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GRIFFIN Detector Acceptance Tests

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Gamma-Ray Infrastructure For Fundamental Investigation of Nuclei (GRIFFIN) is a state-of-the-art facility for spectroscopic studies following nuclear decay being built at TRIUMF, Vancouver, B.C. It will accommodate 16 detectors, each made of four high purity Germanium crystals arranged in a clover configuration. GRIFFIN's efficiency will allow decay spectroscopy studies to be extended to regions far from stability that are currently not accessible at TRIUMF.

Individual GRIFFIN detectors are delivered to SFU for acceptance tests. To accommodate these detectors an automatic LN₂ cooling system, as well as analog and digital data acquisition systems have been set up to carry out the acceptance tests. Software analysis tools and experimental procedures have also been established to examine the consistency of the hardware with the list of specifications provided by the GRIFFIN collaboration. The acceptance tests include measurements of energy resolution, absolute efficiency, analog timing resolution with respect to a BaF₂ scintillator, preamplifier and cryogenic properties, and mechanical dimensions. As of February 2014, eleven GRIFFIN detectors have been delivered by the manufacturer and nine have been fully accepted and transferred to TRIUMF.

Several additional investigations of the GRIFFIN clover performance have been undertaken. The improvement in photopeak efficiency via energy add back of gamma rays which scatter between the four crystals of a clover has been measured with standard calibration sources. Digital timing resolution with respect to a BaF₂ scintillator has been measured using 14-bit, 100 MHz digitizer cards. An absolute efficiency response curve has been measured in the 80-3500 keV energy range. In addition, GRIFFIN detectors were incorporated into a charged-particle-gamma-ray coincidence setup enabling studies of the angular distribution of gamma rays following ²⁴¹Am alpha decay. In this presentation the details of the aforementioned tests will be discussed.

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