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Probing Dark Matter with RES-NOVA's archaeological Pb-based Detectors

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The quest to understand dark matter (DM) continues to be a driving force in astrophysics and particle physics. This talk discusses the potential of the RES-NOVA project, envisioned for detecting astrophysical neutrinos via Coherent Elastic Neutrino-Nucleus Scattering (CEvNS), to also serve as a DM observatory. Leveraging the array of cryogenic detectors made from archaeological Pb, known for its ultra-high radiopurity, RES-NOVA is uniquely positioned to detect both neutrino and DM interactions via nuclear recoils. The use of Pb significantly enhances the interaction cross-section for neutrinos and DM, making it an ideal candidate for astrophysical phenomena investigation. By extending the operational principles and sensitivity of CEvNS-based detectors, RES-NOVA may also be capable of observing DM particles from our galactic halo.
RES-NOVA's sensitivity to low-energy interactions offers a unique avenue to probe discrete symmetries, where any observed deviations could indicate symmetry violations in neutrino and DM interactions beyond the Standard Model.
The theoretical implications for such dual-use of the RES-NOVA detector, the detector design, sensitivity, and a preliminary background model aimed at identifying DM candidate signals, are presented.

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