

Electric monopole (E0) studies at iThemba LABS

Electric monopole (E0) transition studies focus on nuclear transitions between states of the same spin and parity (typically $0^+ \rightarrow 0^+$), which are critical for probing nuclear structure, shape coexistence, and deformation. The E0 strengths ($\rho^2(E0)$) are key parameters to understanding nuclear shape mixing and isomerism in various nuclei, including light, odd-A, and shape-coexistence in nuclei.

Because single-photon emission is forbidden, these transitions are measured via internal conversion electrons (ICE) or electron-positron pair formation (IPF), serving as a sensitive indicator of changes in the mean-squared charge radius.

As such, high-precision electron spectrometers (e.g., Si(Li) detectors) and detector arrays consisting of HPGe and LaBr3:Ce detectors are used to measure internal conversion coefficients (ICC) to identify E0 components. iThemba LABS has, in the last 5 to 10 years, been developing spectrometers suited for E0 transition studies. This talk will focus on the in-house refurbishment of the existing solenoid magnetic lens into an electron and internal-pairs spectrometer, the in-beam experiment involving 30 MeV proton beam on a ^{50}Ti target aimed at investigating the excited 0_2^+ state in ^{50}Ti , as well as future experimental possibilities, for example when this facility will be used in conjunction with other existing spectrometers like the K600.

Primary author: CHISAPI, Maluba Vernon J. (iThemba LABS/Stellenbosch University)

Co-authors: JONES, Pete (iThemba LABS); AVAA, Abraham (iThemba/Wits)

Presenter: CHISAPI, Maluba Vernon J. (iThemba LABS/Stellenbosch University)

Track Classification: Nuclear Structure Studies