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A high-performance electromagnetic calorimeter for neutrino physics in the DUNE Near Detector complex

DUNE is a long-baseline neutrino oscillation experiment, which will observe neutrinos produced by a high-power, broadband neutrino beam by means of 70 kton mass liquid argon time-projection chambers. The Far Detector will be installed at the Sanford Underground Research Facility (SURF), located at a depth of 1500 m in South Dakota (USA). The Near Detector complex, located at Fermilab, is necessary for monitoring possible variations of the neutrino beam, for constraining neutrino cross-section at GeV energy and for reducing systematics due to neutrino flux uncertainties.

Within the Near Detector complex, the SAND (System for on-Axis Neutrino Detection) detector, whose primary goal is the beam monitoring, will benefit of a high-performance electromagnetic calorimeter, designed and built for the KLOE experiment, running from 1999 to 2018 at Laboratori Nazionali di Frascati for observing kaon decays from the DAFNE Phi-factory.

The calorimeter has demonstrated excellent energy and temporal resolution, together with high efficiency for neutrons and charged particles. All these properties make it well exploitable for neutrino experiments.

In this talk the fundamental role of the electromagnetic calorimeter in the SAND design will be described, together with the expected performance of the Near Detector complex for data-driven neutrino interaction studies and for the CP violation measurement.

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