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Measurement of Neutron Total Cross Section of 169Tm at Back-n

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The neutron total cross sections (σ tot) are of great value in nuclear reactor design, nuclear theory models, nuclear applications and other fields. Thulium (169Tm) is a crucial neutron absorbing material, and the σ tot of 169Tm are highly useful for nuclear reactor design. However, there are only a few experimental σ tot of 169Tm in EXFOR and no data in the energy between 10 keV and hundreds keV. Besides, the evaluated σ tot of 169Tm in ENDF/B-VIII.1, JENDL, and TENDL show significant discrepancies within the 10 keV and 100 keV energy region. To determine the σ tot of 169Tm in the energy between 10 keV and 100 keV, a wing-shaped lithium glass detector was designed in this work, and a measurement was carried out with this lithium glass scintillation detector at the Back-n facility. The experimental backgrounds induced by gamma rays were measured with lithium-7 enriched scintillator and "black resonance filter" method. The corrections for dead time, beam stability, and self-shielding were taken into consideration in the evaluated data from ENDF/B-VIII.1, JENDL, and TENDL. The comparison result indicated that the σ tot of 169Tm measured by this work is more consistent with the evaluated data of JENDL-5.

Primary authors: REN, Jie (China Institute of Atomic Energy); YANG, Haolan (China Institute of Atomic Energy); XUE, Jieming (China Institute of Atomic Energy)

Presenter: REN, Jie (China Institute of Atomic Energy)

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