

The SPICE detector at ISAC

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Work is underway to construct a new ancillary detector system for the TIGRESS HPGe array called SPectrometer for Internal Conversion Electrons (SPICE). SPICE will enable in-beam electron spectroscopy and, in coupling to the TIGRESS HPGe array, coincident gamma–electron spectroscopy with stable and radioactive beams. The device has been designed with a particular sensitivity to higher–energy electrons than the majority of existing spectrometers in order to focus on the measurement of electric monopole transition strengths in medium mass nuclei. The experimental setup involves an annular 120–fold segmented 6.1 mm thick lithium–drifted silicon detector located in vacuum which is shielded from direct sight of the target by a photon shield. A single large magnetic lens formed of NdFeB plates is used to collect and transport electrons released from the target around the photon shield to the detector.

Detailed GEANT4 simulations have been used to model this device and optimize the performance of its various components. These simulations indicate that SPICE will provide an absolute efficiency between 5 and 20% for electrons in the energy range of 100–3000 keV. Methods of background suppression and reduction have been investigated using the GEANT4 simulations. These include coating high- Z surfaces with low- Z material to reduce the contribution from scattered electrons and the resulting secondary radiations.

Construction of SPICE is underway and the spectrometer will be ready to begin in–beam studies in 2013. The main features of the design, results of the GEANT4 simulations and the progress to date will be presented.