

RES-NOVA

Archaeological Lead based cryogenic
detector



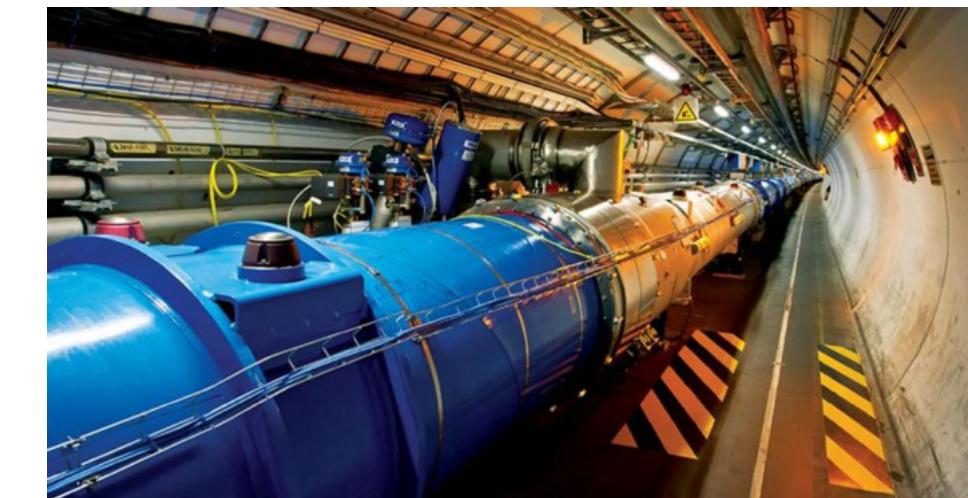
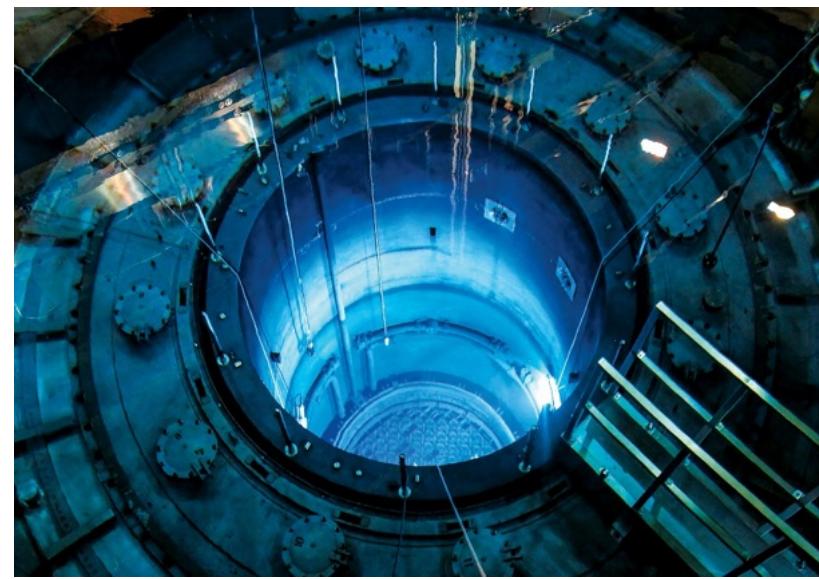
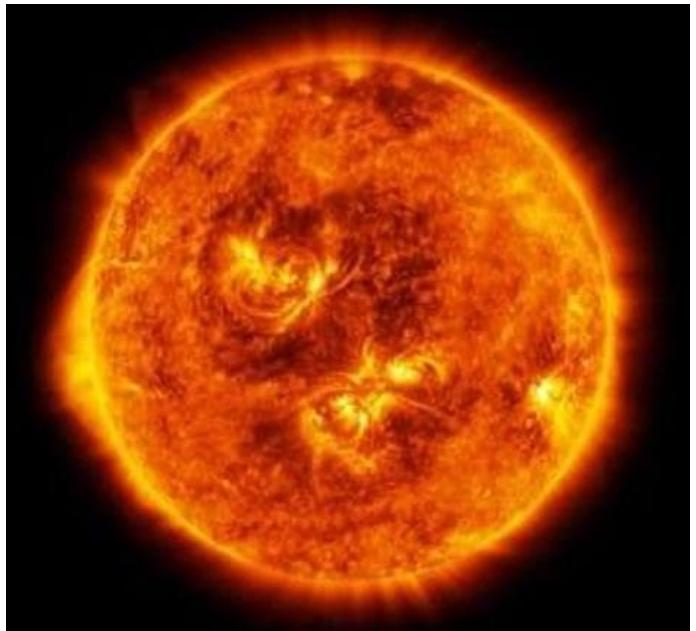
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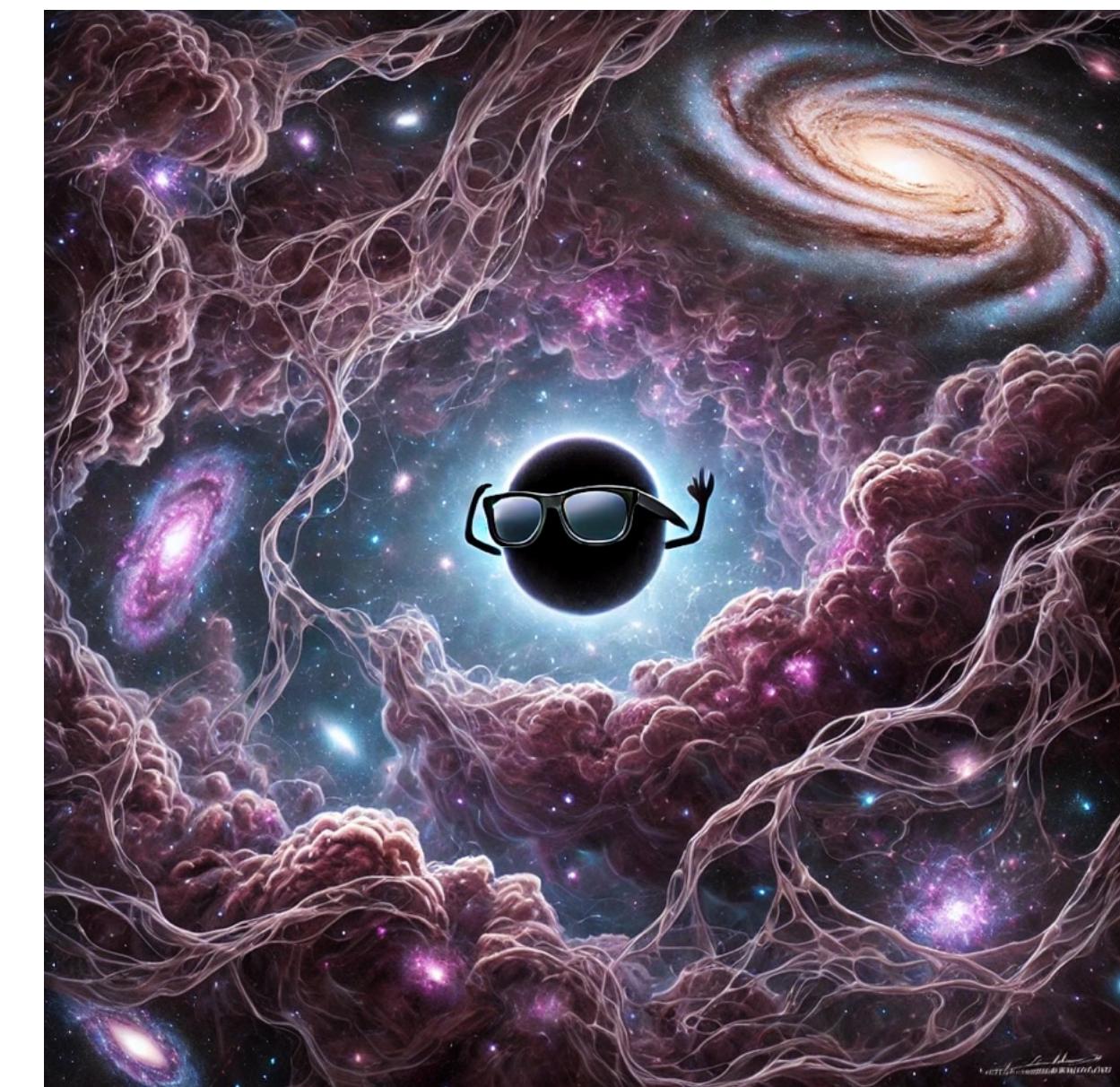
Astro-particles: Neutrinos and Dark Matter

- AMONG THE MOST ABUNDANT PARTICLES IN NATURE
- COSMIC MESSENGERS

NEUTRINOS



DARK MATTER

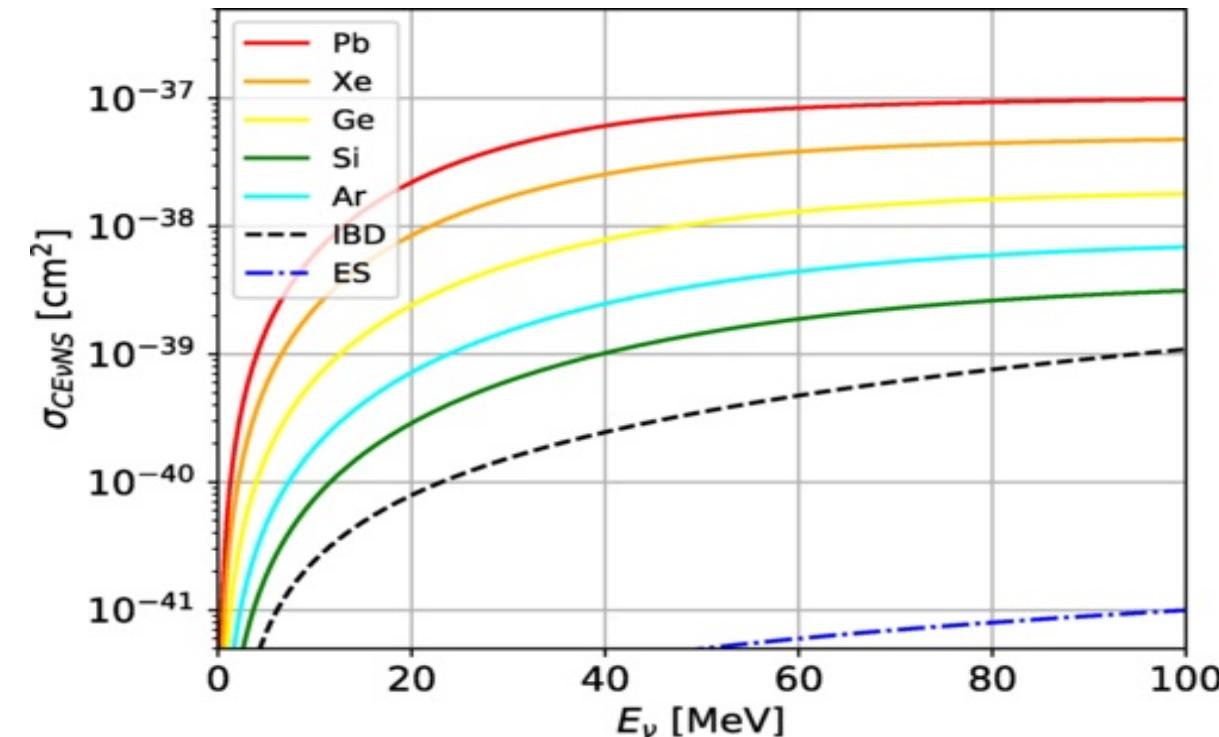


WE CAN USE NEUTRINOS/DM PROPERTIES TO STUDY NEUTRINO/DM SOURCES

Archaeo-Pb based cryogenic detectors

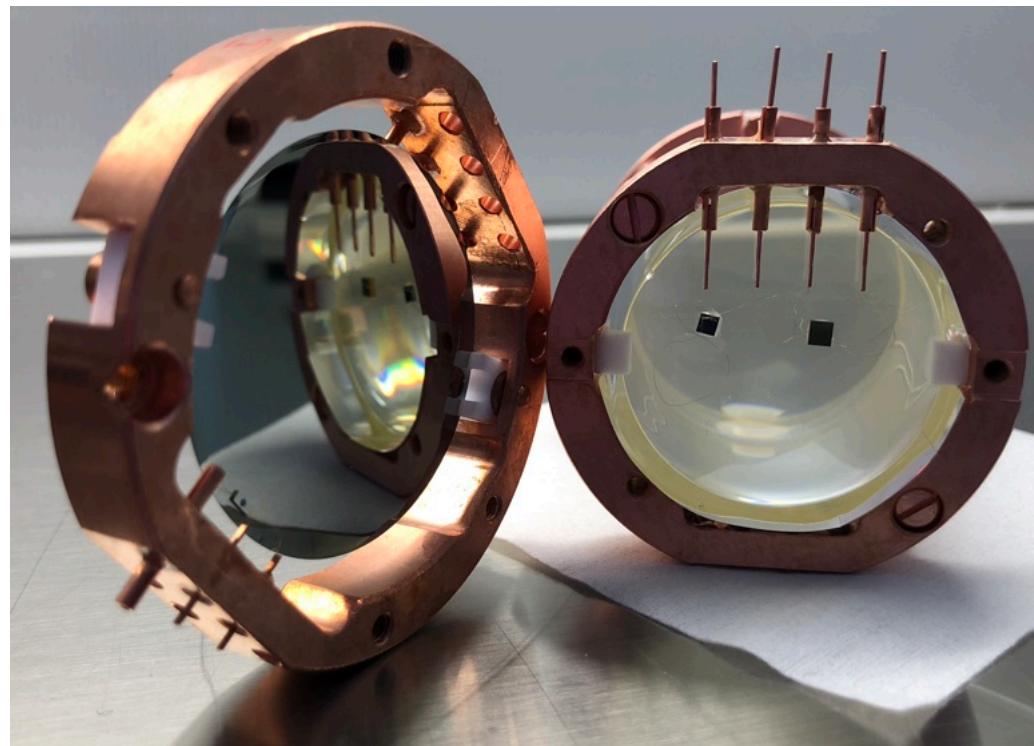
1. HIGH STATISTICS (LARGEST CROSS-SECTION)

2. ULTRA-LOW-BACKGROUND



RES-NOVA: NEW EXPERIMENTAL APPROACH WITH CM-SCALE NEUTRINO DETECTOR
AIM: MEASUREMENT OF SUPERNOVAE NEUTRINOS TO STUDY STELLAR CORE COLLAPSES

**RES-NOVA CRYOGENIC
DETECTORS**



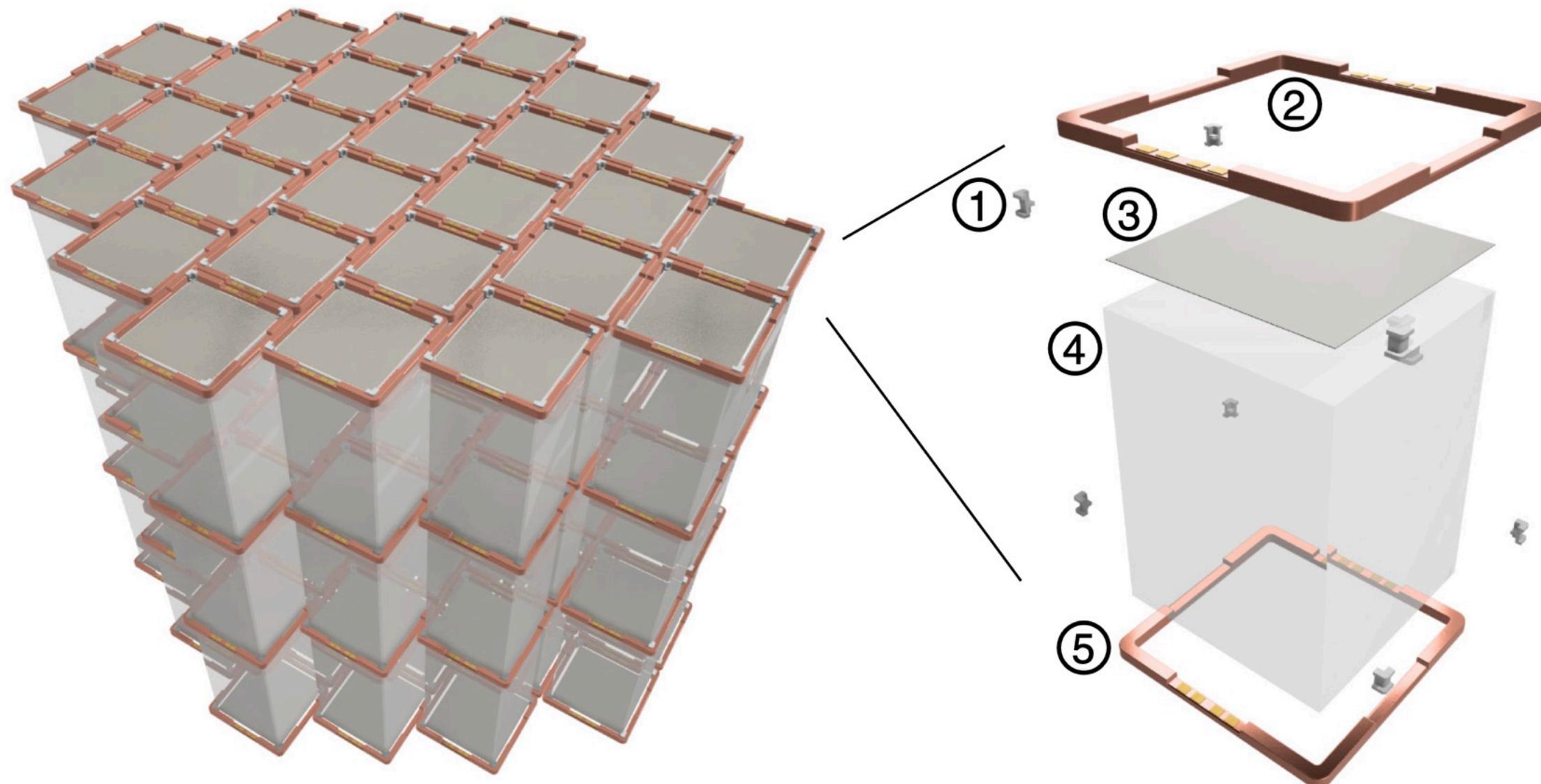
4 cm

**TRADITIONAL NEUTRINO
DETECTOR**



20 m

RES-NOVA detector



RES-NOVA DEMONSTRATOR DETECTOR

3 layers of 28 crystals each - 170 kg



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KEY RESEARCH AREAS FOR THE RES-NOVA EXPERIMENT:

- **RADIOACTIVITY**: ANALYSIS AND ASSESSMENT OF MATERIALS RADIOPURITY
- **ELECTRONICS**: DEVELOPMENT AND TESTING OF SIGNAL READOUT ELECTRONICS
- **MONTE CARLO SIMULATIONS**: DEVELOPMENT OF THE EXPERIMENTAL BACKGROUND MODEL
- **MACHINE LEARNING**: DEVELOPMENT OF DECISION ALGORITHMS FOR SIGNAL DISCRIMINATION

Proposed thesis topics

Assembly, operation and data analysis of detector prototypes with archeological Lead  (hardware)

Characterization of SQUIDs (Superconducting Quantum Interference Devices) for detector readout  (hardware)

Study of cosmogenic activation in PbWO_4 crystals produced with Roman Lead for the RES-NOVA experiment  (hardware + software)

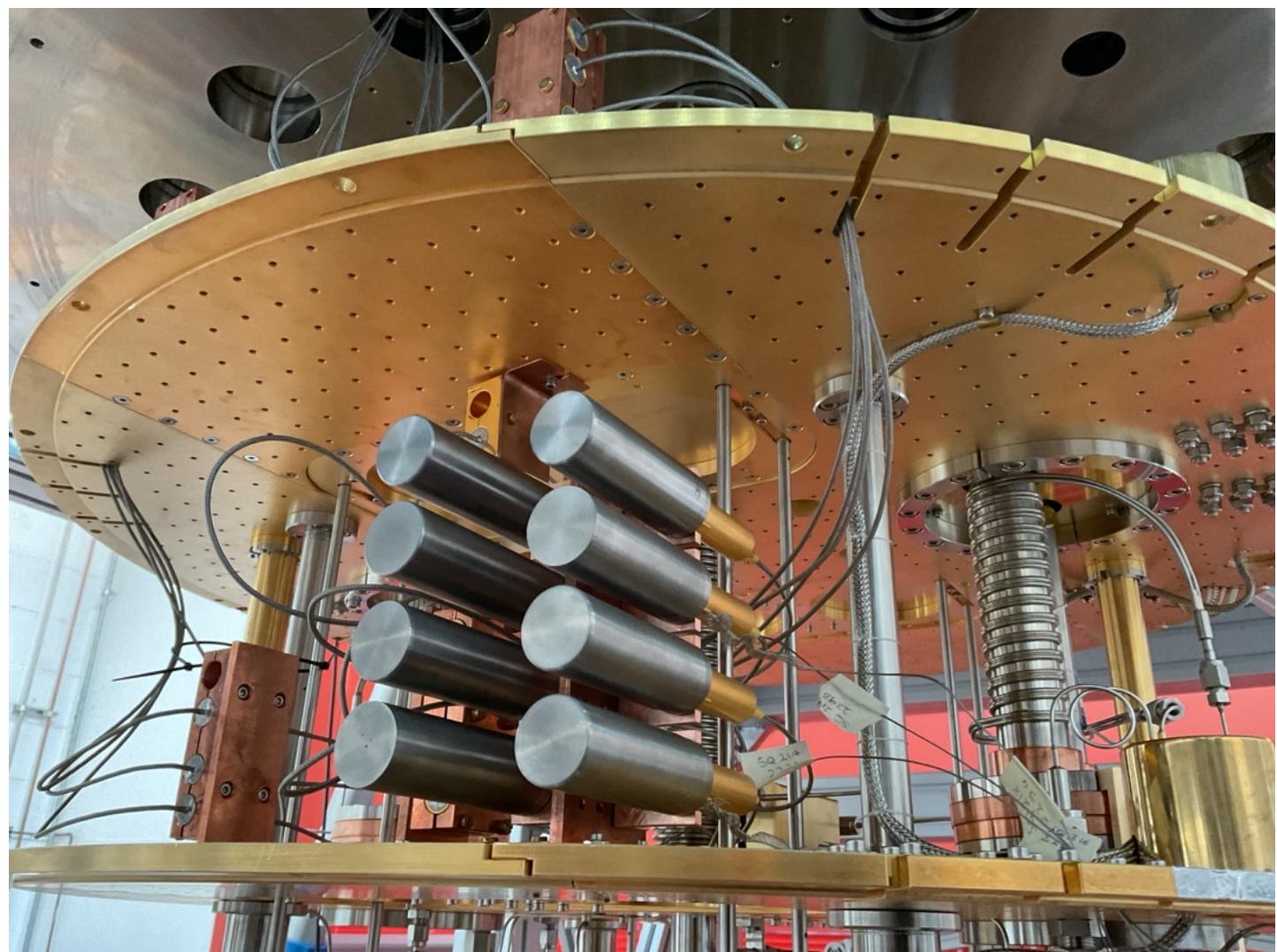
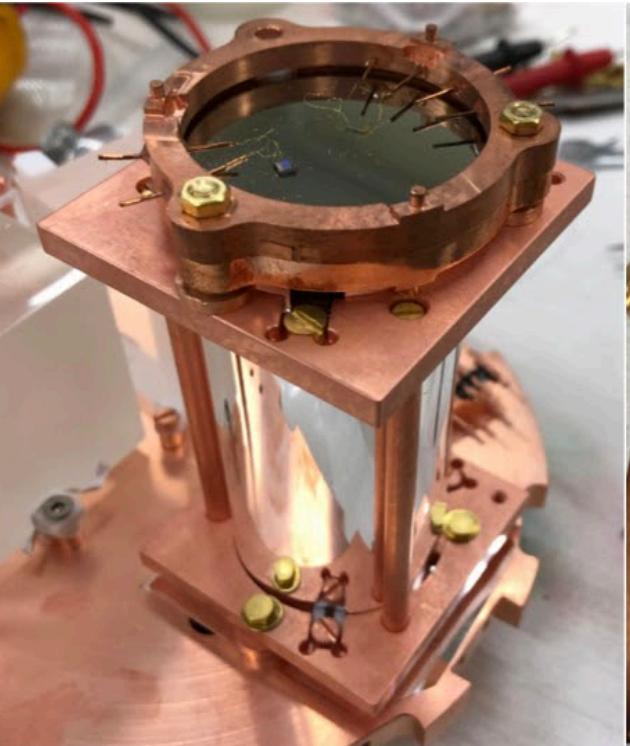
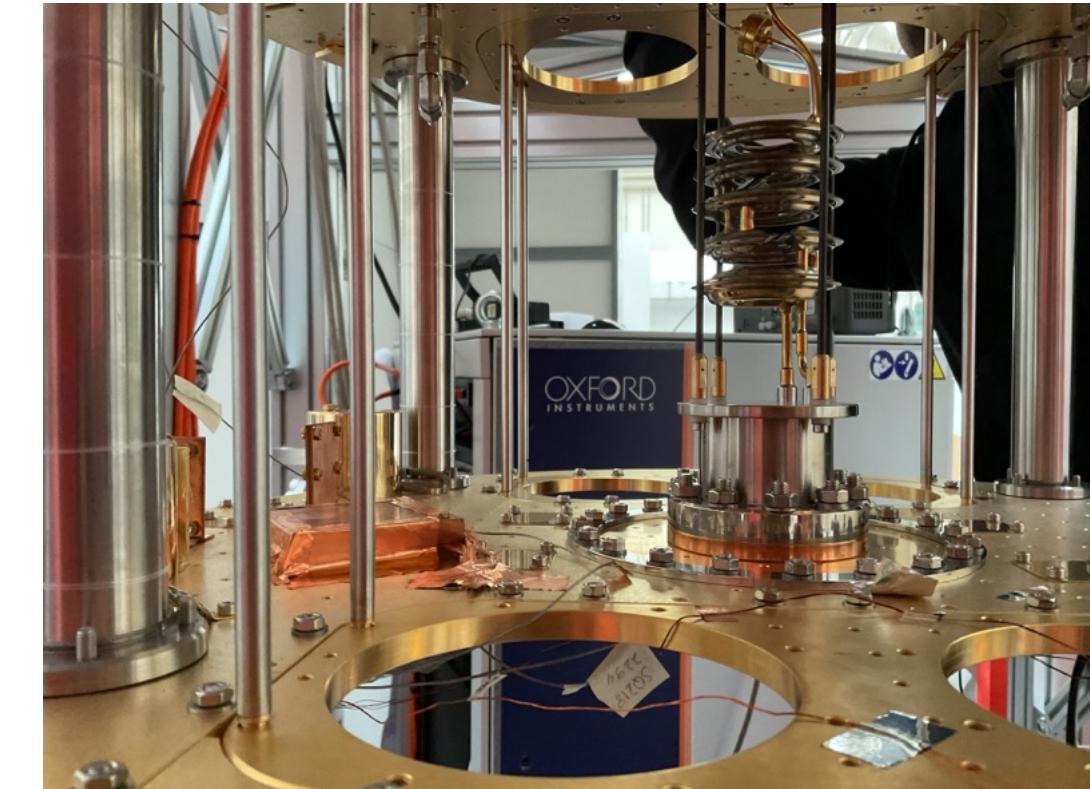
Neutron activation of archeological Lead at the nuclear reactor TRIGA MkII in Pavia  (hardware+software)



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Sensitivity studies of rare processes: Dark Matter interactions, Supernova and Solar Axions searches, Solar neutrinos  (software)

Development of a background model using Monte Carlo simulations  (software)

Linearization of the energy response of sensors operated in the superconducting transition (TES) for the RES-NOVA experiment  (machine learning)

Development of a classifier for the identification of nuclear recoils and background suppression in the RES-NOVA experiment  (machine learning)

Thank you for the attention!

Contact us!

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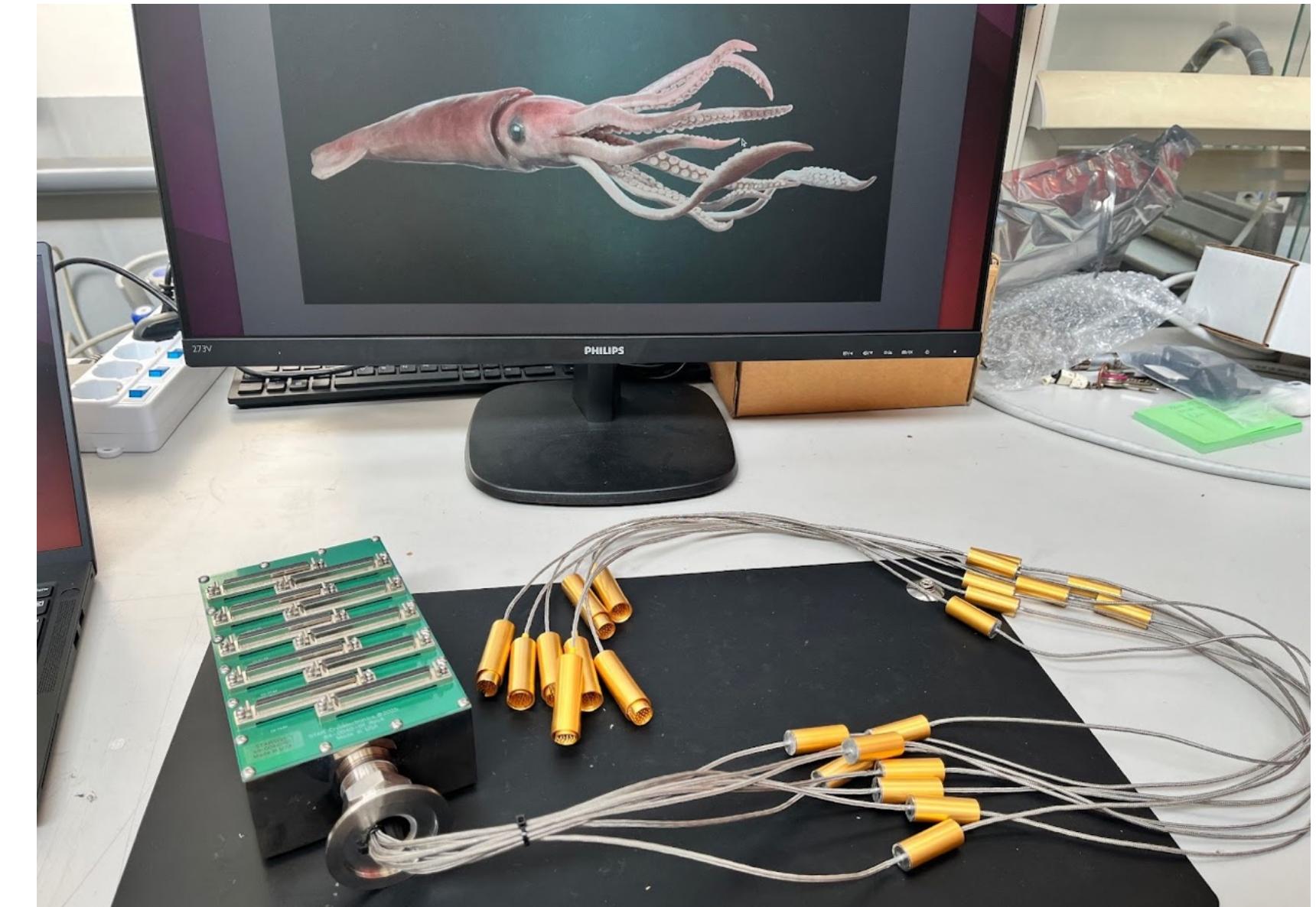
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More information: <https://res-nova.unimib.it/experiment>