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Detection efficiency measurement and operational tests of the X-Arapuca for the first module of DUNE Far Detector

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The Deep Underground Neutrino Experiment (DUNE) is a dual-site experiment for long-baseline neutrino oscillation studies, able to resolve the neutrino mass hierarchy and measure δ_{CP}.
DUNE will also have sensitivity to supernova neutrinos and to processes beyond the Standard Model, such as nucleon decay searches.
The Far Detector (FD) will consist of four liquid argon TPC (17.5kton total mass) with systems for the detection of charge and scintillation light produced by an ionization event.
The charge detection system permits both calorimetry and position determination.
In addition, the photon-detection system (PDS) enhances the detector capabilities for all DUNE physics drivers. The PDS of the first FD module consists of light collector modules placed in the inactive space between the innermost wire planes of the TPC anode. The light collectors, the so-called X-Arapucas, are functionally a light trap that captures wavelength-shifted photons inside boxes with highly reflective internal surfaces where they are guided to Silicon Photo-multipliers (SiPM) by wavelength-shifting bars. Functionality and operational tests of the X-Arapucas to be installed in ProtoDUNE-phase II (FD DUNE prototype at the scale 1:20), as well as the measurement of their absolute detection efficiency will be shown in this presentation.

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