

# CUPID-1T: A FUTURE NORMAL HIERARCHY BOLOMETRIC EXPERIMENT

## CUPID-1T: HALLMARKS

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

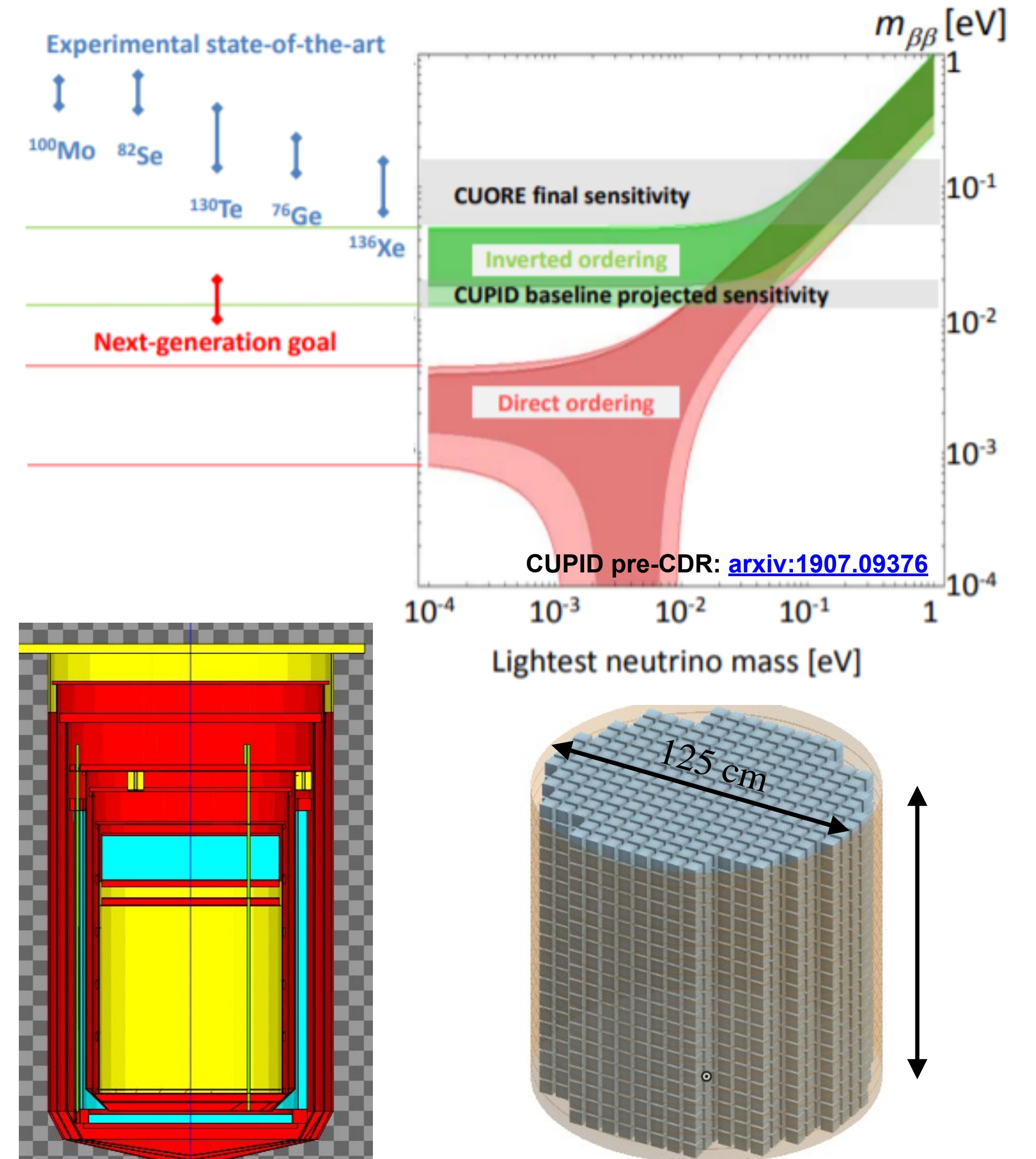
## REQUIREMENTS

- **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  $\text{Li}_2\text{MoO}_4$** , few keV thresholds possible
  - **Light detectors:**
    - **~6200 units, 68 kg of Ge** (or 29 kg of Si)
    - O(10 eV) threshold, active  $\gamma$  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 $0\nu\beta\beta$

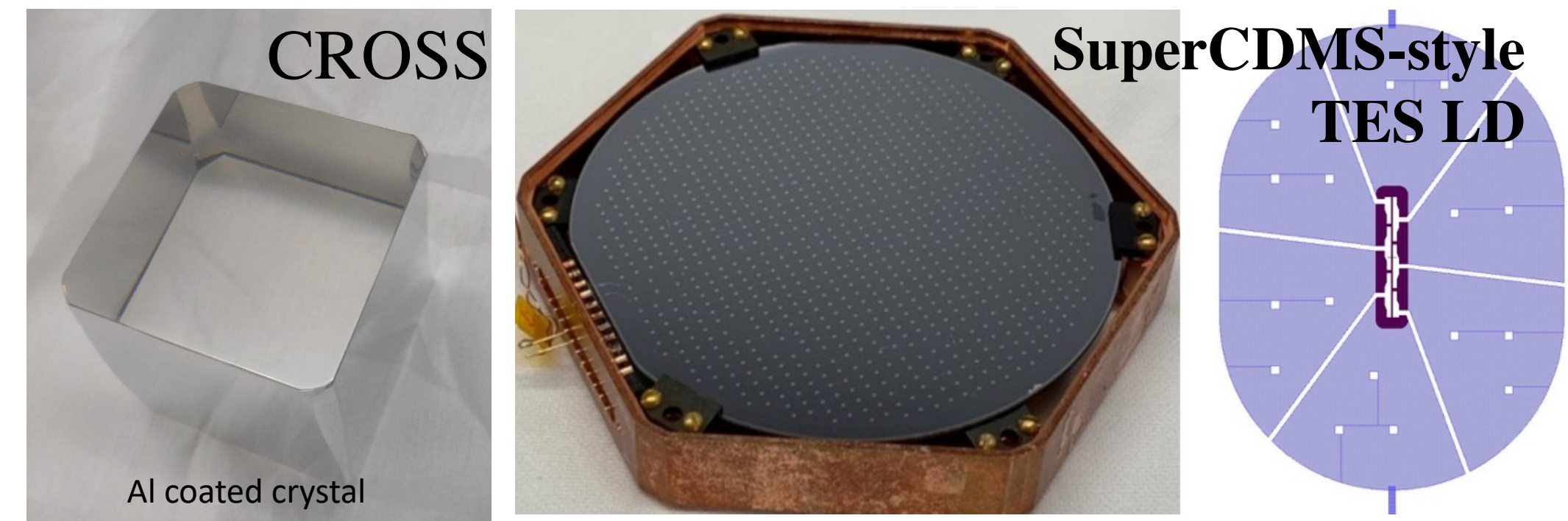
## LONGER-TERM R&D ON ADVANCED DETECTOR

### TECHNOLOGIES:

- Superconducting coating of crystals to enhance PSD capabilities (CROSS @ Canfranc)
- Active  $\gamma$  veto (synergy with low-mass DM experiments)
- High-speed superconducting sensors (TES, MKID)
- Multiplexed readout (synergy with CMB)
- Cryogenic CMOS ASIC developments (synergy with QIS)
- **Technological overlap with dark matter, CMB experiments and quantum sensor/QIS community**

## POSSIBLE PHYSICS TOPICS

- Low-mass DM
- Neutrino magnetic moment (with external sources or beams)
- Solar axion searches
- Lorentz/CPT violations
- Tracked particle searches



TES-based LD

