

RES-NOVA

Archaeological Lead based cryogenic
detector



Funded by
the European Union

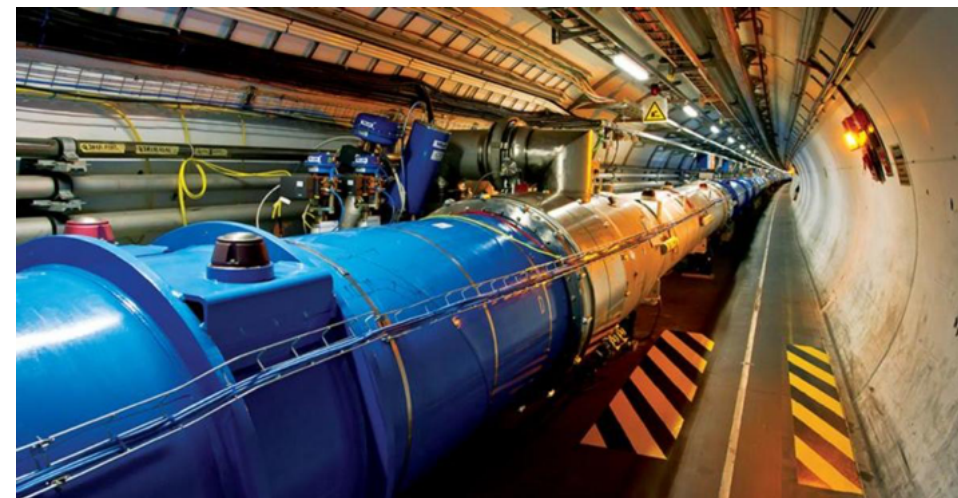
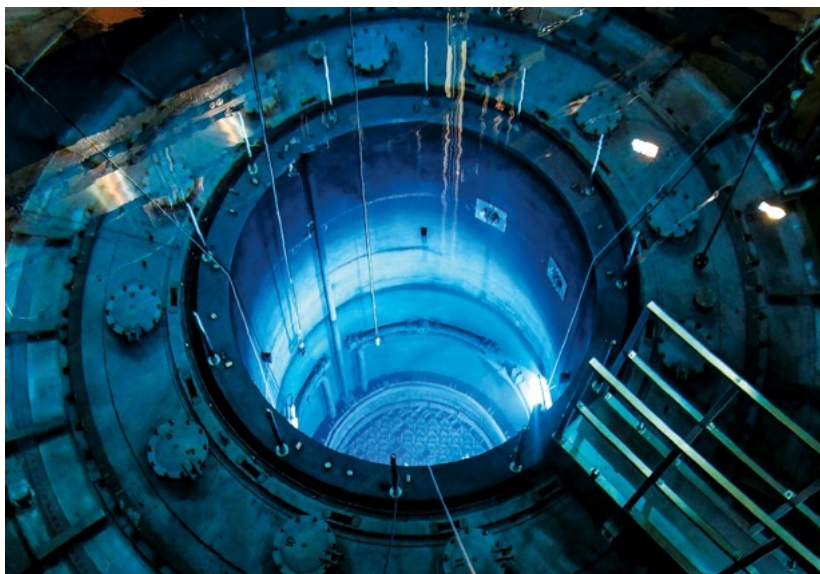
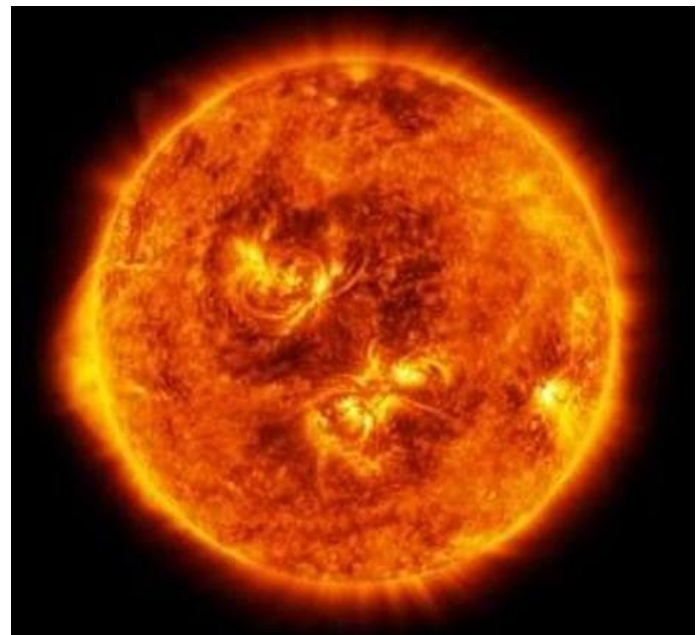


European Research Council
Established by the European Commission

Astro-particles: Neutrinos and Dark Matter

- AMONG THE MOST ABUNDANT PARTICLES IN NATURE
- COSMIC MESSENGERS

NEUTRINOS



DARK MATTER

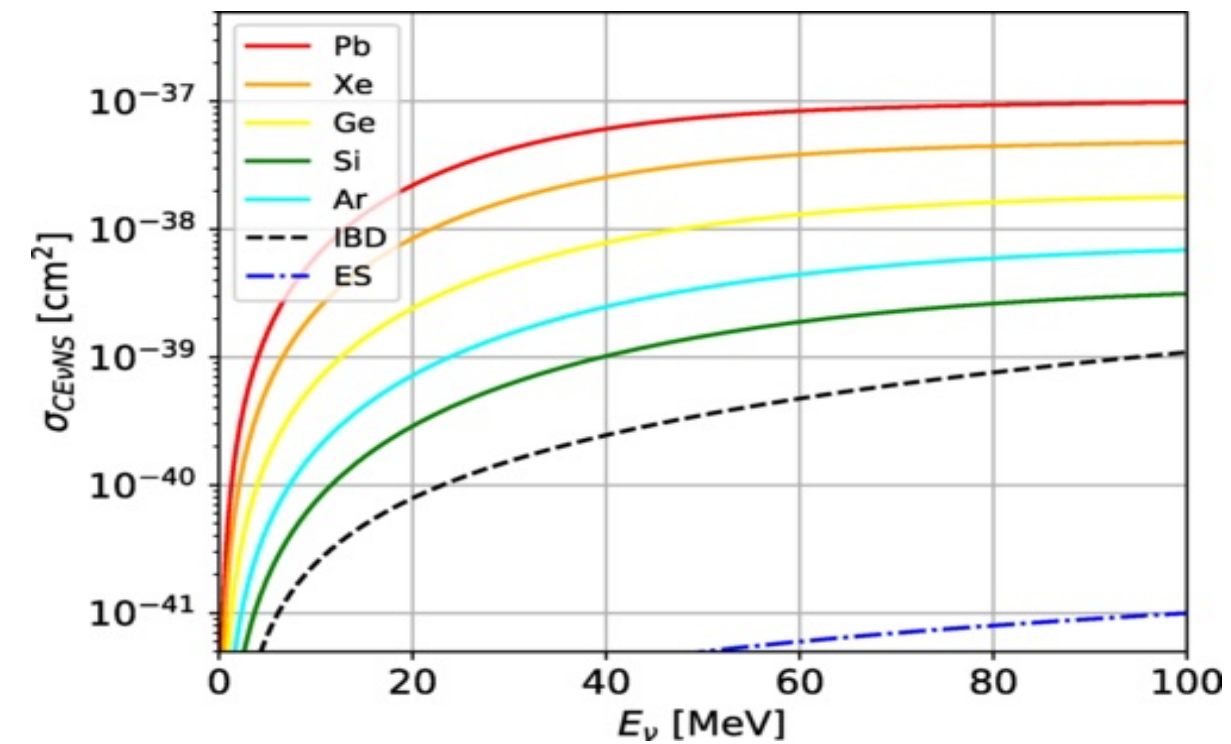


WE CAN USE NEUTRINOS/DM PROPERTIES TO STUDY NEUTRINO/DM SOURCES

Archaeo-Pb based cryogenic detectors

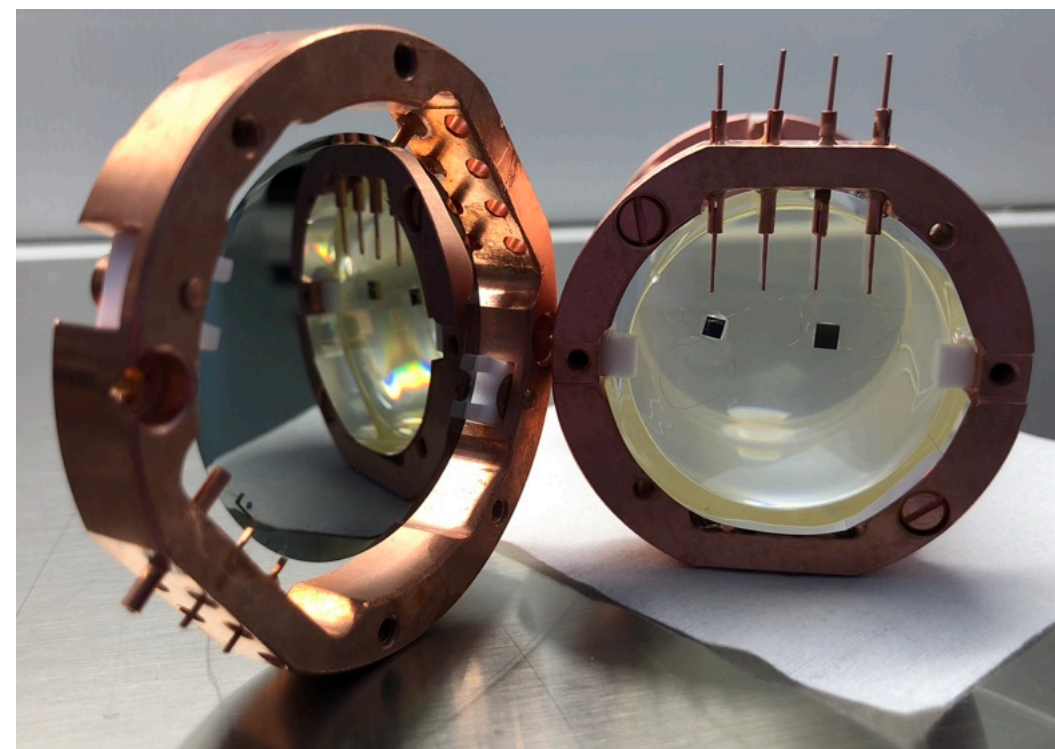
1. HIGH STATISTICS (LARGEST CROSS-SECTION)

2. ULTRA-LOW-BACKGROUND



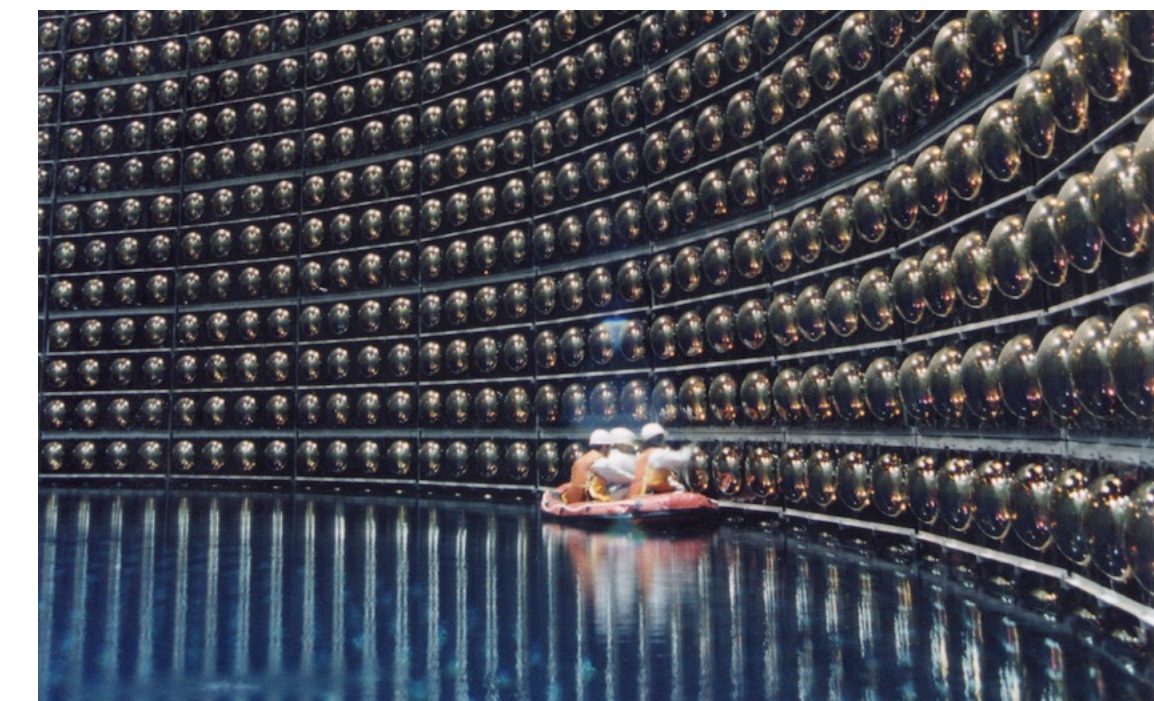
RES-NOVA: NEW EXPERIMENTAL APPROACH WITH CM-SCALE NEUTRINO DETECTOR
AIM: MEASUREMENT OF SUPERNOVAE NEUTRINOS TO STUDY STELLAR CORE COLLAPSES

RES-NOVA CRYOGENIC DETECTORS



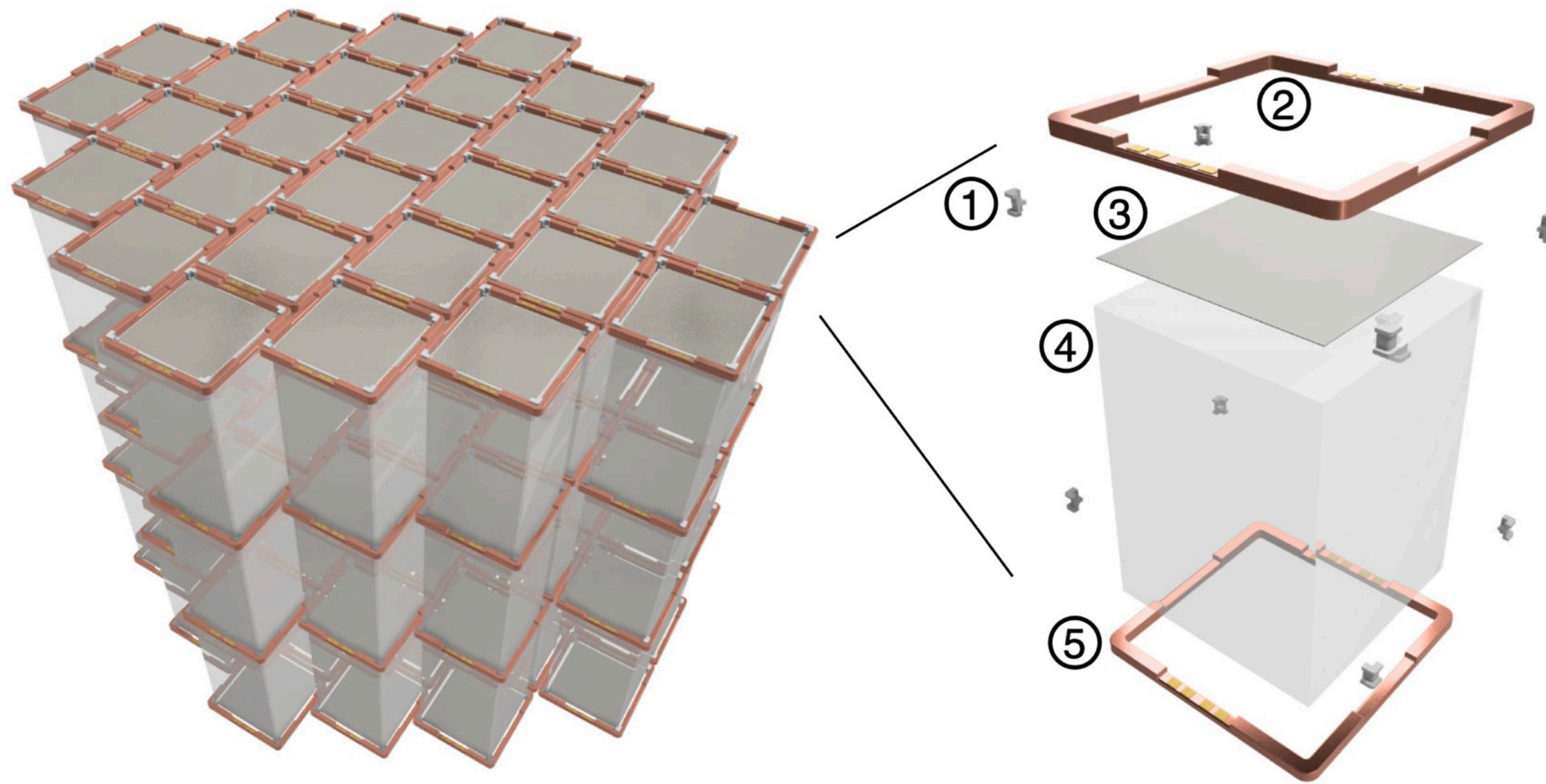
4 cm

TRADITIONAL NEUTRINO DETECTOR



20 m

RES-NOVA detector



RES-NOVA DEMONSTRATOR DETECTOR

3 layers of 28 crystals each - 170 kg

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



Check us out: <https://res-nova.unimib.it/experiment>

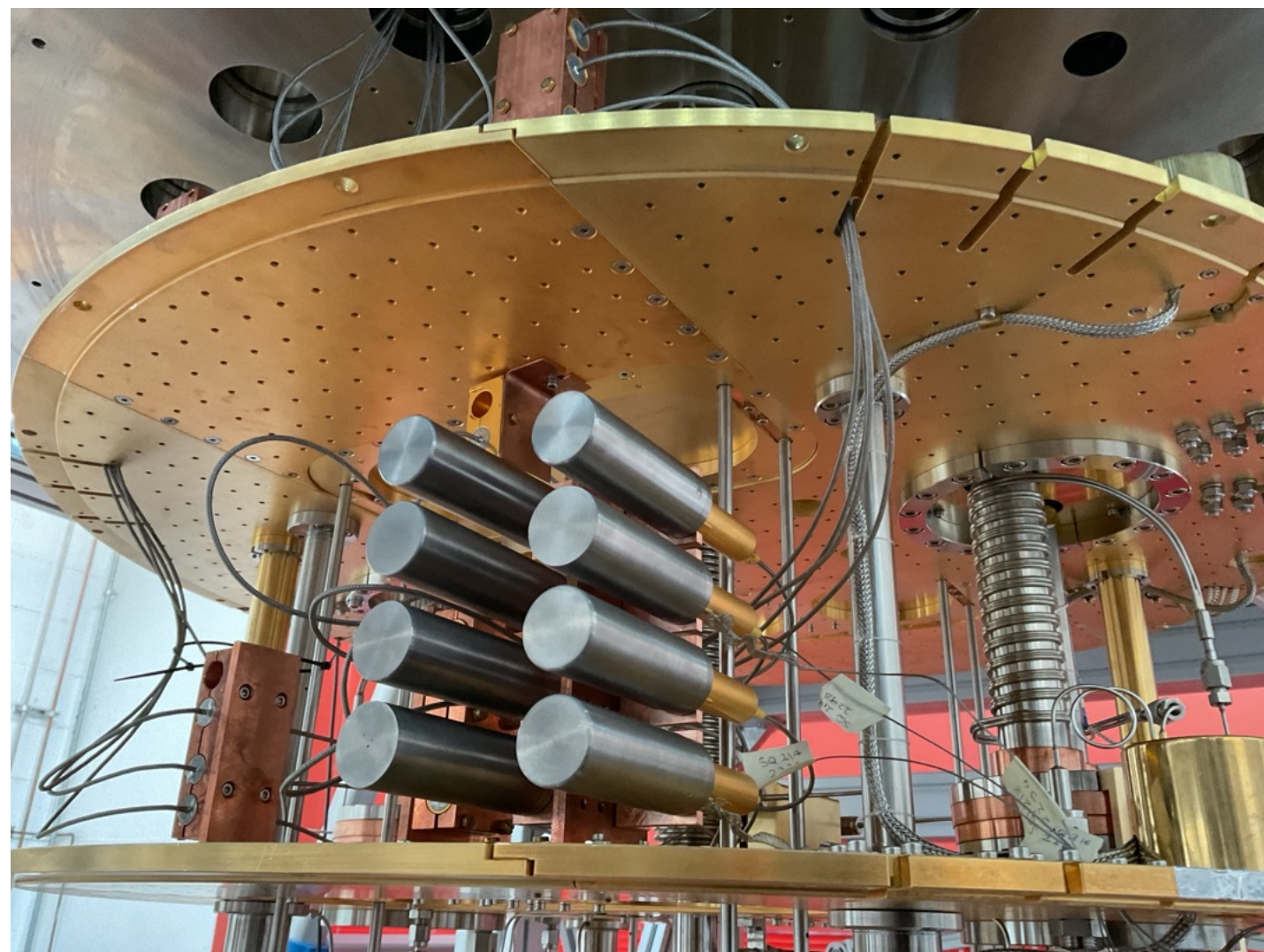
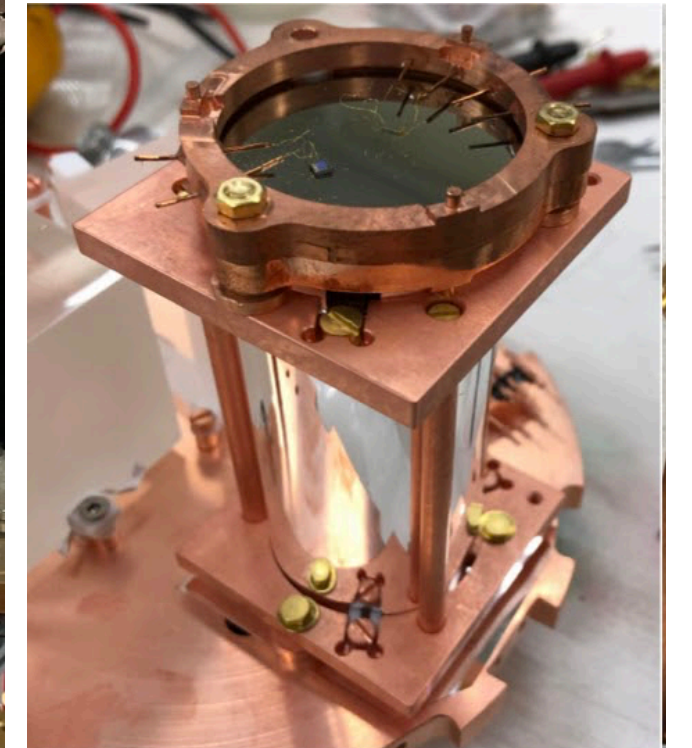
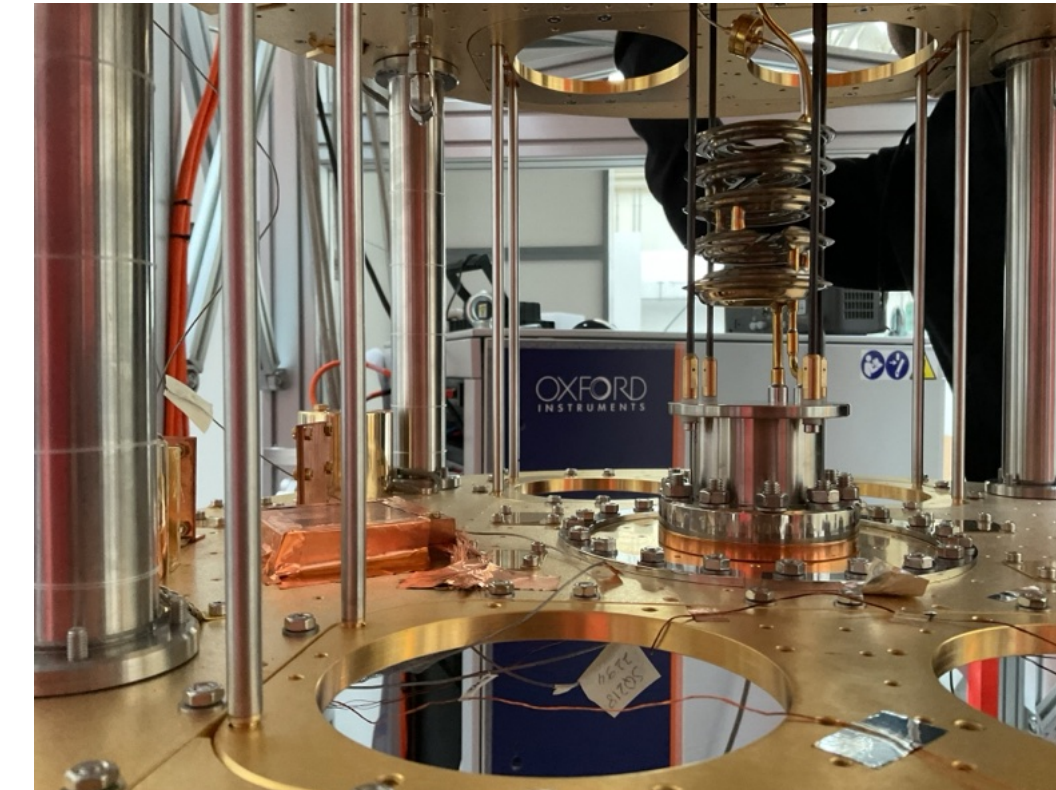
Proposed thesis topics

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)



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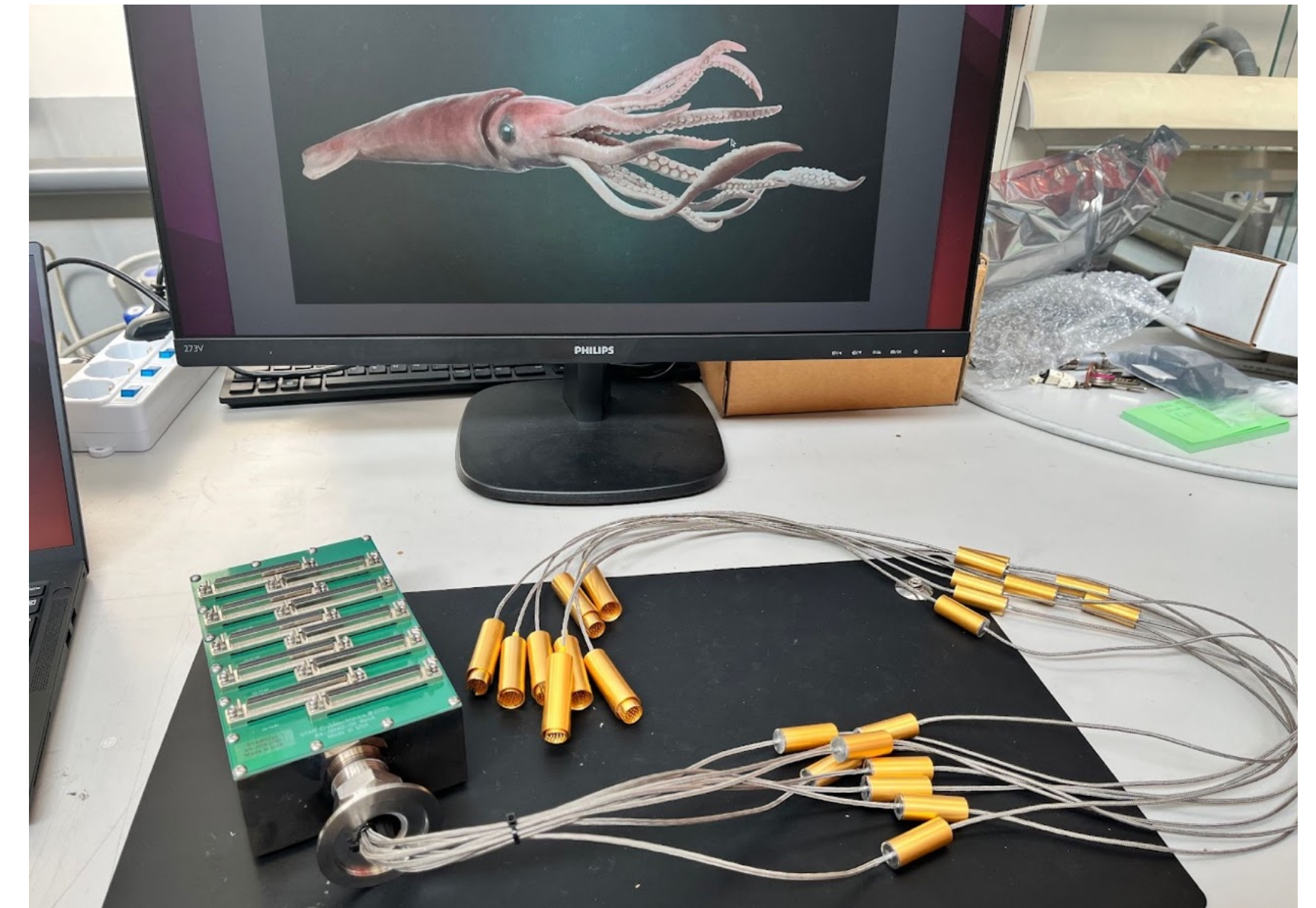
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More information: <https://res-nova.unimib.it/experiment>