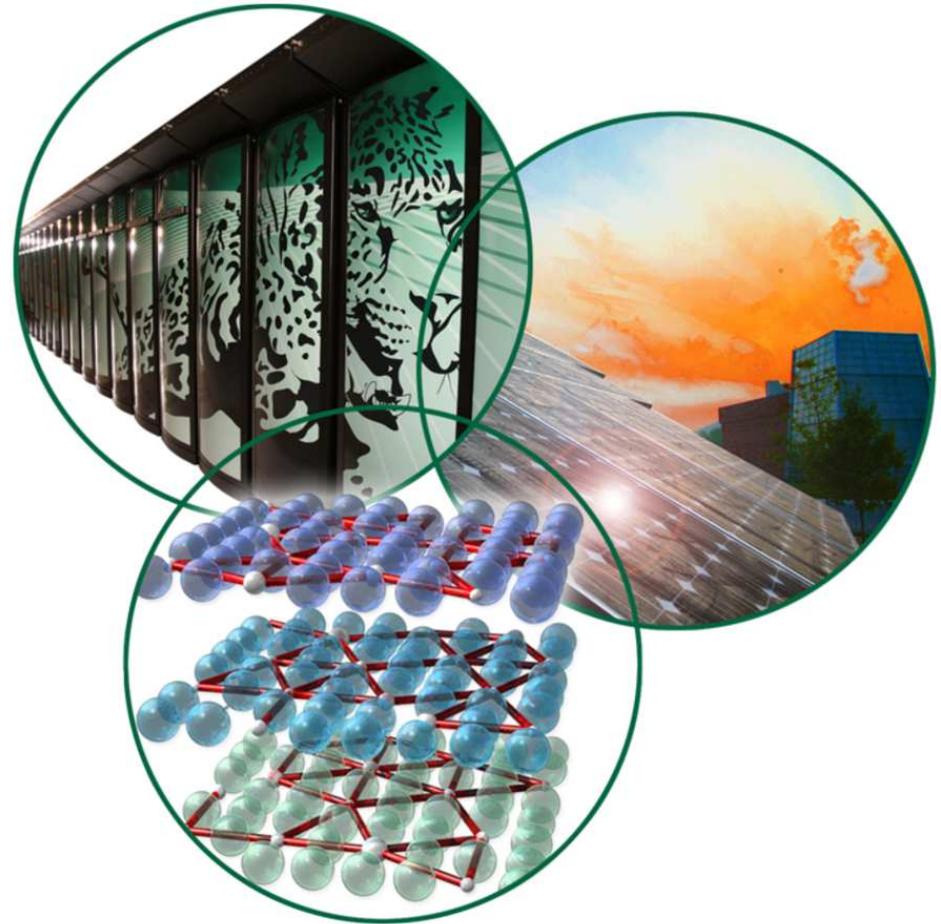


^{23}Na Cross-section Evaluation

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Nuclear Data & Criticality Safety



Outline

- **Outline**

- β -releases
- Comparison
- Validation
- Conclusions

- Summary of ^{23}Na cross-section evaluation in the β -releases of ENDF/B-VII.1
- ENDF/B-VII.0 evaluation versus new evaluation
- Summary and results of the validation procedure
- Status of the latest ^{23}Na cross-section evaluation
- The latest validation results (see presentation A. Trkov)

^{23}Na evaluation in the ENDF/B-VII.1 β -releases

- ENDF/B-VII.1 β_1 release:
 - ✓ New ^{23}Na evaluation submitted (validation results still on going)
 - Resolved Resonance Region (RRR) - close to ENDF/B-VII.0, most significant change in the rise of 2.8 keV resonance
 - Fast neutron region - close to ENDF/B-VII.0 up to 5-7 MeV, above most significant changes for (n,inl), (n,2n), (n,p), and (n, α)
- ENDF/B-VII.1 β_2 release:
 - ✓ No changes in the evaluation but validation results completed by INL first and BNL later
 - Validation results from INL (Hiruta, Palmiotti) indicate not improvements on ENDF/B-VII.0 evaluation
 - ✓ Change in RRR for 2.8 keV resonance and (n,e1) in fast neutron region
 - Validation results from BNL (Arcilla, Herman, Pigni) - using MCNP5 inputs from INL - indicate some improvements but any better than ENDF/B-VII.0 evaluation

^{23}Na evaluation in the ENDF/B-VII.1 β -releases

- ENDF/B-VII.1 β_1 release:
 - ✓ New ^{23}Na evaluation submitted (validation results still on going)
 - Resolved Resonance Region (RRR) - close to ENDF/B-VII.0, most significant change in the rise of 2.8 keV resonance
 - Fast neutron region - close to ENDF/B-VII.0 up to 5-7 MeV, above most significant changes for (n,inl), (n,2n), (n,p), and (n, α)
- ENDF/B-VII.1 β_2 release:
 - ✓ No changes in the evaluation but validation results completed by INL first and BNL later
 - Validation results from INL (Hiruta, Palmiotti) indicate not improvements on ENDF/B-VII.0 evaluation
 - ✓ Change in RRR for 2.8 keV resonance and (n,e1) in fast neutron region
 - Validation results from BNL (Arcilla, Herman, Pigni) - using MCNP5 inputs from INL - indicate some improvements but any better than ENDF/B-VII.0 evaluation

^{23}Na evaluation in the ENDF/B-VII.1 β -releases

- ENDF/B-VII.1 β_3 release:
 - ✓ ENDF/B-VII.0 evaluation restored in ENDF/B-VII.1 library
 - ✓ Validation results from JSI (Trkov) found discrepancies between previous validation results performed with INL inputs
 - ✓ Submitted a corrected ^{23}Na evaluation (Pigni) - RRR taken from ENDF/B-VII.0 and fast neutron region corrected for the (n,inl) channel
 - ✓ Validation results from BNL (Arcilla, Herman) and JSI (Trkov) for the corrected evaluation still on going

New evaluation Vs old evaluation till β_3 release

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Differences and improvements on cross-section between the new evaluation versus the old one

- Resolved Resonance Region taken from ATLAS (Mughabghab) with some corrections
- (n,inl) lowered to 200 mb at 20 MeV
- (n,2n) lowered to 10 mb ($E \gtrsim 12$ MeV)
- (n,p) and (n, α) taken from experiments up to 5-8 MeV. Improvements above $\gtrsim 10$ MeV
- Obvious differences in elastic scattering ≈ 7 MeV

Validation results (Arcilla, Herman, Pigni)

		Euracos $^{32}\text{S}(n,p)^{32}\text{P}$		
D (cm)	C/E	VII.0	VII.1 ²⁷	VII.1 ^{27m}
18.35		1.0000±8.08%	1.0000±8.08%	1.0000±8.07%
66.40		0.9285±8.09%	0.8583±8.09%	0.8626±8.08%
125.2		0.9238±8.10%	0.8375±8.12%	0.8269±8.09%
184.5		0.9700±8.29%	0.8594±8.29%	0.8598±8.28%
243.2		1.0481±8.29%	0.9403±8.29%	0.9426±8.28%
302.4		1.1274±8.29%	1.0481±8.29%	1.0454±8.29%
362.2		1.3796±16.05%	1.3365±16.05%	1.3500±16.05%

Validation results (Arcilla, Herman, Pigni)

Janus $^{32}\text{S}(n,p)^{32}\text{P}$				
C/E	VII.0	VII.1 ²⁷	VII.1 ^{27m}	
D (cm)				
25.08	1.0000±1.59%	1.0000±1.59%	1.0000±1.44%	
57.23	1.1175±1.62%	1.0425±1.63%	1.0384±1.45%	
118.64	1.2150±3.29%	1.0863±3.31%	1.0943±3.20%	
180.49	0.6945±1.81%	0.6096±1.82%	0.6093±1.74%	
243.35	0.6532±4.09%	0.5843±4.06%	0.5811±3.68%	

Validation results (Arcilla, Herman, Pigni)

		Euracos $^{197}\text{Au}(n,\gamma)^{198}\text{Au}$		
D (cm) \ C/E		VII.0	VII.1 ²⁷	VII.1 ^{27m}
18.35		1.0000±9.13%	1.0000±8.64%	1.0000±9.09%
66.40		0.9164±8.42%	0.9285±8.26%	0.9881±8.62%
125.2		0.8866±8.99%	1.0021±8.86%	0.9887±8.95%
184.5		1.0463±9.82%	1.0376±9.67%	1.0985±9.70%
243.2		1.1632±10.01%	1.2228±9.79%	1.2103±9.95%
302.4		1.2226±10.48%	1.2358±10.18%	1.2732±10.41%
362.2		1.1079±11.26%	1.2625±11.07%	1.1689±11.16%

Validation results (Arcilla, Herman, Pigni)

		Janus $^{197}\text{Au}(n,\gamma)^{198}\text{Au}$		
D (cm) \ C/E	VII.0	VII.1 ²⁷	VII.1 ^{27m}	
25.08	1.0000±10.69%	1.0000±11.04%	1.0000±2.57%	
57.23	1.0011±10.04%	1.1825±11.14%	1.0170±2.50%	
118.64	0.9647±9.77%	0.9918±10.04%	0.9498±2.49%	
180.49	1.0687±10.68%	1.0546±10.61%	0.9864±2.44%	
243.35	0.9927±9.00%	1.0755±9.30%	0.9850±2.42%	
305.75	0.9923±8.90%	1.0708±9.10%	0.9862±2.38%	

Conclusions

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- ✓ In β_3 release old Sodium evaluation was restored
- ✓ A corrected (closer to ENDF/B-VII.0) Sodium evaluation was submitted (Pigni)
- ✓ Analysis of Euracos Sodium benchmark experiment is still on going (Arcilla, Herman, Trkov)