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Experimental Update of the TIGRESS HPGe Clover Array

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Radioactive isotopes far from the valley of beta stability exhibit a variety of interesting properties. Quantifying the evolution of nuclear structure with increasing proton-neutron asymmetry is a major focus of current experimental efforts. High precision gamma-ray spectroscopy plays an important role in this pursuit and provides fundamental probes of nuclear structure and stringent tests for theoretical models important to our understanding of these many-bodied systems. As such, the high-efficiency and Compton-suppressed segmented germanium clover detector array TIGRESS is the key driver for the in-beam gamma-ray spectroscopy program at TRIUMF, where accelerated radioactive beams from the ISAC-II facility permit access to nuclear structure information for a wide range of exotic isotopes.

Several sophisticated ancillary detector systems enhance the sensitivity of gamma-ray spectroscopy and provide additional experimental observables. These devices couple to the TIGRESS experimental infrastructure, resulting in a highly specialized and quickly reconfigurable experimental facility for nuclear structure studies. In particular, two highly-segmented, double-sided silicon detector arrays have been used for transition rate studies of 11Be using low-energy Coulomb excitation (BAMBINO) and single-particle structure measurements using (d,p) transfer reactions with 94Sr as the first accelerated high-mass radioactive ion beam delivered by ISAC-II (SHARC). In addition, recent Doppler-shift lifetime studies have used CsI(Tl) scintillator and silicon PIN diode arrays for fusion evaporation exit channel and inelastic scattering selectivity, respectively (TIP). Finally, the first test of in-beam internal conversion electron spectroscopy took place in December (SPICE), extending current transition rate measurement capabilities. This presentation will provide an overview of these systems and discuss recent experimental results of the TIGRESS nuclear structure program.

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