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Statistical properties of 133Xe from inverse kinematics Reactions extracted using the Ratio Method

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Abstract. A significant set of experimental studies over the years have revealed the presence of a Low-Energy Enhancement (LEE) in the Gamma Strength Function (GSF) in many light-to-medium as well as in some rareearth nuclei [1,2,3,4 and references therein]. The GSF and the Nuclear level density (NLD) are critical input parameters in calculations of nuclear reaction rates within Hauser-Feshbach formalism. It has been shown that the existence of this LEE can enhance astrophysical r-process reaction rates, by up to several orders of magnitude [5] for the neutron-rich nuclei. This would be very significant for models of nucleosynthesis hence; it should be investigated further. Furthermore, experimental data on the LEE is non-existent for noble gas isotopes, such as 133Xe due to the difficulty to produce suitable targets.

To search for the LEE in the 133Xe nucleus, the 132Xe (d,p) reactions conducted at iThemba LABS, with beam energy of 530 MeV. The AFRODITE and ALBA arrays were used to measure the gamma-rays in coincidence with a silicon particle telescope which were used to measure the charged particles from the reactions. At the time of the experiments the array consisted of eight high resolution germanium, six large volume and six small volume LaBr3(Ce) detectors and two S2 silicon strip detectors, particle-gamma-gamma events were extracted and are being used obtain the GSF of 133Xe using the Ratio Method [6].

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