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Analysis of Silicon Photomultiplier Detector Waveforms from Cosmic Rays using Digital Signal Processing Techniques[1] JUAN CASTRO, FAVIAN ZAVALA, REXAVALMAR NIDUAZA, ZACHARY WEDEL, SEWAN FAN, Hartnell College, STEFAN RITT, Paul Scherrer Institute, LAURA FATUZZO, Hartnell College — Silicon photomultiplier detectors exhibit high gain, low operating voltage, are insensitive to magnetic fields, and can detect light at the single photon level, making them very attractive for applications in fields such as particle physics, astrophysics, and medical physics. However, they exhibit effects that may prevent their optimal operation, including thermally induced high dark count rate, after pulse effects, and cross talk produced from photons in nearby pixels. In this presentation, we describe our coincidence setup using two scintillator pads and a Hamamatsu multipixel photon counter (MPPC) to gather cosmic ray produced signal pulses, and our methods of analysis for the detector waveforms. In particular, we discuss our methods of digitization, software implementation of low pass and Gaussian type filters, and the application of a domino ring sampler (DRS4) digitizing board to obtain signal waveforms to determine the operating characteristics for these detectors.

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