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# The RES-NOVA astroparticle physics observatory

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Core-collapse Supernovae (SN) represent critical astronomical events where nearly an entire star's binding energy is emitted as neutrinos. RES-NOVA addresses a significant challenge in astroparticle physics by introducing a novel neutrino detection method using cryogenic detectors constructed from ultra-pure archaeological lead (Pb). The project's key innovation lies in leveraging Coherent Elastic Neutrino-Nucleus Scattering (CEvNS), a detection mechanism with a cross-section approximately 10^4 times larger than traditional detection channels like inverse-beta decay or electron-scattering.
The proposed detector array offers unprecedented sensitivity through its unique design. With a compact volume of just (30 cm)^3, RES-NOVA can survey approximately 90% of potential galactic SNe. The cryogenic detectors utilize Pb with extremely low intrinsic radioactivity, optimized for a low energy threshold and minimal background interference. This approach enables comprehensive measurement of SN neutrino signals while eliminating uncertainties related to neutrino flavor oscillations.
Beyond SN research, the technology presents broad applications in astroparticle physics. The low-energy threshold and advanced background reduction techniques make these detectors promising for multi-messenger astronomy, Dark Matter searches, and fundamental neutrino property studies.
In this contribution, we will present the current experimental efforts focused on the realization of this new technology. Results on the first prototype detectors will be presented, as well as sensitivity projections for the full detector operations. RES-NOVA represents a significant technological advancement, potentially establishing the foundation for a next-generation neutrino and dark matter observatory.

## Neutrino Properties

no

## Neutrino Telescopes & Multi-messenger

Yes

## Neutrino Theory & Cosmology

no

## Data Science and Detector R&D

no

**Author:** PATTAVINA, Luca (Univesity of Milano-Bicocca & INFN)

**Presenter:** PATTAVINA, Luca (Univesity of Milano-Bicocca & INFN)

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