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Development of a Photon Detection System in Liquid Argon for the Long-Baseline Neutrino Experiment

The Long-Baseline Neutrino Experiment (LBNE) will be a premier facility for exploring long-standing questions about the boundaries of the standard model. Acting in concert with the liquid argon time projection chambers underpinning the far detector design, the LBNE photon detection system will capture ultraviolet scintillation light in order to provide valuable timing information for event reconstruction. The team at Indiana University is exploring a design based on acrylic waveguides coated with a wavelength-shifting compound, combined with silicon photomultipliers, to collect and record scintillation light from liquid argon. Large-scale tests of this design are being conducted at the “TallBo” liquid argon dewar facility at Fermilab alongside similar designs from other groups. Performance studies with cosmic ray events are helping steer decisions for the final detector design. We present an overview of the design and function of this photon detection system and the latest results from the analysis of data collected during these tests.

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