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Statistical Properties of Xe-133 from Inverse Kinematics Reactions using Ratio Method.

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Abstract. A substantial number of experimental studies over the years have shown that many light-to-medium-sized and some rare-earth nuclei exhibit a Low-Energy Enhancement (LEE) in the Gamma Strength Function (GSF) [1,2,3,4 and references therein]. Within the Hauser-Feshbach formalism, the GSF and the Nuclear Level Density (NLD) play crucial roles in the estimates of nuclear reaction rates. It has been demonstrated that the presence of this LEE can significantly speed up astrophysical r-process reaction rates [5] for neutron-rich nuclei. This should be further researched because it would have a big impact on models of nucleosynthesis. Due to the difficulty in creating adequate targets, experimental data on the LEE for noble gas isotopes like ^{133}Xe are also non-existent.

At the iThemba LABS, ^{132}Xe (d,p) reactions in inverse kinematics were carried out with beam energy of 530 MeV in order to look for the LEE in the ^{133}Xe nucleus. In conjunction with a silicon particle telescope that was used to measure the charged particles from the reactions, the AFRODITE and ALBA arrays were utilized to measure the gamma-rays. Eight high resolution germanium detectors, six large and six small volume $\text{LaBr}_3(\text{Ce})$, and two S2 silicon strip detectors made up the array at the time of the studies. Particle- γ events extraction and the Ratio Method are being utilized to determine the GSF of ^{133}Xe .

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

PhD

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