Doppler shift lifetime studies using the TIGRESS Integrated Plunger at ISAC-II/TRIUMF

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Transition rate measurements via gamma-ray spectroscopy provide fundamental probes of the structure of nuclei and stringent tests for theoretical models important to our understanding of these many-bodied ensembles. Intense re-accelerated beams delivered by the ISAC-II facility at TRIUMF, Canada's National Laboratory for Particle and Nuclear Physics, permit access to nuclear structure information for a wide range of radionuclides via in-beam gamma-ray spectroscopy with TIGRESS, a high-efficiency and Compton-suppressed segmented germanium clover array. Precise Doppler-shift lifetime measurements play an important role in this pursuit. Accordingly, the development of the TIGRESS Integrated Plunger (TIP) [1,2] at Simon Fraser University (SFU) presents the opportunity for Doppler-shift lifetime measurements of short-lived excited states using TIGRESS in combination with a plunger and an extensive suite of auxiliary charged-particle detector systems for exit channel selection following a variety of reaction mechanisms. We highlight the construction, characteristics, and implementation of the TIP plunger and its ancillary detectors as they enable a rich set of electromagnetic transition rate measurements via Doppler-shift lifetime techniques following fusion-evaporation as well as unsafe Coulomb excitation.

[1] P. Voss et al., Nucl. Instr. And Meth. A746, (2014) 87.

[2] P. Voss et al., Phys. Proc. 66 (2015) 524.