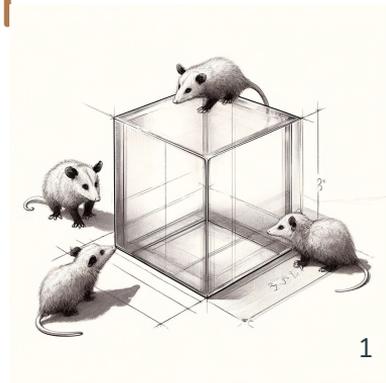


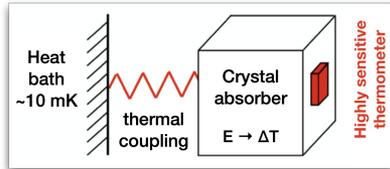
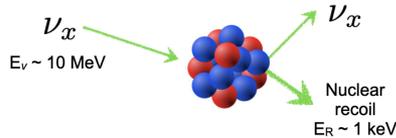
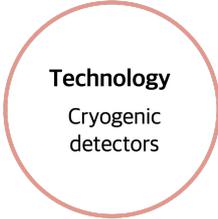
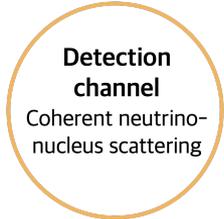
Development of low-temperature detectors for RESNOVA and OPOSSUM



European Research Council
Established by the European Commission



RES-NOVA: A revolutionary archaeological Pb observatory for astrophysical neutrino sources



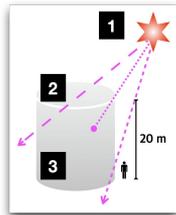
Archaeo-Pb cryogenic detector

$$\sigma_{CE\nu NS} \propto N^2$$

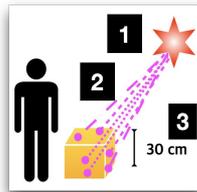
cross-section Neutron number

High radiopurity: < 1 mBq/kg

x10⁴ better than commercial low-background Pb



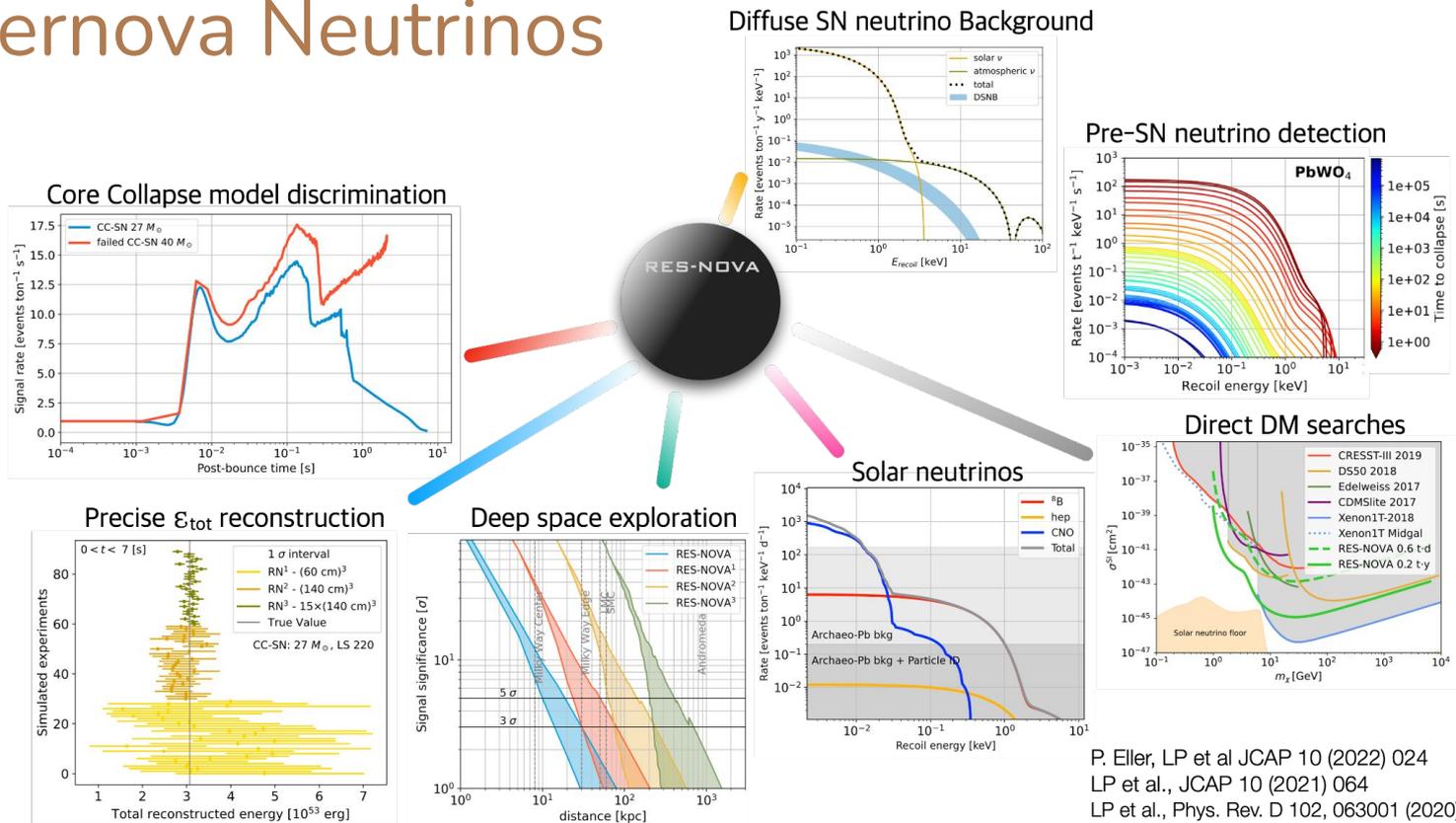
- Status quo:
- 1** detection of ~1/6 SN flux
 - 2** small cross-section
 - 3** large volume detectors



- Opportunities:
- 1** detection of full SN v flux
 - 2** highest cross-section
 - 3** cm-scale v telescope

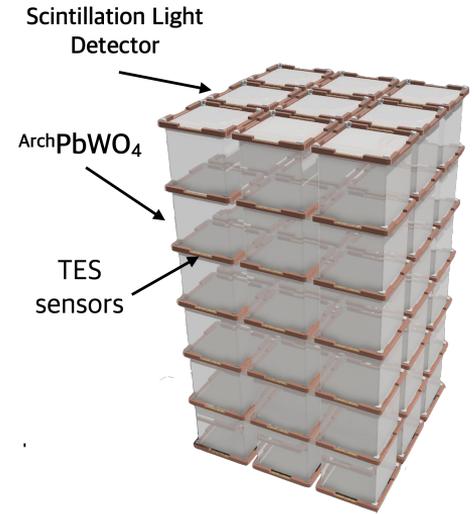
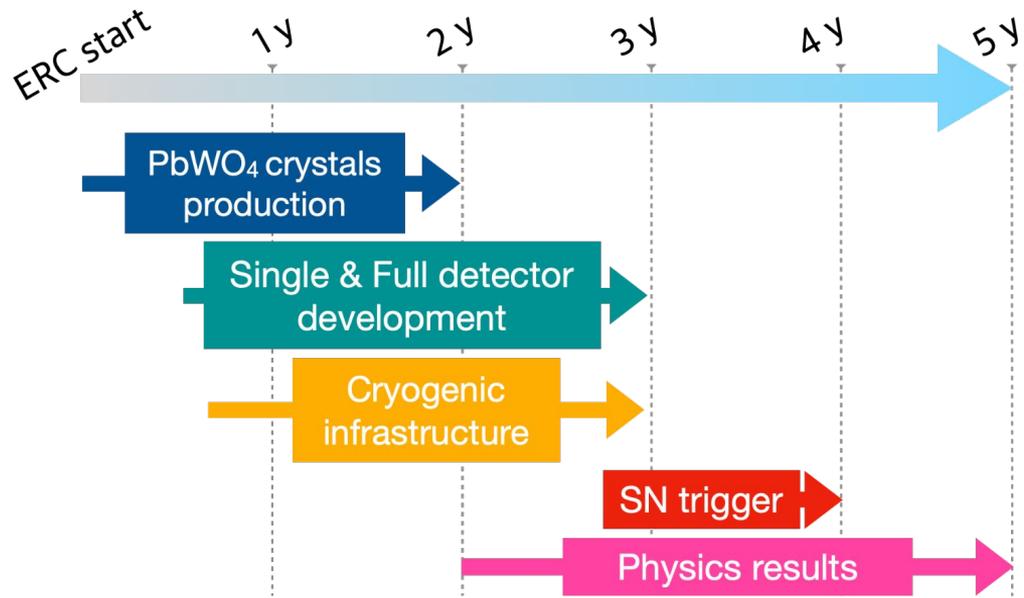
→ **~200 ev./m³**

RES-NOVA: Opening a Window Beyond Supernova Neutrinos



P. Eller, LP et al JCAP 10 (2022) 024
 LP et al., JCAP 10 (2021) 064
 LP et al., Phys. Rev. D 102, 063001 (2020)

RES-NOVA plan

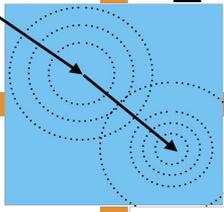


Survey of 90% Galactic SNe

OPOSSUM

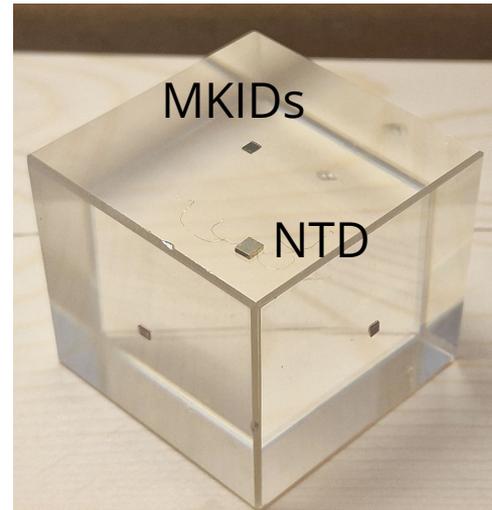
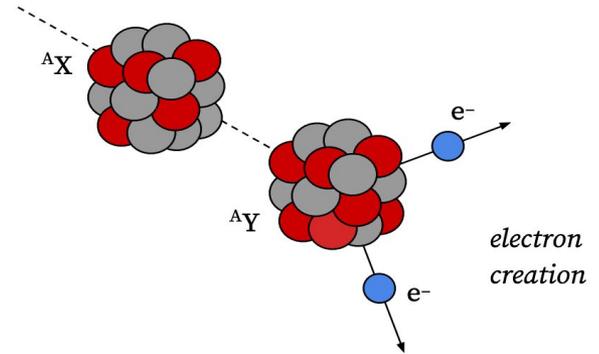
Optimal Particle identification Of Single Site events with Underground MKIDs detectors

Elimination of all background events in the search for the **Zero Neutrinos Double Beta Decay**.



Event **topology reconstruction** in low temperature calorimeters.

For the **first** truly **background free** ton-scale experiment in the next 10 years.

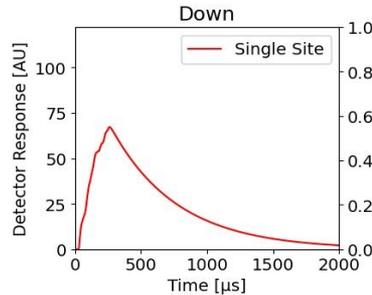
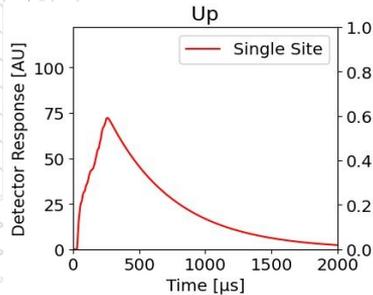
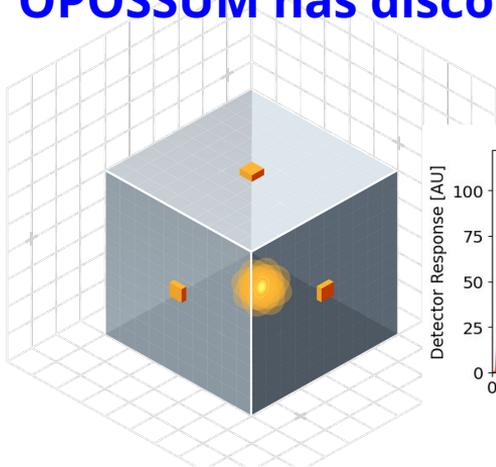
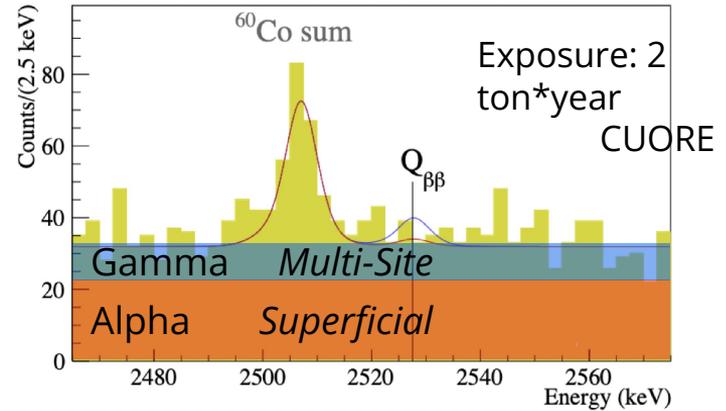


OPOSSUM identifies the 0νBB events

OPOSSUM will positively identify the Single Site Events

Background reduction of two orders of magnitude

OPOSSUM has discovery potential!

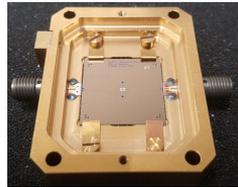


OPOSSUM's PLAN

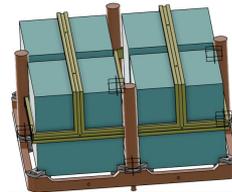
RF and cryo setup



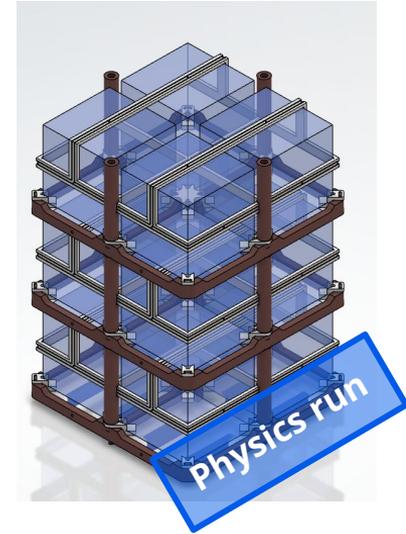
MKID
Deposition
on TeO_2



$4 \times \text{TeO}_2$
+
MKID's



OPOSSUM
final array
10 kg test



DR setup

MKIDs design on TeO_2

$5 \times 5 \times 5 \text{ cm}^3$ TeO_2 with MKIDs

Data analysis and background model

12 TeO_2 array with MKIDs: 10 kg*y

1st year

2nd year

3rd year

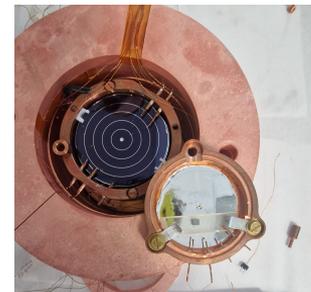
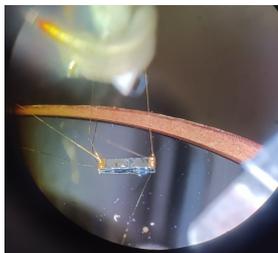
4th year

5th year

Research and Activity opportunities at LNGS



- Characterization of TES and MKID detectors
 - Detector R&D
 - Data analysis and signal processing
- Radiopurity and material characterization
 - Electronics and DAQ test



Thank you for you attention

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OPOSSUM :

- **ANDREI PUIU** andrei.puiu@lngs.infn.it

LE-8: Cryogenics sensors for astroparticle physics

Andrei Puiu (INFN - LNGS)

