

Abstract Submitted
for the HAW09 Meeting of
The American Physical Society

Solid-State Photomultiplier with Integrated Front End Electronics JAMES CHRISTIAN, CHRISTOPHER STAPELS, ERIK JOHNSON, SHARMISTHA MUKHOPADHYAY, XIAO JIE CHEN, Radiation Monitoring Devices, RORY MISKIMEN, University of Massachusetts — The instrumentation cost of physics experiments has been reduced per channel, by the use of solid-state detectors, but these cost-effective techniques have not been translated to scintillation-based detectors. When considering photodetectors, the cost per channel is determined by the use of high-voltage, analog-to-digital converters, BNC cables, and any other ancillary devices. The overhead associated with device operation limits the number of channels for the detector system, while potentially limiting the scope of physics that can be explored. The PRIMEX experiment at JLab, which is being designed to measure the radiative widths of the η and η' pseudo-scalar mesons for a more comprehensive understanding of QCD at low energies, is an example where CMOS solid-state photomultipliers (SSPMs) can be implemented. The ubiquitous nature of CMOS allows for on-chip signal processing to provide front-end electronics within the detector package. We present the results of the device development for the PRIMEX calorimeter, discussing the characteristics of SSPMs, the potential cost savings, and experimental results of on-chip signal processing.

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Date submitted: 02 Jul 2009

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