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DUNE Low Energy Physics with Solar and Supernova Neutrinos

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The Deep Underground Neutrino Experiment (DUNE) is a project that includes four 17.5-kton modules with liquid argon that will be located about a mile underground at the Sanford Underground Research Facility in Lead, South Dakota. One of its primary goals is to observe and characterize neutrinos coming from a supernova burst in the Milky Way and surrounding galaxies. In the case of a successful measurement, the resulting energy spectrum and time distribution of neutrinos would provide important information for supernova modeling and black hole formation. DUNE may also be able to detect supernova-burst neutrinos before the light signal reaches the Earth, serving as an early warning system, as well as point to the supernova. Additionally, dependent on achieved backgrounds mitigation during production and underground installation, DUNE may measure B-8 neutrinos coming from the Sun and use them to improve our understanding of neutrino interactions and oscillations. This could include potential non-standard neutrino interactions and resolving the metallicity content in the Sun. Finally, DUNE will be able to detect the more rare but higher energetic hep solar neutrinos, and possibly diffuse supernova burst neutrinos, both of which have never been observed before.

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