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Characterization of Electronics and Software in QUARTIC Detectors for High-Energy Physics RYAN HALL, University of Texas — Precision timing is necessary in detector systems for high-energy physics applications, specifically, experiments conducted in large accelerators. The capabilities of the microchannel-plate photomultipler tubes (MCP-PMTs) proposed for use in much of this research as sensing devices are not fully known, and several models exist only at a prototype level. Our group is testing various configurations of electronics and software, including constant-fraction discriminators and high-frequency amplifiers, in order to establish a time-of-flight precision on the order of 10 ps (10e-12 s). In that amount of time, light travels 3mm. The experiment focuses on the QUARTIC detector design, which utilizes an array of quartz bars as a medium to generate and collect photons emitted by incident particles travelling faster than the local speed of light. By simulating this Cerenkov radiation using a picosecond pulse laser of controlled intensity and frequency, we intend to design and improve a system to assist in screening for possible Higgs signatures in events observed in the ATLAS experiment at the Large Hadron Collider (LHC). Currently, our best results give a spread in measured time values on the order of 28 ps, but using statistical methods over multiple simultaneous measurements can reduce the uncertainty to approximately 16 ps.

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