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Supernova detection in SNO+

SNO+ is a neutrinoless double beta decay experiment which reuses the SNO detector by filling it with tellurium-loaded liquid scintillator. It is also sensitive to galactic core-collapse supernovae and will participate in the Supernova Early Warning System (SNEWS). For a supernova at 10kpc, SNO+ will observe around 700 events. It can measure both the total flux of all neutrino species, through proton elastic scattering interactions, and also the electron anti-neutrinos separately via inverse beta decay. The largest number of events is in the elastic scattering channel, but due to quenching in the scintillator these are peaked at very low visible energy. To maximize the number observed, we use a two level trigger scheme. The DAQ's level-1 trigger runs at a low threshold, sufficient to see nearly all supernova events. We retain all of these events in a week-long buffer while also using a level-2 software filter to produce a reduced dataset for non-supernova analyses. In the same nearline processing chain, we search for supernova-like event bursts with a goal of being able to identify a supernova within one minute of the first events. We will be able to efficiently tag inverse beta decay events due to the clear delayed-coincidence signal in scintillator; this enhances the ability to identify supernova bursts with high confidence.

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