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Solar and Supernova Neutrino Detection in the Deep Underground Neutrino Experiment

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The Deep Underground Neutrino Experiment (DUNE) is an upcoming experiment dedicated to the study of neutrino oscillation physics, nucleon decay, and supernova neutrinos. Understanding the physics of how massive stars die will lead to a better understanding of the creation of elements, properties of neutrinos, and constraints on beyond-the-Standard-Model physics. Neutrinos carry a majority of the core-collapse energy; thus, these neutrinos provide crucial information about the supernova. Solar and supernova neutrinos have much lower energies (few to 10s of MeV energy range) than those studied in the rest of DUNE's physics program. In order to extract as much information about our sun or a future supernova as possible, the DUNE collaboration has initiated various Monte Carlo simulation studies to study detector response and reconstruction ability, in order to optimize the DUNE neutrino detectors for low-energy physics. These studies improve expectations for solar and supernova neutrinos, advance the low-energy neutrino physics field, and prepare the DUNE detectors to detect these neutrinos under the most optimal circumstances.

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