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Production and Testing of a Low-Cost Precision Timing Microchannel Plate Photodetector (12' + 3')

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The Argonne Microchannel Plate (MCP) Photodetector Group has produced 6cm × 6cm active area MCP photodetectors that feature fabrication with low-cost borosilicate glass, bialkali photocathodes, single photoelectron time resolution of approximately 30ps, and sub-millimeter spatial resolution. We report on the design, fabrication technology, and test results of production runs of an improved design of the detector that allows biasing of each component individually for best optimization. In addition, we have improved the quantum efficiency of the photocathode and report results from this work. The detectors are appealing for applications requiring precision timing and/or spatial resolution including time-of-flight measurement and optical time projection chambers (TPCs) in which tracks are reconstructed using Cherenkov imaging of particles produced in or entering the chamber. Prospects for incorporation into such instrumentation are discussed.

Primary author: WANG, Jingbo (Argonne National Laboratory)

Co-authors: XIE, JUNQI (Argonne National Laboratory); BYRUM, Karen (Argonne National Lab); XIA, Lei (Argonne National Laboratory); Prof. DEMARTEAU, Marcel (Argonne National Laboratory); Prof. WAGNER, Robert (Argonne National Laboratory)

Presenter: WANG, Jingbo (Argonne National Laboratory)

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