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The 3DST Spectrometer as part of the DUNE Near Detector

The main purpose of the Deep Underground Neutrino Experiment (DUNE) is to observe the violation of the charge-parity symmetry in neutrino oscillations, proton decay and supernova neutrinos with a liquid-argon far detector of unprecedented size.

In the near detector complex, a spectrometer system called 3DST-S centered by a 3D projection scintillator tracker (3DST) is proposed and being studied. It consists of a large 3D matrix of 1 cm³ scintillator cubes, optically isolated, for a total weight of approximately 11 tons. A gas tracker measures the momentum of particles exiting the 3DST, while an electromagnetic calorimeter reconstructs the energy of electrons and neutral pions. The whole system is placed in a 0.6 T magnetic field.

3DST-S, located downstream of a liquid-argon TPC and a magnetized high pressure gaseous-argon TPC, will be the only detector complex always on the neutrino beam axis and will precisely monitor the neutrino beam spectrum, rate and profile.

Thanks to its unprecedented capability of neutron detection and energy measurement, it will provide comprehensive measurements on a fully active scintillator target, allowing further constraints of neutrino interaction models.

Moreover, promising methods for the measure of the neutrino and antineutrino flux have been tested, showing strong potential.

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