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Validity analysis of gamma-ray strength function models for radiative capture reactions of heavy nuclei

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Abstract
Accurate simulation of radiative capture reactions (RCRs), which hold significant importance in various areas of nuclear physics and technology, relies on precise evaluation and modeling of gamma-ray strength functions (GSF). Therefore, several phenomenological and microscopic GSF models have been developed in nuclear reaction codes for practical applications. Since theoretical GSF models behave differently mainly at low energies, GSF models require normalization, typically performed based on experimental data of total radiative width (TRW). In this investigation, it is observed that such normalization fails to adequately reproduce the experimental data of neutron-induced RCRs for 238U and 233Th heavy nuclei. Therefore, re-normalization values are presented for each model and it is demonstrated that such re-normalization brings various GSF models closer together in behavior at low energy regions and a range is obtained for GSF at low energies, where its actual value lies in this range. It is also shown that the widely used standard Lorentzian (SLO) model shows the most reliable fit to the experimental data with the least amount of required normalization.

Section

Experimental and theoretical studies of nuclear reactions

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