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Electrical Characterization of Silicon Photo-Multipliers[1] JOHN MWATHI, Alabama A&M University, CRAIG WOODY, SEAN STOLL, Brookhaven National Laboratory — Silicon photo-multipliers (SiPM) also known as Multi-Pixel Photon Counters (MPPC)are single photon sensitive, semiconductor devices built from Avalanche Photo Diodes (APDs) working in the Geiger mode. The SiPM detectors provide an attractive solution for the detection of signals with low numbers of photons and are suitable candidates to replace Vacuum Photo-Multiplier Tubes (PMTs). They offer advantages over both PMTs and the APDs, including compactness, insensitivity to magnetic fields, high gain (10ˆ5), ability to be operated at moderate bias voltage (normally lower than 100 volts), and excellent timing properties these characteristics make them suitable for applications in several fields of high energy physics and medical imaging. At Brookhaven National Laboratory, silicon photo-multipliers have been suggested as the readout device to be used in the upgraded sPHENIX in the area of high-energy physics calorimetry and future Positron Emission Tomography (PET) medical imaging systems. Despite all these advantages SiPMs have several drawbacks such as crosstalk, after pulse rate and dark-count rate, exposure to radiation damages the detector and greatly affects its efficiency. We characterized SiPMs of different pixel sizes from SensL and Hamamatsu to determine the SiPM's performance and which of these detectors would best be suited for application. We characterized these SiPM samples using lab instruments including a Picometer and a digital oscilloscope. A Lab view program controlling and reading out the Keithley Picometer via an IEEE-GPIB interface was developed to automate the dark current as a function of bias voltage measurement.

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