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Supernova Detection with SNO+

An exciting component of the research program for SNO+ is the potential to detect neutrinos from a supernova. A core-collapse supernova in our galaxy is expected to produce a significant number of events in a short time period in the SNO+ liquid scintillator. Though supernova explosions in our galaxy are rare, occurring on average three times per century, the potential knowledge that can be gained from the observation of neutrinos from a galactic supernova is great, making preparations vital. The core of a collapsing star has conditions that occur nowhere else in the universe. In this unique environment, neutrinos are expected to interact with each other through collective effects induced by neutrino-neutrino forward scattering, which would lead to neutrino flavour transformations in addition to the matter-enhanced transformations associated with the MSW effect. The implications of observing the effects of collective interactions will be discussed, as well as methods to identify their presence or absence. Calculations of the number of neutrinos that may be detected by SNO+ during a core-collapse supernova will be presented, and the role of SNO+ in the SuperNova Early-Warning System (SNEWS) will be explained.

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