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Enrichment Meter Dataset from High-Resolution Gamma Spectroscopy Measurements of U_3O_8 Enrichment Standards and UF_6 Cylinder Wall Equivalents

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OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE US DEPARTMENT OF ENERGY

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Nuclear Security and Isotope Technology Division

ENRICHMENT METER DATASET FROM HIGH-RESOLUTION GAMMA SPECTROSCOPY MEASUREMENTS OF U_3O_8 ENRICHMENT STANDARDS AND UF_6 CYLINDER WALL EQUIVALENTS

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ACRONYMS AND ABBREVIATIONS

ASTM	American Society for Testing and Materials
BG	background
EMP	Enrichment Meter Principle
FRAM	Fixed-Energy Response Function Analysis with Multiple Efficiency
FWHM	full width at half maximum
HEU	high-enriched uranium
ISOCS	In Situ Object Counting System
LEU	low-enriched uranium
MCA	Multi-Channel Analyzer
MGAU	Multi-Group Analysis for Uranium
NIST	National Institute of Standards and Technology
QA	Quality Assurance
QC	Quality Control
ROI	regions of interest

1. INTRODUCTION

1.1 PURPOSE AND SCOPE

The Enrichment Meter Principle (EMP) is the basis for a commonly used standard test method for the non-destructive assay of ^{235}U enrichment in bulk compounds [1]. The technique involves determining the net count rate in the direct 186 keV peak using medium or high energy gamma-ray spectrometry in a fixed geometry.

With suitable correction for wall attenuation, compound type, rate loss (live time), and peaked background (if significant), the atom fraction of ^{235}U may be obtained from the counting rate from a linear relationship through the origin.

The widespread use of this method for field verification of enrichment [2,3] together with the fact that the response function rests on fundamental physics considerations (i.e., is not represented by a convenient but arbitrary form) makes it an interesting example of uncertainty quantification, one in which one can expect a valid measurement model can be applied.

When applied using NaI(Tl) and region of interest analysis, the technique is susceptible to both interference error and bias [2-4]. When implemented using high-resolution gamma-ray spectroscopy, the spectrum interpretation is considerable simplified and more robust [5]. However, a practical challenge to studying the uncertainty budget of the EMP method (for example, to test linearity, extract wall corrections and so forth using modern methods) is the availability of quality experimental data that can be referenced and shared. To fill this gap, the research team undertook an experimental campaign [6].

A measurement campaign was conducted to produce high-resolution gamma spectroscopy enrichment meter data comparable to UF_6 cylinder measurements. The purpose of this report is to provide both an introduction to and quality assurance (QA) of the raw data produced. This report is intended for the analyst or researcher who uses the raw data. Unfortunately, the raw data (i.e., the spectra files) are too voluminous to include in this report but can be requested from Steven Croft of the Safeguards & Security Technology Group (scroft@ornl.gov 865-241-2834). The complete processed data are tabulated in Appendix A.

The analysis techniques used to produce the QA data presented in this report [e.g., three regions-of-interest (ROI) peak extraction and batch analysis processes] are not the most sophisticated techniques available; analysts are encouraged to reanalyze the raw data using more sensitive techniques and to improve upon the results presented here. With that being said, the analysis techniques used here are more than adequate to present and inspect the quality of the data.

1.2 OVERVIEW

A dataset of 696 enrichment meter measurements has been produced. The configuration of the measurements was to be comparable to UF_6 cylinder measurements. This report summarizes the data collection. Forthcoming reports will extend data analysis and results.

Measurements were collected using stainless steel–type 304 attenuators with nominal thicknesses of 0, 8, 13, and 16 mm and certified U_3O_8 uranium enrichment standards with nominal enrichments of 0.31, 0.71, 1.94, 2.95, 4.46, 20.11, 52.49, and 93.17 wt%. For QA purposes, additional measurements were collected using spacers (i.e., air attenuators) with nominal thicknesses of 0, 8, 13, and 16 mm, corresponding to the SS304 attenuator thicknesses. The SS304 attenuator thicknesses are approximately equivalent to the wall thicknesses of standard product, feed, and tails cylinders (i.e., 30B, 48Y, 48G). The detector was a

ϕ7.0xH2.6 cm broad energy germanium detector (Canberra BEGE-3825), and the collimator was 2 cm thick lead with a ϕ1.5 cm aperture.

Two data subsets were collected—the high-quality dataset and the field-quality dataset.

The high-quality dataset is characterized by 56 measurements, with a measurement cutoff of 100,000 counts in the 186 keV net peak area. The 100,000 count cutoff corresponds to a low Poisson counting uncertainty of 0.32% (1 s), which provides for a precise characterization of the measurement system. The high-quality dataset has *only one* measurement for each combination of enrichment and SS304 attenuator/spacer thickness. The inclusion of the spacer measurements affords confirmation of the "narrow beam geometry" and "sample infinite thickness."

The field-quality dataset is characterized by 640 measurements with a measurement cutoff of 5 min (real time). The 5 min cutoff of the field-quality dataset permits direct comparison with other commonly reported data and the international target values [7]. The field-quality dataset has 20 measurements for each combination of enrichment and SS304 attenuator thickness but omits spacer measurements. The 20 replicate measurements of each configuration provide a sample size sufficient for statistical analysis. Additionally, the spectra can be summed together to create spectra with longer count times.

QA procedures included four 12 h background (BG) measurements, fifty-eight 5 min BG measurements, forty-nine 5 min quality control (QC) measurements, and photographic documentation of each measurement for the duration of the measurement campaign. The 5 min BG and 5 min QC measurements were taken three times per day, with omissions for long measurements and weekends. The QC measurements were of the 4.46 wt%+^{137}Cs-0 mm configuration (i.e., the 4.46 wt% enrichment standards in the presence of a ^{137}Cs check source and without an SS304 attenuator/spacer).

2. DATA

Two data subsets were collected, the high-quality dataset and the field-quality dataset. The high-quality dataset is characterized by a measurement cutoff of 100,000 counts in the 186 keV net peak area. The field-quality dataset is characterized by a measurement cutoff of 5 min (real time). These datasets are introduced and described in this section.

DISCLAIMER: The purpose of this report is to summarize the data and data collection process and to provide QA documentation to users of the raw data (i.e., acquired spectra). The purpose is not to perform a critical analysis of the data, which will instead appear in forthcoming reports. Hence, the analysis techniques used (e.g., three ROI peak extraction and batch analysis processes) to produce the processed data presented in this section and throughout the report are not the most sophisticated techniques available. Analysts are encouraged to reanalyze the raw data using more sensitive techniques and to improve upon the results presented here. However, the analysis techniques used here are more than adequate to present and inspect the quality of the data.

The ROIs applied to the 186 and 1001 keV net peak area calculations are shown in Fig. 1 and Table 1 and are sufficient to accommodate observed peak shifts which are discussed in Sect. 4.2.2.

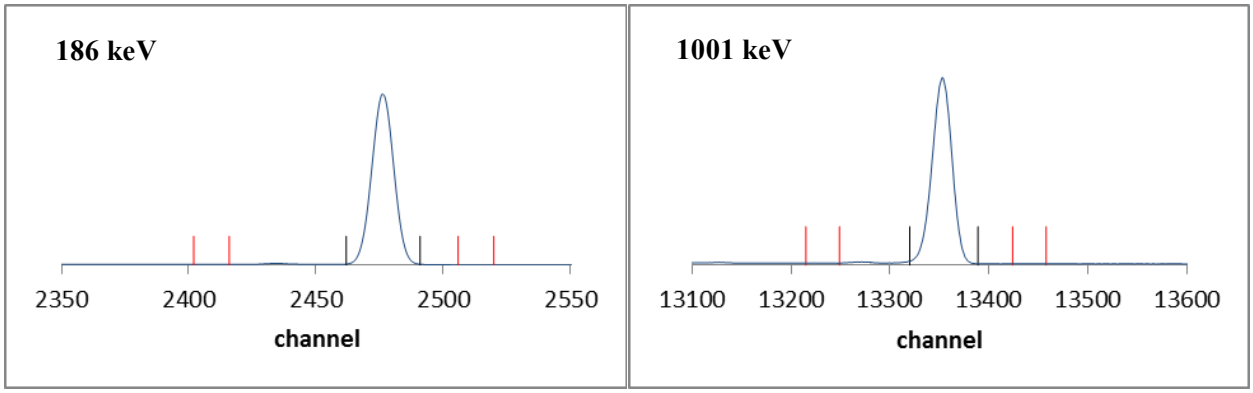

Fig. 1. Regions of interest for the (LEFT) 186 and (RIGHT) 1001 keV net peak area calculation.

Table 1. Regions of interest for the 186 and 1001 keV net peak area calculation

	186 keV		1001 keV	
	Lower [ch]	Upper [ch]	Lower [ch]	Upper [ch]
Peak	2462	2491	13320	13389
Lower BG	2402	2416	13215	13249
Upper BG	2506	2520	13424	13458

2.1 HIGH-QUALITY DATASET

The high-quality dataset measurements were performed such that the measurement cutoff occurred when approximately 100,000 counts were recorded in the 186 keV net peak area, corresponding to a Poisson counting uncertainty of 0.32% (1 s). The parameter space includes all eight enrichment standards paired with each of the three SS304 attenuators (8, 13, 16 mm), three spacers (8, 13, 16 mm), and no

attenuator/spacer (0 mm) configurations. A total of 56 measurements were performed. Table 2 presents the measured background corrected 186 keV net peak area count rates. This dataset can be used to characterize the system (i.e., absolute efficiency calibration, SS304 linear attenuation coefficient measurement, enrichment meter calibration, etc.). The comparison of the SS304 attenuator and spacer data is presented in Sect. 4.4 to confirm narrow beam geometry, sample infinite thickness, and sample alignment.

Table 2. High-quality dataset: 186 keV net peak area count rates and relative uncertainties (1 s) with respect to enrichment and SS304 attenuator/spacer thickness – corrected for an estimated peaked 186 keV background of 0.0061 ±0.00069 c/s (1 s)

Nom. enr.	None	Nom. SS304 thickness [mm]			Nom. spacer thickness [mm]		
[wt%]	0	8	13	16	8	13	16
0.31	3.715 *(±0.52%)*	1.404 *(±0.64%)*	0.771 *(±0.74%)*	0.535 *(±0.81%)*	3.697 *(±0.51%)*	3.720 *(±0.50%)*	3.690 *(±0.49%)*
0.71	8.339 *(±0.42%)*	3.164 *(±0.49%)*	1.712 *(±0.55%)*	1.188 *(±0.59%)*	8.294 *(±0.42%)*	8.291 *(±0.41%)*	8.330 *(±0.41%)*
1.94	22.549 *(±0.36%)*	8.641 *(±0.40%)*	4.676 *(±0.43%)*	3.230 *(±0.45%)*	22.555 *(±0.36%)*	22.726 *(±0.36%)*	22.584 *(±0.35%)*
2.95	34.570 *(±0.35%)*	13.156 *(±0.37%)*	7.057 *(±0.40%)*	4.920 *(±0.41%)*	34.333 *(±0.34%)*	34.351 *(±0.34%)*	34.413 *(±0.34%)*
4.46	51.687 *(±0.34%)*	19.806 *(±0.36%)*	10.767 *(±0.37%)*	7.431 *(±0.39%)*	51.764 *(±0.34%)*	51.885 *(±0.34%)*	51.805 *(±0.34%)*
20.11	234.563 *(±0.33%)*	88.999 *(±0.34%)*	48.502 *(±0.34%)*	33.365 *(±0.35%)*	233.991 *(±0.33%)*	233.912 *(±0.33%)*	233.477 *(±0.32%)*
52.49	607.690 *(±0.32%)*	231.950 *(±0.33%)*	125.880 *(±0.33%)*	87.300 *(±0.34%)*	607.112 *(±0.32%)*	608.887 *(±0.32%)*	604.626 *(±0.32%)*
93.17	1074.449 *(±0.32%)*	409.547 *(±0.33%)*	222.900 *(±0.33%)*	154.209 *(±0.33%)*	1079.900 *(±0.32%)*	1067.651 *(±0.32%)*	1076.691 *(±0.32%)*

2.2 FIELD-QUALITY DATASET

The field-quality dataset measurements were performed such that the measurement cutoff occurred at 5 min (real time). The parameter space includes all eight enrichment standards paired with each of the three SS304 attenuators (8, 13, 16 mm) and no attenuator (i.e., 0 mm) configurations; the spacer configurations are not included in the field-quality dataset. Each measurement was performed 20 times sequentially without any disturbance of the measurement configuration. A total of 640 measurements were performed.

Table 3 presents the measured 186 keV net peak area count rates (background *neglected*). The 5 min (real time) count time measurement cutoff of the field-quality measurements permits direct comparison with other commonly reported data and the international target values [7]. The 20 repeated measurements permit statistical analysis of the measurement error/variance and comparison against uncertainty predictions reported by a code or uncertainty model.

Table 3. Field-quality dataset: 186 keV net peak area count rates and relative uncertainties (1 s) with respect to enrichment and SS304 attenuator thickness – estimated peaked 186 keV background of 0.0061 ±0.00069 c/s (1 s) is *neglected.* Both count rate and uncertainty values reported here are an average of the 20 measured values

Nom. enr. [wt%]	None	Nom. SS304 thickness [mm]		
	0	**8**	**13**	**16**
0.31	3.742 *(±5.0%)*	1.467 *(±9.5%)*	0.774 *(±15%)*	0.510 *(±21%)*
0.71	8.378 *(±2.7%)*	3.183 *(±5.0%)*	1.675 *(±7.8%)*	1.212 *(±9.7%)*
1.94	22.568 *(±1.4%)*	8.636 *(±2.5%)*	4.696 *(±3.6%)*	3.240 *(±4.5%)*
2.95	34.239 *(±1.1%)*	13.125 *(±1.9%)*	7.112 *(±2.7%)*	4.953 *(±3.4%)*
4.46	51.940 *(±0.86%)*	19.764 *(±1.5%)*	10.777 *(±2.1%)*	7.442 *(±2.6%)*
20.11	374.014 *(±0.40%)*	88.897 *(±0.65%)*	48.338 *(±0.89%)*	33.490 *(±1.1%)*
52.49	607.276 *(±0.25%)*	231.141 *(±0.40%)*	125.843 *(±0.54%)*	86.935 *(±0.66%)*
93.17	1073.005 *(±0.19%)*	408.359 *(±0.30%)*	222.043 *(±0.41%)*	153.843 *(±0.49%)*

3. EXPERIMENT

This section describes the sources, measurement equipment and settings, experiment configuration, data acquisition procedures, and collimator design.

3.1 SOURCES

Eight certified enrichment standards and one ^{137}Cs check source were used during the campaign. The certificates for the uranium reference standards appear in Appendix B and Appendix C for the low-enriched uranium (LEU) and high-enriched uranium (HEU) standards, respectively. Photographs and general characteristics of each source are shown in Figs. 2 and 3 and tabulated in Table 4. The ^{137}Cs check source activity was calculated to be ~0.75 μCi at the time of the measurements.

Fig. 2. Certified enrichment standards used in the measurement campaign.

Fig. 3. ^{137}Cs check source. Activity for August 2001 is 1.0 μCi. Campaign began on 8 May 2015.

Table 4. Certified enrichment standard characteristics (excerpted from the certificates provided in Appendix B and Appendix C)[a]

Nominal enrichment [wt%]	**0.31**	**0.71**	**1.94**	**2.95**	**4.46**	**20.11**	**52.49**	**93.17**
container ID	**SRM969-031-078**	**SRM969-071-078**	**SRM969-194-078**	**SRM969-295-078**	**SRM969-446-078**	**CRM146-NBL0001**	**CRM146-NBL0002**	**CRM146-NBL0003**
^{234}U [at-frac]	0.000020	0.000053	0.000174	0.000284	0.000365	0.0015076	0.003756	0.009849
±2s	0.000002	0.000002	0.000002	0.000004	0.000003	0.0000037	0.000011	0.000029
^{234}U [wt-frac]	0.000020	0.000052	0.000171	0.000279	0.000359	0.0014861	0.003718	0.009800
±2s	0.000002	0.000002	0.000002	0.000004	0.000003	0.0000037	0.000010	0.000029
^{235}U [at-frac]	0.003206	0.007209	0.019664	0.029857	0.045168	0.20311	0.52800	0.932330
±2s	0.000002	0.000005	0.000014	0.000021	0.000032	0.00020	0.00042	0.000053
^{235}U [wt-frac]	0.003166	0.007119	0.019420	0.029492	0.044623	0.20107	0.52488	0.931703
±2s	0.000002	0.000005	0.000014	0.000021	0.000032	0.00020	0.00042	0.000052
^{236}U [at-frac]	0.000147	<0.0000002	0.000003	0.000033	0.000069	0.001985	0.0026495	0.002927
±2s	0.000003		0.000001	0.000002	0.000002	0.000013	0.0000060	0.000022
^{236}U [wt-frac]	0.000146	<0.0000002	0.000003	0.000033	0.000068	0.001973	0.0026451	0.002937
±2s	0.000003		0.000001	0.000002	0.000002	0.000013	0.0000060	0.000022
^{238}U [at-frac]	0.996627	0.992738	0.980159	0.969826	0.954398	0.79339	0.46560	0.054895
±2s	0.000004	0.000004	0.000018	0.000029	0.000032	0.00020	0.00043	0.000053
^{238}U [wt-frac]	0.996668	0.992828	0.980406	0.970196	0.954950	0.79547	0.46876	0.055559
±2s	0.000004	0.000004	0.000018	0.000029	0.000032	0.00020	0.00043	0.000053
U_3O_8 mass [g]	200.1	200.1	200.1	200.1	200.1	229.99	229.93	230.04
U molar mass [g/mol]	*238.04089*	*238.02893*	*237.99170*	*237.96092*	*237.91503*	237.43002	236.4428	235.20204
U mass fraction [wt-frac]	*0.84801*	*0.84800*	*0.84798*	*0.84796*	*0.84794*	0.84553	0.84286	0.84519
U mass [g]	*169.7*	*169.7*	*169.7*	*169.7*	*169.7*	*194.5*	*193.8*	*194.4*
^{235}U mass [g]	*0.5372*	*1.208*	*3.295*	*5.004*	*7.571*	39.10	101.72	181.15
aluminum window thickness [mm]	1.996	1.996	1.996	1.997	1.996	1.994	1.994	1.994
air standoff thickness [mm]	1.02	1.02	1.02	1.02	1.04	*1*	*1*	*1*
material diameter [mm]	70.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00
material fill height [mm]	20.8	20.8	20.8	20.8	15.8	15.8	15.8	15.8
U_3O_8 areal density [g/cm^2]	5.2	5.2	5.2	5.2	5.2	5.98	5.98	5.98
U_3O_8 volumetric density [g/cm^3]	*2.50*	*2.50*	*2.50*	*2.50*	*3.29*	3.78	3.78	3.78
chemical separation date	1997	1997	1997	1997	1997	1990	1990	1990
Reference	Appendix B	Appendix B	Appendix B	Appendix B	Appendix B	Appendix C	Appendix C	Appendix C

[a] *Underlined and italicized values* are calculated/estimated for reader convenience but are not certified values.

3.2 EQUIPMENT AND SETTINGS

The measurement equipment and settings used during the campaign are listed below in Tables 5 and 6. The detector is germanium, planer, 38 cm^2 area (70 mm diameter), 26 mm thick, and is In Situ Object Counting System (ISOCS) characterized. The manufacture's detector specifications and ISOCS calibration parameters are included in Appendix D. The gain setting was 0.075 keV/channel for compatibility with the Fixed-Energy Response Function Analysis with Multiple Efficiency (FRAM) and Multi-Group Analysis for Uranium (MGAU) uranium enrichment analysis codes; 16,384 channels were selected to include the ^{238}U daughter peak at 1,001 keV for use with the ISOCS analysis code.

Table 5. Measurement equipment

	Make	Model	S/N	Version
Detector	Canberra	BE3825	8,509	
Cryostat	Canberra	7935-7F/RDC		
Pre-Amp	Canberra	2002C	13,000,291	
MCA	Canberra	Inspector 2000	501,873	
DAQ Software	Canberra	Genie 2000		3.1

Table 6. Multi-channel analyzer (MCA) settings

Channels	16,384
Gain [keV/ch]	0.075
PUR	1.1
FDISC Mode	AUTO
LT Trim	500
LTC Mode	ON
LLD	AUTO
Rise Time [µs]	5.6
Flat Top [µs]	0.8
BLR	AUTO

3.3 CONFIGURATION

The experiment apparatus is shown in Figs. 4 through 10. The lead "castle" (lead bricks in yellow tape) surrounded the detector and sample on all sides except from below and at the neck of the detector.

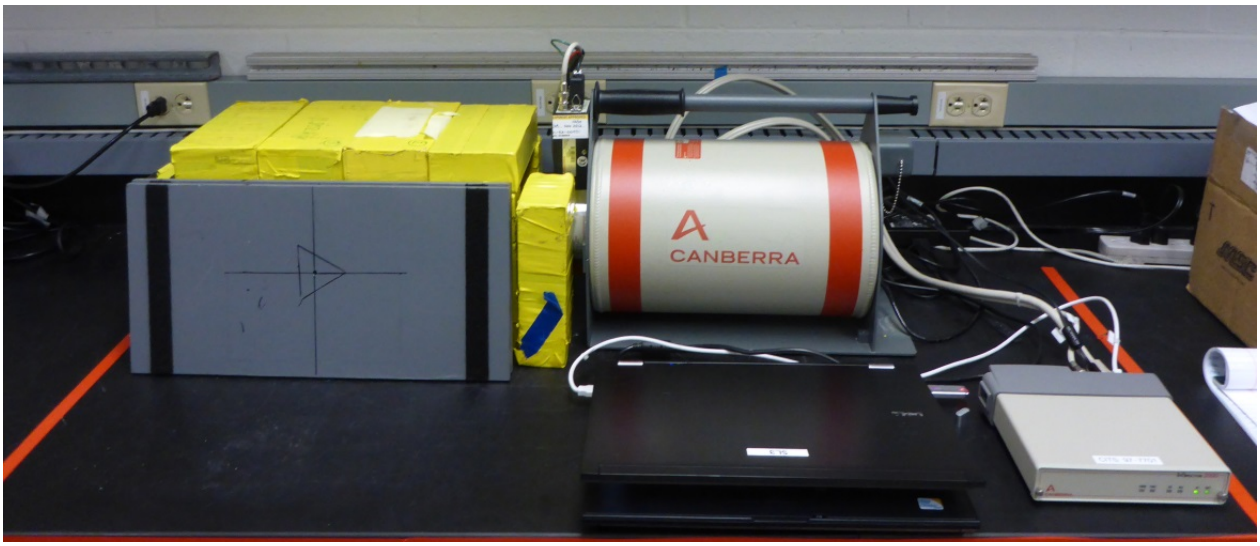

Fig. 4. General experiment configuration showing dewar and lead "castle."

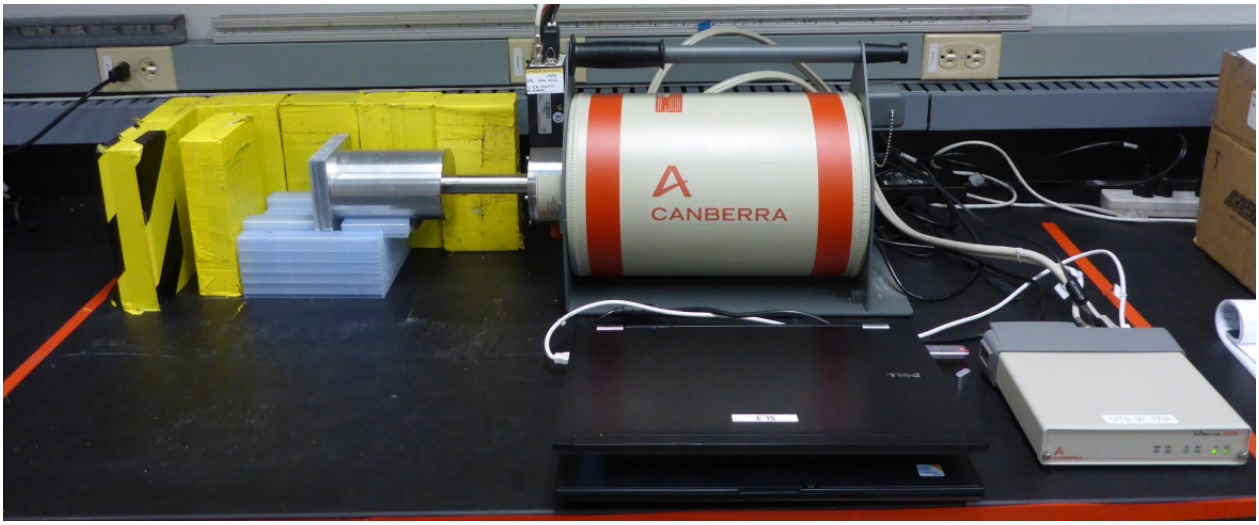

Fig. 5. Cutaway view of the general experiment configuration showing germanium detector housing, plastic track, thin aluminum filter, and lead collimator.

The plastic track, plastic sample sled, and plastic detector sled (Fig. 6) ensure a consistent sample position and a high degree of reproducibility. The lead collimator (Fig. 7) is shown wrapped in vinyl tape (for compliance with laboratory lead safety requirements).

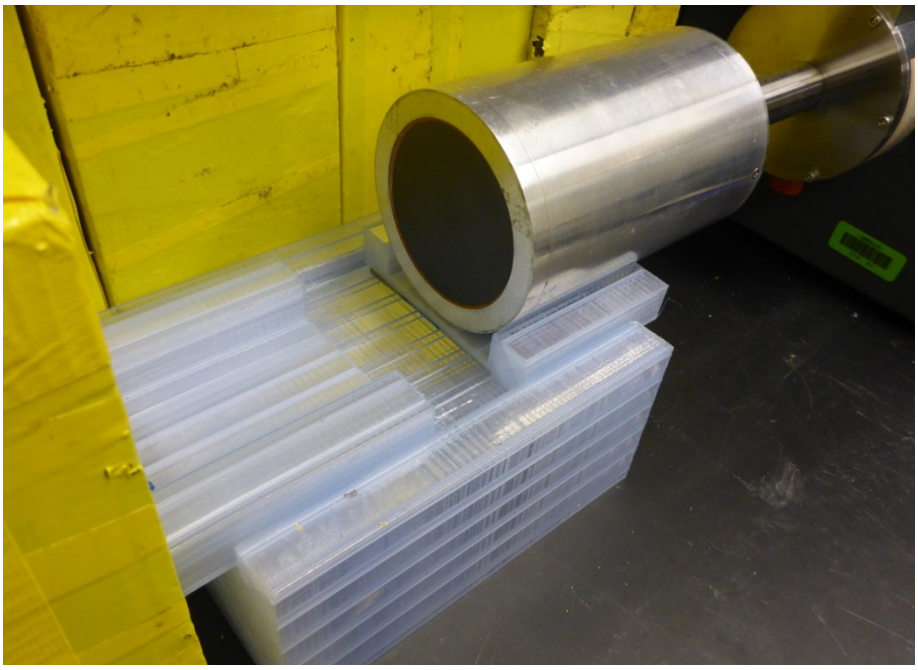

Fig. 6. Plastic sample stand ensures accurate, consistent, and reproducible geometries.

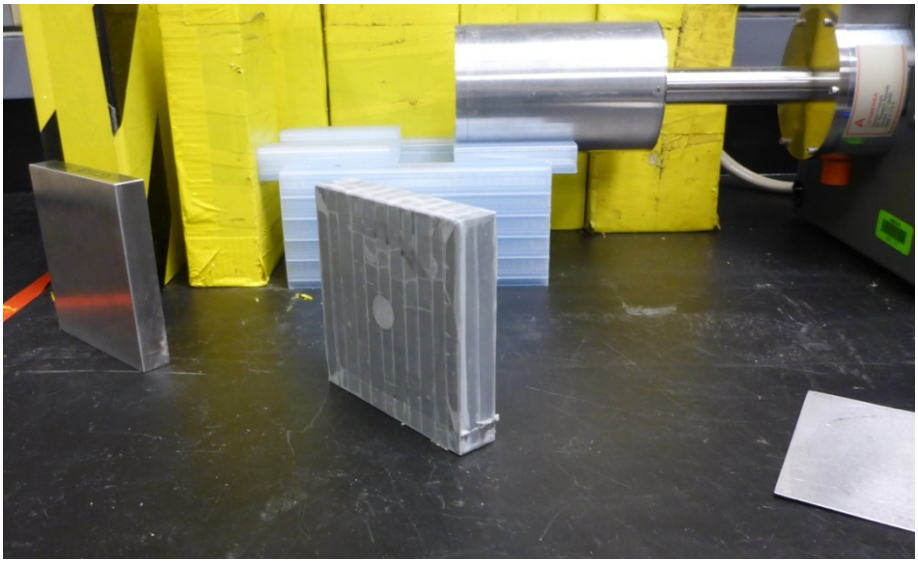

Fig. 7. (LEFT) SS304 attenuator, (CENTER) lead collimator taped with standard office tape to comply with laboratory standards for lead handling, (RIGHT) thin aluminum filter (partially shown).

The aluminum filter, lead collimator, SS304 attenuators, and aluminum spacers fit tightly on the track. A lead brick is used to lightly compress the sample-attenuator-collimator-filter-detector chain.

Fig. 8. Top cutaway view. Standard measurement configuration showing (from right to left) detector housing, 0.5 mm Al filter, 20 mm Pb collimator with 15 mm aperture, 16 mm SS304 attenuator, 4.46 wt% U standard, and Pb brick (providing slight pressure).

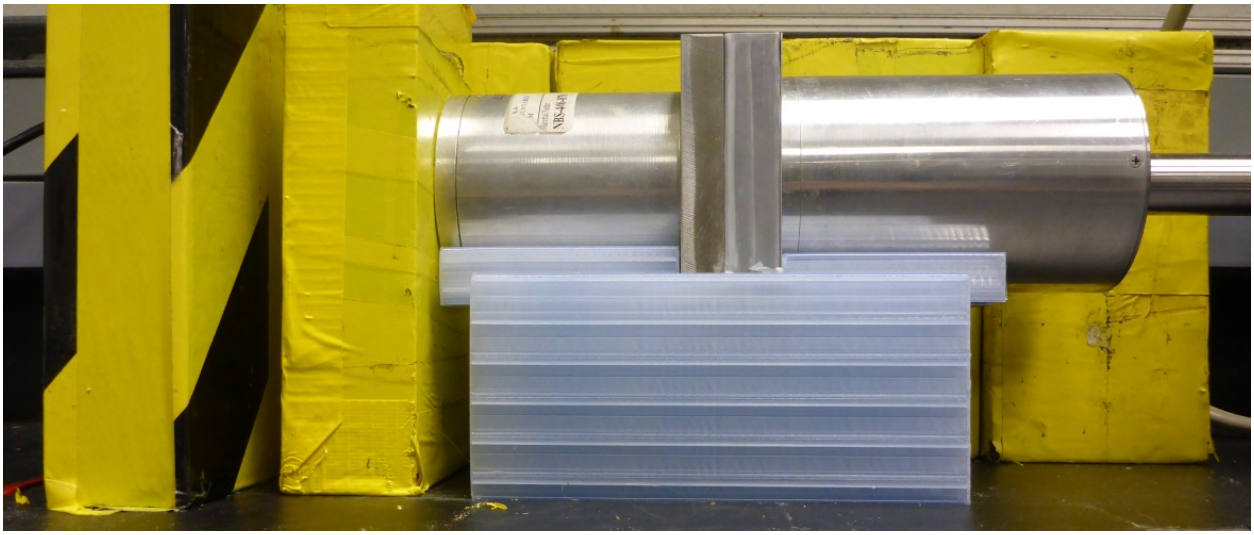

Fig. 9. Side cutaway view (same description as Fig. 8).

The spacers are aluminum plates, each with a 7 cm diameter through-hole which corresponds to the 7 cm active sample diameter of the enrichment standard. The spacer measurements are used to confirm both the narrow beam geometry and the sample infinite thickness at 186 keV. By meeting these two criteria, the 186 keV net peak area count rate will be shown to be independent of the sample offset from the detector face. The confirmation of the narrow beam geometry is necessary to measure the linear attenuation coefficient of the SS304 attenuators. The confirmation of sample infinite thickness is necessary to rule out measurement geometry (i.e., sample offset from the detector or off-axis sample alignment) as a variable in subsequent analyses. The SS304 attenuators and spacers are clearly labeled for identification purposes in QA photos (since both look similar).

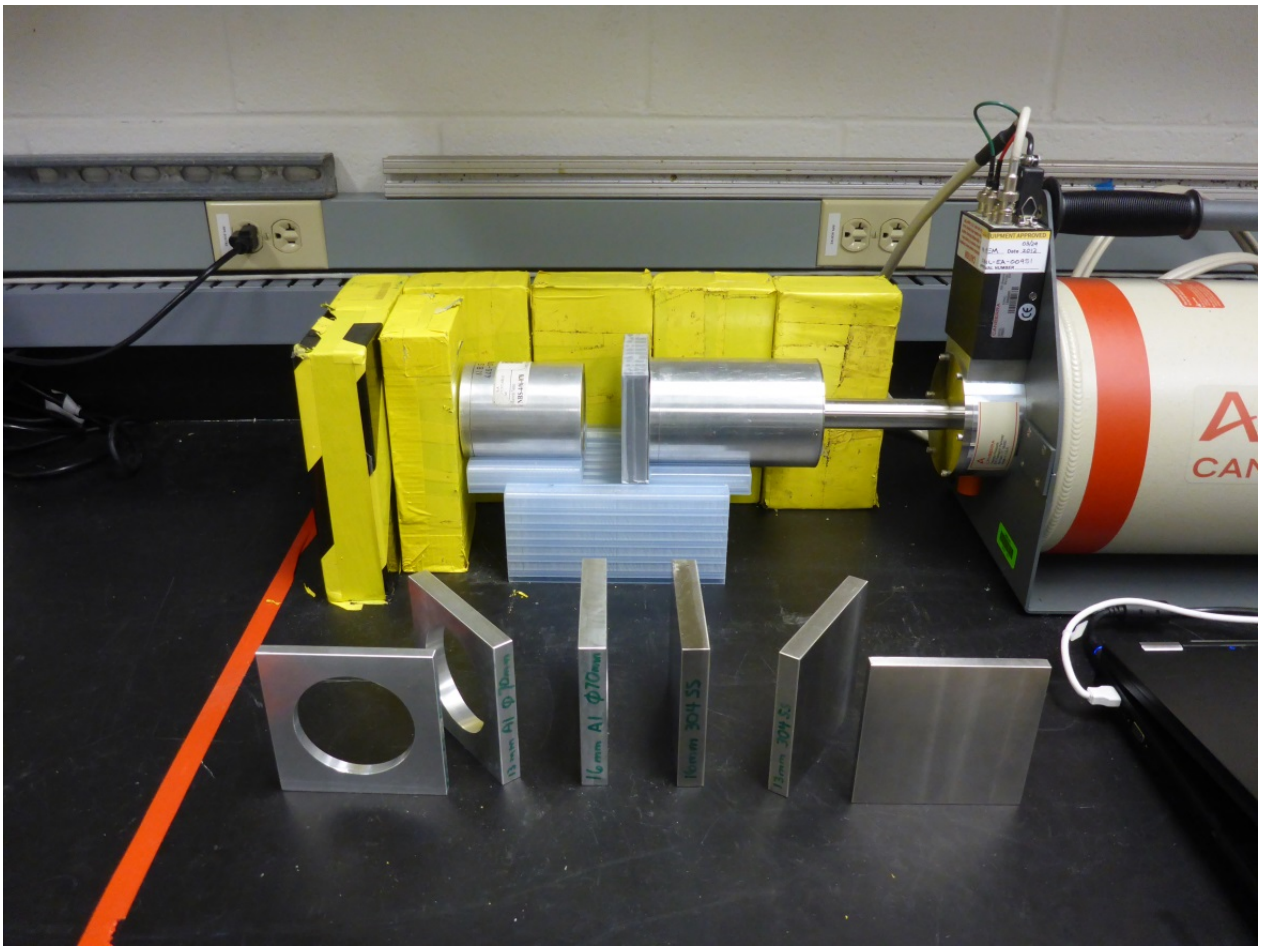

Fig. 10. Cutaway view of general measurement configuration showing all SS304 attenuators and spacers.

3.4 PROCEDURE

With reference to Fig. 4 through Fig. 10, the measurement procedure was as follows.

1) Set up measurement configuration as shown in Figs. 8 and 9.

    a. Insert SS304 attenuator, spacer, or neither (ensuring label is visible)
    b. Insert enrichment standard (ensuring label is visible)
    c. Ensure Pb collimator and 0.5 mm Al filter are present

2) Press the Pb brick firmly against the enrichment standard to apply slight pressure; there should be no visible gaps between components in the chain.

3) Fill out quality assurance board.

    a. Date
    b. Time
    c. Unique Measurement ID (1-849)
    d. Purpose (CAL, BG, QC, or MSMT)
    e. Sample (NBS-031-078, NBS-071-078, NBS-194-078, NBS-295-078, NBS-446-078, NBS-446-078+Cs137 5640, NBL-0001, NBL-0002, NBL-0003)

f. Enrichment (0.31, 0.71, 1.94, 2.95, 4.46, 20.11, 52.49, 93.17 wt%)
g. Attenuator (none, 8 mm SS304, 13 mm SS304, 16 mm SS304, 8 mm Al ϕ70 mm, 13 mm Al ϕ70 mm, 16 mm Al ϕ70 mm)
h. Cutoff (300 s RT, 100k cnt 186 ROI [Net Peak] Area, 12 h RT)

4) Take four QA pictures.

a. Quality assurance board view
b. Top view
c. Sample and attenuator view
d. Lead brick cover view

5) Setup software.

a. Clear previous data
b. Preset measurement cutoff

6) Perform measurement.

a. Start
b. Wait
c. Save (file name: ID#_MMDDYYYY_HHMM_sample_cutoff_attenuator_seriesID#.cnf) *(seriesID# appears only when there are sequential measurements of the same configuration)*

7) Review

a. Transcribe values into laboratory notebook and Excel spreadsheet
b. Observe values on quality control charts

8) Repeat

3.5 COLLIMATOR DESIGN

The Pb collimator dimensions are nominally 20 mm thick with an aperture diameter of 15 mm; the measured dimensions are 20.003 ±0.023 mm (1 s) thick with an aperture diameter of 14.669 ±0.066 mm (1 s). The collimator dimensions were chosen to satisfy the sample infinite thickness criteria required by the enrichment meter principle [8], where an infinite thickness is defined here to be seven mean free paths. The infinite thickness of the eight enrichment standards varies with the U_3O_8 density of each standard. The 0.31, 0.71, 1.94, and 2.95 wt% standards have a U_3O_8 density of 2.50 g/cm^3, the 4.46 wt% standard has a U_3O_8 density of 3.29 g/cm^3, and the 20.11, 52.49, and 93.17 wt% standards have a U_3O_8 density of 3.78 g/cm^3. The infinite thicknesses that correspond to these three densities are calculated in Table 7. Each sample is approximately infinitely thick, but the LEU samples are slightly less than the calculated infinite thickness (e.g., 1-exp(-7) = 0.9991). At the very outside, this imposes a systematic bias of less than ~0.1% when no correction is applied.

Figure 11 shows the viewing window into the U_3O_8 sample for the limiting case of the 16 mm thick SS304 attenuator/spacer for the two U_3O_8 sample depths of 1.58 and 2.08 cm shown in Table 7. The viewing window is defined by the sample infinite thickness and the angle constrained by the collimator dimensions. The viewing window is shown to not extend outside the sides of the sample. Figure 12 shows the range of collimator designs that are compatible with all eight enrichment standards for the cases of 0 and 16 mm SS304 attenuators/spacers. The “Limit-0 mm” and “Limit-16 mm” lines define the collimator

thickness and aperture diameters outside of which the viewing window will extend outside the U_3O_8 material. The collimator used in this experiment is shown to be just inside the 16 mm limit.

Table 7. 186 keV infinite thickness calculation for each enrichment standard

Nom. enr. [wt%]	Mass atten. coef.,[a] μ/ρ [cm^2/g]	Density,[b] ρ [g/cm^3]	Linear atten. coef., μ [cm^{-1}]	Mean free path, $1/\mu$ [cm]	Inf. thk., $7/\mu$ [cm]	Sample thk.,[b] t [cm]	Areal density,[b] ρt [g/cm^3]	Sample atten., 1-exp(-μt) [-]
0.31	1.27	2.50	3.18	0.31	2.20	2.08	5.2	0.9986
0.71	1.27	2.50	3.18	0.31	2.20	2.08	5.2	0.9986
1.94	1.27	2.50	3.18	0.31	2.20	2.08	5.2	0.9986
2.95	1.27	2.50	3.18	0.31	2.20	2.08	5.2	0.9986
4.46	1.27	3.29	4.18	0.24	1.68	1.58	5.2	0.9986
20.11	1.27	3.78	4.80	0.21	1.46	1.58	5.98	0.9995
52.49	1.27	3.78	4.80	0.21	1.46	1.58	5.98	0.9995
93.17	1.27	3.78	4.80	0.21	1.46	1.58	5.98	0.9995

[a]Values taken from [8] at 185.7 keV.
[b]Values from Table 4.

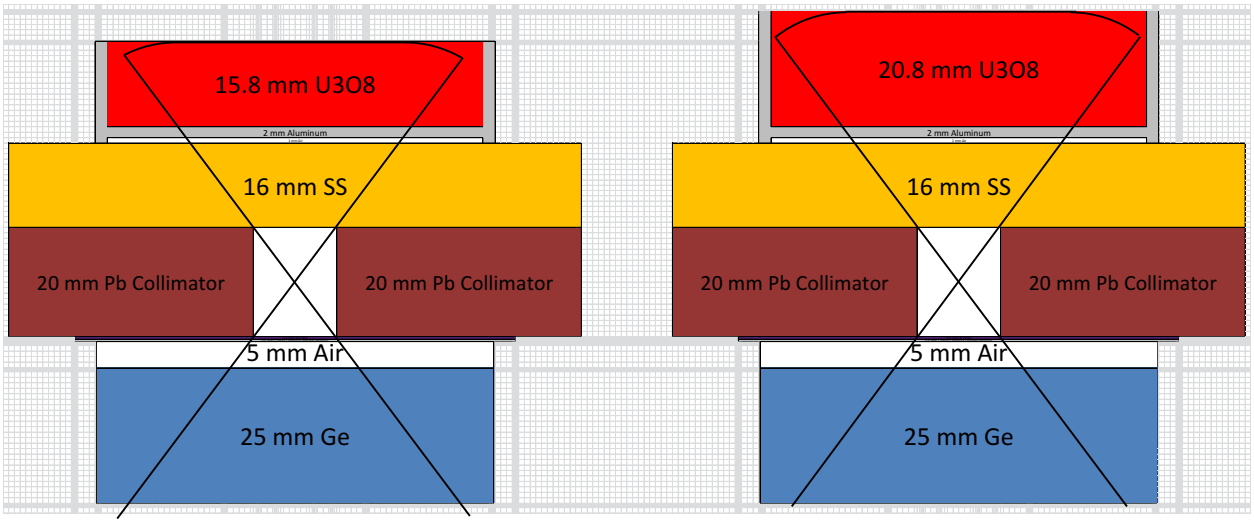

Fig. 11. Viewing window for the limiting cases of the 16 mm SS304 attenuator/spacer. (LEFT) The 4.46, 20.11, 52.49, 93.17 wt% enrichment standards have a sample thickness of 15.8 mm. (RIGHT) The 0.31, 0.71, 1.94, and 2.95 wt% enrichment standards have a sample thickness of 20.8 mm.

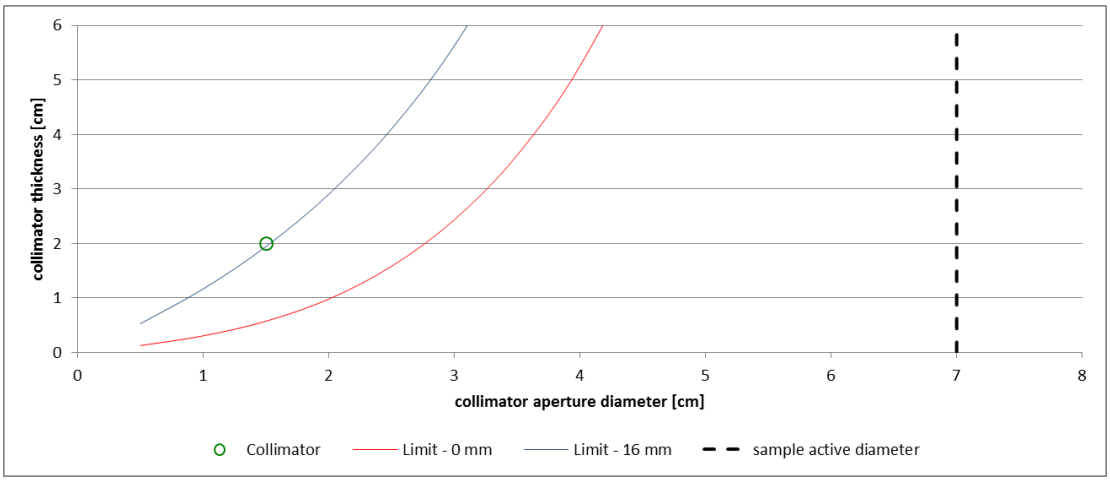

Fig. 12. Geometric collimator design constraints with respect to thickness and aperture dimensions applicable for use with the 0 mm and 16 mm SS304 attenuator/spacer configurations.

3.6 ATTENUATOR, SPACER, FILTER, AND COLLIMATOR PHYSICAL PROPERTIES

The measured physical properties of the three SS304 attenuators, three Al spacers, Al filter, and Pb collimator vary from the nominal values stated throughout the report. The nominal values for each part are tabulated in Table 8. The measured values for these parts, which are recommended for use in subsequent analyses, are tabulated in Tables 9, 10, and 11 and discussed in this section.

Table 8. Nominal part dimensions

Part	Material	Nominal dimensions
Filter	Al	100 × 100 × 0.5 mm
Collimator	Pb	100 × 100 × 20 mm, 15 mm diam aperture
Attenuators	SS304	100 × 100 × 8 mm
	SS304	100 × 100 × 13 mm
	SS304	100 × 100 × 16 mm
Spacers	Al	100 × 100 × 8 mm, 70 mm diam. aperture
	Al	100 × 100 × 13 mm, 70 mm diam. aperture
	Al	100 × 100 × 16 mm, 70 mm diam. aperture

Reference values and measurement results for the SS304 attenuator elemental concentration measurements using a Niton x-ray fluorescence analyzer, model XL3t, are shown in Table 9. Also included in Table 9 are the weighted average of the elemental compositions and separately the ASTM standard elemental concentration ranges for SS304 [9]. A few cautions are advised with regard to the use of the elemental concentration data in Table 9. The weighted averages assume that the elemental concentrations of all three SS304 attenuators are identical and uniformly distributed. The values reported by the instrument are not normalized and do not add up to 100% and, consequently, neither do the weighted average values reported in Table 9. Also, laboratory safety procedures limit x-ray fluorescence measurements to short time periods, which limits counting precision. The elemental concentration values should be regarded as "rough" values because the Niton XL3t is a field instrument and not a precision laboratory instrument; the units of wt% appearing in Table 9 were neither reported by the instrument nor appear in the accompanying documentation and were obtained verbally through the vendor's customer support service. That being said, the results are in agreement with the American Society for Testing and Materials (ASTM) reference values.

Table 9. Measured and reference elemental concentrations for the SS304 attenuators

Element	8 mm		13 mm		16 mm		wt. avg.		ASTM[a]
	conc. [wt%]	unc. (1s) [wt%]	conc. [wt%]	unc. (1s) [wt%]	conc. [wt%]	unc. (1s) [wt%]	conc. [wt%]	unc. (1s) [wt%]	Min-Max
Fe	70.562	1.177	70.021	0.980	71.737	0.888	70.868	0.574	65.845–74
Cr	18.321	0.624	19.192	0.524	18.170	0.468	18.551	0.305	18–20
Ni	9.044	0.771	7.916	0.609	8.239	0.564	8.303	0.365	8–11
Mo	0.341	0.045	0.288	0.034	0.298	0.031	0.303	0.020	-
Mn	-[b]	-	-	-	-	-	-	-	0–2.00
Si	-	-	-	-	-	-	-	-	0–1.00
C	-	-	-	-	-	-	-	-	0–0.08
P	-	-	-	-	-	-	-	-	0–0.045
S	-	-	-	-	-	-	-	-	0–0.030
N	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Total	98.267	1.540	97.416	1.267	98.444	1.152	98.025	0.746	
Remainder	1.733		2.584		1.556		1.975		

[a] *ASTM A276/A276M – 15 Standard Specification for Stainless Steel Bars and Shapes* [9]
[b] " – " indicates no measured or prescribed standard value.
Other elements, including C, Mn, P, S, and N, may be present but were not above detection thresholds.

Thickness measurements of the SS304 attenuators and spacers were made using a Mitutoyo coordinate measuring machine, model CRTA920H. Table 10 presents the measurement results for the relevant dimensions and densities of the SS304 attenuators, spacers, Al filter, and Pb collimator. The total uncertainty for a single measurement was reported by the metrologists to conservatively be ±0.005 mm (2 s). The SS304 attenuator center thickness is reported separately from the SS304 attenuator average thickness. The center thickness is directly in front of the lead collimator aperture and is recommended for attenuation calculations. The thickness uncertainties reported in Table 10 are the larger of the (a) single measurement uncertainty for the instrument equal to ±0.0025 mm (1 s) and (b) standard deviation of repeated measurements.

Height and length measurements, used to obtain the densities of the SS304 attenuators, were made using a common laboratory micrometer. The total uncertainty for a single measurement is reported by the metrologiest to conservatively be ±0.01 mm (1 s). The height and length uncertainties used to calculate the densities reported in Table 10 were the larger of the (a) single measurement uncertainty for the

instrument equal to ±0.01 mm (1 s) and (b) standard deviation of repeated measurements at various points on the parts.

Mass measurements, used to obtain the densities of the SS304 attenuators, were made using a Mettler Toledo direct-read balance, model XP10003S. The total uncertainty for a single measurement is reported by the metrologists to conservatively be ±0.0025 g (2 s). The mass uncertainties used to calculate the densities reported in Table 10 were the larger of the (a) single measurement uncertainty for the instrument equal to ±0.0013 g (1 s) and (b) standard deviation of repeated measurements.

The reported densities were calculated from the measured masses and dimensions. The weighted average of the three SS304 attenuator densities is included in Table 10 and assumes that the densities of all three SS304 attenuators are identical and uniformly distributed. Since the densities of all three SS304 attenuators are consistent, the weighted average density is recommended for attenuation calculations. The density uncertainties are the propagated uncertainties of the mass and dimensional measurements.

Table 10. Measured thicknesses and densities for the SS304 attenuators, spacers, Al filter, and Pb collimator

		SS304 attenuator				Spacer			Al filter	Pb collimator
		8 mm	**13 mm**	**16 mm**	**wt. avg.**	**8 mm**	**13 mm**	**16 mm**	**-**	**-**
thickness (center)	**[mm]**	7.948	12.968	16.016	-	-	-	-	-	-
unc. (1s)	**[mm]**	0.0025	0.0025	0.0025	-	-	-	-	-	-
unc. (1s)	**[%]**	0.031	0.019	0.016	-	-	-	-	-	-
thickness (average)	**[mm]**	7.922	12.986	16.034	-	8.058	12.944	15.955	0.501	20.003
unc. (1s)	**[mm]**	0.017	0.014	0.010	-	0.051	0.029	0.027	0.018	0.023
unc. (1s)	**[%]**	0.21	0.11	0.064	-	0.63	0.23	0.17	3.6	0.11
diameter (aperture)	**[mm]**	-	-	-	-	-	-	-	-	14.669
unc. (1s)	**[mm]**	-	-	-	-	-	-	-	-	0.066
unc. (1s)	**[%]**	-	-	-	-	-	-	-	-	0.45
density	**[g/cm^3]**	7.908	7.890	7.890	7.892	-	-	-	2.80[a]	11.13[a]
unc. (1s)	**[g/cm^3]**	0.017	0.0088	0.0056	0.0046	-	-	-	0.10	0.12
unc. (1s)	**[%]**	0.21	0.11	0.071	0.058	-	-	-	3.6	1.1

[a]These values are thought to carry a bias related to difficulties in measurement and an unavailability of calibration standards; the standard values of 2.70 g/cm^3 and 11.34 g/cm^3 are recommended for use in subsequent analysis.

The dimensional and mass measurements of the Al filter and Pb collimator were made using a common laboratory micrometer and digital scale. These values should be considered rough estimates because the dimensions of the filter and collimator aperture were difficult to measure, and adequate calibration blocks and weights were not available. The uncertainties of the Al filter and Pb collimator thicknesses and masses were estimated based on the metrologist's experience with the equipment and extrapolation from available calibration blocks and weights not in the range of the sample. The density uncertainties are the propagated uncertainties of the mass and dimensional measurements. The measured filter and collimator values are expected to carry some bias, and hence the standard values of 2.70 g/cm^3 and 11.34 g/cm^3 for Al and Pb densities, respectively, are recommended in place of the measured densities reported here.

Table 11 and Fig. 13 present preliminary results for the measured and reference values for the linear and mass attenuation coefficients for the three SS304 attenuators.

Table 11. Measured and reference linear and mass attenuation coefficients for the SS304 attenuators

		8 mm	13 mm	16 mm	wt. avg.	NIST Lower Bound[a]	NIST Upper Bound[a]
linear atten. coef.	[cm^{-1}]	**1.2137**	**1.2152**	**1.2138**	**1.2143**	**1.2268**	**1.2283**
unc. (1s)	[cm^{-1}]	0.0023	0.0014	0.0012	0.00085	0.0067	0.0090
unc. (1s)	[%]	0.19	0.12	0.10	0.070	0.54	0.73
mass atten. coef.	[cm^2/g]	**0.1535**	**0.1540**	**0.1538**	**0.1536**	**0.1555**	**0.1556**
unc. (1s)	[cm^2/g]	0.00031	0.00019	0.00016	0.00011	0.0008	0.0011
unc. (1s)	[%]	0.20	0.13	0.10	0.074	0.55	0.74

[a]NIST reference values are calculated using the mass attenuation coefficients (which include coherent scattering) from [10], the wt. avg. elemental concentrations from Table 9, and the wt. avg. density from Table 10. Because the wt. avg. elemental concentration sums to 98.025%, the remainder is distributed as 0.82 wt% Mn, 1.00 wt% Si, 0.08 wt% C, 0.045 wt% P, and 0.03 wt% S for the lower bound and 1.975 wt% Mn for the upper bound. Corresponding uncertainties are the propagated elemental concentration uncertainties, and assume a negligible uncertainty associated with the NIST mass attenuation coefficients.

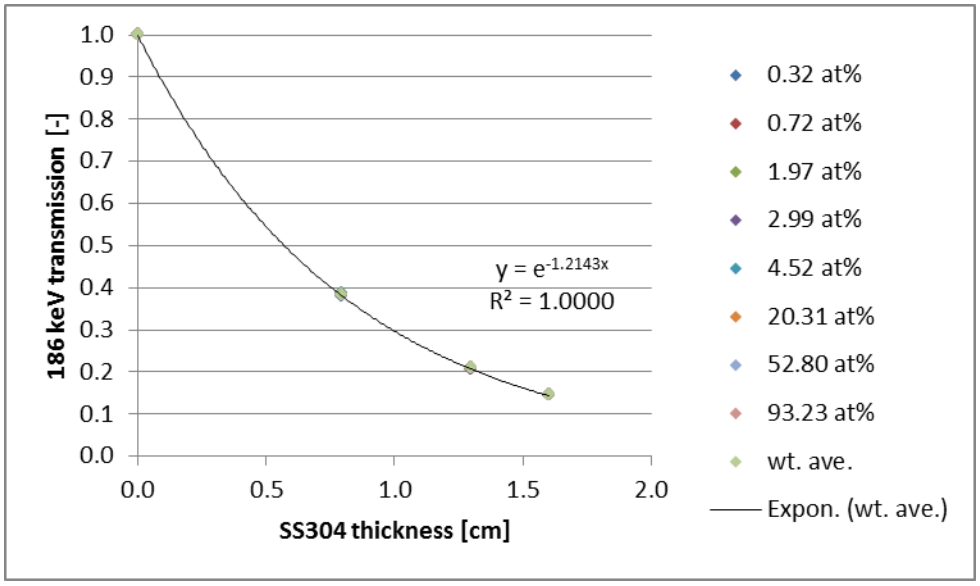

Fig. 13. High-quality dataset: 186 keV transmission with respect to SS304 attenuator thickness and enrichment. Data points with the same thickness lie directly on top of one another. Error bars are smaller than the data points.

The measured linear and mass attenuation coefficients in Table 11 were determined from the 186 keV attenuation data from the high-quality dataset (Table 2) and the SS304 attenuator densities and center thicknesses (Table 10). The linear attenuation values for the 8, 13, 16 mm SS304 attenuators were calculated from the measured data using the equation:

$$I = I_0 e^{-\mu x} \quad \Rightarrow \quad \mu = -\frac{\ln\left(\frac{I}{I_0}\right)}{x}, \tag{1}$$

where I is the 186 keV net peak area count rate for a given SS304 attenuator, I_0 is the 186 keV net peak area count rate for the no attenuator (i.e., 0 mm) configuration, μ is the linear attenuation coefficient, and

x is the SS304 attenuator thickness. The linear attenuation coefficients presented in Table 11 are the weighted average of the eight measured linear attenuation coefficients from the high-quality dataset for each SS304 attenuator. The reported mass attenuation coefficients are simply the measured linear attenuation coefficient divided by the corresponding SS304 attenuator density (Table 10). The linear and mass attenuation coefficient uncertainties are simply the propagated measurement uncertainties.

The National Institute of Standards and Technology (NIST) linear and mass attenuation coefficients were derived from the NIST reported mass attenuation coefficients [10] (which include coherent scattering), the weighted average elemental concentrations (Table 9), the weighted average density (Table 10), and the assumption that all three SS304 attenuators have identical and uniform physical properties. However, the weighted average elemental concentrations from Table 9 sum to 98.025 wt% and not 100 wt%, where the remainder of 1.975 wt% is assumed to be Mn, S, P, Si, and C (i.e., the other constituents listed in the ASTM standard for SS304 [9], also listed in Table 9). The two bounding cases which maximize and minimize the linear and mass attenuation coefficients without exceeding the ASTM [9] element concentration ranges for SS304 are reported in Table 11. No uncertainties are included with the NIST mass attenuation coefficients; thus, it is assumed that the uncertainties of the NIST reported mass attenuation coefficients are negligible. The uncertainties reported with the NIST values are the propagated uncertainties of the measured elemental concentrations.

It is observed from Table 11 that the measured linear and mass attenuation coefficients are ~1.3% less than the NIST values but are within the 3 sigma confidence intervals (but not 2 sigma) of both the NIST upper and lower bounds.

The assumptions underlying the indirectly measured values presented in this section are:

1) the SS304 attenuators have identical and uniform physical properties;

2) the elemental concentration results in Table 10 do not sum to 100%; the remainder consists of Mn, Si, S, P, and C within the ASTM [9] specified ranges for SS304;

3) the three-ROI peak extraction technique is adequate;

4) Poisson counting statistics adequately describe the net peak area uncertainties;

5) the 186 keV background is constant; and

6) the NIST [10] mass attenuation coefficient uncertainties are negligible.

In summary, the measurement system is well characterized, self-consistent, and consistent with reference values.

4. QUALITY ASSURANCE

Quality assurance (QA) measures were observed when acquiring the data. These included photographic documentation, background monitoring, and detector performance monitoring.

Photograph Review – A set of four photographs was taken prior to each measurement, as shown in Fig. 14, and reviewed to confirm data accuracy.

12 h Background (BG) Measurements – Four separate 12 h (real time) background measurements were taken intermittently during the measurement campaign.

5 min BG Measurements – Fifty-eight 5 min (real time) background measurements were taken at the beginning, middle, and end of each day (with omissions for long counts and weekends).

5 min Quality Control (QC) Measurements – Forty-nine 5 min (real time) measurements of the 4.46 wt% in the presence of the ^{137}Cs check source were acquired at the beginning, middle, and end of each day (with omissions for long counts and weekends) and were acquired before the 5 min BG measurements.

Repetition of Measurements – The high-quality dataset serves as a repetition of measurements for the field-quality dataset; however, there is no repetition of measurements of the high-quality dataset.

Dead Time – The dead time was below 6.5% for all measurements. Dead time correction was performed by the electronics.

Narrow Beam Geometry and Infinite Thickness Confirmation – The high-quality dataset includes measurements using spacers with thicknesses equivalent to the SS304 attenuator thicknesses. These measurements are used to demonstrate that the 186 keV count rate is geometry independent and that all observed changes in count rate can be attributed to attenuation in the SS304 attenuators.

Upon review of the data, it was discovered that one measurement was incidentally not saved, namely, #832-4.46 wt%-13 mm SS304-high quality dataset. Unfortunately, the experiment had been dismantled prior to this discovery. To obtain the missing data point, the experiment was rebuilt. The first group of measurements, #1–#841, were collected from day 0–26. The second group of measurements, #842–#849, were collected from day 71–75. All measurements in the second group are BG and QC measurements EXCEPT for #844-4.46 wt%-13 mm SS304-high quality dataset, which is the only production measurement in the second group.

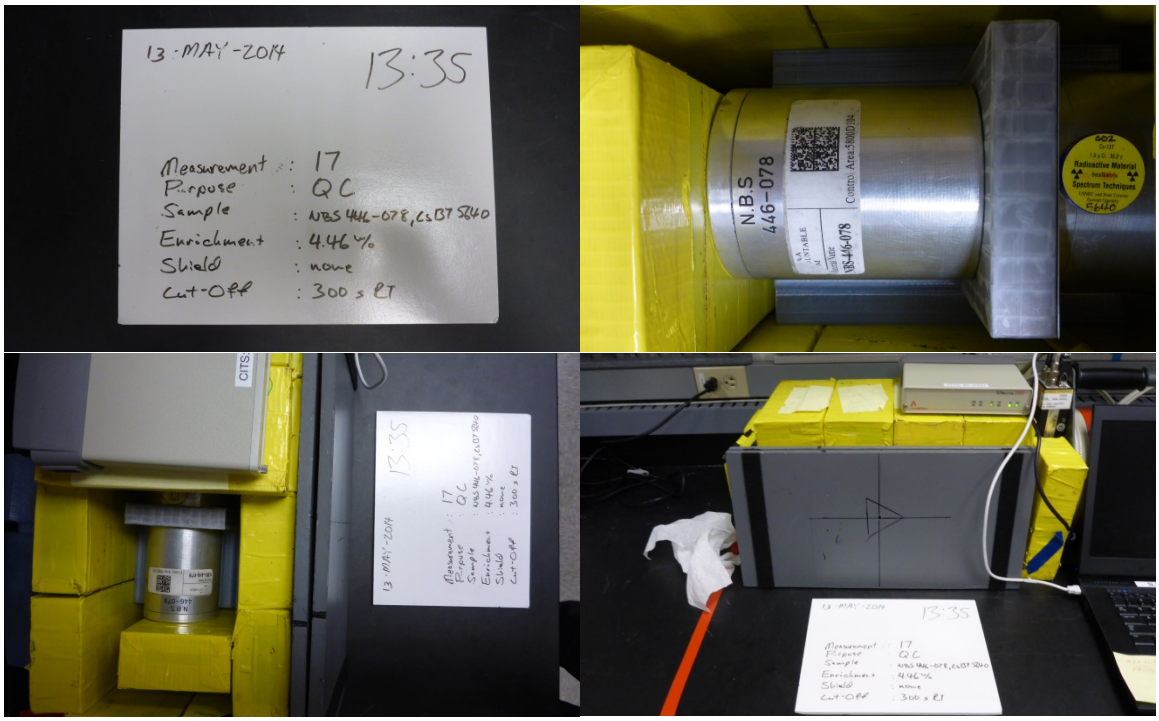

Fig. 14. Example QA photographs set taken prior to each measurement. This set is for a standard 5 min QC measurement configuration.

4.1 BACKGROUND MEASUREMENTS

In this section, the four separate 12 h (real time) and fifty-eight 5 min (real time) BG measurements are presented, analyzed, and summarized. BG measurement geometry was the same as the QA measurement but without the uranium or cesium sources. See Fig. 5 for a photograph taken before of one BG measurement. As with measurements with sources, the count rates are determined using the three-ROI peak extraction technique and batch processing. The processed data appear in Appendix A. The background spectra and 186 and 1001 keV ROIs are shown in Fig. 15 Fig. 16, and Table 1. The BG will be shown to *NOT* be negligible for some cases.

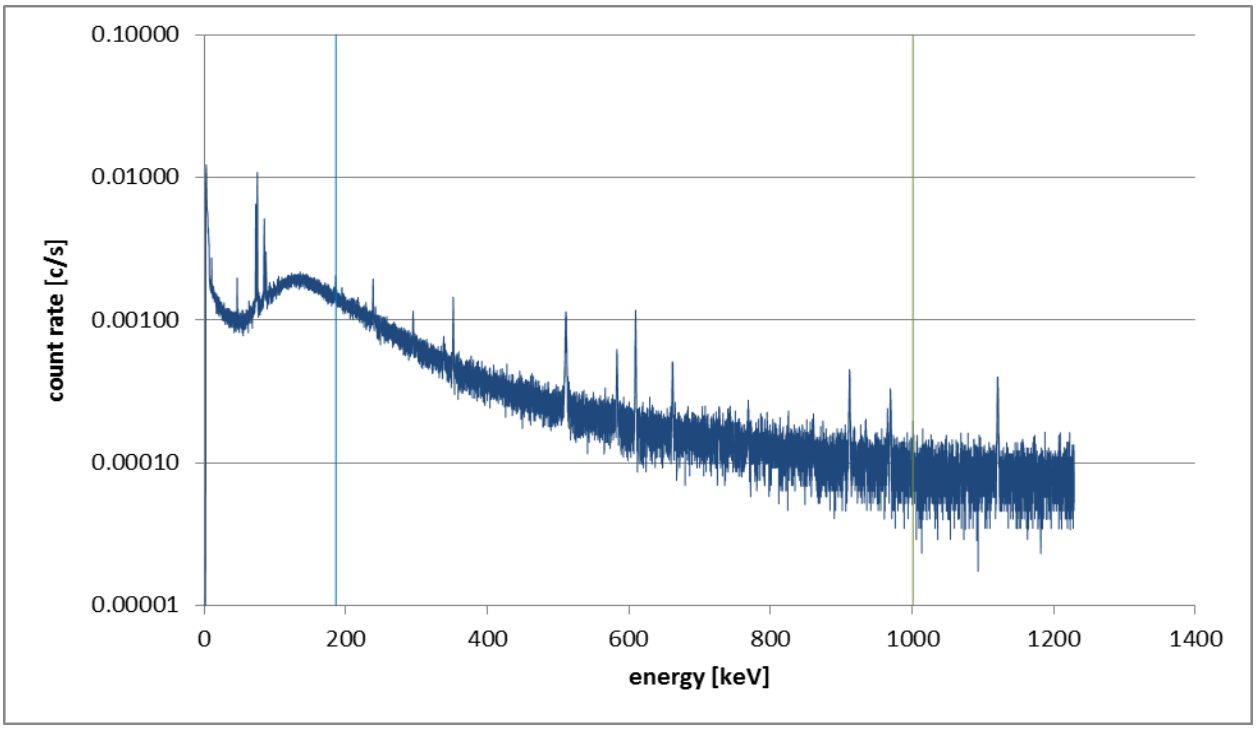

Fig. 15. Background spectrum.

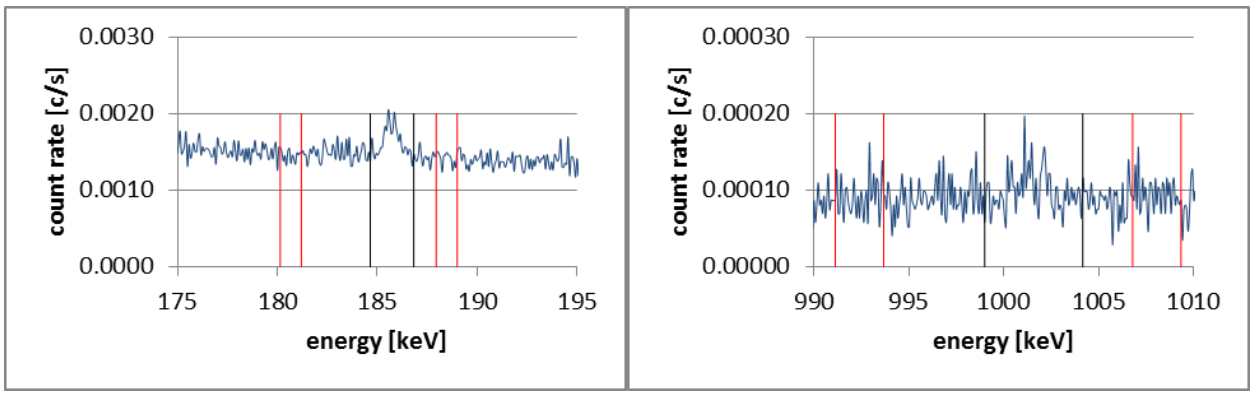

Fig. 16. Regions-of-interest for the (LEFT) 186 and (RIGHT) 1001 keV net peak area BG calculation. Regions-of-interest channels are listed in Table 1.

4.1.1 12 h Background Measurements

Four 12 h (real time) BG measurements were taken over the course of the measurement campaign. These measurements indicate the presence of a 186 and 1001 keV BG. The 186 and 1001 keV net peak area count rates with respect to time are plotted in Figs. 17 and 18, with a quantitative summary appearing at the end of this section. The error bars and 3-sigma confidence intervals are based on the assumption that count rates are normally distributed. Although this is not the case for radioactive decay, these error estimates are intended as a qualitative guide to the reader. A new error analysis will be completed in the future.

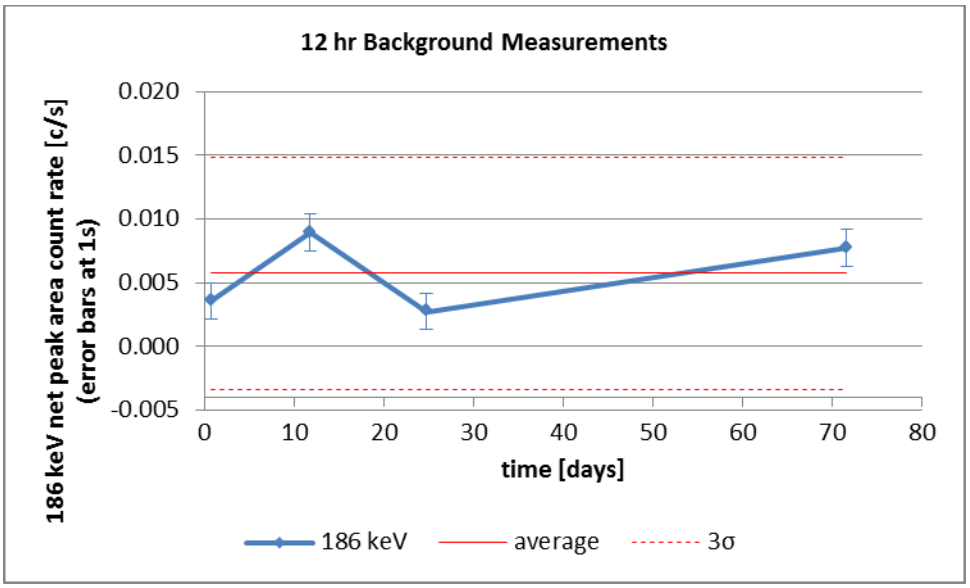

Fig. 17. 12 h BG measurements: 186 keV net peak area count rate with respect to time.

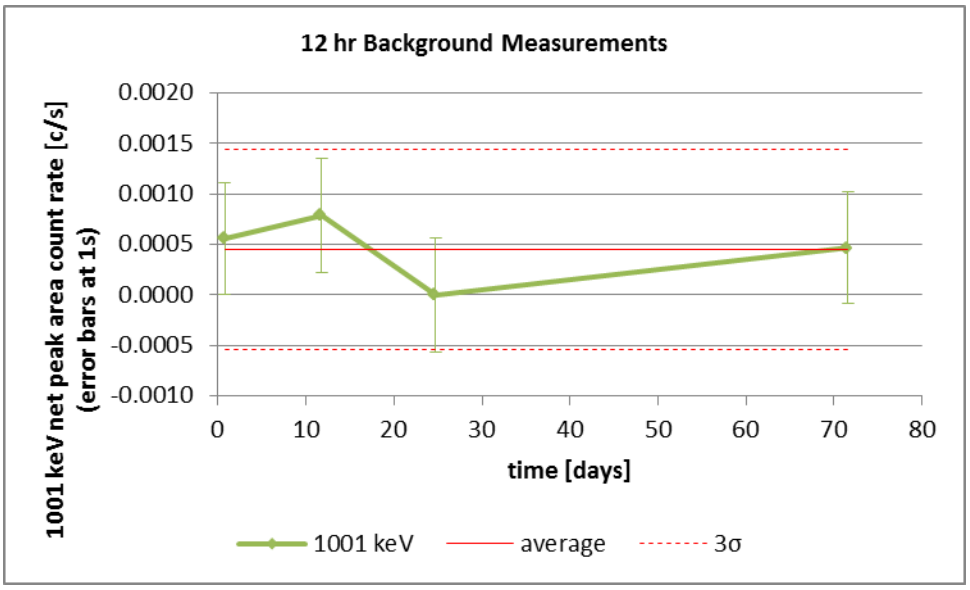

Fig. 18. 12 h BG measurements: 1001 keV net peak area count rate with respect to time.

4.1.2 5 min Background Measurements

Fifty-eight 5 min (real time) BG measurements were collected over the course of the campaign. Even though the statistical error on these measurements is large, for completeness these results are analyzed. One could sum these measurements together, assuming gain shifts between measurements is small, to generate almost five hours of additional background data. The 186 and 1001 keV net peak area count rates with respect to time are plotted in Figs. 19 and 20, with a quantitative summary appearing at the end of this section.

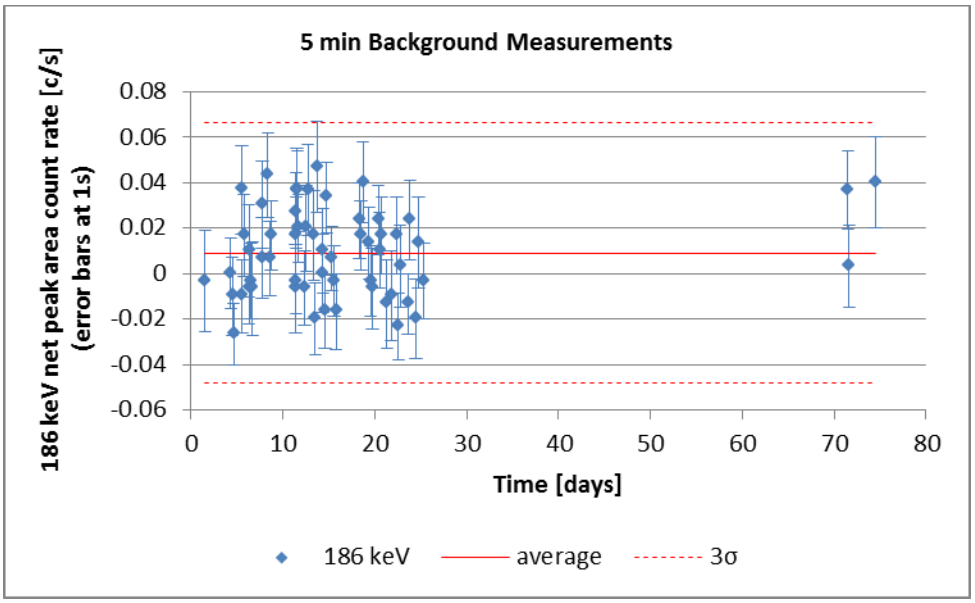

Fig. 19. 5 min BG measurements: 186 keV net peak area count rate with respect to time.

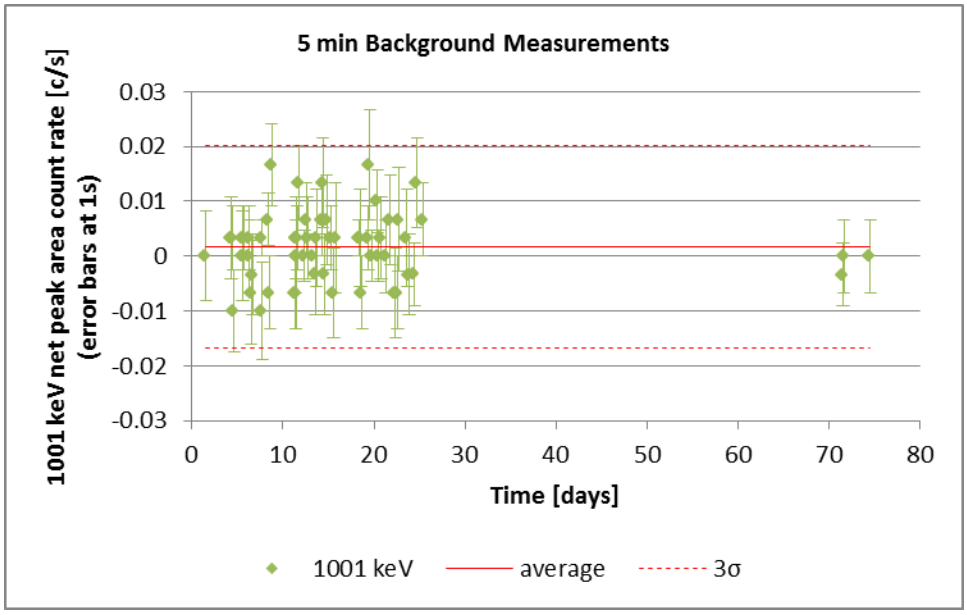

Fig. 20. 5 min BG measurements: 1001 keV net peak area count rate with respect to time.

4.1.3 Background Analysis

In this section, a crude background analysis is presented to study the magnitude of the measured backgrounds and to see if there was any large change in the background during the measurement campaign. A least squares analysis using a linear fit to the 186 and 1001 keV background peak areas as a function of time is presented in Table 12. Since the three data points taken after day >70 strongly leverage the least squares analysis, the analysis is performed both including and excluding these data points.

Table 12. 12 h and 5 min BG measurements: Least-squares analysis results of the 186 and 1001 keV net peak area count rates with respect to time; uncertainties at 1 s absolute

		186 keV	1001 keV
All data	**slope (cps/day)**	0.00018 ± 0.00015	−0.000014 ± 0.000049
	r^2	0.02	0.00
Time <30 days	**slope (cps/day)**	−0.00017 ± 0.00036	0.00013 ± 0.00012
	r^2	0.00	0.02

The results of the least-squares analysis show that the slopes of both the 186 and 1001 keV net peak area count rates with respect to time include zero within a 2-sigma confidence interval and r-squared values near zero; thus, no change in the 186 and 1001 keV net peak area count rate with respect to time is detected. The results of this first pass analysis show that the 186 and 1001 keV BGs can be assumed to be constant for the duration of the measurement campaign.

Under the assumption of a constant background, Table 13 reports the average 186 and 1001 keV net peak area count rates for the 12 h BG measurements, 5 min BG measurements, and all BG measurements.

Table 13. 12 h and 5 min BG measurements: Average 186 and 1001 keV net peak area count rates

	# spectra	186 keV			1001 keV		
		count rate [c/s]	**unc. (1s) [c/s]**	**unc. (1s) [%]**	**count rate [c/s]**	**unc. (1s) [c/s]**	**unc. (1s) [%]**
12 h	4	0.0058	0.00073	13	0.00045	0.00028	62
5 min	58	0.0090	0.0023	25	0.0017	0.00093	55
Total	62	0.0061	0.00069	11	0.00056	0.00027	47

From the results in Table 13, **the 186 and 1001 keV BGs recommended for use in subsequent analyses are 0.0061 ±0.00069 c/s (1 s) and 0.00056 ±0.00027 c/s (1 s), respectively.**

To determine the significance of the 186 keV BG count rates relative to 186 keV count rates with enrichment standards, the 186 keV BG count rate of 0.0061 c/s is compared to the measured 186 keV sample + BG count rate for each measurement configuration in the high-quality dataset using the relationship

$$S = (S+B) - B \quad \Rightarrow \quad 1 = \frac{(S+B)}{S} - \frac{B}{S}\,, \tag{2}$$

where S, (S + B), and B are the 186 keV net peak area count rates from the sample, sample + BG, and BG. The relative contribution of each term to the final result is calculated and tabulated in Table 14 and plotted in Fig. 21.

Table 14. High-quality dataset: 186 keV BG with respect to 186 keV net peak area count rate, enrichment, and SS304 attenuator thickness

Nom. enrichment	Nom. SS304 thickness	S	(S+B)	B	(S+B)/S x100	B/S x100
[wt%]	[mm]	[c/s]	[c/s]	[c/s]	[%]	[%]
0.31	0	3.7150	3.7210	0.0061	100.16	0.16
0.71	0	8.3391	8.3451	0.0061	100.07	0.073
1.94	0	22.5494	22.5554	0.0061	100.03	0.027
2.95	0	34.5698	34.5759	0.0061	100.02	0.018
4.46	0	51.6873	51.6934	0.0061	100.01	0.012
20.11	0	234.5628	234.5689	0.0061	100.00	0.0026
52.49	0	607.6904	607.6965	0.0061	100.00	0.0010
93.17	0	1074.4490	1074.4550	0.0061	100.00	0.00056
0.31	8	1.4041	1.4102	0.0061	100.43	0.43
0.71	8	3.1638	3.1698	0.0061	100.19	0.19
1.94	8	8.6414	8.6474	0.0061	100.07	0.070
2.95	8	13.1564	13.1625	0.0061	100.05	0.046
4.46	8	19.8056	19.8116	0.0061	100.03	0.031
20.11	8	88.9986	89.0046	0.0061	100.01	0.0068
52.49	8	231.9503	231.9564	0.0061	100.00	0.0026
93.17	8	409.5474	409.5535	0.0061	100.00	0.0015
0.31	13	0.7709	0.7769	0.0061	100.79	0.79
0.71	13	1.7120	1.7181	0.0061	100.35	0.35
1.94	13	4.6762	4.6823	0.0061	100.13	0.13
2.95	13	7.0569	7.0629	0.0061	100.09	0.086
4.46	13	10.7665	10.7726	0.0061	100.06	0.056
20.11	13	48.5019	48.5079	0.0061	100.01	0.012
52.49	13	125.8796	125.8857	0.0061	100.00	0.0048
93.17	13	222.9003	222.9064	0.0061	100.00	0.0027
0.31	16	0.5351	0.5412	0.0061	101.13	1.13
0.71	16	1.1884	1.1944	0.0061	100.51	0.51
1.94	16	3.2298	3.2359	0.0061	100.19	0.19
2.95	16	4.9202	4.9263	0.0061	100.12	0.12
4.46	16	7.4314	7.4374	0.0061	100.08	0.081
20.11	16	33.3653	33.3714	0.0061	100.02	0.018
52.49	16	87.3004	87.3065	0.0061	100.01	0.0069
93.17	16	154.2089	154.2149	0.0061	100.00	0.0039

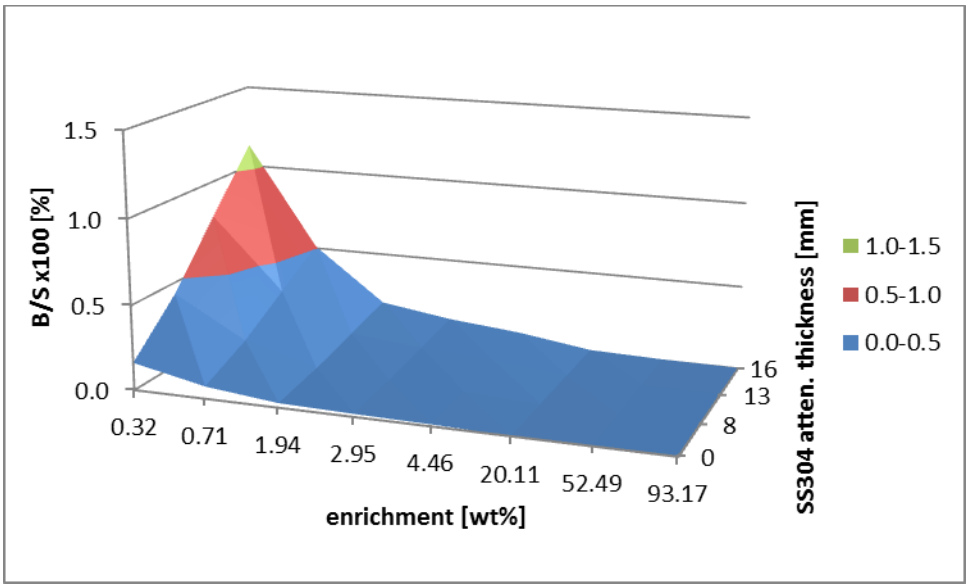

Fig. 21. High-quality dataset: 186 keV BG with respect to 186 keV net peak area count rate, enrichment, and SS304 attenuator thickness.

From Table 14, the 186 keV B/S ratio exceeds ~1% for the 0.31 wt%-16 mm SS304 configuration. The 186 keV B/S ratio becomes all but negligible for enrichments greater than 20 wt%. In general, **the peaked 186 keV BG cannot be neglected in detailed calculations.** The authors of this report suggest subtracting the closest 12 h background spectrum from a measured spectrum during analysis.

To determine the significance of the 186 keV BG uncertainty, the estimated 186 keV BG count rate uncertainty of ±0.00069 c/s (1 s) is compared to the measured 186 keV count rate uncertainty for each measurement configuration in the high-quality dataset. Using the relationship

$$\sigma_S^2 = \sigma_{(S+B)}^2 + \sigma_B^2 \quad \Rightarrow \quad 1 = \frac{\sigma_{(S+B)}^2}{\sigma_S^2} + \frac{\sigma_B^2}{\sigma_S^2}\,, \tag{3}$$

where σ_S, $\sigma_{(S+B)}$, and σ_B are the 186 keV net peak area count rate absolute uncertainties (1 s) from the sample, sample + BG, and BG, the relative contribution of each term is calculated and tabulated in Table 15 and plotted in Fig. 22.

Table 15. High-quality dataset: 186 keV BG uncertainty with respect to 186 keV net peak area count rate absolute uncertainty, enrichment, and SS304 attenuator thickness

Nom. enr.	Nom. SS304 thickness	σ_S (1s)	$\sigma_{(S+B)}$ (1s)	σ_B (1s)	$\sigma^2_{(S+B)}/\sigma^2_S$ x100	σ^2_B/σ^2_S x100
[wt%]	[mm]	[c/s]	[c/s]	[c/s]	[%]	[%]
0.31	0	0.01925	0.01924	0.00069	99.87	0.13
0.71	0	0.03466	0.03465	0.00069	99.96	0.040
1.94	0	0.08072	0.08072	0.00069	99.99	0.0074
2.95	0	0.11879	0.11879	0.00069	100.00	0.0034
4.46	0	0.17291	0.17291	0.00069	100.00	0.0016

Table 15. High-quality dataset: 186 keV BG uncertainty with respect to 186 keV net peak area count rate absolute uncertainty, enrichment, and SS304 attenuator thickness

Nom. enr.	Nom. SS304 thickness	σ_S (1s)	$\sigma_{(S+B)}$ (1s)	σ_B (1s)	$\sigma^2_{(S+B)}/\sigma^2_S$ x100	σ^2_B/σ^2_S x100
[wt%]	[mm]	[c/s]	[c/s]	[c/s]	[%]	[%]
20.11	0	0.75271	0.75271	0.00069	100.00	0.000085
52.49	0	1.92572	1.92572	0.00069	100.00	0.000013
93.17	0	3.39232	3.39232	0.00069	100.00	0.0000042
0.31	8	0.00895	0.00892	0.00069	99.40	0.60
0.71	8	0.01548	0.01547	0.00069	99.80	0.20
1.94	8	0.03383	0.03382	0.00069	99.96	0.042
2.95	8	0.04858	0.04857	0.00069	99.98	0.020
4.46	8	0.07035	0.07035	0.00069	99.99	0.010
20.11	8	0.29462	0.29462	0.00069	100.00	0.00056
52.49	8	0.75349	0.75349	0.00069	100.00	0.000085
93.17	8	1.32549	1.32549	0.00069	100.00	0.000027
0.31	13	0.00564	0.00560	0.00069	98.48	1.52
0.71	13	0.00936	0.00933	0.00069	99.45	0.55
1.94	13	0.01970	0.01969	0.00069	99.88	0.12
2.95	13	0.02755	0.02754	0.00069	99.94	0.064
4.46	13	0.03956	0.03955	0.00069	99.97	0.031
20.11	13	0.16348	0.16348	0.00069	100.00	0.0018
52.49	13	0.41398	0.41398	0.00069	100.00	0.00028
93.17	13	0.72943	0.72943	0.00069	100.00	0.000091
0.31	16	0.00431	0.00425	0.00069	97.40	2.60
0.71	16	0.00700	0.00697	0.00069	99.02	0.98
1.94	16	0.01434	0.01433	0.00069	99.77	0.23
2.95	16	0.01996	0.01994	0.00069	99.88	0.12
4.46	16	0.02832	0.02831	0.00069	99.94	0.060
20.11	16	0.11431	0.11431	0.00069	100.00	0.0037
52.49	16	0.28897	0.28897	0.00069	100.00	0.00058
93.17	16	0.50758	0.50758	0.00069	100.00	0.00019

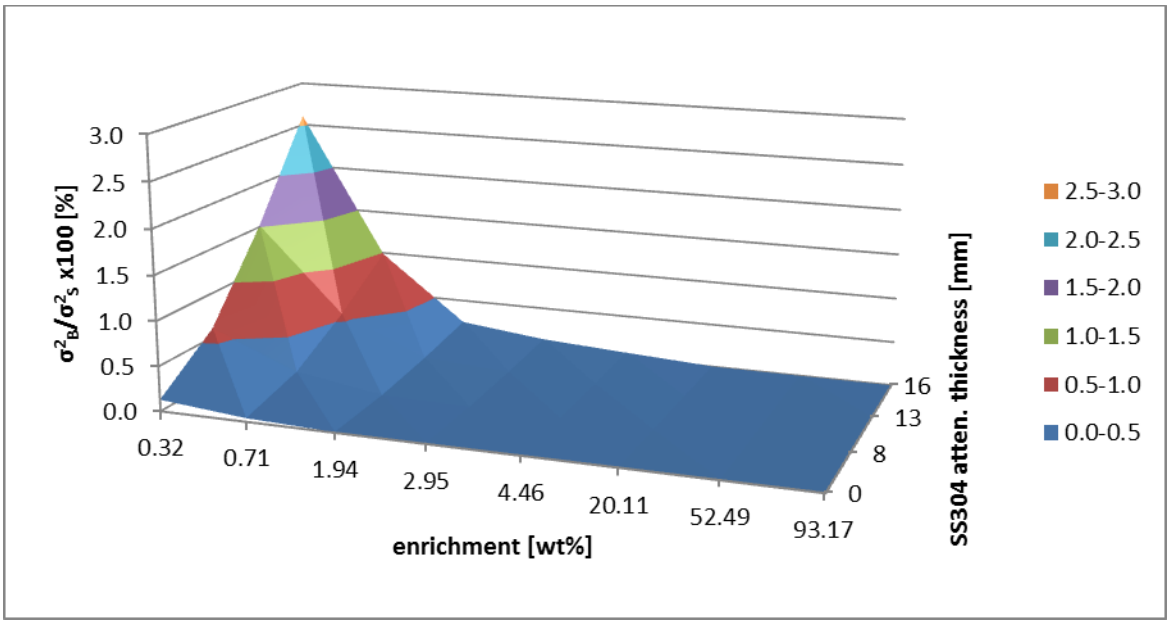

Fig. 22. High-quality dataset: 186 keV BG uncertainty with respect to 186 keV net peak area count rate absolute uncertainty, enrichment, and SS304 attenuator thickness.

From Table 15 and Fig. 22, the 186 keV σ_B^2/σ_B^2 ratio contributes upwards of ~3% to the overall uncertainty for the low count rate configurations, namely, the 0.31 wt%-16 mm SS304, 0.31 wt%-13 mm SS304, and 0.71 wt%-16 mm SS304 configurations. In general, **the peaked 186 keV BG uncertainty cannot be neglected in detailed calculations.**

4.1.4 Background Summary

Both 186 and 1001 keV BGs are present and constant for the duration of the measurement campaign. The average 186 and 1001 keV BGs are 0.0061 ±0.00069 c/s (1 s) and 0.00056 ±0.00027 c/s (1 s), respectively. The 186 keV BG and corresponding uncertainty cannot be neglected in detailed calculations.

4.2 QUALITY CONTROL MEASUREMENTS

A total of forty-nine 5 min (real time) measurements of the 4.46 wt% + ^{137}Cs-0 mm configuration were made three times per day (with omissions for long measurements and weekends), where ^{137}Cs is a check source (Fig. 3 and Fig. 14). The 186 keV and 1001 keV peaks, while not producing strong counting statistics, provided an adequate check on the centroid position, full width at half maximum (FWHM), and absolute efficiency. The 662 keV peak, which always had more the 100,000 counts in the net peak area, provided a strong check on the centroid position and FWHM and provided an additional peak for energy calibration; however, the ^{137}Cs source position was not reproducible, and thus the 662 keV net peak area count rate is not used as a QC figure of merit. The reproducibility of the 186, 662, and 1001 keV parameters is critical to demonstrating the consistency and comparability of all measurements taken over the campaign.

4.2.1 Count Rate

The 186 and 1001 keV net peak area count rates from the QC measurements are analyzed to test for any changes in absolute efficiency with respect to time; these are plotted in Figs. 23 and 24. The count rates were determined using the three-ROI peak extraction technique and batch processing.

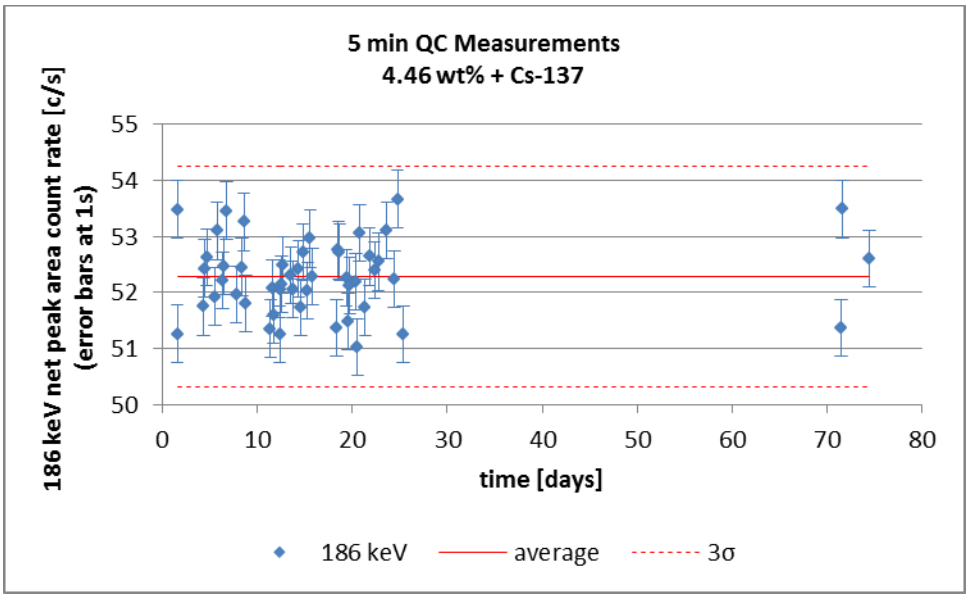

Fig. 23. 5 min QC measurements: 186 keV net peak area count rate with respect to time.

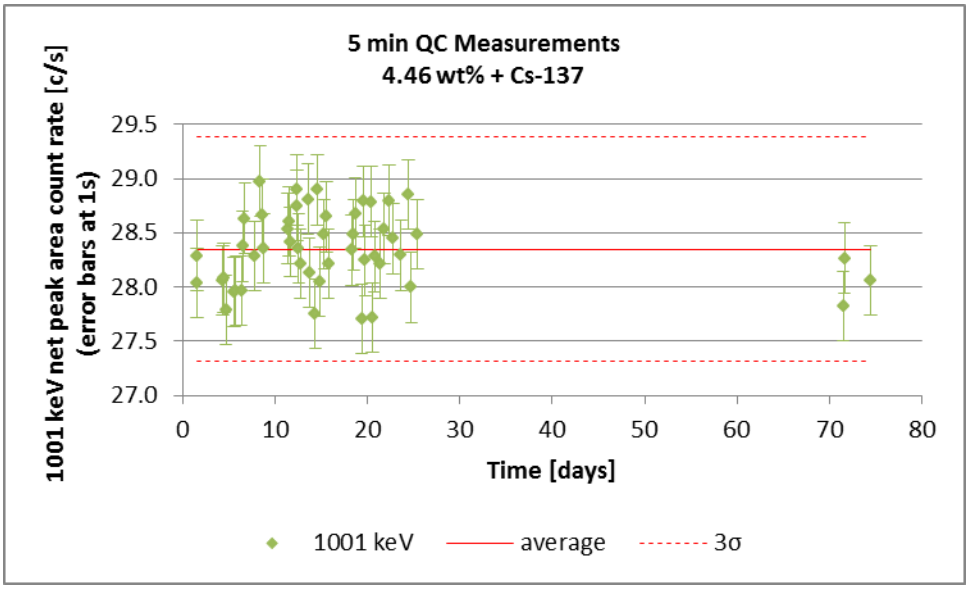

Fig. 24. 5 min QC measurements: 1001 keV net peak area count rate with respect to time.

In Fig. 23, the 186 keV net peak area count rate is 52.28 ±0.51 c/s (1 s) with no data points outside a 3-sigma confidence interval. In Fig. 24, the 1001 keV net peak area count rate is 28.35 ±0.32 c/s (1 s) with no data points outside a 3-sigma confidence interval. The 662 keV net peak area count rate is not used as a detector-performance figure of merit because the ^{137}Cs source position was not controlled.

A least-squares analysis is performed on the 5 min QC measurements to test if the 186 and 1001 keV net peak area count rates change with respect to time. The results of the least-squares analysis are presented in Table 16 and show the slope, slope uncertainty, and r-squared value for the 186 and 1001 keV net peak area count rates with respect to time. Since the data points taken after day 70 strongly leverage the least-squares analysis, the analysis is performed both including and excluding these points.

Table 16. 5 min QC measurements: Least-squares analysis of 186 and 1001 keV net peak area count rates with respect to time; uncertainties at 1 s absolute

		186 keV	1001 keV
All data	slope (cps/day)	0.0027 ± 0.006	−0.0027 ± 0.0032
	r^2	0.00	0.01
Time <30 days	slope (cps/day)	−0.0026 ± 0.014	0.0104 ± 0.0075
	r^2	0.00	0.04

The results of the least-squares analysis show that the slopes of both the 186 and 1001 keV net peak area count rates with respect to time include zero within a 2-sigma confidence interval and an r-squared value near zero; thus, no change in 186 or 1001 keV net peak area count rates with respect to time is detected. It is concluded that **the absolute efficiency can be assumed to be constant over the course of the campaign.**

4.2.2 Centroid

The centroid positions of the 186, 662, and 1001 keV peaks from the QC measurements are analyzed to test for any changes in peak position with respect to time. The average counting statistics for each peak are shown in Table 17. From Table 17, the counting statistics are sufficient to obtain a relatively strong confidence about the centroid position for all peaks, with the 662 keV peak being the most sensitive. The 186, 662, and 1001 keV centroid position, absolute centroid shift, and relative centroid shift are plotted in Figs. 25, 26, and 27. The centroid position values were determined using the Peak Easy analysis software and batch processing. Unfortunately, Peak Easy does not report uncertainties with peak locations, so no uncertainties are applied to these estimates. In the future, uncertainty estimates will be provided for centroid locations. The processed data appear in Appendix A.

Table 17. 5 min QC measurements: Average net peak area counts and uncertainties

	Net peak area counts [c]	Unc. (1s) [c]	Unc. (1s) [%]
186 keV	14,961	145	1.0
662 keV	101,955	323	0.32
1001 keV	8,081	92	1.1

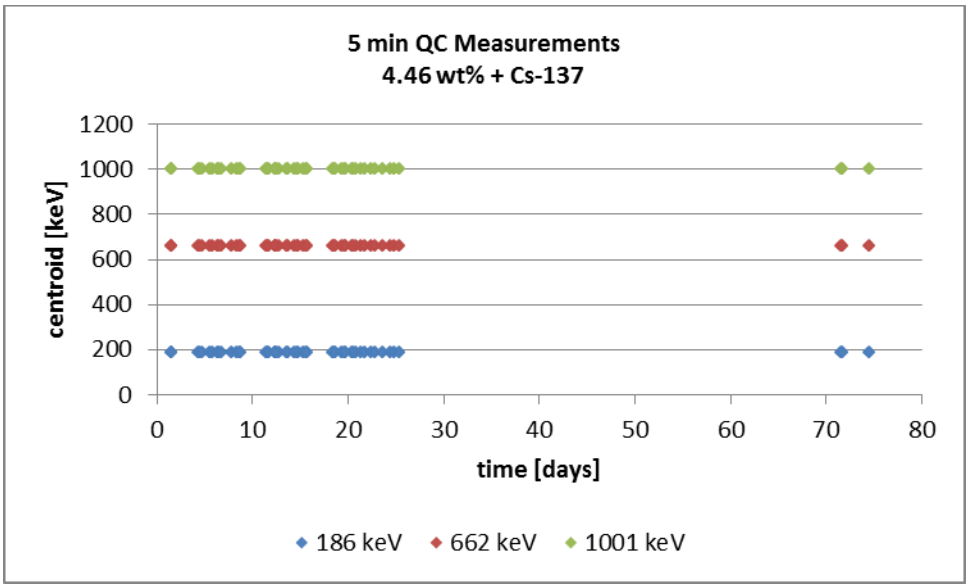

Fig. 25. 5 min QC measurements: Centroid position of the 186, 662, and 1001 keV peaks with respect to time.

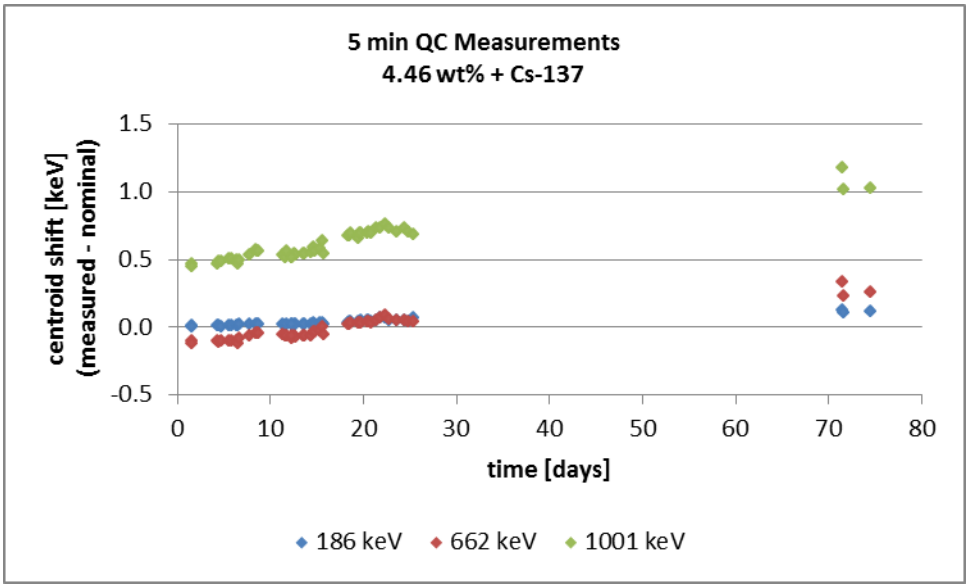

Fig. 26. 5 min QC measurements: Absolute centroid position shift with respect to time – nominal values used were 185.715, 661.657, and 1001.01 keV.

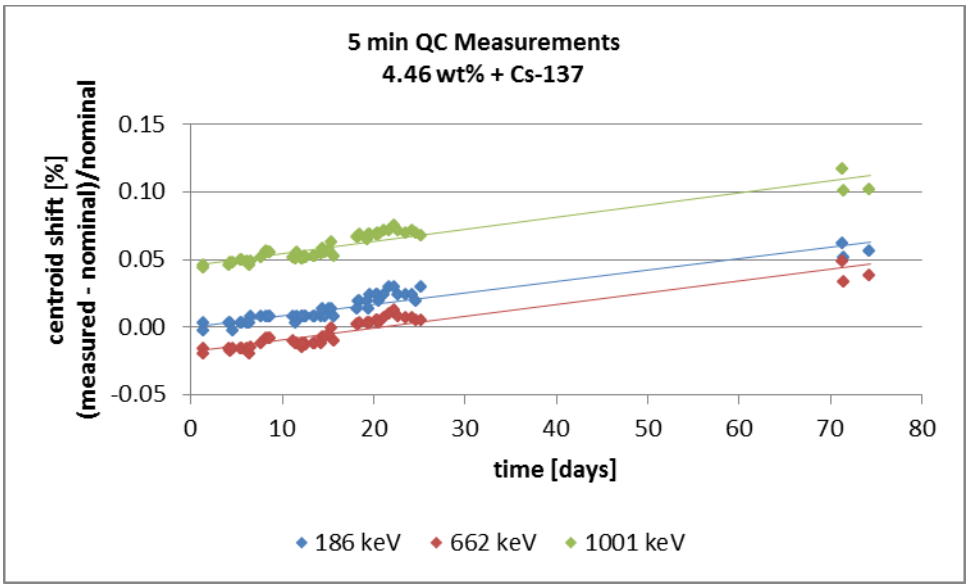

Fig. 27. 5 min QC measurements: Relative centroid position shift with respect to time – nominal values used were 185.715, 661.657, and 1001.01 keV.

From Fig. 25, the centroid positions are relatively stable about their respective energies with no obvious outliers.

From Figs. 26 and 27, the absolute and relative centroid position shift with respect to time is less than 1 keV or 0.1%, respectively, over the entire energy range with a positive trend. From Fig. 26, the absolute centroid position shift with respect to time is apparent for all three energies. From Fig. 27, the relative centroid position shift with respect to time has approximately the same slope (%/day) for all three energies.

In Figs. 26 and 27, the centroid positions are offset from zero to observe the linearity of the detector. A gain setting and linear energy calibration are applied to position the 186 keV peak at channel 2476 or 0.075 keV/channel, hence the normalization to 186 keV and not 1001 keV. These gain and calibration settings were selected because the FRAM and MGAU uranium analysis codes use these settings.

A least-squares analysis was performed to estimate the centroid position shift rate with respect to time. The results of the least-squares analysis are presented in Tables 18 and 19 and show the slope, slope uncertainty, and r-squared value for the 186, 662, and 1001 keV centroid position shift with respect to time in absolute and relative quantities, respectively. Since the data points taken after day 70 strongly leverage the least-squares analysis, the analysis is performed both including and excluding these points.

Table 18. 5 min QC measurements: Least-squares analysis of 186, 662, and 1001 keV absolute centroid position shift with respect **to time; uncertainties at 1 s absolute**

		186 keV	**662 keV**	**1001 keV**
All data	slope(keV/day)	0.0016 ± 0.000079	0.0058 ± 0.00030	0.0090 ± 0.00045
	r^2	0.89	0.89	0.90
Time <30 days	slope(keV/day)	0.0023 ± 0.00015	0.0085 ± 0.00053	0.013 ± 0.00079
	r^2	0.84	0.86	0.86

Table 19. 5 min QC measurements: Least-squares analysis of 186, 662, and 1001 keV relative centroid position shift with respect to time; uncertainties at 1 s absolute

		186 keV			662 keV			1001 keV		
All data	slope(%/day)	0.00084	±	0.000043	0.00087	±	0.000045	0.00090	±	0.000045
	r^2	0.89			0.89			0.90		
Time <30 days	slope(%/day)	0.0012	±	0.000080	0.0013	±	0.000080	0.0013	±	0.000079
	r^2	0.84			0.86			0.86		

The results of the least-squares analyses indicate a shift in the centroid position of the 186, 662, and 1001 keV peaks over the course of the campaign. From Table 18, using fits for the first thirty days, the centroid position shift rates were 0.0023, 0.0085, and 0.013 keV/day (or 0.031, 0.113, 0.173 channel/day) for the 186, 662, and 1001 keV peaks, respectively. From Table 19, the relative centroid shift rate is the same for all three peaks of about 0.0013 %/day. All r-squared values for both the relative and absolute centroid positions with respect to time are greater than 0.8, which indicates a strong correlation between centroid position and time. No explanation for this phenomenon is provided; however, it is noted that the high voltage across the detector was cycled multiple times (i.e., high voltage turned off and back on) during the full 75 day campaign, but the system was never thermally cycled during the full 75 day campaign (i.e., allowed to warm up to room temperature and then cooled back down). This is most apparent by the agreement between the data collected before day 26 and after day 70. It is concluded that **the centroid positions cannot be assumed to be constant, but instead increase at a rate of approximately 0.00087 %/day over the course of the campaign.**

4.2.3 Full Width at Half Maximum (FWHM)

The FWHMs of the 186, 662, and 1001 keV peaks are analyzed to detect any change in resolution with respect to time and are plotted in Figs. 28 through 31. The average absolute and relative FWHMs for the 186, 662, and 1001 keV peaks are tabulated in Table 20. The absolute and relative FWHM with respect to time are plotted in Figs. 28 and 29, and the absolute and relative FWHM shift with respect to time are plotted in Figs. 30 and 31. The FWHM values were determined using the Peak Easy analysis software using batch processing. As with Peak Easy's peak centroid calculations, no uncertainty estimate is given for the FWHM values. Uncertainties will be given to these values in the future.

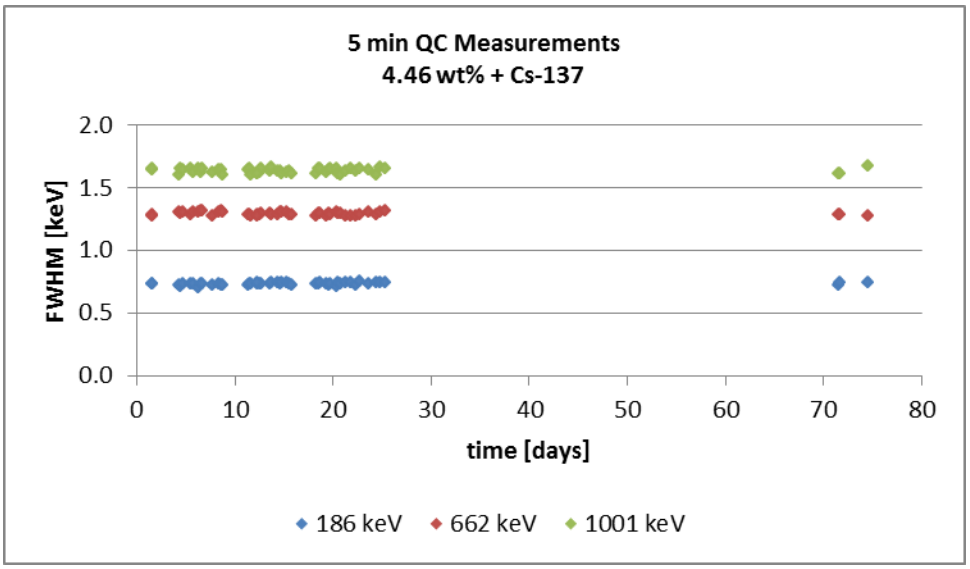

Fig. 28. 5 min QC measurements: Absolute FWHM with respect to time.

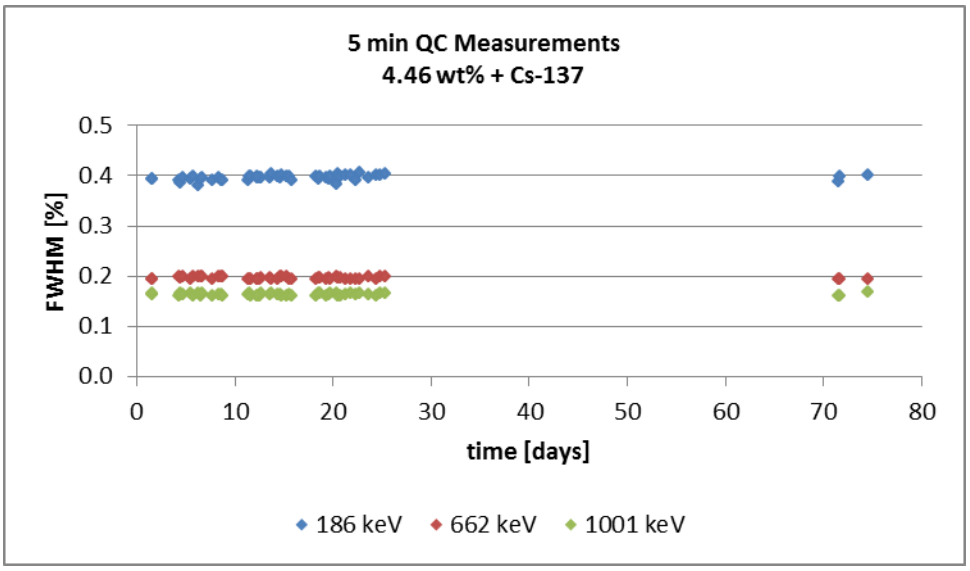

Fig. 29. 5 min QC measurements: Relative FWHM with respect to time.

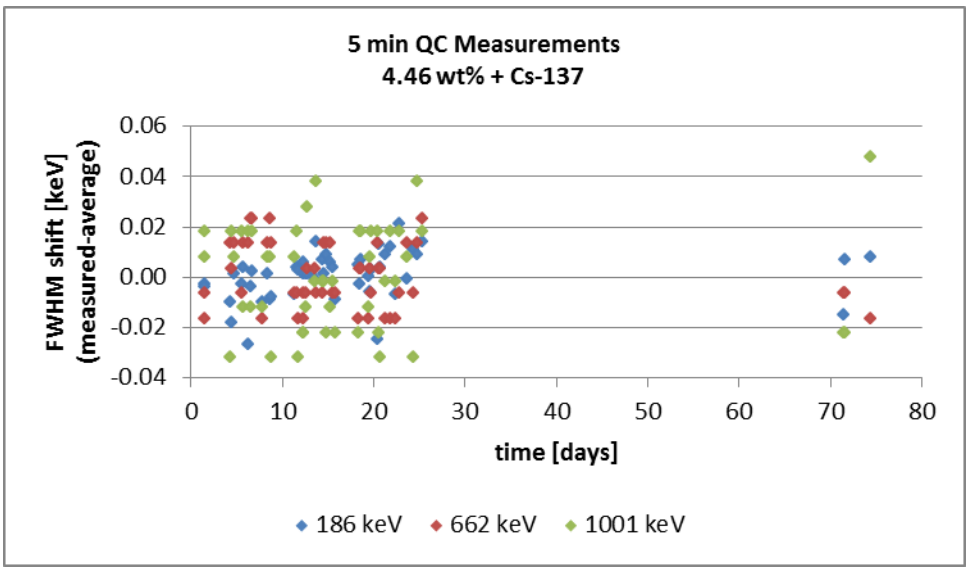

Fig. 30. 5 min QC measurements: Absolute FWHM shift with respect to time.

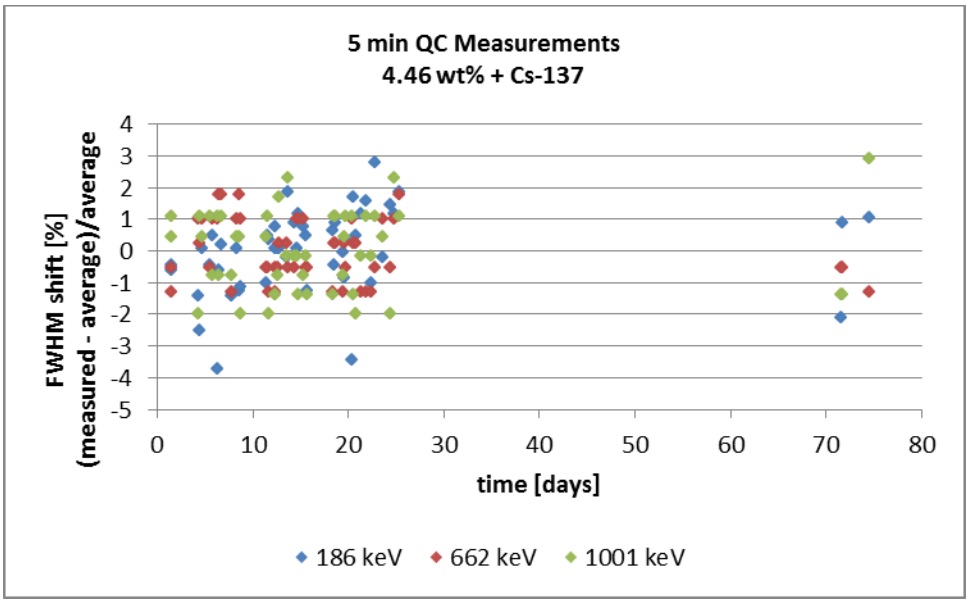

Fig. 31. 5 min QC measurements: Relative FWHM shift with respect to time.

Table 20. 5 min QC measurements: average FWHM at 186, 662, and 1001 keV

Energy [keV]	FWHM [keV]	FWHM [%]
186	0.735	0.396
662	1.297	0.196
1001	1.632	0.163

From Figs. 28 and 29, the FWHM appears stable with respect to time with no obvious outliers. From Figs. 30 and 31, no shift in resolution is visually observed.

A least-squares analysis is performed to test if the FWHM changes with respect to time. The results of the least-squares analysis are presented in Tables 21 and 22 and show the slope, slope uncertainty, and r-squared values for the absolute and relative 186, 662, and 1001 keV FHWM shift with respect to time. Since the data points taken after day 70 strongly leverage the least-squares analysis, the analysis is performed both including and excluding these points.

Table 21. 5 min QC measurements: Least-squares analysis of the absolute FWHM shift with respect to time; uncertainties at 1 s absolute

		186 keV			662 keV			1001 keV		
All data	slope (keV/day)	0.00011	±	0.000088	−0.00020	±	0.00012	0.000039	±	0.00019
	r^2	0.03			0.06			0.00		
Time <26 days	slope (keV/day)	0.00065	±	0.00019	−0.00026	±	0.00028	0.000084	±	0.00044
	r^2	0.21			0.02			0.00		

Table 22. 5 min QC measurements: Least squares analysis of the relative FWHM shift with respect to time; uncertainties at 1 s absolute

		186 keV	662 keV	1001 keV
All data	slope (%/day)	0.000056 ± 0.000048	−0.000032 ± 0.000018	0.0000025 ± 0.000019
	r^2	0.03	0.07	0.00
Time <26 days	slope (%/day)	0.00034 ± 0.00010	−0.000042 ± 0.000043	0.0000062 ± 0.000044
	r^2	0.21	0.02	0.00

The results of the least-squares analysis do not show a definitive change in the FWHM of the 186, 662 and 1001 keV peaks over the course of the campaign. The results of this analysis show that both the slopes of the 662 and 1001 keV FWHMs with respect to time include zero within a 2-sigma confidence interval and an r-squared value near zero. The 186 keV slope for time <26 days does not include zero within a 3-sigma confidence interval and has an r-squared value of 0.21. However, since no error is provided for the FWHM for each peak and the mean and errors found in this analysis are very small, **it is concluded that no change in resolution can be found with the current analysis method applied.**

4.3 DEAD TIME

The dead time for each measurement configuration is tabulated in Table 23. The **maximum dead time was 6.46%** for the 93 wt%-0 mm configuration. The dead time correction is performed by the electronics.

Table 23. High-quality dataset: Dead time (in percent) with respect to enrichment and SS304 attenuator thickness

Nom. enr. [wt%]	Nom. SS304 thickness [mm]			
	0	**8**	**13**	**16**
0.31	1.63	1.05	0.82	0.72
0.71	1.66	1.05	0.80	0.73
1.94	1.71	1.05	0.81	0.72
2.95	1.73	1.06	0.82	0.73
4.46	1.90	1.12	0.86	0.74
20.11	3.13	1.67	1.24	1.05
52.49	4.26	1.91	1.29	1.07
93.17	**6.46**	2.71	1.77	1.40

4.4 NARROW BEAM GEOMETRY AND INFINITE THICKNESS CONFIRMATION

The narrow beam geometry and infinite thickness are confirmed by demonstrating that the 186 keV net peak area count rate is independent of sample offset from the detector; this is demonstrated using the spacer measurements from the high-quality dataset. An additional check on these criteria was shown in Sect. 3.5 by demonstrating that the measured mass and linear attenuation coefficient is independent of the SS304 attenuator thickness and consistent across measurements.

Figures 32 and 33 present the measurement results for the 186 keV net peak area count rates with respect to enrichment and spacer thickness for the high-quality dataset. In these plots, the error bars are omitted for readability; all data points are within 2-sigma of the average and weighted average values. The change to at% from wt% in these plots is necessary because uranium atom density is independent of enrichment while uranium mass density is not.

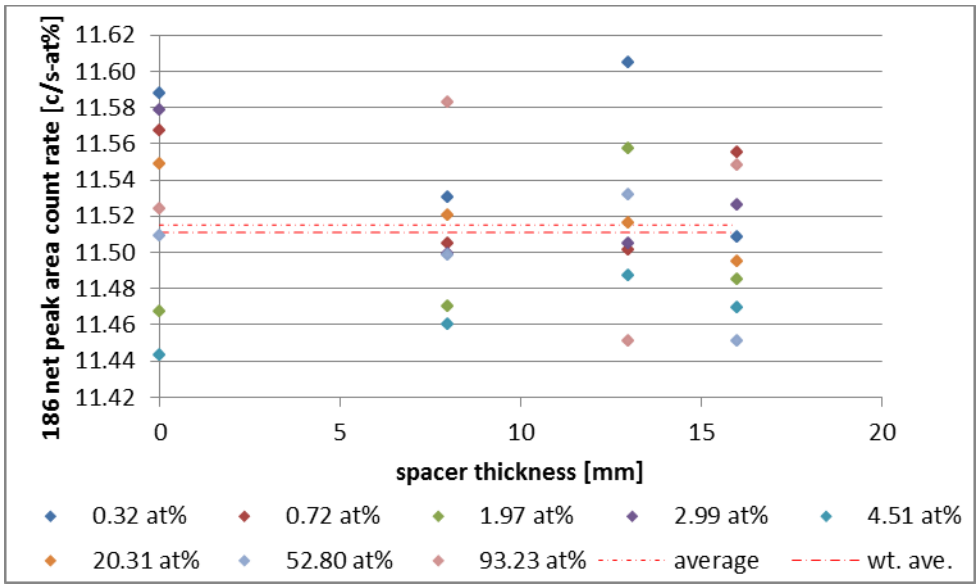

Fig. 32. High-quality dataset: 186 keV net peak area count rate (background corrected) with respect to enrichment and spacer thickness. Errorbars not shown; however, all data points are within a 2-sigma confidence interval of the average and weighted average.

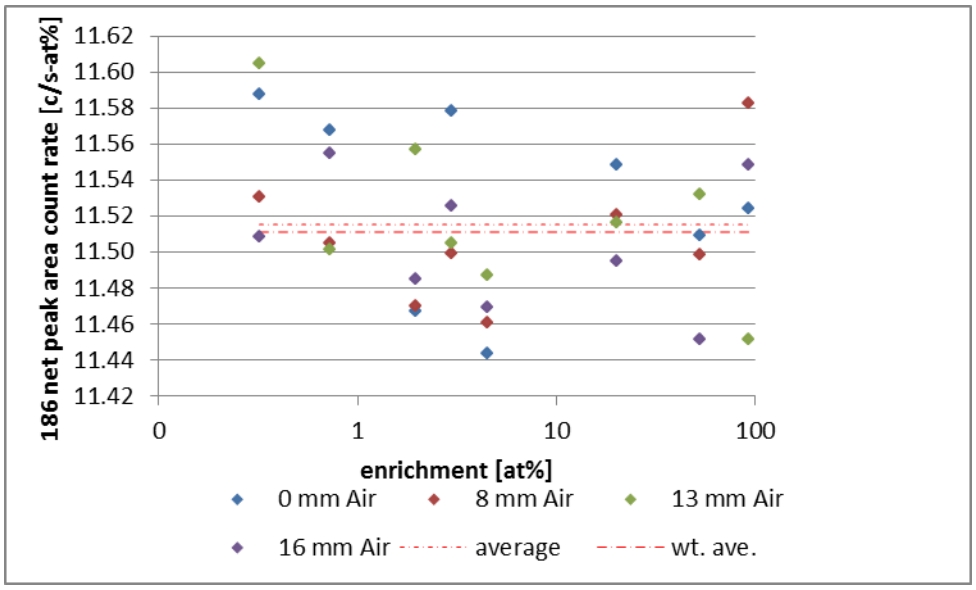

Fig. 33. High-quality dataset: 186 keV net peak area count rate (background corrected) with respect to the enrichment and spacer thickness. Errorbars not shown; however, all data points are within a 2-sigma confidence interval of the average and weighted average.

From Figs. 32 and 33, the atom percent normalized 186 keV net peak area count rate appears constant about the average and weighted average values of 11.515 c/s and 11.511 c/s, respectively. See data in Table 2 and Appendix A. No indication of a correlation between the 186 keV net peak area and enrichment or spacer thickness is observed. Additionally, no data points outside a 2-sigma confidence interval are observed. **It is concluded that the narrow beam geometry and infinite thickness criteria are confirmed by the high-quality dataset.**

4.5 CAMPAIGN NOTES

This section logs the experimenter's observations while acquiring the data and additionally notes a few irregularities which occurred. This section references the processed data tabulated in Appendix A.

With reference to Appendix A, measurements #1 and #2 have different settings from all other measurements (e.g., energy calibration, FHWM calibration, L-tail calibration, gain, and pole-zero). Both measurements #1 and #2 use the calibration established from measurement #1. Measurement #2 is a background measurement and *is* included in the analysis, while Measurement #1 is a calibration measurement and is *not* used in the analysis. Measurements #3–#849 have the same settings and use the calibration established from measurement #3. The differences in the settings between measurements #1–#2 and #3–#849 are all but negligible.

There is no shielding on the bottom of the lead castle (Figs. 4–10) or back side of the detector. Small gaps are present in the lead shielding castle. For the 0.31 wt%-16 mm SS304, 0.31 wt%-13 mm SS304, and 0.71 wt%-16 mm SS304 configurations, the peaked 186 keV BG count rate approaches and exceeds 1% of the sample 186 keV count rate; i.e., the background cannot be assumed to be negligible. This is discussed in Sect. 4. The measurements were conducted in the same room as the source lockup, which included other uranium samples of the full range of enrichment. The uranium inventory of the source lockup was not static but changed regularly. Routine BG measurements were performed to monitor the possible effect this had on the data. This is also discussed in Sect. 4.

One measurement was discovered to have not been saved after the experiment was dismantled (#832-4.46 wt%-13 mm SS304-high-quality dataset). To acquire the outstanding measurement, the experiment (e.g., lead castle, detector, plastic track, etc.) was reassembled in approximately the same position (same collimator direction, same sample height, same Pb castle layout, etc.). Obviously the "exact" configuration of the original experiment could not be reproduced. Measurements #842-849 were collected to generate the missing measurement. All measurements #842-849 are BG and QC measurements except #844, which is 4.46 wt%-13 mm SS304-high-quality dataset (i.e., the missing measurement). There is no evidence of any anomalies associated with this measurement. Further discussion appears in Sect. 4.

Also during measurements #842–849, a different sample sled (Fig. 6) was incidentally used. The second sample sled is geometrically and physicaly identical to the sample sled used for all other measurements. There is no evidence or expectation of any effect upon these measurements.

The detector high voltage was cycled multiple times during the campaign; the detector was not thermally cycled during the campaign.

The calibration, gain, and pole-zero settings were "bumped" between measurements #258 and #259. An old file was opened, and incidentally the system settings were changed to that of the old file. Measurement #259 incidentally FAIL's the QC check because it has different calibration, gain, and pole-zero settings than the other measurements. Measurement #259 was not used in any of the preceding analyses. The system settings were changed back to the original settings, i.e., those of measurement #3, and no indication of the disturbance was detected in measurement #260 or thereafter.

Measurement #265 inexplicably overshot the 5 min real-time cutoff; the data file reports a count time (real time) of 300.01 s instead of 300.00 s. This overshoot results in at most a 0.00003% bias and is consequently ignored for all practical purposes. The measurement is accepted and used in the preceding analysis. No other anomalies regarding this measurement or reoccurrences of this overshoot are observed.

The SS304 attenuator/spacer direction was not consistently oriented in the same direction throughout the campaign. From the review of the QA photographs, measurements #23, #36, #151, and #717 show the

SS304 attenuator/spacer facing in the opposite direction from the other measurements. Incidentally, measurement #23 (opposite direction) was repeated in measurement #55 (nominal direction), and both measurements are consistent with each other within a 3-sigma (but not 2-sigma) confidence interval. No anomalies regarding these measurements were observed.

Dummy samples were not used during background measurements; hence, the measured BG may overestimate the actual background (i.e., no sample attenuation of uranium in the environmental surroundings).

5. USING THE DATA

5.1 DATA LOCATION

The data are currently stored on an ORNL internal SharePoint site (similar to a network drive) belonging to the Safeguards and Security Technology group.

5.2 DATA FORMAT

The original data file types are the Canberra proprietary ".cnf" format. Derived data were compiled in ".spe" format for universal usage. Each file name uniquely and completely identifies the corresponding measurement configuration.

file name: *ID#_MMDDYYYY_HHMM_sample_cutoff_attenuator_seriesID#.cnf*

Furthermore, a single Microsoft Excel spreadsheet that contains all data and spectra has been compiled. The spreadsheet is titled "RAW DATA."

6. FUTURE WORK

This document is intended as a first draft review of the data to check for consistency to perform a quick preliminary analysis. The measurement team plans to make this document and measured data available online to share with collaborators and perhaps a student. In the near future, the measurement teams plans to perform a more detailed analysis including:

1. Implementing peak fitting methods, instead of ROI, to determine peak locations, areas and widths along with defensible uncertainty estimates;
2. Monte Carlo transport modeling to study the effect of attenuators and field of view;
3. Propagating errors on a spectrum by spectrum basis on observables;
4. Do a full enrichment meter principle analysis;
5. Look for changes in small angle scattering as a function of attenuator thickness; and
6. Provide a detailed study of attenuator thickness using an ultrasonic thickness gauge.

7. REFERENCES

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APPENDIX A. PROCESSED DATA

APPENDIX A. PROCESSED DATA

A total of 849 measurements were collected, of which 56 were the high-quality dataset, 640 were the field-quality dataset, four were 12 h backgrounds, 58 were 5 min backgrounds, 49 were quality control, and the remaining 42 were auxiliary measurements. In this section, Tables A.1–A.4 contain the data descriptions of 186 keV, 662 keV, and 1001 keV processed data. The 662 keV data in Table A.3 was only compiled for the quality control measurements which included the ^{137}Cs check source.

In Tables A.1, A.2, A.3, and A.4, the header descriptions are as follows.

ID# Unique identifier for each measurement.

QC test result? **PASS, CAUTION, or FAIL**. PASS indicates that the measurement passed all quality control tests including background and detector performance monitoring. CAUTION indicates that the measurement passed the quality control tests but that there was an irregularity associated with the measurement which is further discussed in the comments. FAIL indicates that the measurement failed the quality control tests.

accurate? **YES or NO**. YES indicates that the data is accurate and could be used with confidence. NO indicates that the data is not accurate and should NOT be used in data analysis. Data can be accurate while at the same time failing the QC test and/or not being used in the analysis. For example, after review of the QC photos, measurements #817 and #827 were discovered to have used the 0.31 wt% instead of the 4.46 wt% source for the QC measurements. The source ID has been corrected in the following tables and the data reported for these measurements is accurate.

used in analysis? **YES or NO**. YES indicates that the data was used in the analysis presented in the body of this document. NO indicates that the data was not used. Data can pass the QC tests and be accurate but not be used in the analysis. An example is #23 which was a duplicate measurement of #55 and was consequently not used in the analysis.

comment Researcher's notes, observations, and explanations

day Time in days since the beginning of the measurement campaign

purpose **CAL, LONG BG, BG, CAL, or MSMT**. States the purpose of the measurement.

nom. enrichment **0.31, 0.71, 1.94, 2.94, 4.46, 20.11, 52.49, 93.17**. Value indicates the nominal enrichment of the enrichment standard used in the measurement. The certified enrichment values, which should be used in subsequent analysis, are found in Table 4.

^{137}Cs **5646 or '-'**. 5646 indicates that ^{137}Cs source ID# 5646 was used in the configuration shown in Fig. 3 and Fig. 14. '-' indicates that no ^{137}Cs source was present.

atten. material	**SS304 or AIR**. SS304 indicates the stainless steel attenuator was used. AIR indicates that the spacer was used (see Fig. 10).
nom. atten. thickness	**'-', 8, 13, 16**. '-' indicates that no attenuator was used (i.e. 0 mm). 8, 13, and 16 indicate the nominal attenuator thickness in mm. The measured thickness values, which should be used in subsequent analysis, are found in Table 10.
live time	Measurement duration live time in seconds
real time	Measurement duration real time in seconds
centroid	Peak centroid in keV reported by Peak Easy analysis software using batch processing
integral area	Counts appearing in the peak region of interest, see Fig. 1 and Table 1
BG area	**C**ounts appear in the background regions of interest to the left and right of peak region of interest (# of BG channels = # integral area channels), see Fig. 1 and Table 1
net peak area	Counts in the net peak area (net peak area = integral area – BG area).
FWHM	Full width at half maximum in keV reported by Peak Easy analysis software using batch processing

Table A.1. Data description and summary

ID#	QC test result?	accurate?	used in analysis?	comment	day	purpose	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]
1	CAUTION	YES	NO	#1 and #2 have different Gain and PZC than all other measurements. Canberra raw data files #1 and #2 use #1 for energy, FHWM, L-tail calibration	0.58	CAL	0.71	-	-	-
2	CAUTION	YES	YES	#1 and #2 have different Gain and PZC than all other measurements.	0.75	LONG BG	-	-	-	-
3	PASS	YES	YES	#3 - #849 have the same gain adjustment. Canberra raw data files #3 - #849 use #3 for energy, FWHM, and L-tail calibration.	1.46	CAL	4.46	5640	-	-
4	PASS	YES	YES	-	1.54	QC	4.46	5640	-	-
5	PASS	YES	YES	-	1.54	BG	-	-	-	-
6	PASS	YES	YES	-	1.54	QC	4.46	5640	-	-
7	FAIL	YES	NO	First measurement of campaign - over ran 100kcnt because of operator error - data is good	1.58	MSMT	0.31	-	SS304	16
8	PASS	YES	YES	-	4.29	QC	4.46	5640	-	-
9	PASS	YES	YES	-	4.33	BG	-	-	-	-
10	PASS	YES	YES	-	4.33	MSMT	0.71	-	-	-
11	PASS	YES	YES	-	4.46	QC	4.46	5640	-	-
12	PASS	YES	YES	-	4.50	BG	-	-	-	-
13	PASS	YES	YES	-	4.50	MSMT	0.71	-	AIR	8
14	PASS	YES	YES	-	4.67	QC	4.46	5640	-	-
15	PASS	YES	YES	-	4.67	BG	-	-	-	-
16	PASS	YES	YES	-	4.67	MSMT	0.31	-	SS304	8
17	PASS	YES	YES	-	5.54	QC	4.46	5640	-	-
18	PASS	YES	YES	Highest 186 ROI area counts, rerun BG measurement	5.54	BG	-	-	-	-
19	PASS	YES	YES	-	5.58	BG	-	-	-	-
20	PASS	YES	YES	-	5.58	MSMT	0.71	-	AIR	13
21	PASS	YES	YES	-	5.75	QC	4.46	5640	-	-
22	PASS	YES	YES	Highest 186 ROI area counts, no peak in ROI, not rerun	5.75	BG	-	-	-	-
23	PASS	YES	NO	duplicated measurement with #55, shield direction inconsistent (turned the other way) - measurement is good	5.75	MSMT	0.71	-	SS304	8
24	PASS	YES	YES	-	6.33	QC	4.46	5640	-	-
25	PASS	YES	YES	High 186 ROI area counts, rerun BG measurement	6.33	BG	-	-	-	-
26	PASS	YES	YES	clean BG	6.33	BG	-	-	-	-
27	PASS	YES	YES	-	6.38	MSMT	20.11	-	-	-
28	PASS	YES	YES	-	6.38	MSMT	20.11	-	SS304	8
29	CAUTION	YES	YES	Mislabeled photos - data is good	6.38	MSMT	20.11	-	SS304	13
30	CAUTION	YES	YES	Mislabeled photos - data is good	6.42	MSMT	20.11	-	SS304	16
31	CAUTION	YES	YES	Mislabeled photos - data is good	6.46	MSMT	20.11	-	AIR	8
32	PASS	YES	YES	-	6.58	MSMT	20.11	-	AIR	13
33	PASS	YES	YES	-	6.50	MSMT	20.11	-	AIR	16
34	PASS	YES	YES	-	6.50	QC	4.46	5640	-	-
35	PASS	YES	YES	-	6.50	BG	-	-	-	-
36	CAUTION	YES	YES	shield direction inconsistent (turned the other way) - measurement is good	6.50	MSMT	0.71	-	AIR	16
37	CAUTION	YES	NO	Mislabeled photos - data is good; extra measurements	6.67	MSMT	20.11	-	-	-

Table A.1. Data description and summary (continued)

ID#	QC test result?	accurate?	used in analysis?	comment	day	purpose	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]
38	CAUTION	YES	NO	Mislabeled photos - data is good; extra measurements	6.67	MSMT	20.11	-	-	-
39	CAUTION	YES	NO	Mislabeled photos - data is good; extra measurements	6.67	MSMT	20.11	-	-	-
40	CAUTION	YES	NO	Mislabeled photos - data is good; extra measurements	6.67	MSMT	20.11	-	-	-
41	CAUTION	YES	NO	Mislabeled photos - data is good; extra measurements	6.67	MSMT	20.11	-	-	-
42	CAUTION	YES	NO	Mislabeled photos - data is good; extra measurements	6.67	MSMT	20.11	-	-	-
43	CAUTION	YES	NO	Mislabeled photos - data is good; extra measurements	6.67	MSMT	20.11	-	-	-
44	CAUTION	YES	NO	Mislabeled photos - data is good; extra measurements	6.71	MSMT	20.11	-	-	-
45	CAUTION	YES	NO	Mislabeled photos - data is good; extra measurements	6.71	MSMT	20.11	-	-	-
46	CAUTION	YES	NO	Mislabeled photos - data is good; extra measurements	6.71	MSMT	20.11	-	-	-
47	CAUTION	YES	NO	Mislabeled photos - data is good; extra measurements	6.71	MSMT	20.11	-	-	-
48	CAUTION	YES	NO	Mislabeled photos - data is good; extra measurements	6.71	MSMT	20.11	-	-	-
49	PASS	YES	YES	-	6.71	QC	4.46	5640	-	-
50	PASS	YES	YES	-	6.71	BG	-	-	-	-
51	PASS	YES	YES	-	6.75	MSMT	0.71	-	SS304	16
52	PASS	YES	YES	-	7.75	QC	4.46	5640	-	-
53	PASS	YES	YES	-	7.75	BG	-	-	-	-
54	PASS	YES	YES	-	7.75	BG	-	-	-	-
55	PASS	YES	YES	-	7.75	MSMT	0.71	-	SS304	8
56	PASS	YES	YES	-	8.38	QC	4.46	5640	-	-
57	PASS	YES	YES	-	8.38	BG	-	-	-	-
58	PASS	YES	YES	duplicate measurement of #23	8.38	MSMT	20.11	-	SS304	8
59	PASS	YES	YES	-	8.38	MSMT	20.11	-	SS304	8
60	PASS	YES	YES	-	8.42	MSMT	20.11	-	SS304	8
61	PASS	YES	YES	-	8.42	MSMT	20.11	-	SS304	8
62	PASS	YES	YES	-	8.42	MSMT	20.11	-	SS304	8
63	PASS	YES	YES	-	8.42	MSMT	20.11	-	SS304	8
64	PASS	YES	YES	-	8.42	MSMT	20.11	-	SS304	8
65	PASS	YES	YES	-	8.42	MSMT	20.11	-	SS304	8
66	PASS	YES	YES	-	8.42	MSMT	20.11	-	SS304	8
67	PASS	YES	YES	-	8.42	MSMT	20.11	-	SS304	8
68	PASS	YES	YES	-	8.42	MSMT	20.11	-	SS304	8
69	PASS	YES	YES	-	8.46	MSMT	20.11	-	SS304	8
70	PASS	YES	YES	-	8.46	MSMT	20.11	-	SS304	8
71	PASS	YES	YES	-	8.46	MSMT	20.11	-	SS304	8
72	PASS	YES	YES	-	8.46	MSMT	20.11	-	SS304	8
73	PASS	YES	YES	-	8.46	MSMT	20.11	-	SS304	8
74	PASS	YES	YES	-	8.46	MSMT	20.11	-	SS304	8
75	PASS	YES	YES	-	8.46	MSMT	20.11	-	SS304	8
76	PASS	YES	YES	-	8.46	MSMT	20.11	-	SS304	8
77	PASS	YES	YES	-	8.50	MSMT	20.11	-	SS304	8
78	PASS	YES	YES	-	8.50	MSMT	20.11	-	SS304	13
79	PASS	YES	YES	-	8.50	MSMT	20.11	-	SS304	13
80	PASS	YES	YES	-	8.50	MSMT	20.11	-	SS304	13

81	PASS	YES	YES	-	8.50	MSMT	20.11	-	SS304	13
82	PASS	YES	YES	-	8.50	MSMT	20.11	-	SS304	13
83	PASS	YES	YES	-	8.50	MSMT	20.11	-	SS304	13
84	PASS	YES	YES	-	8.50	MSMT	20.11	-	SS304	13
85	PASS	YES	YES	-	8.50	MSMT	20.11	-	SS304	13
86	PASS	YES	YES	-	8.50	MSMT	20.11	-	SS304	13
87	PASS	YES	YES	-	8.54	MSMT	20.11	-	SS304	13
88	PASS	YES	YES	-	8.54	MSMT	20.11	-	SS304	13
89	PASS	YES	YES	-	8.54	MSMT	20.11	-	SS304	13
90	PASS	YES	YES	-	8.54	MSMT	20.11	-	SS304	13
91	PASS	YES	YES	-	8.54	MSMT	20.11	-	SS304	13
92	PASS	YES	YES	-	8.54	MSMT	20.11	-	SS304	13
93	PASS	YES	YES	-	8.54	MSMT	20.11	-	SS304	13
94	PASS	YES	YES	-	8.54	MSMT	20.11	-	SS304	13
95	PASS	YES	YES	-	8.54	MSMT	20.11	-	SS304	13
96	PASS	YES	YES	-	8.54	MSMT	20.11	-	SS304	13
97	PASS	YES	YES	-	8.54	MSMT	20.11	-	SS304	13
98	PASS	YES	YES	-	8.58	QC	4.46	5640	-	-
99	PASS	YES	YES	-	8.58	BG	-	-	-	-
100	PASS	YES	YES	-	8.58	MSMT	20.11	-	SS304	16
101	PASS	YES	YES	-	8.58	MSMT	20.11	-	SS304	16
102	PASS	YES	YES	-	8.58	MSMT	20.11	-	SS304	16
103	PASS	YES	YES	-	8.63	MSMT	20.11	-	SS304	16
104	PASS	YES	YES	-	8.63	MSMT	20.11	-	SS304	16
105	PASS	YES	YES	-	8.63	MSMT	20.11	-	SS304	16
106	PASS	YES	YES	-	8.63	MSMT	20.11	-	SS304	16
107	PASS	YES	YES	-	8.63	MSMT	20.11	-	SS304	16
108	PASS	YES	YES	-	8.63	MSMT	20.11	-	SS304	16
109	PASS	YES	YES	-	8.63	MSMT	20.11	-	SS304	16
110	PASS	YES	YES	-	8.63	MSMT	20.11	-	SS304	16
111	PASS	YES	YES	-	8.63	MSMT	20.11	-	SS304	16
112	PASS	YES	YES	-	8.63	MSMT	20.11	-	SS304	16
113	PASS	YES	YES	-	8.67	MSMT	20.11	-	SS304	16
114	PASS	YES	YES	-	8.67	MSMT	20.11	-	SS304	16
115	PASS	YES	YES	-	8.67	MSMT	20.11	-	SS304	16
116	PASS	YES	YES	-	8.67	MSMT	20.11	-	SS304	16
117	PASS	YES	YES	-	8.67	MSMT	20.11	-	SS304	16
118	PASS	YES	YES	-	8.67	MSMT	20.11	-	SS304	16
119	PASS	YES	YES	-	8.67	MSMT	20.11	-	SS304	16
120	PASS	YES	YES	-	8.67	MSMT	20.11	-	-	-
121	PASS	YES	YES	-	8.67	MSMT	20.11	-	-	-
122	PASS	YES	YES	-	8.67	MSMT	20.11	-	-	-
123	PASS	YES	YES	-	8.71	MSMT	20.11	-	-	-
124	PASS	YES	YES	-	8.71	MSMT	20.11	-	-	-
125	PASS	YES	YES	-	8.71	MSMT	20.11	-	-	-
126	PASS	YES	YES	-	8.71	MSMT	20.11	-	-	-
127	PASS	YES	YES	-	8.71	MSMT	20.11	-	-	-
128	PASS	YES	YES	-	8.71	MSMT	20.11	-	-	-

129	PASS	YES	YES	-	8.71	MSMT	20.11	-	-	-
130	PASS	YES	YES	-	8.71	MSMT	20.11	-	-	-
131	PASS	YES	YES	-	8.71	MSMT	20.11	-	-	-
132	PASS	YES	YES	-	8.71	MSMT	20.11	-	-	-
133	PASS	YES	YES	-	8.75	MSMT	20.11	-	-	-
134	PASS	YES	YES	-	8.75	MSMT	20.11	-	-	-
135	PASS	YES	YES	-	8.75	MSMT	20.11	-	-	-
136	PASS	YES	YES	-	8.75	MSMT	20.11	-	-	-
137	PASS	YES	YES	-	8.75	MSMT	20.11	-	-	-
138	PASS	YES	YES	-	8.75	MSMT	20.11	-	-	-
139	PASS	YES	YES	-	8.75	MSMT	20.11	-	-	-
140	PASS	YES	YES	-	8.75	QC	4.46	5640	-	-
141	PASS	YES	YES	-	8.75	BG	-	-	-	-
142	PASS	YES	YES	-	8.79	MSMT	0.31	-	SS304	13
143	PASS	YES	YES	-	11.38	QC	4.46	5640	-	-
144	PASS	YES	YES	-	11.38	BG	-	-	-	-
145	FAIL	NO	NO	High HEU traffic in proximity to measurement	11.38	MSMT	4.46	-	-	-
146	PASS	YES	YES	High 186 ROI area counts, rerun BG measurement	11.42	BG	-	-	-	-
147	PASS	YES	YES	-	11.42	BG	-	-	-	-
148	PASS	YES	YES	-	11.42	BG	-	-	-	-
149	PASS	YES	YES	-	11.46	MSMT	93.17	-	-	-
150	PASS	YES	YES	-	11.46	MSMT	93.17	-	SS304	8
151	CAUTION	YES	YES	shield direction inconsistent (turned the other way) - measurement is good	11.46	MSMT	93.17	-	SS304	13
152	PASS	YES	YES	-	11.46	MSMT	93.17	-	SS304	16
153	PASS	YES	YES	-	11.46	MSMT	93.17	-	AIR	16
154	PASS	YES	YES	-	11.50	MSMT	93.17	-	AIR	13
155	PASS	YES	YES	-	11.50	MSMT	93.17	-	AIR	8
156	PASS	YES	YES	-	11.50	MSMT	52.49	-	-	-
157	PASS	YES	YES	-	11.50	MSMT	52.49	-	SS304	8
158	PASS	YES	YES	-	11.50	MSMT	52.49	-	SS304	13
159	PASS	YES	YES	-	11.50	MSMT	52.49	-	SS304	16
160	PASS	YES	YES	-	11.54	MSMT	52.49	-	AIR	16
161	PASS	YES	YES	-	11.54	MSMT	52.49	-	AIR	13
162	PASS	YES	YES	-	11.54	MSMT	52.49	-	AIR	8
163	PASS	YES	YES	-	11.54	QC	4.46	5640	-	-
164	PASS	YES	YES	Highest DT and 186 ROI area counts, rerun, added Pb shielding to source cabinet (post measurement)	11.54	BG	-	-	-	-
165	PASS	YES	YES	significant reduction in 186 ROI area counts - possible 186 background has effected previous measurements	11.58	BG	-	-	-	-
166	PASS	YES	YES	-	11.58	MSMT	4.46	-	-	-
167	PASS	YES	YES	-	11.63	MSMT	4.46	-	AIR	8
168	PASS	YES	YES	-	11.63	MSMT	4.46	-	AIR	13
169	PASS	YES	YES	-	11.67	MSMT	4.46	-	AIR	16
170	PASS	YES	YES	-	11.67	QC	4.46	5640	-	-
171	PASS	YES	YES	-	11.71	BG	-	-	-	-
172	PASS	YES	YES	-	11.79	LONG BG	-	-	-	-
173	PASS	YES	YES	-	12.33	QC	4.46	5640	-	-

174	PASS	YES	YES	-	12.33	BG	-	-	-	-
175	PASS	YES	YES	-	12.33	MSMT	93.17	-	-	-
176	PASS	YES	YES	-	12.33	MSMT	93.17	-	-	-
177	PASS	YES	YES	-	12.33	MSMT	93.17	-	-	-
178	PASS	YES	YES	-	12.33	MSMT	93.17	-	-	-
179	PASS	YES	YES	-	12.38	MSMT	93.17	-	-	-
180	PASS	YES	YES	-	12.38	MSMT	93.17	-	-	-
181	PASS	YES	YES	-	12.38	MSMT	93.17	-	-	-
182	PASS	YES	YES	-	12.38	MSMT	93.17	-	-	-
183	PASS	YES	YES	-	12.38	MSMT	93.17	-	-	-
184	PASS	YES	YES	-	12.38	MSMT	93.17	-	-	-
185	PASS	YES	YES	-	12.38	MSMT	93.17	-	-	-
186	PASS	YES	YES	-	12.38	MSMT	93.17	-	-	-
187	PASS	YES	YES	-	12.38	MSMT	93.17	-	-	-
188	PASS	YES	YES	-	12.38	MSMT	93.17	-	-	-
189	PASS	YES	YES	-	12.38	MSMT	93.17	-	-	-
190	PASS	YES	YES	-	12.42	MSMT	93.17	-	-	-
191	PASS	YES	YES	-	12.42	MSMT	93.17	-	-	-
192	PASS	YES	YES	-	12.42	MSMT	93.17	-	-	-
193	PASS	YES	YES	-	12.42	MSMT	93.17	-	-	-
194	PASS	YES	YES	-	12.42	MSMT	93.17	-	-	-
195	PASS	YES	YES	-	12.42	MSMT	93.17	-	SS304	8
196	PASS	YES	YES	-	12.42	MSMT	93.17	-	SS304	8
197	PASS	YES	YES	-	12.46	MSMT	93.17	-	SS304	8
198	PASS	YES	YES	-	12.46	MSMT	93.17	-	SS304	8
199	PASS	YES	YES	-	12.46	MSMT	93.17	-	SS304	8
200	PASS	YES	YES	-	12.46	MSMT	93.17	-	SS304	8
201	PASS	YES	YES	-	12.46	MSMT	93.17	-	SS304	8
202	PASS	YES	YES	-	12.46	MSMT	93.17	-	SS304	8
203	PASS	YES	YES	-	12.46	MSMT	93.17	-	SS304	8
204	PASS	YES	YES	-	12.46	MSMT	93.17	-	SS304	8
205	PASS	YES	YES	-	12.46	MSMT	93.17	-	SS304	8
206	PASS	YES	YES	-	12.46	MSMT	93.17	-	SS304	8
207	PASS	YES	YES	-	12.50	MSMT	93.17	-	SS304	8
208	PASS	YES	YES	-	12.50	MSMT	93.17	-	SS304	8
209	PASS	YES	YES	-	12.50	MSMT	93.17	-	SS304	8
210	PASS	YES	YES	-	12.50	MSMT	93.17	-	SS304	8
211	PASS	YES	YES	-	12.50	MSMT	93.17	-	SS304	8
212	PASS	YES	YES	-	12.50	MSMT	93.17	-	SS304	8
213	PASS	YES	YES	-	12.50	MSMT	93.17	-	SS304	8
214	PASS	YES	YES	-	12.50	MSMT	93.17	-	SS304	8
215	PASS	YES	YES	-	12.54	QC	4.46	5640	-	-
216	PASS	YES	YES	-	12.54	BG	-	-	-	-
217	PASS	YES	YES	-	12.54	MSMT	93.17	-	SS304	13
218	PASS	YES	YES	-	12.54	MSMT	93.17	-	SS304	13
219	PASS	YES	YES	-	12.54	MSMT	93.17	-	SS304	13
220	PASS	YES	YES	-	12.54	MSMT	93.17	-	SS304	13
221	PASS	YES	YES	-	12.54	MSMT	93.17	-	SS304	13

222	PASS	YES	YES	-	12.54	MSMT	93.17	-	SS304	13
223	PASS	YES	YES	-	12.58	MSMT	93.17	-	SS304	13
224	PASS	YES	YES	-	12.58	MSMT	93.17	-	SS304	13
225	PASS	YES	YES	-	12.58	MSMT	93.17	-	SS304	13
226	PASS	YES	YES	-	12.58	MSMT	93.17	-	SS304	13
227	PASS	YES	YES	-	12.58	MSMT	93.17	-	SS304	13
228	PASS	YES	YES	-	12.58	MSMT	93.17	-	SS304	13
229	PASS	YES	YES	-	12.58	MSMT	93.17	-	SS304	13
230	PASS	YES	YES	-	12.58	MSMT	93.17	-	SS304	13
231	PASS	YES	YES	-	12.58	MSMT	93.17	-	SS304	13
232	PASS	YES	YES	-	12.58	MSMT	93.17	-	SS304	13
233	PASS	YES	YES	-	12.58	MSMT	93.17	-	SS304	13
234	PASS	YES	YES	-	12.63	MSMT	93.17	-	SS304	13
235	PASS	YES	YES	-	12.63	MSMT	93.17	-	SS304	13
236	PASS	YES	YES	-	12.63	MSMT	93.17	-	SS304	13
237	PASS	YES	YES	-	12.63	MSMT	93.17	-	SS304	16
238	PASS	YES	YES	-	12.63	MSMT	93.17	-	SS304	16
239	PASS	YES	YES	-	12.63	MSMT	93.17	-	SS304	16
240	PASS	YES	YES	-	12.63	MSMT	93.17	-	SS304	16
241	PASS	YES	YES	-	12.63	MSMT	93.17	-	SS304	16
242	PASS	YES	YES	-	12.63	MSMT	93.17	-	SS304	16
243	PASS	YES	YES	-	12.67	MSMT	93.17	-	SS304	16
244	PASS	YES	YES	-	12.67	MSMT	93.17	-	SS304	16
245	PASS	YES	YES	-	12.67	MSMT	93.17	-	SS304	16
246	PASS	YES	YES	-	12.67	MSMT	93.17	-	SS304	16
247	PASS	YES	YES	-	12.67	MSMT	93.17	-	SS304	16
248	PASS	YES	YES	-	12.67	MSMT	93.17	-	SS304	16
249	PASS	YES	YES	-	12.67	MSMT	93.17	-	SS304	16
250	PASS	YES	YES	-	12.67	MSMT	93.17	-	SS304	16
251	PASS	YES	YES	-	12.67	MSMT	93.17	-	SS304	16
252	PASS	YES	YES	-	12.67	MSMT	93.17	-	SS304	16
253	PASS	YES	YES	-	12.67	MSMT	93.17	-	SS304	16
254	PASS	YES	YES	-	12.71	MSMT	93.17	-	SS304	16
255	PASS	YES	YES	-	12.71	MSMT	93.17	-	SS304	16
256	PASS	YES	YES	-	12.71	MSMT	93.17	-	SS304	16
257	PASS	YES	YES	-	12.71	QC	4.46	5640	-	-
258	PASS	YES	YES	-	12.71	BG	-	-	-	-
259	FAIL	YES	NO	accidental disturbance of settings (GAIN, PZC, ROIS)	12.71	MSMT	1.94	-	SS304	16
260	PASS	YES	YES	-	12.33	QC	4.46	5640	-	-
261	PASS	YES	YES	-	13.38	BG	-	-	-	-
262	PASS	YES	YES	-	13.38	MSMT	52.49	-	-	-
263	PASS	YES	YES	-	13.38	MSMT	52.49	-	-	-
264	PASS	YES	YES	-	13.38	MSMT	52.49	-	-	-
265	PASS	YES	YES	-	13.38	MSMT	52.49	-	-	-
266	PASS	YES	YES	-	13.38	MSMT	52.49	-	-	-
267	PASS	YES	YES	-	13.38	MSMT	52.49	-	-	-
268	PASS	YES	YES	-	13.42	MSMT	52.49	-	-	-
269	PASS	YES	YES	-	13.42	MSMT	52.49	-	-	-

270	PASS	YES	YES	-	13.42	MSMT	52.49	-	-	-
271	PASS	YES	YES	-	13.42	MSMT	52.49	-	-	-
272	PASS	YES	YES	-	13.42	MSMT	52.49	-	-	-
273	PASS	YES	YES	-	13.42	MSMT	52.49	-	-	-
274	PASS	YES	YES	-	13.42	MSMT	52.49	-	-	-
275	PASS	YES	YES	-	13.42	MSMT	52.49	-	-	-
276	PASS	YES	YES	-	13.42	MSMT	52.49	-	-	-
277	PASS	YES	YES	-	13.42	MSMT	52.49	-	-	-
278	PASS	YES	YES	-	13.46	MSMT	52.49	-	-	-
279	PASS	YES	YES	-	13.46	MSMT	52.49	-	-	-
280	PASS	YES	YES	-	13.46	MSMT	52.49	-	-	-
281	PASS	YES	YES	-	13.46	MSMT	52.49	-	-	-
282	PASS	YES	YES	-	13.46	MSMT	52.49	-	SS304	8
283	PASS	YES	YES	-	13.46	MSMT	52.49	-	SS304	8
284	PASS	YES	YES	-	13.46	MSMT	52.49	-	SS304	8
285	PASS	YES	YES	-	13.46	MSMT	52.49	-	SS304	8
286	PASS	YES	YES	-	13.46	MSMT	52.49	-	SS304	8
287	PASS	YES	YES	-	13.46	MSMT	52.49	-	SS304	8
288	PASS	YES	YES	-	13.50	MSMT	52.49	-	SS304	8
289	PASS	YES	YES	-	13.50	MSMT	52.49	-	SS304	8
290	PASS	YES	YES	-	13.50	MSMT	52.49	-	SS304	8
291	PASS	YES	YES	-	13.50	MSMT	52.49	-	SS304	8
292	PASS	YES	YES	-	13.50	MSMT	52.49	-	SS304	8
293	PASS	YES	YES	-	13.50	MSMT	52.49	-	SS304	8
294	PASS	YES	YES	-	13.50	MSMT	52.49	-	SS304	8
295	PASS	YES	YES	-	13.50	MSMT	52.49	-	SS304	8
296	PASS	YES	YES	-	13.50	MSMT	52.49	-	SS304	8
297	PASS	YES	YES	-	13.50	MSMT	52.49	-	SS304	8
298	PASS	YES	YES	-	13.50	MSMT	52.49	-	SS304	8
299	PASS	YES	YES	-	13.54	MSMT	52.49	-	SS304	8
300	PASS	YES	YES	-	13.54	MSMT	52.49	-	SS304	8
301	PASS	YES	YES	-	13.54	MSMT	52.49	-	SS304	8
302	PASS	YES	YES	-	13.54	QC	4.46	5640	-	-
303	PASS	YES	YES	-	13.54	BG	-	-	-	-
304	PASS	YES	YES	-	13.54	MSMT	52.49	-	SS304	13
305	PASS	YES	YES	-	13.54	MSMT	52.49	-	SS304	13
306	PASS	YES	YES	-	13.54	MSMT	52.49	-	SS304	13
307	PASS	YES	YES	-	13.58	MSMT	52.49	-	SS304	13
308	PASS	YES	YES	-	13.58	MSMT	52.49	-	SS304	13
309	PASS	YES	YES	-	13.58	MSMT	52.49	-	SS304	13
310	PASS	YES	YES	-	13.58	MSMT	52.49	-	SS304	13
311	PASS	YES	YES	-	13.58	MSMT	52.49	-	SS304	13
312	PASS	YES	YES	-	13.58	MSMT	52.49	-	SS304	13
313	PASS	YES	YES	-	13.58	MSMT	52.49	-	SS304	13
314	PASS	YES	YES	-	13.58	MSMT	52.49	-	SS304	13
315	PASS	YES	YES	-	13.58	MSMT	52.49	-	SS304	13
316	PASS	YES	YES	-	13.63	MSMT	52.49	-	SS304	13
317	PASS	YES	YES	-	13.63	MSMT	52.49	-	SS304	13

318	PASS	YES	YES	-	13.63	MSMT	52.49	-	SS304	13
319	PASS	YES	YES	-	13.63	MSMT	52.49	-	SS304	13
320	PASS	YES	YES	-	13.63	MSMT	52.49	-	SS304	13
321	PASS	YES	YES	-	13.63	MSMT	52.49	-	SS304	13
322	PASS	YES	YES	-	13.63	MSMT	52.49	-	SS304	13
323	PASS	YES	YES	-	13.63	MSMT	52.49	-	SS304	13
324	PASS	YES	YES	-	13.63	MSMT	52.49	-	SS304	16
325	PASS	YES	YES	-	13.63	MSMT	52.49	-	SS304	16
326	PASS	YES	YES	-	13.67	MSMT	52.49	-	SS304	16
327	PASS	YES	YES	-	13.67	MSMT	52.49	-	SS304	16
328	PASS	YES	YES	-	13.67	MSMT	52.49	-	SS304	16
329	PASS	YES	YES	-	13.67	MSMT	52.49	-	SS304	16
330	PASS	YES	YES	-	13.67	MSMT	52.49	-	SS304	16
331	PASS	YES	YES	-	13.67	MSMT	52.49	-	SS304	16
332	PASS	YES	YES	-	13.67	MSMT	52.49	-	SS304	16
333	PASS	YES	YES	-	13.67	MSMT	52.49	-	SS304	16
334	PASS	YES	YES	-	13.67	MSMT	52.49	-	SS304	16
335	PASS	YES	YES	-	13.67	MSMT	52.49	-	SS304	16
336	PASS	YES	YES	-	13.67	MSMT	52.49	-	SS304	16
337	PASS	YES	YES	-	13.71	MSMT	52.49	-	SS304	16
338	PASS	YES	YES	-	13.71	MSMT	52.49	-	SS304	16
339	PASS	YES	YES	-	13.71	MSMT	52.49	-	SS304	16
340	PASS	YES	YES	-	13.71	MSMT	52.49	-	SS304	16
341	PASS	YES	YES	-	13.71	MSMT	52.49	-	SS304	16
342	PASS	YES	YES	-	13.71	MSMT	52.49	-	SS304	16
343	PASS	YES	YES	-	13.71	MSMT	52.49	-	SS304	16
344	PASS	YES	YES	-	13.71	QC	4.46	5640	-	-
345	PASS	YES	YES	-	13.71	BG	-	-	-	-
346	PASS	YES	YES	-	13.75	MSMT	1.94	-	SS304	16
347	PASS	YES	YES	-	14.33	QC	4.46	5640	-	-
348	PASS	YES	YES	-	14.33	BG	-	-	-	-
349	FAIL	NO	NO	High HEU traffic in proximity to measurement	14.38	MSMT	4.46	-	-	-
350	FAIL	NO	NO	High HEU traffic in proximity to measurement	14.38	MSMT	4.46	-	-	-
351	FAIL	NO	NO	High HEU traffic in proximity to measurement	14.38	MSMT	4.46	-	-	-
352	FAIL	NO	NO	High HEU traffic in proximity to measurement	14.38	MSMT	4.46	-	-	-
353	FAIL	NO	NO	High HEU traffic in proximity to measurement	14.38	MSMT	4.46	-	-	-
354	FAIL	NO	NO	High HEU traffic in proximity to measurement	14.38	MSMT	4.46	-	-	-
355	FAIL	NO	NO	NO DATA	-	-	-	-	-	-
356	FAIL	NO	NO	NO DATA	-	-	-	-	-	-
357	FAIL	NO	NO	NO DATA	-	-	-	-	-	-
358	FAIL	NO	NO	NO DATA	-	-	-	-	-	-
359	FAIL	NO	NO	NO DATA	-	-	-	-	-	-
360	FAIL	NO	NO	NO DATA	-	-	-	-	-	-
361	FAIL	NO	NO	NO DATA	-	-	-	-	-	-
362	FAIL	NO	NO	NO DATA	-	-	-	-	-	-
363	FAIL	NO	NO	NO DATA	-	-	-	-	-	-
364	FAIL	NO	NO	NO DATA	-	-	-	-	-	-
365	FAIL	NO	NO	NO DATA	-	-	-	-	-	-

366	FAIL	NO	NO	NO DATA	-	-	-	-	-	-
367	FAIL	NO	NO	NO DATA	-	-	-	-	-	-
368	FAIL	NO	NO	NO DATA	-	-	-	-	-	-
369	PASS	YES	YES	-	14.38	BG	-	-	-	-
370	PASS	YES	YES	-	14.42	MSMT	4.46	-	-	-
371	PASS	YES	YES	-	14.42	MSMT	4.46	-	-	-
372	PASS	YES	YES	-	14.42	MSMT	4.46	-	-	-
373	PASS	YES	YES	-	14.42	MSMT	4.46	-	-	-
374	PASS	YES	YES	-	14.42	MSMT	4.46	-	-	-
375	PASS	YES	YES	-	14.42	MSMT	4.46	-	-	-
376	PASS	YES	YES	-	14.42	MSMT	4.46	-	-	-
377	PASS	YES	YES	-	14.42	MSMT	4.46	-	-	-
378	PASS	YES	YES	-	14.42	MSMT	4.46	-	-	-
379	PASS	YES	YES	-	14.42	MSMT	4.46	-	-	-
380	PASS	YES	YES	-	14.46	MSMT	4.46	-	-	-
381	PASS	YES	YES	-	14.46	MSMT	4.46	-	-	-
382	PASS	YES	YES	-	14.46	MSMT	4.46	-	-	-
383	PASS	YES	YES	-	14.46	MSMT	4.46	-	-	-
384	PASS	YES	YES	-	14.46	MSMT	4.46	-	-	-
385	PASS	YES	YES	-	14.46	MSMT	4.46	-	-	-
386	PASS	YES	YES	-	14.46	MSMT	4.46	-	-	-
387	PASS	YES	YES	-	14.46	MSMT	4.46	-	-	-
388	PASS	YES	YES	-	14.46	MSMT	4.46	-	-	-
389	PASS	YES	YES	-	14.50	MSMT	4.46	-	-	-
390	PASS	YES	YES	-	14.50	MSMT	4.46	-	SS304	8
391	PASS	YES	YES	-	14.50	MSMT	4.46	-	SS304	8
392	PASS	YES	YES	-	14.50	MSMT	4.46	-	SS304	8
393	PASS	YES	YES	-	14.50	MSMT	4.46	-	SS304	8
394	PASS	YES	YES	-	14.50	MSMT	4.46	-	SS304	8
395	PASS	YES	YES	-	14.50	MSMT	4.46	-	SS304	8
396	PASS	YES	YES	-	14.54	MSMT	4.46	-	SS304	8
397	PASS	YES	YES	-	14.54	MSMT	4.46	-	SS304	8
398	PASS	YES	YES	-	14.54	MSMT	4.46	-	SS304	8
399	PASS	YES	YES	-	14.54	MSMT	4.46	-	SS304	8
400	PASS	YES	YES	-	14.54	MSMT	4.46	-	SS304	8
401	PASS	YES	YES	-	14.54	MSMT	4.46	-	SS304	8
402	PASS	YES	YES	-	14.54	MSMT	4.46	-	SS304	8
403	PASS	YES	YES	-	14.54	MSMT	4.46	-	SS304	8
404	PASS	YES	YES	-	14.54	MSMT	4.46	-	SS304	8
405	PASS	YES	YES	-	14.58	MSMT	4.46	-	SS304	8
406	PASS	YES	YES	-	14.58	MSMT	4.46	-	SS304	8
407	PASS	YES	YES	-	14.58	MSMT	4.46	-	SS304	8
408	PASS	YES	YES	-	14.58	MSMT	4.46	-	SS304	8
409	PASS	YES	YES	-	14.58	MSMT	4.46	-	SS304	8
410	PASS	YES	YES	-	14.58	QC	4.46	5640	-	-
411	PASS	YES	YES	-	14.58	BG	-	-	-	-
412	PASS	YES	YES	-	14.63	MSMT	4.46	-	SS304	13
413	PASS	YES	YES	-	14.63	MSMT	4.46	-	SS304	13

414	PASS	YES	YES	-	14.63	MSMT	4.46	-	SS304	13
415	PASS	YES	YES	-	14.63	MSMT	4.46	-	SS304	13
416	PASS	YES	YES	-	14.63	MSMT	4.46	-	SS304	13
417	PASS	YES	YES	-	14.63	MSMT	4.46	-	SS304	13
418	PASS	YES	YES	-	14.63	MSMT	4.46	-	SS304	13
419	PASS	YES	YES	-	14.63	MSMT	4.46	-	SS304	13
420	PASS	YES	YES	-	14.63	MSMT	4.46	-	SS304	13
421	PASS	YES	YES	-	14.63	MSMT	4.46	-	SS304	13
422	PASS	YES	YES	-	14.63	MSMT	4.46	-	SS304	13
423	PASS	YES	YES	-	14.67	MSMT	4.46	-	SS304	13
424	PASS	YES	YES	-	14.67	MSMT	4.46	-	SS304	13
425	PASS	YES	YES	-	14.67	MSMT	4.46	-	SS304	13
426	PASS	YES	YES	-	14.67	MSMT	4.46	-	SS304	13
427	PASS	YES	YES	-	14.67	MSMT	4.46	-	SS304	13
428	PASS	YES	YES	-	14.67	MSMT	4.46	-	SS304	13
429	PASS	YES	YES	-	14.67	MSMT	4.46	-	SS304	13
430	PASS	YES	YES	-	14.67	MSMT	4.46	-	SS304	13
431	PASS	YES	YES	-	14.67	MSMT	4.46	-	SS304	13
432	PASS	YES	YES	-	14.71	MSMT	4.46	-	SS304	16
433	PASS	YES	YES	-	14.71	MSMT	4.46	-	SS304	16
434	PASS	YES	YES	-	14.71	MSMT	4.46	-	SS304	16
435	PASS	YES	YES	-	14.71	MSMT	4.46	-	SS304	16
436	PASS	YES	YES	-	14.71	MSMT	4.46	-	SS304	16
437	PASS	YES	YES	-	14.71	MSMT	4.46	-	SS304	16
438	PASS	YES	YES	-	14.71	MSMT	4.46	-	SS304	16
439	PASS	YES	YES	-	14.71	MSMT	4.46	-	SS304	16
440	PASS	YES	YES	-	14.71	MSMT	4.46	-	SS304	16
441	PASS	YES	YES	-	14.71	MSMT	4.46	-	SS304	16
442	PASS	YES	YES	-	14.75	MSMT	4.46	-	SS304	16
443	PASS	YES	YES	-	14.75	MSMT	4.46	-	SS304	16
444	PASS	YES	YES	-	14.75	MSMT	4.46	-	SS304	16
445	PASS	YES	YES	-	14.75	MSMT	4.46	-	SS304	16
446	PASS	YES	YES	-	14.75	MSMT	4.46	-	SS304	16
447	PASS	YES	YES	-	14.75	MSMT	4.46	-	SS304	16
448	PASS	YES	YES	-	14.75	MSMT	4.46	-	SS304	16
449	PASS	YES	YES	-	14.75	MSMT	4.46	-	SS304	16
450	PASS	YES	YES	-	14.75	MSMT	4.46	-	SS304	16
451	PASS	YES	YES	-	14.75	MSMT	4.46	-	SS304	16
452	PASS	YES	YES	-	14.79	QC	4.46	5640	-	-
453	PASS	YES	YES	-	14.79	BG	-	-	-	-
454	CAUTION	YES	YES	Shielding direction is not consistent (is the other way) - measurement is good	14.79	MSMT	2.95	-	SS304	16
455	PASS	YES	YES	-	15.29	QC	4.46	5640	-	-
456	PASS	YES	YES	-	15.33	BG	-	-	-	-
457	PASS	YES	YES	-	15.33	MSMT	2.95	-	-	-
458	PASS	YES	YES	-	15.33	MSMT	2.95	-	-	-
459	PASS	YES	YES	-	15.33	MSMT	2.95	-	-	-
460	PASS	YES	YES	-	15.33	MSMT	2.95	-	-	-

461	PASS	YES	YES	-	15.33	MSMT	2.95	-	-	-
462	PASS	YES	YES	-	15.33	MSMT	2.95	-	-	-
463	PASS	YES	YES	-	15.38	MSMT	2.95	-	-	-
464	PASS	YES	YES	-	15.38	MSMT	2.95	-	-	-
465	PASS	YES	YES	-	15.38	MSMT	2.95	-	-	-
466	PASS	YES	YES	-	15.38	MSMT	2.95	-	-	-
467	PASS	YES	YES	-	15.42	MSMT	2.95	-	-	-
468	PASS	YES	YES	-	15.42	MSMT	2.95	-	-	-
469	PASS	YES	YES	-	15.42	MSMT	2.95	-	-	-
470	PASS	YES	YES	-	15.42	MSMT	2.95	-	-	-
471	PASS	YES	YES	-	15.42	MSMT	2.95	-	-	-
472	PASS	YES	YES	-	15.42	MSMT	2.95	-	-	-
473	PASS	YES	YES	-	15.42	MSMT	2.95	-	-	-
474	PASS	YES	YES	-	15.46	MSMT	2.95	-	-	-
475	PASS	YES	YES	-	15.46	MSMT	2.95	-	-	-
476	PASS	YES	YES	-	15.46	MSMT	2.95	-	-	-
477	PASS	YES	YES	-	15.46	MSMT	2.95	-	SS304	8
478	PASS	YES	YES	-	15.46	MSMT	2.95	-	SS304	8
479	PASS	YES	YES	-	15.46	MSMT	2.95	-	SS304	8
480	PASS	YES	YES	-	15.50	MSMT	2.95	-	SS304	8
481	PASS	YES	YES	-	15.50	MSMT	2.95	-	SS304	8
482	PASS	YES	YES	-	15.50	MSMT	2.95	-	SS304	8
483	PASS	YES	YES	-	15.50	MSMT	2.95	-	SS304	8
484	PASS	YES	YES	-	15.50	MSMT	2.95	-	SS304	8
485	PASS	YES	YES	-	15.50	MSMT	2.95	-	SS304	8
486	PASS	YES	YES	-	15.50	MSMT	2.95	-	SS304	8
487	PASS	YES	YES	-	15.50	MSMT	2.95	-	SS304	8
488	PASS	YES	YES	-	15.50	MSMT	2.95	-	SS304	8
489	PASS	YES	YES	-	15.54	MSMT	2.95	-	SS304	8
490	PASS	YES	YES	-	15.54	MSMT	2.95	-	SS304	8
491	PASS	YES	YES	-	15.54	MSMT	2.95	-	SS304	8
492	PASS	YES	YES	-	15.54	MSMT	2.95	-	SS304	8
493	PASS	YES	YES	-	15.54	MSMT	2.95	-	SS304	8
494	PASS	YES	YES	-	15.54	MSMT	2.95	-	SS304	8
495	PASS	YES	YES	-	15.54	MSMT	2.95	-	SS304	8
496	PASS	YES	YES	-	15.54	MSMT	2.95	-	SS304	8
497	PASS	YES	YES	-	15.54	QC	4.46	5640	-	-
498	PASS	YES	YES	-	15.58	BG	-	-	-	-
499	CAUTION	YES	YES	error on sign, should say 499-518 - measurements are good	15.58	MSMT	2.95	-	SS304	13
500	CAUTION	YES	YES	error on sign, should say 499-518 - measurements are good	15.58	MSMT	2.95	-	SS304	13
501	CAUTION	YES	YES	error on sign, should say 499-518 - measurements are good	15.58	MSMT	2.95	-	SS304	13
502	CAUTION	YES	YES	error on sign, should say 499-518 - measurements are good	15.58	MSMT	2.95	-	SS304	13
503	CAUTION	YES	YES	error on sign, should say 499-518 - measurements are good	15.58	MSMT	2.95	-	SS304	13
504	CAUTION	YES	YES	error on sign, should say 499-518 - measurements are good	15.63	MSMT	2.95	-	SS304	13
505	CAUTION	YES	YES	error on sign, should say 499-518 - measurements are good	15.63	MSMT	2.95	-	SS304	13
506	CAUTION	YES	YES	error on sign, should say 499-518 - measurements are good	15.63	MSMT	2.95	-	SS304	13
507	CAUTION	YES	YES	error on sign, should say 499-518 - measurements are good	15.63	MSMT	2.95	-	SS304	13
508	CAUTION	YES	YES	error on sign, should say 499-518 - measurements are good	15.63	MSMT	2.95	-	SS304	13

509	CAUTION	YES	YES	error on sign, should say 499-518 - measurements are good	15.63	MSMT	2.95	-	SS304	13
510	CAUTION	YES	YES	error on sign, should say 499-518 - measurements are good	15.63	MSMT	2.95	-	SS304	13
511	CAUTION	YES	YES	error on sign, should say 499-518 - measurements are good	15.63	MSMT	2.95	-	SS304	13
512	CAUTION	YES	YES	error on sign, should say 499-518 - measurements are good	15.63	MSMT	2.95	-	SS304	13
513	CAUTION	YES	YES	error on sign, should say 499-518 - measurements are good	15.63	MSMT	2.95	-	SS304	13
514	CAUTION	YES	YES	error on sign, should say 499-518 - measurements are good	15.63	MSMT	2.95	-	SS304	13
515	CAUTION	YES	YES	error on sign, should say 499-518 - measurements are good	15.67	MSMT	2.95	-	SS304	13
516	CAUTION	YES	YES	error on sign, should say 499-518 - measurements are good	15.67	MSMT	2.95	-	SS304	13
517	CAUTION	YES	YES	error on sign, should say 499-518 - measurements are good	15.67	MSMT	2.95	-	SS304	13
518	CAUTION	YES	YES	error on sign, should say 499-518 - measurements are good	15.67	MSMT	2.95	-	SS304	13
519	PASS	YES	YES	-	15.67	MSMT	2.95	-	SS304	16
520	PASS	YES	YES	-	15.67	MSMT	2.95	-	SS304	16
521	PASS	YES	YES	-	15.71	MSMT	2.95	-	SS304	16
522	PASS	YES	YES	-	15.71	MSMT	2.95	-	SS304	16
523	PASS	YES	YES	-	15.71	MSMT	2.95	-	SS304	16
524	PASS	YES	YES	-	15.71	MSMT	2.95	-	SS304	16
525	PASS	YES	YES	-	15.71	MSMT	2.95	-	SS304	16
526	PASS	YES	YES	-	15.71	MSMT	2.95	-	SS304	16
527	PASS	YES	YES	-	15.71	MSMT	2.95	-	SS304	16
528	PASS	YES	YES	-	15.71	MSMT	2.95	-	SS304	16
529	PASS	YES	YES	-	15.71	MSMT	2.95	-	SS304	16
530	PASS	YES	YES	-	15.71	MSMT	2.95	-	SS304	16
531	PASS	YES	YES	-	15.75	MSMT	2.95	-	SS304	16
532	PASS	YES	YES	-	15.75	MSMT	2.95	-	SS304	16
533	PASS	YES	YES	-	15.75	MSMT	2.95	-	SS304	16
534	PASS	YES	YES	-	15.75	MSMT	2.95	-	SS304	16
535	PASS	YES	YES	-	15.75	MSMT	2.95	-	SS304	16
536	PASS	YES	YES	-	15.75	MSMT	2.95	-	SS304	16
537	PASS	YES	YES	-	15.75	MSMT	2.95	-	SS304	16
538	PASS	YES	YES	-	15.75	MSMT	2.95	-	SS304	16
539	PASS	YES	YES	-	15.75	QC	4.46	5640	-	-
540	PASS	YES	YES	-	15.79	BG	-	-	-	-
541	PASS	YES	YES	redo of #7 because #7 overran the 100kcnt cutoff	15.79	MSMT	0.31	-	SS304	16
542	PASS	YES	YES	-	18.33	QC	4.46	5640	-	-
543	PASS	YES	YES	-	18.33	BG	-	-	-	-
544	PASS	YES	YES	-	18.33	MSMT	1.94	-	-	-
545	PASS	YES	YES	-	18.33	MSMT	1.94	-	-	-
546	PASS	YES	YES	-	18.33	MSMT	1.94	-	-	-
547	PASS	YES	YES	-	18.33	MSMT	1.94	-	-	-
548	PASS	YES	YES	-	18.38	MSMT	1.94	-	-	-
549	PASS	YES	YES	-	18.38	MSMT	1.94	-	-	-
550	PASS	YES	YES	-	18.38	MSMT	1.94	-	-	-
551	PASS	YES	YES	-	18.38	MSMT	1.94	-	-	-
552	PASS	YES	YES	-	18.38	MSMT	1.94	-	-	-
553	PASS	YES	YES	-	18.38	MSMT	1.94	-	-	-
554	PASS	YES	YES	-	18.38	MSMT	1.94	-	-	-
555	PASS	YES	YES	-	18.38	MSMT	1.94	-	-	-
556	PASS	YES	YES	-	18.38	MSMT	1.94	-	-	-

557	PASS	YES	YES	-	18.38	MSMT	1.94	-	-	-
558	PASS	YES	YES	-	18.38	MSMT	1.94	-	-	-
559	PASS	YES	YES	-	18.42	MSMT	1.94	-	-	-
560	PASS	YES	YES	-	18.42	MSMT	1.94	-	-	-
561	PASS	YES	YES	-	18.42	MSMT	1.94	-	-	-
562	PASS	YES	YES	-	18.42	MSMT	1.94	-	-	-
563	PASS	YES	YES	-	18.42	MSMT	1.94	-	-	-
564	PASS	YES	YES	-	18.42	MSMT	1.94	-	SS304	8
565	PASS	YES	YES	-	18.42	MSMT	1.94	-	SS304	8
566	PASS	YES	YES	-	18.42	MSMT	1.94	-	SS304	8
567	PASS	YES	YES	-	18.42	MSMT	1.94	-	SS304	8
568	PASS	YES	YES	-	18.42	MSMT	1.94	-	SS304	8
569	PASS	YES	YES	-	18.46	MSMT	1.94	-	SS304	8
570	PASS	YES	YES	-	18.46	MSMT	1.94	-	SS304	8
571	PASS	YES	YES	-	18.46	MSMT	1.94	-	SS304	8
572	PASS	YES	YES	-	18.46	MSMT	1.94	-	SS304	8
573	PASS	YES	YES	-	18.46	MSMT	1.94	-	SS304	8
574	PASS	YES	YES	-	18.46	MSMT	1.94	-	SS304	8
575	PASS	YES	YES	-	18.46	MSMT	1.94	-	SS304	8
576	PASS	YES	YES	-	18.46	MSMT	1.94	-	SS304	8
577	PASS	YES	YES	-	18.46	MSMT	1.94	-	SS304	8
578	PASS	YES	YES	-	18.46	MSMT	1.94	-	SS304	8
579	PASS	YES	YES	-	18.50	MSMT	1.94	-	SS304	8
580	PASS	YES	YES	-	18.50	MSMT	1.94	-	SS304	8
581	PASS	YES	YES	-	18.50	MSMT	1.94	-	SS304	8
582	PASS	YES	YES	-	18.50	MSMT	1.94	-	SS304	8
583	PASS	YES	YES	-	18.50	MSMT	1.94	-	SS304	8
584	PASS	YES	YES	-	18.50	QC	4.46	5640	-	-
585	PASS	YES	YES	-	18.50	BG	-	-	-	-
586	CAUTION	YES	YES	error on sign, should say 586-605 instead of 585-605, measurement is good	18.50	MSMT	1.94	-	SS304	13
587	CAUTION	YES	YES	error on sign, should say 586-605 instead of 585-605, measurement is good	18.54	MSMT	1.94	-	SS304	13
588	CAUTION	YES	YES	error on sign, should say 586-605 instead of 585-605, measurement is good	18.54	MSMT	1.94	-	SS304	13
589	CAUTION	YES	YES	error on sign, should say 586-605 instead of 585-605, measurement is good	18.54	MSMT	1.94	-	SS304	13
590	CAUTION	YES	YES	error on sign, should say 586-605 instead of 585-605, measurement is good	18.54	MSMT	1.94	-	SS304	13
591	CAUTION	YES	YES	error on sign, should say 586-605 instead of 585-605, measurement is good	18.54	MSMT	1.94	-	SS304	13
592	CAUTION	YES	YES	error on sign, should say 586-605 instead of 585-605, measurement is good	18.54	MSMT	1.94	-	SS304	13
593	CAUTION	YES	YES	error on sign, should say 586-605 instead of 585-605, measurement is good	18.54	MSMT	1.94	-	SS304	13
594	CAUTION	YES	YES	error on sign, should say 586-605 instead of 585-605, measurement is good	18.54	MSMT	1.94	-	SS304	13
595	CAUTION	YES	YES	error on sign, should say 586-605 instead of 585-605, measurement is good	18.54	MSMT	1.94	-	SS304	13
596	CAUTION	YES	YES	error on sign, should say 586-605 instead of 585-605, measurement is good	18.54	MSMT	1.94	-	SS304	13
597	CAUTION	YES	YES	error on sign, should say 586-605 instead of 585-605, measurement is good	18.54	MSMT	1.94	-	SS304	13
598	CAUTION	YES	YES	error on sign, should say 586-605 instead of 585-605, measurement is good	18.58	MSMT	1.94	-	SS304	13
599	CAUTION	YES	YES	error on sign, should say 586-605 instead of 585-605, measurement is good	18.58	MSMT	1.94	-	SS304	13
600	CAUTION	YES	YES	error on sign, should say 586-605 instead of 585-605, measurement is good	18.58	MSMT	1.94	-	SS304	13
601	CAUTION	YES	YES	error on sign, should say 586-605 instead of 585-605, measurement is good	18.58	MSMT	1.94	-	SS304	13
602	CAUTION	YES	YES	error on sign, should say 586-605 instead of 585-605, measurement is good	18.58	MSMT	1.94	-	SS304	13
603	CAUTION	YES	YES	error on sign, should say 586-605 instead of 585-605, measurement is good	18.58	MSMT	1.94	-	SS304	13
604	CAUTION	YES	YES	error on sign, should say 586-605 instead of 585-605, measurement is good	18.58	MSMT	1.94	-	SS304	13

605	CAUTION	YES	YES	error on sign, should say 586-605 instead of 585-605, measurement is good	18.58	MSMT	1.94	-	SS304	13
606	PASS	YES	YES	-	18.58	MSMT	1.94	-	SS304	16
607	PASS	YES	YES	-	18.63	MSMT	1.94	-	SS304	16
608	PASS	YES	YES	-	18.63	MSMT	1.94	-	SS304	16
609	PASS	YES	YES	-	18.63	MSMT	1.94	-	SS304	16
610	PASS	YES	YES	-	18.63	MSMT	1.94	-	SS304	16
611	PASS	YES	YES	-	18.63	MSMT	1.94	-	SS304	16
612	PASS	YES	YES	-	18.63	MSMT	1.94	-	SS304	16
613	PASS	YES	YES	-	18.63	MSMT	1.94	-	SS304	16
614	PASS	YES	YES	-	18.63	MSMT	1.94	-	SS304	16
615	PASS	YES	YES	-	18.63	MSMT	1.94	-	SS304	16
616	PASS	YES	YES	-	18.63	MSMT	1.94	-	SS304	16
617	PASS	YES	YES	-	18.67	MSMT	1.94	-	SS304	16
618	PASS	YES	YES	-	18.67	MSMT	1.94	-	SS304	16
619	PASS	YES	YES	-	18.67	MSMT	1.94	-	SS304	16
620	PASS	YES	YES	-	18.67	MSMT	1.94	-	SS304	16
621	PASS	YES	YES	-	18.67	MSMT	1.94	-	SS304	16
622	PASS	YES	YES	-	18.67	MSMT	1.94	-	SS304	16
623	PASS	YES	YES	-	18.67	MSMT	1.94	-	SS304	16
624	PASS	YES	YES	-	18.67	MSMT	1.94	-	SS304	16
625	PASS	YES	YES	-	18.67	MSMT	1.94	-	SS304	16
626	PASS	YES	YES	-	18.67	QC	4.46	5640	-	-
627	PASS	YES	YES	-	18.71	BG	-	-	-	-
628	PASS	YES	YES	-	18.88	MSMT	0.31	-	-	-
629	PASS	YES	YES	-	19.38	QC	4.46	5640	-	-
630	PASS	YES	YES	-	19.38	BG	-	-	-	-
631	PASS	YES	YES	-	19.38	MSMT	0.71	-	-	-
632	PASS	YES	YES	-	19.38	MSMT	0.71	-	-	-
633	PASS	YES	YES	-	19.38	MSMT	0.71	-	-	-
634	PASS	YES	YES	-	19.38	MSMT	0.71	-	-	-
635	PASS	YES	YES	-	19.38	MSMT	0.71	-	-	-
636	PASS	YES	YES	-	19.42	MSMT	0.71	-	-	-
637	PASS	YES	YES	-	19.42	MSMT	0.71	-	-	-
638	PASS	YES	YES	-	19.42	MSMT	0.71	-	-	-
639	PASS	YES	YES	-	19.42	MSMT	0.71	-	-	-
640	PASS	YES	YES	-	19.42	MSMT	0.71	-	-	-
641	PASS	YES	YES	-	19.42	MSMT	0.71	-	-	-
642	PASS	YES	YES	-	19.42	MSMT	0.71	-	-	-
643	PASS	YES	YES	-	19.42	MSMT	0.71	-	-	-
644	PASS	YES	YES	-	19.42	MSMT	0.71	-	-	-
645	PASS	YES	YES	-	19.42	MSMT	0.71	-	-	-
646	PASS	YES	YES	-	19.42	MSMT	0.71	-	-	-
647	PASS	YES	YES	-	19.46	MSMT	0.71	-	-	-
648	PASS	YES	YES	-	19.46	MSMT	0.71	-	-	-
649	PASS	YES	YES	-	19.46	MSMT	0.71	-	-	-
650	PASS	YES	YES	-	19.46	MSMT	0.71	-	-	-
651	PASS	YES	YES	-	19.46	MSMT	0.71	-	SS304	8
652	PASS	YES	YES	-	19.46	MSMT	0.71	-	SS304	8

653	PASS	YES	YES	-	19.46	MSMT	0.71	-	SS304	8
654	PASS	YES	YES	-	19.46	MSMT	0.71	-	SS304	8
655	PASS	YES	YES	-	19.46	MSMT	0.71	-	SS304	8
656	PASS	YES	YES	-	19.46	MSMT	0.71	-	SS304	8
657	PASS	YES	YES	-	19.50	MSMT	0.71	-	SS304	8
658	PASS	YES	YES	-	19.50	MSMT	0.71	-	SS304	8
659	PASS	YES	YES	-	19.50	MSMT	0.71	-	SS304	8
660	PASS	YES	YES	-	19.50	MSMT	0.71	-	SS304	8
661	PASS	YES	YES	-	19.50	MSMT	0.71	-	SS304	8
662	PASS	YES	YES	-	19.50	MSMT	0.71	-	SS304	8
663	PASS	YES	YES	-	19.50	MSMT	0.71	-	SS304	8
664	PASS	YES	YES	-	19.50	MSMT	0.71	-	SS304	8
665	PASS	YES	YES	-	19.50	MSMT	0.71	-	SS304	8
666	PASS	YES	YES	-	19.50	MSMT	0.71	-	SS304	8
667	PASS	YES	YES	-	19.54	MSMT	0.71	-	SS304	8
668	PASS	YES	YES	-	19.54	MSMT	0.71	-	SS304	8
669	PASS	YES	YES	-	19.54	MSMT	0.71	-	SS304	8
670	PASS	YES	YES	-	19.54	MSMT	0.71	-	SS304	8
671	PASS	YES	YES	-	19.54	QC	4.46	5640	-	-
672	PASS	YES	YES	-	19.54	BG	-	-	-	-
673	PASS	YES	YES	-	19.54	MSMT	0.71	-	SS304	13
674	PASS	YES	YES	-	19.58	MSMT	0.71	-	SS304	13
675	PASS	YES	YES	-	19.58	MSMT	0.71	-	SS304	13
676	PASS	YES	YES	-	19.58	MSMT	0.71	-	SS304	13
677	PASS	YES	YES	-	19.58	MSMT	0.71	-	SS304	13
678	PASS	YES	YES	-	19.58	MSMT	0.71	-	SS304	13
679	PASS	YES	YES	-	19.58	MSMT	0.71	-	SS304	13
680	PASS	YES	YES	-	19.58	MSMT	0.71	-	SS304	13
681	PASS	YES	YES	-	19.58	MSMT	0.71	-	SS304	13
682	PASS	YES	YES	-	19.58	MSMT	0.71	-	SS304	13
683	PASS	YES	YES	-	19.58	MSMT	0.71	-	SS304	13
684	PASS	YES	YES	-	19.63	MSMT	0.71	-	SS304	13
685	PASS	YES	YES	-	19.63	MSMT	0.71	-	SS304	13
686	PASS	YES	YES	-	19.63	MSMT	0.71	-	SS304	13
687	PASS	YES	YES	-	19.63	MSMT	0.71	-	SS304	13
688	PASS	YES	YES	-	19.63	MSMT	0.71	-	SS304	13
689	PASS	YES	YES	-	19.63	MSMT	0.71	-	SS304	13
690	PASS	YES	YES	-	19.63	MSMT	0.71	-	SS304	13
691	PASS	YES	YES	-	19.63	MSMT	0.71	-	SS304	13
692	PASS	YES	YES	-	19.63	MSMT	0.71	-	SS304	13
693	PASS	YES	YES	-	19.67	MSMT	0.71	-	SS304	16
694	PASS	YES	YES	-	19.67	MSMT	0.71	-	SS304	16
695	PASS	YES	YES	-	19.67	MSMT	0.71	-	SS304	16
696	PASS	YES	YES	-	19.67	MSMT	0.71	-	SS304	16
697	PASS	YES	YES	-	19.67	MSMT	0.71	-	SS304	16
698	PASS	YES	YES	-	19.67	MSMT	0.71	-	SS304	16
699	PASS	YES	YES	-	19.67	MSMT	0.71	-	SS304	16
700	PASS	YES	YES	-	19.67	MSMT	0.71	-	SS304	16

701	PASS	YES	YES	-	19.71	MSMT	0.71	-	SS304	16
702	PASS	YES	YES	-	19.71	MSMT	0.71	-	SS304	16
703	PASS	YES	YES	-	19.71	MSMT	0.71	-	SS304	16
704	PASS	YES	YES	-	19.71	MSMT	0.71	-	SS304	16
705	PASS	YES	YES	-	19.71	MSMT	0.71	-	SS304	16
706	PASS	YES	YES	-	19.71	MSMT	0.71	-	SS304	16
707	PASS	YES	YES	-	19.71	MSMT	0.71	-	SS304	16
708	PASS	YES	YES	-	19.71	MSMT	0.71	-	SS304	16
709	PASS	YES	YES	-	19.71	MSMT	0.71	-	SS304	16
710	PASS	YES	YES	-	19.71	MSMT	0.71	-	SS304	16
711	PASS	YES	YES	-	19.75	MSMT	0.71	-	SS304	16
712	PASS	YES	YES	-	19.75	MSMT	0.71	-	SS304	16
713	PASS	YES	YES	-	19.75	QC	4.46	5640	-	-
714	PASS	YES	YES	-	19.75	BG	-	-	-	-
715	PASS	YES	YES	-	19.75	MSMT	1.94	-	-	-
716	PASS	YES	YES	-	19.83	MSMT	1.94	-	AIR	8
717	CAUTION	YES	YES	Shield direction inconsistent with other measurements (shield faces other direction) - measurement is good	19.88	MSMT	0.31	-	AIR	16
718	PASS	YES	YES	-	20.38	QC	4.46	5640	-	-
719	PASS	YES	YES	-	20.38	BG	-	-	-	-
720	PASS	YES	YES	-	20.38	MSMT	0.31	-	-	-
721	PASS	YES	YES	-	20.38	MSMT	0.31	-	-	-
722	PASS	YES	YES	-	20.38	MSMT	0.31	-	-	-
723	PASS	YES	YES	-	20.38	MSMT	0.31	-	-	-
724	PASS	YES	YES	-	20.38	MSMT	0.31	-	-	-
725	PASS	YES	YES	-	20.38	MSMT	0.31	-	-	-
726	PASS	YES	YES	-	20.42	MSMT	0.31	-	-	-
727	PASS	YES	YES	-	20.42	MSMT	0.31	-	-	-
728	PASS	YES	YES	-	20.42	MSMT	0.31	-	-	-
729	PASS	YES	YES	-	20.42	MSMT	0.31	-	-	-
730	PASS	YES	YES	-	20.42	MSMT	0.31	-	-	-
731	PASS	YES	YES	-	20.42	MSMT	0.31	-	-	-
732	PASS	YES	YES	-	20.42	MSMT	0.31	-	-	-
733	PASS	YES	YES	-	20.42	MSMT	0.31	-	-	-
734	PASS	YES	YES	-	20.42	MSMT	0.31	-	-	-
735	PASS	YES	YES	-	20.42	MSMT	0.31	-	-	-
736	PASS	YES	YES	-	20.42	MSMT	0.31	-	-	-
737	PASS	YES	YES	-	20.46	MSMT	0.31	-	-	-
738	PASS	YES	YES	-	20.46	MSMT	0.31	-	-	-
739	PASS	YES	YES	-	20.46	MSMT	0.31	-	-	-
740	PASS	YES	YES	-	20.46	MSMT	0.31	-	SS304	8
741	PASS	YES	YES	-	20.46	MSMT	0.31	-	SS304	8
742	PASS	YES	YES	-	20.46	MSMT	0.31	-	SS304	8
743	PASS	YES	YES	-	20.46	MSMT	0.31	-	SS304	8
744	PASS	YES	YES	-	20.46	MSMT	0.31	-	SS304	8
745	PASS	YES	YES	-	20.46	MSMT	0.31	-	SS304	8
746	PASS	YES	YES	-	20.50	MSMT	0.31	-	SS304	8
747	PASS	YES	YES	-	20.50	MSMT	0.31	-	SS304	8

748	PASS	YES	YES	-	20.50	MSMT	0.31	-	SS304	8
749	PASS	YES	YES	-	20.50	MSMT	0.31	-	SS304	8
750	PASS	YES	YES	-	20.50	MSMT	0.31	-	SS304	8
751	PASS	YES	YES	-	20.50	MSMT	0.31	-	SS304	8
752	PASS	YES	YES	-	20.50	MSMT	0.31	-	SS304	8
753	PASS	YES	YES	-	20.50	MSMT	0.31	-	SS304	8
754	PASS	YES	YES	-	20.50	MSMT	0.31	-	SS304	8
755	PASS	YES	YES	-	20.54	MSMT	0.31	-	SS304	8
756	PASS	YES	YES	-	20.54	MSMT	0.31	-	SS304	8
757	PASS	YES	YES	-	20.54	MSMT	0.31	-	SS304	8
758	PASS	YES	YES	-	20.54	MSMT	0.31	-	SS304	8
759	PASS	YES	YES	-	20.54	MSMT	0.31	-	SS304	8
760	PASS	YES	YES	-	20.54	QC	4.46	5640	-	-
761	PASS	YES	YES	-	20.54	BG	-	-	-	-
762	PASS	YES	YES	-	20.58	MSMT	0.31	-	SS304	13
763	PASS	YES	YES	-	20.58	MSMT	0.31	-	SS304	13
764	PASS	YES	YES	-	20.58	MSMT	0.31	-	SS304	13
765	PASS	YES	YES	-	20.58	MSMT	0.31	-	SS304	13
766	PASS	YES	YES	-	20.58	MSMT	0.31	-	SS304	13
767	PASS	YES	YES	-	20.58	MSMT	0.31	-	SS304	13
768	PASS	YES	YES	-	20.58	MSMT	0.31	-	SS304	13
769	PASS	YES	YES	-	20.58	MSMT	0.31	-	SS304	13
770	PASS	YES	YES	-	20.63	MSMT	0.31	-	SS304	13
771	PASS	YES	YES	-	20.63	MSMT	0.31	-	SS304	13
772	PASS	YES	YES	-	20.63	MSMT	0.31	-	SS304	13
773	PASS	YES	YES	-	20.63	MSMT	0.31	-	SS304	13
774	PASS	YES	YES	-	20.63	MSMT	0.31	-	SS304	13
775	PASS	YES	YES	-	20.63	MSMT	0.31	-	SS304	13
776	PASS	YES	YES	-	20.63	MSMT	0.31	-	SS304	13
777	PASS	YES	YES	-	20.63	MSMT	0.31	-	SS304	13
778	PASS	YES	YES	-	20.63	MSMT	0.31	-	SS304	13
779	PASS	YES	YES	-	20.63	MSMT	0.31	-	SS304	13
780	PASS	YES	YES	-	20.67	MSMT	0.31	-	SS304	13
781	PASS	YES	YES	-	20.67	MSMT	0.31	-	SS304	13
782	PASS	YES	YES	-	20.67	MSMT	0.31	-	SS304	16
783	PASS	YES	YES	-	20.67	MSMT	0.31	-	SS304	16
784	PASS	YES	YES	-	20.67	MSMT	0.31	-	SS304	16
785	PASS	YES	YES	-	20.67	MSMT	0.31	-	SS304	16
786	PASS	YES	YES	-	20.67	MSMT	0.31	-	SS304	16
787	PASS	YES	YES	-	20.67	MSMT	0.31	-	SS304	16
788	PASS	YES	YES	-	20.67	MSMT	0.31	-	SS304	16
789	PASS	YES	YES	-	20.67	MSMT	0.31	-	SS304	16
790	PASS	YES	YES	-	20.71	MSMT	0.31	-	SS304	16
791	PASS	YES	YES	-	20.71	MSMT	0.31	-	SS304	16
792	PASS	YES	YES	-	20.71	MSMT	0.31	-	SS304	16
793	PASS	YES	YES	-	20.71	MSMT	0.31	-	SS304	16
794	PASS	YES	YES	-	20.71	MSMT	0.31	-	SS304	16
795	PASS	YES	YES	-	20.71	MSMT	0.31	-	SS304	16

796	PASS	YES	YES	-	20.71	MSMT	0.31	-	SS304	16
797	PASS	YES	YES	-	20.75	MSMT	0.31	-	SS304	16
798	PASS	YES	YES	-	20.75	MSMT	0.31	-	SS304	16
799	PASS	YES	YES	-	20.75	MSMT	0.31	-	SS304	16
800	PASS	YES	YES	-	20.75	MSMT	0.31	-	SS304	16
801	PASS	YES	YES	-	20.75	MSMT	0.31	-	SS304	16
802	PASS	YES	YES	-	20.75	QC	4.46	5640	-	-
803	PASS	YES	YES	-	20.75	BG	-	-	-	-
804	FAIL	YES	NO	accidental duplicate measurement of #20, measurement was stopped prematurely	20.79	MSMT	0.71	-	AIR	13
805	PASS	YES	YES	-	20.79	MSMT	0.31	-	AIR	13
806	PASS	YES	YES	-	21.33	QC	4.46	5640	-	-
807	PASS	YES	YES	-	21.33	BG	-	-	-	-
808	PASS	YES	YES	-	21.38	MSMT	1.94	-	AIR	13
809	PASS	YES	YES	-	21.42	MSMT	1.94	-	SS304	13
810	PASS	YES	YES	-	21.79	QC	4.46	5640	-	-
811	PASS	YES	YES	-	21.79	BG	-	-	-	-
812	PASS	YES	YES	-	21.79	MSMT	0.31	-	AIR	8
813	PASS	YES	YES	-	22.33	QC	4.46	5640	-	-
814	PASS	YES	YES	-	22.38	BG	-	-	-	-
815	PASS	YES	YES	-	22.38	MSMT	1.94	-	AIR	16
816	PASS	YES	YES	-	22.42	MSMT	1.94	-	SS304	8
817	FAIL	YES	NO	wrong QC enrichment - 0.31 instead of 4.46	22.58	QC	0.31	5640	-	-
818	PASS	YES	YES	-	22.58	BG	-	-	-	-
819	PASS	YES	YES	-	22.58	MSMT	2.95	-	SS304	8
820	PASS	YES	YES	-	22.71	MSMT	4.46	-	SS304	8
821	PASS	YES	YES	-	22.75	QC	4.46	5640	-	-
822	CAUTION	YES	YES	errors on sign, sign was not updated after previous measurement, spectra is clearly a background spectra consistent with the photos - measurement is good	22.75	BG	-	-	-	-
823	PASS	YES	YES	-	22.79	MSMT	0.71	-	SS304	13
824	PASS	YES	YES	-	23.63	QC	4.46	5640	-	-
825	PASS	YES	YES	-	23.63	BG	-	-	-	-
826	PASS	YES	YES	-	23.67	MSMT	2.95	-	SS304	13
827	FAIL	YES	NO	wrong QC enrichment - 0.31 instead of 4.46	23.83	QC	0.31	5640	-	-
828	PASS	YES	YES	-	23.83	BG	-	-	-	-
829	PASS	YES	YES	-	23.83	MSMT	4.46	-	SS304	16
830	PASS	YES	YES	-	24.42	QC	4.46	5640	-	-
831	PASS	YES	YES	-	24.46	BG	-	-	-	-
832	FAIL	NO	NO	measurement file missing - measurement is bad	24.46	MSMT	4.46	-	SS304	13
833	PASS	YES	YES	-	24.58	MSMT	2.95	-	-	-
834	PASS	YES	YES	-	24.63	MSMT	2.95	-	AIR	8
835	PASS	YES	YES	-	24.67	MSMT	2.95	-	AIR	13
836	PASS	YES	YES	-	24.71	MSMT	2.95	-	AIR	16
837	PASS	YES	YES	-	24.75	QC	4.46	5640	-	-
838	PASS	YES	YES	-	24.75	BG	-	-	-	-
839	PASS	YES	YES	-	24.75	LONG BG	-	-	-	-

840	PASS	YES	YES	-	25.38	QC	4.46	5640	-	-
841	PASS	YES	YES	-	25.38	BG	-	-	-	-
842	CAUTION	YES	YES	Experiment was taken down after #841 and rebuilt to collect #842-#849 after discovery of missing data file #832. Different but geometrically and physically identical sample sled is used.	71.50	QC	4.46	5640	-	-
843	CAUTION	YES	YES	Experiment was taken down after #841 and rebuilt to collect #842-#849 after discovery of missing data file #832. Different but geometrically and physically identical sample sled is used.	71.50	BG	-	-	-	-
844	CAUTION	YES	YES	Experiment was taken down after #841 and rebuilt to collect #842-#849 after discovery of missing data file #832. Different but geometrically and physically identical sample sled is used.	71.50	MSMT	4.46	-	SS304	13
845	CAUTION	YES	YES	Experiment was taken down after #841 and rebuilt to collect #842-#849 after discovery of missing data file #832. Different but geometrically and physically identical sample sled is used.	71.63	QC	4.46	5640	-	-
846	CAUTION	YES	YES	Experiment was taken down after #841 and rebuilt to collect #842-#849 after discovery of missing data file #832. Different but geometrically and physically identical sample sled is used.	71.63	BG	-	-	-	-
847	CAUTION	YES	YES	Experiment was taken down after #841 and rebuilt to collect #842-#849 after discovery of missing data file #832. Different but geometrically and physically identical sample sled is used.	71.63	LONG BG	-	-	-	-
848	CAUTION	YES	YES	Experiment was taken down after #841 and rebuilt to collect #842-#849 after discovery of missing data file #832. Different but geometrically and physically identical sample sled is used.	74.46	QC	4.46	5640	-	-
849	CAUTION	YES	YES	Experiment was taken down after #841 and rebuilt to collect #842-#849 after discovery of missing data file #832. Different but geometrically and physically identical sample sled is used.	74.50	BG	-	-	-	-

Table A.2. 186 keV data

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
1	0.71	-	-	-	12275.40	12470.55	185.66	140581	38875	101706	0.705
2	-	-	-	-	43146.18	43200.00	185.64	1973	1818	155	0.669
3	4.46	5640	-	-	3534.72	3706.02	185.72	223199	37926	185273	0.730
4	4.46	5640	-	-	286.19	300.00	185.72	17798	3128	14670	0.732
5	-	-	-	-	299.54	300.00	185.75	22	23	-1	0.489
6	4.46	5640	-	-	286.11	300.00	185.71	18345	3044	15301	0.731
7	0.31	-	SS304	16	232351.48	234041.58	185.72	453730	328517	125213	0.692
8	4.46	5640	-	-	286.14	300.00	185.72	17982	3176	14806	0.725
9	-	-	-	-	299.53	300.00	No Fit	11	11	0	NA
10	0.71	-	-	-	12164.56	12369.82	185.71	139612	38097	101515	0.703
11	4.46	5640	-	-	286.19	300.00	185.72	18064	3060	15004	0.717
12	-	-	-	-	299.48	300.00	No Fit	12	15	-3	NA
13	0.71	-	AIR	8	12026.00	12206.99	185.71	134204	34388	99816	0.701
14	4.46	5640	-	-	286.30	300.00	185.71	18120	3054	15066	0.736
15	-	-	-	-	299.47	300.00	No Fit	4	12	-8	NA
16	0.31	-	SS304	8	71484.94	72244.15	185.72	253788	152982	100806	0.711
17	4.46	5640	-	-	286.20	300.00	185.72	18101	3242	14859	0.732
18	-	-	-	-	299.42	300.00	No Fit	22	11	11	NA
19	-	-	-	-	299.51	300.00	No Fit	10	13	-3	NA
20	0.71	-	AIR	13	11982.01	12150.62	185.72	131301	31880	99421	0.700
21	4.46	5640	-	-	286.15	300.00	185.72	18172	2979	15193	0.739
22	-	-	-	-	299.44	300.00	No Fit	17	12	5	NA
23	0.71	-	SS304	8	31081.22	31411.51	185.72	165579	67448	98131	0.712
24	4.46	5640	-	-	286.25	300.00	185.72	17967	3021	14946	0.708
25	-	-	-	-	299.51	300.00	No Fit	20	17	3	NA
26	-	-	-	-	299.54	300.00	187.01	10	12	-2	0.382
27	20.11	-	-	-	428.97	442.84	185.72	102441	1818	100623	0.715
28	20.11	-	SS304	8	1120.29	1139.36	185.71	104326	4615	99711	0.700
29	20.11	-	SS304	13	2051.52	2077.32	185.71	106000	6485	99515	0.692
30	20.11	-	SS304	16	2971.62	3003.19	185.71	107275	8108	99167	0.693
31	20.11	-	AIR	8	430.12	442.98	185.72	102399	1752	100647	0.702

Table A.2. 186 keV data (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
32	20.11	-	AIR	13	430.06	442.24	185.72	102328	1729	100599	0.693
33	20.11	-	AIR	16	431.71	443.85	185.71	102364	1567	100797	0.702
34	4.46	5640	-	-	286.19	300.00	185.72	18114	3097	15017	0.731
35	-	-	-	-	299.48	300.00	No Fit	12	13	-1	NA
36	0.71	-	AIR	16	12018.79	12182.19	185.72	130919	30730	100189	0.718
37	20.11	-	-	-	290.66	300.00	185.72	69058	1259	67799	0.718
38	20.11	-	-	-	290.67	300.00	185.72	69132	1303	67829	0.715
39	20.11	-	-	-	290.67	300.00	185.72	69387	1286	68101	0.706
40	20.11	-	-	-	290.66	300.00	185.72	69536	1258	68278	0.719
41	20.11	-	-	-	290.63	300.00	185.72	69551	1283	68268	0.721
42	20.11	-	-	-	290.67	300.00	185.72	69266	1260	68006	0.694
43	20.11	-	-	-	290.67	300.00	185.72	69069	1252	67817	0.703
44	20.11	-	-	-	290.64	300.00	185.72	69522	1284	68238	0.719
45	20.11	-	-	-	290.74	300.00	185.72	68951	1279	67672	0.722
46	20.11	-	-	-	290.75	300.00	185.72	68857	1283	67574	0.704
47	20.11	-	-	-	290.64	300.00	185.72	69424	1271	68153	0.722
48	20.11	-	-	-	290.73	300.00	185.72	68936	1269	67667	0.721
49	4.46	5640	-	-	286.20	300.00	185.73	18431	3133	15298	0.737
50	-	-	-	-	299.47	300.00	No Fit	18	20	-2	NA
51	0.71	-	SS304	16	83816.88	84429.04	185.72	220661	120548	100113	0.699
52	4.46	5640	-	-	286.12	300.00	185.73	18011	3143	14868	0.725
53	-	-	-	-	299.56	300.00	No Fit	21	12	9	NA
54	-	-	-	-	299.52	300.00	No Fit	15	13	2	NA
55	0.71	-	SS304	8	31336.52	31669.76	185.73	167124	67793	99331	0.716
56	4.46	5640	-	-	286.07	300.00	185.73	18111	3107	15004	0.736
57	-	-	-	-	299.50	300.00	No Fit	22	9	13	NA
58	20.11	-	SS304	8	294.97	300.00	185.73	27346	1139	26207	0.719
59	20.11	-	SS304	8	294.92	300.00	185.73	27659	1207	26452	0.706
60	20.11	-	SS304	8	294.91	300.00	185.73	27561	1202	26359	0.715
61	20.11	-	SS304	8	294.99	300.00	185.73	27238	1187	26051	0.695
62	20.11	-	SS304	8	294.94	300.00	185.73	27246	1189	26057	0.709
63	20.11	-	SS304	8	294.93	300.00	185.73	27216	1190	26026	0.695
64	20.11	-	SS304	8	294.97	300.00	185.73	27482	1248	26234	0.720
65	20.11	-	SS304	8	294.90	300.00	185.73	27408	1199	26209	0.710
66	20.11	-	SS304	8	294.93	300.00	185.73	27411	1193	26218	0.715
67	20.11	-	SS304	8	294.95	300.00	185.73	27777	1220	26557	0.717
68	20.11	-	SS304	8	295.07	300.00	185.73	27173	1185	25988	0.720
69	20.11	-	SS304	8	294.96	300.00	185.73	27427	1197	26230	0.696
70	20.11	-	SS304	8	294.96	300.00	185.73	27442	1169	26273	0.704
71	20.11	-	SS304	8	294.95	300.00	185.73	27434	1228	26206	0.700
72	20.11	-	SS304	8	294.98	300.00	185.73	27389	1245	26144	0.703
73	20.11	-	SS304	8	295.01	300.00	185.73	27433	1174	26259	0.704
74	20.11	-	SS304	8	294.98	300.00	185.73	27430	1229	26201	0.715

Table A.2. 186 keV data (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
75	20.11	-	SS304	8	294.91	300.00	185.73	27424	1207	26217	0.714
76	20.11	-	SS304	8	295.02	300.00	185.73	27599	1188	26411	0.712
77	20.11	-	SS304	8	294.80	300.00	185.73	27377	1268	26109	0.715
78	20.11	-	SS304	13	296.29	300.00	185.73	15157	977	14180	0.704
79	20.11	-	SS304	13	296.22	300.00	185.73	15524	962	14562	0.717
80	20.11	-	SS304	13	296.27	300.00	185.73	15442	951	14491	0.707
81	20.11	-	SS304	13	296.27	300.00	185.73	15183	942	14241	0.689
82	20.11	-	SS304	13	296.27	300.00	185.73	15015	989	14026	0.701
83	20.11	-	SS304	13	296.36	300.00	185.73	15272	944	14328	0.712
84	20.11	-	SS304	13	296.22	300.00	185.72	15266	886	14380	0.718
85	20.11	-	SS304	13	296.23	300.00	185.72	15389	980	14409	0.706
86	20.11	-	SS304	13	296.28	300.00	185.73	15279	940	14339	0.689
87	20.11	-	SS304	13	296.25	300.00	185.73	15442	980	14462	0.714
88	20.11	-	SS304	13	296.25	300.00	185.73	15220	941	14279	0.717
89	20.11	-	SS304	13	296.29	300.00	185.72	15201	897	14304	0.698
90	20.11	-	SS304	13	296.34	300.00	185.73	15220	943	14277	0.717
91	20.11	-	SS304	13	296.29	300.00	185.72	15319	953	14366	0.701
92	20.11	-	SS304	13	296.27	300.00	185.73	15422	953	14469	0.717
93	20.11	-	SS304	13	296.19	300.00	185.73	14952	983	13969	0.715
94	20.11	-	SS304	13	296.27	300.00	185.73	15350	986	14364	0.710
95	20.11	-	SS304	13	296.30	300.00	185.72	15354	976	14378	0.682
96	20.11	-	SS304	13	296.24	300.00	185.73	15304	902	14402	0.712
97	20.11	-	SS304	13	296.24	300.00	185.73	15196	1002	14194	0.705
98	4.46	5640	-	-	286.17	300.00	185.73	18331	3090	15241	0.726
99	-	-	-	-	299.57	300.00	No Fit	13	11	2	NA
100	20.11	-	SS304	16	296.85	300.00	185.72	10574	763	9811	0.732
101	20.11	-	SS304	16	296.89	300.00	185.71	10808	807	10001	0.711
102	20.11	-	SS304	16	296.84	300.00	185.70	10756	808	9948	0.712
103	20.11	-	SS304	16	296.92	300.00	185.70	10690	815	9875	0.737
104	20.11	-	SS304	16	296.80	300.00	185.70	10711	806	9905	0.728
105	20.11	-	SS304	16	296.84	300.00	185.71	10594	836	9758	0.710
106	20.11	-	SS304	16	296.91	300.00	185.71	10717	796	9921	0.750
107	20.11	-	SS304	16	296.90	300.00	185.71	10848	751	10097	0.742
108	20.11	-	SS304	16	296.96	300.00	185.70	10816	766	10050	0.743
109	20.11	-	SS304	16	296.91	300.00	185.71	10621	803	9818	0.753
110	20.11	-	SS304	16	296.83	300.00	185.71	10721	827	9894	0.741
111	20.11	-	SS304	16	296.88	300.00	185.72	10747	772	9975	0.731
112	20.11	-	SS304	16	296.83	300.00	185.72	10879	826	10053	0.732
113	20.11	-	SS304	16	296.98	300.00	185.72	10841	791	10050	0.746
114	20.11	-	SS304	16	296.96	300.00	185.71	10586	772	9814	0.741
115	20.11	-	SS304	16	296.94	300.00	185.71	10726	755	9971	0.731
116	20.11	-	SS304	16	296.87	300.00	185.72	10843	793	10050	0.736
117	20.11	-	SS304	16	296.80	300.00	185.72	10693	764	9929	0.699

Table A.2. 186 keV data (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
118	20.11	-	SS304	16	296.86	300.00	185.71	10611	804	9807	0.733
119	20.11	-	SS304	16	296.93	300.00	185.72	10922	793	10129	0.727
120	20.11	-	-	-	290.74	300.00	185.72	69104	1289	67815	0.734
121	20.11	-	-	-	290.75	300.00	185.72	68794	1287	67507	0.733
122	20.11	-	-	-	290.75	300.00	185.72	69353	1252	68101	0.735
123	20.11	-	-	-	290.84	300.00	185.72	69425	1289	68136	0.727
124	20.11	-	-	-	290.70	300.00	185.72	69066	1329	67737	0.728
125	20.11	-	-	-	290.66	300.00	185.73	68943	1298	67645	0.726
126	20.11	-	-	-	290.82	300.00	185.73	69074	1278	67796	0.731
127	20.11	-	-	-	290.76	300.00	185.73	69253	1260	67993	0.729
128	20.11	-	-	-	290.73	300.00	185.72	69420	1207	68213	0.732
129	20.11	-	-	-	290.73	300.00	185.73	69567	1245	68322	0.705
130	20.11	-	-	-	290.71	300.00	185.73	69254	1302	67952	0.723
131	20.11	-	-	-	290.85	300.00	185.73	69152	1325	67827	0.727
132	20.11	-	-	-	290.65	300.00	185.73	69754	1239	68515	0.725
133	20.11	-	-	-	290.74	300.00	185.73	69356	1286	68070	0.733
134	20.11	-	-	-	290.72	300.00	185.73	69330	1290	68040	0.726
135	20.11	-	-	-	290.66	300.00	185.73	69365	1338	68027	0.720
136	20.11	-	-	-	290.70	300.00	185.73	68914	1243	67671	0.722
137	20.11	-	-	-	290.69	300.00	185.73	69326	1317	68009	0.733
138	20.11	-	-	-	290.65	300.00	185.73	69135	1319	67816	0.723
139	20.11	-	-	-	290.70	300.00	185.73	69237	1250	67987	0.720
140	4.46	5640	-	-	286.21	300.00	185.73	17907	3084	14823	0.727
141	-	-	-	-	299.55	300.00	No Fit	13	8	5	NA
142	0.31	-	SS304	13	130541.20	131622.91	185.72	317564	216141	101423	0.720
143	4.46	5640	-	-	286.06	300.00	185.73	17867	3178	14689	0.728
144	-	-	-	-	299.48	300.00	No Fit	16	18	-2	NA
145	4.46	-	-	-	1938.63	1976.31	185.73	107111	6520	100591	0.724
146	-	-	-	-	299.51	300.00	No Fit	15	10	5	NA
147	-	-	-	-	299.50	300.00	No Fit	18	10	8	NA
148	-	-	-	-	299.62	300.00	No Fit	9	10	-1	NA
149	93.17	-	-	-	94.50	101.03	185.73	102152	616	101536	0.723
150	93.17	-	SS304	8	243.89	250.69	185.73	102196	2310	99886	0.717
151	93.17	-	SS304	13	446.47	454.53	185.73	102791	3270	99521	0.719
152	93.17	-	SS304	16	645.80	654.95	185.73	103520	3928	99592	0.715
153	93.17	-	AIR	16	94.58	100.92	185.73	102371	537	101834	0.721
154	93.17	-	AIR	13	94.89	101.27	185.73	101872	562	101310	0.719
155	93.17	-	AIR	8	93.76	100.19	185.73	101822	570	101252	0.722
156	52.49	-	-	-	166.57	173.98	185.73	102058	834	101224	0.723
157	52.49	-	SS304	8	430.18	438.54	185.73	102423	2640	99783	0.717
158	52.49	-	SS304	13	789.78	800.14	185.72	103161	3739	99422	0.711
159	52.49	-	SS304	16	1138.85	1151.11	185.72	103867	4438	99429	0.719
160	52.49	-	AIR	16	166.67	173.71	185.72	101495	721	100774	0.721

Table A.2. 186 keV data (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
161	52.49	-	AIR	13	165.64	172.80	185.73	101671	814	100857	0.721
162	52.49	-	AIR	8	166.06	173.30	185.73	101582	764	100818	0.731
163	4.46	5640	-	-	286.24	300.00	185.72	17998	3093	14905	0.739
164	-	-	-	-	299.41	300.00	185.70	21	10	11	0.090
165	-	-	-	-	299.56	300.00	185.59	19	8	11	0.660
166	4.46	-	-	-	1953.21	1991.04	185.73	107514	6546	100968	0.719
167	4.46	-	AIR	8	1943.66	1977.85	185.73	106616	5993	100623	0.720
168	4.46	-	AIR	13	1937.01	1969.33	185.73	106057	5543	100514	0.722
169	4.46	-	AIR	16	1932.43	1963.22	185.73	105686	5564	100122	0.722
170	4.46	5640	-	-	286.06	300.00	185.73	17791	3034	14757	0.738
171	-	-	-	-	299.50	300.00	183.62	13	7	6	0.607
172	-	-	-	-	43130.71	43200.00	185.80	2267	1881	386	1.060
173	4.46	5640	-	-	286.11	300.00	185.73	18111	3216	14895	0.736
174	-	-	-	-	299.52	300.00	No Fit	11	13	-2	NA
175	93.17	-	-	-	280.70	300.00	185.73	302338	1782	300556	0.719
176	93.17	-	-	-	280.65	300.00	185.73	303726	1773	301953	0.720
177	93.17	-	-	-	280.67	300.00	185.73	303269	1830	301439	0.720
178	93.17	-	-	-	280.63	300.00	185.73	303893	1755	302138	0.721
179	93.17	-	-	-	280.70	300.00	185.73	302685	1705	300980	0.720
180	93.17	-	-	-	280.68	300.00	185.73	303461	1751	301710	0.721
181	93.17	-	-	-	280.67	300.00	185.73	301650	1786	299864	0.721
182	93.17	-	-	-	280.61	300.00	185.73	303992	1774	302218	0.720
183	93.17	-	-	-	280.73	300.00	185.73	302087	1800	300287	0.724
184	93.17	-	-	-	280.68	300.00	185.73	302610	1764	300846	0.720
185	93.17	-	-	-	280.70	300.00	185.73	302996	1810	301186	0.720
186	93.17	-	-	-	280.79	300.00	185.73	302990	1704	301286	0.721
187	93.17	-	-	-	280.65	300.00	185.73	303123	1775	301348	0.722
188	93.17	-	-	-	280.75	300.00	185.73	302502	1729	300773	0.721
189	93.17	-	-	-	280.68	300.00	185.73	303194	1763	301431	0.720
190	93.17	-	-	-	280.69	300.00	185.73	303184	1751	301433	0.720
191	93.17	-	-	-	280.71	300.00	185.73	302404	1782	300622	0.720
192	93.17	-	-	-	280.70	300.00	185.73	302647	1802	300845	0.720
193	93.17	-	-	-	280.73	300.00	185.73	303151	1707	301444	0.720
194	93.17	-	-	-	280.72	300.00	185.73	303098	1779	301319	0.720
195	93.17	-	SS304	8	291.94	300.00	185.73	122160	2746	119414	0.719
196	93.17	-	SS304	8	292.01	300.00	185.73	121601	2716	118885	0.712
197	93.17	-	SS304	8	291.96	300.00	185.73	122287	2709	119578	0.713
198	93.17	-	SS304	8	291.89	300.00	185.73	122212	2692	119520	0.718
199	93.17	-	SS304	8	292.01	300.00	185.73	122148	2716	119432	0.714
200	93.17	-	SS304	8	291.93	300.00	185.73	121970	2583	119387	0.718
201	93.17	-	SS304	8	291.87	300.00	185.73	121741	2682	119059	0.715
202	93.17	-	SS304	8	291.91	300.00	185.73	121952	2596	119356	0.718
203	93.17	-	SS304	8	291.90	300.00	185.73	121845	2613	119232	0.720

Table A.2. 186 keV data (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
204	93.17	-	SS304	8	291.84	300.00	185.73	121828	2699	119129	0.715
205	93.17	-	SS304	8	291.97	300.00	185.73	121829	2724	119105	0.717
206	93.17	-	SS304	8	291.91	300.00	185.73	121983	2672	119311	0.719
207	93.17	-	SS304	8	291.90	300.00	185.73	121774	2683	119091	0.719
208	93.17	-	SS304	8	291.96	300.00	185.73	121774	2757	119017	0.719
209	93.17	-	SS304	8	291.91	300.00	185.73	121496	2687	118809	0.719
210	93.17	-	SS304	8	291.86	300.00	185.73	122246	2719	119527	0.718
211	93.17	-	SS304	8	291.83	300.00	185.73	121960	2652	119308	0.718
212	93.17	-	SS304	8	291.93	300.00	185.73	122147	2753	119394	0.717
213	93.17	-	SS304	8	291.91	300.00	185.73	121494	2669	118825	0.717
214	93.17	-	SS304	8	291.98	300.00	185.73	121471	2679	118792	0.717
215	4.46	5640	-	-	286.09	300.00	185.73	18079	3162	14917	0.736
216	-	-	-	-	299.54	300.00	No Fit	19	13	6	NA
217	93.17	-	SS304	13	294.66	300.00	185.72	67720	2262	65458	0.716
218	93.17	-	SS304	13	294.62	300.00	185.72	68207	2141	66066	0.713
219	93.17	-	SS304	13	294.54	300.00	185.72	67499	2071	65428	0.715
220	93.17	-	SS304	13	294.75	300.00	185.72	67397	2124	65273	0.715
221	93.17	-	SS304	13	294.76	300.00	185.72	67683	2199	65484	0.704
222	93.17	-	SS304	13	294.73	300.00	185.72	67368	2130	65238	0.713
223	93.17	-	SS304	13	294.76	300.00	185.73	68031	2164	65867	0.717
224	93.17	-	SS304	13	294.73	300.00	185.73	67205	2205	65000	0.717
225	93.17	-	SS304	13	294.77	300.00	185.72	67567	2193	65374	0.718
226	93.17	-	SS304	13	294.73	300.00	185.72	67254	2193	65061	0.720
227	93.17	-	SS304	13	294.64	300.00	185.72	67440	2158	65282	0.714
228	93.17	-	SS304	13	294.75	300.00	185.73	67617	2141	65476	0.717
229	93.17	-	SS304	13	294.76	300.00	185.72	67444	2208	65236	0.721
230	93.17	-	SS304	13	294.67	300.00	185.72	67782	2130	65652	0.716
231	93.17	-	SS304	13	294.71	300.00	185.73	67305	2159	65146	0.694
232	93.17	-	SS304	13	294.70	300.00	185.72	67671	2166	65505	0.707
233	93.17	-	SS304	13	294.76	300.00	185.73	67262	2150	65112	0.719
234	93.17	-	SS304	13	294.78	300.00	185.72	67827	2079	65748	0.717
235	93.17	-	SS304	13	294.63	300.00	185.72	67648	2176	65472	0.719
236	93.17	-	SS304	13	294.79	300.00	185.72	68034	2137	65897	0.718
237	93.17	-	SS304	16	295.84	300.00	185.72	47328	1799	45529	0.715
238	93.17	-	SS304	16	295.86	300.00	185.73	46939	1782	45157	0.714
239	93.17	-	SS304	16	295.73	300.00	185.72	47148	1817	45331	0.718
240	93.17	-	SS304	16	295.78	300.00	185.72	47493	1826	45667	0.716
241	93.17	-	SS304	16	295.79	300.00	185.73	47338	1790	45548	0.718
242	93.17	-	SS304	16	295.81	300.00	185.72	47245	1779	45466	0.716
243	93.17	-	SS304	16	295.84	300.00	185.73	47250	1862	45388	0.712
244	93.17	-	SS304	16	295.79	300.00	185.72	47419	1842	45577	0.711
245	93.17	-	SS304	16	295.77	300.00	185.72	47626	1816	45810	0.710
246	93.17	-	SS304	16	295.79	300.00	185.73	47578	1785	45793	0.707

Table A.2. 186 keV data (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
247	93.17	-	SS304	16	295.83	300.00	185.72	47201	1834	45367	0.710
248	93.17	-	SS304	16	295.76	300.00	185.72	47462	1816	45646	0.710
249	93.17	-	SS304	16	295.81	300.00	185.72	47300	1813	45487	0.714
250	93.17	-	SS304	16	295.70	300.00	185.72	47326	1893	45433	0.714
251	93.17	-	SS304	16	295.85	300.00	185.72	47580	1771	45809	0.720
252	93.17	-	SS304	16	295.82	300.00	185.72	47271	1757	45514	0.716
253	93.17	-	SS304	16	295.79	300.00	185.73	47372	1878	45494	0.715
254	93.17	-	SS304	16	295.89	300.00	185.73	47129	1795	45334	0.715
255	93.17	-	SS304	16	295.72	300.00	185.73	47331	1789	45542	0.715
256	93.17	-	SS304	16	295.75	300.00	185.72	47034	1805	45229	0.714
257	4.46	5640	-	-	286.09	300.00	185.73	18091	3077	15014	0.736
258	-	-	-	-	299.50	300.00	No Fit	23	12	11	NA
259	1.94	-	SS304	16	30948.88	31156.54	185.67	146071	46366	99705	0.716
260	4.46	5640	-	-	286.28	300.00	185.73	17878	3206	14672	0.741
261	-	-	-	-	299.50	300.00	185.23	20	15	5	2.690
262	52.49	-	-	-	287.23	300.00	185.73	176452	1347	175105	0.719
263	52.49	-	-	-	287.28	300.00	185.73	176114	1380	174734	0.721
264	52.49	-	-	-	287.28	300.00	185.73	175814	1420	174394	0.723
265	52.49	-	-	-	287.28	300.01	185.73	176679	1388	175291	0.720
266	52.49	-	-	-	287.23	300.00	185.73	175661	1411	174250	0.720
267	52.49	-	-	-	287.18	300.00	185.73	176159	1378	174781	0.722
268	52.49	-	-	-	287.19	300.00	185.73	175163	1375	173788	0.721
269	52.49	-	-	-	287.25	300.00	185.73	175598	1368	174230	0.721
270	52.49	-	-	-	287.18	300.00	185.73	175499	1390	174109	0.723
271	52.49	-	-	-	287.20	300.00	185.73	175553	1320	174233	0.723
272	52.49	-	-	-	287.21	300.00	185.73	175947	1355	174592	0.719
273	52.49	-	-	-	287.23	300.00	185.73	176153	1354	174799	0.721
274	52.49	-	-	-	287.21	300.00	185.73	174914	1423	173491	0.722
275	52.49	-	-	-	287.22	300.00	185.73	175819	1323	174496	0.725
276	52.49	-	-	-	287.29	300.00	185.73	174796	1445	173351	0.721
277	52.49	-	-	-	287.21	300.00	185.73	175832	1397	174435	0.723
278	52.49	-	-	-	287.21	300.00	185.73	175827	1315	174512	0.724
279	52.49	-	-	-	287.22	300.00	185.73	176710	1358	175352	0.723
280	52.49	-	-	-	287.27	300.00	185.73	174810	1374	173436	0.721
281	52.49	-	-	-	287.22	300.00	185.73	176550	1378	175172	0.719
282	52.49	-	SS304	8	294.29	300.00	185.73	69930	1771	68159	0.723
283	52.49	-	SS304	8	294.34	300.00	185.73	69480	1774	67706	0.726
284	52.49	-	SS304	8	294.26	300.00	185.73	69800	1874	67926	0.726
285	52.49	-	SS304	8	294.34	300.00	185.72	69929	1769	68160	0.732
286	52.49	-	SS304	8	294.26	300.00	185.73	70242	1763	68479	0.721
287	52.49	-	SS304	8	294.24	300.00	185.73	69700	1812	67888	0.724
288	52.49	-	SS304	8	294.33	300.00	185.72	69593	1811	67782	0.719
289	52.49	-	SS304	8	294.32	300.00	185.73	69906	1856	68050	0.723

Table A.2. 186 keV data (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
290	52.49	-	SS304	8	294.34	300.00	185.72	70138	1765	68373	0.725
291	52.49	-	SS304	8	294.26	300.00	185.73	69623	1720	67903	0.701
292	52.49	-	SS304	8	294.14	300.00	185.73	69690	1718	67972	0.723
293	52.49	-	SS304	8	294.28	300.00	185.72	69987	1785	68202	0.722
294	52.49	-	SS304	8	294.22	300.00	185.73	69677	1808	67869	0.723
295	52.49	-	SS304	8	294.24	300.00	185.73	69763	1809	67954	0.723
296	52.49	-	SS304	8	294.34	300.00	185.73	70194	1794	68400	0.723
297	52.49	-	SS304	8	294.30	300.00	185.73	69652	1739	67913	0.721
298	52.49	-	SS304	8	294.22	300.00	185.73	69635	1759	67876	0.723
299	52.49	-	SS304	8	294.25	300.00	185.73	69464	1852	67612	0.722
300	52.49	-	SS304	8	294.34	300.00	185.72	69775	1820	67955	0.722
301	52.49	-	SS304	8	294.26	300.00	185.73	69980	1762	68218	0.725
302	4.46	5640	-	-	286.17	300.00	185.73	17993	3025	14968	0.734
303	-	-	-	-	299.60	300.00	184.37	8	14	-6	0.273
304	52.49	-	SS304	13	296.11	300.00	185.73	38751	1452	37299	0.717
305	52.49	-	SS304	13	296.14	300.00	185.73	38373	1387	36986	0.693
306	52.49	-	SS304	13	296.07	300.00	185.73	38781	1452	37329	0.696
307	52.49	-	SS304	13	296.07	300.00	185.72	38624	1419	37205	0.692
308	52.49	-	SS304	13	296.15	300.00	185.72	38493	1438	37055	0.711
309	52.49	-	SS304	13	296.11	300.00	185.72	38406	1466	36940	0.720
310	52.49	-	SS304	13	296.10	300.00	185.72	38861	1354	37507	0.710
311	52.49	-	SS304	13	296.11	300.00	185.73	39160	1454	37706	0.716
312	52.49	-	SS304	13	296.07	300.00	185.73	38618	1396	37222	0.713
313	52.49	-	SS304	13	296.10	300.00	185.72	38808	1384	37424	0.720
314	52.49	-	SS304	13	296.01	300.00	185.72	38338	1443	36895	0.700
315	52.49	-	SS304	13	296.07	300.00	185.73	38650	1449	37201	0.706
316	52.49	-	SS304	13	296.16	300.00	185.72	38778	1437	37341	0.691
317	52.49	-	SS304	13	296.04	300.00	185.72	38774	1405	37369	0.702
318	52.49	-	SS304	13	296.10	300.00	185.73	38551	1405	37146	0.718
319	52.49	-	SS304	13	296.06	300.00	185.73	38444	1434	37010	0.716
320	52.49	-	SS304	13	296.09	300.00	185.73	38689	1439	37250	0.714
321	52.49	-	SS304	13	296.06	300.00	185.72	38679	1427	37252	0.694
322	52.49	-	SS304	13	295.99	300.00	185.73	38815	1395	37420	0.714
323	52.49	-	SS304	13	296.06	300.00	185.73	39040	1399	37641	0.716
324	52.49	-	SS304	16	296.86	300.00	185.73	26931	1214	25717	0.702
325	52.49	-	SS304	16	296.85	300.00	185.73	26695	1194	25501	0.704
326	52.49	-	SS304	16	296.84	300.00	185.73	26842	1198	25644	0.714
327	52.49	-	SS304	16	296.84	300.00	185.72	26850	1208	25642	0.720
328	52.49	-	SS304	16	296.76	300.00	185.73	27195	1182	26013	0.725
329	52.49	-	SS304	16	296.89	300.00	185.73	26686	1181	25505	0.712
330	52.49	-	SS304	16	296.89	300.00	185.72	27016	1185	25831	0.719
331	52.49	-	SS304	16	296.82	300.00	185.73	26950	1175	25775	0.716
332	52.49	-	SS304	16	296.87	300.00	185.72	27063	1246	25817	0.715

Table A.2. 186 keV data (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
333	52.49	-	SS304	16	296.80	300.00	185.72	27321	1172	26149	0.718
334	52.49	-	SS304	16	296.74	300.00	185.73	27228	1256	25972	0.718
335	52.49	-	SS304	16	296.80	300.00	185.72	26941	1201	25740	0.717
336	52.49	-	SS304	16	296.88	300.00	185.72	27068	1151	25917	0.715
337	52.49	-	SS304	16	296.82	300.00	185.73	27215	1181	26034	0.718
338	52.49	-	SS304	16	296.84	300.00	185.72	26920	1162	25758	0.722
339	52.49	-	SS304	16	296.86	300.00	185.73	27354	1199	26155	0.713
340	52.49	-	SS304	16	296.76	300.00	185.73	27008	1254	25754	0.719
341	52.49	-	SS304	16	296.85	300.00	185.72	26997	1250	25747	0.723
342	52.49	-	SS304	16	296.83	300.00	185.72	26924	1161	25763	0.718
343	52.49	-	SS304	16	296.81	300.00	185.73	26854	1191	25663	0.713
344	4.46	5640	-	-	286.15	300.00	185.73	18072	3177	14895	0.749
345	-	-	-	-	299.44	300.00	No Fit	25	11	14	NA
346	1.94	-	SS304	16	30374.60	30594.55	185.72	143848	45560	98288	0.734
347	4.46	5640	-	-	286.35	300.00	185.73	18027	3018	15009	0.742
348	-	-	-	-	299.61	300.00	No Fit	13	13	0	NA
349	4.46	-	-	-	294.34	300.00	185.72	16319	1013	15306	0.747
350	4.46	-	-	-	294.42	300.00	185.73	16142	988	15154	0.722
351	4.46	-	-	-	294.30	300.00	185.73	16092	1016	15076	0.728
352	4.46	-	-	-	294.33	300.00	185.73	16119	966	15153	0.728
353	4.46	-	-	-	294.31	300.00	185.73	16362	1021	15341	0.737
354	4.46	-	-	-	294.35	300.00	185.73	16205	956	15249	0.742
355	-	-	-	-	-	-	-	-	-	-	-
356	-	-	-	-	-	-	-	-	-	-	-
357	-	-	-	-	-	-	-	-	-	-	-
358	-	-	-	-	-	-	-	-	-	-	-
359	-	-	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-	-	-
361	-	-	-	-	-	-	-	-	-	-	-
362	-	-	-	-	-	-	-	-	-	-	-
363	-	-	-	-	-	-	-	-	-	-	-
364	-	-	-	-	-	-	-	-	-	-	-
365	-	-	-	-	-	-	-	-	-	-	-
366	-	-	-	-	-	-	-	-	-	-	-
367	-	-	-	-	-	-	-	-	-	-	-
368	-	-	-	-	-	-	-	-	-	-	-
369	-	-	-	-	299.59	300.00	No Fit	17	14	3	NA
370	4.46	-	-	-	294.22	300.00	185.73	16302	986	15316	0.736
371	4.46	-	-	-	294.28	300.00	185.72	16155	1004	15151	0.726
372	4.46	-	-	-	294.27	300.00	185.73	16095	962	15133	0.706
373	4.46	-	-	-	294.26	300.00	185.73	16434	1007	15427	0.728
374	4.46	-	-	-	294.26	300.00	185.73	15961	998	14963	0.720
375	4.46	-	-	-	294.31	300.00	185.73	16327	929	15398	0.719

Table A.2. 186 keV data (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
376	4.46	-	-	-	294.19	300.00	185.73	16183	978	15205	0.719
377	4.46	-	-	-	294.20	300.00	185.73	16518	999	15519	0.725
378	4.46	-	-	-	294.27	300.00	185.73	16508	951	15557	0.727
379	4.46	-	-	-	294.24	300.00	185.73	16265	962	15303	0.722
380	4.46	-	-	-	294.29	300.00	185.73	16311	965	15346	0.715
381	4.46	-	-	-	294.30	300.00	185.73	16196	1005	15191	0.719
382	4.46	-	-	-	294.30	300.00	185.73	16060	983	15077	0.722
383	4.46	-	-	-	294.24	300.00	185.73	16098	988	15110	0.734
384	4.46	-	-	-	294.30	300.00	185.73	16228	1050	15178	0.709
385	4.46	-	-	-	294.35	300.00	185.73	16352	1024	15328	0.722
386	4.46	-	-	-	294.29	300.00	185.73	16066	966	15100	0.723
387	4.46	-	-	-	294.30	300.00	185.73	16436	969	15467	0.721
388	4.46	-	-	-	294.37	300.00	185.73	16388	939	15449	0.716
389	4.46	-	-	-	294.22	300.00	185.73	16451	981	15470	0.718
390	4.46	-	SS304	8	296.51	300.00	185.73	6606	756	5850	0.685
391	4.46	-	SS304	8	296.57	300.00	185.74	6522	744	5778	0.723
392	4.46	-	SS304	8	296.53	300.00	185.74	6502	733	5769	0.679
393	4.46	-	SS304	8	296.59	300.00	185.73	6576	819	5757	0.726
394	4.46	-	SS304	8	296.55	300.00	185.73	6549	753	5796	0.700
395	4.46	-	SS304	8	296.61	300.00	185.74	6704	721	5983	0.720
396	4.46	-	SS304	8	296.59	300.00	185.73	6504	742	5762	0.704
397	4.46	-	SS304	8	296.53	300.00	185.73	6615	735	5880	0.717
398	4.46	-	SS304	8	296.44	300.00	185.73	6624	773	5851	0.692
399	4.46	-	SS304	8	296.56	300.00	185.74	6477	774	5703	0.726
400	4.46	-	SS304	8	296.51	300.00	185.73	6650	780	5870	0.717
401	4.46	-	SS304	8	296.62	300.00	185.73	6606	776	5830	0.703
402	4.46	-	SS304	8	296.62	300.00	185.73	6686	751	5935	0.707
403	4.46	-	SS304	8	296.67	300.00	185.74	6607	700	5907	0.709
404	4.46	-	SS304	8	296.62	300.00	185.73	6601	801	5800	0.722
405	4.46	-	SS304	8	296.62	300.00	185.73	6664	691	5973	0.703
406	4.46	-	SS304	8	296.53	300.00	185.74	6589	673	5916	0.715
407	4.46	-	SS304	8	296.54	300.00	185.73	6661	712	5949	0.722
408	4.46	-	SS304	8	296.58	300.00	185.74	6723	724	5999	0.694
409	4.46	-	SS304	8	296.52	300.00	185.74	6683	767	5916	0.734
410	4.46	5640	-	-	286.14	300.00	185.74	17864	3064	14800	0.736
411	-	-	-	-	299.66	300.00	No Fit	9	14	-5	NA
412	4.46	-	SS304	13	297.40	300.00	185.73	3651	565	3086	0.676
413	4.46	-	SS304	13	297.30	300.00	185.74	3880	590	3290	0.705
414	4.46	-	SS304	13	297.31	300.00	185.74	3825	576	3249	0.720
415	4.46	-	SS304	13	297.37	300.00	185.74	3602	602	3000	0.717
416	4.46	-	SS304	13	297.35	300.00	185.73	3819	590	3229	0.712
417	4.46	-	SS304	13	297.32	300.00	185.73	3752	612	3140	0.694
418	4.46	-	SS304	13	297.32	300.00	185.73	3853	621	3232	0.733

Table A.2. 186 keV data (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
419	4.46	-	SS304	13	297.37	300.00	185.74	3774	575	3199	0.738
420	4.46	-	SS304	13	297.36	300.00	185.72	3864	569	3295	0.685
421	4.46	-	SS304	13	297.38	300.00	185.74	3881	594	3287	0.724
422	4.46	-	SS304	13	297.37	300.00	185.73	3750	574	3176	0.712
423	4.46	-	SS304	13	297.38	300.00	185.73	3809	601	3208	0.742
424	4.46	-	SS304	13	297.37	300.00	185.72	3873	548	3325	0.707
425	4.46	-	SS304	13	297.40	300.00	185.73	3803	576	3227	0.736
426	4.46	-	SS304	13	297.40	300.00	185.74	3859	624	3235	0.746
427	4.46	-	SS304	13	297.27	300.00	185.74	3702	602	3100	0.696
428	4.46	-	SS304	13	297.39	300.00	185.73	3770	566	3204	0.727
429	4.46	-	SS304	13	297.35	300.00	185.74	3764	578	3186	0.716
430	4.46	-	SS304	13	297.31	300.00	185.73	3819	602	3217	0.717
431	4.46	-	SS304	13	297.39	300.00	185.73	3797	590	3207	0.733
432	4.46	-	SS304	16	297.74	300.00	185.71	2831	479	2352	0.689
433	4.46	-	SS304	16	297.73	300.00	185.73	2723	496	2227	0.687
434	4.46	-	SS304	16	297.65	300.00	185.72	2750	486	2264	0.710
435	4.46	-	SS304	16	297.69	300.00	185.73	2714	504	2210	0.708
436	4.46	-	SS304	16	297.73	300.00	185.71	2665	517	2148	0.732
437	4.46	-	SS304	16	297.77	300.00	185.71	2690	525	2165	0.705
438	4.46	-	SS304	16	297.81	300.00	185.72	2645	481	2164	0.736
439	4.46	-	SS304	16	297.72	300.00	185.73	2759	499	2260	0.700
440	4.46	-	SS304	16	297.76	300.00	185.72	2769	500	2269	0.725
441	4.46	-	SS304	16	297.80	300.00	185.74	2736	467	2269	0.701
442	4.46	-	SS304	16	297.68	300.00	185.73	2661	460	2201	0.708
443	4.46	-	SS304	16	297.71	300.00	185.74	2718	507	2211	0.719
444	4.46	-	SS304	16	297.71	300.00	185.74	2705	484	2221	0.730
445	4.46	-	SS304	16	297.73	300.00	185.75	2755	505	2250	0.700
446	4.46	-	SS304	16	297.73	300.00	185.72	2662	469	2193	0.731
447	4.46	-	SS304	16	297.69	300.00	185.72	2670	489	2181	0.729
448	4.46	-	SS304	16	297.75	300.00	185.73	2666	473	2193	0.684
449	4.46	-	SS304	16	297.76	300.00	185.73	2680	481	2199	0.737
450	4.46	-	SS304	16	297.70	300.00	185.73	2704	529	2175	0.706
451	4.46	-	SS304	16	297.78	300.00	185.72	2637	474	2163	0.717
452	4.46	5640	-	-	286.01	300.00	185.73	18119	3041	15078	0.744
453	-	-	-	-	299.54	300.00	No Fit	16	6	10	NA
454	2.95	-	SS304	16	20110.59	20258.78	185.73	129968	30898	99070	0.713
455	4.46	5640	-	-	286.31	300.00	185.74	17973	3079	14894	0.741
456	-	-	-	-	299.49	300.00	No Fit	10	8	2	NA
457	2.95	-	-	-	294.67	300.00	185.74	11281	937	10344	0.717
458	2.95	-	-	-	294.69	300.00	185.74	11037	955	10082	0.736
459	2.95	-	-	-	294.69	300.00	185.74	11069	925	10144	0.735
460	2.95	-	-	-	294.61	300.00	185.73	11022	992	10030	0.716
461	2.95	-	-	-	294.73	300.00	185.74	11113	994	10119	0.720

Table A.2. 186 keV data (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
462	2.95	-	-	-	294.71	300.00	185.74	11165	875	10290	0.722
463	2.95	-	-	-	294.59	300.00	185.73	11005	942	10063	0.730
464	2.95	-	-	-	294.75	300.00	185.73	10830	994	9836	0.734
465	2.95	-	-	-	294.58	300.00	185.73	11118	947	10171	0.723
466	2.95	-	-	-	294.68	300.00	185.74	11024	959	10065	0.723
467	2.95	-	-	-	294.70	300.00	185.74	11006	948	10058	0.726
468	2.95	-	-	-	294.72	300.00	185.74	11117	906	10211	0.711
469	2.95	-	-	-	294.79	300.00	185.74	11059	937	10122	0.726
470	2.95	-	-	-	294.72	300.00	185.74	10936	952	9984	0.734
471	2.95	-	-	-	294.68	300.00	185.74	10907	970	9937	0.729
472	2.95	-	-	-	294.64	300.00	185.74	11114	928	10186	0.703
473	2.95	-	-	-	294.79	300.00	185.74	10987	995	9992	0.722
474	2.95	-	-	-	294.70	300.00	185.74	11037	922	10115	0.733
475	2.95	-	-	-	294.65	300.00	185.74	11011	976	10035	0.732
476	2.95	-	-	-	294.72	300.00	185.73	10975	960	10015	0.705
477	2.95	-	SS304	8	296.77	300.00	185.74	4624	695	3929	0.734
478	2.95	-	SS304	8	296.66	300.00	185.74	4573	703	3870	0.726
479	2.95	-	SS304	8	296.74	300.00	185.73	4584	652	3932	0.725
480	2.95	-	SS304	8	296.76	300.00	185.75	4556	767	3789	0.698
481	2.95	-	SS304	8	296.78	300.00	185.73	4605	697	3908	0.732
482	2.95	-	SS304	8	296.73	300.00	185.74	4655	702	3953	0.701
483	2.95	-	SS304	8	296.76	300.00	185.74	4581	683	3898	0.699
484	2.95	-	SS304	8	296.78	300.00	185.74	4588	678	3910	0.748
485	2.95	-	SS304	8	296.76	300.00	185.74	4587	705	3882	0.695
486	2.95	-	SS304	8	296.73	300.00	185.75	4600	736	3864	0.725
487	2.95	-	SS304	8	296.73	300.00	185.73	4560	703	3857	0.723
488	2.95	-	SS304	8	296.85	300.00	185.75	4584	689	3895	0.715
489	2.95	-	SS304	8	296.79	300.00	185.74	4711	707	4004	0.727
490	2.95	-	SS304	8	296.76	300.00	185.74	4473	696	3777	0.725
491	2.95	-	SS304	8	296.75	300.00	185.74	4579	715	3864	0.704
492	2.95	-	SS304	8	296.76	300.00	185.74	4514	661	3853	0.714
493	2.95	-	SS304	8	296.67	300.00	185.74	4644	714	3930	0.693
494	2.95	-	SS304	8	296.72	300.00	185.75	4607	665	3942	0.701
495	2.95	-	SS304	8	296.74	300.00	185.74	4649	658	3991	0.694
496	2.95	-	SS304	8	296.78	300.00	185.74	4535	688	3847	0.718
497	4.46	5640	-	-	286.10	300.00	185.74	18148	2997	15151	0.739
498	-	-	-	-	299.58	300.00	No Fit	10	11	-1	NA
499	2.95	-	SS304	13	297.42	300.00	185.74	2685	560	2125	0.672
500	2.95	-	SS304	13	297.45	300.00	185.73	2644	499	2145	0.701
501	2.95	-	SS304	13	297.44	300.00	185.72	2691	554	2137	0.702
502	2.95	-	SS304	13	297.44	300.00	185.74	2702	530	2172	0.669
503	2.95	-	SS304	13	297.50	300.00	185.75	2621	532	2089	0.686
504	2.95	-	SS304	13	297.45	300.00	185.74	2667	562	2105	0.701

Table A.2. 186 keV data (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
505	2.95	-	SS304	13	297.52	300.00	185.75	2609	555	2054	0.714
506	2.95	-	SS304	13	297.45	300.00	185.73	2705	522	2183	0.698
507	2.95	-	SS304	13	297.62	300.00	185.74	2586	514	2072	0.705
508	2.95	-	SS304	13	297.56	300.00	185.74	2700	599	2101	0.726
509	2.95	-	SS304	13	297.51	300.00	185.74	2747	549	2198	0.731
510	2.95	-	SS304	13	297.48	300.00	185.73	2628	536	2092	0.725
511	2.95	-	SS304	13	297.55	300.00	185.73	2731	562	2169	0.688
512	2.95	-	SS304	13	297.49	300.00	185.74	2621	556	2065	0.673
513	2.95	-	SS304	13	297.48	300.00	185.73	2599	533	2066	0.744
514	2.95	-	SS304	13	297.53	300.00	185.73	2698	563	2135	0.704
515	2.95	-	SS304	13	297.50	300.00	185.74	2660	547	2113	0.707
516	2.95	-	SS304	13	297.52	300.00	185.74	2682	543	2139	0.716
517	2.95	-	SS304	13	297.36	300.00	185.74	2601	517	2084	0.688
518	2.95	-	SS304	13	297.55	300.00	185.73	2624	551	2073	0.736
519	2.95	-	SS304	16	297.75	300.00	185.76	1871	417	1454	0.699
520	2.95	-	SS304	16	297.88	300.00	185.76	1959	467	1492	0.693
521	2.95	-	SS304	16	297.84	300.00	185.74	1886	490	1396	0.712
522	2.95	-	SS304	16	297.89	300.00	185.74	1984	457	1527	0.692
523	2.95	-	SS304	16	297.79	300.00	185.76	1925	486	1439	0.705
524	2.95	-	SS304	16	297.81	300.00	185.73	1887	415	1472	0.698
525	2.95	-	SS304	16	297.79	300.00	185.73	2007	477	1530	0.746
526	2.95	-	SS304	16	297.78	300.00	185.74	1945	443	1502	0.713
527	2.95	-	SS304	16	297.82	300.00	185.73	1957	437	1520	0.686
528	2.95	-	SS304	16	297.85	300.00	185.74	1892	454	1438	0.672
529	2.95	-	SS304	16	297.82	300.00	185.73	1970	496	1474	0.719
530	2.95	-	SS304	16	297.80	300.00	185.74	1876	477	1399	0.705
531	2.95	-	SS304	16	297.83	300.00	185.72	1941	492	1449	0.719
532	2.95	-	SS304	16	297.78	300.00	185.73	1892	470	1422	0.714
533	2.95	-	SS304	16	297.78	300.00	185.72	1914	458	1456	0.731
534	2.95	-	SS304	16	297.78	300.00	185.72	1941	458	1483	0.722
535	2.95	-	SS304	16	297.73	300.00	185.74	1950	485	1465	0.664
536	2.95	-	SS304	16	297.76	300.00	185.72	1947	460	1487	0.730
537	2.95	-	SS304	16	297.85	300.00	185.74	1969	436	1533	0.721
538	2.95	-	SS304	16	297.79	300.00	185.74	1983	420	1563	0.695
539	4.46	5640	-	-	286.19	300.00	185.73	18026	3065	14961	0.726
540	-	-	-	-	299.51	300.00	No Fit	10	15	-5	NA
541	0.31	-	SS304	16	186973.77	188323.77	185.73	366247	265064	101183	0.719
542	4.46	5640	-	-	286.20	300.00	185.74	17817	3115	14702	0.740
543	-	-	-	-	299.52	300.00	No Fit	16	9	7	NA
544	1.94	-	-	-	294.96	300.00	185.74	7575	902	6673	0.706
545	1.94	-	-	-	294.83	300.00	185.74	7513	933	6580	0.728
546	1.94	-	-	-	294.89	300.00	185.74	7620	905	6715	0.737
547	1.94	-	-	-	294.90	300.00	185.75	7474	959	6515	0.731

Table A.2. 186 keV data (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
548	1.94	-	-	-	294.94	300.00	185.75	7654	1016	6638	0.721
549	1.94	-	-	-	294.89	300.00	185.76	7557	956	6601	0.737
550	1.94	-	-	-	294.87	300.00	185.76	7564	949	6615	0.710
551	1.94	-	-	-	294.93	300.00	185.75	7638	890	6748	0.705
552	1.94	-	-	-	294.92	300.00	185.74	7357	961	6396	0.735
553	1.94	-	-	-	294.88	300.00	185.75	7774	969	6805	0.714
554	1.94	-	-	-	294.88	300.00	185.75	7698	934	6764	0.683
555	1.94	-	-	-	294.85	300.00	185.75	7701	923	6778	0.725
556	1.94	-	-	-	294.92	300.00	185.76	7437	898	6539	0.732
557	1.94	-	-	-	294.81	300.00	185.75	7605	969	6636	0.722
558	1.94	-	-	-	294.90	300.00	185.74	7492	924	6568	0.744
559	1.94	-	-	-	294.94	300.00	185.75	7720	888	6832	0.706
560	1.94	-	-	-	294.91	300.00	185.76	7568	967	6601	0.720
561	1.94	-	-	-	294.90	300.00	185.75	7565	951	6614	0.725
562	1.94	-	-	-	294.88	300.00	185.75	7784	946	6838	0.735
563	1.94	-	-	-	294.87	300.00	185.75	7608	963	6645	0.693
564	1.94	-	SS304	8	296.75	300.00	185.75	3200	669	2531	0.709
565	1.94	-	SS304	8	296.89	300.00	185.75	3220	714	2506	0.690
566	1.94	-	SS304	8	296.83	300.00	185.74	3321	731	2590	0.733
567	1.94	-	SS304	8	296.85	300.00	185.75	3243	686	2557	0.685
568	1.94	-	SS304	8	296.87	300.00	185.75	3274	675	2599	0.724
569	1.94	-	SS304	8	296.87	300.00	185.74	3267	665	2602	0.702
570	1.94	-	SS304	8	296.73	300.00	185.73	3262	702	2560	0.705
571	1.94	-	SS304	8	296.78	300.00	185.75	3214	642	2572	0.695
572	1.94	-	SS304	8	296.87	300.00	185.75	3187	716	2471	0.690
573	1.94	-	SS304	8	296.84	300.00	185.75	3229	662	2567	0.712
574	1.94	-	SS304	8	296.85	300.00	185.75	3270	645	2625	0.706
575	1.94	-	SS304	8	296.89	300.00	185.75	3198	684	2514	0.762
576	1.94	-	SS304	8	296.80	300.00	185.74	3280	613	2667	0.720
577	1.94	-	SS304	8	296.84	300.00	185.75	3172	663	2509	0.713
578	1.94	-	SS304	8	296.83	300.00	185.74	3224	681	2543	0.676
579	1.94	-	SS304	8	296.87	300.00	185.75	3247	626	2621	0.731
580	1.94	-	SS304	8	296.93	300.00	185.74	3267	659	2608	0.720
581	1.94	-	SS304	8	296.93	300.00	185.75	3228	703	2525	0.686
582	1.94	-	SS304	8	296.82	300.00	185.75	3203	700	2503	0.694
583	1.94	-	SS304	8	296.90	300.00	185.75	3263	663	2600	0.724
584	4.46	5640	-	-	286.14	300.00	185.75	18132	3038	15094	0.732
585	-	-	-	-	299.55	300.00	No Fit	13	8	5	NA
586	1.94	-	SS304	13	297.48	300.00	185.74	1864	515	1349	0.654
587	1.94	-	SS304	13	297.50	300.00	185.76	1954	540	1414	0.718
588	1.94	-	SS304	13	297.51	300.00	185.73	1900	474	1426	0.663
589	1.94	-	SS304	13	297.53	300.00	185.75	1979	529	1450	0.720
590	1.94	-	SS304	13	297.53	300.00	185.73	1965	527	1438	0.743

Table A.2. 186 keV data (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
591	1.94	-	SS304	13	297.49	300.00	185.77	2043	529	1514	0.708
592	1.94	-	SS304	13	297.50	300.00	185.75	1948	522	1426	0.737
593	1.94	-	SS304	13	297.58	300.00	185.75	1866	499	1367	0.636
594	1.94	-	SS304	13	297.57	300.00	185.74	1851	538	1313	0.726
595	1.94	-	SS304	13	297.57	300.00	185.75	1918	527	1391	0.685
596	1.94	-	SS304	13	297.58	300.00	185.74	1921	487	1434	0.691
597	1.94	-	SS304	13	297.62	300.00	185.76	1921	512	1409	0.724
598	1.94	-	SS304	13	297.50	300.00	185.73	1901	531	1370	0.672
599	1.94	-	SS304	13	297.50	300.00	185.76	1924	527	1397	0.711
600	1.94	-	SS304	13	297.41	300.00	185.74	1864	550	1314	0.722
601	1.94	-	SS304	13	297.50	300.00	185.77	1950	509	1441	0.744
602	1.94	-	SS304	13	297.60	300.00	185.75	1833	542	1291	0.726
603	1.94	-	SS304	13	297.53	300.00	185.75	1863	469	1394	0.740
604	1.94	-	SS304	13	297.48	300.00	185.76	1950	528	1422	0.684
605	1.94	-	SS304	13	297.50	300.00	185.74	1920	534	1386	0.695
606	1.94	-	SS304	16	297.82	300.00	185.74	1467	425	1042	0.709
607	1.94	-	SS304	16	297.90	300.00	185.77	1372	441	931	0.713
608	1.94	-	SS304	16	297.83	300.00	185.74	1380	430	950	0.671
609	1.94	-	SS304	16	297.85	300.00	185.75	1516	421	1095	0.748
610	1.94	-	SS304	16	297.87	300.00	185.74	1411	446	965	0.691
611	1.94	-	SS304	16	297.87	300.00	185.74	1397	436	961	0.692
612	1.94	-	SS304	16	297.89	300.00	185.74	1401	455	946	0.700
613	1.94	-	SS304	16	297.84	300.00	185.76	1443	480	963	0.684
614	1.94	-	SS304	16	297.88	300.00	185.75	1370	484	886	0.703
615	1.94	-	SS304	16	297.81	300.00	185.74	1356	470	886	0.729
616	1.94	-	SS304	16	297.89	300.00	185.76	1454	449	1005	0.705
617	1.94	-	SS304	16	297.86	300.00	185.76	1419	469	950	0.725
618	1.94	-	SS304	16	297.88	300.00	185.75	1378	491	887	0.756
619	1.94	-	SS304	16	297.90	300.00	185.75	1442	427	1015	0.734
620	1.94	-	SS304	16	297.83	300.00	185.77	1491	463	1028	0.745
621	1.94	-	SS304	16	297.91	300.00	185.75	1453	473	980	0.710
622	1.94	-	SS304	16	297.81	300.00	185.77	1399	464	935	0.674
623	1.94	-	SS304	16	297.82	300.00	185.76	1451	480	971	0.703
624	1.94	-	SS304	16	297.88	300.00	185.74	1452	443	1009	0.697
625	1.94	-	SS304	16	297.84	300.00	185.75	1359	462	897	0.739
626	4.46	5640	-	-	286.25	300.00	185.75	18204	3115	15089	0.742
627	-	-	-	-	299.45	300.00	185.85	20	8	12	0.097
628	0.31	-	-	-	27058.44	27508.07	185.75	185856	85171	100685	0.725
629	4.46	5640	-	-	286.25	300.00	185.75	18091	3132	14959	0.735
630	-	-	-	-	299.55	300.00	No Fit	13	9	4	NA
631	0.71	-	-	-	295.06	300.00	185.74	3484	847	2637	0.734
632	0.71	-	-	-	295.06	300.00	185.75	3336	931	2405	0.683
633	0.71	-	-	-	295.10	300.00	185.74	3382	926	2456	0.702

Table A.2. 186 keV data (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
634	0.71	-	-	-	295.13	300.00	185.75	3417	930	2487	0.717
635	0.71	-	-	-	295.04	300.00	185.74	3304	951	2353	0.705
636	0.71	-	-	-	295.18	300.00	185.76	3375	918	2457	0.758
637	0.71	-	-	-	295.10	300.00	185.74	3339	938	2401	0.704
638	0.71	-	-	-	294.95	300.00	185.76	3294	957	2337	0.699
639	0.71	-	-	-	295.10	300.00	185.76	3347	956	2391	0.761
640	0.71	-	-	-	295.02	300.00	185.77	3342	871	2471	0.752
641	0.71	-	-	-	295.12	300.00	185.76	3391	898	2493	0.737
642	0.71	-	-	-	295.05	300.00	185.73	3521	945	2576	0.692
643	0.71	-	-	-	295.00	300.00	185.75	3540	943	2597	0.715
644	0.71	-	-	-	295.08	300.00	185.76	3478	885	2593	0.672
645	0.71	-	-	-	295.07	300.00	185.75	3332	913	2419	0.703
646	0.71	-	-	-	295.13	300.00	185.75	3437	1018	2419	0.741
647	0.71	-	-	-	295.08	300.00	185.75	3396	946	2450	0.708
648	0.71	-	-	-	295.05	300.00	185.75	3442	919	2523	0.720
649	0.71	-	-	-	295.12	300.00	185.74	3418	927	2491	0.724
650	0.71	-	-	-	295.06	300.00	185.74	3408	922	2486	0.733
651	0.71	-	SS304	8	296.89	300.00	185.74	1570	652	918	0.640
652	0.71	-	SS304	8	296.90	300.00	185.74	1588	663	925	0.732
653	0.71	-	SS304	8	296.88	300.00	185.75	1659	645	1014	0.686
654	0.71	-	SS304	8	296.81	300.00	185.74	1571	622	949	0.668
655	0.71	-	SS304	8	296.87	300.00	185.74	1513	668	845	0.784
656	0.71	-	SS304	8	296.92	300.00	185.74	1599	655	944	0.720
657	0.71	-	SS304	8	296.86	300.00	185.75	1586	634	952	0.794
658	0.71	-	SS304	8	296.99	300.00	185.76	1626	642	984	0.694
659	0.71	-	SS304	8	296.81	300.00	185.77	1594	654	940	0.746
660	0.71	-	SS304	8	296.89	300.00	185.75	1606	640	966	0.712
661	0.71	-	SS304	8	296.83	300.00	185.73	1558	645	913	0.659
662	0.71	-	SS304	8	296.90	300.00	185.76	1614	626	988	0.686
663	0.71	-	SS304	8	296.88	300.00	185.72	1598	653	945	0.644
664	0.71	-	SS304	8	296.97	300.00	185.74	1641	639	1002	0.751
665	0.71	-	SS304	8	296.90	300.00	185.74	1558	654	904	0.712
666	0.71	-	SS304	8	296.93	300.00	185.75	1607	608	999	0.691
667	0.71	-	SS304	8	296.96	300.00	185.75	1542	657	885	0.685
668	0.71	-	SS304	8	296.97	300.00	185.76	1534	581	953	0.668
669	0.71	-	SS304	8	296.84	300.00	185.74	1575	617	958	0.735
670	0.71	-	SS304	8	296.86	300.00	185.76	1531	614	917	0.764
671	4.46	5640	-	-	286.29	300.00	185.74	17919	3183	14736	0.729
672	-	-	-	-	299.61	300.00	No Fit	10	11	-1	NA
673	0.71	-	SS304	13	297.49	300.00	185.72	990	531	459	0.733
674	0.71	-	SS304	13	297.57	300.00	185.75	991	497	494	0.728
675	0.71	-	SS304	13	297.58	300.00	185.78	1037	473	564	0.722
676	0.71	-	SS304	13	297.54	300.00	185.80	989	518	471	0.679

Table A.2. 186 keV data (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
677	0.71	-	SS304	13	297.55	300.00	185.71	1005	475	530	0.710
678	0.71	-	SS304	13	297.65	300.00	185.75	1005	539	466	0.649
679	0.71	-	SS304	13	297.58	300.00	185.78	1007	518	489	0.717
680	0.71	-	SS304	13	297.59	300.00	185.75	1033	526	507	0.710
681	0.71	-	SS304	13	297.65	300.00	185.75	961	527	434	0.687
682	0.71	-	SS304	13	297.54	300.00	185.76	994	478	516	0.671
683	0.71	-	SS304	13	297.54	300.00	185.74	1014	489	525	0.683
684	0.71	-	SS304	13	297.65	300.00	No Fit	1004	486	518	NA
685	0.71	-	SS304	13	297.52	300.00	185.78	970	519	451	0.700
686	0.71	-	SS304	13	297.54	300.00	185.75	987	488	499	0.687
687	0.71	-	SS304	13	297.69	300.00	185.74	979	473	506	0.734
688	0.71	-	SS304	13	297.49	300.00	185.76	1010	460	550	0.676
689	0.71	-	SS304	13	297.58	300.00	185.73	1044	484	560	0.762
690	0.71	-	SS304	13	297.56	300.00	185.72	970	508	462	0.709
691	0.71	-	SS304	13	297.48	300.00	185.75	1002	535	467	0.715
692	0.71	-	SS304	13	297.57	300.00	185.74	984	483	501	0.685
693	0.71	-	SS304	16	297.96	300.00	185.73	784	442	342	0.654
694	0.71	-	SS304	16	297.91	300.00	185.76	842	449	393	0.699
695	0.71	-	SS304	16	297.85	300.00	185.73	783	442	341	0.699
696	0.71	-	SS304	16	297.79	300.00	185.77	811	453	358	0.618
697	0.71	-	SS304	16	297.87	300.00	185.75	805	422	383	0.784
698	0.71	-	SS304	16	297.93	300.00	185.73	794	415	379	0.718
699	0.71	-	SS304	16	297.82	300.00	185.75	763	426	337	0.612
700	0.71	-	SS304	16	297.80	300.00	185.77	761	440	321	0.770
701	0.71	-	SS304	16	297.85	300.00	185.77	817	400	417	0.684
702	0.71	-	SS304	16	297.93	300.00	185.74	805	419	386	0.716
703	0.71	-	SS304	16	297.93	300.00	185.71	821	454	367	0.743
704	0.71	-	SS304	16	297.91	300.00	185.75	775	426	349	0.700
705	0.71	-	SS304	16	298.00	300.00	185.77	787	443	344	0.695
706	0.71	-	SS304	16	297.89	300.00	185.79	769	405	364	0.653
707	0.71	-	SS304	16	297.91	300.00	185.76	800	434	366	0.700
708	0.71	-	SS304	16	297.89	300.00	185.72	782	422	360	0.677
709	0.71	-	SS304	16	297.90	300.00	185.76	787	442	345	0.697
710	0.71	-	SS304	16	297.86	300.00	No Fit	797	397	400	NA
711	0.71	-	SS304	16	297.89	300.00	185.73	775	450	325	0.665
712	0.71	-	SS304	16	297.86	300.00	185.77	762	421	341	0.718
713	4.46	5640	-	-	286.26	300.00	185.76	17963	3045	14918	0.738
714	-	-	-	-	299.50	300.00	No Fit	13	15	-2	NA
715	1.94	-	-	-	4446.65	4524.07	185.75	114562	14266	100296	0.720
716	1.94	-	AIR	8	4456.60	4526.13	185.75	113318	12773	100545	0.725
717	0.31	-	AIR	16	27070.70	27429.78	185.76	169537	69494	100043	0.724
718	4.46	5640	-	-	286.21	300.00	185.76	17953	3016	14937	0.710
719	-	-	-	-	299.61	300.00	No Fit	14	7	7	NA

Table A.2. 186 keV data (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
720	0.31	-	-	-	295.13	300.00	185.76	2012	992	1020	0.714
721	0.31	-	-	-	295.00	300.00	185.74	2044	933	1111	0.710
722	0.31	-	-	-	295.11	300.00	185.75	1984	936	1048	0.690
723	0.31	-	-	-	295.22	300.00	185.78	1988	945	1043	0.703
724	0.31	-	-	-	295.06	300.00	185.75	2054	904	1150	0.723
725	0.31	-	-	-	295.07	300.00	185.75	2028	944	1084	0.707
726	0.31	-	-	-	295.15	300.00	185.77	1966	870	1096	0.670
727	0.31	-	-	-	295.11	300.00	185.74	2076	970	1106	0.744
728	0.31	-	-	-	295.13	300.00	185.76	2008	951	1057	0.745
729	0.31	-	-	-	295.16	300.00	185.75	2075	969	1106	0.731
730	0.31	-	-	-	295.14	300.00	185.78	2110	918	1192	0.731
731	0.31	-	-	-	295.11	300.00	185.77	2090	987	1103	0.681
732	0.31	-	-	-	295.13	300.00	185.76	2016	902	1114	0.722
733	0.31	-	-	-	295.00	300.00	185.75	2070	955	1115	0.762
734	0.31	-	-	-	295.15	300.00	185.74	1996	921	1075	0.747
735	0.31	-	-	-	295.04	300.00	185.75	2117	888	1229	0.706
736	0.31	-	-	-	295.06	300.00	185.76	2097	928	1169	0.694
737	0.31	-	-	-	295.09	300.00	185.76	2044	985	1059	0.728
738	0.31	-	-	-	295.12	300.00	185.73	2016	936	1080	0.706
739	0.31	-	-	-	295.16	300.00	185.75	2051	924	1127	0.679
740	0.31	-	SS304	8	296.93	300.00	185.78	1106	630	476	0.741
741	0.31	-	SS304	8	296.84	300.00	185.77	1122	614	508	0.757
742	0.31	-	SS304	8	296.89	300.00	185.76	1050	595	455	0.720
743	0.31	-	SS304	8	296.87	300.00	185.73	1084	714	370	0.664
744	0.31	-	SS304	8	296.86	300.00	185.79	1056	628	428	0.689
745	0.31	-	SS304	8	296.79	300.00	185.78	1034	632	402	0.696
746	0.31	-	SS304	8	296.96	300.00	185.78	1026	677	349	0.635
747	0.31	-	SS304	8	296.87	300.00	185.81	1075	600	475	0.835
748	0.31	-	SS304	8	296.91	300.00	185.76	1081	666	415	0.634
749	0.31	-	SS304	8	296.91	300.00	185.75	1023	657	366	0.734
750	0.31	-	SS304	8	296.85	300.00	185.81	1068	665	403	0.753
751	0.31	-	SS304	8	296.97	300.00	185.75	1053	602	451	0.599
752	0.31	-	SS304	8	296.95	300.00	185.78	1062	652	410	0.711
753	0.31	-	SS304	8	296.84	300.00	185.73	1111	626	485	0.787
754	0.31	-	SS304	8	296.94	300.00	185.73	1058	622	436	0.701
755	0.31	-	SS304	8	296.89	300.00	185.74	1096	604	492	0.795
756	0.31	-	SS304	8	296.96	300.00	185.74	1066	617	449	0.722
757	0.31	-	SS304	8	296.92	300.00	185.75	1055	588	467	0.770
758	0.31	-	SS304	8	296.93	300.00	185.78	1016	591	425	0.719
759	0.31	-	SS304	8	296.92	300.00	185.80	1116	665	451	0.903
760	4.46	5640	-	-	286.26	300.00	185.76	17778	3172	14606	0.748
761	-	-	-	-	299.40	300.00	No Fit	14	11	3	NA
762	0.31	-	SS304	13	297.60	300.00	185.67	722	494	228	0.661

Table A.2. 186 keV data (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
763	0.31	-	SS304	13	297.69	300.00	185.81	712	503	209	0.705
764	0.31	-	SS304	13	297.60	300.00	185.71	700	498	202	0.707
765	0.31	-	SS304	13	297.55	300.00	185.71	755	505	250	0.798
766	0.31	-	SS304	13	297.52	300.00	185.79	703	484	219	0.944
767	0.31	-	SS304	13	297.60	300.00	185.75	702	520	182	0.594
768	0.31	-	SS304	13	297.49	300.00	185.75	714	499	215	0.691
769	0.31	-	SS304	13	297.54	300.00	185.73	752	531	221	0.962
770	0.31	-	SS304	13	297.64	300.00	185.74	712	439	273	0.630
771	0.31	-	SS304	13	297.52	300.00	185.78	683	472	211	0.712
772	0.31	-	SS304	13	297.56	300.00	185.79	769	495	274	0.788
773	0.31	-	SS304	13	297.62	300.00	185.73	704	459	245	0.835
774	0.31	-	SS304	13	297.61	300.00	185.69	729	500	229	0.829
775	0.31	-	SS304	13	297.56	300.00	185.69	711	506	205	0.995
776	0.31	-	SS304	13	297.48	300.00	185.77	706	498	208	0.564
777	0.31	-	SS304	13	297.59	300.00	185.75	753	468	285	0.667
778	0.31	-	SS304	13	297.52	300.00	185.73	747	504	243	0.649
779	0.31	-	SS304	13	297.52	300.00	185.72	742	478	264	0.626
780	0.31	-	SS304	13	297.61	300.00	185.75	750	531	219	0.703
781	0.31	-	SS304	13	297.60	300.00	185.76	726	500	226	0.685
782	0.31	-	SS304	16	297.89	300.00	185.72	588	386	202	0.751
783	0.31	-	SS304	16	297.84	300.00	185.84	611	429	182	0.736
784	0.31	-	SS304	16	297.88	300.00	185.79	577	443	134	0.624
785	0.31	-	SS304	16	297.84	300.00	185.68	549	414	135	0.774
786	0.31	-	SS304	16	297.93	300.00	185.73	576	420	156	0.671
787	0.31	-	SS304	16	297.87	300.00	185.74	562	382	180	0.840
788	0.31	-	SS304	16	297.89	300.00	185.73	618	426	192	0.747
789	0.31	-	SS304	16	297.90	300.00	185.73	570	451	119	0.532
790	0.31	-	SS304	16	297.96	300.00	185.75	575	424	151	0.581
791	0.31	-	SS304	16	297.96	300.00	185.86	576	423	153	0.769
792	0.31	-	SS304	16	297.91	300.00	185.79	557	456	101	0.736
793	0.31	-	SS304	16	297.91	300.00	185.67	555	410	145	0.881
794	0.31	-	SS304	16	297.86	300.00	185.82	585	419	166	0.737
795	0.31	-	SS304	16	297.92	300.00	185.67	549	427	122	0.310
796	0.31	-	SS304	16	297.89	300.00	185.66	539	403	136	0.624
797	0.31	-	SS304	16	297.84	300.00	185.74	578	417	161	0.719
798	0.31	-	SS304	16	297.86	300.00	185.74	557	383	174	0.606
799	0.31	-	SS304	16	297.79	300.00	185.68	584	423	161	0.721
800	0.31	-	SS304	16	297.93	300.00	No Fit	551	426	125	NA
801	0.31	-	SS304	16	297.96	300.00	185.74	572	431	141	0.796
802	4.46	5640	-	-	286.18	300.00	185.75	18105	2922	15183	0.739
803	-	-	-	-	299.63	300.00	No Fit	15	10	5	NA
804	0.71	-	AIR	13	1075.38	1090.28	185.75	11778	2893	8885	0.729
805	0.31	-	AIR	13	26855.04	27224.93	185.75	171353	71277	100076	0.725

Table A.2. 186 keV data (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
806	4.46	5640	-	-	286.46	300.00	185.76	17937	3120	14817	0.744
807	-	-	-	-	299.58	300.00	No Fit	15	19	-4	NA
808	1.94	-	AIR	13	4398.21	4462.21	185.75	111876	11895	99981	0.725
809	1.94	-	SS304	13	21155.66	21329.17	185.76	136283	37226	99057	0.707
810	4.46	5640	-	-	286.28	300.00	185.77	18256	3187	15069	0.747
811	-	-	-	-	299.56	300.00	No Fit	16	19	-3	NA
812	0.31	-	AIR	8	27027.36	27425.86	185.76	176611	76536	100075	0.721
813	4.46	5640	-	-	286.25	300.00	185.77	18066	3068	14998	0.728
814	-	-	-	-	299.60	300.00	186.06	15	10	5	0.783
815	1.94	-	AIR	16	4453.92	4516.31	185.76	112176	11560	100616	0.729
816	1.94	-	SS304	8	11525.53	11647.90	185.77	125800	26134	99666	0.711
817	0.31	5640	-	-	287.01	300.00	185.80	4146	3075	1071	0.672
818	-	-	-	-	299.57	300.00	No Fit	6	13	-7	NA
819	2.95	-	SS304	8	7536.57	7617.50	185.76	116607	17407	99200	0.734
820	4.46	-	SS304	8	5027.20	5084.36	185.76	112338	12741	99597	0.734
821	4.46	5640	-	-	286.31	300.00	185.76	18175	3130	15045	0.756
822	-	-	-	-	299.61	300.00	No Fit	15	14	1	NA
823	0.71	-	SS304	13	58237.57	58707.32	185.76	197777	97719	100058	0.725
824	4.46	5640	-	-	286.21	300.00	185.76	18151	2951	15200	0.734
825	-	-	-	-	299.62	300.00	No Fit	6	10	-4	NA
826	2.95	-	SS304	13	14107.57	14224.58	185.76	125314	25673	99641	0.724
827	0.31	5640	-	-	286.91	300.00	185.77	4163	3012	1151	0.756
828	-	-	-	-	299.58	300.00	No Fit	17	10	7	NA
829	4.46	-	SS304	16	13427.47	13527.53	185.75	122203	22337	99866	0.722
830	4.46	5640	-	-	286.39	300.00	185.76	17974	3017	14957	0.746
831	-	-	-	-	299.65	300.00	No Fit	11	17	-6	NA
832	4.46	-	SS304	13	-	-	-	-	-	-	-
833	2.95	-	-	-	2900.46	2951.67	185.76	109499	9213	100286	0.736
834	2.95	-	AIR	8	2950.26	2997.18	185.76	109876	8568	101308	0.736
835	2.95	-	AIR	13	2924.09	2968.10	185.76	108362	7900	100462	0.737
836	2.95	-	AIR	16	2919.32	2961.63	185.76	108142	7662	100480	0.740
837	4.46	5640	-	-	286.26	300.00	185.75	18397	3036	15361	0.744
838	-	-	-	-	299.59	300.00	No Fit	20	16	4	NA
839	-	-	-	-	43138.69	43200.00	185.65	2015	1896	119	0.675
840	4.46	5640	-	-	286.30	300.00	185.77	17708	3035	14673	0.749
841	-	-	-	-	299.60	300.00	No Fit	12	13	-1	NA
842	4.46	5640	-	-	286.21	300.00	185.83	17665	2963	14702	0.720
843	-	-	-	-	299.57	300.00	No Fit	19	8	11	NA
844	4.46	-	SS304	13	9318.68	9399.96	185.81	118123	17737	100386	0.718
845	4.46	5640	-	-	286.07	300.00	185.81	18439	3137	15302	0.742
846	-	-	-	-	299.59	300.00	185.55	15	14	1	0.109
847	-	-	-	-	43134.16	43200.00	185.78	2161	1827	334	0.589
848	4.46	5640	-	-	286.05	300.00	185.82	18176	3130	15046	0.743

Table A.2. 186 keV data (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid [keV]	integral area [c]	BG area [c]	net peak area [c]	FWHM [keV]
849	-	-	-	-	299.54	300.00	185.65	24	12	12	1.380

Table A.3. 662 keV data for 5 min QC measurements only

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
3	4.46	5640	-	-	3534.72	3706.02	661.56	1275365	14525	1260840	1.28
4	4.46	5640	-	-	286.19	300.00	661.55	102395	1258	101137	1.29
6	4.46	5640	-	-	286.11	300.00	661.53	103992	1249	102743	1.28
8	4.46	5640	-	-	286.14	300.00	661.55	104436	1160	103276	1.31
11	4.46	5640	-	-	286.19	300.00	661.54	102454	1247	101207	1.30
14	4.46	5640	-	-	286.30	300.00	661.55	101852	1148	100704	1.31
17	4.46	5640	-	-	286.20	300.00	661.55	103884	1101	102783	1.29
21	4.46	5640	-	-	286.15	300.00	661.55	103929	1226	102703	1.31
24	4.46	5640	-	-	286.25	300.00	661.55	102720	1202	101518	1.31
34	4.46	5640	-	-	286.19	300.00	661.53	102618	1170	101448	1.32
49	4.46	5640	-	-	286.20	300.00	661.56	103719	1181	102538	1.32
52	4.46	5640	-	-	286.12	300.00	661.58	102498	1200	101298	1.28
56	4.46	5640	-	-	286.07	300.00	661.60	103474	1185	102289	1.31
98	4.46	5640	-	-	286.17	300.00	661.60	102575	1150	101425	1.32
140	4.46	5640	-	-	286.21	300.00	661.60	102776	1191	101585	1.31
143	4.46	5640	-	-	286.06	300.00	661.59	105299	1140	104159	1.29
163	4.46	5640	-	-	286.24	300.00	661.58	102068	1216	100852	1.29
170	4.46	5640	-	-	286.06	300.00	661.58	103307	1206	102101	1.28
173	4.46	5640	-	-	286.11	300.00	661.56	104698	1188	103510	1.29
215	4.46	5640	-	-	286.09	300.00	661.58	104434	1167	103267	1.29
257	4.46	5640	-	-	286.09	300.00	661.57	104954	1171	103783	1.30
260	4.46	5640	-	-	286.28	300.00	661.58	102840	1239	101601	1.28
302	4.46	5640	-	-	286.17	300.00	661.58	102738	1130	101608	1.30
344	4.46	5640	-	-	286.15	300.00	661.58	103355	1216	102139	1.29
347	4.46	5640	-	-	286.35	300.00	661.58	101882	1140	100742	1.29
410	4.46	5640	-	-	286.14	300.00	661.61	102527	1132	101395	1.31
452	4.46	5640	-	-	286.01	300.00	661.61	104768	1197	103571	1.31
455	4.46	5640	-	-	286.31	300.00	661.62	102579	1157	101422	1.31
497	4.46	5640	-	-	286.10	300.00	661.65	104342	1167	103175	1.29
539	4.46	5640	-	-	286.19	300.00	661.59	102639	1142	101497	1.29
542	4.46	5640	-	-	286.20	300.00	661.67	103659	1098	102561	1.28
584	4.46	5640	-	-	286.14	300.00	661.67	102848	1189	101659	1.30
626	4.46	5640	-	-	286.25	300.00	661.68	102274	1189	101085	1.30
629	4.46	5640	-	-	286.25	300.00	661.68	102645	1132	101513	1.28

Table A.3. 662 keV data for 5 min QC measurements only (continued)

ID#	nom. enrichment [wt%]	^{137}Cs	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
671	4.46	5640	-	-	286.29	300.00	661.68	102184	1143	101041	1.30
713	4.46	5640	-	-	286.26	300.00	661.68	101915	1109	100806	1.29
718	4.46	5640	-	-	286.21	300.00	661.69	102445	1142	101303	1.31
760	4.46	5640	-	-	286.26	300.00	661.69	103062	1094	101968	1.30
802	4.46	5640	-	-	286.18	300.00	661.68	102880	1184	101696	1.30
806	4.46	5640	-	-	286.46	300.00	661.70	101356	1126	100230	1.28
810	4.46	5640	-	-	286.28	300.00	661.72	103800	1181	102619	1.28
813	4.46	5640	-	-	286.25	300.00	661.74	102854	1052	101802	1.28
817	0.31	5640	-	-	287.01	300.00	661.75	103906	1084	102822	1.29
821	4.46	5640	-	-	286.31	300.00	661.71	102412	1105	101307	1.29
824	4.46	5640	-	-	286.21	300.00	661.70	103639	1136	102503	1.31
827	0.31	5640	-	-	286.91	300.00	661.70	104517	1157	103360	1.31
830	4.46	5640	-	-	286.39	300.00	661.70	102130	1083	101047	1.29
837	4.46	5640	-	-	286.26	300.00	661.69	103395	1087	102308	1.31
840	4.46	5640	-	-	286.30	300.00	661.69	102724	1147	101577	1.32
842	4.46	5640	-	-	286.21	300.00	661.98	100899	1090	99809	1.29
845	4.46	5640	-	-	286.07	300.00	661.88	105102	1116	103986	1.29
848	4.46	5640	-	-	286.05	300.00	661.91	104631	1134	103497	1.28

Table A.4. 1001 keV data

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
1	0.71	-	-	-	12275.40	12470.55	1001.18	351032	7707	343325	1.61
2	-	-	-	-	43146.18	43200.00	No Fit	293	269	24	NA
3	4.46	5640	-	-	3534.72	3706.02	1001.50	102833	2333	100500	1.64
4	4.46	5640	-	-	286.19	300.00	1001.47	8293	197	8096	1.64
5	-	-	-	-	299.54	300.00	No Fit	3	3	0	NA
6	4.46	5640	-	-	286.11	300.00	1001.45	8212	192	8020	1.65
7	0.31	-	SS304	16	232351.48	234041.58	1001.44	2145279	60962	2084317	1.65
8	4.46	5640	-	-	286.14	300.00	1001.47	8205	175	8030	1.60
9	-	-	-	-	299.53	300.00	No Fit	3	2	1	NA
10	0.71	-	-	-	12164.56	12369.82	1001.44	347200	7408	339792	1.64
11	4.46	5640	-	-	286.19	300.00	1001.49	8224	186	8038	1.65
12	-	-	-	-	299.48	300.00	No Fit	2	1	1	NA
13	0.71	-	AIR	8	12026.00	12206.99	1001.46	294057	6200	287857	1.65
14	4.46	5640	-	-	286.30	300.00	1001.49	8120	165	7955	1.64
15	-	-	-	-	299.47	300.00	No Fit	1	4	-3	NA
16	0.31	-	SS304	8	71484.94	72244.15	1001.46	1166085	28752	1137333	1.65
17	4.46	5640	-	-	286.20	300.00	1001.51	8203	203	8000	1.65
18	-	-	-	-	299.42	300.00	1002.96	2	1	1	2.75
19	-	-	-	-	299.51	300.00	No Fit	3	3	0	NA
20	0.71	-	AIR	13	11982.01	12150.62	1001.47	266756	5479	261277	1.65
21	4.46	5640	-	-	286.15	300.00	1001.51	8188	186	8002	1.62
22	-	-	-	-	299.44	300.00	No Fit	2	1	1	NA
23	0.71	-	SS304	8	31081.22	31411.51	1001.46	503557	12441	491116	1.64
24	4.46	5640	-	-	286.25	300.00	1001.50	8191	185	8006	1.65
25	-	-	-	-	299.51	300.00	No Fit	2	1	1	NA
26	-	-	-	-	299.54	300.00	No Fit	2	2	0	NA
27	20.11	-	-	-	428.97	442.84	1001.47	12033	312	11721	1.60
28	20.11	-	SS304	8	1120.29	1139.36	1001.46	17635	572	17063	1.65
29	20.11	-	SS304	13	2051.52	2077.32	1001.44	22881	798	22083	1.66
30	20.11	-	SS304	16	2971.62	3003.19	1001.46	27130	1023	26107	1.68

Table A.4. 1001 keV data (continued)

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
31	20.11	-	AIR	8	430.12	442.98	1001.44	10423	278	10145	1.68
32	20.11	-	AIR	13	430.06	442.24	1001.46	9476	252	9224	1.68
33	20.11	-	AIR	16	431.71	443.85	1001.46	8863	257	8606	1.65
34	4.46	5640	-	-	286.19	300.00	1001.47	8321	200	8121	1.62
35	-	-	-	-	299.48	300.00	No Fit	3	5	-2	NA
36	0.71	-	AIR	16	12018.79	12182.19	1001.46	251942	5261	246681	1.64
37	20.11	-	-	-	290.66	300.00	1001.45	8161	231	7930	1.67
38	20.11	-	-	-	290.67	300.00	1001.47	8318	232	8086	1.65
39	20.11	-	-	-	290.67	300.00	1001.46	8282	218	8064	1.65
40	20.11	-	-	-	290.66	300.00	1001.45	8046	246	7800	1.68
41	20.11	-	-	-	290.63	300.00	1001.48	8350	231	8119	1.60
42	20.11	-	-	-	290.67	300.00	No Fit	8121	201	7920	NA
43	20.11	-	-	-	290.67	300.00	1001.47	8270	198	8072	1.63
44	20.11	-	-	-	290.64	300.00	1001.47	8119	231	7888	1.64
45	20.11	-	-	-	290.74	300.00	1001.48	8293	218	8075	1.63
46	20.11	-	-	-	290.75	300.00	1001.47	8242	212	8030	1.65
47	20.11	-	-	-	290.64	300.00	1001.49	8229	253	7976	1.65
48	20.11	-	-	-	290.73	300.00	1001.49	8121	230	7891	1.60
49	4.46	5640	-	-	286.20	300.00	1001.50	8387	193	8194	1.65
50	-	-	-	-	299.47	300.00	No Fit	2	3	-1	NA
51	0.71	-	SS304	16	83816.88	84429.04	1001.48	778329	22000	756329	1.65
52	4.46	5640	-	-	286.12	300.00	1001.53	8289	196	8093	1.62
53	-	-	-	-	299.56	300.00	No Fit	1	0	1	NA
54	-	-	-	-	299.52	300.00	No Fit	2	5	-3	NA
55	0.71	-	SS304	8	31336.52	31669.76	1001.52	511522	12719	498803	1.64
56	4.46	5640	-	-	286.07	300.00	1001.57	8477	189	8288	1.64
57	-	-	-	-	299.50	300.00	No Fit	2	0	2	NA
58	20.11	-	SS304	8	294.97	300.00	1001.54	4735	157	4578	1.65
59	20.11	-	SS304	8	294.92	300.00	1001.54	4663	164	4499	1.62
60	20.11	-	SS304	8	294.91	300.00	1001.54	4687	154	4533	1.63
61	20.11	-	SS304	8	294.99	300.00	1001.53	4695	161	4534	1.61
62	20.11	-	SS304	8	294.94	300.00	1001.54	4729	171	4558	1.62
63	20.11	-	SS304	8	294.93	300.00	1001.55	4708	144	4564	1.66
64	20.11	-	SS304	8	294.97	300.00	1001.51	4736	151	4585	1.67
65	20.11	-	SS304	8	294.90	300.00	1001.53	4607	142	4465	1.66
66	20.11	-	SS304	8	294.93	300.00	1001.52	4805	160	4645	1.63
67	20.11	-	SS304	8	294.95	300.00	1001.51	4627	158	4469	1.72
68	20.11	-	SS304	8	295.07	300.00	1001.51	4582	155	4427	1.61
69	20.11	-	SS304	8	294.96	300.00	1001.54	4606	157	4449	1.65
70	20.11	-	SS304	8	294.96	300.00	1001.55	4846	151	4695	1.56
71	20.11	-	SS304	8	294.95	300.00	1001.53	4651	152	4499	1.67
72	20.11	-	SS304	8	294.98	300.00	1001.54	4760	165	4595	1.67
73	20.11	-	SS304	8	295.01	300.00	1001.54	4752	138	4614	1.61

Table A.4. 1001 keV data (continued)

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
74	20.11	-	SS304	8	294.98	300.00	1001.53	4780	141	4639	1.67
75	20.11	-	SS304	8	294.91	300.00	1001.54	4771	174	4597	1.66
76	20.11	-	SS304	8	295.02	300.00	1001.56	4775	150	4625	1.63
77	20.11	-	SS304	8	294.80	300.00	1001.56	4558	144	4414	1.69
78	20.11	-	SS304	13	296.29	300.00	1001.54	3279	108	3171	1.63
79	20.11	-	SS304	13	296.22	300.00	1001.54	3312	99	3213	1.61
80	20.11	-	SS304	13	296.27	300.00	1001.55	3368	116	3252	1.60
81	20.11	-	SS304	13	296.27	300.00	1001.53	3281	116	3165	1.59
82	20.11	-	SS304	13	296.27	300.00	1001.52	3416	106	3310	1.68
83	20.11	-	SS304	13	296.36	300.00	1001.53	3392	119	3273	1.65
84	20.11	-	SS304	13	296.22	300.00	1001.53	3299	128	3171	1.65
85	20.11	-	SS304	13	296.23	300.00	1001.53	3373	99	3274	1.62
86	20.11	-	SS304	13	296.28	300.00	1001.53	3229	92	3137	1.60
87	20.11	-	SS304	13	296.25	300.00	No Fit	3254	121	3133	NA
88	20.11	-	SS304	13	296.25	300.00	1001.55	3366	104	3262	1.65
89	20.11	-	SS304	13	296.29	300.00	1001.55	3357	98	3259	1.51
90	20.11	-	SS304	13	296.34	300.00	1001.55	3370	104	3266	1.65
91	20.11	-	SS304	13	296.29	300.00	1001.52	3378	114	3264	1.70
92	20.11	-	SS304	13	296.27	300.00	1001.51	3330	124	3206	1.68
93	20.11	-	SS304	13	296.19	300.00	1001.52	3368	121	3247	1.67
94	20.11	-	SS304	13	296.27	300.00	1001.57	3371	117	3254	1.66
95	20.11	-	SS304	13	296.30	300.00	1001.55	3287	112	3175	1.63
96	20.11	-	SS304	13	296.24	300.00	1001.50	3349	116	3233	1.64
97	20.11	-	SS304	13	296.24	300.00	1001.52	3458	128	3330	1.58
98	4.46	5640	-	-	286.17	300.00	1001.56	8392	189	8203	1.64
99	-	-	-	-	299.57	300.00	No Fit	1	3	-2	NA
100	20.11	-	SS304	16	296.85	300.00	1001.47	2691	89	2602	1.69
101	20.11	-	SS304	16	296.89	300.00	1001.49	2704	102	2602	1.62
102	20.11	-	SS304	16	296.84	300.00	1001.38	2701	77	2624	1.70
103	20.11	-	SS304	16	296.92	300.00	1001.40	2590	87	2503	1.59
104	20.11	-	SS304	16	296.80	300.00	1001.40	2657	100	2557	1.67
105	20.11	-	SS304	16	296.84	300.00	1001.42	2646	97	2549	1.67
106	20.11	-	SS304	16	296.91	300.00	1001.40	2640	81	2559	1.64
107	20.11	-	SS304	16	296.90	300.00	1001.41	2716	93	2623	1.68
108	20.11	-	SS304	16	296.96	300.00	1001.43	2626	93	2533	1.71
109	20.11	-	SS304	16	296.91	300.00	1001.44	2656	83	2573	1.70
110	20.11	-	SS304	16	296.83	300.00	1001.46	2685	111	2574	1.58
111	20.11	-	SS304	16	296.88	300.00	1001.43	2647	105	2542	1.63
112	20.11	-	SS304	16	296.83	300.00	1001.44	2673	99	2574	1.73
113	20.11	-	SS304	16	296.98	300.00	1001.46	2697	95	2602	1.58
114	20.11	-	SS304	16	296.96	300.00	1001.47	2637	93	2544	1.67
115	20.11	-	SS304	16	296.94	300.00	1001.47	2650	111	2539	1.62
116	20.11	-	SS304	16	296.87	300.00	1001.45	2792	101	2691	1.64

Table A.4. 1001 keV data (continued)

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
117	20.11	-	SS304	16	296.80	300.00	1001.45	2691	98	2593	1.65
118	20.11	-	SS304	16	296.86	300.00	1001.49	2659	92	2567	1.58
119	20.11	-	SS304	16	296.93	300.00	1001.46	2692	104	2588	1.65
120	20.11	-	-	-	290.74	300.00	1001.49	8090	235	7855	1.64
121	20.11	-	-	-	290.75	300.00	1001.50	8186	245	7941	1.68
122	20.11	-	-	-	290.75	300.00	1001.50	8131	230	7901	1.65
123	20.11	-	-	-	290.84	300.00	1001.52	8127	203	7924	1.62
124	20.11	-	-	-	290.70	300.00	1001.53	8204	223	7981	1.64
125	20.11	-	-	-	290.66	300.00	1001.52	8194	236	7958	1.61
126	20.11	-	-	-	290.82	300.00	1001.52	8232	192	8040	1.61
127	20.11	-	-	-	290.76	300.00	1001.52	8253	238	8015	1.59
128	20.11	-	-	-	290.73	300.00	1001.53	8077	235	7842	1.63
129	20.11	-	-	-	290.73	300.00	1001.52	8310	244	8066	1.65
130	20.11	-	-	-	290.71	300.00	1001.52	8306	193	8113	1.60
131	20.11	-	-	-	290.85	300.00	1001.52	8312	216	8096	1.62
132	20.11	-	-	-	290.65	300.00	1001.52	8197	200	7997	1.64
133	20.11	-	-	-	290.74	300.00	1001.54	8249	223	8026	1.64
134	20.11	-	-	-	290.72	300.00	1001.55	8189	199	7990	1.64
135	20.11	-	-	-	290.66	300.00	1001.53	8206	201	8005	1.66
136	20.11	-	-	-	290.70	300.00	1001.55	8105	224	7881	1.64
137	20.11	-	-	-	290.69	300.00	1001.54	8021	217	7804	1.66
138	20.11	-	-	-	290.65	300.00	1001.54	8149	222	7927	1.66
139	20.11	-	-	-	290.70	300.00	1001.55	8154	219	7935	1.60
140	4.46	5640	-	-	286.21	300.00	1001.56	8305	190	8115	1.60
141	-	-	-	-	299.55	300.00	No Fit	5	0	5	NA
142	0.31	-	SS304	13	130541.20	131622.91	1001.51	1497385	40649	1456736	1.65
143	4.46	5640	-	-	286.06	300.00	1001.53	8369	206	8163	1.64
144	-	-	-	-	299.48	300.00	998.61	1	3	-2	1.56
145	4.46	-	-	-	1938.63	1976.31	1001.53	55857	1200	54657	1.65
146	-	-	-	-	299.51	300.00	No Fit	1	3	-2	NA
147	-	-	-	-	299.50	300.00	1000.79	2	2	0	3.63
148	-	-	-	-	299.62	300.00	No Fit	3	2	1	NA
149	93.17	-	-	-	94.50	101.03	1001.45	212	28	184	1.78
150	93.17	-	SS304	8	243.89	250.69	1001.47	305	53	252	1.51
151	93.17	-	SS304	13	446.47	454.53	1001.50	434	95	339	1.68
152	93.17	-	SS304	16	645.80	654.95	1001.53	480	88	392	1.65
153	93.17	-	AIR	16	94.58	100.92	1001.63	158	22	136	1.71
154	93.17	-	AIR	13	94.89	101.27	1001.54	167	23	144	1.93
155	93.17	-	AIR	8	93.76	100.19	1001.58	191	23	168	1.59
156	52.49	-	-	-	166.57	173.98	1001.49	2703	68	2635	1.61
157	52.49	-	SS304	8	430.18	438.54	1001.49	3806	101	3705	1.70
158	52.49	-	SS304	13	789.78	800.14	No Fit	5101	176	4925	NA
159	52.49	-	SS304	16	1138.85	1151.11	1001.50	5692	202	5490	1.67

Table A.4. 1001 keV data (continued)

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
160	52.49	-	AIR	16	166.67	173.71	1001.48	2016	48	1968	1.61
161	52.49	-	AIR	13	165.64	172.80	1001.50	2126	62	2064	1.68
162	52.49	-	AIR	8	166.06	173.30	1001.48	2289	39	2250	1.64
163	4.46	5640	-	-	286.24	300.00	1001.52	8369	181	8188	1.65
164	-	-	-	-	299.41	300.00	No Fit	2	1	1	NA
165	-	-	-	-	299.56	300.00	No Fit	2	1	1	NA
166	4.46	-	-	-	1953.21	1991.04	1001.51	56481	1274	55207	1.64
167	4.46	-	AIR	8	1943.66	1977.85	1001.52	48006	970	47036	1.64
168	4.46	-	AIR	13	1937.01	1969.33	1001.52	43699	932	42767	1.61
169	4.46	-	AIR	16	1932.43	1963.22	1001.52	40740	912	39828	1.64
170	4.46	5640	-	-	286.06	300.00	1001.56	8320	192	8128	1.60
171	-	-	-	-	299.50	300.00	No Fit	4	0	4	NA
172	-	-	-	-	43130.71	43200.00	1002.49	316	282	34	3.56
173	4.46	5640	-	-	286.11	300.00	1001.52	8462	194	8268	1.61
174	-	-	-	-	299.52	300.00	No Fit	1	1	0	NA
175	93.17	-	-	-	280.70	300.00	1001.54	610	91	519	1.53
176	93.17	-	-	-	280.65	300.00	1001.49	589	94	495	1.53
177	93.17	-	-	-	280.67	300.00	1001.56	648	110	538	1.60
178	93.17	-	-	-	280.63	300.00	1001.52	632	78	554	1.77
179	93.17	-	-	-	280.70	300.00	1001.49	619	75	544	1.63
180	93.17	-	-	-	280.68	300.00	1001.54	627	99	528	1.52
181	93.17	-	-	-	280.67	300.00	1001.50	592	86	506	1.69
182	93.17	-	-	-	280.61	300.00	1001.53	607	82	525	1.77
183	93.17	-	-	-	280.73	300.00	1001.52	648	65	583	1.52
184	93.17	-	-	-	280.68	300.00	No Fit	596	79	517	NA
185	93.17	-	-	-	280.70	300.00	1001.56	578	87	491	1.69
186	93.17	-	-	-	280.79	300.00	1001.63	634	73	561	1.54
187	93.17	-	-	-	280.65	300.00	1001.53	606	84	522	1.50
188	93.17	-	-	-	280.75	300.00	1001.52	600	78	522	1.57
189	93.17	-	-	-	280.68	300.00	1001.55	590	84	506	1.62
190	93.17	-	-	-	280.69	300.00	1001.54	614	67	547	1.71
191	93.17	-	-	-	280.71	300.00	1001.57	593	92	501	1.75
192	93.17	-	-	-	280.70	300.00	1001.45	619	88	531	1.75
193	93.17	-	-	-	280.73	300.00	1001.54	597	88	509	1.49
194	93.17	-	-	-	280.72	300.00	1001.60	607	90	517	1.60
195	93.17	-	SS304	8	291.94	300.00	No Fit	360	54	306	NA
196	93.17	-	SS304	8	292.01	300.00	1001.43	365	65	300	1.54
197	93.17	-	SS304	8	291.96	300.00	No Fit	366	62	304	NA
198	93.17	-	SS304	8	291.89	300.00	1001.55	392	70	322	1.52
199	93.17	-	SS304	8	292.01	300.00	1001.54	325	50	275	1.62
200	93.17	-	SS304	8	291.93	300.00	1001.54	328	61	267	1.59
201	93.17	-	SS304	8	291.87	300.00	1001.48	370	51	319	1.56
202	93.17	-	SS304	8	291.91	300.00	No Fit	358	63	295	NA

Table A.4. 1001 keV data (continued)

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
203	93.17	-	SS304	8	291.90	300.00	1001.57	378	80	298	1.53
204	93.17	-	SS304	8	291.84	300.00	1001.48	371	89	282	1.40
205	93.17	-	SS304	8	291.97	300.00	1001.50	386	63	323	1.62
206	93.17	-	SS304	8	291.91	300.00	No Fit	367	68	299	NA
207	93.17	-	SS304	8	291.90	300.00	No Fit	414	63	351	NA
208	93.17	-	SS304	8	291.96	300.00	1001.51	369	60	309	1.55
209	93.17	-	SS304	8	291.91	300.00	1001.52	363	67	296	1.55
210	93.17	-	SS304	8	291.86	300.00	1001.57	351	74	277	1.52
211	93.17	-	SS304	8	291.83	300.00	No Fit	394	63	331	NA
212	93.17	-	SS304	8	291.93	300.00	1001.41	395	67	328	1.69
213	93.17	-	SS304	8	291.91	300.00	1001.61	377	74	303	1.66
214	93.17	-	SS304	8	291.98	300.00	No Fit	361	64	297	NA
215	4.46	5640	-	-	286.09	300.00	1001.54	8284	171	8113	1.62
216	-	-	-	-	299.54	300.00	No Fit	3	1	2	NA
217	93.17	-	SS304	13	294.66	300.00	1001.48	277	56	221	1.54
218	93.17	-	SS304	13	294.62	300.00	1001.54	295	40	255	1.53
219	93.17	-	SS304	13	294.54	300.00	1001.52	264	66	198	1.48
220	93.17	-	SS304	13	294.75	300.00	1001.61	285	55	230	1.38
221	93.17	-	SS304	13	294.76	300.00	1001.51	263	33	230	1.56
222	93.17	-	SS304	13	294.73	300.00	1001.48	294	53	241	1.77
223	93.17	-	SS304	13	294.76	300.00	1001.43	264	47	217	1.65
224	93.17	-	SS304	13	294.73	300.00	1001.49	247	52	195	1.65
225	93.17	-	SS304	13	294.77	300.00	1001.47	294	50	244	1.89
226	93.17	-	SS304	13	294.73	300.00	1001.51	264	31	233	1.57
227	93.17	-	SS304	13	294.64	300.00	1001.54	267	53	214	1.67
228	93.17	-	SS304	13	294.75	300.00	1001.63	233	56	177	1.73
229	93.17	-	SS304	13	294.76	300.00	1001.49	312	53	259	1.72
230	93.17	-	SS304	13	294.67	300.00	1001.53	263	56	207	1.66
231	93.17	-	SS304	13	294.71	300.00	1001.53	282	61	221	1.53
232	93.17	-	SS304	13	294.70	300.00	1001.50	256	50	206	1.63
233	93.17	-	SS304	13	294.76	300.00	1001.48	314	55	259	1.63
234	93.17	-	SS304	13	294.78	300.00	1001.65	292	51	241	1.54
235	93.17	-	SS304	13	294.63	300.00	1001.53	259	49	210	1.50
236	93.17	-	SS304	13	294.79	300.00	1001.45	289	40	249	1.56
237	93.17	-	SS304	16	295.84	300.00	1001.45	243	47	196	1.81
238	93.17	-	SS304	16	295.86	300.00	1001.50	270	40	230	1.73
239	93.17	-	SS304	16	295.73	300.00	1001.49	238	47	191	1.56
240	93.17	-	SS304	16	295.78	300.00	1001.39	220	43	177	1.53
241	93.17	-	SS304	16	295.79	300.00	1001.50	185	50	135	1.53
242	93.17	-	SS304	16	295.81	300.00	1001.48	191	48	143	1.75
243	93.17	-	SS304	16	295.84	300.00	1001.55	222	39	183	1.48
244	93.17	-	SS304	16	295.79	300.00	1001.53	216	43	173	1.64
245	93.17	-	SS304	16	295.77	300.00	1001.53	213	47	166	1.48

Table A.4. 1001 keV data (continued)

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
246	93.17	-	SS304	16	295.79	300.00	1001.44	238	41	197	1.51
247	93.17	-	SS304	16	295.83	300.00	1001.46	197	39	158	1.71
248	93.17	-	SS304	16	295.76	300.00	1001.47	235	54	181	1.83
249	93.17	-	SS304	16	295.81	300.00	1001.46	210	58	152	1.31
250	93.17	-	SS304	16	295.70	300.00	1001.55	231	45	186	1.64
251	93.17	-	SS304	16	295.85	300.00	1001.38	248	56	192	1.90
252	93.17	-	SS304	16	295.82	300.00	1001.56	219	42	177	1.77
253	93.17	-	SS304	16	295.79	300.00	1001.51	213	33	180	1.59
254	93.17	-	SS304	16	295.89	300.00	1001.63	224	44	180	1.67
255	93.17	-	SS304	16	295.72	300.00	1001.51	199	42	157	1.93
256	93.17	-	SS304	16	295.75	300.00	1001.60	223	37	186	1.51
257	4.46	5640	-	-	286.09	300.00	1001.53	8270	198	8072	1.66
258	-	-	-	-	299.50	300.00	No Fit	3	2	1	NA
259	1.94	-	SS304	16	30948.88	31156.54	1001.20	281549	7757	273792	1.65
260	4.46	5640	-	-	286.28	300.00	1001.52	8410	179	8231	1.61
261	-	-	-	-	299.50	300.00	No Fit	0	0	0	NA
262	52.49	-	-	-	287.23	300.00	1001.50	4567	121	4446	1.60
263	52.49	-	-	-	287.28	300.00	1001.49	4521	101	4420	1.63
264	52.49	-	-	-	287.28	300.00	1001.51	4542	110	4432	1.65
265	52.49	-	-	-	287.28	300.01	1001.51	4536	117	4419	1.64
266	52.49	-	-	-	287.23	300.00	1001.50	4468	106	4362	1.60
267	52.49	-	-	-	287.18	300.00	1001.51	4540	109	4431	1.66
268	52.49	-	-	-	287.19	300.00	1001.51	4672	97	4575	1.62
269	52.49	-	-	-	287.25	300.00	1001.50	4479	109	4370	1.66
270	52.49	-	-	-	287.18	300.00	1001.53	4658	121	4537	1.69
271	52.49	-	-	-	287.20	300.00	1001.52	4627	109	4518	1.70
272	52.49	-	-	-	287.21	300.00	1001.49	4634	132	4502	1.65
273	52.49	-	-	-	287.23	300.00	1001.51	4492	111	4381	1.69
274	52.49	-	-	-	287.21	300.00	1001.52	4633	121	4512	1.67
275	52.49	-	-	-	287.22	300.00	1001.51	4574	108	4466	1.65
276	52.49	-	-	-	287.29	300.00	1001.49	4557	124	4433	1.68
277	52.49	-	-	-	287.21	300.00	1001.50	4645	115	4530	1.69
278	52.49	-	-	-	287.21	300.00	1001.50	4574	105	4469	1.62
279	52.49	-	-	-	287.22	300.00	1001.49	4645	114	4531	1.66
280	52.49	-	-	-	287.27	300.00	1001.50	4615	109	4506	1.68
281	52.49	-	-	-	287.22	300.00	1001.51	4462	113	4349	1.66
282	52.49	-	SS304	8	294.29	300.00	No Fit	2673	70	2603	NA
283	52.49	-	SS304	8	294.34	300.00	1001.49	2661	79	2582	1.59
284	52.49	-	SS304	8	294.26	300.00	1001.50	2692	82	2610	1.73
285	52.49	-	SS304	8	294.34	300.00	1001.51	2708	93	2615	1.68
286	52.49	-	SS304	8	294.26	300.00	1001.53	2646	99	2547	1.71
287	52.49	-	SS304	8	294.24	300.00	1001.52	2654	87	2567	1.63
288	52.49	-	SS304	8	294.33	300.00	1001.49	2624	73	2551	1.66

Table A.4. 1001 keV data (continued)

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
289	52.49	-	SS304	8	294.32	300.00	1001.51	2659	67	2592	1.66
290	52.49	-	SS304	8	294.34	300.00	1001.52	2668	77	2591	1.60
291	52.49	-	SS304	8	294.26	300.00	1001.48	2676	81	2595	1.62
292	52.49	-	SS304	8	294.14	300.00	1001.45	2633	69	2564	1.65
293	52.49	-	SS304	8	294.28	300.00	1001.46	2601	87	2514	1.71
294	52.49	-	SS304	8	294.22	300.00	1001.51	2688	73	2615	1.68
295	52.49	-	SS304	8	294.24	300.00	1001.52	2632	80	2552	1.69
296	52.49	-	SS304	8	294.34	300.00	1001.47	2704	88	2616	1.69
297	52.49	-	SS304	8	294.30	300.00	1001.51	2630	74	2556	1.68
298	52.49	-	SS304	8	294.22	300.00	1001.51	2672	72	2600	1.70
299	52.49	-	SS304	8	294.25	300.00	1001.52	2585	74	2511	1.62
300	52.49	-	SS304	8	294.34	300.00	1001.51	2745	75	2670	1.61
301	52.49	-	SS304	8	294.26	300.00	1001.54	2598	81	2517	1.57
302	4.46	5640	-	-	286.17	300.00	1001.54	8451	207	8244	1.63
303	-	-	-	-	299.60	300.00	No Fit	2	3	-1	NA
304	52.49	-	SS304	13	296.11	300.00	1001.50	1851	62	1789	1.55
305	52.49	-	SS304	13	296.14	300.00	1001.52	1816	80	1736	1.55
306	52.49	-	SS304	13	296.07	300.00	1001.52	1895	74	1821	1.62
307	52.49	-	SS304	13	296.07	300.00	1001.49	1853	62	1791	1.73
308	52.49	-	SS304	13	296.15	300.00	1001.46	1884	57	1827	1.61
309	52.49	-	SS304	13	296.11	300.00	1001.52	1811	58	1753	1.62
310	52.49	-	SS304	13	296.10	300.00	1001.50	1801	60	1741	1.55
311	52.49	-	SS304	13	296.11	300.00	1001.53	1809	62	1747	1.59
312	52.49	-	SS304	13	296.07	300.00	1001.50	1933	60	1873	1.61
313	52.49	-	SS304	13	296.10	300.00	1001.48	1905	64	1841	1.66
314	52.49	-	SS304	13	296.01	300.00	1001.50	1937	62	1875	1.62
315	52.49	-	SS304	13	296.07	300.00	1001.51	1855	64	1791	1.62
316	52.49	-	SS304	13	296.16	300.00	1001.54	1896	51	1845	1.64
317	52.49	-	SS304	13	296.04	300.00	1001.51	1868	70	1798	1.61
318	52.49	-	SS304	13	296.10	300.00	1001.53	1869	52	1817	1.59
319	52.49	-	SS304	13	296.06	300.00	1001.48	1770	60	1710	1.67
320	52.49	-	SS304	13	296.09	300.00	1001.52	1908	59	1849	1.62
321	52.49	-	SS304	13	296.06	300.00	1001.51	1839	56	1783	1.65
322	52.49	-	SS304	13	295.99	300.00	1001.47	1840	46	1794	1.61
323	52.49	-	SS304	13	296.06	300.00	1001.52	1899	53	1846	1.67
324	52.49	-	SS304	16	296.86	300.00	1001.47	1502	55	1447	1.63
325	52.49	-	SS304	16	296.85	300.00	1001.52	1481	46	1435	1.66
326	52.49	-	SS304	16	296.84	300.00	1001.51	1479	52	1427	1.68
327	52.49	-	SS304	16	296.84	300.00	1001.51	1506	44	1462	1.65
328	52.49	-	SS304	16	296.76	300.00	1001.47	1514	53	1461	1.57
329	52.49	-	SS304	16	296.89	300.00	1001.52	1538	59	1479	1.53
330	52.49	-	SS304	16	296.89	300.00	1001.55	1521	45	1476	1.59
331	52.49	-	SS304	16	296.82	300.00	No Fit	1515	52	1463	NA

Table A.4. 1001 keV data (continued)

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
332	52.49	-	SS304	16	296.87	300.00	1001.50	1457	53	1404	1.59
333	52.49	-	SS304	16	296.80	300.00	1001.51	1510	48	1462	1.70
334	52.49	-	SS304	16	296.74	300.00	1001.49	1556	35	1521	1.61
335	52.49	-	SS304	16	296.80	300.00	1001.49	1522	50	1472	1.70
336	52.49	-	SS304	16	296.88	300.00	No Fit	1631	61	1570	NA
337	52.49	-	SS304	16	296.82	300.00	1001.51	1471	39	1432	1.69
338	52.49	-	SS304	16	296.84	300.00	No Fit	1506	51	1455	NA
339	52.49	-	SS304	16	296.86	300.00	1001.48	1557	44	1513	1.56
340	52.49	-	SS304	16	296.76	300.00	1001.48	1531	55	1476	1.75
341	52.49	-	SS304	16	296.85	300.00	1001.49	1484	45	1439	1.68
342	52.49	-	SS304	16	296.83	300.00	1001.53	1516	54	1462	1.58
343	52.49	-	SS304	16	296.81	300.00	1001.49	1526	42	1484	1.57
344	4.46	5640	-	-	286.15	300.00	1001.54	8251	202	8049	1.67
345	-	-	-	-	299.44	300.00	No Fit	4	3	1	NA
346	1.94	-	SS304	16	30374.60	30594.55	1001.50	279256	8112	271144	1.66
347	4.46	5640	-	-	286.35	300.00	1001.55	8141	194	7947	1.63
348	-	-	-	-	299.61	300.00	No Fit	3	1	2	NA
349	4.46	-	-	-	294.34	300.00	1001.53	8683	180	8503	1.64
350	4.46	-	-	-	294.42	300.00	1001.53	8589	176	8413	1.69
351	4.46	-	-	-	294.30	300.00	1001.53	8529	186	8343	1.65
352	4.46	-	-	-	294.33	300.00	1001.54	8543	195	8348	1.59
353	4.46	-	-	-	294.31	300.00	1001.52	8487	190	8297	1.63
354	4.46	-	-	-	294.35	300.00	1001.53	8526	192	8334	1.64
355	-	-	-	-	-	-	-	-	-	-	-
356	-	-	-	-	-	-	-	-	-	-	-
357	-	-	-	-	-	-	-	-	-	-	-
358	-	-	-	-	-	-	-	-	-	-	-
359	-	-	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-	-	-
361	-	-	-	-	-	-	-	-	-	-	-
362	-	-	-	-	-	-	-	-	-	-	-
363	-	-	-	-	-	-	-	-	-	-	-
364	-	-	-	-	-	-	-	-	-	-	-
365	-	-	-	-	-	-	-	-	-	-	-
366	-	-	-	-	-	-	-	-	-	-	-
367	-	-	-	-	-	-	-	-	-	-	-
368	-	-	-	-	-	-	-	-	-	-	-
369	-	-	-	-	299.59	300.00	No Fit	5	1	4	NA
370	4.46	-	-	-	294.22	300.00	1001.51	8357	210	8147	1.66
371	4.46	-	-	-	294.28	300.00	1001.53	8645	174	8471	1.64
372	4.46	-	-	-	294.27	300.00	1001.54	8578	188	8390	1.57
373	4.46	-	-	-	294.26	300.00	1001.52	8488	216	8272	1.63
374	4.46	-	-	-	294.26	300.00	1001.51	8693	189	8504	1.65

Table A.4. 1001 keV data (continued)

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
375	4.46	-	-	-	294.31	300.00	1001.52	8546	191	8355	1.64
376	4.46	-	-	-	294.19	300.00	1001.53	8478	197	8281	1.66
377	4.46	-	-	-	294.20	300.00	1001.54	8476	185	8291	1.65
378	4.46	-	-	-	294.27	300.00	1001.52	8461	188	8273	1.66
379	4.46	-	-	-	294.24	300.00	1001.53	8465	189	8276	1.61
380	4.46	-	-	-	294.29	300.00	1001.53	8621	172	8449	1.65
381	4.46	-	-	-	294.30	300.00	1001.52	8632	203	8429	1.69
382	4.46	-	-	-	294.30	300.00	1001.52	8515	214	8301	1.63
383	4.46	-	-	-	294.24	300.00	1001.52	8509	190	8319	1.61
384	4.46	-	-	-	294.30	300.00	1001.54	8480	187	8293	1.64
385	4.46	-	-	-	294.35	300.00	1001.55	8331	187	8144	1.62
386	4.46	-	-	-	294.29	300.00	1001.54	8598	204	8394	1.65
387	4.46	-	-	-	294.30	300.00	1001.54	8410	197	8213	1.62
388	4.46	-	-	-	294.37	300.00	1001.56	8601	197	8404	1.65
389	4.46	-	-	-	294.22	300.00	1001.54	8550	186	8364	1.59
390	4.46	-	SS304	8	296.51	300.00	1001.54	4921	119	4802	1.65
391	4.46	-	SS304	8	296.57	300.00	1001.54	4881	120	4761	1.62
392	4.46	-	SS304	8	296.53	300.00	1001.54	4897	136	4761	1.63
393	4.46	-	SS304	8	296.59	300.00	1001.53	4899	129	4770	1.59
394	4.46	-	SS304	8	296.55	300.00	1001.54	4798	113	4685	1.59
395	4.46	-	SS304	8	296.61	300.00	1001.53	4845	126	4719	1.60
396	4.46	-	SS304	8	296.59	300.00	1001.53	4904	122	4782	1.65
397	4.46	-	SS304	8	296.53	300.00	1001.54	4877	134	4743	1.64
398	4.46	-	SS304	8	296.44	300.00	1001.55	4959	137	4822	1.58
399	4.46	-	SS304	8	296.56	300.00	1001.51	4777	123	4654	1.61
400	4.46	-	SS304	8	296.51	300.00	1001.53	4784	111	4673	1.59
401	4.46	-	SS304	8	296.62	300.00	1001.55	4795	129	4666	1.63
402	4.46	-	SS304	8	296.62	300.00	1001.53	4887	125	4762	1.67
403	4.46	-	SS304	8	296.67	300.00	1001.54	4850	121	4729	1.61
404	4.46	-	SS304	8	296.62	300.00	1001.55	5045	123	4922	1.66
405	4.46	-	SS304	8	296.62	300.00	1001.55	4949	118	4831	1.66
406	4.46	-	SS304	8	296.53	300.00	1001.55	4981	101	4880	1.60
407	4.46	-	SS304	8	296.54	300.00	1001.53	4890	130	4760	1.58
408	4.46	-	SS304	8	296.58	300.00	1001.55	4719	88	4631	1.64
409	4.46	-	SS304	8	296.52	300.00	1001.53	4904	113	4791	1.61
410	4.46	5640	-	-	286.14	300.00	1001.59	8473	204	8269	1.63
411	-	-	-	-	299.66	300.00	No Fit	2	3	-1	NA
412	4.46	-	SS304	13	297.40	300.00	1001.53	3331	109	3222	1.68
413	4.46	-	SS304	13	297.30	300.00	1001.52	3551	86	3465	1.67
414	4.46	-	SS304	13	297.31	300.00	1001.53	3555	91	3464	1.62
415	4.46	-	SS304	13	297.37	300.00	1001.55	3524	86	3438	1.65
416	4.46	-	SS304	13	297.35	300.00	1001.53	3378	103	3275	1.61
417	4.46	-	SS304	13	297.32	300.00	1001.53	3413	97	3316	1.68

Table A.4. 1001 keV data (continued)

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
418	4.46	-	SS304	13	297.32	300.00	1001.56	3418	98	3320	1.67
419	4.46	-	SS304	13	297.37	300.00	1001.53	3439	84	3355	1.68
420	4.46	-	SS304	13	297.36	300.00	1001.55	3483	91	3392	1.70
421	4.46	-	SS304	13	297.38	300.00	1001.58	3349	101	3248	1.66
422	4.46	-	SS304	13	297.37	300.00	1001.55	3389	99	3290	1.67
423	4.46	-	SS304	13	297.38	300.00	1001.56	3426	83	3343	1.62
424	4.46	-	SS304	13	297.37	300.00	1001.54	3438	95	3343	1.64
425	4.46	-	SS304	13	297.40	300.00	1001.55	3463	106	3357	1.64
426	4.46	-	SS304	13	297.40	300.00	1001.53	3484	102	3382	1.65
427	4.46	-	SS304	13	297.27	300.00	1001.54	3509	101	3408	1.65
428	4.46	-	SS304	13	297.39	300.00	1001.55	3295	103	3192	1.69
429	4.46	-	SS304	13	297.35	300.00	1001.54	3466	87	3379	1.65
430	4.46	-	SS304	13	297.31	300.00	1001.55	3496	77	3419	1.66
431	4.46	-	SS304	13	297.39	300.00	1001.54	3407	117	3290	1.67
432	4.46	-	SS304	16	297.74	300.00	1001.56	2837	77	2760	1.63
433	4.46	-	SS304	16	297.73	300.00	1001.54	2780	77	2703	1.52
434	4.46	-	SS304	16	297.65	300.00	1001.55	2776	78	2698	1.62
435	4.46	-	SS304	16	297.69	300.00	1001.52	2756	86	2670	1.66
436	4.46	-	SS304	16	297.73	300.00	1001.55	2847	85	2762	1.68
437	4.46	-	SS304	16	297.77	300.00	1001.55	2857	82	2775	1.65
438	4.46	-	SS304	16	297.81	300.00	1001.55	2716	84	2632	1.58
439	4.46	-	SS304	16	297.72	300.00	1001.54	2792	76	2716	1.73
440	4.46	-	SS304	16	297.76	300.00	1001.55	2756	76	2680	1.69
441	4.46	-	SS304	16	297.80	300.00	1001.56	2772	82	2690	1.67
442	4.46	-	SS304	16	297.68	300.00	1001.51	2732	104	2628	1.72
443	4.46	-	SS304	16	297.71	300.00	1001.55	2760	70	2690	1.60
444	4.46	-	SS304	16	297.71	300.00	1001.56	2685	74	2611	1.61
445	4.46	-	SS304	16	297.73	300.00	1001.54	2813	70	2743	1.65
446	4.46	-	SS304	16	297.73	300.00	1001.54	2776	74	2702	1.64
447	4.46	-	SS304	16	297.69	300.00	1001.53	2698	85	2613	1.63
448	4.46	-	SS304	16	297.75	300.00	1001.56	2789	95	2694	1.64
449	4.46	-	SS304	16	297.76	300.00	1001.58	2754	74	2680	1.64
450	4.46	-	SS304	16	297.70	300.00	1001.54	2811	91	2720	1.63
451	4.46	-	SS304	16	297.78	300.00	1001.56	2692	96	2596	1.60
452	4.46	5640	-	-	286.01	300.00	1001.56	8216	195	8021	1.61
453	-	-	-	-	299.54	300.00	No Fit	4	2	2	NA
454	2.95	-	SS304	16	20110.59	20258.78	1001.55	182123	5172	176951	1.61
455	4.46	5640	-	-	286.31	300.00	1001.58	8372	216	8156	1.62
456	-	-	-	-	299.49	300.00	No Fit	2	1	1	NA
457	2.95	-	-	-	294.67	300.00	1001.56	8220	179	8041	1.64
458	2.95	-	-	-	294.69	300.00	1001.57	8434	183	8251	1.66
459	2.95	-	-	-	294.69	300.00	1001.57	8342	181	8161	1.62
460	2.95	-	-	-	294.61	300.00	1001.59	8407	168	8239	1.63

Table A.4. 1001 keV data (continued)

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
461	2.95	-	-	-	294.73	300.00	1001.58	8209	193	8016	1.58
462	2.95	-	-	-	294.71	300.00	1001.59	8369	200	8169	1.66
463	2.95	-	-	-	294.59	300.00	No Fit	8281	174	8107	NA
464	2.95	-	-	-	294.75	300.00	1001.61	8531	156	8375	1.60
465	2.95	-	-	-	294.58	300.00	1001.59	8268	206	8062	1.61
466	2.95	-	-	-	294.68	300.00	1001.60	8313	195	8118	1.63
467	2.95	-	-	-	294.70	300.00	1001.61	8367	175	8192	1.62
468	2.95	-	-	-	294.72	300.00	No Fit	8438	199	8239	NA
469	2.95	-	-	-	294.79	300.00	1001.61	8208	181	8027	1.65
470	2.95	-	-	-	294.72	300.00	1001.58	8402	175	8227	1.63
471	2.95	-	-	-	294.68	300.00	1001.60	8327	179	8148	1.64
472	2.95	-	-	-	294.64	300.00	1001.58	8367	176	8191	1.63
473	2.95	-	-	-	294.79	300.00	1001.59	8458	202	8256	1.64
474	2.95	-	-	-	294.70	300.00	1001.59	8187	167	8020	1.62
475	2.95	-	-	-	294.65	300.00	1001.59	8259	185	8074	1.64
476	2.95	-	-	-	294.72	300.00	1001.59	8325	167	8158	1.62
477	2.95	-	SS304	8	296.77	300.00	1001.59	4863	112	4751	1.67
478	2.95	-	SS304	8	296.66	300.00	1001.58	4827	129	4698	1.66
479	2.95	-	SS304	8	296.74	300.00	1001.60	4755	111	4644	1.63
480	2.95	-	SS304	8	296.76	300.00	1001.57	4743	109	4634	1.63
481	2.95	-	SS304	8	296.78	300.00	1001.59	4858	132	4726	1.63
482	2.95	-	SS304	8	296.73	300.00	1001.58	4752	106	4646	1.58
483	2.95	-	SS304	8	296.76	300.00	1001.56	4819	115	4704	1.63
484	2.95	-	SS304	8	296.78	300.00	1001.58	4681	115	4566	1.61
485	2.95	-	SS304	8	296.76	300.00	1001.58	4749	128	4621	1.67
486	2.95	-	SS304	8	296.73	300.00	1001.60	4566	118	4448	1.64
487	2.95	-	SS304	8	296.73	300.00	1001.60	4741	118	4623	1.64
488	2.95	-	SS304	8	296.85	300.00	1001.60	4802	114	4688	1.59
489	2.95	-	SS304	8	296.79	300.00	1001.59	4819	108	4711	1.61
490	2.95	-	SS304	8	296.76	300.00	1001.60	4720	100	4620	1.65
491	2.95	-	SS304	8	296.75	300.00	1001.59	4737	125	4612	1.61
492	2.95	-	SS304	8	296.76	300.00	1001.58	4875	120	4755	1.63
493	2.95	-	SS304	8	296.67	300.00	1001.60	4763	113	4650	1.63
494	2.95	-	SS304	8	296.72	300.00	1001.60	4847	147	4700	1.62
495	2.95	-	SS304	8	296.74	300.00	1001.59	4630	110	4520	1.63
496	2.95	-	SS304	8	296.78	300.00	1001.59	4716	97	4619	1.66
497	4.46	5640	-	-	286.10	300.00	1001.64	8371	175	8196	1.63
498	-	-	-	-	299.58	300.00	No Fit	2	4	-2	NA
499	2.95	-	SS304	13	297.42	300.00	1001.58	3350	100	3250	1.63
500	2.95	-	SS304	13	297.45	300.00	1001.58	3326	95	3231	1.64
501	2.95	-	SS304	13	297.44	300.00	1001.63	3281	74	3207	1.64
502	2.95	-	SS304	13	297.44	300.00	1001.60	3201	110	3091	1.67
503	2.95	-	SS304	13	297.50	300.00	1001.57	3398	86	3312	1.61

Table A.4. 1001 keV data (continued)

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
504	2.95	-	SS304	13	297.45	300.00	1001.57	3382	95	3287	1.63
505	2.95	-	SS304	13	297.52	300.00	1001.60	3386	94	3292	1.58
506	2.95	-	SS304	13	297.45	300.00	1001.57	3294	86	3208	1.66
507	2.95	-	SS304	13	297.62	300.00	1001.59	3233	72	3161	1.59
508	2.95	-	SS304	13	297.56	300.00	1001.56	3383	104	3279	1.63
509	2.95	-	SS304	13	297.51	300.00	1001.60	3295	92	3203	1.66
510	2.95	-	SS304	13	297.48	300.00	1001.58	3369	84	3285	1.61
511	2.95	-	SS304	13	297.55	300.00	1001.57	3375	94	3281	1.70
512	2.95	-	SS304	13	297.49	300.00	1001.57	3271	85	3186	1.59
513	2.95	-	SS304	13	297.48	300.00	1001.57	3340	81	3259	1.58
514	2.95	-	SS304	13	297.53	300.00	1001.56	3389	88	3301	1.63
515	2.95	-	SS304	13	297.50	300.00	1001.60	3331	73	3258	1.66
516	2.95	-	SS304	13	297.52	300.00	1001.62	3320	93	3227	1.69
517	2.95	-	SS304	13	297.36	300.00	1001.58	3286	87	3199	1.65
518	2.95	-	SS304	13	297.55	300.00	1001.60	3386	89	3297	1.61
519	2.95	-	SS304	16	297.75	300.00	1001.64	2745	79	2666	1.57
520	2.95	-	SS304	16	297.88	300.00	1001.68	2811	83	2728	1.59
521	2.95	-	SS304	16	297.84	300.00	1001.64	2727	79	2648	1.63
522	2.95	-	SS304	16	297.89	300.00	1001.65	2752	64	2688	1.62
523	2.95	-	SS304	16	297.79	300.00	1001.62	2677	70	2607	1.59
524	2.95	-	SS304	16	297.81	300.00	1001.63	2806	83	2723	1.66
525	2.95	-	SS304	16	297.79	300.00	1001.62	2739	88	2651	1.61
526	2.95	-	SS304	16	297.78	300.00	1001.58	2687	77	2610	1.61
527	2.95	-	SS304	16	297.82	300.00	1001.59	2715	88	2627	1.61
528	2.95	-	SS304	16	297.85	300.00	1001.59	2701	93	2608	1.71
529	2.95	-	SS304	16	297.82	300.00	1001.59	2695	71	2624	1.64
530	2.95	-	SS304	16	297.80	300.00	1001.55	2797	75	2722	1.63
531	2.95	-	SS304	16	297.83	300.00	1001.54	2730	72	2658	1.75
532	2.95	-	SS304	16	297.78	300.00	1001.53	2651	75	2576	1.66
533	2.95	-	SS304	16	297.78	300.00	1001.53	2720	69	2651	1.70
534	2.95	-	SS304	16	297.78	300.00	1001.56	2810	78	2732	1.68
535	2.95	-	SS304	16	297.73	300.00	1001.52	2759	78	2681	1.64
536	2.95	-	SS304	16	297.76	300.00	1001.51	2685	72	2613	1.63
537	2.95	-	SS304	16	297.85	300.00	1001.52	2851	63	2788	1.69
538	2.95	-	SS304	16	297.79	300.00	1001.53	2740	78	2662	1.61
539	4.46	5640	-	-	286.19	300.00	1001.54	8275	201	8074	1.61
540	-	-	-	-	299.51	300.00	No Fit	5	4	1	NA
541	0.31	-	SS304	16	186973.77	188323.77	1001.55	1749236	49693	1699543	1.65
542	4.46	5640	-	-	286.20	300.00	1001.68	8327	216	8111	1.61
543	-	-	-	-	299.52	300.00	No Fit	1	0	1	NA
544	1.94	-	-	-	294.96	300.00	1001.65	8489	190	8299	1.63
545	1.94	-	-	-	294.83	300.00	1001.64	8199	156	8043	1.64
546	1.94	-	-	-	294.89	300.00	1001.65	8283	174	8109	1.61

Table A.4. 1001 keV data (continued)

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
547	1.94	-	-	-	294.90	300.00	1001.65	8372	207	8165	1.62
548	1.94	-	-	-	294.94	300.00	1001.66	8381	179	8202	1.64
549	1.94	-	-	-	294.89	300.00	1001.66	8387	168	8219	1.61
550	1.94	-	-	-	294.87	300.00	1001.64	8350	183	8167	1.60
551	1.94	-	-	-	294.93	300.00	1001.64	8449	165	8284	1.62
552	1.94	-	-	-	294.92	300.00	1001.65	8424	180	8244	1.65
553	1.94	-	-	-	294.88	300.00	1001.64	8474	181	8293	1.68
554	1.94	-	-	-	294.88	300.00	1001.65	8442	166	8276	1.62
555	1.94	-	-	-	294.85	300.00	1001.64	8539	185	8354	1.61
556	1.94	-	-	-	294.92	300.00	1001.66	8413	146	8267	1.62
557	1.94	-	-	-	294.81	300.00	1001.66	8266	169	8097	1.66
558	1.94	-	-	-	294.90	300.00	1001.65	8413	176	8237	1.59
559	1.94	-	-	-	294.94	300.00	1001.65	8306	159	8147	1.61
560	1.94	-	-	-	294.91	300.00	1001.66	8526	207	8319	1.62
561	1.94	-	-	-	294.90	300.00	1001.65	8340	203	8137	1.66
562	1.94	-	-	-	294.88	300.00	1001.65	8400	209	8191	1.59
563	1.94	-	-	-	294.87	300.00	1001.64	8328	182	8146	1.62
564	1.94	-	SS304	8	296.75	300.00	1001.66	4760	132	4628	1.63
565	1.94	-	SS304	8	296.89	300.00	1001.63	4784	107	4677	1.66
566	1.94	-	SS304	8	296.83	300.00	1001.63	4727	106	4621	1.57
567	1.94	-	SS304	8	296.85	300.00	1001.64	4808	114	4694	1.63
568	1.94	-	SS304	8	296.87	300.00	1001.62	4656	112	4544	1.67
569	1.94	-	SS304	8	296.87	300.00	1001.62	4869	128	4741	1.67
570	1.94	-	SS304	8	296.73	300.00	1001.62	4777	118	4659	1.61
571	1.94	-	SS304	8	296.78	300.00	1001.62	4705	113	4592	1.63
572	1.94	-	SS304	8	296.87	300.00	1001.63	4810	142	4668	1.62
573	1.94	-	SS304	8	296.84	300.00	1001.63	4752	111	4641	1.63
574	1.94	-	SS304	8	296.85	300.00	1001.61	4787	113	4674	1.64
575	1.94	-	SS304	8	296.89	300.00	1001.63	4848	116	4732	1.63
576	1.94	-	SS304	8	296.80	300.00	1001.62	4886	111	4775	1.60
577	1.94	-	SS304	8	296.84	300.00	No Fit	4742	123	4619	NA
578	1.94	-	SS304	8	296.83	300.00	1001.63	4785	118	4667	1.63
579	1.94	-	SS304	8	296.87	300.00	1001.62	4863	115	4748	1.64
580	1.94	-	SS304	8	296.93	300.00	1001.65	4800	135	4665	1.62
581	1.94	-	SS304	8	296.93	300.00	1001.60	4611	108	4503	1.66
582	1.94	-	SS304	8	296.82	300.00	1001.61	4650	138	4512	1.55
583	1.94	-	SS304	8	296.90	300.00	1001.64	4630	112	4518	1.66
584	4.46	5640	-	-	286.14	300.00	1001.68	8344	194	8150	1.65
585	-	-	-	-	299.55	300.00	No Fit	4	3	1	NA
586	1.94	-	SS304	13	297.48	300.00	1001.66	3330	96	3234	1.59
587	1.94	-	SS304	13	297.50	300.00	1001.65	3413	83	3330	1.66
588	1.94	-	SS304	13	297.51	300.00	1001.64	3419	94	3325	1.64
589	1.94	-	SS304	13	297.53	300.00	1001.64	3361	108	3253	1.51

Table A.4. 1001 keV data (continued)

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
590	1.94	-	SS304	13	297.53	300.00	1001.68	3297	98	3199	1.63
591	1.94	-	SS304	13	297.49	300.00	1001.67	3361	88	3273	1.56
592	1.94	-	SS304	13	297.50	300.00	1001.64	3343	74	3269	1.63
593	1.94	-	SS304	13	297.58	300.00	1001.65	3432	96	3336	1.61
594	1.94	-	SS304	13	297.57	300.00	No Fit	3365	112	3253	NA
595	1.94	-	SS304	13	297.57	300.00	1001.65	3501	100	3401	1.66
596	1.94	-	SS304	13	297.58	300.00	1001.66	3421	92	3329	1.63
597	1.94	-	SS304	13	297.62	300.00	1001.67	3366	96	3270	1.59
598	1.94	-	SS304	13	297.50	300.00	1001.64	3325	91	3234	1.62
599	1.94	-	SS304	13	297.50	300.00	1001.65	3348	87	3261	1.60
600	1.94	-	SS304	13	297.41	300.00	1001.64	3398	90	3308	1.64
601	1.94	-	SS304	13	297.50	300.00	1001.64	3255	94	3161	1.63
602	1.94	-	SS304	13	297.60	300.00	1001.65	3366	95	3271	1.65
603	1.94	-	SS304	13	297.53	300.00	1001.63	3366	94	3272	1.65
604	1.94	-	SS304	13	297.48	300.00	1001.63	3356	85	3271	1.62
605	1.94	-	SS304	13	297.50	300.00	1001.68	3357	77	3280	1.61
606	1.94	-	SS304	16	297.82	300.00	1001.67	2722	79	2643	1.70
607	1.94	-	SS304	16	297.90	300.00	1001.65	2690	74	2616	1.63
608	1.94	-	SS304	16	297.83	300.00	1001.65	2634	65	2569	1.65
609	1.94	-	SS304	16	297.85	300.00	1001.62	2731	66	2665	1.63
610	1.94	-	SS304	16	297.87	300.00	1001.66	2759	60	2699	1.72
611	1.94	-	SS304	16	297.87	300.00	1001.70	2743	78	2665	1.55
612	1.94	-	SS304	16	297.89	300.00	1001.67	2738	76	2662	1.64
613	1.94	-	SS304	16	297.84	300.00	1001.63	2682	67	2615	1.66
614	1.94	-	SS304	16	297.88	300.00	1001.66	2776	85	2691	1.60
615	1.94	-	SS304	16	297.81	300.00	No Fit	2775	74	2701	NA
616	1.94	-	SS304	16	297.89	300.00	1001.64	2775	77	2698	1.66
617	1.94	-	SS304	16	297.86	300.00	1001.64	2737	85	2652	1.68
618	1.94	-	SS304	16	297.88	300.00	1001.69	2784	69	2715	1.67
619	1.94	-	SS304	16	297.90	300.00	1001.64	2726	71	2655	1.66
620	1.94	-	SS304	16	297.83	300.00	1001.68	2645	88	2557	1.73
621	1.94	-	SS304	16	297.91	300.00	1001.70	2775	66	2709	1.64
622	1.94	-	SS304	16	297.81	300.00	1001.68	2761	76	2685	1.69
623	1.94	-	SS304	16	297.82	300.00	1001.67	2769	81	2688	1.74
624	1.94	-	SS304	16	297.88	300.00	1001.65	2712	80	2632	1.62
625	1.94	-	SS304	16	297.84	300.00	1001.69	2728	86	2642	1.62
626	4.46	5640	-	-	286.25	300.00	1001.70	8389	180	8209	1.65
627	-	-	-	-	299.45	300.00	No Fit	1	3	-2	NA
628	0.31	-	-	-	27058.44	27508.07	1001.65	788774	17209	771565	1.64
629	4.46	5640	-	-	286.25	300.00	1001.66	8120	189	7931	1.62
630	-	-	-	-	299.55	300.00	No Fit	2	1	1	NA
631	0.71	-	-	-	295.06	300.00	1001.65	8663	189	8474	1.65
632	0.71	-	-	-	295.06	300.00	1001.65	8587	167	8420	1.66

Table A.4. 1001 keV data (continued)

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
633	0.71	-	-	-	295.10	300.00	1001.65	8623	223	8400	1.65
634	0.71	-	-	-	295.13	300.00	1001.64	8490	196	8294	1.63
635	0.71	-	-	-	295.04	300.00	1001.65	8378	186	8192	1.61
636	0.71	-	-	-	295.18	300.00	1001.65	8661	185	8476	1.62
637	0.71	-	-	-	295.10	300.00	1001.65	8614	203	8411	1.65
638	0.71	-	-	-	294.95	300.00	1001.65	8523	169	8354	1.69
639	0.71	-	-	-	295.10	300.00	1001.63	8702	192	8510	1.63
640	0.71	-	-	-	295.02	300.00	1001.63	8596	168	8428	1.66
641	0.71	-	-	-	295.12	300.00	1001.64	8657	188	8469	1.58
642	0.71	-	-	-	295.05	300.00	1001.66	8674	186	8488	1.61
643	0.71	-	-	-	295.00	300.00	1001.65	8457	193	8264	1.61
644	0.71	-	-	-	295.08	300.00	1001.66	8558	176	8382	1.63
645	0.71	-	-	-	295.07	300.00	1001.65	8522	188	8334	1.67
646	0.71	-	-	-	295.13	300.00	1001.64	8405	202	8203	1.63
647	0.71	-	-	-	295.08	300.00	1001.65	8495	175	8320	1.62
648	0.71	-	-	-	295.05	300.00	1001.66	8477	155	8322	1.64
649	0.71	-	-	-	295.12	300.00	1001.64	8661	185	8476	1.64
650	0.71	-	-	-	295.06	300.00	1001.65	8532	203	8329	1.64
651	0.71	-	SS304	8	296.89	300.00	1001.65	4861	112	4749	1.54
652	0.71	-	SS304	8	296.90	300.00	1001.65	4968	111	4857	1.71
653	0.71	-	SS304	8	296.88	300.00	1001.63	4932	119	4813	1.60
654	0.71	-	SS304	8	296.81	300.00	1001.64	4763	137	4626	1.60
655	0.71	-	SS304	8	296.87	300.00	1001.62	4865	103	4762	1.65
656	0.71	-	SS304	8	296.92	300.00	1001.65	4781	123	4658	1.59
657	0.71	-	SS304	8	296.86	300.00	1001.66	4818	131	4687	1.60
658	0.71	-	SS304	8	296.99	300.00	No Fit	4879	122	4757	NA
659	0.71	-	SS304	8	296.81	300.00	1001.64	4903	129	4774	1.60
660	0.71	-	SS304	8	296.89	300.00	1001.65	4857	116	4741	1.60
661	0.71	-	SS304	8	296.83	300.00	1001.64	4970	108	4862	1.65
662	0.71	-	SS304	8	296.90	300.00	1001.66	4982	122	4860	1.61
663	0.71	-	SS304	8	296.88	300.00	1001.65	4824	139	4685	1.58
664	0.71	-	SS304	8	296.97	300.00	1001.65	4774	125	4649	1.64
665	0.71	-	SS304	8	296.90	300.00	1001.65	4679	120	4559	1.61
666	0.71	-	SS304	8	296.93	300.00	1001.66	4779	126	4653	1.66
667	0.71	-	SS304	8	296.96	300.00	1001.63	4891	112	4779	1.60
668	0.71	-	SS304	8	296.97	300.00	1001.66	4827	119	4708	1.67
669	0.71	-	SS304	8	296.84	300.00	1001.64	4830	119	4711	1.70
670	0.71	-	SS304	8	296.86	300.00	1001.65	4839	136	4703	1.63
671	4.46	5640	-	-	286.29	300.00	1001.70	8424	182	8242	1.64
672	-	-	-	-	299.61	300.00	1001.62	7	2	5	5.28
673	0.71	-	SS304	13	297.49	300.00	1001.66	3371	106	3265	1.67
674	0.71	-	SS304	13	297.57	300.00	1001.65	3418	104	3314	1.60
675	0.71	-	SS304	13	297.58	300.00	1001.66	3435	88	3347	1.67

Table A.4. 1001 keV data (continued)

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
676	0.71	-	SS304	13	297.54	300.00	1001.67	3482	116	3366	1.63
677	0.71	-	SS304	13	297.55	300.00	1001.65	3451	83	3368	1.65
678	0.71	-	SS304	13	297.65	300.00	1001.65	3465	87	3378	1.66
679	0.71	-	SS304	13	297.58	300.00	1001.64	3391	94	3297	1.59
680	0.71	-	SS304	13	297.59	300.00	1001.65	3480	90	3390	1.64
681	0.71	-	SS304	13	297.65	300.00	1001.63	3403	91	3312	1.60
682	0.71	-	SS304	13	297.54	300.00	1001.67	3426	98	3328	1.63
683	0.71	-	SS304	13	297.54	300.00	1001.65	3410	96	3314	1.59
684	0.71	-	SS304	13	297.65	300.00	1001.65	3620	89	3531	1.55
685	0.71	-	SS304	13	297.52	300.00	1001.65	3394	93	3301	1.59
686	0.71	-	SS304	13	297.54	300.00	1001.65	3455	85	3370	1.65
687	0.71	-	SS304	13	297.69	300.00	1001.67	3437	79	3358	1.71
688	0.71	-	SS304	13	297.49	300.00	1001.67	3414	96	3318	1.64
689	0.71	-	SS304	13	297.58	300.00	1001.67	3445	79	3366	1.65
690	0.71	-	SS304	13	297.56	300.00	1001.66	3449	99	3350	1.64
691	0.71	-	SS304	13	297.48	300.00	1001.67	3396	94	3302	1.64
692	0.71	-	SS304	13	297.57	300.00	1001.66	3368	100	3268	1.63
693	0.71	-	SS304	16	297.96	300.00	1001.63	2801	82	2719	1.61
694	0.71	-	SS304	16	297.91	300.00	No Fit	2755	72	2683	NA
695	0.71	-	SS304	16	297.85	300.00	1001.65	2801	70	2731	1.63
696	0.71	-	SS304	16	297.79	300.00	1001.62	2875	82	2793	1.66
697	0.71	-	SS304	16	297.87	300.00	1001.63	2758	68	2690	1.69
698	0.71	-	SS304	16	297.93	300.00	No Fit	2769	79	2690	NA
699	0.71	-	SS304	16	297.82	300.00	1001.61	2848	92	2756	1.72
700	0.71	-	SS304	16	297.80	300.00	1001.68	2795	85	2710	1.66
701	0.71	-	SS304	16	297.85	300.00	1001.66	2748	90	2658	1.67
702	0.71	-	SS304	16	297.93	300.00	1001.68	2863	83	2780	1.63
703	0.71	-	SS304	16	297.93	300.00	1001.63	2895	81	2814	1.62
704	0.71	-	SS304	16	297.91	300.00	1001.63	2828	80	2748	1.67
705	0.71	-	SS304	16	298.00	300.00	1001.63	2739	79	2660	1.67
706	0.71	-	SS304	16	297.89	300.00	1001.68	2788	77	2711	1.65
707	0.71	-	SS304	16	297.91	300.00	1001.66	2794	75	2719	1.56
708	0.71	-	SS304	16	297.89	300.00	1001.68	2828	80	2748	1.70
709	0.71	-	SS304	16	297.90	300.00	1001.64	2800	86	2714	1.63
710	0.71	-	SS304	16	297.86	300.00	1001.69	2764	61	2703	1.64
711	0.71	-	SS304	16	297.89	300.00	1001.66	2766	81	2685	1.63
712	0.71	-	SS304	16	297.86	300.00	1001.69	2744	60	2684	1.64
713	4.46	5640	-	-	286.26	300.00	1001.70	8288	203	8085	1.65
714	-	-	-	-	299.50	300.00	No Fit	1	1	0	NA
715	1.94	-	-	-	4446.65	4524.07	1001.67	127299	2787	124512	1.63
716	1.94	-	AIR	8	4456.60	4526.13	1001.68	109354	2266	107088	1.64
717	0.31	-	AIR	16	27070.70	27429.78	1001.69	578511	11781	566730	1.62
718	4.46	5640	-	-	286.21	300.00	1001.70	8418	180	8238	1.65

Table A.4. 1001 keV data (continued)

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
719	-	-	-	-	299.61	300.00	No Fit	3	0	3	NA
720	0.31	-	-	-	295.13	300.00	1001.68	8668	193	8475	1.63
721	0.31	-	-	-	295.00	300.00	1001.68	8498	171	8327	1.69
722	0.31	-	-	-	295.11	300.00	1001.68	8437	168	8269	1.61
723	0.31	-	-	-	295.22	300.00	1001.69	8436	170	8266	1.58
724	0.31	-	-	-	295.06	300.00	1001.68	8601	185	8416	1.60
725	0.31	-	-	-	295.07	300.00	1001.69	8520	220	8300	1.66
726	0.31	-	-	-	295.15	300.00	1001.68	8587	187	8400	1.64
727	0.31	-	-	-	295.11	300.00	1001.69	8543	176	8367	1.65
728	0.31	-	-	-	295.13	300.00	1001.68	8564	210	8354	1.63
729	0.31	-	-	-	295.16	300.00	1001.67	8647	175	8472	1.64
730	0.31	-	-	-	295.14	300.00	1001.66	8513	197	8316	1.65
731	0.31	-	-	-	295.11	300.00	1001.69	8414	180	8234	1.61
732	0.31	-	-	-	295.13	300.00	1001.68	8443	195	8248	1.64
733	0.31	-	-	-	295.00	300.00	1001.68	8641	208	8433	1.66
734	0.31	-	-	-	295.15	300.00	1001.67	8444	181	8263	1.62
735	0.31	-	-	-	295.04	300.00	1001.68	8650	147	8503	1.64
736	0.31	-	-	-	295.06	300.00	1001.69	8548	215	8333	1.65
737	0.31	-	-	-	295.09	300.00	1001.68	8602	203	8399	1.65
738	0.31	-	-	-	295.12	300.00	1001.66	8595	185	8410	1.68
739	0.31	-	-	-	295.16	300.00	1001.66	8498	206	8292	1.60
740	0.31	-	SS304	8	296.93	300.00	1001.67	4929	122	4807	1.58
741	0.31	-	SS304	8	296.84	300.00	1001.67	4839	131	4708	1.61
742	0.31	-	SS304	8	296.89	300.00	1001.68	4874	139	4735	1.58
743	0.31	-	SS304	8	296.87	300.00	1001.66	4881	112	4769	1.63
744	0.31	-	SS304	8	296.86	300.00	1001.70	4917	137	4780	1.63
745	0.31	-	SS304	8	296.79	300.00	1001.69	4934	110	4824	1.64
746	0.31	-	SS304	8	296.96	300.00	1001.66	4932	122	4810	1.61
747	0.31	-	SS304	8	296.87	300.00	1001.65	4764	127	4637	1.68
748	0.31	-	SS304	8	296.91	300.00	1001.65	4898	108	4790	1.70
749	0.31	-	SS304	8	296.91	300.00	1001.67	4835	110	4725	1.65
750	0.31	-	SS304	8	296.85	300.00	1001.67	4932	118	4814	1.65
751	0.31	-	SS304	8	296.97	300.00	1001.68	4779	115	4664	1.61
752	0.31	-	SS304	8	296.95	300.00	1001.68	4911	133	4778	1.65
753	0.31	-	SS304	8	296.84	300.00	1001.66	4826	109	4717	1.62
754	0.31	-	SS304	8	296.94	300.00	1001.66	4850	115	4735	1.59
755	0.31	-	SS304	8	296.89	300.00	1001.67	4887	94	4793	1.61
756	0.31	-	SS304	8	296.96	300.00	1001.67	4879	132	4747	1.67
757	0.31	-	SS304	8	296.92	300.00	1001.69	4864	128	4736	1.66
758	0.31	-	SS304	8	296.93	300.00	1001.66	4998	121	4877	1.63
759	0.31	-	SS304	8	296.92	300.00	1001.68	4958	101	4857	1.65
760	4.46	5640	-	-	286.26	300.00	1001.71	8122	188	7934	1.61
761	-	-	-	-	299.40	300.00	No Fit	1	1	0	NA

Table A.4. 1001 keV data (continued)

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
762	0.31	-	SS304	13	297.60	300.00	1001.67	3490	100	3390	1.63
763	0.31	-	SS304	13	297.69	300.00	1001.65	3587	85	3502	1.62
764	0.31	-	SS304	13	297.60	300.00	1001.66	3485	88	3397	1.61
765	0.31	-	SS304	13	297.55	300.00	1001.66	3477	90	3387	1.62
766	0.31	-	SS304	13	297.52	300.00	1001.67	3472	87	3385	1.61
767	0.31	-	SS304	13	297.60	300.00	1001.66	3481	85	3396	1.68
768	0.31	-	SS304	13	297.49	300.00	1001.66	3422	75	3347	1.61
769	0.31	-	SS304	13	297.54	300.00	1001.65	3440	89	3351	1.61
770	0.31	-	SS304	13	297.64	300.00	1001.68	3457	92	3365	1.61
771	0.31	-	SS304	13	297.52	300.00	1001.65	3412	79	3333	1.62
772	0.31	-	SS304	13	297.56	300.00	1001.66	3479	87	3392	1.65
773	0.31	-	SS304	13	297.62	300.00	1001.68	3500	96	3404	1.59
774	0.31	-	SS304	13	297.61	300.00	1001.67	3457	87	3370	1.61
775	0.31	-	SS304	13	297.56	300.00	1001.64	3353	100	3253	1.61
776	0.31	-	SS304	13	297.48	300.00	1001.67	3352	95	3257	1.55
777	0.31	-	SS304	13	297.59	300.00	1001.65	3363	94	3269	1.67
778	0.31	-	SS304	13	297.52	300.00	1001.68	3446	78	3368	1.60
779	0.31	-	SS304	13	297.52	300.00	1001.67	3444	97	3347	1.58
780	0.31	-	SS304	13	297.61	300.00	1001.69	3342	96	3246	1.62
781	0.31	-	SS304	13	297.60	300.00	1001.67	3449	91	3358	1.61
782	0.31	-	SS304	16	297.89	300.00	1001.65	2754	85	2669	1.61
783	0.31	-	SS304	16	297.84	300.00	1001.64	2755	78	2677	1.60
784	0.31	-	SS304	16	297.88	300.00	1001.71	2841	93	2748	1.73
785	0.31	-	SS304	16	297.84	300.00	1001.69	2814	84	2730	1.60
786	0.31	-	SS304	16	297.93	300.00	1001.64	2738	94	2644	1.55
787	0.31	-	SS304	16	297.87	300.00	1001.66	2729	86	2643	1.66
788	0.31	-	SS304	16	297.89	300.00	1001.64	2800	79	2721	1.65
789	0.31	-	SS304	16	297.90	300.00	1001.66	2835	77	2758	1.54
790	0.31	-	SS304	16	297.96	300.00	1001.65	2779	77	2702	1.61
791	0.31	-	SS304	16	297.96	300.00	1001.65	2713	70	2643	1.63
792	0.31	-	SS304	16	297.91	300.00	1001.66	2811	82	2729	1.60
793	0.31	-	SS304	16	297.91	300.00	1001.64	2789	89	2700	1.76
794	0.31	-	SS304	16	297.86	300.00	1001.68	2770	73	2697	1.62
795	0.31	-	SS304	16	297.92	300.00	1001.68	2745	73	2672	1.73
796	0.31	-	SS304	16	297.89	300.00	1001.67	2804	76	2728	1.67
797	0.31	-	SS304	16	297.84	300.00	1001.68	2725	84	2641	1.74
798	0.31	-	SS304	16	297.86	300.00	1001.68	2758	100	2658	1.53
799	0.31	-	SS304	16	297.79	300.00	1001.68	2809	78	2731	1.58
800	0.31	-	SS304	16	297.93	300.00	1001.68	2727	71	2656	1.69
801	0.31	-	SS304	16	297.96	300.00	1001.67	2858	86	2772	1.62
802	4.46	5640	-	-	286.18	300.00	1001.70	8278	185	8093	1.60
803	-	-	-	-	299.63	300.00	No Fit	3	2	1	NA
804	0.71	-	AIR	13	1075.38	1090.28	No Fit	24278	521	23757	NA

Table A.4. 1001 keV data (continued)

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
805	0.31	-	AIR	13	26855.04	27224.93	1001.68	607210	12759	594451	1.64
806	4.46	5640	-	-	286.46	300.00	1001.73	8269	186	8083	1.63
807	-	-	-	-	299.58	300.00	No Fit	2	2	0	NA
808	1.94	-	AIR	13	4398.21	4462.21	1001.69	97188	2046	95142	1.66
809	1.94	-	SS304	13	21155.66	21329.17	1001.70	239740	6478	233262	1.66
810	4.46	5640	-	-	286.28	300.00	1001.73	8347	177	8170	1.65
811	-	-	-	-	299.56	300.00	No Fit	4	2	2	NA
812	0.31	-	AIR	8	27027.36	27425.86	1001.72	674058	13983	660075	1.64
813	4.46	5640	-	-	286.25	300.00	1001.76	8424	181	8243	1.63
814	-	-	-	-	299.60	300.00	No Fit	2	4	-2	NA
815	1.94	-	AIR	16	4453.92	4516.31	1001.74	93113	1940	91173	1.64
816	1.94	-	SS304	8	11525.53	11647.90	1001.75	186635	4696	181939	1.64
817	0.31	5640	-	-	287.01	300.00	1001.79	8297	183	8114	1.68
818	-	-	-	-	299.57	300.00	No Fit	1	3	-2	NA
819	2.95	-	SS304	8	7536.57	7617.50	1001.72	120491	3027	117464	1.64
820	4.46	-	SS304	8	5027.20	5084.36	1001.70	83049	2094	80955	1.65
821	4.46	5640	-	-	286.31	300.00	1001.73	8350	206	8144	1.65
822	-	-	-	-	299.61	300.00	No Fit	5	3	2	NA
823	0.71	-	SS304	13	58237.57	58707.32	1001.70	667947	17980	649967	1.63
824	4.46	5640	-	-	286.21	300.00	1001.71	8297	200	8097	1.64
825	-	-	-	-	299.62	300.00	No Fit	4	3	1	NA
826	2.95	-	SS304	13	14107.57	14224.58	1001.68	159001	4229	154772	1.65
827	0.31	5640	-	-	286.91	300.00	1001.71	8228	185	8043	1.66
828	-	-	-	-	299.58	300.00	999.78	2	3	-1	3.15
829	4.46	-	SS304	16	13427.47	13527.53	1001.68	126185	3570	122615	1.65
830	4.46	5640	-	-	286.39	300.00	1001.73	8447	184	8263	1.60
831	-	-	-	-	299.65	300.00	No Fit	1	2	-1	NA
832	4.46	-	SS304	13	-	-	-	-	-	-	-
833	2.95	-	-	-	2900.46	2951.67	1001.69	81928	1831	80097	1.62
834	2.95	-	AIR	8	2950.26	2997.18	1001.69	71353	1495	69858	1.67
835	2.95	-	AIR	13	2924.09	2968.10	1001.69	64467	1271	63196	1.62
836	2.95	-	AIR	16	2919.32	2961.63	1001.70	60456	1258	59198	1.64
837	4.46	5640	-	-	286.26	300.00	1001.71	8215	201	8014	1.67
838	-	-	-	-	299.59	300.00	1000.88	5	1	4	4.30
839	-	-	-	-	43138.69	43200.00	1001.22	297	297	0	1.26
840	4.46	5640	-	-	286.30	300.00	1001.69	8327	171	8156	1.65
841	-	-	-	-	299.60	300.00	No Fit	3	1	2	NA
842	4.46	5640	-	-	286.21	300.00	1002.18	8136	174	7962	1.61
843	-	-	-	-	299.57	300.00	No Fit	1	2	-1	NA
844	4.46	-	SS304	13	9318.68	9399.96	1001.98	106778	2984	103794	1.61
845	4.46	5640	-	-	286.07	300.00	1002.02	8252	166	8086	1.61
846	-	-	-	-	299.59	300.00	No Fit	2	2	0	NA
847	-	-	-	-	43134.16	43200.00	1001.50	291	271	20	1.83

Table A.4. 1001 keV data (continued)

ID#	nom. enrichment [wt%]	Cs137	atten. material	nom. atten. thickness [mm]	live time [s]	real time [s]	centroid energy [keV]	integral area [c]	BG area [c]	peak area [c]	FWHM [keV]
848	4.46	5640	-	-	286.05	300.00	1002.03	8210	183	8027	1.68
849	-	-	-	-	299.54	300.00	No Fit	2	2	0	NA

APPENDIX B. LOW ENRICHED URANIUM (LEU) STANDARDS CERTIFICATE

APPENDIX B. LOW ENRICHED URANIUM (LEU) STANDARDS CERTIFICATE

U. S. Department of Commerce
Malcolm Baldrige
Secretary

National Bureau of Standards
Ernest Ambler, Director

National Bureau of Standards

Certificate

Standard Reference Material 969

Uranium Isotopic Standard Reference Material

for Gamma Spectrometry Measurements

(In Cooperation with the Commission of the European Communities, Central Bureau for Nuclear Measurements, Geel, Belgium, and the U.S. Department of Energy, New Brunswick Laboratory, Argonne, Illinois.)

This Standard Reference Material (SRM) is intended for use in the calibration and evaluation of gamma-ray counting procedures for the nondestructive determination of the $^{235}U/U$ isotope abundance in uranium bulk materials. SRM 969 consists of a set of five different U_3O_8 powders, with nominal ^{235}U abundances of 0.31, 0.71, 1.94, 2.95, and 4.46 mass percent, encased in aluminum cans that have been manufactured to rigid specifications (See attached specifications) and thoroughly tested. In addition an empty can is provided for use when measuring uranium materials of unknown ^{235}U abundances. SRM 969 was prepared as a set to permit measurement of materials containing uranium by using the theoretically expected linear relationship between ^{235}U abundance and the counting rate of the 185.7 keV gamma-ray of ^{235}U. Each SRM subunit is made up of 200 g of U_3O_8 powder. Since SRM 969 consists of 5 different containers, and each is unique in dimensions, the attached data sheets should be used with the specified container number. Individual data sheets are provided for each set along with the certificate.

The certified $^{235}U/U$ isotope abundances are shown in Table 1. The isotope abundances for $^{234}U/U$, $^{236}U/U$, and $^{238}U/U$ are given in Table 2.

Table 1

Certified $^{235}U/U$ Abundances in SRM 969

Material ID:	031	071	194	295	446
Atom Percent:	0.3206 ±0.0002	0.7209 ±0.0005	1.9664 ±0.0014	2.9857 ±0.0021	4.5168 ±0.0032
Mass Percent	0.3166 ±0.0002	0.7119 ±0.0005	1.9420 ±0.0014	2.9492 ±0.0021	4.4623 ±0.0032

Statement of Uncertainty

The overall uncertainty of the $^{235}U/U$ abundance of each individual reference sample was estimated by combining the different uncertainty components from the mass spectrometry measurements and the $^{235}U/U$ homogeneity. The resulting values were conservatively enlarged to 0.07% to include other possible measurement errors.

Isotope Certification: The uranium isotopic abundances were determined by thermal ionization mass spectrometry (THIMS) at the National Bureau of Standards (NBS) and by uranium hexafluoride mass spectrometry (UF_6 MS) and THIMS at the Central Bureau of Nuclear Measurements (CBNM). These measurements were corrected for mass discrimination effects relative to NBS uranium isotopic SRM's or synthetic isotope mixtures.

Additional measurements supporting the certification were made by the U.S. Department of Energy, New Brunswick Laboratory (NBL), using THIMS and by NBS using gamma spectrometry (see summary of the final results in Table 3).

Measurements by Gamma Spectrometry: The isotope abundance measurements and verification by gamma spectrometry were performed at NBS and CBNM utilizing the 185.7 keV gamma-ray of ^{235}U. All measurements were made using a high-resolution germanium detector. The heterogeneity of the $^{235}U/U$ in each SRM subunit is $\leq 0.05\%$ relative.

June 27, 1985
Gaithersburg, MD 20899

Stanley D. Rasberry, Chief
Office of Standard Reference Materials

(over)

Table 2. $^{234}U/U$, $^{236}U/U$ and $^{238}U/U$, Abundances in SRM 969

Material	Uranium Isotopes		
	$^{234}U/U$	$^{236}U/U$	$^{238}U/U$
031 atom	0.0020	0.0147	99.6627
2s	±0.0002	±0.0003	± 0.0004
mass	0.0020	0.0146	99.6668
071 atom	0.0053	<0.00002	99.2738
2s	±0.0002		± 0.0004
mass	0.0052	<0.00002	99.2828
194 atom	0.0174	0.0003	98.0159
2s	±0.0002	±0.0001	± 0.0018
mass	0.0171	0.0003	98.0406
295 atom	0.0284	0.0033	96.9826
2s	±0.0004	±0.0002	± 0.0029
mass	0.0279	0.0033	97.0196
446 atom	0.0365	0.0069	95.4398
2s	±0.0003	±0.0002	± 0.0032
mass	0.0359	0.0068	95.4950

Measurements leading to the development and certification of this SRM were made at NBS in the Inorganic Analytical Research Division by B.S. Carpenter, J.W. Gramlich, R.R. Greenberg, and L.A. Machlan; at CBNM by E. Bouwmeester, R. Damen, P. De Bièvre, W. De Bolle, H.L. Eschbach, R. Eyckens, M. Gallet, W. Lycke, H. Meyer, G. Müschenborn, W. Nagel, F. Quik, and J. Van Audenhove; at U.S. Department of Energy New Brunswick Laboratory (NBL), by V.E. Connolly and A.C. Zook in the Safeguards Assessment and Reference Materials Branch.

The sampling plan used for the certification measurements was developed by W. Liggett, NBS Center for Applied Mathematics. The statistical assessment of the data used for the certification of this SRM was performed by R. Werz, CBNM.

The overall scope and coordination of the technical measurements leading to certification were performed by B.S. Carpenter, NBS, and P. De Bièvre, CBNM.

The technical and support aspects concerning the preparation, certification, and issuance of this Standard Reference Material were coordinated through the Office of Standard Reference Materials by T.E. Gills.

Supplemental Information

Description of SRM 969

The uranium oxides used for this SRM are from the same lots of material used and jointly certified by CBNM and NBS to produce this SRM and the Certified Nuclear Reference Material (EC NRM 171) for the Commission of European Communities.

For unique identification and for checking the integrity of the subunit, the plugs used for sealing the cans are equipped with ultrasonic seals, each having a unique ultrasonic spectrum.

Parameters that are of special interest for abundance measurements by gamma spectrometry are summarized below:

Chemical Purity of the U_3O_8

Material:	U_3O_8 powder
Total impurities:	<0.05 mass% of U_3O_8 content
Moisture content:	<0.3 mass% of U_3O_8 content

Uranium Minor Isotopes (that could interfere with gamma spectrometry measurements)

(Note: Data is presented as a ratio of the minor isotope gamma-ray line intensity to ^{235}U gamma-ray line intensity)

Material ID	$^{232}U/^{235}U$	$^{233}U/^{235}U$	$(^{237}U + ^{237}Np)/^{235}U$	Chemical Separation Date
031	$8x10^{-10}$	$<5x10^{-5}$	$<3x10^{-6}$	1977
071	$<0.3x10^{-10}$	$<5x10^{-5}$	$<3x10^{-6}$	1977
194	$0.3x10^{-10}$	$<5x10^{-5}$	$<3.10^{-6}$	1977
295	$0.1x10^{-10}$	$<5x10^{-5}$	$<3x10^{-6}$	1977
446	$1x10^{-10}$	$<5x10^{-5}$	$<3x10^{-6}$	1979

U_3O_8 Filling Information

Material ID	Mass (g)	Filling Height (mm)	Diameter (mm)	U_3O_8 Density (g/cm^2)
031	200.1 ±0.2	20.8 ± 0.5	70.00	5.2 ± 0.3
071	200.1 ±0.2	20.8 ± 0.5	70.00	5.2 ± 0.3
194	200.1 ±0.2	20.8 ± 0.5	70.00	5.2 ± 0.3
295	200.1 ±0.2	20.8 ± 0.5	70.00	5.2 ± 0.3
446	200.1 ±0.2	15.8 ± 0.5	70.00	5.2 ± 0.3

Container Material Characteristics and Specifications

Container Material:	Aluminum type 6061 (ASTM-GS T6)			
	(All containers manufactured from the same base material)			
Constituent Elements: (in Base Material, Wt.%)	Mg	0.8 - 1.2	Zn ≤0.25	U ≤0.00025
	Si	0.4 - 0.8	Ti ≤0.15	Mn ≤0.15
	Cu	0.15 - 0.4	Fe ≤0.7	
	Cr	0.04 - 0.35	Total other Elements <0.15	

Container dimensions: See attached specifications

Use of SRM 969

Ideally, physical materials used for the evaluation of nondestructive measurements should be representative of the unknown samples with respect to all parameters that influence the measurement. One of the most crucial factors in gamma spectrometry is the strong attenuation of the gamma ray in the sample material itself and in the sample container. This attenuation is generally influenced by parameters such as sample size, shape, material density, and matrix composition. In addition, characteristics such as container material, wall thicknesses and container size can also influence attenuation.

SRM 969 is ideally suited for use with U_3O_8 materials contained in aluminum cans with 2mm bottom wall thickness. To be useful in the calibration of assay systems using other types of uranium samples, correction factors are needed. These factors are intended to normalize the gamma-ray response with respect to differences in both the matrix composition and the container. Typical correction factors are given in a special user's manual (Report KfK 3752(1984)) that has been prepared to facilitate the correct use of SRM 969 and EC NRM 171. Note: The attenuation correction factors given are based on theoretical values for photon cross sections. They represent a possible source of systematic error for those cases where the required corrections are large. Therfore, the correction given and the range of application should be experimentally validated to eliminate possible systematic errors from the gamma spectrometry abundance measurements.

Because the enrichment meter principle is based on the assumption that a sample is "quasi-infinitely thick" for the 185.7 keV gamma ray, the application of the method is inherently restricted to relatively large samples. About 200 g of unknown material is required when standard containers, with 7cm diameter, are used. For many applications it may be desirable to have reference samples that both physically and chemically differ from SRM 969. These reference samples can be calibrated against SRM 969.

Notice and Warnings

Container: The aluminum cans for SRM 969 have numbers engraved in the cylindrical wall. The numbering system on each can reflects the nominal isotope abundance of ^{235}U in mass percent and a sequence number. The cans within a set should have the same sequence number.

SRM 969 should be handled with great care to avoid any damage or deformation to the bottoms of the cans, since the bottoms serve as a window for the emitted gamma radiation. A special transport and storage case is supplied with this SRM.

Identification: A unique tamperproof system, making use of an ultrasonic "fingerprint" identification device, has been placed into the plug of each can.

Documentation

An NBS Special Publication, 260-96, and a European Commission Publication COM 4153, have been issued describing the preparation and characterization of this SRM, and should be used in conjunction with SRM 969/EC NRM 171. An additional User's Guide has been prepared and published as report KfK 3752.

Storage

The SRM subunits should be stored above −10 °C and below 40 °C.

Table 3. Summary of $^{235}U/U$ Isotope Abundance Measurements, in atom percent with 2s uncertainties, by Method and Laboratory

Material ID Laboratory/Method	031	071	194	295	446
CBNM-UF6	0.32049 ±0.00016	0.72096 ±0.00017	1.96575 ±0.00037	2.98432 ±0.00048	4.51668 ±0.00075
CBNM-THIMS	0.32061 ±0.00047	0.72119 ±0.00098	1.9675 ±0.0017	2.9875 ±0.0039	4.5201 ±0.0052
NBS-THIMS	0.32076 ±0.00052	0.72069 ±0.00068	1.9664 ±0.0017	2.9869 ±0.0022	4.5138 ±0.0033
NBL-THIMS	0.3203 ±0.0007	0.7207 ±0.0007	1.9657 ±0.0015	2.9843 ±0.0039	4.5162 ±0.0039
NBS-Gamma	0.32053 ±0.00026	0.72081 ±0.00058	1.9660 ±0.0016	2.9830 ±0.0024	4.5158 ±0.0036

NBS Standard Reference Material 969

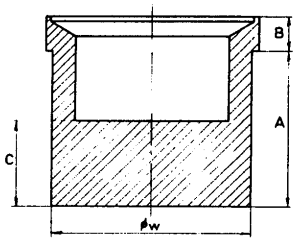
^{235}Uranium Isotope Abundance certified Reference Material

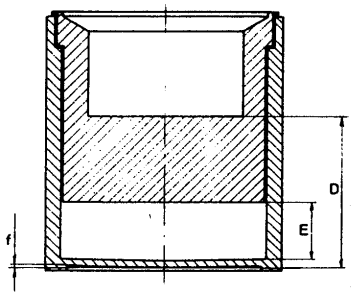
for Gamma Spectrometry

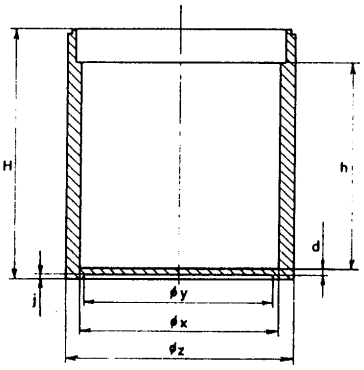
Can dimensions and U_3O_8 mass

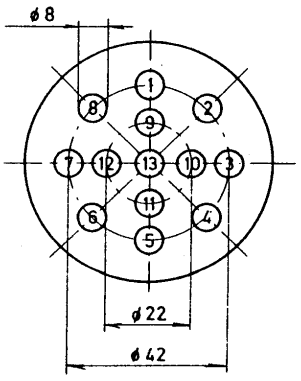
Container N°:	NBS - 078
Tot. Mass U_3O_8:	-
A :	54.19 mm
B :	11.99
C :	29.99
ϕ_W:	69.88
d :	1.996
H :	88.98
h :	86.99
j :	1.00
ϕ_X:	70.03
ϕ_Y:	66.0
ϕ_Z:	79.99
D :	-
E :	-
f :	≤0.1

Bottom thickness : 1	1.998 mm
2	1.996
3	1.993
4	2.004
5	1.995
6	2.002
7	2.001
8	1.997
9	1.991
10	1.991
11	1.993
12	1.995
13	2.008
$\bar{x}_{13}$	1.997
$\bar{s}_{13}$	0.005
$\bar{x}_5$	1.996
$\bar{s}_5$	0.007









NBS Standard Reference Material 969

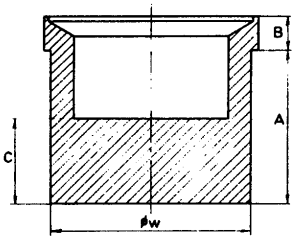
^{235}Uranium Isotope Abundance certified Reference Material

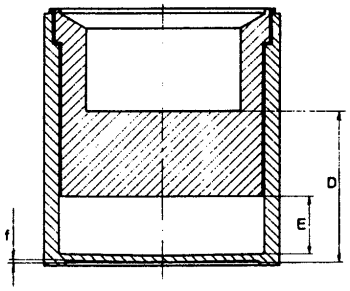
for Gamma Spectrometry

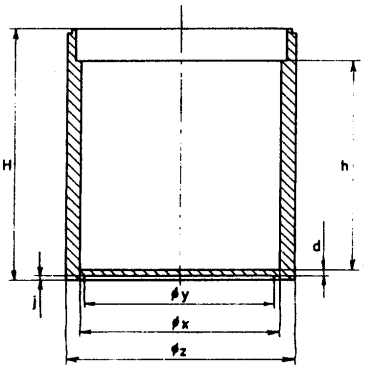
Can dimensions and U_3O_8 mass

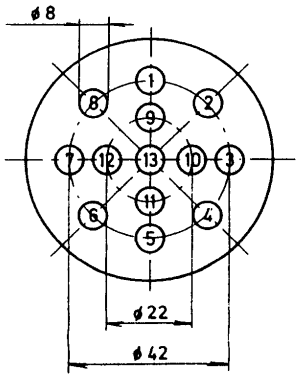
Container N° :	NBS 031-078
Tot. Mass U_3O_8 :	(200.1 ± 0.2)g
A :	54.21 mm
B :	11.97
C :	30.00
ϕ_W :	69.87
d :	1.996
H :	89.02
h :	87.00
j :	1.02
ϕ_X :	70.04
ϕ_Y :	66.0
ϕ_Z :	80.00
D :	52.80
E :	20.80
f :	<0.1

Bottom thickness : 1	2.009 mm
2	2.012
3	2.013
4	2.013
5	2.014
6	2.015
7	2.011
8	2.014
9	1.988
10	1.994
11	1.993
12	1.991
13	2.013
$\bar{x}_{13}$	2.006
$\bar{s}_{13}$	0.010
$\bar{x}_5$	1.996
$\bar{s}_5$	0.010









NBS Standard Reference Material 969

^{235}Uranium Isotope Abundance certified Reference Material

for Gamma Spectrometry

Can dimensions and U_3O_8 mass

Container N°: NBS 071-078

Tot. Mass U_3O_8: (200.1 ± 0.2)g

A : 54.19 mm

B : 11.99

C : 30.00

ϕ_W: 69.88

d : 1.996

H : 88.98

h : 87.00

j : 1.02

ϕ_X: 70.03

ϕ_Y: 66.0

ϕ_Z: 79.97

D : 52.81

E : 20.81

f : ⩽0.1

Bottom thickness : 1 2.005 mm

2 1.999

3 2.004

4 2.000

5 2.011

6 2.006

7 2.003

8 2.007

9 1.994

10 1.990

11 1.990

12 1.993

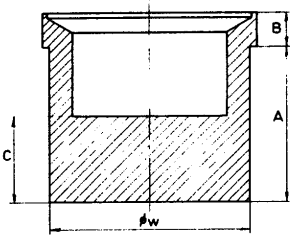
13 2.013

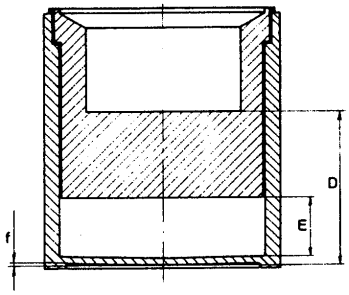
$\bar{x}_{13}$ 2.001

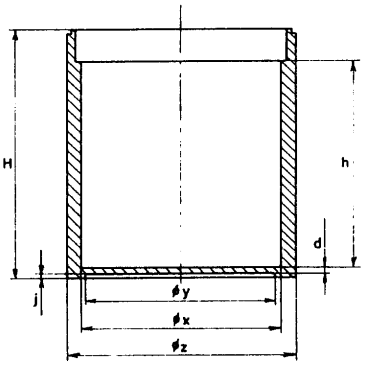
$\bar{s}_{13}$ 0.008

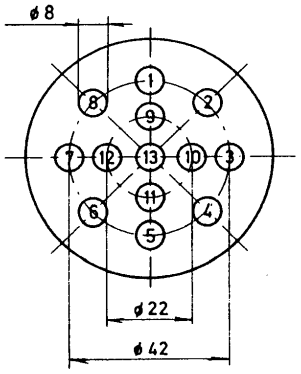
$\bar{x}_5$ 1.996

$\bar{s}_5$ 0.010









NBS Standard Reference Material 969

^{235}Uranium Isotope Abundance certified Reference Material

for Gamma Spectrometry

Can dimensions and U_3O_8 mass

Container N°: NBS 194 - 078
Tot. Mass U_3O_8: (200.1 ± 0.2)g
A : 54.19 mm
B : 12.00
C : 30.00
ϕ_W: 69.87

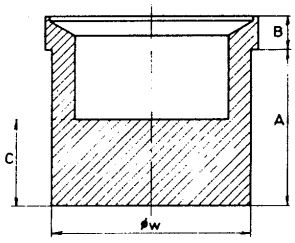
d : 1.996
H : 88.98
h : 86.98
j : 1.02
ϕ_X: 70.03
ϕ_Y: 66.0
ϕ_Z: 79.99

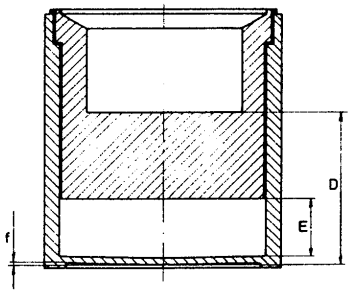
D : 52.77
E : 20.77
f : <0.1

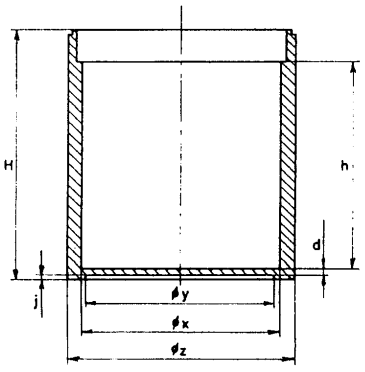
Bottom thickness : 1 2.008 mm
2 2.011
3 2.005
4 2.004
5 2.014
6 2.009
7 2.017
8 2.011
9 1.994
10 1.993
11 1.991
12 1.995
13 2.009

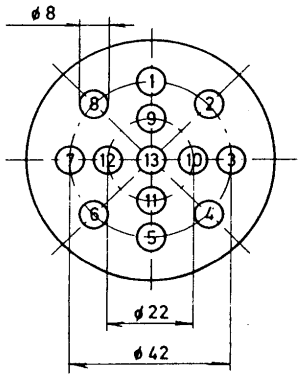
$\bar{x}_{13}$ 2.005
$\bar{s}_{13}$ 0.009

$\bar{x}_5$ 1.996
$\bar{s}_5$ 0.007









NBS Standard Reference Material 969

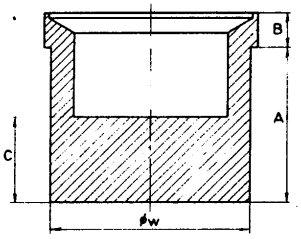
^{235}Uranium Isotope Abundance certified Reference Material

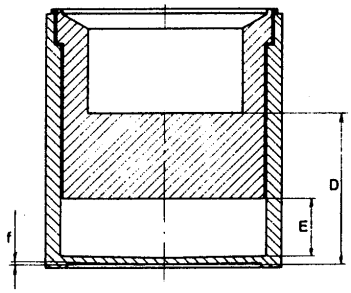
for Gamma Spectrometry

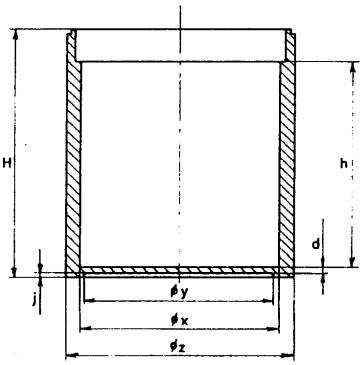
Can dimensions and U_3O_8 mass

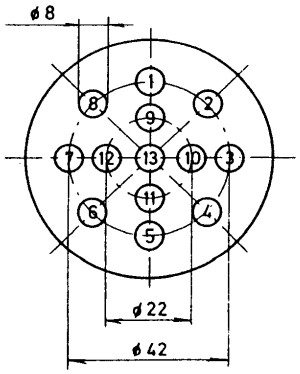
Container N°:	NBS 295 - 078
Tot. Mass U_3O_8:	(200.1 ± 0.2)g
A :	54.19 mm
B :	11.98
C :	30.00
ϕ_W:	69.89
d :	1.997
H :	88.98
h :	86.99
j :	1.02
ϕ_X:	70.03
ϕ_Y:	66.0
ϕ_Z:	79.97
D :	52.79
E :	20.79
f :	⩽0.1

Bottom thickness : 1	1.999 mm
2	1.992
3	2.008
4	1.997
5	2.005
6	1.996
7	2.000
8	1.999
9	1.996
10	1.999
11	1.995
12	1.992
13	2.005
$\bar{x}_{13}$	1.999
$\bar{s}_{13}$	0.005
$\bar{x}_5$	1.997
$\bar{s}_5$	0.005









NBS Standard Reference Material 969

^{235}Uranium Isotope Abundance certified Reference Material

for Gamma Spectrometry

Can dimensions and U_3O_8 mass

NDA-U_3O_8 RM programme.

Container N°: NBS 446 - 078

Tot. Mass U_3O_8: (200.1 ± 0.2)g

A : 54.19 mm

B : 12.01

C : 35.01

ϕ_W: 69.87

d : 1.996

H : 88.98

h : 87.00

j : 1.04

ϕ_X: 70.03

ϕ_Y: 66.0

ϕ_Z: 79.99

D : 52.81

E : 15.80

f : ≤0.1

Bottom thickness :

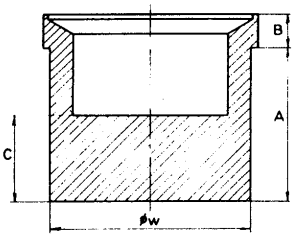
1	1.992 mm
2	2.002
3	2.003
4	2.003
5	2.006
6	1.996
7	1.988
8	1.996
9	1.992
10	1.994
11	1.997
12	1.990
13	2.006

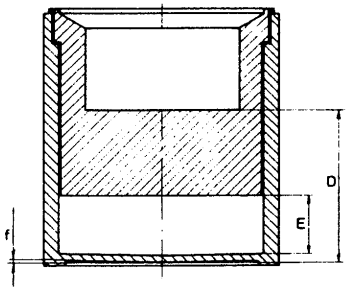
$\bar{x}_{13}$ 1.997

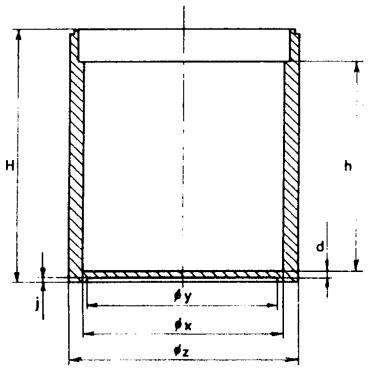
$\bar{s}_{13}$ 0.006

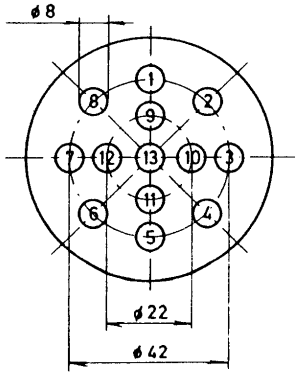
$\bar{x}_5$ 1.996

$\bar{s}_5$ 0.006









APPENDIX C. HIGHLY ENRICHED URANIUM (HEU) STANDARDS CERTIFICATE

APPENDIX C. HIGHLY ENRICHED URANIUM (HEU) STANDARDS CERTIFICATE

U.S. Department of Energy
New Brunswick Laboratory

New Brunswick Laboratory Certified Reference Material Certificate of Analysis

CRM 146

Uranium Isotopic Standard For Gamma Spectrometry Measurements

Table I. ^{235}U Isotopic Abundance
Certified Values

Can Identification	NBL 0001	NBL 0002	NBL 0003
^{235}U Atom Fraction (x 100)	20.311 ± 0.020	52.800 ± 0.042	93.2330 ± 0.0053
^{235}U Mass Fraction (x 100)	20.107 ± 0.020	52.488 ± 0.042	93.1703 ± 0.0052

The last figure in the reported values and their uncertainties is provided for information purposes only and is not intended to convey a significant degree of reliability.

This Certified Reference Material (CRM) is primarily intended for use in the calibration and evaluation of gamma-ray counting procedures for the nondestructive determination of ^{235}U isotopic abundance in uranium bulk material. Each set of CRM 146 consists of three sealed aluminum cans and one unsealed empty can. Each sealed can is filled with approximately 230 grams of U_3O_8 powder with nominal ^{235}U isotopic abundances of 20%, 53% and 93%. The cans were manufactured to specific dimensions and each can has a unique engraved identification number and a paper label indicating the nominal ^{235}U isotopic abundance. The certified ^{235}U atom and mass fraction values are listed in Table I. The New Brunswick Laboratory (NBL) prepared CRM 146 as a set to permit measurement of uranium-bearing materials by using the theoretically expected linear relationship between ^{235}U isotopic abundance and the counting rate of the 185.7 keV gamma-ray from ^{235}U. Appropriate correction factors must be applied for calibration of assay systems used to measure other types of uranium samples and containers. Additional material properties are certified and the values provided in Table II for use with other nondestructive assay (NDA) techniques. Table III contains supplemental information; these values are not certified.

NOTE: The CRM 146 set should be stored and handled under proper radiologically-controlled conditions at all times. The cans should be handled with great care to avoid any damage or deformation to the bottoms of the cans, since the bottoms serve as a window for the emitted gamma radiation.

July 30, 1999
Argonne, Illinois

Margaret E.M. Tolbert
Laboratory Director

NBL CRM 146 can be used with NBL CRM 969 (formerly NBS SRM 969) to extend the calibration range for uranium isotopic enrichment measurements from depleted (0.32% ^{235}U) to highly enriched uranium (93% ^{235}U). The National Bureau of Standards (NBS; now the National Institute of Standards and Technology) issued NBS Standard Reference Material (SRM) 969 in June 1985. NBS SRM 969 was produced in cooperation with the Commission of the European Communities Central Bureau for Nuclear Measurement (now the Institute for Reference Materials and Measurements), Geel, Belgium and the U.S. Department of Energy New Brunswick Laboratory, Argonne, Illinois (see Reference).

Lockheed Martin Energy Systems Y-12 Plant, Oak Ridge, Tennessee, provided the source materials for the preparation of CRM 146. NBL accepted the materials based on available analytical data and process knowledge from Y-12. The materials were packaged into aluminum cans at NBL. The CRM 146 cans were packed to a sufficient density to assure that they would meet the "infinitely thick" criteria. NDA tests performed on each set showed a linear correlation coefficient greater than 0.999, indicating that the criterion was met.

The uranium isotopic compositions and their molar masses were determined by thermal ionization mass spectrometry. Uranium isotopic ratio measurements were performed by two analysts each using a different mass spectrometer. Mass discrimination correction factors applied to measured CRM 146 isotopic ratios were determined from multiple analyses of matching NBL Uranium Isotopic Standards (CRM U200, CRM U500 or CRM U930-D), run sequentially with CRM 146 materials. NBL CRM U500, Uranium Isotopic Standard (50% enriched), was used as a control to verify proper performance of the measurement system. No measurable ^{233}U was detected in CRM 146. The following nuclide masses were used in calculations: ^{234}U – 234.0409447, ^{235}U – 235.0439222, ^{236}U – 236.0455610, and ^{238}U – 238.0507835. The uranium mass fraction was determined by the NBL Titrimetric Method (Modified Davies and Gray Titrimetric Method) using potassium dichromate as the titrant. The uranium equivalency of the potassium dichromate titrant was determined by titrating against NBL CRM 112-A, Uranium Metal Assay Standard. CRM 112-A was also used to verify proper performance of the measurement systems. Uranium assay measurements were performed by two analysts each using independent titration systems. The U_3O_8 mass in each can of CRM 146 was determined using a 2-place balance. The balance was monitored through the laboratory balance control program and checked during the packaging of the cans for accuracy and linearity by using calibrated and traceable mass standards.

The expanded uncertainty (U) for a certified property of CRM 146 defines a confidence interval around the value of the property. The magnitude of U is obtained by multiplying the combined standard uncertainty, u_c, by a coverage factor, k. The coverage factor is the Student's t factor based on the effective degrees of freedom to provide a 95% level of confidence. The combined standard uncertainties for uranium isotopic abundances consist of Type A components derived from standard deviations associated with isotopic ratio measurements and Type B components which are based on the standard uncertainties taken from the certified values of the NBL Uranium Isotopic Standards. Uncertainties for the minor isotopic abundances (^{234}U and ^{236}U) and ratios ($^{234}U/^{238}U$ and $^{236}U/^{238}U$) are augmented to accommodate possible bias in the measurement of small signal intensities by including the repeatability of the NBL Uranium Isotopic Standard measurements corrected for mass discrimination and the associated uncertainties of these standards. The combined standard uncertainty for the uranium mass fraction consists of Type A components derived from standard deviations associated with sample and standard measurements. The combined standard uncertainty for the U_3O_8 mass in each can consists of Type A components derived from standard deviations associated with repeated weighings of traceable mass standards and components due to the difference in the measured and reference values taken from the certificate of calibration for the mass standards.

Table II. Additional Certified Values

Can Identification	NBL 0001	NBL 0002	NBL 0003
^{234}U Atom Fraction (x 100)	0.15076 ± 0.00037	0.3756 ± 0.0011	0.9849 ± 0.0029
^{234}U Mass Fraction (x 100)	0.14861 ± 0.00037	0.3718 ± 0.0010	0.9800 ± 0.0029
^{236}U Atom Fraction (x 100)	0.1985 ± 0.0013	0.26495 ± 0.00060	0.2927 ± 0.0022
^{236}U Mass Fraction (x 100)	0.1973 ± 0.0013	0.26451 ± 0.00060	0.2937 ± 0.0022
^{238}U Atom Fraction (x 100)	79.339 ± 0.020	46.560 ± 0.043	5.4895 ± 0.0053
^{238}U Mass Fraction (x 100)	79.547 ± 0.020	46.876 ± 0.043	5.5559 ± 0.0053
$^{234}U/^{238}U$ Atom Ratio	0.0019002 ± 0.0000050	0.008067 ± 0.000028	0.17942 ± 0.00058
$^{235}U/^{238}U$ Atom Ratio	0.25601 ± 0.00031	1.1340 ± 0.0020	16.984 ± 0.017
$^{236}U/^{238}U$ Atom Ratio	0.002501 ± 0.000016	0.005691 ± 0.000013	0.05332 ± 0.00038
Molar Mass of Uranium (g/mol)	237.43002 ± 0.00060	236.4428 ± 0.0012	235.20204 ± 0.00017
Uranium Mass Fraction (x 100)	84.553 ± 0.019	84.286 ± 0.030	84.519 ± 0.074
U_3O_8 Mass (grams)	229.99 ± 0.10	229.93 ± 0.10	230.04 ± 0.10
^{235}U Mass (grams)	39.10 ± 0.04	101.72 ± 0.10	181.15 ± 0.12

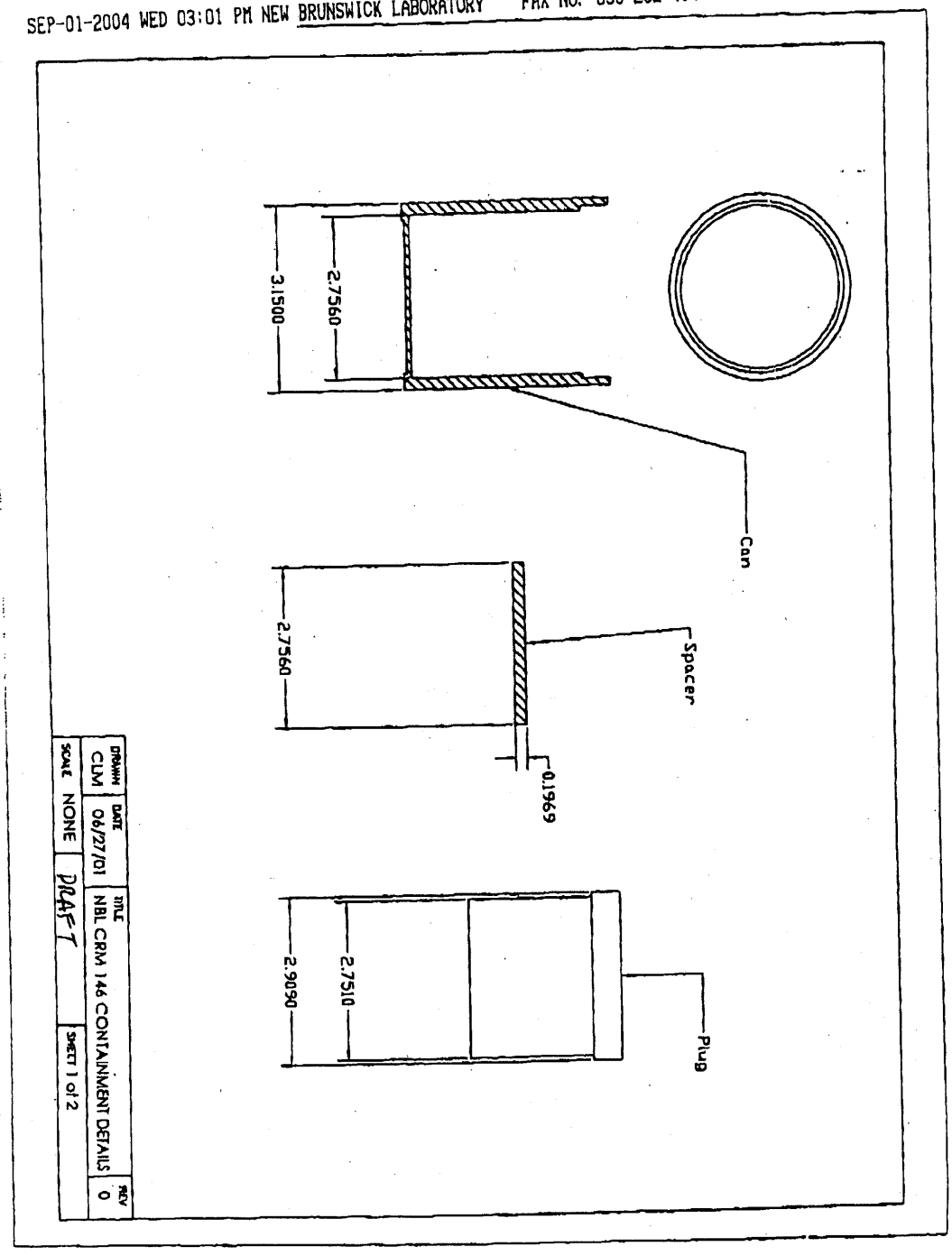
The last figure in the reported values and their uncertainties is provided for information purposes only and is not intended to convey a significant degree of reliability.

Table III. Supplemental Information
(Values Not Certified)

Can Identification	NBL 0001	NBL 0002	NBL 0003
Aluminum Window Thickness (mm)	1.994 ± 0.0052	1.994 ± 0.0052	1.994 ± 0.0052
Can Inner Diameter (mm) (0.01mm tolerance)	70.00	70.00	70.00
Material Fill Height (mm)	15.8	15.8	15.8
U_3O_8 Surface Density (g/cm^2)	5.98	5.98	5.98
U_3O_8 Density (g/cm^3)	3.78	3.78	3.78
Moisture Content in U_3O_8	Insignificant	< 0.05%	Insignificant
Volatile Substances in U_3O_8	< 0.2%	< 0.3%	Insignificant
Detectable Elemental Impurities in U_3O_8 (µg/g)	456	143	310
Chemical Separation Date	1990	1990	1990

David T. Baran served as project leader for packaging the material and Anna M. Voeks served as project leader for certification measurements. Kimberly Johnson-Miller, Gary A. Sowell and Robert D. Oldham packaged the CRM cans. Alma V. Stiffin and Khalida Scheidelman prepared samples for analysis. Anthony J. Traina and Peter B. Mason performed the isotopic abundance measurements and Steven A. Goldberg provided the experimental design and assessed the isotopic data. Glennda J. Orlowicz and Iris W. Frank performed titrimetric assay measurements. Anna M. Voeks measured moisture content and total volatile substances. David T. Baran and Gary A. Sowell made gamma-ray spectrometry measurements. Francis P. Orlowicz provided health physics support. Elemental impurities were measured at BWX Technologies Naval Nuclear Fuel Division, Lynchburg, Virginia. Michael D. Soriano and Marianne M. Smith prepared the statistical sampling and analysis plan. Michael D. Soriano, Marianne M. Smith and David T. Baran assessed the data for certification. Usha I. Narayanan provided technical guidance for packaging, certification, and issuance of CRM 146. Robert D. Oldham, Wanda G. Mitchell and Jon W. Neuhoff supervised project work.

Reference: NBS Special Publication 260-96, "Standard Reference Materials: Uranium-235 Isotope Abundance Standard Reference Materials for Gamma Spectrometry Measurements," by B.S. Carpenter et.al., September 1986.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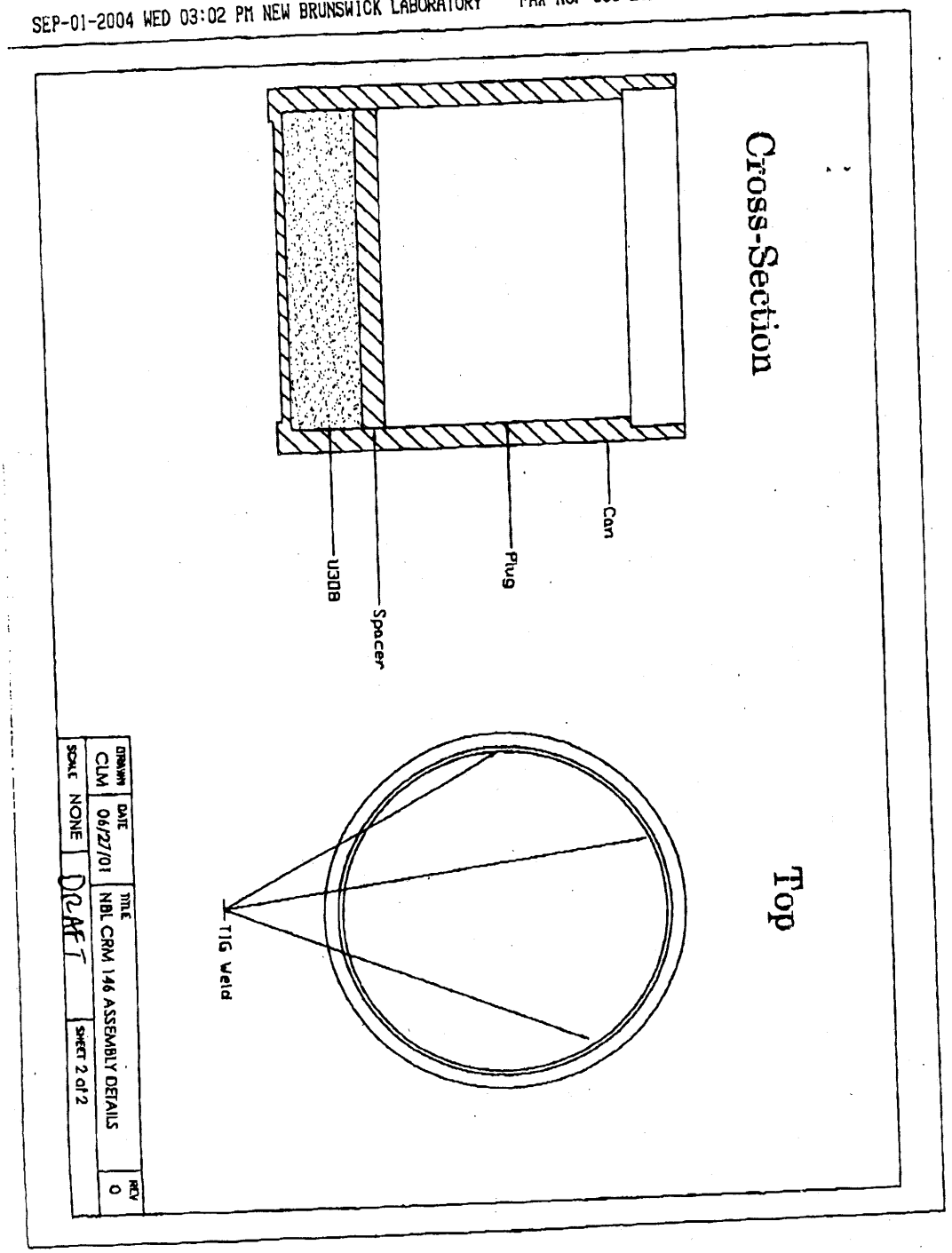
SHEET 1 of 2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SHEET 2 of 2

APPENDIX D. HIGH PURITY GERMANIUM (HPGE) DETECTOR CHARACTERISTICS

APPENDIX D. HIGH PURITY GERMANIUM (HPGE) DETECTOR CHARACTERISTICS

CANBERRA	Detector Specification and Performance Data	Doc. No.: DPF-009 Rev: D Date: 8/13/2009

Specifications

Detector Model	BE3825	Detector Serial Number	8509
Preamplifier Model	2002C	Preamp Serial Number	13000291
Cryostat Model	7935-7F/RDC	Order Number	12282

The purchase specifications, and therefore the warranted performance, of this detector are as follows:

Relative Efficiency		%	Active Volume	cc
Resolution	2.100	keV (FWHM) @ 1.33 MeV		
		keV (FWTM) @ 1.33 MeV		
	0.750	keV (FWHM) @ 122 keV		
	0.450	keV (FWHM) @ 5.9 keV		
Peak/Compton		:1		
Well diameter		mm	Well depth	mm

Cryostat description (if special) 3.5" Ø End Cap with 4" long Remote Detector Chamber

Physical Characteristics

Active diameter	70	mm	Active area	3800	mm^2
Length/Thickness	26	mm	Well diameter	---	mm
Distance from window	5	mm	Well depth	---	mm
Window thickness	0.6	mm	Active volume	---	cc
Window material	Carbon Composite				

Electrical Characteristics

Depletion voltage	(+)3500	V dc
Recommended bias voltage	(+)4000	V dc
Test point voltage at recommended bias	(-)0.96	V dc (RC preamp only)
Reset interval at recommended bias	---	sec. (Reset preamp only)
Capacitance at recommended bias	---	pF

Measured Performance

With amp time constant of 4 µS

Isotope	^{57}Co	^{60}Co	^{55}Fe	^{57}Co	^{109}Cd	^{109}Cd	^{109}Cd Ratio
Energy (keV)	122	1332	5.9	6.4*	22	88	22:88
FWHM (keV)	0.556	1.830	0.317				
FWTM (keV)	1.030	3.501					
Peak/Compton/Bkgd							
Efficiency %							

* Substitutes for ^{55}Fe in some cases where ^{55}Fe peaks are not well separated

Cool Down Time 6 Hrs LN_2 Loss Rate <1.5 $L/_D$ PRTD 28.2 Ω (cold)

Tested by: Daniel J. Archambault Date: 6/1/15

Approved by: Patty Elmer Date: 6/1/15

800 Research Parkway, Meriden, CT USA 06450 • Tel. 203-238-2351/Fax. 203-639-2420

Table D.1. ISOCS calibration parameters

```
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c,0.5,1.42, #
al,1.6,2.7, #
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cu,1.599,8.96, #
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cu,1.3,8.96, #
al,5.0,2.7
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