

Supernova Pointing Resolution of DUNE

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One of the primary physics goals of the Deep Underground Neutrino Experiment (DUNE) is measuring the electron neutrino flux from a core-collapse supernova or black hole formation. If a neutrino burst were detected, an essential piece of information would be its source location, which would be shared via the Supernova Early Warning System (SNEWS). This would allow other astronomers to observe it and help determine which star collapsed, and thus its distance and history. Because of the importance of locating a neutrino burst's source, the pointing resolution of DUNE for neutrino bursts has been calculated using simulations in this study. The pointing resolution was first calculated for single electrons, then for neutrino-electron elastic scattering events, and finally for the expected supernova signal, looking only at elastic scattering events, since this type of event has the most directional signal. Using daughter tracks to determine primary track direction and a likelihood function to determine supernova direction were shown to improve pointing resolution. The model used in this study will be made more realistic by adding noise and the other supernova neutrino interaction modes in order to more accurately estimate DUNE's pointing resolution for supernovae.

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