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Innovative Detector Developments for Nuclear Science

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Electric monopole (E0) studies at iThemba LABS have been recently performed using in-beam reactions with an electron spectrometer (made of a solenoid magnetic lens coupled to a Si(Li), etc. detector). The spectrometer coupled with an array of fast-timing detectors and low energy photon spectrometers (LEPS) has been successfully commissioned and measurements of conversion coefficients and monopole strength parameter in ^{72}Ge and ^{72}Se determined from electron-gamma coincident measurement by ^{70}Ge(α,α') reaction. Here traditional thick (several mm) Si(Li) detectors were used to detect the electrons.
For the study of higher-lying 0^+ states, where positron-electron pair emission becomes dominant, the adaptation of the spectrometer to use a thick (11 mm) segmented Ge detector for detection of these internal-pairs was successfully carried out. GEANT4 simulations of the performance of the spectrometer have also been undertaken.
The re-encapsulated detector with think window has been employed in source measurements for conversion-electrons. Subsequently spectroscopy of the ^{50}Ti(α,α')reaction has been completed at iThemba LABS.
A research programme has been launched to further improve on this detection method through semiconductor advances and instrumentation. The production and use of these detectors will be invaluable to the scientific programme both at the Joint Institute for Nuclear Research (JINR) and iThemba LABS (Laboratory for Accelerator Based Sciences) to further fundamental science and to catalyse innovative techniques and methodologies between the two institutes and countries.
Results of measurements will be presented together with future plans to develop at the forthcoming Technology Innovation Platform (TIP) at iThemba LABS.

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