

The straw tube tracker for the SAND near detector of DUNE experiment

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The Deep Underground Neutrino Experiment (DUNE) is an international, world-class experiment aimed at precisely measuring the neutrino oscillation parameters. The experiment consists of a far detector at the Sanford Underground Research Facility (SURF) in South Dakota and a Near Detector (ND) complex, close to the neutrino source at Fermi National Accelerator Laboratory (FNAL).

The System for on Axis Neutrino Detection (SAND) exploits a 0.6 T superconductive magnet, an electromagnetic calorimeter made of lead scintillating fibers, a 1-ton liquid argon detector, and a straw tube tracker (STT) integrating a series of thin replaceable CH₂ and C targets located between tracking modules made of straw tubes. The STT allows the reconstruction of neutrino interactions in the targets providing both an accurate tracking for charged particles and particle identification. The STT tracking modules are designed to minimize their thickness and mass and require fully integrated readout electronics for both time and charge measurements of individual straws. Strict low-power consumption requirements combined with the relatively modest rates led us to the development of a microcontroller-based readout electronics concept for STT. The design is based on compact modular boards reading up to 64 channels and directly integrated within the C-fiber frame of the STT modules.

A 80 cm x 120 cm prototype of a STT tracking module has been built at CERN to validate the mechanical design and the assembly procedure. The first version of the integrated readout boards was installed within the C-fiber frame of such a prototype. The mechanics, the performance of the microcontroller-based readout, and the test beam results will be presented together.

Collaboration

Role of Submitter

I am the presenter

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