

5 - 26 Measurement of Leakage Neutron Spectra from ^{238}U Slabs with D-T Neutrons and Validation of Nuclear Evaluation Data Libraries

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The accurate nuclear data for ^{238}U are of great importance in the design of the Accelerator-Driven Sub-critical Systems (ADS). An integral experiment was carried out at China Institute of Atomic Energy (CIAE) to measure the neutron spectra from pure Uranium-238 slabs with 14.8 MeV D-T neutrons using Time-of-Flight (TOF) Method. The leakage neutron spectra at 60° and 120° have been measured for different sizes of the slabs ($10\text{ cm}\times 10\text{ cm}\times 2\text{ cm}$, $10\text{ cm}\times 10\text{ cm}\times 5\text{ cm}$, and $10\text{ cm}\times 10\text{ cm}\times 11\text{ cm}$). The simulations with MCNP-4C code coupled with different nuclear evaluation data libraries (ENDF/B-VII.1, JENDL-4.0, CENDL-3.1, JEFF-3.2 and TENDL-2015) have been performed. Fig. 1 shows the comparison of measured and calculated leakage neutron energy spectra for 14.8 MeV neutron on the Uranium-238 sample in size of $10\text{ cm}\times 10\text{ cm}\times 2\text{ cm}$. It is found that JENDL-4.0 fitted the experimental data best.

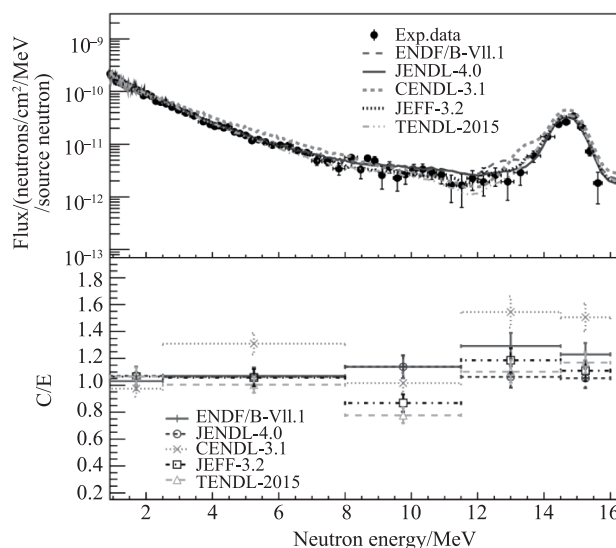


Fig. 1 Comparison of measured and calculated leakage neutron energy spectra for 14.8 MeV neutron on a ^{238}U sample ($10\text{ cm}\times 10\text{ cm}\times 2\text{ cm}$).

5 - 27 Study of Energy Spectra of Light Charged Particles from $^{12}\text{C} + ^{12}\text{C}$ at 95 AMeV with Moving Source Model

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The $^{12}\text{C} + ^{12}\text{C}$ reaction at 95 MeV/u was performed at GANIL ^[1], motivated by the hadron beam therapy with carbon ions to treat cancerous tumors. In Ref. [2] the angular distributions and energy spectra of the outgoing particles were compared with the reaction models embedded in the GEANT4 and none of the toolkits provide good enough reproductions of the experimental data. In order to reproduce the energy spectra and elucidate the production mechanism of LCPs, the moving source model was applied to analyze the energy spectra of light charged particles.

In the moving source model, three sources, projectile-like fragment (PLF), intermediate velocity (IV), and target-like fragment (TLF) sources^[3] are used to describe the energy spectra of LCPs particles. The IV source has a source velocity of about a half-projectile velocity and a harder slope, comparing to those of PLF and TLF. Each source has four parameters, multiplicity, energy slope (or temperature), Coulomb barrier, and source velocity. Typical results after optimizing these parameters for protons and ^4He particles at selected angles are shown in Fig. 1.

For ^4He particles on the right column, each source dominates at specific angle(s), i.e., PLF dominates at 11° , the IV source at 19° and TLF at 41° . For protons on the left, the dominance of each source at a given angle becomes