.70744-3 5.53084-3 9.11882-3
1.50344-2 2.35786-2 2.47875-2 2.60584-2 2.70001-2
2.85011-2 3.43067-2 5.24752-2 5.65622-2 8.65169-2
1.22773-1 1.49956-1 1.83156-1 2.23708-1 2.73237-1
2.94518-1 2.97211-1 2.98491-1 3.01974-1 3.87742-1
4.97870-1 5.23397-1 6.08101-1 7.42735-1 9.07180-1
1.10803+0 1.35335+0 1.65299+0 2.01897+0 2.23130+0
2.34570+0 2.46597+0 3.01194+0 3.67879+0 4.49329+0
5.48811+0 6.70320+0 8.18730+0 1.00000+1 1.22140+1
1.49183+1
e212
2.00000-2 4.50000-2 7.00000-2 1.00000-1 1.50000-1
3.00000-1 4.00000-1 5.10000-1 6.00000-1 7.00000-1
1.00000+0 1.50000+0 2.00000+0 2.50000+0 3.00000+0
4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1
e122
4.13994-7 1.12535-6 2.38237-6 5.04348-6 1.06770-5
2.26033-5 4.78512-5 1.01301-4 1.67017-4 2.75364-4
4.53999-4 7.48518-4 1.23410-3 2.03468-3 2.24867-3
2.61259-3 3.03539-3 3.70744-3 5.53084-3 9.11882-3
1.50344-2 2.35786-2 2.47875-2 2.60584-2 2.70001-2
2.85011-2 3.43067-2 5.24752-2 5.65622-2 8.65169-2
1.22773-1 1.49956-1 1.83156-1 2.23708-1 2.73237-1
2.94518-1 2.97211-1 2.98491-1 3.01974-1 3.87742-1
4.97870-1 5.23397-1 6.08101-1 7.42735-1 9.07180-1
1.10803+0 1.35335+0 1.65299+0 2.01897+0 2.23130+0
2.34570+0 2.46597+0 3.01194+0 3.67879+0 4.49329+0
5.48811+0 6.70320+0 8.18730+0 1.00000+1 1.22140+1
1.49183+1
e222
2.00000-2 4.50000-2 7.00000-2 1.00000-1 1.50000-1
3.00000-1 4.00000-1 5.10000-1 6.00000-1 7.00000-1
1.00000+0 1.50000+0 2.00000+0 2.50000+0 3.00000+0
4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1
e132
4.13994-7 1.12535-6 2.38237-6 5.04348-6 1.06770-5
2.26033-5 4.78512-5 1.01301-4 1.67017-4 2.75364-4
4.53999-4 7.48518-4 1.23410-3 2.03468-3 2.24867-3
2.61259-3 3.03539-3 3.70744-3 5.53084-3 9.11882-3
1.50344-2 2.35786-2 2.47875-2 2.60584-2 2.70001-2
2.85011-2 3.43067-2 5.24752-2 5.65622-2 8.65169-2
1.22773-1 1.49956-1 1.83156-1 2.23708-1 2.73237-1
2.94518-1 2.97211-1 2.98491-1 3.01974-1 3.87742-1
4.97870-1 5.23397-1 6.08101-1 7.42735-1 9.07180-1
1.10803+0 1.35335+0 1.65299+0 2.01897+0 2.23130+0
2.34570+0 2.46597+0 3.01194+0 3.67879+0 4.49329+0
5.48811+0 6.70320+0 8.18730+0 1.00000+1 1.22140+1
1.49183+1
e232
2.00000-2 4.50000-2 7.00000-2 1.00000-1 1.50000-1
3.00000-1 4.00000-1 5.10000-1 6.00000-1 7.00000-1
1.00000+0 1.50000+0 2.00000+0 2.50000+0 3.00000+0
4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1
sd102 100.0
sd112 100.0
sd122 100.0
sd132 100.0
sd202 100.0
sd212 100.0
sd222 100.0
sd232 100.0
sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2
c sil 0.0 0.5 0.8660254 0.9961946 1.0

```

```
c      sp1      0 1.21+10 8.82+9 1.47+10 1.09+9
si1    s 11 12 13 14
sp1    1.21+10 8.82+9 1.47+10 1.09+9
si11   h 0.0 0.5
si12   h 0.5 0.8660254
si13   h 0.8660254 0.9961946
si14   h 0.9961946 1.0
sp11   0 1
sp12   0 1
sp13   0 1
sp14   0 1
ds2    s 21 22 23 24
si21   h 5.7645 5.675
si22   h 5.675 7.3865
si23   h 7.3865 8.321
si24   h 8.321 8.753
sp21   0 1
sp22   0 1
sp23   0 1
sp24   0 1
nps    400000
prcmp  2j 1
print
```

File for MCNP-4B surface-detector dose-rate calculations for a water-
reflected Pu sphere in the PFNA beam at the center of the truck lane
(400,000 histories)

message: outp=pfna8.o mctal=pfna8.m

```
mcnp file for PFNA project Water-reflected PU sphere calculation
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
#(-400 +101 +224 -227)
#(-401 +400 +101 +225 -226)
#(102 -129 +201 -250 +301 -304)
#(129 -126 +252 -257 +301 -304)
#(102 -126 +201 -250 +306 -301)
#(615 -616 +625 -626 +635 -636)
3 1 0.10549 -400 +101 +224 -227 #(503 -504)
4 1 0.10549 -401 +400 +101 +225 -226 #(503 -504)
5 0 102 -127 +223 -228 +301 -304
#(-400 +224 -227) #(-401 +400 +225 -226)
6 0 127 -124 +501 -502 +301 -304
#(-401 +400 +225 -226)
7 0 124 -126 +254 -255 +301 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
9 1 0.10549 102 -124 +222 -229 +301 -304
#(127 +501 -502) #(-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
#(221 -230)
#(103 -104 +217 -234)
#(104 -105 +216 -235)
#(105 -107 +219 -232)
#(107 -108 +219 -220) #(107 -108 +231 -232)
#(106 -109 +212 -218) #(106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
#(221 -230)
#(109 -110 +211 -237)
#(110 -111 +210 -238)
#(111 -112 +209 -239)
#(112 -113 +208 -240)
#(113 -114 +207 -241)
#(114 -115 +206 -242)
#(115 -116 +205 -243)
#(116 -117 +204 -244)
#(117 -118 +203 -245)
#(118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
#(-124 +214 -247) #(124 +253 -256)
#(122 +248) #(122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
#(221 -230) #(104 -220) #(104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
#(103 -120 202 -221 302 -303)
#(120 -123 215 -221 302 -303)
#(121 -214)
29 4 5.977931-2 102 -124 +229 -250 +301 -304
#(103 -120 230 -249 302 -303)
```

```

#(120 -123 230 -246 302 -303)
#(121 +247)
30 4 5.977931-1 124 -126 +256 -254 +301 -304
#(-125 +213 -248)
31 4 5.977931-1 124 -126 +256 -257 +301 -304
#(-125 +256 -248)
32 6 4.9726293-2 -402
33 8 1.0014900-1 -404 +402
34 8 1.0014900-1 -403 +404
35 0 -400 +101 +224 -227 +503 -504
36 0 -401 +400 +101 +225 -226 +503 -504
37 4 5.977931-2 122 -124 +201 -250 +301 -304
#(213 -248)
#(129 -252)
#(129 +257)
38 0 615 -616 +625 -626 +635 -636 +403
#(611 -614 622 -623 +632 -633)
#(612 -613 +621 -624 +632 -633)
#(612 -613 +622 -623 +631 -634)
39 0 611 -614 +622 -623 +632 -633 +403
c 40 0 612 -613 +621 -624 +632 -633 +403 #(622 -623)
c 41 0 612 -613 +622 -623 +631 -634 +403 #(632 -633)
40 0 612 -613 +621 -624 +632 -633 +403
41 0 612 -613 +622 -623 +631 -634 +403

```

c end cells

```

c
c surfaces
100 px -100.0
101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 500.0
129 px 87.9856
200 py -500.0
201 py -74.7056
202 py -72.8006
203 py -47.0958
204 py -45.8258
205 py -44.5558
206 py -43.2858
207 py -42.0158
208 py -40.7458
209 py -39.4758
210 py -38.2058
211 py -36.9358
212 py -34.3958
213 py -38.6122

```


214	py	-33.2782			
215	py	-31.3732			
216	py	-30.5858			
217	py	-24.2358			
218	py	-19.1558			
219	py	-16.6158			
220	py	-15.3458			
221	py	-12.8058			
222	py	-10.9008			
223	py	-5.8208			
224	py	-5.5245			
225	py	-4.2037			
226	py	4.2037			
227	py	5.5245			
228	py	5.8208			
229	py	10.9008			
230	py	12.8058			
231	py	15.3458			
232	py	16.6158			
233	py	19.1558			
234	py	24.2358			
235	py	30.5858			
236	py	34.3958			
237	py	36.9358			
238	py	38.2058			
239	py	39.4758			
240	py	40.7458			
241	py	42.0158			
242	py	43.2858			
243	py	44.5558			
244	py	45.8258			
245	py	47.0958			
246	py	31.3732			
247	py	33.2782			
248	py	38.6122			
249	py	72.8006			
250	py	74.7056			
251	py	500.0			
252	py	-39.8822			
253	py	-9.8848			
254	py	-8.6148			
255	py	8.6148			
256	py	9.8848			
257	py	39.8822			
300	pz	-500.0			
301	pz	-112.395			
302	pz	-110.49			
303	pz	193.04			
304	pz	199.945			
305	pz	500.0			
306	pz	-113.665			
400	c/y	10.3124	0.0	32.2120	
401	c/y	10.3124	0.0	59.9948	
402	sx	292.2524		4.0801	
403	sx	292.2524		29.4801	
404	sx	292.2524		15.0000	
501	p	0.05557761	1.0	0.0	-1.613162
502	p	-0.05557761	1.0	0.0	1.613162
503	p	0.03492076	0.0	1.0	-7.209883
504	p	-0.03492076	0.0	1.0	7.209883
611	px	257.2524			
612	px	282.2524			
613	px	302.2524			
614	px	327.2524			
615	px	242.2524			
616	px	342.2524			
621	py	-35.0			
622	py	-10.0			
623	py	10.0			
624	py	35.0			
625	py	-50.0			
626	py	50.0			

631 pz -35.0
 632 pz -10.0
 633 pz 10.0
 634 pz 35.0
 635 pz -50.0
 636 pz 50.0

c end surfaces

mode n p

imp:n,p 0 1 29r 8 4 2 1 6r

c m1=borated polyethylene (Asum=0.10549)

m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
 6000.60c 2.9100-2 8016.60c 7.9400-3

mt1 poly.01t

c m2=borated paraffin (Asum=0.1187956)

m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
 6000.60c 3.8230-2

mt2 poly.01t

c m3=Lead (Asum=3.284-2)

m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2

c m4=Aluminum 6061-T6 (Asum=5.977988-2)

m4 12000.60c 6.6890-4 13027.60c 5.8270-4 14000.60c 1.4740-4
 22000.60c 5.0930-5 24050.60c 2.7230-4 25000.60c 5.2444-5
 24053.60c 5.9460-6 24054.60c 1.4770-4 25004.60c 1.1920-5
 26056.60c 1.8699-4 26057.60c 4.3210-4 27008.60c 5.7060-7
 29063.60c 9.08133-5 29065.60c 4.04767-5 30055.60c 4.4400-5

c m5=Steel (Asum=8.734441-2)

m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
 26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
 24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
 28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
 28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
 25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
 7014.60c 5.43529-4

c m6=Plutonium (Asum=4.9726293-2)

m6 94239.60c 4.6982-2 94240.60c 2.5852-3 94241.60c 1.4915-4
 94242.60c 9.9432-6

c m7=Tungsten (Asum=6.605306-2)

m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
 28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
 29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
 74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2

c m8=water (Asum=0.100149)

m8 1001.60c 6.6766-2 8016.60c 3.3383-2

mt8 lwtr.01t

f102:n 611

del102

2.07002-7 7.69672-7 1.75386-6 3.71293-6
 7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
 2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
 2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
 7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
 2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
 7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
 2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
 3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
 8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
 2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
 4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
 1.11070+1 1.35661+1

df102

3.70370-3 4.37060-3 4.52500-3 4.57410-3
 4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
 4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
 3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
 3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
 7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
 1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
 4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
 6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
 1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
 1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
 1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
 1.63200-1 2.00340-1

fm102	3.671+10				
f112:n	614				
de112		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df112		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm112	3.671+10				
f122:n	624				
de122		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df122		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm122	3.671+10				
f132:n	634				
de132		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df132		3.70370-3	4.37060-3	4.52500-3	4.57410-3

	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35000-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm132	3.671+10				
f202:p	611				
de202		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df202		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm202	3.671+10				
f212:p	614				
de212		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df212		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm212	3.671+10				
f222:p	624				
de222		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df222		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm222	3.671+10				
f232:p	634				
de232		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df232		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm232	3.671+10				
e102		4.13994-7	1.12535-6	2.38237-6	5.04348-6
		2.26033-5	4.78512-5	1.01301-4	1.67017-4
		4.53999-4	7.48518-4	1.23410-3	2.03468-3
		2.61259-3	3.03539-3	3.70744-3	5.53084-3
		1.50344-2	2.35786-2	2.47875-2	2.60584-2
		2.85011-2	3.43067-2	5.24752-2	5.65622-2
		1.22773-1	1.49956-1	1.83156-1	2.23708-1
		2.94518-1	2.97211-1	2.98491-1	3.01974-1
		4.97870-1	5.23397-1	6.08101-1	7.42735-1
		1.10803+0	1.35335+0	1.65299+0	2.01897+0

	2.34570+0	2.46597+0	3.01194+0	3.67879+0	4.49329+0
	5.48811+0	6.70320+0	8.18730+0	1.00000+1	1.22140+1
	1.49183+1				
e202	2.00000-2	4.50000-2	7.00000-2	1.00000-1	1.50000-1
	3.00000-1	4.00000-1	5.10000-1	6.00000-1	7.00000-1
	1.00000+0	1.50000+0	2.00000+0	2.50000+0	3.00000+0
	4.00000+0	5.00000+0	6.00000+0	7.00000+0	7.50000+0
	8.00000+0	1.00000+1	1.40000+1		
e112	4.13994-7	1.12535-6	2.38237-6	5.04348-6	1.06770-5
	2.26033-5	4.78512-5	1.01301-4	1.67017-4	2.75364-4
	4.53999-4	7.48518-4	1.23410-3	2.03468-3	2.24867-3
	2.61259-3	3.03539-3	3.70744-3	5.53084-3	9.11882-3
	1.50344-2	2.35786-2	2.47875-2	2.60584-2	2.70001-2
	2.85011-2	3.43067-2	5.24752-2	5.65622-2	8.65169-2
	1.22773-1	1.49956-1	1.83156-1	2.23708-1	2.73237-1
	2.94518-1	2.97211-1	2.98491-1	3.01974-1	3.87742-1
	4.97870-1	5.23397-1	6.08101-1	7.42735-1	9.07180-1
	1.10803+0	1.35335+0	1.65299+0	2.01897+0	2.23130+0
	2.34570+0	2.46597+0	3.01194+0	3.67879+0	4.49329+0
	5.48811+0	6.70320+0	8.18730+0	1.00000+1	1.22140+1
	1.49183+1				
e212	2.00000-2	4.50000-2	7.00000-2	1.00000-1	1.50000-1
	3.00000-1	4.00000-1	5.10000-1	6.00000-1	7.00000-1
	1.00000+0	1.50000+0	2.00000+0	2.50000+0	3.00000+0
	4.00000+0	5.00000+0	6.00000+0	7.00000+0	7.50000+0
	8.00000+0	1.00000+1	1.40000+1		
e122	4.13994-7	1.12535-6	2.38237-6	5.04348-6	1.06770-5
	2.26033-5	4.78512-5	1.01301-4	1.67017-4	2.75364-4
	4.53999-4	7.48518-4	1.23410-3	2.03468-3	2.24867-3
	2.61259-3	3.03539-3	3.70744-3	5.53084-3	9.11882-3
	1.50344-2	2.35786-2	2.47875-2	2.60584-2	2.70001-2
	2.85011-2	3.43067-2	5.24752-2	5.65622-2	8.65169-2
	1.22773-1	1.49956-1	1.83156-1	2.23708-1	2.73237-1
	2.94518-1	2.97211-1	2.98491-1	3.01974-1	3.87742-1
	4.97870-1	5.23397-1	6.08101-1	7.42735-1	9.07180-1
	1.10803+0	1.35335+0	1.65299+0	2.01897+0	2.23130+0
	2.34570+0	2.46597+0	3.01194+0	3.67879+0	4.49329+0
	5.48811+0	6.70320+0	8.18730+0	1.00000+1	1.22140+1
	1.49183+1				
e222	2.00000-2	4.50000-2	7.00000-2	1.00000-1	1.50000-1
	3.00000-1	4.00000-1	5.10000-1	6.00000-1	7.00000-1
	1.00000+0	1.50000+0	2.00000+0	2.50000+0	3.00000+0
	4.00000+0	5.00000+0	6.00000+0	7.00000+0	7.50000+0
	8.00000+0	1.00000+1	1.40000+1		
e132	4.13994-7	1.12535-6	2.38237-6	5.04348-6	1.06770-5
	2.26033-5	4.78512-5	1.01301-4	1.67017-4	2.75364-4
	4.53999-4	7.48518-4	1.23410-3	2.03468-3	2.24867-3
	2.61259-3	3.03539-3	3.70744-3	5.53084-3	9.11882-3
	1.50344-2	2.35786-2	2.47875-2	2.60584-2	2.70001-2
	2.85011-2	3.43067-2	5.24752-2	5.65622-2	8.65169-2
	1.22773-1	1.49956-1	1.83156-1	2.23708-1	2.73237-1
	2.94518-1	2.97211-1	2.98491-1	3.01974-1	3.87742-1
	4.97870-1	5.23397-1	6.08101-1	7.42735-1	9.07180-1
	1.10803+0	1.35335+0	1.65299+0	2.01897+0	2.23130+0
	2.34570+0	2.46597+0	3.01194+0	3.67879+0	4.49329+0
	5.48811+0	6.70320+0	8.18730+0	1.00000+1	1.22140+1
	1.49183+1				
e232	2.00000-2	4.50000-2	7.00000-2	1.00000-1	1.50000-1
	3.00000-1	4.00000-1	5.10000-1	6.00000-1	7.00000-1
	1.00000+0	1.50000+0	2.00000+0	2.50000+0	3.00000+0
	4.00000+0	5.00000+0	6.00000+0	7.00000+0	7.50000+0
	8.00000+0	1.00000+1	1.40000+1		
sd102	400.0				
sd112	400.0				
sd122	400.0				

```

sd132 400.0
sd202 400.0
sd212 400.0
sd222 400.0
sd232 400.0
sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2
c      si1      0.0 0.5 0.8660254 0.9961946 1.0
c      sp1      0 1.21+10 8.82+9 1.47+10 1.09+9
si1    s 11 12 13 14
sp1    1.21+10 8.82+9 1.47+10 1.09+9
si11   h 0.0 0.5
si12   h 0.5 0.8660254
si13   h 0.8660254 0.9961946
si14   h 0.9961946 1.0
sp11   0 1
sp12   0 1
sp13   0 1
sp14   0 1
ds2    s 21 22 23 24
si21   h 3.7645 5.675
si22   h 5.675 7.3865
si23   h 7.3865 8.321
si24   h 8.321 8.753
sp21   0 1
sp22   0 1
sp23   0 1
sp24   0 1
nps    400000
prdmp  2j 1
print

```

File for MCNP-4B surface-detector dose-rate background calculations for
the tungsten-reflected Pu spheres in the PFNA beam at the center of the
truck lane (2,000,000 histories)

message: outp=pfna9.o mctal=pfna9.m

```
mcnp file for PFNA project W-reflected PU sphere calc (background)
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
#(-400 +101 +224 -227)
#(-401 +400 +101 +225 -226)
#(102 -129 +201 -250 +301 -304)
#(129 -126 +252 -257 +301 -304)
#(102 -126 +201 -250 +306 -301)
#(615 -616 +625 -626 +635 -636)
3 1 0.10549 -400 +101 +224 -227 #(503 -504)
4 1 0.10549 -401 +400 +101 +225 -226 #(503 -504)
5 0 102 -127 +223 -228 +301 -304
#(-400 +224 -227) #(-401 +400 +225 -226)
6 0 127 -124 +501 -502 +301 -304
#(-401 +400 +225 -226)
7 0 124 -126 +254 -255 +301 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
9 1 0.10549 102 -124 +222 -229 +301 -304
#(127 +501 -502) #(-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
#(221 -230)
#(103 -104 +217 -234)
#(104 -105 +216 -235)
#(105 -107 +219 -232)
#(107 -108 +219 -220) #(107 -108 +231 -232)
#(106 -109 +212 -218) #(106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
#(221 -230)
#(109 -110 +211 -237)
#(110 -111 +210 -238)
#(111 -112 +209 -239)
#(112 -113 +208 -240)
#(113 -114 +207 -241)
#(114 -115 +206 -242)
#(115 -116 +205 -243)
#(116 -117 +204 -244)
#(117 -118 +203 -245)
#(118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
#(-124 +214 -247) #(124 +253 -256)
#(122 +248) #(122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
#(221 -230) #(104 -220) #(104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
#(103 -120 202 -221 302 -303)
#(120 -123 215 -221 302 -303)
#(121 -214)
29 4 5.977931-2 102 -124 +229 -250 +301 -304
#(103 -120 230 -249 302 -303)
```

```

#(120 -123 230 -246 302 -303)
#(121 +247)
30 4 5.977931-2 124 -126 +252 -254 +301 -304
#(-125 +213 -253)
31 4 5.977931-2 124 -126 +255 -257 +301 -304
#(-125 +256 -248)
32 0 -402
33 0 -403 +402
34 0 -400 +101 +224 -227 +503 -504
35 0 -401 +400 +101 +225 -226 +503 -504
36 4 5.977931-2 122 -124 +201 -250 +301 -304
#(213 -248)
#(129 -252)
#(129 +257)
37 0 615 -616 +625 -626 +635 -636 +403
#(611 -614 622 -623 +632 -633)
#(612 -613 +621 -624 +632 -633)
#(612 -613 +622 -623 +631 -634)
38 0 611 -614 +622 -623 +632 -633 +403
39 0 612 -613 +621 -624 +632 -633 +403
40 0 612 -613 +622 -623 +631 -634 +403

```

c end cells

c

c surfaces

```

100 px -100.0
101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 500.0
129 px 87.9856
200 py -500.0
201 py -74.7056
202 py -72.8006
203 py -47.0958
204 py -45.8258
205 py -44.5558
206 py -43.2858
207 py -42.0158
208 py -40.7458
209 py -39.4758
210 py -38.2058
211 py -36.9358
212 py -34.3958
213 py -38.6122
214 py -33.2782
215 py -31.3732
216 py -30.5858

```


217	py	-24.2358			
218	py	-19.1558			
219	py	-16.6158			
220	py	-15.3458			
221	py	-12.8058			
222	py	-10.9008			
223	py	-5.8208			
224	py	-5.5245			
225	py	-4.2037			
226	py	4.2037			
227	py	5.5245			
228	py	5.8208			
229	py	10.9008			
230	py	12.8058			
231	py	15.3458			
232	py	16.6158			
233	py	19.1558			
234	py	24.2358			
235	py	30.5858			
236	py	34.3958			
237	py	36.9358			
238	py	38.2058			
239	py	39.4758			
240	py	40.7458			
241	py	42.0158			
242	py	43.2858			
243	py	44.5558			
244	py	45.8258			
245	py	47.0958			
246	py	31.3732			
247	py	33.2782			
248	py	38.6122			
249	py	72.8006			
250	py	74.7056			
251	py	500.0			
252	py	-39.8822			
253	py	-9.8848			
254	py	-8.6148			
255	py	8.6148			
256	py	9.8848			
257	py	39.8822			
300	pz	-500.0			
301	pz	-112.395			
302	pz	-110.49			
303	pz	193.04			
304	pz	199.945			
305	pz	500.0			
306	pz	-113.665			
400	c/y	10.3124	0.0	32.2120	
401	c/y	10.3124	0.0	59.9948	
402	sx	292.2524		4.9910	
403	sx	292.2524		9.6900	
501	p	0.05557761	1.0	0.0	-1.613162
502	p	-0.05557761	1.0	0.0	1.613162
503	p	0.03492076	0.0	1.0	-7.209883
504	p	-0.03492076	0.0	1.0	7.209883
611	px	277.25			
612	px	287.25			
613	px	297.25			
614	px	307.25			
615	px	272.25			
616	px	312.25			
621	py	-15.0			
622	py	-5.0			
623	py	5.0			
624	py	15.0			
625	py	-20.0			
626	py	20.0			
631	pz	-15.0			
632	pz	-5.0			
633	pz	5.0			
634	pz	15.0			

```

635 pz -20.0
636 pz 20.0

c end surfaces
mode n p
imp:n,p 0 1 29r 4 2 1 6r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.070346-2)
m6 94239.60c 3.7291-2 94240.60c 1.9277-3 94241.60c 1.2196-4
31000.60c 1.3628-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2

f102:n
del102 611
2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1

df102 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1

fm102 3.671+10
f112:n 614
del112 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2

```

	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df112		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm112	3.671+10				
f122:n	624				
de122		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df122		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm122	3.671+10				
f132:n	634				
de132		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df132		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2

	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm132	3.671+10				
f202:p	611				
de202		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df202		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm202	3.671+10				
f212:p	614				
de212		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df212		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm212	3.671+10				
f222:p	624				
de222		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df222		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm222	3.671+10				
f232:p	634				
de232		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df232		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm232	3.671+10				
e102		4.13994-7	1.12535-6	2.38237-6	5.04348-6
		2.26033-5	4.78512-5	1.01301-4	1.67017-4
		4.53999-4	7.48518-4	1.23410-3	2.03468-3
		2.61259-3	3.03539-3	3.70744-3	5.53084-3
		1.50344-2	2.35786-2	2.47875-2	2.60584-2
		2.85011-2	3.43067-2	5.24752-2	5.65622-2
		1.22773-1	1.49956-1	1.83156-1	2.23708-1
		2.94518-1	2.97211-1	2.98491-1	3.01974-1
		4.97870-1	5.23397-1	6.08101-1	7.42735-1
		1.10803+0	1.35335+0	1.65299+0	2.01897+0
		2.34570+0	2.46597+0	3.01194+0	3.67879+0
		5.48811+0	6.70320+0	8.18730+0	1.00000+1
		1.49183+1			1.22140+1
e202		2.00000-2	4.50000-2	7.00000-2	1.00000-1
		3.00000-1	4.00000-1	5.10000-1	6.00000-1
		1.00000+0	1.50000+0	2.00000+0	2.50000+0
					3.00000+0

```

4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1
e112
4.13994-7 1.12535-6 2.38237-6 5.04348-6 1.06770-5
2.26033-5 4.78512-5 1.01301-4 1.67017-4 2.75364-4
4.53999-4 7.48518-4 1.23410-3 2.03468-3 2.24867-3
2.61259-3 3.03539-3 3.70744-3 5.53084-3 9.11882-3
1.50344-2 2.35786-2 2.47875-2 2.60584-2 2.70001-2
2.85011-2 3.43067-2 5.24752-2 5.65622-2 8.65169-2
1.22773-1 1.49956-1 1.83156-1 2.23708-1 2.73237-1
2.94518-1 2.97211-1 2.98491-1 3.01974-1 3.87742-1
4.97870-1 5.23397-1 6.08101-1 7.42735-1 9.07180-1
1.10803+0 1.35335+0 1.65299+0 2.01897+0 2.23130+0
2.34570+0 2.46597+0 3.01194+0 3.67879+0 4.49329+0
5.48811+0 6.70320+0 8.18730+0 1.00000+1 1.22140+1
1.49183+1
e212
2.00000-2 4.50000-2 7.00000-2 1.00000-1 1.50000-1
3.00000-1 4.00000-1 5.10000-1 6.00000-1 7.00000-1
1.00000+0 1.50000+0 2.00000+0 2.50000+0 3.00000+0
4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1
e122
4.13994-7 1.12535-6 2.38237-6 5.04348-6 1.06770-5
2.26033-5 4.78512-5 1.01301-4 1.67017-4 2.75364-4
4.53999-4 7.48518-4 1.23410-3 2.03468-3 2.24867-3
2.61259-3 3.03539-3 3.70744-3 5.53084-3 9.11882-3
1.50344-2 2.35786-2 2.47875-2 2.60584-2 2.70001-2
2.85011-2 3.43067-2 5.24752-2 5.65622-2 8.65169-2
1.22773-1 1.49956-1 1.83156-1 2.23708-1 2.73237-1
2.94518-1 2.97211-1 2.98491-1 3.01974-1 3.87742-1
4.97870-1 5.23397-1 6.08101-1 7.42735-1 9.07180-1
1.10803+0 1.35335+0 1.65299+0 2.01897+0 2.23130+0
2.34570+0 2.46597+0 3.01194+0 3.67879+0 4.49329+0
5.48811+0 6.70320+0 8.18730+0 1.00000+1 1.22140+1
1.49183+1
e222
2.00000-2 4.50000-2 7.00000-2 1.00000-1 1.50000-1
3.00000-1 4.00000-1 5.10000-1 6.00000-1 7.00000-1
1.00000+0 1.50000+0 2.00000+0 2.50000+0 3.00000+0
4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1
e132
4.13994-7 1.12535-6 2.38237-6 5.04348-6 1.06770-5
2.26033-5 4.78512-5 1.01301-4 1.67017-4 2.75364-4
4.53999-4 7.48518-4 1.23410-3 2.03468-3 2.24867-3
2.61259-3 3.03539-3 3.70744-3 5.53084-3 9.11882-3
1.50344-2 2.35786-2 2.47875-2 2.60584-2 2.70001-2
2.85011-2 3.43067-2 5.24752-2 5.65622-2 8.65169-2
1.22773-1 1.49956-1 1.83156-1 2.23708-1 2.73237-1
2.94518-1 2.97211-1 2.98491-1 3.01974-1 3.87742-1
4.97870-1 5.23397-1 6.08101-1 7.42735-1 9.07180-1
1.10803+0 1.35335+0 1.65299+0 2.01897+0 2.23130+0
2.34570+0 2.46597+0 3.01194+0 3.67879+0 4.49329+0
5.48811+0 6.70320+0 8.18730+0 1.00000+1 1.22140+1
1.49183+1
e232
2.00000-2 4.50000-2 7.00000-2 1.00000-1 1.50000-1
3.00000-1 4.00000-1 5.10000-1 6.00000-1 7.00000-1
1.00000+0 1.50000+0 2.00000+0 2.50000+0 3.00000+0
4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1
sd102 100.0
sd112 100.0
sd122 100.0
sd132 100.0
sd202 100.0
sd212 100.0
sd222 100.0
sd232 100.0
sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2
c sil 0.0 0.5 0.8660254 0.9961946 1.0

```

```
c          sp1      0 1.21+10 8.82+9 1.47+10 1.09+9
si1       s  11 12 13 14
sp1       1.21+10 8.82+9 1.47+10 1.09+9
si11      h 0.0 0.5
si12      h 0.5 0.8660254
si13      h 0.8660254 0.9961946
si14      h 0.9961946 1.0
sp11      0 1
sp12      0 1
sp13      0 1
sp14      0 1
ds2       s 21 22 23 24
si21      h 3.7645 5.675
si22      h 5.675 7.3865
si23      h 7.3865 8.321
si24      h 8.321 8.753
sp21      0 1
sp22      0 1
sp23      0 1
sp24      0 1
nps       2000000
prdmp     2j 1
print
```

File for MCNP-4B surface-detector dose-rate background calculations for
the water-reflected Pu spheres in the PFNA beam at the center of the
truck lane (2,000,000 histories)

message: outp=pfnaa.o mctal=pfnaa.m

```

mcnp file for PFNA project H2O-reflected PU sphere calc (background)
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
#(-400 +101 +224 -227)
#(-401 +400 +101 +225 -226)
#(102 -129 +201 -250 +301 -304)
#(129 -126 +252 -257 +301 -304)
#(102 -126 +201 -250 +306 -301)
#(615 -616 +625 -626 +635 -636)
3 1 0.10549 -400 +101 +224 -227 #(503 -504)
4 1 0.10549 -401 +400 +101 +225 -226 #(503 -504)
5 0 102 -127 +223 -228 +301 -304
#(-400 +224 -227) #(-401 +400 +225 -226)
6 0 127 -124 +501 -502 +301 -304
#(-401 +400 +225 -226)
7 0 124 -126 +254 -255 +301 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
9 1 0.10549 102 -124 +222 -229 +301 -304
#(127 +501 -502) #(-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
#(221 -230)
#(103 -104 +217 -234)
#(104 -105 +216 -235)
#(105 -107 +219 -232)
#(107 -108 +219 -220) #(107 -108 +231 -232)
#(106 -109 +212 -218) #(106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
#(221 -230)
#(109 -110 +211 -237)
#(110 -111 +210 -238)
#(111 -112 +209 -239)
#(112 -113 +208 -240)
#(113 -114 +207 -241)
#(114 -115 +206 -242)
#(115 -116 +205 -243)
#(116 -117 +204 -244)
#(117 -118 +203 -245)
#(118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
#(-124 +214 -247) #(124 +253 -256)
#(122 +248) #(122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
#(221 -230) #(104 -220) #(104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
#(103 -120 202 -221 302 -303)
#(120 -123 215 -221 302 -303)
#(121 -214)
29 4 5.977931-2 102 -124 +229 -250 +301 -304
#(103 -120 230 -249 302 -303)

```

```

#(120 -123 230 -246 302 -303)
#(121 +247)
30 4 5.977931-2 124 -126 +252 -254 +301 -304
#(-125 +213 -253)
31 4 5.977931-2 124 -126 +255 -257 +301 -304
#(-125 +256 -248)
32 0 -402
33 0 -404 +402
34 0 -403 +404
35 0 -400 +101 +224 -227 +503 -504
36 0 -401 +400 +101 +225 -226 +503 -504
37 4 5.977931-2 122 -124 +201 -250 +301 -304
#(213 -248)
#(129 -252)
#(129 +257)
38 0 615 -616 +625 -626 +635 -636 +403
#(611 -614 622 -623 +632 -633)
#(612 -613 +621 -624 +632 -633)
#(612 -613 +622 -623 +631 -634)
39 0 611 -614 +622 -623 +632 -633 +403
c 40 0 612 -613 +621 -624 +632 -633 +403 #(622 -623)
c 41 0 612 -613 +622 -623 +631 -634 +403 #(632 -633)
40 0 612 -613 +621 -624 +632 -633 +403
41 0 612 -613 +622 -623 +631 -634 +403

c end cells
c
c surfaces
100 px -100.0
101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 500.0
129 px 87.9856
200 py -500.0
201 py -74.7056
202 py -72.8006
203 py -47.0958
204 py -45.8258
205 py -44.5558
206 py -43.2858
207 py -42.0158
208 py -40.7458
209 py -39.4758
210 py -38.2058
211 py -36.9358
212 py -34.3958
213 py -38.6122

```


214	py	-33.2782			
215	py	-31.3732			
216	py	-30.5858			
217	py	-24.2358			
218	py	-19.1558			
219	py	-16.6158			
220	py	-15.3458			
221	py	-12.8058			
222	py	-10.9008			
223	py	-5.8208			
224	py	-5.5245			
225	py	-4.2037			
226	py	4.2037			
227	py	5.5245			
228	py	5.8208			
229	py	10.9008			
230	py	12.8058			
231	py	15.3458			
232	py	16.6158			
233	py	19.1558			
234	py	24.2358			
235	py	30.5858			
236	py	34.3958			
237	py	36.9358			
238	py	38.2058			
239	py	39.4758			
240	py	40.7458			
241	py	42.0158			
242	py	43.2858			
243	py	44.5558			
244	py	45.8258			
245	py	47.0958			
246	py	31.3732			
247	py	33.2782			
248	py	38.6122			
249	py	72.8006			
250	py	74.7056			
251	py	500.0			
252	py	-39.8822			
253	py	-9.8848			
254	py	-8.6148			
255	py	8.6148			
256	py	9.8848			
257	py	39.8822			
300	pz	-500.0			
301	pz	-112.395			
302	pz	-110.49			
303	pz	193.04			
304	pz	199.945			
305	pz	500.0			
306	pz	-113.665			
400	c/y	10.3124	0.0	32.2120	
401	c/y	10.3124	0.0	59.9948	
402	sx	292.2524		4.0801	
403	sx	292.2524		29.4801	
404	sx	292.2524		15.0000	
501	p	0.05557761	1.0	0.0	-1.613162
502	p	-0.05557761	1.0	0.0	1.613162
503	p	0.03492076	0.0	1.0	-7.209883
504	p	-0.03492076	0.0	1.0	7.209883
611	px	257.2524			
612	px	282.2524			
613	px	302.2524			
614	px	327.2524			
615	px	242.2524			
616	px	342.2524			
621	py	-35.0			
622	py	-10.0			
623	py	10.0			
624	py	35.0			
625	py	-50.0			
626	py	50.0			

```

631 pz -35.0
632 pz -10.0
633 pz 10.0
634 pz 35.0
635 pz -50.0
636 pz 50.0

c end surfaces
mode n p
imp:n,p 0 1 29r 8 4 2 1 6r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.9726293-2)
m6 94239.60c 4.6982-2 94240.60c 2.5852-3 94241.60c 1.4915-4
94242.60c 9.9432-6
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
f102:n 611
del102 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df102 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1

```

```

fm102      3.671+10
f112:n    614
de112
  2.07002-7 7.69672-7 1.75386-6 3.71293-6
  7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
  2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
  2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
  7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
  2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
  7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
  2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
  3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
  8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
  2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
  4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
  1.11070+1 1.35661+1
df112
  3.70370-3 4.37060-3 4.52500-3 4.57410-3
  4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
  4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
  3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
  3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
  7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
  1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
  4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
  6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
  1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
  1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
  1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
  1.63200-1 2.00340-1
fm112      3.671+10
f122:n    624
de122
  2.07002-7 7.69672-7 1.75386-6 3.71293-6
  7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
  2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
  2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
  7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
  2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
  7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
  2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
  3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
  8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
  2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
  4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
  1.11070+1 1.35661+1
df122
  3.70370-3 4.37060-3 4.52500-3 4.57410-3
  4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
  4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
  3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
  3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
  7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
  1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
  4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
  6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
  1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
  1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
  1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
  1.63200-1 2.00340-1
fm122      3.671+10
f132:n    634
de132
  2.07002-7 7.69672-7 1.75386-6 3.71293-6
  7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
  2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
  2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
  7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
  2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
  7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
  2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
  3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
  8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
  2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
  4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
  1.11070+1 1.35661+1
df132
  3.70370-3 4.37060-3 4.52500-3 4.57410-3

```

	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm132	3.671+10				
f202:p	611				
de202		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df202		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm202	3.671+10				
f212:p	614				
de212		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df212		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm212	3.671+10				
f222:p	624				
de222		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df222		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm222	3.671+10				
f232:p	634				
de232		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df232		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm232	3.671+10				
e102		4.13994-7	1.12535-6	2.38237-6	5.04348-6
		2.26033-5	4.78512-5	1.01301-4	1.67017-4
		4.53999-4	7.48518-4	1.23410-3	2.03468-3
		2.61259-3	3.03539-3	3.70744-3	5.53084-3
		1.50344-2	2.35786-2	2.47875-2	2.60584-2
		2.85011-2	3.43067-2	5.24752-2	5.65622-2
		1.22773-1	1.49956-1	1.83156-1	2.23708-1
		2.94518-1	2.97211-1	2.98491-1	3.01974-1
		4.97870-1	5.23397-1	6.08101-1	7.42735-1
		1.10803+0	1.35335+0	1.65299+0	2.01897+0

	2.34570+0	2.46597+0	3.01194+0	3.67879+0	4.49329+0
	5.48811+0	6.70320+0	8.18730+0	1.00000+1	1.22140+1
	1.49183+1				
e202	2.00000-2	4.50000-2	7.00000-2	1.00000-1	1.50000-1
	3.00000-1	4.00000-1	5.10000-1	6.00000-1	7.00000-1
	1.00000+0	1.50000+0	2.00000+0	2.50000+0	3.00000+0
	4.00000+0	5.00000+0	6.00000+0	7.00000+0	7.50000+0
	8.00000+0	1.00000+1	1.40000+1		
e112	4.13994-7	1.12535-6	2.38237-6	5.04348-6	1.06770-5
	2.26033-5	4.78512-5	1.01301-4	1.67017-4	2.75364-4
	4.53999-4	7.48518-4	1.23410-3	2.03468-3	2.24867-3
	2.61259-3	3.03539-3	3.70744-3	5.53084-3	9.11882-3
	1.50344-2	2.35786-2	2.47875-2	2.60584-2	2.70001-2
	2.85011-2	3.43067-2	5.24752-2	5.65622-2	8.65169-2
	1.22773-1	1.49956-1	1.83156-1	2.23708-1	2.73237-1
	2.94518-1	2.97211-1	2.98491-1	3.01974-1	3.87742-1
	4.97870-1	5.23397-1	6.08101-1	7.42735-1	9.07180-1
	1.10803+0	1.35335+0	1.65299+0	2.01897+0	2.23130+0
	2.34570+0	2.46597+0	3.01194+0	3.67879+0	4.49329+0
	5.48811+0	6.70320+0	8.18730+0	1.00000+1	1.22140+1
	1.49183+1				
e212	2.00000-2	4.50000-2	7.00000-2	1.00000-1	1.50000-1
	3.00000-1	4.00000-1	5.10000-1	6.00000-1	7.00000-1
	1.00000+0	1.50000+0	2.00000+0	2.50000+0	3.00000+0
	4.00000+0	5.00000+0	6.00000+0	7.00000+0	7.50000+0
	8.00000+0	1.00000+1	1.40000+1		
e122	4.13994-7	1.12535-6	2.38237-6	5.04348-6	1.06770-5
	2.26033-5	4.78512-5	1.01301-4	1.67017-4	2.75364-4
	4.53999-4	7.48518-4	1.23410-3	2.03468-3	2.24867-3
	2.61259-3	3.03539-3	3.70744-3	5.53084-3	9.11882-3
	1.50344-2	2.35786-2	2.47875-2	2.60584-2	2.70001-2
	2.85011-2	3.43067-2	5.24752-2	5.65622-2	8.65169-2
	1.22773-1	1.49956-1	1.83156-1	2.23708-1	2.73237-1
	2.94518-1	2.97211-1	2.98491-1	3.01974-1	3.87742-1
	4.97870-1	5.23397-1	6.08101-1	7.42735-1	9.07180-1
	1.10803+0	1.35335+0	1.65299+0	2.01897+0	2.23130+0
	2.34570+0	2.46597+0	3.01194+0	3.67879+0	4.49329+0
	5.48811+0	6.70320+0	8.18730+0	1.00000+1	1.22140+1
	1.49183+1				
e222	2.00000-2	4.50000-2	7.00000-2	1.00000-1	1.50000-1
	3.00000-1	4.00000-1	5.10000-1	6.00000-1	7.00000-1
	1.00000+0	1.50000+0	2.00000+0	2.50000+0	3.00000+0
	4.00000+0	5.00000+0	6.00000+0	7.00000+0	7.50000+0
	8.00000+0	1.00000+1	1.40000+1		
e132	4.13994-7	1.12535-6	2.38237-6	5.04348-6	1.06770-5
	2.26033-5	4.78512-5	1.01301-4	1.67017-4	2.75364-4
	4.53999-4	7.48518-4	1.23410-3	2.03468-3	2.24867-3
	2.61259-3	3.03539-3	3.70744-3	5.53084-3	9.11882-3
	1.50344-2	2.35786-2	2.47875-2	2.60584-2	2.70001-2
	2.85011-2	3.43067-2	5.24752-2	5.65622-2	8.65169-2
	1.22773-1	1.49956-1	1.83156-1	2.23708-1	2.73237-1
	2.94518-1	2.97211-1	2.98491-1	3.01974-1	3.87742-1
	4.97870-1	5.23397-1	6.08101-1	7.42735-1	9.07180-1
	1.10803+0	1.35335+0	1.65299+0	2.01897+0	2.23130+0
	2.34570+0	2.46597+0	3.01194+0	3.67879+0	4.49329+0
	5.48811+0	6.70320+0	8.18730+0	1.00000+1	1.22140+1
	1.49183+1				
e232	2.00000-2	4.50000-2	7.00000-2	1.00000-1	1.50000-1
	3.00000-1	4.00000-1	5.10000-1	6.00000-1	7.00000-1
	1.00000+0	1.50000+0	2.00000+0	2.50000+0	3.00000+0
	4.00000+0	5.00000+0	6.00000+0	7.00000+0	7.50000+0
	8.00000+0	1.00000+1	1.40000+1		
sd102	400.0				
sd112	400.0				
sd122	400.0				

```
sd132 400.0
sd202 400.0
sd212 400.0
sd222 400.0
sd232 400.0
sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2
c      sil      0.0 0.5 0.8660254 0.9961946 1.0
c      spl      0 1.21+10 8.82+9 1.47+10 1.09+9
sil    s 11 12 13 14
spl    1.21+10 8.82+9 1.47+10 1.09+9
sil11  h 0.0 0.5
sil12  h 0.5 0.8660254
sil13  h 0.8660254 0.9961946
sil14  h 0.9961946 1.0 .
spl11  0 1
spl12  0 1
spl13  0 1
spl14  0 1
ds2    s 21 22 23 24
si21   h 3.7645 5.675
si22   h 5.675 7.3865
si23   h 7.3865 8.321
si24   h 8.321 8.753
sp21   0 1
sp22   0 1
sp23   0 1
sp24   0 1
nps    2000000
prdmp  2j 1
print
```

File for MCNP-4B surface-detector dose-rate calculations for a 6.38-cm-radius
bare Pu sphere in the PFNA beam at the center of the truck lane
(400,000 histories)

message: outp=pfna11.o mctal=pfna11.m

```
mcnp file for PFNA project bare PU sphere calculation (r=6.38)
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
#(-400 +101 +224 -227)
#(-401 +400 +101 +225 -226)
#(102 -129 +201 -250 +301 -304)
#(129 -126 +252 -257 +301 -304)
#(102 -126 +201 -250 +306 -301)
#(615 -616 +625 -626 +635 -636)
3 1 0.10549 -400 +101 +224 -227 #(503 -504)
4 1 0.10549 -401 +400 +101 +225 -226 #(503 -504)
5 0 102 -127 +223 -228 +301 -304
#(-400 +224 -227) #(-401 +400 +225 -226)
6 0 127 -124 +501 -502 +301 -304
#(-401 +400 +225 -226)
7 0 124 -126 +254 -255 +301 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
9 1 0.10549 102 -124 +222 -229 +301 -304
#(127 +501 -502) #(-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
#(221 -230)
#(103 -104 +217 -234)
#(104 -105 +216 -235)
#(105 -107 +219 -232)
#(107 -108 +219 -220) #(107 -108 +231 -232)
#(106 -109 +212 -218) #(106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
#(221 -230)
#(109 -110 +211 -237)
#(110 -111 +210 -238)
#(111 -112 +209 -239)
#(112 -113 +208 -240)
#(113 -114 +207 -241)
#(114 -115 +206 -242)
#(115 -116 +205 -243)
#(116 -117 +204 -244)
#(117 -118 +203 -245)
#(118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
#(-124 +214 -247) #(124 +253 -256)
#(122 +248) #(122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
#(221 -230) #(104 -220) #(104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
#(103 -120 202 -221 302 -303)
#(120 -123 215 -221 302 -303)
#(121 -214)
29 4 5.977931-2 102 -124 +229 -250 +301 -304
#(103 -120 230 -249 302 -303)
```

```

#(120 -123 230 -246 302 -303)
#(121 +247)
30 4 5.977931-2 124 -126 +252 -254 +301 -304
#(-125 +213 -253)
31 4 5.977931-2 124 -126 +255 -257 +301 -304
#(-125 +256 -248)
32 6 4.029014-2 -402
33 6 4.029014-2 -403 +402
34 0 -400 +101 +224 -227 +503 -504
35 0 -401 +400 +101 +225 -226 +503 -504
36 4 5.977931-2 122 -124 +201 -250 +301 -304
#(213 -248)
#(129 -252)
#(129 +257)
37 0 615 -616 +625 -626 +635 -636 +403
#(611 -614 622 -623 +632 -633)
#(612 -613 +621 -624 +632 -633)
#(612 -613 +622 -623 +631 -634)
38 0 611 -614 +622 -623 +632 -633 +403
39 0 612 -613 +621 -624 +632 -633 +403 #(622 -623)
40 0 612 -613 +622 -623 +631 -634 +403 #(632 -633)

```

c end cells

```

c
c surfaces
100 px -100.0
101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 500.0
129 px 87.9856
200 py -500.0
201 py -74.7056
202 py -72.8006
203 py -47.0958
204 py -45.8258
205 py -44.5558
206 py -43.2858
207 py -42.0158
208 py -40.7458
209 py -39.4758
210 py -38.2058
211 py -36.9358
212 py -34.3958
213 py -38.6122
214 py -33.2782
215 py -31.3732
216 py -30.5858

```


217	py	-24.2358			
218	py	-19.1558			
219	py	-16.6158			
220	py	-15.3458			
221	py	-12.8058			
222	py	-10.9008			
223	py	-5.8208			
224	py	-5.5245			
225	py	-4.2037			
226	py	4.2037			
227	py	5.5245			
228	py	5.8208			
229	py	10.9008			
230	py	12.8058			
231	py	15.3458			
232	py	16.6158			
233	py	19.1558			
234	py	24.2358			
235	py	30.5858			
236	py	34.3958			
237	py	36.9358			
238	py	38.2058			
239	py	39.4758			
240	py	40.7458			
241	py	42.0158			
242	py	43.2858			
243	py	44.5558			
244	py	45.8258			
245	py	47.0958			
246	py	31.3732			
247	py	33.2782			
248	py	38.6122			
249	py	72.8006			
250	py	74.7056			
251	py	500.0			
252	py	-39.8822			
253	py	-9.8848			
254	py	-8.6148			
255	py	8.6148			
256	py	9.8848			
257	py	39.8822			
300	pz	-500.0			
301	pz	-112.395			
302	pz	-110.49			
303	pz	193.04			
304	pz	199.945			
305	pz	500.0			
306	pz	-113.665			
400	c/y	10.3124	0.0	32.2120	
401	c/y	10.3124	0.0	59.9948	
402	sx	292.2524		5.0	
403	sx	292.2524		6.38	
501	p	0.05557761	1.0	0.0	-1.613162
502	p	-0.05557761	1.0	0.0	1.613162
503	p	0.03492076	0.0	1.0	-7.209883
504	p	-0.03492076	0.0	1.0	7.209883
611	px	282.25			
612	px	287.25			
613	px	297.25			
614	px	302.25			
615	px	272.25			
616	px	312.25			
621	py	-10.0			
622	py	-5.0			
623	py	5.0			
624	py	10.0			
625	py	-20.0			
626	py	20.0			
631	pz	-10.0			
632	pz	-5.0			
633	pz	5.0			
634	pz	10.0			

```

635 pz -20.0
636 pz 20.0

c end surfaces
mode n p
imp:n,p 0 1 38r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 16.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2

f102:n 611
del102 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1

df102 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1

fm102 3.671+10
f112:n 614
del112 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2

```

	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df112		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm112		3.671+10			
f122:n		624			
de122		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df122		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm122		3.671+10			
f132:n		634			
de132		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df132		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2

	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm132	3.671+10				
f202:p	611				
de202		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df202		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm202	3.671+10				
f212:p	614				
de212		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df212		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm212	3.671+10				
f222:p	624				
de222		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df222		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm222	3.671+10				
f232:p	634				
de232		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df232		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm232	3.671+10				
e102		4.13994-7	1.12535-6	2.38237-6	5.04348-6
		2.26033-5	4.78512-5	1.01301-4	1.67017-4
		4.53999-4	7.48518-4	1.23410-3	2.03468-3
		2.61259-3	3.03539-3	3.70744-3	5.53084-3
		1.50344-2	2.35786-2	2.47875-2	2.60584-2
		2.85011-2	3.43067-2	5.24752-2	5.65622-2
		1.22773-1	1.49956-1	1.83156-1	2.23708-1
		2.94518-1	2.97211-1	2.98491-1	3.01974-1
		4.97870-1	5.23397-1	6.08101-1	7.42735-1
		1.10803+0	1.35335+0	1.65299+0	2.01897+0
		2.34570+0	2.46597+0	3.01194+0	3.67879+0
		5.48811+0	6.70320+0	8.18730+0	1.00000+1
		1.49183+1			1.22140+1
e202		2.00000-2	4.50000-2	7.00000-2	1.00000-1
		3.00000-1	4.00000-1	5.10000-1	6.00000-1
		1.00000+0	1.50000+0	2.00000+0	2.50000+0
					3.00000+0

```

4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1
e112
4.13994-7 1.12535-6 2.38237-6 5.04348-6 1.06770-5
2.26033-5 4.78512-5 1.01301-4 1.67017-4 2.75364-4
4.53999-4 7.48518-4 1.23410-3 2.03468-3 2.24867-3
2.61259-3 3.03539-3 3.70744-3 5.53084-3 9.11882-3
1.50344-2 2.35786-2 2.47875-2 2.60584-2 2.70001-2
2.85011-2 3.43067-2 5.24752-2 5.65622-2 8.65169-2
1.22773-1 1.49956-1 1.83156-1 2.23708-1 2.73237-1
2.94518-1 2.97211-1 2.98491-1 3.01974-1 3.87742-1
4.97870-1 5.23397-1 6.08101-1 7.42735-1 9.07180-1
1.10803+0 1.35335+0 1.65299+0 2.01897+0 2.23130+0
2.34570+0 2.46597+0 3.01194+0 3.67879+0 4.49329+0
5.48811+0 6.70320+0 8.18730+0 1.00000+1 1.22140+1
1.49183+1
e212
2.00000-2 4.50000-2 7.00000-2 1.00000-1 1.50000-1
3.00000-1 4.00000-1 5.10000-1 6.00000-1 7.00000-1
1.00000+0 1.50000+0 2.00000+0 2.50000+0 3.00000+0
4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1
e122
4.13994-7 1.12535-6 2.38237-6 5.04348-6 1.06770-5
2.26033-5 4.78512-5 1.01301-4 1.67017-4 2.75364-4
4.53999-4 7.48518-4 1.23410-3 2.03468-3 2.24867-3
2.61259-3 3.03539-3 3.70744-3 5.53084-3 9.11882-3
1.50344-2 2.35786-2 2.47875-2 2.60584-2 2.70001-2
2.85011-2 3.43067-2 5.24752-2 5.65622-2 8.65169-2
1.22773-1 1.49956-1 1.83156-1 2.23708-1 2.73237-1
2.94518-1 2.97211-1 2.98491-1 3.01974-1 3.87742-1
4.97870-1 5.23397-1 6.08101-1 7.42735-1 9.07180-1
1.10803+0 1.35335+0 1.65299+0 2.01897+0 2.23130+0
2.34570+0 2.46597+0 3.01194+0 3.67879+0 4.49329+0
5.48811+0 6.70320+0 8.18730+0 1.00000+1 1.22140+1
1.49183+1
e222
2.00000-2 4.50000-2 7.00000-2 1.00000-1 1.50000-1
3.00000-1 4.00000-1 5.10000-1 6.00000-1 7.00000-1
1.00000+0 1.50000+0 2.00000+0 2.50000+0 3.00000+0
4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1
e132
4.13994-7 1.12535-6 2.38237-6 5.04348-6 1.06770-5
2.26033-5 4.78512-5 1.01301-4 1.67017-4 2.75364-4
4.53999-4 7.48518-4 1.23410-3 2.03468-3 2.24867-3
2.61259-3 3.03539-3 3.70744-3 5.53084-3 9.11882-3
1.50344-2 2.35786-2 2.47875-2 2.60584-2 2.70001-2
2.85011-2 3.43067-2 5.24752-2 5.65622-2 8.65169-2
1.22773-1 1.49956-1 1.83156-1 2.23708-1 2.73237-1
2.94518-1 2.97211-1 2.98491-1 3.01974-1 3.87742-1
4.97870-1 5.23397-1 6.08101-1 7.42735-1 9.07180-1
1.10803+0 1.35335+0 1.65299+0 2.01897+0 2.23130+0
2.34570+0 2.46597+0 3.01194+0 3.67879+0 4.49329+0
5.48811+0 6.70320+0 8.18730+0 1.00000+1 1.22140+1
1.49183+1
e232
2.00000-2 4.50000-2 7.00000-2 1.00000-1 1.50000-1
3.00000-1 4.00000-1 5.10000-1 6.00000-1 7.00000-1
1.00000+0 1.50000+0 2.00000+0 2.50000+0 3.00000+0
4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1
sd102 100.0
sd112 100.0
sd122 100.0
sd132 100.0
sd202 100.0
sd212 100.0
sd222 100.0
sd232 100.0
sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2
c sil 0.0 0.5 0.8660254 0.9961946 1.0

```

```
c          sp1      0 1.21+10 8.82+9 1.47+10 1.09+9
si1       s  11 12 13 14
sp1       1.21+10 8.82+9 1.47+10 1.09+9
si11      h  0.0 0.5
si12      h  0.5 0.8660254
si13      h  0.8660254 0.9961946
si14      h  0.9961946 1.0
sp11      0 1
sp12      0 1
sp13      0 1
sp14      0 1
ds2       s  21 22 23 24
si21      h  3.7645 5.675
si22      h  5.675 7.3865
si23      h  7.3865 8.321
si24      h  8.321 8.753
sp21      0 1
sp22      0 1
sp23      0 1
sp24      0 1
nps       400000
prcnp     2j 1
print
```

File for MCNP-4B surface-detector dose-rate calculations for a 6.38-cm-radius
bare Pu sphere in the PFNA beam at the center of the truck lane
(16,000,000 histories)

message: outp=pfna12.o mctal=pfna12.m

```
mcnp file for PFNA project bare PU sphere calculation (r=6.38)
1      0      -100:128:-200:251:-300:305
2      0      100 -128 200 -251 300 -305
          #(-400 +101 +224 -227)
          #(-401 +400 +101 +225 -226)
          #(102 -129 +201 -250 +301 -304)
          #(129 -126 +252 -257 +301 -304)
          #(102 -126 +201 -250 +306 -301)
          #(615 -616 +625 -626 +635 -636)
3      1 0.10549 -400 +101 +224 -227 #(503 -504)
4      1 0.10549 -401 +400 +101 +225 -226 #(503 -504)
5      0      102 -127 +223 -228 +301 -304
          #(-400 +224 -227) #(-401 +400 +225 -226)
6      0      127 -124 +501 -502 +301 -304
          #(-401 +400 +225 -226)
7      0      124 -126 +254 -255 +301 -304
8      5 8.734441-2 102 -126 +201 -250 +306 -301
9      1 0.10549 102 -124 +222 -229 +301 -304
          #(127 +501 -502) #(-127 +223 -228)
10     1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11     1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12     1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13     1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14     1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15     1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16     1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17     1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18     1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19     1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20     1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21     2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22     2 0.1187956 103 -109 +202 -249 +302 -303
          #(221 -230)
          #(103 -104 +217 -234)
          #(104 -105 +216 -235)
          #(105 -107 +219 -232)
          #(107 -108 +219 -220) #(107 -108 +231 -232)
          #(106 -109 +212 -218) #(106 -109 +233 -236)
23     2 0.1187956 109 -120 +202 -249 +302 -303
          #(221 -230)
          #(109 -110 +211 -237)
          #(110 -111 +210 -238)
          #(111 -112 +209 -239)
          #(112 -113 +208 -240)
          #(113 -114 +207 -241)
          #(114 -115 +206 -242)
          #(115 -116 +205 -243)
          #(116 -117 +204 -244)
          #(117 -118 +203 -245)
          #(118 -119)
24     3 3.284-2 121 -125 +201 -250 +301 -304
          #(-124 +214 -247) #(124 +253 -256)
          #(122 +248) #(122 -213)
25     3 3.284-2 103 -107 +217 -234 +302 -303
          #(221 -230) #(104 -220) #(104 +231)
26     4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27     4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28     4 5.977931-2 102 -124 +201 -222 +301 -304
          #(103 -120 202 -221 302 -303)
          #(120 -123 215 -221 302 -303)
          #(121 -214)
29     4 5.977931-2 102 -124 +229 -250 +301 -304
          #(103 -120 230 -249 302 -303)
```

```

#(120 -123 230 -246 302 -303)
#(121 +247)
30 4 5.977931-2 124 -126 +252 -254 +301 -304
#(-125 +213 -253)
31 4 5.977931-2 124 -126 +255 -257 +301 -304
#(-125 +256 -248)
32 6 4.029014-2 -402
33 6 4.029014-2 -403 +402
34 0 -400 +101 +224 -227 +503 -504
35 0 -401 +400 +101 +225 -226 +503 -504
36 4 5.977931-2 122 -124 +201 -250 +301 -304
#(213 -248)
#(129 -252)
#(129 +257)
37 0 615 -616 +625 -626 +635 -636 +403
#(611 -614 622 -623 +632 -633)
#(612 -613 +621 -624 +632 -633)
#(612 -613 +622 -623 +631 -634)
38 0 611 -614 +622 -623 +632 -633 +403
39 0 612 -613 +621 -624 +632 -633 +403 #(622 -623)
40 0 612 -613 +622 -623 +631 -634 +403 #(632 -633)

```

c end cells

c

c surfaces

```

100 px -100.0
101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 500.0
129 px 87.9856
200 py -500.0
201 py -74.7056
202 py -72.8006
203 py -47.0958
204 py -45.8258
205 py -44.5558
206 py -43.2858
207 py -42.0158
208 py -40.7458
209 py -39.4758
210 py -38.2058
211 py -36.9358
212 py -34.3958
213 py -38.6122
214 py -33.2782
215 py -31.3732
216 py -30.5858

```


217	py	-24.2358			
218	py	-19.1558			
219	py	-16.6158			
220	py	-15.3458			
221	py	-12.8058			
222	py	-10.9008			
223	py	-5.8208			
224	py	-5.5245			
225	py	-4.2037			
226	py	4.2037			
227	py	5.5245			
228	py	5.8208			
229	py	10.9008			
230	py	12.8058			
231	py	15.3458			
232	py	16.6158			
233	py	19.1558			
234	py	24.2358			
235	py	30.5858			
236	py	34.3958			
237	py	36.9358			
238	py	38.2058			
239	py	39.4758			
240	py	40.7458			
241	py	42.0158			
242	py	43.2858			
243	py	44.5558			
244	py	45.8258			
245	py	47.0958			
246	py	31.3732			
247	py	33.2782			
248	py	38.6122			
249	py	72.8006			
250	py	74.7056			
251	py	500.0			
252	py	-39.8822			
253	py	-9.8848			
254	py	-8.6148			
255	py	8.6148			
256	py	9.8848			
257	py	39.8822			
300	pz	-500.0			
301	pz	-112.395			
302	pz	-110.49			
303	pz	193.04			
304	pz	199.945			
305	pz	500.0			
306	pz	-113.665			
400	c/y	10.3124	0.0	32.2120	
401	c/y	10.3124	0.0	59.9948	
402	sx	292.2524		5.0	
403	sx	292.2524		6.38	
501	p	0.05557761	1.0	0.0	-1.613162
502	p	-0.05557761	1.0	0.0	1.613162
503	p	0.03492076	0.0	1.0	-7.209883
504	p	-0.03492076	0.0	1.0	7.209883
611	px	282.25			
612	px	287.25			
613	px	297.25			
614	px	302.25			
615	px	272.25			
616	px	312.25			
621	py	-10.0			
622	py	-5.0			
623	py	5.0			
624	py	10.0			
625	py	-20.0			
626	py	20.0			
631	pz	-10.0			
632	pz	-5.0			
633	pz	5.0			
634	pz	10.0			

```

635 pz -20.0
636 pz 20.0

c end surfaces
mode n p
imp:n,p 0 1 38r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2

f102:n
del102 611
2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1

df102 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1

fm102 3.671+10
f112:n
del112 614
2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2

```

	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df112		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm112	3.671+10				
f122:n	624				
de122		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df122		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm122	3.671+10				
f132:n	634				
de132		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df132		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2

	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm132	3.671+10				
f202:p	611				
de202		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df202		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm202	3.671+10				
f212:p	614				
de212		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df212		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm212	3.671+10				
f222:p	624				
de222		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df222		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm222	3.671+10				
f232:p	634				
de232		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df232		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm232	3.671+10				
e102		4.13994-7	1.12535-6	2.38237-6	5.04348-6
		2.26033-5	4.78512-5	1.01301-4	1.67017-4
		4.53999-4	7.48518-4	1.23410-3	2.03468-3
		2.61259-3	3.03539-3	3.70744-3	5.53084-3
		1.50344-2	2.35786-2	2.47875-2	2.60584-2
		2.85011-2	3.43067-2	5.24752-2	5.65622-2
		1.22773-1	1.49956-1	1.83156-1	2.23708-1
		2.94518-1	2.97211-1	2.98491-1	3.01974-1
		4.97870-1	5.23397-1	6.08101-1	7.42735-1
		1.10803+0	1.35335+0	1.65299+0	2.01897+0
		2.34570+0	2.46597+0	3.01194+0	3.67879+0
		5.48811+0	6.70320+0	8.18730+0	1.00000+1
		1.49183+1			1.22140+1
e202		2.00000-2	4.50000-2	7.00000-2	1.00000-1
		3.00000-1	4.00000-1	5.10000-1	6.00000-1
		1.00000+0	1.50000+0	2.00000+0	2.50000+0
					3.00000+0

```

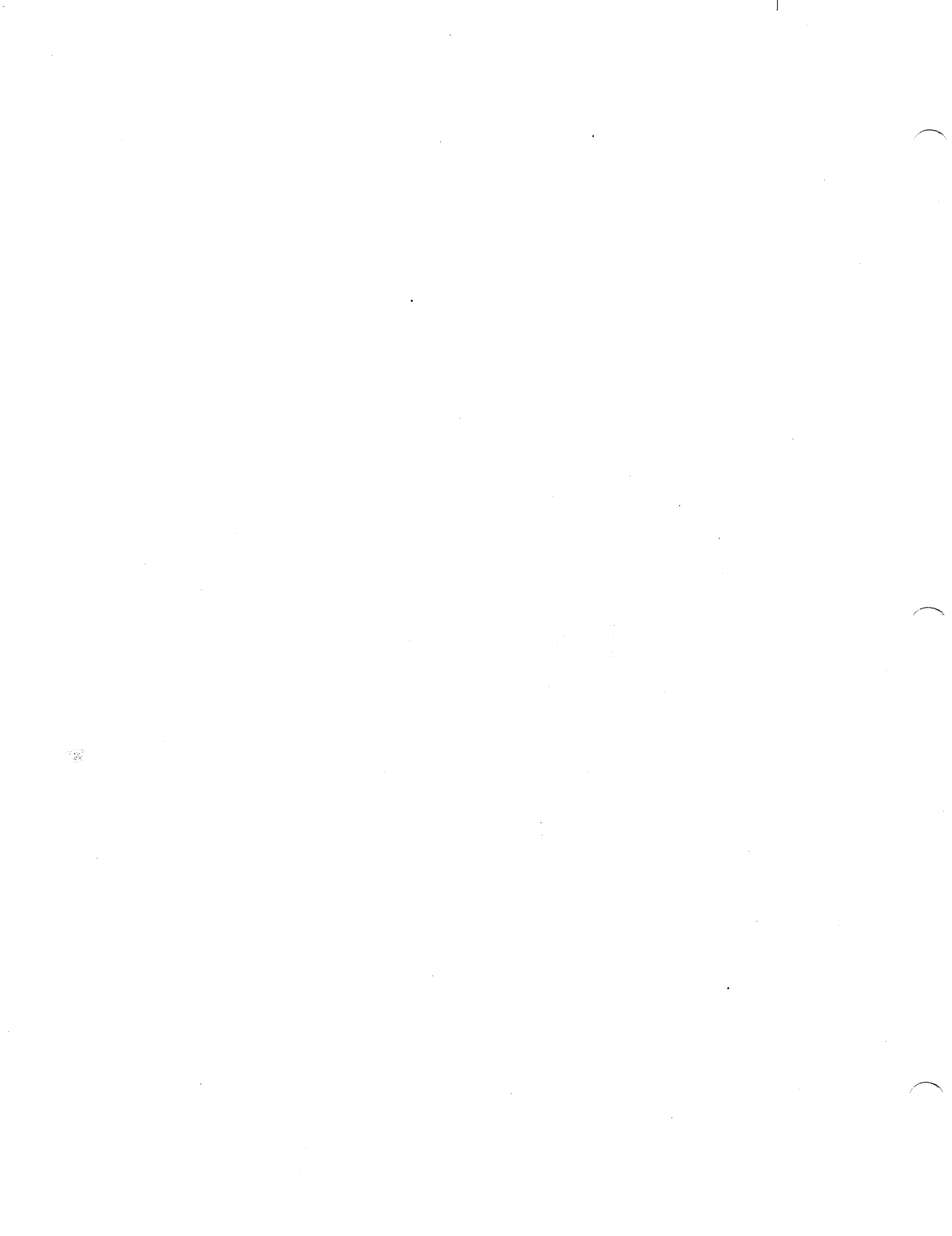
4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1
e112
4.13994-7 1.12535-6 2.38237-6 5.04348-6 1.06770-5
2.26033-5 4.78512-5 1.01301-4 1.67017-4 2.75364-4
4.53999-4 7.48518-4 1.23410-3 2.03468-3 2.24867-3
2.61259-3 3.03539-3 3.70744-3 5.53084-3 9.11882-3
1.50344-2 2.35786-2 2.47875-2 2.60584-2 2.70001-2
2.85011-2 3.43067-2 5.24752-2 5.65622-2 8.65169-2
1.22773-1 1.49956-1 1.83156-1 2.23708-1 2.73237-1
2.94518-1 2.97211-1 2.98491-1 3.01974-1 3.87742-1
4.97870-1 5.23397-1 6.08101-1 7.42735-1 9.07180-1
1.10803+0 1.35335+0 1.65299+0 2.01897+0 2.23130+0
2.34570+0 2.46597+0 3.01194+0 3.67879+0 4.49329+0
5.48811+0 6.70320+0 8.18730+0 1.00000+1 1.22140+1
1.49183+1
e212
2.00000-2 4.50000-2 7.00000-2 1.00000-1 1.50000-1
3.00000-1 4.00000-1 5.10000-1 6.00000-1 7.00000-1
1.00000+0 1.50000+0 2.00000+0 2.50000+0 3.00000+0
4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1
e122
4.13994-7 1.12535-6 2.38237-6 5.04348-6 1.06770-5
2.26033-5 4.78512-5 1.01301-4 1.67017-4 2.75364-4
4.53999-4 7.48518-4 1.23410-3 2.03468-3 2.24867-3
2.61259-3 3.03539-3 3.70744-3 5.53084-3 9.11882-3
1.50344-2 2.35786-2 2.47875-2 2.60584-2 2.70001-2
2.85011-2 3.43067-2 5.24752-2 5.65622-2 8.65169-2
1.22773-1 1.49956-1 1.83156-1 2.23708-1 2.73237-1
2.94518-1 2.97211-1 2.98491-1 3.01974-1 3.87742-1
4.97870-1 5.23397-1 6.08101-1 7.42735-1 9.07180-1
1.10803+0 1.35335+0 1.65299+0 2.01897+0 2.23130+0
2.34570+0 2.46597+0 3.01194+0 3.67879+0 4.49329+0
5.48811+0 6.70320+0 8.18730+0 1.00000+1 1.22140+1
1.49183+1
e222
2.00000-2 4.50000-2 7.00000-2 1.00000-1 1.50000-1
3.00000-1 4.00000-1 5.10000-1 6.00000-1 7.00000-1
1.00000+0 1.50000+0 2.00000+0 2.50000+0 3.00000+0
4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1
e132
4.13994-7 1.12535-6 2.38237-6 5.04348-6 1.06770-5
2.26033-5 4.78512-5 1.01301-4 1.67017-4 2.75364-4
4.53999-4 7.48518-4 1.23410-3 2.03468-3 2.24867-3
2.61259-3 3.03539-3 3.70744-3 5.53084-3 9.11882-3
1.50344-2 2.35786-2 2.47875-2 2.60584-2 2.70001-2
2.85011-2 3.43067-2 5.24752-2 5.65622-2 8.65169-2
1.22773-1 1.49956-1 1.83156-1 2.23708-1 2.73237-1
2.94518-1 2.97211-1 2.98491-1 3.01974-1 3.87742-1
4.97870-1 5.23397-1 6.08101-1 7.42735-1 9.07180-1
1.10803+0 1.35335+0 1.65299+0 2.01897+0 2.23130+0
2.34570+0 2.46597+0 3.01194+0 3.67879+0 4.49329+0
5.48811+0 6.70320+0 8.18730+0 1.00000+1 1.22140+1
1.49183+1
e232
2.00000-2 4.50000-2 7.00000-2 1.00000-1 1.50000-1
3.00000-1 4.00000-1 5.10000-1 6.00000-1 7.00000-1
1.00000+0 1.50000+0 2.00000+0 2.50000+0 3.00000+0
4.00000+0 5.00000+0 6.00000+0 7.00000+0 7.50000+0
8.00000+0 1.00000+1 1.40000+1
sd102 100.0
sd112 100.0
sd122 100.0
sd132 100.0
sd202 100.0
sd212 100.0
sd222 100.0
sd232 100.0
sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2
c sil 0.0 0.5 0.8660254 0.9961946 1.0

```

```
c      sp1      0 1.21+10 8.82+9 1.47+10 1.09+9
sil    s  11 12 13 14
sp1    1.21+10 8.82+9 1.47+10 1.09+9
sil1   h 0.0 0.5
sil2   h 0.5 0.8660254
sil3   h 0.8660254 0.9961946
sil4   h 0.9961946 1.0
sp11   0 1
sp12   0 1
sp13   0 1
sp14   0 1
ds2    s 21 22 23 24
si21   h 3.7645 5.675
si22   h 5.675 7.3865
si23   h 7.3865 8.321
si24   h 8.321 8.753
sp21   0 1
sp22   0 1
sp23   0 1
sp24   0 1
nps    16000000
prdump 2j 1
print
```

APPENDIX C

**PLOTS OF PLANE SLICES THROUGH THE PFNA FACILITY
CALCULATIONAL GEOMETRY.**



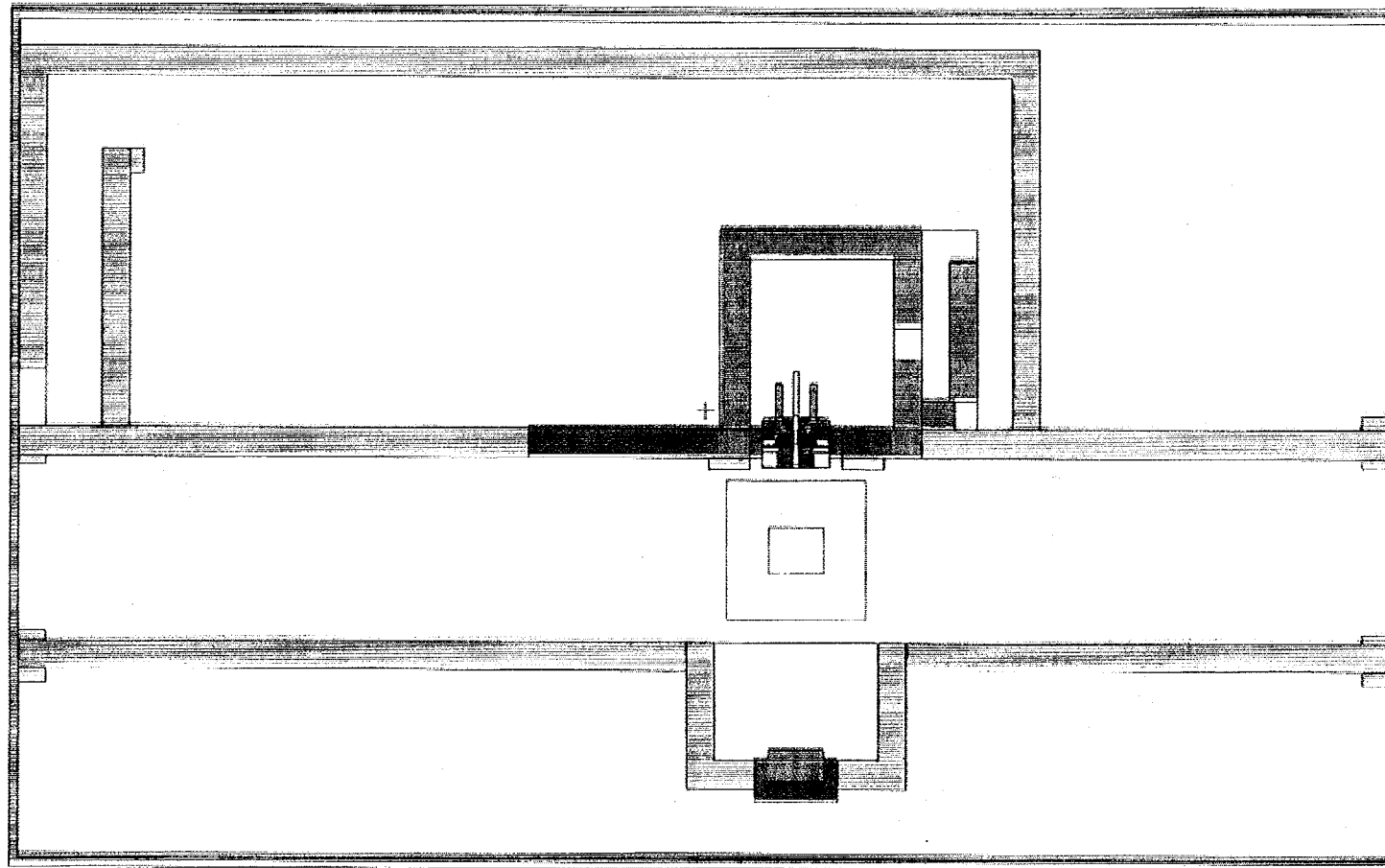


Figure C1. Plan view at $z=0$ cm through the MCNP geometry mockup of the PFNA Facility.

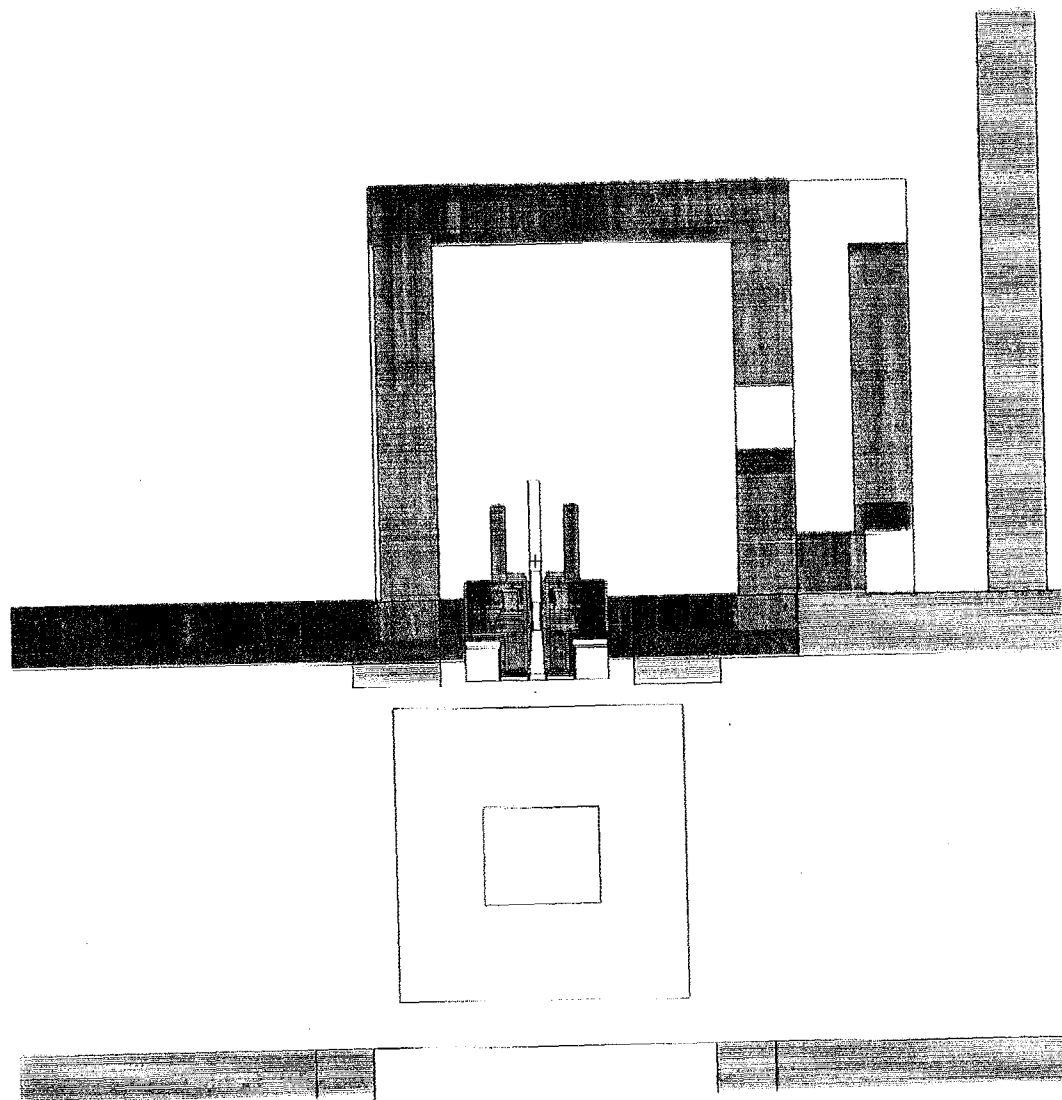


Figure C2. Plan view at $z=0$ cm through the MCNP geometry mockup of the PFNA Facility. Closeup view of regions around the stationary collimator.

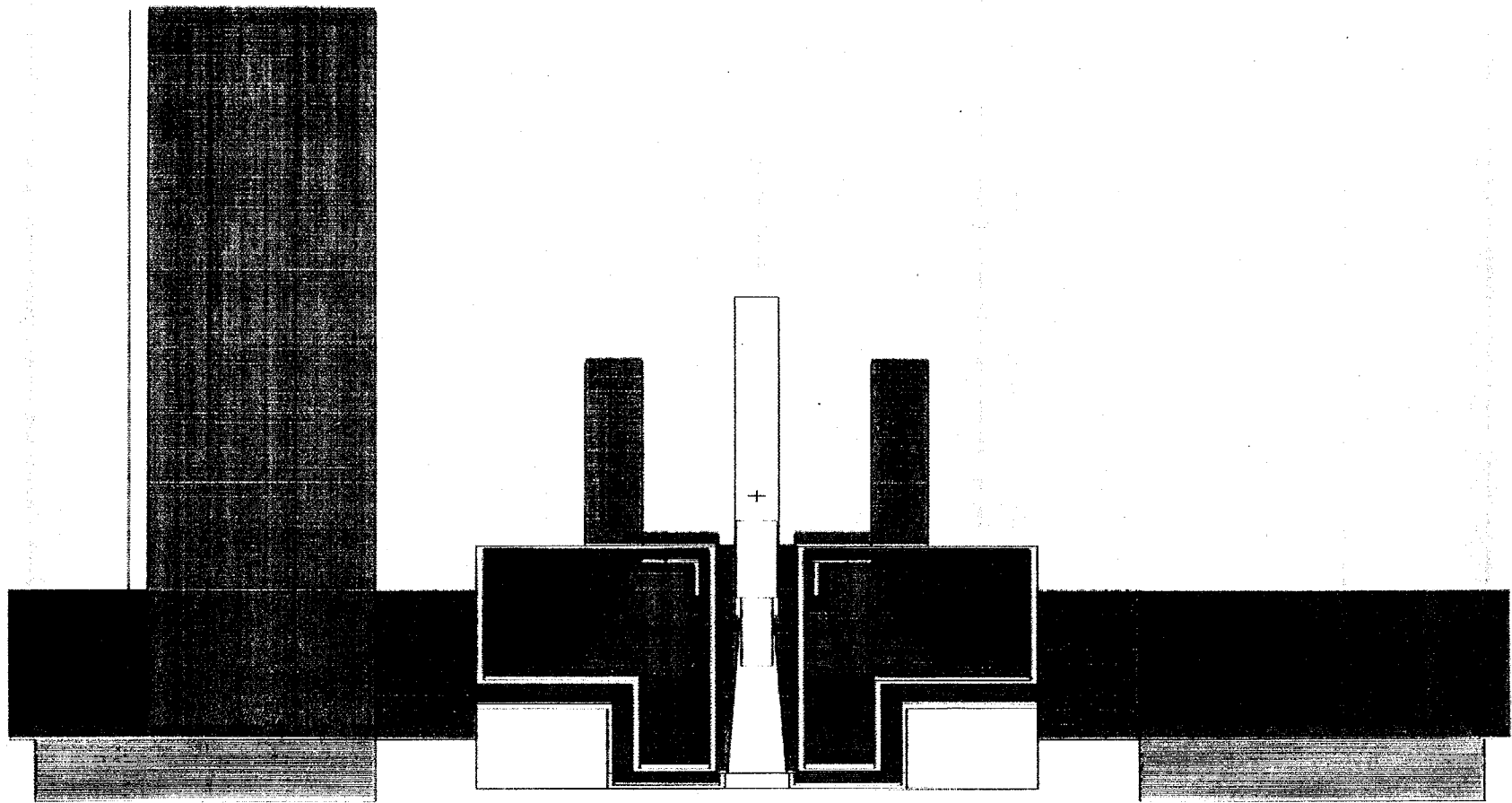


Figure C3. Plan view at $z=0$ cm through the MCNP geometry mockup of the PFNA Facility. Closeup view of regions around the stationary collimator.

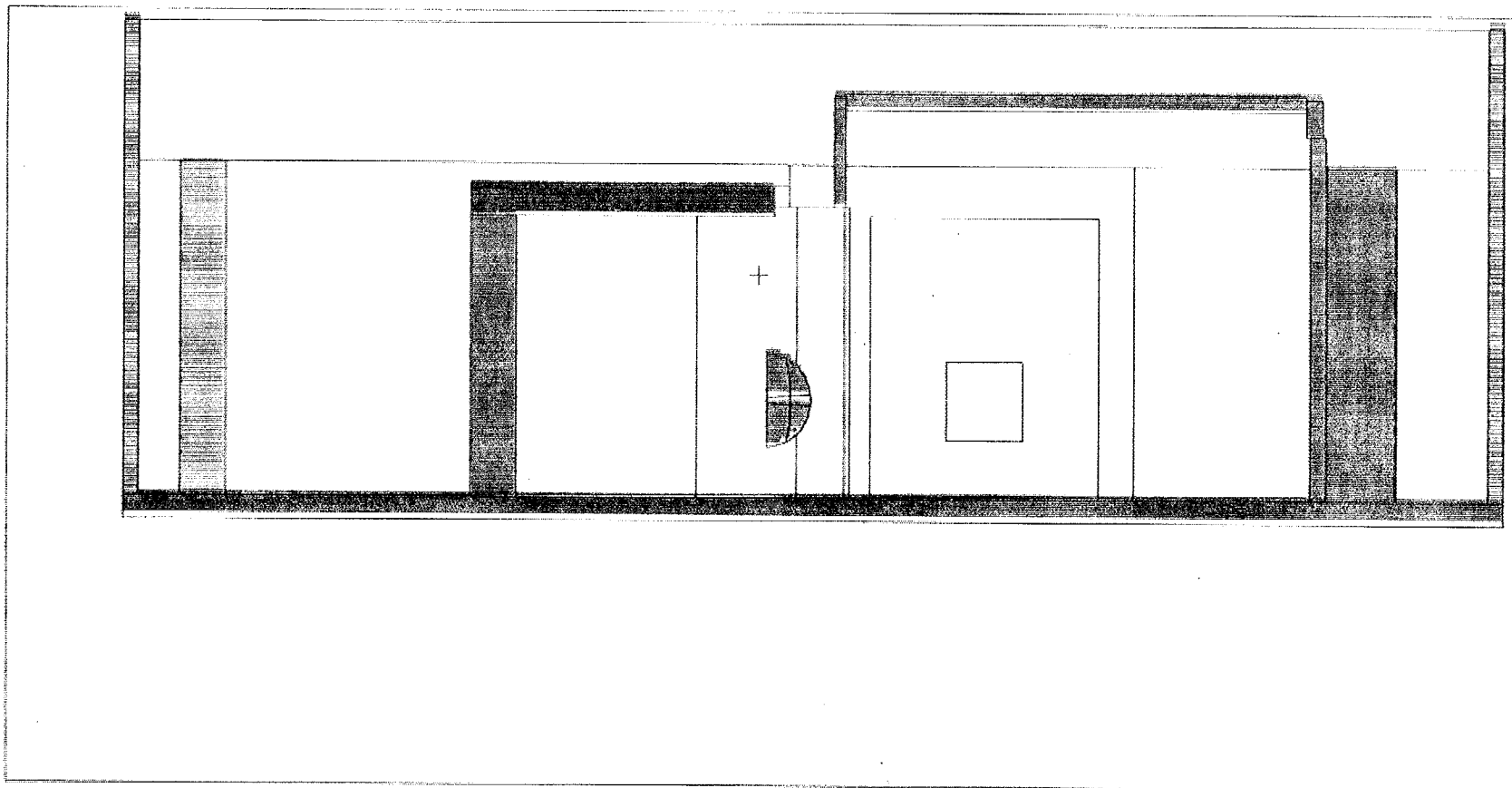


Figure C4. Elevation view at $y=0$ cm through the MCNP geometry mockup of the PFNA Facility for the vertical collimator in the horizontal position.

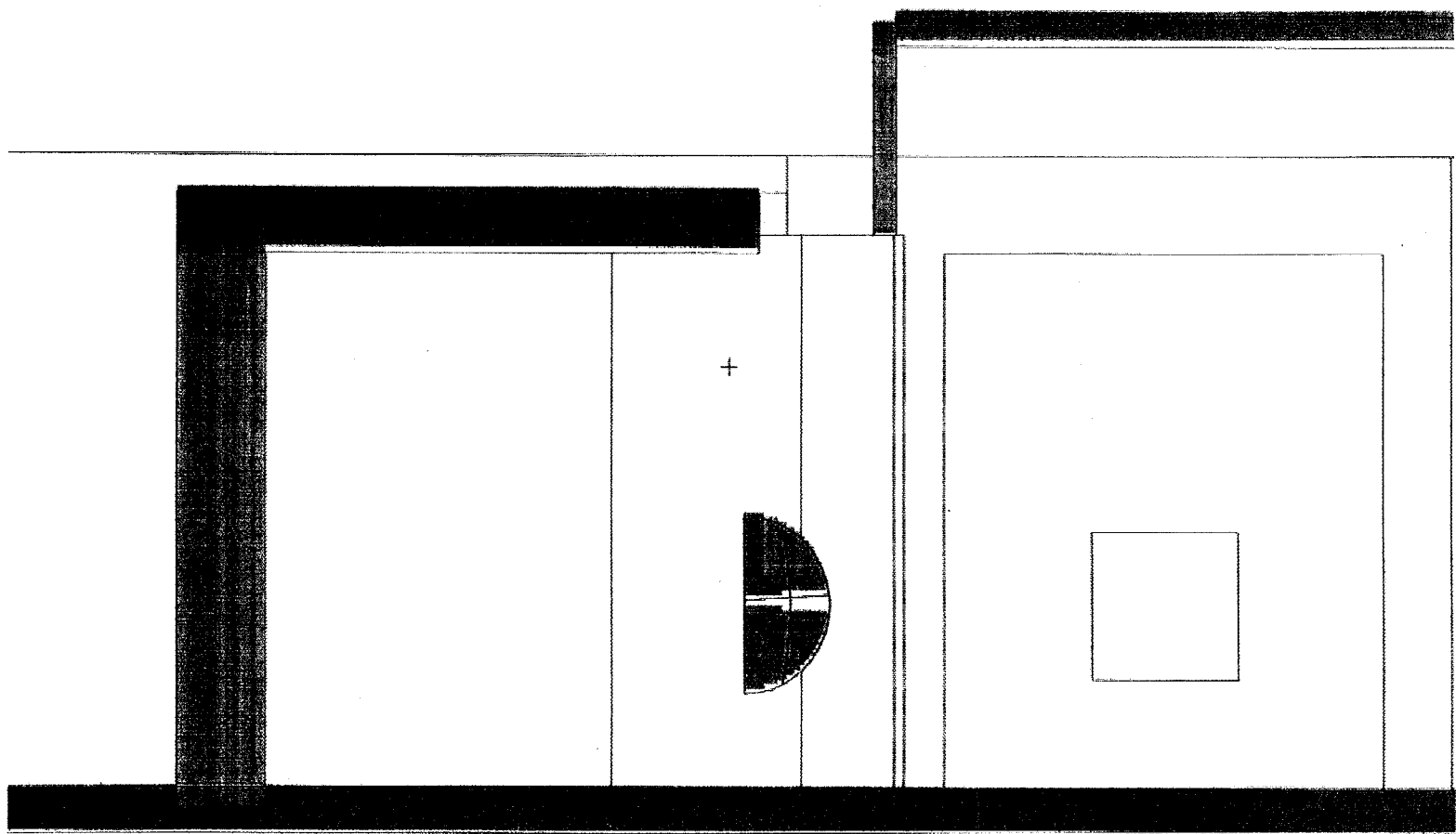


Figure C5. Elevation view at $y=0$ cm through the MCNP geometry mockup of the PFNA Facility for the vertical collimator in the horizontal position. Closeup view of the vertical collimator.

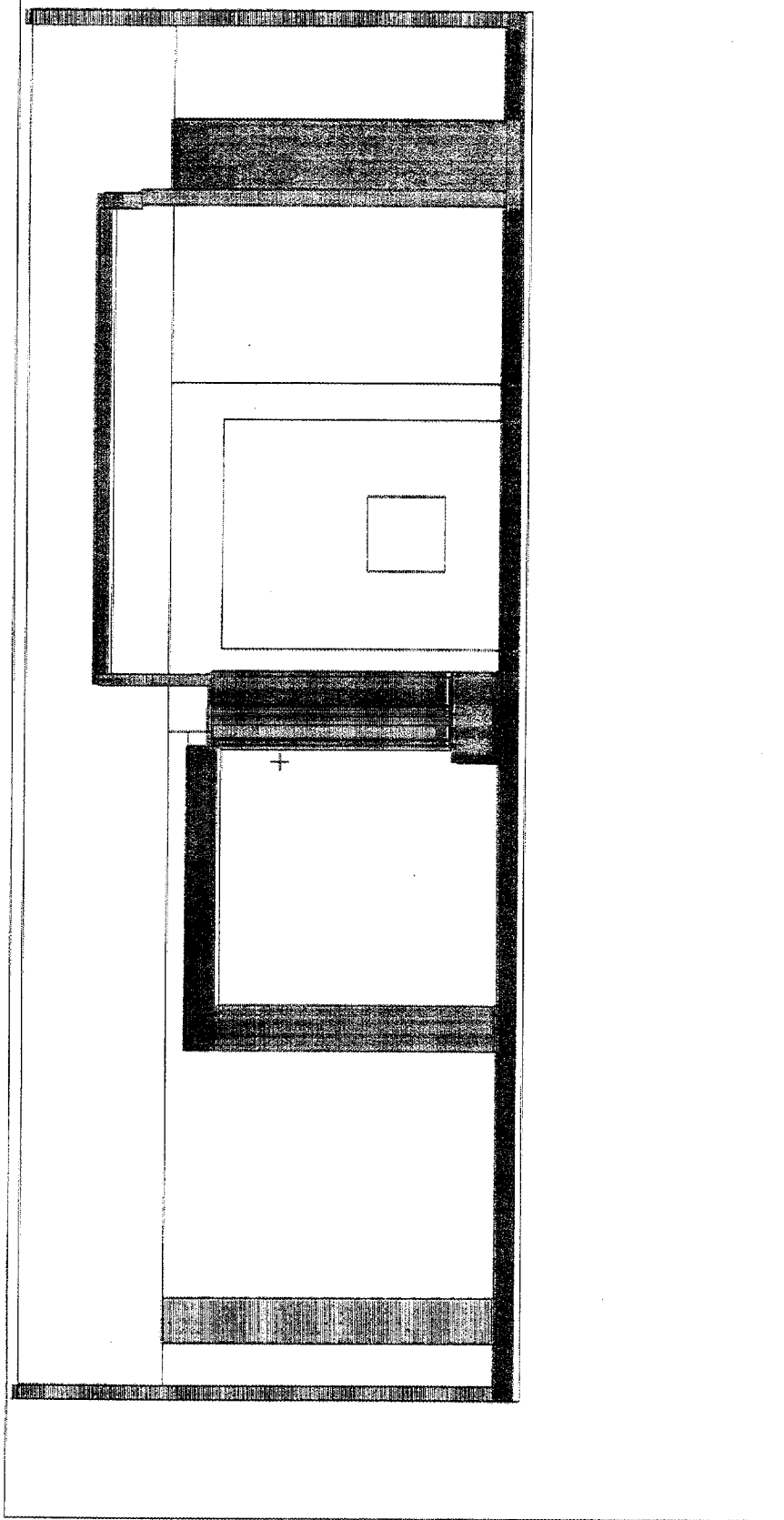


Figure C6. Elevation view at $y=30$ cm through the MCNP geometry mockup of the PFNA Facility.

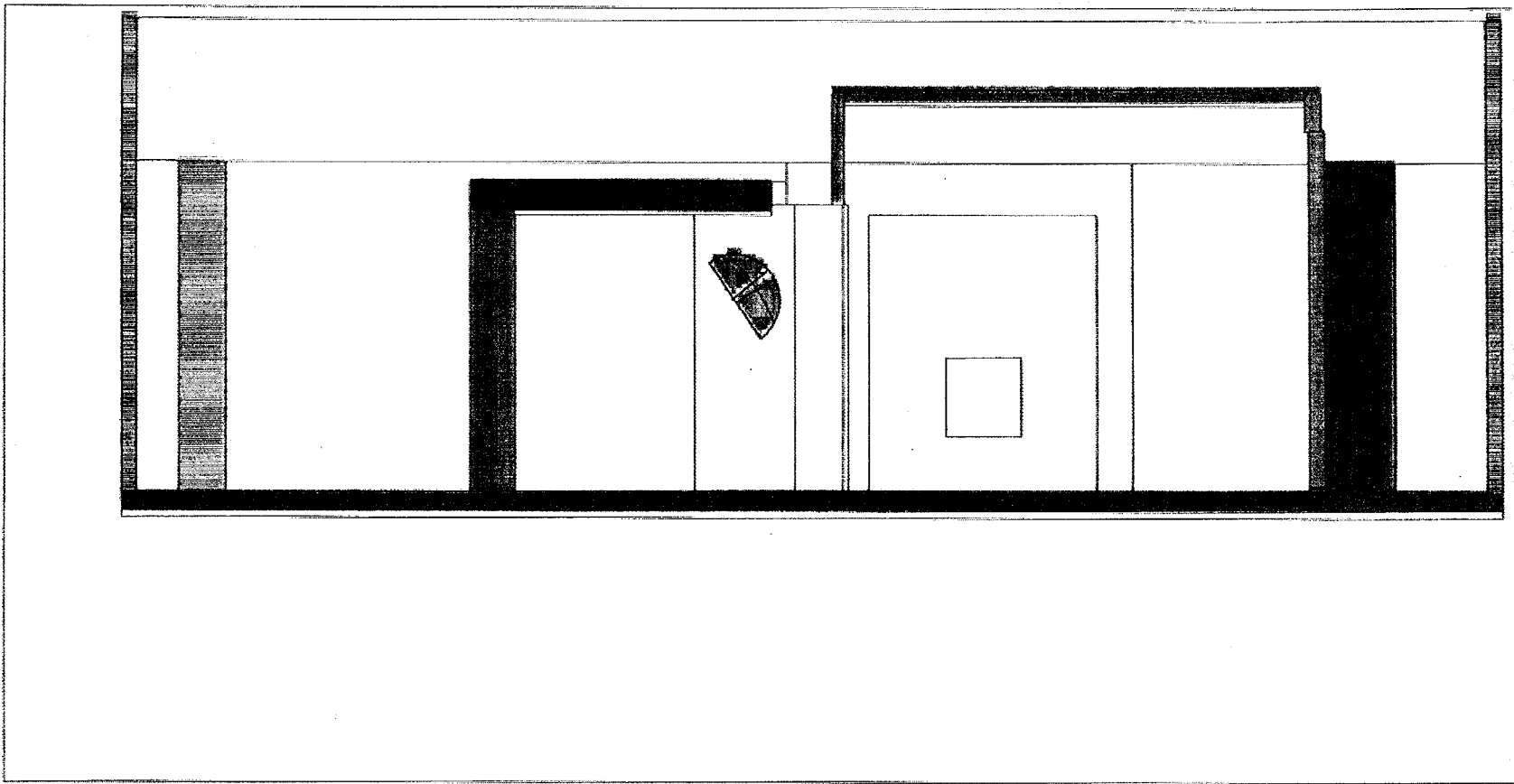


Figure C7. Elevation view at $y=0$ cm through the MCNP geometry mockup of the PFNA Facility for the vertical collimator in the maximum up position.

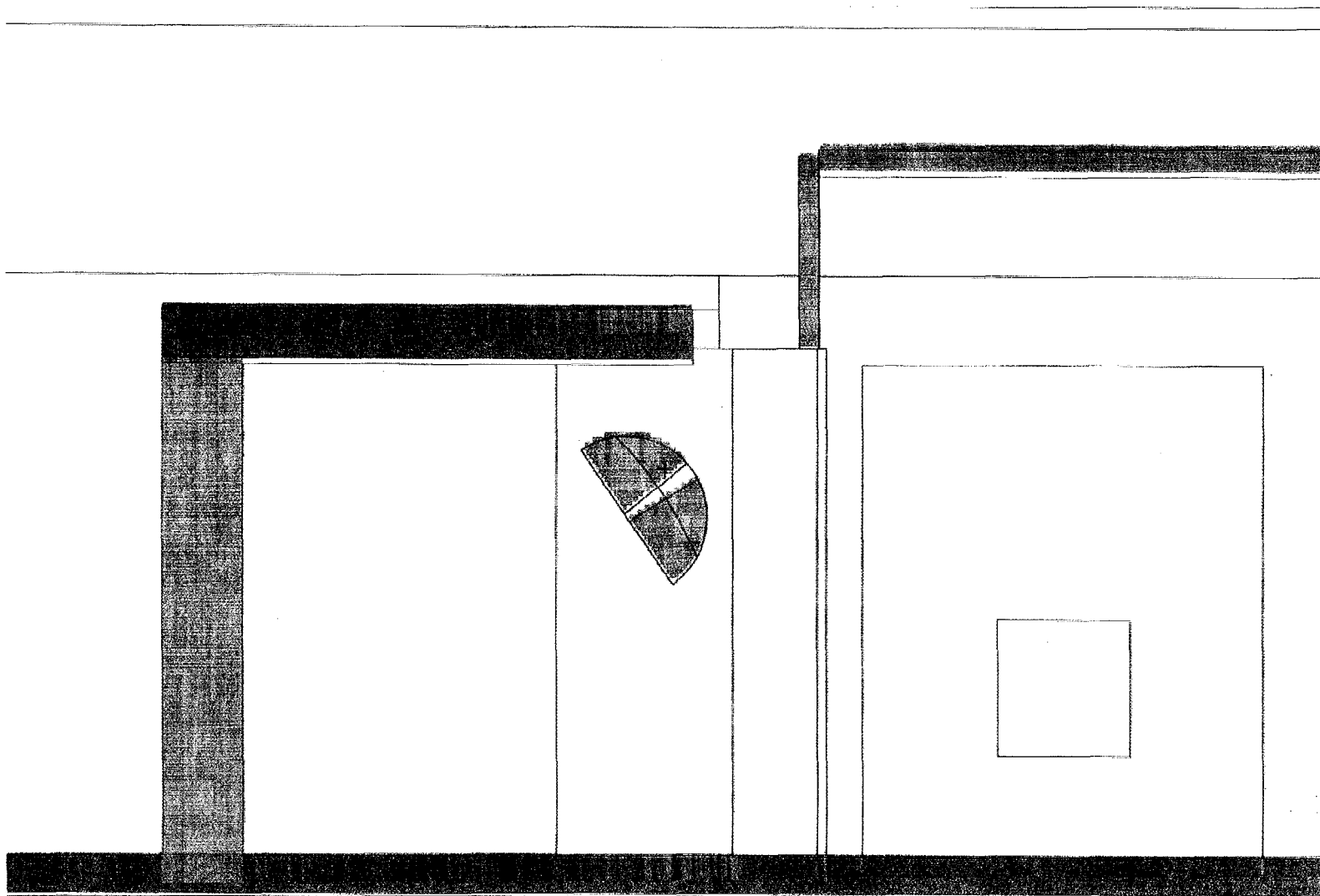


Figure C8. Elevation view at $y=0$ cm through the MCNP geometry mockup of the PFNA Facility for the vertical collimator in the maximum up position. Closeup view of the vertical collimator.

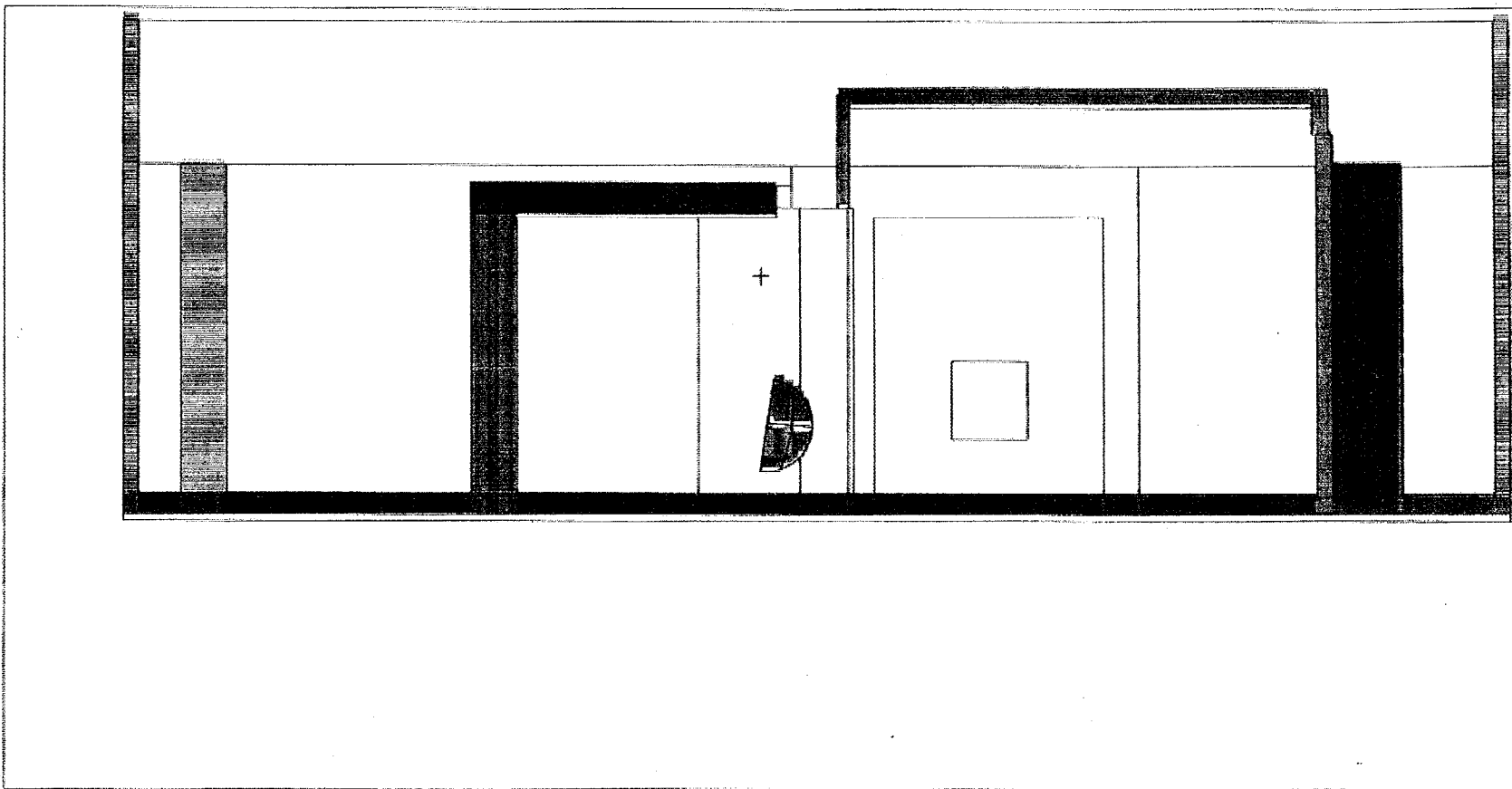


Figure C9. Elevation view at $y=0$ cm through the MCNP geometry mockup of the PFNA Facility for the vertical collimator in the maximum down position.

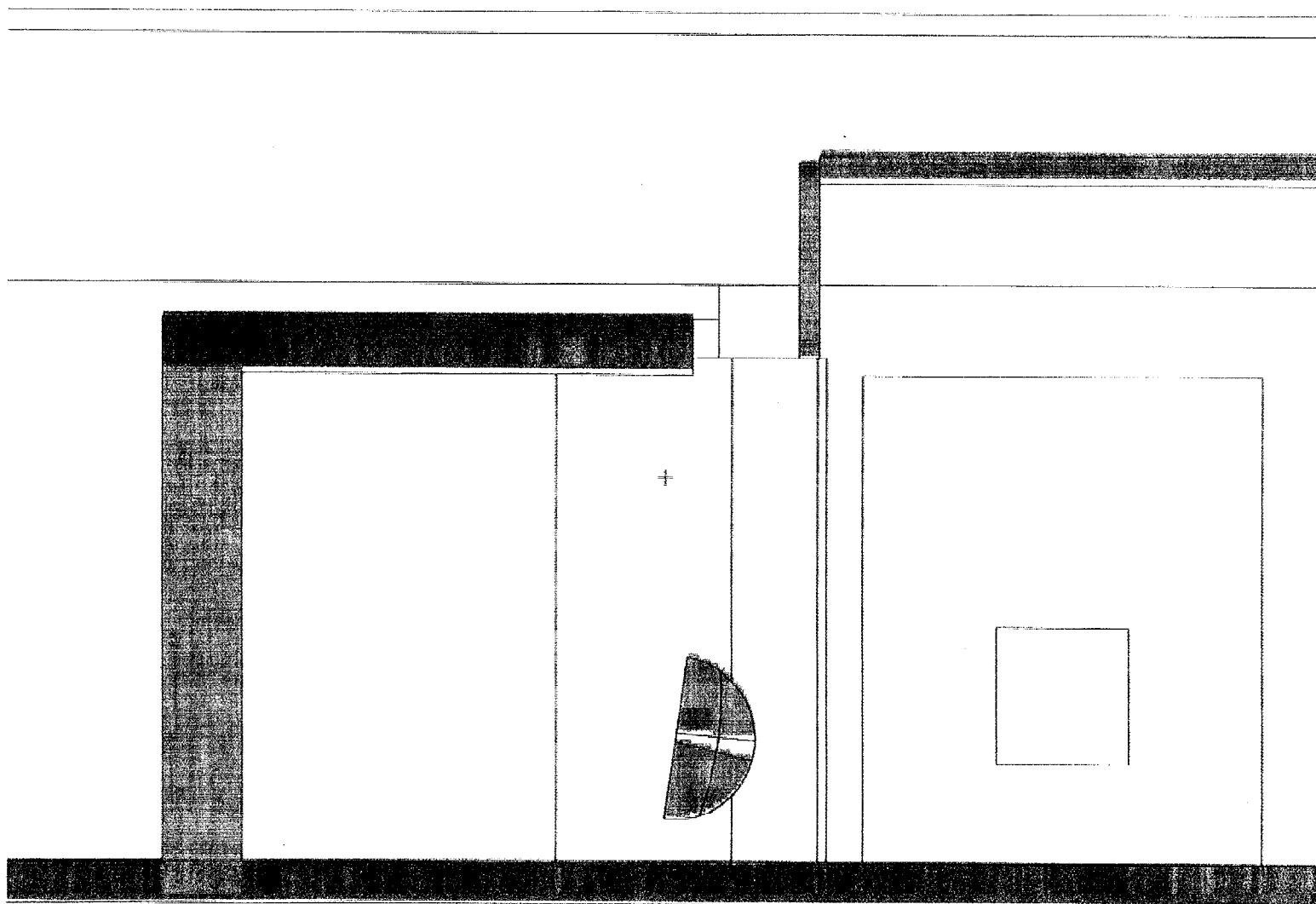


Figure C10. Elevation view at $y=0$ cm through the MCNP geometry mockup of the PFNA Facility for the vertical collimator in the maximum down position. Closeup view of the vertical collimator.

APPENDIX D

LISTINGS OF CODES AND INPUT FILES DOSE-RATE AVERAGING



APPENDIX D

LISTINGS OF CODES AND INPUT FILES DOSE-RATE AVERAGING

Listing of FORTRAN program used to average the PFNA dose rates exponentially as a function of theta (the source forward emission angle)

```
dimension xi(3),ds(4,600),yd(200)
character*18 dtitl(3)
data dtitl/'neutron dose rates','photon dose rates ',
1 'total dose rates '/
data xi/-0.1500983,0.0,0.6073745/
data ds/2400*0.0/
dmx=xi(3)-xi(1)
read(5,5)nd,(yd(i),i=1,nd)
5 format(i5/(6e12.4))
do id=1,2*nd
md=mod(id-1,nd)+1
read(5,10)(ds(i,id),i=1,3)
10 format(3e12.4)
write(6,15)id,(ds(i,id),i=1,3)
15 format(i6,1p3e13.5)
do i=1,3
ds(i,2*nd+md)=ds(i,2*nd+md)+ds(i,id)
enddo
enddo
do id=1,3*nd
kd=(id-1)/nd+1
if(mod(id,nd).eq.1)write(6,20)dtitl(kd)
20 format(1h0,a18//22x,19hDose Rates (mrem/h)/10x,8hLocation/
1 1x,4hdet.,7x,4h(cm),6x,9hmax. down,4x,10hhorizontal,4x,
2 7hmax. up,6x,7haverage/)
sum=0.0
do k=1,2
dx=xi(k+1)-xi(k)
ala=alog(ds(k+1,id)/ds(k,id))/dx
trm=ds(k,id)*dx
if(abs(ala).gt.0.0)trm=(ds(k+1,id)-ds(k,id))/ala
sum=sum+trm
enddo
ds(4,id)=sum/dmx
m4=mod(id-1,nd)+1
write(6,30)m4,yd(m4),(ds(k,id),k=1,4)
30 format(i5,3x,f9.1,3x,1p4e13.5)
enddo
stop
end
```

Listing of input file for averaging dose rates calculated at various locations around the PFNA facility as a function of source angle

10						
	0.0	245.0	0.0	-1710.0	1296.0	0.0
	300.0	0.0	0.0	0.0		
5.58024-1	4.70220+0	2.39937-1				
6.10697-1	5.47704-1	1.25419-1				
5.87105+2	1.49350+4	7.00707+1				
1.81381+0	3.90125-1	4.05931-1				
2.28500+0	8.29166-1	9.49863+0				
1.16587+3	7.67914+4	1.63541+2				
6.21285+0	4.34500+0	7.28572+0				
2.26431-5	4.08722-3	2.34775-4				
1.46130-1	5.60654-1	8.76999-2				
1.99241-1	2.23255-1	4.66521-1				
5.56058-2	1.30955+0	9.76129-3				
1.62714-1	1.45858-1	2.94213-2				
1.25930+1	8.43161+1	2.27785+0				
3.56180-2	1.43302-2	2.55025-2				
9.11276-2	3.90251-2	5.37723-2				
1.70391+1	1.39578+1	5.39429+0				
1.83418+0	1.67950+0	2.31934+0				
1.14903-2	4.35777-2	1.36479-2				
5.30021-2	1.11127-1	7.83837-3				
6.01096+0	5.54711+0	6.62591+0				

Listing of input file to average PFNA dose rates calculated at various locations along the centerline of the truck lane as a function of source angle

24						
	-1710.0	-1524.0	-1371.6	-1219.2	-1066.8	-914.4
	-762.0	-609.6	-457.2	-304.8	-152.4	-76.2
	-30.48	0.0	30.48	76.2	152.4	304.8
	457.2	609.6	762.0	914.4	1066.8	1296.0
1.81381+0	3.90125-1	4.05931-1				
1.45005+0	5.09248-1	6.68034-1				
1.84981+0	6.24773-1	7.66245-1				
2.51946+0	8.40224-1	1.08589+0				
3.58813+0	1.22390+0	1.50473+0				
5.30024+0	1.83703+0	2.28986+0				
8.48255+0	3.05426+0	3.77451+0				
1.48590+1	5.49383+0	6.45836+0				
2.91353+1	1.06697+1	1.76760+1				
7.20955+1	3.57631+1	2.99380+1				
1.77789+2	9.28149+1	5.16757+1				
3.20803+2	2.13007+2	7.27455+1				
8.00332+2	1.15811+3	1.36333+2				
1.16687+3	7.67914+4	1.63541+2				
8.00332+2	1.15811+3	1.36333+2				
3.20803+2	2.13007+2	7.27455+1				
1.81242+2	9.43788+1	5.21843+1				
7.28867+1	3.59743+1	3.02640+1				
2.95375+1	1.08823+1	1.77131+1				
1.53587+1	5.56264+0	6.13926+0				
8.95194+0	3.29045+0	3.34407+0				
5.68971+0	2.08403+0	2.12947+0				
3.93217+0	1.44988+0	1.48254+0				
2.28500+0	8.29166-1	9.49863+0				
3.56180-2	1.43302-2	2.55025-2				
5.39488-2	2.43626-2	3.71394-2				
6.46439-2	2.74815-2	4.31652-2				
8.69921-2	3.69437-2	5.14859-2				
1.25492-1	4.82811-2	7.10139-2				
1.84925-1	6.76465-2	1.01122-1				
2.88393-1	1.07229-1	1.61069-1				
4.83245-1	1.73985-1	2.32722-1				
9.01676-1	3.19502-1	4.74318-1				
2.17521+0	1.12029+0	7.88501-1				
4.72385+0	2.50499+0	1.38074+0				
7.33929+0	4.02129+0	2.08345+0				
1.37813+1	1.08577+1	3.52223+0				
1.70391+1	1.39578+1	5.39429+0				
1.37813+1	1.08577+1	3.52223+0				
7.33929+0	4.02129+0	2.08345+0				
4.76635+0	2.39828+0	1.46280+0				
2.25568+0	1.19457+0	9.42471-1				
9.48638-1	3.53345-1	5.41115-1				
4.94655-1	1.85464-1	2.59925-1				
3.00849-1	1.22278-1	1.61437-1				
2.01295-1	8.19611-2	1.15803-1				
1.52244-1	5.45651-2	8.09399-2				
9.11276-2	3.90251-2	5.37723-2				

Listing of input file to average PFNA dose rates calculated at locations
in the beam line and across the truck lane as a function of source angle

06						
	116.078	177.038	237.998	359.918	420.878	481.838
	5.27242+3	5.38063+5	8.05332+2			
	2.64372+3	2.21584+5	2.96955+2			
	1.57531+3	1.21564+5	2.17530+2			
	9.88388+2	5.28997+4	1.31665+2			
	9.24120+2	3.86709+4	1.11483+2			
	8.85173+2	2.95280+4	9.70457+1			
	1.61237+2	2.94997+2	2.00615+1			
	4.49017+1	5.27021+1	1.03627+1			
	2.36999+1	2.33104+1	7.18505+0			
	1.48370+1	9.98272+0	4.26452+0			
	1.47948+1	8.24923+0	3.49869+0			
	1.50075+1	7.79060+0	2.96020+0			

APPENDIX E

**LISTINGS OF INPUT FILES MCNP-4B CALCULATIONS OF DOSE
RATES WITHIN AND AROUND THE PFNA FACILITY**



APPENDIX E

LISTINGS OF INPUT FILES MCNP-4B CALCULATIONS OF DOSE RATES WITHIN AND AROUND THE PFNA FACILITY

File for MCNP-4B calculation of dose rates around the PFNA facility for the source in the horizontal position

message: outp=pfna13.o mctal=pfna13.m

```
mcnp file for PFNA facility -- dose rates at selected locations
1      0      -100:128:-200:251:-300:305
2      0      100 -128 200 -251 300 -305
          #(-131 -164 +258 -297 +307 -321)
3      1 0.10549 -400 -401 +505 +224 -227 #(503 -504)
4      1 0.10549 -401 +400 +505 +225 -226 #(503 -504)
5      0      142 -127 +223 -228 +308 -304
          #(-400 -401 +505 +224 -227) #(+137 -102 +310)
          #(-401 +400 +505 +225 -226)
6      0      127 -124 +501 -502 +308 -304
          #(-401 +400 +505 +225 -226)
7      0      124 -126 +254 -255 +308 -304
8      5 8.734441-2 102 -126 +201 -250 +306 -301
          #(+102 -127 +223 -228) #(+127 -124 +501 -502)
          #(+124 +254 -255) #(+129 -252) #(+129 +257)
9      1 0.10549 102 -124 +222 -229 +301 -304
          #(+129 -252) #(+129 +257)
          #(-127 +501 -502) #(-127 +223 -228)
10     1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11     1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12     1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13     1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14     1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15     1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16     1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17     1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18     1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19     1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20     1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21     2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22     2 0.1187956 103 -109 +202 -249 +302 -303
          #(221 -230)
          #(103 -104 +217 -234)
          #(104 -105 +216 -235)
          #(105 -107 +219 -232)
          #(107 -108 +219 -220) #(107 -108 +231 -232)
          #(106 -109 +212 -218) #(106 -109 +233 -236)
23     2 0.1187956 109 -120 +202 -249 +302 -303
          #(221 -230)
          #(109 -110 +211 -237)
          #(110 -111 +210 -238)
          #(111 -112 +209 -239)
          #(112 -113 +208 -240)
          #(113 -114 +207 -241)
          #(114 -115 +206 -242)
          #(115 -116 +205 -243)
          #(116 -117 +204 -244)
          #(117 -118 +203 -245)
          #(118 -119)
24     3 3.284-2 121 -125 +201 -250 +301 -304
          #(-124 +214 -247) #(124 +253 -256)
          #(122 +248) #(122 -213)
25     3 3.284-2 103 -107 +217 -234 +302 -303
          #(221 -230) #(104 -220) #(104 +231)
```

26	4	5.977931-2	104	-108	+216	-220	+302	-303	#(105 -219)
27	4	5.977931-2	104	-108	+231	-235	+302	-303	#(105 +232)
28	4	5.977931-2	102	-124	+201	-222	+301	-304	#(103 -120 202 -221 302 -303)
									#(120 -123 215 -221 302 -303)
									#(121 -214)
29	4	5.977931-2	102	-124	+229	-250	+301	-304	#(103 -120 230 -249 302 -303)
									#(120 -123 230 -246 302 -303)
									#(121 +247)
30	4	5.977931-2	124	-126	+252	-254	+301	-304	#(-125 +213 -253)
31	4	5.977931-2	124	-126	+255	-257	+301	-304	#(-125 +256 -248)
32	0								+167 -168 +274 -281 +317 -318
33	0								+165 -166 +270 -285 +308 -310
									#(+167 -168 +274 -281 +317 -318)
34	0								-400 +505 +224 -227 +503 -504
35	0								-401 +400 +505 +225 -226 +503 -504
36	4	5.977931-2	122	-124	+201	-250	+301	-304	#(213 -248)
									#(129 -252)
									#(129 +257)
37	9	-2.0							+131 -164 +258 -297 +307 -308
38	11	-1.0							+131 -164 +258 -297 +308 -320
									#(+132 -163 +259 -296)
39	12	-7.86							+131 -164 +258 -297 +320 -321
40	0								+132 -163 +259 -296 +319 -320
									#(+151 -169 +271 -284 +304 -315)
									#(+151 -160 +270 -271 +312 -314)
									#(+151 -160 +284 -285 +312 -314)
									#(+157 -159 +274 -281 +313 -315)
									#(+158 -160 +274 -281 -313)
									#(+169 -157 +274 -281 +314 -316)
41	1	0.10549							+151 -169 +271 -284 +304 -315
42	1	0.10549							+151 -160 +270 -271 +312 -314
43	1	0.10549							+151 -160 +284 -285 +312 -314
44	1	0.10549							+157 -159 +274 -281 +313 -315
45	1	0.10549							+158 -160 +274 -281 +308 -313
46	1	0.10549							+169 -157 +274 -281 +314 -316
47	9	-2.0							+160 -162 +273 -282 +308 -319
48	10	-2.0							+154 -161 +265 -289 +308 -319
									#47 #(-160 +267 -286)
49	0								+154 -160 +267 -286 +308 -319 #42 #43 #45
50	10	-2.0							+155 -156 +259 -260 +308 -319
51	10	-2.0							+155 -156 +295 -296 +308 -319
52	10	-2.0							+154 -155 +259 -296 +308 -319
									#(+265 -289)
53	0								+155 -163 +259 -296 +308 -319 #50 #51
									#(-161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0							+153 -154 +295 -296 +308 -319
55	10	-2.0							+151 -126 +295 -296 +308 -319
56	10	-2.0							+151 -126 +259 -260 +308 -319
57	10	-2.0							+153 -154 +259 -260 +308 -319
58	10	-2.0							+151 -152 +266 -272 +308 -304
59	10	-2.0							+151 -152 +283 -287 +308 -304
60	0								+151 -154 +259 -296 +308 -319
									#41 #42 #43 #54 #55 #56 #57 #58 #59
									#(+165 -166 +270 -285 +308 -310)
									#(-126 +201 -250 -304)
61	1	0.10549							+149 -151 +272 -201 +308 -304
62	1	0.10549							+149 -151 +250 -283 +308 -304
63	9	-2.0							+149 -151 +264 -290 +308 -319
									#(+272 -283)
64	10	-2.0							+149 -151 +259 -296 +308 -319
									#(+264 -290)
65	10	-2.0							+146 -149 +295 -296 +308 -319
66	0								+132 -149 +259 -296 +308 -319
									#65 #(+133 -294)
67	10	-2.0							+133 -149 +259 -294 +308 -319
									#(+142 -260 -322) #(+134 +260 -298)
68	10	-2.0							+135 -149 +261 -262 +308 -319

69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311
			#(-138 -290 -310) #(-102 +310)
			#(+138 +269 -290 -310) #(+144 +290 -292 -310)
			#(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71	1	0.10549	+137 -138 +268 -290 +308 -310
72	1	0.10549	+138 -149 +269 -272 +308 -310
73	1	0.10549	+138 -149 +288 -290 +308 -310 #(+140 -141)
74	0		+140 -141 +288 -290 +308 -310
75	1	0.10549	+144 -149 +290 -292 +308 -310
76	1	0.10549	+139 -144 +291 -293 +308 -310
77	2	0.1187956	+137 -102 +268 -293 +310 -311
78	0		+138 -149 +272 -288 +308 -310
			#(+102 +201 -250 +309 -304)
			#(+143 -102 +275 -276 +301)
			#(+143 -102 +279 -280 +301)
			#(+147 -102 +276 -277 +301)
			#(+147 -102 +278 -279 +301)
			#(+142 +223 -228) #(+145 +201 -250 -309)
79	1	0.10549	+143 -102 +275 -276 +301 -310
80	1	0.10549	+143 -102 +279 -280 +301 -310
81	1	0.10549	+147 -102 +276 -277 +301 -310
82	1	0.10549	+147 -102 +278 -279 +301 -310
83	0		+142 -149 +259 -260 +308 -322
84	0		+134 -149 +260 -298 +308 -319
			#68 #69 #(+137 -149 +268 -293 +308 -311)
			#(+102 +201 -250 -304) #(+142 +223 -228 -304)
85	9	-2.0	+145 -126 +201 -250 +308 -309
			#(+145 -127 +223 -228) #(+127 -124 +501 -502)
			#(+129 -252) #(+129 +257) #(+124 +254 -255)
86	0		+129 -126 +201 -250 +308 -304
			#(+252 -257)
87	0		+102 -126 +201 -250 +309 -306
			#(+102 -127 +223 -228) #(+127 -124 +501 -502)
			#(+129 -252) #(+129 +257) #(+124 +254 -255)
88	0		+149 -151 +272 -283 +304 -319

c end cells

c
c surfaces
c px -1000.0
c 101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 1200.0
129 px 87.9856
131 px -844.042
132 px -823.722

133	px	-767.842
134	px	-706.882
135	px	-548.962
136	px	-493.522
137	px	-381.762
138	px	-320.802
139	px	-315.722
140	px	-173.482
141	px	-107.442
142	px	-82.042
143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358

235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058
239	py	39.4758
240	py	40.7458
241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258
245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0

```

308 pz -125.095
309 pz -67.451
310 pz 235.585
311 pz 276.225
312 pz 283.845
313 pz 342.265
314 pz 375.285
315 pz 390.525
316 pz 395.605
317 pz -50.0
318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y 10.3124 0.0 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p 0.06683670 0.0 1.0 -2.518636
504 p -0.06683670 0.0 1.0 2.518636
505 px 10.3124

c end surfaces
mode n p
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2

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26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concretè at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]
m11 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt11 lwtr.01t
c m12=iron at 7.86 g/cc
m12 26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
26058.60c 0.0028
c m13=Heavy concrete at 4.2 g/cc [wt %]
m13 1001.60c -0.0005 8016.60c -0.18
12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
26054.60c -4.073938-2 26056.60c -0.6625828
26057.60c -1.558362-2 26058.60c -2.094288-3
mt13 lwtr.01t
f105:n 845.0 0.0 0.0 0.0
de105
3.70370-3 4.37060-3 4.52500-3 4.57410-3
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df105
3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm105 5.701+10
f115:n 700.0 245.0 0.0 0.0
de115
3.70370-3 4.37060-3 4.52500-3 4.57410-3
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df115
3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3

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3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
5.701+10
fm115
f125:n
de125
725.0 0.0 0.0 0.0
2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df125
3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
5.701+10
fm125
f135:n
de135
298.958 -1710.0 0.0 0.0
2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df135
3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
5.701+10
fm135
f145:n
de145
298.958 1296.0 0.0 0.0
2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2

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	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df145		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm145	5.701+10				
f155:n	298.958	0.0 0.0 0.0			
de155		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df155		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm155	5.701+10				
f165:n	-385.0	300.0 0.0 0.0			
de165		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df165		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2

	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
	5.701+10				
fm165	-846.0	0.0	0.0	0.0	
f175:n		2.07002-7	7.69672-7	1.75386-6	3.71293-6
de175	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df175		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
	5.701+10				
fm175	986.0	0.0	0.0	0.0	
f185:n		2.07002-7	7.69672-7	1.75386-6	3.71293-6
de185	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df185		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
	5.701+10				
fm185	-385.0	0.0	0.0	0.0	
f195:n		2.07002-7	7.69672-7	1.75386-6	3.71293-6
de195	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1

	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df195		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm195	5.701+10				
f205:p	845.0	0.0	0.0	0.0	
de205		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df205		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm205	5.701+10				
f215:p	700.0	245.0	0.0	0.0	
de215		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df215		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm215	5.701+10				
f225:p	725.0	0.0	0.0	0.0	
de225		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df225		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm225	5.701+10				
f235:p	298.958	-1710.0	0.0	0.0	
de235		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df235		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm235	5.701+10				
f245:p	298.958	1296.0	0.0	0.0	
de245		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	

```

df245          2.14390-3  5.77600-4  2.71850-4  2.68170-4
3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm245          5.701+10
f255:p        298.958  0.0  0.0  0.0
de255          1.50000-2  3.25000-2  5.75000-2  8.50000-2
1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
7.25000+0  7.75000+0  9.00000+0  1.20000+1
df255          2.14390-3  5.77600-4  2.71850-4  2.68170-4
3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm255          5.701+10
f265:p       -385.0  300.0  0.0  0.0
de265          1.50000-2  3.25000-2  5.75000-2  8.50000-2
1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
7.25000+0  7.75000+0  9.00000+0  1.20000+1
df265          2.14390-3  5.77600-4  2.71850-4  2.68170-4
3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm265          5.701+10
f275:p       -846.0  0.0  0.0  0.0
de275          1.50000-2  3.25000-2  5.75000-2  8.50000-2
1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
7.25000+0  7.75000+0  9.00000+0  1.20000+1
df275          2.14390-3  5.77600-4  2.71850-4  2.68170-4
3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm275          5.701+10
f285:p        986.0  0.0  0.0  0.0
de285          1.50000-2  3.25000-2  5.75000-2  8.50000-2
1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
7.25000+0  7.75000+0  9.00000+0  1.20000+1
df285          2.14390-3  5.77600-4  2.71850-4  2.68170-4
3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm285          5.701+10
f295:p       -385.0  0.0  0.0  0.0
de295          1.50000-2  3.25000-2  5.75000-2  8.50000-2
1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
7.25000+0  7.75000+0  9.00000+0  1.20000+1
df295          2.14390-3  5.77600-4  2.71850-4  2.68170-4
3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm295          5.701+10
sdef pos=0  0  0  vec=1  0  0  dir=d1  erg=fdir=d2
sil          s  11  12  13  14  15  16
spl          1.17+10  8.60+9  1.21+10  8.82+9  1.47+10  1.09+9
sil1         h  -1.0  -0.7071067
sil2         h  -0.7071067  0.0
sil3         h  0.0  0.5

```

```
si14      h 0.5 0.8660254
si15      h 0.8660254 0.9961946
si16      h 0.9961946 1.0
sp11      0 1
sp12      0 1
sp13      0 1
sp14      0 1
sp15      0 1
sp16      0 1
ds2       s 21 22 23 24 25 26
si21      h 1.8245 1.9295
si22      h 1.9295 3.7645
si23      h 3.7645 5.675
si24      h 5.675 7.3865
si25      h 7.3865 8.321
si26      h 8.321 8.753
sp21      0 1
sp22      0 1
sp23      0 1
sp24      0 1
sp25      0 1
sp26      0 1
nps       2000000
prdmp     2j 1
print
```

File for MCNP-4B calculation of dose rates around the PFNA facility for the source in the maximum up position

message: outp=pfna14.o mctal=pfna14.m

```
mcnp file for PFNA facility -- dose rates at selected locations
c source in nominal maximum upward position (34.8 deg.) of the
c movable vertical collimator. check sdef, cells 3-6, surfaces
c 401 and 503-505, and the sign on surface 505.
c
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
#(131 -164 +258 -297 +307 -321)
3 1 0.10549 -400 -401 +505 +224 -227 #(503 -504)
4 1 0.10549 -401 +400 +505 +225 -226 #(503 -504)
5 0 142 -127 +223 -228 +308 -304
#(-400 -401 +505 +224 -227) #(+137 -102 +310)
#(-401 +400 +505 +225 -226)
6 0 127 -124 +501 -502 +308 -304
#(-401 +400 +505 +225 -226)
7 0 124 -126 +254 -255 +308 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
#(+102 -127 +223 -228) #(+127 -124 +501 -502)
#(+124 +254 -255) #(+129 -252) #(+129 +257)
9 1 0.10549 102 -124 +222 -229 +301 -304
#(+129 -252) #(+129 +257)
#(127 +501 -502) #(-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
#(221 -230)
#(103 -104 +217 -234)
#(104 -105 +216 -235)
#(105 -107 +219 -232)
#(107 -108 +219 -220) #(107 -108 +231 -232)
#(106 -109 +212 -218) #(106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
#(221 -230)
#(109 -110 +211 -237)
#(110 -111 +210 -238)
#(111 -112 +209 -239)
#(112 -113 +208 -240)
#(113 -114 +207 -241)
#(114 -115 +206 -242)
#(115 -116 +205 -243)
#(116 -117 +204 -244)
#(117 -118 +203 -245)
#(118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
#(-124 +214 -247) #(124 +253 -256)
#(122 +248) #(122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
#(221 -230) #(104 -220) #(104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
#(103 -120 202 -221 302 -303)
#(120 -123 215 -221 302 -303)
#(121 -214)
```


29	4	5.977931-2	102 -124 +229 -250 +301 -304
			#(103 -120 230 -249 302 -303)
			#(120 -123 230 -246 302 -303)
			#(121 +247)
30	4	5.977931-2	124 -126 +252 -254 +301 -304
			#(-125 +213 -253)
31	4	5.977931-2	124 -126 +255 -257 +301 -304
			#(-125 +256 -248)
32	0		+167 -168 +274 -281 +317 -318
33	0		+165 -166 +270 -285 +308 -310
			#(+167 -168 +274 -281 +317 -318)
34	0		-400 +505 +224 -227 +503 -504
35	0		-401 +400 +505 +225 -226 +503 -504
36	4	5.977931-2	122 -124 +201 -250 +301 -304
			#(213 -248)
			#(129 -252)
			#(129 +257)
37	9	-2.0	+131 -164 +258 -297 +307 -308
38	11	-1.0	+131 -164 +258 -297 +308 -320
			#(+132 -163 +259 -296)
39	12	-7.86	+131 -164 +258 -297 +320 -321
40	0		+132 -163 +259 -296 +319 -320
			#(+151 -169 +271 -284 +304 -315)
			#(+151 -160 +270 -271 +312 -314)
			#(+151 -160 +284 -285 +312 -314)
			#(+157 -159 +274 -281 +313 -315)
			#(+158 -160 +274 -281 -313)
			#(+169 -157 +274 -281 +314 -316)
41	1	0.10549	+151 -169 +271 -284 +304 -315
42	1	0.10549	+151 -160 +270 -271 +312 -314
43	1	0.10549	+151 -160 +284 -285 +312 -314
44	1	0.10549	+157 -159 +274 -281 +313 -315
45	1	0.10549	+158 -160 +274 -281 +308 -313
46	1	0.10549	+169 -157 +274 -281 +314 -316
47	9	-2.0	+160 -162 +273 -282 +308 -319
48	10	-2.0	+154 -161 +265 -289 +308 -319
			#47 #(-160 +267 -286)
49	0		+154 -160 +267 -286 +308 -319 #42 #43 #45
50	10	-2.0	+155 -156 +259 -260 +308 -319
51	10	-2.0	+155 -156 +295 -296 +308 -319
52	10	-2.0	+154 -155 +259 -296 +308 -319
			#(+265 -289)
53	0		+155 -163 +259 -296 +308 -319 #50 #51
			#(-161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0	+153 -154 +295 -296 +308 -319
55	10	-2.0	+151 -126 +295 -296 +308 -319
56	10	-2.0	+151 -126 +259 -260 +308 -319
57	10	-2.0	+153 -154 +259 -260 +308 -319
58	10	-2.0	+151 -152 +266 -272 +308 -304
59	10	-2.0	+151 -152 +283 -287 +308 -304
60	0		+151 -154 +259 -296 +308 -319
			#41 #42 #43 #54 #55 #56 #57 #58 #59
			#(+165 -166 +270 -285 +308 -310)
			#(-126 +201 -250 -304)
61	1	0.10549	+149 -151 +272 -201 +308 -304
62	1	0.10549	+149 -151 +250 -283 +308 -304
63	9	-2.0	+149 -151 +264 -290 +308 -319
			#(+272 -283)
64	10	-2.0	+149 -151 +259 -296 +308 -319
			#(+264 -290)
65	10	-2.0	+146 -149 +295 -296 +308 -319
66	0		+132 -149 +259 -296 +308 -319
			#65 #(+133 -294)
67	10	-2.0	+133 -149 +259 -294 +308 -319
			#(+142 -260 -322) #(+134 +260 -298)
68	10	-2.0	+135 -149 +261 -262 +308 -319
69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311
			#(-138 -290 -310) #(-102 +310)
			#(+138 +269 -290 -310) #(+144 +290 -292 -310)
			#(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71	1	0.10549	+137 -138 +268 -290 +308 -310

72	1	0.10549	+138	-149	+269	-272	+308	-310	
73	1	0.10549	+138	-149	+288	-290	+308	-310	#+(+140 -141)
74	0		+140	-141	+288	-290	+308	-310	
75	1	0.10549	+144	-149	+290	-292	+308	-310	
76	1	0.10549	+139	-144	+291	-293	+308	-310	
77	2	0.1187956	+137	-102	+268	-293	+310	-311	
78	0		+138	-149	+272	-288	+308	-310	
									#+(+102 +201 -250 +309 -304)
									#+(+143 -102 +275 -276 +301)
									#+(+143 -102 +279 -280 +301)
									#+(+147 -102 +276 -277 +301)
									#+(+147 -102 +278 -279 +301)
									#+(+142 +223 -228) #(+145 +201 -250 -309)
79	1	0.10549	+143	-102	+275	-276	+301	-310	
80	1	0.10549	+143	-102	+279	-280	+301	-310	
81	1	0.10549	+147	-102	+276	-277	+301	-310	
82	1	0.10549	+147	-102	+278	-279	+301	-310	
83	0		+142	-149	+259	-260	+308	-322	
84	0		+134	-149	+260	-298	+308	-319	
									#68 #69 #(+137 -149 +268 -293 +308 -311)
									#+(+102 +201 -250 -304) #(+142 +223 -228 -304)
85	9	-2.0	+145	-126	+201	-250	+308	-309	
									#+(+145 -127 +223 -228) #(+127 -124 +501 -502)
									#+(+129 -252) #(+129 +257) #(+124 +254 -255)
86	0		+129	-126	+201	-250	+308	-304	
									#+(+252 -257)
87	0		+102	-126	+201	-250	+309	-306	
									#+(+102 -127 +223 -228) #(+127 -124 +501 -502)
									#+(+129 -252) #(+129 +257) #(+124 +254 -255)
88	0		+149	-151	+272	-283	+304	-319	

c end cells

c

c

surfaces

100	px	-1000.0
c	101	px 10.3124
102	px	20.7264
103	px	22.6314
104	px	27.7114
105	px	28.9814
106	px	31.5214
107	px	36.6014
108	px	42.9514
109	px	49.3014
110	px	51.8414
111	px	54.3814
112	px	56.9214
113	px	59.4614
114	px	62.0014
115	px	64.5414
116	px	67.0814
117	px	69.6214
118	px	72.1614
119	px	74.7014
120	px	76.3016
121	px	78.2066
122	px	86.0806
123	px	112.649
124	px	114.554
125	px	119.888
126	px	121.158
127	px	50.5714
128	px	1200.0
129	px	87.9856
131	px	-844.042
132	px	-823.722
133	px	-767.842
134	px	-706.882
135	px	-548.962
136	px	-493.522
137	px	-381.762
138	px	-320.802

139	px	-315.722
140	px	-173.482
141	px	-107.442
142	px	-82.042
143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058
239	py	39.4758
240	py	40.7458

241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258
245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225
312	pz	283.845
313	pz	342.265

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314 pz 375.285
315 pz 390.525
316 pz 395.605
317 pz -50.0
318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y -28.60131 124.1738 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p -0.60029580 0.0 1.0 137.6099
504 p -0.79896920 0.0 1.0 151.1223
505 p 1.43881100 0.0 1.0 83.0219

c end surfaces
mode n p
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044

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| 26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]
m11 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt11 lwtr.01t
c m12=iron at 7.86 g/cc
m12 26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
26058.60c 0.0028
c m13=Heavy concrete at 4.2 g/cc [wt %]
m13 1001.60c -0.0005 8016.60c -0.18
12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
26054.60c -4.073938-2 26056.60c -0.6625828
26057.60c -1.558362-2 26058.60c -2.094288-3
mt13 lwtr.01t
f105:n 845.0 0.0 0.0 0.0
del105 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df105 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
5.701+10
fm105 f115:n 700.0 245.0 0.0 0.0
del115 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df115 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1

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	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm115	5.701+10				
f125:n	725.0	0.0	0.0	0.0	
del125		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df125		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm125	5.701+10				
f135:n	298.958	-1710.0	0.0	0.0	
del135		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df135		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm135	5.701+10				
f145:n	298.958	1296.0	0.0	0.0	
del145		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0

```

4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
df145 1.11070+1 1.35661+1
      3.70370-3 4.37060-3 4.52500-3 4.57410-3
      4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
      4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
      3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
      3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
      7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
      1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
      4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
      6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
      1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
      1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
      1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
      1.63200-1 2.00340-1
fm145 5.701+10
fl155:n 298.958 0.0 0.0 0.0
del155 2.07002-7 7.69672-7 1.75386-6 3.71293-6
      7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
      2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
      2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
      7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
      2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
      7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
      2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
      3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
      8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
      2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
      4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
      1.11070+1 1.35661+1
df155 3.70370-3 4.37060-3 4.52500-3 4.57410-3
      4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
      4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
      3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
      3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
      7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
      1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
      4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
      6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
      1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
      1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
      1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
      1.63200-1 2.00340-1
fm155 5.701+10
fl165:n -385.0 300.0 0.0 0.0
del165 2.07002-7 7.69672-7 1.75386-6 3.71293-6
      7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
      2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
      2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
      7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
      2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
      7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
      2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
      3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
      8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
      2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
      4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
      1.11070+1 1.35661+1
df165 3.70370-3 4.37060-3 4.52500-3 4.57410-3
      4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
      4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
      3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
      3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
      7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
      1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
      4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
      6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
      1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
      1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
      1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
      1.63200-1 2.00340-1
fm165 5.701+10

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f175:n      -846.0      0.0 0.0 0.0
de175      2.07002-7  7.69672-7  1.75386-6  3.71293-6
          7.86024-6  1.66401-5  3.52273-5  7.45761-5  1.34159-4
          2.21191-4  3.64682-4  6.01258-4  9.91309-4  1.63439-3
          2.14167-3  2.43063-3  2.82399-3  3.37141-3  4.61914-3
          7.32483-3  1.20766-2  1.93065-2  2.41830-2  2.54229-2
          2.65293-2  2.77506-2  3.14039-2  4.33909-2  5.45187-2
          7.15396-2  1.04645-1  1.36365-1  1.66556-1  2.03432-1
          2.48472-1  2.83877-1  2.95864-1  2.97851-1  3.00232-1
          3.44858-1  4.42806-1  5.10634-1  5.65749-1  6.75418-1
          8.24957-1  1.00760+0  1.23069+0  1.50317+0  1.83598+0
          2.12513+0  2.28850+0  2.40583+0  2.73896+0  3.34537+0
          4.08604+0  4.99070+0  6.09565+0  7.44525+0  9.09365+0
          1.11070+1  1.35661+1
df175      3.70370-3  4.37060-3  4.52500-3  4.57410-3
          4.55830-3  4.48970-3  4.38170-3  4.24920-3  4.12890-3
          4.03110-3  3.93550-3  3.84530-3  3.76290-3  3.69080-3
          3.65280-3  3.63870-3  3.62290-3  3.60620-3  3.58250-3
          3.55850-3  4.08750-3  5.89750-3  7.13870-3  7.42410-3
          7.67700-3  7.95180-3  8.74210-3  1.11490-2  1.35030-2
          1.65080-2  2.25270-2  2.86610-2  3.43150-2  4.10860-2
          4.92110-2  5.56070-2  5.77300-2  5.80800-2  5.84980-2
          6.59980-2  8.26560-2  9.04890-2  9.54810-2  1.05360-1
          1.17860-1  1.29670-1  1.30100-1  1.28650-1  1.27220-1
          1.26160-1  1.25620-1  1.25270-1  1.28500-1  1.36960-1
          1.45980-1  1.54120-1  1.51160-1  1.47220-1  1.47060-1
          1.63200-1  2.00340-1
fm175      5.701+10
f185:n      986.0      0.0 0.0 0.0
de185      2.07002-7  7.69672-7  1.75386-6  3.71293-6
          7.86024-6  1.66401-5  3.52273-5  7.45761-5  1.34159-4
          2.21191-4  3.64682-4  6.01258-4  9.91309-4  1.63439-3
          2.14167-3  2.43063-3  2.82399-3  3.37141-3  4.61914-3
          7.32483-3  1.20766-2  1.93065-2  2.41830-2  2.54229-2
          2.65293-2  2.77506-2  3.14039-2  4.33909-2  5.45187-2
          7.15396-2  1.04645-1  1.36365-1  1.66556-1  2.03432-1
          2.48472-1  2.83877-1  2.95864-1  2.97851-1  3.00232-1
          3.44858-1  4.42806-1  5.10634-1  5.65749-1  6.75418-1
          8.24957-1  1.00760+0  1.23069+0  1.50317+0  1.83598+0
          2.12513+0  2.28850+0  2.40583+0  2.73896+0  3.34537+0
          4.08604+0  4.99070+0  6.09565+0  7.44525+0  9.09365+0
          1.11070+1  1.35661+1
df185      3.70370-3  4.37060-3  4.52500-3  4.57410-3
          4.55830-3  4.48970-3  4.38170-3  4.24920-3  4.12890-3
          4.03110-3  3.93550-3  3.84530-3  3.76290-3  3.69080-3
          3.65280-3  3.63870-3  3.62290-3  3.60620-3  3.58250-3
          3.55850-3  4.08750-3  5.89750-3  7.13870-3  7.42410-3
          7.67700-3  7.95180-3  8.74210-3  1.11490-2  1.35030-2
          1.65080-2  2.25270-2  2.86610-2  3.43150-2  4.10860-2
          4.92110-2  5.56070-2  5.77300-2  5.80800-2  5.84980-2
          6.59980-2  8.26560-2  9.04890-2  9.54810-2  1.05360-1
          1.17860-1  1.29670-1  1.30100-1  1.28650-1  1.27220-1
          1.26160-1  1.25620-1  1.25270-1  1.28500-1  1.36960-1
          1.45980-1  1.54120-1  1.51160-1  1.47220-1  1.47060-1
          1.63200-1  2.00340-1
fm185      5.701+10
f195:n      -385.0      0.0 0.0 0.0
de195      2.07002-7  7.69672-7  1.75386-6  3.71293-6
          7.86024-6  1.66401-5  3.52273-5  7.45761-5  1.34159-4
          2.21191-4  3.64682-4  6.01258-4  9.91309-4  1.63439-3
          2.14167-3  2.43063-3  2.82399-3  3.37141-3  4.61914-3
          7.32483-3  1.20766-2  1.93065-2  2.41830-2  2.54229-2
          2.65293-2  2.77506-2  3.14039-2  4.33909-2  5.45187-2
          7.15396-2  1.04645-1  1.36365-1  1.66556-1  2.03432-1
          2.48472-1  2.83877-1  2.95864-1  2.97851-1  3.00232-1
          3.44858-1  4.42806-1  5.10634-1  5.65749-1  6.75418-1
          8.24957-1  1.00760+0  1.23069+0  1.50317+0  1.83598+0
          2.12513+0  2.28850+0  2.40583+0  2.73896+0  3.34537+0
          4.08604+0  4.99070+0  6.09565+0  7.44525+0  9.09365+0
          1.11070+1  1.35661+1
df195      3.70370-3  4.37060-3  4.52500-3  4.57410-3
          4.55830-3  4.48970-3  4.38170-3  4.24920-3  4.12890-3

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	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm195	5.701+10				
f205:p	845.0	0.0	0.0	0.0	
de205		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df205		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm205	5.701+10				
f215:p	700.0	245.0	0.0	0.0	
de215		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df215		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm215	5.701+10				
f225:p	725.0	0.0	0.0	0.0	
de225		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df225		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm225	5.701+10				
f235:p	298.958	-1710.0	0.0	0.0	
de235		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df235		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm235	5.701+10				
f245:p	298.958	1296.0	0.0	0.0	
de245		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df245		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm245	5.701+10				

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f255:p      298.958  0.0 0.0 0.0
de255      1.50000-2  3.25000-2  5.75000-2  8.50000-2
          1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
          6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
          2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
          7.25000+0  7.75000+0  9.00000+0  1.20000+1
df255      2.14390-3  5.77600-4  2.71850-4  2.68170-4
          3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
          1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
          3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
          7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm255      5.701+10
f265:p     -385.0 300.0 0.0 0.0
de265      1.50000-2  3.25000-2  5.75000-2  8.50000-2
          1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
          6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
          2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
          7.25000+0  7.75000+0  9.00000+0  1.20000+1
df265      2.14390-3  5.77600-4  2.71850-4  2.68170-4
          3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
          1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
          3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
          7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm265      5.701+10
f275:p     -846.0 0.0 0.0 0.0
de275      1.50000-2  3.25000-2  5.75000-2  8.50000-2
          1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
          6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
          2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
          7.25000+0  7.75000+0  9.00000+0  1.20000+1
df275      2.14390-3  5.77600-4  2.71850-4  2.68170-4
          3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
          1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
          3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
          7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm275      5.701+10
f285:p     986.0 0.0 0.0 0.0
de285      1.50000-2  3.25000-2  5.75000-2  8.50000-2
          1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
          6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
          2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
          7.25000+0  7.75000+0  9.00000+0  1.20000+1
df285      2.14390-3  5.77600-4  2.71850-4  2.68170-4
          3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
          1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
          3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
          7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm285      5.701+10
f295:p     -385.0 0.0 0.0 0.0
de295      1.50000-2  3.25000-2  5.75000-2  8.50000-2
          1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
          6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
          2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
          7.25000+0  7.75000+0  9.00000+0  1.20000+1
df295      2.14390-3  5.77600-4  2.71850-4  2.68170-4
          3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
          1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
          3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
          7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm295      5.701+10
sdef      pos=-37.0693 0 118.288 dir=d1 erg=fdir=d2
          vec=0.821149209 0.0 0.570713568
si1       s 11 12 13 14 15 16
sp1       1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
si11      h -1.0 -0.7071067
si12      h -0.7071067 0.0
si13      h 0.0 0.5
si14      h 0.5 0.8660254
si15      h 0.8660254 0.9961946
si16      h 0.9961946 1.0
sp11      0 1
sp12      0 1

```

```
sp13 0 1
sp14 0 1
sp15 0 1
sp16 0 1
ds2 s 21 22 23 24 25 26
si21 h 1.8245 1.9295
si22 h 1.9295 3.7645
si23 h 3.7645 5.675
si24 h 5.675 7.3865
si25 h 7.3865 8.321
si26 h 8.321 8.753
sp21 0 1
sp22 0 1
sp23 0 1
sp24 0 1
sp25 0 1
sp26 0 1
nps 2000000
prtmp 2j 1
print
```

File for MCNP-4B calculation of dose rates around the PFNA facility for the source in the maximum down position

message: outp=pfna15.o mctal=pfna15.m

```
mcnp file for PFNA facility -- dose rates at selected locations
c source in nominal minimum downward position (-8.6 deg.) of the
c movable vertical collimator. check sdef, cells 3-6, surfaces
c 401 and 503-505, and the sign on surface 505.
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
#(131 -164 +258 -297 +307 -321)
3 1 0.10549 -400 -401 -505 +224 -227 #(503 -504)
4 1 0.10549 -401 +400 -505 +225 -226 #(503 -504)
5 0 142 -127 +223 -228 +308 -304
#(-400 -401 -505 +224 -227) #(+137 -102 +310)
#(-401 +400 -505 +225 -226)
6 0 127 -124 +501 -502 +308 -304
#(-401 +400 -505 +225 -226)
7 0 124 -126 +254 -255 +308 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
#(+102 -127 +223 -228) #(+127 -124 +501 -502)
#(+124 +254 -255) #(+129 -252) #(+129 +257)
9 1 0.10549 102 -124 +222 -229 +301 -304
#(+129 -252) #(+129 +257)
#(127 +501 -502) #(-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
#(221 -230)
#(103 -104 +217 -234)
#(104 -105 +216 -235)
#(105 -107 +219 -232)
#(107 -108 +219 -220) #(107 -108 +231 -232)
#(106 -109 +212 -218) #(106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
#(221 -230)
#(109 -110 +211 -237)
#(110 -111 +210 -238)
#(111 -112 +209 -239)
#(112 -113 +208 -240)
#(113 -114 +207 -241)
#(114 -115 +206 -242)
#(115 -116 +205 -243)
#(116 -117 +204 -244)
#(117 -118 +203 -245)
#(118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
#(-124 +214 -247) #(124 +253 -256)
#(122 +248) #(122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
#(221 -230) #(104 -220) #(104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
#(103 -120 202 -221 302 -303)
#(120 -123 215 -221 302 -303)
#(121 -214)
```

29	4	5.977931-2	102 -124 +229 -250 +301 -304 #(103 -120 230 -249 302 -303) #(120 -123 230 -246 302 -303) #(121 +247)
30	4	5.977931-2	124 -126 +252 -254 +301 -304 #(-125 +213 -253)
31	4	5.977931-2	124 -126 +255 -257 +301 -304 #(-125 +256 -248)
32	0		+167 -168 +274 -281 +317 -318
33	0		+165 -166 +270 -285 +308 -310 #(+167 -168 +274 -281 +317 -318)
34	0		-400 -505 +224 -227 +503 -504
35	0		-401 +400 -505 +225 -226 +503 -504
36	4	5.977931-2	122 -124 +201 -250 +301 -304 #(213 -248) #(129 -252) #(129 +257)
37	9	-2.0	+131 -164 +258 -297 +307 -308
38	11	-1.0	+131 -164 +258 -297 +308 -320 #(+132 -163 +259 -296)
39	12	-7.86	+131 -164 +258 -297 +320 -321
40	0		+132 -163 +259 -296 +319 -320 #(+151 -169 +271 -284 +304 -315) #(+151 -160 +270 -271 +312 -314) #(+151 -160 +284 -285 +312 -314) #(+157 -159 +274 -281 +313 -315) #(+158 -160 +274 -281 -313) #(+169 -157 +274 -281 +314 -316)
41	1	0.10549	+151 -169 +271 -284 +304 -315
42	1	0.10549	+151 -160 +270 -271 +312 -314
43	1	0.10549	+151 -160 +284 -285 +312 -314
44	1	0.10549	+157 -159 +274 -281 +313 -315
45	1	0.10549	+158 -160 +274 -281 +308 -313
46	1	0.10549	+169 -157 +274 -281 +314 -316
47	9	-2.0	+160 -162 +273 -282 +308 -319
48	10	-2.0	+154 -161 +265 -289 +308 -319 #47 #(-160 +267 -286)
49	0		+154 -160 +267 -286 +308 -319 #42 #43 #45
50	10	-2.0	+155 -156 +259 -260 +308 -319
51	10	-2.0	+155 -156 +295 -296 +308 -319
52	10	-2.0	+154 -155 +259 -296 +308 -319 #(+265 -289)
53	0		+155 -163 +259 -296 +308 -319 #50 #51 #(-161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0	+153 -154 +295 -296 +308 -319
55	10	-2.0	+151 -126 +295 -296 +308 -319
56	10	-2.0	+151 -126 +259 -260 +308 -319
57	10	-2.0	+153 -154 +259 -260 +308 -319
58	10	-2.0	+151 -152 +266 -272 +308 -304
59	10	-2.0	+151 -152 +283 -287 +308 -304
60	0		+151 -154 +259 -296 +308 -319 #41 #42 #43 #54 #55 #56 #57 #58 #59 #(+165 -166 +270 -285 +308 -310) #(-126 +201 -250 -304)
61	1	0.10549	+149 -151 +272 -201 +308 -304
62	1	0.10549	+149 -151 +250 -283 +308 -304
63	9	-2.0	+149 -151 +264 -290 +308 -319 #(+272 -283)
64	10	-2.0	+149 -151 +259 -296 +308 -319 #(+264 -290)
65	10	-2.0	+146 -149 +295 -296 +308 -319
66	0		+132 -149 +259 -296 +308 -319 #65 #(+133 -294)
67	10	-2.0	+133 -149 +259 -294 +308 -319 #(+142 -260 -322) #(+134 +260 -298)
68	10	-2.0	+135 -149 +261 -262 +308 -319
69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311 #(-138 -290 -310) #(-102 +310) #(+138 +269 -290 -310) #(+144 +290 -292 -310) #(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71	1	0.10549	+137 -138 +268 -290 +308 -310

```

72 1 0.10549 +138 -149 +269 -272 +308 -310
73 1 0.10549 +138 -149 +288 -290 +308 -310 #(+140 -141)
74 0 +140 -141 +288 -290 +308 -310
75 1 0.10549 +144 -149 +290 -292 +308 -310
76 1 0.10549 +139 -144 +291 -293 +308 -310
77 2 0.1187956 +137 -102 +268 -293 +310 -311
78 0 +138 -149 +272 -288 +308 -310
    #(+102 +201 -250 +309 -304)
    #(+143 -102 +275 -276 +301)
    #(+143 -102 +279 -280 +301)
    #(+147 -102 +276 -277 +301)
    #(+147 -102 +278 -279 +301)
    #(+142 +223 -228) #(+145 +201 -250 -309)
79 1 0.10549 +143 -102 +275 -276 +301 -310
80 1 0.10549 +143 -102 +279 -280 +301 -310
81 1 0.10549 +147 -102 +276 -277 +301 -310
82 1 0.10549 +147 -102 +278 -279 +301 -310
83 0 +142 -149 +259 -260 +308 -322
84 0 +134 -149 +260 -298 +308 -319
    #68 #69 #(+137 -149 +268 -293 +308 -311)
    #(+102 +201 -250 -304) #(+142 +223 -228 -304)
    +145 -126 +201 -250 +308 -309
85 9 -2.0 #(+145 -127 +223 -228) #(+127 -124 +501 -502)
    #(+129 -252) #(+129 +257) #(+124 +254 -255)
86 0 +129 -126 +201 -250 +308 -304
    #(+252 -257)
87 0 +102 -126 +201 -250 +309 -306
    #(+102 -127 +223 -228) #(+127 -124 +501 -502)
    #(+129 -252) #(+129 +257) #(+124 +254 -255)
88 0 +149 -151 +272 -283 +304 -319

```

c end cells

c

c

surfaces

```

100 px -1000.0
c 101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 1200.0
129 px 87.9856
131 px -844.042
132 px -823.722
133 px -767.842
134 px -706.882
135 px -548.962
136 px -493.522
137 px -381.762
138 px -320.802

```

139	px	-315.722
140	px	-173.482
141	px	-107.442
142	px	-82.042
143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058
239	py	39.4758
240	py	40.7458

241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258
245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225
312	pz	283.845
313	pz	342.265

```

314 pz 375.285
315 pz 390.525
316 pz 395.605
317 pz -50.0
318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y 7.866053 -32.53536 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p 0.22029930 0.0 1.0 -34.07997
504 p 0.08355454 0.0 1.0 -28.66622
505 p -6.61219100 0.0 1.0 -84.54721

c end surfaces
mode n p
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044

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26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]
m11 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt11 lwtr.01t
c m12=iron at 7.86 g/cc
m12 26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
26058.60c 0.0028
c m13=Heavy concrete at 4.2 g/cc [wt %]
m13 1001.60c -0.0005 8016.60c -0.18
12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
26054.60c -4.073938-2 26056.60c -0.6625828
26057.60c -1.558362-2 26058.60c -2.094288-3
mt13 lwtr.01t
f105:n 845.0 0.0 0.0 0.0
del105
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df105
3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
5.701+10
fm105
f115:n 700.0 245.0 0.0 0.0
del115
2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df115
3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1

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1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm115 5.701+10
fl125:n 725.0 0.0 0.0 0.0
de125 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df125 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm125 5.701+10
fl135:n 298.958 -1710.0 0.0 0.0
de135 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df135 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm135 5.701+10
fl145:n 298.958 1296.0 0.0 0.0
de145 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0

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4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
df145 1.11070+1 1.35661+1
      3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm145 5.701+10
fl55:n 298.958 0.0 0.0 0.0
del55 2.07002-7 7.69672-7 1.75386-6 3.71293-6
      7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
df155 1.11070+1 1.35661+1
      3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm155 5.701+10
fl65:n -385.0 300.0 0.0 0.0
del65 2.07002-7 7.69672-7 1.75386-6 3.71293-6
      7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
df165 1.11070+1 1.35661+1
      3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm165 5.701+10

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f175:n      -846.0    0.0 0.0 0.0
del175      2.07002-7  7.69672-7  1.75386-6  3.71293-6
            7.86024-6  1.66401-5  3.52273-5  7.45761-5  1.34159-4
            2.21191-4  3.64682-4  6.01258-4  9.91309-4  1.63439-3
            2.14167-3  2.43063-3  2.82399-3  3.37141-3  4.61914-3
            7.32483-3  1.20766-2  1.93065-2  2.41830-2  2.54229-2
            2.65293-2  2.77506-2  3.14039-2  4.33909-2  5.45187-2
            7.15396-2  1.04645-1  1.36365-1  1.66556-1  2.03432-1
            2.48472-1  2.83877-1  2.95864-1  2.97851-1  3.00232-1
            3.44858-1  4.42806-1  5.10634-1  5.65749-1  6.75418-1
            8.24957-1  1.00760+0  1.23069+0  1.50317+0  1.83598+0
            2.12513+0  2.28850+0  2.40583+0  2.73896+0  3.34537+0
            4.08604+0  4.99070+0  6.09565+0  7.44525+0  9.09365+0
            1.11070+1  1.35661+1
df175      3.70370-3  4.37060-3  4.52500-3  4.57410-3
            4.55830-3  4.48970-3  4.38170-3  4.24920-3  4.12890-3
            4.03110-3  3.93550-3  3.84530-3  3.76290-3  3.69080-3
            3.65280-3  3.63870-3  3.62290-3  3.60620-3  3.58250-3
            3.55850-3  4.08750-3  5.89750-3  7.13870-3  7.42410-3
            7.67700-3  7.95180-3  8.74210-3  1.11490-2  1.35030-2
            1.65080-2  2.25270-2  2.86610-2  3.43150-2  4.10860-2
            4.92110-2  5.56070-2  5.77300-2  5.80800-2  5.84980-2
            6.59980-2  8.26560-2  9.04890-2  9.54810-2  1.05360-1
            1.17860-1  1.29670-1  1.30100-1  1.28650-1  1.27220-1
            1.26160-1  1.25620-1  1.25270-1  1.28500-1  1.36960-1
            1.45980-1  1.54120-1  1.51160-1  1.47220-1  1.47060-1
            1.63200-1  2.00340-1
fm175      5.701+10
f185:n      986.0    0.0 0.0 0.0
del185      2.07002-7  7.69672-7  1.75386-6  3.71293-6
            7.86024-6  1.66401-5  3.52273-5  7.45761-5  1.34159-4
            2.21191-4  3.64682-4  6.01258-4  9.91309-4  1.63439-3
            2.14167-3  2.43063-3  2.82399-3  3.37141-3  4.61914-3
            7.32483-3  1.20766-2  1.93065-2  2.41830-2  2.54229-2
            2.65293-2  2.77506-2  3.14039-2  4.33909-2  5.45187-2
            7.15396-2  1.04645-1  1.36365-1  1.66556-1  2.03432-1
            2.48472-1  2.83877-1  2.95864-1  2.97851-1  3.00232-1
            3.44858-1  4.42806-1  5.10634-1  5.65749-1  6.75418-1
            8.24957-1  1.00760+0  1.23069+0  1.50317+0  1.83598+0
            2.12513+0  2.28850+0  2.40583+0  2.73896+0  3.34537+0
            4.08604+0  4.99070+0  6.09565+0  7.44525+0  9.09365+0
            1.11070+1  1.35661+1
df185      3.70370-3  4.37060-3  4.52500-3  4.57410-3
            4.55830-3  4.48970-3  4.38170-3  4.24920-3  4.12890-3
            4.03110-3  3.93550-3  3.84530-3  3.76290-3  3.69080-3
            3.65280-3  3.63870-3  3.62290-3  3.60620-3  3.58250-3
            3.55850-3  4.08750-3  5.89750-3  7.13870-3  7.42410-3
            7.67700-3  7.95180-3  8.74210-3  1.11490-2  1.35030-2
            1.65080-2  2.25270-2  2.86610-2  3.43150-2  4.10860-2
            4.92110-2  5.56070-2  5.77300-2  5.80800-2  5.84980-2
            6.59980-2  8.26560-2  9.04890-2  9.54810-2  1.05360-1
            1.17860-1  1.29670-1  1.30100-1  1.28650-1  1.27220-1
            1.26160-1  1.25620-1  1.25270-1  1.28500-1  1.36960-1
            1.45980-1  1.54120-1  1.51160-1  1.47220-1  1.47060-1
            1.63200-1  2.00340-1
fm185      5.701+10
f195:n      -385.0    0.0 0.0 0.0
del195      2.07002-7  7.69672-7  1.75386-6  3.71293-6
            7.86024-6  1.66401-5  3.52273-5  7.45761-5  1.34159-4
            2.21191-4  3.64682-4  6.01258-4  9.91309-4  1.63439-3
            2.14167-3  2.43063-3  2.82399-3  3.37141-3  4.61914-3
            7.32483-3  1.20766-2  1.93065-2  2.41830-2  2.54229-2
            2.65293-2  2.77506-2  3.14039-2  4.33909-2  5.45187-2
            7.15396-2  1.04645-1  1.36365-1  1.66556-1  2.03432-1
            2.48472-1  2.83877-1  2.95864-1  2.97851-1  3.00232-1
            3.44858-1  4.42806-1  5.10634-1  5.65749-1  6.75418-1
            8.24957-1  1.00760+0  1.23069+0  1.50317+0  1.83598+0
            2.12513+0  2.28850+0  2.40583+0  2.73896+0  3.34537+0
            4.08604+0  4.99070+0  6.09565+0  7.44525+0  9.09365+0
            1.11070+1  1.35661+1
df195      3.70370-3  4.37060-3  4.52500-3  4.57410-3
            4.55830-3  4.48970-3  4.38170-3  4.24920-3  4.12890-3

```

	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm195	5.701+10				
f205:p	845.0	0.0	0.0	0.0	
de205		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df205		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm205	5.701+10				
f215:p	700.0	245.0	0.0	0.0	
de215		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df215		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm215	5.701+10				
f225:p	725.0	0.0	0.0	0.0	
de225		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df225		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm225	5.701+10				
f235:p	298.958	-1710.0	0.0	0.0	
de235		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df235		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm235	5.701+10				
f245:p	298.958	1296.0	0.0	0.0	
de245		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df245		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm245	5.701+10				

```

f255:p      298.958  0.0 0.0 0.0
de255      1.50000-2 3.25000-2 5.75000-2 8.50000-2
           1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
           6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
           2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
           7.25000+0 7.75000+0 9.00000+0 1.20000+1
df255      2.14390-3 5.77600-4 2.71850-4 2.68170-4
           3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
           1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
           3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
           7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm255      5.701+10
f265:p     -385.0 300.0 0.0 0.0
de265      1.50000-2 3.25000-2 5.75000-2 8.50000-2
           1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
           6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
           2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
           7.25000+0 7.75000+0 9.00000+0 1.20000+1
df265      2.14390-3 5.77600-4 2.71850-4 2.68170-4
           3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
           1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
           3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
           7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm265      5.701+10
f275:p     -846.0 0.0 0.0 0.0
de275      1.50000-2 3.25000-2 5.75000-2 8.50000-2
           1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
           6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
           2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
           7.25000+0 7.75000+0 9.00000+0 1.20000+1
df275      2.14390-3 5.77600-4 2.71850-4 2.68170-4
           3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
           1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
           3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
           7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm275      5.701+10
f285:p     986.0 0.0 0.0 0.0
de285      1.50000-2 3.25000-2 5.75000-2 8.50000-2
           1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
           6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
           2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
           7.25000+0 7.75000+0 9.00000+0 1.20000+1
df285      2.14390-3 5.77600-4 2.71850-4 2.68170-4
           3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
           1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
           3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
           7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm285      5.701+10
f295:p     -385.0 0.0 0.0 0.0
de295      1.50000-2 3.25000-2 5.75000-2 8.50000-2
           1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
           6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
           2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
           7.25000+0 7.75000+0 9.00000+0 1.20000+1
df295      2.14390-3 5.77600-4 2.71850-4 2.68170-4
           3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
           1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
           3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
           7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm295      5.701+10
sdef      pos=-2.3304 0 -30.993 dir=d1 erg=fdir=d2
           vec=0.988756381 0.0 -0.149535343
sil       s 11 12 13 14 15 16
sp1       1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
sil1      h -1.0 -0.7071067
sil2      h -0.7071067 0.0
sil3      h 0.0 0.5
sil4      h 0.5 0.8660254
sil5      h 0.8660254 0.9961946
sil6      h 0.9961946 1.0
sp11      0 1
sp12      0 1

```



```
sp13 0 1
sp14 0 1
sp15 0 1
sp16 0 1
ds2 s 21 22 23 24 25 26
si21 h 1.8245 1.9295
si22 h 1.9295 3.7645
si23 h 3.7645 5.675
si24 h 5.675 7.3865
si25 h 7.3865 8.321
si26 h 8.321 8.753
sp21 0 1
sp22 0 1
sp23 0 1
sp24 0 1
sp25 0 1
sp26 0 1
nps 2000000
prtmp 2j 1
print
```

File for MCNP-4B calculation of neutron dose rates along the truck lane of the PFNA facility for the source in the horizontal position

message: outp=pfna16.o mctal=pfna16.m

```
mcnp file for PFNA facility -- dose rates at selected locations
1      0      -100:128:-200:251:-300:305
2      0      100 -128 200 -251 300 -305
          #(131 -164 +258 -297 +307 -321)
3      1 0.10549 -400 -401 +505 +224 -227 #(503 -504)
4      1 0.10549 -401 +400 +505 +225 -226 #(503 -504)
5      0      142 -127 +223 -228 +308 -304
          #(-400 -401 +505 +224 -227) #(+137 -102 +310)
          #(-401 +400 +505 +225 -226)
6      0      127 -124 +501 -502 +308 -304
          #(-401 +400 +505 +225 -226)
7      0      124 -126 +254 -255 +308 -304
8      5 8.734441-2 102 -126 +201 -250 +306 -301
          #(+102 -127 +223 -228) #(+127 -124 +501 -502)
          #(+124 +254 -255) #(+129 -252) #(+129 +257)
9      1 0.10549 102 -124 +222 -229 +301 -304
          #(+129 -252) #(+129 +257)
          #(+127 +501 -502) #(-127 +223 -228)
10     1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11     1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12     1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13     1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14     1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15     1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16     1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17     1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18     1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19     1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20     1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21     2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22     2 0.1187956 103 -109 +202 -249 +302 -303
          #(221 -230)
          #(103 -104 +217 -234)
          #(104 -105 +216 -235)
          #(105 -107 +219 -232)
          #(107 -108 +219 -220) #(107 -108 +231 -232)
          #(106 -109 +212 -218) #(106 -109 +233 -236)
23     2 0.1187956 109 -120 +202 -249 +302 -303
          #(221 -230)
          #(109 -110 +211 -237)
          #(110 -111 +210 -238)
          #(111 -112 +209 -239)
          #(112 -113 +208 -240)
          #(113 -114 +207 -241)
          #(114 -115 +206 -242)
          #(115 -116 +205 -243)
          #(116 -117 +204 -244)
          #(117 -118 +203 -245)
          #(118 -119)
24     3 3.284-2 121 -125 +201 -250 +301 -304
          #(-124 +214 -247) #(124 +253 -256)
          #(122 +248) #(122 -213)
25     3 3.284-2 103 -107 +217 -234 +302 -303
          #(221 -230) #(104 -220) #(104 +231)
26     4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27     4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28     4 5.977931-2 102 -124 +201 -222 +301 -304
          #(103 -120 202 -221 302 -303)
          #(120 -123 215 -221 302 -303)
          #(121 -214)
29     4 5.977931-2 102 -124 +229 -250 +301 -304
          #(103 -120 230 -249 302 -303)
          #(120 -123 230 -246 302 -303)
          #(121 +247)
```

30	4	5.977931-2	124 -126 +252 -254 +301 -304
			#(-125 +213 -253)
31	4	5.977931-2	124 -126 +255 -257 +301 -304
			#(-125 +256 -248)
32	0		+167 -168 +274 -281 +317 -318
33	0		+165 -166 +270 -285 +308 -310
			#(+167 -168 +274 -281 +317 -318)
34	0		-400 +505 +224 -227 +503 -504
35	0		-401 +400 +505 +225 -226 +503 -504
36	4	5.977931-2	122 -124 +201 -250 +301 -304
			#(213 -248)
			#(129 -252)
			#(129 +257)
37	9	-2.0	+131 -164 +258 -297 +307 -308
38	11	-1.0	+131 -164 +258 -297 +308 -320
			#(+132 -163 +259 -296)
39	12	-7.86	+131 -164 +258 -297 +320 -321
40	0		+132 -163 +259 -296 +319 -320
			#(+151 -169 +271 -284 +304 -315)
			#(+151 -160 +270 -271 +312 -314)
			#(+151 -160 +284 -285 +312 -314)
			#(+157 -159 +274 -281 +313 -315)
			#(+158 -160 +274 -281 -313)
			#(+169 -157 +274 -281 +314 -316)
41	1	0.10549	+151 -169 +271 -284 +304 -315
42	1	0.10549	+151 -160 +270 -271 +312 -314
43	1	0.10549	+151 -160 +284 -285 +312 -314
44	1	0.10549	+157 -159 +274 -281 +313 -315
45	1	0.10549	+158 -160 +274 -281 +308 -313
46	1	0.10549	+169 -157 +274 -281 +314 -316
47	9	-2.0	+160 -162 +273 -282 +308 -319
48	10	-2.0	+154 -161 +265 -289 +308 -319
			#47 #(-160 +267 -286)
49	0		+154 -160 +267 -286 +308 -319 #42 #43 #45
50	10	-2.0	+155 -156 +259 -260 +308 -319
51	10	-2.0	+155 -156 +295 -296 +308 -319
52	10	-2.0	+154 -155 +259 -296 +308 -319
			#(+265 -289)
53	0		+155 -163 +259 -296 +308 -319 #50 #51
			#(-161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0	+153 -154 +295 -296 +308 -319
55	10	-2.0	+151 -126 +295 -296 +308 -319
56	10	-2.0	+151 -126 +259 -260 +308 -319
57	10	-2.0	+153 -154 +259 -260 +308 -319
58	10	-2.0	+151 -152 +266 -272 +308 -304
59	10	-2.0	+151 -152 +283 -287 +308 -304
60	0		+151 -154 +259 -296 +308 -319
			#41 #42 #43 #54 #55 #56 #57 #58 #59
			#(+165 -166 +270 -285 +308 -310)
			#(-126 +201 -250 -304)
61	1	0.10549	+149 -151 +272 -201 +308 -304
62	1	0.10549	+149 -151 +250 -283 +308 -304
63	9	-2.0	+149 -151 +264 -290 +308 -319
			#(+272 -283)
64	10	-2.0	+149 -151 +259 -296 +308 -319
			#(+264 -290)
65	10	-2.0	+146 -149 +295 -296 +308 -319
66	0		+132 -149 +259 -296 +308 -319
			#65 #(+133 -294)
67	10	-2.0	+133 -149 +259 -294 +308 -319
			#(+142 -260 -322) #(+134 +260 -298)
68	10	-2.0	+135 -149 +261 -262 +308 -319
69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311
			#(-138 -290 -310) #(-102 +310)
			#(+138 +269 -290 -310) #(+144 +290 -292 -310)
			#(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71	1	0.10549	+137 -138 +268 -290 +308 -310
72	1	0.10549	+138 -149 +269 -272 +308 -310
73	1	0.10549	+138 -149 +288 -290 +308 -310 #(+140 -141)
74	0		+140 -141 +288 -290 +308 -310
75	1	0.10549	+144 -149 +290 -292 +308 -310

```

76      1  0.10549  +139 -144 +291 -293 +308 -310
77      2  0.1187956 +137 -102 +268 -293 +310 -311
78      0
          +138 -149 +272 -288 +308 -310
          #(+102 +201 -250 +309 -304)
          #(+143 -102 +275 -276 +301)
          #(+143 -102 +279 -280 +301)
          #(+147 -102 +276 -277 +301)
          #(+147 -102 +278 -279 +301)
          #(+142 +223 -228) #(+145 +201 -250 -309)
79      1  0.10549  +143 -102 +275 -276 +301 -310
80      1  0.10549  +143 -102 +279 -280 +301 -310
81      1  0.10549  +147 -102 +276 -277 +301 -310
82      1  0.10549  +147 -102 +278 -279 +301 -310
83      0
          +142 -149 +259 -260 +308 -322
84      0
          +134 -149 +260 -298 +308 -319
          #68 #69 #(+137 -149 +268 -293 +308 -311)
          #(+102 +201 -250 -304) #(+142 +223 -228 -304)
85      9 -2.0
          +145 -126 +201 -250 +308 -309
          #(+145 -127 +223 -228) #(+127 -124 +501 -502)
          #(+129 -252) #(+129 +257) #(+124 +254 -255)
86      0
          +129 -126 +201 -250 +308 -304
          #(+252 -257)
87      0
          +102 -126 +201 -250 +309 -306
          #(+102 -127 +223 -228) #(+127 -124 +501 -502)
          #(+129 -252) #(+129 +257) #(+124 +254 -255)
88      0
          +149 -151 +272 -283 +304 -319

```

c end cells

c

c surfaces

```

100    px -1000.0
c      101    px 10.3124
102    px 20.7264
103    px 22.6314
104    px 27.7114
105    px 28.9814
106    px 31.5214
107    px 36.6014
108    px 42.9514
109    px 49.3014
110    px 51.8414
111    px 54.3814
112    px 56.9214
113    px 59.4614
114    px 62.0014
115    px 64.5414
116    px 67.0814
117    px 69.6214
118    px 72.1614
119    px 74.7014
120    px 76.3016
121    px 78.2066
122    px 86.0806
123    px 112.649
124    px 114.554
125    px 119.888
126    px 121.158
127    px 50.5714
128    px 1200.0
129    px 87.9856
131    px -844.042
132    px -823.722
133    px -767.842
134    px -706.882
135    px -548.962
136    px -493.522
137    px -381.762
138    px -320.802
139    px -315.722
140    px -173.482
141    px -107.442
142    px -82.042

```

143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058
239	py	39.4758
240	py	40.7458
241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258

245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225
312	pz	283.845
313	pz	342.265
314	pz	375.285
315	pz	390.525
316	pz	395.605
317	pz	-50.0

```

318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y 10.3124 0.0 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p 0.06683670 0.0 1.0 -2.518636
504 p -0.06683670 0.0 1.0 2.518636
505 px 10.3124

c end surfaces
mode n p
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]

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```

m11      1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
         11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
         14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
         26054.60c -7.91056-4 26056.60c -1.286568-2
         26057.60c -3.025946-4 26058.60c -4.06658-5
mt11     lwtr.01t
c        m12=iron at 7.86 g/cc
m12     26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
         26058.60c 0.0028
c        m13=Heavy concrete at 4.2 g/cc [wt %]
m13     1001.60c -0.0005 8016.60c -0.18
         12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
         16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
         26054.60c -4.073938-2 26056.60c -0.6625828
         26057.60c -1.558362-2 26058.60c -2.094288-3
mt13     lwtr.01t
f105:n   298.958 -1524.0 0.0 0.0
del105   2.07002-7 7.69672-7 1.75386-6 3.71293-6
         7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
         2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
         2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
         7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
         2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
         7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
         2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
         3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
         8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
         2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
         4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
         1.11070+1 1.35661+1
df105    3.70370-3 4.37060-3 4.52500-3 4.57410-3
         4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
         4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
         3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
         3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
         7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
         1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
         4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
         6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
         1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
         1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
         1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
         1.63200-1 2.00340-1
         5.701+10
fml105   298.958 -1371.6 0.0 0.0
f115:n   2.07002-7 7.69672-7 1.75386-6 3.71293-6
del115   7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
         2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
         2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
         7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
         2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
         7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
         2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
         3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
         8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
         2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
         4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
         1.11070+1 1.35661+1
df115    3.70370-3 4.37060-3 4.52500-3 4.57410-3
         4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
         4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
         3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
         3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
         7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
         1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
         4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
         6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
         1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
         1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
         1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
         1.63200-1 2.00340-1
         5.701+10
fm115    298.958 -1371.6 0.0 0.0

```



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f125:n      298.958 -1219.2  0.0  0.0
de125      2.07002-7  7.69672-7  1.75386-6  3.71293-6
           7.86024-6  1.66401-5  3.52273-5  7.45761-5  1.34159-4
           2.21191-4  3.64682-4  6.01258-4  9.91309-4  1.63439-3
           2.14167-3  2.43063-3  2.82399-3  3.37141-3  4.61914-3
           7.32483-3  1.20766-2  1.93065-2  2.41830-2  2.54229-2
           2.65293-2  2.77506-2  3.14039-2  4.33909-2  5.45187-2
           7.15396-2  1.04645-1  1.36365-1  1.66556-1  2.03432-1
           2.48472-1  2.83877-1  2.95864-1  2.97851-1  3.00232-1
           3.44858-1  4.42806-1  5.10634-1  5.65749-1  6.75418-1
           8.24957-1  1.00760+0  1.23069+0  1.50317+0  1.83598+0
           2.12513+0  2.28850+0  2.40583+0  2.73896+0  3.34537+0
           4.08604+0  4.99070+0  6.09565+0  7.44525+0  9.09365+0
           1.11070+1  1.35661+1
df125      3.70370-3  4.37060-3  4.52500-3  4.57410-3
           4.55830-3  4.48970-3  4.38170-3  4.24920-3  4.12890-3
           4.03110-3  3.93550-3  3.84530-3  3.76290-3  3.69080-3
           3.65280-3  3.63870-3  3.62290-3  3.60620-3  3.58250-3
           3.55850-3  4.08750-3  5.89750-3  7.13870-3  7.42410-3
           7.67700-3  7.95180-3  8.74210-3  1.11490-2  1.35030-2
           1.65080-2  2.25270-2  2.86610-2  3.43150-2  4.10860-2
           4.92110-2  5.56070-2  5.77300-2  5.80800-2  5.84980-2
           6.59980-2  8.26560-2  9.04890-2  9.54810-2  1.05360-1
           1.17860-1  1.29670-1  1.30100-1  1.28650-1  1.27220-1
           1.26160-1  1.25620-1  1.25270-1  1.28500-1  1.36960-1
           1.45980-1  1.54120-1  1.51160-1  1.47220-1  1.47060-1
           1.63200-1  2.00340-1
fm125      5.701+10
f135:n      298.958 -1066.8  0.0  0.0
de135      2.07002-7  7.69672-7  1.75386-6  3.71293-6
           7.86024-6  1.66401-5  3.52273-5  7.45761-5  1.34159-4
           2.21191-4  3.64682-4  6.01258-4  9.91309-4  1.63439-3
           2.14167-3  2.43063-3  2.82399-3  3.37141-3  4.61914-3
           7.32483-3  1.20766-2  1.93065-2  2.41830-2  2.54229-2
           2.65293-2  2.77506-2  3.14039-2  4.33909-2  5.45187-2
           7.15396-2  1.04645-1  1.36365-1  1.66556-1  2.03432-1
           2.48472-1  2.83877-1  2.95864-1  2.97851-1  3.00232-1
           3.44858-1  4.42806-1  5.10634-1  5.65749-1  6.75418-1
           8.24957-1  1.00760+0  1.23069+0  1.50317+0  1.83598+0
           2.12513+0  2.28850+0  2.40583+0  2.73896+0  3.34537+0
           4.08604+0  4.99070+0  6.09565+0  7.44525+0  9.09365+0
           1.11070+1  1.35661+1
df135      3.70370-3  4.37060-3  4.52500-3  4.57410-3
           4.55830-3  4.48970-3  4.38170-3  4.24920-3  4.12890-3
           4.03110-3  3.93550-3  3.84530-3  3.76290-3  3.69080-3
           3.65280-3  3.63870-3  3.62290-3  3.60620-3  3.58250-3
           3.55850-3  4.08750-3  5.89750-3  7.13870-3  7.42410-3
           7.67700-3  7.95180-3  8.74210-3  1.11490-2  1.35030-2
           1.65080-2  2.25270-2  2.86610-2  3.43150-2  4.10860-2
           4.92110-2  5.56070-2  5.77300-2  5.80800-2  5.84980-2
           6.59980-2  8.26560-2  9.04890-2  9.54810-2  1.05360-1
           1.17860-1  1.29670-1  1.30100-1  1.28650-1  1.27220-1
           1.26160-1  1.25620-1  1.25270-1  1.28500-1  1.36960-1
           1.45980-1  1.54120-1  1.51160-1  1.47220-1  1.47060-1
           1.63200-1  2.00340-1
fm135      5.701+10
f145:n      298.958 -914.4  0.0  0.0
de145      2.07002-7  7.69672-7  1.75386-6  3.71293-6
           7.86024-6  1.66401-5  3.52273-5  7.45761-5  1.34159-4
           2.21191-4  3.64682-4  6.01258-4  9.91309-4  1.63439-3
           2.14167-3  2.43063-3  2.82399-3  3.37141-3  4.61914-3
           7.32483-3  1.20766-2  1.93065-2  2.41830-2  2.54229-2
           2.65293-2  2.77506-2  3.14039-2  4.33909-2  5.45187-2
           7.15396-2  1.04645-1  1.36365-1  1.66556-1  2.03432-1
           2.48472-1  2.83877-1  2.95864-1  2.97851-1  3.00232-1
           3.44858-1  4.42806-1  5.10634-1  5.65749-1  6.75418-1
           8.24957-1  1.00760+0  1.23069+0  1.50317+0  1.83598+0
           2.12513+0  2.28850+0  2.40583+0  2.73896+0  3.34537+0
           4.08604+0  4.99070+0  6.09565+0  7.44525+0  9.09365+0
           1.11070+1  1.35661+1
df145      3.70370-3  4.37060-3  4.52500-3  4.57410-3
           4.55830-3  4.48970-3  4.38170-3  4.24920-3  4.12890-3

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3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
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7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df155 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
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7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
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2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df165 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
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1.63200-1 2.00340-1
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7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3

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	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df175		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
	5.701+10				
fm175	298.958	-304.8	0.0	0.0	
f185:n		2.07002-7	7.69672-7	1.75386-6	3.71293-6
de185		1.66401-5	3.52273-5	7.45761-5	1.34159-4
	7.86024-6	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.21191-4	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	2.14167-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	7.32483-3	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	2.65293-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	7.15396-2	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	2.48472-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	3.44858-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	8.24957-1	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	2.12513+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	4.08604+0	1.35661+1			
	1.11070+1	3.70370-3	4.37060-3	4.52500-3	4.57410-3
df185		4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.55830-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	4.03110-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.65280-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	3.55850-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	7.67700-3	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	1.65080-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	4.92110-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	6.59980-2	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.17860-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.26160-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.45980-1	1.63200-1	2.00340-1		
	1.63200-1	2.00340-1			
	5.701+10				
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de195		1.66401-5	3.52273-5	7.45761-5	1.34159-4
	7.86024-6	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.21191-4	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	2.14167-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	7.32483-3	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	2.65293-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	7.15396-2	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	2.48472-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	3.44858-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	8.24957-1	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	2.12513+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	4.08604+0	1.35661+1			
	1.11070+1	3.70370-3	4.37060-3	4.52500-3	4.57410-3
df195		4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.55830-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	4.03110-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.65280-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	3.55850-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	7.67700-3				

	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm195	5.701+10				
f305:n	298.958	152.4	0.0	0.0	
de305	2.07002-7	7.69672-7	1.75386-6	3.71293-6	
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df305	3.70370-3	4.37060-3	4.52500-3	4.57410-3	
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm305	5.701+10				
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de315	2.07002-7	7.69672-7	1.75386-6	3.71293-6	
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df315	3.70370-3	4.37060-3	4.52500-3	4.57410-3	
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm315	5.701+10				
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de325	2.07002-7	7.69672-7	1.75386-6	3.71293-6	
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1

	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df325		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm325	5.701+10				
f335:n	298.958	609.6	0.0	0.0	
de335		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df335		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm335	5.701+10				
f345:n	298.958	762.0	0.0	0.0	
de345		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df345		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1

```

1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm345 5.701+10
f355:n 298.958 914.4 0.0 0.0
de355 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df355 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm355 5.701+10
f365:n 298.958 1066.8 0.0 0.0
de365 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df365 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm365 5.701+10
f205:p 298.958 -1524.0 0.0 0.0
de205 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df205 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm205 5.701+10

```

```
sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2
si1 s 11 12 13 14 15 16
sp1 1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
si11 h -1.0 -0.7071067
si12 h -0.7071067 0.0
si13 h 0.0 0.5
si14 h 0.5 0.8660254
si15 h 0.8660254 0.9961946
si16 h 0.9961946 1.0
sp11 0 1
sp12 0 1
sp13 0 1
sp14 0 1
sp15 0 1
sp16 0 1
ds2 s 21 22 23 24 25 26
si21 h 1.8245 1.9295
si22 h 1.9295 3.7645
si23 h 3.7645 5.675
si24 h 5.675 7.3865
si25 h 7.3865 8.321
si26 h 8.321 8.753
sp21 0 1
sp22 0 1
sp23 0 1
sp24 0 1
sp25 0 1
sp26 0 1
nps 2000000
prtmp 2j 1
print
```

File for MCNP-4B calculation of photon dose rates along the truck lane of
the PFNA facility for the source in the horizontal position

message: outp=pfnal7.o mctal=pfnal7.m

```
mcnp file for PFNA facility -- dose rates at selected locations
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
   # (131 -164 +258 -297 +307 -321)
3 1 0.10549 -400 -401 +505 +224 -227 # (503 -504)
4 1 0.10549 -401 +400 +505 +225 -226 # (503 -504)
5 0 142 -127 +223 -228 +308 -304
   # (-400 -401 +505 +224 -227) # (+137 -102 +310)
   # (-401 +400 +505 +225 -226)
6 0 127 -124 +501 -502 +308 -304
   # (-401 +400 +505 +225 -226)
7 0 124 -126 +254 -255 +308 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
   # (+102 -127 +223 -228) # (+127 -124 +501 -502)
   # (+124 +254 -255) # (+129 -252) # (+129 +257)
9 1 0.10549 102 -124 +222 -229 +301 -304
   # (+129 -252) # (+129 +257)
   # (127 +501 -502) # (-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 # (218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 # (221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 # (221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 # (221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 # (221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 # (221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 # (221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 # (221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 # (221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 # (221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 # (221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 # (221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
   # (221 -230)
   # (103 -104 +217 -234)
   # (104 -105 +216 -235)
   # (105 -107 +219 -232)
   # (107 -108 +219 -220) # (107 -108 +231 -232)
   # (106 -109 +212 -218) # (106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
   # (221 -230)
   # (109 -110 +211 -237)
   # (110 -111 +210 -238)
   # (111 -112 +209 -239)
   # (112 -113 +208 -240)
   # (113 -114 +207 -241)
   # (114 -115 +206 -242)
   # (115 -116 +205 -243)
   # (116 -117 +204 -244)
   # (117 -118 +203 -245)
   # (118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
   # (-124 +214 -247) # (124 +253 -256)
   # (122 +248) # (122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
   # (221 -230) # (104 -220) # (104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 # (105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 # (105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
   # (103 -120 202 -221 302 -303)
   # (120 -123 215 -221 302 -303)
   # (121 -214)
29 4 5.977931-2 102 -124 +229 -250 +301 -304
   # (103 -120 230 -249 302 -303)
   # (120 -123 230 -246 302 -303)
   # (121 +247)
```


30	4	5.977931-2	124 -126 +252 -254 +301 -304
			#(-125 +213 -253)
31	4	5.977931-2	124 -126 +255 -257 +301 -304
			#(-125 +256 -248)
32	0		+167 -168 +274 -281 +317 -318
33	0		+165 -166 +270 -285 +308 -310
			#(+167 -168 +274 -281 +317 -318)
34	0		-400 +505 +224 -227 +503 -504
35	0		-401 +400 +505 +225 -226 +503 -504
36	4	5.977931-2	122 -124 +201 -250 +301 -304
			#(213 -248)
			#(129 -252)
			#(129 +257)
37	9	-2.0	+131 -164 +258 -297 +307 -308
38	11	-1.0	+131 -164 +258 -297 +308 -320
			#(+132 -163 +259 -296)
39	12	-7.86	+131 -164 +258 -297 +320 -321
40	0		+132 -163 +259 -296 +319 -320
			#(+151 -169 +271 -284 +304 -315)
			#(+151 -160 +270 -271 +312 -314)
			#(+151 -160 +284 -285 +312 -314)
			#(+157 -159 +274 -281 +313 -315)
			#(+158 -160 +274 -281 -313)
			#(+169 -157 +274 -281 +314 -316)
41	1	0.10549	+151 -169 +271 -284 +304 -315
42	1	0.10549	+151 -160 +270 -271 +312 -314
43	1	0.10549	+151 -160 +284 -285 +312 -314
44	1	0.10549	+157 -159 +274 -281 +313 -315
45	1	0.10549	+158 -160 +274 -281 +308 -313
46	1	0.10549	+169 -157 +274 -281 +314 -316
47	9	-2.0	+160 -162 +273 -282 +308 -319
48	10	-2.0	+154 -161 +265 -289 +308 -319
			#47 #(-160 +267 -286)
49	0		+154 -160 +267 -286 +308 -319 #42 #43 #45
50	10	-2.0	+155 -156 +259 -260 +308 -319
51	10	-2.0	+155 -156 +295 -296 +308 -319
52	10	-2.0	+154 -155 +259 -296 +308 -319
			#(+265 -289)
53	0		+155 -163 +259 -296 +308 -319 #50 #51
			#(-161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0	+153 -154 +295 -296 +308 -319
55	10	-2.0	+151 -126 +295 -296 +308 -319
56	10	-2.0	+151 -126 +259 -260 +308 -319
57	10	-2.0	+153 -154 +259 -260 +308 -319
58	10	-2.0	+151 -152 +266 -272 +308 -304
59	10	-2.0	+151 -152 +283 -287 +308 -304
60	0		+151 -154 +259 -296 +308 -319
			#41 #42 #43 #54 #55 #56 #57 #58 #59
			#(+165 -166 +270 -285 +308 -310)
			#(-126 +201 -250 -304)
61	1	0.10549	+149 -151 +272 -201 +308 -304
62	1	0.10549	+149 -151 +250 -283 +308 -304
63	9	-2.0	+149 -151 +264 -290 +308 -319
			#(+272 -283)
64	10	-2.0	+149 -151 +259 -296 +308 -319
			#(+264 -290)
65	10	-2.0	+146 -149 +295 -296 +308 -319
66	0		+132 -149 +259 -296 +308 -319
			#65 #(+133 -294)
67	10	-2.0	+133 -149 +259 -294 +308 -319
			#(+142 -260 -322) #(+134 +260 -298)
68	10	-2.0	+135 -149 +261 -262 +308 -319
69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311
			#(-138 -290 -310) #(-102 +310)
			#(+138 +269 -290 -310) #(+144 +290 -292 -310)
			#(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71	1	0.10549	+137 -138 +268 -290 +308 -310
72	1	0.10549	+138 -149 +269 -272 +308 -310
73	1	0.10549	+138 -149 +288 -290 +308 -310 #(+140 -141)
74	0		+140 -141 +288 -290 +308 -310
75	1	0.10549	+144 -149 +290 -292 +308 -310

```

76 1 0.10549 +139 -144 +291 -293 +308 -310
77 2 0.1187956 +137 -102 +268 -293 +310 -311
78 0          +138 -149 +272 -288 +308 -310
          #(+102 +201 -250 +309 -304)
          #(+143 -102 +275 -276 +301)
          #(+143 -102 +279 -280 +301)
          #(+147 -102 +276 -277 +301)
          #(+147 -102 +278 -279 +301)
          #(+142 +223 -228) #(+145 +201 -250 -309)
79 1 0.10549 +143 -102 +275 -276 +301 -310
80 1 0.10549 +143 -102 +279 -280 +301 -310
81 1 0.10549 +147 -102 +276 -277 +301 -310
82 1 0.10549 +147 -102 +278 -279 +301 -310
83 0          +142 -149 +259 -260 +308 -322
84 0          +134 -149 +260 -298 +308 -319
          #68 #69 #(+137 -149 +268 -293 +308 -311)
          #(+102 +201 -250 -304) #(+142 +223 -228 -304)
85 9 -2.0    +145 -126 +201 -250 +308 -309
          #(+145 -127 +223 -228) #(+127 -124 +501 -502)
          #(+129 -252) #(+129 +257) #(+124 +254 -255)
86 0          +129 -126 +201 -250 +308 -304
          #(+252 -257)
87 0          +102 -126 +201 -250 +309 -306
          #(+102 -127 +223 -228) #(+127 -124 +501 -502)
          #(+129 -252) #(+129 +257) #(+124 +254 -255)
88 0          +149 -151 +272 -283 +304 -319

```

c end cells

c

c surfaces

```

100 px -1000.0
c 101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 1200.0
129 px 87.9856
131 px -844.042
132 px -823.722
133 px -767.842
134 px -706.882
135 px -548.962
136 px -493.522
137 px -381.762
138 px -320.802
139 px -315.722
140 px -173.482
141 px -107.442
142 px -82.042

```

143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058
239	py	39.4758
240	py	40.7458
241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258

245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225
312	pz	283.845
313	pz	342.265
314	pz	375.285
315	pz	390.525
316	pz	395.605
317	pz	-50.0

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318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y 10.3124 0.0 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p 0.06683670 0.0 1.0 -2.518636
504 p -0.06683670 0.0 1.0 2.518636
505 px 10.3124

c end surfaces
mode n p
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]

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m11      1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
         11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
         14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
         26054.60c -7.91056-4 26056.60c -1.286568-2
         26057.60c -3.025946-4 26058.60c -4.06658-5
mt11     lwtr.01t
c        m12=iron at 7.86 g/cc
m12     26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
         26058.60c 0.0028
c        m13=Heavy concrete at 4.2 g/cc [wt %]
m13     1001.60c -0.0005 8016.60c -0.18
         12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
         16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
         26054.60c -4.073938-2 26056.60c -0.6625828
         26057.60c -1.558362-2 26058.60c -2.094288-3
mt13     lwtr.01t
f105:n  298.958 -1524.0 0.0 0.0
de105   2.07002-7 7.69672-7 1.75386-6 3.71293-6
         7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
         2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
         2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
         7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
         2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
         7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
         2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
         3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
         8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
         2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
         4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
         1.11070+1 1.35661+1
df105   3.70370-3 4.37060-3 4.52500-3 4.57410-3
         4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
         4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
         3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
         3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
         7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
         1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
         4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
         6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
         1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
         1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
         1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
         1.63200-1 2.00340-1
fm105   5.701+10
f205:p  298.958 -1524.0 0.0 0.0
de205   1.50000-2 3.25000-2 5.75000-2 8.50000-2
         1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
         6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
         2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
         7.25000+0 7.75000+0 9.00000+0 1.20000+1
df205   2.14390-3 5.77600-4 2.71850-4 2.68170-4
         3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
         1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
         3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
         7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm205   5.701+10
f215:p  298.958 -1371.6 0.0 0.0
de215   1.50000-2 3.25000-2 5.75000-2 8.50000-2
         1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
         6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
         2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
         7.25000+0 7.75000+0 9.00000+0 1.20000+1
df215   2.14390-3 5.77600-4 2.71850-4 2.68170-4
         3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
         1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
         3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
         7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm215   5.701+10
f225:p  298.958 -1219.2 0.0 0.0
de225   1.50000-2 3.25000-2 5.75000-2 8.50000-2
         1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
         6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0

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	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df225		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm225	5.701+10				
f235:p	298.958	-1066.8	0.0	0.0	
de235		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df235		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm235	5.701+10				
f245:p	298.958	-914.4	0.0	0.0	
de245		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df245		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm245	5.701+10				
f255:p	298.958	-762.0	0.0	0.0	
de255		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df255		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm255	5.701+10				
f265:p	298.958	-609.6	0.0	0.0	
de265		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df265		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm265	5.701+10				
f275:p	298.958	-457.2	0.0	0.0	
de275		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df275		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm275	5.701+10				
f285:p	298.958	-304.8	0.0	0.0	
de285		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0

	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
df285	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm285	5.701+10				
f295:p	298.958	-152.4	0.0	0.0	
de295		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df295		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm295	5.701+10				
f405:p	298.958	152.4	0.0	0.0	
de405		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df405		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm405	5.701+10				
f415:p	298.958	304.8	0.0	0.0	
de415		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df415		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm415	5.701+10				
f425:p	298.958	457.2	0.0	0.0	
de425		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df425		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm425	5.701+10				
f435:p	298.958	609.6	0.0	0.0	
de435		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df435		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm435	5.701+10				
f445:p	298.958	762.0	0.0	0.0	
de445		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0


```

2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df445      2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm445      5.701+10
f455:p     298.958      914.4      0.0      0.0
de455      1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df455      2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm455      5.701+10
f465:p     298.958     1066.8      0.0      0.0
de465      1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df465      2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm465      5.701+10
sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2
sil        s 11 12 13 14 15 16
sp1        1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
sil1       h -1.0 -0.7071067
sil2       h -0.7071067 0.0
sil3       h 0.0 0.5
sil4       h 0.5 0.8660254
sil5       h 0.8660254 0.9961946
sil6       h 0.9961946 1.0
sp11       0 1
sp12       0 1
sp13       0 1
sp14       0 1
sp15       0 1
sp16       0 1
ds2        s 21 22 23 24 25 26
si21       h 1.8245 1.9295
si22       h 1.9295 3.7645
si23       h 3.7645 5.675
si24       h 5.675 7.3865
si25       h 7.3865 8.321
si26       h 8.321 8.753
sp21       0 1
sp22       0 1
sp23       0 1
sp24       0 1
sp25       0 1
sp26       0 1
nps        2000000
prcimp     2j 1
print

```

File for MCNP-4B calculation of neutron dose rates along the truck lane of
the PFNA facility for the source in the maximum up position

message: outp=pfna18.o mctal=pfna18.m

```
mcnp file for PFNA facility -- dose rates at selected locations
c source in nominal maximum upward position (34.8 deg.) of the
c movable vertical collimator. check sdef, cells 3-6, surfaces
c 401 and 503-505, and the sign on surface 505.
c
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
#(131 -164 +258 -297 +307 -321)
3 1 0.10549 -400 -401 +505 +224 -227 #(503 -504)
4 1 0.10549 -401 +400 +505 +225 -226 #(503 -504)
5 0 142 -127 +223 -228 +308 -304
#(-400 -401 +505 +224 -227) #(+137 -102 +310)
#(-401 +400 +505 +225 -226)
6 0 127 -124 +501 -502 +308 -304
#(-401 +400 +505 +225 -226)
7 0 124 -126 +254 -255 +308 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
#(+102 -127 +223 -228) #(+127 -124 +501 -502)
#(+124 +254 -255) #(+129 -252) #(+129 +257)
9 1 0.10549 102 -124 +222 -229 +301 -304
#(+129 -252) #(+129 +257)
#(127 +501 -502) #(-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
#(221 -230)
#(103 -104 +217 -234)
#(104 -105 +216 -235)
#(105 -107 +219 -232)
#(107 -108 +219 -220) #(107 -108 +231 -232)
#(106 -109 +212 -218) #(106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
#(221 -230)
#(109 -110 +211 -237)
#(110 -111 +210 -238)
#(111 -112 +209 -239)
#(112 -113 +208 -240)
#(113 -114 +207 -241)
#(114 -115 +206 -242)
#(115 -116 +205 -243)
#(116 -117 +204 -244)
#(117 -118 +203 -245)
#(118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
#(-124 +214 -247) #(124 +253 -256)
#(122 +248) #(122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
#(221 -230) #(104 -220) #(104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
#(103 -120 202 -221 302 -303)
#(120 -123 215 -221 302 -303)
#(121 -214)
```

29	4	5.977931-2	102 -124 +229 -250 +301 -304
			103 -120 230 -249 302 -303)
			120 -123 230 -246 302 -303)
			121 +247)
30	4	5.977931-2	124 -126 +252 -254 +301 -304
			125 +213 -253)
31	4	5.977931-2	124 -126 +255 -257 +301 -304
			125 +256 -248)
32	0		+167 -168 +274 -281 +317 -318
33	0		+165 -166 +270 -285 +308 -310
			167 -168 +274 -281 +317 -318)
34	0		-400 +505 +224 -227 +503 -504
35	0		-401 +400 +505 +225 -226 +503 -504
36	4	5.977931-2	122 -124 +201 -250 +301 -304
			213 -248)
			129 -252)
			129 +257)
37	9	-2.0	+131 -164 +258 -297 +307 -308
38	11	-1.0	+131 -164 +258 -297 +308 -320
			132 -163 +259 -296)
39	12	-7.86	+131 -164 +258 -297 +320 -321
40	0		+132 -163 +259 -296 +319 -320
			151 -169 +271 -284 +304 -315)
			151 -160 +270 -271 +312 -314)
			151 -160 +284 -285 +312 -314)
			157 -159 +274 -281 +313 -315)
			158 -160 +274 -281 -313)
			169 -157 +274 -281 +314 -316)
41	1	0.10549	+151 -169 +271 -284 +304 -315
42	1	0.10549	+151 -160 +270 -271 +312 -314
43	1	0.10549	+151 -160 +284 -285 +312 -314
44	1	0.10549	+157 -159 +274 -281 +313 -315
45	1	0.10549	+158 -160 +274 -281 +308 -313
46	1	0.10549	+169 -157 +274 -281 +314 -316
47	9	-2.0	+160 -162 +273 -282 +308 -319
48	10	-2.0	+154 -161 +265 -289 +308 -319
			47 #(-160 +267 -286)
49	0		+154 -160 +267 -286 +308 -319 #42 #43 #45
50	10	-2.0	+155 -156 +259 -260 +308 -319
51	10	-2.0	+155 -156 +295 -296 +308 -319
52	10	-2.0	+154 -155 +259 -296 +308 -319
			265 -289)
53	0		+155 -163 +259 -296 +308 -319 #50 #51
			161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0	+153 -154 +295 -296 +308 -319
55	10	-2.0	+151 -126 +295 -296 +308 -319
56	10	-2.0	+151 -126 +259 -260 +308 -319
57	10	-2.0	+153 -154 +259 -260 +308 -319
58	10	-2.0	+151 -152 +266 -272 +308 -304
59	10	-2.0	+151 -152 +283 -287 +308 -304
60	0		+151 -154 +259 -296 +308 -319
			41 #42 #43 #54 #55 #56 #57 #58 #59
			165 -166 +270 -285 +308 -310)
			126 +201 -250 -304)
61	1	0.10549	+149 -151 +272 -201 +308 -304
62	1	0.10549	+149 -151 +250 -283 +308 -304
63	9	-2.0	+149 -151 +264 -290 +308 -319
			272 -283)
64	10	-2.0	+149 -151 +259 -296 +308 -319
			264 -290)
65	10	-2.0	+146 -149 +295 -296 +308 -319
66	0		+132 -149 +259 -296 +308 -319
			65 #(+133 -294)
67	10	-2.0	+133 -149 +259 -294 +308 -319
			142 -260 -322) #(+134 +260 -298)
68	10	-2.0	+135 -149 +261 -262 +308 -319
69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311
			138 -290 -310) #(-102 +310)
			138 +269 -290 -310) #(+144 +290 -292 -310)
			139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71	1	0.10549	+137 -138 +268 -290 +308 -310

```

72 1 0.10549 +138 -149 +269 -272 +308 -310
73 1 0.10549 +138 -149 +288 -290 +308 -310 #(+140 -141)
74 0 +140 -141 +288 -290 +308 -310
75 1 0.10549 +144 -149 +290 -292 +308 -310
76 1 0.10549 +139 -144 +291 -293 +308 -310
77 2 0.1187956 +137 -102 +268 -293 +310 -311
78 0 +138 -149 +272 -288 +308 -310
    #(+102 +201 -250 +309 -304)
    #(+143 -102 +275 -276 +301)
    #(+143 -102 +279 -280 +301)
    #(+147 -102 +276 -277 +301)
    #(+147 -102 +278 -279 +301)
    #(+142 +223 -228) #(+145 +201 -250 -309)
79 1 0.10549 +143 -102 +275 -276 +301 -310
80 1 0.10549 +143 -102 +279 -280 +301 -310
81 1 0.10549 +147 -102 +276 -277 +301 -310
82 1 0.10549 +147 -102 +278 -279 +301 -310
83 0 +142 -149 +259 -260 +308 -322
84 0 +134 -149 +260 -298 +308 -319
    #68 #69 #(+137 -149 +268 -293 +308 -311)
    #(+102 +201 -250 -304) #(+142 +223 -228 -304)
    +145 -126 +201 -250 +308 -309
    #(+145 -127 +223 -228) #(+127 -124 +501 -502)
    #(+129 -252) #(+129 +257) #(+124 +254 -255)
85 9 -2.0 +129 -126 +201 -250 +308 -304
    #(+252 -257)
86 0 +102 -126 +201 -250 +309 -306
    #(+102 -127 +223 -228) #(+127 -124 +501 -502)
    #(+129 -252) #(+129 +257) #(+124 +254 -255)
87 0 +149 -151 +272 -283 +304 -319
88 0

```

c end cells

c

c surfaces

```

100 px -1000.0
c 101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 1200.0
129 px 87.9856
131 px -844.042
132 px -823.722
133 px -767.842
134 px -706.882
135 px -548.962
136 px -493.522
137 px -381.762
138 px -320.802

```

139	px	-315.722
140	px	-173.482
141	px	-107.442
142	px	-82.042
143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058
239	py	39.4758
240	py	40.7458

241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258
245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225
312	pz	283.845
313	pz	342.265

```

314 pz 375.285
315 pz 390.525
316 pz 395.605
317 pz -50.0
318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y -28.60131 124.1738 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p -0.60029580 0.0 1.0 137.6099
504 p -0.79896920 0.0 1.0 151.1223
505 p 1.43881100 0.0 1.0 83.0219

c end surfaces
mode n p
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044

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26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]
m11 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt11 lwtr.01t
c m12=iron at 7.86 g/cc
m12 26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
26058.60c 0.0028
c m13=Heavy concrete at 4.2 g/cc [wt %]
m13 1001.60c -0.0005 8016.60c -0.18
12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
26054.60c -4.073938-2 26056.60c -0.6625828
26057.60c -1.558362-2 26058.60c -2.094288-3
mt13 lwtr.01t
f105:n 298.958 -1524.0 0.0 0.0
del105 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df105 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
5.701+10
fm105 298.958 -1371.6 0.0 0.0
f115:n del115 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df115 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1

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1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm115 5.701+10
f125:n 298.958 -1219.2 0.0 0.0
del125 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df125 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm125 5.701+10
f135:n 298.958 -1066.8 0.0 0.0
del135 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df135 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm135 5.701+10
f145:n 298.958 -914.4 0.0 0.0
del145 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0

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	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
df145	1.11070+1	1.35661+1	3.70370-3	4.37060-3	4.52500-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm145	5.701+10				
f155:n	298.958	-762.0	0.0	0.0	
del55		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
df155	1.11070+1	1.35661+1	3.70370-3	4.37060-3	4.52500-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm155	5.701+10				
f165:n	298.958	-609.6	0.0	0.0	
del65		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
df165	1.11070+1	1.35661+1	3.70370-3	4.37060-3	4.52500-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm165	5.701+10				

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f175:n      298.958  -457.2  0.0  0.0
del175      2.07002-7  7.69672-7  1.75386-6  3.71293-6
7.86024-6  1.66401-5  3.52273-5  7.45761-5  1.34159-4
2.21191-4  3.64682-4  6.01258-4  9.91309-4  1.63439-3
2.14167-3  2.43063-3  2.82399-3  3.37141-3  4.61914-3
7.32483-3  1.20766-2  1.93065-2  2.41830-2  2.54229-2
2.65293-2  2.77506-2  3.14039-2  4.33909-2  5.45187-2
7.15396-2  1.04645-1  1.36365-1  1.66556-1  2.03432-1
2.48472-1  2.83877-1  2.95864-1  2.97851-1  3.00232-1
3.44858-1  4.42806-1  5.10634-1  5.65749-1  6.75418-1
8.24957-1  1.00760+0  1.23069+0  1.50317+0  1.83598+0
2.12513+0  2.28850+0  2.40583+0  2.73896+0  3.34537+0
4.08604+0  4.99070+0  6.09565+0  7.44525+0  9.09365+0
1.11070+1  1.35661+1
df175      3.70370-3  4.37060-3  4.52500-3  4.57410-3
4.55830-3  4.48970-3  4.38170-3  4.24920-3  4.12890-3
4.03110-3  3.93550-3  3.84530-3  3.76290-3  3.69080-3
3.65280-3  3.63870-3  3.62290-3  3.60620-3  3.58250-3
3.55850-3  4.08750-3  5.89750-3  7.13870-3  7.42410-3
7.67700-3  7.95180-3  8.74210-3  1.11490-2  1.35030-2
1.65080-2  2.25270-2  2.86610-2  3.43150-2  4.10860-2
4.92110-2  5.56070-2  5.77300-2  5.80800-2  5.84980-2
6.59980-2  8.26560-2  9.04890-2  9.54810-2  1.05360-1
1.17860-1  1.29670-1  1.30100-1  1.28650-1  1.27220-1
1.26160-1  1.25620-1  1.25270-1  1.28500-1  1.36960-1
1.45980-1  1.54120-1  1.51160-1  1.47220-1  1.47060-1
1.63200-1  2.00340-1
5.701+10
f185:n      298.958  -304.8  0.0  0.0
del185      2.07002-7  7.69672-7  1.75386-6  3.71293-6
7.86024-6  1.66401-5  3.52273-5  7.45761-5  1.34159-4
2.21191-4  3.64682-4  6.01258-4  9.91309-4  1.63439-3
2.14167-3  2.43063-3  2.82399-3  3.37141-3  4.61914-3
7.32483-3  1.20766-2  1.93065-2  2.41830-2  2.54229-2
2.65293-2  2.77506-2  3.14039-2  4.33909-2  5.45187-2
7.15396-2  1.04645-1  1.36365-1  1.66556-1  2.03432-1
2.48472-1  2.83877-1  2.95864-1  2.97851-1  3.00232-1
3.44858-1  4.42806-1  5.10634-1  5.65749-1  6.75418-1
8.24957-1  1.00760+0  1.23069+0  1.50317+0  1.83598+0
2.12513+0  2.28850+0  2.40583+0  2.73896+0  3.34537+0
4.08604+0  4.99070+0  6.09565+0  7.44525+0  9.09365+0
1.11070+1  1.35661+1
df185      3.70370-3  4.37060-3  4.52500-3  4.57410-3
4.55830-3  4.48970-3  4.38170-3  4.24920-3  4.12890-3
4.03110-3  3.93550-3  3.84530-3  3.76290-3  3.69080-3
3.65280-3  3.63870-3  3.62290-3  3.60620-3  3.58250-3
3.55850-3  4.08750-3  5.89750-3  7.13870-3  7.42410-3
7.67700-3  7.95180-3  8.74210-3  1.11490-2  1.35030-2
1.65080-2  2.25270-2  2.86610-2  3.43150-2  4.10860-2
4.92110-2  5.56070-2  5.77300-2  5.80800-2  5.84980-2
6.59980-2  8.26560-2  9.04890-2  9.54810-2  1.05360-1
1.17860-1  1.29670-1  1.30100-1  1.28650-1  1.27220-1
1.26160-1  1.25620-1  1.25270-1  1.28500-1  1.36960-1
1.45980-1  1.54120-1  1.51160-1  1.47220-1  1.47060-1
1.63200-1  2.00340-1
5.701+10
f195:n      298.958  -152.4  0.0  0.0
del195      2.07002-7  7.69672-7  1.75386-6  3.71293-6
7.86024-6  1.66401-5  3.52273-5  7.45761-5  1.34159-4
2.21191-4  3.64682-4  6.01258-4  9.91309-4  1.63439-3
2.14167-3  2.43063-3  2.82399-3  3.37141-3  4.61914-3
7.32483-3  1.20766-2  1.93065-2  2.41830-2  2.54229-2
2.65293-2  2.77506-2  3.14039-2  4.33909-2  5.45187-2
7.15396-2  1.04645-1  1.36365-1  1.66556-1  2.03432-1
2.48472-1  2.83877-1  2.95864-1  2.97851-1  3.00232-1
3.44858-1  4.42806-1  5.10634-1  5.65749-1  6.75418-1
8.24957-1  1.00760+0  1.23069+0  1.50317+0  1.83598+0
2.12513+0  2.28850+0  2.40583+0  2.73896+0  3.34537+0
4.08604+0  4.99070+0  6.09565+0  7.44525+0  9.09365+0
1.11070+1  1.35661+1
df195      3.70370-3  4.37060-3  4.52500-3  4.57410-3
4.55830-3  4.48970-3  4.38170-3  4.24920-3  4.12890-3

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	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm195	5.701+10				
f305:n	298.958	152.4	0.0	0.0	
de305	2.07002-7	7.69672-7	1.75386-6	3.71293-6	
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df305	3.70370-3	4.37060-3	4.52500-3	4.57410-3	
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm305	5.701+10				
f315:n	298.958	304.8	0.0	0.0	
de315	2.07002-7	7.69672-7	1.75386-6	3.71293-6	
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df315	3.70370-3	4.37060-3	4.52500-3	4.57410-3	
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm315	5.701+10				
f325:n	298.958	457.2	0.0	0.0	
de325	2.07002-7	7.69672-7	1.75386-6	3.71293-6	
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3

	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
df325	1.11070+1	1.35661+1			
		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm325	5.701+10				
f335:n	298.958	609.6	0.0	0.0	
de335		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
df335	1.11070+1	1.35661+1			
		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm335	5.701+10				
f345:n	298.958	762.0	0.0	0.0	
de345		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
df345	1.11070+1	1.35661+1			
		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2

	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm345	5.701+10				
f355:n	298.958	914.4	0.0	0.0	
de355		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df355		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm355	5.701+10				
f365:n	298.958	1066.8	0.0	0.0	
de365		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df365		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm365	5.701+10				
f205:p	298.958	-1524.0	0.0	0.0	
de205		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df205		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3

```

1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm205 5.701+10
sdef pos=-37.0693 0 118.288 dir=d1 erg=fdir=d2
vec=0.821149209 0.0 0.570713568
si1 s 11 12 13 14 15 16
sp1 1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
si11 h -1.0 -0.7071067
si12 h -0.7071067 0.0
si13 h 0.0 0.5
si14 h 0.5 0.8660254
si15 h 0.8660254 0.9961946
si16 h 0.9961946 1.0
sp11 0 1
sp12 0 1
sp13 0 1
sp14 0 1
sp15 0 1
sp16 0 1
ds2 s 21 22 23 24 25 26
si21 h 1.8245 1.9295
si22 h 1.9295 3.7645
si23 h 3.7645 5.675
si24 h 5.675 7.3865
si25 h 7.3865 8.321
si26 h 8.321 8.753
sp21 0 1
sp22 0 1
sp23 0 1
sp24 0 1
sp25 0 1
sp26 0 1
nps 2000000
prcjmp 2j 1
print

```

File for MCNP-4B calculation of photon dose rates along the truck lane of
the PFNA facility for the source in the maximum up position

message: outp=pfna19.o mctal=pfna19.m

```

mcnp file for PFNA facility -- dose rates at selected locations
c source in nominal maximum upward position (34.8 deg.) of the
c movable vertical collimator. check sdef, cells 3-6, surfaces
c 401 and 503-505, and the sign on surface 505.
c
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
   # (131 -164 +258 -297 +307 -321)
3 1 0.10549 -400 -401 +505 +224 -227 # (503 -504)
4 1 0.10549 -401 +400 +505 +225 -226 # (503 -504)
5 0 142 -127 +223 -228 +308 -304
   # (-400 -401 +505 +224 -227) # (+137 -102 +310)
   # (-401 +400 +505 +225 -226)
6 0 127 -124 +501 -502 +308 -304
   # (-401 +400 +505 +225 -226)
7 0 124 -126 +254 -255 +308 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
   # (+102 -127 +223 -228) # (+127 -124 +501 -502)
   # (+124 +254 -255) # (+129 -252) # (+129 +257)
9 1 0.10549 102 -124 +222 -229 +301 -304
   # (+129 -252) # (+129 +257)
   # (127 +501 -502) # (-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 # (218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 # (221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 # (221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 # (221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 # (221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 # (221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 # (221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 # (221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 # (221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 # (221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 # (221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 # (221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
   # (221 -230)
   # (103 -104 +217 -234)
   # (104 -105 +216 -235)
   # (105 -107 +219 -232)
   # (107 -108 +219 -220) # (107 -108 +231 -232)
   # (106 -109 +212 -218) # (106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
   # (221 -230)
   # (109 -110 +211 -237)
   # (110 -111 +210 -238)
   # (111 -112 +209 -239)
   # (112 -113 +208 -240)
   # (113 -114 +207 -241)
   # (114 -115 +206 -242)
   # (115 -116 +205 -243)
   # (116 -117 +204 -244)
   # (117 -118 +203 -245)
   # (118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
   # (-124 +214 -247) # (124 +253 -256)
   # (122 +248) # (122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
   # (221 -230) # (104 -220) # (104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 # (105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 # (105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
   # (103 -120 202 -221 302 -303)
   # (120 -123 215 -221 302 -303)
   # (121 -214)

```


29	4	5.977931-2	102 -124 +229 -250 +301 -304
			#(103 -120 230 -249 302 -303)
			#(120 -123 230 -246 302 -303)
			#(121 +247)
30	4	5.977931-2	124 -126 +252 -254 +301 -304
			#(-125 +213 -253)
31	4	5.977931-2	124 -126 +255 -257 +301 -304
			#(-125 +256 -248)
32	0		+167 -168 +274 -281 +317 -318
33	0		+165 -166 +270 -285 +308 -310
			#(+167 -168 +274 -281 +317 -318)
34	0		-400 +505 +224 -227 +503 -504
35	0		-401 +400 +505 +225 -226 +503 -504
36	4	5.977931-2	122 -124 +201 -250 +301 -304
			#(213 -248)
			#(129 -252)
			#(129 +257)
37	9	-2.0	+131 -164 +258 -297 +307 -308
38	11	-1.0	+131 -164 +258 -297 +308 -320
			#(+132 -163 +259 -296)
39	12	-7.86	+131 -164 +258 -297 +320 -321
40	0		+132 -163 +259 -296 +319 -320
			#(+151 -169 +271 -284 +304 -315)
			#(+151 -160 +270 -271 +312 -314)
			#(+151 -160 +284 -285 +312 -314)
			#(+157 -159 +274 -281 +313 -315)
			#(+158 -160 +274 -281 -313)
			#(+169 -157 +274 -281 +314 -316)
41	1	0.10549	+151 -169 +271 -284 +304 -315
42	1	0.10549	+151 -160 +270 -271 +312 -314
43	1	0.10549	+151 -160 +284 -285 +312 -314
44	1	0.10549	+157 -159 +274 -281 +313 -315
45	1	0.10549	+158 -160 +274 -281 +308 -313
46	1	0.10549	+169 -157 +274 -281 +314 -316
47	9	-2.0	+160 -162 +273 -282 +308 -319
48	10	-2.0	+154 -161 +265 -289 +308 -319
			#47 #(-160 +267 -286)
49	0		+154 -160 +267 -286 +308 -319 #42 #43 #45
50	10	-2.0	+155 -156 +259 -260 +308 -319
51	10	-2.0	+155 -156 +295 -296 +308 -319
52	10	-2.0	+154 -155 +259 -296 +308 -319
			#(+265 -289)
53	0		+155 -163 +259 -296 +308 -319 #50 #51
			#(-161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0	+153 -154 +295 -296 +308 -319
55	10	-2.0	+151 -126 +295 -296 +308 -319
56	10	-2.0	+151 -126 +259 -260 +308 -319
57	10	-2.0	+153 -154 +259 -260 +308 -319
58	10	-2.0	+151 -152 +266 -272 +308 -304
59	10	-2.0	+151 -152 +283 -287 +308 -304
60	0		+151 -154 +259 -296 +308 -319
			#41 #42 #43 #54 #55 #56 #57 #58 #59
			#(+165 -166 +270 -285 +308 -310)
			#(-126 +201 -250 -304)
61	1	0.10549	+149 -151 +272 -201 +308 -304
62	1	0.10549	+149 -151 +250 -283 +308 -304
63	9	-2.0	+149 -151 +264 -290 +308 -319
			#(+272 -283)
64	10	-2.0	+149 -151 +259 -296 +308 -319
			#(+264 -290)
65	10	-2.0	+146 -149 +295 -296 +308 -319
66	0		+132 -149 +259 -296 +308 -319
			#65 #(+133 -294)
67	10	-2.0	+133 -149 +259 -294 +308 -319
			#(+142 -260 -322) #(+134 +260 -298)
68	10	-2.0	+135 -149 +261 -262 +308 -319
69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311
			#(-138 -290 -310) #(-102 +310)
			#(+138 +269 -290 -310) #(+144 +290 -292 -310)
			#(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71	1	0.10549	+137 -138 +268 -290 +308 -310

72	1	0.10549	+138	-149	+269	-272	+308	-310	
73	1	0.10549	+138	-149	+288	-290	+308	-310	#+(+140 -141)
74	0		+140	-141	+288	-290	+308	-310	
75	1	0.10549	+144	-149	+290	-292	+308	-310	
76	1	0.10549	+139	-144	+291	-293	+308	-310	
77	2	0.1187956	+137	-102	+268	-293	+310	-311	
78	0		+138	-149	+272	-288	+308	-310	
									#+(+102 +201 -250 +309 -304)
									#+(+143 -102 +275 -276 +301)
									#+(+143 -102 +279 -280 +301)
									#+(+147 -102 +276 -277 +301)
									#+(+147 -102 +278 -279 +301)
									#+(+142 +223 -228) #(+145 +201 -250 -309)
79	1	0.10549	+143	-102	+275	-276	+301	-310	
80	1	0.10549	+143	-102	+279	-280	+301	-310	
81	1	0.10549	+147	-102	+276	-277	+301	-310	
82	1	0.10549	+147	-102	+278	-279	+301	-310	
83	0		+142	-149	+259	-260	+308	-322	
84	0		+134	-149	+260	-298	+308	-319	
									#68 #69 #(+137 -149 +268 -293 +308 -311)
									#+(+102 +201 -250 -304) #(+142 +223 -228 -304)
85	9	-2.0	+145	-126	+201	-250	+308	-309	
									#+(+145 -127 +223 -228) #(+127 -124 +501 -502)
									#+(+129 -252) #(+129 +257) #(+124 +254 -255)
86	0		+129	-126	+201	-250	+308	-304	
									#+(+252 -257)
87	0		+102	-126	+201	-250	+309	-306	
									#+(+102 -127 +223 -228) #(+127 -124 +501 -502)
									#+(+129 -252) #(+129 +257) #(+124 +254 -255)
88	0		+149	-151	+272	-283	+304	-319	

c end cells

c

c

surfaces

100	px	-1000.0
c	101	px 10.3124
102	px	20.7264
103	px	22.6314
104	px	27.7114
105	px	28.9814
106	px	31.5214
107	px	36.6014
108	px	42.9514
109	px	49.3014
110	px	51.8414
111	px	54.3814
112	px	56.9214
113	px	59.4614
114	px	62.0014
115	px	64.5414
116	px	67.0814
117	px	69.6214
118	px	72.1614
119	px	74.7014
120	px	76.3016
121	px	78.2066
122	px	86.0806
123	px	112.649
124	px	114.554
125	px	119.888
126	px	121.158
127	px	50.5714
128	px	1200.0
129	px	87.9856
131	px	-844.042
132	px	-823.722
133	px	-767.842
134	px	-706.882
135	px	-548.962
136	px	-493.522
137	px	-381.762
138	px	-320.802

139	px	-315.722
140	px	-173.482
141	px	-107.442
142	px	-82.042
143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058
239	py	39.4758
240	py	40.7458

241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258
245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225
312	pz	283.845
313	pz	342.265

```

314 pz 375.285
315 pz 390.525
316 pz 395.605
317 pz -50.0
318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y -28.60131 124.1738 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p -0.60029580 0.0 1.0 137.6099
504 p -0.79896920 0.0 1.0 151.1223
505 p 1.43881100 0.0 1.0 83.0219

c end surfaces
mode n p
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044

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26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]
m11 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt11 lwtr.01t
c m12=iron at 7.86 g/cc
m12 26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
26058.60c 0.0028
c m13=Heavy concrete at 4.2 g/cc [wt %]
m13 1001.60c -0.0005 8016.60c -0.18
12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
26054.60c -4.073938-2 26056.60c -0.6625828
26057.60c -1.558362-2 26058.60c -2.094288-3
mt13 lwtr.01t
f105:n 298.958 -1524.0 0.0 0.0
de105 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df105 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
5.701+10
fm105 298.958 -1524.0 0.0 0.0
f205:p 1.50000-2 3.25000-2 5.75000-2 8.50000-2
de205 1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df205 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
5.701+10
fm205 298.958 -1371.6 0.0 0.0
f215:p 1.50000-2 3.25000-2 5.75000-2 8.50000-2
de215 1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df215 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
5.701+10
fm215

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f225:p	298.958	-1219.2	0.0	0.0				
de225		1.50000-2	3.25000-2	5.75000-2	8.50000-2			
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1			
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0			
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0			
	7.25000+0	7.75000+0	9.00000+0	1.20000+1				
df225		2.14390-3	5.77600-4	2.71850-4	2.68170-4			
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3			
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3			
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3			
	7.47830-3	7.84680-3	8.77160-3	1.10200-2				
fm225	5.701+10							
f235:p	298.958	-1066.8	0.0	0.0				
de235		1.50000-2	3.25000-2	5.75000-2	8.50000-2			
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1			
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0			
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0			
	7.25000+0	7.75000+0	9.00000+0	1.20000+1				
df235		2.14390-3	5.77600-4	2.71850-4	2.68170-4			
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3			
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3			
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3			
	7.47830-3	7.84680-3	8.77160-3	1.10200-2				
fm235	5.701+10							
f245:p	298.958	-914.4	0.0	0.0				
de245		1.50000-2	3.25000-2	5.75000-2	8.50000-2			
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1			
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0			
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0			
	7.25000+0	7.75000+0	9.00000+0	1.20000+1				
df245		2.14390-3	5.77600-4	2.71850-4	2.68170-4			
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3			
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3			
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3			
	7.47830-3	7.84680-3	8.77160-3	1.10200-2				
fm245	5.701+10							
f255:p	298.958	-762.0	0.0	0.0				
de255		1.50000-2	3.25000-2	5.75000-2	8.50000-2			
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1			
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0			
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0			
	7.25000+0	7.75000+0	9.00000+0	1.20000+1				
df255		2.14390-3	5.77600-4	2.71850-4	2.68170-4			
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3			
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3			
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3			
	7.47830-3	7.84680-3	8.77160-3	1.10200-2				
fm255	5.701+10							
f265:p	298.958	-609.6	0.0	0.0				
de265		1.50000-2	3.25000-2	5.75000-2	8.50000-2			
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1			
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0			
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0			
	7.25000+0	7.75000+0	9.00000+0	1.20000+1				
df265		2.14390-3	5.77600-4	2.71850-4	2.68170-4			
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3			
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3			
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3			
	7.47830-3	7.84680-3	8.77160-3	1.10200-2				
fm265	5.701+10							
f275:p	298.958	-457.2	0.0	0.0				
de275		1.50000-2	3.25000-2	5.75000-2	8.50000-2			
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1			
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0			
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0			
	7.25000+0	7.75000+0	9.00000+0	1.20000+1				
df275		2.14390-3	5.77600-4	2.71850-4	2.68170-4			
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3			
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3			
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3			
	7.47830-3	7.84680-3	8.77160-3	1.10200-2				
fm275	5.701+10							

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f285:p      298.958  -304.8  0.0  0.0
de285      1.50000-2  3.25000-2  5.75000-2  8.50000-2
          1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
          6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
          2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
          7.25000+0  7.75000+0  9.00000+0  1.20000+1
df285      2.14390-3  5.77600-4  2.71850-4  2.68170-4
          3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
          1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
          3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
          7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm285      5.701+10
f295:p      298.958  -152.4  0.0  0.0
de295      1.50000-2  3.25000-2  5.75000-2  8.50000-2
          1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
          6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
          2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
          7.25000+0  7.75000+0  9.00000+0  1.20000+1
df295      2.14390-3  5.77600-4  2.71850-4  2.68170-4
          3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
          1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
          3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
          7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm295      5.701+10
f405:p      298.958   152.4  0.0  0.0
de405      1.50000-2  3.25000-2  5.75000-2  8.50000-2
          1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
          6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
          2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
          7.25000+0  7.75000+0  9.00000+0  1.20000+1
df405      2.14390-3  5.77600-4  2.71850-4  2.68170-4
          3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
          1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
          3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
          7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm405      5.701+10
f415:p      298.958   304.8  0.0  0.0
de415      1.50000-2  3.25000-2  5.75000-2  8.50000-2
          1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
          6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
          2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
          7.25000+0  7.75000+0  9.00000+0  1.20000+1
df415      2.14390-3  5.77600-4  2.71850-4  2.68170-4
          3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
          1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
          3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
          7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm415      5.701+10
f425:p      298.958   457.2  0.0  0.0
de425      1.50000-2  3.25000-2  5.75000-2  8.50000-2
          1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
          6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
          2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
          7.25000+0  7.75000+0  9.00000+0  1.20000+1
df425      2.14390-3  5.77600-4  2.71850-4  2.68170-4
          3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
          1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
          3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
          7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm425      5.701+10
f435:p      298.958   609.6  0.0  0.0
de435      1.50000-2  3.25000-2  5.75000-2  8.50000-2
          1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
          6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
          2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
          7.25000+0  7.75000+0  9.00000+0  1.20000+1
df435      2.14390-3  5.77600-4  2.71850-4  2.68170-4
          3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
          1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
          3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
          7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm435      5.701+10

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f445:p      298.958  762.0  0.0  0.0
de445      1.50000-2  3.25000-2  5.75000-2  8.50000-2
          1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
          6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
          2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
          7.25000+0  7.75000+0  9.00000+0  1.20000+1
df445      2.14390-3  5.77600-4  2.71850-4  2.68170-4
          3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
          1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
          3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
          7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm445      5.701+10
f455:p      298.958  914.4  0.0  0.0
de455      1.50000-2  3.25000-2  5.75000-2  8.50000-2
          1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
          6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
          2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
          7.25000+0  7.75000+0  9.00000+0  1.20000+1
df455      2.14390-3  5.77600-4  2.71850-4  2.68170-4
          3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
          1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
          3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
          7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm455      5.701+10
f465:p      298.958  1066.8  0.0  0.0
de465      1.50000-2  3.25000-2  5.75000-2  8.50000-2
          1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
          6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
          2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
          7.25000+0  7.75000+0  9.00000+0  1.20000+1
df465      2.14390-3  5.77600-4  2.71850-4  2.68170-4
          3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
          1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
          3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
          7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm465      5.701+10
sdef       pos=-37.0693  0  118.288  dir=d1  erg=fdir=d2
          vec=0.821149209  0.0  0.570713568
sil        s  11  12  13  14  15  16
sp1        h  1.17+10  8.60+9  1.21+10  8.82+9  1.47+10  1.09+9
sil1       h  -1.0  -0.7071067
sil2       h  -0.7071067  0.0
sil3       h  0.0  0.5
sil4       h  0.5  0.8660254
sil5       h  0.8660254  0.9961946
sil6       h  0.9961946  1.0
sp11       0  1
sp12       0  1
sp13       0  1
sp14       0  1
sp15       0  1
sp16       0  1
ds2        s  21  22  23  24  25  26
si21       h  1.8245  1.9295
si22       h  1.9295  3.7645
si23       h  3.7645  5.675
si24       h  5.675  7.3865
si25       h  7.3865  8.321
si26       h  8.321  8.753
sp21       0  1
sp22       0  1
sp23       0  1
sp24       0  1
sp25       0  1
sp26       0  1
nps        2000000
prcimp     2j  1
print

```

File for MCNP-4B calculation of neutron dose rates along the truck lane of
the PFNA facility for the source in the maximum down position

message: outp=pfna20.o mctal=pfna20.m

```
mcnp file for PFNA facility -- dose rates at selected locations
c source in nominal minimum downward position (-8.6 deg.) of the
c movable vertical collimator. check sdef, cells 3-6, surfaces
c 401 and 503-505, and the sign on surface 505.
c
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
#(131 -164 +258 -297 +307 -321)
3 1 0.10549 -400 -401 -505 +224 -227 #(503 -504)
4 1 0.10549 -401 +400 -505 +225 -226 #(503 -504)
5 0 142 -127 +223 -228 +308 -304
#(-400 -401 -505 +224 -227) #(+137 -102 +310)
#(-401 +400 -505 +225 -226)
6 0 127 -124 +501 -502 +308 -304
#(-401 +400 -505 +225 -226)
7 0 124 -126 +254 -255 +308 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
#(+102 -127 +223 -228) #(+127 -124 +501 -502)
#(+124 +254 -255) #(+129 -252) #(+129 +257)
9 1 0.10549 102 -124 +222 -229 +301 -304
#(+129 -252) #(+129 +257)
#(127 +501 -502) #(-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
#(221 -230)
#(103 -104 +217 -234)
#(104 -105 +216 -235)
#(105 -107 +219 -232)
#(107 -108 +219 -220) #(107 -108 +231 -232)
#(106 -109 +212 -218) #(106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
#(221 -230)
#(109 -110 +211 -237)
#(110 -111 +210 -238)
#(111 -112 +209 -239)
#(112 -113 +208 -240)
#(113 -114 +207 -241)
#(114 -115 +206 -242)
#(115 -116 +205 -243)
#(116 -117 +204 -244)
#(117 -118 +203 -245)
#(118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
#(-124 +214 -247) #(124 +253 -256)
#(122 +248) #(122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
#(221 -230) #(104 -220) #(104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
#(103 -120 202 -221 302 -303)
#(120 -123 215 -221 302 -303)
#(121 -214)
```

29	4	5.977931-2	102 -124 +229 -250 +301 -304 #(103 -120 230 -249 302 -303) #(120 -123 230 -246 302 -303) #(121 +247)
30	4	5.977931-2	124 -126 +252 -254 +301 -304 #(-125 +213 -253)
31	4	5.977931-2	124 -126 +255 -257 +301 -304 #(-125 +256 -248)
32	0		+167 -168 +274 -281 +317 -318
33	0		+165 -166 +270 -285 +308 -310 #(+167 -168 +274 -281 +317 -318)
34	0		-400 -505 +224 -227 +503 -504
35	0		-401 +400 -505 +225 -226 +503 -504
36	4	5.977931-2	122 -124 +201 -250 +301 -304 #(213 -248) #(129 -252) #(129 +257)
37	9	-2.0	+131 -164 +258 -297 +307 -308
38	11	-1.0	+131 -164 +258 -297 +308 -320 #(+132 -163 +259 -296)
39	12	-7.86	+131 -164 +258 -297 +320 -321
40	0		+132 -163 +259 -296 +319 -320 #(+151 -169 +271 -284 +304 -315) #(+151 -160 +270 -271 +312 -314) #(+151 -160 +284 -285 +312 -314) #(+157 -159 +274 -281 +313 -315) #(+158 -160 +274 -281 -313) #(+169 -157 +274 -281 +314 -316)
41	1	0.10549	+151 -169 +271 -284 +304 -315
42	1	0.10549	+151 -160 +270 -271 +312 -314
43	1	0.10549	+151 -160 +284 -285 +312 -314
44	1	0.10549	+157 -159 +274 -281 +313 -315
45	1	0.10549	+158 -160 +274 -281 +308 -313
46	1	0.10549	+169 -157 +274 -281 +314 -316
47	9	-2.0	+160 -162 +273 -282 +308 -319
48	10	-2.0	+154 -161 +265 -289 +308 -319 #47 #(-160 +267 -286)
49	0		+154 -160 +267 -286 +308 -319 #42 #43 #45
50	10	-2.0	+155 -156 +259 -260 +308 -319
51	10	-2.0	+155 -156 +295 -296 +308 -319
52	10	-2.0	+154 -155 +259 -296 +308 -319 #(+265 -289)
53	0		+155 -163 +259 -296 +308 -319 #50 #51 #(-161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0	+153 -154 +295 -296 +308 -319
55	10	-2.0	+151 -126 +295 -296 +308 -319
56	10	-2.0	+151 -126 +259 -260 +308 -319
57	10	-2.0	+153 -154 +259 -260 +308 -319
58	10	-2.0	+151 -152 +266 -272 +308 -304
59	10	-2.0	+151 -152 +283 -287 +308 -304
60	0		+151 -154 +259 -296 +308 -319 #41 #42 #43 #54 #55 #56 #57 #58 #59 #(+165 -166 +270 -285 +308 -310) #(-126 +201 -250 -304)
61	1	0.10549	+149 -151 +272 -201 +308 -304
62	1	0.10549	+149 -151 +250 -283 +308 -304
63	9	-2.0	+149 -151 +264 -290 +308 -319 #(+272 -283)
64	10	-2.0	+149 -151 +259 -296 +308 -319 #(+264 -290)
65	10	-2.0	+146 -149 +295 -296 +308 -319
66	0		+132 -149 +259 -296 +308 -319 #65 #(+133 -294)
67	10	-2.0	+133 -149 +259 -294 +308 -319 #(+142 -260 -322) #(+134 +260 -298)
68	10	-2.0	+135 -149 +261 -262 +308 -319
69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311 #(-138 -290 -310) #(-102 +310) #(+138 +269 -290 -310) #(+144 +290 -292 -310) #(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71	1	0.10549	+137 -138 +268 -290 +308 -310

72	1	0.10549	+138	-149	+269	-272	+308	-310		
73	1	0.10549	+138	-149	+288	-290	+308	-310	#+(+140 -141)	
74	0		+140	-141	+288	-290	+308	-310		
75	1	0.10549	+144	-149	+290	-292	+308	-310		
76	1	0.10549	+139	-144	+291	-293	+308	-310		
77	2	0.1187956	+137	-102	+268	-293	+310	-311		
78	0		+138	-149	+272	-288	+308	-310		
			#(+102 +201 -250 +309 -304)							
			#(+143 -102 +275 -276 +301)							
			#(+143 -102 +279 -280 +301)							
			#(+147 -102 +276 -277 +301)							
			#(+147 -102 +278 -279 +301)							
			#(+142 +223 -228) #(+145 +201 -250 -309)							
79	1	0.10549	+143	-102	+275	-276	+301	-310		
80	1	0.10549	+143	-102	+279	-280	+301	-310		
81	1	0.10549	+147	-102	+276	-277	+301	-310		
82	1	0.10549	+147	-102	+278	-279	+301	-310		
83	0		+142	-149	+259	-260	+308	-322		
84	0		+134	-149	+260	-298	+308	-319		
			#68 #69 #(+137 -149 +268 -293 +308 -311)							
			#(+102 +201 -250 -304) #(+142 +223 -228 -304)							
85	9	-2.0	+145	-126	+201	-250	+308	-309		
			#(+145 -127 +223 -228) #(+127 -124 +501 -502)							
			#(+129 -252) #(+129 +257) #(+124 +254 -255)							
86	0		+129	-126	+201	-250	+308	-304		
			#(+252 -257)							
87	0		+102	-126	+201	-250	+309	-306		
			#(+102 -127 +223 -228) #(+127 -124 +501 -502)							
			#(+129 -252) #(+129 +257) #(+124 +254 -255)							
88	0		+149	-151	+272	-283	+304	-319		

c end cells

c

c surfaces

100	px	-1000.0
c	101	px 10.3124
102	px	20.7264
103	px	22.6314
104	px	27.7114
105	px	28.9814
106	px	31.5214
107	px	36.6014
108	px	42.9514
109	px	49.3014
110	px	51.8414
111	px	54.3814
112	px	56.9214
113	px	59.4614
114	px	62.0014
115	px	64.5414
116	px	67.0814
117	px	69.6214
118	px	72.1614
119	px	74.7014
120	px	76.3016
121	px	78.2066
122	px	86.0806
123	px	112.649
124	px	114.554
125	px	119.888
126	px	121.158
127	px	50.5714
128	px	1200.0
129	px	87.9856
131	px	-844.042
132	px	-823.722
133	px	-767.842
134	px	-706.882
135	px	-548.962
136	px	-493.522
137	px	-381.762
138	px	-320.802

139	px	-315.722
140	px	-173.482
141	px	-107.442
142	px	-82.042
143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058
239	py	39.4758
240	py	40.7458

241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258
245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225
312	pz	283.845
313	pz	342.265

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314 pz 375.285
315 pz 390.525
316 pz 395.605
317 pz -50.0
318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y 7.866053 -32.53536 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p 0.22029930 0.0 1.0 -34.07997
504 p 0.08355454 0.0 1.0 -28.66622
505 p -6.61219100 0.0 1.0 -84.54721

c end surfaces
mode n p
imp:n.p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-4
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044

```

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26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]
m11 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt11 lwtr.01t
c m12=iron at 7.86 g/cc
m12 26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
26058.60c 0.0028
c m13=Heavy concrete at 4.2 g/cc [wt %]
m13 1001.60c -0.0005 8016.60c -0.18
12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
26054.60c -4.073938-2 26056.60c -0.6625828
26057.60c -1.558362-2 26058.60c -2.094288-3
mt13 lwtr.01t
fm105:n 298.958 -1524.0 0.0 0.0
del105 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df105 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
5.701+10
fm105 298.958 -1371.6 0.0 0.0
f115:n del115 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df115 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1

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	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
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	1.63200-1	2.00340-1			
fm115	5.701+10				
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	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df125		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm125	5.701+10				
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	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df135		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm135	5.701+10				
f145:n	298.958	-914.4	0.0	0.0	
del145		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0

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4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
df145 1.11070+1 1.35661+1
      3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm145 5.701+10
f155:n 298.958 -762.0 0.0 0.0
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      7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
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2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
df155 1.11070+1 1.35661+1
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4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm155 5.701+10
f165:n 298.958 -609.6 0.0 0.0
del165 2.07002-7 7.69672-7 1.75386-6 3.71293-6
      7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
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2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
df165 1.11070+1 1.35661+1
      3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
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fm165 5.701+10

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2.21191-4  3.64682-4  6.01258-4  9.91309-4  1.63439-3
2.14167-3  2.43063-3  2.82399-3  3.37141-3  4.61914-3
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2.65293-2  2.77506-2  3.14039-2  4.33909-2  5.45187-2
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2.48472-1  2.83877-1  2.95864-1  2.97851-1  3.00232-1
3.44858-1  4.42806-1  5.10634-1  5.65749-1  6.75418-1
8.24957-1  1.00760+0  1.23069+0  1.50317+0  1.83598+0
2.12513+0  2.28850+0  2.40583+0  2.73896+0  3.34537+0
4.08604+0  4.99070+0  6.09565+0  7.44525+0  9.09365+0
1.11070+1  1.35661+1
df175      3.70370-3  4.37060-3  4.52500-3  4.57410-3
4.55830-3  4.48970-3  4.38170-3  4.24920-3  4.12890-3
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3.65280-3  3.63870-3  3.62290-3  3.60620-3  3.58250-3
3.55850-3  4.08750-3  5.89750-3  7.13870-3  7.42410-3
7.67700-3  7.95180-3  8.74210-3  1.11490-2  1.35030-2
1.65080-2  2.25270-2  2.86610-2  3.43150-2  4.10860-2
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6.59980-2  8.26560-2  9.04890-2  9.54810-2  1.05360-1
1.17860-1  1.29670-1  1.30100-1  1.28650-1  1.27220-1
1.26160-1  1.25620-1  1.25270-1  1.28500-1  1.36960-1
1.45980-1  1.54120-1  1.51160-1  1.47220-1  1.47060-1
1.63200-1  2.00340-1
fm175      5.701+10
f185:n     298.958  -304.8  0.0  0.0
de185      2.07002-7  7.69672-7  1.75386-6  3.71293-6
7.86024-6  1.66401-5  3.52273-5  7.45761-5  1.34159-4
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2.14167-3  2.43063-3  2.82399-3  3.37141-3  4.61914-3
7.32483-3  1.20766-2  1.93065-2  2.41830-2  2.54229-2
2.65293-2  2.77506-2  3.14039-2  4.33909-2  5.45187-2
7.15396-2  1.04645-1  1.36365-1  1.66556-1  2.03432-1
2.48472-1  2.83877-1  2.95864-1  2.97851-1  3.00232-1
3.44858-1  4.42806-1  5.10634-1  5.65749-1  6.75418-1
8.24957-1  1.00760+0  1.23069+0  1.50317+0  1.83598+0
2.12513+0  2.28850+0  2.40583+0  2.73896+0  3.34537+0
4.08604+0  4.99070+0  6.09565+0  7.44525+0  9.09365+0
1.11070+1  1.35661+1
df185      3.70370-3  4.37060-3  4.52500-3  4.57410-3
4.55830-3  4.48970-3  4.38170-3  4.24920-3  4.12890-3
4.03110-3  3.93550-3  3.84530-3  3.76290-3  3.69080-3
3.65280-3  3.63870-3  3.62290-3  3.60620-3  3.58250-3
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6.59980-2  8.26560-2  9.04890-2  9.54810-2  1.05360-1
1.17860-1  1.29670-1  1.30100-1  1.28650-1  1.27220-1
1.26160-1  1.25620-1  1.25270-1  1.28500-1  1.36960-1
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1.63200-1  2.00340-1
fm185      5.701+10
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7.86024-6  1.66401-5  3.52273-5  7.45761-5  1.34159-4
2.21191-4  3.64682-4  6.01258-4  9.91309-4  1.63439-3
2.14167-3  2.43063-3  2.82399-3  3.37141-3  4.61914-3
7.32483-3  1.20766-2  1.93065-2  2.41830-2  2.54229-2
2.65293-2  2.77506-2  3.14039-2  4.33909-2  5.45187-2
7.15396-2  1.04645-1  1.36365-1  1.66556-1  2.03432-1
2.48472-1  2.83877-1  2.95864-1  2.97851-1  3.00232-1
3.44858-1  4.42806-1  5.10634-1  5.65749-1  6.75418-1
8.24957-1  1.00760+0  1.23069+0  1.50317+0  1.83598+0
2.12513+0  2.28850+0  2.40583+0  2.73896+0  3.34537+0
4.08604+0  4.99070+0  6.09565+0  7.44525+0  9.09365+0
1.11070+1  1.35661+1
df195      3.70370-3  4.37060-3  4.52500-3  4.57410-3
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	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm195	5.701+10				
f305:n	298.958	152.4	0.0	0.0	
de305		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df305		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm305	5.701+10				
f315:n	298.958	304.8	0.0	0.0	
de315		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df315		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm315	5.701+10				
f325:n	298.958	457.2	0.0	0.0	
de325		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3

	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df325		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm325		5.701+10			
f335:n	298.958	609.6	0.0	0.0	
de335		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df335		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm335		5.701+10			
f345:n	298.958	762.0	0.0	0.0	
de345		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df345		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2

	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm345	5.701+10				
f355:n	298.958	914.4	0.0	0.0	
de355	2.07002-7	7.69672-7	1.75386-6	3.71293-6	
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df355	3.70370-3	4.37060-3	4.52500-3	4.57410-3	
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm355	5.701+10				
f365:n	298.958	1066.8	0.0	0.0	
de365	2.07002-7	7.69672-7	1.75386-6	3.71293-6	
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df365	3.70370-3	4.37060-3	4.52500-3	4.57410-3	
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm365	5.701+10				
f205:p	298.958	-1524.0	0.0	0.0	
de205	1.50000-2	3.25000-2	5.75000-2	8.50000-2	
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df205	2.14390-3	5.77600-4	2.71850-4	2.68170-4	
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3

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1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm205 5.701+10
sdef pos=-2.3304 0 -30.993 dir=d1 erg=fdir=d2
vec=0.988756381 0.0 -0.149535343
si1 s 11 12 13 14 15 16
sp1 1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
si11 h -1.0 -0.7071067
si12 h -0.7071067 0.0
si13 h 0.0 0.5
si14 h 0.5 0.8660254
si15 h 0.8660254 0.9961946
si16 h 0.9961946 1.0
sp11 0 1
sp12 0 1
sp13 0 1
sp14 0 1
sp15 0 1
sp16 0 1
ds2 s 21 22 23 24 25 26
si21 h 1.8245 1.9295
si22 h 1.9295 3.7645
si23 h 3.7645 5.675
si24 h 5.675 7.3865
si25 h 7.3865 8.321
si26 h 8.321 8.753
sp21 0 1
sp22 0 1
sp23 0 1
sp24 0 1
sp25 0 1
sp26 0 1
nps 2000000
prtmp 2j 1
print

```

File for MCNP-4B calculation of photon dose rates along the truck lane of
the PFNA facility for the source in the maximum down position

message: outp=pfna21.o mctal=pfna21.m

```

mcnp file for PFNA facility -- dose rates at selected locations
c   source in nominal minimum downward position (-8.6 deg.) of the
c   movable vertical collimator.  check sdef, cells 3-6, surfaces
c   401 and 503-505, and the sign on surface 505.
c
1   0           -100:128:-200:251:-300:305
2   0           100 -128 200 -251 300 -305
           #(131 -164 +258 -297 +307 -321)
3   1 0.10549   -400 -401 -505 +224 -227 #(503 -504)
4   1 0.10549   -401 +400 -505 +225 -226 #(503 -504)
5   0           142 -127 +223 -228 +308 -304
           #(-400 -401 -505 +224 -227) #(+137 -102 +310)
           #(-401 +400 -505 +225 -226)
6   0           127 -124 +501 -502 +308 -304
           #(-401 +400 -505 +225 -226)
7   0           124 -126 +254 -255 +308 -304
8   5 8.734441-2 102 -126 +201 -250 +306 -301
           #(+102 -127 +223 -228) #(+127 -124 +501 -502)
           #(+124 +254 -255) #(+129 -252) #(+129 +257)
9   1 0.10549   102 -124 +222 -229 +301 -304
           #(+129 -252) #(+129 +257)
           #(+127 +501 -502) #(-127 +223 -228)
10  1 0.10549   106 -109 +212 -236 +302 -303 #(218 -233)
11  1 0.10549   109 -110 +211 -237 +302 -303 #(221 -230)
12  1 0.10549   110 -111 +210 -238 +302 -303 #(221 -230)
13  1 0.10549   111 -112 +209 -239 +302 -303 #(221 -230)
14  1 0.10549   112 -113 +208 -240 +302 -303 #(221 -230)
15  1 0.10549   113 -114 +207 -241 +302 -303 #(221 -230)
16  1 0.10549   114 -115 +206 -242 +302 -303 #(221 -230)
17  1 0.10549   115 -116 +205 -243 +302 -303 #(221 -230)
18  1 0.10549   116 -117 +204 -244 +302 -303 #(221 -230)
19  1 0.10549   117 -118 +203 -245 +302 -303 #(221 -230)
20  1 0.10549   118 -119 +202 -249 +302 -303 #(221 -230)
21  2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22  2 0.1187956 103 -109 +202 -249 +302 -303
           #(221 -230)
           #(103 -104 +217 -234)
           #(104 -105 +216 -235)
           #(105 -107 +219 -232)
           #(107 -108 +219 -220) #(107 -108 +231 -232)
           #(106 -109 +212 -218) #(106 -109 +233 -236)
23  2 0.1187956 109 -120 +202 -249 +302 -303
           #(221 -230)
           #(109 -110 +211 -237)
           #(110 -111 +210 -238)
           #(111 -112 +209 -239)
           #(112 -113 +208 -240)
           #(113 -114 +207 -241)
           #(114 -115 +206 -242)
           #(115 -116 +205 -243)
           #(116 -117 +204 -244)
           #(117 -118 +203 -245)
           #(118 -119)
24  3 3.284-2   121 -125 +201 -250 +301 -304
           #(-124 +214 -247) #(124 +253 -256)
           #(122 +248) #(122 -213)
25  3 3.284-2   103 -107 +217 -234 +302 -303
           #(221 -230) #(104 -220) #(104 +231)
26  4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27  4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28  4 5.977931-2 102 -124 +201 -222 +301 -304
           #(103 -120 202 -221 302 -303)
           #(120 -123 215 -221 302 -303)
           #(121 -214)

```


29	4	5.977931-2	102 -124 +229 -250 +301 -304 #(103 -120 230 -249 302 -303) #(120 -123 230 -246 302 -303) #(121 +247)
30	4	5.977931-2	124 -126 +252 -254 +301 -304 #(-125 +213 -253)
31	4	5.977931-2	124 -126 +255 -257 +301 -304 #(-125 +256 -248)
32	0		+167 -168 +274 -281 +317 -318
33	0		+165 -166 +270 -285 +308 -310 #(+167 -168 +274 -281 +317 -318)
34	0		-400 -505 +224 -227 +503 -504
35	0		-401 +400 -505 +225 -226 +503 -504
36	4	5.977931-2	122 -124 +201 -250 +301 -304 #(213 -248) #(129 -252) #(129 +257)
37	9	-2.0	+131 -164 +258 -297 +307 -308
38	11	-1.0	+131 -164 +258 -297 +308 -320 #(+132 -163 +259 -296)
39	12	-7.86	+131 -164 +258 -297 +320 -321
40	0		+132 -163 +259 -296 +319 -320 #(+151 -169 +271 -284 +304 -315) #(+151 -160 +270 -271 +312 -314) #(+151 -160 +284 -285 +312 -314) #(+157 -159 +274 -281 +313 -315) #(+158 -160 +274 -281 -313) #(+169 -157 +274 -281 +314 -316)
41	1	0.10549	+151 -169 +271 -284 +304 -315
42	1	0.10549	+151 -160 +270 -271 +312 -314
43	1	0.10549	+151 -160 +284 -285 +312 -314
44	1	0.10549	+157 -159 +274 -281 +313 -315
45	1	0.10549	+158 -160 +274 -281 +308 -313
46	1	0.10549	+169 -157 +274 -281 +314 -316
47	9	-2.0	+160 -162 +273 -282 +308 -319
48	10	-2.0	+154 -161 +265 -289 +308 -319 #47 #(-160 +267 -286)
49	0		+154 -160 +267 -286 +308 -319 #42 #43 #45
50	10	-2.0	+155 -156 +259 -260 +308 -319
51	10	-2.0	+155 -156 +295 -296 +308 -319
52	10	-2.0	+154 -155 +259 -296 +308 -319 #(+265 -289)
53	0		+155 -163 +259 -296 +308 -319 #50 #51 #(-161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0	+153 -154 +295 -296 +308 -319
55	10	-2.0	+151 -126 +295 -296 +308 -319
56	10	-2.0	+151 -126 +259 -260 +308 -319
57	10	-2.0	+153 -154 +259 -260 +308 -319
58	10	-2.0	+151 -152 +266 -272 +308 -304
59	10	-2.0	+151 -152 +283 -287 +308 -304
60	0		+151 -154 +259 -296 +308 -319 #41 #42 #43 #54 #55 #56 #57 #58 #59 #(+165 -166 +270 -285 +308 -310) #(-126 +201 -250 -304)
61	1	0.10549	+149 -151 +272 -201 +308 -304
62	1	0.10549	+149 -151 +250 -283 +308 -304
63	9	-2.0	+149 -151 +264 -290 +308 -319 #(+272 -283)
64	10	-2.0	+149 -151 +259 -296 +308 -319 #(+264 -290)
65	10	-2.0	+146 -149 +295 -296 +308 -319
66	0		+132 -149 +259 -296 +308 -319 #65 #(+133 -294)
67	10	-2.0	+133 -149 +259 -294 +308 -319 #(+142 -260 -322) #(+134 +260 -298)
68	10	-2.0	+135 -149 +261 -262 +308 -319
69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311 #(-138 -290 -310) #(-102 +310) #(+138 +269 -290 -310) #(+144 +290 -292 -310) #(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71	1	0.10549	+137 -138 +268 -290 +308 -310

```

72 1 0.10549 +138 -149 +269 -272 +308 -310
73 1 0.10549 +138 -149 +288 -290 +308 -310 #(+140 -141)
74 0 +140 -141 +288 -290 +308 -310
75 1 0.10549 +144 -149 +290 -292 +308 -310
76 1 0.10549 +139 -144 +291 -293 +308 -310
77 2 0.1187956 +137 -102 +268 -293 +310 -311
78 0 +138 -149 +272 -288 +308 -310
    #(+102 +201 -250 +309 -304)
    #(+143 -102 +275 -276 +301)
    #(+143 -102 +279 -280 +301)
    #(+147 -102 +276 -277 +301)
    #(+147 -102 +278 -279 +301)
    #(+142 +223 -228) #(+145 +201 -250 -309)
79 1 0.10549 +143 -102 +275 -276 +301 -310
80 1 0.10549 +143 -102 +279 -280 +301 -310
81 1 0.10549 +147 -102 +276 -277 +301 -310
82 1 0.10549 +147 -102 +278 -279 +301 -310
83 0 +142 -149 +259 -260 +308 -322
84 0 +134 -149 +260 -298 +308 -319
    #68 #69 #(+137 -149 +268 -293 +308 -311)
    #(+102 +201 -250 -304) #(+142 +223 -228 -304)
85 9 -2.0 . +145 -126 +201 -250 +308 -309
    #(+145 -127 +223 -228) #(+127 -124 +501 -502)
    #(+129 -252) #(+129 +257) #(+124 +254 -255)
86 0 +129 -126 +201 -250 +308 -304
    #(+252 -257)
87 0 +102 -126 +201 -250 +309 -306
    #(+102 -127 +223 -228) #(+127 -124 +501 -502)
    #(+129 -252) #(+129 +257) #(+124 +254 -255)
88 0 +149 -151 +272 -283 +304 -319

```

c end cells

c

c

surfaces

```

100 px -1000.0
c 101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 1200.0
129 px 87.9856
131 px -844.042
132 px -823.722
133 px -767.842
134 px -706.882
135 px -548.962
136 px -493.522
137 px -381.762
138 px -320.802

```

139	px	-315.722
140	px	-173.482
141	px	-107.442
142	px	-82.042
143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058
239	py	39.4758
240	py	40.7458

241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258
245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225
312	pz	283.845
313	pz	342.265

```

314 pz 375.285
315 pz 390.525
316 pz 395.605
317 pz -50.0
318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y 7.866053 -32.53536 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p 0.22029930 0.0 1.0 -34.07997
504 p 0.08355454 0.0 1.0 -28.66622
505 p -6.61219100 0.0 1.0 -84.54721

c end surfaces
mode n p
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044

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26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]
m11 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt11 lwtr.01t
c m12=iron at 7.86 g/cc
m12 26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
26058.60c 0.0028
c m13=Heavy concrete at 4.2 g/cc [wt %]
m13 1001.60c -0.0005 8016.60c -0.18
12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
26054.60c -4.073938-2 26056.60c -0.6625828
26057.60c -1.558362-2 26058.60c -2.094288-3
mt13 lwtr.01t
f105:n 298.958 -1524.0 0.0 0.0
de105 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df105 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm105 5.701+10
f205:p 298.958 -1524.0 0.0 0.0
de205 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df205 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm205 5.701+10
f215:p 298.958 -1371.6 0.0 0.0
de215 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df215 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm215 5.701+10

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f225:p      298.958 -1219.2  0.0 0.0
de225      1.50000-2 3.25000-2 5.75000-2 8.50000-2
          1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
          6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
          2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
          7.25000+0 7.75000+0 9.00000+0 1.20000+1
df225      2.14390-3 5.77600-4 2.71850-4 2.68170-4
          3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
          1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
          3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
          7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm225      5.701+10
f235:p      298.958 -1066.8  0.0 0.0
de235      1.50000-2 3.25000-2 5.75000-2 8.50000-2
          1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
          6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
          2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
          7.25000+0 7.75000+0 9.00000+0 1.20000+1
df235      2.14390-3 5.77600-4 2.71850-4 2.68170-4
          3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
          1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
          3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
          7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm235      5.701+10
f245:p      298.958 -914.4  0.0 0.0
de245      1.50000-2 3.25000-2 5.75000-2 8.50000-2
          1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
          6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
          2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
          7.25000+0 7.75000+0 9.00000+0 1.20000+1
df245      2.14390-3 5.77600-4 2.71850-4 2.68170-4
          3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
          1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
          3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
          7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm245      5.701+10
f255:p      298.958 -762.0  0.0 0.0
de255      1.50000-2 3.25000-2 5.75000-2 8.50000-2
          1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
          6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
          2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
          7.25000+0 7.75000+0 9.00000+0 1.20000+1
df255      2.14390-3 5.77600-4 2.71850-4 2.68170-4
          3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
          1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
          3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
          7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm255      5.701+10
f265:p      298.958 -609.6  0.0 0.0
de265      1.50000-2 3.25000-2 5.75000-2 8.50000-2
          1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
          6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
          2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
          7.25000+0 7.75000+0 9.00000+0 1.20000+1
df265      2.14390-3 5.77600-4 2.71850-4 2.68170-4
          3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
          1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
          3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
          7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm265      5.701+10
f275:p      298.958 -457.2  0.0 0.0
de275      1.50000-2 3.25000-2 5.75000-2 8.50000-2
          1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
          6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
          2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
          7.25000+0 7.75000+0 9.00000+0 1.20000+1
df275      2.14390-3 5.77600-4 2.71850-4 2.68170-4
          3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
          1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
          3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
          7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm275      5.701+10

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f285:p      298.958  -304.8  0.0  0.0
de285      1.50000-2  3.25000-2  5.75000-2  8.50000-2
1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
7.25000+0  7.75000+0  9.00000+0  1.20000+1
df285      2.14390-3  5.77600-4  2.71850-4  2.68170-4
3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm285      5.701+10
f295:p      298.958  -152.4  0.0  0.0
de295      1.50000-2  3.25000-2  5.75000-2  8.50000-2
1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
7.25000+0  7.75000+0  9.00000+0  1.20000+1
df295      2.14390-3  5.77600-4  2.71850-4  2.68170-4
3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm295      5.701+10
f405:p      298.958   152.4  0.0  0.0
de405      1.50000-2  3.25000-2  5.75000-2  8.50000-2
1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
7.25000+0  7.75000+0  9.00000+0  1.20000+1
df405      2.14390-3  5.77600-4  2.71850-4  2.68170-4
3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm405      5.701+10
f415:p      298.958   304.8  0.0  0.0
de415      1.50000-2  3.25000-2  5.75000-2  8.50000-2
1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
7.25000+0  7.75000+0  9.00000+0  1.20000+1
df415      2.14390-3  5.77600-4  2.71850-4  2.68170-4
3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm415      5.701+10
f425:p      298.958   457.2  0.0  0.0
de425      1.50000-2  3.25000-2  5.75000-2  8.50000-2
1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
7.25000+0  7.75000+0  9.00000+0  1.20000+1
df425      2.14390-3  5.77600-4  2.71850-4  2.68170-4
3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm425      5.701+10
f435:p      298.958   609.6  0.0  0.0
de435      1.50000-2  3.25000-2  5.75000-2  8.50000-2
1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
7.25000+0  7.75000+0  9.00000+0  1.20000+1
df435      2.14390-3  5.77600-4  2.71850-4  2.68170-4
3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm435      5.701+10

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f445:p      298.958  762.0  0.0  0.0
de445      1.25000-1  1.50000-2  3.25000-2  5.75000-2  8.50000-2
           2.25000-1  3.50000-1  4.55000-1  5.55000-1
           6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
           2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
           7.25000+0  7.75000+0  9.00000+0  1.20000+1
df445      2.14390-3  5.77600-4  2.71850-4  2.68170-4
           3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
           1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
           3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
           7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm445      5.701+10
f455:p      298.958  914.4  0.0  0.0
de455      1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
           6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
           2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
           7.25000+0  7.75000+0  9.00000+0  1.20000+1
df455      2.14390-3  5.77600-4  2.71850-4  2.68170-4
           3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
           1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
           3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
           7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm455      5.701+10
f465:p      298.958  1066.8  0.0  0.0
de465      1.25000-1  2.25000-1  3.50000-1  4.55000-1  5.55000-1
           6.50000-1  8.50000-1  1.25000+0  1.75000+0  2.25000+0
           2.75000+0  3.50000+0  4.50000+0  5.50000+0  6.50000+0
           7.25000+0  7.75000+0  9.00000+0  1.20000+1
df465      2.14390-3  5.77600-4  2.71850-4  2.68170-4
           3.27670-4  5.66760-4  8.75940-4  1.08450-3  1.27970-3
           1.44170-3  1.75630-3  2.31560-3  2.92700-3  3.46860-3
           3.95960-3  4.62210-3  5.41370-3  6.19090-3  6.92650-3
           7.47830-3  7.84680-3  8.77160-3  1.10200-2
fm465      5.701+10
sdef       pos=-2.3304 0 -30.993 dir=d1 erg=fdir=d2
           vec=0.988756381 0.0 -0.149535343
si1        s 11 12 13 14 15 16
sp1        h 1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
si11       h -1.0 -0.7071067
si12       h -0.7071067 0.0
si13       h 0.0 0.5
si14       h 0.5 0.8660254
si15       h 0.8660254 0.9961946
si16       h 0.9961946 1.0
sp11       0 1
sp12       0 1
sp13       0 1
sp14       0 1
sp15       0 1
sp16       0 1
ds2        s 21 22 23 24 25 26
si21       h 1.8245 1.9295
si22       h 1.9295 3.7645
si23       h 3.7645 5.675
si24       h 5.675 7.3865
si25       h 7.3865 8.321
si26       h 8.321 8.753
sp21       0 1
sp22       0 1
sp23       0 1
sp24       0 1
sp25       0 1
sp26       0 1
nps        2000000
prcimp     2j 1
print

```

File for MCNP-4B calculation of dose rates at additional points along the truck lane of the PFNA facility for the source in the horizontal position

message: outp=pfna22.o mctal=pfna22.m

```
mcnp file for PFNA facility -- dose rates at selected locations
1      0      -100:128:-200:251:-300:305
2      0      100 -128 200 -251 300 -305
          #(131 -164 +258 -297 +307 -321)
3      1 0.10549 -400 -401 +505 +224 -227 #(503 -504)
4      1 0.10549 -401 +400 +505 +225 -226 #(503 -504)
5      0      142 -127 +223 -228 +308 -304
          #(-400 -401 +505 +224 -227) #(+137 -102 +310)
          #(-401 +400 +505 +225 -226)
6      0      127 -124 +501 -502 +308 -304
          #(-401 +400 +505 +225 -226)
7      0      124 -126 +254 -255 +308 -304
8      5 8.734441-2 102 -126 +201 -250 +306 -301
          #(+102 -127 +223 -228) #(+127 -124 +501 -502)
          #(+124 +254 -255) #(+129 -252) #(+129 +257)
9      1 0.10549 102 -124 +222 -229 +301 -304
          #(+129 -252) #(+129 +257)
          #(127 +501 -502) #(-127 +223 -228)
10     1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11     1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12     1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13     1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14     1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15     1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16     1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17     1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18     1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19     1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20     1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21     2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22     2 0.1187956 103 -109 +202 -249 +302 -303
          #(221 -230)
          #(103 -104 +217 -234)
          #(104 -105 +216 -235)
          #(105 -107 +219 -232)
          #(107 -108 +219 -220) #(107 -108 +231 -232)
          #(106 -109 +212 -218) #(106 -109 +233 -236)
23     2 0.1187956 109 -120 +202 -249 +302 -303
          #(221 -230)
          #(109 -110 +211 -237)
          #(110 -111 +210 -238)
          #(111 -112 +209 -239)
          #(112 -113 +208 -240)
          #(113 -114 +207 -241)
          #(114 -115 +206 -242)
          #(115 -116 +205 -243)
          #(116 -117 +204 -244)
          #(117 -118 +203 -245)
          #(118 -119)
24     3 3.284-2 121 -125 +201 -250 +301 -304
          #(-124 +214 -247) #(124 +253 -256)
          #(122 +248) #(122 -213)
25     3 3.284-2 103 -107 +217 -234 +302 -303
          #(221 -230) #(104 -220) #(104 +231)
26     4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27     4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28     4 5.977931-2 102 -124 +201 -222 +301 -304
          #(103 -120 202 -221 302 -303)
          #(120 -123 215 -221 302 -303)
          #(121 -214)
29     4 5.977931-2 102 -124 +229 -250 +301 -304
          #(103 -120 230 -249 302 -303)
          #(120 -123 230 -246 302 -303)
          #(121 +247)
30     4 5.977931-2 124 -126 +252 -254 +301 -304
```

31	4	5.977931-2	#(-125 +213 -253) 124 -126 +255 -257 +301 -304 #(-125 +256 -248)
32	0		+167 -168 +274 -281 +317 -318
33	0		+165 -166 +270 -285 +308 -310 #(+167 -168 +274 -281 +317 -318)
34	0		-400 +505 +224 -227 +503 -504
35	0		-401 +400 +505 +225 -226 +503 -504
36	4	5.977931-2	122 -124 +201 -250 +301 -304 #(213 -248) #(129 -252) #(129 +257)
37	9	-2.0	+131 -164 +258 -297 +307 -308
38	11	-1.0	+131 -164 +258 -297 +308 -320 #(+132 -163 +259 -296)
39	12	-7.86	+131 -164 +258 -297 +320 -321
40	0		+132 -163 +259 -296 +319 -320 #(+151 -169 +271 -284 +304 -315) #(+151 -160 +270 -271 +312 -314) #(+151 -160 +284 -285 +312 -314) #(+157 -159 +274 -281 +313 -315) #(+158 -160 +274 -281 -313) #(+169 -157 +274 -281 +314 -316)
41	1	0.10549	+151 -169 +271 -284 +304 -315
42	1	0.10549	+151 -160 +270 -271 +312 -314
43	1	0.10549	+151 -160 +284 -285 +312 -314
44	1	0.10549	+157 -159 +274 -281 +313 -315
45	1	0.10549	+158 -160 +274 -281 +308 -313
46	1	0.10549	+169 -157 +274 -281 +314 -316
47	9	-2.0	+160 -162 +273 -282 +308 -319
48	10	-2.0	+154 -161 +265 -289 +308 -319 #47 #(-160 +267 -286)
49	0		+154 -160 +267 -286 +308 -319 #42 #43 #45
50	10	-2.0	+155 -156 +259 -260 +308 -319
51	10	-2.0	+155 -156 +295 -296 +308 -319
52	10	-2.0	+154 -155 +259 -296 +308 -319 #(+265 -289)
53	0		+155 -163 +259 -296 +308 -319 #50 #51 #(-161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0	+153 -154 +295 -296 +308 -319
55	10	-2.0	+151 -126 +295 -296 +308 -319
56	10	-2.0	+151 -126 +259 -260 +308 -319
57	10	-2.0	+153 -154 +259 -260 +308 -319
58	10	-2.0	+151 -152 +266 -272 +308 -304
59	10	-2.0	+151 -152 +283 -287 +308 -304
60	0		+151 -154 +259 -296 +308 -319 #41 #42 #43 #54 #55 #56 #57 #58 #59 #(+165 -166 +270 -285 +308 -310) #(-126 +201 -250 -304)
61	1	0.10549	+149 -151 +272 -201 +308 -304
62	1	0.10549	+149 -151 +250 -283 +308 -304
63	9	-2.0	+149 -151 +264 -290 +308 -319 #(+272 -283)
64	10	-2.0	+149 -151 +259 -296 +308 -319 #(+264 -290)
65	10	-2.0	+146 -149 +295 -296 +308 -319
66	0		+132 -149 +259 -296 +308 -319 #65 #(+133 -294)
67	10	-2.0	+133 -149 +259 -294 +308 -319 #(+142 -260 -322) #(+134 +260 -298)
68	10	-2.0	+135 -149 +261 -262 +308 -319
69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311 #(-138 -290 -310) #(-102 +310) #(+138 +269 -290 -310) #(+144 +290 -292 -310) #(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71	1	0.10549	+137 -138 +268 -290 +308 -310
72	1	0.10549	+138 -149 +269 -272 +308 -310
73	1	0.10549	+138 -149 +288 -290 +308 -310 #(+140 -141)
74	0		+140 -141 +288 -290 +308 -310
75	1	0.10549	+144 -149 +290 -292 +308 -310
76	1	0.10549	+139 -144 +291 -293 +308 -310

```

77      2  0.1187956 +137 -102 +268 -293 +310 -311
78      0              +138 -149 +272 -288 +308 -310
                        #(+102 +201 -250 +309 -304)
                        #(+143 -102 +275 -276 +301)
                        #(+143 -102 +279 -280 +301)
                        #(+147 -102 +276 -277 +301)
                        #(+147 -102 +278 -279 +301)
                        #(+142 +223 -228) #(+145 +201 -250 -309)
79      1  0.10549    +143 -102 +275 -276 +301 -310
80      1  0.10549    +143 -102 +279 -280 +301 -310
81      1  0.10549    +147 -102 +276 -277 +301 -310
82      1  0.10549    +147 -102 +278 -279 +301 -310
83      0              +142 -149 +259 -260 +308 -322
84      0              +134 -149 +260 -298 +308 -319
                        #68 #69 #(+137 -149 +268 -293 +308 -311)
                        #(+102 +201 -250 -304) #(+142 +223 -228 -304)
85      9 -2.0        +145 -126 +201 -250 +308 -309
                        #(+145 -127 +223 -228) #(+127 -124 +501 -502)
                        #(+129 -252) #(+129 +257) #(+124 +254 -255)
86      0              +129 -126 +201 -250 +308 -304
                        #(+252 -257)
87      0              +102 -126 +201 -250 +309 -306
                        #(+102 -127 +223 -228) #(+127 -124 +501 -502)
                        #(+129 -252) #(+129 +257) #(+124 +254 -255)
88      0              +149 -151 +272 -283 +304 -319

```

```

c      end cells
c
c      surfaces
100    px      -1000.0
c      101     px      10.3124
102    px      20.7264
103    px      22.6314
104    px      27.7114
105    px      28.9814
106    px      31.5214
107    px      36.6014
108    px      42.9514
109    px      49.3014
110    px      51.8414
111    px      54.3814
112    px      56.9214
113    px      59.4614
114    px      62.0014
115    px      64.5414
116    px      67.0814
117    px      69.6214
118    px      72.1614
119    px      74.7014
120    px      76.3016
121    px      78.2066
122    px      86.0806
123    px      112.649
124    px      114.554
125    px      119.888
126    px      121.158
127    px      50.5714
128    px      1200.0
129    px      87.9856
131    px      -844.042
132    px      -823.722
133    px      -767.842
134    px      -706.882
135    px      -548.962
136    px      -493.522
137    px      -381.762
138    px      -320.802
139    px      -315.722
140    px      -173.482
141    px      -107.442
142    px      -82.042
143    px      -55.4736

```

144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058
239	py	39.4758
240	py	40.7458
241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258
245	py	47.0958

246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225
312	pz	283.845
313	pz	342.265
314	pz	375.285
315	pz	390.525
316	pz	395.605
317	pz	-50.0
318	pz	50.0

```

319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y 10.3124 0.0 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p 0.06683670 0.0 1.0 -2.518636
504 p -0.06683670 0.0 1.0 2.518636
505 px 10.3124

c end surfaces
mode n p
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]
m11 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529

```

```

11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt11 lwtr.01t
c m12=iron at 7.86 g/cc
m12 26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
26058.60c 0.0028
c m13=Heavy concrete at 4.2 g/cc [wt %]
m13 1001.60c -0.0005 8016.60c -0.18
12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
26054.60c -4.073938-2 26056.60c -0.6625828
26057.60c -1.558362-2 26058.60c -2.094288-3
mt13 lwtr.01t
f105:n 298.958 30.48 0.0 0.0
de105 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df105 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm105 5.701+10
f115:n 298.958 76.20 0.0 0.0
de115 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df115 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm115 5.701+10
f205:p 298.958 30.48 0.0 0.0

```



```

de205      1.50000-2 3.25000-2 5.75000-2 8.50000-2
           1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
           6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
           2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
           7.25000+0 7.75000+0 9.00000+0 1.20000+1
df205      2.14390-3 5.77600-4 2.71850-4 2.68170-4
           3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
           1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
           3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
           7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm205      5.701+10
f215:p     298.958      76.20  0.0  0.0
de215      1.50000-2 3.25000-2 5.75000-2 8.50000-2
           1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
           6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
           2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
           7.25000+0 7.75000+0 9.00000+0 1.20000+1
df215      2.14390-3 5.77600-4 2.71850-4 2.68170-4
           3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
           1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
           3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
           7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm215      5.701+10
sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2
sil        s  11 12 13 14 15 16
sp1        1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
sil1       h -1.0 -0.7071067
sil2       h -0.7071067 0.0
sil3       h 0.0 0.5
sil4       h 0.5 0.8660254
sil5       h 0.8660254 0.9961946
sil6       h 0.9961946 1.0
sp11       0 1
sp12       0 1
sp13       0 1
sp14       0 1
sp15       0 1
sp16       0 1
ds2        s 21 22 23 24 25 26
si21       h 1.8245 1.9295
si22       h 1.9295 3.7645
si23       h 3.7645 5.675
si24       h 5.675 7.3865
si25       h 7.3865 8.321
si26       h 8.321 8.753
sp21       0 1
sp22       0 1
sp23       0 1
sp24       0 1
sp25       0 1
sp26       0 1
nps        2000000
prdmp      2j 1
print

```

File for MCNP-4B calculation of dose rates at additional points along the truck lane of the PFNA facility for the source in the maximum up position

message: outp=pfna23.o mctal=pfna23.m

```
mcnp file for PFNA facility -- dose rates at selected locations
c source in nominal maximum upward position (34.8 deg.) of the
c movable vertical collimator. check sdef, cells 3-6, surfaces
c 401 and 503-505, and the sign on surface 505.
c
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
   #(131 -164 +258 -297 +307 -321)
3 1 0.10549 -400 -401 +505 +224 -227 #(503 -504)
4 1 0.10549 -401 +400 +505 +225 -226 #(503 -504)
5 0 142 -127 +223 -228 +308 -304
   #(-400 -401 +505 +224 -227) #(+137 -102 +310)
   #(-401 +400 +505 +225 -226)
6 0 127 -124 +501 -502 +308 -304
   #(-401 +400 +505 +225 -226)
7 0 124 -126 +254 -255 +308 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
   #(+102 -127 +223 -228) #(+127 -124 +501 -502)
   #(+124 +254 -255) #(+129 -252) #(+129 +257)
9 1 0.10549 102 -124 +222 -229 +301 -304
   #(+129 -252) #(+129 +257)
   #(127 +501 -502) #(-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
   #(221 -230)
   #(103 -104 +217 -234)
   #(104 -105 +216 -235)
   #(105 -107 +219 -232)
   #(107 -108 +219 -220) #(107 -108 +231 -232)
   #(106 -109 +212 -218) #(106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
   #(221 -230)
   #(109 -110 +211 -237)
   #(110 -111 +210 -238)
   #(111 -112 +209 -239)
   #(112 -113 +208 -240)
   #(113 -114 +207 -241)
   #(114 -115 +206 -242)
   #(115 -116 +205 -243)
   #(116 -117 +204 -244)
   #(117 -118 +203 -245)
   #(118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
   #(-124 +214 -247) #(124 +253 -256)
   #(122 +248) #(122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
   #(221 -230) #(104 -220) #(104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
   #(103 -120 202 -221 302 -303)
   #(120 -123 215 -221 302 -303)
   #(121 -214)
29 4 5.977931-2 102 -124 +229 -250 +301 -304
```

			#(103 -120 230 -249 302 -303)
			#(120 -123 230 -246 302 -303)
			#(121 +247)
30	4	5.977931-2	124 -126 +252 -254 +301 -304
			#(-125 +213 -253)
31	4	5.977931-2	124 -126 +255 -257 +301 -304
			#(-125 +256 -248)
32	0		+167 -168 +274 -281 +317 -318
33	0		+165 -166 +270 -285 +308 -310
			#(+167 -168 +274 -281 +317 -318)
34	0		-400 +505 +224 -227 +503 -504
35	0		-401 +400 +505 +225 -226 +503 -504
36	4	5.977931-2	122 -124 +201 -250 +301 -304
			#(213 -248)
			#(129 -252)
			#(129 +257)
37	9	-2.0	+131 -164 +258 -297 +307 -308
38	11	-1.0	+131 -164 +258 -297 +308 -320
			#(+132 -163 +259 -296)
39	12	-7.86	+131 -164 +258 -297 +320 -321
40	0		+132 -163 +259 -296 +319 -320
			#(+151 -169 +271 -284 +304 -315)
			#(+151 -160 +270 -271 +312 -314)
			#(+151 -160 +284 -285 +312 -314)
			#(+157 -159 +274 -281 +313 -315)
			#(+158 -160 +274 -281 -313)
			#(+169 -157 +274 -281 +314 -316)
41	1	0.10549	+151 -169 +271 -284 +304 -315
42	1	0.10549	+151 -160 +270 -271 +312 -314
43	1	0.10549	+151 -160 +284 -285 +312 -314
44	1	0.10549	+157 -159 +274 -281 +313 -315
45	1	0.10549	+158 -160 +274 -281 +308 -313
46	1	0.10549	+169 -157 +274 -281 +314 -316
47	9	-2.0	+160 -162 +273 -282 +308 -319
48	10	-2.0	+154 -161 +265 -289 +308 -319
			#47 #(-160 +267 -286)
49	0		+154 -160 +267 -286 +308 -319 #42 #43 #45
50	10	-2.0	+155 -156 +259 -260 +308 -319
51	10	-2.0	+155 -156 +295 -296 +308 -319
52	10	-2.0	+154 -155 +259 -296 +308 -319
			#(+265 -289)
53	0		+155 -163 +259 -296 +308 -319 #50 #51
			#(-161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0	+153 -154 +295 -296 +308 -319
55	10	-2.0	+151 -126 +295 -296 +308 -319
56	10	-2.0	+151 -126 +259 -260 +308 -319
57	10	-2.0	+153 -154 +259 -260 +308 -319
58	10	-2.0	+151 -152 +266 -272 +308 -304
59	10	-2.0	+151 -152 +283 -287 +308 -304
60	0		+151 -154 +259 -296 +308 -319
			#41 #42 #43 #54 #55 #56 #57 #58 #59
			#(+165 -166 +270 -285 +308 -310)
			#(-126 +201 -250 -304)
61	1	0.10549	+149 -151 +272 -201 +308 -304
62	1	0.10549	+149 -151 +250 -283 +308 -304
63	9	-2.0	+149 -151 +264 -290 +308 -319
			#(+272 -283)
64	10	-2.0	+149 -151 +259 -296 +308 -319
			#(+264 -290)
65	10	-2.0	+146 -149 +295 -296 +308 -319
66	0		+132 -149 +259 -296 +308 -319
			#65 #(+133 -294)
67	10	-2.0	+133 -149 +259 -294 +308 -319
			#(+142 -260 -322) #(+134 +260 -298)
68	10	-2.0	+135 -149 +261 -262 +308 -319
69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311
			#(-138 -290 -310) #(-102 +310)
			#(+138 +269 -290 -310) #(+144 +290 -292 -310)
			#(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71	1	0.10549	+137 -138 +268 -290 +308 -310
72	1	0.10549	+138 -149 +269 -272 +308 -310

73	1	0.10549	+138 -149 +288 -290 +308 -310	#(+140 -141)
74	0		+140 -141 +288 -290 +308 -310	
75	1	0.10549	+144 -149 +290 -292 +308 -310	
76	1	0.10549	+139 -144 +291 -293 +308 -310	
77	2	0.1187956	+137 -102 +268 -293 +310 -311	
78	0		+138 -149 +272 -288 +308 -310	
			#(+102 +201 -250 +309 -304)	
			#(+143 -102 +275 -276 +301)	
			#(+143 -102 +279 -280 +301)	
			#(+147 -102 +276 -277 +301)	
			#(+147 -102 +278 -279 +301)	
			#(+142 +223 -228) #(+145 +201 -250 -309)	
79	1	0.10549	+143 -102 +275 -276 +301 -310	
80	1	0.10549	+143 -102 +279 -280 +301 -310	
81	1	0.10549	+147 -102 +276 -277 +301 -310	
82	1	0.10549	+147 -102 +278 -279 +301 -310	
83	0		+142 -149 +259 -260 +308 -322	
84	0		+134 -149 +260 -298 +308 -319	
			#68 #69 #(+137 -149 +268 -293 +308 -311)	
			#(+102 +201 -250 -304) #(+142 +223 -228 -304)	
85	9	-2.0	+145 -126 +201 -250 +308 -309	
			#(+145 -127 +223 -228) #(+127 -124 +501 -502)	
			#(+129 -252) #(+129 +257) #(+124 +254 -255)	
86	0		+129 -126 +201 -250 +308 -304	
			#(+252 -257)	
87	0		+102 -126 +201 -250 +309 -306	
			#(+102 -127 +223 -228) #(+127 -124 +501 -502)	
			#(+129 -252) #(+129 +257) #(+124 +254 -255)	
88	0		+149 -151 +272 -283 +304 -319	

c end cells

c

c

surfaces

px -1000.0

c 101 px 10.3124

102	px	20.7264
103	px	22.6314
104	px	27.7114
105	px	28.9814
106	px	31.5214
107	px	36.6014
108	px	42.9514
109	px	49.3014
110	px	51.8414
111	px	54.3814
112	px	56.9214
113	px	59.4614
114	px	62.0014
115	px	64.5414
116	px	67.0814
117	px	69.6214
118	px	72.1614
119	px	74.7014
120	px	76.3016
121	px	78.2066
122	px	86.0806
123	px	112.649
124	px	114.554
125	px	119.888
126	px	121.158
127	px	50.5714
128	px	1200.0
129	px	87.9856
131	px	-844.042
132	px	-823.722
133	px	-767.842
134	px	-706.882
135	px	-548.962
136	px	-493.522
137	px	-381.762
138	px	-320.802
139	px	-315.722

140	px	-173.482
141	px	-107.442
142	px	-82.042
143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058
239	py	39.4758
240	py	40.7458
241	py	42.0158

242	py	43.2858
243	py	44.5558
244	py	45.8258
245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225
312	pz	283.845
313	pz	342.265
314	pz	375.285

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315 pz 390.525
316 pz 395.605
317 pz -50.0
318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y -28.60131 124.1738 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p -0.60029580 0.0 1.0 137.6099
504 p -0.79896920 0.0 1.0 151.1223
505 p 1.43881100 0.0 1.0 83.0219

c end surfaces
mode n p
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2

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26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]
m11 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt11 lwtr.01t
c m12=iron at 7.86 g/cc
m12 26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
26058.60c 0.0028
c m13=Heavy concrete at 4.2 g/cc [wt %]
m13 1001.60c -0.0005 8016.60c -0.18
12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
26054.60c -4.073938-2 26056.60c -0.6625828
26057.60c -1.558362-2 26058.60c -2.094288-3
mt13 lwtr.01t
f105:n 298.958 30.48 0.0 0.0
de105 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df105 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm105 5.701+10
f115:n 298.958 76.20 0.0 0.0
de115 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df115 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1

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1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm115 5.701+10
f205:p 298.958 30.48 0.0 0.0
de205 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df205 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm205 5.701+10
f215:p 298.958 76.20 0.0 0.0
de215 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df215 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm215 5.701+10
sdef pos=-37.0693 0 118.288 dir=d1 erg=fdir=d2
vec=0.821149209 0.0 0.570713568
si1 s 11 12 13 14 15 16
sp1 1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
si11 h -1.0 -0.7071067
si12 h -0.7071067 0.0
si13 h 0.0 0.5
si14 h 0.5 0.8660254
si15 h 0.8660254 0.9961946
si16 h 0.9961946 1.0
sp11 0 1
sp12 0 1
sp13 0 1
sp14 0 1
sp15 0 1
sp16 0 1
ds2 s 21 22 23 24 25 26
si21 h 1.8245 1.9295
si22 h 1.9295 3.7645
si23 h 3.7645 5.675
si24 h 5.675 7.3865
si25 h 7.3865 8.321
si26 h 8.321 8.753
sp21 0 1
sp22 0 1
sp23 0 1
sp24 0 1
sp25 0 1
sp26 0 1
nps 2000000
prdmp 2j 1
print

```

File for MCNP-4B calculation of dose rates at additional points along the truck lane of the PFNA facility for the source in the maximum down position

message: outp=pfna24.o mctal=pfna24.m

```
mcnp file for PFNA facility -- dose rates at selected locations
c source in nominal minimum downward position (-8.6 deg.) of the
c movable vertical collimator. check sdef, cells 3-6, surfaces
c 401 and 503-505, and the sign on surface 505.
c
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
   # (131 -164 +258 -297 +307 -321)
3 1 0.10549 -400 -401 -505 +224 -227 # (503 -504)
4 1 0.10549 -401 +400 -505 +225 -226 # (503 -504)
5 0 142 -127 +223 -228 +308 -304
   # (-400 -401 -505 +224 -227) # (+137 -102 +310)
   # (-401 +400 -505 +225 -226)
6 0 127 -124 +501 -502 +308 -304
   # (-401 +400 -505 +225 -226)
7 0 124 -126 +254 -255 +308 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
   # (+102 -127 +223 -228) # (+127 -124 +501 -502)
   # (+124 +254 -255) # (+129 -252) # (+129 +257)
9 1 0.10549 102 -124 +222 -229 +301 -304
   # (+129 -252) # (+129 +257)
   # (127 +501 -502) # (-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 # (218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 # (221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 # (221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 # (221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 # (221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 # (221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 # (221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 # (221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 # (221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 # (221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 # (221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 # (221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
   # (221 -230)
   # (103 -104 +217 -234)
   # (104 -105 +216 -235)
   # (105 -107 +219 -232)
   # (107 -108 +219 -220) # (107 -108 +231 -232)
   # (106 -109 +212 -218) # (106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
   # (221 -230)
   # (109 -110 +211 -237)
   # (110 -111 +210 -238)
   # (111 -112 +209 -239)
   # (112 -113 +208 -240)
   # (113 -114 +207 -241)
   # (114 -115 +206 -242)
   # (115 -116 +205 -243)
   # (116 -117 +204 -244)
   # (117 -118 +203 -245)
   # (118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
   # (-124 +214 -247) # (124 +253 -256)
   # (122 +248) # (122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
   # (221 -230) # (104 -220) # (104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 # (105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 # (105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
   # (103 -120 202 -221 302 -303)
   # (120 -123 215 -221 302 -303)
   # (121 -214)
29 4 5.977931-2 102 -124 +229 -250 +301 -304
```

			#(103 -120 230 -249 302 -303)
			#(120 -123 230 -246 302 -303)
			#(121 +247)
30	4	5.977931-2	124 -126 +252 -254 +301 -304
			#(-125 +213 -253)
31	4	5.977931-2	124 -126 +255 -257 +301 -304
			#(-125 +256 -248)
32	0		+167 -168 +274 -281 +317 -318
33	0		+165 -166 +270 -285 +308 -310
			#(+167 -168 +274 -281 +317 -318)
34	0		-400 -505 +224 -227 +503 -504
35	0		-401 +400 -505 +225 -226 +503 -504
36	4	5.977931-2	122 -124 +201 -250 +301 -304
			#(213 -248)
			#(129 -252)
			#(129 +257)
37	9	-2.0	+131 -164 +258 -297 +307 -308
38	11	-1.0	+131 -164 +258 -297 +308 -320
			#(+132 -163 +259 -296)
39	12	-7.86	+131 -164 +258 -297 +320 -321
40	0		+132 -163 +259 -296 +319 -320
			#(+151 -169 +271 -284 +304 -315)
			#(+151 -160 +270 -271 +312 -314)
			#(+151 -160 +284 -285 +312 -314)
			#(+157 -159 +274 -281 +313 -315)
			#(+158 -160 +274 -281 -313)
			#(+169 -157 +274 -281 +314 -316)
41	1	0.10549	+151 -169 +271 -284 +304 -315
42	1	0.10549	+151 -160 +270 -271 +312 -314
43	1	0.10549	+151 -160 +284 -285 +312 -314
44	1	0.10549	+157 -159 +274 -281 +313 -315
45	1	0.10549	+158 -160 +274 -281 +308 -313
46	1	0.10549	+169 -157 +274 -281 +314 -316
47	9	-2.0	+160 -162 +273 -282 +308 -319
48	10	-2.0	+154 -161 +265 -289 +308 -319
			#47 #(-160 +267 -286)
49	0		+154 -160 +267 -286 +308 -319 #42 #43 #45
50	10	-2.0	+155 -156 +259 -260 +308 -319
51	10	-2.0	+155 -156 +295 -296 +308 -319
52	10	-2.0	+154 -155 +259 -296 +308 -319
			#(+265 -289)
53	0		+155 -163 +259 -296 +308 -319 #50 #51
			#(-161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0	+153 -154 +295 -296 +308 -319
55	10	-2.0	+151 -126 +295 -296 +308 -319
56	10	-2.0	+151 -126 +259 -260 +308 -319
57	10	-2.0	+153 -154 +259 -260 +308 -319
58	10	-2.0	+151 -152 +266 -272 +308 -304
59	10	-2.0	+151 -152 +283 -287 +308 -304
60	0		+151 -154 +259 -296 +308 -319
			#41 #42 #43 #54 #55 #56 #57 #58 #59
			#(+165 -166 +270 -285 +308 -310)
			#(-126 +201 -250 -304)
61	1	0.10549	+149 -151 +272 -201 +308 -304
62	1	0.10549	+149 -151 +250 -283 +308 -304
63	9	-2.0	+149 -151 +264 -290 +308 -319
			#(+272 -283)
64	10	-2.0	+149 -151 +259 -296 +308 -319
			#(+264 -290)
65	10	-2.0	+146 -149 +295 -296 +308 -319
66	0		+132 -149 +259 -296 +308 -319
			#65 #(+133 -294)
67	10	-2.0	+133 -149 +259 -294 +308 -319
			#(+142 -260 -322) #(+134 +260 -298)
68	10	-2.0	+135 -149 +261 -262 +308 -319
69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311
			#(-138 -290 -310) #(-102 +310)
			#(+138 +269 -290 -310) #(+144 +290 -292 -310)
			#(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71	1	0.10549	+137 -138 +268 -290 +308 -310
72	1	0.10549	+138 -149 +269 -272 +308 -310

```

73   1  0.10549  +138 -149 +288 -290 +308 -310 #(+140 -141)
74   0          +140 -141 +288 -290 +308 -310
75   1  0.10549  +144 -149 +290 -292 +308 -310
76   1  0.10549  +139 -144 +291 -293 +308 -310
77   2  0.1187956 +137 -102 +268 -293 +310 -311
78   0          +138 -149 +272 -288 +308 -310
          #(+102 +201 -250 +309 -304)
          #(+143 -102 +275 -276 +301)
          #(+143 -102 +279 -280 +301)
          #(+147 -102 +276 -277 +301)
          #(+147 -102 +278 -279 +301)
          #(+142 +223 -228) #(+145 +201 -250 -309)
79   1  0.10549  +143 -102 +275 -276 +301 -310
80   1  0.10549  +143 -102 +279 -280 +301 -310
81   1  0.10549  +147 -102 +276 -277 +301 -310
82   1  0.10549  +147 -102 +278 -279 +301 -310
83   0          +142 -149 +259 -260 +308 -322
84   0          +134 -149 +260 -298 +308 -319
          #68 #69 #(+137 -149 +268 -293 +308 -311)
          #(+102 +201 -250 -304) #(+142 +223 -228 -304)
85   9 -2.0     +145 -126 +201 -250 +308 -309
          #(+145 -127 +223 -228) #(+127 -124 +501 -502)
          #(+129 -252) #(+129 +257) #(+124 +254 -255)
86   0          +129 -126 +201 -250 +308 -304
          #(+252 -257)
87   0          +102 -126 +201 -250 +309 -306
          #(+102 -127 +223 -228) #(+127 -124 +501 -502)
          #(+129 -252) #(+129 +257) #(+124 +254 -255)
88   0          +149 -151 +272 -283 +304 -319

```

c end cells

c

c surfaces

```

100 px -1000.0
c 101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 1200.0
129 px 87.9856
131 px -844.042
132 px -823.722
133 px -767.842
134 px -706.882
135 px -548.962
136 px -493.522
137 px -381.762
138 px -320.802
139 px -315.722

```

140	px	-173.482
141	px	-107.442
142	px	-82.042
143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058
239	py	39.4758
240	py	40.7458
241	py	42.0158

242	py	43.2858
243	py	44.5558
244	py	45.8258
245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225
312	pz	283.845
313	pz	342.265
314	pz	375.285

```

315 pz 390.525
316 pz 395.605
317 pz -50.0
318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y 7.866053 -32.53536 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p 0.22029930 0.0 1.0 -34.07997
504 p 0.08355454 0.0 1.0 -28.66622
505 p -6.61219100 0.0 1.0 -84.54721

c end surfaces
mode n p
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2

```

```

26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]
m11 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt11 lwtr.01t
c m12=iron at 7.86 g/cc
m12 26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
26058.60c 0.0028
c m13=Heavy concrete at 4.2 g/cc [wt %]
m13 1001.60c -0.0005 8016.60c -0.18
12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
26054.60c -4.073938-2 26056.60c -0.6625828
26057.60c -1.558362-2 26058.60c -2.094288-3
mt13 lwtr.01t
f105:n 298.958 30.48 0.0 0.0
de105 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df105 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm105 5.701+10
f115:n 298.958 76.20 0.0 0.0
de115 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df115 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1

```



```

1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm115 5.701+10
f205:p 298.958 30.48 0.0 0.0
de205 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df205 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm205 5.701+10
f215:p 298.958 76.20 0.0 0.0
de215 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df215 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm215 5.701+10
sdef pos=-2.3304 0 -30.993 dir=d1 erg=fdir=d2
vec=0.988756381 0.0 -0.149535343
si1 s 11 12 13 14 15 16
sp1 1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
si11 h -1.0 -0.7071067
si12 h -0.7071067 0.0
si13 h 0.0 0.5
si14 h 0.5 0.8660254
si15 h 0.8660254 0.9961946
si16 h 0.9961946 1.0
sp11 0 1
sp12 0 1
sp13 0 1
sp14 0 1
sp15 0 1
sp16 0 1
ds2 s 21 22 23 24 25 26
si21 h 1.8245 1.9295
si22 h 1.9295 3.7645
si23 h 3.7645 5.675
si24 h 5.675 7.3865
si25 h 7.3865 8.321
si26 h 8.321 8.753
sp21 0 1
sp22 0 1
sp23 0 1
sp24 0 1
sp25 0 1
sp26 0 1
nps 2000000
prdmp 2j 1
print

```

File for MCNP-4B calculation of dose rates below the overhead source shield and below the roof of the PFNA facility for the source in the maximum up position

message: outp=pfna28.o mctal=pfna28.m

```

mcnp file for PFNA facility -- dose rates at selected locations
c source in nominal maximum upward position (34.8 deg.) of the
c movable vertical collimator. check sdef, cells 3-6, surfaces
c 401 and 503-505, and the sign on surface 505.
c
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
   # (131 -164 +258 -297 +307 -321)
3 1 0.10549 -400 -401 +505 +224 -227 # (503 -504)
4 1 0.10549 -401 +400 +505 +225 -226 # (503 -504)
5 0 142 -127 +223 -228 +308 -304
   # (-400 -401 +505 +224 -227) # (+137 -102 +310)
   # (-401 +400 +505 +225 -226)
6 0 127 -124 +501 -502 +308 -304
   # (-401 +400 +505 +225 -226)
7 0 124 -126 +254 -255 +308 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
   # (+102 -127 +223 -228) # (+127 -124 +501 -502)
   # (+124 +254 -255) # (+129 -252) # (+129 +257)
9 1 0.10549 102 -124 +222 -229 +301 -304
   # (+129 -252) # (+129 +257)
   # (127 +501 -502) # (-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 # (218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 # (221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 # (221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 # (221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 # (221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 # (221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 # (221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 # (221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 # (221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 # (221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 # (221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 # (221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
   # (221 -230)
   # (103 -104 +217 -234)
   # (104 -105 +216 -235)
   # (105 -107 +219 -232)
   # (107 -108 +219 -220) # (107 -108 +231 -232)
   # (106 -109 +212 -218) # (106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
   # (221 -230)
   # (109 -110 +211 -237)
   # (110 -111 +210 -238)
   # (111 -112 +209 -239)
   # (112 -113 +208 -240)
   # (113 -114 +207 -241)
   # (114 -115 +206 -242)
   # (115 -116 +205 -243)
   # (116 -117 +204 -244)
   # (117 -118 +203 -245)
   # (118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
   # (-124 +214 -247) # (124 +253 -256)
   # (122 +248) # (122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
   # (221 -230) # (104 -220) # (104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 # (105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 # (105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
   # (103 -120 202 -221 302 -303)

```

```

#(120 -123 215 -221 302 -303)
#(121 -214)
29 4 5.977931-2 102 -124 +229 -250 +301 -304
#(103 -120 230 -249 302 -303)
#(120 -123 230 -246 302 -303)
#(121 +247)
30 4 5.977931-2 124 -126 +252 -254 +301 -304
#(-125 +213 -253)
31 4 5.977931-2 124 -126 +255 -257 +301 -304
#(-125 +256 -248)
32 0 +167 -168 +274 -281 +317 -318
33 0 +165 -166 +270 -285 +308 -310
#(+167 -168 +274 -281 +317 -318)
34 0 -400 +505 +224 -227 +503 -504
35 0 -401 +400 +505 +225 -226 +503 -504
36 4 5.977931-2 122 -124 +201 -250 +301 -304
#(213 -248)
#(129 -252)
#(129 +257)
37 9 -2.0 +131 -164 +258 -297 +307 -308
38 11 -1.0 +131 -164 +258 -297 +308 -320
#(+132 -163 +259 -296)
39 12 -7.86 +131 -164 +258 -297 +320 -321
40 0 +132 -163 +259 -296 +319 -320
#(+151 -169 +271 -284 +304 -315)
#(+151 -160 +270 -271 +312 -314)
#(+151 -160 +284 -285 +312 -314)
#(+157 -159 +274 -281 +313 -315)
#(+158 -160 +274 -281 -313)
#(+169 -157 +274 -281 +314 -316)
41 1 0.10549 +151 -169 +271 -284 +304 -315
42 1 0.10549 +151 -160 +270 -271 +312 -314
43 1 0.10549 +151 -160 +284 -285 +312 -314
44 1 0.10549 +157 -159 +274 -281 +313 -315
45 1 0.10549 +158 -160 +274 -281 +308 -313
46 1 0.10549 +169 -157 +274 -281 +314 -316
47 9 -2.0 +160 -162 +273 -282 +308 -319
48 10 -2.0 +154 -161 +265 -289 +308 -319
#47 #(-160 +267 -286)
49 0 +154 -160 +267 -286 +308 -319 #42 #43 #45
50 10 -2.0 +155 -156 +259 -260 +308 -319
51 10 -2.0 +155 -156 +295 -296 +308 -319
52 10 -2.0 +154 -155 +259 -296 +308 -319
#(+265 -289)
53 0 +155 -163 +259 -296 +308 -319 #50 #51
#(-161 +265 -289) #(+161 -162 +273 -282)
54 10 -2.0 +153 -154 +295 -296 +308 -319
55 10 -2.0 +151 -126 +295 -296 +308 -319
56 10 -2.0 +151 -126 +259 -260 +308 -319
57 10 -2.0 +153 -154 +259 -260 +308 -319
58 10 -2.0 +151 -152 +266 -272 +308 -304
59 10 -2.0 +151 -152 +283 -287 +308 -304
60 0 +151 -154 +259 -296 +308 -319
#41 #42 #43 #54 #55 #56 #57 #58 #59
#(+165 -166 +270 -285 +308 -310)
#(-126 +201 -250 -304)
61 1 0.10549 +149 -151 +272 -201 +308 -304
62 1 0.10549 +149 -151 +250 -283 +308 -304
63 9 -2.0 +149 -151 +264 -290 +308 -319
#(+272 -283)
64 10 -2.0 +149 -151 +259 -296 +308 -319
#(+264 -290)
65 10 -2.0 +146 -149 +295 -296 +308 -319
66 0 +132 -149 +259 -296 +308 -319
#65 #(+133 -294)
67 10 -2.0 +133 -149 +259 -294 +308 -319
#(+142 -260 -322) #(+134 +260 -298)
68 10 -2.0 +135 -149 +261 -262 +308 -319
69 10 -2.0 +135 -136 +262 -263 +308 -319
70 0 +137 -149 +268 -293 +308 -311
#(-138 -290 -310) #(-102 +310)
#(+138 +269 -290 -310) #(+144 +290 -292 -310)

```

```

71      1  0.10549      +137 -138 +268 -290 +308 -310      #(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
72      1  0.10549      +138 -149 +269 -272 +308 -310
73      1  0.10549      +138 -149 +288 -290 +308 -310      #(+140 -141)
74      0
75      1  0.10549      +144 -149 +290 -292 +308 -310
76      1  0.10549      +139 -144 +291 -293 +308 -310
77      2  0.1187956     +137 -102 +268 -293 +310 -311
78      0
          +138 -149 +272 -288 +308 -310
          #(+102 +201 -250 +309 -304)
          #(+143 -102 +275 -276 +301)
          #(+143 -102 +279 -280 +301)
          #(+147 -102 +276 -277 +301)
          #(+147 -102 +278 -279 +301)
          #(+142 +223 -228) #(+145 +201 -250 -309)
79      1  0.10549      +143 -102 +275 -276 +301 -310
80      1  0.10549      +143 -102 +279 -280 +301 -310
81      1  0.10549      +147 -102 +276 -277 +301 -310
82      1  0.10549      +147 -102 +278 -279 +301 -310
83      0
          +142 -149 +259 -260 +308 -322
84      0
          +134 -149 +260 -298 +308 -319
          #68 #69 #(+137 -149 +268 -293 +308 -311)
          #(+102 +201 -250 -304) #(+142 +223 -228 -304)
85      9 -2.0
          +145 -126 +201 -250 +308 -309
          #(+145 -127 +223 -228) #(+127 -124 +501 -502)
          #(+129 -252) #(+129 +257) #(+124 +254 -255)
86      0
          +129 -126 +201 -250 +308 -304
          #(+252 -257)
87      0
          +102 -126 +201 -250 +309 -306
          #(+102 -127 +223 -228) #(+127 -124 +501 -502)
          #(+129 -252) #(+129 +257) #(+124 +254 -255)
88      0
          +149 -151 +272 -283 +304 -319

```

c end cells

```

c
c surfaces
100 px -1000.0
c 101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 1200.0
129 px 87.9856
131 px -844.042
132 px -823.722
133 px -767.842
134 px -706.882
135 px -548.962
136 px -493.522

```

137	px	-381.762
138	px	-320.802
139	px	-315.722
140	px	-173.482
141	px	-107.442
142	px	-82.042
143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058

239	py	39.4758
240	py	40.7458
241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258
245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225

```

312 pz 283.845
313 pz 342.265
314 pz 375.285
315 pz 390.525
316 pz 395.605
317 pz -50.0
318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y -28.60131 124.1738 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p -0.60029580 0.0 1.0 137.6099
504 p -0.79896920 0.0 1.0 151.1223
505 p 1.43881100 0.0 1.0 83.0219

c end surfaces
mode n
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529

```

```

11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]
m11 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt11 lwtr.01t
c m12=iron at 7.86 g/cc
m12 26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
26058.60c 0.0028
c m13=Heavy concrete at 4.2 g/cc [wt %]
m13 1001.60c -0.0005 8016.60c -0.18
12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
26054.60c -4.073938-2 26056.60c -0.6625828
26057.60c -1.558362-2 26058.60c -2.094288-3
mt13 lwtr.01t
e0 5-7 1.0 30.0
de0 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df0 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
f105:n 275.0 0.0 374.0 0.0
fm105 5.701+10
f115:n 300.0 0.0 374.0 0.0
fm115 5.701+10
f125:n 315.0 0.0 374.0 0.0
fm125 5.701+10
f135:n 332.7 0.0 374.0 0.0
fm135 5.701+10
f145:n 345.0 0.0 374.0 0.0
fm145 5.701+10
f155:n 360.0 0.0 374.0 0.0
fm155 5.701+10
f165:n 375.0 0.0 374.0 0.0
fm165 5.701+10
f175:n 400.0 0.0 374.0 0.0
fm175 5.701+10
f185:n 332.7 0.0 480.0 0.0
fm185 5.701+10
f195:n 350.0 0.0 480.0 0.0
fm195 5.701+10
f205:n 400.0 0.0 480.0 0.0
fm205 5.701+10
f215:n 450.0 0.0 480.0 0.0

```



```
fm215      5.701+10
f225:n     485.0      0.0  480.0  0.0
fm225      5.701+10
sdef       pos=-37.0693 0 118.288 dir=d1 erg=fdir=d2
vec=0.821149209 0.0 0.570713568
si1        s  11 12 13 14 15 16
sp1        1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
si11       h -1.0 -0.7071067
si12       h -0.7071067 0.0
si13       h 0.0 0.5
si14       h 0.5 0.8660254
si15       h 0.8660254 0.9961946
si16       h 0.9961946 1.0
sp11       0 1
sp12       0 1
sp13       0 1
sp14       0 1
sp15       0 1
sp16       0 1
ds2        s 21 22 23 24 25 26
si21       h 1.8245 1.9295
si22       h 1.9295 3.7645
si23       h 3.7645 5.675
si24       h 5.675 7.3865
si25       h 7.3865 8.321
si26       h 8.321 8.753
sp21       0 1
sp22       0 1
sp23       0 1
sp24       0 1
sp25       0 1
sp26       0 1
nps        2000000
prdmp      2j 1
print
```

File for MCNP-4B calculation of the dose rate in the PFNA beam and across
the truck lane for the source in the horizontal position

message: outp=pfna30.o mctal=pfna30.m

```
mcnp file for PFNA facility -- dose rates at selected locations
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
  # (131 -164 +258 -297 +307 -321)
3 1 0.10549 -400 -401 +505 +224 -227 # (503 -504)
4 1 0.10549 -401 +400 +505 +225 -226 # (503 -504)
5 0 142 -127 +223 -228 +308 -304
  # (-400 -401 +505 +224 -227) # (+137 -102 +310)
  # (-401 +400 +505 +225 -226)
6 0 127 -124 +501 -502 +308 -304
  # (-401 +400 +505 +225 -226)
7 0 124 -126 +254 -255 +308 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
  # (+102 -127 +223 -228) # (+127 -124 +501 -502)
  # (+124 +254 -255) # (+129 -252) # (+129 +257)
9 1 0.10549 102 -124 +222 -229 +301 -304
  # (+129 -252) # (+129 +257)
  # (127 +501 -502) # (-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 # (218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 # (221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 # (221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 # (221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 # (221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 # (221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 # (221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 # (221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 # (221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 # (221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 # (221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 # (221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
  # (221 -230)
  # (103 -104 +217 -234)
  # (104 -105 +216 -235)
  # (105 -107 +219 -232)
  # (107 -108 +219 -220) # (107 -108 +231 -232)
  # (106 -109 +212 -218) # (106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
  # (221 -230)
  # (109 -110 +211 -237)
  # (110 -111 +210 -238)
  # (111 -112 +209 -239)
  # (112 -113 +208 -240)
  # (113 -114 +207 -241)
  # (114 -115 +206 -242)
  # (115 -116 +205 -243)
  # (116 -117 +204 -244)
  # (117 -118 +203 -245)
  # (118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
  # (-124 +214 -247) # (124 +253 -256)
  # (122 +248) # (122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
  # (221 -230) # (104 -220) # (104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 # (105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 # (105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
  # (103 -120 202 -221 302 -303)
  # (120 -123 215 -221 302 -303)
  # (121 -214)
29 4 5.977931-2 102 -124 +229 -250 +301 -304
  # (103 -120 230 -249 302 -303)
  # (120 -123 230 -246 302 -303)
  # (121 +247)
```

30	4	5.977931-2	124 -126 +252 -254 +301 -304
			#(-125 +213 -253)
31	4	5.977931-2	124 -126 +255 -257 +301 -304
			#(-125 +256 -248)
32	0		+167 -168 +274 -281 +317 -318
33	0		+165 -166 +270 -285 +308 -310
			#(+167 -168 +274 -281 +317 -318)
34	0		-400 +505 +224 -227 +503 -504
35	0		-401 +400 +505 +225 -226 +503 -504
36	4	5.977931-2	122 -124 +201 -250 +301 -304
			#(213 -248)
			#(129 -252)
			#(129 +257)
37	9	-2.0	+131 -164 +258 -297 +307 -308
38	11	-1.0	+131 -164 +258 -297 +308 -320
			#(+132 -163 +259 -296)
39	12	-7.86	+131 -164 +258 -297 +320 -321
40	0		+132 -163 +259 -296 +319 -320
			#(+151 -169 +271 -284 +304 -315)
			#(+151 -160 +270 -271 +312 -314)
			#(+151 -160 +284 -285 +312 -314)
			#(+157 -159 +274 -281 +313 -315)
			#(+158 -160 +274 -281 -313)
			#(+169 -157 +274 -281 +314 -316)
41	1	0.10549	+151 -169 +271 -284 +304 -315
42	1	0.10549	+151 -160 +270 -271 +312 -314
43	1	0.10549	+151 -160 +284 -285 +312 -314
44	1	0.10549	+157 -159 +274 -281 +313 -315
45	1	0.10549	+158 -160 +274 -281 +308 -313
46	1	0.10549	+169 -157 +274 -281 +314 -316
47	9	-2.0	+160 -162 +273 -282 +308 -319
48	10	-2.0	+154 -161 +265 -289 +308 -319
			#47 #(-160 +267 -286)
49	0		+154 -160 +267 -286 +308 -319 #42 #43 #45
50	10	-2.0	+155 -156 +259 -260 +308 -319
51	10	-2.0	+155 -156 +295 -296 +308 -319
52	10	-2.0	+154 -155 +259 -296 +308 -319
			#(+265 -289)
53	0		+155 -163 +259 -296 +308 -319 #50 #51
			#(-161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0	+153 -154 +295 -296 +308 -319
55	10	-2.0	+151 -126 +295 -296 +308 -319
56	10	-2.0	+151 -126 +259 -260 +308 -319
57	10	-2.0	+153 -154 +259 -260 +308 -319
58	10	-2.0	+151 -152 +266 -272 +308 -304
59	10	-2.0	+151 -152 +283 -287 +308 -304
60	0		+151 -154 +259 -296 +308 -319
			#41 #42 #43 #54 #55 #56 #57 #58 #59
			#(+165 -166 +270 -285 +308 -310)
			#(-126 +201 -250 -304)
61	1	0.10549	+149 -151 +272 -201 +308 -304
62	1	0.10549	+149 -151 +250 -283 +308 -304
63	9	-2.0	+149 -151 +264 -290 +308 -319
			#(+272 -283)
64	10	-2.0	+149 -151 +259 -296 +308 -319
			#(+264 -290)
65	10	-2.0	+146 -149 +295 -296 +308 -319
66	0		+132 -149 +259 -296 +308 -319
			#65 #(+133 -294)
67	10	-2.0	+133 -149 +259 -294 +308 -319
			#(+142 -260 -322) #(+134 +260 -298)
68	10	-2.0	+135 -149 +261 -262 +308 -319
69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311
			#(-138 -290 -310) #(-102 +310)
			#(+138 +269 -290 -310) #(+144 +290 -292 -310)
			#(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71	1	0.10549	+137 -138 +268 -290 +308 -310
72	1	0.10549	+138 -149 +269 -272 +308 -310
73	1	0.10549	+138 -149 +288 -290 +308 -310 #(+140 -141)
74	0		+140 -141 +288 -290 +308 -310
75	1	0.10549	+144 -149 +290 -292 +308 -310

```

76      1  0.10549  +139 -144 +291 -293 +308 -310
77      2  0.1187956 +137 -102 +268 -293 +310 -311
78      0
          +138 -149 +272 -288 +308 -310
          #(+102 +201 -250 +309 -304)
          #(+143 -102 +275 -276 +301)
          #(+143 -102 +279 -280 +301)
          #(+147 -102 +276 -277 +301)
          #(+147 -102 +278 -279 +301)
          #(+142 +223 -228) #(+145 +201 -250 -309)
79      1  0.10549  +143 -102 +275 -276 +301 -310
80      1  0.10549  +143 -102 +279 -280 +301 -310
81      1  0.10549  +147 -102 +276 -277 +301 -310
82      1  0.10549  +147 -102 +278 -279 +301 -310
83      0
          +142 -149 +259 -260 +308 -322
84      0
          +134 -149 +260 -298 +308 -319
          #68 #69 #(+137 -149 +268 -293 +308 -311)
          #(+102 +201 -250 -304) #(+142 +223 -228 -304)
85      9 -2.0
          +145 -126 +201 -250 +308 -309
          #(+145 -127 +223 -228) #(+127 -124 +501 -502)
          #(+129 -252) #(+129 +257) #(+124 +254 -255)
86      0
          +129 -126 +201 -250 +308 -304
          #(+252 -257)
87      0
          +102 -126 +201 -250 +309 -306
          #(+102 -127 +223 -228) #(+127 -124 +501 -502)
          #(+129 -252) #(+129 +257) #(+124 +254 -255)
88      0
          +149 -151 +272 -283 +304 -319

```

```

c      end cells
c
c      surfaces
100    px      -1000.0
c      101     px      10.3124
102    px      20.7264
103    px      22.6314
104    px      27.7114
105    px      28.9814
106    px      31.5214
107    px      36.6014
108    px      42.9514
109    px      49.3014
110    px      51.8414
111    px      54.3814
112    px      56.9214
113    px      59.4614
114    px      62.0014
115    px      64.5414
116    px      67.0814
117    px      69.6214
118    px      72.1614
119    px      74.7014
120    px      76.3016
121    px      78.2066
122    px      86.0806
123    px      112.649
124    px      114.554
125    px      119.888
126    px      121.158
127    px      50.5714
128    px      1200.0
129    px      87.9856
131    px      -844.042
132    px      -823.722
133    px      -767.842
134    px      -706.882
135    px      -548.962
136    px      -493.522
137    px      -381.762
138    px      -320.802
139    px      -315.722
140    px      -173.482
141    px      -107.442
142    px      -82.042

```

143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058
239	py	39.4758
240	py	40.7458
241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258

245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225
312	pz	283.845
313	pz	342.265
314	pz	375.285
315	pz	390.525
316	pz	395.605
317	pz	-50.0

```

318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y 10.3124 0.0 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p 0.06683670 0.0 1.0 -2.518636
504 p -0.06683670 0.0 1.0 2.518636
505 px 10.3124

c end surfaces
mode n p
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]

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m11      1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
         11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
         14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
         26054.60c -7.91056-4 26056.60c -1.286568-2
         26057.60c -3.025946-4 26058.60c -4.06658-5
mt11     lwtr.01t
c        m12=iron at 7.86 g/cc
m12     26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
         26058.60c 0.0028
c        m13=Heavy concrete at 4.2 g/cc [wt %]
m13     1001.60c -0.0005 8016.60c -0.18
         12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
         16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
         26054.60c -4.073938-2 26056.60c -0.6625828
         26057.60c -1.558362-2 26058.60c -2.094288-3
mt13     lwtr.01t
f105:n   116.078 0.0 0.0 0.0
del105   2.07002-7 7.69672-7 1.75386-6 3.71293-6
         7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
         2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
         2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
         7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
         2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
         7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
         2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
         3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
         8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
         2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
         4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
         1.11070+1 1.35661+1
df105    3.70370-3 4.37060-3 4.52500-3 4.57410-3
         4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
         4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
         3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
         3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
         7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
         1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
         4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
         6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
         1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
         1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
         1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
         1.63200-1 2.00340-1
         5.701+10
fm105
f115:n   177.038 0.0 0.0 0.0
del115   2.07002-7 7.69672-7 1.75386-6 3.71293-6
         7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
         2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
         2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
         7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
         2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
         7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
         2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
         3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
         8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
         2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
         4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
         1.11070+1 1.35661+1
df115    3.70370-3 4.37060-3 4.52500-3 4.57410-3
         4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
         4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
         3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
         3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
         7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
         1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
         4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
         6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
         1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
         1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
         1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
         1.63200-1 2.00340-1
         5.701+10
fm115

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f125:n      237.998 0.0 0.0 0.0
del125      2.07002-7 7.69672-7 1.75386-6 3.71293-6
            7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
            2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
            2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
            7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
            2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
            7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
            2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
            3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
            8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
            2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
            4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
            1.11070+1 1.35661+1
df125      3.70370-3 4.37060-3 4.52500-3 4.57410-3
            4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
            4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
            3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
            3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
            7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
            1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
            4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
            6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
            1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
            1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
            1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
            1.63200-1 2.00340-1
fm125      5.701+10
f135:n      359.918 0.0 0.0 0.0
del135      2.07002-7 7.69672-7 1.75386-6 3.71293-6
            7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
            2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
            2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
            7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
            2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
            7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
            2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
            3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
            8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
            2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
            4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
            1.11070+1 1.35661+1
df135      3.70370-3 4.37060-3 4.52500-3 4.57410-3
            4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
            4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
            3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
            3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
            7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
            1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
            4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
            6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
            1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
            1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
            1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
            1.63200-1 2.00340-1
fm135      5.701+10
f145:n      420.878 0.0 0.0 0.0
del145      2.07002-7 7.69672-7 1.75386-6 3.71293-6
            7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
            2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
            2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
            7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
            2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
            7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
            2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
            3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
            8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
            2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
            4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
            1.11070+1 1.35661+1
df145      3.70370-3 4.37060-3 4.52500-3 4.57410-3
            4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3

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4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm145 5.701+10
f155:n 481.838 0.0 0.0 0.0
de155 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df155 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm155 5.701+10
f205:p 116.078 0.0 0.0 0.0
de205 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df205 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm205 5.701+10
f215:p 177.038 0.0 0.0 0.0
de215 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df215 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm215 5.701+10
f225:p 237.998 0.0 0.0 0.0
de225 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df225 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3

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1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm225 5.701+10
f235:p 359.918 0.0 0.0 0.0
de235 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df235 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm235 5.701+10
f245:p 420.878 0.0 0.0 0.0
de245 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df245 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm245 5.701+10
f255:p 481.838 0.0 0.0 0.0
de255 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df255 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm255 5.701+10
sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2
si1 s 11 12 13 14 15 16
sp1 1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
si11 h -1.0 -0.7071067
si12 h -0.7071067 0.0
si13 h 0.0 0.5
si14 h 0.5 0.8660254
si15 h 0.8660254 0.9961946
si16 h 0.9961946 1.0
sp11 0 1
sp12 0 1
sp13 0 1
sp14 0 1
sp15 0 1
sp16 0 1
ds2 s 21 22 23 24 25 26
si21 h 1.8245 1.9295
si22 h 1.9295 3.7645
si23 h 3.7645 5.675
si24 h 5.675 7.3865
si25 h 7.3865 8.321
si26 h 8.321 8.753
sp21 0 1
sp22 0 1
sp23 0 1
sp24 0 1
sp25 0 1
sp26 0 1
nps 2000000
prcimp 2j 1
print

```

File for MCNP-4B calculation of the dose rate in the PFNA beam and across
the truck lane for the source in the maximum up position

message: outp=pfna31.o mctal=pfna31.m

```
mcnp file for PFNA facility -- dose rates at selected locations
c source in nominal maximum upward position (34.8 deg.) of the
c movable vertical collimator. check sdef, cells 3-6, surfaces
c 401 and 503-505, and the sign on surface 505.
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
#(131 -164 +258 -297 +307 -321)
3 1 0.10549 -400 -401 +505 +224 -227 #(503 -504)
4 1 0.10549 -401 +400 +505 +225 -226 #(503 -504)
5 0 142 -127 +223 -228 +308 -304
#(-400 -401 +505 +224 -227) #(+137 -102 +310)
#(-401 +400 +505 +225 -226)
6 0 127 -124 +501 -502 +308 -304
#(-401 +400 +505 +225 -226)
7 0 124 -126 +254 -255 +308 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
#(+102 -127 +223 -228) #(+127 -124 +501 -502)
#(+124 +254 -255) #(+129 -252) #(+129 +257)
9 1 0.10549 102 -124 +222 -229 +301 -304
#(+129 -252) #(+129 +257)
#(127 +501 -502) #(-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
#(221 -230)
#(103 -104 +217 -234)
#(104 -105 +216 -235)
#(105 -107 +219 -232)
#(107 -108 +219 -220) #(107 -108 +231 -232)
#(106 -109 +212 -218) #(106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
#(221 -230)
#(109 -110 +211 -237)
#(110 -111 +210 -238)
#(111 -112 +209 -239)
#(112 -113 +208 -240)
#(113 -114 +207 -241)
#(114 -115 +206 -242)
#(115 -116 +205 -243)
#(116 -117 +204 -244)
#(117 -118 +203 -245)
#(118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
#(-124 +214 -247) #(124 +253 -256)
#(122 +248) #(122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
#(221 -230) #(104 -220) #(104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
#(103 -120 202 -221 302 -303)
#(120 -123 215 -221 302 -303)
#(121 -214)
```

29	4	5.977931-2	102 -124 +229 -250 +301 -304 #(103 -120 230 -249 302 -303) #(120 -123 230 -246 302 -303) #(121 +247)
30	4	5.977931-2	124 -126 +252 -254 +301 -304 #(-125 +213 -253)
31	4	5.977931-2	124 -126 +255 -257 +301 -304 #(-125 +256 -248)
32	0		+167 -168 +274 -281 +317 -318
33	0		+165 -166 +270 -285 +308 -310 #(+167 -168 +274 -281 +317 -318)
34	0		-400 +505 +224 -227 +503 -504
35	0		-401 +400 +505 +225 -226 +503 -504
36	4	5.977931-2	122 -124 +201 -250 +301 -304 #(213 -248) #(129 -252) #(129 +257)
37	9	-2.0	+131 -164 +258 -297 +307 -308
38	11	-1.0	+131 -164 +258 -297 +308 -320 #(+132 -163 +259 -296)
39	12	-7.86	+131 -164 +258 -297 +320 -321
40	0		+132 -163 +259 -296 +319 -320 #(+151 -169 +271 -284 +304 -315) #(+151 -160 +270 -271 +312 -314) #(+151 -160 +284 -285 +312 -314) #(+157 -159 +274 -281 +313 -315) #(+158 -160 +274 -281 -313) #(+169 -157 +274 -281 +314 -316)
41	1	0.10549	+151 -169 +271 -284 +304 -315
42	1	0.10549	+151 -160 +270 -271 +312 -314
43	1	0.10549	+151 -160 +284 -285 +312 -314
44	1	0.10549	+157 -159 +274 -281 +313 -315
45	1	0.10549	+158 -160 +274 -281 +308 -313
46	1	0.10549	+169 -157 +274 -281 +314 -316
47	9	-2.0	+160 -162 +273 -282 +308 -319
48	10	-2.0	+154 -161 +265 -289 +308 -319 #47 #(-160 +267 -286)
49	0		+154 -160 +267 -286 +308 -319 #42 #43 #45
50	10	-2.0	+155 -156 +259 -260 +308 -319
51	10	-2.0	+155 -156 +295 -296 +308 -319
52	10	-2.0	+154 -155 +259 -296 +308 -319 #(+265 -289)
53	0		+155 -163 +259 -296 +308 -319 #50 #51 #(-161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0	+153 -154 +295 -296 +308 -319
55	10	-2.0	+151 -126 +295 -296 +308 -319
56	10	-2.0	+151 -126 +259 -260 +308 -319
57	10	-2.0	+153 -154 +259 -260 +308 -319
58	10	-2.0	+151 -152 +266 -272 +308 -304
59	10	-2.0	+151 -152 +283 -287 +308 -304
60	0		+151 -154 +259 -296 +308 -319 #41 #42 #43 #54 #55 #56 #57 #58 #59 #(+165 -166 +270 -285 +308 -310) #(-126 +201 -250 -304)
61	1	0.10549	+149 -151 +272 -201 +308 -304
62	1	0.10549	+149 -151 +250 -283 +308 -304
63	9	-2.0	+149 -151 +264 -290 +308 -319 #(+272 -283)
64	10	-2.0	+149 -151 +259 -296 +308 -319 #(+264 -290)
65	10	-2.0	+146 -149 +295 -296 +308 -319
66	0		+132 -149 +259 -296 +308 -319 #65 #(+133 -294)
67	10	-2.0	+133 -149 +259 -294 +308 -319 #(+142 -260 -322) #(+134 +260 -298)
68	10	-2.0	+135 -149 +261 -262 +308 -319
69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311 #(-138 -290 -310) #(-102 +310) #(+138 +269 -290 -310) #(+144 +290 -292 -310) #(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71	1	0.10549	+137 -138 +268 -290 +308 -310

72	1	0.10549	+138	-149	+269	-272	+308	-310	
73	1	0.10549	+138	-149	+288	-290	+308	-310	#+(+140 -141)
74	0		+140	-141	+288	-290	+308	-310	
75	1	0.10549	+144	-149	+290	-292	+308	-310	
76	1	0.10549	+139	-144	+291	-293	+308	-310	
77	2	0.1187956	+137	-102	+268	-293	+310	-311	
78	0		+138	-149	+272	-288	+308	-310	
			#+(+102	+201	-250	+309	-304)		
			#+(+143	-102	+275	-276	+301)		
			#+(+143	-102	+279	-280	+301)		
			#+(+147	-102	+276	-277	+301)		
			#+(+147	-102	+278	-279	+301)		
			#+(+142	+223	-228)	#+(+145	+201	-250	-309)
79	1	0.10549	+143	-102	+275	-276	+301	-310	
80	1	0.10549	+143	-102	+279	-280	+301	-310	
81	1	0.10549	+147	-102	+276	-277	+301	-310	
82	1	0.10549	+147	-102	+278	-279	+301	-310	
83	0		+142	-149	+259	-260	+308	-322	
84	0		+134	-149	+260	-298	+308	-319	
			#68	#69	#+(+137	-149	+268	-293	+308 -311)
			#+(+102	+201	-250	-304)	#+(+142	+223	-228 -304)
85	9	-2.0	+145	-126	+201	-250	+308	-309	
			#+(+145	-127	+223	-228)	#+(+127	-124	+501 -502)
			#+(+129	-252)	#+(+129	+257)	#+(+124	+254	-255)
86	0		+129	-126	+201	-250	+308	-304	
			#+(+252	-257)					
87	0		+102	-126	+201	-250	+309	-306	
			#+(+102	-127	+223	-228)	#+(+127	-124	+501 -502)
			#+(+129	-252)	#+(+129	+257)	#+(+124	+254	-255)
88	0		+149	-151	+272	-283	+304	-319	

c end cells

c

c

100

c

102

103

104

105

106

107

108

109

110

111

112

113

114

115

116

117

118

119

120

121

122

123

124

125

126

127

128

129

131

132

133

134

135

136

137

138

px -1000.0

101 px 10.3124

px 20.7264

px 22.6314

px 27.7114

px 28.9814

px 31.5214

px 36.6014

px 42.9514

px 49.3014

px 51.8414

px 54.3814

px 56.9214

px 59.4614

px 62.0014

px 64.5414

px 67.0814

px 69.6214

px 72.1614

px 74.7014

px 76.3016

px 78.2066

px 86.0806

px 112.649

px 114.554

px 119.888

px 121.158

px 50.5714

px 1200.0

px 87.9856

px -844.042

px -823.722

px -767.842

px -706.882

px -548.962

px -493.522

px -381.762

px -320.802

139	px	-315.722
140	px	-173.482
141	px	-107.442
142	px	-82.042
143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058
239	py	39.4758
240	py	40.7458

241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258
245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225
312	pz	283.845
313	pz	342.265


```

314 pz 375.285
315 pz 390.525
316 pz 395.605
317 pz -50.0
318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y -28.60131 124.1738 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p -0.60029580 0.0 1.0 137.6099
504 p -0.79896920 0.0 1.0 151.1223
505 p 1.43881100 0.0 1.0 83.0219

c end surfaces
mode n p
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044

```

```

26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]
m11 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt11 lwtr.01t
c m12=iron at 7.86 g/cc
m12 26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
26058.60c 0.0028
c m13=Heavy concrete at 4.2 g/cc [wt %]
m13 1001.60c -0.0005 8016.60c -0.18
12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
26054.60c -4.073938-2 26056.60c -0.6625828
26057.60c -1.558362-2 26058.60c -2.094288-3
mt13 lwtr.01t
f105:n 116.078 0.0 0.0 0.0
del105 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df105 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
5.701+10
fm105 177.038 0.0 0.0 0.0
f115:n 2.07002-7 7.69672-7 1.75386-6 3.71293-6
del115 7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df115 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1

```

	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm115	5.701+10				
f125:n	237.998	0.0	0.0	0.0	
de125	2.07002-7	7.69672-7	1.75386-6	3.71293-6	
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df125	3.70370-3	4.37060-3	4.52500-3	4.57410-3	
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm125	5.701+10				
f135:n	359.918	0.0	0.0	0.0	
de135	2.07002-7	7.69672-7	1.75386-6	3.71293-6	
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df135	3.70370-3	4.37060-3	4.52500-3	4.57410-3	
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm135	5.701+10				
f145:n	420.878	0.0	0.0	0.0	
de145	2.07002-7	7.69672-7	1.75386-6	3.71293-6	
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0

	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
df145	1.11070+1	1.35661+1			
		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm145	5.701+10				
f155:n	481.838	0.0	0.0	0.0	
de155		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df155		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm155	5.701+10				
f205:p	116.078	0.0	0.0	0.0	
de205		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df205		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm205	5.701+10				
f215:p	177.038	0.0	0.0	0.0	
de215		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df215		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm215	5.701+10				
f225:p	237.998	0.0	0.0	0.0	
de225		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0

```

2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df225 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm225 5.701+10
f235:p 359.918 0.0 0.0 0.0
de235 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df235 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm235 5.701+10
f245:p 420.878 0.0 0.0 0.0
de245 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df245 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm245 5.701+10
f255:p 481.838 0.0 0.0 0.0
de255 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df255 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm255 5.701+10
sdef pos=-37.0693 0 118.288 dir=d1 erg=fdir=d2
vec=0.821149209 0.0 0.570713568
si1 s 11 12 13 14 15 16
sp1 1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
si11 h -1.0 -0.7071067
si12 h -0.7071067 0.0
si13 h 0.0 0.5
si14 h 0.5 0.8660254
si15 h 0.8660254 0.9961946
si16 h 0.9961946 1.0
sp11 0 1
sp12 0 1
sp13 0 1
sp14 0 1
sp15 0 1
sp16 0 1
ds2 s 21 22 23 24 25 26
si21 h 1.8245 1.9295
si22 h 1.9295 3.7645
si23 h 3.7645 5.675
si24 h 5.675 7.3865
si25 h 7.3865 8.321
si26 h 8.321 8.753
sp21 0 1
sp22 0 1
sp23 0 1
sp24 0 1
sp25 0 1

```

sp26 0 1
nps 2000000
prcmp 2j 1
print

File for MCNP-4B calculation of the dose rate in the PFNA beam and across the truck lane and ORIGEN neutron spectra within the stationary collimator for the source in the maximum down position

message: outp=pfna32.o mctal=pfna32.m

```

mcnp file for PFNA facility -- dose rates at selected locations
c source in nominal minimum downward position (-8.6 deg.) of the
c movable vertical collimator. check sdef, cells 3-6, surfaces
c 401 and 503-505, and the sign on surface 505.
C
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
#(131 -164 +258 -297 +307 -321)
3 1 0.10549 -400 -401 -505 +224 -227 #(503 -504)
4 1 0.10549 -401 +400 -505 +225 -226 #(503 -504)
5 0 142 -127 +223 -228 +308 -304
#(-400 -401 -505 +224 -227) #(+137 -102 +310)
#(-401 +400 -505 +225 -226)
6 0 127 -124 +501 -502 +308 -304
#(-401 +400 -505 +225 -226)
7 0 124 -126 +254 -255 +308 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
#(+102 -127 +223 -228) #(+127 -124 +501 -502)
#(+124 +254 -255) #(+129 -252) #(+129 +257)
9 1 0.10549 102 -124 +222 -229 +301 -304
#(+129 -252) #(+129 +257)
#(127 +501 -502) #(-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
#(221 -230)
#(103 -104 +217 -234)
#(104 -105 +216 -235)
#(105 -107 +219 -232)
#(107 -108 +219 -220) #(107 -108 +231 -232)
#(106 -109 +212 -218) #(106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
#(221 -230)
#(109 -110 +211 -237)
#(110 -111 +210 -238)
#(111 -112 +209 -239)
#(112 -113 +208 -240)
#(113 -114 +207 -241)
#(114 -115 +206 -242)
#(115 -116 +205 -243)
#(116 -117 +204 -244)
#(117 -118 +203 -245)
#(118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
#(-124 +214 -247) #(124 +253 -256)
#(122 +248) #(122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
#(221 -230) #(104 -220) #(104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
#(103 -120 202 -221 302 -303)

```

```

#(120 -123 215 -221 302 -303)
#(121 -214)
29 4 5.977931-2 102 -124 +229 -250 +301 -304
#(103 -120 230 -249 302 -303)
#(120 -123 230 -246 302 -303)
#(121 +247)
30 4 5.977931-2 124 -126 +252 -254 +301 -304
#(-125 +213 -253)
31 4 5.977931-2 124 -126 +255 -257 +301 -304
#(-125 +256 -248)
32 0 +167 -168 +274 -281 +317 -318
33 0 +165 -166 +270 -285 +308 -310
#(+167 -168 +274 -281 +317 -318)
34 0 -400 -505 +224 -227 +503 -504
35 0 -401 +400 -505 +225 -226 +503 -504
36 4 5.977931-2 122 -124 +201 -250 +301 -304
#(213 -248)
#(129 -252)
#(129 +257)
37 9 -2.0 +131 -164 +258 -297 +307 -308
38 11 -1.0 +131 -164 +258 -297 +308 -320
#(+132 -163 +259 -296)
39 12 -7.86 +131 -164 +258 -297 +320 -321
40 0 +132 -163 +259 -296 +319 -320
#(+151 -169 +271 -284 +304 -315)
#(+151 -160 +270 -271 +312 -314)
#(+151 -160 +284 -285 +312 -314)
#(+157 -159 +274 -281 +313 -315)
#(+158 -160 +274 -281 -313)
#(+169 -157 +274 -281 +314 -316)
41 1 0.10549 +151 -169 +271 -284 +304 -315
42 1 0.10549 +151 -160 +270 -271 +312 -314
43 1 0.10549 +151 -160 +284 -285 +312 -314
44 1 0.10549 +157 -159 +274 -281 +313 -315
45 1 0.10549 +158 -160 +274 -281 +308 -313
46 1 0.10549 +169 -157 +274 -281 +314 -316
47 9 -2.0 +160 -162 +273 -282 +308 -319
48 10 -2.0 +154 -161 +265 -289 +308 -319
#47 #(-160 +267 -286)
49 0 +154 -160 +267 -286 +308 -319 #42 #43 #45
50 10 -2.0 +155 -156 +259 -260 +308 -319
51 10 -2.0 +155 -156 +295 -296 +308 -319
52 10 -2.0 +154 -155 +259 -296 +308 -319
#(+265 -289)
53 0 +155 -163 +259 -296 +308 -319 #50 #51
#(-161 +265 -289) #(+161 -162 +273 -282)
54 10 -2.0 +153 -154 +295 -296 +308 -319
55 10 -2.0 +151 -126 +295 -296 +308 -319
56 10 -2.0 +151 -126 +259 -260 +308 -319
57 10 -2.0 +153 -154 +259 -260 +308 -319
58 10 -2.0 +151 -152 +266 -272 +308 -304
59 10 -2.0 +151 -152 +283 -287 +308 -304
60 0 +151 -154 +259 -296 +308 -319
#41 #42 #43 #54 #55 #56 #57 #58 #59
#(+165 -166 +270 -285 +308 -310)
#(-126 +201 -250 -304)
61 1 0.10549 +149 -151 +272 -201 +308 -304
62 1 0.10549 +149 -151 +250 -283 +308 -304
63 9 -2.0 +149 -151 +264 -290 +308 -319
#(+272 -283)
64 10 -2.0 +149 -151 +259 -296 +308 -319
#(+264 -290)
65 10 -2.0 +146 -149 +295 -296 +308 -319
66 0 +132 -149 +259 -296 +308 -319
#65 #(+133 -294)
67 10 -2.0 +133 -149 +259 -294 +308 -319
#(+142 -260 -322) #(+134 +260 -298)
68 10 -2.0 +135 -149 +261 -262 +308 -319
69 10 -2.0 +135 -136 +262 -263 +308 -319
70 0 +137 -149 +268 -293 +308 -311
#(-138 -290 -310) #(-102 +310)
#(+138 +269 -290 -310) #(+144 +290 -292 -310)

```



```

71 1 0.10549 +137 -138 +268 -290 +308 -310 #(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
72 1 0.10549 +138 -149 +269 -272 +308 -310
73 1 0.10549 +138 -149 +288 -290 +308 -310 #(+140 -141)
74 0 +140 -141 +288 -290 +308 -310
75 1 0.10549 +144 -149 +290 -292 +308 -310
76 1 0.10549 +139 -144 +291 -293 +308 -310
77 2 0.1187956 +137 -102 +268 -293 +310 -311
78 0 +138 -149 +272 -288 +308 -310
    #(+102 +201 -250 +309 -304)
    #(+143 -102 +275 -276 +301)
    #(+143 -102 +279 -280 +301)
    #(+147 -102 +276 -277 +301)
    #(+147 -102 +278 -279 +301)
    #(+142 +223 -228) #(+145 +201 -250 -309)
79 1 0.10549 +143 -102 +275 -276 +301 -310
80 1 0.10549 +143 -102 +279 -280 +301 -310
81 1 0.10549 +147 -102 +276 -277 +301 -310
82 1 0.10549 +147 -102 +278 -279 +301 -310
83 0 +142 -149 +259 -260 +308 -322
84 0 +134 -149 +260 -298 +308 -319
    #68 #69 #(+137 -149 +268 -293 +308 -311)
    #(+102 +201 -250 -304) #(+142 +223 -228 -304)
    +145 -126 +201 -250 +308 -309
85 9 -2.0 #(+145 -127 +223 -228) #(+127 -124 +501 -502)
    #(+129 -252) #(+129 +257) #(+124 +254 -255)
    +129 -126 +201 -250 +308 -304
86 0 #(+252 -257)
87 0 +102 -126 +201 -250 +309 -306
    #(+102 -127 +223 -228) #(+127 -124 +501 -502)
    #(+129 -252) #(+129 +257) #(+124 +254 -255)
88 0 +149 -151 +272 -283 +304 -319

```

c end cells

c

c surfaces

```

100 px -1000.0
c 101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 1200.0
129 px 87.9856
131 px -844.042
132 px -823.722
133 px -767.842
134 px -706.882
135 px -548.962
136 px -493.522

```

137	px	-381.762
138	px	-320.802
139	px	-315.722
140	px	-173.482
141	px	-107.442
142	px	-82.042
143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058

239	py	39.4758
240	py	40.7458
241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258
245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225

```

312 pz 283.845
313 pz 342.265
314 pz 375.285
315 pz 390.525
316 pz 395.605
317 pz -50.0
318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y 7.866053 -32.53536 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p 0.22029930 0.0 1.0 -34.07997
504 p 0.08355454 0.0 1.0 -28.66622
505 p -6.61219100 0.0 1.0 -84.54721

c end surfaces
mode n p
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529

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11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]
m11 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt11 lwtr.01t
c m12=iron at 7.86 g/cc
m12 26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
26058.60c 0.0028
c m13=Heavy concrete at 4.2 g/cc [wt %]
m13 1001.60c -0.0005 8016.60c -0.18
12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
26054.60c -4.073938-2 26056.60c -0.6625828
26057.60c -1.558362-2 26058.60c -2.094288-3
mt13 lwtr.01t
f105:n 116.078 0.0 0.0 0.0
del105 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df105 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm105 5.701+10
f115:n 177.038 0.0 0.0 0.0
del115 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df115 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2

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6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
5.701+10
fm115
f125:n
de125
237.998 0.0 0.0 0.0
2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df125
3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
5.701+10
fm125
f135:n
de135
359.918 0.0 0.0 0.0
2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df135
3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
5.701+10
fm135
f145:n
de145
420.878 0.0 0.0 0.0
2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1

```

```

8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df145 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm145 5.701+10
f155:n 481.838 0.0 0.0 0.0
de155 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df155 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm155 5.701+10
f165:n 116.078 0.0 0.0 0.0
e165 5-7 1.0 30.0
fm165 5.701+10
f175:n 116.078 0.0 0.0 0.0
e175 5-7 1.0 30.0
fm175 5.701+10
de175 1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
1.0-9 5.0-9 1.0-8 2.53-8 5.0-8 1.0-7 5.0-7
5.00001-7 20.0
df175 159.0597 71.1337 50.2991 22.4944 15.906 7.11337
5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
1.0-15 1.0-15
f205:p 116.078 0.0 0.0 0.0
de205 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df205 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm205 5.701+10
f215:p 177.038 0.0 0.0 0.0
de215 1.50000-2 3.25000-2 5.75000-2 8.50000-2

```

```

1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df215      2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm215      5.701+10
f225:p     237.998 0.0 0.0 0.0
de225      1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df225      2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm225      5.701+10
f235:p     359.918 0.0 0.0 0.0
de235      1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df235      2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm235      5.701+10
f245:p     420.878 0.0 0.0 0.0
de245      1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df245      2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm245      5.701+10
f255:p     481.838 0.0 0.0 0.0
de255      1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df255      2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm255      5.701+10
sdef       pos=-2.3304 0 -30.993 dir=d1 erg=fdir=d2
vec=0.988756381 0.0 -0.149535343
sil        s 11 12 13 14 15 16
sp1        1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
sil1       h -1.0 -0.7071067
sil2       h -0.7071067 0.0
sil3       h 0.0 0.5
sil4       h 0.5 0.8660254
sil5       h 0.8660254 0.9961946
sil6       h 0.9961946 1.0
sp11       0 1
sp12       0 1
sp13       0 1
sp14       0 1

```



```
sp15 0 1
sp16 0 1
ds2 s 21 22 23 24 25 26
si21 h 1.8245 1.9295
si22 h 1.9295 3.7645
si23 h 3.7645 5.675
si24 h 5.675 7.3865
si25 h 7.3865 8.321
si26 h 8.321 8.753
sp21 0 1
sp22 0 1
sp23 0 1
sp24 0 1
sp25 0 1
sp26 0 1
nps 2000000
prtmp 2j 1
print
```

File for MCNP-4B calculation of the dose-rate distribution in the middle of salted beef cargo at the center of the PFNA facility truck lane for the source in the horizontal position

message: outp=pfna29.o mctal=pfna29.m

```

mcnp file for PFNA facility -- dose rates at selected locations
1      0      -100:128:-200:251:-300:305
2      0      100 -128 200 -251 300 -305
          #(131 -164 +258 -297 +307 -321)
3      1 0.10549 -400 -401 +505 +224 -227 #(503 -504)
4      1 0.10549 -401 +400 +505 +225 -226 #(503 -504)
5      0      142 -127 +223 -228 +308 -304
          #(-400 -401 +505 +224 -227) #(+137 -102 +310)
          #(-401 +400 +505 +225 -226)
6      0      127 -124 +501 -502 +308 -304
          #(-401 +400 +505 +225 -226)
7      0      124 -126 +254 -255 +308 -304
8      5 8.734441-2 102 -126 +201 -250 +306 -301
          #(+102 -127 +223 -228) #(+127 -124 +501 -502)
          #(+124 +254 -255) #(+129 -252) #(+129 +257)
9      1 0.10549 102 -124 +222 -229 +301 -304
          #(+129 -252) #(+129 +257)
          #(+127 +501 -502) #(-127 +223 -228)
10     1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11     1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12     1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13     1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14     1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15     1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16     1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17     1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18     1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19     1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20     1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21     2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22     2 0.1187956 103 -109 +202 -249 +302 -303
          #(221 -230)
          #(103 -104 +217 -234)
          #(104 -105 +216 -235)
          #(105 -107 +219 -232)
          #(107 -108 +219 -220) #(107 -108 +231 -232)
          #(106 -109 +212 -218) #(106 -109 +233 -236)
23     2 0.1187956 109 -120 +202 -249 +302 -303
          #(221 -230)
          #(109 -110 +211 -237)
          #(110 -111 +210 -238)
          #(111 -112 +209 -239)
          #(112 -113 +208 -240)
          #(113 -114 +207 -241)
          #(114 -115 +206 -242)
          #(115 -116 +205 -243)
          #(116 -117 +204 -244)
          #(117 -118 +203 -245)
          #(118 -119)
24     3 3.284-2 121 -125 +201 -250 +301 -304
          #(-124 +214 -247) #(124 +253 -256)
          #(122 +248) #(122 -213)
25     3 3.284-2 103 -107 +217 -234 +302 -303
          #(221 -230) #(104 -220) #(104 +231)
26     4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27     4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28     4 5.977931-2 102 -124 +201 -222 +301 -304
          #(103 -120 202 -221 302 -303)
          #(120 -123 215 -221 302 -303)
          #(121 -214)
29     4 5.977931-2 102 -124 +229 -250 +301 -304
          #(103 -120 230 -249 302 -303)

```

			#(120 -123 230 -246 302 -303)
			#(121 +247)
30	4	5.977931-2	124 -126 +252 -254 +301 -304
			#(-125 +213 -253)
31	4	5.977931-2	124 -126 +255 -257 +301 -304
			#(-125 +256 -248)
32	14	-0.74315	+167 -168 +274 -281 +317 -318
33	14	-0.74315	+601 -602 +603 -604 +308 -605
			#(+167 -168 +274 -281 +317 -318)
34	0		-400 +505 +224 -227 +503 -504
35	0		-401 +400 +505 +225 -226 +503 -504
36	4	5.977931-2	122 -124 +201 -250 +301 -304
			#(213 -248)
			#(129 -252)
			#(129 +257)
37	9	-2.0	+131 -164 +258 -297 +307 -308
38	11	-1.0	+131 -164 +258 -297 +308 -320
			#(+132 -163 +259 -296)
39	12	-7.86	+131 -164 +258 -297 +320 -321
40	0		+132 -163 +259 -296 +319 -320
			#(+151 -169 +271 -284 +304 -315)
			#(+151 -160 +270 -271 +312 -314)
			#(+151 -160 +284 -285 +312 -314)
			#(+157 -159 +274 -281 +313 -315)
			#(+158 -160 +274 -281 -313)
			#(+169 -157 +274 -281 +314 -316)
41	1	0.10549	+151 -169 +271 -284 +304 -315
42	1	0.10549	+151 -160 +270 -271 +312 -314
43	1	0.10549	+151 -160 +284 -285 +312 -314
44	1	0.10549	+157 -159 +274 -281 +313 -315
45	1	0.10549	+158 -160 +274 -281 +308 -313
46	1	0.10549	+169 -157 +274 -281 +314 -316
47	9	-2.0	+160 -162 +273 -282 +308 -319
48	10	-2.0	+154 -161 +265 -289 +308 -319
			#47 #(-160 +267 -286)
49	0		+154 -160 +267 -286 +308 -319 #42 #43 #45
50	10	-2.0	+155 -156 +259 -260 +308 -319
51	10	-2.0	+155 -156 +295 -296 +308 -319
52	10	-2.0	+154 -155 +259 -296 +308 -319
			#(+265 -289)
53	0		+155 -163 +259 -296 +308 -319 #50 #51
			#(-161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0	+153 -154 +295 -296 +308 -319
55	10	-2.0	+151 -126 +295 -296 +308 -319
56	10	-2.0	+151 -126 +259 -260 +308 -319
57	10	-2.0	+153 -154 +259 -260 +308 -319
58	10	-2.0	+151 -152 +266 -272 +308 -304
59	10	-2.0	+151 -152 +283 -287 +308 -304
60	0		+151 -154 +259 -296 +308 -319
			#41 #42 #43 #54 #55 #56 #57 #58 #59
			#(+601 -602 +603 -604 +308 -605)
			#(-126 +201 -250 -304)
61	1	0.10549	+149 -151 +272 -201 +308 -304
62	1	0.10549	+149 -151 +250 -283 +308 -304
63	9	-2.0	+149 -151 +264 -290 +308 -319
			#(+272 -283)
64	10	-2.0	+149 -151 +259 -296 +308 -319
			#(+264 -290)
65	10	-2.0	+146 -149 +295 -296 +308 -319
66	0		+132 -149 +259 -296 +308 -319
			#65 #(+133 -294)
67	10	-2.0	+133 -149 +259 -294 +308 -319
			#(+142 -260 -322) #(+134 +260 -298)
68	10	-2.0	+135 -149 +261 -262 +308 -319
69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311
			#(-138 -290 -310) #(-102 +310)
			#(+138 +269 -290 -310) #(+144 +290 -292 -310)
			#(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71	1	0.10549	+137 -138 +268 -290 +308 -310
72	1	0.10549	+138 -149 +269 -272 +308 -310
73	1	0.10549	+138 -149 +288 -290 +308 -310 #(+140 -141)

```

74      0      +140 -141 +288 -290 +308 -310
75      1  0.10549 +144 -149 +290 -292 +308 -310
76      1  0.10549 +139 -144 +291 -293 +308 -310
77      2  0.1187956 +137 -102 +268 -293 +310 -311
78      0      +138 -149 +272 -288 +308 -310
          #(+102 +201 -250 +309 -304)
          #(+143 -102 +275 -276 +301)
          #(+143 -102 +279 -280 +301)
          #(+147 -102 +276 -277 +301)
          #(+147 -102 +278 -279 +301)
          #(+142 +223 -228) #(+145 +201 -250 -309)
79      1  0.10549 +143 -102 +275 -276 +301 -310
80      1  0.10549 +143 -102 +279 -280 +301 -310
81      1  0.10549 +147 -102 +276 -277 +301 -310
82      1  0.10549 +147 -102 +278 -279 +301 -310
83      0      +142 -149 +259 -260 +308 -322
84      0      +134 -149 +260 -298 +308 -319
          #68 #69 #(+137 -149 +268 -293 +308 -311)
          #(+102 +201 -250 -304) #(+142 +223 -228 -304)
          #(+145 -127 +223 -228) #(+127 -124 +501 -502)
          #(+129 -252) #(+129 +257) #(+124 +254 -255)
85      9 -2.0   +129 -126 +201 -250 +308 -304
          #(+252 -257)
86      0      +102 -126 +201 -250 +309 -306
          #(+102 -127 +223 -228) #(+127 -124 +501 -502)
          #(+129 -252) #(+129 +257) #(+124 +254 -255)
87      0      +149 -151 +272 -283 +304 -319
88      0

```

c end cells

```

c
c surfaces
100 px -1000.0
c 101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 1200.0
129 px 87.9856
131 px -844.042
132 px -823.722
133 px -767.842
134 px -706.882
135 px -548.962
136 px -493.522
137 px -381.762
138 px -320.802
139 px -315.722
140 px -173.482

```

141	px	-107.442
142	px	-82.042
143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058
239	py	39.4758
240	py	40.7458
241	py	42.0158
242	py	43.2858

243	py	44.5558
244	py	45.8258
245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225
312	pz	283.845
313	pz	342.265
314	pz	375.285
315	pz	390.525

```

316 pz 395.605
317 pz -50.0
318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y 10.3124 0.0 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p 0.06683670 0.0 1.0 -2.518636
504 p -0.06683670 0.0 1.0 2.518636
505 px 10.3124
601 px 227.758
602 px 375.158
603 py -304.8
604 py 304.8
605 pz 149.225

c end surfaces
mode n p
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]

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```

m10      1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
        11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
        14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
        26054.60c -7.91056-4 26056.60c -1.286568-2
        26057.60c -3.025946-4 26058.60c -4.06658-5
mt10     lwtr.01t
c        m11=concrete at 1.0 g/cc (Masonry Block) [wt %]
m11      1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
        11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
        14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
        26054.60c -7.91056-4 26056.60c -1.286568-2
        26057.60c -3.025946-4 26058.60c -4.06658-5
mt11     lwtr.01t
c        m12=iron at 7.86 g/cc
m12      26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
        26058.60c 0.0028
c        m13=Heavy concrete at 4.2 g/cc [wt %]
m13      1001.60c -0.0005 8016.60c -0.18
        12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
        16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
        26054.60c -4.073938-2 26056.60c -0.6625828
        26057.60c -1.558362-2 26058.60c -2.094288-3
mt13     lwtr.01t
c        m14=Salted Pork at 0.64315 g/cc [wt %]
m14      1001.60c -0.105244 6000.60c -0.270864 7014.60c -0.127000
        8016.60c -0.588573 9019.60c -0.000037 11023.60c -0.018321
        12000.60c -0.000171 13027.60c -0.000090 14000.60c -0.000284
        15031.60c -0.001634 19000.60c -0.002082
mt14     lwtr.01t
f105:n   298.958 -200.0 0.0 1.0
de105    2.07002-7 7.69672-7 1.75386-6 3.71293-6
        7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
        2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
        2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
        7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
        2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
        7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
        2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
        3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
        8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
        2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
        4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
        1.11070+1 1.35661+1
df105    3.70370-3 4.37060-3 4.52500-3 4.57410-3
        4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
        4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
        3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
        3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
        7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
        1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
        4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
        6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
        1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
        1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
        1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
        1.63200-1 2.00340-1
        5.701+10
fm105    298.958 -100.0 0.0 1.0
f115:n   2.07002-7 7.69672-7 1.75386-6 3.71293-6
de115    7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
        2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
        2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
        7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
        2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
        7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
        2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
        3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
        8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
        2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
        4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
        1.11070+1 1.35661+1
df115    3.70370-3 4.37060-3 4.52500-3 4.57410-3

```


	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
	5.701+10				
fm115	298.958	-50.0	0.0	1.0	
f125:n		2.07002-7	7.69672-7	1.75386-6	3.71293-6
de125		7.86024-6	1.66401-5	3.52273-5	7.45761-5
		2.21191-4	3.64682-4	6.01258-4	9.91309-4
		2.14167-3	2.43063-3	2.82399-3	3.37141-3
		7.32483-3	1.20766-2	1.93065-2	2.41830-2
		2.65293-2	2.77506-2	3.14039-2	4.33909-2
		7.15396-2	1.04645-1	1.36365-1	1.66556-1
		2.48472-1	2.83877-1	2.95864-1	2.97851-1
		3.44858-1	4.42806-1	5.10634-1	5.65749-1
		8.24957-1	1.00760+0	1.23069+0	1.50317+0
		2.12513+0	2.28850+0	2.40583+0	2.73896+0
		4.08604+0	4.99070+0	6.09565+0	7.44525+0
		1.11070+1	1.35661+1		9.09365+0
df125		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
	5.701+10				
fm125	298.958	-25.0	0.0	1.0	
f135:n		2.07002-7	7.69672-7	1.75386-6	3.71293-6
de135		7.86024-6	1.66401-5	3.52273-5	7.45761-5
		2.21191-4	3.64682-4	6.01258-4	9.91309-4
		2.14167-3	2.43063-3	2.82399-3	3.37141-3
		7.32483-3	1.20766-2	1.93065-2	2.41830-2
		2.65293-2	2.77506-2	3.14039-2	4.33909-2
		7.15396-2	1.04645-1	1.36365-1	1.66556-1
		2.48472-1	2.83877-1	2.95864-1	2.97851-1
		3.44858-1	4.42806-1	5.10634-1	5.65749-1
		8.24957-1	1.00760+0	1.23069+0	1.50317+0
		2.12513+0	2.28850+0	2.40583+0	2.73896+0
		4.08604+0	4.99070+0	6.09565+0	7.44525+0
		1.11070+1	1.35661+1		9.09365+0
df135		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
	5.701+10				
fm135	298.958	0.0	0.0	1.0	
f145:n		2.07002-7	7.69672-7	1.75386-6	3.71293-6
de145		7.86024-6	1.66401-5	3.52273-5	7.45761-5
					1.34159-4

	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df145		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm145	5.701+10				
f155:n	298.958	25.0	0.0	1.0	
del155		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df155		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm155	5.701+10				
f165:n	298.958	50.0	0.0	1.0	
del165		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df165		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3

7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1

fm165
f175:n
del175

5.701+10
298.958 100.0 0.0 1.0
2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1

df175

3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1

fm175
f185:n
del185

5.701+10
298.958 200.0 0.0 1.0
2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1

df185

3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1

fm185
f195:n
del195

5.701+10
298.958 250.0 0.0 1.0
2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2

	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df195		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm195	5.701+10				
f205:p	298.958	-200.0	0.0	1.0	
de205		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df205		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm205	5.701+10				
f215:p	298.958	-100.0	0.0	1.0	
de215		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df215		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm215	5.701+10				
f225:p	298.958	-50.0	0.0	1.0	
de225		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df225		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm225	5.701+10				
f235:p	298.958	-25.0	0.0	1.0	
de235		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df235		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm235	5.701+10				
f245:p	298.958	0.0	0.0	1.0	
de245		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1

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6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df245 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm245 5.701+10
f255:p 298.958 25.0 0.0 1.0
de255 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df255 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm255 5.701+10
f265:p 298.958 50.0 0.0 1.0
de265 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df265 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm265 5.701+10
f275:p 298.958 100.0 0.0 1.0
de275 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df275 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm275 5.701+10
f285:p 298.958 200.0 0.0 1.0
de285 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df285 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm285 5.701+10
f295:p 298.958 250.0 0.0 1.0
de295 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df295 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm295 5.701+10
sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2
sil s 11 12 13 14 15 16
spl 1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9

```

```
si11      h -1.0 -0.7071067
si12      h -0.7071067 0.0
si13      h 0.0 0.5
si14      h 0.5 0.8660254
si15      h 0.8660254 0.9961946
si16      h 0.9961946 1.0
sp11      0 1
sp12      0 1
sp13      0 1
sp14      0 1
sp15      0 1
sp16      0 1
ds2       s 21 22 23 24 25 26
si21      h 1.8245 1.9295
si22      h 1.9295 3.7645
si23      h 3.7645 5.675
si24      h 5.675 7.3865
si25      h 7.3865 8.321
si26      h 8.321 8.753
sp21      0 1
sp22      0 1
sp23      0 1
sp24      0 1
sp25      0 1
sp26      0 1
nps       2000000
prtmp     2j 1
print
```

File for MCNP-4B calculation of the dose-rate distribution near the source side of salted beef cargo at the center of the PFNA facility truck lane for the source in the horizontal position

message: outp=pfna36.o mctal=pfna36.m

```

mcnp file for PFNA facility -- dose rates in salted-beef cargo
1      0      -100:128:-200:251:-300:305
2      0      100 -128 200 -251 300 -305
          # (131 -164 +258 -297 +307 -321)
3      1 0.10549 -400 -401 +505 +224 -227 # (503 -504)
4      1 0.10549 -401 +400 +505 +225 -226 # (503 -504)
5      0      142 -127 +223 -228 +308 -304
          # (-400 -401 +505 +224 -227) # (+137 -102 +310)
          # (-401 +400 +505 +225 -226)
6      0      127 -124 +501 -502 +308 -304
          # (-401 +400 +505 +225 -226)
7      0      124 -126 +254 -255 +308 -304
8      5 8.734441-2 102 -126 +201 -250 +306 -301
          # (+102 -127 +223 -228) # (+127 -124 +501 -502)
          # (+124 +254 -255) # (+129 -252) # (+129 +257)
9      1 0.10549 102 -124 +222 -229 +301 -304
          # (+129 -252) # (+129 +257)
          # (127 +501 -502) # (-127 +223 -228)
10     1 0.10549 106 -109 +212 -236 +302 -303 # (218 -233)
11     1 0.10549 109 -110 +211 -237 +302 -303 # (221 -230)
12     1 0.10549 110 -111 +210 -238 +302 -303 # (221 -230)
13     1 0.10549 111 -112 +209 -239 +302 -303 # (221 -230)
14     1 0.10549 112 -113 +208 -240 +302 -303 # (221 -230)
15     1 0.10549 113 -114 +207 -241 +302 -303 # (221 -230)
16     1 0.10549 114 -115 +206 -242 +302 -303 # (221 -230)
17     1 0.10549 115 -116 +205 -243 +302 -303 # (221 -230)
18     1 0.10549 116 -117 +204 -244 +302 -303 # (221 -230)
19     1 0.10549 117 -118 +203 -245 +302 -303 # (221 -230)
20     1 0.10549 118 -119 +202 -249 +302 -303 # (221 -230)
21     2 0.1187956 120 -123 +215 -246 +302 -303 # (221 -230)
22     2 0.1187956 103 -109 +202 -249 +302 -303
          # (221 -230)
          # (103 -104 +217 -234)
          # (104 -105 +216 -235)
          # (105 -107 +219 -232)
          # (107 -108 +219 -220) # (107 -108 +231 -232)
          # (106 -109 +212 -218) # (106 -109 +233 -236)
23     2 0.1187956 109 -120 +202 -249 +302 -303
          # (221 -230)
          # (109 -110 +211 -237)
          # (110 -111 +210 -238)
          # (111 -112 +209 -239)
          # (112 -113 +208 -240)
          # (113 -114 +207 -241)
          # (114 -115 +206 -242)
          # (115 -116 +205 -243)
          # (116 -117 +204 -244)
          # (117 -118 +203 -245)
          # (118 -119)
24     3 3.284-2 121 -125 +201 -250 +301 -304
          # (-124 +214 -247) # (124 +253 -256)
          # (122 +248) # (122 -213)
25     3 3.284-2 103 -107 +217 -234 +302 -303
          # (221 -230) # (104 -220) # (104 +231)
26     4 5.977931-2 104 -108 +216 -220 +302 -303 # (105 -219)
27     4 5.977931-2 104 -108 +231 -235 +302 -303 # (105 +232)
28     4 5.977931-2 102 -124 +201 -222 +301 -304
          # (103 -120 202 -221 302 -303)
          # (120 -123 215 -221 302 -303)
          # (121 -214)
29     4 5.977931-2 102 -124 +229 -250 +301 -304
          # (103 -120 230 -249 302 -303)

```

			#(120 -123 230 -246 302 -303)
			#(121 +247)
30	4	5.977931-2	124 -126 +252 -254 +301 -304
			#(-125 +213 -253)
31	4	5.977931-2	124 -126 +255 -257 +301 -304
			#(-125 +256 -248)
32	14	-0.74315	+167 -168 +274 -281 +317 -318
33	14	-0.74315	+601 -602 +603 -604 +308 -605
			#(+167 -168 +274 -281 +317 -318)
34	0		-400 +505 +224 -227 +503 -504
35	0		-401 +400 +505 +225 -226 +503 -504
36	4	5.977931-2	122 -124 +201 -250 +301 -304
			#(213 -248)
			#(129 -252)
			#(129 +257)
37	9	-2.0	+131 -164 +258 -297 +307 -308
38	11	-1.0	+131 -164 +258 -297 +308 -320
			#(+132 -163 +259 -296)
39	12	-7.86	+131 -164 +258 -297 +320 -321
40	0		+132 -163 +259 -296 +319 -320
			#(+151 -169 +271 -284 +304 -315)
			#(+151 -160 +270 -271 +312 -314)
			#(+151 -160 +284 -285 +312 -314)
			#(+157 -159 +274 -281 +313 -315)
			#(+158 -160 +274 -281 -313)
			#(+169 -157 +274 -281 +314 -316)
41	1	0.10549	+151 -169 +271 -284 +304 -315
42	1	0.10549	+151 -160 +270 -271 +312 -314
43	1	0.10549	+151 -160 +284 -285 +312 -314
44	1	0.10549	+157 -159 +274 -281 +313 -315
45	1	0.10549	+158 -160 +274 -281 +308 -313
46	1	0.10549	+169 -157 +274 -281 +314 -316
47	9	-2.0	+160 -162 +273 -282 +308 -319
48	10	-2.0	+154 -161 +265 -289 +308 -319
			#47 #(-160 +267 -286)
49	0		+154 -160 +267 -286 +308 -319 #42 #43 #45
50	10	-2.0	+155 -156 +259 -260 +308 -319
51	10	-2.0	+155 -156 +295 -296 +308 -319
52	10	-2.0	+154 -155 +259 -296 +308 -319
			#(+265 -289)
53	0		+155 -163 +259 -296 +308 -319 #50 #51
			#(-161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0	+153 -154 +295 -296 +308 -319
55	10	-2.0	+151 -126 +295 -296 +308 -319
56	10	-2.0	+151 -126 +259 -260 +308 -319
57	10	-2.0	+153 -154 +259 -260 +308 -319
58	10	-2.0	+151 -152 +266 -272 +308 -304
59	10	-2.0	+151 -152 +283 -287 +308 -304
60	0		+151 -154 +259 -296 +308 -319
			#41 #42 #43 #54 #55 #56 #57 #58 #59
			#(+601 -602 +603 -604 +308 -605)
			#(-126 +201 -250 -304)
61	1	0.10549	+149 -151 +272 -201 +308 -304
62	1	0.10549	+149 -151 +250 -283 +308 -304
63	9	-2.0	+149 -151 +264 -290 +308 -319
			#(+272 -283)
64	10	-2.0	+149 -151 +259 -296 +308 -319
			#(+264 -290)
65	10	-2.0	+146 -149 +295 -296 +308 -319
66	0		+132 -149 +259 -296 +308 -319
			#65 #(+133 -294)
67	10	-2.0	+133 -149 +259 -294 +308 -319
			#(+142 -260 -322) #(+134 +260 -298)
68	10	-2.0	+135 -149 +261 -262 +308 -319
69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311
			#(-138 -290 -310) #(-102 +310)
			#(+138 +269 -290 -310) #(+144 +290 -292 -310)
			#(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71	1	0.10549	+137 -138 +268 -290 +308 -310
72	1	0.10549	+138 -149 +269 -272 +308 -310
73	1	0.10549	+138 -149 +288 -290 +308 -310 #(+140 -141)


```

74 0 +140 -141 +288 -290 +308 -310
75 1 0.10549 +144 -149 +290 -292 +308 -310
76 1 0.10549 +139 -144 +291 -293 +308 -310
77 2 0.1187956 +137 -102 +268 -293 +310 -311
78 0 +138 -149 +272 -288 +308 -310
    #(+102 +201 -250 +309 -304)
    #(+143 -102 +275 -276 +301)
    #(+143 -102 +279 -280 +301)
    #(+147 -102 +276 -277 +301)
    #(+147 -102 +278 -279 +301)
    #(+142 +223 -228) #(+145 +201 -250 -309)
79 1 0.10549 +143 -102 +275 -276 +301 -310
80 1 0.10549 +143 -102 +279 -280 +301 -310
81 1 0.10549 +147 -102 +276 -277 +301 -310
82 1 0.10549 +147 -102 +278 -279 +301 -310
83 0 +142 -149 +259 -260 +308 -322
84 0 +134 -149 +260 -298 +308 -319
    #68 #69 #(+137 -149 +268 -293 +308 -311)
    #(+102 +201 -250 -304) #(+142 +223 -228 -304)
    +145 -126 +201 -250 +308 -309
85 9 -2.0 #(+145 -127 +223 -228) #(+127 -124 +501 -502)
    #(+129 -252) #(+129 +257) #(+124 +254 -255)
86 0 +129 -126 +201 -250 +308 -304
    #(+252 -257)
87 0 +102 -126 +201 -250 +309 -306
    #(+102 -127 +223 -228) #(+127 -124 +501 -502)
    #(+129 -252) #(+129 +257) #(+124 +254 -255)
88 0 +149 -151 +272 -283 +304 -319

```

c end cells

```

c
c surfaces
100 px -1000.0
c 101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 1200.0
129 px 87.9856
131 px -844.042
132 px -823.722
133 px -767.842
134 px -706.882
135 px -548.962
136 px -493.522
137 px -381.762
138 px -320.802
139 px -315.722
140 px -173.482

```

141	px	-107.442
142	px	-82.042
143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058
239	py	39.4758
240	py	40.7458
241	py	42.0158
242	py	43.2858

243	py	44.5558
244	py	45.8258
245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225
312	pz	283.845
313	pz	342.265
314	pz	375.285
315	pz	390.525

```

316 pz 395.605
317 pz -50.0
318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y 10.3124 0.0 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p 0.06683670 0.0 1.0 -2.518636
504 p -0.06683670 0.0 1.0 2.518636
505 px 10.3124
601 px 227.758
602 px 375.158
603 py -304.8
604 py 304.8
605 pz 149.225

c end surfaces
mode n p
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]

```

```

m10      1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
         11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
         14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
         26054.60c -7.91056-4 26056.60c -1.286568-2
         26057.60c -3.025946-4 26058.60c -4.06658-5
mt10     lwtr.01t
c        m11=concrete at 1.0 g/cc (Masonry Block) [wt %]
m11      1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
         11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
         14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
         26054.60c -7.91056-4 26056.60c -1.286568-2
         26057.60c -3.025946-4 26058.60c -4.06658-5
mt11     lwtr.01t
c        m12=iron at 7.86 g/cc
m12      26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
         26058.60c 0.0028
c        m13=Heavy concrete at 4.2 g/cc [wt %]
m13      1001.60c -0.0005 8016.60c -0.18
         12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
         16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
         26054.60c -4.073938-2 26056.60c -0.6625828
         26057.60c -1.558362-2 26058.60c -2.094288-3
mt13     lwtr.01t
c        m14=Salted Beef at 0.74315 g/cc [wt %]
m14      1001.60c -0.105244 6000.60c -0.270864 7014.60c -0.127000
         8016.60c -0.588573 9019.60c -0.000037 11023.60c -0.018321
         12000.60c -0.000171 13027.60c -0.000090 14000.60c -0.000284
         15031.60c -0.001634 19000.60c -0.002082
mt14     lwtr.01t
f105:n   240.000 -200.0 0.0 1.0
de105    2.07002-7 7.69672-7 1.75386-6 3.71293-6
         7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
         2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
         2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
         7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
         2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
         7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
         2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
         3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
         8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
         2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
         4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
         1.11070+1 1.35661+1
df105    3.70370-3 4.37060-3 4.52500-3 4.57410-3
         4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
         4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
         3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
         3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
         7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
         1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
         4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
         6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
         1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
         1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
         1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
         1.63200-1 2.00340-1
         5.701+10
f115:n   240.000 -100.0 0.0 1.0
de115    2.07002-7 7.69672-7 1.75386-6 3.71293-6
         7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
         2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
         2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
         7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
         2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
         7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
         2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
         3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
         8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
         2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
         4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
         1.11070+1 1.35661+1
df115    3.70370-3 4.37060-3 4.52500-3 4.57410-3

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4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm115 5.701+10
f125:n 240.000 -50.0 0.0 1.0
de125 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df125 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm125 5.701+10
f135:n 240.000 -25.0 0.0 1.0
de135 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df135 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm135 5.701+10
f145:n 240.000 0.0 0.0 1.0
de145 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4

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	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df145		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm145	5.701+10				
f155:n	240.000	25.0	0.0	1.0	
de155		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df155		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm155	5.701+10				
f165:n	240.000	50.0	0.0	1.0	
de165		2.07002-7	7.69672-7	1.75386-6	3.71293-6
	7.86024-6	1.66401-5	3.52273-5	7.45761-5	1.34159-4
	2.21191-4	3.64682-4	6.01258-4	9.91309-4	1.63439-3
	2.14167-3	2.43063-3	2.82399-3	3.37141-3	4.61914-3
	7.32483-3	1.20766-2	1.93065-2	2.41830-2	2.54229-2
	2.65293-2	2.77506-2	3.14039-2	4.33909-2	5.45187-2
	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df165		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3

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7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm165 5.701+10
fl175:n 240.000 100.0 0.0 1.0
del175 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df175 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm175 5.701+10
fl185:n 240.000 200.0 0.0 1.0
del185 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df185 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm185 5.701+10
fl195:n 240.000 250.0 0.0 1.0
del195 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2

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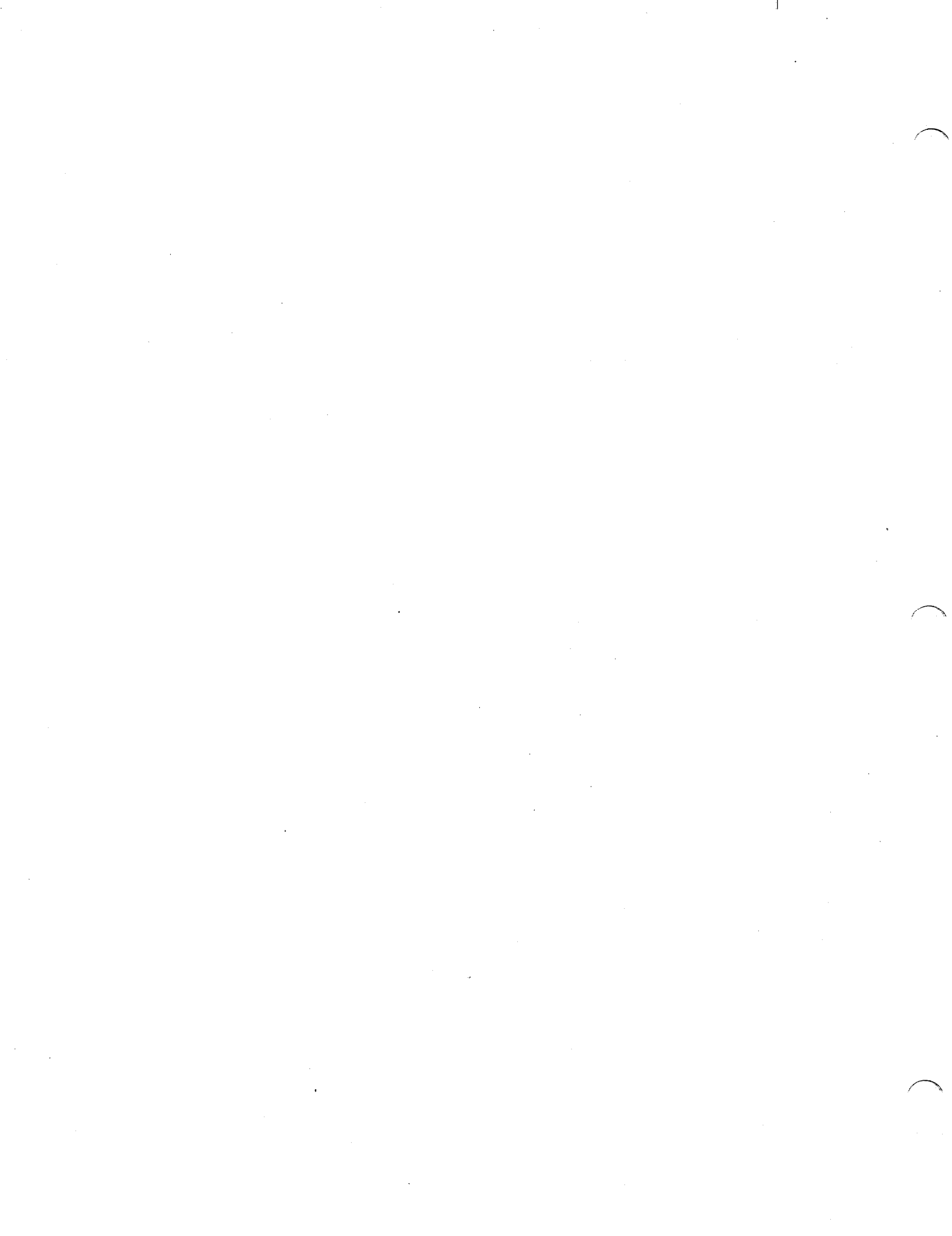

	7.15396-2	1.04645-1	1.36365-1	1.66556-1	2.03432-1
	2.48472-1	2.83877-1	2.95864-1	2.97851-1	3.00232-1
	3.44858-1	4.42806-1	5.10634-1	5.65749-1	6.75418-1
	8.24957-1	1.00760+0	1.23069+0	1.50317+0	1.83598+0
	2.12513+0	2.28850+0	2.40583+0	2.73896+0	3.34537+0
	4.08604+0	4.99070+0	6.09565+0	7.44525+0	9.09365+0
	1.11070+1	1.35661+1			
df195		3.70370-3	4.37060-3	4.52500-3	4.57410-3
	4.55830-3	4.48970-3	4.38170-3	4.24920-3	4.12890-3
	4.03110-3	3.93550-3	3.84530-3	3.76290-3	3.69080-3
	3.65280-3	3.63870-3	3.62290-3	3.60620-3	3.58250-3
	3.55850-3	4.08750-3	5.89750-3	7.13870-3	7.42410-3
	7.67700-3	7.95180-3	8.74210-3	1.11490-2	1.35030-2
	1.65080-2	2.25270-2	2.86610-2	3.43150-2	4.10860-2
	4.92110-2	5.56070-2	5.77300-2	5.80800-2	5.84980-2
	6.59980-2	8.26560-2	9.04890-2	9.54810-2	1.05360-1
	1.17860-1	1.29670-1	1.30100-1	1.28650-1	1.27220-1
	1.26160-1	1.25620-1	1.25270-1	1.28500-1	1.36960-1
	1.45980-1	1.54120-1	1.51160-1	1.47220-1	1.47060-1
	1.63200-1	2.00340-1			
fm195	5.701+10				
f205:p	240.000	-200.0	0.0	1.0	
de205		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df205		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm205	5.701+10				
f215:p	240.000	-100.0	0.0	1.0	
de215		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df215		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm215	5.701+10				
f225:p	240.000	-50.0	0.0	1.0	
de225		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df225		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm225	5.701+10				
f235:p	240.000	-25.0	0.0	1.0	
de235		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1
	6.50000-1	8.50000-1	1.25000+0	1.75000+0	2.25000+0
	2.75000+0	3.50000+0	4.50000+0	5.50000+0	6.50000+0
	7.25000+0	7.75000+0	9.00000+0	1.20000+1	
df235		2.14390-3	5.77600-4	2.71850-4	2.68170-4
	3.27670-4	5.66760-4	8.75940-4	1.08450-3	1.27970-3
	1.44170-3	1.75630-3	2.31560-3	2.92700-3	3.46860-3
	3.95960-3	4.62210-3	5.41370-3	6.19090-3	6.92650-3
	7.47830-3	7.84680-3	8.77160-3	1.10200-2	
fm235	5.701+10				
f245:p	240.000	0.0	0.0	1.0	
de245		1.50000-2	3.25000-2	5.75000-2	8.50000-2
	1.25000-1	2.25000-1	3.50000-1	4.55000-1	5.55000-1

```

6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df245 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm245 5.701+10
f255:p 240.000 25.0 0.0 1.0
de255 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df255 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm255 5.701+10
f265:p 240.000 50.0 0.0 1.0
de265 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df265 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm265 5.701+10
f275:p 240.000 100.0 0.0 1.0
de275 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df275 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm275 5.701+10
f285:p 240.000 200.0 0.0 1.0
de285 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df285 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm285 5.701+10
f295:p 240.000 250.0 0.0 1.0
de295 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df295 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm295 5.701+10
sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2
sil s 11 12 13 14 15 16
spl 1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9

```

```
si11 h -1.0 -0.7071067
si12 h -0.7071067 0.0
si13 h 0.0 0.5
si14 h 0.5 0.8660254
si15 h 0.8660254 0.9961946
si16 h 0.9961946 1.0
sp11 0 1
sp12 0 1
sp13 0 1
sp14 0 1
sp15 0 1
sp16 0 1
ds2 s 21 22 23 24 25 26
si21 h 1.8245 1.9295
si22 h 1.9295 3.7645
si23 h 3.7645 5.675
si24 h 5.675 7.3865
si25 h 7.3865 8.321
si26 h 8.321 8.753
sp21 0 1
sp22 0 1
sp23 0 1
sp24 0 1
sp25 0 1
sp26 0 1
nps 4000000
prtmp 2j 1
print
```



APPENDIX F

**TABLES OF ORIGIN-CALCULATED RADIOACTIVITIES OF
SELECTED CARGOES AND STRUCTURES IRRADIATED IN THE
PFNA FACILITY**



APPENDIX F

TABLES OF ORIGEN-CALCULATED RADIOACTIVITIES OF SELECTED CARGOES AND STRUCTURES IRRADIATED IN THE PFNA FACILITY

Table F1. Radioactivity (Ci) After 8-s Irradiation of 1-kg Salted Beef Cargo (Flux Parameter Set 1).

	Time After Discharge										
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
b 12	5.85E-13	5.85E-13	6.59E-14	2.75E-14	1.04E-14	3.93E-15	2.13E-16	6.24E-19	1.57E-26	0.00E+00	0.00E+00
c 14	8.84E-18	8.84E-18	8.84E-18	8.84E-18	8.84E-18	8.84E-18	8.84E-18	8.84E-18	8.84E-18	8.84E-18	8.84E-18
c 15	1.19E-09	1.19E-09	8.99E-10	7.04E-11	4.15E-12	2.45E-13	5.03E-17	2.12E-24	0.00E+00	0.00E+00	0.00E+00
n 16	6.04E-09	6.04E-09	5.48E-09	2.28E-09	8.64E-10	3.27E-10	1.77E-11	5.18E-14	1.30E-21	0.00E+00	0.00E+00
o 19	4.62E-12	4.62E-12	4.51E-12	3.57E-12	2.76E-12	2.14E-12	9.86E-13	2.10E-13	2.04E-15	8.98E-19	1.74E-25
f 20	2.05E-09	2.05E-09	1.93E-09	1.09E-09	5.82E-10	3.10E-10	4.68E-11	1.07E-12	1.27E-17	7.80E-26	0.00E+00
ne 23	9.16E-10	9.16E-10	8.99E-10	7.61E-10	6.31E-10	5.24E-10	3.00E-10	9.82E-11	3.44E-12	1.29E-14	1.83E-19
na 24	4.73E-13	4.73E-13	4.73E-13	4.73E-13	4.73E-13	4.73E-13	4.73E-13	4.72E-13	4.71E-13	4.70E-13	4.66E-13
na 24m	1.88E-09	1.88E-09	2.27E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
na 25	1.47E-12	1.47E-12	1.45E-12	1.31E-12	1.17E-12	1.04E-12	7.32E-13	3.64E-13	4.49E-14	1.37E-15	1.28E-18
mg 27	1.19E-12	1.19E-12	1.19E-12	1.17E-12	1.16E-12	1.15E-12	1.10E-12	1.03E-12	8.24E-13	5.71E-13	2.74E-13
al 28	5.06E-11	5.06E-11	5.04E-11	4.81E-11	4.57E-11	4.34E-11	3.71E-11	2.73E-11	1.08E-11	2.29E-12	1.04E-13
al 29	2.11E-13	2.11E-13	2.11E-13	2.07E-13	2.04E-13	2.00E-13	1.90E-13	1.71E-13	1.24E-13	7.34E-14	2.55E-14
al 30	1.15E-14	1.15E-14	9.50E-15	1.68E-15	2.45E-16	3.57E-17	1.11E-19	1.06E-24	0.00E+00	0.00E+00	0.00E+00
si 31	1.14E-11	1.14E-11	1.14E-11	1.13E-11	1.13E-11	1.13E-11	1.13E-11	1.13E-11	1.11E-11	1.09E-11	1.04E-11
p 32	2.63E-16	2.63E-16	2.63E-16	2.63E-16	2.63E-16	2.63E-16	2.63E-16	2.63E-16	2.63E-16	2.63E-16	2.63E-16
ar 39	2.76E-17	2.76E-17	2.76E-17	2.76E-17	2.76E-17	2.76E-17	2.76E-17	2.76E-17	2.76E-17	2.76E-17	2.76E-17
k 40	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09
k 42	4.87E-15	4.87E-15	4.87E-15	4.87E-15	4.87E-15	4.87E-15	4.87E-15	4.86E-15	4.85E-15	4.83E-15	4.78E-15
total	1.39E-08	1.39E-08	1.10E-08	5.99E-09	3.86E-09	2.94E-09	2.13E-09	1.86E-09	1.74E-09	1.73E-09	1.73E-09

Table F2. Radioactivity (Ci) After 16-s Irradiation of 1-kg Salted Beef Cargo (Flux Parameter Set 1).

	Time After Discharge										
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
b 12	6.18E-13	6.18E-13	9.62E-14	4.01E-14	1.52E-14	5.74E-15	3.11E-16	9.10E-19	2.29E-26	0.00E+00	0.00E+00
c 14	1.77E-17	1.77E-17	1.77E-17	1.77E-17	1.77E-17	1.77E-17	1.77E-17	1.77E-17	1.77E-17	1.77E-17	1.77E-17
c 15	1.32E-09	1.32E-09	9.92E-10	7.77E-11	4.58E-12	2.70E-13	5.55E-17	2.34E-24	0.00E+00	0.00E+00	0.00E+00
n 16	8.81E-09	8.81E-09	8.00E-09	3.33E-09	1.26E-09	4.77E-10	2.58E-11	7.56E-14	1.90E-21	0.00E+00	0.00E+00
o 19	8.39E-12	8.39E-12	8.17E-12	6.48E-12	5.01E-12	3.87E-12	1.79E-12	3.81E-13	3.70E-15	1.63E-18	3.16E-25
f 20	3.29E-09	3.29E-09	3.09E-09	1.75E-09	9.33E-10	4.97E-10	7.51E-11	1.71E-12	2.03E-17	1.25E-25	0.00E+00
ne 23	1.71E-09	1.71E-09	1.67E-09	1.42E-09	1.18E-09	9.76E-10	5.58E-10	1.83E-10	6.41E-12	2.41E-14	3.40E-19
na 24	9.46E-13	9.46E-13	9.46E-13	9.46E-13	9.46E-13	9.46E-13	9.46E-13	9.45E-13	9.43E-13	9.39E-13	9.32E-13
na 24m	1.88E-09	1.88E-09	2.27E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
na 25	2.81E-12	2.81E-12	2.78E-12	2.50E-12	2.23E-12	1.98E-12	1.40E-12	6.97E-13	8.59E-14	2.62E-15	2.44E-18
mg 27	2.36E-12	2.36E-12	2.36E-12	2.34E-12	2.31E-12	2.28E-12	2.20E-12	2.04E-12	1.64E-12	1.14E-12	5.46E-13
al 28	9.92E-11	9.92E-11	9.87E-11	9.42E-11	8.95E-11	8.50E-11	7.28E-11	5.34E-11	2.11E-11	4.49E-12	2.04E-13
al 29	4.19E-13	4.19E-13	4.18E-13	4.12E-13	4.04E-13	3.97E-13	3.77E-13	3.39E-13	2.47E-13	1.46E-13	5.07E-14
al 30	1.40E-14	1.40E-14	1.15E-14	2.04E-15	2.97E-16	4.33E-17	1.34E-19	1.29E-24	0.00E+00	0.00E+00	0.00E+00
si 31	2.27E-11	2.27E-11	2.27E-11	2.27E-11	2.27E-11	2.27E-11	2.26E-11	2.25E-11	2.22E-11	2.17E-11	2.08E-11
p 32	5.27E-16	5.27E-16	5.27E-16	5.27E-16	5.27E-16	5.27E-16	5.27E-16	5.27E-16	5.27E-16	5.27E-16	5.26E-16
cl 36	1.17E-20	1.17E-20	1.17E-20	1.17E-20	1.17E-20	1.17E-20	1.17E-20	1.17E-20	1.17E-20	1.17E-20	1.17E-20
ar 39	5.51E-17	5.51E-17	5.51E-17	5.51E-17	5.51E-17	5.51E-17	5.51E-17	5.51E-17	5.51E-17	5.51E-17	5.51E-17
k 40	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09
k 42	9.74E-15	9.74E-15	9.74E-15	9.74E-15	9.74E-15	9.74E-15	9.73E-15	9.72E-15	9.70E-15	9.65E-15	9.56E-15
total	1.89E-08	1.89E-08	1.56E-08	8.43E-09	5.22E-09	3.78E-09	2.48E-09	1.98E-09	1.77E-09	1.75E-09	1.74E-09

Table F3. Radioactivity (Ci) After 24-s Irradiation of 1-kg Salted Beef Cargo (Flux Parameter Set 1).

	Time After Discharge										
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
b 12	6.34E-13	6.34E-13	1.10E-13	4.59E-14	1.74E-14	6.57E-15	3.56E-16	1.04E-18	2.62E-26	0.00E+00	0.00E+00
c 14	2.65E-17	2.65E-17	2.65E-17	2.65E-17	2.65E-17	2.65E-17	2.65E-17	2.65E-17	2.65E-17	2.65E-17	2.65E-17
c 15	1.33E-09	1.33E-09	1.00E-09	7.84E-11	4.63E-12	2.73E-13	5.60E-17	2.36E-24	0.00E+00	0.00E+00	0.00E+00
n 16	1.01E-08	1.01E-08	9.15E-09	3.82E-09	1.44E-09	5.46E-10	2.96E-11	8.66E-14	2.18E-21	0.00E+00	0.00E+00
o 19	1.14E-11	1.14E-11	1.12E-11	8.85E-12	6.84E-12	5.29E-12	2.44E-12	5.20E-13	5.04E-15	2.22E-18	4.31E-25
f 20	4.04E-09	4.04E-09	3.79E-09	2.15E-09	1.15E-09	6.10E-10	9.21E-11	2.10E-12	2.49E-17	1.54E-25	0.00E+00
ne 23	2.39E-09	2.39E-09	2.34E-09	1.98E-09	1.64E-09	1.37E-09	7.81E-10	2.56E-10	8.97E-12	3.37E-14	4.76E-19
na 24	1.42E-12	1.42E-12	1.42E-12	1.42E-12	1.42E-12	1.42E-12	1.42E-12	1.42E-12	1.41E-12	1.41E-12	1.40E-12
na 24m	1.88E-09	1.88E-09	2.27E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
na 25	4.03E-12	4.03E-12	3.99E-12	3.59E-12	3.20E-12	2.85E-12	2.01E-12	9.99E-13	1.23E-13	3.76E-15	3.51E-18
mg 27	3.53E-12	3.53E-12	3.52E-12	3.49E-12	3.44E-12	3.40E-12	3.28E-12	3.05E-12	2.45E-12	1.70E-12	8.15E-13
al 28	1.46E-10	1.46E-10	1.45E-10	1.38E-10	1.31E-10	1.25E-10	1.07E-10	7.85E-11	3.10E-11	6.60E-12	2.99E-13
al 29	6.24E-13	6.24E-13	6.23E-13	6.13E-13	6.02E-13	5.92E-13	5.62E-13	5.05E-13	3.68E-13	2.17E-13	7.56E-14
al 30	1.45E-14	1.45E-14	1.20E-14	2.12E-15	3.08E-16	4.50E-17	1.39E-19	1.34E-24	0.00E+00	0.00E+00	0.00E+00
si 31	3.40E-11	3.40E-11	3.40E-11	3.40E-11	3.40E-11	3.40E-11	3.39E-11	3.38E-11	3.33E-11	3.26E-11	3.12E-11
p 32	7.90E-16	7.90E-16	7.90E-16	7.90E-16	7.90E-16	7.90E-16	7.90E-16	7.90E-16	7.90E-16	7.90E-16	7.90E-16
cl 36	1.76E-20	1.76E-20	1.76E-20	1.76E-20	1.76E-20	1.76E-20	1.76E-20	1.76E-20	1.76E-20	1.76E-20	1.76E-20
ar 39	8.27E-17	8.27E-17	8.27E-17	8.27E-17	8.27E-17	8.27E-17	8.27E-17	8.27E-17	8.27E-17	8.27E-17	8.27E-17
k 40	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09	1.72E-09
k 42	1.46E-14	1.46E-14	1.46E-14	1.46E-14	1.46E-14	1.46E-14	1.46E-14	1.46E-14	1.45E-14	1.45E-14	1.43E-14
total	2.16E-08	2.16E-08	1.82E-08	9.93E-09	6.14E-09	4.41E-09	2.77E-09	2.09E-09	1.80E-09	1.76E-09	1.75E-09

Table F4. Radioactivity (Ci) After 8-s Irradiation of 1-kg Ball Bearings Cargo (Flux Parameter Set 1).

	initial	Time After Discharge									
		1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
b 12	1.87E-18	1.87E-18	1.70E-18	7.07E-19	2.67E-19	1.01E-19	5.48E-21	1.60E-23	7.83E-31	0.00E+00	0.00E+00
c 15	3.16E-14	3.16E-14	2.38E-14	1.87E-15	1.10E-16	6.50E-18	1.33E-21	5.62E-29	0.00E+00	0.00E+00	0.00E+00
n 16	1.55E-13	1.55E-13	1.41E-13	5.88E-14	2.22E-14	8.41E-15	4.55E-16	1.33E-18	3.35E-26	0.00E+00	0.00E+00
o 19	1.05E-18	1.05E-18	1.02E-18	8.09E-19	6.25E-19	4.83E-19	2.23E-19	4.76E-20	4.61E-22	2.03E-25	3.94E-32
na 24	1.55E-14	1.55E-14	1.55E-14	1.55E-14	1.55E-14	1.55E-14	1.55E-14	1.55E-14	1.55E-14	1.55E-14	1.54E-14
mg 27	6.91E-12	6.91E-12	6.90E-12	6.82E-12	6.74E-12	6.66E-12	6.42E-12	5.97E-12	4.79E-12	3.32E-12	1.53E-14
al 28	1.70E-10	1.70E-10	1.69E-10	1.61E-10	1.53E-10	1.45E-10	1.25E-10	9.14E-11	3.61E-11	7.69E-12	3.48E-13
al 29	1.93E-12	1.93E-12	1.93E-12	1.90E-12	1.86E-12	1.83E-12	1.74E-12	1.56E-12	1.14E-12	6.72E-13	2.34E-13
al 30	1.05E-13	1.05E-13	8.70E-14	1.54E-14	2.24E-15	3.27E-16	1.01E-18	9.74E-24	0.00E+00	0.00E+00	0.00E+00
si 31	1.81E-12	1.81E-12	1.81E-12	1.81E-12	1.81E-12	1.81E-12	1.81E-12	1.80E-12	1.77E-12	1.74E-12	1.66E-12
p 32	1.48E-14	1.48E-14	1.48E-14	1.48E-14	1.48E-14	1.48E-14	1.48E-14	1.48E-14	1.48E-14	1.48E-14	1.48E-14
p 33	7.10E-14	7.10E-14	7.10E-14	7.10E-14	7.10E-14	7.10E-14	7.10E-14	7.10E-14	7.10E-14	7.10E-14	7.10E-14
p 34	5.49E-13	5.49E-13	5.19E-13	3.14E-13	1.80E-13	1.03E-13	1.93E-14	6.81E-16	2.98E-20	1.62E-27	0.00E+00
s 35	1.83E-19	1.83E-19	1.83E-19	1.83E-19	1.83E-19	1.83E-19	1.83E-19	1.83E-19	1.83E-19	1.83E-19	1.83E-19
s 37	1.14E-17	1.14E-17	1.14E-17	1.11E-17	1.09E-17	1.06E-17	9.93E-18	8.65E-18	5.73E-18	2.89E-18	7.32E-19
ti 51	6.13E-14	6.13E-14	6.12E-14	6.01E-14	5.89E-14	5.77E-14	5.44E-14	4.82E-14	3.36E-14	1.84E-14	5.52E-15
y 52	6.04E-11	6.04E-11	6.02E-11	5.85E-11	5.67E-11	5.50E-11	5.02E-11	4.17E-11	2.40E-11	9.50E-12	1.50E-12
v 53	1.87E-12	1.87E-12	1.85E-12	1.74E-12	1.62E-12	1.50E-12	1.21E-12	7.89E-13	2.17E-13	2.52E-14	3.40E-16
v 54	3.53E-14	3.53E-14	3.48E-14	3.07E-14	2.67E-14	2.32E-14	1.53E-14	6.64E-15	5.42E-16	8.33E-18	1.97E-21
cr 51	7.13E-14	7.13E-14	7.13E-14	7.13E-14	7.13E-14	7.13E-14	7.13E-14	7.13E-14	7.13E-14	7.13E-14	7.13E-14
cr 55	8.76E-12	8.76E-12	8.73E-12	8.47E-12	8.20E-12	7.93E-12	7.18E-12	5.89E-12	3.25E-12	1.21E-12	1.66E-13
mn 54	1.67E-13	1.67E-13	1.67E-13	1.67E-13	1.67E-13	1.67E-13	1.67E-13	1.67E-13	1.67E-13	1.67E-13	1.67E-13
mn 56	1.05E-10	1.05E-10	1.05E-10	1.05E-10	1.05E-10	1.05E-10	1.05E-10	1.04E-10	1.03E-10	1.01E-10	9.61E-11
mn 57	1.13E-10	1.13E-10	1.12E-10	1.04E-10	9.61E-11	8.88E-11	7.00E-11	4.34E-11	1.04E-11	9.56E-13	8.12E-15
mn 58	5.00E-13	5.00E-13	4.95E-13	4.50E-13	4.04E-13	3.64E-13	2.65E-13	1.40E-13	2.07E-14	8.57E-16	1.47E-18
fe 55	9.68E-16	9.68E-16	9.68E-16	9.68E-16	9.68E-16	9.68E-16	9.68E-16	9.68E-16	9.68E-16	9.68E-16	9.68E-16
fe 59	6.59E-16	6.59E-16	6.59E-16	6.59E-16	6.59E-16	6.59E-16	6.59E-16	6.59E-16	6.59E-16	6.59E-16	6.59E-16
co 58	3.62E-14	3.62E-14	3.62E-14	3.62E-14	3.62E-14	3.62E-14	3.62E-14	3.62E-14	3.62E-14	3.62E-14	3.62E-14
co 60	1.88E-17	1.88E-17	1.88E-17	1.88E-17	1.88E-17	1.88E-17	1.88E-17	1.88E-17	1.88E-17	1.88E-17	1.88E-17
co 61	9.40E-15	9.40E-15	9.40E-15	9.39E-15	9.37E-15	9.36E-15	9.33E-15	9.27E-15	9.07E-15	8.76E-15	8.17E-15
co 62	1.72E-12	1.72E-12	1.70E-12	1.59E-12	1.47E-12	1.36E-12	1.08E-12	6.81E-13	1.70E-13	1.69E-14	1.66E-16
ni 63	6.60E-18	6.60E-18	6.60E-18	6.60E-18	6.60E-18	6.60E-18	6.60E-18	6.60E-18	6.60E-18	6.60E-18	6.60E-18
ni 65	4.20E-14	4.20E-14	4.20E-14	4.20E-14	4.19E-14	4.19E-14	4.18E-14	4.16E-14	4.10E-14	4.01E-14	3.83E-14
cu 64	1.59E-13	1.59E-13	1.59E-13	1.59E-13	1.59E-13	1.59E-13	1.59E-13	1.59E-13	1.59E-13	1.58E-13	1.57E-13
cu 66	4.60E-12	4.60E-12	4.59E-12	4.50E-12	4.40E-12	4.30E-12	4.02E-12	3.51E-12	2.33E-12	1.18E-12	3.04E-13
y 89m	1.79E-18	1.79E-18	2.20E-18	5.23E-18	7.46E-18	8.91E-18	1.09E-17	1.15E-17	1.16E-17	1.16E-17	1.16E-17
zr 89	1.16E-17	1.16E-17	1.16E-17	1.16E-17	1.16E-17	1.16E-17	1.16E-17	1.16E-17	1.16E-17	1.16E-17	1.16E-17
zr 95	2.05E-18	2.05E-18	2.05E-18	2.05E-18	2.05E-18	2.05E-18	2.05E-18	2.05E-18	2.05E-18	2.04E-18	2.04E-18
zr 97	4.27E-18	4.27E-18	4.27E-18	4.26E-18	4.26E-18	4.26E-18	4.26E-18	4.26E-18	4.25E-18	4.24E-18	4.21E-18
nb 95	4.87E-18	4.87E-18	4.87E-18	4.87E-18	4.87E-18	4.87E-18	4.87E-18	4.87E-18	4.87E-18	4.87E-18	4.87E-18
nb 96	2.69E-16	2.69E-16	2.69E-16	2.69E-16	2.69E-16	2.68E-16	2.68E-16	2.68E-16	2.68E-16	2.67E-16	2.66E-16
nb 97	2.05E-15	2.05E-15	2.05E-15	2.05E-15	2.05E-15	2.04E-15	2.03E-15	2.01E-15	1.96E-15	1.86E-15	1.69E-15
nb 97m	1.81E-19	1.81E-19	2.26E-19	6.03E-19	9.78E-19	1.31E-18	2.11E-18	3.08E-18	3.91E-18	4.02E-18	3.99E-18

Table F4. (continued)

	initial	Time After Discharge									
		1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
nb 98	2.11E-13	2.11E-13	1.66E-13	1.87E-14	1.66E-15	1.47E-16	1.02E-19	4.95E-26	0.00E+00	0.00E+00	0.00E+00
nb100	1.20E-14	1.20E-14	7.55E-15	1.18E-16	1.16E-18	1.14E-20	1.09E-26	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mo 99	9.81E-16	9.81E-16	9.81E-16	9.81E-16	9.81E-16	9.81E-16	9.81E-16	9.80E-16	9.80E-16	9.79E-16	9.77E-16
mo101	6.78E-14	6.78E-14	6.78E-14	6.73E-14	6.68E-14	6.62E-14	6.47E-14	6.17E-14	5.35E-14	4.22E-14	2.62E-14
tc101	2.21E-16	2.21E-16	2.75E-16	7.66E-16	1.30E-15	1.83E-15	3.37E-15	6.21E-15	1.32E-14	2.06E-14	2.54E-14
total	4.78E-10	4.78E-10	4.76E-10	4.57E-10	4.38E-10	4.21E-10	3.74E-10	3.02E-10	1.88E-10	1.28E-10	1.03E-10

Table F5. Radioactivity (Ci) After 16-s Irradiation of 1-kg Ball Bearings Cargo (Flux Parameter Set 1).

	Time After Discharge										
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
b 12	2.73E-18	2.73E-18	2.48E-18	1.03E-18	3.90E-19	1.48E-19	7.99E-21	2.34E-23	7.83E-31	0.00E+00	0.00E+00
c 15	3.49E-14	3.49E-14	2.63E-14	2.06E-15	1.22E-16	7.17E-18	1.47E-21	6.21E-29	0.00E+00	0.00E+00	0.00E+00
n 16	2.27E-13	2.27E-13	2.06E-13	8.57E-14	3.24E-14	1.23E-14	6.64E-16	1.95E-18	4.89E-26	0.00E+00	0.00E+00
o 19	1.90E-18	1.90E-18	1.85E-18	1.47E-18	1.13E-18	8.76E-19	4.05E-19	8.63E-20	8.36E-22	3.68E-25	7.17E-32
na 24	3.11E-14	3.11E-14	3.11E-14	3.11E-14	3.11E-14	3.11E-14	3.11E-14	3.10E-14	3.10E-14	3.08E-14	3.06E-14
mg 27	1.37E-11	1.37E-11	1.37E-11	1.36E-11	1.34E-11	1.33E-11	1.28E-11	1.19E-11	9.53E-12	6.61E-12	3.18E-12
al 28	3.33E-10	3.33E-10	3.31E-10	3.16E-10	3.00E-10	2.85E-10	2.44E-10	1.79E-10	7.08E-11	1.51E-11	6.83E-13
al 29	3.84E-12	3.84E-12	3.83E-12	3.77E-12	3.70E-12	3.64E-12	3.45E-12	3.11E-12	2.26E-12	1.34E-12	4.65E-13
al 30	1.28E-13	1.28E-13	1.06E-13	1.87E-14	2.72E-15	3.97E-16	1.23E-18	1.18E-23	0.00E+00	0.00E+00	0.00E+00
si 31	3.63E-12	3.63E-12	3.63E-12	3.62E-12	3.62E-12	3.62E-12	3.61E-12	3.59E-12	3.55E-12	3.47E-12	3.32E-12
p 32	2.96E-14	2.96E-14	2.96E-14	2.96E-14	2.96E-14	2.96E-14	2.96E-14	2.96E-14	2.96E-14	2.96E-14	2.96E-14
p 33	1.42E-13	1.42E-13	1.42E-13	1.42E-13	1.42E-13	1.42E-13	1.42E-13	1.42E-13	1.42E-13	1.42E-13	1.42E-13
p 34	9.00E-13	9.00E-13	8.52E-13	5.16E-13	2.95E-13	1.69E-13	3.17E-14	1.12E-15	4.89E-20	2.65E-27	0.00E+00
s 35	3.65E-19	3.65E-19	3.65E-19	3.65E-19	3.65E-19	3.65E-19	3.65E-19	3.65E-19	3.65E-19	3.65E-19	3.65E-19
s 37	2.26E-17	2.26E-17	2.25E-17	2.21E-17	2.16E-17	2.11E-17	1.97E-17	1.72E-17	1.14E-17	5.72E-18	1.45E-18
ti 51	1.22E-13	1.22E-13	1.21E-13	1.19E-13	1.17E-13	1.15E-13	1.08E-13	9.56E-14	6.66E-14	3.65E-14	1.10E-14
v 52	1.19E-10	1.19E-10	1.19E-10	1.16E-10	1.12E-10	1.09E-10	9.91E-11	8.24E-11	4.73E-11	1.88E-11	2.96E-12
v 53	3.63E-12	3.63E-12	3.60E-12	3.38E-12	3.14E-12	2.92E-12	2.36E-12	1.53E-12	4.21E-13	4.89E-14	6.61E-16
v 54	6.69E-14	6.69E-14	6.59E-14	5.82E-14	5.06E-14	4.40E-14	2.90E-14	1.26E-14	1.03E-15	1.58E-17	3.73E-21
cr 51	1.43E-13	1.43E-13	1.43E-13	1.43E-13	1.43E-13	1.43E-13	1.43E-13	1.43E-13	1.43E-13	1.43E-13	1.43E-13
cr 55	1.73E-11	1.73E-11	1.72E-11	1.67E-11	1.62E-11	1.57E-11	1.42E-11	1.16E-11	6.42E-12	2.38E-12	3.28E-13
mn 54	3.35E-13	3.35E-13	3.35E-13	3.35E-13	3.35E-13	3.35E-13	3.35E-13	3.35E-13	3.35E-13	3.35E-13	3.34E-13
mn 56	2.10E-10	2.10E-10	2.10E-10	2.10E-10	2.10E-10	2.10E-10	2.09E-10	2.08E-10	2.06E-10	2.01E-10	1.92E-10
mn 57	2.18E-10	2.18E-10	2.17E-10	2.02E-10	1.86E-10	1.72E-10	1.36E-10	8.42E-11	2.01E-11	1.85E-12	1.57E-14
mn 58	9.59E-13	9.59E-13	9.49E-13	8.63E-13	7.76E-13	6.98E-13	5.07E-13	2.68E-13	3.97E-14	1.64E-15	2.82E-18
fe 55	1.94E-15	1.94E-15	1.94E-15	1.94E-15	1.94E-15	1.94E-15	1.94E-15	1.94E-15	1.94E-15	1.94E-15	1.94E-15
fe 59	1.32E-15	1.32E-15	1.32E-15	1.32E-15	1.32E-15	1.32E-15	1.32E-15	1.32E-15	1.32E-15	1.32E-15	1.32E-15
co 58	7.24E-14	7.24E-14	7.24E-14	7.24E-14	7.24E-14	7.24E-14	7.24E-14	7.24E-14	7.24E-14	7.24E-14	7.24E-14
co 60	3.75E-17	3.75E-17	3.75E-17	3.75E-17	3.75E-17	3.75E-17	3.75E-17	3.75E-17	3.75E-17	3.75E-17	3.75E-17
co 61	1.88E-14	1.88E-14	1.88E-14	1.88E-14	1.87E-14	1.87E-14	1.87E-14	1.85E-14	1.81E-14	1.75E-14	1.63E-14
co 62	3.33E-12	3.33E-12	3.30E-12	3.08E-12	2.85E-12	2.64E-12	2.10E-12	1.32E-12	3.30E-13	3.28E-14	3.23E-16
ni 63	1.32E-17	1.32E-17	1.32E-17	1.32E-17	1.32E-17	1.32E-17	1.32E-17	1.32E-17	1.32E-17	1.32E-17	1.32E-17
ni 65	8.40E-14	8.40E-14	8.40E-14	8.39E-14	8.38E-14	8.38E-14	8.36E-14	8.32E-14	8.21E-14	8.02E-14	7.66E-14
cu 64	3.19E-13	3.19E-13	3.19E-13	3.19E-13	3.19E-13	3.19E-13	3.18E-13	3.18E-13	3.17E-13	3.16E-13	3.13E-13
cu 66	9.12E-12	9.12E-12	9.10E-12	8.92E-12	8.72E-12	8.52E-12	7.96E-12	6.95E-12	4.62E-12	2.34E-12	6.02E-13
y 89m	6.44E-18	6.44E-18	7.15E-18	1.23E-17	1.61E-17	1.86E-17	2.19E-17	2.31E-17	2.32E-17	2.32E-17	2.31E-17
zr 89	2.32E-17	2.32E-17	2.32E-17	2.32E-17	2.32E-17	2.32E-17	2.32E-17	2.32E-17	2.32E-17	2.32E-17	2.31E-17
zr 95	4.09E-18	4.09E-18	4.09E-18	4.09E-18	4.09E-18	4.09E-18	4.09E-18	4.09E-18	4.09E-18	4.09E-18	4.09E-18
zr 97	8.53E-18	8.53E-18	8.53E-18	8.53E-18	8.53E-18	8.53E-18	8.52E-18	8.52E-18	8.50E-18	8.47E-18	8.41E-18
nb 95	9.75E-18	9.75E-18	9.75E-18	9.75E-18	9.75E-18	9.75E-18	9.75E-18	9.75E-18	9.75E-18	9.75E-18	9.75E-18
nb 96	5.37E-16	5.37E-16	5.37E-16	5.37E-16	5.37E-16	5.37E-16	5.37E-16	5.37E-16	5.36E-16	5.34E-16	5.32E-16
nb 97	4.10E-15	4.10E-15	4.10E-15	4.09E-15	4.09E-15	4.08E-15	4.06E-15	4.02E-15	3.91E-15	3.73E-15	3.39E-15
nb 97m	7.03E-19	7.03E-19	7.88E-19	1.51E-18	2.23E-18	2.87E-18	4.39E-18	6.24E-18	7.84E-18	8.03E-18	7.98E-18

Table F5. (continued)

	initial 1E-15 sec	Time After Discharge											
		1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec			
nb 98	2.42E-13	1.90E-13	2.14E-14	1.90E-15	1.68E-16	1.17E-19	5.66E-26	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
nb100	1.23E-14	1.23E-14	1.21E-16	1.19E-18	1.17E-20	1.12E-26	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mo 99	1.96E-15	1.96E-15	1.96E-15	1.96E-15	1.96E-15	1.96E-15	1.96E-15	1.96E-15	1.96E-15	1.96E-15	1.96E-15	1.96E-15	1.96E-15
mo101	1.35E-13	1.35E-13	1.34E-13	1.33E-13	1.32E-13	1.29E-13	1.23E-13	1.07E-13	1.07E-13	1.07E-13	8.41E-14	5.23E-14	5.23E-14
tc101	8.78E-16	8.78E-16	9.87E-16	1.96E-15	3.03E-15	4.08E-15	7.13E-15	1.28E-14	2.66E-14	2.66E-14	4.13E-14	5.07E-14	5.07E-14
total	9.39E-10	9.39E-10	8.99E-10	8.63E-10	8.28E-10	7.36E-10	5.96E-10	3.72E-10	3.72E-10	3.72E-10	2.54E-10	2.05E-10	2.05E-10

Table F6. Radioactivity (Ci) After 24-s Irradiation of 1-kg Ball Bearings Cargo (Flux Parameter Set 1).

		Time After Discharge										
		initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
b	12	3.12E-18	3.12E-18	2.83E-18	1.18E-18	4.47E-19	1.69E-19	9.15E-21	2.68E-23	7.83E-31	0.00E+00	0.00E+00
c	15	3.53E-14	3.53E-14	2.66E-14	2.08E-15	1.23E-16	7.24E-18	1.49E-21	6.27E-29	0.00E+00	0.00E+00	0.00E+00
n	16	2.59E-13	2.59E-13	2.35E-13	9.81E-14	3.71E-14	1.40E-14	7.60E-16	2.23E-18	5.60E-26	0.00E+00	0.00E+00
o	19	2.59E-18	2.59E-18	2.53E-18	2.00E-18	1.55E-18	1.20E-18	5.52E-19	1.18E-19	1.14E-21	5.03E-25	9.76E-32
na	24	4.66E-14	4.66E-14	4.66E-14	4.66E-14	4.66E-14	4.66E-14	4.66E-14	4.66E-14	4.64E-14	4.63E-14	4.59E-14
mg	27	2.05E-11	2.05E-11	2.05E-11	2.03E-11	2.00E-11	1.98E-11	1.91E-11	1.77E-11	1.42E-11	9.86E-12	4.74E-12
al	28	4.89E-10	4.89E-10	4.86E-10	4.64E-10	4.41E-10	4.19E-10	3.59E-10	2.63E-10	1.04E-10	2.21E-11	1.00E-12
al	29	5.71E-12	5.71E-12	5.70E-12	5.61E-12	5.52E-12	5.42E-12	5.14E-12	4.63E-12	3.37E-12	1.99E-12	6.92E-13
al	30	1.33E-13	1.33E-13	1.10E-13	1.94E-14	2.82E-15	4.12E-16	1.28E-18	1.23E-23	0.00E+00	0.00E+00	0.00E+00
si	31	5.44E-12	5.44E-12	5.44E-12	5.43E-12	5.43E-12	5.42E-12	5.41E-12	5.39E-12	5.32E-12	5.20E-12	4.98E-12
p	32	4.44E-14	4.44E-14	4.44E-14	4.44E-14	4.44E-14	4.44E-14	4.44E-14	4.44E-14	4.44E-14	4.44E-14	4.44E-14
p	33	2.13E-13	2.13E-13	2.13E-13	2.13E-13	2.13E-13	2.13E-13	2.13E-13	2.13E-13	2.13E-13	2.13E-13	2.13E-13
p	34	1.13E-12	1.13E-12	1.06E-12	6.44E-13	3.69E-13	2.11E-13	3.96E-14	1.40E-15	6.11E-20	3.31E-27	0.00E+00
s	35	5.48E-19	5.48E-19	5.48E-19	5.48E-19	5.48E-19	5.48E-19	5.48E-19	5.48E-19	5.48E-19	5.48E-19	5.48E-19
s	37	3.35E-17	3.35E-17	3.35E-17	3.28E-17	3.20E-17	3.13E-17	2.92E-17	2.55E-17	1.69E-17	8.50E-18	2.16E-18
ti	51	1.81E-13	1.81E-13	1.81E-13	1.77E-13	1.74E-13	1.70E-13	1.60E-13	1.42E-13	9.92E-14	5.43E-14	1.63E-14
v	52	1.77E-10	1.77E-10	1.76E-10	1.71E-10	1.66E-10	1.61E-10	1.47E-10	1.22E-10	7.01E-11	2.78E-11	4.38E-12
v	53	5.29E-12	5.29E-12	5.25E-12	4.92E-12	4.58E-12	4.27E-12	3.44E-12	2.24E-12	6.15E-13	7.14E-14	9.64E-16
v	54	9.51E-14	9.51E-14	9.38E-14	8.28E-14	7.20E-14	6.26E-14	4.13E-14	1.79E-14	1.46E-15	2.25E-17	5.30E-21
cr	51	2.14E-13	2.14E-13	2.14E-13	2.14E-13	2.14E-13	2.14E-13	2.14E-13	2.14E-13	2.14E-13	2.14E-13	2.14E-13
cr	55	2.56E-11	2.56E-11	2.55E-11	2.48E-11	2.40E-11	2.32E-11	2.10E-11	1.72E-11	9.50E-12	3.53E-12	4.86E-13
mn	54	5.02E-13	5.02E-13	5.02E-13	5.02E-13	5.02E-13	5.02E-13	5.02E-13	5.02E-13	5.02E-13	5.02E-13	5.02E-13
mn	56	3.15E-10	3.15E-10	3.15E-10	3.15E-10	3.15E-10	3.14E-10	3.14E-10	3.12E-10	3.08E-10	3.01E-10	2.88E-10
mn	57	3.18E-10	3.18E-10	3.15E-10	2.93E-10	2.71E-10	2.50E-10	1.97E-10	1.22E-10	2.93E-11	2.70E-12	2.29E-14
mn	58	1.38E-12	1.38E-12	1.37E-12	1.24E-12	1.12E-12	1.00E-12	7.31E-13	3.86E-13	5.72E-14	2.37E-15	4.06E-18
fe	55	2.90E-15	2.90E-15	2.90E-15	2.90E-15	2.90E-15	2.90E-15	2.90E-15	2.90E-15	2.90E-15	2.90E-15	2.90E-15
fe	59	1.98E-15	1.98E-15	1.98E-15	1.98E-15	1.98E-15	1.98E-15	1.98E-15	1.98E-15	1.98E-15	1.98E-15	1.98E-15
co	58	1.09E-13	1.09E-13	1.09E-13	1.09E-13	1.09E-13	1.09E-13	1.09E-13	1.09E-13	1.09E-13	1.09E-13	1.09E-13
co	60	5.63E-17	5.63E-17	5.63E-17	5.63E-17	5.63E-17	5.63E-17	5.63E-17	5.63E-17	5.63E-17	5.63E-17	5.63E-17
co	61	2.82E-14	2.82E-14	2.82E-14	2.81E-14	2.81E-14	2.81E-14	2.80E-14	2.78E-14	2.72E-14	2.63E-14	2.45E-14
co	62	4.85E-12	4.85E-12	4.81E-12	4.49E-12	4.15E-12	3.85E-12	3.05E-12	1.92E-12	4.81E-13	4.77E-14	4.70E-16
ni	63	1.98E-17	1.98E-17	1.98E-17	1.98E-17	1.98E-17	1.98E-17	1.98E-17	1.98E-17	1.98E-17	1.98E-17	1.98E-17
ni	65	1.26E-13	1.26E-13	1.26E-13	1.26E-13	1.26E-13	1.26E-13	1.25E-13	1.25E-13	1.23E-13	1.20E-13	1.15E-13
cu	64	4.78E-13	4.78E-13	4.78E-13	4.78E-13	4.78E-13	4.78E-13	4.78E-13	4.77E-13	4.76E-13	4.74E-13	4.70E-13
cu	66	1.36E-11	1.36E-11	1.35E-11	1.33E-11	1.30E-11	1.27E-11	1.18E-11	1.03E-11	6.87E-12	3.48E-12	8.95E-13
y	89m	1.31E-17	1.31E-17	1.40E-17	2.07E-17	2.56E-17	2.88E-17	3.31E-17	3.46E-17	3.48E-17	3.47E-17	3.47E-17
zr	89	3.48E-17	3.48E-17	3.48E-17	3.48E-17	3.48E-17	3.48E-17	3.48E-17	3.48E-17	3.48E-17	3.48E-17	3.47E-17
zr	95	6.14E-18	6.14E-18	6.14E-18	6.14E-18	6.14E-18	6.14E-18	6.14E-18	6.14E-18	6.14E-18	6.13E-18	6.13E-18
zr	97	1.28E-17	1.28E-17	1.28E-17	1.28E-17	1.28E-17	1.28E-17	1.28E-17	1.28E-17	1.28E-17	1.27E-17	1.26E-17
nb	95	1.46E-17	1.46E-17	1.46E-17	1.46E-17	1.46E-17	1.46E-17	1.46E-17	1.46E-17	1.46E-17	1.46E-17	1.46E-17
nb	96	8.06E-16	8.06E-16	8.06E-16	8.06E-16	8.06E-16	8.05E-16	8.05E-16	8.05E-16	8.04E-16	8.02E-16	7.98E-16
nb	97	6.15E-15	6.15E-15	6.15E-15	6.14E-15	6.13E-15	6.12E-15	6.09E-15	6.03E-15	5.86E-15	5.59E-15	5.07E-15
nb	97m	1.54E-18	1.54E-18	1.66E-18	2.69E-18	3.72E-18	4.64E-18	6.83E-18	9.47E-18	1.18E-17	1.20E-17	1.20E-17

Table F6. (continued)

	initial IE-15 sec	Time After Discharge									
		1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec	
nb 98	2.46E-13	2.18E-14	1.93E-15	1.71E-16	1.19E-19	5.76E-26	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
nb100	1.23E-14	1.21E-16	1.19E-18	1.17E-20	1.12E-26	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
mo 99	2.94E-15	2.94E-15	2.94E-15	2.94E-15	2.94E-15	2.94E-15	2.94E-15	2.94E-15	2.94E-15	2.94E-15	
mc101	2.02E-13	2.01E-13	1.99E-13	1.97E-13	1.93E-13	1.84E-13	1.59E-13	1.59E-13	1.26E-13	7.82E-14	
tc101	1.97E-15	3.58E-15	5.17E-15	6.74E-15	1.13E-14	1.97E-14	4.03E-14	6.22E-14	6.22E-14	7.61E-14	
total	1.38E-09	1.33E-09	1.27E-09	1.22E-09	1.09E-09	8.82E-10	5.54E-10	3.80E-10	3.07E-10		

Table F7. Radioactivity (Ci) After 8-s Irradiation of 1-kg Surgical Implant Composition A Cargo (Flux Parameter Set 1).

		Time After Discharge										
		initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
li	8	3.80E-12	3.80E-12	1.66E-12	9.73E-16	2.49E-19	6.36E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
be	8	3.80E-12	3.80E-12	1.66E-12	9.73E-16	2.49E-19	6.36E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
be	11	1.08E-14	1.08E-14	1.03E-14	6.56E-15	3.97E-15	2.41E-15	5.34E-16	2.63E-17	3.13E-21	9.04E-28	0.00E+00
b	12	3.49E-13	3.49E-13	4.88E-22	2.03E-22	7.69E-23	2.91E-23	1.57E-24	4.61E-27	0.00E+00	0.00E+00	0.00E+00
c	14	1.81E-18	1.81E-18	1.81E-18	1.81E-18	1.81E-18	1.81E-18	1.81E-18	1.81E-18	1.81E-18	1.81E-18	1.81E-18
c	15	1.41E-14	1.41E-14	1.06E-14	8.29E-16	4.89E-17	2.89E-18	5.93E-22	2.50E-29	0.00E+00	0.00E+00	0.00E+00
n	16	4.47E-17	4.47E-17	4.05E-17	1.69E-17	6.39E-18	2.42E-18	1.31E-19	3.83E-22	9.64E-30	0.00E+00	0.00E+00
na	24	9.33E-14	9.33E-14	9.33E-14	9.33E-14	9.32E-14	9.32E-14	9.32E-14	9.31E-14	9.29E-14	9.25E-14	9.18E-14
mg	27	4.14E-11	4.14E-11	4.13E-11	4.09E-11	4.04E-11	3.99E-11	3.85E-11	3.57E-11	2.87E-11	1.99E-11	9.56E-12
al	28	6.65E-10	6.65E-10	6.61E-10	6.31E-10	6.00E-10	5.70E-10	4.88E-10	3.58E-10	1.42E-10	3.01E-11	1.36E-12
al	29	7.73E-12	7.73E-12	7.71E-12	7.59E-12	7.46E-12	7.33E-12	6.95E-12	6.26E-12	4.56E-12	2.69E-12	9.36E-13
al	30	4.22E-13	4.22E-13	3.48E-13	6.15E-14	8.97E-15	1.31E-15	4.05E-18	3.90E-23	0.00E+00	0.00E+00	0.00E+00
si	31	1.45E-12	1.45E-12	1.45E-12	1.45E-12	1.45E-12	1.45E-12	1.45E-12	1.44E-12	1.42E-12	1.39E-12	1.33E-12
p	32	9.88E-15	9.88E-15	9.88E-15	9.88E-15	9.88E-15	9.88E-15	9.88E-15	9.88E-15	9.88E-15	9.88E-15	9.87E-15
p	33	4.74E-14	4.74E-14	4.74E-14	4.74E-14	4.74E-14	4.74E-14	4.74E-14	4.74E-14	4.74E-14	4.74E-14	4.73E-14
p	34	3.66E-13	3.66E-13	3.46E-13	2.10E-13	1.20E-13	6.87E-14	1.29E-14	4.54E-16	1.99E-20	1.08E-27	0.00E+00
s	35	1.22E-19	1.22E-19	1.22E-19	1.22E-19	1.22E-19	1.22E-19	1.22E-19	1.22E-19	1.22E-19	1.22E-19	1.22E-19
s	37	7.59E-18	7.59E-18	7.57E-18	7.42E-18	7.25E-18	7.09E-18	6.62E-18	5.77E-18	3.82E-18	1.92E-18	4.88E-19
ti	51	1.23E-12	1.23E-12	1.22E-12	1.20E-12	1.18E-12	1.15E-12	1.09E-12	9.64E-13	6.72E-13	3.68E-13	1.10E-13
v	52	1.16E-09	1.16E-09	1.16E-09	1.13E-09	1.09E-09	1.06E-09	9.68E-10	8.05E-10	4.62E-10	1.83E-10	2.89E-11
v	53	3.73E-11	3.73E-11	3.70E-11	3.47E-11	3.23E-11	3.01E-11	2.43E-11	1.58E-11	4.33E-12	5.04E-13	6.80E-15
v	54	7.06E-13	7.06E-13	6.96E-13	6.14E-13	5.34E-13	4.65E-13	3.06E-13	1.33E-13	1.08E-14	1.67E-16	3.94E-20
cr	51	6.06E-14	6.06E-14	6.06E-14	6.06E-14	6.06E-14	6.06E-14	6.06E-14	6.06E-14	6.06E-14	6.06E-14	6.06E-14
cr	55	3.18E-11	3.18E-11	3.16E-11	3.07E-11	2.97E-11	2.88E-11	2.60E-11	2.14E-11	1.18E-11	4.37E-12	6.02E-13
mn	54	1.30E-15	1.30E-15	1.30E-15	1.30E-15	1.30E-15	1.30E-15	1.30E-15	1.30E-15	1.30E-15	1.30E-15	1.30E-15
mn	56	1.23E-11	1.23E-11	1.23E-11	1.23E-11	1.23E-11	1.23E-11	1.23E-11	1.22E-11	1.21E-11	1.18E-11	1.13E-11
mn	57	8.79E-13	8.79E-13	8.72E-13	8.12E-13	7.50E-13	6.92E-13	5.46E-13	3.39E-13	8.10E-14	7.46E-15	6.33E-17
mn	58	3.90E-15	3.90E-15	3.86E-15	3.51E-15	3.15E-15	2.84E-15	2.06E-15	1.09E-15	1.61E-16	6.68E-18	1.15E-20
fe	55	2.82E-17	2.82E-17	2.82E-17	2.82E-17	2.82E-17	2.82E-17	2.82E-17	2.82E-17	2.82E-17	2.82E-17	2.82E-17
fe	59	1.22E-17	1.22E-17	1.22E-17	1.22E-17	1.22E-17	1.22E-17	1.22E-17	1.22E-17	1.22E-17	1.22E-17	1.22E-17
co	58	1.45E-13	1.45E-13	1.45E-13	1.45E-13	1.45E-13	1.45E-13	1.45E-13	1.45E-13	1.45E-13	1.45E-13	1.45E-13
co	60	5.92E-14	5.92E-14	5.93E-14	6.00E-14	6.07E-14	6.15E-14	6.37E-14	6.78E-14	7.86E-14	9.26E-14	1.10E-13
co	60m	1.83E-08	1.83E-08	1.82E-08	1.81E-08	1.79E-08	1.77E-08	1.71E-08	1.60E-08	1.31E-08	9.42E-09	4.86E-09
co	61	3.76E-14	3.76E-14	3.76E-14	3.75E-14	3.75E-14	3.75E-14	3.73E-14	3.71E-14	3.63E-14	3.50E-14	3.27E-14
co	62	4.50E-13	4.50E-13	4.46E-13	4.16E-13	3.85E-13	3.57E-13	2.83E-13	1.78E-13	4.46E-14	4.42E-15	4.36E-17
ni	63	9.91E-19	9.91E-19	9.91E-19	9.91E-19	9.91E-19	9.91E-19	9.91E-19	9.91E-19	9.91E-19	9.91E-19	9.91E-19
ni	65	1.01E-14	1.01E-14	1.01E-14	1.01E-14	1.01E-14	1.01E-14	1.01E-14	1.00E-14	9.89E-15	9.67E-15	9.24E-15
y	89m	1.25E-16	1.25E-16	1.54E-16	3.66E-16	5.22E-16	6.23E-16	7.60E-16	8.07E-16	8.11E-16	8.10E-16	8.09E-16
zr	89	8.13E-16	8.13E-16	8.13E-16	8.13E-16	8.13E-16	8.12E-16	8.12E-16	8.12E-16	8.12E-16	8.11E-16	8.10E-16
zr	95	1.43E-16	1.43E-16	1.43E-16	1.43E-16	1.43E-16	1.43E-16	1.43E-16	1.43E-16	1.43E-16	1.43E-16	1.43E-16
zr	97	2.99E-16	2.99E-16	2.99E-16	2.99E-16	2.98E-16	2.98E-16	2.98E-16	2.98E-16	2.98E-16	2.97E-16	2.95E-16
nb	95	3.41E-16	3.41E-16	3.41E-16	3.41E-16	3.41E-16	3.41E-16	3.41E-16	3.41E-16	3.41E-16	3.41E-16	3.41E-16
nb	96	1.88E-14	1.88E-14	1.88E-14	1.88E-14	1.88E-14	1.88E-14	1.88E-14	1.88E-14	1.88E-14	1.87E-14	1.86E-14

Table F7. (continued)

	initial	Time After Discharge									
		1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
nb 97	1.44E-13	1.44E-13	1.44E-13	1.43E-13	1.43E-13	1.43E-13	1.42E-13	1.41E-13	1.37E-13	1.30E-13	1.19E-13
nb 97m	1.27E-17	1.27E-17	1.58E-17	4.22E-17	6.85E-17	9.19E-17	1.48E-16	2.15E-16	2.74E-16	2.81E-16	2.79E-16
nb 98	1.48E-11	1.48E-11	1.16E-11	1.31E-12	1.16E-13	1.03E-14	7.16E-18	3.46E-24	0.00E+00	0.00E+00	0.00E+00
nb100	8.39E-13	8.39E-13	5.29E-13	8.26E-15	8.13E-17	8.00E-19	7.63E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mo 99	6.87E-14	6.87E-14	6.87E-14	6.86E-14	6.86E-14	6.86E-14	6.86E-14	6.86E-14	6.86E-14	6.85E-14	6.84E-14
mo101	4.75E-12	4.75E-12	4.74E-12	4.71E-12	4.67E-12	4.64E-12	4.53E-12	4.32E-12	3.75E-12	2.95E-12	1.84E-12
tc101	1.54E-14	1.54E-14	1.93E-14	5.36E-14	9.12E-14	1.28E-13	2.36E-13	4.35E-13	9.23E-13	1.44E-12	1.78E-12
w181	4.01E-18	4.01E-18	4.01E-18	4.01E-18	4.01E-18	4.01E-18	4.01E-18	4.01E-18	4.01E-18	4.01E-18	4.01E-18
w185	1.30E-16	1.30E-16	1.30E-16	1.30E-16	1.30E-16	1.30E-16	1.30E-16	1.30E-16	1.30E-16	1.30E-16	1.30E-16
w185m	9.03E-15	9.03E-15	8.97E-15	8.43E-15	7.87E-15	7.34E-15	5.96E-15	3.94E-15	1.13E-15	1.42E-16	2.24E-18
w187	2.99E-13	2.99E-13	2.99E-13	2.99E-13	2.99E-13	2.99E-13	2.99E-13	2.99E-13	2.99E-13	2.98E-13	2.96E-13
total	2.03E-08	2.03E-08	2.02E-08	2.00E-08	1.97E-08	1.94E-08	1.87E-08	1.73E-08	1.38E-08	9.68E-09	4.92E-09

Table F8. Radioactivity (Ci) After 16-s Irradiation of 1-kg Surgical Implant Composition A Cargo (Flux Parameter Set 1).

		Time After Discharge										
		initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
li	8	3.81E-12	3.81E-12	1.67E-12	9.74E-16	2.49E-19	6.37E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
be	8	3.81E-12	3.81E-12	1.67E-12	9.74E-16	2.49E-19	6.37E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
be	11	1.81E-14	1.81E-14	1.72E-14	1.10E-14	6.63E-15	4.01E-15	8.91E-16	4.38E-17	5.23E-21	1.51E-27	0.00E+00
b	12	3.49E-13	3.49E-13	7.12E-22	2.97E-22	1.12E-22	4.25E-23	2.30E-24	6.73E-27	0.00E+00	0.00E+00	0.00E+00
c	14	3.62E-18	3.62E-18	3.62E-18	3.62E-18	3.62E-18	3.62E-18	3.62E-18	3.62E-18	3.62E-18	3.62E-18	3.62E-18
c	15	1.55E-14	1.55E-14	1.17E-14	9.16E-16	5.40E-17	3.19E-18	6.54E-22	2.76E-29	0.00E+00	0.00E+00	0.00E+00
n	16	6.52E-17	6.52E-17	5.91E-17	2.47E-17	9.33E-18	3.53E-18	1.91E-19	5.59E-22	1.41E-29	0.00E+00	0.00E+00
na	24	1.87E-13	1.87E-13	1.87E-13	1.86E-13	1.86E-13	1.86E-13	1.86E-13	1.86E-13	1.86E-13	1.85E-13	1.84E-13
mg	27	8.23E-11	8.23E-11	8.22E-11	8.13E-11	8.04E-11	7.94E-11	7.65E-11	7.11E-11	5.71E-11	3.96E-11	1.90E-11
al	28	1.30E-09	1.30E-09	1.30E-09	1.24E-09	1.18E-09	1.12E-09	9.56E-10	7.02E-10	2.77E-10	5.90E-11	2.67E-12
al	29	1.53E-11	1.53E-11	1.53E-11	1.51E-11	1.48E-11	1.46E-11	1.38E-11	1.24E-11	9.05E-12	5.34E-12	1.86E-12
al	30	5.12E-13	5.12E-13	4.22E-13	7.47E-14	1.09E-14	1.59E-15	4.92E-18	4.73E-23	0.00E+00	0.00E+00	0.00E+00
si	31	2.91E-12	2.91E-12	2.91E-12	2.91E-12	2.90E-12	2.90E-12	2.90E-12	2.88E-12	2.84E-12	2.78E-12	2.66E-12
p	32	1.98E-14	1.98E-14	1.98E-14	1.98E-14	1.98E-14	1.98E-14	1.98E-14	1.98E-14	1.98E-14	1.98E-14	1.97E-14
p	33	9.47E-14	9.47E-14	9.47E-14	9.47E-14	9.47E-14	9.47E-14	9.47E-14	9.47E-14	9.47E-14	9.47E-14	9.47E-14
p	34	6.00E-13	6.00E-13	5.68E-13	3.44E-13	1.97E-13	1.13E-13	2.11E-14	7.45E-16	3.26E-20	1.77E-27	0.00E+00
s	35	2.43E-19	2.43E-19	2.43E-19	2.43E-19	2.43E-19	2.43E-19	2.43E-19	2.43E-19	2.43E-19	2.43E-19	2.43E-19
s	37	1.50E-17	1.50E-17	1.50E-17	1.47E-17	1.44E-17	1.40E-17	1.31E-17	1.14E-17	7.58E-18	3.81E-18	9.67E-19
ti	51	2.43E-12	2.43E-12	2.43E-12	2.38E-12	2.34E-12	2.29E-12	2.16E-12	1.91E-12	1.33E-12	7.30E-13	2.19E-13
v	52	2.30E-09	2.30E-09	2.29E-09	2.23E-09	2.16E-09	2.10E-09	1.91E-09	1.59E-09	9.13E-10	3.62E-10	5.71E-11
v	53	7.25E-11	7.25E-11	7.20E-11	6.75E-11	6.28E-11	5.85E-11	4.72E-11	3.07E-11	8.43E-12	9.79E-13	1.32E-14
v	54	1.34E-12	1.34E-12	1.32E-12	1.16E-12	1.01E-12	8.81E-13	5.80E-13	2.52E-13	2.06E-14	3.16E-16	7.46E-20
cr	51	1.21E-13	1.21E-13	1.21E-13	1.21E-13	1.21E-13	1.21E-13	1.21E-13	1.21E-13	1.21E-13	1.21E-13	1.21E-13
cr	55	6.27E-11	6.27E-11	6.25E-11	6.06E-11	5.87E-11	5.68E-11	5.14E-11	4.22E-11	2.33E-11	8.63E-12	1.19E-12
mn	54	2.61E-15	2.61E-15	2.61E-15	2.61E-15	2.61E-15	2.61E-15	2.61E-15	2.61E-15	2.61E-15	2.61E-15	2.61E-15
mn	56	2.47E-11	2.47E-11	2.47E-11	2.46E-11	2.46E-11	2.46E-11	2.45E-11	2.44E-11	2.41E-11	2.36E-11	2.25E-11
mn	57	1.70E-12	1.70E-12	1.69E-12	1.57E-12	1.45E-12	1.34E-12	1.06E-12	6.56E-13	1.57E-13	1.45E-14	1.23E-16
mn	58	7.48E-15	7.48E-15	7.40E-15	6.73E-15	6.05E-15	5.44E-15	3.96E-15	2.09E-15	3.10E-16	1.28E-17	2.20E-20
fe	55	5.63E-17	5.63E-17	5.63E-17	5.63E-17	5.63E-17	5.63E-17	5.63E-17	5.63E-17	5.63E-17	5.63E-17	5.63E-17
fe	59	2.44E-17	2.44E-17	2.44E-17	2.44E-17	2.44E-17	2.44E-17	2.44E-17	2.44E-17	2.44E-17	2.44E-17	2.44E-17
co	58	2.89E-13	2.89E-13	2.89E-13	2.89E-13	2.89E-13	2.89E-13	2.89E-13	2.89E-13	2.89E-13	2.89E-13	2.89E-13
co	60	1.19E-13	1.19E-13	1.19E-13	1.21E-13	1.22E-13	1.24E-13	1.28E-13	1.36E-13	1.58E-13	1.85E-13	2.20E-13
co	60m	3.64E-08	3.64E-08	3.63E-08	3.60E-08	3.56E-08	3.52E-08	3.40E-08	3.19E-08	2.61E-08	1.88E-08	9.67E-09
co	61	7.51E-14	7.51E-14	7.51E-14	7.51E-14	7.50E-14	7.49E-14	7.46E-14	7.41E-14	7.26E-14	7.01E-14	6.53E-14
co	62	8.72E-13	8.72E-13	8.65E-13	8.07E-13	7.48E-13	6.92E-13	5.49E-13	3.46E-13	8.65E-14	8.58E-15	8.45E-17
ni	59	1.63E-20	1.63E-20	1.63E-20	1.63E-20	1.63E-20	1.63E-20	1.63E-20	1.63E-20	1.63E-20	1.63E-20	1.63E-20
ni	63	1.98E-18	1.98E-18	1.98E-18	1.98E-18	1.98E-18	1.98E-18	1.98E-18	1.98E-18	1.98E-18	1.98E-18	1.98E-18
ni	65	2.02E-14	2.02E-14	2.02E-14	2.02E-14	2.02E-14	2.02E-14	2.01E-14	2.01E-14	1.98E-14	1.93E-14	1.85E-14
y	89m	4.51E-16	4.51E-16	5.00E-16	8.62E-16	1.13E-15	1.30E-15	1.53E-15	1.62E-15	1.62E-15	1.62E-15	1.62E-15
zr	89	1.63E-15	1.63E-15	1.63E-15	1.63E-15	1.62E-15	1.62E-15	1.62E-15	1.62E-15	1.62E-15	1.62E-15	1.62E-15
zr	95	2.86E-16	2.86E-16	2.86E-16	2.86E-16	2.86E-16	2.86E-16	2.86E-16	2.86E-16	2.86E-16	2.86E-16	2.86E-16
zr	97	5.97E-16	5.97E-16	5.97E-16	5.97E-16	5.97E-16	5.97E-16	5.97E-16	5.96E-16	5.95E-16	5.93E-16	5.89E-16
nb	94	1.20E-20	1.20E-20	1.20E-20	1.20E-20	1.20E-20	1.20E-20	1.20E-20	1.20E-20	1.20E-20	1.20E-20	1.20E-20

Table F8. (continued)

	initial	Time After Discharge											
		1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec		
nb 95	6.82E-16	6.82E-16	6.82E-16	6.82E-16	6.82E-16	6.82E-16	6.82E-16	6.82E-16	6.82E-16	6.82E-16	6.82E-16	6.82E-16	6.82E-16
nb 96	3.76E-14	3.76E-14	3.76E-14	3.76E-14	3.76E-14	3.76E-14	3.76E-14	3.76E-14	3.76E-14	3.75E-14	3.74E-14	3.72E-14	3.72E-14
nb 97	2.87E-13	2.87E-13	2.87E-13	2.87E-13	2.86E-13	2.86E-13	2.84E-13	2.82E-13	2.74E-13	2.61E-13	2.37E-13	2.37E-13	2.37E-13
nb 97m	4.92E-17	4.92E-17	5.52E-17	1.06E-16	1.56E-16	2.01E-16	3.08E-16	4.36E-16	5.48E-16	5.62E-16	5.59E-16	5.59E-16	5.59E-16
nb 98	1.69E-11	1.69E-11	1.33E-11	1.50E-12	1.33E-13	1.18E-14	8.19E-18	3.96E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
nb100	8.60E-13	8.60E-13	5.42E-13	8.46E-15	8.33E-17	8.20E-19	7.82E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mo 93	1.72E-20	1.72E-20	1.72E-20	1.72E-20	1.72E-20	1.72E-20	1.72E-20	1.72E-20	1.72E-20	1.72E-20	1.72E-20	1.72E-20	1.72E-20
mo 99	1.37E-13	1.37E-13	1.37E-13	1.37E-13	1.37E-13	1.37E-13	1.37E-13	1.37E-13	1.37E-13	1.37E-13	1.37E-13	1.37E-13	1.37E-13
mo101	9.47E-12	9.47E-12	9.46E-12	9.39E-12	9.32E-12	9.24E-12	9.03E-12	8.61E-12	7.47E-12	5.89E-12	3.66E-12	3.66E-12	3.66E-12
tc101	6.15E-14	6.15E-14	6.91E-14	1.37E-13	2.12E-13	2.86E-13	4.99E-13	8.95E-13	1.86E-12	2.89E-12	3.55E-12	3.55E-12	3.55E-12
w181	8.03E-18	8.03E-18	8.03E-18	8.03E-18	8.03E-18	8.03E-18	8.03E-18	8.03E-18	8.03E-18	8.03E-18	8.03E-18	8.03E-18	8.03E-18
w185	2.60E-16	2.60E-16	2.60E-16	2.60E-16	2.60E-16	2.60E-16	2.60E-16	2.61E-16	2.61E-16	2.61E-16	2.61E-16	2.61E-16	2.61E-16
w185m	1.76E-14	1.76E-14	1.75E-14	1.64E-14	1.53E-14	1.43E-14	1.16E-14	7.66E-15	2.21E-15	2.77E-16	4.36E-18	4.36E-18	4.36E-18
w187	5.99E-13	5.99E-13	5.99E-13	5.99E-13	5.98E-13	5.98E-13	5.98E-13	5.98E-13	5.97E-13	5.96E-13	5.93E-13	5.93E-13	5.93E-13
total	4.03E-08	4.03E-08	4.02E-08	3.97E-08	3.92E-08	3.86E-08	3.71E-08	3.43E-08	2.74E-08	1.93E-08	9.79E-09	9.79E-09	9.79E-09

Table F9. Radioactivity (Ci) After 24-s Irradiation of 1-kg Surgical Implant Composition A Cargo (Flux Parameter Set 1).

		Time After Discharge										
		initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
li	8	3.81E-12	3.81E-12	1.67E-12	9.74E-16	2.49E-19	6.37E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
be	8	3.81E-12	3.81E-12	1.67E-12	9.74E-16	2.49E-19	6.37E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
be	11	2.30E-14	2.30E-14	2.18E-14	1.39E-14	8.41E-15	5.09E-15	1.13E-15	5.56E-17	6.63E-21	1.91E-27	0.00E+00
b	12	3.49E-13	3.49E-13	8.15E-22	3.40E-22	1.28E-22	4.86E-23	2.63E-24	7.71E-27	0.00E+00	0.00E+00	0.00E+00
c	14	5.44E-18	5.44E-18	5.44E-18	5.44E-18	5.44E-18	5.44E-18	5.44E-18	5.44E-18	5.44E-18	5.44E-18	5.44E-18
c	15	1.57E-14	1.57E-14	1.18E-14	9.25E-16	5.45E-17	3.22E-18	6.61E-22	2.78E-29	0.00E+00	0.00E+00	0.00E+00
n	16	7.46E-17	7.46E-17	6.77E-17	2.82E-17	1.07E-17	4.04E-18	2.19E-19	6.40E-22	1.61E-29	0.00E+00	0.00E+00
na	24	2.80E-13	2.80E-13	2.80E-13	2.80E-13	2.80E-13	2.80E-13	2.80E-13	2.79E-13	2.79E-13	2.78E-13	2.75E-13
mg	27	1.23E-10	1.23E-10	1.23E-10	1.21E-10	1.20E-10	1.18E-10	1.14E-10	1.06E-10	8.52E-11	5.91E-11	2.84E-11
al	28	1.92E-09	1.92E-09	1.91E-09	1.82E-09	1.73E-09	1.64E-09	1.41E-09	1.03E-09	4.08E-10	8.68E-11	3.93E-12
al	29	2.29E-11	2.29E-11	2.28E-11	2.25E-11	2.21E-11	2.17E-11	2.06E-11	1.85E-11	1.35E-11	7.95E-12	2.77E-12
al	30	5.31E-13	5.31E-13	4.38E-13	7.75E-14	1.13E-14	1.65E-15	5.11E-18	4.91E-23	0.00E+00	0.00E+00	0.00E+00
si	31	4.36E-12	4.36E-12	4.36E-12	4.36E-12	4.35E-12	4.35E-12	4.34E-12	4.32E-12	4.27E-12	4.17E-12	3.99E-12
p	32	2.96E-14	2.96E-14	2.96E-14	2.96E-14	2.96E-14	2.96E-14	2.96E-14	2.96E-14	2.96E-14	2.96E-14	2.96E-14
p	33	1.42E-13	1.42E-13	1.42E-13	1.42E-13	1.42E-13	1.42E-13	1.42E-13	1.42E-13	1.42E-13	1.42E-13	1.42E-13
p	34	7.50E-13	7.50E-13	7.10E-13	4.30E-13	2.46E-13	1.41E-13	2.64E-14	9.31E-16	4.07E-20	2.21E-27	0.00E+00
s	35	3.65E-19	3.65E-19	3.65E-19	3.65E-19	3.65E-19	3.65E-19	3.65E-19	3.65E-19	3.65E-19	3.65E-19	3.65E-19
s	37	2.24E-17	2.24E-17	2.23E-17	2.19E-17	2.14E-17	2.09E-17	1.95E-17	1.70E-17	1.13E-17	5.67E-18	1.44E-18
ti	51	3.62E-12	3.62E-12	3.61E-12	3.55E-12	3.48E-12	3.41E-12	3.21E-12	2.85E-12	1.98E-12	1.09E-12	3.26E-13
v	52	3.41E-09	3.41E-09	3.40E-09	3.31E-09	3.21E-09	3.11E-09	2.83E-09	2.36E-09	1.35E-09	5.37E-10	8.46E-11
v	53	1.06E-10	1.06E-10	1.05E-10	9.85E-11	9.16E-11	8.53E-11	6.88E-11	4.47E-11	1.23E-11	1.43E-12	1.93E-14
v	54	1.90E-12	1.90E-12	1.88E-12	1.66E-12	1.44E-12	1.25E-12	8.25E-13	3.58E-13	2.92E-14	4.49E-16	1.06E-19
cr	51	1.82E-13	1.82E-13	1.82E-13	1.82E-13	1.82E-13	1.82E-13	1.82E-13	1.82E-13	1.82E-13	1.82E-13	1.82E-13
cr	55	9.28E-11	9.28E-11	9.25E-11	8.98E-11	8.69E-11	8.40E-11	7.61E-11	6.24E-11	3.44E-11	1.28E-11	1.76E-12
mn	54	3.91E-15	3.91E-15	3.91E-15	3.91E-15	3.91E-15	3.91E-15	3.91E-15	3.91E-15	3.91E-15	3.91E-15	3.91E-15
mn	56	3.70E-11	3.70E-11	3.70E-11	3.69E-11	3.69E-11	3.69E-11	3.68E-11	3.66E-11	3.62E-11	3.54E-11	3.38E-11
mn	57	2.48E-12	2.48E-12	2.46E-12	2.29E-12	2.11E-12	1.95E-12	1.54E-12	9.54E-13	2.28E-13	2.10E-14	1.78E-16
mn	58	1.08E-14	1.08E-14	1.07E-14	9.69E-15	8.71E-15	7.83E-15	5.70E-15	3.01E-15	4.46E-16	1.85E-17	3.16E-20
fe	55	8.45E-17	8.45E-17	8.45E-17	8.45E-17	8.45E-17	8.45E-17	8.45E-17	8.45E-17	8.45E-17	8.45E-17	8.45E-17
fe	59	3.65E-17	3.65E-17	3.65E-17	3.65E-17	3.65E-17	3.65E-17	3.65E-17	3.65E-17	3.65E-17	3.65E-17	3.65E-17
co	58	4.34E-13	4.34E-13	4.34E-13	4.34E-13	4.34E-13	4.34E-13	4.34E-13	4.34E-13	4.34E-13	4.34E-13	4.34E-13
co	60	1.80E-13	1.80E-13	1.80E-13	1.82E-13	1.84E-13	1.86E-13	1.93E-13	2.05E-13	2.37E-13	2.79E-13	3.30E-13
co	60m	5.43E-08	5.43E-08	5.42E-08	5.37E-08	5.31E-08	5.25E-08	5.08E-08	4.76E-08	3.90E-08	2.80E-08	1.44E-08
co	61	1.13E-13	1.13E-13	1.13E-13	1.13E-13	1.12E-13	1.12E-13	1.12E-13	1.11E-13	1.09E-13	1.05E-13	9.79E-14
co	62	1.27E-12	1.27E-12	1.26E-12	1.18E-12	1.09E-12	1.01E-12	8.00E-13	5.04E-13	1.26E-13	1.25E-14	1.23E-16
ni	59	2.44E-20	2.44E-20	2.44E-20	2.44E-20	2.44E-20	2.44E-20	2.44E-20	2.44E-20	2.44E-20	2.44E-20	2.44E-20
ni	63	2.97E-18	2.97E-18	2.97E-18	2.97E-18	2.97E-18	2.97E-18	2.97E-18	2.97E-18	2.97E-18	2.97E-18	2.97E-18
ni	65	3.04E-14	3.04E-14	3.04E-14	3.03E-14	3.03E-14	3.03E-14	3.02E-14	3.01E-14	2.97E-14	2.90E-14	2.77E-14
y	89m	9.18E-16	9.18E-16	9.82E-16	1.45E-15	1.79E-15	2.02E-15	2.32E-15	2.43E-15	2.43E-15	2.43E-15	2.43E-15
zr	89	2.44E-15	2.44E-15	2.44E-15	2.44E-15	2.44E-15	2.44E-15	2.44E-15	2.44E-15	2.44E-15	2.43E-15	2.43E-15
zr	95	4.29E-16	4.29E-16	4.29E-16	4.29E-16	4.29E-16	4.29E-16	4.29E-16	4.29E-16	4.29E-16	4.29E-16	4.29E-16
zr	97	8.96E-16	8.96E-16	8.96E-16	8.95E-16	8.95E-16	8.95E-16	8.95E-16	8.94E-16	8.93E-16	8.89E-16	8.83E-16
nb	94	1.80E-20	1.80E-20	1.80E-20	1.80E-20	1.80E-20	1.80E-20	1.80E-20	1.80E-20	1.80E-20	1.80E-20	1.80E-20

Table F9. (continued)

	Time After Discharge										
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
nb 95	1.02E-15	1.02E-15	1.02E-15	1.02E-15	1.02E-15	1.02E-15	1.02E-15	1.02E-15	1.02E-15	1.02E-15	1.02E-15
nb 96	5.64E-14	5.64E-14	5.64E-14	5.64E-14	5.64E-14	5.64E-14	5.64E-14	5.63E-14	5.63E-14	5.61E-14	5.58E-14
nb 97	4.30E-13	4.30E-13	4.30E-13	4.30E-13	4.29E-13	4.28E-13	4.26E-13	4.22E-13	4.10E-13	3.91E-13	3.55E-13
nb 97m	1.08E-16	1.08E-16	1.16E-16	1.88E-16	2.60E-16	3.25E-16	4.78E-16	6.63E-16	8.24E-16	8.43E-16	8.38E-16
nb 98	1.72E-11	1.72E-11	1.35E-11	1.53E-12	1.35E-13	1.20E-14	8.34E-18	4.03E-24	0.00E+00	0.00E+00	0.00E+00
nb100	8.60E-13	8.60E-13	5.42E-13	8.47E-15	8.33E-17	8.20E-19	7.82E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mo 93	2.57E-20	2.57E-20	2.57E-20	2.57E-20	2.57E-20	2.57E-20	2.57E-20	2.57E-20	2.57E-20	2.57E-20	2.57E-20
mo 99	2.06E-13	2.06E-13	2.06E-13	2.06E-13	2.06E-13	2.06E-13	2.06E-13	2.06E-13	2.06E-13	2.06E-13	2.05E-13
mo101	1.42E-11	1.42E-11	1.41E-11	1.40E-11	1.39E-11	1.38E-11	1.35E-11	1.29E-11	1.12E-11	8.81E-12	5.48E-12
tc101	1.38E-13	1.38E-13	1.49E-13	2.51E-13	3.62E-13	4.72E-13	7.90E-13	1.38E-12	2.82E-12	4.35E-12	5.33E-12
w181	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17
w185	3.91E-16	3.91E-16	3.91E-16	3.91E-16	3.91E-16	3.91E-16	3.91E-16	3.91E-16	3.91E-16	3.91E-16	3.91E-16
w185m	2.57E-14	2.57E-14	2.55E-14	2.39E-14	2.23E-14	2.09E-14	1.69E-14	1.12E-14	3.22E-15	4.04E-16	6.37E-18
w187	8.98E-13	8.98E-13	8.98E-13	8.98E-13	8.98E-13	8.98E-13	8.97E-13	8.97E-13	8.96E-13	8.94E-13	8.89E-13
total	6.01E-08	6.01E-08	6.00E-08	5.92E-08	5.84E-08	5.77E-08	5.54E-08	5.13E-08	4.10E-08	2.88E-08	1.46E-08

Table F10. Radioactivity (Ci) After 8-s Irradiation of 1-kg Surgical Implant Composition B Cargo (Flux Parameter Set 1).

		Time After Discharge										
		initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
ti	51	1.10E-12	1.10E-12	1.10E-12	1.08E-12	1.06E-12	1.04E-12	9.78E-13	8.67E-13	6.05E-13	3.31E-13	9.94E-14
v	52	1.04E-09	1.04E-09	1.04E-09	1.01E-09	9.79E-10	9.50E-10	8.66E-10	7.20E-10	4.13E-10	1.64E-10	2.58E-11
v	53	3.36E-11	3.36E-11	3.33E-11	3.13E-11	2.91E-11	2.71E-11	2.18E-11	1.42E-11	3.90E-12	4.53E-13	6.12E-15
v	54	6.35E-13	6.35E-13	6.27E-13	5.53E-13	4.81E-13	4.18E-13	2.76E-13	1.20E-13	9.76E-15	1.50E-16	3.54E-20
cr	51	5.41E-14	5.41E-14	5.41E-14	5.41E-14	5.41E-14	5.41E-14	5.41E-14	5.41E-14	5.41E-14	5.41E-14	5.40E-14
cr	55	7.54E-12	7.54E-12	7.52E-12	7.30E-12	7.06E-12	6.83E-12	6.19E-12	5.07E-12	2.80E-12	1.04E-12	1.43E-13
co	60	6.93E-14	6.93E-14	6.94E-14	7.02E-14	7.10E-14	7.19E-14	7.44E-14	7.93E-14	9.20E-14	1.08E-13	1.28E-13
co	60m	2.14E-08	2.14E-08	2.13E-08	2.11E-08	2.09E-08	2.07E-08	2.00E-08	1.87E-08	1.53E-08	1.10E-08	5.69E-09
y	89m	8.95E-17	8.95E-17	1.10E-16	2.61E-16	3.73E-16	4.45E-16	5.43E-16	5.77E-16	5.79E-16	5.79E-16	5.78E-16
zr	89	5.80E-16	5.80E-16	5.80E-16	5.80E-16	5.80E-16	5.80E-16	5.80E-16	5.80E-16	5.80E-16	5.80E-16	5.79E-16
zr	95	1.02E-16	1.02E-16	1.02E-16	1.02E-16	1.02E-16	1.02E-16	1.02E-16	1.02E-16	1.02E-16	1.02E-16	1.02E-16
zr	97	2.13E-16	2.13E-16	2.13E-16	2.13E-16	2.13E-16	2.13E-16	2.13E-16	2.13E-16	2.13E-16	2.12E-16	2.10E-16
nb	95	2.44E-16	2.44E-16	2.44E-16	2.44E-16	2.44E-16	2.44E-16	2.44E-16	2.44E-16	2.44E-16	2.44E-16	2.44E-16
nb	96	1.34E-14	1.34E-14	1.34E-14	1.34E-14	1.34E-14	1.34E-14	1.34E-14	1.34E-14	1.34E-14	1.34E-14	1.33E-14
nb	97	1.03E-13	1.03E-13	1.03E-13	1.02E-13	1.02E-13	1.02E-13	1.02E-13	1.01E-13	9.78E-14	9.32E-14	8.47E-14
nb	97m	9.06E-18	9.06E-18	1.13E-17	3.01E-17	4.89E-17	6.56E-17	1.06E-16	1.54E-16	1.96E-16	2.01E-16	2.00E-16
nb	98	1.06E-11	1.06E-11	8.30E-12	9.37E-13	8.30E-14	7.35E-15	5.11E-18	2.47E-24	0.00E+00	0.00E+00	0.00E+00
nb	100	5.99E-13	5.99E-13	3.78E-13	5.90E-15	5.81E-17	5.71E-19	5.45E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mo	99	4.90E-14	4.90E-14	4.90E-14	4.90E-14	4.90E-14	4.90E-14	4.90E-14	4.90E-14	4.90E-14	4.90E-14	4.89E-14
mo	101	3.39E-12	3.39E-12	3.39E-12	3.36E-12	3.34E-12	3.31E-12	3.23E-12	3.08E-12	2.68E-12	2.11E-12	1.31E-12
tc	101	1.10E-14	1.10E-14	1.38E-14	3.83E-14	6.52E-14	9.16E-14	1.68E-13	3.11E-13	6.59E-13	1.03E-12	1.27E-12
total		2.25E-08	2.25E-08	2.24E-08	2.22E-08	2.19E-08	2.17E-08	2.09E-08	1.95E-08	1.58E-08	1.12E-08	5.71E-09

Table F11. Radioactivity (Ci) After 16-s Irradiation of 1-kg Surgical Implant Composition B Cargo (Flux Parameter Set 1).

		Time After Discharge										
		initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
ti	51	2.19E-12	2.19E-12	2.19E-12	2.15E-12	2.10E-12	2.06E-12	1.94E-12	1.72E-12	1.20E-12	6.57E-13	1.97E-13
v	52	2.06E-09	2.06E-09	2.05E-09	2.00E-09	1.94E-09	1.88E-09	1.71E-09	1.42E-09	8.17E-10	3.24E-10	5.10E-11
v	53	6.53E-11	6.53E-11	6.48E-11	6.08E-11	5.66E-11	5.26E-11	4.24E-11	2.76E-11	7.58E-12	8.81E-13	1.19E-14
v	54	1.20E-12	1.20E-12	1.19E-12	1.05E-12	9.11E-13	7.93E-13	5.22E-13	2.27E-13	1.85E-14	2.84E-16	6.71E-20
cr	51	1.08E-13	1.08E-13	1.08E-13	1.08E-13	1.08E-13	1.08E-13	1.08E-13	1.08E-13	1.08E-13	1.08E-13	1.08E-13
cr	55	1.49E-11	1.49E-11	1.48E-11	1.44E-11	1.39E-11	1.35E-11	1.22E-11	1.00E-11	5.53E-12	2.05E-12	2.83E-13
co	60	1.39E-13	1.39E-13	1.39E-13	1.41E-13	1.43E-13	1.44E-13	1.50E-13	1.59E-13	1.84E-13	2.17E-13	2.57E-13
co	60m	4.26E-08	4.26E-08	4.25E-08	4.21E-08	4.16E-08	4.12E-08	3.98E-08	3.73E-08	3.06E-08	2.19E-08	1.13E-08
y	89m	3.22E-16	3.22E-16	3.57E-16	6.16E-16	8.06E-16	9.30E-16	1.10E-15	1.15E-15	1.16E-15	1.16E-15	1.16E-15
zr	89	1.16E-15	1.16E-15	1.16E-15	1.16E-15	1.16E-15	1.16E-15	1.16E-15	1.16E-15	1.16E-15	1.16E-15	1.16E-15
zr	95	2.05E-16	2.05E-16	2.05E-16	2.05E-16	2.05E-16	2.05E-16	2.05E-16	2.05E-16	2.05E-16	2.04E-16	2.04E-16
zr	97	4.26E-16	4.26E-16	4.26E-16	4.26E-16	4.26E-16	4.26E-16	4.26E-16	4.26E-16	4.25E-16	4.24E-16	4.21E-16
nb	95	4.87E-16	4.87E-16	4.87E-16	4.87E-16	4.87E-16	4.87E-16	4.87E-16	4.87E-16	4.87E-16	4.87E-16	4.87E-16
nb	96	2.69E-14	2.69E-14	2.69E-14	2.69E-14	2.69E-14	2.68E-14	2.68E-14	2.68E-14	2.68E-14	2.67E-14	2.66E-14
nb	97	2.05E-13	2.05E-13	2.05E-13	2.05E-13	2.04E-13	2.04E-13	2.03E-13	2.01E-13	1.95E-13	1.86E-13	1.69E-13
nb	97m	3.52E-17	3.52E-17	3.94E-17	7.54E-17	1.11E-16	1.43E-16	2.20E-16	3.12E-16	3.92E-16	4.02E-16	3.99E-16
nb	98	1.21E-11	1.21E-11	9.49E-12	1.07E-12	9.49E-14	8.41E-15	5.85E-18	2.83E-24	0.00E+00	0.00E+00	0.00E+00
nb	100	6.14E-13	6.14E-13	3.87E-13	6.04E-15	5.95E-17	5.86E-19	5.58E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mo	93	1.23E-20	1.23E-20	1.23E-20	1.23E-20	1.23E-20	1.23E-20	1.23E-20	1.23E-20	1.23E-20	1.23E-20	1.23E-20
mo	99	9.81E-14	9.81E-14	9.81E-14	9.81E-14	9.81E-14	9.81E-14	9.81E-14	9.80E-14	9.80E-14	9.79E-14	9.77E-14
mo	101	6.76E-12	6.76E-12	6.76E-12	6.71E-12	6.66E-12	6.60E-12	6.45E-12	6.15E-12	5.33E-12	4.21E-12	2.62E-12
tc	101	4.39E-14	4.39E-14	4.94E-14	9.81E-14	1.51E-13	2.04E-13	3.56E-13	6.39E-13	1.33E-12	2.07E-12	2.54E-12
total		4.47E-08	4.47E-08	4.47E-08	4.42E-08	4.36E-08	4.31E-08	4.16E-08	3.87E-08	3.14E-08	2.23E-08	1.14E-08

Table F12. Radioactivity (Ci) After 24-s Irradiation of 1-kg Surgical Implant Composition B Cargo (Flux Parameter Set 1).

	Time After Discharge										
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
ti 51	3.26E-12	3.26E-12	3.25E-12	3.19E-12	3.13E-12	3.07E-12	2.89E-12	2.56E-12	1.79E-12	9.78E-13	2.94E-13
v 52	3.05E-09	3.05E-09	3.04E-09	2.96E-09	2.87E-09	2.78E-09	2.54E-09	2.11E-09	1.21E-09	4.80E-10	7.56E-11
v 53	9.52E-11	9.52E-11	9.45E-11	8.86E-11	8.25E-11	7.68E-11	6.19E-11	4.02E-11	1.11E-11	1.29E-12	1.73E-14
v 54	1.71E-12	1.71E-12	1.69E-12	1.49E-12	1.30E-12	1.13E-12	7.43E-13	3.22E-13	2.63E-14	4.04E-16	9.54E-20
cr 51	1.62E-13	1.62E-13	1.62E-13	1.62E-13	1.62E-13	1.62E-13	1.62E-13	1.62E-13	1.62E-13	1.62E-13	1.62E-13
cr 55	2.20E-11	2.20E-11	2.20E-11	2.13E-11	2.06E-11	2.00E-11	1.81E-11	1.48E-11	8.18E-12	3.04E-12	4.18E-13
co 60	2.10E-13	2.10E-13	2.10E-13	2.13E-13	2.15E-13	2.18E-13	2.25E-13	2.40E-13	2.77E-13	3.26E-13	3.86E-13
co 60m	6.35E-08	6.35E-08	6.35E-08	6.28E-08	6.22E-08	6.15E-08	5.95E-08	5.57E-08	4.56E-08	3.28E-08	1.69E-08
y 89m	6.56E-16	6.56E-16	7.02E-16	1.04E-15	1.28E-15	1.44E-15	1.66E-15	1.73E-15	1.74E-15	1.74E-15	1.73E-15
zr 89	1.74E-15	1.74E-15	1.74E-15	1.74E-15	1.74E-15	1.74E-15	1.74E-15	1.74E-15	1.74E-15	1.74E-15	1.74E-15
zr 95	3.07E-16	3.07E-16	3.07E-16	3.07E-16	3.07E-16	3.07E-16	3.07E-16	3.07E-16	3.07E-16	3.07E-16	3.07E-16
zr 97	6.40E-16	6.40E-16	6.40E-16	6.40E-16	6.40E-16	6.39E-16	6.39E-16	6.39E-16	6.38E-16	6.35E-16	6.31E-16
nb 94	1.29E-20	1.29E-20	1.29E-20	1.29E-20	1.29E-20	1.29E-20	1.29E-20	1.29E-20	1.29E-20	1.29E-20	1.29E-20
nb 95	7.31E-16	7.31E-16	7.31E-16	7.31E-16	7.31E-16	7.31E-16	7.31E-16	7.31E-16	7.31E-16	7.31E-16	7.31E-16
nb 96	4.03E-14	4.03E-14	4.03E-14	4.03E-14	4.03E-14	4.03E-14	4.03E-14	4.02E-14	4.02E-14	4.01E-14	3.99E-14
nb 97	3.07E-13	3.07E-13	3.07E-13	3.07E-13	3.06E-13	3.06E-13	3.04E-13	3.02E-13	2.93E-13	2.79E-13	2.54E-13
nb 97m	7.68E-17	7.68E-17	8.29E-17	1.35E-16	1.86E-16	2.32E-16	3.42E-16	4.74E-16	5.88E-16	6.02E-16	5.99E-16
nb 98	1.23E-11	1.23E-11	9.66E-12	1.09E-12	9.67E-14	8.56E-15	5.96E-18	2.88E-24	0.00E+00	0.00E+00	0.00E+00
nb100	6.14E-13	6.14E-13	3.87E-13	6.05E-15	5.95E-17	5.86E-19	5.59E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mo 93	1.84E-20	1.84E-20	1.84E-20	1.84E-20	1.84E-20	1.84E-20	1.84E-20	1.84E-20	1.84E-20	1.84E-20	1.84E-20
mo 99	1.47E-13	1.47E-13	1.47E-13	1.47E-13	1.47E-13	1.47E-13	1.47E-13	1.47E-13	1.47E-13	1.47E-13	1.47E-13
mo101	1.01E-11	1.01E-11	1.01E-11	1.00E-11	9.95E-12	9.87E-12	9.64E-12	9.20E-12	7.97E-12	6.29E-12	3.91E-12
tc101	9.84E-14	9.84E-14	1.07E-13	1.79E-13	2.59E-13	3.37E-13	5.64E-13	9.86E-13	2.02E-12	3.11E-12	3.81E-12
total	6.67E-08	6.67E-08	6.67E-08	6.59E-08	6.51E-08	6.44E-08	6.21E-08	5.78E-08	4.69E-08	3.33E-08	1.70E-08

Table F13. Radioactivity (Ci) After 8-s Irradiation of 1-kg 16-16-16 Fertilizer Cargo (Flux Parameter Set 1).

	Time After Discharge										
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
b 12	7.28E-12	7.28E-12	3.50E-14	1.46E-14	5.51E-15	2.09E-15	1.13E-16	3.31E-19	8.31E-27	0.00E+00	0.00E+00
c 14	1.25E-16	1.25E-16	1.25E-16	1.25E-16	1.25E-16	1.25E-16	1.25E-16	1.25E-16	1.25E-16	1.25E-16	1.25E-16
c 15	6.53E-10	6.53E-10	4.92E-10	3.85E-11	2.27E-12	1.34E-13	2.75E-17	1.16E-24	0.00E+00	0.00E+00	0.00E+00
n 16	3.20E-09	3.20E-09	2.90E-09	1.21E-09	4.58E-10	1.73E-10	9.38E-12	2.75E-14	6.91E-22	0.00E+00	0.00E+00
o 19	2.16E-14	2.16E-14	2.10E-14	1.67E-14	1.29E-14	9.96E-15	4.60E-15	9.80E-16	9.50E-18	4.19E-21	8.13E-28
f 20	2.37E-10	2.37E-10	2.22E-10	1.26E-10	6.71E-11	3.57E-11	5.40E-12	1.23E-13	1.46E-18	9.00E-27	0.00E+00
ne 23	1.05E-10	1.05E-10	1.03E-10	8.74E-11	7.25E-11	6.02E-11	3.45E-11	1.13E-11	3.96E-13	1.49E-15	2.10E-20
na 24	5.32E-14	5.32E-14	5.32E-14	5.32E-14	5.32E-14	5.32E-14	5.32E-14	5.31E-14	5.30E-14	5.28E-14	5.24E-14
na 24m	2.17E-10	2.17E-10	2.62E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
al 28	1.69E-09	1.69E-09	1.69E-09	1.61E-09	1.53E-09	1.45E-09	1.24E-09	9.12E-10	3.61E-10	7.67E-11	3.48E-12
si 31	5.91E-10	5.91E-10	5.91E-10	5.90E-10	5.90E-10	5.89E-10	5.88E-10	5.86E-10	5.78E-10	5.65E-10	5.41E-10
p 32	9.28E-13	9.28E-13	9.28E-13	9.28E-13	9.28E-13	9.28E-13	9.28E-13	9.28E-13	9.28E-13	9.27E-13	9.27E-13
p 34	4.60E-09	4.60E-09	4.35E-09	2.63E-09	1.51E-09	8.63E-10	1.62E-10	5.70E-12	2.49E-16	1.35E-23	0.00E+00
s 35	3.98E-13	3.98E-13	3.98E-13	3.98E-13	3.98E-13	3.98E-13	3.98E-13	3.98E-13	3.98E-13	3.98E-13	3.98E-13
s 37	4.64E-11	4.64E-11	4.63E-11	4.54E-11	4.44E-11	4.33E-11	4.05E-11	3.53E-11	2.34E-11	1.18E-11	2.98E-12
cl 36	8.26E-19	8.26E-19	8.26E-19	8.26E-19	8.26E-19	8.26E-19	8.26E-19	8.26E-19	8.26E-19	8.26E-19	8.26E-19
cl 38	4.88E-12	4.88E-12	4.89E-12	4.88E-12	4.86E-12	4.84E-12	4.80E-12	4.71E-12	4.46E-12	4.06E-12	3.37E-12
cl 38m	2.27E-11	2.27E-11	8.60E-12	1.40E-15	8.61E-20	5.31E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ar 37	2.57E-13	2.57E-13	2.57E-13	2.57E-13	2.57E-13	2.57E-13	2.57E-13	2.57E-13	2.57E-13	2.57E-13	2.57E-13
ar 39	1.88E-15	1.88E-15	1.88E-15	1.88E-15	1.88E-15	1.88E-15	1.88E-15	1.88E-15	1.88E-15	1.88E-15	1.88E-15
ar 41	1.33E-14	1.33E-14	1.33E-14	1.32E-14	1.32E-14	1.32E-14	1.32E-14	1.31E-14	1.28E-14	1.24E-14	1.17E-14
k 40	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07
k 42	6.96E-13	6.96E-13	6.96E-13	6.96E-13	6.96E-13	6.96E-13	6.96E-13	6.95E-13	6.93E-13	6.90E-13	6.83E-13
k 43	6.57E-15	6.57E-15	6.57E-15	6.57E-15	6.57E-15	6.57E-15	6.56E-15	6.56E-15	6.55E-15	6.53E-15	6.50E-15
k 44	1.50E-13	1.50E-13	1.50E-13	1.49E-13	1.48E-13	1.48E-13	1.45E-13	1.41E-13	1.28E-13	1.10E-13	8.01E-14
ca 45	9.62E-17	9.62E-17	9.62E-17	9.62E-17	9.62E-17	9.62E-17	9.62E-17	9.62E-17	9.62E-17	9.62E-17	9.62E-17
ca 47	3.91E-18	3.91E-18	3.91E-18	3.91E-18	3.91E-18	3.91E-18	3.91E-18	3.91E-18	3.91E-18	3.91E-18	3.90E-18
ca 49	2.03E-13	2.03E-13	2.03E-13	2.00E-13	1.98E-13	1.95E-13	1.88E-13	1.73E-13	1.36E-13	9.17E-14	4.14E-14
sc 49	1.64E-16	1.64E-16	2.05E-16	5.71E-16	9.72E-16	1.37E-15	2.51E-15	4.66E-15	9.99E-15	1.60E-14	2.13E-14
total	1.28E-07	1.28E-07	1.27E-07	1.23E-07	1.21E-07	1.20E-07	1.19E-07	1.19E-07	1.18E-07	1.18E-07	1.18E-07

Table F14. Radioactivity (Ci) After 16-s Irradiation of 1-kg 16-16-16 Fertilizer Cargo (Flux Parameter Set 1).

	Time After Discharge										
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
b 12	7.30E-12	7.30E-12	5.10E-14	2.13E-14	8.04E-15	3.04E-15	1.65E-16	4.82E-19	1.21E-26	0.00E+00	0.00E+00
c 14	2.50E-16	2.50E-16	2.50E-16	2.50E-16	2.50E-16	2.50E-16	2.50E-16	2.50E-16	2.50E-16	2.50E-16	2.50E-16
c 15	7.21E-10	7.21E-10	5.43E-10	4.25E-11	2.51E-12	1.48E-13	3.04E-17	1.28E-24	0.00E+00	0.00E+00	0.00E+00
n 16	4.67E-09	4.67E-09	4.24E-09	1.77E-09	6.68E-10	2.53E-10	1.37E-11	4.01E-14	1.01E-21	0.00E+00	0.00E+00
o 19	3.91E-14	3.91E-14	3.81E-14	3.02E-14	2.34E-14	1.81E-14	8.34E-15	1.78E-15	1.72E-17	7.59E-21	1.47E-27
f 20	3.80E-10	3.80E-10	3.56E-10	2.02E-10	1.08E-10	5.73E-11	8.66E-12	1.97E-13	2.34E-18	1.44E-26	0.00E+00
ne 23	1.96E-10	1.96E-10	1.92E-10	1.63E-10	1.35E-10	1.12E-10	6.41E-11	2.10E-11	7.36E-13	2.77E-15	3.91E-20
na 24	1.06E-13	1.06E-13	1.06E-13	1.06E-13	1.06E-13	1.06E-13	1.06E-13	1.06E-13	1.06E-13	1.06E-13	1.05E-13
na 24m	2.17E-10	2.17E-10	2.62E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
al 28	3.32E-09	3.32E-09	3.30E-09	3.15E-09	2.99E-09	2.84E-09	2.44E-09	1.79E-09	7.07E-10	1.50E-10	6.81E-12
si 31	1.18E-09	1.18E-09	1.18E-09	1.18E-09	1.18E-09	1.18E-09	1.18E-09	1.17E-09	1.16E-09	1.13E-09	1.08E-09
p 32	1.86E-12	1.86E-12	1.86E-12	1.86E-12	1.86E-12	1.86E-12	1.86E-12	1.86E-12	1.86E-12	1.85E-12	1.85E-12
p 34	7.54E-09	7.54E-09	7.13E-09	4.32E-09	2.47E-09	1.41E-09	2.66E-10	9.36E-12	4.09E-16	2.22E-23	0.00E+00
s 35	7.95E-13	7.95E-13	7.95E-13	7.95E-13	7.95E-13	7.95E-13	7.95E-13	7.95E-13	7.95E-13	7.95E-13	7.95E-13
s 37	9.20E-11	9.20E-11	9.18E-11	8.99E-11	8.79E-11	8.59E-11	8.02E-11	6.99E-11	4.63E-11	2.33E-11	5.91E-12
cl 36	1.65E-18	1.65E-18	1.65E-18	1.65E-18	1.65E-18	1.65E-18	1.65E-18	1.65E-18	1.65E-18	1.65E-18	1.65E-18
cl 38	9.76E-12	9.76E-12	9.76E-12	9.74E-12	9.71E-12	9.68E-12	9.59E-12	9.41E-12	8.90E-12	8.11E-12	6.73E-12
cl 38m	2.27E-11	2.27E-11	8.60E-12	1.40E-15	8.62E-20	5.31E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ar 37	5.13E-13	5.13E-13	5.13E-13	5.13E-13	5.13E-13	5.13E-13	5.13E-13	5.13E-13	5.13E-13	5.13E-13	5.13E-13
ar 39	3.76E-15	3.76E-15	3.76E-15	3.76E-15	3.76E-15	3.76E-15	3.76E-15	3.76E-15	3.76E-15	3.76E-15	3.76E-15
ar 41	2.65E-14	2.65E-14	2.65E-14	2.65E-14	2.64E-14	2.64E-14	2.63E-14	2.62E-14	2.57E-14	2.49E-14	2.34E-14
k 40	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07
k 42	1.39E-12	1.39E-12	1.39E-12	1.39E-12	1.39E-12	1.39E-12	1.39E-12	1.39E-12	1.39E-12	1.38E-12	1.37E-12
k 43	1.31E-14	1.31E-14	1.31E-14	1.31E-14	1.31E-14	1.31E-14	1.31E-14	1.31E-14	1.31E-14	1.31E-14	1.30E-14
k 44	2.99E-13	2.99E-13	2.99E-13	2.98E-13	2.96E-13	2.94E-13	2.90E-13	2.81E-13	2.56E-13	2.19E-13	1.60E-13
ca 41	1.49E-20	1.49E-20	1.49E-20	1.49E-20	1.49E-20	1.49E-20	1.49E-20	1.49E-20	1.49E-20	1.49E-20	1.49E-20
ca 45	1.92E-16	1.92E-16	1.92E-16	1.92E-16	1.92E-16	1.92E-16	1.92E-16	1.92E-16	1.92E-16	1.92E-16	1.92E-16
ca 47	7.82E-18	7.82E-18	7.82E-18	7.82E-18	7.82E-18	7.82E-18	7.82E-18	7.82E-18	7.82E-18	7.81E-18	7.80E-18
ca 49	4.04E-13	4.04E-13	4.04E-13	3.99E-13	3.93E-13	3.88E-13	3.73E-13	3.45E-13	2.71E-13	1.82E-13	8.23E-14
sc 49	6.54E-16	6.54E-16	7.36E-16	1.46E-15	2.26E-15	3.04E-15	5.32E-15	9.58E-15	2.02E-14	3.21E-14	4.27E-14
total	1.35E-07	1.35E-07	1.34E-07	1.28E-07	1.25E-07	1.23E-07	1.21E-07	1.20E-07	1.19E-07	1.18E-07	1.18E-07

Table F15. Radioactivity (Ci) After 24-s Irradiation of 1-kg 16-16-16 Fertilizer Cargo (Flux Parameter Set 1).

	Time After Discharge										
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
b 12	7.31E-12	7.31E-12	5.84E-14	2.43E-14	9.21E-15	3.48E-15	1.89E-16	5.52E-19	1.39E-26	0.00E+00	0.00E+00
c 14	3.75E-16	3.75E-16	3.75E-16	3.75E-16	3.75E-16	3.75E-16	3.75E-16	3.75E-16	3.75E-16	3.75E-16	3.75E-16
c 15	7.28E-10	7.28E-10	5.49E-10	4.30E-11	2.53E-12	1.49E-13	3.07E-17	1.29E-24	0.00E+00	0.00E+00	0.00E+00
n 16	5.35E-09	5.35E-09	4.85E-09	2.02E-09	7.65E-10	2.89E-10	1.57E-11	4.59E-14	1.15E-21	0.00E+00	0.00E+00
o 19	5.34E-14	5.34E-14	5.20E-14	4.13E-14	3.19E-14	2.47E-14	1.14E-14	2.43E-15	2.35E-17	1.04E-20	2.01E-27
f 20	4.66E-10	4.66E-10	4.38E-10	2.48E-10	1.32E-10	7.04E-11	1.06E-11	2.42E-13	2.87E-18	1.77E-26	0.00E+00
ne 23	2.74E-10	2.74E-10	2.69E-10	2.28E-10	1.89E-10	1.57E-10	8.97E-11	2.94E-11	1.03E-12	3.87E-15	5.47E-20
na 24	1.60E-13	1.60E-13	1.60E-13	1.60E-13	1.60E-13	1.60E-13	1.60E-13	1.59E-13	1.59E-13	1.58E-13	1.57E-13
na 24m	2.17E-10	2.17E-10	2.62E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
al 28	4.88E-09	4.88E-09	4.85E-09	4.63E-09	4.40E-09	4.18E-09	3.58E-09	2.63E-09	1.04E-09	2.21E-10	1.00E-11
si 31	1.77E-09	1.77E-09	1.77E-09	1.77E-09	1.77E-09	1.77E-09	1.76E-09	1.76E-09	1.73E-09	1.69E-09	1.62E-09
p 32	2.78E-12	2.78E-12	2.78E-12	2.78E-12	2.78E-12	2.78E-12	2.78E-12	2.78E-12	2.78E-12	2.78E-12	2.78E-12
p 34	9.42E-09	9.42E-09	8.91E-09	5.39E-09	3.09E-09	1.77E-09	3.32E-10	1.17E-11	5.11E-16	2.77E-23	0.00E+00
s 35	1.19E-12	1.19E-12	1.19E-12	1.19E-12	1.19E-12	1.19E-12	1.19E-12	1.19E-12	1.19E-12	1.19E-12	1.19E-12
s 37	1.37E-10	1.37E-10	1.36E-10	1.34E-10	1.31E-10	1.28E-10	1.19E-10	1.04E-10	6.89E-11	3.47E-11	8.79E-12
cl 36	2.48E-18	2.48E-18	2.48E-18	2.48E-18	2.48E-18	2.48E-18	2.48E-18	2.48E-18	2.48E-18	2.48E-18	2.48E-18
cl 38	1.46E-11	1.46E-11	1.46E-11	1.46E-11	1.45E-11	1.45E-11	1.44E-11	1.41E-11	1.33E-11	1.21E-11	1.01E-11
cl 38m	2.27E-11	2.27E-11	8.60E-12	1.40E-15	8.62E-20	5.31E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ar 37	7.70E-13	7.70E-13	7.70E-13	7.70E-13	7.70E-13	7.70E-13	7.70E-13	7.70E-13	7.70E-13	7.70E-13	7.70E-13
ar 39	5.64E-15	5.64E-15	5.64E-15	5.64E-15	5.64E-15	5.64E-15	5.64E-15	5.64E-15	5.64E-15	5.64E-15	5.64E-15
ar 41	3.97E-14	3.97E-14	3.97E-14	3.97E-14	3.97E-14	3.96E-14	3.95E-14	3.92E-14	3.85E-14	3.73E-14	3.50E-14
k 40	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07	1.17E-07
k 42	2.09E-12	2.09E-12	2.09E-12	2.09E-12	2.09E-12	2.09E-12	2.09E-12	2.08E-12	2.08E-12	2.07E-12	2.05E-12
k 43	1.97E-14	1.97E-14	1.97E-14	1.97E-14	1.97E-14	1.97E-14	1.97E-14	1.97E-14	1.97E-14	1.96E-14	1.95E-14
k 44	4.48E-13	4.48E-13	4.47E-13	4.45E-13	4.43E-13	4.41E-13	4.34E-13	4.21E-13	3.83E-13	3.27E-13	2.39E-13
ca 41	2.23E-20	2.23E-20	2.23E-20	2.23E-20	2.23E-20	2.23E-20	2.23E-20	2.23E-20	2.23E-20	2.23E-20	2.23E-20
ca 45	2.89E-16	2.89E-16	2.89E-16	2.89E-16	2.89E-16	2.89E-16	2.89E-16	2.89E-16	2.89E-16	2.89E-16	2.89E-16
ca 47	1.17E-17	1.17E-17	1.17E-17	1.17E-17	1.17E-17	1.17E-17	1.17E-17	1.17E-17	1.17E-17	1.17E-17	1.17E-17
ca 49	6.03E-13	6.03E-13	6.02E-13	5.95E-13	5.87E-13	5.79E-13	5.57E-13	5.14E-13	4.05E-13	2.72E-13	1.23E-13
sc 49	1.47E-15	1.47E-15	1.59E-15	2.67E-15	3.86E-15	5.03E-15	8.43E-15	1.48E-14	3.06E-14	4.84E-14	6.41E-14
total	1.40E-07	1.40E-07	1.39E-07	1.31E-07	1.27E-07	1.25E-07	1.23E-07	1.22E-07	1.20E-07	1.19E-07	1.19E-07

Table F16. Radioactivity (Ci) After One-Day Irradiation of 1-kg Concrete (Flux Parameter Set 1).

		Time After Discharge										
		initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
h 3		2.64E-19	2.64E-19	2.64E-19	2.64E-19	2.64E-19	2.64E-19	2.64E-19	2.64E-19	2.64E-19	2.64E-19	2.64E-19
be 10		1.17E-20	1.17E-20	1.17E-20	1.17E-20	1.17E-20	1.17E-20	1.17E-20	1.17E-20	1.17E-20	1.17E-20	1.17E-20
c 14		2.09E-18	2.09E-18	2.09E-18	2.09E-18	2.09E-18	2.09E-18	2.09E-18	2.09E-18	2.09E-18	2.09E-18	2.09E-18
na 24		4.75E-09	4.64E-09	4.53E-09	4.32E-09	3.93E-09	3.58E-09	3.25E-09	2.96E-09	2.69E-09	2.45E-09	2.23E-09
na 25		2.02E-10	1.64E-19	1.33E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mg 27		4.85E-08	5.39E-09	5.99E-10	7.38E-12	1.12E-15	1.71E-19	2.60E-23	3.95E-27	6.01E-31	8.36E-35	0.00E+00
al 28		5.47E-07	5.08E-11	4.73E-15	4.08E-23	1.03E-28	9.60E-29	8.98E-29	8.41E-29	7.87E-29	7.36E-29	6.89E-29
al 29		1.86E-08	7.85E-10	3.31E-11	5.88E-14	1.85E-19	5.85E-25	1.84E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00
si 31		2.74E-10	2.40E-10	2.10E-10	1.61E-10	9.51E-11	5.61E-11	3.30E-11	1.95E-11	1.15E-11	6.76E-12	3.99E-12
cl 36		1.37E-16	1.37E-16	1.37E-16	1.37E-16	1.37E-16	1.37E-16	1.37E-16	1.37E-16	1.37E-16	1.37E-16	1.37E-16
ar 37		5.78E-10	5.77E-10	5.77E-10	5.77E-10	5.76E-10	5.75E-10	5.74E-10	5.73E-10	5.72E-10	5.71E-10	5.70E-10
ar 39		6.50E-13	6.50E-13	6.50E-13	6.50E-13	6.50E-13	6.50E-13	6.50E-13	6.50E-13	6.50E-13	6.50E-13	6.50E-13
ar 41		9.39E-12	7.77E-12	6.43E-12	4.40E-12	2.06E-12	9.64E-13	4.51E-13	2.11E-13	9.90E-14	4.63E-14	2.17E-14
k 40		1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08
k 42		7.55E-10	7.34E-10	7.14E-10	6.75E-10	6.03E-10	5.39E-10	4.82E-10	4.31E-10	3.85E-10	3.44E-10	3.08E-10
k 43		1.31E-11	1.29E-11	1.27E-11	1.23E-11	1.16E-11	1.09E-11	1.02E-11	9.62E-12	9.04E-12	8.50E-12	7.99E-12
k 44		2.26E-11	8.82E-12	3.45E-12	5.26E-13	1.23E-14	2.86E-16	6.68E-18	1.56E-19	3.64E-21	8.48E-23	1.98E-24
ca 41		1.68E-17	1.68E-17	1.68E-17	1.68E-17	1.68E-17	1.68E-17	1.68E-17	1.68E-17	1.68E-17	1.68E-17	1.68E-17
ca 45		2.17E-13	2.17E-13	2.17E-13	2.17E-13	2.17E-13	2.17E-13	2.17E-13	2.17E-13	2.17E-13	2.17E-13	2.17E-13
ca 47		8.61E-15	8.58E-15	8.56E-15	8.50E-15	8.39E-15	8.29E-15	8.18E-15	8.08E-15	7.98E-15	7.88E-15	7.78E-15
ca 49		1.21E-11	1.11E-12	1.02E-13	8.65E-16	6.19E-20	4.44E-24	3.18E-28	2.27E-32	0.00E+00	0.00E+00	0.00E+00
sc 47		2.93E-16	3.29E-16	3.64E-16	4.35E-16	5.72E-16	7.05E-16	8.34E-16	9.59E-16	1.08E-15	1.20E-15	1.31E-15
sc 49		1.20E-11	9.68E-12	6.85E-12	3.32E-12	7.75E-13	1.81E-13	4.23E-14	9.88E-15	2.31E-15	5.39E-16	1.26E-16
cr 51		3.57E-12	3.56E-12	3.56E-12	3.56E-12	3.55E-12	3.54E-12	3.54E-12	3.53E-12	3.52E-12	3.51E-12	3.51E-12
cr 55		8.94E-14	2.34E-16	6.11E-19	4.17E-24	2.26E-34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 54		8.76E-12	8.76E-12	8.76E-12	8.76E-12	8.76E-12	8.76E-12	8.75E-12	8.75E-12	8.75E-12	8.75E-12	8.75E-12
mn 56		2.18E-09	1.90E-09	1.66E-09	1.27E-09	7.43E-10	4.34E-10	2.53E-10	1.48E-10	8.65E-11	5.05E-11	2.95E-11
mn 57		2.66E-11	1.63E-17	9.94E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
fe 55		5.04E-14	5.04E-14	5.04E-14	5.04E-14	5.04E-14	5.04E-14	5.04E-14	5.04E-14	5.04E-14	5.04E-14	5.04E-14
fe 59		3.44E-14	3.44E-14	3.43E-14	3.43E-14	3.43E-14	3.42E-14	3.42E-14	3.41E-14	3.41E-14	3.41E-14	3.40E-14
total		6.58E-07	2.55E-08	1.95E-08	1.82E-08	1.71E-08	1.64E-08	1.58E-08	1.53E-08	1.49E-08	1.46E-08	1.43E-08

Table F17. Radioactivity (Ci) After Ten-Day Irradiation of 1-kg Concrete (Flux Parameter Set 1).

		Time After Discharge										
		initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
h	3	2.64E-18	2.64E-18	2.64E-18	2.64E-18	2.64E-18	2.63E-18	2.63E-18	2.63E-18	2.63E-18	2.63E-18	2.63E-18
be	10	1.17E-19	1.17E-19	1.17E-19	1.17E-19	1.17E-19	1.17E-19	1.17E-19	1.17E-19	1.17E-19	1.17E-19	1.17E-19
c	14	2.09E-17	2.09E-17	2.09E-17	2.09E-17	2.09E-17	2.09E-17	2.09E-17	2.09E-17	2.09E-17	2.09E-17	2.09E-17
na	24	7.00E-09	6.83E-09	6.67E-09	6.37E-09	5.79E-09	5.27E-09	4.79E-09	4.36E-09	3.97E-09	3.61E-09	3.28E-09
na	25	2.02E-10	1.64E-19	1.33E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mg	27	4.85E-08	5.39E-09	5.99E-10	7.38E-12	1.12E-15	1.71E-19	2.60E-23	3.95E-27	6.01E-31	8.36E-35	0.00E+00
al	28	5.47E-07	5.08E-11	4.73E-15	4.08E-23	1.87E-28	1.75E-28	1.64E-28	1.53E-28	1.43E-28	1.34E-28	1.26E-28
al	29	1.86E-08	7.85E-10	3.31E-11	5.88E-14	1.85E-19	5.85E-25	1.84E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00
si	31	2.74E-10	2.40E-10	2.11E-10	1.62E-10	9.53E-11	5.62E-11	3.31E-11	1.95E-11	1.15E-11	6.78E-12	3.99E-12
cl	36	1.37E-15	1.37E-15	1.37E-15	1.37E-15	1.37E-15	1.37E-15	1.37E-15	1.37E-15	1.37E-15	1.37E-15	1.37E-15
ar	37	5.29E-09	5.29E-09	5.29E-09	5.28E-09	5.27E-09	5.27E-09	5.26E-09	5.25E-09	5.24E-09	5.23E-09	5.22E-09
ar	39	6.50E-12	6.50E-12	6.50E-12	6.50E-12	6.50E-12	6.50E-12	6.50E-12	6.50E-12	6.50E-12	6.50E-12	6.50E-12
ar	41	9.39E-12	7.77E-12	6.43E-12	4.40E-12	2.06E-12	9.64E-13	4.52E-13	2.11E-13	9.90E-14	4.63E-14	2.17E-14
k	40	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08
k	42	1.02E-09	9.93E-10	9.65E-10	9.13E-10	8.16E-10	7.29E-10	6.52E-10	5.83E-10	5.21E-10	4.66E-10	4.16E-10
k	43	2.50E-11	2.46E-11	2.42E-11	2.35E-11	2.21E-11	2.07E-11	1.95E-11	1.83E-11	1.72E-11	1.62E-11	1.52E-11
k	44	2.26E-11	8.82E-12	3.45E-12	5.26E-13	1.23E-14	2.86E-16	6.68E-18	1.56E-19	3.64E-21	8.48E-23	1.98E-24
ca	41	1.68E-16	1.68E-16	1.68E-16	1.68E-16	1.68E-16	1.68E-16	1.68E-16	1.68E-16	1.68E-16	1.68E-16	1.68E-16
ca	45	2.13E-12	2.13E-12	2.13E-12	2.13E-12	2.13E-12	2.13E-12	2.13E-12	2.13E-12	2.13E-12	2.13E-12	2.12E-12
ca	47	4.76E-14	4.74E-14	4.73E-14	4.70E-14	4.64E-14	4.58E-14	4.52E-14	4.46E-14	4.41E-14	4.35E-14	4.30E-14
ca	49	1.21E-11	1.11E-12	1.02E-13	8.65E-16	6.19E-20	4.44E-24	3.18E-28	2.27E-32	0.00E+00	0.00E+00	0.00E+00
sc	47	2.94E-14	2.95E-14	2.96E-14	2.97E-14	3.00E-14	3.03E-14	3.06E-14	3.08E-14	3.10E-14	3.12E-14	3.15E-14
sc	49	1.20E-11	9.68E-12	6.85E-12	3.32E-12	7.75E-13	1.81E-13	4.23E-14	9.88E-15	2.31E-15	5.39E-16	1.26E-16
cr	51	3.19E-11	3.19E-11	3.19E-11	3.19E-11	3.18E-11	3.17E-11	3.17E-11	3.16E-11	3.16E-11	3.15E-11	3.14E-11
cr	55	8.94E-14	2.34E-16	6.11E-19	4.17E-24	2.26E-34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn	54	8.67E-11	8.67E-11	8.67E-11	8.67E-11	8.67E-11	8.67E-11	8.67E-11	8.67E-11	8.67E-11	8.66E-11	8.66E-11
mn	56	2.18E-09	1.91E-09	1.67E-09	1.27E-09	7.44E-10	4.35E-10	2.54E-10	1.48E-10	8.66E-11	5.06E-11	2.96E-11
mn	57	2.66E-11	1.63E-17	9.94E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
fe	55	5.03E-13	5.03E-13	5.03E-13	5.03E-13	5.03E-13	5.03E-13	5.03E-13	5.03E-13	5.03E-13	5.02E-13	5.02E-13
fe	59	3.21E-13	3.21E-13	3.20E-13	3.20E-13	3.20E-13	3.19E-13	3.19E-13	3.19E-13	3.18E-13	3.18E-13	3.17E-13
total		6.65E-07	3.28E-08	2.68E-08	2.53E-08	2.40E-08	2.31E-08	2.23E-08	2.17E-08	2.11E-08	2.07E-08	2.03E-08

Table F18. Radioactivity (Ci) After One-Day Irradiation of 1-kg Concrete (Flux Parameter Set 2).

		Time After Discharge										
		initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
h	3	2.65E-18	2.65E-18	2.65E-18	2.65E-18	2.65E-18	2.65E-18	2.65E-18	2.65E-18	2.65E-18	2.65E-18	2.65E-18
be	10	8.17E-20	8.17E-20	8.17E-20	8.17E-20	8.17E-20	8.17E-20	8.17E-20	8.17E-20	8.17E-20	8.17E-20	8.17E-20
c	14	2.00E-17	2.00E-17	2.00E-17	2.00E-17	2.00E-17	2.00E-17	2.00E-17	2.00E-17	2.00E-17	2.00E-17	2.00E-17
na	24	3.52E-08	3.43E-08	3.35E-08	3.20E-08	2.91E-08	2.65E-08	2.41E-08	2.19E-08	1.99E-08	1.81E-08	1.65E-08
na	25	1.41E-09	1.14E-18	9.26E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mg	27	3.39E-07	3.77E-08	4.18E-09	5.16E-11	7.85E-15	1.19E-18	1.82E-22	2.76E-26	4.20E-30	6.41E-34	0.00E+00
al	28	3.83E-06	3.56E-10	3.31E-14	2.86E-22	3.64E-27	3.40E-27	3.19E-27	2.98E-27	2.79E-27	2.61E-27	2.44E-27
al	29	1.30E-07	5.49E-09	2.31E-10	4.11E-13	1.30E-18	4.09E-24	1.29E-29	4.01E-35	0.00E+00	0.00E+00	0.00E+00
si	31	3.61E-09	3.17E-09	2.77E-09	2.13E-09	1.26E-09	7.40E-10	4.36E-10	2.57E-10	1.51E-10	8.92E-11	5.26E-11
cl	36	9.57E-16	9.57E-16	9.57E-16	9.57E-16	9.57E-16	9.57E-16	9.57E-16	9.57E-16	9.57E-16	9.57E-16	9.57E-16
ar	37	4.04E-09	4.03E-09	4.03E-09	4.03E-09	4.02E-09	4.02E-09	4.01E-09	4.00E-09	4.00E-09	3.99E-09	3.98E-09
ar	39	4.54E-12	4.54E-12	4.54E-12	4.54E-12	4.54E-12	4.54E-12	4.54E-12	4.54E-12	4.54E-12	4.54E-12	4.54E-12
ar	41	6.56E-11	5.43E-11	4.49E-11	3.07E-11	1.44E-11	6.74E-12	3.16E-12	1.48E-12	6.92E-13	3.24E-13	1.52E-13
k	40	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08
k	42	5.84E-09	5.68E-09	5.52E-09	5.22E-09	4.66E-09	4.17E-09	3.73E-09	3.33E-09	2.98E-09	2.66E-09	2.38E-09
k	43	9.18E-11	9.04E-11	8.90E-11	8.62E-11	8.11E-11	7.62E-11	7.16E-11	6.73E-11	6.32E-11	5.94E-11	5.58E-11
k	44	1.58E-10	6.16E-11	2.41E-11	3.68E-12	8.58E-14	2.00E-15	4.67E-17	1.09E-18	2.54E-20	5.93E-22	1.38E-23
ca	41	1.61E-16	1.61E-16	1.61E-16	1.61E-16	1.61E-16	1.61E-16	1.61E-16	1.61E-16	1.61E-16	1.61E-16	1.61E-16
ca	45	2.26E-12	2.26E-12	2.26E-12	2.26E-12	2.26E-12	2.26E-12	2.26E-12	2.26E-12	2.26E-12	2.26E-12	2.26E-12
ca	47	8.29E-14	8.26E-14	8.23E-14	8.18E-14	8.08E-14	7.97E-14	7.87E-14	7.77E-14	7.68E-14	7.58E-14	7.48E-14
ca	49	6.13E-11	5.64E-12	5.19E-13	4.39E-15	3.14E-19	2.25E-23	1.61E-27	1.15E-31	0.00E+00	0.00E+00	0.00E+00
sc	47	2.82E-15	3.16E-15	3.51E-15	4.18E-15	5.50E-15	6.78E-15	8.02E-15	9.22E-15	1.04E-14	1.15E-14	1.26E-14
sc	49	6.11E-11	4.91E-11	3.48E-11	1.68E-11	3.93E-12	9.19E-13	2.15E-13	5.02E-14	1.17E-14	2.74E-15	6.39E-16
cr	51	2.49E-11	2.49E-11	2.49E-11	2.49E-11	2.48E-11	2.48E-11	2.47E-11	2.47E-11	2.46E-11	2.46E-11	2.45E-11
cr	55	6.25E-13	1.63E-15	4.27E-18	2.92E-23	1.36E-33	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn	54	6.12E-11	6.12E-11	6.12E-11	6.12E-11	6.12E-11	6.12E-11	6.12E-11	6.12E-11	6.12E-11	6.11E-11	6.11E-11
mn	56	1.52E-08	1.33E-08	1.16E-08	8.89E-09	5.19E-09	3.03E-09	1.77E-09	1.03E-09	6.04E-10	3.53E-10	2.06E-10
mn	57	1.86E-10	1.14E-16	6.95E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
fe	55	5.16E-13	5.16E-13	5.15E-13	5.15E-13	5.15E-13	5.15E-13	5.15E-13	5.15E-13	5.15E-13	5.15E-13	5.15E-13
fe	59	4.62E-13	4.61E-13	4.61E-13	4.61E-13	4.60E-13	4.60E-13	4.59E-13	4.59E-13	4.58E-13	4.57E-13	4.57E-13
total		4.55E-06	1.16E-07	7.34E-08	6.37E-08	5.56E-08	4.98E-08	4.54E-08	4.19E-08	3.90E-08	3.65E-08	3.44E-08

Table F19. Radioactivity (Ci) After Ten-Day Irradiation of 1-kg Concrete (Flux Parameter Set 2).

	initial	Time After Discharge												
		.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr			
h 3	2.65E-17	2.65E-17	2.65E-17	2.65E-17	2.65E-17	2.65E-17	2.65E-17	2.65E-17	2.65E-17	2.65E-17	2.65E-17	2.65E-17	2.65E-17	2.65E-17
be 10	8.17E-19	8.17E-19	8.17E-19	8.17E-19	8.17E-19	8.17E-19	8.17E-19	8.17E-19	8.17E-19	8.17E-19	8.17E-19	8.17E-19	8.17E-19	8.17E-19
c 14	2.00E-16	2.00E-16	2.00E-16	2.00E-16	2.00E-16	2.00E-16	2.00E-16	2.00E-16	2.00E-16	2.00E-16	2.00E-16	2.00E-16	2.00E-16	2.00E-16
na 24	5.18E-08	5.06E-08	4.94E-08	4.71E-08	4.29E-08	3.90E-08	3.55E-08	3.23E-08	2.94E-08	2.67E-08	2.43E-08	2.21E-08	2.00E-08	1.81E-08
na 25	1.41E-09	1.14E-18	9.26E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mg 27	3.39E-07	3.77E-08	4.18E-09	5.16E-11	7.85E-15	1.19E-18	1.82E-22	2.76E-26	4.20E-30	6.41E-34	0.00E+00	0.00E+00	0.00E+00	0.00E+00
al 28	3.83E-06	3.56E-10	3.31E-14	2.86E-22	6.63E-27	6.20E-27	5.80E-27	5.43E-27	5.08E-27	4.76E-27	4.45E-27	4.15E-27	3.86E-27	3.58E-27
al 29	1.30E-07	5.49E-09	2.31E-10	4.11E-13	1.30E-18	4.09E-24	1.29E-29	4.01E-35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
si 31	3.62E-09	3.17E-09	2.78E-09	2.13E-09	1.26E-09	7.41E-10	4.37E-10	2.57E-10	1.52E-10	8.94E-11	5.27E-11	3.11E-11	1.81E-11	1.04E-11
cl 36	9.57E-15	9.57E-15	9.57E-15	9.57E-15	9.57E-15	9.57E-15	9.57E-15	9.57E-15	9.57E-15	9.57E-15	9.57E-15	9.57E-15	9.57E-15	9.57E-15
ar 37	3.70E-08	3.70E-08	3.70E-08	3.69E-08	3.69E-08	3.68E-08	3.67E-08	3.67E-08	3.66E-08	3.66E-08	3.65E-08	3.65E-08	3.65E-08	3.65E-08
ar 39	4.54E-11	4.54E-11	4.54E-11	4.54E-11	4.54E-11	4.54E-11	4.54E-11	4.54E-11	4.54E-11	4.54E-11	4.54E-11	4.54E-11	4.54E-11	4.54E-11
ar 41	6.57E-11	5.43E-11	4.49E-11	3.07E-11	1.44E-11	6.74E-12	3.16E-12	1.48E-12	6.92E-13	3.24E-13	1.52E-13	7.11E-14	3.24E-14	1.45E-14
k 40	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08
k 42	7.89E-09	7.67E-09	7.46E-09	7.06E-09	6.31E-09	5.64E-09	5.04E-09	4.50E-09	4.03E-09	3.60E-09	3.22E-09	2.88E-09	2.57E-09	2.29E-09
k 43	1.75E-10	1.72E-10	1.69E-10	1.64E-10	1.54E-10	1.45E-10	1.36E-10	1.28E-10	1.20E-10	1.13E-10	1.06E-10	1.00E-10	9.47E-11	8.95E-11
k 44	1.58E-10	6.16E-11	2.41E-11	3.68E-12	8.58E-14	2.00E-15	4.67E-17	1.09E-18	2.54E-20	5.93E-22	1.38E-23	3.07E-25	6.87E-27	1.51E-28
ca 41	1.61E-15	1.61E-15	1.61E-15	1.61E-15	1.61E-15	1.61E-15	1.61E-15	1.61E-15	1.61E-15	1.61E-15	1.61E-15	1.61E-15	1.61E-15	1.61E-15
ca 45	2.22E-11	2.22E-11	2.22E-11	2.22E-11	2.22E-11	2.22E-11	2.22E-11	2.22E-11	2.22E-11	2.22E-11	2.22E-11	2.22E-11	2.22E-11	2.22E-11
ca 47	4.58E-13	4.56E-13	4.55E-13	4.52E-13	4.46E-13	4.41E-13	4.35E-13	4.30E-13	4.24E-13	4.19E-13	4.13E-13	4.08E-13	4.03E-13	3.98E-13
ca 49	6.13E-11	5.64E-12	5.19E-13	4.39E-15	3.14E-19	2.25E-23	1.61E-27	1.15E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
sc 47	2.83E-13	2.84E-13	2.85E-13	2.86E-13	2.89E-13	2.91E-13	2.94E-13	2.96E-13	2.99E-13	3.01E-13	3.03E-13	3.05E-13	3.07E-13	3.09E-13
sc 49	6.11E-11	4.91E-11	3.48E-11	1.68E-11	3.93E-12	9.19E-13	2.15E-13	5.02E-14	1.17E-14	2.74E-15	6.39E-16	1.48E-16	3.34E-17	7.54E-18
cr 51	2.23E-10	2.23E-10	2.23E-10	2.23E-10	2.22E-10	2.22E-10	2.21E-10	2.21E-10	2.20E-10	2.20E-10	2.20E-10	2.20E-10	2.20E-10	2.20E-10
cr 55	6.25E-13	1.63E-15	4.27E-18	2.92E-23	1.36E-33	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 54	6.06E-10	6.06E-10	6.06E-10	6.06E-10	6.06E-10	6.06E-10	6.06E-10	6.06E-10	6.06E-10	6.06E-10	6.06E-10	6.06E-10	6.06E-10	6.06E-10
mn 56	1.52E-08	1.33E-08	1.16E-08	8.90E-09	5.20E-09	3.04E-09	1.77E-09	1.04E-09	6.05E-10	3.54E-10	2.07E-10	1.16E-10	6.54E-11	3.61E-11
mn 57	1.86E-10	1.14E-16	6.95E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
fe 55	5.14E-12	5.14E-12	5.14E-12	5.14E-12	5.14E-12	5.14E-12	5.14E-12	5.14E-12	5.14E-12	5.14E-12	5.14E-12	5.14E-12	5.14E-12	5.14E-12
fe 59	4.31E-12	4.31E-12	4.30E-12	4.30E-12	4.30E-12	4.29E-12	4.29E-12	4.28E-12	4.27E-12	4.27E-12	4.26E-12	4.26E-12	4.26E-12	4.26E-12
total	4.60E-06	1.68E-07	1.25E-07	1.14E-07	1.05E-07	9.75E-08	9.17E-08	8.70E-08	8.30E-08	7.95E-08	7.65E-08	7.35E-08	7.05E-08	6.75E-08

Table F20. Radioactivity (Ci) After One-Day Irradiation of 1-kg Aluminum 6061-T6 (Flux Parameter Set 1).

	Time After Discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
na 24	9.17E-08	8.96E-08	8.75E-08	8.35E-08	7.59E-08	6.91E-08	6.28E-08	5.72E-08	5.20E-08	4.73E-08	4.31E-08
na 25	1.01E-09	8.18E-19	6.63E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mg 27	1.37E-06	1.52E-07	1.69E-08	2.08E-10	3.16E-14	4.81E-18	7.32E-22	1.11E-25	1.69E-29	2.56E-33	0.00E+00
al 28	6.88E-08	6.40E-12	5.95E-16	5.15E-24	2.89E-27	2.70E-27	2.53E-27	2.37E-27	2.22E-27	2.07E-27	1.94E-27
al 29	3.32E-10	1.40E-11	5.89E-13	1.05E-15	3.30E-21	1.04E-26	3.28E-32	0.00E+00	0.00E+00	0.00E+00	0.00E+00
si 31	4.88E-12	4.27E-12	3.74E-12	2.87E-12	1.69E-12	9.98E-13	5.88E-13	3.47E-13	2.04E-13	1.20E-13	7.10E-14
ca 45	4.43E-15	4.42E-15	4.42E-15	4.42E-15	4.42E-15	4.42E-15	4.42E-15	4.42E-15	4.42E-15	4.41E-15	4.41E-15
ca 47	4.01E-16	4.00E-16	3.99E-16	3.96E-16	3.91E-16	3.86E-16	3.81E-16	3.77E-16	3.72E-16	3.67E-16	3.62E-16
sc 46	1.12E-12	1.12E-12	1.12E-12	1.12E-12	1.12E-12	1.12E-12	1.12E-12	1.12E-12	1.12E-12	1.12E-12	1.12E-12
sc 47	4.22E-11	4.20E-11	4.18E-11	4.14E-11	4.07E-11	4.00E-11	3.93E-11	3.87E-11	3.80E-11	3.74E-11	3.67E-11
sc 48	7.11E-12	7.05E-12	7.00E-12	6.89E-12	6.67E-12	6.46E-12	6.26E-12	6.07E-12	5.88E-12	5.69E-12	5.51E-12
sc 49	4.78E-11	3.32E-11	2.31E-11	1.12E-11	2.61E-12	6.09E-13	1.42E-13	3.32E-14	7.76E-15	1.81E-15	4.23E-16
sc 50	1.00E-12	5.18E-18	2.68E-23	7.72E-34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ti 51	2.55E-12	6.89E-14	1.86E-15	1.36E-18	7.29E-25	3.90E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 52	3.61E-10	1.41E-12	5.50E-15	8.40E-20	1.95E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 53	4.46E-12	1.10E-17	2.70E-23	1.64E-34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
cr 51	3.22E-12	3.22E-12	3.22E-12	3.21E-12	3.21E-12	3.20E-12	3.19E-12	3.19E-12	3.18E-12	3.17E-12	3.17E-12
cr 55	1.37E-10	3.57E-13	9.33E-16	6.37E-21	2.98E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 54	4.38E-12	4.38E-12	4.38E-12	4.38E-12	4.38E-12	4.38E-12	4.38E-12	4.38E-12	4.38E-12	4.37E-12	4.37E-12
mn 56	3.65E-09	3.19E-09	2.79E-09	2.13E-09	1.25E-09	7.28E-10	4.25E-10	2.48E-10	1.45E-10	8.47E-11	4.95E-11
mn 57	1.33E-11	8.14E-18	4.97E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
fe 55	2.52E-14	2.52E-14	2.52E-14	2.52E-14	2.52E-14	2.52E-14	2.52E-14	2.52E-14	2.52E-14	2.52E-14	2.52E-14
fe 59	1.72E-14	1.72E-14	1.72E-14	1.72E-14	1.71E-14	1.71E-14	1.71E-14	1.71E-14	1.70E-14	1.70E-14	1.70E-14
co 60	3.12E-14	3.12E-14	3.12E-14	3.12E-14	3.12E-14	3.12E-14	3.12E-14	3.12E-14	3.12E-14	3.12E-14	3.12E-14
co 62	2.42E-11	2.30E-17	2.20E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ni 63	2.06E-14	2.06E-14	2.06E-14	2.06E-14	2.06E-14	2.06E-14	2.06E-14	2.06E-14	2.06E-14	2.06E-14	2.06E-14
ni 65	5.17E-11	4.50E-11	3.93E-11	2.98E-11	1.72E-11	9.92E-12	5.72E-12	3.30E-12	1.91E-12	1.10E-12	6.34E-13
cu 64	4.18E-10	4.07E-10	3.96E-10	3.75E-10	3.36E-10	3.02E-10	2.70E-10	2.42E-10	2.17E-10	1.95E-10	1.75E-10
cu 66	2.31E-10	3.91E-12	6.63E-14	1.90E-17	1.57E-24	3.95E-28	3.85E-28	3.75E-28	3.66E-28	3.57E-28	3.48E-28
zn 65	1.36E-13	1.36E-13	1.36E-13	1.36E-13	1.36E-13	1.36E-13	1.36E-13	1.36E-13	1.36E-13	1.36E-13	1.36E-13
zn 69	9.66E-11	6.75E-11	4.73E-11	2.37E-11	6.90E-12	2.92E-12	1.88E-12	1.53E-12	1.34E-12	1.20E-12	1.09E-12
zn 69m	2.27E-12	2.21E-12	2.16E-12	2.05E-12	1.85E-12	1.68E-12	1.52E-12	1.37E-12	1.24E-12	1.12E-12	1.01E-12
zn 71	1.04E-13	2.13E-17	4.39E-21	1.87E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
zn 71m	8.18E-15	7.49E-15	6.87E-15	5.76E-15	4.06E-15	2.86E-15	2.02E-15	1.42E-15	1.00E-15	7.06E-16	4.97E-16
total	1.54E-06	2.45E-07	1.08E-07	8.63E-08	7.76E-08	7.02E-08	6.36E-08	5.77E-08	5.24E-08	4.77E-08	4.33E-08

Table F21. Radioactivity (Ci) After Ten-Day Irradiation of 1-kg Aluminum 6061-T6 (Flux Parameter Set 1).

		Time After Discharge										
		initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
na 24		1.35E-07	1.32E-07	1.29E-07	1.23E-07	1.12E-07	1.02E-07	9.26E-08	8.43E-08	7.67E-08	6.97E-08	6.34E-08
na 25		1.01E-09	8.18E-19	6.63E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mg 27		1.37E-06	1.52E-07	1.69E-08	2.08E-10	3.16E-14	4.81E-18	7.32E-22	1.11E-25	1.69E-29	2.56E-33	0.00E+00
al 28		6.88E-08	6.40E-12	5.95E-16	5.15E-24	5.26E-27	4.92E-27	4.61E-27	4.31E-27	4.04E-27	3.78E-27	3.54E-27
al 29		3.32E-10	1.40E-11	5.89E-13	1.05E-15	3.30E-21	1.04E-26	3.28E-32	0.00E+00	0.00E+00	0.00E+00	0.00E+00
si 31		4.89E-12	4.28E-12	3.75E-12	2.88E-12	1.70E-12	1.00E-12	5.89E-13	3.47E-13	2.05E-13	1.21E-13	7.11E-14
ca 45		4.34E-14	4.34E-14	4.34E-14	4.34E-14	4.34E-14	4.34E-14	4.34E-14	4.33E-14	4.33E-14	4.33E-14	4.33E-14
ca 47		2.22E-15	2.21E-15	2.20E-15	2.19E-15	2.16E-15	2.13E-15	2.11E-15	2.08E-15	2.05E-15	2.03E-15	2.00E-15
sc 46		1.08E-11	1.08E-11	1.08E-11	1.08E-11	1.08E-11	1.08E-11	1.08E-11	1.08E-11	1.08E-11	1.08E-11	1.08E-11
sc 47		1.97E-10	1.96E-10	1.95E-10	1.94E-10	1.90E-10	1.87E-10	1.84E-10	1.81E-10	1.78E-10	1.74E-10	1.72E-10
sc 48		2.20E-11	2.18E-11	2.16E-11	2.13E-11	2.06E-11	2.00E-11	1.93E-11	1.87E-11	1.81E-11	1.76E-11	1.70E-11
sc 49		4.78E-11	3.32E-11	2.31E-11	1.12E-11	2.61E-12	6.09E-13	1.42E-13	3.32E-14	7.76E-15	1.81E-15	4.23E-16
sc 50		1.00E-12	5.18E-18	2.68E-23	7.72E-34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ti 51		2.55E-12	6.89E-14	1.86E-15	1.36E-18	7.29E-25	3.90E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 52		3.61E-10	1.41E-12	5.50E-15	8.40E-20	1.95E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 53		4.46E-12	1.10E-17	2.70E-23	1.64E-34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
cr 51		2.88E-11	2.88E-11	2.88E-11	2.88E-11	2.87E-11	2.87E-11	2.86E-11	2.85E-11	2.85E-11	2.84E-11	2.84E-11
cr 55		1.37E-10	3.57E-13	9.33E-16	6.37E-21	2.98E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 54		4.34E-11	4.34E-11	4.34E-11	4.34E-11	4.34E-11	4.33E-11	4.33E-11	4.33E-11	4.33E-11	4.33E-11	4.33E-11
mn 56		3.66E-09	3.20E-09	2.79E-09	2.14E-09	1.25E-09	7.29E-10	4.26E-10	2.49E-10	1.45E-10	8.48E-11	4.96E-11
mn 57		1.33E-11	8.14E-18	4.97E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
fe 55		2.51E-13	2.51E-13	2.51E-13	2.51E-13	2.51E-13	2.51E-13	2.51E-13	2.51E-13	2.51E-13	2.51E-13	2.51E-13
fe 59		1.60E-13	1.60E-13	1.60E-13	1.60E-13	1.60E-13	1.60E-13	1.60E-13	1.59E-13	1.59E-13	1.59E-13	1.59E-13
co 60		3.12E-13	3.12E-13	3.12E-13	3.12E-13	3.12E-13	3.12E-13	3.12E-13	3.12E-13	3.12E-13	3.12E-13	3.12E-13
co 62		2.42E-11	2.30E-17	2.20E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ni 63		2.06E-13	2.06E-13	2.06E-13	2.06E-13	2.06E-13	2.06E-13	2.06E-13	2.06E-13	2.06E-13	2.06E-13	2.06E-13
ni 65		5.18E-11	4.51E-11	3.93E-11	2.99E-11	1.72E-11	9.94E-12	5.73E-12	3.31E-12	1.91E-12	1.10E-12	6.35E-13
cu 64		5.73E-10	5.58E-10	5.43E-10	5.14E-10	4.61E-10	4.13E-10	3.70E-10	3.32E-10	2.98E-10	2.67E-10	2.39E-10
cu 66		2.31E-10	3.91E-12	6.63E-14	1.90E-17	1.57E-24	1.44E-27	1.41E-27	1.37E-27	1.34E-27	1.30E-27	1.27E-27
zn 65		1.34E-12	1.34E-12	1.34E-12	1.34E-12	1.34E-12	1.34E-12	1.34E-12	1.34E-12	1.34E-12	1.34E-12	1.34E-12
zn 69		9.76E-11	6.85E-11	4.83E-11	2.46E-11	7.75E-12	3.69E-12	2.57E-12	2.15E-12	1.91E-12	1.72E-12	1.55E-12
zn 69m		3.23E-12	3.15E-12	3.07E-12	2.92E-12	2.64E-12	2.39E-12	2.16E-12	1.95E-12	1.77E-12	1.60E-12	1.44E-12
zn 71		1.04E-13	2.13E-17	4.39E-21	1.87E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
zn 71m		8.30E-15	7.61E-15	6.97E-15	5.85E-15	4.12E-15	2.91E-15	2.05E-15	1.44E-15	1.02E-15	7.17E-16	5.05E-16
total		1.58E-06	2.88E-07	1.50E-07	1.26E-07	1.14E-07	1.03E-07	9.37E-08	8.51E-08	7.74E-08	7.04E-08	6.40E-08

Table F22. Radioactivity (Ci) After One-Day Irradiation of 1-kg Aluminum 6061-T6 (Flux Parameter Set 2).

	Time After Discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
na 24	6.41E-07	6.26E-07	6.12E-07	5.83E-07	5.31E-07	4.83E-07	4.39E-07	4.00E-07	3.64E-07	3.31E-07	3.01E-07
na 25	7.06E-09	5.72E-18	4.63E-27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mg 27	9.56E-06	1.06E-06	1.18E-07	1.45E-09	2.21E-13	3.36E-17	5.11E-21	7.78E-25	1.18E-28	1.80E-32	0.00E+00
al 28	7.59E-07	7.05E-11	6.56E-15	5.68E-23	1.02E-25	9.59E-26	8.97E-26	8.40E-26	7.86E-26	7.35E-26	6.88E-26
al 29	2.32E-09	9.77E-11	4.12E-12	7.31E-15	2.31E-20	7.28E-26	2.30E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00
si 31	6.43E-11	5.64E-11	4.94E-11	3.79E-11	2.23E-11	1.32E-11	7.76E-12	4.57E-12	2.70E-12	1.59E-12	9.36E-13
ca 45	3.09E-14	3.09E-14	3.09E-14	3.09E-14	3.09E-14	3.09E-14	3.09E-14	3.09E-14	3.09E-14	3.09E-14	3.08E-14
ca 47	2.80E-15	2.80E-15	2.79E-15	2.77E-15	2.73E-15	2.70E-15	2.67E-15	2.63E-15	2.60E-15	2.57E-15	2.53E-15
sc 46	7.85E-12	7.85E-12	7.85E-12	7.85E-12	7.84E-12	7.84E-12	7.83E-12	7.83E-12	7.82E-12	7.82E-12	7.81E-12
sc 47	2.95E-10	2.93E-10	2.92E-10	2.90E-10	2.85E-10	2.80E-10	2.75E-10	2.70E-10	2.66E-10	2.61E-10	2.57E-10
sc 48	4.97E-11	4.93E-11	4.89E-11	4.81E-11	4.66E-11	4.52E-11	4.38E-11	4.24E-11	4.11E-11	3.98E-11	3.85E-11
sc 49	3.34E-10	2.32E-10	1.61E-10	7.80E-11	1.82E-11	4.25E-12	9.94E-13	2.32E-13	5.42E-14	1.27E-14	2.96E-15
sc 50	7.00E-12	3.62E-17	1.87E-22	4.94E-33	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ti 51	2.62E-11	7.09E-13	1.92E-14	1.40E-17	7.51E-24	4.02E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 52	2.52E-09	9.84E-12	3.85E-14	5.87E-19	1.37E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 53	3.12E-11	7.66E-17	1.88E-22	1.15E-33	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
cr 51	2.65E-11	2.65E-11	2.65E-11	2.65E-11	2.64E-11	2.64E-11	2.63E-11	2.62E-11	2.62E-11	2.61E-11	2.61E-11
cr 55	9.61E-10	2.51E-12	6.56E-15	4.48E-20	2.09E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 54	3.06E-11	3.06E-11	3.06E-11	3.06E-11	3.06E-11	3.06E-11	3.06E-11	3.06E-11	3.06E-11	3.06E-11	3.06E-11
mn 56	4.23E-08	3.69E-08	3.23E-08	2.47E-08	1.44E-08	8.42E-09	4.92E-09	2.87E-09	1.68E-09	9.81E-10	5.73E-10
mn 57	9.30E-11	5.69E-17	3.47E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
fe 55	2.58E-13	2.58E-13	2.58E-13	2.58E-13	2.58E-13	2.58E-13	2.58E-13	2.58E-13	2.58E-13	2.58E-13	2.58E-13
fe 59	2.31E-13	2.31E-13	2.31E-13	2.30E-13	2.30E-13	2.30E-13	2.30E-13	2.29E-13	2.29E-13	2.29E-13	2.28E-13
co 60	2.18E-13	2.18E-13	2.18E-13	2.18E-13	2.18E-13	2.18E-13	2.18E-13	2.18E-13	2.18E-13	2.18E-13	2.18E-13
co 62	1.69E-10	1.61E-16	1.54E-22	1.76E-34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ni 63	1.44E-13	1.44E-13	1.44E-13	1.44E-13	1.44E-13	1.44E-13	1.44E-13	1.44E-13	1.44E-13	1.44E-13	1.44E-13
ni 65	3.61E-10	3.15E-10	2.74E-10	2.08E-10	1.20E-10	6.93E-11	4.00E-11	2.31E-11	1.33E-11	7.68E-12	4.43E-12
cu 64	5.47E-09	5.32E-09	5.18E-09	4.90E-09	4.40E-09	3.94E-09	3.53E-09	3.17E-09	2.84E-09	2.55E-09	2.28E-09
cu 66	3.18E-09	5.40E-11	9.15E-13	2.63E-16	2.17E-23	2.65E-26	2.58E-26	2.52E-26	2.45E-26	2.39E-26	2.33E-26
zn 65	2.27E-12	2.27E-12	2.27E-12	2.27E-12	2.27E-12	2.27E-12	2.27E-12	2.27E-12	2.27E-12	2.26E-12	2.26E-12
zn 69	1.93E-09	1.35E-09	9.46E-10	4.74E-10	1.38E-10	5.84E-11	3.77E-11	3.06E-11	2.69E-11	2.41E-11	2.18E-11
zn 69m	4.54E-11	4.42E-11	4.31E-11	4.10E-11	3.71E-11	3.35E-11	3.03E-11	2.74E-11	2.48E-11	2.24E-11	2.03E-11
zn 71	5.25E-13	1.08E-16	2.23E-20	9.47E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
zn 71m	4.15E-14	3.80E-14	3.48E-14	2.93E-14	2.06E-14	1.45E-14	1.02E-14	7.21E-15	5.08E-15	3.58E-15	2.52E-15
total	1.10E-05	1.73E-06	7.69E-07	6.16E-07	5.50E-07	4.96E-07	4.48E-07	4.06E-07	3.68E-07	3.35E-07	3.04E-07

Table F23. Radioactivity (Ci) After Ten-Day Irradiation of 1-kg Aluminum 6061-T6 (Flux Parameter Set 2).

		Time After Discharge										
		initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
na 24		9.45E-07	9.23E-07	9.01E-07	8.60E-07	7.82E-07	7.11E-07	6.47E-07	5.89E-07	5.36E-07	4.87E-07	4.43E-07
na 25		7.06E-09	5.72E-18	4.63E-27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mg 27		9.56E-06	1.06E-06	1.18E-07	1.45E-09	2.21E-13	3.36E-17	5.11E-21	7.78E-25	1.18E-28	1.80E-32	0.00E+00
al 28		7.59E-07	7.05E-11	6.56E-15	5.69E-23	1.87E-25	1.75E-25	1.63E-25	1.53E-25	1.43E-25	1.34E-25	1.25E-25
al 29		2.32E-09	9.77E-11	4.12E-12	7.31E-15	2.31E-20	7.28E-26	2.30E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00
si 31		6.44E-11	5.65E-11	4.95E-11	3.80E-11	2.24E-11	1.32E-11	7.78E-12	4.58E-12	2.70E-12	1.59E-12	9.38E-13
ca 45		3.03E-13	3.03E-13	3.03E-13	3.03E-13	3.03E-13	3.03E-13	3.03E-13	3.03E-13	3.03E-13	3.03E-13	3.03E-13
ca 47		1.55E-14	1.54E-14	1.54E-14	1.53E-14	1.51E-14	1.49E-14	1.47E-14	1.45E-14	1.44E-14	1.42E-14	1.40E-14
sc 46		7.57E-11	7.57E-11	7.57E-11	7.56E-11	7.56E-11	7.55E-11	7.55E-11	7.54E-11	7.54E-11	7.53E-11	7.53E-11
sc 47		1.38E-09	1.37E-09	1.36E-09	1.35E-09	1.33E-09	1.31E-09	1.28E-09	1.26E-09	1.24E-09	1.22E-09	1.20E-09
sc 48		1.53E-10	1.52E-10	1.51E-10	1.49E-10	1.44E-10	1.39E-10	1.35E-10	1.31E-10	1.27E-10	1.23E-10	1.19E-10
sc 49		3.34E-10	2.32E-10	1.61E-10	7.80E-11	1.82E-11	4.25E-12	9.94E-13	2.32E-13	5.42E-14	1.27E-14	2.96E-15
sc 50		7.00E-12	3.62E-17	1.87E-22	4.94E-33	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ti 51		2.62E-11	7.09E-13	1.92E-14	1.40E-17	7.51E-24	4.02E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 52		2.52E-09	9.84E-12	3.85E-14	5.87E-19	1.37E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 53		3.12E-11	7.66E-17	1.88E-22	1.15E-33	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
cr 51		2.38E-10	2.37E-10	2.37E-10	2.37E-10	2.37E-10	2.36E-10	2.36E-10	2.35E-10	2.35E-10	2.34E-10	2.34E-10
cr 55		9.61E-10	2.51E-12	6.56E-15	4.48E-20	2.09E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 54		3.03E-10	3.03E-10	3.03E-10	3.03E-10	3.03E-10	3.03E-10	3.03E-10	3.03E-10	3.03E-10	3.03E-10	3.03E-10
mn 56		4.23E-08	3.70E-08	3.23E-08	2.47E-08	1.44E-08	8.44E-09	4.93E-09	2.88E-09	1.68E-09	9.82E-10	5.74E-10
mn 57		9.30E-11	5.69E-17	3.47E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
fe 55		2.57E-12	2.57E-12	2.57E-12	2.57E-12	2.57E-12	2.57E-12	2.57E-12	2.57E-12	2.57E-12	2.57E-12	2.57E-12
fe 59		2.15E-12	2.15E-12	2.15E-12	2.15E-12	2.15E-12	2.15E-12	2.14E-12	2.14E-12	2.14E-12	2.13E-12	2.13E-12
co 60		2.18E-12	2.18E-12	2.18E-12	2.18E-12	2.18E-12	2.18E-12	2.18E-12	2.18E-12	2.18E-12	2.18E-12	2.18E-12
co 62		1.69E-10	1.61E-16	1.54E-22	1.76E-34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ni 63		1.44E-12	1.44E-12	1.44E-12	1.44E-12	1.44E-12	1.44E-12	1.44E-12	1.44E-12	1.44E-12	1.44E-12	1.44E-12
ni 65		3.62E-10	3.15E-10	2.75E-10	2.09E-10	1.20E-10	6.94E-11	4.01E-11	2.31E-11	1.33E-11	7.69E-12	4.44E-12
cu 64		7.49E-09	7.29E-09	7.09E-09	6.72E-09	6.02E-09	5.40E-09	4.84E-09	4.34E-09	3.89E-09	3.49E-09	3.13E-09
cu 66		3.18E-09	5.40E-11	9.15E-13	2.63E-16	2.18E-23	9.67E-26	9.42E-26	9.19E-26	8.96E-26	8.73E-26	8.51E-26
zn 65		2.24E-11	2.24E-11	2.24E-11	2.24E-11	2.24E-11	2.24E-11	2.24E-11	2.24E-11	2.24E-11	2.24E-11	2.24E-11
zn 69		1.95E-09	1.37E-09	9.66E-10	4.93E-10	1.55E-10	7.37E-11	5.15E-11	4.31E-11	3.82E-11	3.43E-11	3.10E-11
zn 69m		6.47E-11	6.31E-11	6.15E-11	5.85E-11	5.29E-11	4.78E-11	4.32E-11	3.91E-11	3.53E-11	3.19E-11	2.89E-11
zn 71		5.25E-13	1.08E-16	2.23E-20	9.47E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
zn 71m		4.21E-14	3.86E-14	3.54E-14	2.97E-14	2.09E-14	1.47E-14	1.04E-14	7.32E-15	5.16E-15	3.64E-15	2.56E-15
total		1.13E-05	2.03E-06	1.06E-06	8.96E-07	8.05E-07	7.28E-07	6.59E-07	5.98E-07	5.43E-07	4.94E-07	4.49E-07

Table F24. Radioactivity (Ci) After One-Day Irradiation of 1-kg Steel Plate (Flux Parameter Set 1).

	Time After Discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
c 14	4.17E-15	4.17E-15	4.17E-15	4.17E-15	4.17E-15	4.17E-15	4.17E-15	4.17E-15	4.17E-15	4.17E-15	4.17E-15
mg 27	1.02E-11	1.13E-12	1.26E-13	1.55E-15	2.36E-19	3.58E-23	5.45E-27	8.29E-31	1.39E-34	0.00E+00	0.00E+00
al 28	1.24E-08	1.15E-12	1.07E-16	9.23E-25	2.28E-32	2.28E-32	2.28E-32	2.28E-32	2.28E-32	2.28E-32	2.28E-32
al 29	4.15E-10	1.75E-11	7.36E-13	1.31E-15	4.13E-21	1.30E-26	4.11E-32	0.00E+00	0.00E+00	0.00E+00	0.00E+00
si 31	4.89E-09	4.28E-09	3.75E-09	2.88E-09	1.70E-09	1.00E-09	5.90E-10	3.48E-10	2.05E-10	1.21E-10	7.12E-11
p 32	1.06E-10	1.06E-10	1.06E-10	1.05E-10	1.05E-10	1.04E-10	1.04E-10	1.04E-10	1.03E-10	1.03E-10	1.02E-10
p 33	5.09E-10	5.09E-10	5.09E-10	5.08E-10	5.07E-10	5.06E-10	5.05E-10	5.03E-10	5.02E-10	5.01E-10	5.00E-10
s 35	1.31E-15	1.31E-15	1.31E-15	1.31E-15	1.31E-15	1.31E-15	1.31E-15	1.31E-15	1.31E-15	1.31E-15	1.31E-15
s 37	1.26E-15	2.04E-17	3.33E-19	8.83E-23	6.20E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ti 51	5.14E-11	1.39E-12	3.76E-14	2.75E-17	1.47E-23	7.87E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 52	3.23E-08	1.26E-10	4.93E-13	7.52E-18	1.75E-27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 53	4.46E-10	1.10E-15	2.70E-21	1.64E-32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
cr 51	3.09E-10	3.09E-10	3.09E-10	3.08E-10	3.08E-10	3.07E-10	3.06E-10	3.06E-10	3.05E-10	3.04E-10	3.04E-10
cr 55	2.01E-09	5.25E-12	1.37E-14	9.38E-20	4.38E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 54	4.06E-10	4.06E-10	4.06E-10	4.06E-10	4.06E-10	4.06E-10	4.06E-10	4.06E-10	4.06E-10	4.06E-10	4.06E-10
mn 56	1.35E-07	1.18E-07	1.03E-07	7.89E-08	4.61E-08	2.69E-08	1.57E-08	9.19E-09	5.37E-09	3.14E-09	1.83E-09
mn 57	1.24E-09	7.55E-16	4.61E-22	1.81E-34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 58	4.15E-12	2.09E-20	1.05E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
fe 55	3.23E-12	3.23E-12	3.23E-12	3.23E-12	3.23E-12	3.23E-12	3.23E-12	3.23E-12	3.23E-12	3.23E-12	3.23E-12
fe 59	1.90E-12	1.90E-12	1.90E-12	1.90E-12	1.89E-12	1.89E-12	1.89E-12	1.89E-12	1.88E-12	1.88E-12	1.88E-12
co 58	6.24E-09	6.24E-09	6.24E-09	6.24E-09	6.23E-09	6.23E-09	6.22E-09	6.22E-09	6.21E-09	6.21E-09	6.20E-09
co 60	1.58E-12	1.58E-12	1.58E-12	1.58E-12	1.57E-12	1.57E-12	1.57E-12	1.57E-12	1.57E-12	1.57E-12	1.57E-12
co 61	4.67E-10	3.78E-10	3.07E-10	2.01E-10	8.69E-11	3.75E-11	1.62E-11	6.99E-12	3.02E-12	1.30E-12	5.62E-13
co 62	9.03E-11	8.61E-17	8.21E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ni 59	3.52E-16	3.52E-16	3.52E-16	3.52E-16	3.52E-16	3.52E-16	3.52E-16	3.52E-16	3.52E-16	3.52E-16	3.52E-16
ni 63	4.28E-14	4.28E-14	4.28E-14	4.28E-14	4.28E-14	4.28E-14	4.28E-14	4.28E-14	4.28E-14	4.28E-14	4.28E-14
ni 65	1.77E-10	1.54E-10	1.34E-10	1.02E-10	5.88E-11	3.39E-11	1.96E-11	1.13E-11	6.52E-12	3.76E-12	2.17E-12
total	1.97E-07	1.31E-07	1.15E-07	8.97E-08	5.55E-08	3.56E-08	2.39E-08	1.71E-08	1.31E-08	1.08E-08	9.43E-09

Table F25. Radioactivity (Ci) After Ten-Day Irradiation of 1-kg Steel Plate (Flux Parameter Set 1).

	Time After Discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
be 10	9.36E-20	9.36E-20	9.36E-20	9.36E-20	9.36E-20	9.36E-20	9.36E-20	9.36E-20	9.36E-20	9.36E-20	9.36E-20
c 14	4.17E-14	4.17E-14	4.17E-14	4.17E-14	4.17E-14	4.17E-14	4.17E-14	4.17E-14	4.17E-14	4.17E-14	4.17E-14
mg 27	1.02E-11	1.13E-12	1.26E-13	1.55E-15	2.36E-19	3.58E-23	5.45E-27	8.29E-31	1.39E-34	0.00E+00	0.00E+00
al 28	1.24E-08	1.15E-12	1.07E-16	9.23E-25	4.57E-32	4.57E-32	4.57E-32	2.28E-32	2.28E-32	2.28E-32	2.28E-32
al 29	4.15E-10	1.75E-11	7.36E-13	1.31E-15	4.13E-21	1.30E-26	4.11E-32	0.00E+00	0.00E+00	0.00E+00	0.00E+00
si 31	4.90E-09	4.29E-09	3.76E-09	2.89E-09	1.70E-09	1.00E-09	5.91E-10	3.48E-10	2.05E-10	1.21E-10	7.13E-11
p 32	8.58E-10	8.57E-10	8.56E-10	8.55E-10	8.51E-10	8.48E-10	8.44E-10	8.41E-10	8.38E-10	8.34E-10	8.31E-10
p 33	4.52E-09	4.51E-09	4.51E-09	4.51E-09	4.50E-09	4.49E-09	4.48E-09	4.46E-09	4.45E-09	4.44E-09	4.43E-09
s 35	1.27E-14	1.27E-14	1.27E-14	1.27E-14	1.27E-14	1.27E-14	1.26E-14	1.26E-14	1.26E-14	1.26E-14	1.26E-14
s 37	1.26E-15	2.04E-17	3.33E-19	8.83E-23	6.20E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ti 51	5.14E-11	1.39E-12	3.76E-14	2.75E-17	1.47E-23	7.87E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 52	3.23E-08	1.26E-10	4.93E-13	7.52E-18	1.75E-27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 53	4.46E-10	1.10E-15	2.70E-21	1.64E-32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
cr 51	2.77E-09	2.77E-09	2.77E-09	2.76E-09	2.76E-09	2.75E-09	2.74E-09	2.74E-09	2.73E-09	2.73E-09	2.72E-09
cr 55	2.01E-09	5.25E-12	1.37E-14	9.38E-20	4.38E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 54	4.02E-09	4.02E-09	4.02E-09	4.02E-09	4.02E-09	4.02E-09	4.02E-09	4.02E-09	4.02E-09	4.02E-09	4.02E-09
mn 56	1.35E-07	1.18E-07	1.03E-07	7.91E-08	4.62E-08	2.70E-08	1.58E-08	9.21E-09	5.38E-09	3.14E-09	1.83E-09
mn 57	1.24E-09	7.55E-16	4.61E-22	1.81E-34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 58	4.15E-12	2.09E-20	1.05E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
fe 55	3.22E-11	3.22E-11	3.22E-11	3.22E-11	3.22E-11	3.22E-11	3.22E-11	3.22E-11	3.22E-11	3.22E-11	3.22E-11
fe 59	1.77E-11	1.77E-11	1.77E-11	1.77E-11	1.77E-11	1.76E-11	1.76E-11	1.76E-11	1.76E-11	1.76E-11	1.75E-11
co 58	5.98E-08	5.97E-08	5.97E-08	5.97E-08	5.97E-08	5.96E-08	5.96E-08	5.95E-08	5.95E-08	5.94E-08	5.94E-08
co 60	1.57E-11	1.57E-11	1.57E-11	1.57E-11	1.57E-11	1.57E-11	1.57E-11	1.57E-11	1.57E-11	1.57E-11	1.57E-11
co 61	4.67E-10	3.78E-10	3.07E-10	2.01E-10	8.69E-11	3.75E-11	1.62E-11	6.99E-12	3.02E-12	1.30E-12	5.62E-13
co 62	9.03E-11	8.61E-17	8.21E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ni 59	3.52E-15	3.52E-15	3.52E-15	3.52E-15	3.52E-15	3.52E-15	3.52E-15	3.52E-15	3.52E-15	3.52E-15	3.52E-15
ni 63	4.28E-13	4.28E-13	4.28E-13	4.28E-13	4.28E-13	4.28E-13	4.28E-13	4.28E-13	4.28E-13	4.28E-13	4.28E-13
ni 65	1.77E-10	1.54E-10	1.34E-10	1.02E-10	5.89E-11	3.40E-11	1.96E-11	1.13E-11	6.53E-12	3.76E-12	2.17E-12
total	2.62E-07	1.95E-07	1.80E-07	1.54E-07	1.20E-07	9.98E-08	8.81E-08	8.12E-08	7.72E-08	7.48E-08	7.34E-08

Table F26. Radioactivity (Ci) After One-Day Irradiation of 1-kg Steel Plate (Flux Parameter Set 2).

	Time After Discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
be 10	6.54E-20	6.54E-20	6.54E-20	6.54E-20	6.54E-20	6.54E-20	6.54E-20	6.54E-20	6.54E-20	6.54E-20	6.54E-20
c 14	2.94E-14	2.94E-14	2.94E-14	2.94E-14	2.94E-14	2.94E-14	2.94E-14	2.94E-14	2.94E-14	2.94E-14	2.94E-14
mg 27	7.12E-11	7.91E-12	8.78E-13	1.08E-14	1.65E-18	2.51E-22	3.81E-26	5.79E-30	8.92E-34	0.00E+00	0.00E+00
al 28	8.63E-08	8.03E-12	7.46E-16	6.45E-24	7.53E-31	7.07E-31	6.62E-31	6.16E-31	5.93E-31	5.48E-31	5.02E-31
al 29	2.90E-09	1.22E-10	5.15E-12	9.14E-15	2.88E-20	9.10E-26	2.87E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00
si 31	3.42E-08	3.00E-08	2.63E-08	2.02E-08	1.19E-08	7.00E-09	4.13E-09	2.43E-09	1.43E-09	8.45E-10	4.98E-10
p 32	7.40E-10	7.39E-10	7.38E-10	7.37E-10	7.34E-10	7.31E-10	7.28E-10	7.25E-10	7.22E-10	7.19E-10	7.16E-10
p 33	3.56E-09	3.56E-09	3.55E-09	3.55E-09	3.54E-09	3.53E-09	3.53E-09	3.52E-09	3.51E-09	3.50E-09	3.49E-09
s 35	6.66E-15	6.66E-15	6.66E-15	6.66E-15	6.66E-15	6.65E-15	6.65E-15	6.64E-15	6.64E-15	6.63E-15	6.63E-15
s 37	6.37E-15	1.04E-16	1.69E-18	4.48E-22	3.15E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ti 51	3.59E-10	9.71E-12	2.63E-13	1.92E-16	1.03E-22	5.50E-29	4.58E-35	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 52	2.26E-07	8.81E-10	3.44E-12	5.25E-17	1.22E-26	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 53	3.12E-09	7.66E-15	1.88E-20	1.14E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
cr 51	2.56E-09	2.56E-09	2.56E-09	2.56E-09	2.55E-09	2.55E-09	2.54E-09	2.53E-09	2.53E-09	2.52E-09	2.52E-09
cr 55	1.47E-08	3.84E-11	1.00E-13	6.85E-19	3.20E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 54	2.84E-09	2.84E-09	2.84E-09	2.84E-09	2.84E-09	2.84E-09	2.84E-09	2.84E-09	2.84E-09	2.84E-09	2.84E-09
mn 56	1.17E-06	1.02E-06	8.93E-07	6.82E-07	3.98E-07	2.33E-07	1.36E-07	7.94E-08	4.64E-08	2.71E-08	1.58E-08
mn 57	8.63E-09	5.27E-15	3.22E-21	1.27E-33	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 58	2.90E-11	1.46E-19	7.35E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
fe 55	3.01E-11	3.01E-11	3.01E-11	3.01E-11	3.01E-11	3.01E-11	3.01E-11	3.01E-11	3.01E-11	3.01E-11	3.01E-11
fe 59	2.35E-11	2.35E-11	2.35E-11	2.35E-11	2.35E-11	2.34E-11	2.34E-11	2.34E-11	2.34E-11	2.33E-11	2.33E-11
co 58	4.36E-08	4.36E-08	4.36E-08	4.36E-08	4.36E-08	4.35E-08	4.35E-08	4.34E-08	4.34E-08	4.34E-08	4.33E-08
co 60	1.10E-11	1.10E-11	1.10E-11	1.10E-11	1.10E-11	1.10E-11	1.10E-11	1.10E-11	1.10E-11	1.10E-11	1.10E-11
co 61	3.26E-09	2.64E-09	2.14E-09	1.41E-09	6.08E-10	2.62E-10	1.13E-10	4.89E-11	2.11E-11	9.10E-12	3.93E-12
co 62	6.31E-10	6.02E-16	5.74E-22	5.27E-34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ni 59	3.45E-15	3.45E-15	3.45E-15	3.45E-15	3.45E-15	3.45E-15	3.45E-15	3.45E-15	3.45E-15	3.45E-15	3.45E-15
ni 63	4.20E-13	4.20E-13	4.20E-13	4.20E-13	4.20E-13	4.20E-13	4.20E-13	4.20E-13	4.20E-13	4.20E-13	4.20E-13
ni 65	2.06E-09	1.80E-09	1.57E-09	1.19E-09	6.87E-10	3.96E-10	2.29E-10	1.32E-10	7.61E-11	4.39E-11	2.53E-11
total	1.60E-06	1.11E-06	9.76E-07	7.58E-07	4.65E-07	2.94E-07	1.94E-07	1.35E-07	1.01E-07	8.10E-08	6.93E-08

Table F27. Radioactivity (Ci) After Ten-Day Irradiation of 1-kg Steel Plate (Flux Parameter Set 2).

	Time After Discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
be 10	6.54E-19	6.54E-19	6.54E-19	6.54E-19	6.54E-19	6.54E-19	6.54E-19	6.54E-19	6.54E-19	6.54E-19	6.54E-19
c 14	2.94E-13	2.94E-13	2.94E-13	2.94E-13	2.94E-13	2.94E-13	2.94E-13	2.94E-13	2.94E-13	2.94E-13	2.94E-13
mg 27	7.12E-11	7.91E-12	8.78E-13	1.08E-14	1.65E-18	2.51E-22	3.81E-26	5.79E-30	8.92E-34	0.00E+00	0.00E+00
al 28	8.63E-08	8.03E-12	7.46E-16	6.45E-24	1.39E-30	1.30E-30	1.21E-30	1.14E-30	1.07E-30	1.00E-30	9.36E-31
al 29	2.90E-09	1.22E-10	5.15E-12	9.14E-15	2.88E-20	9.10E-26	2.87E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00
si 31	3.43E-08	3.00E-08	2.63E-08	2.02E-08	1.19E-08	7.02E-09	4.14E-09	2.44E-09	1.44E-09	8.46E-10	4.99E-10
p 32	6.00E-09	6.00E-09	5.99E-09	5.98E-09	5.95E-09	5.93E-09	5.91E-09	5.88E-09	5.86E-09	5.84E-09	5.81E-09
p 33	3.16E-08	3.15E-08	3.15E-08	3.15E-08	3.14E-08	3.13E-08	3.13E-08	3.12E-08	3.11E-08	3.11E-08	3.10E-08
s 35	6.43E-14	6.43E-14	6.43E-14	6.43E-14	6.43E-14	6.42E-14	6.42E-14	6.41E-14	6.41E-14	6.40E-14	6.40E-14
s 37	6.37E-15	1.04E-16	1.69E-18	4.48E-22	3.15E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ti 51	3.59E-10	9.71E-12	2.63E-13	1.92E-16	1.03E-22	5.50E-29	4.58E-35	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 52	2.26E-07	8.81E-10	3.44E-12	5.25E-17	1.22E-26	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 53	3.12E-09	7.66E-15	1.88E-20	1.14E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
cr 51	2.29E-08	2.29E-08	2.29E-08	2.29E-08	2.29E-08	2.28E-08	2.28E-08	2.27E-08	2.27E-08	2.26E-08	2.26E-08
cr 55	1.47E-08	3.84E-11	1.00E-13	6.85E-19	3.20E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 54	2.81E-08	2.81E-08	2.81E-08	2.81E-08	2.81E-08	2.81E-08	2.81E-08	2.81E-08	2.81E-08	2.81E-08	2.81E-08
mn 56	1.17E-06	1.02E-06	8.94E-07	6.83E-07	3.99E-07	2.33E-07	1.36E-07	7.95E-08	4.65E-08	2.71E-08	1.59E-08
mn 57	8.63E-09	5.27E-15	3.22E-21	1.27E-33	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 58	2.90E-11	1.46E-19	7.35E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
fe 55	3.00E-10	3.00E-10	3.00E-10	3.00E-10	3.00E-10	3.00E-10	3.00E-10	3.00E-10	3.00E-10	3.00E-10	3.00E-10
fe 59	2.20E-10	2.20E-10	2.19E-10	2.19E-10	2.19E-10	2.19E-10	2.18E-10	2.18E-10	2.18E-10	2.18E-10	2.17E-10
co 58	4.18E-07	4.18E-07	4.17E-07	4.17E-07	4.17E-07	4.17E-07	4.16E-07	4.16E-07	4.16E-07	4.15E-07	4.15E-07
co 60	1.10E-10	1.10E-10	1.10E-10	1.10E-10	1.10E-10	1.10E-10	1.10E-10	1.10E-10	1.10E-10	1.10E-10	1.10E-10
co 61	3.26E-09	2.64E-09	2.14E-09	1.41E-09	6.08E-10	2.62E-10	1.13E-10	4.89E-11	2.11E-11	9.10E-12	3.93E-12
co 62	6.31E-10	6.02E-16	5.74E-22	5.27E-34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ni 59	3.45E-14	3.45E-14	3.45E-14	3.45E-14	3.45E-14	3.45E-14	3.45E-14	3.45E-14	3.45E-14	3.45E-14	3.45E-14
ni 63	4.19E-12	4.19E-12	4.19E-12	4.19E-12	4.19E-12	4.19E-12	4.19E-12	4.19E-12	4.19E-12	4.19E-12	4.19E-12
ni 65	2.07E-09	1.80E-09	1.57E-09	1.19E-09	6.88E-10	3.97E-10	2.29E-10	1.32E-10	7.62E-11	4.39E-11	2.54E-11
total	2.06E-06	1.56E-06	1.43E-06	1.21E-06	9.18E-07	7.46E-07	6.46E-07	5.87E-07	5.52E-07	5.32E-07	5.19E-07

Table F28. Radioactivity (Ci) After One-Day Irradiation of 1-kg Havar Foil (Flux Parameter Set 1).

	Time After Discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
be 10	2.34E-20	2.34E-20	2.34E-20	2.34E-20	2.34E-20	2.34E-20	2.34E-20	2.34E-20	2.34E-20	2.34E-20	2.34E-20
ti 51	5.01E-11	1.35E-12	3.66E-14	2.68E-17	1.43E-23	7.68E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 52	3.14E-08	1.23E-10	4.79E-13	7.30E-18	1.70E-27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 53	4.35E-10	1.07E-15	2.63E-21	1.59E-32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
cr 51	1.89E-10	1.89E-10	1.88E-10	1.88E-10	1.88E-10	1.87E-10	1.87E-10	1.87E-10	1.86E-10	1.86E-10	1.86E-10
cr 55	1.64E-09	4.30E-12	1.12E-14	7.67E-20	3.58E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 54	1.20E-10	1.20E-10	1.20E-10	1.20E-10	1.20E-10	1.19E-10	1.19E-10	1.19E-10	1.19E-10	1.19E-10	1.19E-10
mn 56	5.70E-08	4.99E-08	4.36E-08	3.33E-08	1.95E-08	1.14E-08	6.64E-09	3.88E-09	2.27E-09	1.32E-09	7.73E-10
mn 57	3.63E-10	2.22E-16	1.36E-22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
fe 55	1.63E-12	1.63E-12	1.63E-12	1.63E-12	1.63E-12	1.63E-12	1.63E-12	1.63E-12	1.63E-12	1.63E-12	1.63E-12
fe 59	7.90E-13	7.90E-13	7.90E-13	7.89E-13	7.88E-13	7.87E-13	7.86E-13	7.85E-13	7.84E-13	7.83E-13	7.82E-13
co 58	6.61E-09	6.61E-09	6.60E-09	6.60E-09	6.60E-09	6.59E-09	6.59E-09	6.58E-09	6.57E-09	6.57E-09	6.56E-09
co 60	3.29E-10	3.34E-10	3.35E-10	3.35E-10	3.35E-10	3.35E-10	3.35E-10	3.35E-10	3.35E-10	3.35E-10	3.35E-10
co 60m	1.50E-06	2.06E-07	2.83E-08	5.33E-10	1.89E-13	6.70E-17	2.38E-20	8.42E-24	2.99E-27	1.06E-30	3.78E-34
co 61	4.94E-10	4.00E-10	3.24E-10	2.13E-10	9.20E-11	3.97E-11	1.71E-11	7.40E-12	3.19E-12	1.38E-12	5.95E-13
co 62	9.55E-11	9.11E-17	8.69E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ni 59	3.72E-16	3.72E-16	3.72E-16	3.72E-16	3.72E-16	3.72E-16	3.72E-16	3.72E-16	3.72E-16	3.72E-16	3.72E-16
ni 63	4.53E-14	4.53E-14	4.53E-14	4.53E-14	4.53E-14	4.53E-14	4.53E-14	4.53E-14	4.53E-14	4.53E-14	4.53E-14
ni 65	1.87E-10	1.63E-10	1.42E-10	1.08E-10	6.23E-11	3.59E-11	2.07E-11	1.20E-11	6.90E-12	3.98E-12	2.30E-12
y 89m	8.86E-13	8.83E-13	8.79E-13	8.71E-13	8.56E-13	8.41E-13	8.26E-13	8.12E-13	7.97E-13	7.83E-13	7.70E-13
zr 89	8.88E-13	8.84E-13	8.80E-13	8.72E-13	8.57E-13	8.42E-13	8.27E-13	8.13E-13	7.98E-13	7.84E-13	7.71E-13
zr 93	5.84E-20	5.84E-20	5.84E-20	5.84E-20	5.84E-20	5.84E-20	5.84E-20	5.84E-20	5.84E-20	5.84E-20	5.84E-20
zr 95	1.62E-13	1.62E-13	1.62E-13	1.62E-13	1.61E-13	1.61E-13	1.61E-13	1.61E-13	1.61E-13	1.61E-13	1.61E-13
zr 97	2.88E-13	2.82E-13	2.76E-13	2.65E-13	2.44E-13	2.25E-13	2.07E-13	1.91E-13	1.76E-13	1.62E-13	1.49E-13
nb 92	4.68E-20	4.68E-20	4.68E-20	4.68E-20	4.68E-20	4.68E-20	4.68E-20	4.68E-20	4.68E-20	4.68E-20	4.68E-20
nb 94	6.79E-18	6.79E-18	6.79E-18	6.79E-18	6.79E-18	6.79E-18	6.79E-18	6.79E-18	6.79E-18	6.79E-18	6.79E-18
nb 95	3.85E-13	3.85E-13	3.85E-13	3.85E-13	3.84E-13	3.84E-13	3.84E-13	3.83E-13	3.83E-13	3.83E-13	3.82E-13
nb 95m	5.63E-17	6.32E-17	7.01E-17	8.38E-17	1.11E-16	1.38E-16	1.64E-16	1.90E-16	2.15E-16	2.40E-16	2.64E-16
nb 96	1.89E-11	1.87E-11	1.84E-11	1.78E-11	1.68E-11	1.58E-11	1.49E-11	1.41E-11	1.33E-11	1.25E-11	1.18E-11
nb 97	3.51E-11	2.64E-11	1.99E-11	1.13E-11	3.73E-12	1.33E-12	5.67E-13	3.14E-13	2.23E-13	1.85E-13	1.64E-13
nb 97m	2.73E-13	2.68E-13	2.62E-13	2.52E-13	2.32E-13	2.14E-13	1.97E-13	1.81E-13	1.67E-13	1.54E-13	1.42E-13
mo 93	9.70E-18	9.70E-18	9.70E-18	9.70E-18	9.70E-18	9.70E-18	9.70E-18	9.70E-18	9.70E-18	9.70E-18	9.70E-18
mo 99	7.45E-11	7.41E-11	7.37E-11	7.29E-11	7.14E-11	6.99E-11	6.85E-11	6.71E-11	6.57E-11	6.43E-11	6.30E-11
mo101	2.36E-10	5.69E-11	1.37E-11	7.94E-13	2.66E-15	8.94E-18	3.00E-20	1.01E-22	3.38E-25	1.13E-27	3.80E-30
tc 99	1.36E-20	1.53E-20	1.69E-20	2.02E-20	2.67E-20	3.31E-20	3.93E-20	4.54E-20	5.13E-20	5.72E-20	6.29E-20
tc101	2.36E-10	1.36E-10	5.12E-11	4.97E-12	2.86E-14	1.30E-16	5.34E-19	2.07E-21	7.75E-24	2.83E-26	1.01E-28
w181	1.95E-13	1.95E-13	1.95E-13	1.95E-13	1.95E-13	1.95E-13	1.95E-13	1.94E-13	1.94E-13	1.94E-13	1.94E-13
w185	6.32E-12	6.32E-12	6.32E-12	6.32E-12	6.32E-12	6.31E-12	6.31E-12	6.30E-12	6.30E-12	6.29E-12	6.29E-12
w185m	2.26E-12	8.86E-18	3.46E-23	4.74E-34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
w187	1.30E-08	1.28E-08	1.26E-08	1.23E-08	1.16E-08	1.09E-08	1.03E-08	9.71E-09	9.17E-09	8.65E-09	8.16E-09
total	1.61E-06	2.77E-07	9.24E-08	5.38E-08	3.85E-08	2.97E-08	2.43E-08	2.09E-08	1.87E-08	1.73E-08	1.62E-08

Table F29. Radioactivity (Ci) After Ten-Day Irradiation of 1-kg Havar Foil (Flux Parameter Set 1).

	Time After Discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
be 10	2.34E-19	2.34E-19	2.34E-19	2.34E-19	2.34E-19	2.34E-19	2.34E-19	2.34E-19	2.34E-19	2.34E-19	2.34E-19
c 14	1.65E-20	1.65E-20	1.65E-20	1.65E-20	1.65E-20	1.65E-20	1.65E-20	1.65E-20	1.65E-20	1.65E-20	1.65E-20
ti 51	5.01E-11	1.35E-12	3.66E-14	2.68E-17	1.43E-23	7.68E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 52	3.14E-08	1.23E-10	4.79E-13	7.30E-18	1.70E-27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 53	4.35E-10	1.07E-15	2.63E-21	1.59E-32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
cr 51	1.69E-09	1.69E-09	1.69E-09	1.69E-09	1.69E-09	1.68E-09	1.68E-09	1.68E-09	1.67E-09	1.67E-09	1.66E-09
cr 55	1.64E-09	4.30E-12	1.12E-14	7.67E-20	3.58E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 54	1.18E-09	1.18E-09	1.18E-09	1.18E-09	1.18E-09	1.18E-09	1.18E-09	1.18E-09	1.18E-09	1.18E-09	1.18E-09
mn 56	5.71E-08	4.99E-08	4.37E-08	3.34E-08	1.95E-08	1.14E-08	6.65E-09	3.88E-09	2.27E-09	1.33E-09	7.74E-10
mn 57	3.63E-10	2.22E-16	1.36E-22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
fe 55	1.63E-11	1.63E-11	1.63E-11	1.63E-11	1.63E-11	1.63E-11	1.63E-11	1.63E-11	1.63E-11	1.63E-11	1.63E-11
fe 59	7.38E-12	7.37E-12	7.37E-12	7.37E-12	7.36E-12	7.35E-12	7.34E-12	7.33E-12	7.32E-12	7.31E-12	7.30E-12
co 58	6.32E-08	6.32E-08	6.32E-08	6.32E-08	6.31E-08	6.31E-08	6.30E-08	6.30E-08	6.29E-08	6.29E-08	6.28E-08
co 60	3.34E-09	3.34E-09	3.34E-09	3.34E-09	3.34E-09	3.34E-09	3.34E-09	3.34E-09	3.34E-09	3.34E-09	3.34E-09
co 60m	1.50E-06	2.06E-07	2.83E-08	5.33E-10	1.89E-13	6.70E-17	2.38E-20	8.42E-24	2.99E-27	1.06E-30	3.78E-34
co 61	4.94E-10	4.00E-10	3.24E-10	2.13E-10	9.20E-11	3.97E-11	1.71E-11	7.40E-12	3.19E-12	1.38E-12	5.95E-13
co 62	9.55E-11	9.11E-17	8.69E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ni 59	3.72E-15	3.72E-15	3.72E-15	3.72E-15	3.72E-15	3.72E-15	3.72E-15	3.72E-15	3.72E-15	3.72E-15	3.72E-15
ni 63	4.53E-13	4.53E-13	4.53E-13	4.53E-13	4.53E-13	4.53E-13	4.53E-13	4.53E-13	4.53E-13	4.53E-13	4.53E-13
ni 65	1.87E-10	1.63E-10	1.42E-10	1.08E-10	6.24E-11	3.60E-11	2.08E-11	1.20E-11	6.91E-12	3.98E-12	2.30E-12
y 89m	4.08E-12	4.06E-12	4.05E-12	4.01E-12	3.94E-12	3.87E-12	3.80E-12	3.74E-12	3.67E-12	3.61E-12	3.54E-12
zr 89	4.09E-12	4.07E-12	4.05E-12	4.02E-12	3.95E-12	3.88E-12	3.81E-12	3.74E-12	3.68E-12	3.61E-12	3.55E-12
zr 93	5.84E-19	5.84E-19	5.84E-19	5.84E-19	5.84E-19	5.84E-19	5.84E-19	5.84E-19	5.84E-19	5.84E-19	5.84E-19
zr 95	1.54E-12	1.54E-12	1.54E-12	1.54E-12	1.54E-12	1.54E-12	1.54E-12	1.53E-12	1.53E-12	1.53E-12	1.53E-12
zr 97	4.60E-13	4.50E-13	4.41E-13	4.24E-13	3.90E-13	3.59E-13	3.31E-13	3.05E-13	2.81E-13	2.59E-13	2.39E-13
nb 92	4.68E-19	4.68E-19	4.68E-19	4.68E-19	4.68E-19	4.68E-19	4.68E-19	4.68E-19	4.68E-19	4.68E-19	4.68E-19
nb 93m	4.40E-20	4.42E-20	4.44E-20	4.48E-20	4.56E-20	4.64E-20	4.71E-20	4.79E-20	4.87E-20	4.95E-20	5.03E-20
nb 94	6.79E-17	6.79E-17	6.79E-17	6.79E-17	6.79E-17	6.79E-17	6.79E-17	6.79E-17	6.79E-17	6.79E-17	6.79E-17
nb 95	3.66E-12	3.66E-12	3.66E-12	3.66E-12	3.65E-12	3.65E-12	3.65E-12	3.64E-12	3.64E-12	3.63E-12	3.63E-12
nb 95m	9.11E-15	9.14E-15	9.17E-15	9.23E-15	9.36E-15	9.48E-15	9.60E-15	9.72E-15	9.83E-15	9.95E-15	1.01E-14
nb 96	3.71E-11	3.66E-11	3.60E-11	3.50E-11	3.30E-11	3.11E-11	2.93E-11	2.76E-11	2.60E-11	2.45E-11	2.31E-11
nb 97	3.53E-11	2.66E-11	2.00E-11	1.14E-11	3.88E-12	1.48E-12	7.00E-13	4.36E-13	3.36E-13	2.88E-13	2.59E-13
nb 97m	4.36E-13	4.27E-13	4.19E-13	4.02E-13	3.70E-13	3.41E-13	3.14E-13	2.89E-13	2.67E-13	2.46E-13	2.26E-13
mo 93	9.70E-17	9.70E-17	9.70E-17	9.70E-17	9.70E-17	9.70E-17	9.70E-17	9.70E-17	9.70E-17	9.70E-17	9.70E-17
mo 99	3.07E-10	3.06E-10	3.04E-10	3.01E-10	2.95E-10	2.89E-10	2.83E-10	2.77E-10	2.71E-10	2.65E-10	2.60E-10
mo101	2.36E-10	5.69E-11	1.37E-11	7.94E-13	2.66E-15	8.94E-18	3.00E-20	1.01E-22	3.38E-25	1.13E-27	3.80E-30
tc 99	2.01E-18	2.01E-18	2.02E-18	2.03E-18	2.06E-18	2.09E-18	2.11E-18	2.14E-18	2.16E-18	2.19E-18	2.21E-18
tc101	2.36E-10	1.36E-10	5.12E-11	4.97E-12	2.86E-14	1.30E-16	5.34E-19	2.07E-21	7.75E-24	2.83E-26	1.01E-28
w181	1.90E-12	1.90E-12	1.90E-12	1.90E-12	1.90E-12	1.90E-12	1.90E-12	1.89E-12	1.89E-12	1.89E-12	1.89E-12
w185	6.07E-11	6.07E-11	6.07E-11	6.06E-11	6.06E-11	6.06E-11	6.05E-11	6.05E-11	6.04E-11	6.04E-11	6.03E-11
w185m	2.26E-12	8.86E-18	3.46E-23	4.74E-34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
w187	2.59E-08	2.55E-08	2.51E-08	2.44E-08	2.30E-08	2.17E-08	2.05E-08	1.94E-08	1.83E-08	1.72E-08	1.63E-08
total	1.69E-06	3.52E-07	1.67E-07	1.28E-07	1.12E-07	1.03E-07	9.69E-08	9.28E-08	9.01E-08	8.80E-08	8.64E-08

Table F30. Radioactivity (Ci) After One-Day Irradiation of 1-kg Havar Foil (Flux Parameter Set 2).

	Time After Discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
be 10	1.63E-19	1.63E-19	1.63E-19	1.63E-19	1.63E-19	1.63E-19	1.63E-19	1.63E-19	1.63E-19	1.63E-19	1.63E-19
c 14	2.54E-20	2.54E-20	2.54E-20	2.54E-20	2.54E-20	2.54E-20	2.54E-20	2.54E-20	2.54E-20	2.54E-20	2.54E-20
ti 51	3.50E-10	9.47E-12	2.56E-13	1.87E-16	1.00E-22	5.36E-29	4.58E-35	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 52	2.19E-07	8.57E-10	3.35E-12	5.10E-17	1.19E-26	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 53	3.04E-09	7.47E-15	1.84E-20	1.11E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
cr 51	1.71E-09	1.71E-09	1.71E-09	1.71E-09	1.70E-09	1.70E-09	1.70E-09	1.69E-09	1.69E-09	1.69E-09	1.68E-09
cr 55	1.21E-08	3.16E-11	8.27E-14	5.65E-19	2.64E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 54	8.35E-10	8.35E-10	8.35E-10	8.35E-10	8.35E-10	8.35E-10	8.35E-10	8.35E-10	8.34E-10	8.34E-10	8.34E-10
mn 56	5.77E-07	5.05E-07	4.41E-07	3.37E-07	1.97E-07	1.15E-07	6.72E-08	3.93E-08	2.29E-08	1.34E-08	7.82E-09
mn 57	2.54E-09	1.55E-15	9.48E-22	3.63E-34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 58	8.52E-12	4.29E-20	2.16E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
fe 55	1.36E-11	1.36E-11	1.36E-11	1.36E-11	1.36E-11	1.36E-11	1.36E-11	1.36E-11	1.36E-11	1.36E-11	1.36E-11
fe 59	8.55E-12	8.54E-12	8.54E-12	8.53E-12	8.52E-12	8.51E-12	8.50E-12	8.49E-12	8.48E-12	8.47E-12	8.46E-12
co 58	4.62E-08	4.62E-08	4.62E-08	4.61E-08	4.61E-08	4.61E-08	4.60E-08	4.60E-08	4.59E-08	4.59E-08	4.59E-08
co 60	5.74E-09	5.82E-09	5.83E-09	5.84E-09	5.84E-09	5.84E-09	5.84E-09	5.84E-09	5.84E-09	5.84E-09	5.84E-09
co 60m	2.63E-05	3.60E-06	4.95E-07	9.31E-09	3.30E-12	1.17E-15	4.15E-19	1.47E-22	5.22E-26	1.85E-29	6.57E-33
co 61	3.45E-09	2.80E-09	2.27E-09	1.49E-09	6.43E-10	2.78E-10	1.20E-10	5.17E-11	2.23E-11	9.63E-12	4.16E-12
co 62	6.68E-10	6.37E-16	6.07E-22	5.27E-34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ni 59	3.65E-15	3.65E-15	3.65E-15	3.65E-15	3.65E-15	3.65E-15	3.65E-15	3.65E-15	3.65E-15	3.65E-15	3.65E-15
ni 63	4.44E-13	4.44E-13	4.44E-13	4.44E-13	4.44E-13	4.44E-13	4.44E-13	4.44E-13	4.44E-13	4.44E-13	4.44E-13
ni 65	2.18E-09	1.90E-09	1.66E-09	1.26E-09	7.27E-10	4.19E-10	2.42E-10	1.40E-10	8.05E-11	4.64E-11	2.68E-11
y 89m	6.20E-12	6.17E-12	6.14E-12	6.09E-12	5.98E-12	5.88E-12	5.77E-12	5.67E-12	5.57E-12	5.47E-12	5.38E-12
zr 89	6.20E-12	6.18E-12	6.15E-12	6.09E-12	5.99E-12	5.88E-12	5.78E-12	5.68E-12	5.58E-12	5.48E-12	5.39E-12
zr 93	4.08E-19	4.08E-19	4.08E-19	4.08E-19	4.08E-19	4.08E-19	4.08E-19	4.08E-19	4.08E-19	4.08E-19	4.08E-19
zr 95	1.13E-12	1.13E-12	1.13E-12	1.13E-12	1.13E-12	1.13E-12	1.13E-12	1.12E-12	1.12E-12	1.12E-12	1.12E-12
zr 97	2.01E-12	1.97E-12	1.93E-12	1.85E-12	1.71E-12	1.57E-12	1.45E-12	1.34E-12	1.23E-12	1.13E-12	1.04E-12
nb 92	3.27E-19	3.27E-19	3.27E-19	3.27E-19	3.27E-19	3.27E-19	3.27E-19	3.27E-19	3.27E-19	3.27E-19	3.27E-19
nb 94	4.74E-17	4.74E-17	4.74E-17	4.74E-17	4.74E-17	4.74E-17	4.74E-17	4.74E-17	4.74E-17	4.74E-17	4.74E-17
nb 95	2.69E-12	2.69E-12	2.69E-12	2.69E-12	2.69E-12	2.68E-12	2.68E-12	2.68E-12	2.68E-12	2.67E-12	2.67E-12
nb 95m	3.93E-16	4.42E-16	4.90E-16	5.86E-16	7.75E-16	9.62E-16	1.14E-15	1.33E-15	1.50E-15	1.68E-15	1.85E-15
nb 96	1.32E-10	1.30E-10	1.28E-10	1.25E-10	1.18E-10	1.11E-10	1.04E-10	9.83E-11	9.27E-11	8.73E-11	8.23E-11
nb 97	2.45E-10	1.84E-10	1.39E-10	7.87E-11	2.60E-11	9.33E-12	3.96E-12	2.19E-12	1.56E-12	1.29E-12	1.14E-12
nb 97m	1.91E-12	1.87E-12	1.83E-12	1.76E-12	1.62E-12	1.49E-12	1.38E-12	1.27E-12	1.17E-12	1.08E-12	9.91E-13
mo 93	2.54E-16	2.54E-16	2.54E-16	2.54E-16	2.54E-16	2.54E-16	2.54E-16	2.54E-16	2.54E-16	2.54E-16	2.54E-16
mo 99	2.15E-09	2.14E-09	2.13E-09	2.11E-09	2.06E-09	2.02E-09	1.98E-09	1.94E-09	1.90E-09	1.86E-09	1.82E-09
mo101	6.49E-09	1.56E-09	3.76E-10	2.18E-11	7.31E-14	2.45E-16	8.23E-19	2.76E-21	9.27E-24	3.11E-26	1.04E-28
tc 99	3.92E-19	4.40E-19	4.88E-19	5.83E-19	7.70E-19	9.54E-19	1.13E-18	1.31E-18	1.48E-18	1.65E-18	1.82E-18
tc101	6.49E-09	3.74E-09	1.41E-09	1.36E-10	7.86E-13	3.57E-15	1.47E-17	5.69E-20	2.13E-22	7.76E-25	2.78E-27
w181	5.66E-12	5.65E-12	5.65E-12	5.65E-12	5.65E-12	5.65E-12	5.64E-12	5.64E-12	5.64E-12	5.64E-12	5.63E-12
w185	1.56E-10	1.56E-10	1.56E-10	1.56E-10	1.56E-10	1.56E-10	1.56E-10	1.56E-10	1.56E-10	1.56E-10	1.56E-10
w185m	5.60E-11	2.19E-16	8.56E-22	1.31E-32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
w187	3.45E-07	3.40E-07	3.35E-07	3.25E-07	3.07E-07	2.90E-07	2.73E-07	2.58E-07	2.44E-07	2.30E-07	2.17E-07
total	2.75E-05	4.52E-06	1.33E-06	7.32E-07	5.62E-07	4.62E-07	3.98E-07	3.54E-07	3.23E-07	3.00E-07	2.81E-07

Table F31. Radioactivity (Ci) After Ten-Day Irradiation of 1-kg Havar Foil (Flux Parameter Set 2).

	Time After Discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
be 10	1.63E-18	1.63E-18	1.63E-18	1.63E-18	1.63E-18	1.63E-18	1.63E-18	1.63E-18	1.63E-18	1.63E-18	1.63E-18
c 14	2.54E-19	2.54E-19	2.54E-19	2.54E-19	2.54E-19	2.54E-19	2.54E-19	2.54E-19	2.54E-19	2.54E-19	2.54E-19
ti 51	3.50E-10	9.47E-12	2.56E-13	1.87E-16	1.00E-22	5.36E-29	4.58E-35	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 52	2.19E-07	8.57E-10	3.35E-12	5.10E-17	1.19E-26	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
v 53	3.04E-09	7.47E-15	1.84E-20	1.11E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
cr 51	1.53E-08	1.53E-08	1.53E-08	1.53E-08	1.53E-08	1.52E-08	1.52E-08	1.52E-08	1.51E-08	1.51E-08	1.51E-08
cr 55	1.21E-08	3.16E-11	8.27E-14	5.65E-19	2.64E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 54	8.27E-09	8.27E-09	8.27E-09	8.27E-09	8.27E-09	8.27E-09	8.26E-09	8.26E-09	8.26E-09	8.26E-09	8.26E-09
mn 56	5.78E-07	5.05E-07	4.42E-07	3.38E-07	1.97E-07	1.15E-07	6.73E-08	3.93E-08	2.30E-08	1.34E-08	7.84E-09
mn 57	2.54E-09	1.55E-15	9.48E-22	3.63E-34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 58	8.52E-12	4.29E-20	2.16E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
fe 55	1.36E-10	1.36E-10	1.36E-10	1.36E-10	1.36E-10	1.36E-10	1.36E-10	1.36E-10	1.36E-10	1.36E-10	1.36E-10
fe 59	7.97E-11	7.97E-11	7.97E-11	7.96E-11	7.95E-11	7.94E-11	7.93E-11	7.92E-11	7.91E-11	7.90E-11	7.89E-11
co 58	4.42E-07	4.42E-07	4.42E-07	4.42E-07	4.41E-07	4.41E-07	4.41E-07	4.40E-07	4.40E-07	4.39E-07	4.39E-07
co 60	5.82E-08	5.83E-08	5.83E-08	5.83E-08	5.83E-08	5.83E-08	5.83E-08	5.83E-08	5.83E-08	5.83E-08	5.83E-08
co 60m	2.63E-05	3.60E-06	4.95E-07	9.31E-09	3.30E-12	1.17E-15	4.15E-19	1.47E-22	5.22E-26	1.85E-29	6.57E-33
co 61	3.45E-09	2.80E-09	2.27E-09	1.49E-09	6.43E-10	2.78E-10	1.20E-10	5.17E-11	2.23E-11	9.63E-12	4.16E-12
co 62	6.68E-10	6.37E-16	6.07E-22	5.27E-34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ni 59	3.65E-14	3.65E-14	3.65E-14	3.65E-14	3.65E-14	3.65E-14	3.65E-14	3.65E-14	3.65E-14	3.65E-14	3.65E-14
ni 63	4.44E-12	4.44E-12	4.44E-12	4.44E-12	4.44E-12	4.44E-12	4.44E-12	4.44E-12	4.44E-12	4.44E-12	4.44E-12
ni 65	2.19E-09	1.91E-09	1.66E-09	1.26E-09	7.28E-10	4.20E-10	2.42E-10	1.40E-10	8.06E-11	4.65E-11	2.68E-11
y 89m	2.85E-11	2.84E-11	2.83E-11	2.80E-11	2.75E-11	2.71E-11	2.66E-11	2.61E-11	2.57E-11	2.52E-11	2.48E-11
zr 89	2.86E-11	2.84E-11	2.83E-11	2.81E-11	2.76E-11	2.71E-11	2.66E-11	2.62E-11	2.57E-11	2.52E-11	2.48E-11
zr 93	4.08E-18	4.08E-18	4.08E-18	4.08E-18	4.08E-18	4.08E-18	4.08E-18	4.08E-18	4.08E-18	4.08E-18	4.08E-18
zr 95	1.08E-11	1.08E-11	1.08E-11	1.08E-11	1.07E-11	1.07E-11	1.07E-11	1.07E-11	1.07E-11	1.07E-11	1.07E-11
zr 97	3.21E-12	3.15E-12	3.08E-12	2.96E-12	2.73E-12	2.51E-12	2.31E-12	2.13E-12	1.96E-12	1.81E-12	1.67E-12
nb 92	3.27E-18	3.27E-18	3.27E-18	3.27E-18	3.27E-18	3.27E-18	3.27E-18	3.27E-18	3.27E-18	3.27E-18	3.27E-18
nb 93m	1.14E-18	1.15E-18	1.15E-18	1.17E-18	1.19E-18	1.21E-18	1.23E-18	1.25E-18	1.27E-18	1.29E-18	1.31E-18
nb 94	4.74E-16	4.74E-16	4.74E-16	4.74E-16	4.74E-16	4.74E-16	4.74E-16	4.74E-16	4.74E-16	4.74E-16	4.74E-16
nb 95	2.56E-11	2.56E-11	2.56E-11	2.55E-11	2.55E-11	2.55E-11	2.55E-11	2.55E-11	2.54E-11	2.54E-11	2.54E-11
nb 95m	6.36E-14	6.39E-14	6.41E-14	6.45E-14	6.54E-14	6.63E-14	6.71E-14	6.79E-14	6.87E-14	6.95E-14	7.03E-14
nb 96	2.59E-10	2.56E-10	2.52E-10	2.45E-10	2.30E-10	2.17E-10	2.05E-10	1.93E-10	1.82E-10	1.71E-10	1.61E-10
nb 97	2.47E-10	1.86E-10	1.40E-10	7.99E-11	2.71E-11	1.03E-11	4.89E-12	3.05E-12	2.34E-12	2.01E-12	1.81E-12
nb 97m	3.05E-12	2.99E-12	2.93E-12	2.81E-12	2.59E-12	2.38E-12	2.20E-12	2.02E-12	1.86E-12	1.72E-12	1.58E-12
mo 93	2.54E-15	2.54E-15	2.54E-15	2.54E-15	2.54E-15	2.54E-15	2.54E-15	2.54E-15	2.54E-15	2.54E-15	2.54E-15
mo 99	8.87E-09	8.82E-09	8.78E-09	8.68E-09	8.50E-09	8.33E-09	8.15E-09	7.98E-09	7.82E-09	7.65E-09	7.50E-09
mo101	6.49E-09	1.56E-09	3.76E-10	2.18E-11	7.31E-14	2.45E-16	8.23E-19	2.76E-21	9.27E-24	3.11E-26	1.04E-28
tc 99	5.79E-17	5.81E-17	5.83E-17	5.87E-17	5.95E-17	6.02E-17	6.10E-17	6.17E-17	6.24E-17	6.31E-17	6.38E-17
tc101	6.49E-09	3.74E-09	1.41E-09	1.36E-10	7.86E-13	3.57E-15	1.47E-17	5.69E-20	2.13E-22	7.76E-25	2.78E-27
w181	5.51E-11	5.51E-11	5.51E-11	5.51E-11	5.51E-11	5.50E-11	5.50E-11	5.50E-11	5.50E-11	5.49E-11	5.49E-11
w185	1.50E-09	1.50E-09	1.50E-09	1.50E-09	1.50E-09	1.50E-09	1.50E-09	1.49E-09	1.49E-09	1.49E-09	1.49E-09
w185m	5.60E-11	2.19E-16	8.56E-22	1.31E-32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
w187	6.87E-07	6.77E-07	6.67E-07	6.48E-07	6.12E-07	5.77E-07	5.45E-07	5.14E-07	4.85E-07	4.58E-07	4.32E-07

Table F31. (continued)

	Time After Discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
w188	2.56E-20	2.56E-20	2.56E-20	2.56E-20	2.55E-20	2.55E-20	2.55E-20	2.55E-20	2.54E-20	2.54E-20	2.54E-20
re187	1.73E-19	1.74E-19	1.74E-19	1.75E-19	1.77E-19	1.79E-19	1.81E-19	1.83E-19	1.84E-19	1.86E-19	1.87E-19
re188	2.61E-19	2.64E-19	2.61E-19	2.53E-19	2.35E-19	2.19E-19	2.04E-19	1.90E-19	1.77E-19	1.65E-19	1.54E-19
re188m	5.95E-19	1.95E-19	6.36E-20	6.80E-21	7.77E-23	8.87E-25	1.01E-26	1.16E-28	1.32E-30	1.51E-32	1.70E-34
total	2.83E-05	5.33E-06	2.14E-06	1.53E-06	1.34E-06	1.23E-06	1.15E-06	1.09E-06	1.04E-06	1.00E-06	9.70E-07

Table F32. Radioactivity (Ci) After One-Day Irradiation of 1-kg Concrete (Flux Parameter Set 3).

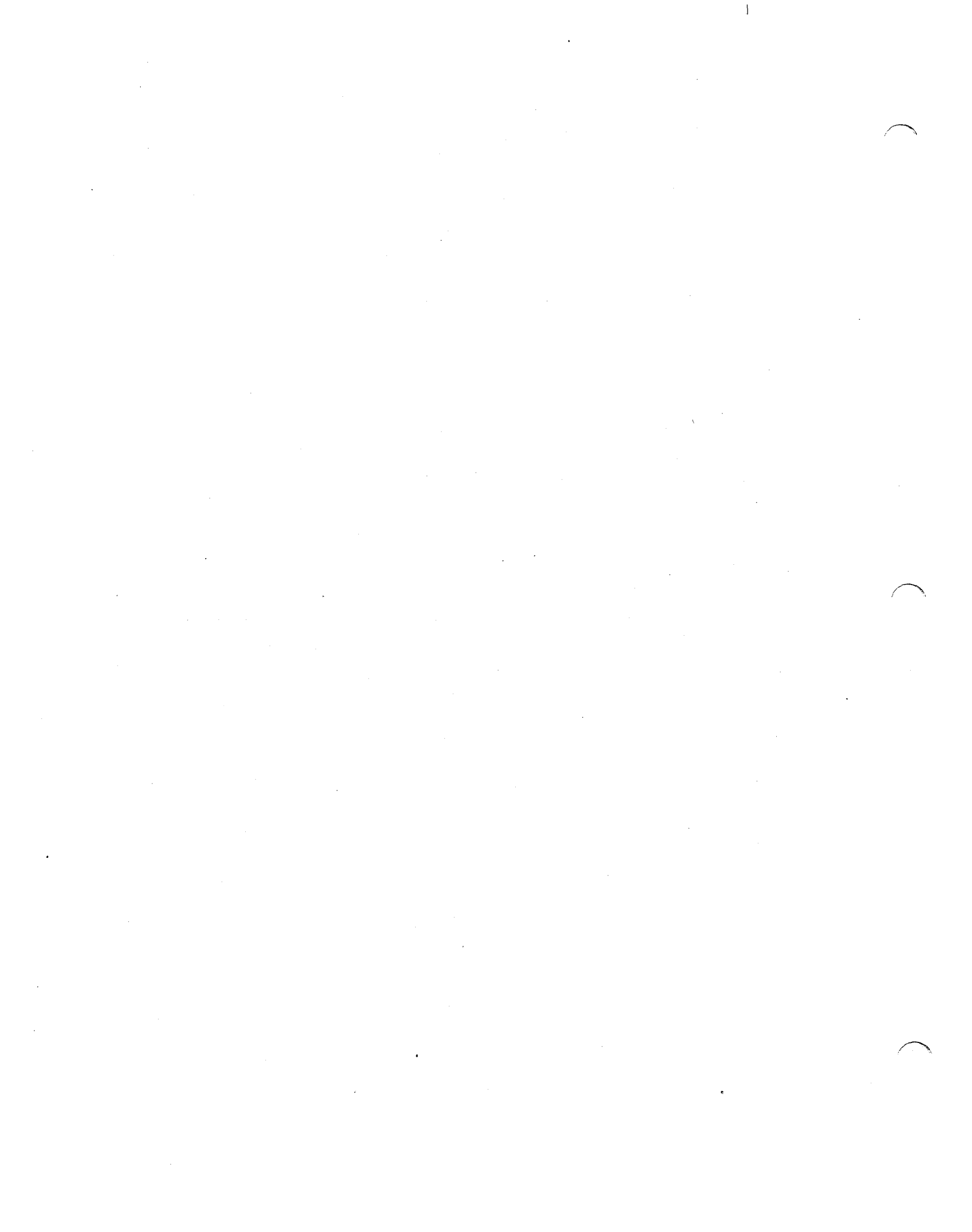
	Time After Discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
h 3	1.66E-18	1.66E-18	1.66E-18	1.66E-18	1.66E-18	1.66E-18	1.66E-18	1.66E-18	1.66E-18	1.66E-18	1.66E-18
c 14	1.30E-17	1.30E-17	1.30E-17	1.30E-17	1.30E-17	1.30E-17	1.30E-17	1.30E-17	1.30E-17	1.30E-17	1.30E-17
na 24	7.82E-09	7.63E-09	7.45E-09	7.11E-09	6.47E-09	5.88E-09	5.35E-09	4.87E-09	4.43E-09	4.03E-09	3.67E-09
na 25	1.76E-11	1.42E-20	1.15E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mg 27	4.24E-09	4.71E-10	5.23E-11	6.45E-13	9.81E-17	1.49E-20	2.27E-24	3.45E-28	5.25E-32	0.00E+00	0.00E+00
al 28	6.11E-08	5.68E-12	5.28E-16	4.57E-24	4.81E-29	4.50E-29	4.21E-29	3.94E-29	3.69E-29	3.45E-29	3.23E-29
al 29	1.62E-09	6.84E-11	2.88E-12	5.12E-15	1.61E-20	5.09E-26	1.61E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00
si 31	1.88E-09	1.65E-09	1.44E-09	1.11E-09	6.53E-10	3.85E-10	2.27E-10	1.34E-10	7.88E-11	4.64E-11	2.74E-11
cl 36	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17
ar 37	5.08E-11	5.08E-11	5.07E-11	5.07E-11	5.06E-11	5.05E-11	5.05E-11	5.04E-11	5.03E-11	5.02E-11	5.01E-11
ar 39	5.66E-14	5.66E-14	5.66E-14	5.66E-14	5.66E-14	5.66E-14	5.66E-14	5.66E-14	5.66E-14	5.66E-14	5.66E-14
ar 41	8.18E-13	6.77E-13	5.60E-13	3.83E-13	1.79E-13	8.40E-14	3.93E-14	1.84E-14	8.62E-15	4.04E-15	1.89E-15
k 40	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08
k 42	6.87E-10	6.68E-10	6.49E-10	6.14E-10	5.49E-10	4.90E-10	4.38E-10	3.92E-10	3.50E-10	3.13E-10	2.80E-10
k 43	1.14E-12	1.13E-12	1.11E-12	1.07E-12	1.01E-12	9.49E-13	8.92E-13	8.38E-13	7.88E-13	7.40E-13	6.96E-13
k 44	1.96E-12	7.68E-13	3.00E-13	4.58E-14	1.07E-15	2.49E-17	5.82E-19	1.36E-20	3.17E-22	7.39E-24	1.72E-25
ca 41	1.04E-16	1.04E-16	1.04E-16	1.04E-16	1.04E-16	1.04E-16	1.04E-16	1.04E-16	1.04E-16	1.04E-16	1.04E-16
ca 45	1.38E-12	1.38E-12	1.38E-12	1.38E-12	1.38E-12	1.38E-12	1.38E-12	1.38E-12	1.38E-12	1.38E-12	1.38E-12
ca 47	5.34E-14	5.32E-14	5.31E-14	5.27E-14	5.21E-14	5.14E-14	5.08E-14	5.01E-14	4.95E-14	4.89E-14	4.82E-14
ca 49	6.48E-11	5.96E-12	5.48E-13	4.64E-15	3.32E-19	2.38E-23	1.70E-27	1.22E-31	0.00E+00	0.00E+00	0.00E+00
sc 47	1.82E-15	2.04E-15	2.26E-15	2.70E-15	3.55E-15	4.37E-15	5.17E-15	5.95E-15	6.70E-15	7.42E-15	8.13E-15
sc 49	6.45E-11	5.19E-11	3.67E-11	1.78E-11	4.16E-12	9.71E-13	2.27E-13	5.30E-14	1.24E-14	2.89E-15	6.75E-16
cr 51	3.11E-13	3.10E-13	3.10E-13	3.10E-13	3.09E-13	3.09E-13	3.08E-13	3.07E-13	3.07E-13	3.06E-13	3.05E-13
cr 55	7.79E-15	2.04E-17	5.32E-20	3.63E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 54	7.63E-13	7.63E-13	7.63E-13	7.63E-13	7.63E-13	7.63E-13	7.62E-13	7.62E-13	7.62E-13	7.62E-13	7.62E-13
mn 56	1.90E-10	1.66E-10	1.45E-10	1.11E-10	6.47E-11	3.78E-11	2.21E-11	1.29E-11	7.53E-12	4.40E-12	2.57E-12
mn 57	2.32E-12	1.42E-18	8.66E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
fe 55	3.18E-13	3.18E-13	3.18E-13	3.18E-13	3.18E-13	3.18E-13	3.18E-13	3.18E-13	3.18E-13	3.18E-13	3.18E-13
fe 59	2.37E-13	2.37E-13	2.37E-13	2.37E-13	2.37E-13	2.37E-13	2.36E-13	2.36E-13	2.36E-13	2.35E-13	2.35E-13
total	1.01E-07	2.19E-08	2.10E-08	2.02E-08	1.90E-08	1.80E-08	1.73E-08	1.66E-08	1.61E-08	1.56E-08	1.52E-08

Table F33. Radioactivity (Ci) After Ten-Day Irradiation of 1-kg Concrete (Flux Parameter Set 3).

	Time After Discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
hr 3	1.66E-17	1.66E-17	1.66E-17	1.66E-17	1.66E-17	1.66E-17	1.66E-17	1.66E-17	1.66E-17	1.66E-17	1.66E-17
be 10	1.02E-20	1.02E-20	1.02E-20	1.02E-20	1.02E-20	1.02E-20	1.02E-20	1.02E-20	1.02E-20	1.02E-20	1.02E-20
c 14	1.30E-16	1.30E-16	1.30E-16	1.30E-16	1.30E-16	1.30E-16	1.30E-16	1.30E-16	1.30E-16	1.30E-16	1.30E-16
na 24	1.15E-08	1.12E-08	1.10E-08	1.05E-08	9.53E-09	8.67E-09	7.89E-09	7.18E-09	6.53E-09	5.94E-09	5.40E-09
na 25	1.76E-11	1.42E-20	1.15E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mg 27	4.24E-09	4.71E-10	5.23E-11	6.45E-13	9.81E-17	1.49E-20	2.27E-24	3.45E-28	5.25E-32	0.00E+00	0.00E+00
al 28	6.11E-08	5.68E-12	5.28E-16	4.57E-24	8.76E-29	8.19E-29	7.67E-29	7.18E-29	6.72E-29	6.28E-29	5.88E-29
al 29	1.62E-09	6.84E-11	2.88E-12	5.12E-15	1.61E-20	5.09E-26	1.61E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00
si 31	1.88E-09	1.65E-09	1.45E-09	1.11E-09	6.54E-10	3.86E-10	2.27E-10	1.34E-10	7.89E-11	4.65E-11	2.74E-11
cl 36	1.20E-16	1.20E-16	1.20E-16	1.20E-16	1.20E-16	1.20E-16	1.20E-16	1.20E-16	1.20E-16	1.20E-16	1.20E-16
ar 37	4.65E-10	4.65E-10	4.65E-10	4.65E-10	4.64E-10	4.63E-10	4.62E-10	4.62E-10	4.61E-10	4.60E-10	4.59E-10
ar 39	5.66E-13	5.66E-13	5.66E-13	5.66E-13	5.66E-13	5.66E-13	5.66E-13	5.66E-13	5.66E-13	5.66E-13	5.66E-13
ar 41	8.18E-13	6.77E-13	5.60E-13	3.83E-13	1.79E-13	8.40E-14	3.93E-14	1.84E-14	8.62E-15	4.04E-15	1.89E-15
k 40	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08
k 42	9.28E-10	9.03E-10	8.78E-10	8.30E-10	7.42E-10	6.63E-10	5.93E-10	5.30E-10	4.74E-10	4.23E-10	3.78E-10
k 43	2.17E-12	2.14E-12	2.11E-12	2.04E-12	1.92E-12	1.80E-12	1.70E-12	1.59E-12	1.50E-12	1.41E-12	1.32E-12
k 44	1.96E-12	7.68E-13	3.00E-13	4.58E-14	1.07E-15	2.49E-17	5.82E-19	1.36E-20	3.17E-22	7.39E-24	1.72E-25
ca 41	1.04E-15	1.04E-15	1.04E-15	1.04E-15	1.04E-15	1.04E-15	1.04E-15	1.04E-15	1.04E-15	1.04E-15	1.04E-15
ca 45	1.35E-11	1.35E-11	1.35E-11	1.35E-11	1.35E-11	1.35E-11	1.35E-11	1.35E-11	1.35E-11	1.35E-11	1.35E-11
ca 47	2.95E-13	2.94E-13	2.93E-13	2.91E-13	2.88E-13	2.84E-13	2.80E-13	2.77E-13	2.73E-13	2.70E-13	2.67E-13
ca 49	6.48E-11	5.96E-12	5.48E-13	4.64E-15	3.32E-19	2.38E-23	1.70E-27	1.22E-31	0.00E+00	0.00E+00	0.00E+00
sc 47	1.83E-13	1.83E-13	1.83E-13	1.84E-13	1.86E-13	1.88E-13	1.90E-13	1.91E-13	1.92E-13	1.94E-13	1.95E-13
sc 49	6.45E-11	5.19E-11	3.67E-11	1.78E-11	4.16E-12	9.71E-13	2.27E-13	5.30E-14	1.24E-14	2.89E-15	6.75E-16
cr 51	2.78E-12	2.78E-12	2.78E-12	2.78E-12	2.77E-12	2.77E-12	2.76E-12	2.75E-12	2.75E-12	2.74E-12	2.74E-12
cr 55	7.79E-15	2.04E-17	5.32E-20	3.63E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
mn 54	7.55E-12	7.55E-12	7.55E-12	7.55E-12	7.55E-12	7.55E-12	7.55E-12	7.55E-12	7.55E-12	7.54E-12	7.54E-12
mn 56	1.90E-10	1.66E-10	1.45E-10	1.11E-10	6.48E-11	3.79E-11	2.21E-11	1.29E-11	7.55E-12	4.41E-12	2.57E-12
mn 57	2.32E-12	1.42E-18	8.66E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
fe 55	3.17E-12	3.17E-12	3.17E-12	3.17E-12	3.17E-12	3.17E-12	3.17E-12	3.17E-12	3.17E-12	3.17E-12	3.17E-12
fe 59	2.22E-12	2.21E-12	2.21E-12	2.21E-12	2.21E-12	2.21E-12	2.20E-12	2.20E-12	2.20E-12	2.20E-12	2.19E-12
total	1.06E-07	2.62E-08	2.52E-08	2.42E-08	2.27E-08	2.14E-08	2.04E-08	1.95E-08	1.87E-08	1.81E-08	1.75E-08

APPENDIX G

Tables of ORIGEN-Calculated Decay Photon Spectra for Selected Cargoes and Structures Irradiated in the PFNA Facility



APPENDIX G

Tables of ORIGEN-Calculated Decay Photon Spectra for Selected Cargoes and Structures Irradiated in the PFNA Facility

Table G1. Decay Photon Spectrum (/kg.s) After 8-s Irradiation of 1-kg Salted Beef Cargo (Flux Parameter Set 1).

e _{mean} (mev)	time after discharge										
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
3.00E-01	6.74E+01	6.74E+01	6.00E+01	2.48E+01	1.15E+01	6.42E+00	2.63E+00	1.40E+00	8.55E-01	8.13E-01	8.06E-01
6.50E-01	5.89E+01	5.89E+01	5.29E+01	2.46E+01	1.34E+01	8.61E+00	3.95E+00	1.44E+00	2.94E-01	2.31E-01	2.17E-01
1.12E+00	1.57E+01	1.57E+01	1.39E+01	5.47E+00	2.34E+00	1.15E+00	3.28E-01	1.13E-01	2.23E-02	1.25E-02	7.28E-03
1.58E+00	1.63E+01	1.63E+01	1.54E+01	1.12E+01	9.53E+00	8.82E+00	8.10E+00	7.53E+00	6.77E+00	6.42E+00	6.32E+00
2.00E+00	3.71E+00	3.71E+00	3.28E+00	1.27E+00	5.21E-01	2.40E-01	5.42E-02	1.52E-02	7.91E-04	1.20E-04	3.41E-05
2.40E+00	2.49E+00	2.49E+00	2.19E+00	8.28E-01	3.25E-01	1.39E-01	2.32E-02	5.95E-03	4.74E-04	1.57E-04	5.29E-05
2.80E+00	3.25E+00	3.25E+00	2.91E+00	1.17E+00	4.60E-01	1.95E-01	3.64E-02	2.07E-02	1.72E-02	1.71E-02	1.69E-02
3.25E+00	9.95E-01	9.95E-01	8.78E-01	3.26E-01	1.22E-01	4.78E-02	4.21E-03	5.95E-04	2.07E-05	8.09E-08	2.02E-09
3.75E+00	1.10E+00	1.10E+00	9.70E-01	3.60E-01	1.33E-01	5.06E-02	3.12E-03	1.54E-04	1.59E-05	1.11E-05	1.10E-05
4.25E+00	3.90E-01	3.90E-01	3.44E-01	1.28E-01	4.73E-02	1.79E-02	9.93E-04	1.27E-05	4.88E-07	1.47E-07	1.44E-07
4.75E+00	3.35E-01	3.35E-01	2.96E-01	1.11E-01	4.10E-02	1.55E-02	8.36E-04	2.45E-06	6.16E-14	0.00E+00	0.00E+00
5.50E+00	5.64E-01	5.64E-01	4.99E-01	1.88E-01	6.97E-02	2.63E-02	1.42E-03	4.16E-06	1.05E-13	0.00E+00	0.00E+00
total	1.71E+02	1.71E+02	1.54E+02	7.05E+01	3.85E+01	2.57E+01	1.51E+01	1.05E+01	7.96E+00	7.49E+00	7.37E+00
mev/sec	1.38E+02	1.38E+02	1.24E+02	5.96E+01	3.46E+01	2.47E+01	1.68E+01	1.34E+01	1.12E+01	1.06E+01	1.04E+01

Table G2. Decay Photon Spectrum (/kg.s) After 16-s Irradiation of 1-kg Salted Beef Cargo (Flux Parameter Set 1).

e _{mean} (mev)	time after discharge										
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
3.00E-01	9.62E+01	9.62E+01	8.62E+01	3.73E+01	1.79E+01	1.02E+01	4.16E+00	1.93E+00	9.10E-01	8.29E-01	8.15E-01
6.50E-01	8.72E+01	8.72E+01	7.92E+01	3.94E+01	2.25E+01	1.50E+01	7.14E+00	2.52E+00	3.76E-01	2.57E-01	2.29E-01
1.12E+00	2.23E+01	2.23E+01	1.99E+01	8.20E+00	3.64E+00	1.88E+00	5.97E-01	2.11E-01	4.06E-02	2.16E-02	1.12E-02
1.58E+00	2.17E+01	2.17E+01	2.06E+01	1.46E+01	1.22E+01	1.10E+01	9.80E+00	8.70E+00	7.22E+00	6.52E+00	6.34E+00
2.00E+00	5.25E+00	5.25E+00	4.68E+00	1.89E+00	7.98E-01	3.81E-01	9.74E-02	2.84E-02	1.50E-03	2.38E-04	6.76E-05
2.40E+00	3.50E+00	3.50E+00	3.11E+00	1.22E+00	4.88E-01	2.15E-01	4.09E-02	1.11E-02	9.17E-04	3.11E-04	1.05E-04
2.80E+00	4.67E+00	4.67E+00	4.20E+00	1.72E+00	6.89E-01	3.01E-01	6.66E-02	4.08E-02	3.45E-02	3.41E-02	3.38E-02
3.25E+00	1.40E+00	1.40E+00	1.24E+00	4.74E-01	1.80E-01	7.10E-02	6.87E-03	1.11E-03	3.85E-05	1.51E-07	4.04E-09
3.75E+00	1.54E+00	1.54E+00	1.37E+00	5.22E-01	1.95E-01	7.42E-02	4.73E-03	2.85E-04	3.11E-05	2.22E-05	2.20E-05
4.25E+00	5.47E-01	5.47E-01	4.86E-01	1.86E-01	6.90E-02	2.61E-02	1.46E-03	2.26E-05	9.29E-07	2.93E-07	2.89E-07
4.75E+00	4.71E-01	4.71E-01	4.19E-01	1.61E-01	5.98E-02	2.26E-02	1.22E-03	3.57E-06	8.98E-14	0.00E+00	0.00E+00
5.50E+00	7.95E-01	7.95E-01	7.08E-01	2.73E-01	1.02E-01	3.84E-02	2.08E-03	6.08E-06	1.53E-13	0.00E+00	0.00E+00
total	2.46E+02	2.46E+02	2.22E+02	1.06E+02	5.88E+01	3.92E+01	2.19E+01	1.34E+01	8.59E+00	7.67E+00	7.43E+00
mev/sec	1.96E+02	1.96E+02	1.78E+02	8.71E+01	5.04E+01	3.54E+01	2.25E+01	1.64E+01	1.20E+01	1.08E+01	1.05E+01

Table G3. Decay Photon Spectrum (/kg.s) After 24-s Irradiation of 1-kg Salted Beef Cargo (Flux Parameter Set 1).

e _{mean} (mev)	time after discharge										
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
3.00E-01	1.11E+02	1.11E+02	9.97E+01	4.44E+01	2.20E+01	1.29E+01	5.46E+00	2.39E+00	9.61E-01	8.44E-01	8.24E-01
6.50E-01	1.04E+02	1.04E+02	9.48E+01	4.93E+01	2.93E+01	2.01E+01	9.88E+00	3.45E+00	4.53E-01	2.83E-01	2.41E-01
1.12E+00	2.55E+01	2.55E+01	2.28E+01	9.70E+00	4.45E+00	2.38E+00	8.25E-01	2.98E-01	5.82E-02	3.06E-02	1.51E-02
1.58E+00	2.55E+01	2.55E+01	2.41E+01	1.74E+01	1.44E+01	1.31E+01	1.14E+01	9.82E+00	7.66E+00	6.63E+00	6.36E+00
2.00E+00	5.99E+00	5.99E+00	5.36E+00	2.21E+00	9.58E-01	4.74E-01	1.33E-01	3.98E-02	2.15E-03	3.53E-04	1.01E-04
2.40E+00	3.96E+00	3.96E+00	3.53E+00	1.41E+00	5.76E-01	2.60E-01	5.51E-02	1.56E-02	1.33E-03	4.63E-04	1.56E-04
2.80E+00	5.33E+00	5.33E+00	4.80E+00	1.99E+00	8.12E-01	3.65E-01	9.35E-02	6.06E-02	5.17E-02	5.12E-02	5.08E-02
3.25E+00	1.58E+00	1.58E+00	1.40E+00	5.44E-01	2.08E-01	8.28E-02	8.71E-03	1.54E-03	5.38E-05	2.12E-07	6.06E-09
3.75E+00	1.74E+00	1.74E+00	1.55E+00	5.97E-01	2.23E-01	8.53E-02	5.61E-03	3.98E-04	4.58E-05	3.34E-05	3.30E-05
4.25E+00	6.18E-01	6.18E-01	5.50E-01	2.12E-01	7.90E-02	2.99E-02	1.69E-03	3.05E-05	1.33E-06	4.40E-07	4.33E-07
4.75E+00	5.32E-01	5.32E-01	4.74E-01	1.84E-01	6.84E-02	2.58E-02	1.40E-03	4.09E-06	1.03E-13	0.00E+00	0.00E+00
5.50E+00	8.98E-01	8.98E-01	8.01E-01	3.12E-01	1.16E-01	4.39E-02	2.38E-03	6.96E-06	1.75E-13	0.00E+00	0.00E+00
total	2.86E+02	2.86E+02	2.60E+02	1.28E+02	7.32E+01	4.99E+01	2.79E+01	1.61E+01	9.18E+00	7.84E+00	7.49E+00
mev/sec	2.28E+02	2.28E+02	2.07E+02	1.05E+02	6.18E+01	4.39E+01	2.77E+01	1.90E+01	1.29E+01	1.11E+01	1.06E+01

Table G4. Decay Photon Spectrum (/kg.s) After 8-s Irradiation of 1-kg Ball Bearings Cargo (Flux Parameter Set 1).

emean (mev)	time after discharge										
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
3.00E-01	1.20E+00	1.20E+00	1.19E+00	1.14E+00	1.08E+00	1.03E+00	8.98E-01	6.93E-01	3.78E-01	2.22E-01	1.66E-01
6.50E-01	6.09E+00	6.09E+00	6.09E+00	6.04E+00	5.99E+00	5.94E+00	5.82E+00	5.62E+00	5.29E+00	5.03E+00	4.73E+00
1.12E+00	4.36E-01	4.36E-01	4.34E-01	4.14E-01	3.96E-01	3.79E-01	3.34E-01	2.66E-01	1.57E-01	8.99E-02	4.53E-02
1.58E+00	9.79E+00	9.79E+00	9.74E+00	9.37E+00	8.96E+00	8.58E+00	7.54E+00	5.85E+00	2.92E+00	1.23E+00	6.25E-01
2.00E+00	1.08E+00	1.08E+00	1.08E+00	1.07E+00	1.07E+00	1.07E+00	1.07E+00	1.06E+00	1.05E+00	1.02E+00	9.77E-01
2.40E+00	5.81E-02	5.81E-02	5.76E-02	5.50E-02	5.39E-02	5.31E-02	5.10E-02	4.80E-02	4.34E-02	4.06E-02	3.79E-02
2.80E+00	3.84E-02	3.84E-02	3.84E-02	3.82E-02	3.80E-02	3.80E-02	3.77E-02	3.74E-02	3.68E-02	3.60E-02	3.44E-02
3.25E+00	8.39E-03	8.39E-03	8.26E-03	7.72E-03	7.56E-03	7.48E-03	7.32E-03	7.07E-03	6.72E-03	6.49E-03	6.20E-03
3.75E+00	7.16E-04	7.16E-04	6.09E-04	1.89E-04	1.02E-04	8.17E-05	5.99E-05	3.49E-05	7.43E-06	9.34E-07	3.67E-07
4.25E+00	1.93E-04	1.93E-04	1.90E-04	1.72E-04	1.57E-04	1.45E-04	1.15E-04	7.23E-05	1.81E-05	1.80E-06	2.24E-08
4.75E+00	9.75E-05	9.75E-05	8.20E-05	2.05E-05	7.85E-06	5.18E-06	3.32E-06	1.74E-06	2.58E-07	1.07E-08	1.85E-11
5.50E+00	1.47E-05	1.47E-05	1.30E-05	4.86E-06	1.80E-06	6.78E-07	3.76E-08	7.59E-10	1.63E-10	1.62E-11	1.59E-13
total	1.87E+01	1.87E+01	1.86E+01	1.81E+01	1.76E+01	1.71E+01	1.58E+01	1.36E+01	9.88E+00	7.68E+00	6.62E+00
mev/sec	2.27E+01	2.27E+01	2.26E+01	2.19E+01	2.12E+01	2.05E+01	1.87E+01	1.57E+01	1.07E+01	7.64E+00	6.32E+00

Table G5. Decay Photon Spectrum (/kg.s) After 16-s Irradiation of 1-kg Ball Bearings Cargo (Flux Parameter Set 1).

emean (mev)	time after discharge										
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
3.00E-01	2.35E+00	2.35E+00	2.33E+00	2.23E+00	2.13E+00	2.03E+00	1.76E+00	1.36E+00	7.47E-01	4.42E-01	3.32E-01
6.50E-01	1.21E+01	1.21E+01	1.21E+01	1.20E+01	1.19E+01	1.18E+01	1.16E+01	1.12E+01	1.06E+01	1.01E+01	9.46E+00
1.12E+00	8.54E-01	8.54E-01	8.50E-01	8.14E-01	7.78E-01	7.45E-01	6.57E-01	5.24E-01	3.11E-01	1.79E-01	9.03E-02
1.58E+00	1.92E+01	1.92E+01	1.92E+01	1.84E+01	1.76E+01	1.69E+01	1.48E+01	1.15E+01	5.76E+00	2.44E+00	1.25E+00
2.00E+00	2.15E+00	2.15E+00	2.15E+00	2.15E+00	2.15E+00	2.14E+00	2.14E+00	2.13E+00	2.09E+00	2.04E+00	1.95E+00
2.40E+00	1.14E-01	1.14E-01	1.13E-01	1.09E-01	1.07E-01	1.06E-01	1.02E-01	9.57E-02	8.68E-02	8.12E-02	7.58E-02
2.80E+00	7.66E-02	7.66E-02	7.65E-02	7.62E-02	7.60E-02	7.58E-02	7.54E-02	7.48E-02	7.36E-02	7.19E-02	6.88E-02
3.25E+00	1.62E-02	1.62E-02	1.60E-02	1.53E-02	1.51E-02	1.49E-02	1.46E-02	1.41E-02	1.34E-02	1.30E-02	1.24E-02
3.75E+00	9.49E-04	9.49E-04	8.18E-04	2.99E-04	1.86E-04	1.56E-04	1.16E-04	6.74E-05	1.44E-05	1.83E-06	7.33E-07
4.25E+00	3.68E-04	3.68E-04	3.64E-04	3.32E-04	3.05E-04	2.81E-04	2.23E-04	1.40E-04	3.51E-05	3.49E-06	4.37E-08
4.75E+00	1.24E-04	1.24E-04	1.05E-04	2.95E-05	1.33E-05	9.58E-06	6.35E-06	3.34E-06	4.95E-07	2.05E-08	3.54E-11
5.50E+00	2.07E-05	2.07E-05	1.84E-05	7.05E-06	2.62E-06	9.90E-07	5.54E-08	1.42E-09	3.16E-10	3.14E-11	3.09E-13
total	3.69E+01	3.69E+01	3.68E+01	3.58E+01	3.48E+01	3.38E+01	3.12E+01	2.69E+01	1.97E+01	1.53E+01	1.32E+01
mev/sec	4.47E+01	4.47E+01	4.45E+01	4.32E+01	4.18E+01	4.05E+01	3.69E+01	3.12E+01	2.12E+01	1.52E+01	1.26E+01

Table G6. Decay Photon Spectrum (/kg.s) After 24-s Irradiation of 1-kg Ball Bearings Cargo (Flux Parameter Set 1).

emEAN (meV)	time after discharge										
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
3.00E-01	3.45E+00	3.45E+00	3.43E+00	3.28E+00	3.13E+00	2.98E+00	2.60E+00	2.01E+00	1.11E+00	6.61E-01	4.98E-01
6.50E-01	1.81E+01	1.81E+01	1.81E+01	1.80E+01	1.79E+01	1.77E+01	1.74E+01	1.68E+01	1.58E+01	1.51E+01	1.42E+01
1.12E+00	1.26E+00	1.26E+00	1.25E+00	1.20E+00	1.15E+00	1.10E+00	9.70E-01	7.75E-01	4.62E-01	2.67E-01	1.35E-01
1.58E+00	2.84E+01	2.84E+01	2.82E+01	2.71E+01	2.60E+01	2.49E+01	2.19E+01	1.70E+01	8.52E+00	3.62E+00	1.87E+00
2.00E+00	3.23E+00	3.23E+00	3.23E+00	3.22E+00	3.22E+00	3.22E+00	3.21E+00	3.19E+00	3.14E+00	3.07E+00	2.93E+00
2.40E+00	1.68E-01	1.68E-01	1.67E-01	1.62E-01	1.60E-01	1.57E-01	1.52E-01	1.43E-01	1.30E-01	1.22E-01	1.14E-01
2.80E+00	1.15E-01	1.15E-01	1.15E-01	1.14E-01	1.14E-01	1.14E-01	1.13E-01	1.12E-01	1.10E-01	1.08E-01	1.03E-01
3.25E+00	2.38E-02	2.38E-02	2.36E-02	2.28E-02	2.25E-02	2.23E-02	2.18E-02	2.11E-02	2.01E-02	1.95E-02	1.86E-02
3.75E+00	1.07E-03	1.07E-03	9.33E-04	3.86E-04	2.62E-04	2.24E-04	1.67E-04	9.77E-05	2.09E-05	2.70E-06	1.10E-06
4.25E+00	5.31E-04	5.31E-04	5.25E-04	4.82E-04	4.43E-04	4.09E-04	3.24E-04	2.04E-04	5.10E-05	5.08E-06	6.40E-08
4.75E+00	1.35E-04	1.35E-04	1.15E-04	3.54E-05	1.79E-05	1.35E-05	9.14E-06	4.81E-06	7.12E-07	2.95E-08	5.10E-11
5.50E+00	2.33E-05	2.33E-05	2.08E-05	8.05E-06	3.00E-06	1.13E-06	6.40E-08	2.02E-09	4.61E-10	4.57E-11	4.50E-13
total	5.47E+01	5.47E+01	5.46E+01	5.31E+01	5.16E+01	5.02E+01	4.63E+01	4.01E+01	2.93E+01	2.29E+01	1.99E+01
meV/sec	6.62E+01	6.62E+01	6.59E+01	6.40E+01	6.20E+01	6.00E+01	5.47E+01	4.63E+01	3.15E+01	2.28E+01	1.89E+01

Table G7. Decay Photon Spectrum (/kg.s) After 8-s Irradiation of 1-kg Surgical Implant Composition A Cargo (Flux Parameter Set 1).

emEAN (meV)	time after discharge										
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
3.00E-01	4.87E+00	4.87E+00	4.79E+00	4.53E+00	4.35E+00	4.19E+00	3.73E+00	2.98E+00	1.57E+00	6.16E-01	1.70E-01
6.50E-01	4.91E+00	4.91E+00	4.83E+00	4.61E+00	4.49E+00	4.38E+00	4.08E+00	3.56E+00	2.52E+00	1.66E+00	1.00E+00
1.12E+00	4.85E+00	4.85E+00	4.82E+00	4.65E+00	4.50E+00	4.37E+00	4.01E+00	3.43E+00	2.35E+00	1.49E+00	7.09E-01
1.58E+00	6.72E+01	6.72E+01	6.70E+01	6.46E+01	6.21E+01	5.98E+01	5.32E+01	4.22E+01	2.16E+01	7.54E+00	1.11E+00
2.00E+00	1.83E-01	1.83E-01	1.78E-01	1.71E-01	1.70E-01	1.69E-01	1.66E-01	1.62E-01	1.51E-01	1.39E-01	1.25E-01
2.40E+00	4.30E-02	4.30E-02	3.72E-02	2.62E-02	2.44E-02	2.37E-02	2.22E-02	1.99E-02	1.50E-02	1.04E-02	6.44E-03
2.80E+00	1.33E-02	1.33E-02	1.05E-02	7.87E-03	7.77E-03	7.75E-03	7.73E-03	7.70E-03	7.63E-03	7.52E-03	7.31E-03
3.25E+00	7.14E-03	7.14E-03	4.80E-03	1.42E-03	1.05E-03	9.86E-04	9.38E-04	8.80E-04	8.00E-04	7.62E-04	7.27E-04
3.75E+00	6.38E-03	6.38E-03	3.72E-03	3.60E-04	6.34E-05	1.98E-05	1.04E-05	7.34E-06	3.47E-06	2.31E-06	2.17E-06
4.25E+00	1.53E-03	1.53E-03	6.98E-04	4.55E-05	4.10E-05	3.79E-05	3.01E-05	1.90E-05	4.76E-06	4.98E-07	3.31E-08
4.75E+00	1.75E-03	1.75E-03	8.91E-04	4.86E-05	7.07E-06	1.06E-06	2.92E-08	1.38E-08	2.06E-09	8.81E-11	1.91E-13
5.50E+00	2.65E-03	2.65E-03	1.16E-03	8.04E-07	1.45E-08	2.21E-09	2.86E-10	1.71E-10	4.27E-11	4.24E-12	4.17E-14
total	8.21E+01	8.21E+01	8.16E+01	7.86E+01	7.57E+01	7.29E+01	6.52E+01	5.24E+01	2.82E+01	1.15E+01	3.13E+00
meV/sec	1.17E+02	1.17E+02	1.16E+02	1.12E+02	1.08E+02	1.04E+02	9.25E+01	7.40E+01	3.92E+01	1.51E+01	3.54E+00

Table G8. Decay Photon Spectrum (/kg.s) After 16-s Irradiation of 1-kg Surgical Implant Composition A Cargo (Flux Parameter Set 1).

emEAN (meV)	time after discharge											
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec	
3.00E-01	9.44E+00	9.44E+00	9.34E+00	8.92E+00	8.57E+00	8.25E+00	7.35E+00	5.87E+00	3.10E+00	1.22E+00	3.39E-01	
6.50E-01	9.55E+00	9.55E+00	9.46E+00	9.13E+00	8.89E+00	8.68E+00	8.08E+00	7.07E+00	5.01E+00	3.31E+00	2.00E+00	
1.12E+00	9.53E+00	9.53E+00	9.48E+00	9.18E+00	8.90E+00	8.64E+00	7.93E+00	6.79E+00	4.67E+00	2.96E+00	1.41E+00	
1.58E+00	1.32E+02	1.32E+02	1.32E+02	1.27E+02	1.22E+02	1.18E+02	1.05E+02	8.32E+01	4.26E+01	1.49E+01	2.20E+00	
2.00E+00	3.55E-01	3.55E-01	3.49E-01	3.41E-01	3.39E-01	3.37E-01	3.32E-01	3.23E-01	3.02E-01	2.78E-01	2.50E-01	
2.40E+00	7.01E-02	7.01E-02	6.38E-02	5.08E-02	4.82E-02	4.70E-02	4.41E-02	3.94E-02	2.98E-02	2.08E-02	1.28E-02	
2.80E+00	2.12E-02	2.12E-02	1.84E-02	1.56E-02	1.55E-02	1.55E-02	1.55E-02	1.54E-02	1.53E-02	1.50E-02	1.46E-02	
3.25E+00	8.76E-03	8.76E-03	6.31E-03	2.50E-03	2.04E-03	1.95E-03	1.87E-03	1.75E-03	1.60E-03	1.52E-03	1.45E-03	
3.75E+00	6.91E-03	6.91E-03	4.16E-03	4.47E-04	8.68E-05	3.33E-05	2.03E-05	1.44E-05	6.86E-06	4.62E-06	4.34E-06	
4.25E+00	1.58E-03	1.58E-03	7.45E-04	8.72E-05	7.95E-05	7.35E-05	5.84E-05	3.68E-05	9.24E-06	9.68E-07	6.59E-08	
4.75E+00	1.82E-03	1.82E-03	9.51E-04	5.90E-05	8.61E-06	1.31E-06	5.37E-08	2.64E-08	3.95E-09	1.69E-10	3.67E-13	
5.50E+00	2.66E-03	2.66E-03	1.16E-03	8.26E-07	1.76E-08	2.96E-09	5.47E-10	3.32E-10	8.29E-11	8.22E-12	8.09E-14	
total	1.61E+02	1.61E+02	1.61E+02	1.55E+02	1.49E+02	1.44E+02	1.29E+02	1.03E+02	5.57E+01	2.27E+01	6.23E+00	
meV/sec	2.29E+02	2.29E+02	2.28E+02	2.20E+02	2.12E+02	2.04E+02	1.82E+02	1.46E+02	7.73E+01	2.99E+01	7.03E+00	

Table G9. Decay Photon Spectrum (/kg.s) After 24-s Irradiation of 1-kg Surgical Implant Composition A Cargo (Flux Parameter Set 1).

emEAN (meV)	time after discharge											
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec	
3.00E-01	1.39E+01	1.39E+01	1.37E+01	1.32E+01	1.27E+01	1.22E+01	1.09E+01	8.68E+00	4.59E+00	1.81E+00	5.05E-01	
6.50E-01	1.41E+01	1.41E+01	1.40E+01	1.35E+01	1.32E+01	1.29E+01	1.20E+01	1.05E+01	7.47E+00	4.94E+00	2.99E+00	
1.12E+00	1.41E+01	1.41E+01	1.40E+01	1.36E+01	1.32E+01	1.28E+01	1.18E+01	1.01E+01	6.96E+00	4.41E+00	2.11E+00	
1.58E+00	1.96E+02	1.96E+02	1.95E+02	1.88E+02	1.81E+02	1.74E+02	1.55E+02	1.23E+02	6.30E+01	2.20E+01	3.26E+00	
2.00E+00	5.25E-01	5.25E-01	5.19E-01	5.11E-01	5.08E-01	5.05E-01	4.97E-01	4.83E-01	4.52E-01	4.17E-01	3.75E-01	
2.40E+00	9.49E-02	9.49E-02	8.85E-02	7.48E-02	7.16E-02	6.98E-02	6.57E-02	5.88E-02	4.44E-02	3.11E-02	1.92E-02	
2.80E+00	2.90E-02	2.90E-02	2.62E-02	2.34E-02	2.33E-02	2.32E-02	2.32E-02	2.31E-02	2.29E-02	2.25E-02	2.19E-02	
3.25E+00	9.89E-03	9.89E-03	7.41E-03	3.50E-03	3.02E-03	2.91E-03	2.79E-03	2.62E-03	2.40E-03	2.29E-03	2.18E-03	
3.75E+00	7.03E-03	7.03E-03	4.26E-03	4.76E-04	1.01E-04	4.50E-05	2.98E-05	2.11E-05	1.02E-05	6.92E-06	6.52E-06	
4.25E+00	1.62E-03	1.62E-03	7.87E-04	1.26E-04	1.16E-04	1.07E-04	8.49E-05	5.35E-05	1.35E-05	1.41E-06	9.84E-08	
4.75E+00	1.83E-03	1.83E-03	9.63E-04	6.13E-05	8.97E-06	1.39E-06	7.58E-08	3.81E-08	5.69E-09	2.44E-10	5.30E-13	
5.50E+00	2.66E-03	2.66E-03	1.16E-03	8.31E-07	1.85E-08	3.38E-09	7.90E-10	4.83E-10	1.21E-10	1.20E-11	1.18E-13	
total	2.38E+02	2.38E+02	2.37E+02	2.29E+02	2.20E+02	2.12E+02	1.90E+02	1.53E+02	8.25E+01	3.36E+01	9.28E+00	
meV/sec	3.39E+02	3.39E+02	3.37E+02	3.25E+02	3.13E+02	3.02E+02	2.69E+02	2.16E+02	1.14E+02	4.44E+01	1.05E+01	

Table G10. Decay Photon Spectrum (/kg.s) After 8-s Irradiation of 1-kg Surgical Implant Composition B Cargo (Flux Parameter Set 1).

e _{mean} (mev)	time after discharge										
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
3.00E-01	2.49E+00	2.49E+00	2.47E+00	2.36E+00	2.29E+00	2.22E+00	2.02E+00	1.68E+00	9.77E-01	4.18E-01	1.08E-01
6.50E-01	1.51E+00	1.51E+00	1.49E+00	1.40E+00	1.35E+00	1.31E+00	1.20E+00	1.01E+00	6.14E-01	2.88E-01	8.79E-02
1.12E+00	4.06E+00	4.06E+00	4.04E+00	3.92E+00	3.80E+00	3.70E+00	3.40E+00	2.93E+00	2.06E+00	1.34E+00	6.63E-01
1.58E+00	3.52E+01	3.52E+01	3.51E+01	3.41E+01	3.31E+01	3.21E+01	2.92E+01	2.43E+01	1.40E+01	5.55E+00	8.81E-01
2.00E+00	2.59E-02	2.59E-02	2.55E-02	2.40E-02	2.35E-02	2.32E-02	2.24E-02	2.10E-02	1.72E-02	1.27E-02	7.32E-03
2.40E+00	1.20E-03	1.20E-03	1.03E-03	4.88E-04	4.18E-04	4.05E-04	3.82E-04	3.42E-04	2.54E-04	1.67E-04	8.84E-05
2.80E+00	3.08E-04	3.08E-04	2.42E-04	2.73E-05	2.42E-06	2.14E-07	1.49E-10	5.39E-14	4.67E-14	3.68E-14	2.29E-14
3.25E+00	1.07E-04	1.07E-04	8.41E-05	9.50E-06	8.42E-07	7.46E-08	5.19E-11	2.51E-17	3.18E-26	8.22E-27	4.46E-27
3.75E+00	3.48E-05	3.48E-05	2.73E-05	3.08E-06	2.73E-07	2.42E-08	1.68E-11	8.14E-18	2.93E-27	5.66E-28	1.65E-28
4.25E+00	4.65E-06	4.65E-06	3.65E-06	4.12E-07	3.65E-08	3.23E-09	2.25E-12	1.09E-18	1.27E-28	4.86E-29	2.77E-29
4.75E+00	2.50E-10	2.50E-10	1.96E-10	2.21E-11	1.96E-12	1.74E-13	1.21E-16	5.85E-23	4.44E-31	3.45E-31	2.47E-31
5.50E+00	2.16E-10	2.16E-10	1.69E-10	1.91E-11	1.69E-12	1.50E-13	1.04E-16	5.05E-23	3.84E-31	2.98E-31	2.13E-31
total	4.33E+01	4.33E+01	4.31E+01	4.18E+01	4.05E+01	3.93E+01	3.59E+01	2.99E+01	1.76E+01	7.61E+00	1.75E+00
mev/sec	6.18E+01	6.18E+01	6.16E+01	5.98E+01	5.80E+01	5.62E+01	5.13E+01	4.28E+01	2.50E+01	1.06E+01	2.24E+00

Table G11. Decay Photon Spectrum (/kg.s) After 16-s Irradiation of 1-kg Surgical Implant Composition B Cargo (Flux Parameter Set 1).

e _{mean} (mev)	time after discharge										
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
3.00E-01	4.88E+00	4.88E+00	4.85E+00	4.67E+00	4.52E+00	4.38E+00	3.99E+00	3.32E+00	1.93E+00	8.26E-01	2.15E-01
6.50E-01	2.92E+00	2.92E+00	2.89E+00	2.75E+00	2.67E+00	2.59E+00	2.37E+00	2.00E+00	1.22E+00	5.71E-01	1.75E-01
1.12E+00	8.00E+00	8.00E+00	7.97E+00	7.75E+00	7.52E+00	7.31E+00	6.73E+00	5.81E+00	4.09E+00	2.66E+00	1.32E+00
1.58E+00	6.95E+01	6.95E+01	6.93E+01	6.74E+01	6.53E+01	6.34E+01	5.78E+01	4.80E+01	2.76E+01	1.10E+01	1.74E+00
2.00E+00	5.00E-02	5.00E-02	4.95E-02	4.76E-02	4.68E-02	4.63E-02	4.47E-02	4.17E-02	3.43E-02	2.54E-02	1.46E-02
2.40E+00	1.73E-03	1.73E-03	1.54E-03	9.11E-04	8.25E-04	8.03E-04	7.58E-04	6.80E-04	5.04E-04	3.32E-04	1.76E-04
2.80E+00	3.52E-04	3.52E-04	2.76E-04	3.12E-05	2.77E-06	2.45E-07	1.71E-10	1.07E-13	9.31E-14	7.34E-14	4.57E-14
3.25E+00	1.23E-04	1.23E-04	9.62E-05	1.09E-05	9.63E-07	8.53E-08	5.93E-11	2.87E-17	1.34E-25	4.25E-26	2.72E-26
3.75E+00	3.98E-05	3.98E-05	3.12E-05	3.52E-06	3.12E-07	2.77E-08	1.92E-11	9.31E-18	1.13E-26	2.17E-27	5.85E-28
4.25E+00	5.32E-06	5.32E-06	4.17E-06	4.71E-07	4.17E-08	3.70E-09	2.57E-12	1.24E-18	4.67E-28	1.78E-28	9.47E-29
4.75E+00	2.86E-10	2.86E-10	2.24E-10	2.53E-11	2.24E-12	1.99E-13	1.38E-16	6.69E-23	1.48E-30	1.23E-30	8.39E-31
5.50E+00	2.47E-10	2.47E-10	1.94E-10	2.19E-11	1.94E-12	1.72E-13	1.19E-16	5.77E-23	1.28E-30	1.07E-30	7.24E-31
total	8.54E+01	8.54E+01	8.51E+01	8.26E+01	8.01E+01	7.77E+01	7.09E+01	5.92E+01	3.49E+01	1.51E+01	3.47E+00
mev/sec	1.22E+02	1.22E+02	1.22E+02	1.18E+02	1.15E+02	1.11E+02	1.01E+02	8.46E+01	4.95E+01	2.09E+01	4.43E+00

Table G12. Decay Photon Spectrum (/kg.s) After 24-s Irradiation of 1-kg Surgical Implant Composition B Cargo (Flux Parameter Set 1).

emEAN (meV)	initial	time after discharge									
		1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
3.00E-01	7.19E+00	7.19E+00	7.16E+00	6.91E+00	6.69E+00	6.49E+00	5.91E+00	4.91E+00	2.86E+00	1.23E+00	3.20E-01
6.50E-01	4.29E+00	4.29E+00	4.25E+00	4.08E+00	3.95E+00	3.84E+00	3.52E+00	2.96E+00	1.80E+00	8.48E-01	2.60E-01
1.12E+00	1.19E+01	1.19E+01	1.18E+01	1.15E+01	1.12E+01	1.08E+01	1.00E+01	8.63E+00	6.09E+00	3.98E+00	1.97E+00
1.58E+00	1.03E+02	1.03E+02	1.03E+02	9.99E+01	9.68E+01	9.39E+01	8.56E+01	7.12E+01	4.09E+01	1.63E+01	2.58E+00
2.00E+00	7.37E-02	7.37E-02	7.31E-02	7.09E-02	6.99E-02	6.91E-02	6.67E-02	6.23E-02	5.13E-02	3.80E-02	2.18E-02
2.40E+00	2.16E-03	2.16E-03	1.96E-03	1.32E-03	1.22E-03	1.20E-03	1.13E-03	1.01E-03	7.52E-04	4.96E-04	2.63E-04
2.80E+00	3.59E-04	3.59E-04	2.81E-04	3.18E-05	2.82E-06	2.49E-07	1.74E-10	1.61E-13	1.39E-13	1.10E-13	6.83E-14
3.25E+00	1.25E-04	1.25E-04	9.80E-05	1.11E-05	9.80E-07	8.68E-08	6.04E-11	2.92E-17	3.20E-25	1.16E-25	8.16E-26
3.75E+00	4.05E-05	4.05E-05	3.18E-05	3.59E-06	3.18E-07	2.82E-08	1.96E-11	9.48E-18	2.50E-26	4.80E-27	1.30E-27
4.25E+00	5.41E-06	5.41E-06	4.25E-06	4.80E-07	4.25E-08	3.77E-09	2.62E-12	1.27E-18	1.03E-27	3.91E-28	2.11E-28
4.75E+00	2.91E-10	2.91E-10	2.28E-10	2.58E-11	2.28E-12	2.02E-13	1.41E-16	6.81E-23	3.26E-30	2.71E-30	1.87E-30
5.50E+00	2.51E-10	2.51E-10	1.97E-10	2.23E-11	1.97E-12	1.75E-13	1.22E-16	5.88E-23	2.81E-30	2.34E-30	1.62E-30
total	1.26E+02	1.26E+02	1.26E+02	1.22E+02	1.19E+02	1.15E+02	1.05E+02	8.77E+01	5.17E+01	2.23E+01	5.15E+00
meV/sec	1.81E+02	1.81E+02	1.80E+02	1.75E+02	1.70E+02	1.65E+02	1.50E+02	1.25E+02	7.34E+01	3.11E+01	6.59E+00

Table G13. Decay Photon Spectrum (/kg.s) After 8-s Irradiation of 1-kg 16-16-16 Fertilizer Cargo (Flux Parameter Set 1).

emEAN (meV)	initial	time after discharge									
		1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
3.00E-01	9.29E+01	9.29E+01	8.89E+01	7.02E+01	6.32E+01	6.05E+01	5.85E+01	5.73E+01	5.57E+01	5.49E+01	5.47E+01
6.50E-01	4.43E+01	4.43E+01	4.06E+01	2.57E+01	2.03E+01	1.82E+01	1.65E+01	1.56E+01	1.46E+01	1.42E+01	1.41E+01
1.12E+00	8.70E+00	8.70E+00	7.74E+00	3.29E+00	1.65E+00	1.04E+00	6.30E-01	5.04E-01	3.47E-01	2.70E-01	2.49E-01
1.58E+00	5.04E+02	5.04E+02	5.03E+02	4.98E+02	4.94E+02	4.90E+02	4.81E+02	4.68E+02	4.44E+02	4.33E+02	4.30E+02
2.00E+00	2.03E+00	2.03E+00	1.80E+00	7.30E-01	3.39E-01	1.95E-01	1.08E-01	9.49E-02	8.30E-02	7.29E-02	5.99E-02
2.40E+00	1.31E+00	1.31E+00	1.15E+00	4.25E-01	1.61E-01	6.45E-02	8.03E-03	2.92E-03	1.11E-03	4.64E-04	2.61E-04
2.80E+00	1.70E+00	1.70E+00	1.52E+00	6.02E-01	2.28E-01	8.85E-02	7.90E-03	2.53E-03	2.10E-03	2.06E-03	2.02E-03
3.25E+00	5.28E-01	5.28E-01	4.66E-01	1.71E-01	6.34E-02	2.41E-02	1.55E-03	1.36E-04	6.34E-05	5.56E-05	4.62E-05
3.75E+00	5.85E-01	5.85E-01	5.16E-01	1.91E-01	7.04E-02	2.66E-02	1.55E-03	9.50E-05	7.18E-05	6.51E-05	5.42E-05
4.25E+00	2.08E-01	2.08E-01	1.83E-01	6.79E-02	2.51E-02	9.45E-03	5.20E-04	8.40E-06	5.51E-06	4.99E-06	4.14E-06
4.75E+00	1.78E-01	1.78E-01	1.58E-01	5.88E-02	2.17E-02	8.19E-03	4.43E-04	1.38E-06	8.03E-08	7.32E-08	6.08E-08
5.50E+00	3.00E-01	3.00E-01	2.66E-01	9.98E-02	3.70E-02	1.39E-02	7.54E-04	2.28E-06	6.94E-08	6.32E-08	5.25E-08
total	6.57E+02	6.57E+02	6.47E+02	6.00E+02	5.80E+02	5.70E+02	5.57E+02	5.41E+02	5.15E+02	5.02E+02	4.99E+02
meV/sec	8.80E+02	8.80E+02	8.72E+02	8.32E+02	8.14E+02	8.05E+02	7.87E+02	7.65E+02	7.27E+02	7.08E+02	7.02E+02

Table G14. Decay Photon Spectrum (/kg.s) After 16-s Irradiation of 1-kg 16-16-16 Fertilizer Cargo (Flux Parameter Set 1).

emEAN (meV)	time after discharge										
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
3.00E-01	1.11E+02	1.11E+02	1.06E+02	8.01E+01	6.99E+01	6.58E+01	6.24E+01	6.03E+01	5.72E+01	5.56E+01	5.52E+01
6.50E-01	5.80E+01	5.80E+01	5.34E+01	3.28E+01	2.48E+01	2.16E+01	1.88E+01	1.72E+01	1.53E+01	1.45E+01	1.42E+01
1.12E+00	1.24E+01	1.24E+01	1.11E+01	4.92E+00	2.55E+00	1.64E+00	1.01E+00	7.71E-01	4.65E-01	3.15E-01	2.74E-01
1.58E+00	5.74E+02	5.74E+02	5.73E+02	5.63E+02	5.55E+02	5.49E+02	5.31E+02	5.04E+02	4.59E+02	4.36E+02	4.30E+02
2.00E+00	2.90E+00	2.90E+00	2.59E+00	1.12E+00	5.53E-01	3.43E-01	2.12E-01	1.89E-01	1.66E-01	1.46E-01	1.20E-01
2.40E+00	1.83E+00	1.83E+00	1.62E+00	6.20E-01	2.38E-01	9.72E-02	1.40E-02	5.66E-03	2.19E-03	9.22E-04	5.21E-04
2.80E+00	2.44E+00	2.44E+00	2.19E+00	8.78E-01	3.34E-01	1.31E-01	1.32E-02	4.99E-03	4.20E-03	4.11E-03	4.03E-03
3.25E+00	7.39E-01	7.39E-01	6.55E-01	2.48E-01	9.26E-02	3.54E-02	2.38E-03	2.60E-04	1.26E-04	1.11E-04	9.23E-05
3.75E+00	8.19E-01	8.19E-01	7.27E-01	2.76E-01	1.03E-01	3.89E-02	2.33E-03	1.85E-04	1.43E-04	1.30E-04	1.08E-04
4.25E+00	2.91E-01	2.91E-01	2.59E-01	9.84E-02	3.65E-02	1.38E-02	7.63E-04	1.58E-05	1.10E-05	9.97E-06	8.28E-06
4.75E+00	2.51E-01	2.51E-01	2.23E-01	8.53E-02	3.17E-02	1.20E-02	6.47E-04	2.06E-06	1.60E-07	1.46E-07	1.21E-07
5.50E+00	4.23E-01	4.23E-01	3.76E-01	1.45E-01	5.39E-02	2.03E-02	1.10E-03	3.37E-06	1.39E-07	1.26E-07	1.05E-07
total	7.65E+02	7.65E+02	7.52E+02	6.85E+02	6.54E+02	6.39E+02	6.14E+02	5.83E+02	5.32E+02	5.06E+02	5.00E+02
meV/sec	1.02E+03	1.02E+03	1.00E+03	9.48E+02	9.19E+02	9.02E+02	8.70E+02	8.25E+02	7.51E+02	7.13E+02	7.03E+02

Table G15. Decay Photon Spectrum (/kg.s) After 24-s Irradiation of 1-kg 16-16-16 Fertilizer Cargo (Flux Parameter Set 1).

emEAN (meV)	time after discharge										
	initial	1E-15 sec	1.0sec	10.0sec	20.0sec	30.0sec	60.0sec	120.0sec	300.0sec	600.0sec	1200.0sec
3.00E-01	1.22E+02	1.22E+02	1.16E+02	8.72E+01	7.54E+01	7.06E+01	6.62E+01	6.31E+01	5.86E+01	5.63E+01	5.56E+01
6.50E-01	6.60E+01	6.60E+01	6.08E+01	3.77E+01	2.84E+01	2.46E+01	2.11E+01	1.88E+01	1.60E+01	1.47E+01	1.44E+01
1.12E+00	1.43E+01	1.43E+01	1.28E+01	5.92E+00	3.19E+00	2.14E+00	1.37E+00	1.03E+00	5.79E-01	3.59E-01	2.98E-01
1.58E+00	6.40E+02	6.40E+02	6.38E+02	6.26E+02	6.15E+02	6.05E+02	5.79E+02	5.39E+02	4.73E+02	4.39E+02	4.30E+02
2.00E+00	3.35E+00	3.35E+00	3.01E+00	1.36E+00	7.09E-01	4.67E-01	3.14E-01	2.82E-01	2.48E-01	2.18E-01	1.79E-01
2.40E+00	2.06E+00	2.06E+00	1.84E+00	7.12E-01	2.76E-01	1.15E-01	1.89E-02	8.26E-03	3.24E-03	1.37E-03	7.80E-04
2.80E+00	2.77E+00	2.77E+00	2.49E+00	1.01E+00	3.85E-01	1.53E-01	1.72E-02	7.41E-03	6.29E-03	6.16E-03	6.05E-03
3.25E+00	8.33E-01	8.33E-01	7.40E-01	2.84E-01	1.06E-01	4.07E-02	2.87E-03	3.75E-04	1.89E-04	1.66E-04	1.38E-04
3.75E+00	9.24E-01	9.24E-01	8.22E-01	3.16E-01	1.18E-01	4.46E-02	2.74E-03	2.73E-04	2.15E-04	1.95E-04	1.62E-04
4.25E+00	3.28E-01	3.28E-01	2.92E-01	1.12E-01	4.18E-02	1.58E-02	8.79E-04	2.27E-05	1.65E-05	1.49E-05	1.24E-05
4.75E+00	2.83E-01	2.83E-01	2.52E-01	9.74E-02	3.63E-02	1.37E-02	7.41E-04	2.42E-06	2.40E-07	2.19E-07	1.82E-07
5.50E+00	4.78E-01	4.78E-01	4.26E-01	1.65E-01	6.17E-02	2.33E-02	1.26E-03	3.91E-06	2.08E-07	1.89E-07	1.57E-07
total	8.53E+02	8.53E+02	8.38E+02	7.60E+02	7.23E+02	7.03E+02	6.68E+02	6.23E+02	5.48E+02	5.10E+02	5.00E+02
meV/sec	1.13E+03	1.13E+03	1.12E+03	1.05E+03	1.02E+03	9.94E+02	9.48E+02	8.83E+02	7.74E+02	7.18E+02	7.04E+02

Table G16. Decay Photon Spectrum (/kg.s) After One-Day Irradiation of 1-kg Concrete (Flux Parameter Set 1).

hr	emean (mev)	time after discharge										
		initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0
	3.00E-01	1.75E+03	2.22E+01	1.50E+01	1.33E+01	1.19E+01	1.08E+01	1.00E+01	9.45E+00	8.97E+00	8.57E+00	8.23E+00
	6.50E-01	2.81E+03	2.86E+02	1.06E+02	6.64E+01	4.02E+01	2.50E+01	1.61E+01	1.08E+01	7.60E+00	5.70E+00	4.54E+00
	1.12E+00	1.35E+03	8.19E+01	7.88E+00	8.86E-01	5.73E-01	4.32E-01	3.44E-01	2.87E-01	2.46E-01	2.16E-01	1.92E-01
	1.58E+00	2.31E+04	2.08E+02	2.01E+02	1.92E+02	1.76E+02	1.62E+02	1.50E+02	1.40E+02	1.31E+02	1.22E+02	1.15E+02
	2.00E+00	5.83E+01	2.04E+01	1.70E+01	1.30E+01	7.58E+00	4.44E+00	2.60E+00	1.53E+00	9.01E-01	5.33E-01	3.17E-01
	2.40E+00	4.49E+01	2.37E+00	7.34E-01	5.12E-01	3.04E-01	1.82E-01	1.11E-01	6.85E-02	4.33E-02	2.83E-02	1.92E-02
	2.80E+00	1.79E+02	1.69E+02	1.65E+02	1.57E+02	1.43E+02	1.30E+02	1.18E+02	1.08E+02	9.78E+01	8.90E+01	8.10E+01
	3.25E+00	1.85E+00	1.23E-01	1.08E-01	8.23E-02	4.81E-02	2.82E-02	1.65E-02	9.72E-03	5.73E-03	3.40E-03	2.03E-03
	3.75E+00	1.95E+00	1.10E-01	1.07E-01	1.02E-01	9.29E-02	8.46E-02	7.69E-02	7.00E-02	6.37E-02	5.79E-02	5.27E-02
	4.25E+00	6.18E-01	1.44E-03	1.40E-03	1.34E-03	1.22E-03	1.11E-03	1.01E-03	9.17E-04	8.34E-04	7.59E-04	6.90E-04
	4.75E+00	5.44E-01	5.60E-15	3.37E-23	1.81E-24	1.93E-25	2.07E-26	2.22E-27	2.38E-28	2.54E-29	2.68E-30	2.55E-31
	5.50E+00	8.96E-01	8.33E-24	4.77E-24	1.56E-24	1.67E-25	1.79E-26	1.92E-27	2.05E-28	2.19E-29	2.31E-30	2.20E-31
	total	2.93E+04	7.90E+02	5.13E+02	4.43E+02	3.79E+02	3.33E+02	2.98E+02	2.70E+02	2.46E+02	2.26E+02	2.09E+02
	mev/sec	4.10E+04	1.13E+03	8.98E+02	8.18E+02	7.24E+02	6.49E+02	5.87E+02	5.35E+02	4.90E+02	4.50E+02	4.14E+02

Table G17. Decay Photon Spectrum (/kg.s) After Ten-Day Irradiation of 1-kg Concrete (Flux Parameter Set 1).

hr	emean (mev)	time after discharge										
		initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
	3.00E-01	1.75E+03	2.53E+01	1.80E+01	1.62E+01	1.45E+01	1.32E+01	1.22E+01	1.15E+01	1.08E+01	1.02E+01	9.77E+00
	6.50E-01	2.82E+03	2.91E+02	1.11E+02	7.15E+01	4.52E+01	2.98E+01	2.08E+01	1.54E+01	1.21E+01	1.01E+01	8.92E+00
	1.12E+00	1.35E+03	8.20E+01	8.02E+00	1.02E+00	6.92E-01	5.39E-01	4.41E-01	3.74E-01	3.24E-01	2.86E-01	2.55E-01
	1.58E+00	2.32E+04	2.80E+02	2.71E+02	2.59E+02	2.37E+02	2.18E+02	2.01E+02	1.86E+02	1.72E+02	1.60E+02	1.49E+02
	2.00E+00	5.84E+01	2.04E+01	1.70E+01	1.30E+01	7.61E+00	4.46E+00	2.62E+00	1.54E+00	9.10E-01	5.41E-01	3.24E-01
	2.40E+00	4.50E+01	2.38E+00	7.41E-01	5.19E-01	3.10E-01	1.87E-01	1.15E-01	7.24E-02	4.68E-02	3.14E-02	2.20E-02
	2.80E+00	2.60E+02	2.49E+02	2.43E+02	2.32E+02	2.11E+02	1.92E+02	1.74E+02	1.58E+02	1.44E+02	1.31E+02	1.19E+02
	3.25E+00	1.85E+00	1.23E-01	1.08E-01	8.25E-02	4.83E-02	2.83E-02	1.66E-02	9.80E-03	5.80E-03	3.45E-03	2.08E-03
	3.75E+00	2.00E+00	1.62E-01	1.58E-01	1.51E-01	1.37E-01	1.25E-01	1.13E-01	1.03E-01	9.38E-02	8.54E-02	7.77E-02
	4.25E+00	6.18E-01	2.12E-03	2.07E-03	1.97E-03	1.79E-03	1.63E-03	1.49E-03	1.35E-03	1.23E-03	1.12E-03	1.02E-03
	4.75E+00	5.44E-01	5.60E-15	1.83E-21	5.89E-22	6.31E-23	6.76E-24	7.24E-25	7.75E-26	8.30E-27	8.89E-28	9.52E-29
	5.50E+00	8.96E-01	2.72E-21	1.55E-21	5.09E-22	5.45E-23	5.84E-24	6.25E-25	6.69E-26	7.17E-27	7.68E-28	8.22E-29
	total	2.95E+04	9.51E+02	6.70E+02	5.93E+02	5.16E+02	4.58E+02	4.11E+02	3.73E+02	3.41E+02	3.13E+02	2.88E+02
	mev/sec	4.14E+04	1.48E+03	1.23E+03	1.14E+03	1.01E+03	9.13E+02	8.28E+02	7.54E+02	6.89E+02	6.31E+02	5.79E+02

Table G18. Decay Photon Spectrum (/kg.s) After One-Day Irradiation of 1-kg Concrete (Flux Parameter Set 2).

emean (mev)	time after discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
3.00E-01	1.22E+04	1.29E+02	7.80E+01	6.60E+01	5.50E+01	4.73E+01	4.16E+01	3.71E+01	3.36E+01	3.06E+01	2.80E+01
6.50E-01	1.97E+04	1.99E+03	7.36E+02	4.58E+02	2.75E+02	1.68E+02	1.05E+02	6.82E+01	4.60E+01	3.26E+01	2.44E+01
1.12E+00	9.44E+03	5.72E+02	5.53E+01	6.35E+00	4.12E+00	3.10E+00	2.46E+00	2.04E+00	1.74E+00	1.51E+00	1.33E+00
1.58E+00	1.62E+05	1.27E+03	1.22E+03	1.15E+03	1.04E+03	9.37E+02	8.50E+02	7.73E+02	7.05E+02	6.43E+02	5.88E+02
2.00E+00	4.08E+02	1.43E+02	1.19E+02	9.06E+01	5.30E+01	3.11E+01	1.82E+01	1.07E+01	6.31E+00	3.74E+00	2.23E+00
2.40E+00	3.14E+02	1.66E+01	5.14E+00	3.59E+00	2.14E+00	1.29E+00	7.83E-01	4.86E-01	3.10E-01	2.04E-01	1.40E-01
2.80E+00	1.32E+03	1.25E+03	1.22E+03	1.17E+03	1.06E+03	9.63E+02	8.76E+02	7.97E+02	7.25E+02	6.59E+02	6.00E+02
3.25E+00	1.29E+01	8.60E-01	7.52E-01	5.75E-01	3.37E-01	1.97E-01	1.16E-01	6.81E-02	4.02E-02	2.39E-02	1.43E-02
3.75E+00	1.37E+01	8.12E-01	7.93E-01	7.57E-01	6.88E-01	6.26E-01	5.70E-01	5.18E-01	4.72E-01	4.29E-01	3.90E-01
4.25E+00	4.32E+00	1.06E-02	1.04E-02	9.91E-03	9.02E-03	8.21E-03	7.46E-03	6.79E-03	6.18E-03	5.62E-03	5.11E-03
4.75E+00	3.80E+00	3.92E-14	3.93E-22	6.40E-23	6.86E-24	7.35E-25	7.87E-26	8.43E-27	9.02E-28	9.66E-29	1.03E-29
5.50E+00	6.26E+00	2.95E-22	1.69E-22	5.53E-23	5.92E-24	6.34E-25	6.80E-26	7.28E-27	7.79E-28	8.34E-29	8.93E-30
total	2.05E+05	5.38E+03	3.44E+03	2.95E+03	2.49E+03	2.15E+03	1.89E+03	1.69E+03	1.52E+03	1.37E+03	1.24E+03
mev/sec	2.87E+05	7.82E+03	6.17E+03	5.60E+03	4.91E+03	4.37E+03	3.92E+03	3.53E+03	3.20E+03	2.90E+03	2.64E+03

Table G19. Decay Photon Spectrum (/kg.s) After Ten-Day Irradiation of 1-kg Concrete (Flux Parameter Set 2).

emean (mev)	time after discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
3.00E-01	1.22E+04	1.52E+02	1.00E+02	8.72E+01	7.44E+01	6.50E+01	5.77E+01	5.19E+01	4.71E+01	4.29E+01	3.93E+01
6.50E-01	1.97E+04	2.03E+03	7.73E+02	4.94E+02	3.10E+02	2.02E+02	1.39E+02	1.01E+02	7.79E+01	6.40E+01	5.53E+01
1.12E+00	9.44E+03	5.74E+02	5.63E+01	7.37E+00	5.03E+00	3.92E+00	3.20E+00	2.70E+00	2.34E+00	2.05E+00	1.81E+00
1.58E+00	1.62E+05	1.81E+03	1.75E+03	1.65E+03	1.49E+03	1.35E+03	1.23E+03	1.11E+03	1.02E+03	9.26E+02	8.45E+02
2.00E+00	4.08E+02	1.43E+02	1.19E+02	9.09E+01	5.32E+01	3.12E+01	1.83E+01	1.08E+01	6.38E+00	3.80E+00	2.28E+00
2.40E+00	3.14E+02	1.67E+01	5.20E+00	3.64E+00	2.18E+00	1.32E+00	8.17E-01	5.17E-01	3.37E-01	2.28E-01	1.61E-01
2.80E+00	1.93E+03	1.84E+03	1.80E+03	1.72E+03	1.56E+03	1.42E+03	1.29E+03	1.17E+03	1.07E+03	9.71E+02	8.84E+02
3.25E+00	1.29E+01	8.62E-01	7.54E-01	5.77E-01	3.38E-01	1.98E-01	1.16E-01	6.87E-02	4.07E-02	2.43E-02	1.46E-02
3.75E+00	1.41E+01	1.20E+00	1.17E+00	1.12E+00	1.01E+00	9.23E-01	8.40E-01	7.64E-01	6.95E-01	6.32E-01	5.75E-01
4.25E+00	4.32E+00	1.57E-02	1.53E-02	1.46E-02	1.33E-02	1.21E-02	1.10E-02	1.00E-02	9.11E-03	8.28E-03	7.54E-03
4.75E+00	3.80E+00	3.92E-14	6.40E-20	2.09E-20	2.24E-21	2.40E-22	2.57E-23	2.75E-24	2.94E-25	3.15E-26	3.38E-27
5.50E+00	6.26E+00	9.64E-20	5.51E-20	1.80E-20	1.93E-21	2.07E-22	2.22E-23	2.37E-24	2.54E-25	2.72E-26	2.92E-27
total	2.06E+05	6.57E+03	4.60E+03	4.05E+03	3.50E+03	3.07E+03	2.74E+03	2.46E+03	2.22E+03	2.01E+03	1.83E+03
mev/sec	2.90E+05	1.04E+04	8.64E+03	7.96E+03	7.06E+03	6.32E+03	5.70E+03	5.15E+03	4.67E+03	4.25E+03	3.86E+03

Table G20. Decay Photon Spectrum (/kg.s) After One-Day Irradiation of 1-kg Aluminum 6061-T6 (Flux Parameter Set 1).

emean (mev)	time after discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
3.00E-01	1.74E+03	2.28E+02	8.20E+01	6.04E+01	5.36E+01	4.81E+01	4.34E+01	3.92E+01	3.56E+01	3.23E+01	2.93E+01
6.50E-01	4.80E+04	5.47E+03	7.44E+02	1.31E+02	7.87E+01	5.19E+01	3.57E+01	2.58E+01	1.95E+01	1.54E+01	1.27E+01
1.12E+00	1.28E+04	1.42E+03	1.60E+02	3.79E+00	1.54E+00	1.33E+00	1.20E+00	1.10E+00	1.02E+00	9.58E-01	9.07E-01
1.58E+00	5.87E+03	2.90E+03	2.83E+03	2.70E+03	2.45E+03	2.22E+03	2.02E+03	1.84E+03	1.67E+03	1.52E+03	1.38E+03
2.00E+00	3.86E+01	3.24E+01	2.83E+01	2.17E+01	1.27E+01	7.39E+00	4.32E+00	2.52E+00	1.47E+00	8.61E-01	5.03E-01
2.40E+00	2.54E+00	1.27E+00	1.09E+00	8.30E-01	4.85E-01	2.83E-01	1.66E-01	9.67E-02	5.65E-02	3.30E-02	1.93E-02
2.80E+00	3.33E+03	3.26E+03	3.18E+03	3.03E+03	2.76E+03	2.51E+03	2.28E+03	2.08E+03	1.89E+03	1.72E+03	1.56E+03
3.25E+00	2.61E-01	2.06E-01	1.80E-01	1.37E-01	8.03E-02	4.69E-02	2.74E-02	1.60E-02	9.36E-03	5.47E-03	3.20E-03
3.75E+00	2.17E+00	2.12E+00	2.07E+00	1.97E+00	1.80E+00	1.63E+00	1.49E+00	1.35E+00	1.23E+00	1.12E+00	1.02E+00
4.25E+00	3.12E-02	2.78E-02	2.71E-02	2.59E-02	2.35E-02	2.14E-02	1.95E-02	1.77E-02	1.61E-02	1.47E-02	1.33E-02
4.75E+00	2.53E-04	2.84E-14	2.44E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5.50E+00	3.89E-07	2.21E-14	2.10E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
total	7.18E+04	1.33E+04	7.03E+03	5.95E+03	5.36E+03	4.85E+03	4.39E+03	3.99E+03	3.62E+03	3.29E+03	2.99E+03
mev/sec	6.48E+04	1.90E+04	1.41E+04	1.29E+04	1.17E+04	1.06E+04	9.63E+03	8.75E+03	7.96E+03	7.24E+03	6.58E+03

Table G21. Decay Photon Spectrum (/kg.s) After Ten-Day Irradiation of 1-kg Aluminum 6061-T6 (Flux Parameter Set 1).

emean (mev)	time after discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
3.00E-01	1.77E+03	2.57E+02	1.10E+02	8.74E+01	7.81E+01	7.04E+01	6.37E+01	5.77E+01	5.24E+01	4.76E+01	4.32E+01
6.50E-01	4.80E+04	5.48E+03	7.56E+02	1.42E+02	8.91E+01	6.15E+01	4.46E+01	3.40E+01	2.72E+01	2.26E+01	1.94E+01
1.12E+00	1.28E+04	1.43E+03	1.62E+02	6.12E+00	3.80E+00	3.53E+00	3.33E+00	3.17E+00	3.04E+00	2.92E+00	2.82E+00
1.58E+00	7.27E+03	4.26E+03	4.16E+03	3.97E+03	3.60E+03	3.28E+03	2.98E+03	2.71E+03	2.46E+03	2.24E+03	2.04E+03
2.00E+00	3.87E+01	3.25E+01	2.84E+01	2.17E+01	1.27E+01	7.40E+00	4.33E+00	2.53E+00	1.48E+00	8.62E-01	5.04E-01
2.40E+00	2.55E+00	1.27E+00	1.09E+00	8.32E-01	4.86E-01	2.84E-01	1.66E-01	9.69E-02	5.67E-02	3.31E-02	1.94E-02
2.80E+00	4.91E+03	4.80E+03	4.69E+03	4.47E+03	4.07E+03	3.70E+03	3.37E+03	3.06E+03	2.79E+03	2.53E+03	2.31E+03
3.25E+00	2.61E-01	2.06E-01	1.80E-01	1.38E-01	8.04E-02	4.70E-02	2.75E-02	1.60E-02	9.37E-03	5.48E-03	3.20E-03
3.75E+00	3.20E+00	3.12E+00	3.05E+00	2.91E+00	2.65E+00	2.41E+00	2.19E+00	1.99E+00	1.81E+00	1.65E+00	1.50E+00
4.25E+00	4.46E-02	4.09E-02	4.00E-02	3.81E-02	3.47E-02	3.15E-02	2.87E-02	2.61E-02	2.38E-02	2.16E-02	1.97E-02
4.75E+00	2.53E-04	2.84E-14	2.44E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5.50E+00	3.89E-07	2.21E-14	2.10E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
total	7.49E+04	1.63E+04	9.91E+03	8.70E+03	7.86E+03	7.12E+03	6.46E+03	5.87E+03	5.34E+03	4.85E+03	4.41E+03
mev/sec	7.15E+04	2.55E+04	2.05E+04	1.89E+04	1.72E+04	1.56E+04	1.42E+04	1.29E+04	1.17E+04	1.07E+04	9.70E+03

Table G22. Decay Photon Spectrum (/kg.s) After One-Day Irradiation of 1-kg Aluminum 6061-T6 (Flux Parameter Set 2).

emean (mev)	time after discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
3.00E-01	1.29E+04	1.62E+03	5.94E+02	4.39E+02	3.84E+02	3.42E+02	3.06E+02	2.76E+02	2.50E+02	2.26E+02	2.05E+02
6.50E-01	3.37E+05	3.90E+04	5.85E+03	1.41E+03	8.49E+02	5.44E+02	3.62E+02	2.51E+02	1.83E+02	1.39E+02	1.11E+02
1.12E+00	8.98E+04	9.96E+03	1.12E+03	2.87E+01	1.21E+01	1.02E+01	8.95E+00	8.07E+00	7.43E+00	6.93E+00	6.52E+00
1.58E+00	5.27E+04	2.03E+04	1.98E+04	1.89E+04	1.71E+04	1.56E+04	1.41E+04	1.29E+04	1.17E+04	1.06E+04	9.67E+03
2.00E+00	4.43E+02	3.76E+02	3.28E+02	2.51E+02	1.47E+02	8.56E+01	5.00E+01	2.92E+01	1.71E+01	9.97E+00	5.82E+00
2.40E+00	2.49E+01	1.46E+01	1.26E+01	9.61E+00	5.61E+00	3.28E+00	1.92E+00	1.12E+00	6.54E-01	3.82E-01	2.23E-01
2.80E+00	2.33E+04	2.28E+04	2.22E+04	2.12E+04	1.93E+04	1.75E+04	1.60E+04	1.45E+04	1.32E+04	1.20E+04	1.09E+04
3.25E+00	2.90E+00	2.38E+00	2.08E+00	1.59E+00	9.30E-01	5.43E-01	3.17E-01	1.85E-01	1.08E-01	6.33E-02	3.70E-02
3.75E+00	1.52E+01	1.48E+01	1.45E+01	1.38E+01	1.26E+01	1.14E+01	1.04E+01	9.45E+00	8.60E+00	7.82E+00	7.12E+00
4.25E+00	2.18E-01	1.94E-01	1.90E-01	1.81E-01	1.64E-01	1.50E-01	1.36E-01	1.24E-01	1.13E-01	1.02E-01	9.32E-02
4.75E+00	1.77E-03	1.98E-13	1.70E-19	1.95E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5.50E+00	2.72E-06	1.54E-13	1.47E-19	1.68E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
total	5.16E+05	9.41E+04	5.00E+04	4.23E+04	3.78E+04	3.41E+04	3.08E+04	2.80E+04	2.54E+04	2.30E+04	2.09E+04
mev/sec	4.73E+05	1.34E+05	9.95E+04	9.08E+04	8.20E+04	7.43E+04	6.74E+04	6.13E+04	5.57E+04	5.06E+04	4.60E+04

Table G23. Decay Photon Spectrum (/kg.s) After Ten-Day Irradiation of 1-kg Aluminum 6061-T6 (Flux Parameter Set 2).

mean (mev)	time after discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
3.00E-01	1.31E+04	1.82E+03	7.92E+02	6.27E+02	5.56E+02	4.98E+02	4.49E+02	4.06E+02	3.67E+02	3.33E+02	3.03E+02
6.50E-01	3.37E+05	3.91E+04	5.94E+03	1.50E+03	9.30E+02	6.19E+02	4.30E+02	3.15E+02	2.42E+02	1.94E+02	1.62E+02
1.12E+00	8.99E+04	9.98E+03	1.14E+03	4.53E+01	2.82E+01	2.58E+01	2.41E+01	2.28E+01	2.18E+01	2.09E+01	2.01E+01
1.58E+00	6.25E+04	2.99E+04	2.92E+04	2.78E+04	2.52E+04	2.29E+04	2.08E+04	1.89E+04	1.72E+04	1.57E+04	1.43E+04
2.00E+00	4.44E+02	3.76E+02	3.29E+02	2.51E+02	1.47E+02	8.57E+01	5.01E+01	2.93E+01	1.71E+01	9.98E+00	5.83E+00
2.40E+00	2.49E+01	1.46E+01	1.26E+01	9.63E+00	5.62E+00	3.29E+00	1.92E+00	1.12E+00	6.55E-01	3.83E-01	2.24E-01
2.80E+00	3.43E+04	3.35E+04	3.28E+04	3.12E+04	2.84E+04	2.59E+04	2.35E+04	2.14E+04	1.95E+04	1.77E+04	1.61E+04
3.25E+00	2.91E+00	2.39E+00	2.09E+00	1.59E+00	9.31E-01	5.44E-01	3.18E-01	1.86E-01	1.08E-01	6.34E-02	3.70E-02
3.75E+00	2.24E+01	2.18E+01	2.13E+01	2.03E+01	1.85E+01	1.68E+01	1.53E+01	1.39E+01	1.27E+01	1.15E+01	1.05E+01
4.25E+00	3.12E-01	2.86E-01	2.79E-01	2.66E-01	2.42E-01	2.20E-01	2.01E-01	1.82E-01	1.66E-01	1.51E-01	1.37E-01
4.75E+00	1.77E-03	1.98E-13	1.70E-19	1.95E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5.50E+00	2.72E-06	1.54E-13	1.47E-19	1.68E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
total	5.37E+05	1.15E+05	7.01E+04	6.15E+04	5.53E+04	5.00E+04	4.53E+04	4.11E+04	3.74E+04	3.39E+04	3.09E+04
mev/sec	5.20E+05	1.79E+05	1.44E+05	1.33E+05	1.20E+05	1.09E+05	9.93E+04	9.02E+04	8.20E+04	7.46E+04	6.78E+04

Table G24. Decay Photon Spectrum (/kg.s) After One-Day Irradiation of 1-kg Steel Plate (Flux Parameter Set 1).

emean (mev)	time after discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
3.00E-01	3.44E+02	1.98E+02	1.73E+02	1.33E+02	7.85E+01	4.67E+01	2.82E+01	1.73E+01	1.10E+01	7.30E+00	5.14E+00
6.50E-01	6.98E+03	6.09E+03	5.37E+03	4.19E+03	2.60E+03	1.67E+03	1.12E+03	8.07E+02	6.21E+02	5.13E+02	4.49E+02
1.12E+00	8.27E+01	2.54E+01	2.15E+01	1.65E+01	9.66E+00	5.69E+00	3.38E+00	2.03E+00	1.24E+00	7.85E-01	5.17E-01
1.58E+00	2.39E+03	6.93E+02	6.03E+02	4.61E+02	2.70E+02	1.58E+02	9.29E+01	5.48E+01	3.25E+01	1.95E+01	1.19E+01
2.00E+00	1.37E+03	1.20E+03	1.05E+03	8.02E+02	4.69E+02	2.74E+02	1.60E+02	9.34E+01	5.46E+01	3.19E+01	1.86E+01
2.40E+00	5.40E+01	4.60E+01	4.02E+01	3.07E+01	1.80E+01	1.05E+01	6.13E+00	3.58E+00	2.09E+00	1.22E+00	7.13E-01
2.80E+00	4.76E+01	4.16E+01	3.64E+01	2.78E+01	1.62E+01	9.49E+00	5.54E+00	3.24E+00	1.89E+00	1.10E+00	6.45E-01
3.25E+00	8.76E+00	7.62E+00	6.66E+00	5.09E+00	2.97E+00	1.74E+00	1.01E+00	5.92E-01	3.46E-01	2.02E-01	1.18E-01
3.75E+00	5.22E-03	2.42E-09	2.31E-15	4.91E-22	4.47E-22	4.07E-22	3.70E-22	3.37E-22	3.06E-22	2.79E-22	2.53E-22
4.25E+00	9.58E-03	9.13E-09	8.71E-15	6.44E-24	5.86E-24	5.33E-24	4.85E-24	4.41E-24	4.01E-24	3.65E-24	3.32E-24
4.75E+00	3.68E-04	3.55E-13	9.24E-20	8.55E-30	8.93E-31	1.28E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5.50E+00	1.21E-06	8.25E-14	7.86E-20	7.39E-30	7.72E-31	1.10E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
total	1.13E+04	8.31E+03	7.30E+03	5.67E+03	3.46E+03	2.17E+03	1.42E+03	9.82E+02	7.25E+02	5.75E+02	4.87E+02
mev/sec	1.15E+04	7.79E+03	6.84E+03	5.28E+03	3.18E+03	1.96E+03	1.24E+03	8.25E+02	5.80E+02	4.37E+02	3.54E+02

Table G25. Decay Photon Spectrum (/kg.s) After Ten-Day Irradiation of 1-kg Steel Plate (Flux Parameter Set 1).

emean (mev)	time after discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
3.00E-01	3.62E+02	2.16E+02	1.91E+02	1.50E+02	9.60E+01	6.41E+01	4.55E+01	3.46E+01	2.83E+01	2.45E+01	2.23E+01
6.50E-01	1.01E+04	9.22E+03	8.49E+03	7.31E+03	5.71E+03	4.78E+03	4.23E+03	3.91E+03	3.72E+03	3.61E+03	3.54E+03
1.12E+00	8.40E+01	2.67E+01	2.28E+01	1.77E+01	1.09E+01	6.96E+00	4.65E+00	3.29E+00	2.51E+00	2.05E+00	1.78E+00
1.58E+00	2.41E+03	7.05E+02	6.14E+02	4.72E+02	2.81E+02	1.69E+02	1.04E+02	6.57E+01	4.34E+01	3.04E+01	2.28E+01
2.00E+00	1.38E+03	1.20E+03	1.05E+03	8.03E+02	4.69E+02	2.74E+02	1.60E+02	9.35E+01	5.46E+01	3.19E+01	1.86E+01
2.40E+00	5.41E+01	4.61E+01	4.03E+01	3.08E+01	1.80E+01	1.05E+01	6.13E+00	3.58E+00	2.09E+00	1.22E+00	7.14E-01
2.80E+00	4.77E+01	4.17E+01	3.64E+01	2.78E+01	1.63E+01	9.50E+00	5.55E+00	3.24E+00	1.89E+00	1.11E+00	6.46E-01
3.25E+00	8.77E+00	7.63E+00	6.67E+00	5.10E+00	2.98E+00	1.74E+00	1.02E+00	5.93E-01	3.47E-01	2.02E-01	1.18E-01
3.75E+00	5.22E-03	2.42E-09	2.31E-15	1.30E-20	1.18E-20	1.07E-20	9.78E-21	8.89E-21	8.09E-21	7.36E-21	6.70E-21
4.25E+00	9.58E-03	9.13E-09	8.71E-15	1.70E-22	1.55E-22	1.41E-22	1.28E-22	1.17E-22	1.06E-22	9.65E-23	8.77E-23
4.75E+00	3.68E-04	3.55E-13	9.24E-20	9.66E-29	1.03E-29	1.15E-30	1.28E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5.50E+00	1.21E-06	8.25E-14	7.86E-20	8.34E-29	8.93E-30	9.92E-31	1.10E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00
total	1.44E+04	1.15E+04	1.05E+04	8.82E+03	6.61E+03	5.31E+03	4.56E+03	4.11E+03	3.85E+03	3.70E+03	3.61E+03
mev/sec	1.36E+04	9.85E+03	8.89E+03	7.34E+03	5.23E+03	4.00E+03	3.29E+03	2.87E+03	2.62E+03	2.47E+03	2.39E+03

Table G26. Decay Photon Spectrum (/kg.s) After One-Day Irradiation of 1-kg Steel Plate (Flux Parameter Set 2).

emean (mev)	time after discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
3.00E-01	2.77E+03	1.71E+03	1.49E+03	1.14E+03	6.75E+02	4.01E+02	2.41E+02	1.48E+02	9.29E+01	6.10E+01	4.24E+01
6.50E-01	5.96E+04	5.21E+04	4.58E+04	3.56E+04	2.19E+04	1.38E+04	9.12E+03	6.38E+03	4.77E+03	3.83E+03	3.29E+03
1.12E+00	6.27E+02	2.20E+02	1.88E+02	1.43E+02	8.40E+01	4.94E+01	2.92E+01	1.75E+01	1.06E+01	6.60E+00	4.27E+00
1.58E+00	1.80E+04	5.99E+03	5.21E+03	3.98E+03	2.33E+03	1.36E+03	8.01E+02	4.71E+02	2.79E+02	1.67E+02	1.01E+02
2.00E+00	1.19E+04	1.04E+04	9.07E+03	6.93E+03	4.05E+03	2.36E+03	1.38E+03	8.07E+02	4.71E+02	2.75E+02	1.61E+02
2.40E+00	4.64E+02	3.98E+02	3.47E+02	2.66E+02	1.55E+02	9.06E+01	5.29E+01	3.09E+01	1.81E+01	1.05E+01	6.16E+00
2.80E+00	4.11E+02	3.60E+02	3.14E+02	2.40E+02	1.40E+02	8.20E+01	4.79E+01	2.80E+01	1.63E+01	9.54E+00	5.57E+00
3.25E+00	7.56E+01	6.58E+01	5.75E+01	4.40E+01	2.57E+01	1.50E+01	8.76E+00	5.12E+00	2.99E+00	1.75E+00	1.02E+00
3.75E+00	3.65E-02	1.69E-08	1.61E-14	2.40E-20	2.18E-20	1.99E-20	1.81E-20	1.64E-20	1.50E-20	1.36E-20	1.24E-20
4.25E+00	6.70E-02	6.38E-08	6.09E-14	3.15E-22	2.86E-22	2.60E-22	2.37E-22	2.15E-22	1.96E-22	1.78E-22	1.62E-22
4.75E+00	2.57E-03	2.48E-12	6.46E-19	2.21E-28	2.36E-29	2.55E-30	2.55E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5.50E+00	8.43E-06	5.76E-13	5.50E-19	1.91E-28	2.04E-29	2.20E-30	2.20E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00
total	9.39E+04	7.12E+04	6.25E+04	4.84E+04	2.93E+04	1.82E+04	1.17E+04	7.88E+03	5.66E+03	4.37E+03	3.61E+03
mev/sec	9.50E+04	6.69E+04	5.87E+04	4.52E+04	2.71E+04	1.65E+04	1.03E+04	6.73E+03	4.62E+03	3.39E+03	2.67E+03

Table G27. Decay Photon Spectrum (/kg.s) After Ten-Day Irradiation of 1-kg Steel Plate (Flux Parameter Set 2).

emean (mev)	time after discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
3.00E-01	2.91E+03	1.84E+03	1.63E+03	1.28E+03	8.09E+02	5.35E+02	3.74E+02	2.81E+02	2.26E+02	1.94E+02	1.75E+02
6.50E-01	8.15E+04	7.39E+04	6.77E+04	5.74E+04	4.36E+04	3.55E+04	3.08E+04	2.81E+04	2.64E+04	2.55E+04	2.49E+04
1.12E+00	6.36E+02	2.29E+02	1.97E+02	1.52E+02	9.30E+01	5.83E+01	3.81E+01	2.63E+01	1.94E+01	1.54E+01	1.31E+01
1.58E+00	1.81E+04	6.07E+03	5.29E+03	4.07E+03	2.41E+03	1.44E+03	8.78E+02	5.48E+02	3.55E+02	2.43E+02	1.77E+02
2.00E+00	1.19E+04	1.04E+04	9.08E+03	6.94E+03	4.06E+03	2.37E+03	1.38E+03	8.08E+02	4.72E+02	2.76E+02	1.61E+02
2.40E+00	4.65E+02	3.98E+02	3.48E+02	2.66E+02	1.55E+02	9.08E+01	5.30E+01	3.10E+01	1.81E+01	1.06E+01	6.17E+00
2.80E+00	4.12E+02	3.60E+02	3.15E+02	2.41E+02	1.41E+02	8.21E+01	4.80E+01	2.80E+01	1.64E+01	9.56E+00	5.58E+00
3.25E+00	7.57E+01	6.59E+01	5.76E+01	4.40E+01	2.57E+01	1.50E+01	8.78E+00	5.13E+00	3.00E+00	1.75E+00	1.02E+00
3.75E+00	3.65E-02	1.69E-08	1.61E-14	6.34E-19	5.77E-19	5.25E-19	4.77E-19	4.34E-19	3.95E-19	3.60E-19	3.27E-19
4.25E+00	6.70E-02	6.38E-08	6.09E-14	8.31E-21	7.56E-21	6.88E-21	6.26E-21	5.69E-21	5.18E-21	4.71E-21	4.29E-21
4.75E+00	2.57E-03	2.48E-12	6.46E-19	2.49E-27	2.66E-28	2.86E-29	3.06E-30	3.83E-31	0.00E+00	0.00E+00	0.00E+00
5.50E+00	8.43E-06	5.76E-13	5.50E-19	2.15E-27	2.30E-28	2.47E-29	2.65E-30	3.31E-31	0.00E+00	0.00E+00	0.00E+00
total	1.16E+05	9.33E+04	8.46E+04	7.04E+04	5.13E+04	4.01E+04	3.36E+04	2.98E+04	2.75E+04	2.62E+04	2.55E+04
mev/sec	1.09E+05	8.14E+04	7.31E+04	5.96E+04	4.15E+04	3.08E+04	2.46E+04	2.10E+04	1.89E+04	1.76E+04	1.69E+04

Table G28. Decay Photon Spectrum (/kg.s) After One-Day Irradiation of 1-kg Havar Foil (Flux Parameter Set 1).

emEAN (meV)	time after discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
3.00E-01	1.85E+02	9.21E+01	7.84E+01	5.98E+01	3.68E+01	2.34E+01	1.55E+01	1.08E+01	7.99E+00	6.30E+00	5.25E+00
6.50E-01	3.52E+03	3.11E+03	2.80E+03	2.29E+03	1.60E+03	1.19E+03	9.49E+02	8.00E+02	7.08E+02	6.49E+02	6.09E+02
1.12E+00	2.42E+02	6.23E+01	4.09E+01	3.54E+01	3.23E+01	3.05E+01	2.94E+01	2.88E+01	2.85E+01	2.82E+01	2.81E+01
1.58E+00	1.39E+03	2.97E+02	2.56E+02	1.96E+02	1.15E+02	6.77E+01	4.01E+01	2.40E+01	1.46E+01	9.08E+00	5.86E+00
2.00E+00	5.81E+02	5.07E+02	4.43E+02	3.38E+02	1.98E+02	1.15E+02	6.75E+01	3.94E+01	2.30E+01	1.34E+01	7.86E+00
2.40E+00	2.28E+01	1.94E+01	1.70E+01	1.30E+01	7.57E+00	4.42E+00	2.58E+00	1.51E+00	8.82E-01	5.15E-01	3.01E-01
2.80E+00	2.01E+01	1.76E+01	1.53E+01	1.17E+01	6.85E+00	4.00E+00	2.34E+00	1.37E+00	7.98E-01	4.66E-01	2.72E-01
3.25E+00	3.73E+00	3.21E+00	2.81E+00	2.15E+00	1.25E+00	7.33E-01	4.28E-01	2.50E-01	1.46E-01	8.53E-02	4.98E-02
3.75E+00	2.84E-03	2.56E-09	2.44E-15	2.03E-23	1.25E-23	8.40E-24	5.68E-24	3.84E-24	2.59E-24	1.75E-24	1.18E-24
4.25E+00	1.01E-02	9.67E-09	9.22E-15	3.33E-25	3.89E-27	4.43E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4.75E+00	1.53E-05	1.78E-13	9.68E-20	2.97E-27	3.47E-29	3.95E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5.50E+00	9.16E-08	8.73E-14	8.32E-20	2.56E-27	3.00E-29	3.41E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
total	5.96E+03	4.11E+03	3.65E+03	2.95E+03	2.00E+03	1.44E+03	1.11E+03	9.06E+02	7.84E+02	7.07E+02	6.57E+02
meV/sec	6.09E+03	3.71E+03	3.27E+03	2.60E+03	1.71E+03	1.18E+03	8.67E+02	6.80E+02	5.68E+02	4.99E+02	4.56E+02

Table G29. Decay Photon Spectrum (/kg.s) After Ten-Day Irradiation of 1-kg Havar Foil (Flux Parameter Set 1).

emEAN (meV)	time after discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
3.00E-01	2.02E+02	1.09E+02	9.56E+01	7.70E+01	5.36E+01	4.00E+01	3.19E+01	2.70E+01	2.40E+01	2.22E+01	2.10E+01
6.50E-01	7.01E+03	6.60E+03	6.28E+03	5.76E+03	5.05E+03	4.63E+03	4.36E+03	4.20E+03	4.09E+03	4.01E+03	3.96E+03
1.12E+00	4.90E+02	3.11E+02	2.89E+02	2.84E+02	2.81E+02	2.79E+02	2.78E+02	2.77E+02	2.77E+02	2.76E+02	2.76E+02
1.58E+00	1.41E+03	3.09E+02	2.68E+02	2.08E+02	1.27E+02	7.93E+01	5.17E+01	3.55E+01	2.61E+01	2.06E+01	1.73E+01
2.00E+00	5.82E+02	5.08E+02	4.44E+02	3.39E+02	1.98E+02	1.16E+02	6.76E+01	3.95E+01	2.31E+01	1.35E+01	7.87E+00
2.40E+00	2.28E+01	1.94E+01	1.70E+01	1.30E+01	7.59E+00	4.43E+00	2.59E+00	1.51E+00	8.83E-01	5.16E-01	3.01E-01
2.80E+00	2.01E+01	1.76E+01	1.54E+01	1.18E+01	6.86E+00	4.01E+00	2.34E+00	1.37E+00	7.99E-01	4.67E-01	2.73E-01
3.25E+00	3.73E+00	3.22E+00	2.81E+00	2.15E+00	1.26E+00	7.34E-01	4.29E-01	2.50E-01	1.46E-01	8.54E-02	4.99E-02
3.75E+00	2.84E-03	2.56E-09	2.44E-15	3.05E-22	1.93E-22	1.30E-22	8.81E-23	5.95E-23	4.02E-23	2.72E-23	1.84E-23
4.25E+00	1.01E-02	9.67E-09	9.22E-15	3.50E-24	4.10E-26	4.81E-28	5.53E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4.75E+00	1.53E-05	1.78E-13	9.68E-20	3.13E-26	3.66E-28	4.29E-30	4.93E-32	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5.50E+00	9.16E-08	8.73E-14	8.32E-20	2.70E-26	3.16E-28	3.71E-30	4.26E-32	0.00E+00	0.00E+00	0.00E+00	0.00E+00
total	9.74E+03	7.88E+03	7.42E+03	6.70E+03	5.73E+03	5.15E+03	4.80E+03	4.58E+03	4.44E+03	4.35E+03	4.28E+03
meV/sec	8.67E+03	6.28E+03	5.84E+03	5.17E+03	4.25E+03	3.71E+03	3.39E+03	3.19E+03	3.07E+03	2.99E+03	2.93E+03

Table G30. Decay Photon Spectrum (/kg.s) After One-Day Irradiation of 1-kg Havar Foil (Flux Parameter Set 2).

e _{mean} (mev)	time after discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
3.00E-01	1.84E+03	1.07E+03	8.80E+02	6.63E+02	4.23E+02	2.84E+02	2.01E+02	1.51E+02	1.21E+02	1.01E+02	8.82E+01
6.50E-01	3.98E+04	3.56E+04	3.24E+04	2.71E+04	1.98E+04	1.54E+04	1.27E+04	1.09E+04	9.78E+03	8.97E+03	8.38E+03
1.12E+00	3.80E+03	1.01E+03	6.41E+02	5.60E+02	5.28E+02	5.09E+02	4.99E+02	4.92E+02	4.89E+02	4.86E+02	4.85E+02
1.58E+00	1.08E+04	3.00E+03	2.59E+03	1.98E+03	1.16E+03	6.82E+02	4.02E+02	2.39E+02	1.43E+02	8.77E+01	5.51E+01
2.00E+00	5.90E+03	5.13E+03	4.48E+03	3.43E+03	2.00E+03	1.17E+03	6.83E+02	3.99E+02	2.33E+02	1.36E+02	7.95E+01
2.40E+00	2.29E+02	1.97E+02	1.72E+02	1.31E+02	7.67E+01	4.48E+01	2.62E+01	1.53E+01	8.93E+00	5.21E+00	3.05E+00
2.80E+00	2.03E+02	1.78E+02	1.55E+02	1.19E+02	6.94E+01	4.05E+01	2.37E+01	1.38E+01	8.08E+00	4.72E+00	2.76E+00
3.25E+00	3.76E+01	3.25E+01	2.84E+01	2.17E+01	1.27E+01	7.42E+00	4.33E+00	2.53E+00	1.48E+00	8.63E-01	5.04E-01
3.75E+00	1.98E-02	1.79E-08	1.71E-14	9.91E-22	6.08E-22	4.10E-22	2.77E-22	1.87E-22	1.27E-22	8.56E-23	5.79E-23
4.25E+00	7.09E-02	6.76E-08	6.44E-14	1.63E-23	1.90E-25	2.22E-27	2.77E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4.75E+00	1.07E-04	1.24E-12	6.76E-19	1.45E-25	1.70E-27	1.98E-29	2.47E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5.50E+00	6.40E-07	6.10E-13	5.82E-19	1.25E-25	1.46E-27	1.71E-29	2.13E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00
total	6.26E+04	4.63E+04	4.13E+04	3.40E+04	2.41E+04	1.82E+04	1.45E+04	1.23E+04	1.08E+04	9.79E+03	9.09E+03
mev/sec	6.08E+04	4.07E+04	3.60E+04	2.91E+04	1.99E+04	1.43E+04	1.10E+04	8.97E+03	7.68E+03	6.85E+03	6.28E+03

Table G31. Decay Photon Spectrum (/kg.s) After Ten-Day Irradiation of 1-kg Havar Foil (Flux Parameter Set 2).

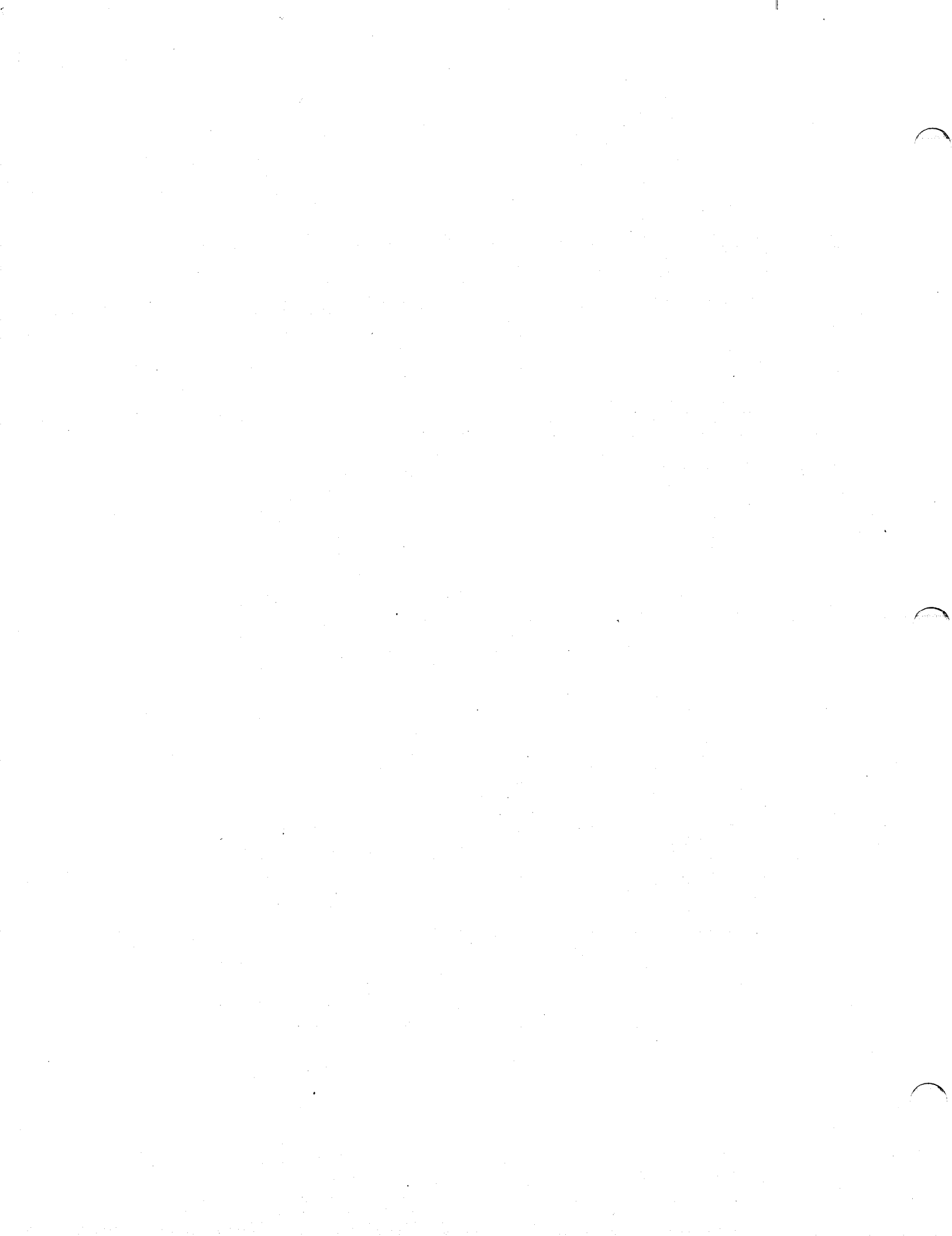
e _{mean} (mev)	time after discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
3.00E-01	2.05E+03	1.28E+03	1.09E+03	8.66E+02	6.21E+02	4.77E+02	3.89E+02	3.34E+02	2.99E+02	2.75E+02	2.58E+02
6.50E-01	7.05E+04	6.63E+04	6.29E+04	5.73E+04	4.96E+04	4.47E+04	4.16E+04	3.94E+04	3.79E+04	3.67E+04	3.58E+04
1.12E+00	8.13E+03	5.33E+03	4.96E+03	4.88E+03	4.85E+03	4.83E+03	4.82E+03	4.81E+03	4.81E+03	4.81E+03	4.81E+03
1.58E+00	1.09E+04	3.08E+03	2.67E+03	2.06E+03	1.24E+03	7.63E+02	4.83E+02	3.19E+02	2.24E+02	1.68E+02	1.35E+02
2.00E+00	5.91E+03	5.14E+03	4.49E+03	3.43E+03	2.00E+03	1.17E+03	6.84E+02	4.00E+02	2.33E+02	1.36E+02	7.97E+01
2.40E+00	2.29E+02	1.97E+02	1.72E+02	1.31E+02	7.68E+01	4.49E+01	2.62E+01	1.53E+01	8.94E+00	5.22E+00	3.05E+00
2.80E+00	2.04E+02	1.78E+02	1.56E+02	1.19E+02	6.95E+01	4.06E+01	2.37E+01	1.38E+01	8.09E+00	4.72E+00	2.76E+00
3.25E+00	3.76E+01	3.26E+01	2.85E+01	2.18E+01	1.27E+01	7.43E+00	4.34E+00	2.53E+00	1.48E+00	8.65E-01	5.05E-01
3.75E+00	1.98E-02	1.79E-08	1.71E-14	1.49E-20	9.43E-21	6.37E-21	4.30E-21	2.91E-21	1.97E-21	1.33E-21	8.98E-22
4.25E+00	7.09E-02	6.76E-08	6.44E-14	1.71E-22	2.00E-24	2.34E-26	2.77E-28	5.53E-30	0.00E+00	0.00E+00	0.00E+00
4.75E+00	1.07E-04	1.24E-12	6.76E-19	1.53E-24	1.79E-26	2.09E-28	2.47E-30	4.93E-32	0.00E+00	0.00E+00	0.00E+00
5.50E+00	6.40E-07	6.10E-13	5.82E-19	1.32E-24	1.54E-26	1.81E-28	2.13E-30	4.26E-32	0.00E+00	0.00E+00	0.00E+00
total	9.80E+04	8.15E+04	7.65E+04	6.88E+04	5.85E+04	5.21E+04	4.80E+04	4.53E+04	4.35E+04	4.21E+04	4.11E+04
mev/sec	8.59E+04	6.57E+04	6.09E+04	5.39E+04	4.43E+04	3.84E+04	3.48E+04	3.25E+04	3.10E+04	2.99E+04	2.91E+04

Table G32. Decay Photon Spectrum (/kg.s) After One-Day Irradiation of 1-kg Concrete (Flux Parameter Set 3).

emean (mev)	time after discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
3.00E-01	2.03E+02	1.51E+01	1.41E+01	1.33E+01	1.22E+01	1.14E+01	1.07E+01	1.01E+01	9.57E+00	9.13E+00	8.75E+00
6.50E-01	2.71E+02	2.93E+01	1.34E+01	9.76E+00	7.12E+00	5.51E+00	4.50E+00	3.83E+00	3.38E+00	3.07E+00	2.83E+00
1.12E+00	1.22E+02	7.55E+00	1.08E+00	4.35E-01	3.60E-01	3.10E-01	2.72E-01	2.41E-01	2.16E-01	1.94E-01	1.76E-01
1.58E+00	2.86E+03	2.92E+02	2.86E+02	2.74E+02	2.53E+02	2.34E+02	2.16E+02	2.00E+02	1.86E+02	1.73E+02	1.61E+02
2.00E+00	5.26E+00	1.81E+00	1.51E+00	1.16E+00	6.88E-01	4.12E-01	2.49E-01	1.53E-01	9.64E-02	6.24E-02	4.20E-02
2.40E+00	3.96E+00	2.22E-01	7.86E-02	5.85E-02	3.90E-02	2.70E-02	1.96E-02	1.49E-02	1.17E-02	9.57E-03	8.03E-03
2.80E+00	2.84E+02	2.77E+02	2.71E+02	2.58E+02	2.35E+02	2.14E+02	1.95E+02	1.77E+02	1.61E+02	1.46E+02	1.33E+02
3.25E+00	1.61E-01	1.10E-02	9.61E-03	7.39E-03	4.40E-03	2.64E-03	1.60E-03	9.92E-04	6.29E-04	4.12E-04	2.81E-04
3.75E+00	3.45E-01	1.81E-01	1.76E-01	1.68E-01	1.53E-01	1.39E-01	1.27E-01	1.15E-01	1.05E-01	9.53E-02	8.67E-02
4.25E+00	5.61E-02	2.37E-03	2.31E-03	2.20E-03	2.00E-03	1.82E-03	1.66E-03	1.51E-03	1.37E-03	1.25E-03	1.14E-03
4.75E+00	4.74E-02	4.88E-16	5.11E-24	8.67E-25	9.29E-26	9.95E-27	1.07E-27	1.14E-28	1.23E-29	1.28E-30	1.28E-31
5.50E+00	7.80E-02	4.00E-24	2.29E-24	7.49E-25	8.02E-26	8.59E-27	9.20E-28	9.85E-29	1.06E-29	1.10E-30	1.10E-31
total	3.75E+03	6.23E+02	5.87E+02	5.57E+02	5.08E+02	4.65E+02	4.26E+02	3.92E+02	3.60E+02	3.32E+02	3.06E+02
mev/sec	5.69E+03	1.27E+03	1.23E+03	1.17E+03	1.07E+03	9.75E+02	8.92E+02	8.17E+02	7.49E+02	6.87E+02	6.31E+02

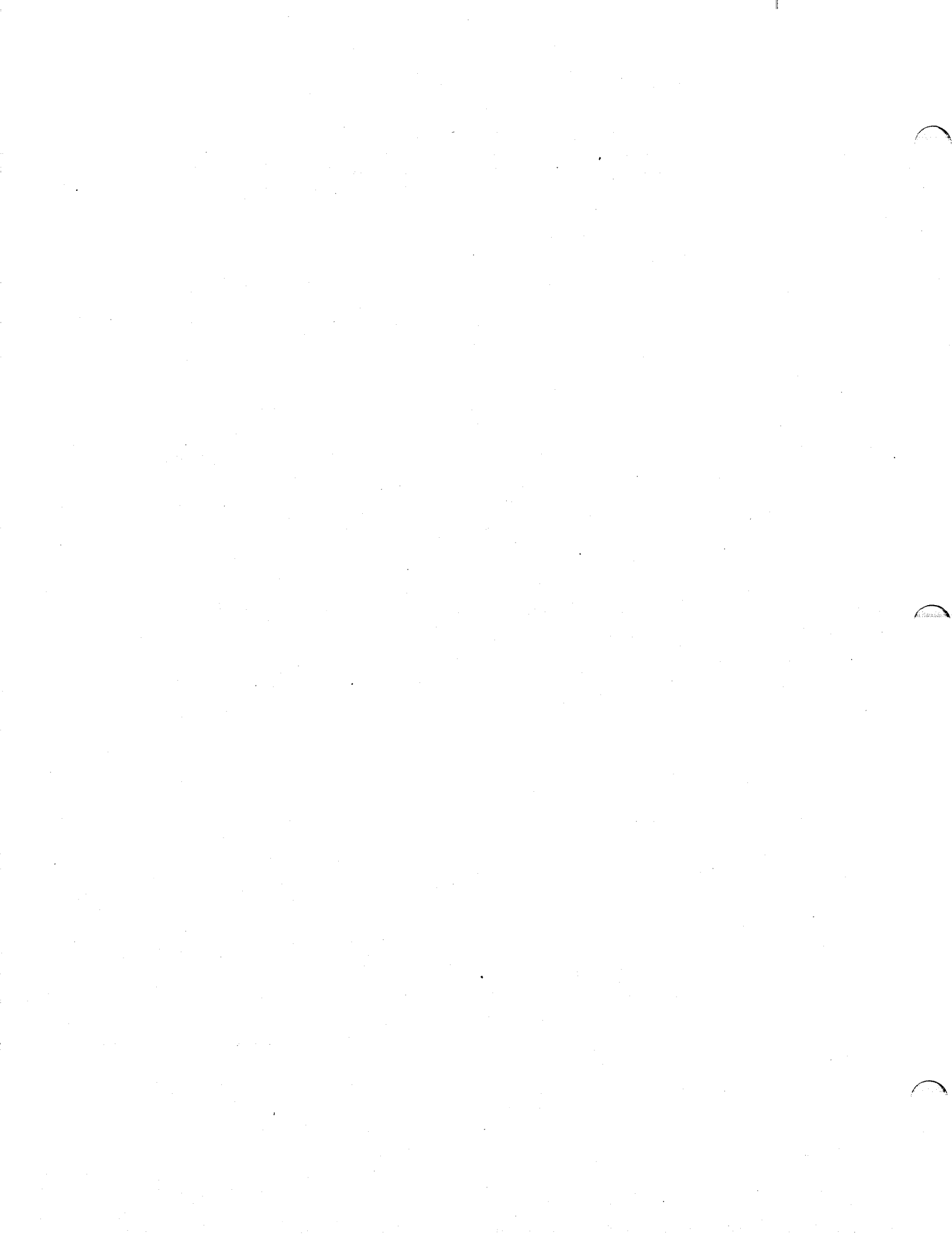
Table G33. Decay Photon Spectrum (/kg.s) After Ten-Day Irradiation of 1-kg Concrete (Flux Parameter Set 3).

emean (mev)	time after discharge										
	initial	.5 hr	1.0 hr	2.0 hr	4.0 hr	6.0 hr	8.0 hr	10.0 hr	12.0 hr	14.0 hr	16.0 hr
3.00E-01	2.07E+02	1.84E+01	1.74E+01	1.65E+01	1.51E+01	1.39E+01	1.30E+01	1.22E+01	1.15E+01	1.09E+01	1.03E+01
6.50E-01	2.72E+02	3.08E+01	1.50E+01	1.12E+01	8.49E+00	6.78E+00	5.67E+00	4.92E+00	4.40E+00	4.02E+00	3.72E+00
1.12E+00	1.22E+02	7.69E+00	1.21E+00	5.62E-01	4.75E-01	4.14E-01	3.65E-01	3.26E-01	2.92E-01	2.63E-01	2.38E-01
1.58E+00	2.98E+03	4.10E+02	4.01E+02	3.84E+02	3.53E+02	3.24E+02	2.99E+02	2.75E+02	2.54E+02	2.35E+02	2.17E+02
2.00E+00	5.27E+00	1.83E+00	1.53E+00	1.17E+00	7.00E-01	4.22E-01	2.58E-01	1.61E-01	1.03E-01	6.87E-02	4.76E-02
2.40E+00	3.96E+00	2.28E-01	8.45E-02	6.40E-02	4.38E-02	3.14E-02	2.35E-02	1.83E-02	1.48E-02	1.23E-02	1.05E-02
2.80E+00	4.19E+02	4.09E+02	3.99E+02	3.81E+02	3.46E+02	3.15E+02	2.87E+02	2.61E+02	2.37E+02	2.16E+02	1.96E+02
3.25E+00	1.62E-01	1.11E-02	9.72E-03	7.49E-03	4.48E-03	2.71E-03	1.67E-03	1.05E-03	6.81E-04	4.58E-04	3.21E-04
3.75E+00	4.32E-01	2.66E-01	2.60E-01	2.48E-01	2.25E-01	2.05E-01	1.87E-01	1.70E-01	1.54E-01	1.41E-01	1.28E-01
4.25E+00	5.72E-02	3.49E-03	3.40E-03	3.25E-03	2.95E-03	2.69E-03	2.45E-03	2.22E-03	2.02E-03	1.84E-03	1.67E-03
4.75E+00	4.74E-02	4.88E-16	8.52E-22	2.78E-22	2.98E-23	3.19E-24	3.41E-25	3.66E-26	3.92E-27	4.19E-28	4.49E-29
5.50E+00	7.80E-02	1.28E-21	7.33E-22	2.40E-22	2.57E-23	2.75E-24	2.95E-25	3.16E-26	3.38E-27	3.62E-28	3.88E-29
total	4.01E+03	8.78E+02	8.35E+02	7.94E+02	7.24E+02	6.61E+02	6.05E+02	5.54E+02	5.08E+02	4.66E+02	4.28E+02
mev/sec	6.26E+03	1.83E+03	1.77E+03	1.69E+03	1.54E+03	1.40E+03	1.28E+03	1.17E+03	1.07E+03	9.81E+02	8.98E+02



APPENDIX H

**LISTINGS OF THE MCNP-4B INPUT FILES USED TO CALCULATE
NEUTRON SPECTRA FOR THE ORIGEN
ACTIVATION CALCULATIONS**



APPENDIX H

LISTINGS OF THE MCNP-4B INPUT FILES USED TO CALCULATE NEUTRON SPECTRA FOR THE ORIGEN ACTIVATION CALCULATIONS

File for MCNP-4B calculation of ORIGEN neutron spectra at selected points
and dose rates near the roof of the PFNA facility for the source in the
horizontal position

message: outp=pfna25.o mctal=pfna25.m

```
mcnp file for PFNA facility -- fluxes at selected locations
1      0      -100:128:-200:251:-300:305
2      0      100 -128 200 -251 300 -305
          # (131 -164 +258 -297 +307 -321)
3      1 0.10549 -400 -401 +505 +224 -227 # (503 -504)
4      1 0.10549 -401 +400 +505 +225 -226 # (503 -504)
5      0      142 -127 +223 -228 +308 -304
          # (-400 -401 +505 +224 -227) # (+137 -102 +310)
          # (-401 +400 +505 +225 -226)
6      0      127 -124 +501 -502 +308 -304
          # (-401 +400 +505 +225 -226)
7      0      124 -126 +254 -255 +308 -304
8      5 8.734441-2 102 -126 +201 -250 +306 -301
          # (+102 -127 +223 -228) # (+127 -124 +501 -502)
          # (+124 +254 -255) # (+129 -252) # (+129 +257)
9      1 0.10549 102 -124 +222 -229 +301 -304
          # (+129 -252) # (+129 +257)
          # (127 +501 -502) # (-127 +223 -228)
10     1 0.10549 106 -109 +212 -236 +302 -303 # (218 -233)
11     1 0.10549 109 -110 +211 -237 +302 -303 # (221 -230)
12     1 0.10549 110 -111 +210 -238 +302 -303 # (221 -230)
13     1 0.10549 111 -112 +209 -239 +302 -303 # (221 -230)
14     1 0.10549 112 -113 +208 -240 +302 -303 # (221 -230)
15     1 0.10549 113 -114 +207 -241 +302 -303 # (221 -230)
16     1 0.10549 114 -115 +206 -242 +302 -303 # (221 -230)
17     1 0.10549 115 -116 +205 -243 +302 -303 # (221 -230)
18     1 0.10549 116 -117 +204 -244 +302 -303 # (221 -230)
19     1 0.10549 117 -118 +203 -245 +302 -303 # (221 -230)
20     1 0.10549 118 -119 +202 -249 +302 -303 # (221 -230)
21     2 0.1187956 120 -123 +215 -246 +302 -303 # (221 -230)
22     2 0.1187956 103 -109 +202 -249 +302 -303
          # (221 -230)
          # (103 -104 +217 -234)
          # (104 -105 +216 -235)
          # (105 -107 +219 -232)
          # (107 -108 +219 -220) # (107 -108 +231 -232)
          # (106 -109 +212 -218) # (106 -109 +233 -236)
23     2 0.1187956 109 -120 +202 -249 +302 -303
          # (221 -230)
          # (109 -110 +211 -237)
          # (110 -111 +210 -238)
          # (111 -112 +209 -239)
          # (112 -113 +208 -240)
          # (113 -114 +207 -241)
          # (114 -115 +206 -242)
          # (115 -116 +205 -243)
          # (116 -117 +204 -244)
          # (117 -118 +203 -245)
```

24	3	3.284-2	#(118 -119) 121 -125 +201 -250 +301 -304 #(-124 +214 -247) #(124 +253 -256) #(122 +248) #(122 -213)
25	3	3.284-2	103 -107 +217 -234 +302 -303 #(221 -230) #(104 -220) #(104 +231)
26	4	5.977931-2	104 -108 +216 -220 +302 -303 #(105 -219)
27	4	5.977931-2	104 -108 +231 -235 +302 -303 #(105 +232)
28	4	5.977931-2	102 -124 +201 -222 +301 -304 #(103 -120 202 -221 302 -303) #(120 -123 215 -221 302 -303) #(121 -214)
29	4	5.977931-2	102 -124 +229 -250 +301 -304 #(103 -120 230 -249 302 -303) #(120 -123 230 -246 302 -303) #(121 +247)
30	4	5.977931-2	124 -126 +252 -254 +301 -304 #(-125 +213 -253)
31	4	5.977931-2	124 -126 +255 -257 +301 -304 #(-125 +256 -248)
32	0		+167 -168 +274 -281 +317 -318
33	0		+165 -166 +270 -285 +308 -310
			#+167 -168 +274 -281 +317 -318)
34	0		-400 +505 +224 -227 +503 -504
35	0		-401 +400 +505 +225 -226 +503 -504
36	4	5.977931-2	122 -124 +201 -250 +301 -304 #(213 -248) #(129 -252) #(129 +257)
37	9	-2.0	+131 -164 +258 -297 +307 -308
38	11	-1.0	+131 -164 +258 -297 +308 -320
			#+132 -163 +259 -296)
39	12	-7.86	+131 -164 +258 -297 +320 -321
40	0		+132 -163 +259 -296 +319 -320
			#+151 -169 +271 -284 +304 -315)
			#+151 -160 +270 -271 +312 -314)
			#+151 -160 +284 -285 +312 -314)
			#+157 -159 +274 -281 +313 -315)
			#+158 -160 +274 -281 -313)
			#+169 -157 +274 -281 +314 -316)
41	1	0.10549	+151 -169 +271 -284 +304 -315
42	1	0.10549	+151 -160 +270 -271 +312 -314
43	1	0.10549	+151 -160 +284 -285 +312 -314
44	1	0.10549	+157 -159 +274 -281 +313 -315
45	1	0.10549	+158 -160 +274 -281 +308 -313
46	1	0.10549	+169 -157 +274 -281 +314 -316
47	9	-2.0	+160 -162 +273 -282 +308 -319
48	10	-2.0	+154 -161 +265 -289 +308 -319
			#47 #(-160 +267 -286)
49	0		+154 -160 +267 -286 +308 -319 #42 #43 #45
50	10	-2.0	+155 -156 +259 -260 +308 -319
51	10	-2.0	+155 -156 +295 -296 +308 -319
52	10	-2.0	+154 -155 +259 -296 +308 -319
			#+265 -289)
53	0		+155 -163 +259 -296 +308 -319 #50 #51
			#+(-161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0	+153 -154 +295 -296 +308 -319
55	10	-2.0	+151 -126 +295 -296 +308 -319
56	10	-2.0	+151 -126 +259 -260 +308 -319
57	10	-2.0	+153 -154 +259 -260 +308 -319
58	10	-2.0	+151 -152 +266 -272 +308 -304
59	10	-2.0	+151 -152 +283 -287 +308 -304
60	0		+151 -154 +259 -296 +308 -319
			#41 #42 #43 #54 #55 #56 #57 #58 #59
			#+165 -166 +270 -285 +308 -310)
			#+(-126 +201 -250 -304)
61	1	0.10549	+149 -151 +272 -201 +308 -304
62	1	0.10549	+149 -151 +250 -283 +308 -304
63	9	-2.0	+149 -151 +264 -290 +308 -319
			#+272 -283)
64	10	-2.0	+149 -151 +259 -296 +308 -319
			#+264 -290)

65	10	-2.0	+146 -149 +295 -296 +308 -319
66	0		+132 -149 +259 -296 +308 -319
			#65 #(+133 -294)
67	10	-2.0	+133 -149 +259 -294 +308 -319
			#(+142 -260 -322) #(+134 +260 -298)
68	10	-2.0	+135 -149 +261 -262 +308 -319
69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311
			#(-138 -290 -310) #(-102 +310)
			#(+138 +269 -290 -310) #(+144 +290 -292 -310)
			#(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71	1	0.10549	+137 -138 +268 -290 +308 -310
72	1	0.10549	+138 -149 +269 -272 +308 -310
73	1	0.10549	+138 -149 +288 -290 +308 -310 #(+140 -141)
74	0		+140 -141 +288 -290 +308 -310
75	1	0.10549	+144 -149 +290 -292 +308 -310
76	1	0.10549	+139 -144 +291 -293 +308 -310
77	2	0.1187956	+137 -102 +268 -293 +310 -311
78	0		+138 -149 +272 -288 +308 -310
			#(+102 +201 -250 +309 -304)
			#(+143 -102 +275 -276 +301)
			#(+143 -102 +279 -280 +301)
			#(+147 -102 +276 -277 +301)
			#(+147 -102 +278 -279 +301)
			#(+142 +223 -228) #(+145 +201 -250 -309)
79	1	0.10549	+143 -102 +275 -276 +301 -310
80	1	0.10549	+143 -102 +279 -280 +301 -310
81	1	0.10549	+147 -102 +276 -277 +301 -310
82	1	0.10549	+147 -102 +278 -279 +301 -310
83	0		+142 -149 +259 -260 +308 -322
84	0		+134 -149 +260 -298 +308 -319
			#68 #69 #(+137 -149 +268 -293 +308 -311)
			#(+102 +201 -250 -304) #(+142 +223 -228 -304)
85	9	-2.0	+145 -126 +201 -250 +308 -309
			#(+145 -127 +223 -228) #(+127 -124 +501 -502)
			#(+129 -252) #(+129 +257) #(+124 +254 -255)
86	0		+129 -126 +201 -250 +308 -304
			#(+252 -257)
87	0		+102 -126 +201 -250 +309 -306
			#(+102 -127 +223 -228) #(+127 -124 +501 -502)
			#(+129 -252) #(+129 +257) #(+124 +254 -255)
88	0		+149 -151 +272 -283 +304 -319

c end cells

c	
c	surfaces
100	px -1000.0
c	101 px 10.3124
102	px 20.7264
103	px 22.6314
104	px 27.7114
105	px 28.9814
106	px 31.5214
107	px 36.6014
108	px 42.9514
109	px 49.3014
110	px 51.8414
111	px 54.3814
112	px 56.9214
113	px 59.4614
114	px 62.0014
115	px 64.5414
116	px 67.0814
117	px 69.6214
118	px 72.1614
119	px 74.7014
120	px 76.3016
121	px 78.2066
122	px 86.0806
123	px 112.649
124	px 114.554
125	px 119.888

126	px	121.158
127	px	50.5714
128	px	1200.0
129	px	87.9856
131	px	-844.042
132	px	-823.722
133	px	-767.842
134	px	-706.882
135	px	-548.962
136	px	-493.522
137	px	-381.762
138	px	-320.802
139	px	-315.722
140	px	-173.482
141	px	-107.442
142	px	-82.042
143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208

229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058
239	py	39.4758
240	py	40.7458
241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258
245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478

```

302 pz -57.573
303 pz 245.957
304 pz 247.862
305 pz 500.0
306 pz -60.748
307 pz -156.0
308 pz -125.095
309 pz -67.451
310 pz 235.585
311 pz 276.225
312 pz 283.845
313 pz 342.265
314 pz 375.285
315 pz 390.525
316 pz 395.605
317 pz -50.0
318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y 10.3124 0.0 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p 0.06683670 0.0 1.0 -2.518636
504 p -0.06683670 0.0 1.0 2.518636
505 px 10.3124

c end surfaces
mode n
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2

```

```

mt8      lwtr.01t
c        m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9       1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
        11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
        14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
        26054.60c -7.91056-4 26056.60c -1.286568-2
        26057.60c -3.025946-4 26058.60c -4.06658-5

mt9      lwtr.01t
c        m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10     1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
        11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
        14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
        26054.60c -7.91056-4 26056.60c -1.286568-2
        26057.60c -3.025946-4 26058.60c -4.06658-5

mt10     lwtr.01t
c        m11=concrete at 1.0 g/cc (Masonry Block) [wt %]
m11     1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
        11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
        14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
        26054.60c -7.91056-4 26056.60c -1.286568-2
        26057.60c -3.025946-4 26058.60c -4.06658-5

mt11     lwtr.01t
c        m12=iron at 7.86 g/cc
m12     26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
        26058.60c 0.0028
c        m13=Heavy concrete at 4.2 g/cc [wt %]
m13     1001.60c -0.0005 8016.60c -0.18
        12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
        16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
        26054.60c -4.073938-2 26056.60c -0.6625828
        26057.60c -1.558362-2 26058.60c -2.094288-3

mt13     lwtr.01t
e0      5-7 1.0 30.0
f105:n  298.958      0.0 0.0 0.0
fm105   5.701+10
f115:n  725.0      0.0 0.0 0.0
fm115   5.701+10
f125:n  298.958    152.4 0.0 0.0
fm125   5.701+10
f135:n  298.958    304.8 0.0 0.0
fm135   5.701+10
f145:n  298.958    609.6 0.0 0.0
fm145   5.701+10
f155:n  298.958      0.0 374.0 0.0
fm155   5.701+10
f165:n  298.958      0.0 480.0 0.0
fm165   5.701+10
f175:n  298.958      0.0 480.0 0.0
de175   2.07002-7 7.69672-7 1.75386-6 3.71293-6
        7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
        2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
        2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
        7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
        2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
        7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
        2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
        3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
        8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
        2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
        4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
        1.11070+1 1.35661+1
df175   3.70370-3 4.37060-3 4.52500-3 4.57410-3
        4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
        4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
        3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
        3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
        7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
        1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
        4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
        6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
        1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
        1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1

```

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1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm175 5.701+10
f185:n 298.958 0.0 0.0 0.0
de185 1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
1.0-9 5.0-9 1.0-8 2.53-8 5.0-8 1.0-7 5.0-7
5.00001-7 20.0
df185 159.0597 71.1337 50.2991 22.4944 15.906 7.11337
5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
1.0-15 1.0-15
fm185 5.701+10
f195:n 725.0 0.0 0.0 0.0
de195 1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
1.0-9 5.0-9 1.0-8 2.53-8 5.0-8 1.0-7 5.0-7
5.00001-7 20.0
df195 159.0597 71.1337 50.2991 22.4944 15.906 7.11337
5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
1.0-15 1.0-15
fm195 5.701+10
f205:n 298.958 152.4 0.0 0.0
de205 1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
1.0-9 5.0-9 1.0-8 2.53-8 5.0-8 1.0-7 5.0-7
5.00001-7 20.0
df205 159.0597 71.1337 50.2991 22.4944 15.906 7.11337
5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
1.0-15 1.0-15
fm205 5.701+10
f215:n 298.958 304.8 0.0 0.0
de215 1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
1.0-9 5.0-9 1.0-8 2.53-8 5.0-8 1.0-7 5.0-7
5.00001-7 20.0
df215 159.0597 71.1337 50.2991 22.4944 15.906 7.11337
5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
1.0-15 1.0-15
fm215 5.701+10
f225:n 298.958 609.6 0.0 0.0
de225 1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
1.0-9 5.0-9 1.0-8 2.53-8 5.0-8 1.0-7 5.0-7
5.00001-7 20.0
df225 159.0597 71.1337 50.2991 22.4944 15.906 7.11337
5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
1.0-15 1.0-15
fm225 5.701+10
f235:n 298.958 0.0 374.0 0.0
de235 1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
1.0-9 5.0-9 1.0-8 2.53-8 5.0-8 1.0-7 5.0-7
5.00001-7 20.0
df235 159.0597 71.1337 50.2991 22.4944 15.906 7.11337
5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
1.0-15 1.0-15
fm235 5.701+10
sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2
si1 s 11 12 13 14 15 16
sp1 1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
si11 h -1.0 -0.7071067
si12 h -0.7071067 0.0
si13 h 0.0 0.5
si14 h 0.5 0.8660254
si15 h 0.8660254 0.9961946
si16 h 0.9961946 1.0
sp11 0 1
sp12 0 1
sp13 0 1
sp14 0 1
sp15 0 1
sp16 0 1
ds2 s 21 22 23 24 25 26
si21 h 1.8245 1.9295
si22 h 1.9295 3.7645
si23 h 3.7645 5.675
si24 h 5.675 7.3865
si25 h 7.3865 8.321

```

si26 h 8.321 8.753
sp21 0 1
sp22 0 1
sp23 0 1
sp24 0 1
sp25 0 1
sp26 0 1
nps 2000000
prdmp 2j 1
print

File for MCNP-4B calculation of ORIGEN neutron spectra at selected points
 and dose rates near the roof of the PFNA facility for the source in the
 maximum up position

message: outp=pfna26.o mctal=pfna26.m

```

mcnp file for PFNA facility -- fluxes at selected locations
c source in nominal maximum upward position (34.8 deg.) of the
c movable vertical collimator. check sdef, cells 3-6, surfaces
c 401 and 503-505, and the sign on surface 505.
c
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
   #(131 -164 +258 -297 +307 -321)
3 1 0.10549 -400 -401 +505 +224 -227 #(503 -504)
4 1 0.10549 -401 +400 +505 +225 -226 #(503 -504)
5 0 142 -127 +223 -228 +308 -304
   #(-400 -401 +505 +224 -227) #(+137 -102 +310)
   #(-401 +400 +505 +225 -226)
6 0 127 -124 +501 -502 +308 -304
   #(-401 +400 +505 +225 -226)
7 0 124 -126 +254 -255 +308 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
   #(+102 -127 +223 -228) #(+127 -124 +501 -502)
   #(+124 +254 -255) #(+129 -252) #(+129 +257)
9 1 0.10549 102 -124 +222 -229 +301 -304
   #(+129 -252) #(+129 +257)
   #(127 +501 -502) #(-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
   #(221 -230)
   #(103 -104 +217 -234)
   #(104 -105 +216 -235)
   #(105 -107 +219 -232)
   #(107 -108 +219 -220) #(107 -108 +231 -232)
   #(106 -109 +212 -218) #(106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
   #(221 -230)
   #(109 -110 +211 -237)
   #(110 -111 +210 -238)
   #(111 -112 +209 -239)
   #(112 -113 +208 -240)
   #(113 -114 +207 -241)
   #(114 -115 +206 -242)
   #(115 -116 +205 -243)
   #(116 -117 +204 -244)
   #(117 -118 +203 -245)
   #(118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
   #(-124 +214 -247) #(124 +253 -256)
   #(122 +248) #(122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
   #(221 -230) #(104 -220) #(104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
   #(103 -120 202 -221 302 -303)

```

```

#(120 -123 215 -221 302 -303)
#(121 -214)
29 4 5.977931-2 102 -124 +229 -250 +301 -304
#(103 -120 230 -249 302 -303)
#(120 -123 230 -246 302 -303)
#(121 +247)
30 4 5.977931-2 124 -126 +252 -254 +301 -304
#(-125 +213 -253)
31 4 5.977931-2 124 -126 +255 -257 +301 -304
#(-125 +256 -248)
32 0 +167 -168 +274 -281 +317 -318
33 0 +165 -166 +270 -285 +308 -310
#(+167 -168 +274 -281 +317 -318)
34 0 -400 +505 +224 -227 +503 -504
35 0 -401 +400 +505 +225 -226 +503 -504
36 4 5.977931-2 122 -124 +201 -250 +301 -304
#(213 -248)
#(129 -252)
#(129 +257)
37 9 -2.0 +131 -164 +258 -297 +307 -308
38 11 -1.0 +131 -164 +258 -297 +308 -320
#(+132 -163 +259 -296)
39 12 -7.86 +131 -164 +258 -297 +320 -321
40 0 +132 -163 +259 -296 +319 -320
#(+151 -169 +271 -284 +304 -315)
#(+151 -160 +270 -271 +312 -314)
#(+151 -160 +284 -285 +312 -314)
#(+157 -159 +274 -281 +313 -315)
#(+158 -160 +274 -281 -313)
#(+169 -157 +274 -281 +314 -316)
41 1 0.10549 +151 -169 +271 -284 +304 -315
42 1 0.10549 +151 -160 +270 -271 +312 -314
43 1 0.10549 +151 -160 +284 -285 +312 -314
44 1 0.10549 +157 -159 +274 -281 +313 -315
45 1 0.10549 +158 -160 +274 -281 +308 -313
46 1 0.10549 +169 -157 +274 -281 +314 -316
47 9 -2.0 +160 -162 +273 -282 +308 -319
48 10 -2.0 +154 -161 +265 -289 +308 -319
#47 #(-160 +267 -286)
49 0 +154 -160 +267 -286 +308 -319 #42 #43 #45
50 10 -2.0 +155 -156 +259 -260 +308 -319
51 10 -2.0 +155 -156 +295 -296 +308 -319
52 10 -2.0 +154 -155 +259 -296 +308 -319
#(+265 -289)
53 0 +155 -163 +259 -296 +308 -319 #50 #51
#(-161 +265 -289) #(+161 -162 +273 -282)
54 10 -2.0 +153 -154 +295 -296 +308 -319
55 10 -2.0 +151 -126 +295 -296 +308 -319
56 10 -2.0 +151 -126 +259 -260 +308 -319
57 10 -2.0 +153 -154 +259 -260 +308 -319
58 10 -2.0 +151 -152 +266 -272 +308 -304
59 10 -2.0 +151 -152 +283 -287 +308 -304
60 0 +151 -154 +259 -296 +308 -319
#41 #42 #43 #54 #55 #56 #57 #58 #59
#(+165 -166 +270 -285 +308 -310)
#(-126 +201 -250 -304)
61 1 0.10549 +149 -151 +272 -201 +308 -304
62 1 0.10549 +149 -151 +250 -283 +308 -304
63 9 -2.0 +149 -151 +264 -290 +308 -319
#(+272 -283)
64 10 -2.0 +149 -151 +259 -296 +308 -319
#(+264 -290)
65 10 -2.0 +146 -149 +295 -296 +308 -319
66 0 +132 -149 +259 -296 +308 -319
#65 #(+133 -294)
67 10 -2.0 +133 -149 +259 -294 +308 -319
#(+142 -260 -322) #(+134 +260 -298)
68 10 -2.0 +135 -149 +261 -262 +308 -319
69 10 -2.0 +135 -136 +262 -263 +308 -319
70 0 +137 -149 +268 -293 +308 -311
#(-138 -290 -310) #(-102 +310)
#(+138 +269 -290 -310) #(+144 +290 -292 -310)

```

```

#(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71 1 0.10549 +137 -138 +268 -290 +308 -310
72 1 0.10549 +138 -149 +269 -272 +308 -310
73 1 0.10549 +138 -149 +288 -290 +308 -310 #(+140 -141)
74 0 +140 -141 +288 -290 +308 -310
75 1 0.10549 +144 -149 +290 -292 +308 -310
76 1 0.10549 +139 -144 +291 -293 +308 -310
77 2 0.1187956 +137 -102 +268 -293 +310 -311
78 0 +138 -149 +272 -288 +308 -310
#(+102 +201 -250 +309 -304)
#(+143 -102 +275 -276 +301)
#(+143 -102 +279 -280 +301)
#(+147 -102 +276 -277 +301)
#(+147 -102 +278 -279 +301)
#(+142 +223 -228) #(+145 +201 -250 -309)
79 1 0.10549 +143 -102 +275 -276 +301 -310
80 1 0.10549 +143 -102 +279 -280 +301 -310
81 1 0.10549 +147 -102 +276 -277 +301 -310
82 1 0.10549 +147 -102 +278 -279 +301 -310
83 0 +142 -149 +259 -260 +308 -322
84 0 +134 -149 +260 -298 +308 -319
#68 #69 #(+137 -149 +268 -293 +308 -311)
#(+102 +201 -250 -304) #(+142 +223 -228 -304)
85 9 -2.0 +145 -126 +201 -250 +308 -309
#(+145 -127 +223 -228) #(+127 -124 +501 -502)
#(+129 -252) #(+129 +257) #(+124 +254 -255)
86 0 +129 -126 +201 -250 +308 -304
#(+252 -257)
87 0 +102 -126 +201 -250 +309 -306
#(+102 -127 +223 -228) #(+127 -124 +501 -502)
#(+129 -252) #(+129 +257) #(+124 +254 -255)
88 0 +149 -151 +272 -283 +304 -319

```

c end cells

```

c
c surfaces
100 px -1000.0
c 101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 1200.0
129 px 87.9856
131 px -844.042
132 px -823.722
133 px -767.842
134 px -706.882
135 px -548.962
136 px -493.522

```


137	px	-381.762
138	px	-320.802
139	px	-315.722
140	px	-173.482
141	px	-107.442
142	px	-82.042
143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058

239	py	39.4758
240	py	40.7458
241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258
245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225

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312 pz 283.845
313 pz 342.265
314 pz 375.285
315 pz 390.525
316 pz 395.605
317 pz -50.0
318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y -28.60131 124.1738 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p -0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p -0.60029580 0.0 1.0 137.6099
504 p -0.79896920 0.0 1.0 151.1223
505 p 1.43881100 0.0 1.0 83.0219

c end surfaces
mode n
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529

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11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]
m11 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt11 lwtr.01t
c m12=iron at 7.86 g/cc
m12 26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
26058.60c 0.0028
c m13=Heavy concrete at 4.2 g/cc [wt %]
m13 1001.60c -0.0005 8016.60c -0.18
12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
26054.60c -4.073938-2 26056.60c -0.6625828
26057.60c -1.558362-2 26058.60c -2.094288-3
mt13 lwtr.01t
e0 5-7 1.0 30.0
f105:n 298.958 0.0 0.0 0.0
fm105 5.701+10
f115:n 725.0 0.0 0.0 0.0
fm115 5.701+10
f125:n 298.958 152.4 0.0 0.0
fm125 5.701+10
f135:n 298.958 304.8 0.0 0.0
fm135 5.701+10
f145:n 298.958 609.6 0.0 0.0
fm145 5.701+10
f155:n 298.958 0.0 374.0 0.0
fm155 5.701+10
f165:n 298.958 0.0 480.0 0.0
fm165 5.701+10
f175:n 298.958 0.0 480.0 0.0
del175 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df175 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
5.701+10
fm175 298.958 0.0 0.0 0.0
f185:n 1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
del185 1.0-9 5.0-9 1.0-8 2.53-8 5.0-8 1.0-7 5.0-7
5.00001-7 20.0
df185 159.0597 71.1337 50.2991 22.4944 15.906 7.11337
5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
1.0-15 1.0-15

```

```

fm185      5.701+10
f195:n    725.0      0.0  0.0  0.0
de195     1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
          1.0-9  5.0-9  1.0-8  2.53-8 5.0-8  1.0-7  5.0-7
          5.00001-7 20.0
df195     159.0597 71.1337 50.2991 22.4944 15.906 7.11337
          5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
          1.0-15 1.0-15
fm195     5.701+10
f205:n    298.958   152.4  0.0  0.0
de205     1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
          1.0-9  5.0-9  1.0-8  2.53-8 5.0-8  1.0-7  5.0-7
          5.00001-7 20.0
df205     159.0597 71.1337 50.2991 22.4944 15.906 7.11337
          5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
          1.0-15 1.0-15
fm205     5.701+10
f215:n    298.958   304.8  0.0  0.0
de215     1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
          1.0-9  5.0-9  1.0-8  2.53-8 5.0-8  1.0-7  5.0-7
          5.00001-7 20.0
df215     159.0597 71.1337 50.2991 22.4944 15.906 7.11337
          5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
          1.0-15 1.0-15
fm215     5.701+10
f225:n    298.958   609.6  0.0  0.0
de225     1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
          1.0-9  5.0-9  1.0-8  2.53-8 5.0-8  1.0-7  5.0-7
          5.00001-7 20.0
df225     159.0597 71.1337 50.2991 22.4944 15.906 7.11337
          5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
          1.0-15 1.0-15
fm225     5.701+10
f235:n    298.958      0.0  374.0  0.0
de235     1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
          1.0-9  5.0-9  1.0-8  2.53-8 5.0-8  1.0-7  5.0-7
          5.00001-7 20.0
df235     159.0597 71.1337 50.2991 22.4944 15.906 7.11337
          5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
          1.0-15 1.0-15
fm235     5.701+10
sdef      pos=-37.0693 0 118.288 dir=d1 erg=fdir=d2
          vec=0.821149209 0.0 0.570713568
si1       s  11 12 13 14 15 16
spl       1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
si11      h -1.0 -0.7071067
si12      h -0.7071067 0.0
si13      h 0.0 0.5
si14      h 0.5 0.8660254
si15      h 0.8660254 0.9961946
si16      h 0.9961946 1.0
sp11      0 1
sp12      0 1
sp13      0 1
sp14      0 1
sp15      0 1
sp16      0 1
ds2       s  21 22 23 24 25 26
si21      h 1.8245 1.9295
si22      h 1.9295 3.7645
si23      h 3.7645 5.675
si24      h 5.675 7.3865
si25      h 7.3865 8.321
si26      h 8.321 8.753
sp21      0 1
sp22      0 1
sp23      0 1
sp24      0 1
sp25      0 1
sp26      0 1
nps       2000000
prdmp     2j 1

```

print

File for MCNP-4B calculation of ORIGEN neutron spectra at selected points
 and dose rates near the roof of the PFNA facility for the source in the
 maximum down position

message: outp=pfna27.o mctal=pfna27.m

```

mcnp file for PFNA facility -- fluxes at selected locations
c source in nominal minimum downward position (-8.6 deg.) of the
c movable vertical collimator. check sdef, cells 3-6, surfaces
c 401 and 503-505, and the sign on surface 505.
c
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
   # (131 -164 +258 -297 +307 -321)
3 1 0.10549 -400 -401 -505 +224 -227 # (503 -504)
4 1 0.10549 -401 +400 -505 +225 -226 # (503 -504)
5 0 142 -127 +223 -228 +308 -304
   # (-400 -401 -505 +224 -227) # (+137 -102 +310)
   # (-401 +400 -505 +225 -226)
6 0 127 -124 +501 -502 +308 -304
   # (-401 +400 -505 +225 -226)
7 0 124 -126 +254 -255 +308 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
   # (+102 -127 +223 -228) # (+127 -124 +501 -502)
   # (+124 +254 -255) # (+129 -252) # (+129 +257)
9 1 0.10549 102 -124 +222 -229 +301 -304
   # (+129 -252) # (+129 +257)
   # (127 +501 -502) # (-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 # (218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 # (221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 # (221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 # (221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 # (221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 # (221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 # (221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 # (221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 # (221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 # (221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 # (221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 # (221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
   # (221 -230)
   # (103 -104 +217 -234)
   # (104 -105 +216 -235)
   # (105 -107 +219 -232)
   # (107 -108 +219 -220) # (107 -108 +231 -232)
   # (106 -109 +212 -218) # (106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
   # (221 -230)
   # (109 -110 +211 -237)
   # (110 -111 +210 -238)
   # (111 -112 +209 -239)
   # (112 -113 +208 -240)
   # (113 -114 +207 -241)
   # (114 -115 +206 -242)
   # (115 -116 +205 -243)
   # (116 -117 +204 -244)
   # (117 -118 +203 -245)
   # (118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
   # (-124 +214 -247) # (124 +253 -256)
   # (122 +248) # (122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
   # (221 -230) # (104 -220) # (104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 # (105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 # (105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
   # (103 -120 202 -221 302 -303)

```

			#(120 -123 215 -221 302 -303)
			#(121 -214)
29	4	5.977931-2	102 -124 +229 -250 +301 -304
			#(103 -120 230 -249 302 -303)
			#(120 -123 230 -246 302 -303)
			#(121 +247)
30	4	5.977931-2	124 -126 +252 -254 +301 -304
			#(-125 +213 -253)
31	4	5.977931-2	124 -126 +255 -257 +301 -304
			#(-125 +256 -248)
32	0		+167 -168 +274 -281 +317 -318
33	0		+165 -166 +270 -285 +308 -310
			#(+167 -168 +274 -281 +317 -318)
34	0		-400 -505 +224 -227 +503 -504
35	0		-401 +400 -505 +225 -226 +503 -504
36	4	5.977931-2	122 -124 +201 -250 +301 -304
			#(213 -248)
			#(129 -252)
			#(129 +257)
37	9	-2.0	+131 -164 +258 -297 +307 -308
38	11	-1.0	+131 -164 +258 -297 +308 -320
			#(+132 -163 +259 -296)
39	12	-7.86	+131 -164 +258 -297 +320 -321
40	0		+132 -163 +259 -296 +319 -320
			#(+151 -169 +271 -284 +304 -315)
			#(+151 -160 +270 -271 +312 -314)
			#(+151 -160 +284 -285 +312 -314)
			#(+157 -159 +274 -281 +313 -315)
			#(+158 -160 +274 -281 -313)
			#(+169 -157 +274 -281 +314 -316)
41	1	0.10549	+151 -169 +271 -284 +304 -315
42	1	0.10549	+151 -160 +270 -271 +312 -314
43	1	0.10549	+151 -160 +284 -285 +312 -314
44	1	0.10549	+157 -159 +274 -281 +313 -315
45	1	0.10549	+158 -160 +274 -281 +308 -313
46	1	0.10549	+169 -157 +274 -281 +314 -316
47	9	-2.0	+160 -162 +273 -282 +308 -319
48	10	-2.0	+154 -161 +265 -289 +308 -319
			#47 #(-160 +267 -286)
			+154 -160 +267 -286 +308 -319 #42 #43 #45
49	0		+155 -156 +259 -260 +308 -319
50	10	-2.0	+155 -156 +295 -296 +308 -319
51	10	-2.0	+155 -156 +295 -296 +308 -319
52	10	-2.0	+154 -155 +259 -296 +308 -319
			#(+265 -289)
53	0		+155 -163 +259 -296 +308 -319 #50 #51
			#(-161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0	+153 -154 +295 -296 +308 -319
55	10	-2.0	+151 -126 +295 -296 +308 -319
56	10	-2.0	+151 -126 +259 -260 +308 -319
57	10	-2.0	+153 -154 +259 -260 +308 -319
58	10	-2.0	+151 -152 +266 -272 +308 -304
59	10	-2.0	+151 -152 +283 -287 +308 -304
60	0		+151 -154 +259 -296 +308 -319
			#41 #42 #43 #54 #55 #56 #57 #58 #59
			#(+165 -166 +270 -285 +308 -310)
			#(-126 +201 -250 -304)
61	1	0.10549	+149 -151 +272 -201 +308 -304
62	1	0.10549	+149 -151 +250 -283 +308 -304
63	9	-2.0	+149 -151 +264 -290 +308 -319
			#(+272 -283)
64	10	-2.0	+149 -151 +259 -296 +308 -319
			#(+264 -290)
65	10	-2.0	+146 -149 +295 -296 +308 -319
66	0		+132 -149 +259 -296 +308 -319
			#65 #(+133 -294)
67	10	-2.0	+133 -149 +259 -294 +308 -319
			#(+142 -260 -322) #(+134 +260 -298)
68	10	-2.0	+135 -149 +261 -262 +308 -319
69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311
			#(-138 -290 -310) #(-102 +310)
			#(+138 +269 -290 -310) #(+144 +290 -292 -310)


```

71 1 0.10549 #(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
72 1 0.10549 +137 -138 +268 -290 +308 -310
73 1 0.10549 +138 -149 +269 -272 +308 -310
74 0 +138 -149 +288 -290 +308 -310 #(+140 -141)
75 1 0.10549 +140 -141 +288 -290 +308 -310
76 1 0.10549 +144 -149 +290 -292 +308 -310
77 2 0.1187956 +139 -144 +291 -293 +308 -310
78 0 +137 -102 +268 -293 +310 -311
    +138 -149 +272 -288 +308 -310
    #(+102 +201 -250 +309 -304)
    #(+143 -102 +275 -276 +301)
    #(+143 -102 +279 -280 +301)
    #(+147 -102 +276 -277 +301)
    #(+147 -102 +278 -279 +301)
    #(+142 +223 -228) #(+145 +201 -250 -309)
79 1 0.10549 +143 -102 +275 -276 +301 -310
80 1 0.10549 +143 -102 +279 -280 +301 -310
81 1 0.10549 +147 -102 +276 -277 +301 -310
82 1 0.10549 +147 -102 +278 -279 +301 -310
83 0 +142 -149 +259 -260 +308 -322
84 0 +134 -149 +260 -298 +308 -319
    #68 #69 #(+137 -149 +268 -293 +308 -311)
    #(+102 +201 -250 -304) #(+142 +223 -228 -304)
85 9 -2.0 +145 -126 +201 -250 +308 -309
    #(+145 -127 +223 -228) #(+127 -124 +501 -502)
    #(+129 -252) #(+129 +257) #(+124 +254 -255)
86 0 +129 -126 +201 -250 +308 -304
    #(+252 -257)
87 0 +102 -126 +201 -250 +309 -306
    #(+102 -127 +223 -228) #(+127 -124 +501 -502)
    #(+129 -252) #(+129 +257) #(+124 +254 -255)
88 0 +149 -151 +272 -283 +304 -319

```

c end cells

c

c surfaces

```

100 px -1000.0
c 101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 1200.0
129 px 87.9856
131 px -844.042
132 px -823.722
133 px -767.842
134 px -706.882
135 px -548.962
136 px -493.522

```

137	px	-381.762
138	px	-320.802
139	px	-315.722
140	px	-173.482
141	px	-107.442
142	px	-82.042
143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058

239	py	39.4758
240	py	40.7458
241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258
245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848

254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225
312	pz	283.845
313	pz	342.265
314	pz	375.285
315	pz	390.525
316	pz	395.605
317	pz	-50.0
318	pz	50.0
319	pz	301.625
320	pz	484.505
321	pz	484.823
322	pz	118.745
c	Mobile Vertical collimator cylinders	
400	c/y	-207.264 0.0 249.7884
401	c/y	7.866053 -32.53536 59.9948
c	Target concentric spheres	

```

402  sx  292.2524  5.0
403  sx  292.2524  6.38
c    Stationary collimator planes
501  p    0.05557761  1.0  0.0 -1.613162
502  p   -0.05557761  1.0  0.0  1.613162
c    Mobile Vertical collimator planes
503  p    0.22029930  0.0  1.0 -34.07997
504  p    0.08355454  0.0  1.0 -28.66622
505  p   -6.61219100  0.0  1.0 -84.54721

c    end surfaces
mode n
imp:n,p 0 1 86r
c    m1=borated polyethylene (Asum=0.10549)
m1   1001.60c  6.5800-2  5010.60c  5.1940-4  5011.60c  2.1306-3
      6000.60c  2.9100-2  8016.60c  7.9400-3
mt1  poly.01t
c    m2=borated paraffin (Asum=0.1187956)
m2   1001.60c  7.8350-2  5010.60c  4.3426-4  5011.60c  1.78134-3
      6000.60c  3.8230-2
mt2  poly.01t
c    m3=Lead (Asum=3.284-2)
m3   82206.60c  8.3742-3  82207.60c  7.25764-3  82208.60c  1.720816-2
c    m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4   12000.60c  6.6890-4  13027.60c  5.8270-2  14000.60c  3.4740-4
      22000.60c  5.0930-5  24050.60c  2.7230-6  24052.60c  5.2444-5
      24053.60c  5.9460-6  24054.60c  1.4770-6  26054.60c  1.1920-5
      26056.60c  1.8699-4  26057.60c  4.3210-6  26058.60c  5.7060-7
      29063.60c  9.08133-5  29065.60c  4.04767-5  25055.60c  4.4400-5
c    m5=Steel (Asum=8.734441-2)
m5   26054.60c  3.2367-3  26056.60c  5.07622-2  26057.60c  1.1729-3
      26058.60c  1.5490-4  24050.60c  7.9660-4  24052.60c  1.53441-2
      24053.60c  1.7397-3  24054.60c  4.3220-4  28058.60c  6.62295-3
      28060.60c  2.55073-3  28061.60c  1.1090-4  28062.60c  3.5313-4
      28064.60c  9.0460-5  6000.60c  3.16929-4  14000.60c  1.27063-3
      25055.60c  1.73219-3  15031.60c  6.91287-5  16032.60c  4.4516-5
      7014.60c  5.43529-4
c    m6=Plutonium (Asum=4.029014-2)
m6   94239.60c  3.7047-2  94240.60c  1.7512-3  94241.60c  1.1674-4
      31000.60c  1.3752-3
c    m7=Tungsten (Asum=6.605306-2)
m7   28058.60c  6.6122-3  28060.60c  2.54659-3  28061.60c  1.10721-4
      28062.60c  3.5256-4  28064.60c  9.0325-5  29063.60c  2.82034-3
      29065.60c  1.25706-3  40000.60c  7.9528-4  74182.60c  1.369975-2
      74183.60c  7.36713-3  74184.60c  1.577082-2  74186.60c  1.463029-2
c    m8=water (Asum=0.100149)
m8   1001.60c  6.6766-2  8016.60c  3.3383-2
mt8  lwtr.01t
c    m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9   1001.60c  -0.01  6000.60c  -0.001  8016.60c  -0.529
      11023.60c  -0.016  12000.60c  -0.002  13027.60c  -0.034
      14000.60c  -0.337  19000.60c  -0.013  20000.60c  -0.044
      26054.60c  -7.91056-4  26056.60c  -1.286568-2
      26057.60c  -3.025946-4  26058.60c  -4.06658-5
mt9  lwtr.01t
c    m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10  1001.60c  -0.01  6000.60c  -0.001  8016.60c  -0.529
      11023.60c  -0.016  12000.60c  -0.002  13027.60c  -0.034
      14000.60c  -0.337  19000.60c  -0.013  20000.60c  -0.044
      26054.60c  -7.91056-4  26056.60c  -1.286568-2
      26057.60c  -3.025946-4  26058.60c  -4.06658-5
mt10 lwtr.01t
c    m11=concrete at 1.0 g/cc (Masonry Block) [wt %]
m11  1001.60c  -0.01  6000.60c  -0.001  8016.60c  -0.529
      11023.60c  -0.016  12000.60c  -0.002  13027.60c  -0.034
      14000.60c  -0.337  19000.60c  -0.013  20000.60c  -0.044
      26054.60c  -7.91056-4  26056.60c  -1.286568-2
      26057.60c  -3.025946-4  26058.60c  -4.06658-5
mt11 lwtr.01t
c    m12=iron at 7.86 g/cc
m12  26054.60c  0.0585  26056.60c  0.9175  26057.60c  0.0212
      26058.60c  0.0028

```

```

c      ml3=Heavy concrete at 4.2 g/cc [wt %]
ml3   1001.60c -0.0005 8016.60c -0.18
      12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
      16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
      26054.60c -4.073938-2 26056.60c -0.6625828
      26057.60c -1.558362-2 26058.60c -2.094288-3
mt13  lwtr.01t
e0     5-7 1.0 30.0
f105:n 298.958      0.0 0.0 0.0
fm105  5.701+10
f115:n 725.0       0.0 0.0 0.0
fm115  5.701+10
f125:n 298.958    152.4 0.0 0.0
fm125  5.701+10
f135:n 298.958    304.8 0.0 0.0
fm135  5.701+10
f145:n 298.958    609.6 0.0 0.0
fm145  5.701+10
f155:n 298.958      0.0 374.0 0.0
fm155  5.701+10
f165:n 298.958      0.0 480.0 0.0
fm165  5.701+10
f175:n 298.958      0.0 480.0 0.0
de175  2.07002-7 7.69672-7 1.75386-6 3.71293-6
      7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
      2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
      2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
      7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
      2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
      7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
      2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
      3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
      8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
      2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
      4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
      1.11070+1 1.35661+1
df175  3.70370-3 4.37060-3 4.52500-3 4.57410-3
      4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
      4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
      3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
      3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
      7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
      1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
      4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
      6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
      1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
      1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
      1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
      1.63200-1 2.00340-1
fm175  5.701+10
f185:n 298.958      0.0 0.0 0.0
de185  1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
      1.0-9 5.0-9 1.0-8 2.53-8 5.0-8 1.0-7 5.0-7
      5.00001-7 20.0
df185  159.0597 71.1337 50.2991 22.4944 15.906 7.11337
      5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
      1.0-15 1.0-15
fm185  5.701+10
f195:n 725.0       0.0 0.0 0.0
de195  1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
      1.0-9 5.0-9 1.0-8 2.53-8 5.0-8 1.0-7 5.0-7
      5.00001-7 20.0
df195  159.0597 71.1337 50.2991 22.4944 15.906 7.11337
      5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
      1.0-15 1.0-15
fm195  5.701+10
f205:n 298.958    152.4 0.0 0.0
de205  1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
      1.0-9 5.0-9 1.0-8 2.53-8 5.0-8 1.0-7 5.0-7
      5.00001-7 20.0
df205  159.0597 71.1337 50.2991 22.4944 15.906 7.11337
      5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944

```

```

1.0-15 1.0-15
fm205 5.701+10
f215:n 298.958 304.8 0.0 0.0
de215 1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
1.0-9 5.0-9 1.0-8 2.53-8 5.0-8 1.0-7 5.0-7
5.00001-7 20.0
df215 159.0597 71.1337 50.2991 22.4944 15.906 7.11337
5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
1.0-15 1.0-15
5.701+10
fm215 5.701+10
f225:n 298.958 609.6 0.0 0.0
de225 1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
1.0-9 5.0-9 1.0-8 2.53-8 5.0-8 1.0-7 5.0-7
5.00001-7 20.0
df225 159.0597 71.1337 50.2991 22.4944 15.906 7.11337
5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
1.0-15 1.0-15
5.701+10
fm225 5.701+10
f235:n 298.958 0.0 374.0 0.0
de235 1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
1.0-9 5.0-9 1.0-8 2.53-8 5.0-8 1.0-7 5.0-7
5.00001-7 20.0
df235 159.0597 71.1337 50.2991 22.4944 15.906 7.11337
5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
1.0-15 1.0-15
5.701+10
fm235 5.701+10
sdef pos=-2.3304 0 -30.993 dir=d1 erg=fdir=d2
vec=0.988756381 0.0 -0.149535343
si1 s 11 12 13 14 15 16
sp1 1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
si11 h -1.0 -0.7071067
si12 h -0.7071067 0.0
si13 h 0.0 0.5
si14 h 0.5 0.8660254
si15 h 0.8660254 0.9961946
si16 h 0.9961946 1.0
sp11 0 1
sp12 0 1
sp13 0 1
sp14 0 1
sp15 0 1
sp16 0 1
ds2 s 21 22 23 24 25 26
si21 h 1.8245 1.9295
si22 h 1.9295 3.7645
si23 h 3.7645 5.675
si24 h 5.675 7.3865
si25 h 7.3865 8.321
si26 h 8.321 8.753
sp21 0 1
sp22 0 1
sp23 0 1
sp24 0 1
sp25 0 1
sp26 0 1
nps 2000000
prdump 2j 1
print

```

File for MCNP-4B calculation of the dose rate in the PFNA beam and across the truck lane and ORIGEN neutron spectra within the stationary collimator for the source in the maximum down position

message: outp=pfna32.o mctal=pfna32.m

```

mcnp file for PFNA facility -- dose rates at selected locations
c source in nominal minimum downward position (-8.6 deg.) of the
c movable vertical collimator. check sdef, cells 3-6, surfaces
c 401 and 503-505, and the sign on surface 505.
c
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
   # (131 -164 +258 -297 +307 -321)
3 1 0.10549 -400 -401 -505 +224 -227 # (503 -504)
4 1 0.10549 -401 +400 -505 +225 -226 # (503 -504)
5 0 142 -127 +223 -228 +308 -304
   # (-400 -401 -505 +224 -227) # (+137 -102 +310)
   # (-401 +400 -505 +225 -226)
6 0 127 -124 +501 -502 +308 -304
   # (-401 +400 -505 +225 -226)
7 0 124 -126 +254 -255 +308 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
   # (+102 -127 +223 -228) # (+127 -124 +501 -502)
   # (+124 +254 -255) # (+129 -252) # (+129 +257)
9 1 0.10549 102 -124 +222 -229 +301 -304
   # (+129 -252) # (+129 +257)
   # (127 +501 -502) # (-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 # (218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 # (221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 # (221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 # (221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 # (221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 # (221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 # (221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 # (221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 # (221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 # (221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 # (221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 # (221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
   # (221 -230)
   # (103 -104 +217 -234)
   # (104 -105 +216 -235)
   # (105 -107 +219 -232)
   # (107 -108 +219 -220) # (107 -108 +231 -232)
   # (106 -109 +212 -218) # (106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
   # (221 -230)
   # (109 -110 +211 -237)
   # (110 -111 +210 -238)
   # (111 -112 +209 -239)
   # (112 -113 +208 -240)
   # (113 -114 +207 -241)
   # (114 -115 +206 -242)
   # (115 -116 +205 -243)
   # (116 -117 +204 -244)
   # (117 -118 +203 -245)
   # (118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
   # (-124 +214 -247) # (124 +253 -256)
   # (122 +248) # (122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
   # (221 -230) # (104 -220) # (104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 # (105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 # (105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
   # (103 -120 202 -221 302 -303)

```



```

#(120 -123 215 -221 302 -303)
#(121 -214)
29 4 5.977931-2 102 -124 +229 -250 +301 -304
#(103 -120 230 -249 302 -303)
#(120 -123 230 -246 302 -303)
#(121 +247)
30 4 5.977931-2 124 -126 +252 -254 +301 -304
#(-125 +213 -253)
31 4 5.977931-2 124 -126 +255 -257 +301 -304
#(-125 +256 -248)
32 0 +167 -168 +274 -281 +317 -318
33 0 +165 -166 +270 -285 +308 -310
#(+167 -168 +274 -281 +317 -318)
34 0 -400 -505 +224 -227 +503 -504
35 0 -401 +400 -505 +225 -226 +503 -504
36 4 5.977931-2 122 -124 +201 -250 +301 -304
#(213 -248)
#(129 -252)
#(129 +257)
37 9 -2.0 +131 -164 +258 -297 +307 -308
38 11 -1.0 +131 -164 +258 -297 +308 -320
#(+132 -163 +259 -296)
39 12 -7.86 +131 -164 +258 -297 +320 -321
40 0 +132 -163 +259 -296 +319 -320
#(+151 -169 +271 -284 +304 -315)
#(+151 -160 +270 -271 +312 -314)
#(+151 -160 +284 -285 +312 -314)
#(+157 -159 +274 -281 +313 -315)
#(+158 -160 +274 -281 -313)
#(+169 -157 +274 -281 +314 -316)
41 1 0.10549 +151 -169 +271 -284 +304 -315
42 1 0.10549 +151 -160 +270 -271 +312 -314
43 1 0.10549 +151 -160 +284 -285 +312 -314
44 1 0.10549 +157 -159 +274 -281 +313 -315
45 1 0.10549 +158 -160 +274 -281 +308 -313
46 1 0.10549 +169 -157 +274 -281 +314 -316
47 9 -2.0 +160 -162 +273 -282 +308 -319
48 10 -2.0 +154 -161 +265 -289 +308 -319
#47 #(-160 +267 -286)
49 0 +154 -160 +267 -286 +308 -319 #42 #43 #45
50 10 -2.0 +155 -156 +259 -260 +308 -319
51 10 -2.0 +155 -156 +295 -296 +308 -319
52 10 -2.0 +154 -155 +259 -296 +308 -319
#(+265 -289)
53 0 +155 -163 +259 -296 +308 -319 #50 #51
#(-161 +265 -289) #(+161 -162 +273 -282)
54 10 -2.0 +153 -154 +295 -296 +308 -319
55 10 -2.0 +151 -126 +295 -296 +308 -319
56 10 -2.0 +151 -126 +259 -260 +308 -319
57 10 -2.0 +153 -154 +259 -260 +308 -319
58 10 -2.0 +151 -152 +266 -272 +308 -304
59 10 -2.0 +151 -152 +283 -287 +308 -304
60 0 +151 -154 +259 -296 +308 -319
#41 #42 #43 #54 #55 #56 #57 #58 #59
#(+165 -166 +270 -285 +308 -310)
#(-126 +201 -250 -304)
61 1 0.10549 +149 -151 +272 -201 +308 -304
62 1 0.10549 +149 -151 +250 -283 +308 -304
63 9 -2.0 +149 -151 +264 -290 +308 -319
#(+272 -283)
64 10 -2.0 +149 -151 +259 -296 +308 -319
#(+264 -290)
65 10 -2.0 +146 -149 +295 -296 +308 -319
66 0 +132 -149 +259 -296 +308 -319
#65 #(+133 -294)
67 10 -2.0 +133 -149 +259 -294 +308 -319
#(+142 -260 -322) #(+134 +260 -298)
68 10 -2.0 +135 -149 +261 -262 +308 -319
69 10 -2.0 +135 -136 +262 -263 +308 -319
70 0 +137 -149 +268 -293 +308 -311
#(-138 -290 -310) #(-102 +310)
#(+138 +269 -290 -310) #(+144 +290 -292 -310)

```

```

71      1  0.10549  +137 -138 +268 -290 +308 -310
72      1  0.10549  +138 -149 +269 -272 +308 -310
73      1  0.10549  +138 -149 +288 -290 +308 -310  #(+140 -141)
74      0
75      1  0.10549  +144 -149 +290 -292 +308 -310
76      1  0.10549  +139 -144 +291 -293 +308 -310
77      2  0.1187956 +137 -102 +268 -293 +310 -311
78      0
          +138 -149 +272 -288 +308 -310
          #(+102 +201 -250 +309 -304)
          #(+143 -102 +275 -276 +301)
          #(+143 -102 +279 -280 +301)
          #(+147 -102 +276 -277 +301)
          #(+147 -102 +278 -279 +301)
          #(+142 +223 -228) #(+145 +201 -250 -309)
79      1  0.10549  +143 -102 +275 -276 +301 -310
80      1  0.10549  +143 -102 +279 -280 +301 -310
81      1  0.10549  +147 -102 +276 -277 +301 -310
82      1  0.10549  +147 -102 +278 -279 +301 -310
83      0
          +142 -149 +259 -260 +308 -322
84      0
          +134 -149 +260 -298 +308 -319
          #68 #69 #(+137 -149 +268 -293 +308 -311)
          #(+102 +201 -250 -304) #(+142 +223 -228 -304)
          +145 -126 +201 -250 +308 -309
85      9 -2.0
          #(+145 -127 +223 -228) #(+127 -124 +501 -502)
          #(+129 -252) #(+129 +257) #(+124 +254 -255)
86      0
          +129 -126 +201 -250 +308 -304
          #(+252 -257)
87      0
          +102 -126 +201 -250 +309 -306
          #(+102 -127 +223 -228) #(+127 -124 +501 -502)
          #(+129 -252) #(+129 +257) #(+124 +254 -255)
88      0
          +149 -151 +272 -283 +304 -319

```

c end cells

```

c
c
c surfaces
100 px -1000.0
c 101 px 10.3124
102 px 20.7264
103 px 22.6314
104 px 27.7114
105 px 28.9814
106 px 31.5214
107 px 36.6014
108 px 42.9514
109 px 49.3014
110 px 51.8414
111 px 54.3814
112 px 56.9214
113 px 59.4614
114 px 62.0014
115 px 64.5414
116 px 67.0814
117 px 69.6214
118 px 72.1614
119 px 74.7014
120 px 76.3016
121 px 78.2066
122 px 86.0806
123 px 112.649
124 px 114.554
125 px 119.888
126 px 121.158
127 px 50.5714
128 px 1200.0
129 px 87.9856
131 px -844.042
132 px -823.722
133 px -767.842
134 px -706.882
135 px -548.962
136 px -493.522

```

137	px	-381.762
138	px	-320.802
139	px	-315.722
140	px	-173.482
141	px	-107.442
142	px	-82.042
143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058

239	py	39.4758
240	py	40.7458
241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258
245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225

```

312 pz 283.845
313 pz 342.265
314 pz 375.285
315 pz 390.525
316 pz 395.605
317 pz -50.0
318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y 7.866053 -32.53536 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p 0.22029930 0.0 1.0 -34.07997
504 p 0.08355454 0.0 1.0 -28.66622
505 p -6.61219100 0.0 1.0 -84.54721

c end surfaces
mode n p
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529

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11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]
m11 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt11 lwtr.01t
c m12=iron at 7.86 g/cc
m12 26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
26058.60c 0.0028
c m13=Heavy concrete at 4.2 g/cc [wt %]
m13 1001.60c -0.0005 8016.60c -0.18
12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
26054.60c -4.073938-2 26056.60c -0.6625828
26057.60c -1.558362-2 26058.60c -2.094288-3
mt13 lwtr.01t
f105:n 116.078 0.0 0.0 0.0
de105 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df105 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm105 5.701+10
f115:n 177.038 0.0 0.0 0.0
de115 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df115 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2

```

```

6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
5.701+10
fm115
f125:n
de125
237.998 0.0 0.0 0.0
2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df125
3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
5.701+10
fm125
f135:n
de135
359.918 0.0 0.0 0.0
2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df135
3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
5.701+10
fm135
f145:n
de145
420.878 0.0 0.0 0.0
2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1

```

```

8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df145 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm145 5.701+10
f155:n 481.838 0.0 0.0 0.0
del55 2.07002-7 7.69672-7 1.75386-6 3.71293-6
7.86024-6 1.66401-5 3.52273-5 7.45761-5 1.34159-4
2.21191-4 3.64682-4 6.01258-4 9.91309-4 1.63439-3
2.14167-3 2.43063-3 2.82399-3 3.37141-3 4.61914-3
7.32483-3 1.20766-2 1.93065-2 2.41830-2 2.54229-2
2.65293-2 2.77506-2 3.14039-2 4.33909-2 5.45187-2
7.15396-2 1.04645-1 1.36365-1 1.66556-1 2.03432-1
2.48472-1 2.83877-1 2.95864-1 2.97851-1 3.00232-1
3.44858-1 4.42806-1 5.10634-1 5.65749-1 6.75418-1
8.24957-1 1.00760+0 1.23069+0 1.50317+0 1.83598+0
2.12513+0 2.28850+0 2.40583+0 2.73896+0 3.34537+0
4.08604+0 4.99070+0 6.09565+0 7.44525+0 9.09365+0
1.11070+1 1.35661+1
df155 3.70370-3 4.37060-3 4.52500-3 4.57410-3
4.55830-3 4.48970-3 4.38170-3 4.24920-3 4.12890-3
4.03110-3 3.93550-3 3.84530-3 3.76290-3 3.69080-3
3.65280-3 3.63870-3 3.62290-3 3.60620-3 3.58250-3
3.55850-3 4.08750-3 5.89750-3 7.13870-3 7.42410-3
7.67700-3 7.95180-3 8.74210-3 1.11490-2 1.35030-2
1.65080-2 2.25270-2 2.86610-2 3.43150-2 4.10860-2
4.92110-2 5.56070-2 5.77300-2 5.80800-2 5.84980-2
6.59980-2 8.26560-2 9.04890-2 9.54810-2 1.05360-1
1.17860-1 1.29670-1 1.30100-1 1.28650-1 1.27220-1
1.26160-1 1.25620-1 1.25270-1 1.28500-1 1.36960-1
1.45980-1 1.54120-1 1.51160-1 1.47220-1 1.47060-1
1.63200-1 2.00340-1
fm155 5.701+10
f165:n 116.078 0.0 0.0 0.0
e165 5-7 1.0 30.0
fm165 5.701+10
f175:n 116.078 0.0 0.0 0.0
e175 5-7 1.0 30.0
fm175 5.701+10
del175 1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
1.0-9 5.0-9 1.0-8 2.53-8 5.0-8 1.0-7 5.0-7
5.00001-7 20.0
df175 159.0597 71.1337 50.2991 22.4944 15.906 7.11337
5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
1.0-15 1.0-15
f205:p 116.078 0.0 0.0 0.0
de205 1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df205 2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm205 5.701+10
f215:p 177.038 0.0 0.0 0.0
de215 1.50000-2 3.25000-2 5.75000-2 8.50000-2

```



```

1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df215      2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm215      5.701+10
f225:p     237.998 0.0 0.0 0.0
de225      1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df225      2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm225      5.701+10
f235:p     359.918 0.0 0.0 0.0
de235      1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df235      2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm235      5.701+10
f245:p     420.878 0.0 0.0 0.0
de245      1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df245      2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm245      5.701+10
f255:p     481.838 0.0 0.0 0.0
de255      1.50000-2 3.25000-2 5.75000-2 8.50000-2
1.25000-1 2.25000-1 3.50000-1 4.55000-1 5.55000-1
6.50000-1 8.50000-1 1.25000+0 1.75000+0 2.25000+0
2.75000+0 3.50000+0 4.50000+0 5.50000+0 6.50000+0
7.25000+0 7.75000+0 9.00000+0 1.20000+1
df255      2.14390-3 5.77600-4 2.71850-4 2.68170-4
3.27670-4 5.66760-4 8.75940-4 1.08450-3 1.27970-3
1.44170-3 1.75630-3 2.31560-3 2.92700-3 3.46860-3
3.95960-3 4.62210-3 5.41370-3 6.19090-3 6.92650-3
7.47830-3 7.84680-3 8.77160-3 1.10200-2
fm255      5.701+10
sdef       pos=-2.3304 0 -30.993 dir=d1 erg=fdir=d2
vec=0.988756381 0.0 -0.149535343
s 11 12 13 14 15 16
sp1        1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
si11       h -1.0 -0.7071067
si12       h -0.7071067 0.0
si13       h 0.0 0.5
si14       h 0.5 0.8660254
si15       h 0.8660254 0.9961946
si16       h 0.9961946 1.0
sp11       0 1
sp12       0 1
sp13       0 1
sp14       0 1

```

```
sp15 0 1
sp16 0 1
ds2 s 21 22 23 24 25 26
si21 h 1.8245 1.9295
si22 h 1.9295 3.7645
si23 h 3.7645 5.675
si24 h 5.675 7.3865
si25 h 7.3865 8.321
si26 h 8.321 8.753
sp21 0 1
sp22 0 1
sp23 0 1
sp24 0 1
sp25 0 1
sp26 0 1
nps 2000000
prtmp 2j 1
print
```

File for MCNP-4B calculation of ORIGEN neutron spectra within the stationary collimator for the source in the horizontal position

message: outp=pfna33.o mctal=pfna33.m

```
mcnp file for PFNA facility -- dose rates at selected locations
1      0      -100:128:-200:251:-300:305
2      0      100 -128 200 -251 300 -305
          #(131 -164 +258 -297 +307 -321)
3      1 0.10549 -400 -401 +505 +224 -227 #(503 -504)
4      1 0.10549 -401 +400 +505 +225 -226 #(503 -504)
5      0      142 -127 +223 -228 +308 -304
          #(-400 -401 +505 +224 -227) #(+137 -102 +310)
          #(-401 +400 +505 +225 -226)
6      0      127 -124 +501 -502 +308 -304
          #(-401 +400 +505 +225 -226)
7      0      124 -126 +254 -255 +308 -304
8      5 8.734441-2 102 -126 +201 -250 +306 -301
          #(+102 -127 +223 -228) #(+127 -124 +501 -502)
          #(+124 +254 -255) #(+129 -252) #(+129 +257)
9      1 0.10549 102 -124 +222 -229 +301 -304
          #(+129 -252) #(+129 +257)
          #(+127 +501 -502) #(-127 +223 -228)
10     1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11     1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12     1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13     1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14     1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15     1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16     1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17     1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18     1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19     1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20     1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21     2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22     2 0.1187956 103 -109 +202 -249 +302 -303
          #(221 -230)
          #(103 -104 +217 -234)
          #(104 -105 +216 -235)
          #(105 -107 +219 -232)
          #(107 -108 +219 -220) #(107 -108 +231 -232)
          #(106 -109 +212 -218) #(106 -109 +233 -236)
23     2 0.1187956 109 -120 +202 -249 +302 -303
          #(221 -230)
          #(109 -110 +211 -237)
          #(110 -111 +210 -238)
          #(111 -112 +209 -239)
          #(112 -113 +208 -240)
          #(113 -114 +207 -241)
          #(114 -115 +206 -242)
          #(115 -116 +205 -243)
          #(116 -117 +204 -244)
          #(117 -118 +203 -245)
          #(118 -119)
24     3 3.284-2 121 -125 +201 -250 +301 -304
          #(-124 +214 -247) #(124 +253 -256)
          #(122 +248) #(122 -213)
25     3 3.284-2 103 -107 +217 -234 +302 -303
          #(221 -230) #(104 -220) #(104 +231)
26     4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27     4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28     4 5.977931-2 102 -124 +201 -222 +301 -304
          #(103 -120 202 -221 302 -303)
          #(120 -123 215 -221 302 -303)
          #(121 -214)
29     4 5.977931-2 102 -124 +229 -250 +301 -304
          #(103 -120 230 -249 302 -303)
          #(120 -123 230 -246 302 -303)
          #(121 +247)
```

30	4	5.977931-2	124 -126 +252 -254 +301 -304
			#(-125 +213 -253)
31	4	5.977931-2	124 -126 +255 -257 +301 -304
			#(-125 +256 -248)
32	0		+167 -168 +274 -281 +317 -318
33	0		+165 -166 +270 -285 +308 -310
			#(+167 -168 +274 -281 +317 -318)
34	0		-400 +505 +224 -227 +503 -504
35	0		-401 +400 +505 +225 -226 +503 -504
36	4	5.977931-2	122 -124 +201 -250 +301 -304
			#(213 -248)
			#(129 -252)
			#(129 +257)
37	9	-2.0	+131 -164 +258 -297 +307 -308
38	11	-1.0	+131 -164 +258 -297 +308 -320
			#(+132 -163 +259 -296)
39	12	-7.86	+131 -164 +258 -297 +320 -321
40	0		+132 -163 +259 -296 +319 -320
			#(+151 -169 +271 -284 +304 -315)
			#(+151 -160 +270 -271 +312 -314)
			#(+151 -160 +284 -285 +312 -314)
			#(+157 -159 +274 -281 +313 -315)
			#(+158 -160 +274 -281 -313)
			#(+169 -157 +274 -281 +314 -316)
41	1	0.10549	+151 -169 +271 -284 +304 -315
42	1	0.10549	+151 -160 +270 -271 +312 -314
43	1	0.10549	+151 -160 +284 -285 +312 -314
44	1	0.10549	+157 -159 +274 -281 +313 -315
45	1	0.10549	+158 -160 +274 -281 +308 -313
46	1	0.10549	+169 -157 +274 -281 +314 -316
47	9	-2.0	+160 -162 +273 -282 +308 -319
48	10	-2.0	+154 -161 +265 -289 +308 -319
			#47 #(-160 +267 -286)
49	0		+154 -160 +267 -286 +308 -319 #42 #43 #45
50	10	-2.0	+155 -156 +259 -260 +308 -319
51	10	-2.0	+155 -156 +295 -296 +308 -319
52	10	-2.0	+154 -155 +259 -296 +308 -319
			#(+265 -289)
53	0		+155 -163 +259 -296 +308 -319 #50 #51
			#(-161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0	+153 -154 +295 -296 +308 -319
55	10	-2.0	+151 -126 +295 -296 +308 -319
56	10	-2.0	+151 -126 +259 -260 +308 -319
57	10	-2.0	+153 -154 +259 -260 +308 -319
58	10	-2.0	+151 -152 +266 -272 +308 -304
59	10	-2.0	+151 -152 +283 -287 +308 -304
60	0		+151 -154 +259 -296 +308 -319
			#41 #42 #43 #54 #55 #56 #57 #58 #59
			#(+165 -166 +270 -285 +308 -310)
			#(-126 +201 -250 -304)
61	1	0.10549	+149 -151 +272 -201 +308 -304
62	1	0.10549	+149 -151 +250 -283 +308 -304
63	9	-2.0	+149 -151 +264 -290 +308 -319
			#(+272 -283)
64	10	-2.0	+149 -151 +259 -296 +308 -319
			#(+264 -290)
65	10	-2.0	+146 -149 +295 -296 +308 -319
66	0		+132 -149 +259 -296 +308 -319
			#65 #(+133 -294)
67	10	-2.0	+133 -149 +259 -294 +308 -319
			#(+142 -260 -322) #(+134 +260 -298)
68	10	-2.0	+135 -149 +261 -262 +308 -319
69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311
			#(-138 -290 -310) #(-102 +310)
			#(+138 +269 -290 -310) #(+144 +290 -292 -310)
			#(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71	1	0.10549	+137 -138 +268 -290 +308 -310
72	1	0.10549	+138 -149 +269 -272 +308 -310
73	1	0.10549	+138 -149 +288 -290 +308 -310 #(+140 -141)
74	0		+140 -141 +288 -290 +308 -310
75	1	0.10549	+144 -149 +290 -292 +308 -310

76	1	0.10549	+139 -144 +291 -293 +308 -310
77	2	0.1187956	+137 -102 +268 -293 +310 -311
78	0		+138 -149 +272 -288 +308 -310
			#+102 +201 -250 +309 -304)
			#+143 -102 +275 -276 +301)
			#+143 -102 +279 -280 +301)
			#+147 -102 +276 -277 +301)
			#+147 -102 +278 -279 +301)
			#+142 +223 -228) #(+145 +201 -250 -309)
79	1	0.10549	+143 -102 +275 -276 +301 -310
80	1	0.10549	+143 -102 +279 -280 +301 -310
81	1	0.10549	+147 -102 +276 -277 +301 -310
82	1	0.10549	+147 -102 +278 -279 +301 -310
83	0		+142 -149 +259 -260 +308 -322
84	0		+134 -149 +260 -298 +308 -319
			#68 #69 #(+137 -149 +268 -293 +308 -311)
			#+102 +201 -250 -304) #(+142 +223 -228 -304)
85	9	-2.0	+145 -126 +201 -250 +308 -309
			#+145 -127 +223 -228) #(+127 -124 +501 -502)
			#+129 -252) #(+129 +257) #(+124 +254 -255)
86	0		+129 -126 +201 -250 +308 -304
			#+252 -257)
87	0		+102 -126 +201 -250 +309 -306
			#+102 -127 +223 -228) #(+127 -124 +501 -502)
			#+129 -252) #(+129 +257) #(+124 +254 -255)
88	0		+149 -151 +272 -283 +304 -319

c end cells

c

c surfaces

100	px	-1000.0
c	101	px 10.3124
102	px	20.7264
103	px	22.6314
104	px	27.7114
105	px	28.9814
106	px	31.5214
107	px	36.6014
108	px	42.9514
109	px	49.3014
110	px	51.8414
111	px	54.3814
112	px	56.9214
113	px	59.4614
114	px	62.0014
115	px	64.5414
116	px	67.0814
117	px	69.6214
118	px	72.1614
119	px	74.7014
120	px	76.3016
121	px	78.2066
122	px	86.0806
123	px	112.649
124	px	114.554
125	px	119.888
126	px	121.158
127	px	50.5714
128	px	1200.0
129	px	87.9856
131	px	-844.042
132	px	-823.722
133	px	-767.842
134	px	-706.882
135	px	-548.962
136	px	-493.522
137	px	-381.762
138	px	-320.802
139	px	-315.722
140	px	-173.482
141	px	-107.442
142	px	-82.042

143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058
239	py	39.4758
240	py	40.7458
241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258

245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225
312	pz	283.845
313	pz	342.265
314	pz	375.285
315	pz	390.525
316	pz	395.605
317	pz	-50.0

```

318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y 10.3124 0.0 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p 0.06683670 0.0 1.0 -2.518636
504 p -0.06683670 0.0 1.0 2.518636
505 px 10.3124

c end surfaces
mode n
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]

```



```

m11      1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5

mt11     lwtr.01t
c         m12=iron at 7.86 g/cc
m12      26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
26058.60c 0.0028
c         m13=Heavy concrete at 4.2 g/cc [wt %]
m13      1001.60c -0.0005 8016.60c -0.18
12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
26054.60c -4.073938-2 26056.60c -0.6625828
26057.60c -1.558362-2 26058.60c -2.094288-3

mt13     lwtr.01t
f165:n   116.078      0.0 0.0 0.0
e165     5-7 1.0 30.0
fm165    5.701+10
f175:n   116.078      0.0 0.0 0.0
e175     5-7 1.0 30.0
fm175    5.701+10
de175    1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
1.0-9 5.0-9 1.0-8 2.53-8 5.0-8 1.0-7 5.0-7
5.00001-7 20.0
df175    159.0597 71.1337 50.2991 22.4944 15.906 7.11337
5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
1.0-15 1.0-15

sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2
si1      s 11 12 13 14 15 16
sp1      1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
si11     h -1.0 -0.7071067
si12     h -0.7071067 0.0
si13     h 0.0 0.5
si14     h 0.5 0.8660254
si15     h 0.8660254 0.9961946
si16     h 0.9961946 1.0
sp11     0 1
sp12     0 1
sp13     0 1
sp14     0 1
sp15     0 1
sp16     0 1
ds2      s 21 22 23 24 25 26
si21     h 1.8245 1.9295
si22     h 1.9295 3.7645
si23     h 3.7645 5.675
si24     h 5.675 7.3865
si25     h 7.3865 8.321
si26     h 8.321 8.753
sp21     0 1
sp22     0 1
sp23     0 1
sp24     0 1
sp25     0 1
sp26     0 1
nps      2000000
prcimp   2j 1
print

```

File for MCNP-4B calculation of ORIGEN neutron spectra within the stationary collimator for the source in the maximum up position

message: outp=pfna34.o mctal=pfna34.m

```
mcnp file for PFNA facility -- dose rates at selected locations
c source in nominal maximum upward position (34.8 deg.) of the
c movable vertical collimator. check sdef, cells 3-6, surfaces
c 401 and 503-505, and the sign on surface 505.
c
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
   #(131 -164 +258 -297 +307 -321)
3 1 0.10549 -400 -401 +505 +224 -227 #(503 -504)
4 1 0.10549 -401 +400 +505 +225 -226 #(503 -504)
5 0 142 -127 +223 -228 +308 -304
   #(-400 -401 +505 +224 -227) #(+137 -102 +310)
   #(-401 +400 +505 +225 -226)
6 0 127 -124 +501 -502 +308 -304
   #(-401 +400 +505 +225 -226)
7 0 124 -126 +254 -255 +308 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
   #(+102 -127 +223 -228) #(+127 -124 +501 -502)
   #(+124 +254 -255) #(+129 -252) #(+129 +257)
9 1 0.10549 102 -124 +222 -229 +301 -304
   #(+129 -252) #(+129 +257)
   #(127 +501 -502) #(-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 #(218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 #(221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 #(221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 #(221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 #(221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 #(221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 #(221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 #(221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 #(221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 #(221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 #(221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 #(221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
   #(221 -230)
   #(103 -104 +217 -234)
   #(104 -105 +216 -235)
   #(105 -107 +219 -232)
   #(107 -108 +219 -220) #(107 -108 +231 -232)
   #(106 -109 +212 -218) #(106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
   #(221 -230)
   #(109 -110 +211 -237)
   #(110 -111 +210 -238)
   #(111 -112 +209 -239)
   #(112 -113 +208 -240)
   #(113 -114 +207 -241)
   #(114 -115 +206 -242)
   #(115 -116 +205 -243)
   #(116 -117 +204 -244)
   #(117 -118 +203 -245)
   #(118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
   #(-124 +214 -247) #(124 +253 -256)
   #(122 +248) #(122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
   #(221 -230) #(104 -220) #(104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 #(105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 #(105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
   #(103 -120 202 -221 302 -303)
   #(120 -123 215 -221 302 -303)
   #(121 -214)
```

29	4	5.977931-2	102 -124 +229 -250 +301 -304 #(103 -120 230 -249 302 -303) #(120 -123 230 -246 302 -303) #(121 +247)
30	4	5.977931-2	124 -126 +252 -254 +301 -304 #(-125 +213 -253)
31	4	5.977931-2	124 -126 +255 -257 +301 -304 #(-125 +256 -248)
32	0		+167 -168 +274 -281 +317 -318
33	0		+165 -166 +270 -285 +308 -310 #(+167 -168 +274 -281 +317 -318)
34	0		-400 +505 +224 -227 +503 -504
35	0		-401 +400 +505 +225 -226 +503 -504
36	4	5.977931-2	122 -124 +201 -250 +301 -304 #(213 -248) #(129 -252) #(129 +257)
37	9	-2.0	+131 -164 +258 -297 +307 -308
38	11	-1.0	+131 -164 +258 -297 +308 -320 #(+132 -163 +259 -296)
39	12	-7.86	+131 -164 +258 -297 +320 -321
40	0		+132 -163 +259 -296 +319 -320 #(+151 -169 +271 -284 +304 -315) #(+151 -160 +270 -271 +312 -314) #(+151 -160 +284 -285 +312 -314) #(+157 -159 +274 -281 +313 -315) #(+158 -160 +274 -281 -313) #(+169 -157 +274 -281 +314 -316)
41	1	0.10549	+151 -169 +271 -284 +304 -315
42	1	0.10549	+151 -160 +270 -271 +312 -314
43	1	0.10549	+151 -160 +284 -285 +312 -314
44	1	0.10549	+157 -159 +274 -281 +313 -315
45	1	0.10549	+158 -160 +274 -281 +308 -313
46	1	0.10549	+169 -157 +274 -281 +314 -316
47	9	-2.0	+160 -162 +273 -282 +308 -319
48	10	-2.0	+154 -161 +265 -289 +308 -319 #47 #(-160 +267 -286)
49	0		+154 -160 +267 -286 +308 -319 #42 #43 #45
50	10	-2.0	+155 -156 +259 -260 +308 -319
51	10	-2.0	+155 -156 +295 -296 +308 -319
52	10	-2.0	+154 -155 +259 -296 +308 -319 #(+265 -289)
53	0		+155 -163 +259 -296 +308 -319 #50 #51 #(-161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0	+153 -154 +295 -296 +308 -319
55	10	-2.0	+151 -126 +295 -296 +308 -319
56	10	-2.0	+151 -126 +259 -260 +308 -319
57	10	-2.0	+153 -154 +259 -260 +308 -319
58	10	-2.0	+151 -152 +266 -272 +308 -304
59	10	-2.0	+151 -152 +283 -287 +308 -304
60	0		+151 -154 +259 -296 +308 -319 #41 #42 #43 #54 #55 #56 #57 #58 #59 #(+165 -166 +270 -285 +308 -310) #(-126 +201 -250 -304)
61	1	0.10549	+149 -151 +272 -201 +308 -304
62	1	0.10549	+149 -151 +250 -283 +308 -304
63	9	-2.0	+149 -151 +264 -290 +308 -319 #(+272 -283)
64	10	-2.0	+149 -151 +259 -296 +308 -319 #(+264 -290)
65	10	-2.0	+146 -149 +295 -296 +308 -319
66	0		+132 -149 +259 -296 +308 -319 #65 #(+133 -294)
67	10	-2.0	+133 -149 +259 -294 +308 -319 #(+142 -260 -322) #(+134 +260 -298)
68	10	-2.0	+135 -149 +261 -262 +308 -319
69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311 #(-138 -290 -310) #(-102 +310) #(+138 +269 -290 -310) #(+144 +290 -292 -310) #(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71	1	0.10549	+137 -138 +268 -290 +308 -310

72	1	0.10549	+138	-149	+269	-272	+308	-310	
73	1	0.10549	+138	-149	+288	-290	+308	-310	#+(+140 -141)
74	0		+140	-141	+288	-290	+308	-310	
75	1	0.10549	+144	-149	+290	-292	+308	-310	
76	1	0.10549	+139	-144	+291	-293	+308	-310	
77	2	0.1187956	+137	-102	+268	-293	+310	-311	
78	0		+138	-149	+272	-288	+308	-310	
			#(+102 +201 -250 +309 -304)						
			#(+143 -102 +275 -276 +301)						
			#(+143 -102 +279 -280 +301)						
			#(+147 -102 +276 -277 +301)						
			#(+147 -102 +278 -279 +301)						
			#(+142 +223 -228) #(+145 +201 -250 -309)						
79	1	0.10549	+143	-102	+275	-276	+301	-310	
80	1	0.10549	+143	-102	+279	-280	+301	-310	
81	1	0.10549	+147	-102	+276	-277	+301	-310	
82	1	0.10549	+147	-102	+278	-279	+301	-310	
83	0		+142	-149	+259	-260	+308	-322	
84	0		+134	-149	+260	-298	+308	-319	
			#68 #69 #(+137 -149 +268 -293 +308 -311)						
			#(+102 +201 -250 -304) #(+142 +223 -228 -304)						
85	9	-2.0	+145	-126	+201	-250	+308	-309	
			#(+145 -127 +223 -228) #(+127 -124 +501 -502)						
			#(+129 -252) #(+129 +257) #(+124 +254 -255)						
86	0		+129	-126	+201	-250	+308	-304	
			#(+252 -257)						
87	0		+102	-126	+201	-250	+309	-306	
			#(+102 -127 +223 -228) #(+127 -124 +501 -502)						
			#(+129 -252) #(+129 +257) #(+124 +254 -255)						
88	0		+149	-151	+272	-283	+304	-319	

c end cells

c

c

surfaces

100	px	-1000.0
c	101	px 10.3124
102	px	20.7264
103	px	22.6314
104	px	27.7114
105	px	28.9814
106	px	31.5214
107	px	36.6014
108	px	42.9514
109	px	49.3014
110	px	51.8414
111	px	54.3814
112	px	56.9214
113	px	59.4614
114	px	62.0014
115	px	64.5414
116	px	67.0814
117	px	69.6214
118	px	72.1614
119	px	74.7014
120	px	76.3016
121	px	78.2066
122	px	86.0806
123	px	112.649
124	px	114.554
125	px	119.888
126	px	121.158
127	px	50.5714
128	px	1200.0
129	px	87.9856
131	px	-844.042
132	px	-823.722
133	px	-767.842
134	px	-706.882
135	px	-548.962
136	px	-493.522
137	px	-381.762
138	px	-320.802

139	px	-315.722
140	px	-173.482
141	px	-107.442
142	px	-82.042
143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058
239	py	39.4758
240	py	40.7458

241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258
245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225
312	pz	283.845
313	pz	342.265

```

314 pz 375.285
315 pz 390.525
316 pz 395.605
317 pz -50.0
318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y -28.60131 124.1738 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p -0.60029580 0.0 1.0 137.6099
504 p -0.79896920 0.0 1.0 151.1223
505 p 1.43881100 0.0 1.0 83.0219

c end surfaces
mode n
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044

```

```

26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]
m11 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt11 lwtr.01t
c m12=iron at 7.86 g/cc
m12 26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
26058.60c 0.0028
c m13=Heavy concrete at 4.2 g/cc [wt %]
m13 1001.60c -0.0005 8016.60c -0.18
12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
26054.60c -4.073938-2 26056.60c -0.6625828
26057.60c -1.558362-2 26058.60c -2.094288-3
mt13 lwtr.01t
fl165:n 116.078 0.0 0.0 0.0
e165 5-7 1.0 30.0
fm165 5.701+10
fl175:n 116.078 0.0 0.0 0.0
e175 5-7 1.0 30.0
fm175 5.701+10
de175 1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
1.0-9 5.0-9 1.0-8 2.53-8 5.0-8 1.0-7 5.0-7
5.00001-7 20.0
df175 159.0597 71.1337 50.2991 22.4944 15.906 7.11337
5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
1.0-15 1.0-15
sdef pos=-37.0693 0 118.288 dir=dl erg=fdir=d2
vec=0.821149209 0.0 0.570713568
sil s 11 12 13 14 15 16
sp1 1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
si11 h -1.0 -0.7071067
si12 h -0.7071067 0.0
si13 h 0.0 0.5
si14 h 0.5 0.8660254
si15 h 0.8660254 0.9961946
si16 h 0.9961946 1.0
sp11 0 1
sp12 0 1
sp13 0 1
sp14 0 1
sp15 0 1
sp16 0 1
ds2 s 21 22 23 24 25 26
si21 h 1.8245 1.9295
si22 h 1.9295 3.7645
si23 h 3.7645 5.675
si24 h 5.675 7.3865
si25 h 7.3865 8.321
si26 h 8.321 8.753
sp21 0 1
sp22 0 1
sp23 0 1
sp24 0 1
sp25 0 1
sp26 0 1
nps 2000000
prdump 2j 1
print

```


File for MCNP-4B calculation of ORIGEN neutron spectra within the concrete
 beam stop for the source in the horizontal position

message: outp-pfna35.o mctal=pfna35.m

```

mcnp file for PFNA facility -- fluxes at concrete backstop
1 0 -100:128:-200:251:-300:305
2 0 100 -128 200 -251 300 -305
  # (131 -164 +258 -297 +307 -321)
3 1 0.10549 -400 -401 +505 +224 -227 # (503 -504)
4 1 0.10549 -401 +400 +505 +225 -226 # (503 -504)
5 0 142 -127 +223 -228 +308 -304
  # (-400 -401 +505 +224 -227) # (+137 -102 +310)
  # (-401 +400 +505 +225 -226)
6 0 127 -124 +501 -502 +308 -304
  # (-401 +400 +505 +225 -226)
7 0 124 -126 +254 -255 +308 -304
8 5 8.734441-2 102 -126 +201 -250 +306 -301
  # (+102 -127 +223 -228) # (+127 -124 +501 -502)
  # (+124 +254 -255) # (+129 -252) # (+129 +257)
9 1 0.10549 102 -124 +222 -229 +301 -304
  # (+129 -252) # (+129 +257)
  # (127 +501 -502) # (-127 +223 -228)
10 1 0.10549 106 -109 +212 -236 +302 -303 # (218 -233)
11 1 0.10549 109 -110 +211 -237 +302 -303 # (221 -230)
12 1 0.10549 110 -111 +210 -238 +302 -303 # (221 -230)
13 1 0.10549 111 -112 +209 -239 +302 -303 # (221 -230)
14 1 0.10549 112 -113 +208 -240 +302 -303 # (221 -230)
15 1 0.10549 113 -114 +207 -241 +302 -303 # (221 -230)
16 1 0.10549 114 -115 +206 -242 +302 -303 # (221 -230)
17 1 0.10549 115 -116 +205 -243 +302 -303 # (221 -230)
18 1 0.10549 116 -117 +204 -244 +302 -303 # (221 -230)
19 1 0.10549 117 -118 +203 -245 +302 -303 # (221 -230)
20 1 0.10549 118 -119 +202 -249 +302 -303 # (221 -230)
21 2 0.1187956 120 -123 +215 -246 +302 -303 # (221 -230)
22 2 0.1187956 103 -109 +202 -249 +302 -303
  # (221 -230)
  # (103 -104 +217 -234)
  # (104 -105 +216 -235)
  # (105 -107 +219 -232)
  # (107 -108 +219 -220) # (107 -108 +231 -232)
  # (106 -109 +212 -218) # (106 -109 +233 -236)
23 2 0.1187956 109 -120 +202 -249 +302 -303
  # (221 -230)
  # (109 -110 +211 -237)
  # (110 -111 +210 -238)
  # (111 -112 +209 -239)
  # (112 -113 +208 -240)
  # (113 -114 +207 -241)
  # (114 -115 +206 -242)
  # (115 -116 +205 -243)
  # (116 -117 +204 -244)
  # (117 -118 +203 -245)
  # (118 -119)
24 3 3.284-2 121 -125 +201 -250 +301 -304
  # (-124 +214 -247) # (124 +253 -256)
  # (122 +248) # (122 -213)
25 3 3.284-2 103 -107 +217 -234 +302 -303
  # (221 -230) # (104 -220) # (104 +231)
26 4 5.977931-2 104 -108 +216 -220 +302 -303 # (105 -219)
27 4 5.977931-2 104 -108 +231 -235 +302 -303 # (105 +232)
28 4 5.977931-2 102 -124 +201 -222 +301 -304
  # (103 -120 202 -221 302 -303)
  # (120 -123 215 -221 302 -303)
  # (121 -214)
29 4 5.977931-2 102 -124 +229 -250 +301 -304
  # (103 -120 230 -249 302 -303)
  # (120 -123 230 -246 302 -303)
  # (121 +247)

```

30	4	5.977931-2	124 -126 +252 -254 +301 -304
			#(-125 +213 -253)
31	4	5.977931-2	124 -126 +255 -257 +301 -304
			#(-125 +256 -248)
32	0		+167 -168 +274 -281 +317 -318
33	0		+165 -166 +270 -285 +308 -310
			#(+167 -168 +274 -281 +317 -318)
34	0		-400 +505 +224 -227 +503 -504
35	0		-401 +400 +505 +225 -226 +503 -504
36	4	5.977931-2	122 -124 +201 -250 +301 -304
			#(213 -248)
			#(129 -252)
			#(129 +257)
37	9	-2.0	+131 -164 +258 -297 +307 -308
38	11	-1.0	+131 -164 +258 -297 +308 -320
			#(+132 -163 +259 -296)
39	12	-7.86	+131 -164 +258 -297 +320 -321
40	0		+132 -163 +259 -296 +319 -320
			#(+151 -169 +271 -284 +304 -315)
			#(+151 -160 +270 -271 +312 -314)
			#(+151 -160 +284 -285 +312 -314)
			#(+157 -159 +274 -281 +313 -315)
			#(+158 -160 +274 -281 -313)
			#(+169 -157 +274 -281 +314 -316)
41	1	0.10549	+151 -169 +271 -284 +304 -315
42	1	0.10549	+151 -160 +270 -271 +312 -314
43	1	0.10549	+151 -160 +284 -285 +312 -314
44	1	0.10549	+157 -159 +274 -281 +313 -315
45	1	0.10549	+158 -160 +274 -281 +308 -313
46	1	0.10549	+169 -157 +274 -281 +314 -316
47	9	-2.0	+160 -162 +273 -282 +308 -319
48	10	-2.0	+154 -161 +265 -289 +308 -319
			#47 #(-160 +267 -286)
49	0		+154 -160 +267 -286 +308 -319 #42 #43 #45
50	10	-2.0	+155 -156 +259 -260 +308 -319
51	10	-2.0	+155 -156 +295 -296 +308 -319
52	10	-2.0	+154 -155 +259 -296 +308 -319
			#(+265 -289)
53	0		+155 -163 +259 -296 +308 -319 #50 #51
			#(-161 +265 -289) #(+161 -162 +273 -282)
54	10	-2.0	+153 -154 +295 -296 +308 -319
55	10	-2.0	+151 -126 +295 -296 +308 -319
56	10	-2.0	+151 -126 +259 -260 +308 -319
57	10	-2.0	+153 -154 +259 -260 +308 -319
58	10	-2.0	+151 -152 +266 -272 +308 -304
59	10	-2.0	+151 -152 +283 -287 +308 -304
60	0		+151 -154 +259 -296 +308 -319
			#41 #42 #43 #54 #55 #56 #57 #58 #59
			#(+165 -166 +270 -285 +308 -310)
			#(-126 +201 -250 -304)
61	1	0.10549	+149 -151 +272 -201 +308 -304
62	1	0.10549	+149 -151 +250 -283 +308 -304
63	9	-2.0	+149 -151 +264 -290 +308 -319
			#(+272 -283)
64	10	-2.0	+149 -151 +259 -296 +308 -319
			#(+264 -290)
65	10	-2.0	+146 -149 +295 -296 +308 -319
66	0		+132 -149 +259 -296 +308 -319
			#65 #(+133 -294)
67	10	-2.0	+133 -149 +259 -294 +308 -319
			#(+142 -260 -322) #(+134 +260 -298)
68	10	-2.0	+135 -149 +261 -262 +308 -319
69	10	-2.0	+135 -136 +262 -263 +308 -319
70	0		+137 -149 +268 -293 +308 -311
			#(-138 -290 -310) #(-102 +310)
			#(+138 +269 -290 -310) #(+144 +290 -292 -310)
			#(+139 -144 +291 -293 -310) #(+102 +201 -250 -304)
71	1	0.10549	+137 -138 +268 -290 +308 -310
72	1	0.10549	+138 -149 +269 -272 +308 -310
73	1	0.10549	+138 -149 +288 -290 +308 -310 #(+140 -141)
74	0		+140 -141 +288 -290 +308 -310
75	1	0.10549	+144 -149 +290 -292 +308 -310

76	1	0.10549	+139 -144 +291 -293 +308 -310
77	2	0.1187956	+137 -102 +268 -293 +310 -311
78	0		+138 -149 +272 -288 +308 -310
			#+102 +201 -250 +309 -304)
			#+143 -102 +275 -276 +301)
			#+143 -102 +279 -280 +301)
			#+147 -102 +276 -277 +301)
			#+147 -102 +278 -279 +301)
			#+142 +223 -228) #(+145 +201 -250 -309)
79	1	0.10549	+143 -102 +275 -276 +301 -310
80	1	0.10549	+143 -102 +279 -280 +301 -310
81	1	0.10549	+147 -102 +276 -277 +301 -310
82	1	0.10549	+147 -102 +278 -279 +301 -310
83	0		+142 -149 +259 -260 +308 -322
84	0		+134 -149 +260 -298 +308 -319
			#68 #69 #(+137 -149 +268 -293 +308 -311)
			#+102 +201 -250 -304) #(+142 +223 -228 -304)
85	9	-2.0	+145 -126 +201 -250 +308 -309
			#+145 -127 +223 -228) #(+127 -124 +501 -502)
			#+129 -252) #(+129 +257) #(+124 +254 -255)
86	0		+129 -126 +201 -250 +308 -304
			#+252 -257)
87	0		+102 -126 +201 -250 +309 -306
			#+102 -127 +223 -228) #(+127 -124 +501 -502)
			#+129 -252) #(+129 +257) #(+124 +254 -255)
88	0		+149 -151 +272 -283 +304 -319

c end cells

c

c

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surfaces

px -1000.0

px 10.3124

px 20.7264

px 22.6314

px 27.7114

px 28.9814

px 31.5214

px 36.6014

px 42.9514

px 49.3014

px 51.8414

px 54.3814

px 56.9214

px 59.4614

px 62.0014

px 64.5414

px 67.0814

px 69.6214

px 72.1614

px 74.7014

px 76.3016

px 78.2066

px 86.0806

px 112.649

px 114.554

px 119.888

px 121.158

px 50.5714

px 1200.0

px 87.9856

px -844.042

px -823.722

px -767.842

px -706.882

px -548.962

px -493.522

px -381.762

px -320.802

px -315.722

px -173.482

px -107.442

px -82.042

143	px	-55.4736
144	px	-21.082
145	px	-0.762
146	px	9.398
147	px	15.6464
148	px	30.1103
149	px	39.878
150	px	45.3503
151	px	100.838
152	px	126.238
153	px	476.758
154	px	497.078
155	px	558.038
156	px	588.518
157	px	725.678
158	px	730.758
159	px	745.998
160	px	751.078
161	px	812.038
162	px	842.518
163	px	964.438
164	px	984.758
165	px	148.387
166	px	449.529
167	px	250.0
168	px	350.0
169	px	116.078
200	py	-2000.0
201	py	-74.7056
202	py	-72.8006
203	py	-47.0958
204	py	-45.8258
205	py	-44.5558
206	py	-43.2858
207	py	-42.0158
208	py	-40.7458
209	py	-39.4758
210	py	-38.2058
211	py	-36.9358
212	py	-34.3958
213	py	-38.6122
214	py	-33.2782
215	py	-31.3732
216	py	-30.5858
217	py	-24.2358
218	py	-19.1558
219	py	-16.6158
220	py	-15.3458
221	py	-12.8058
222	py	-10.9008
223	py	-5.8208
224	py	-5.5245
225	py	-4.2037
226	py	4.2037
227	py	5.5245
228	py	5.8208
229	py	10.9008
230	py	12.8058
231	py	15.3458
232	py	16.6158
233	py	19.1558
234	py	24.2358
235	py	30.5858
236	py	34.3958
237	py	36.9358
238	py	38.2058
239	py	39.4758
240	py	40.7458
241	py	42.0158
242	py	43.2858
243	py	44.5558
244	py	45.8258

245	py	47.0958
246	py	31.3732
247	py	33.2782
248	py	38.6122
249	py	72.8006
250	py	74.7056
251	py	1500.0
252	py	-39.8822
253	py	-9.8848
254	py	-8.6148
255	py	8.6148
256	py	9.8848
257	py	39.8822
258	py	-1731.28
259	py	-1710.96
260	py	-1650.0
261	py	-1528.08
262	py	-1467.12
263	py	-1436.64
264	py	-589.28
265	py	-241.3
266	py	-193.04
267	py	-180.34
268	py	-167.64
269	py	-162.56
270	py	-152.4
271	py	-137.16
272	py	-101.6
273	py	-91.44
274	py	-60.96
275	py	-45.72
276	py	-30.48
277	py	-10.16
278	py	10.16
279	py	30.48
280	py	45.72
281	py	60.96
282	py	91.44
283	py	101.6
284	py	137.16
285	py	152.4
286	py	180.34
287	py	193.04
288	py	213.36
289	py	241.3
290	py	274.32
291	py	335.28
292	py	345.44
293	py	396.24
294	py	533.4
295	py	1235.44
296	py	1296.4
297	py	1316.72
298	py	472.44
300	pz	-500.0
301	pz	-59.478
302	pz	-57.573
303	pz	245.957
304	pz	247.862
305	pz	500.0
306	pz	-60.748
307	pz	-156.0
308	pz	-125.095
309	pz	-67.451
310	pz	235.585
311	pz	276.225
312	pz	283.845
313	pz	342.265
314	pz	375.285
315	pz	390.525
316	pz	395.605
317	pz	-50.0

```

318 pz 50.0
319 pz 301.625
320 pz 484.505
321 pz 484.823
322 pz 118.745
c Mobile Vertical collimator cylinders
400 c/y -207.264 0.0 249.7884
401 c/y 10.3124 0.0 59.9948
c Target concentric spheres
402 sx 292.2524 5.0
403 sx 292.2524 6.38
c Stationary collimator planes
501 p 0.05557761 1.0 0.0 -1.613162
502 p -0.05557761 1.0 0.0 1.613162
c Mobile Vertical collimator planes
503 p 0.06683670 0.0 1.0 -2.518636
504 p -0.06683670 0.0 1.0 2.518636
505 px 10.3124

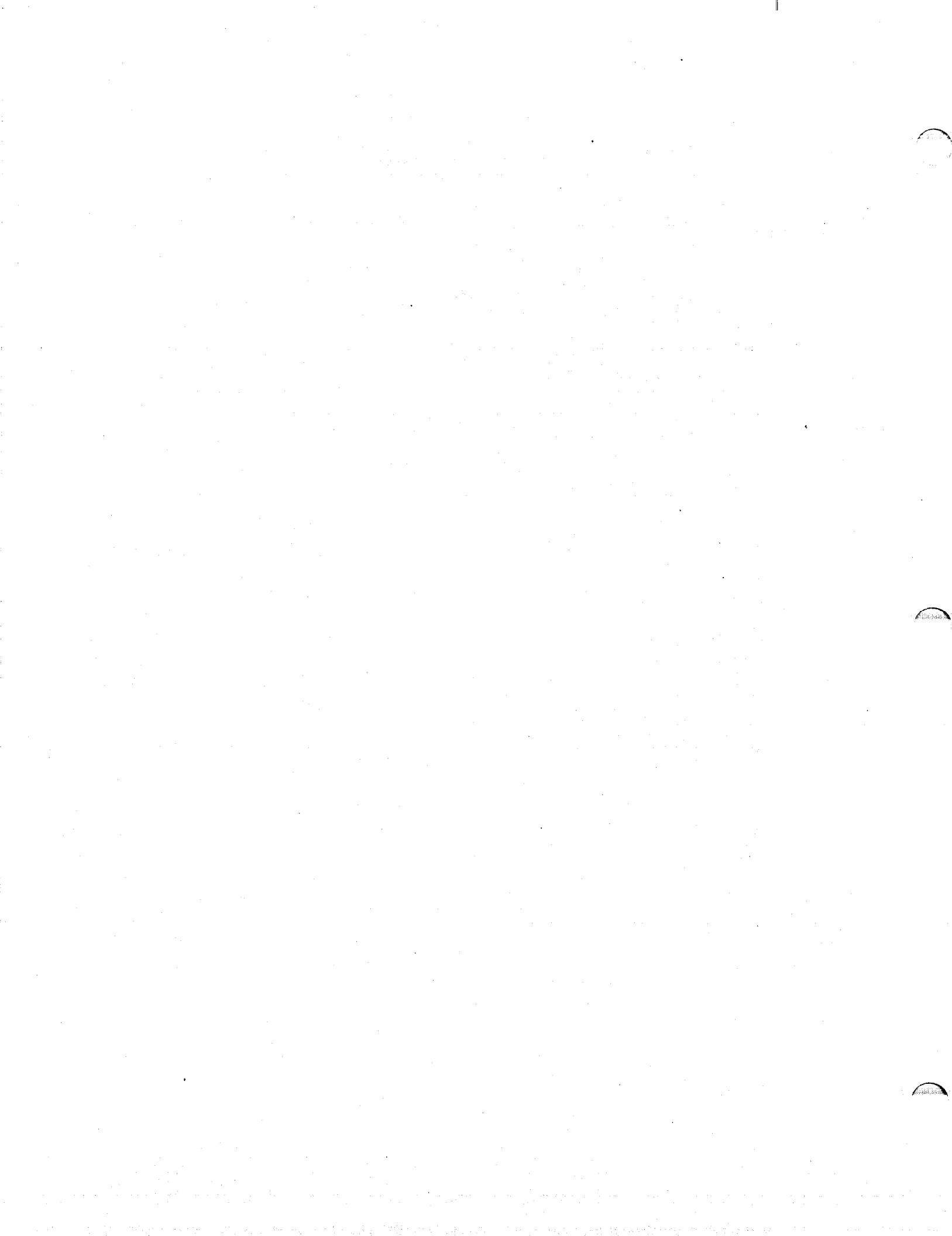
c end surfaces
mode n
imp:n,p 0 1 86r
c m1=borated polyethylene (Asum=0.10549)
m1 1001.60c 6.5800-2 5010.60c 5.1940-4 5011.60c 2.1306-3
6000.60c 2.9100-2 8016.60c 7.9400-3
mt1 poly.01t
c m2=borated paraffin (Asum=0.1187956)
m2 1001.60c 7.8350-2 5010.60c 4.3426-4 5011.60c 1.78134-3
6000.60c 3.8230-2
mt2 poly.01t
c m3=Lead (Asum=3.284-2)
m3 82206.60c 8.3742-3 82207.60c 7.25764-3 82208.60c 1.720816-2
c m4=Aluminum 6061-T6 (Asum=5.977988-2)
m4 12000.60c 6.6890-4 13027.60c 5.8270-2 14000.60c 3.4740-4
22000.60c 5.0930-5 24050.60c 2.7230-6 24052.60c 5.2444-5
24053.60c 5.9460-6 24054.60c 1.4770-6 26054.60c 1.1920-5
26056.60c 1.8699-4 26057.60c 4.3210-6 26058.60c 5.7060-7
29063.60c 9.08133-5 29065.60c 4.04767-5 25055.60c 4.4400-5
c m5=Steel (Asum=8.734441-2)
m5 26054.60c 3.2367-3 26056.60c 5.07622-2 26057.60c 1.1729-3
26058.60c 1.5490-4 24050.60c 7.9660-4 24052.60c 1.53441-2
24053.60c 1.7397-3 24054.60c 4.3220-4 28058.60c 6.62295-3
28060.60c 2.55073-3 28061.60c 1.1090-4 28062.60c 3.5313-4
28064.60c 9.0460-5 6000.60c 3.16929-4 14000.60c 1.27063-3
25055.60c 1.73219-3 15031.60c 6.91287-5 16032.60c 4.4516-5
7014.60c 5.43529-4
c m6=Plutonium (Asum=4.029014-2)
m6 94239.60c 3.7047-2 94240.60c 1.7512-3 94241.60c 1.1674-4
31000.60c 1.3752-3
c m7=Tungsten (Asum=6.605306-2)
m7 28058.60c 6.6122-3 28060.60c 2.54659-3 28061.60c 1.10721-4
28062.60c 3.5256-4 28064.60c 9.0325-5 29063.60c 2.82034-3
29065.60c 1.25706-3 40000.60c 7.9528-4 74182.60c 1.369975-2
74183.60c 7.36713-3 74184.60c 1.577082-2 74186.60c 1.463029-2
c m8=water (Asum=0.100149)
m8 1001.60c 6.6766-2 8016.60c 3.3383-2
mt8 lwtr.01t
c m9=concrete at 2.0 g/cc (Concrete 1) [wt %]
m9 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt9 lwtr.01t
c m10=concrete at 2.0 g/cc (Concrete 2) [wt %]
m10 1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
26054.60c -7.91056-4 26056.60c -1.286568-2
26057.60c -3.025946-4 26058.60c -4.06658-5
mt10 lwtr.01t
c m11=concrete at 1.0 g/cc (Masonry Block) [wt %]

```

```

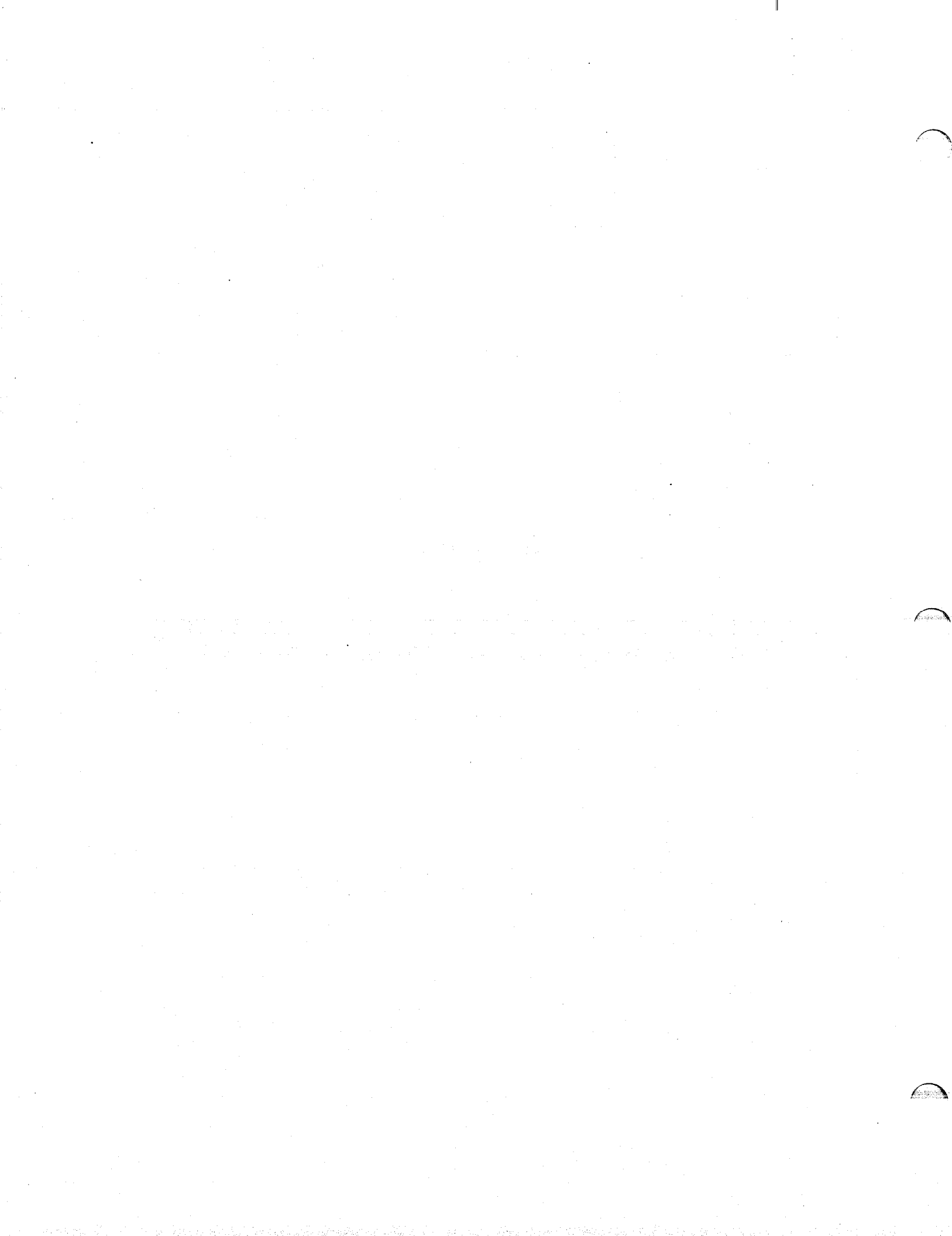
m11      1001.60c -0.01 6000.60c -0.001 8016.60c -0.529
         11023.60c -0.016 12000.60c -0.002 13027.60c -0.034
         14000.60c -0.337 19000.60c -0.013 20000.60c -0.044
         26054.60c -7.91056-4 26056.60c -1.286568-2
         26057.60c -3.025946-4 26058.60c -4.06658-5
mt11     lwtr.01t
c        m12=iron at 7.86 g/cc
m12      26054.60c 0.0585 26056.60c 0.9175 26057.60c 0.0212
         26058.60c 0.0028
c        m13=Heavy concrete at 4.2 g/cc [wt %]
m13      1001.60c -0.0005 8016.60c -0.18
         12000.60c -0.002 13027.60c -0.005 14000.60c -0.014
         16032.60c -0.001 20000.60c -0.061 25055.60c -0.016
         26054.60c -4.073938-2 26056.60c -0.6625828
         26057.60c -1.558362-2 26058.60c -2.094288-3
mt13     lwtr.01t
fl65:n   751.500      0.0 0.0 0.25
el65     5-7 1.0 30.0
fm165    5.701+10
fl75:n   751.500      0.0 0.0 0.25
el75     5-7 1.0 30.0
fm175    5.701+10
del175   1.0-12 5.0-12 1.0-11 5.0-11 1.0-10 5.0-10
         1.0-9 5.0-9 1.0-8 2.53-8 5.0-8 1.0-7 5.0-7
         5.00001-7 20.0
df175    159.0597 71.1337 50.2991 22.4944 15.906 7.11337
         5.02991 2.24944 1.5906 1.0 0.711337 0.502991 0.224944
         1.0-15 1.0-15
sdef pos=0 0 0 vec=1 0 0 dir=d1 erg=fdir=d2
sil      s 11 12 13 14 15 16
sp1      1.17+10 8.60+9 1.21+10 8.82+9 1.47+10 1.09+9
sil1     h -1.0 -0.7071067
sil2     h -0.7071067 0.0
sil3     h 0.0 0.5
sil4     h 0.5 0.8660254
sil5     h 0.8660254 0.9961946
sil6     h 0.9961946 1.0
sp11     0 1
sp12     0 1
sp13     0 1
sp14     0 1
sp15     0 1
sp16     0 1
ds2      s 21 22 23 24 25 26
si21     h 1.8245 1.9295
si22     h 1.9295 3.7645
si23     h 3.7645 5.675
si24     h 5.675 7.3865
si25     h 7.3865 8.321
si26     h 8.321 8.753
sp21     0 1
sp22     0 1
sp23     0 1
sp24     0 1
sp25     0 1
sp26     0 1
nps      2000000
prtmp    2j 1
print

```



APPENDIX I

**LISTINGS OF THE ORIGIN INPUT FILES FOR CALCULATING
NEUTRON ACTIVATION OF SELECTED MATERIALS**



APPENDIX I

LISTINGS OF THE ORIGEN INPUT FILES FOR CALCULATING NEUTRON ACTIVATION OF SELECTED MATERIALS

File for ORIGEN calculation of the activation of salted beef cargo
using neutron spectrum 1

```
set -xv
date
hostname
sco=/usr/epmnas4/sco/pfna
sco2=/usr/epmnas4/sco
jab=/u21/jab/scamp/origen.bcd.libs
jab2=/u21/jab/scamp/origen.bin.libs
mkdir $sco2/xdir$$
cd $sco2/xdir$$
set -
cat > ised1 << 'EOF'
1,$s/^STOP/ STOP/
EOF
cat > ised2 << 'EOF'
1,$s/^/ /
EOF
cat > input << 'EOF'
0$$ a4 0 28 a8 82 a11 12 11 e 1$$ 1 t
  Activation of Salted Beef
3$$ 28 4 0 0 6 1 a16 2 a18 2500 750 750 1000 a33 23 e
4** 0.7171 0.3522 1675.8 1-25 e 5$$ 2
54$$ 11z 1
t
35$$ 0 t
56$$ 04 04 1 0 1 1 a10 0 a13 11 1 3 0 2 1 1 e 57** 0.0 0 1-12 e t
  0 to 8s irradiation
  1 kilogram of material
59** f451.24 60** 2i 2 8 61** f1-20 66$$ 1 11z
73$$
  10000 60000 70000 80000 90000 110000 120000 130000 140000
  150000 190000
74** 101.1 260.2 12.2 565.4 0.036 17.6 0.164 0.086 0.273 1.57 2
75$$ f4
t
56$$ 0 10 1 0 1 1 a10 4 a13 0 1 3 0 2 1 1 e 57** 0 0 1-12 e t
  1 s to 20 min. decay after irradiation
  1 kilogram of material
60** 1-15 1 10 20 30 60 120 300 600 1200 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2.
83**
  2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
  2+4 1+4
t
time=0 s
time=1 s
time=10 s
time=20 s
time=30 s
time=60 s
time=120 s
time=300 s
time=600 s
time=1200 s
56$$ 4 4 1 0 1 1 a10 1 a13 0 1 3 0 2 1 1 e 57** 8.0 0.0 1-12 e t
```

```

8 to 16 s irradiation
1 kilogram of material
59** f451.24 60** 2i 10 16 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 4 a13 0 1 3 0 2 1 1 e 57** 0 0 1-12 e t
1 s to 20 min. decay after irradiation
1 kilogram of material
60** 1-15 1 10 20 30 60 120 300 600 1200 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
2+4 1+4
t
time=0 s
time=1 s
time=10 s
time=20 s
time=30 s
time=60 s
time=120 s
time=300 s
time=600 s
time=1200 s
56$$ 4 4 1 0 1 1 a10 1 a13 0 1 3 0 2 1 1 e 57** 16.0 0.0 1-12 e t
16 to 24 s irradiation
1 kilogram of material
59** f451.24 60** 2i 18 24 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 4 a13 0 1 3 0 2 1 1 e 57** 0 0 1-12 e t
1 s to 20 min. decay after irradiation
1 kilogram of material
60** 1-15 1 10 20 30 60 120 300 600 1200 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
2+4 1+4
t
time=0 s
time=1 s
time=10 s
time=20 s
time=30 s
time=60 s
time=120 s
time=300 s
time=600 s
time=1200 s
1$$ 0 56$$ f0 t
EOF
set -xv
ln -s /u21/jab/scamp/origns origns
ln -s $jab2/maphuo2b ft82f001
ln -s $jab/end6dec ft27f001
ln -s $jab/xsectpho ft28f001
touch \${out}
origns < input
date
ls -l
cat print \${prt} \${out} > q1234
sed -f ised1 q1234 > zprntz
cp $sco/joblog/lpfnorg1 q1234
sed -f ised2 q1234 > opfnorg1
cat zprntz >> opfnorg1
asa opfnorg1 > npfnorg1
# nasq npfnorg1
mv npfnorg1 $sco/output/npfnorg1
mv opfnorg1 $sco/output/opfnorg1
cd $sco2
rm -rf $sco2/xdir$$
exit

```

File for ORIGEN calculation of the activation of ball bearings
 using neutron spectrum 1

```

set -xv
date
hostname
sco=/usr/epmnas4/sco/pfna
sco2=/usr/epmnas4/sco
jab=/u21/jab/scamp/origen.bcd.libs
jab2=/u21/jab/scamp/origen.bin.libs
mkdir $sco2/xdir$$
cd $sco2/xdir$$
set -
cat > ised1 << 'EOF'
1,$s/^STOP/ STOP/
EOF
cat > ised2 << 'EOF'
1,$s/\/ /
EOF
cat > input << 'EOF'
0$$ a4 0 28 a8 82 a11 12 11 e 1$$ 1 t
  Activation of Ball Bearings (ASTM A295)
3$$ 28 4 0 0 6 1 a16 2 a18 2500 750 750 1000 a33 23 e
4** 0.7171 0.3522 1675.8 1-25 e 5$$ 2
54$$ 11z 1
t
35$$ 0 t
56$$ 04 04 1 0 1 1 a10 0 a13 12 1 3 0 2 1 1 e 57** 0.0 0 1-12 e t
  0 to 8s irradiation
  1 kilogram of material
59** f451.24 60** 2i 2 8 61** f1-20 66$$ 1 11z
73$$
  60000 250000 150000 160000 140000 240000 280000 290000 420000
  130000 80000 260000
74** 9.8 3.5 0.25 0.15 2.5 15 2.5 3 1 0.5 0.015 961.785
75$$ f4
t
56$$ 0 10 1 0 1 1 a10 4 a13 0 1 3 0 2 1 1 e 57** 0 0 1-12 e t
  1 s to 20 min. decay after irradiation
  1 kilogram of material
60** 1-15 1 10 20 30 60 120 300 600 1200 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
  2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
  2+4 1+4
t
time=0 s
time=1 s
time=10 s
time=20 s
time=30 s
time=60 s
time=120 s
time=300 s
time=600 s
time=1200 s
56$$ 4 4 1 0 1 1 a10 1 a13 0 1 3 0 2 1 1 e 57** 8.0 0.0 1-12 e t
  8 to 16 s irradiation
  1 kilogram of material
59** f451.24 60** 2i 10 16 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 4 a13 0 1 3 0 2 1 1 e 57** 0 0 1-12 e t
  1 s to 20 min. decay after irradiation
  1 kilogram of material
60** 1-15 1 10 20 30 60 120 300 600 1200 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
  2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
  2+4 1+4
t

```

```

time=0 s
time=1 s
time=10 s
time=20 s
time=30 s
time=60 s
time=120 s
time=300 s
time=600 s
time=1200 s
56$$ 4 4 1 0 1 1 a10 1 a13 0 1 3 0 2 1 1 e 57** 16.0 0.0 1-12 e t
16 to 24 s irradiation
1 kilogram of material
59** f451.24 60** 2i 18 24 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 4 a13 0 1 3 0 2 1 1 e 57** 0 0 1-12 e t
1 s to 20 min. decay after irradiation
1 kilogram of material
60** 1-15 1 10 20 30 60 120 300 600 1200 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
2+4 1+4
t
time=0 s
time=1 s
time=10 s
time=20 s
time=30 s
time=60 s
time=120 s
time=300 s
time=600 s
time=1200 s
1$$ 0 56$$ f0 t
EOF
set -xv
ln -s /u21/jab/scamp/origns origns
ln -s $jab2/maphuo2b ft82f001
ln -s $jab/end6dec ft27f001
ln -s $jab/xsectpho ft28f001
touch \sout
origns < input
date
ls -l
cat print \sprt \sout > q1234
sed -f ised1 q1234 > zprntz
cp $sco/joblog/lpfnorg4 q1234
sed -f ised2 q1234 > opfnorg4
cat zprntz >> opfnorg4
asa opfnorg4 > npfnorg4
# nasq npfnorg4
mv npfnorg4 $sco/output/npfnorg4
mv opfnorg4 $sco/output/opfnorg4
cd $sco2
rm -rf $sco2/xdir$$
exit

```

File for ORIGEN calculation of the activation of surgical implant with
composition A using neutron spectrum 1

```
set -xv
date
hostname
sco=/usr/epmnas4/sco/pfna
sco2=/usr/epmnas4/sco
jab=/u21/jab/scamp/origen.bcd.libs
jab2=/u21/jab/scamp/origen.bin.libs
mkdir $sco2/xdir$$
cd $sco2/xdir$$
set -
cat > ised1 << 'EOF'
1,$s/^STOP/ STOP/
EOF
cat > ised2 << 'EOF'
1,$s/^/ /
EOF
cat > input << 'EOF'
0$$ a4 0 28 a8 82 a11 12 11 e 1$$ 1 t
  Activation of Surgical Implant A
3$$ 28 4 0 0 6 1 a16 2 a18 2500 750 750 1000 a33 23 e
4** 0.7171 0.3522 1675.8 1-25 e 5$$ 2
54$$ 11z 1
t
35$$ 0 t
56$$ 04 04 1 0 1 1 a10 0 a13 14 1 3 0 2 1 1 e 57** 0.0 0 1-12 e t
  0 to 8s irradiation
  1 kilogram of material
59** f451.24 60** 2i 2 8 61** f1-20 66$$ 1 11z
73$$
  240000 420000 280000 260000 60000 140000 250000 740000 150000
  160000 70000 130000 50000 270000
74** 300 70 10 7.5 3.5 10 10 2 0.2 0.1 2.5 3 0.1 581.1
75$$ f4
t
56$$ 0 10 1 0 1 1 a10 4 a13 0 1 3 0 2 1 1 e 57** 0 0 1-12 e t
  1 s to 20 min. decay after irradiation
  1 kilogram of material
60** 1-15 1 10 20 30 60 120 300 600 1200 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
  2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
  2+4 1+4
t
time=0 s
time=1 s
time=10 s
time=20 s
time=30 s
time=60 s
time=120 s
time=300 s
time=600 s
time=1200 s
56$$ 4 4 1 0 1 1 a10 1 a13 0 1 3 0 2 1 1 e 57** 8.0 0.0 1-12 e t
  8 to 16 s irradiation
  1 kilogram of material
59** f451.24 60** 2i 10 16 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 4 a13 0 1 3 0 2 1 1 e 57** 0 0 1-12 e t
  1 s to 20 min. decay after irradiation
  1 kilogram of material
60** 1-15 1 10 20 30 60 120 300 600 1200 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
  2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
  2+4 1+4
t
```

```

time=0 s
time=1 s
time=10 s
time=20 s
time=30 s
time=60 s
time=120 s
time=300 s
time=600 s
time=1200 s
56$$ 4 4 1 0 1 1 a10 1 a13 0 1 3 0 2 1 1 e 57** 16.0 0.0 1-12 e t
16 to 24 s irradiation
1 kilogram of material
59** f451.24 60** 2i 18 24 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 4 a13 0 1 3 0 2 1 1 e 57** 0 0 1-12 e t
1 s to 20 min. decay after irradiation
1 kilogram of material
60** 1-15 1 10 20 30 60 120 300 600 1200 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
2+4 1+4
t
time=0 s
time=1 s
time=10 s
time=20 s
time=30 s
time=60 s
time=120 s
time=300 s
time=600 s
time=1200 s
1$$ 0 56$$ f0 t
EOF
set -xv
ln -s /u21/jab/scamp/origns origns
ln -s $jab2/maphuo2b ft82f001
ln -s $jab/end6dec ft27f001
ln -s $jab/xsectpho ft28f001
touch \out
origns < input
date
ls -l
cat print \sprt \out > q1234
sed -f ised1 q1234 > zprntz
cp $sco/joblog/lpfnorg6 q1234
sed -f ised2 q1234 > opfnorg6
cat zprntz >> opfnorg6
asa opfnorg6 > npfnorg6
# nasq npfnorg6
mv npfnorg6 $sco/output/npfnorg6
mv opfnorg6 $sco/output/opfnorg6
cd $sco2
rm -rf $sco2/xdir$$
exit

```


File for ORIGEN calculation of the activation of surgical implant with
composition B using neutron spectrum 1

```

set -xv
date
hostname
sco=/usr/epmnas4/sco/pfna
sco2=/usr/epmnas4/sco
jab=/u21/jab/scamp/origen.bcd.libs
jab2=/u21/jab/scamp/origen.bin.libs
mkdir $sco2/xdir$$
cd $sco2/xdir$$
set -
cat > ised1 << 'EOF'
1,$s/^STOP/ STOP/
EOF
cat > ised2 << 'EOF'
1,$s/^/ /
EOF
cat > input << 'EOF'
0$$ a4 0 28 a8 82 a11 12 11 e 1$$ 1 t
  Activation of Surgical Implant B
3$$ 28 4 0 0 6 1 a16 2 a18 2500 750 750 1000 a33 23 e
4** 0.7171 0.3522 1675.8 1-25 e 5$$ 2
54$$ 11z 1
t
35$$ 0 t
56$$ 04 04 1 0 1 1 a10 0 a13 14 1 3 0 2 1 1 e 57** 0.0 0 1-12 e t
  0 to 8s irradiation
  1 kilogram of material
59** f451.24 60** 2i 2 8 61** f1-20 66$$ 1 11z
73$$
  240000 420000 280000 260000 60000 140000 250000 740000 150000
  160000 70000 130000 50000 270000
74** 270 50 11z 680
75$$ f4
t
56$$ 0 10 1 0 1 1 a10 4 a13 0 1 3 0 2 1 1 e 57** 0 0 1-12 e t
  1 s to 20 min. decay after irradiation
  1 kilogram of material
60** 1-15 1 10 20 30 60 120 300 600 1200 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
  2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
  2+4 1+4
t
time=0 s
time=1 s
time=10 s
time=20 s
time=30 s
time=60 s
time=120 s
time=300 s
time=600 s
time=1200 s
56$$ 4 4 1 0 1 1 a10 1 a13 0 1 3 0 2 1 1 e 57** 8.0 0.0 1-12 e t
  8 to 16 s irradiation
  1 kilogram of material
59** f451.24 60** 2i 10 16 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 4 a13 0 1 3 0 2 1 1 e 57** 0 0 1-12 e t
  1 s to 20 min. decay after irradiation
  1 kilogram of material
60** 1-15 1 10 20 30 60 120 300 600 1200 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
  2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
  2+4 1+4
t

```

```

time=0 s
time=1 s
time=10 s
time=20 s
time=30 s
time=60 s
time=120 s
time=300 s
time=600 s
time=1200 s
56$$ 4 4 1 0 1 1 a10 1 a13 0 1 3 0 2 1 1 e 57** 16.0 0.0 1-12 e t
16 to 24 s irradiation
1 kilogram of material
59** f451.24 60** 2i 18 24 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 4 a13 0 1 3 0 2 1 1 e 57** 0 0 1-12 e t
1 s to 20 min. decay after irradiation
1 kilogram of material
60** 1-15 1 10 20 30 60 120 300 600 1200 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
2+4 1+4
t
time=0 s
time=1 s
time=10 s
time=20 s
time=30 s
time=60 s
time=120 s
time=300 s
time=600 s
time=1200 s
1$$ 0 56$$ f0 t
EOF
set -xv
ln -s /u21/jab/scamp/origns origns
ln -s $jab2/maphuo2b ft82f001
ln -s $jab/end6dec ft27f001
ln -s $jab/xsectpho ft28f001
touch \sout
origns < input
date
ls -l
cat print \sprt \sout > q1234
sed -f ised1 q1234 > zprntz
cp $sco/joblog/lpfnorg7 q1234
sed -f ised2 q1234 > opfnorg7
cat zprntz >> opfnorg7
asa opfnorg7 > npfnorg7
# nasq npfnorg7
mv npfnorg7 $sco/output/npfnorg7
mv opfnorg7 $sco/output/opfnorg7
cd $sco2
rm -rf $sco2/xdir$$
exit

```

File for ORIGEN calculation of the activation of 16-16-16 fertilizer
cargo using neutron spectrum 1

```
set -xv
date
hostname
sco=/usr/epmnas4/sco/pfna
sco2=/usr/epmnas4/sco
jab=/u21/jab/scamp/origen.bcd.libs
jab2=/u21/jab/scamp/origen.bin.libs
mkdir $sco2/xdir$$
cd $sco2/xdir$$
set -
cat > ised1 << 'EOF'
1,$s/^STOP/ STOP/
EOF
cat > ised2 << 'EOF'
1,$s/^/ /
EOF
cat > input << 'EOF'
0$$ a4 0 28 a8 82 a11 12 11 e 1$$ 1 t
  Activation of Fertilizer (16-16-16)
3$$ 28 4 0 0 6 1 a16 2 a18 2500 750 750 1000 a33 23 e
4** 0.7171 0.3522 1675.8 1-25 e 5$$ 2
54$$ 11z 1
t
35$$ 0 t
56$$ 04 04 1 0 1 1 a10 0 a13 09 1 3 0 2 1 1 e 57** 0.0 0 1-12 e t
  0 to 8s irradiation
  1 kilogram of material
59** f451.24 60** 2i 2 8 61** f1-20 66$$ 1 11z
73$$
  10000 60000 70000 80000 150000 170000 190000 200000 110000
74** 38.1 63.63 172.47 309.15 81.67 126.62 136.19 70.14 2.03
75$$ f4
t
56$$ 0 10 1 0 1 1 a10 4 a13 0 1 3 0 2 1 1 e 57** 0 0 1-12 e t
  1 s to 20 min. decay after irradiation
  1 kilogram of material
60** 1-15 1 10 20 30 60 120 300 600 1200 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
  2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
  2+4 1+4
t
time=0 s
time=1 s
time=10 s
time=20 s
time=30 s
time=60 s
time=120 s
time=300 s
time=600 s
time=1200 s
56$$ 4 4 1 0 1 1 a10 1 a13 0 1 3 0 2 1 1 e 57** 8.0 0.0 1-12 e t
  8 to 16 s irradiation
  1 kilogram of material
59** f451.24 60** 2i 10 16 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 4 a13 0 1 3 0 2 1 1 e 57** 0 0 1-12 e t
  1 s to 20 min. decay after irradiation
  1 kilogram of material
60** 1-15 1 10 20 30 60 120 300 600 1200 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
  2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
  2+4 1+4
t
time=0 s
```

```

time=1 s
time=10 s
time=20 s
time=30 s
time=60 s
time=120 s
time=300 s
time=600 s
time=1200 s
56$$ 4 4 1 0 1 1 a10 1 a13 0 1 3 0 2 1 1 e 57** 16.0 0.0 1-12 e t
16 to 24 s irradiation
1 kilogram of material
59** f451.24 60** 2i 18 24 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 4 a13 0 1 3 0 2 1 1 e 57** 0 0 1-12 e t
1 s to 20 min. decay after irradiation
1 kilogram of material
60** 1-15 1 10 20 30 60 120 300 600 1200 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
2+4 1+4
t
time=0 s
time=1 s
time=10 s
time=20 s
time=30 s
time=60 s
time=120 s
time=300 s
time=600 s
time=1200 s
1$$ 0 56$$ f0 t
EOF
set -xv
ln -s /u21/jab/scamp/origns origns
ln -s $jab2/maphuo2b ft82f001
ln -s $jab/end6dec ft27f001
ln -s $jab/xsectpho ft28f001
touch \sout
origns < input
date
ls -l
cat print \sprt \sout > q1234
sed -f ised1 q1234 > zprntz
cp $sco/joblog/lpfnorg8 q1234
sed -f ised2 q1234 > opfnorg8
cat zprntz >> opfnorg8
asa opfnorg8 > npfnorg8
# nasq npfnorg8
mv npfnorg8 $sco/output/npfnorg8
mv opfnorg8 $sco/output/opfnorg8
cd $sco2
rm -rf $sco2/xdir$$
exit

```

File for ORIGEN calculation of the activation of the concrete structure
using neutron spectrum 1

```

set -xv
date
hostname
sco=/usr/epmnas4/sco/pfna
sco2=/usr/epmnas4/sco
jab=/u21/jab/scamp/origen.bcd.libs
jab2=/u21/jab/scamp/origen.bin.libs
mkdir $sco2/xdir$$
cd $sco2/xdir$$
set -
cat > ised1 << 'EOF'
1,$s/^STOP/ STOP/
EOF
cat > ised2 << 'EOF'
1,$s/^/ /
EOF
cat > input << 'EOF'
0$$ a4 0 28 a8 82 a11 12 11 e 1$$ 1 t
  Activate of Concrete
3$$ 28 4 0 0 6 1 a16 2 a18 2500 750 750 1000 a33 23 e
4** 0.7171 0.3522 1675.8 1-25 e 5$$ 2
54$$ 11z 1
t
35$$ 0 t
56$$ 10 10 1 0 1 1 a10 0 a13 10 3 3 0 2 1 1 e 57** 0.0 0 1-12 e t
  0 to 8 h irradiation
  1 kilogram of material
59** f451.24 60** 8i 0.8 8 61** f1-20 66$$ 1 11z
73$$
  10000 60000 80000 110000 120000 130000 140000 190000 200000 260000
74** 10 1 529 16 2 34 337 13 44 14
75$$ f4
t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
  0.5 to 16 h decay after irradiation
  1 kilogram of material
60** 0.5 1 6i 2 16 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
  2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
  2+4 1+4
t
time=0.5 h
time=1 h
time=2 h
time=4 h
time=6 h
time=8 h
time=10 h
time=12 h
time=14 h
time=16 h
56$$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 24.0 0.0 1-12 e t
  24 to 32 h irradiation
  1 kilogram of material
59** f451.24 60** 8i 24.8 32 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
  0.5 to 16 h decay after irradiation
  1 kilogram of material
60** 0.5 1 6i 2 16 61** f1-20 65$$ 6z 1 f0
t
56$$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 48.0 0.0 1-12 e t
  48 to 56 h irradiation
  1 kilogram of material
59** f451.24 60** 8i 48.8 56 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t

```

0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 72.0 0.0 1-12 e t
 72 to 80 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 72.8 80 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 96.0 0.0 1-12 e t
 96 to 104 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 96.8 104 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 120.0 0.0 1-12 e t
 120 to 128 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 120.8 128 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 144.0 0.0 1-12 e t
 144 to 152 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 144.8 152 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 168.0 0.0 1-12 e t
 168 to 176 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 168.8 176 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 192.0 0.0 1-12 e t
 192 to 200 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 192.8 200 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 216.0 0.0 1-12 e t
 216 to 224 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 216.8 224 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 81\$\$ 2 0 82 1 e 82\$\$ f2
 83**
 2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
 2+4 1+4
 t
 time=0.5 h

```
time=1 h
time=2 h
time=4 h
time=6 h
time=8 h
time=10 h
time=12 h
time=14 h
time=16 h
1$$ 0 56$$ f0 t
EOF
set -xv
ln -s /u21/jab/scamp/origns origns
ln -s $jab2/maphuo2b ft82f001
ln -s $jab/end6dec ft27f001
ln -s $jab/xsectpho ft28f001
touch \${out}
origns < input
date
ls -l
cat print \${prt} \${out} > q1234
sed -f ised1 q1234 > zprntz
cp $sco/joblog/lpfnorg9 q1234
sed -f ised2 q1234 > opfnorg9
cat zprntz >> opfnorg9
asa opfnorg9 > npfnorg9
# nasq npfnorg9
mv npfnorg9 $sco/output/npfnorg9
mv opfnorg9 $sco/output/opfnorg9
cd $sco2
rm -rf $sco2/xdir$$
exit
```

File for ORIGEN calculation of the activation of the aluminum (6061-T6)
structure using neutron spectrum 1

```
set -xv
date
hostname
sco=/usr/epmnas4/sco/pfna
sco2=/usr/epmnas4/sco
jab=/u21/jab/scamp/origen.bcd.libs
jab2=/u21/jab/scamp/origen.bin.libs
mkdir $sco2/xdir$$
cd $sco2/xdir$$
set -
cat > ised1 << 'EOF'
1,$s/^STOP/ STOP/
EOF
cat > ised2 << 'EOF'
1,$s/^/ /
EOF
cat > input << 'EOF'
0$$ a4 0 28 a8 82 a11 12 11 e 1$$ 1 t
  Activation of Aluminum (6061-T6)
3$$ 28 4 0 0 6 1 a16 2 a18 2500 750 750 1000 a33 23 e
4** 0.7171 0.3522 1675.8 1-25 e 5$$ 2
54$$ 11z 1
t
35$$ 0 t
56$$ 10 10 1 0 1 1 a10 0 a13 09 3 3 0 2 1 1 e 57** 0.0 0 1-12 e t
  0 to 8 h irradiation
  1 kilogram of material
59** f451.24 60** 8i 0.8 8 61** f1-20 66$$ 1 11z
73$$
  120000 130000 140000 220000 240000 250000 260000 290000 300000
74** 10 966.8 6 1.5 2 1.5 7 2.7 2.5
75$$ f4
t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
  0.5 to 16 h decay after irradiation
  1 kilogram of material
60** 0.5 1 6i 2 16 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
  2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
  2+4 1+4
t
time=0.5 h
time=1 h
time=2 h
time=4 h
time=6 h
time=8 h
time=10 h
time=12 h
time=14 h
time=16 h
56$$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 24.0 0.0 1-12 e t
  24 to 32 h irradiation
  1 kilogram of material
59** f451.24 60** 8i 24.8 32 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
  0.5 to 16 h decay after irradiation
  1 kilogram of material
60** 0.5 1 6i 2 16 61** f1-20 65$$ 6z 1 f0
t
56$$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 48.0 0.0 1-12 e t
  48 to 56 h irradiation
  1 kilogram of material
59** f451.24 60** 8i 48.8 56 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
```


0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 72.0 0.0 1-12 e t
 72 to 80 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 72.8 80 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 96.0 0.0 1-12 e t
 96 to 104 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 96.8 104 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 120.0 0.0 1-12 e t
 120 to 128 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 120.8 128 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 144.0 0.0 1-12 e t
 144 to 152 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 144.8 152 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 168.0 0.0 1-12 e t
 168 to 176 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 168.8 176 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 192.0 0.0 1-12 e t
 192 to 200 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 192.8 200 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 216.0 0.0 1-12 e t
 216 to 224 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 216.8 224 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 81\$\$ 2 0 82 1 e 82\$\$ f2
 83**
 2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
 2+4 1+4
 t
 time=0.5 h

```
time=1 h
time=2 h
time=4 h
time=6 h
time=8 h
time=10 h
time=12 h
time=14 h
time=16 h
1$$ 0 56$$ f0 t
EOF
set -xv
ln -s /u21/jab/scamp/origns origns
ln -s $jab2/maphuo2b ft82f001
ln -s $jab/end6dec ft27f001
ln -s $jab/xsectpho ft28f001
touch \Sout
origns < input
date
ls -l
cat print \Sprt \Sout > q1234
sed -f ised1 q1234 > zprntz
cp $sco/joblog/lpfnorga q1234
sed -f ised2 q1234 > opfnorga
cat zprntz >> opfnorga
asa opfnorga > npfnorga
# nasq npfnorga
mv npfnorga $sco/output/npfnorga
mv opfnorga $sco/output/opfnorga
cd $sco2
rm -rf $sco2/xdir$$
exit
```

File for ORIGEN calculation of the activation of the steel plate using
neutron spectrum 1

```
set -xv
date
hostname
sco=/usr/epmnas4/sco/pfna
sco2=/usr/epmnas4/sco
jab=/u21/jab/scamp/origen.bcd.libs
jab2=/u21/jab/scamp/origen.bin.libs
mkdir $sco2/xdir$$
cd $sco2/xdir$$
set -
cat > ised1 << 'EOF'
1,$s/^STOP/ STOP/
EOF
cat > ised2 << 'EOF'
1,$s/^/ /
EOF
cat > input << 'EOF'
0$$ a4 0 28 a8 82 a11 12 11 e 1$$ 1 t
  Activation of Steel Plate
3$$ 28 4 0 0 6 1 a16 2 a18 2500 750 750 1000 a33 23 e
4** 0.7171 0.3522 1675.8 1-25 e 5$$ 2
54$$ 11z 1
t
35$$ 0 t
56$$ 10 10 1 0 1 1 a10 0 a13 09 3 3 0 2 1 1 e 57** 0.0 0 1-12 e t
  0 to 8 h irradiation
  1 kilogram of material
59** f451.24 60** 8i 0.8 8 61** f1-20 66$$ 1 11z
73$$
  060000 070000 140000 150000 160000 240000 250000 260000 280000
74** 0.8 1.6 7.5 0.45 0.3 200 20 649.35 120
75$$ f4
t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
  0.5 to 16 h decay after irradiation
  1 kilogram of material
60** 0.5 1 6i 2 16 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
  2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
  2+4 1+4
t
time=0.5 h
time=1 h
time=2 h
time=4 h
time=6 h
time=8 h
time=10 h
time=12 h
time=14 h
time=16 h
56$$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 24.0 0.0 1-12 e t
  24 to 32 h irradiation
  1 kilogram of material
59** f451.24 60** 8i 24.8 32 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
  0.5 to 16 h decay after irradiation
  1 kilogram of material
60** 0.5 1 6i 2 16 61** f1-20 65$$ 6z 1 f0
t
56$$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 48.0 0.0 1-12 e t
  48 to 56 h irradiation
  1 kilogram of material
59** f451.24 60** 8i 48.8 56 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
```

0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 72.0 0.0 1-12 e t
 72 to 80 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 72.8 80 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 96.0 0.0 1-12 e t
 96 to 104 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 96.8 104 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 120.0 0.0 1-12 e t
 120 to 128 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 120.8 128 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 144.0 0.0 1-12 e t
 144 to 152 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 144.8 152 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 168.0 0.0 1-12 e t
 168 to 176 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 168.8 176 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 192.0 0.0 1-12 e t
 192 to 200 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 192.8 200 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 216.0 0.0 1-12 e t
 216 to 224 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 216.8 224 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 81\$\$ 2 0 82 1 e 82\$\$ f2
 83**
 2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
 2+4 1+4
 t
 time=0.5 h

```
time=1 h
time=2 h
time=4 h
time=6 h
time=8 h
time=10 h
time=12 h
time=14 h
time=16 h
1$$ 0 56$$ f0 t
EOF
set -xv
ln -s /u21/jab/scamp/origns origns
ln -s $jab2/maphuo2b ft82f001
ln -s $jab/end6dec ft27f001
ln -s $jab/xsectpho ft28f001
touch \$out
origns < input
date
ls -l
cat print \$prt \$out > q1234
sed -f ised1 q1234 > zprntz
cp $sco/joblog/lpfnorgb q1234
sed -f ised2 q1234 > opfnorgb
cat zprntz >> opfnorgb
asa opfnorgb > npfnorgb
# nasq npfnorgb
mv npfnorgb $sco/output/npfnorgb
mv opfnorgb $sco/output/opfnorgb
cd $sco2
rm -rf $sco2/xdir$$
exit
```

File for ORIGEN calculation of the activation of Havar foil using
neutron spectrum 1

```
set -xv
date
hostname
sco=/usr/epmnas4/sco/pfna
sco2=/usr/epmnas4/sco
jab=/u21/jab/scamp/origen.bcd.libs
jab2=/u21/jab/scamp/origen.bin.libs
mkdir $sco2/xdir$$
cd $sco2/xdir$$
set -
cat > ised1 << 'EOF'
1,$s/^STOP/ STOP/
EOF
cat > ised2 << 'EOF'
1,$s/^/ /
EOF
cat > input << 'EOF'
0$$ a4 0 28 a8 82 a11 12 11 e 1$$ 1 t
  Activation of Havar Foil
3$$ 28 4 0 0 6 1 a16 2 a18 2500 750 750 1000 a33 23 e
4** 0.7171 0.3522 1675.8 1-25 e 5$$ 2
54$$ 11z 1
t
35$$ 0 t
56$$ 10 10 1 0 1 1 a10 0 a13 08 3 3 0 2 1 1 e 57** 0.0 0 1-12 e t
  0 to 8 h irradiation
  1 kilogram of material
59** f451.24 60** 8i 0.8 8 61** f1-20 66$$ 1 11z
73$$
060000 240000 250000 260000 270000 280000 420000 740000
74** 2 195 16 191 420 127 22 27
75$$ f4
t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
  0.5 to 16 h decay after irradiation
  1 kilogram of material
60** 0.5 1 6i 2 16 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
  2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
  2+4 1+4
t
time=0.5 h
time=1 h
time=2 h
time=4 h
time=6 h
time=8 h
time=10 h
time=12 h
time=14 h
time=16 h
56$$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 24.0 0.0 1-12 e t
  24 to 32 h irradiation
  1 kilogram of material
59** f451.24 60** 8i 24.8 32 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
  0.5 to 16 h decay after irradiation
  1 kilogram of material
60** 0.5 1 6i 2 16 61** f1-20 65$$ 6z 1 f0
t
56$$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 48.0 0.0 1-12 e t
  48 to 56 h irradiation
  1 kilogram of material
59** f451.24 60** 8i 48.8 56 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
```

0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 72.0 0.0 1-12 e t
 72 to 80 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 72.8 80 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 96.0 0.0 1-12 e t
 96 to 104 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 96.8 104 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 120.0 0.0 1-12 e t
 120 to 128 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 120.8 128 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 144.0 0.0 1-12 e t
 144 to 152 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 144.8 152 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 168.0 0.0 1-12 e t
 168 to 176 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 168.8 176 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 192.0 0.0 1-12 e t
 192 to 200 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 192.8 200 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 216.0 0.0 1-12 e t
 216 to 224 h irradiation
 1 kilogram of material
 59** f451.24 60** 8i 216.8 224 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 81\$\$ 2 0 82 1 e 82\$\$ f2
 83**
 2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
 2+4 1+4
 t
 time=0.5 h

```
time=1 h
time=2 h
time=4 h
time=6 h
time=8 h
time=10 h
time=12 h
time=14 h
time=16 h
1$$ 0 56$$ f0 t
EOF
set -xv
ln -s /u21/jab/scamp/origns origns
ln -s $jab2/maphuo2b ft82f001
ln -s $jab/end6dec ft27f001
ln -s $jab/xsectpho ft28f001
touch \Sout
origns < input
date
ls -l
cat print \Sprt \Sout > q1234
sed -f ised1 q1234 > zprntz
cp $sco/joblog/lpfnorgc q1234
sed -f ised2 q1234 > opfnorgc
cat zprntz >> opfnorgc
asa opfnorgc > npfnorgc
# nasq npfnorgc
mv npfnorgc $sco/output/npfnorgc
mv opfnorgc $sco/output/opfnorgc
cd $sco2
rm -rf $sco2/xdir$$
exit
```


File for ORIGEN calculation of the activation of the aluminum (6061-T6)
structure using neutron spectrum 2

```

set -xv
date
hostname
sco=/usr/epmnas4/sco/pfna
sco2=/usr/epmnas4/sco
jab=/u21/jab/scamp/origen.bcd.libs
jab2=/u21/jab/scamp/origen.bin.libs
mkdir $sco2/xdir$$
cd $sco2/xdir$$
set -
cat > ised1 << 'EOF'
1,$s/^STOP/ STOP/
EOF
cat > ised2 << 'EOF'
1,$s/^/ /
EOF
cat > input << 'EOF'
0$$ a4 0 28 a8 82 a11 12 11 e 1$$ 1 t
  Activation of Aluminum (6061-T6)
3$$ 28 4 0 0 6 1 a16 2 a18 2500 750 750 1000 a33 23 e
4** 0.5089 1.4711 1637.5 1-25 e 5$$ 2
54$$ 11z 1
t
35$$ 0 t
56$$ 10 10 1 0 1 1 a10 0 a13 09 3 3 0 2 1 1 e 57** 0.0 0 1-12 e t
  0 to 8 h irradiation
  1 kilogram of material
59** f3227.31 60** 8i 0.8 8 61** f1-20 66$$ 1 11z
73$$
  120000 130000 140000 220000 240000 250000 260000 290000 300000
74** 10 966.8 6 1.5 2 1.5 7 2.7 2.5
75$$ f4
t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
  0.5 to 16 h decay after irradiation
  1 kilogram of material
60** 0.5 1 6i 2 16 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
  2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
  2+4 1+4
t
time=0.5 h
time=1 h
time=2 h
time=4 h
time=6 h
time=8 h
time=10 h
time=12 h
time=14 h
time=16 h
56$$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 24.0 0.0 1-12 e t
  24 to 32 h irradiation
  1 kilogram of material
59** f3227.31 60** 8i 24.8 32 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
  0.5 to 16 h decay after irradiation
  1 kilogram of material
60** 0.5 1 6i 2 16 61** f1-20 65$$ 6z 1 f0
t
56$$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 48.0 0.0 1-12 e t
  48 to 56 h irradiation
  1 kilogram of material
59** f3227.31 60** 8i 48.8 56 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t

```

0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 72.0 0.0 1-12 e t
 72 to 80 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 72.8 80 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 96.0 0.0 1-12 e t
 96 to 104 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 96.8 104 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 120.0 0.0 1-12 e t
 120 to 128 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 120.8 128 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 144.0 0.0 1-12 e t
 144 to 152 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 144.8 152 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 168.0 0.0 1-12 e t
 168 to 176 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 168.8 176 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 192.0 0.0 1-12 e t
 192 to 200 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 192.8 200 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 216.0 0.0 1-12 e t
 216 to 224 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 216.8 224 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 81\$\$ 2 0 82 1 e 82\$\$ f2
 83**
 2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
 2+4 1+4
 t
 time=0.5 h

```
time=1 h
time=2 h
time=4 h
time=6 h
time=8 h
time=10 h
time=12 h
time=14 h
time=16 h
1$$ 0 56$$ f0 t
EOF
set -xv
ln -s /u21/jab/scamp/origns origns
ln -s $jab2/maphuo2b ft82f001
ln -s $jab/end6dec ft27f001
ln -s $jab/xsectpho ft28f001
touch \Sout
origns < input
date
ls -l
cat print \Sprt \Sout > q1234
sed -f ised1 q1234 > zprntz
cp $sco/joblog/lpfnorgd q1234
sed -f ised2 q1234 > opfnorgd
cat zprntz >> opfnorgd
asa opfnorgd > npfnorgd
# nasq npfnorgd
mv npfnorgd $sco/output/npfnorgd
mv opfnorgd $sco/output/opfnorgd
cd $sco2
rm -rf $sco2/xdir$$
exit
```

File for ORIGEN calculation of the activation of the steel plate using
neutron spectrum 2

```
set -xv
date
hostname
sco=/usr/epmnas4/sco/pfna
sco2=/usr/epmnas4/sco
jab=/u21/jab/scamp/origen.bcd.libs
jab2=/u21/jab/scamp/origen.bin.libs
mkdir $sco2/xdir$$
cd $sco2/xdir$$
set -
cat > ised1 << 'EOF'
1,$s/^STOP/ STOP/
EOF
cat > ised2 << 'EOF'
1,$s// /
EOF
cat > input << 'EOF'
0$$ a4 0 28 a8 82 a11 12 11 e 1$$ 1 t
  Activation of Steel Plate
3$$ 28 4 0 0 6 1 a16 2 a18 2500 750 750 1000 a33 23 e
4** 0.5089 1.4711 1637.5 1-25 e 5$$ 2
54$$ 11z 1
t
35$$ 0 t
56$$ 10 10 1 0 1 1 a10 0 a13 09 3 3 0 2 1 1 e 57** 0.0 0 1-12 e t
  0 to 8 h irradiation
  1 kilogram of material
59** f3227.31 60** 8i 0.8 8 61** f1-20 66$$ 1 11z
73$$
  060000 070000 140000 150000 160000 240000 250000 260000 280000
74** 0.8 1.6 7.5 0.45 0.3 200 20 649.35 120
75$$ f4
t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
  0.5 to 16 h decay after irradiation
  1 kilogram of material
60** 0.5 1 6i 2 16 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
  2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
  2+4 1+4
t
time=0.5 h
time=1 h
time=2 h
time=4 h
time=6 h
time=8 h
time=10 h
time=12 h
time=14 h
time=16 h
56$$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 24.0 0.0 1-12 e t
  24 to 32 h irradiation
  1 kilogram of material
59** f3227.31 60** 8i 24.8 32 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
  0.5 to 16 h decay after irradiation
  1 kilogram of material
60** 0.5 1 6i 2 16 61** f1-20 65$$ 6z 1 f0
t
56$$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 48.0 0.0 1-12 e t
  48 to 56 h irradiation
  1 kilogram of material
59** f3227.31 60** 8i 48.8 56 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
```

0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 72.0 0.0 1-12 e t
 72 to 80 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 72.8 80 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 96.0 0.0 1-12 e t
 96 to 104 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 96.8 104 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 120.0 0.0 1-12 e t
 120 to 128 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 120.8 128 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 144.0 0.0 1-12 e t
 144 to 152 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 144.8 152 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 168.0 0.0 1-12 e t
 168 to 176 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 168.8 176 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 192.0 0.0 1-12 e t
 192 to 200 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 192.8 200 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 216.0 0.0 1-12 e t
 216 to 224 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 216.8 224 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 81\$\$ 2 0 82 1 e 82\$\$ f2
 83**
 2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
 2+4 1+4
 t
 time=0.5 h

```
time=1 h
time=2 h
time=4 h
time=6 h
time=8 h
time=10 h
time=12 h
time=14 h
time=16 h
1$$ 0 56$$ f0 t
EOF
set -xv
ln -s /u21/jab/scamp/origns origns
ln -s $jab2/maphuc2b ft82f001
ln -s $jab/end6dec ft27f001
ln -s $jab/xsectpho ft28f001
touch \Sout
origns < input
date
ls -l
cat print \Sprt \Sout > q1234
sed -f ised1 q1234 > zprntz
cp $sco/joblog/lpfnorge q1234
sed -f ised2 q1234 > opfnorge
cat zprntz >> opfnorge
asa opfnorge > npfnorge
# nasq npfnorge
mv npfnorge $sco/output/npfnorge
mv opfnorge $sco/output/opfnorge
cd $sco2
rm -rf $sco2/xdir$$
exit
```

File for ORIGEN calculation of the activation of Havar foil using
neutron spectrum 2

```

set -xv
date
hostname
sco=/usr/epmnas4/sco/pfna
sco2=/usr/epmnas4/sco
jab=/u21/jab/scamp/origen.bcd.libs
jab2=/u21/jab/scamp/origen.bin.libs
mkdir $sco2/xdir$$
cd $sco2/xdir$$
set -
cat > ised1 << 'EOF'
1,$s/^STOP/ STOP/
EOF
cat > ised2 << 'EOF'
1,$s/^/ /
EOF
cat > input << 'EOF'
0$$ a4 0 28 a8 82 a11 12 11 e 1$$ 1 t
  Activation of Havar Foil
3$$ 28 4 0 0 6 1 a16 2 a18 2500 750 750 1000 a33 23 e
4** 0.5089 1.4711 1637.5 1-25 e 5$$ 2
54$$ 11z 1
t
35$$ 0 t
56$$ 10 10 1 0 1 1 a10 0 a13 08 3 3 0 2 1 1 e 57** 0.0 0 1-12 e t
  0 to 8 h irradiation
  1 kilogram of material
59** f3227.31 60** 8i 0.8 8 61** f1-20 66$$ 1 11z
73$$
060000 240000 250000 260000 270000 280000 420000 740000
74** 2 195 16 191 420 127 22 27
75$$ f4
t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
  0.5 to 16 h decay after irradiation
  1 kilogram of material
60** 0.5 1 6i 2 16 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
  2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
  2+4 1+4
t
time=0.5 h
time=1 h
time=2 h
time=4 h
time=6 h
time=8 h
time=10 h
time=12 h
time=14 h
time=16 h
56$$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 24.0 0.0 1-12 e t
  24 to 32 h irradiation
  1 kilogram of material
59** f3227.31 60** 8i 24.8 32 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
  0.5 to 16 h decay after irradiation
  1 kilogram of material
60** 0.5 1 6i 2 16 61** f1-20 65$$ 6z 1 f0
t
56$$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 48.0 0.0 1-12 e t
  48 to 56 h irradiation
  1 kilogram of material
59** f3227.31 60** 8i 48.8 56 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t

```

0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 72.0 0.0 1-12 e t
 72 to 80 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 72.8 80 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 96.0 0.0 1-12 e t
 96 to 104 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 96.8 104 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 120.0 0.0 1-12 e t
 120 to 128 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 120.8 128 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 144.0 0.0 1-12 e t
 144 to 152 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 144.8 152 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 168.0 0.0 1-12 e t
 168 to 176 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 168.8 176 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 192.0 0.0 1-12 e t
 192 to 200 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 192.8 200 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 216.0 0.0 1-12 e t
 216 to 224 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 216.8 224 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 81\$\$ 2 0 82 1 e 82\$\$ f2
 83**
 2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
 2+4 1+4
 t
 time=0.5 h


```
time=1 h
time=2 h
time=4 h
time=6 h
time=8 h
time=10 h
time=12 h
time=14 h
time=16 h
1$$ 0 56$$ f0 t
EOF
set -xv
ln -s /u21/jab/scamp/origns origns
ln -s $jab2/maphuo2b ft82f001
ln -s $jab/end6dec ft27f001
ln -s $jab/xsectpho ft28f001
touch \out
origns < input
date
ls -l
cat print \sprt \out > q1234
sed -f ised1 q1234 > zprntz
cp $sco/joblog/lpfnorgf q1234
sed -f ised2 q1234 > opfnorgf
cat zprntz >> opfnorgf
asa opfnorgf > npfnorgf
# nasq npfnorgf
mv npfnorgf $sco/output/npfnorgf
mv opfnorgf $sco/output/opfnorgf
cd $sco2
rm -rf $sco2/xdir$$
exit
```

File for ORIGEN calculation of the activation of the concrete structure
using neutron spectrum 2

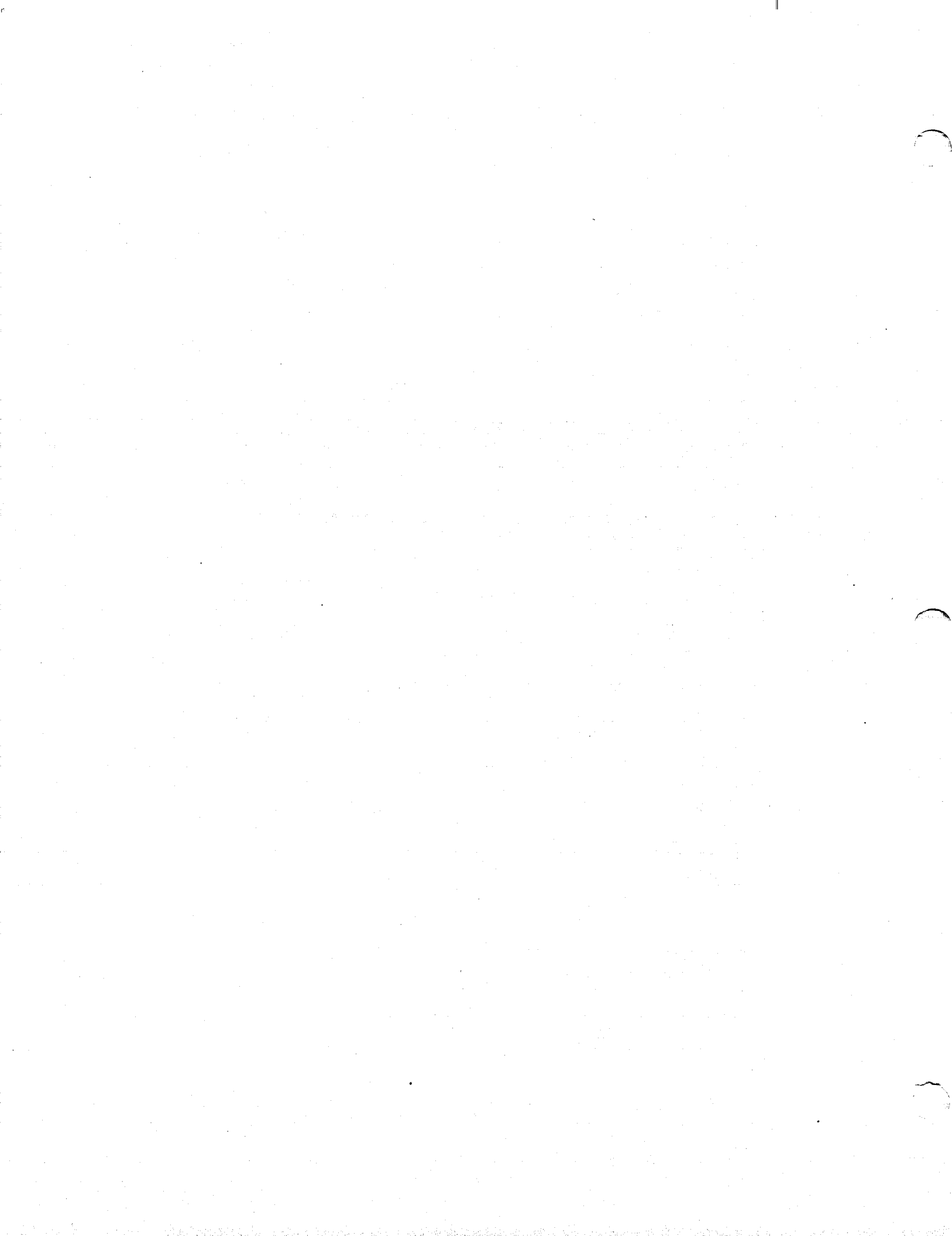
```
set -xv
date
hostname
sco=/usr/epmnas4/sco/pfna
sco2=/usr/epmnas4/sco
jab=/u21/jab/scamp/origen.bcd.libs
jab2=/u21/jab/scamp/origen.bin.libs
mkdir $sco2/xdir$$
cd $sco2/xdir$$
set -
cat > ised1 << 'EOF'
1,$s/^STOP/ STOP/
EOF
cat > ised2 << 'EOF'
1,$s/^/ /
EOF
cat > input << 'EOF'
0$$$ a4 0 28 a8 82 a11 12 11 e 1$$ 1 t
  Activation of Concrete
3$$$ 28 4 0 0 6 1 a16 2 a18 2500 750 750 1000 a33 23 e
4** 0.5089 1.4711 1637.5 1-25 e 5$$ 2
54$$$ 11z 1
t
35$$$ 0 t
56$$$ 10 10 1 0 1 1 a10 0 a13 10 3 3 0 2 1 1 e 57** 0.0 0 1-12 e t
  0 to 8 h irradiation
  1 kilogram of material
59** f3227.31 60** 8i 0.8 8 61** f1-20 66$$ 1 11z
73$$$
  10000 60000 80000 110000 120000 130000 140000 190000 200000 260000
74** 10 1 529 16 2 34 337 13 44 14
75$$$ f4
t
56$$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
  0.5 to 16 h decay after irradiation
  1 kilogram of material
60** 0.5 1 6i 2 16 61** f1-20 65$$ 6z 1 f0
81$$$ 2 0 82 1 e 82$$ f2
83**
  2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
  2+4 1+4
t
time=0.5 h
time=1 h
time=2 h
time=4 h
time=6 h
time=8 h
time=10 h
time=12 h
time=14 h
time=16 h
56$$$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 24.0 0.0 1-12 e t
  24 to 32 h irradiation
  1 kilogram of material
59** f3227.31 60** 8i 24.8 32 61** f1-20 66$$ 1 11z t
56$$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
  0.5 to 16 h decay after irradiation
  1 kilogram of material
60** 0.5 1 6i 2 16 61** f1-20 65$$ 6z 1 f0
t
56$$$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 48.0 0.0 1-12 e t
  48 to 56 h irradiation
  1 kilogram of material
59** f3227.31 60** 8i 48.8 56 61** f1-20 66$$ 1 11z t
56$$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
```

0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 72.0 0.0 1-12 e t
 72 to 80 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 72.8 80 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 96.0 0.0 1-12 e t
 96 to 104 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 96.8 104 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 120.0 0.0 1-12 e t
 120 to 128 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 120.8 128 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 144.0 0.0 1-12 e t
 144 to 152 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 144.8 152 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 168.0 0.0 1-12 e t
 168 to 176 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 168.8 176 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 192.0 0.0 1-12 e t
 192 to 200 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 192.8 200 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 216.0 0.0 1-12 e t
 216 to 224 h irradiation
 1 kilogram of material
 59** f3227.31 60** 8i 216.8 224 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 81\$\$ 2 0 82 1 e 82\$\$ f2
 83**
 2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
 2+4 1+4
 t
 time=0.5 h

```
time=1 h
time=2 h
time=4 h
time=6 h
time=8 h
time=10 h
time=12 h
time=14 h
time=16 h
1$$ 0 56$$ f0 t
EOF
set -xv
ln -s /u21/jab/scamp/origns origns
ln -s $jab2/maphuo2b ft82f001
ln -s $jab/end6dec ft27f001
ln -s $jab/xsectpho ft28f001
touch \Sout
origns < input
date
ls -l
cat print \Sprt \Sout > q1234
sed -f ised1 q1234 > zprntz
cp $sco/joblog/lpfnorgg q1234
sed -f ised2 q1234 > opfnorgg
cat zprntz >> opfnorgg
asa opfnorgg > npfnorgg
# nasq npfnorgg
mv npfnorgg $sco/output/npfnorgg
mv opfnorgg $sco/output/opfnorgg
cd $sco2
rm -rf $sco2/xdir$$
exit
```

File for ORIGEN calculation of the activation of the concrete structure
using neutron spectrum 3

```
set -xv
date
hostname
sco=/usr/epmnas4/sco/pfna
sco2=/usr/epmnas4/sco
jab=/u21/jab/scamp/origen.bcd.libs
jab2=/u21/jab/scamp/origen.bin.libs
mkdir $sco2/xdir$$
cd $sco2/xdir$$
set -
cat > ised1 << 'EOF'
1,$s/^STOP/ STOP/
EOF
cat > ised2 << 'EOF'
1,$s/^/ /
EOF
cat > input << 'EOF'
0$$ a4 0 28 a8 82 a11 12 11 e 1$$ 1 t
  Activation of Concrete -- spectrum 3
3$$ 28 4 0 0 6 1 a16 2 a18 2500 750 750 1000 a33 23 e
4** 0.6192 0.56447 23.505 1-25 e 5$$ 2
54$$ 11z 1
t
35$$ 0 t
56$$ 10 10 1 0 1 1 a10 0 a13 10 3 3 0 2 1 1 e 57** 0.0 0 1-12 e t
  0 to 8 h irradiation
  1 kilogram of material
59** f2801.82 60** 8i 0.8 8 61** f1-20 66$$ 1 11z
73$$
  10000 60000 80000 110000 120000 130000 140000 190000 200000 260000
74** 10 1 529 16 2 34 337 13 44 14
75$$ f4
t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
  0.5 to 16 h decay after irradiation
  1 kilogram of material
60** 0.5 1 6i 2 16 61** f1-20 65$$ 6z 1 f0
81$$ 2 0 82 1 e 82$$ f2
83**
  2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
  2+4 1+4
t
time=0.5 h
time=1 h
time=2 h
time=4 h
time=6 h
time=8 h
time=10 h
time=12 h
time=14 h
time=16 h
56$$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 24.0 0.0 1-12 e t
  24 to 32 h irradiation
  1 kilogram of material
59** f2801.82 60** 8i 24.8 32 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
  0.5 to 16 h decay after irradiation
  1 kilogram of material
60** 0.5 1 6i 2 16 61** f1-20 65$$ 6z 1 f0
t
56$$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 48.0 0.0 1-12 e t
  48 to 56 h irradiation
  1 kilogram of material
59** f2801.82 60** 8i 48.8 56 61** f1-20 66$$ 1 11z t
56$$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
```



0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 72.0 0.0 1-12 e t
 72 to 80 h irradiation
 1 kilogram of material
 59** f2801.82 60** 8i 72.8 80 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 96.0 0.0 1-12 e t
 96 to 104 h irradiation
 1 kilogram of material
 59** f2801.82 60** 8i 96.8 104 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 120.0 0.0 1-12 e t
 120 to 128 h irradiation
 1 kilogram of material
 59** f2801.82 60** 8i 120.8 128 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 144.0 0.0 1-12 e t
 144 to 152 h irradiation
 1 kilogram of material
 59** f2801.82 60** 8i 144.8 152 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 168.0 0.0 1-12 e t
 168 to 176 h irradiation
 1 kilogram of material
 59** f2801.82 60** 8i 168.8 176 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 192.0 0.0 1-12 e t
 192 to 200 h irradiation
 1 kilogram of material
 59** f2801.82 60** 8i 192.8 200 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 t
 56\$\$ 10 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 216.0 0.0 1-12 e t
 216 to 224 h irradiation
 1 kilogram of material
 59** f2801.82 60** 8i 216.8 224 61** f1-20 66\$\$ 1 11z t
 56\$\$ 0 10 1 0 1 1 a10 10 a13 0 3 3 0 2 1 1 e 57** 0 0 1-12 e t
 0.5 to 16 h decay after irradiation
 1 kilogram of material
 60** 0.5 1 6i 2 16 61** f1-20 65\$\$ 6z 1 f0
 81\$\$ 2 0 82 1 e 82\$\$ f2
 83**
 2+7 2i 14+6 4i 8+6 3i 2+6 1+6 7+5 1i 45+4 15+4 1+5 7+4 45+3 3+4
 2+4 1+4
 t
 time=0.5 h

```
time=1 h
time=2 h
time=4 h
time=6 h
time=8 h
time=10 h
time=12 h
time=14 h
time=16 h
1$$ 0 56$$ f0 t
EOF
set -xv
ln -s /u21/jab/scamp/origns origns
ln -s $jab2/maphuo2b ft82f001
ln -s $jab/end6dec ft27f001
ln -s $jab/xsectpho ft28f001
touch \out
origns < input
date
ls -l
cat print \sprt \out > q1234
sed -f ised1 q1234 > zprntz
cp $sco/joblog/lpfnorgh q1234
sed -f ised2 q1234 > opfnorgh
cat zprntz >> opfnorgh
asa opfnorgh > npfnorgh
# nasq npfnorgh
mv npfnorgh $sco/output/npfnorgh
mv opfnorgh $sco/output/opfnorgh
cd $sco2
rm -rf $sco2/xdir$$
exit
```

