

EstrellaNueva: an open-source software to study the interactions and detection of neutrinos emitted by supernovae

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Supernovae emit large fluxes of neutrinos which can be detected by detectors on Earth. Future tonne-scale detectors will be sensitive to several neutrino interaction channels, with thousands of events expected if a supernova emerges in the galaxy neighborhood. There are limited tools to study the interaction rates of supernova neutrinos, although a plethora of available supernova models exist. EstrellaNueva is an open-source software to calculate expected rates of supernova neutrinos in detectors using a variety of target materials. This software considers the flavor transformation of neutrinos in the supernova through the adiabatic Mikheyev–Smirnov–Wolfenstein effect, and their interaction in detectors through several channels. Most of the interaction cross sections are analytically implemented, such as neutrino-electron and neutrino-proton elastic scattering, inverse beta decay, and coherent elastic neutrino-nucleus scattering. This software provides a link between supernova simulations and the expected events in detectors by calculating fluences and event rates to ease any comparison between theory and observation. This simple and standalone tool to explore many physics scenarios will be presented in this talk.

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