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Photon Detection System (PDS) for DUNE low energy physics study and the demonstration of a few nanosecond timing resolution using ProtoDUNE-SP PDS

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Photon detection systems (PDS) are an integral part of liquid-argon neutrino detectors. Besides providing the timing information for an event, which is necessary for reconstructing the drift coordinate of ionizing particle tracks, photon detectors can be effectively used for other purposes including triggering events, background rejection, and calorimetric energy estimation. PDS in particular for the DUNE Far Detector Module 2 is designed to achieve a more extended optical coverage (—> ~4π) with new generation large size PD modules based on the ARAPUCA technology. This will provide enhanced opportunities for the study of low energy neutrino physics using PDS. The ARAPUCA technology was extensively tested within the ProtoDUNE-SP detector operated at the CERN neutrino platform. Here I present a study of the timing resolution of ARAPUCA detectors using light emitted from a sample of energetic cosmic ray muons traveling parallel to the PDS. An intrinsic timing resolution of the order of 3 ns is observed for the ARAPUCA detectors. An excellent timing resolution capability of PDS can be exploited for further enhancing physics study in the DUNE far detectors.

Attendance type

In-person presentation

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