CUPID-1T: A FUTURE NORMAL HIERARCHY BOLOMETRIC EXPERIMENT

CUPID-1T: HALLMARKS

- 1000 kg of ¹⁰⁰Mo in a new cryostat and/or multiple facilities worldwide
- Sensitivity: $T_{1/2} > 8 \times 10^{27}$ years (3 σ), $m_{\beta\beta} > 4-7$ meV (NH)

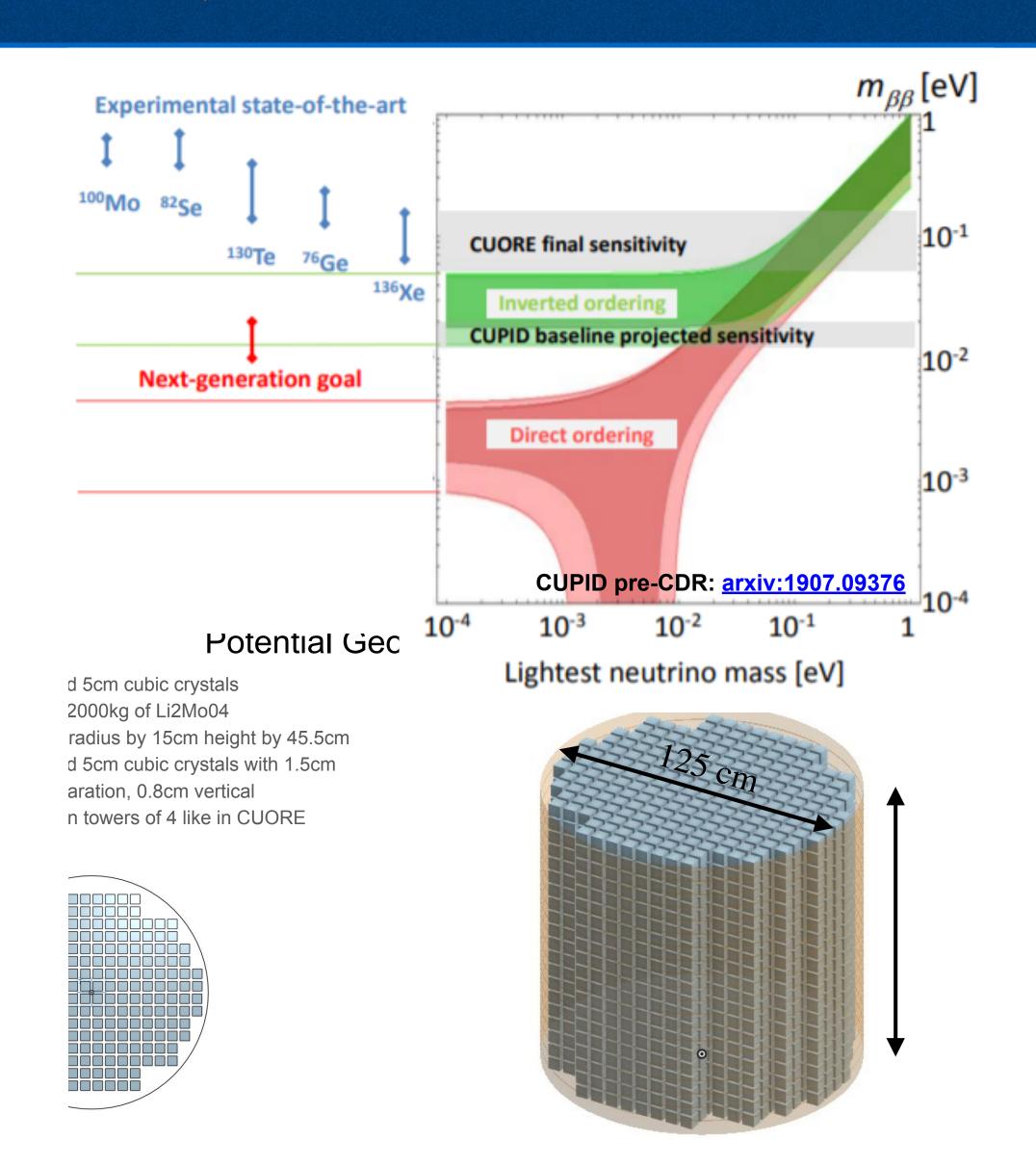
REQUIREMENTS

- Reduction in the background compared to CUPID (x20)
- Readout for O(10k) crystal array

POTENTIAL EXPANSIONS

- Large volume cryogenic facilities in multiple UG labs worldwide
- Possible detector parameters:
 - Main detectors:
 - ~1900 kg of Li₂MoO₄, few keV thresholds possible
 - Light detectors:
 - ~6200 units, 68 kg of Ge (or 29 kg of Si)
 - O(10 eV) threshold, active γ and surface veto
 - Could also deploy **specialized towers**, e.g. SuperCDMS style DM detectors

TARGET TIMELINE: ANTICIPATED CONSTRUCTION LATE 2020'S, COMMISSIONING EARLY 2030'S



PHYSICS BEYOND OVBB

xby enighments

Active background

separation

ROI

2615 keV

• Goal:

rejection through $\alpha / (\beta - \gamma)$

→ $\triangle E_{FWHM} \le 5 \text{ keV}$ @

 \rightarrow B = 0.1 c/ton/y in

discovery sensitivity

(10 yrs of live time)

LONG

Development of transition-edge sensor based large area photon detectors for

TECH

- Superconducting c<u>V Singh</u>¹, W Armstrong ², G Benato ^{1,3}, M Beretta ¹, C L Chang ^{4,5}, B K Fujikawa ³, K Hafidi ², E Hansen ¹, R Huang ¹, G Karapetrov ⁶, Yu Kolomen J Pearson 7, T Polakovic 2,6, B Schmi 1, 2 capabilities (CRC Department of Physics, University of California, Berkeley, CA. 2 Physics Division, Argonn ⁵Kavli Institute for Cosmological Physics, University of Chicago, Chicago, IL. ⁶ Department of Active 11 Vieto (Cymergy With Low mage 11 N/1 experiments)
- High-speed superconducting sensors upgrade with Particle ID
- Multiplexed readout (syntegeyation in the CDR (arxiv: 1907.09376) experiment.
- Cryogenic CMOS ASIC developments (synergy with QIS)

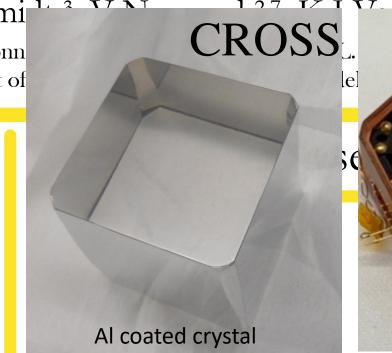
 *Increase sensitive mass

Normal hierarchy

 Technological or and quantum ser

POSSIBLE PHYSICS TOPICS

- Low-mass DM
- Neutrino magnetic moment (with external sources or beams) ~ ~ 10 meV
- Solar axion searches
- Lorentz/CPT violations has successfully demonstrated that a ton
- Tracked particle searches will build on the experience of CUORE and use its cryogenic infrastructure.
 - Li2MoO4 detectors recognized as base WORE/CUPID Collabo



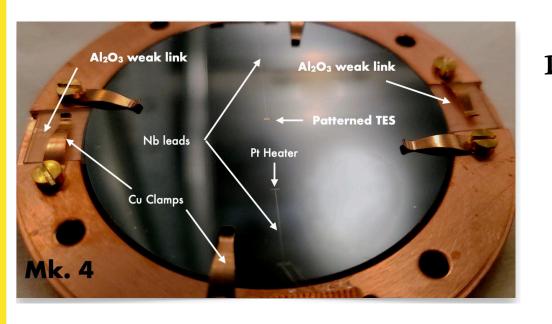
Snowmass 2<mark>0</mark>21 Planning Workshop, 19 Aug 2020

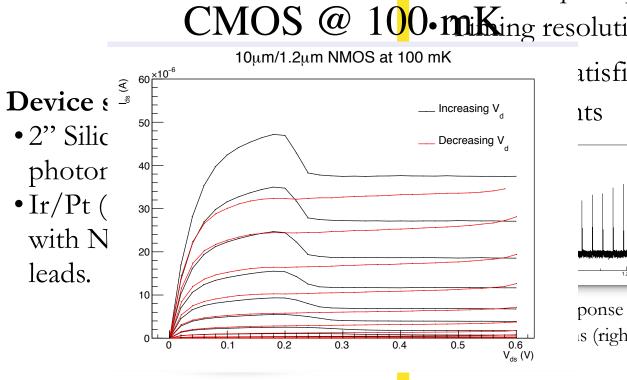
SuperCDMS-style

the subsequent

TES LD

TES-based LD





square Ir/Pt bilayer TES

square Ir/Pt bilayer TES in the middle with Au pads on both sides Energy resolut

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