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Characteristics of CMOS Light Detectors at Cryogenic Temperatures[1] JAMES CHRISTIAN, ERIK JOHNSON, CHRISTOPHER STAPELS, PAUL LINSAY, Radiation Monitoring Devices, Inc., RORY MISKIMEN, University of Massachusetts, DONALD CRABB, University of Virginia, FRANK AUGUSTINE, Augustine Engineering — Advancing nuclear and high-energy physics often requires experiments conducted in harsh environments, such as a liquid helium bath and a superconducting magnet at several Tesla. These experiments need improved sensors that operate in these conditions. Improvements in detector technology used in extreme environments can improve the data quality and allow new designs for experiments that operate under these conditions. Solid-State Photomultipliers (SSPM), a device built from a monolithic array of photodiodes, can be used in these environments where traditional PMTs may not operate. Measurements of the diode properties at low temperatures down to 5 K are used to determine the potential of CMOS SSPMs in these environments. At temperatures below 60 K, extensive after pulsing is observed, which renders the Geiger photodiodes in the SSPM nonfunctional for biases above breakdown. In proportional mode operation, below the reverse bias breakdown, the photodiodes show a linear response to incident light with a relatively large gain and can be used at temperatures near 5 K.

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