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Production of conversion-electron sources

Two solenoid electron spectrometers were donated to iThemba LABS by Orsay in France. These lens spectrometers are currently under refurbishment. They will be used to study higher energy electrons which results from internal conversion (IC) process, a process whereby an atomic nucleus emits an electron instead of γ−ray emission. This process can only occur between two 0+. An emitted electron may come from the K, L1 and L2 shell depending on the transition energy. IC is an important component of most nuclear decay schemes. In order to balance decay schemes correctly, one needs to know the internal conversion contribution to each transition as expressed by its internal conversion coefficient (ICC). The two spectrometers will be used for experiments, both standalone and used with the tape station.
Measurements of IC and ICC around Z≈50 have been conducted for the past few decades [e.g. ref.1, 2]. Unfortunately, over the decades, tabulated ICC values have differed significantly from one calculation to another by a few percent. Although for many applications such differences can be tolerated, transitions used in critical calibrations require very precise and accurate ICC values [1]. E0 transitions (which result from IC) are a sensitive indicator of structure in nuclei, reflecting shape transitional regions, deformation, and intruder states.
In order to expand knowledge of IC and ICC around Z≈50 region, a set of different nuclei which emit conversion-electrons will be produced. Such sources will be used to characterise the lens. The sources of interest are 120Sb, 169Yb and 109Cd. Furthermore, basic research in conversion-electron spectroscopy with short-lived sources will be conducted. This will also help to investigate the applicability of this method in production of sources at iThemba LABS using the RERAME facility.

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