Study of Neutron Multiplicity in ^{232}Th (n,f) Reaction Using TALYS-1.96

Punit Dubey and Ajay Kumar

Banaras Hindu University, Varanasi, India

E-mail: punitdubey@bhu.ac.in

The nuclear scientific community views ^{232}Th as an option for fuel in the future nuclear energy program. Numerous experimental studies have been conducted to determine the cross-section; however, very few [1–3] have been performed to calculate the total neutron multiplicity above 10 MeV energy. In this work, we have compared the experimental data of average neutron multiplicity at different incident energies from EXFOR with the evaluated data from ENDF/B-VI, JENDL-4.0, and the calculated data from TALYS-1.96 [4], as shown in Fig. 1. The experimental data are in good agreement with the evaluated data from both the ENDF/B-VI and JENDL-4.0 libraries and at high incident energy (14.7 MeV), the TALYS data are also in agreement with the experimental data.

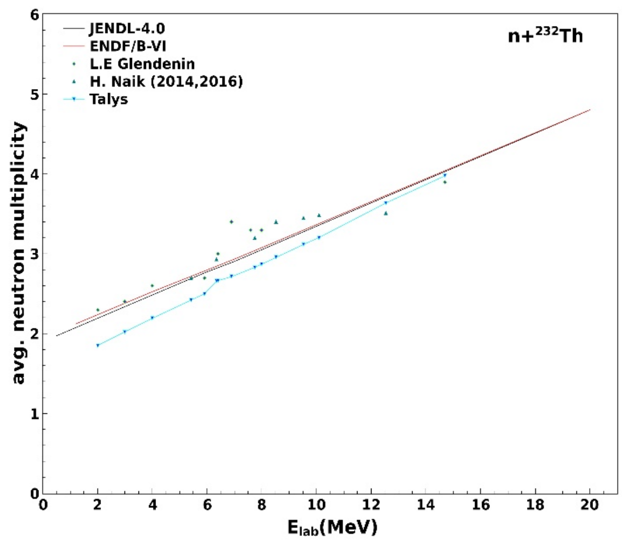

Fig.1: Comparison of experimental and evaluated data w.r.t TALYS calculated data for ^{232}Th (n,f) reaction.

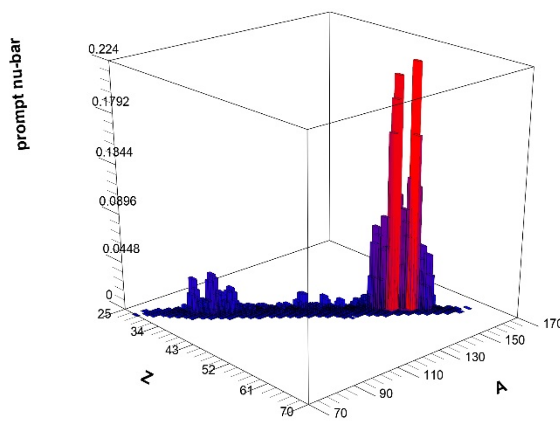

Fig.2: Prompt neutron multiplicity as a function of mass (A) and charge (Z) using TALYS code for ^{232}Th (n,f) reaction at 14.7 MeV.

As shown in Figure 2, we have also calculated the prompt neutron multiplicity at 14.7 MeV as a function of mass (A) and charge (Z). This figure reveals that neutron multiplicity is highly dependent on both Z and A fission fragments, as evidenced by the peaks at $_{54}Xe^{141,142,143,144}$ and $_{56}Ba^{146,147,148,149}$. Therefore, it is evident from the graph that neutron multiplicity varies with respect to Z and A. In order to understand the effect of neutron multiplicity, we require additional experimental data at high incident energies, and we intend to perform such experiment in the near future.

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