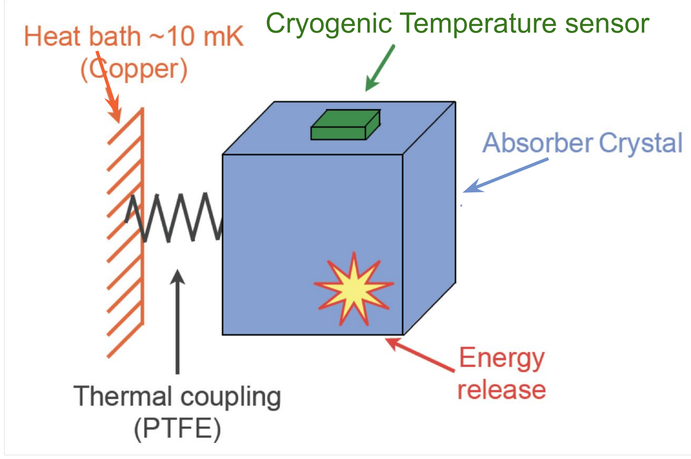
Istituto Nazionale di Fisica Nucleare
SEZIONE DI ROMA

INFN Sezione di Roma 1 - Open Day

Neutrino Experiments with Cryogenic Calorimeters

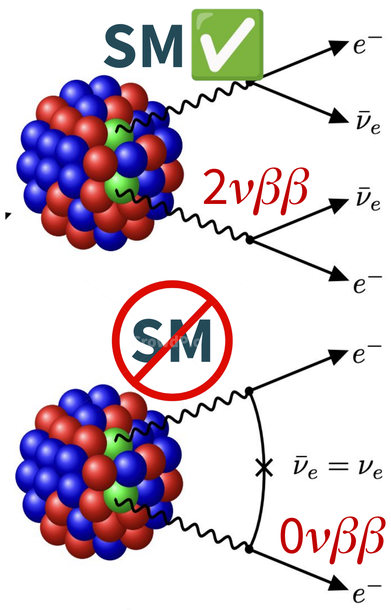
Cryogenic Calorimeters

1. Interacting particles deposit energy in the crystal
2. Energy release heats up the crystal
3. Temperature increase is converted into an electric signal by a cryogenic sensor



- ★ Excellent energy resolution
- ★ Low Detection Thresholds
- ★ Efficient energy collection

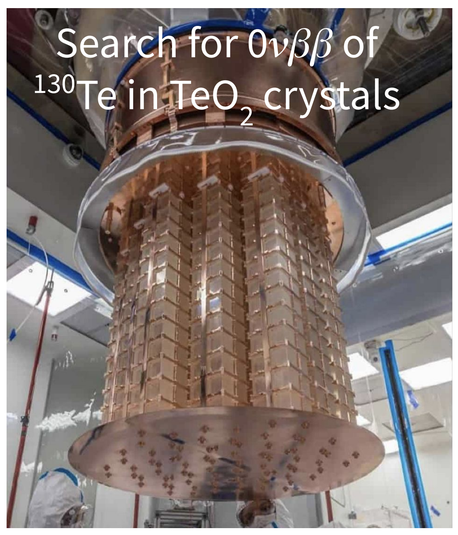
Neutrinoless double β decay



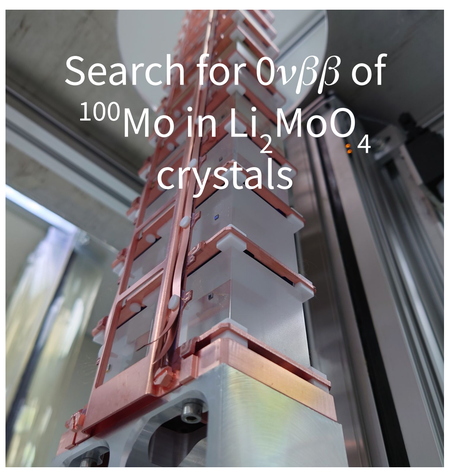
- Elusive decay to investigate the nature of neutrino mass
- Is the neutrino its own antiparticle, i.e. a Majorana particle?
- Hints on the origin of matter-antimatter asymmetry in the Universe

CUORE

- First ton-scale cryogenic calorimeter experiment
- Low background facility
- Taking data sice 2017 at Laboratori Nazionali del Gran Sasso
- Broad physics program with >2 ton yr of exposure



CUPID

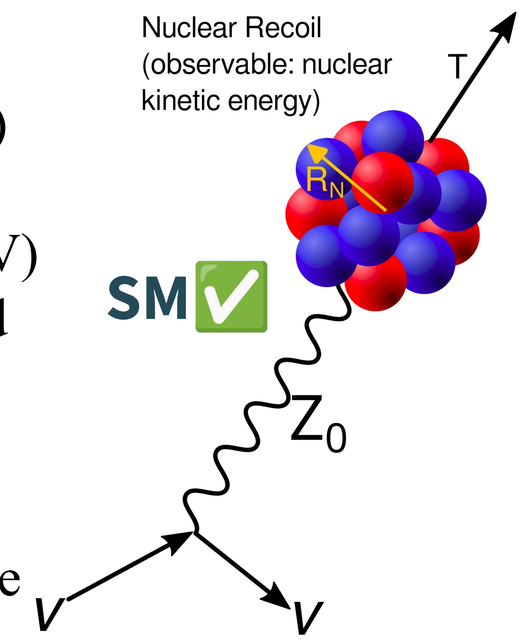


- Next generation experiment, first data expected in 2030
- Light and Heat detection for particle identification
- R&D and Prototype measurements ongoing
- New cryogenic facility in construction at Sapienza

Contacts: Fabio Bellini, Laura Cardani, Nicola Casali, Alberto Ressa, Claudia Tomei

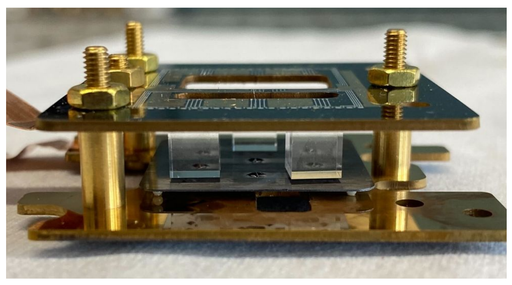
Coherent Elastic Neutrino Nucleus Scattering

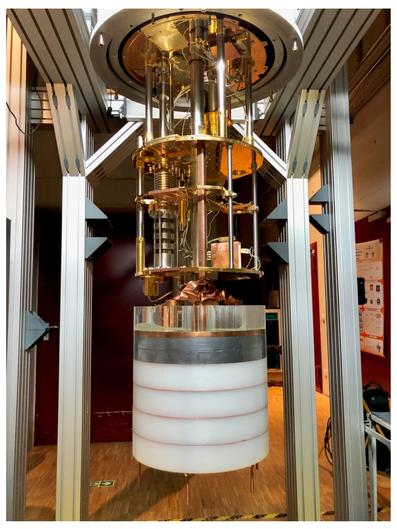
- Challenging to measure: nuclear recoil of O(100 eV)
- Dominant process at low neutrino energies (<10 MeV)
- Excellent probe for SM and beyond studies
- Irreducible background for WIMP experiments
- Monitoring of nuclear waste and nuclear reactors



NUCLEUS

- 10 g detector array with ultralow thresholds
- Complex veto system to reduce surface background
- Same technology and observable as WIMP experiments





- Move to the Chooz nuclear power plant in 2025
- Cross-section measurement with 10% uncertainty
- 5σ neutrino detection significance in few months
- Validation of low energy background model

Contacts: Marco Vignati, Nicola Casali, Giorgio Del Castello, Claudia Tomei