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Detecting SN neutrinos with RES-NOVA archaeological Pb cryogenic detectors

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The RES-NOVA project will hunt neutrinos from core-collapse supernovae (SN) via coherent elastic neutrino-nucleus scattering (CEνNS) using an array of archaeological lead (Pb) based cryogenic detectors. The high CEνNS cross-section on Pb and the ultra-high radiopurity of archaeological Pb enable the operation of a highly sensitive neutrino observatory, equally sensitive to all neutrino flavors, with dimensions at the cm-scale. The first phase of the RES-NOVA project is planning to operate a demonstrator detector with a total active volume of $(30 \text{ cm})^3$. It will be sensitive to SN bursts from the entire Milky Way Galaxy with $>3\sigma$ sensitivity, while running $PbWO_4$ detectors with 1 keV energy threshold. RES-NOVA will discriminate core-collapse SNe from black-holes forming collapses with no ambiguity even with such small volume detector. The main SN parameters can potentially be constrained with a precision of few % while looking at $\nu_{\mu/\tau}/\overline{\nu}_{\mu/\tau}$. We will present the performance of the first prototype detectors, and sensitivity projections for the full detector. We will show that RES-NOVA has the potential to lay the foundations for a new generation of neutrino observatories, while relying on a very simple and modular experimental setup.

Submitted on behalf of a Collaboration?

Yes

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