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Physics Performance of the SAND Near Detector in DUNE

DUNE is a future long-baseline neutrino oscillation experiment hosted by Fermilab, USA. It aims to measure neutrino oscillation properties with high precision, supernova and solar neutrinos, and possible signatures of nucleon decay. To measure neutrino oscillation parameters, it uses a beam produced at Fermilab and detects the oscillated neutrinos in a 70 kton Liquid Argon TPC volume (divided in four modules) at Sanford Underground Research Facility (SURF), 1300 km away from the neutrino source. SAND is a component of the near detector complex in DUNE permanently located on-axis, 574 m from the neutrino source, with the goals of measuring the incoming neutrino flux, measuring cross-sections and nuclear effects, and performing a broad range of precision measurements of fundamental interactions and searches for new physics. A key element to achieve the required precisions is a low-density Straw Tube Tracker (STT) integrating removable thin targets of various materials. The detector has been optimised for the "solid" hydrogen target, obtained from the subtraction of interactions on plastic (CH_2) and graphite (C) targets. The STT has a momentum resolution of about 3% and an angular resolution close to 1 mrad, allowing an excellent reconstruction of the event kinematics, and a particle identification from dE/dx and transition radiation across the entire tracking volume.

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