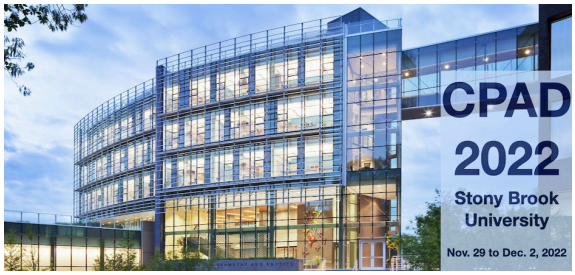

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Waveform Digitizing Electronics for Reading out Next Generation Detectors

Tuesday, 29 November 2022 11:30 (20 minutes)

Recent advances in photonic and radiation sensors and detectors has allowed high quality and high timing resolution measurements of phenomena related to high energy physics, nuclear physics and astro- particle physics experiments. Examples of such sensors include silicon photomultipliers (SiPM), multi-channel plate photomultiplier tubes (MCP-PMTs), large area picosecond photo multipliers (LAPPDs) and low gain avalanche photodiodes (LGADs). What most of these sensors have in common is electrical outputs in the form of a pulse with medium to fast rise times (0.2-2ns) and rather short pulse duration (0.2-4ns FWHM). The pulse amplitude, source driver impedance, physical density and cross talk characteristics of these detectors normally vary and can create challenging environments for optimum readout electronics. One method to get the most performance out of such sensors is to use waveform digitizing electronics to capture the electronic pulse output and then post-process them locally or remotely to extract desired features such as time of arrival or the amount of charge at accuracies that are interesting for the experiments. At Nalu Scientific, LLC we have designed such digitizer microchips, hardware, firmware and software to readout a variety of these sensors. We will discuss a number of the microchips and related circuits and present results on performance that we have measured so far and possibilities for improvement.

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