The US-CUORE Collaboration

A neutrionless double beta decay experiment at the Gran Sasso Lab.

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***CUORE**: A **C**ryogenic **U**nderground **O**bservatory for **R**are **E**vents*

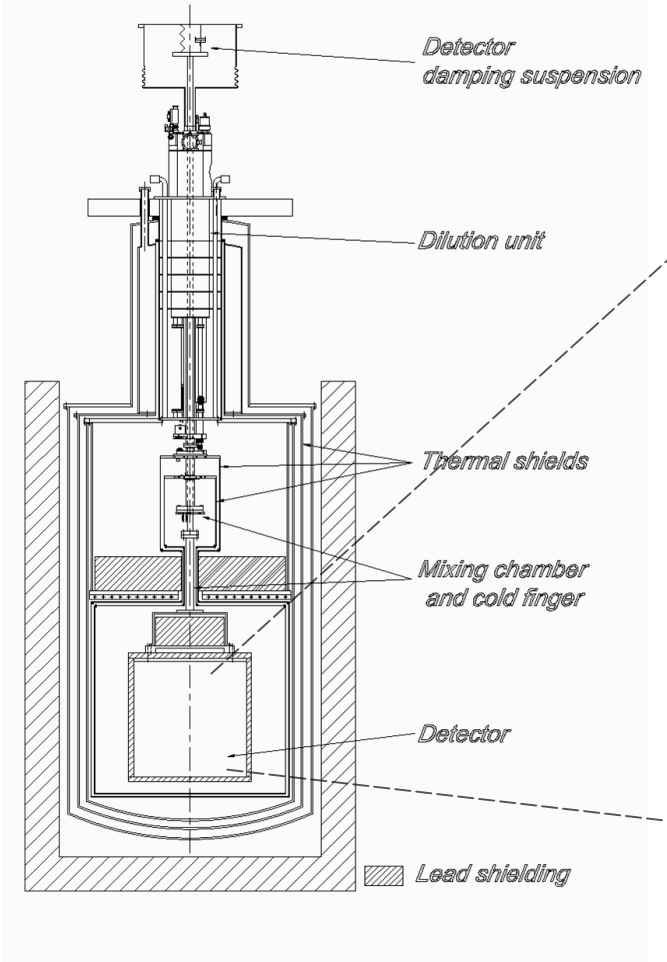
Physics

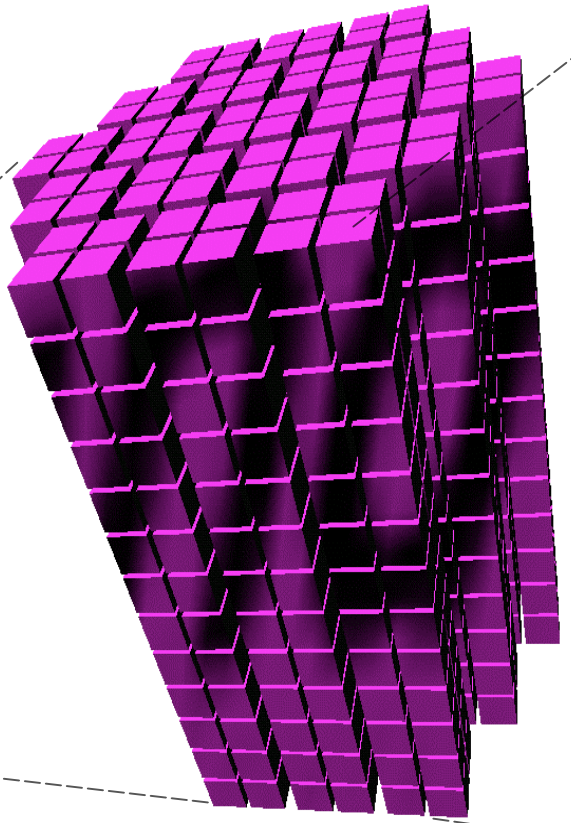
Next generation $0\nu2\beta$ experiments potentials:

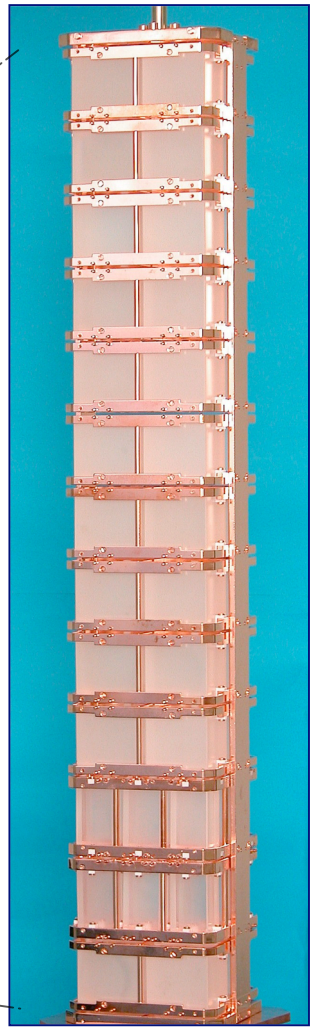
- Rule out(in) inverted hierarchy scenario, based on today's model limit.
- Discover neutrino nature.
- Determine neutrino mass.

CUORE/CUORICINO

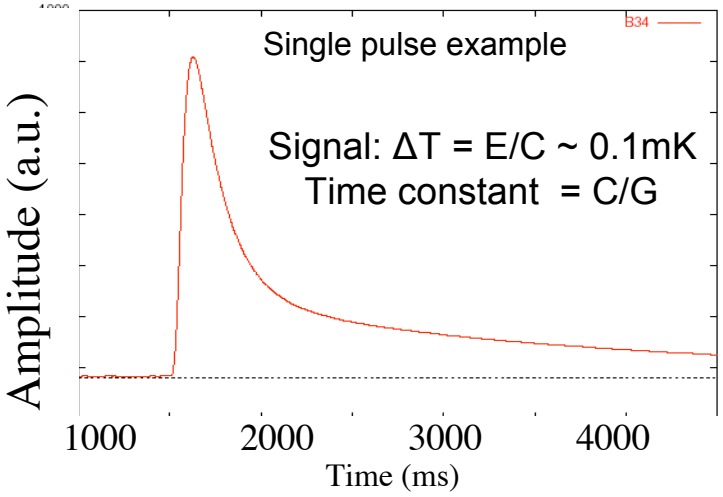
CUORE starts data taking in 2010
http://crio.mib.infn.it/wig/Cuorepage/CUORE.php







Cryogenic bolometers

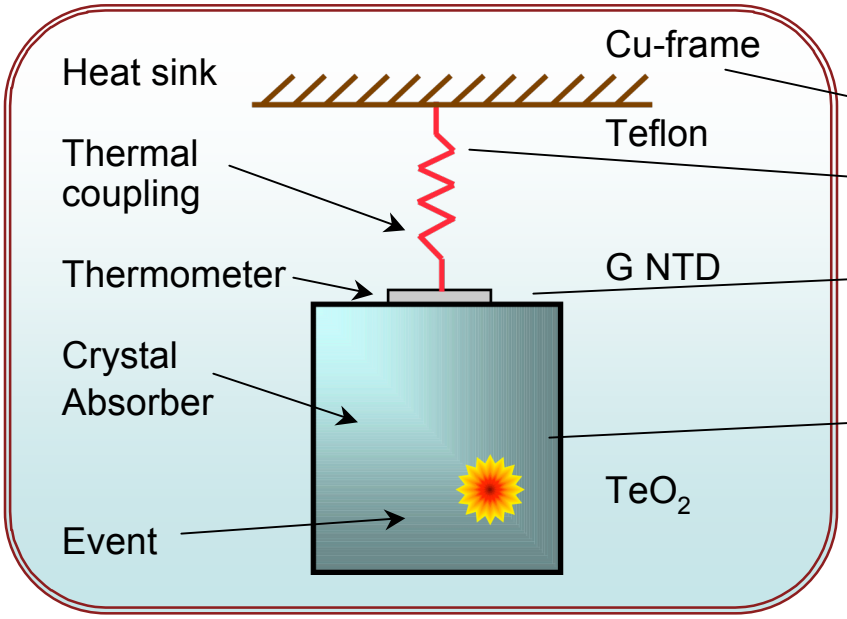


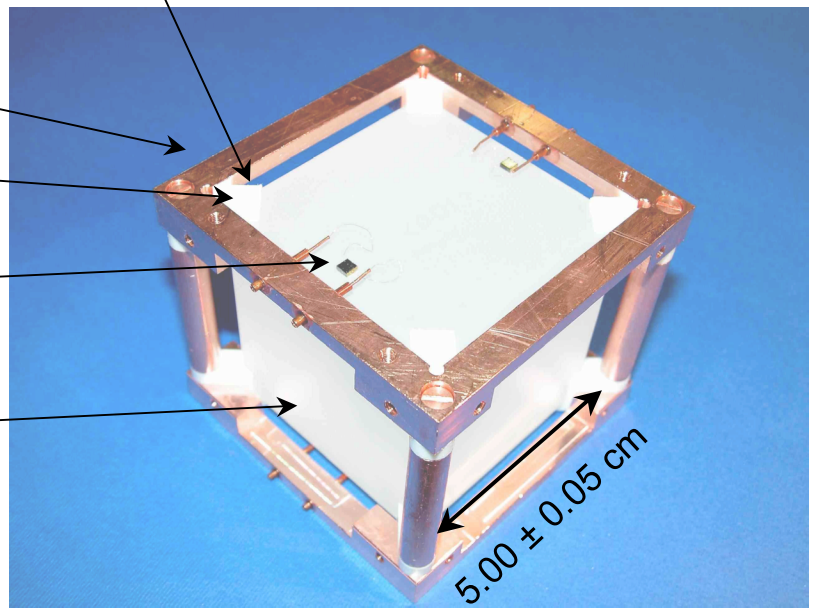
TeO_2 Crystals:

- Dielectric diamagnetic materials
- Low temperatures (~10mK)
- Low heat capacity:
  C ~ 2 nJ/K = 1 MeV / 0.1 mK

Teflon

G = 4 pW/mK





Experimental methods

Fermi's golden rule

Measurements

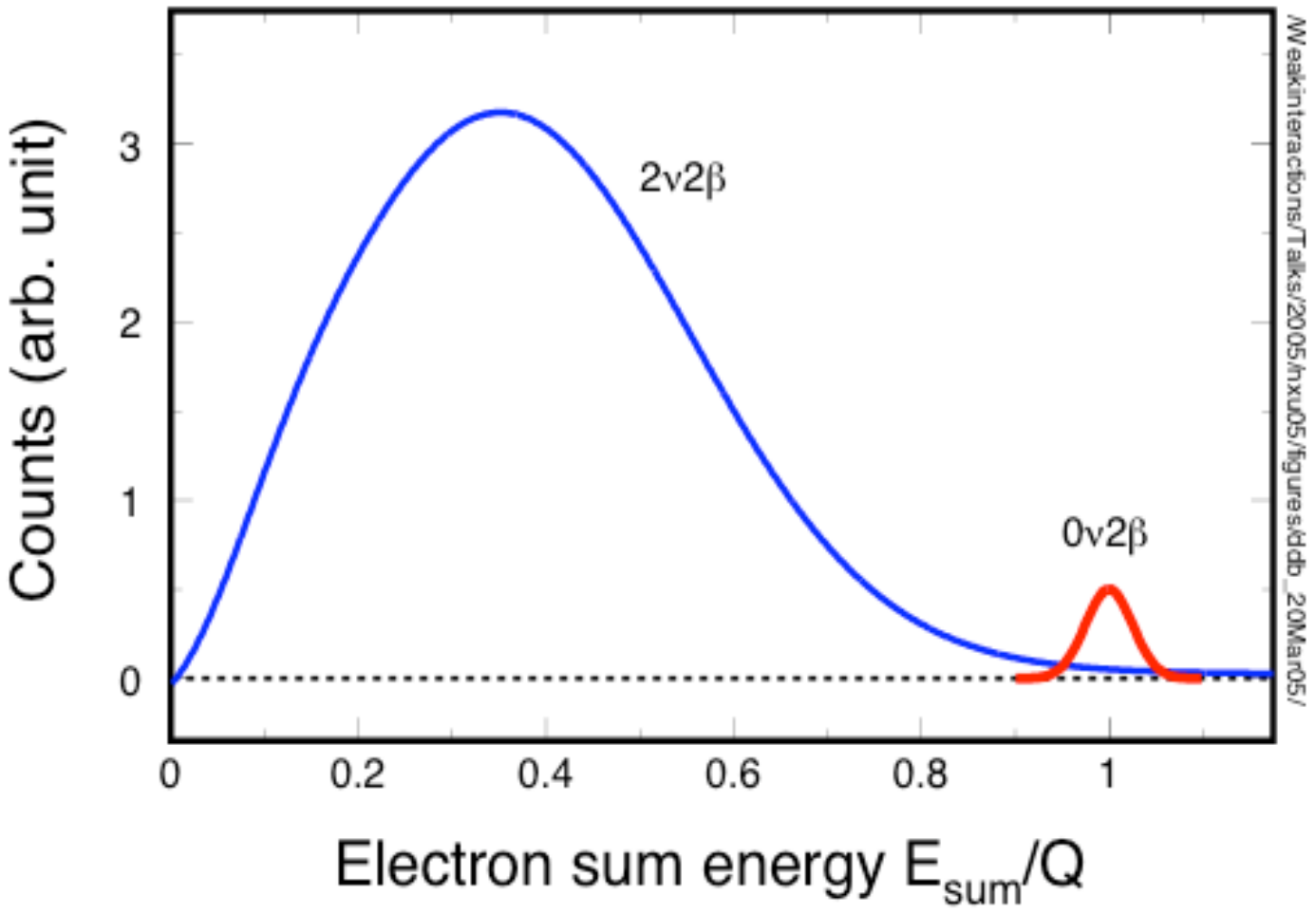
Phase space integral

Neutrino mass

$$\left[T_{1/2}^{0\nu}\right]^{-1} = G^{0\nu} * \left|M^{0\nu}\right|^2 * \left\langle m_\nu \right\rangle^2$$

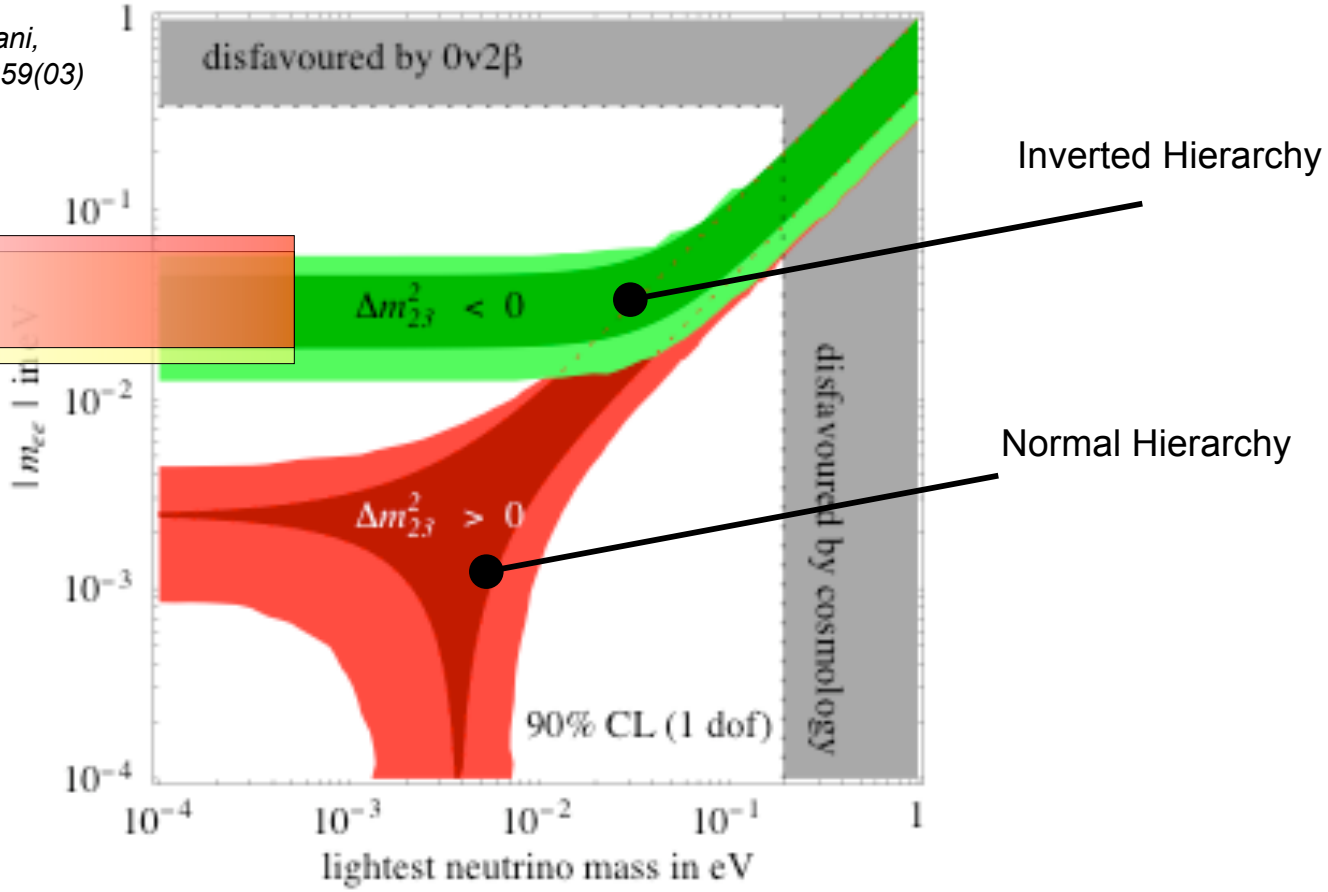
Nuclear decay matrix elements
Large model uncertainties

Double beta decay



Next generation 0ν2β experiments

F. Feruglio, A. Strumia, and F. Vissani,
Nucl. Phys. ***B637****, 345(02);* ***B659****, 359(03)*



CUORE $^{130}Te^{nat}$

(1) Cuoricino current limit : 1.8×10^{24}yr.; $|\langle m_\nu \rangle| \sim 0.2 - 1$ eV.

(2) CUORE: ~ 2×10^{26} yr.; $|\langle m_\nu \rangle| \sim 8 - 45$ meV.

CUORE/CUORICINO: *PRL****95****, 142501(05)*; *hep-ex/0501010*

The US-CUORE Collaboration

Responsibilities:

(1)	NTD:	LBNL UCB
(2)	TeO_2 crystals:	LBNL, LLNL
(3)	Front end electronics:	SC, UCLA
(4)	Data analysis:	LBNL, UCB, UCLA
(5)	Low background counting:	LBNL, LLNL, UCB
(6)	**Source calibration:*	*LBNL*
(7)	**Suspension system:*	*LBNL*

What we are doing:

(1) Forming a strong US collaboration - well on the way
(2) Searching for funding from NSF and DOE

Time line: (Nu's wish)

(1) Funding starts in fy07 by NSF and/or DOE
(2) NTDs production: starts fy06, finish fy08
(3) Crystals purchasing: starts fy07, finish fy09
(4) CUORE assembly: fy09 - fy10