

Mass test setup for DUNE SiPMs characterization

Tuesday, August 2, 2022 5:00 PM (15 minutes)

The Deep Underground Neutrino Experiment (DUNE) is an upcoming neutrino physics experiment that will answer some of the most compelling questions in particle physics and cosmology. The DUNE Far Detector (FD) exploits silicon photomultipliers (SiPMs) to detect scintillation photons produced by the interaction of charged particles in the liquid Argon time projection chamber (LArTPC).

The SiPMs are photosensors consisting of a matrix of single-photon avalanche diodes (SPAD) operating in the Geiger-Mueller region. Their high sensitivity and dynamic range, as well as the possibility to fill large surfaces with high-granularity sensors, makes them an ideal choice for the DUNE FD photodetection system. An international consortium of research groups is currently engaged in systematic quality assurance tests of all the sensors that will be installed in the FD to control their specifications. A custom set-up, CACTUS (Cryogenic Apparatus for Continuous Tests Upon SiPMs), has been developed at Ferrara and Bologna Universities-INFN sites to perform automatically the tests for a large number of sensors in parallel. This system can characterize up to 120 SiPM simultaneously both testing their mechanical and thermal resistance, and measuring the complete current-voltage curve for each sensor at room and cryogenic temperatures. These data allow to extrapolate the quenching resistor (R_q) and the breakdown voltage (V_{bd}), the key operating parameters of the SiPMs.

Furthermore, the CACTUS test facility allows to perform dark noise characterization through a custom-made fixed threshold amplifier-discriminator system.

Attendance type

In-person presentation

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