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Electromagnetic dipole response studies at the southern tip of Africa

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The gamma-ray decay of nuclear states in the quasi-continuum provides important insights into nuclear structure effects and constraints to nucleosynthesis processes. In particular, measurements of Photon Strength Functions (PSFs) and associated resonances have and will continue to play a central role as we are entering an era of incredible potential for novel measurements. This is due to many institutes across the world having established programs to provide enhanced, state-of-the-art research infrastructure including iThemba LABS in South Africa. These range from significant increases in efficiencies of gamma-ray detector arrays, to new or upgraded radioactive ion beam facilities. In parallel, several new experimental and analytical techniques were developed which allow for more reliable PSF and NLD studies, even on nuclei away from stability. All this progress will undoubtedly lead to unprecedented insight into the structure of nuclei and provide reaction rates of relevance to nucleosynthesis processes.

In this presentation, I will provide an overview of the recent experimental (inverse-Oslo method [1]) and analytical (Shape method [2]) advances and how these have laid the foundation for novel and ambitious measurements at radioactive and stable ion beam facilities. Recent progress in exploring the underlying nuclear structure of resonances with a particular focus on the Pygmy Dipole resonance will also be discussed. In addition, I will introduce the low-energy nuclear physics beam line at iThemba LABS' Tandetron laboratory and the measurements of PSFs in neutron deficient isotopes.

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

M. Wiedeking et. al., Phys. Rev. C 104 014311 (2021).

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