

Abstract Submitted
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Properties of Silicon Photomultipliers¹ JESSE FINLEY, Western Kentucky Univ, RICHARD RIEDEL, Oak Ridge National Laboratory — Silicon Photomultipliers (SiPM) are an emerging type of photon detector that could potentially replace photomultiplier tubes (PMT). SiPMs are arrays of Avalanche Photodiodes (APD) that operate in Geiger Mode, meaning that the impact ionization from a photon can trigger an avalanche current on a silicon substrate. The advantages of SiPMs over PMTs are their ability to detect single photons, high durability, low operating voltages, low cost, and ability to function in strong magnetic fields. However, SiPMs have a characteristic noise generated from quantum effects which can affect performance when used in applications where a small number of photons are expected. In this study the market and properties of SiPMs (dark noise, afterpulsing, cross-talk) are analyzed in order to evaluate possible applications and feasibility of their use in various fields of research. Testing is done on a Hamamatsu SiPM array to measure the noise of the device and measure the variation of the noise level with temperature and operating voltage. In conclusion, SiPMs have demonstrated to be a low cost alternative to PMTs when the application is such that noise levels are acceptable.

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