

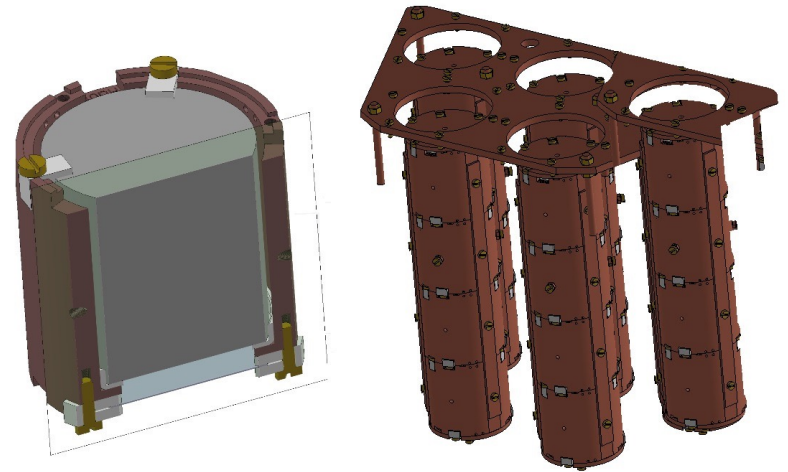


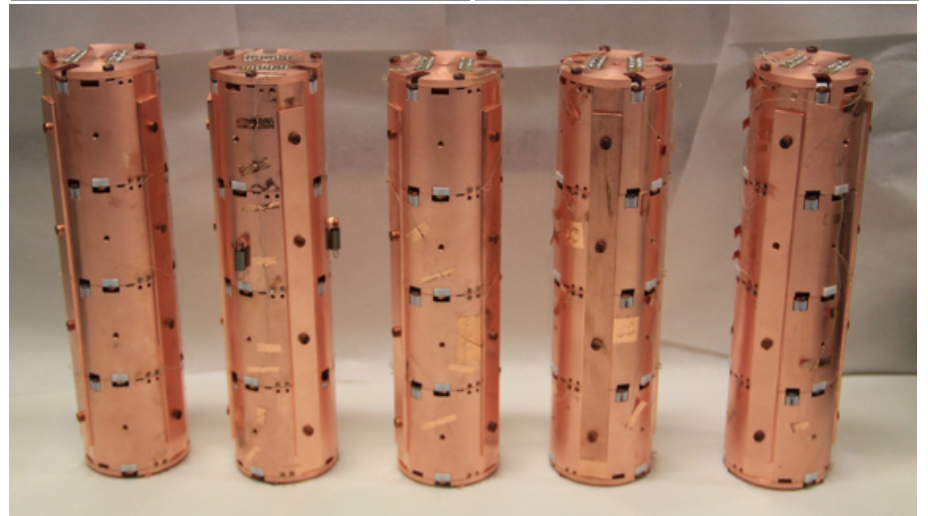
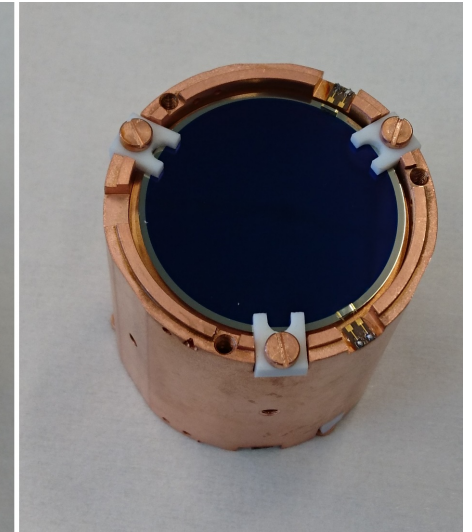
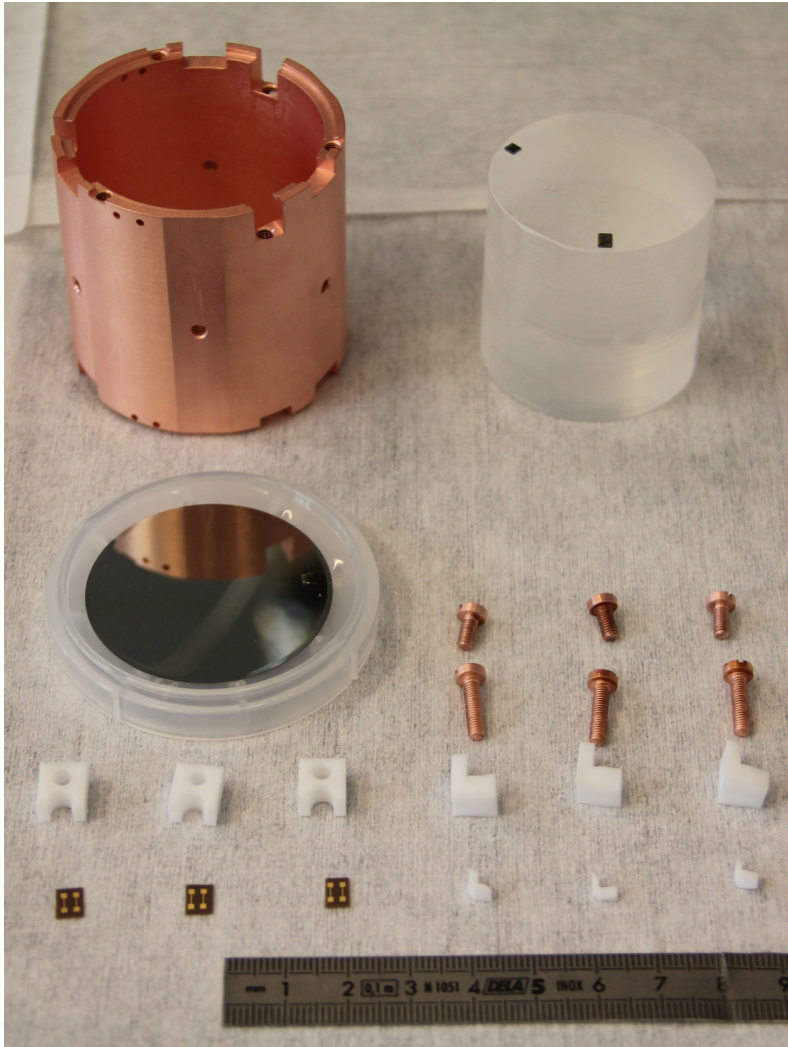
中国科学技术大学  
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# CUPID-Mo article reading

Kangkang Zhao, Sept 5<sup>th</sup> 2019

- An array of  $5 \times 4$  scintillating bolometers;
- Enriched 0.2 kg  $\text{Li}_2\text{MoO}_4$ ,  $\sim 97\%$  enriched Mo
- Crystal  $\sim \phi 44 \times 45$  mm, 4.158 kg crystal, 2.264 kg  $^{100}\text{Mo}$  in total;
- LD Ge  $\sim \phi 44 \times 0.175$  mm with  $\sim 70$  nm SiO coating;
- NTD  $3.0 \times 0.8 \times 1.0$  mm<sup>3</sup>;
- Silicon-based resistive chip;
- Araldite<sup>®</sup> Rapid gule, single glue spot for heater, six glue spots for 5 LMO, nine glue spots for the remain LMOs and LDs

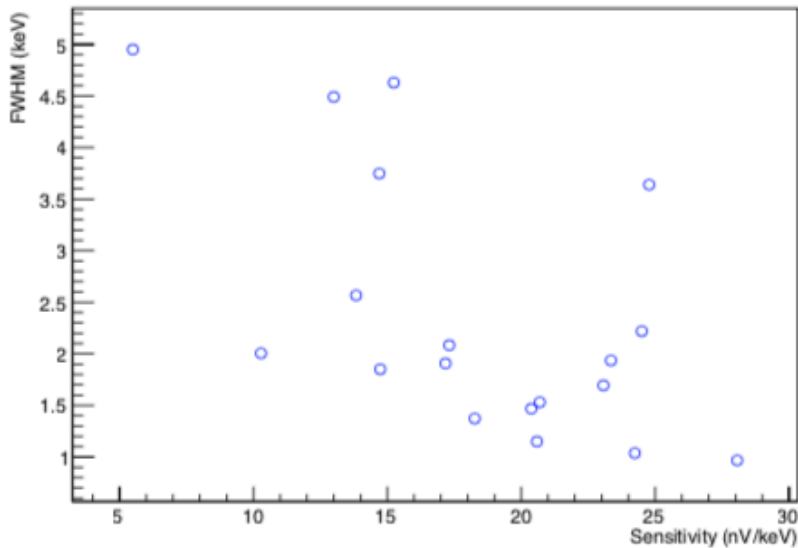




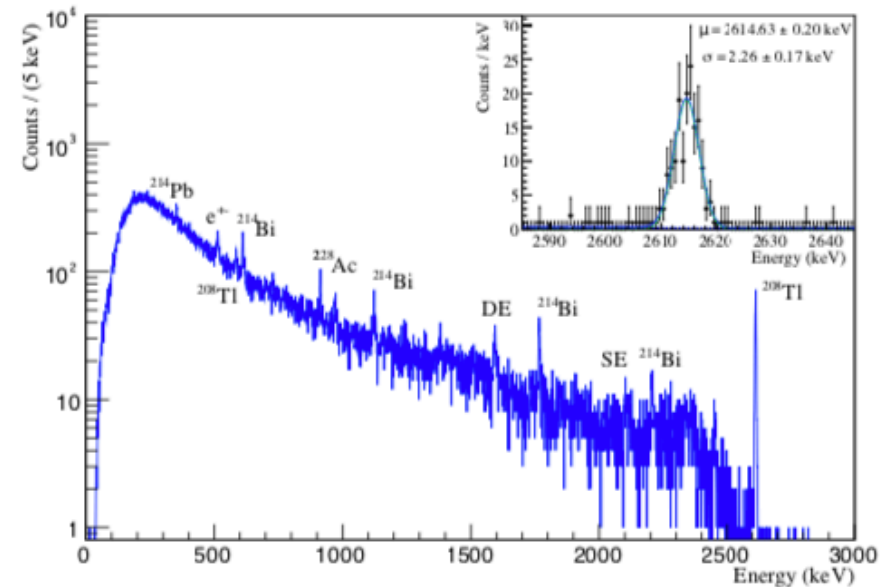


- Low background cryogenic facility (20.7 mK):
  1. 1700 m rock overburden (4800 m water equivalent) with cosmic muon flux 5 muons/m<sup>2</sup>/day;
  2. Refilling of the liquid helium (LHe) bath every 10 days.
  3. Passive shield: 20 cm lead and 55 cm polyethylene;
  4. Inner part: 2 cm Roman lead with <sup>210</sup>Pb radioactivity low than 0.12 Bq/kg;
  5. Roman lead (14 cm) and polyethylene (10 cm) shield at the 1K-plate
  6. Muon veto: 46 individual plastic scintillator modules with a total surface of 100 m<sup>2</sup> and provides a detection efficiency of 97.7% for central muons;
- Operation:
  - The <sup>60</sup>Co source , ~2-days-long Th/U calibration;

- Baseline FWHM versus Sensitivity for Ge LDs also for LMOs;



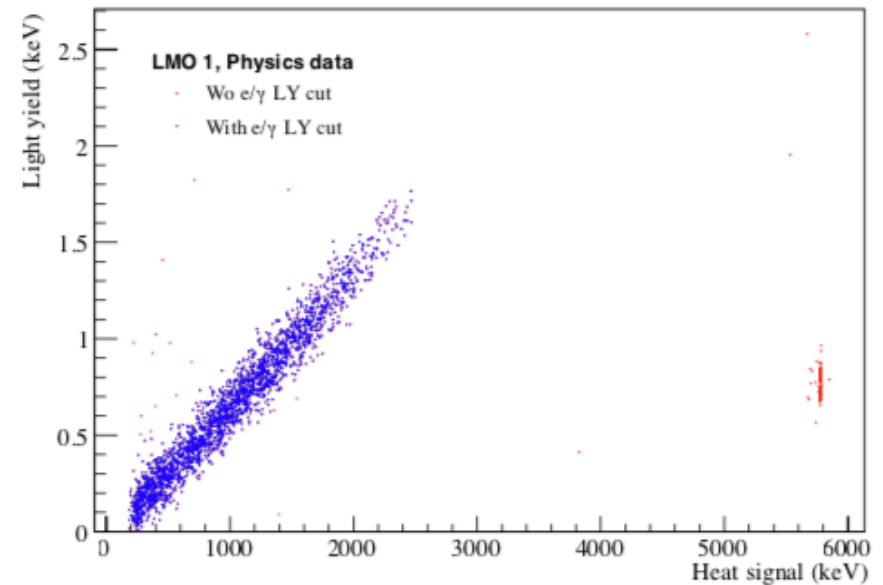
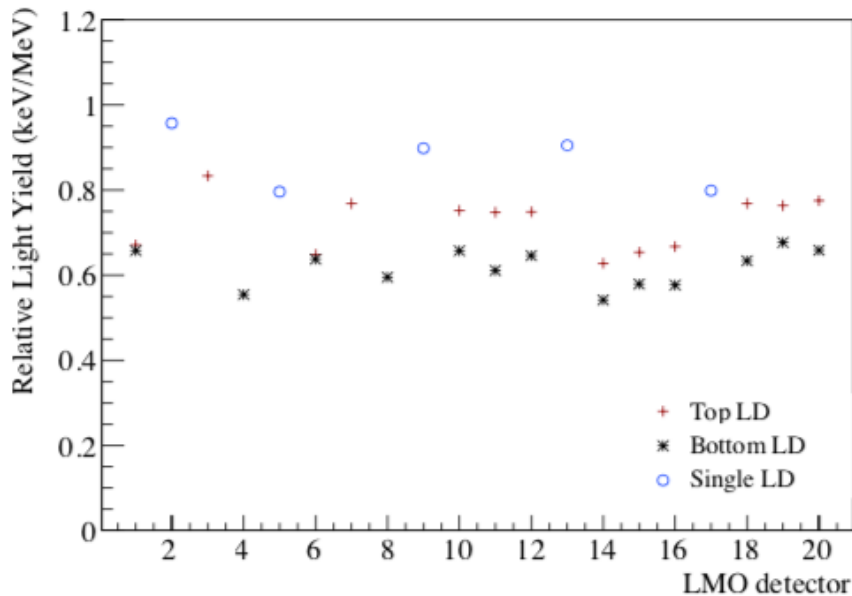
**Fig. 12** Sensitivity versus baseline resolution (FWHM) for the 19 LMO detectors considered in this analysis. One detector (LMO 2) is omitted due to abnormal performance; see text).



**Fig. 13** Summed calibration spectrum for 19/20  $\text{Li}_2\text{MoO}_4$  bolometers. All the major peaks have been labeled. The inset shows a fit of the  $^{208}\text{Tl}$   $\gamma$  peak at 2614.5 keV.

- Median baseline FWHM: 146eV, median sensitivity  $1.1\mu\text{V}/\text{keV}$  for LDs;

- RLY(2-3MeV region) versus LMO top and bottom LD pairs;

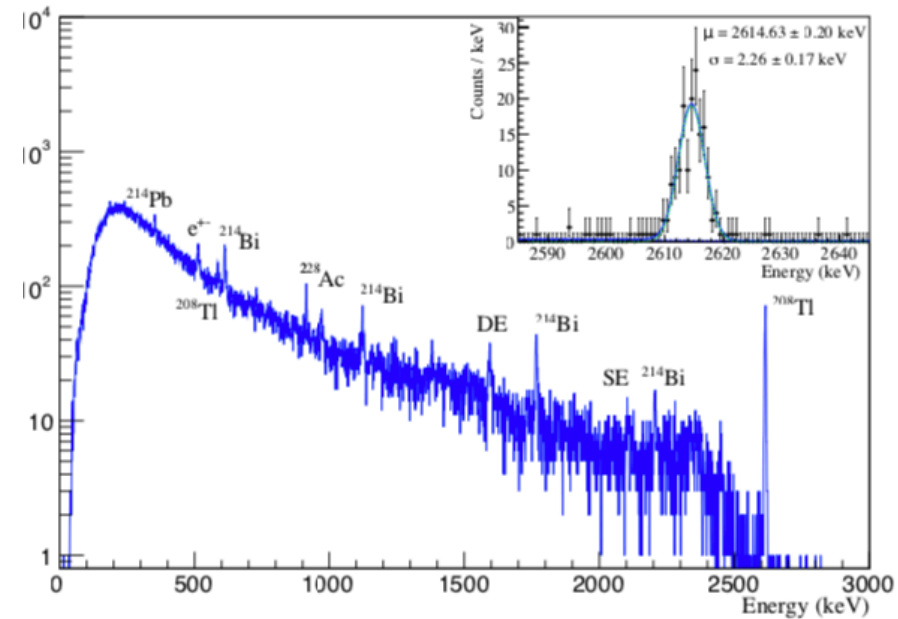
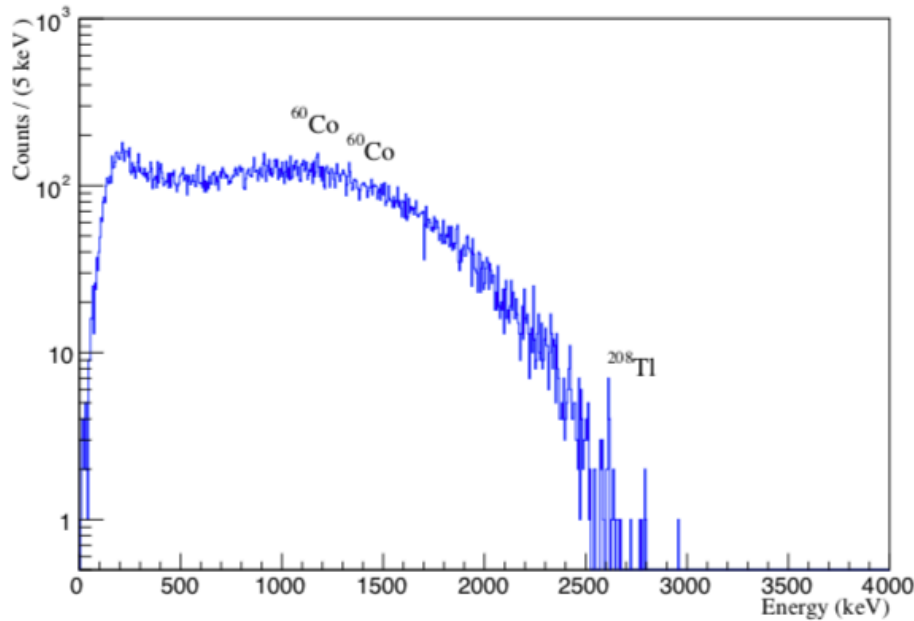


- Top LY $\sim$ 0.74 keV/MeV, bottom $\sim$ 0.64 keV/MeV, high sum $\sim$ 1.44 keV/MeV;



- $\alpha$  discrimination all both reached 99.9%;
- 5.3 keV(6.5 keV) energy resolution(FWHM) at 2615 keV;
- DP  $> 15\sigma$  between  $\alpha$ s and  $\gamma/\beta$ s in the region of interest for  $^{100}\text{Mo } 0\nu\beta\beta$ ;

- Anticoincidence with a time coincidence window of 100 ms, reject multi-Compton and muon shower events ;



- no event compatible with the RLY of  $\gamma/\beta$  events above 3034 keV;
- The  $\gamma/\beta$  spectrum of  $\text{Li}_2^{100}\text{MoO}_4$  bolometers above  $\sim 1$  MeV is dominated by the  $2\nu\beta\beta$  decay of <sup>100</sup>Mo with an activity of 10 mBq/kg