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Refurbishment of the SK solenoid magnetic lens spectrometer at iThemba LABS

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A solenoid magnetic lens spectrometer \cite{avaa2020electron} was refurbished and upgraded to incorporate measurement of internal-pairs in addition to conversion electrons. An in-beam experiment was performed on a setup where the magnetic lens spectrometer was coupled to a gamma-ray array consisting of seven Compton suppressed HPGe clover detectors. A 1.1 mg/cm^2 thick ^{50}Ti target was bombarded with a 30 MeV alpha beam \cite{oakley1987pion}\cite{pronko1974gamma}\cite{morsch1973monopole} in an attempt to excite the 0^+ state at 3.8 MeV, which is expected to subsequently decay via internal-pair formation. The populated nuclei were identified and the observed gamma-ray transitions were built into level schemes. A thorough investigation of gamma-internal-pair and gamma-conversion electron coincidence was also carried out both for a radioactive source (^{207}Bi) and in-beam data. This study highlights the unique capability of of the solenoid magnetic lens spectrometer in measurements of electric monopole ($E0$: $0^+ \rightarrow 0^+$ or $J^\pi \rightarrow J^\pi$) transitions, the only significant alternative nuclei decay mode in cases where nuclear decay via gamma-ray emission is forbidden \cite{ANAndreyev}\cite{wood1992coexistence}\cite{kibedi2005electric}\cite{wood1999electric}.

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

N/A

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N/A

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