The GlueX Start Counter

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Abstract

The GlueX experiment, set to go on-line in Fall 2014, shall study meson photoproduction with unprecedented precision. This experiment will use the coherent bremsstrahlung technique to produce a 9 GeV linearly polarized photon beam incident on a liquid H_2 target. A Start Counter detector has been fabricated to identify the accelerator electron beam buckets, approximately 2 ns apart, and to provide accurate timing information which is used in the level–1 trigger of the experiment. This detector is designed to operate at photon intensities of up to $10^8\gamma$/s in the coherent peak and provide a timing resolution $<$ 350 ps so as to provide successful identification of the electron beam buckets to within 99% accuracy. Furthermore the Start Counter detector will proved excellent solid angle coverage, $\sim$ 90% of 4π hermeticity, and a high degree of segmentation for background rejection. It consists of a cylindrical array of 30 scintillators with *pointed* ends that bend towards the beam at the downstream end. The support structure is kept at an absolute minimum in the active region of the detector, and is made up of Rohacell and carbon fiber. Silicon PhotoMultiplier (SiPM) detectors have been selected as the readout system. These detectors are not affected by the high magnetic field produced by the GlueX superconducting solenoid magnet. Moreover, the SiPMs will be placed as close as possible ($<$ 200 μm) to the upstream end of each scintillator element, thereby minimizing the loss of scintillation light. The EJ-200 scintillator is best suited for the Start Counter due to its fast decay time on the order of 2 ns and a long attenuation length. The physical properties of the scintillators, configured to the desired geometry, have been studied extensively at FIU. The results of these studies are discussed.