



Contribution ID: 35

Type: **Poster Presentation**

## Statistical properties of $^{133}\text{Xe}$ from inverse kinematics Reactions extracted using the Ratio Method

T. W. Seakamela<sup>1,3</sup>, S. H. Connell<sup>1</sup>, B. V. Kheswa<sup>2</sup>, M. Wiedeking<sup>3,12</sup>, V. W. Ingeberg<sup>4</sup>, K. L. Malatji<sup>3,6</sup>, S. Siem<sup>4</sup>, H. C. Berg<sup>4</sup>, A. Avaa<sup>3,8</sup>, D. L. Bleuel<sup>5</sup>, C. P. Brits<sup>3,6</sup>, J. W. Brummer<sup>3,6</sup>, T. S. Dinoko<sup>10</sup>, M. Guttormsen<sup>4</sup>, P. Jones<sup>3</sup>, A. C. Larsen<sup>4</sup>, J. E. Midtbø<sup>4</sup>, L. Msebi<sup>3,7</sup>, S. H. Mthembu<sup>3,9</sup>, G. O'Neil<sup>7</sup>, J. Ndayishimye<sup>3</sup>, L. Pellegrini<sup>3,8</sup>, O. Shirinda<sup>3,6</sup>, F. Zeiser<sup>4</sup>, B. R. Zikhali<sup>3,7</sup>, D. Negi<sup>11</sup>

<sup>1</sup>Department of Engineering, University of Johannesburg, P.O. Box 524, Auckland Park 2006, South Africa, <sup>2</sup>Department of Physics, University of Johannesburg, P.O. Box 524, 55 Beit Str, Doornfontein, Johannesburg, 2028, South Africa, <sup>3</sup>iThemba LABS, P.O. Box 722, Somerset West, 7129, South Africa, <sup>4</sup>Department of Physics, University of Oslo, N-0316 Oslo, Norway, <sup>5</sup>Lawrence Livermore National Laboratory, 7000 East Avenue, Livermore, California, 94550-9234, USA, <sup>6</sup>Department of Physics, Stellenbosch University, Private Bag X1, Matieland, 7602, South Africa, <sup>7</sup>Department of Physics, University of the Western Cape, P/B X17 Bellville 7535, South Africa, <sup>8</sup>School of Physics, University of the Witwatersrand, South Africa, <sup>9</sup>Department of Physics, University of Zululand, Private Bag X1001, KwaDlangezwa 3886, South Africa <sup>10</sup>NMISA, Meiring Naude Rd, Pretoria, 0184, South Africa, <sup>11</sup>Department of Nuclear and Atomic Physics, Tata Institute of Fundamental Research, Mumbai 400005, India, <sup>12</sup>School of Physics, University of the Witwatersrand, Braamfontein, Johannesburg, 2000.

E-mail: {<mailto:teffoseakamela@gmail.com>}

**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 rare-earth 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  $^{133}\text{Xe}$  due to the difficulty to produce suitable targets.

To search for the LEE in the  $^{133}\text{Xe}$  nucleus, the  $^{132}\text{Xe}(d,p)$  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 LaBr<sub>3</sub>(Ce) detectors and two S2 silicon strip detectors, particle-gamma-gamma events were extracted and are being used obtain the GSF of  $^{133}\text{Xe}$  using the Ratio Method [6].

[1] A. C. Larsen et al., J. Phys. G: Nucl. Part. Phys. 44, 064005 (2017).

[2] M. D. Jones et al., Phys. Rev. C 97, 024327 (2018).

[3] J. E. Midtbø, et. al., Phys. Rev. C 98, 064321 (2018).

[4] V. W. Ingeberg et al., Eur. Phys. J. A 56, 68 (2020).

[5] A. C. Larsen and S. Goriely, Phys. Rev. C 82, 014318 (2010).

[6] M. Wiedeking et al, Phys. Rev. Lett. 108.162503 (2012).

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

No

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

PhD

**Primary author:** Ms SEAKAMELA, Teffo (University of Johannesburg)

**Presenter:** Ms SEAKAMELA, Teffo (University of Johannesburg)

**Session Classification:** Poster Session

**Track Classification:** Track B - Nuclear, Particle and Radiation Physics