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Real-time detection of Supernova Neutrinos in XENONnT

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XENONnT is a state-of-the-art dark matter and neutrinos experiment hosted at the Laboratori Nationali del Gran Sasso (LNGS), in Italy. In its core, the experiment runs a time projection chamber (TPC) with an active target of 5.9 t of the liquid xenon at very low background conditions and keV-level energy threshold.
Although primarily developed to detect Weakly Interacting Massive Particles (WIMPs) that scatter of xenon nuclei, the detector will also be sensitive to neutrinos coming from a supernova (SN) burst, within and beyond the Milky Way. These neutrinos interact through coherent elastic neutrino-nucleus scattering (CEvNS), a flavour-blind process that enhances the number of interacting neutrinos when compared with most neutrino detectors. Neutrinos from galactic SNe would also be observed in the ~700 t water-based muon and neutron vetoes of the experiment, increasing its sensitivity and discrimination potential.
With its tonne-scale target, low background rate, and ancillary water-based vetoes, XENONnT is capable of actively contributing to the SuperNova Early Warning System (SNEWS). In this poster we describe the sensitivity to galactic and extragalactic SNe of XENONnT and the framework developed to quickly and effectively communicate any potential SN burst to the SNEWS network in a matter of minutes.

Poster prize

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