Monte Carlo simulation of the CUPID array

Joe Camilleri

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jcamilleri@vt.edu

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- Proposed $0\nu\beta\beta$ search using bolometric array of 1596 lithium molybdate crystals, deployed in the CUORE[1]cryostat.
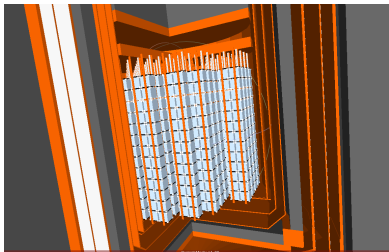- Aims to eliminate dominant background of alpha particles present in CUORE.

Figure: rendering of proposed CUPID array of Li_2MoO_4 crystals

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[1]Clarke and Braginski 2004.

- Li_2MoO_4 crystals allow for discrimination of α backgrounds from $\beta\beta$ events (Q=3034keV) via high-light yield scintillation signals.
- relatively high isotopic abundance of ^{100}Mo (10%)
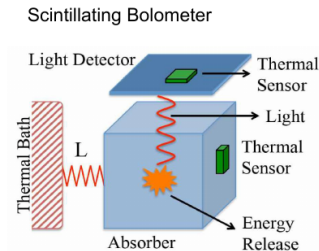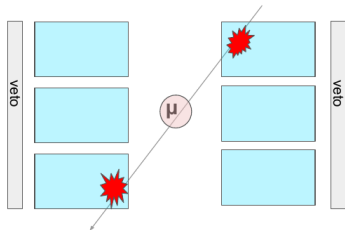- enrichment above 95% already demonstrated in CUPID-Mo

Figure: CUPID bolometer and rejection scheme

- With respect to coincidences, the rate of $2\nu\beta\beta$ events is not negligible in CUPID array (calculate this)
- Minimizing the distance cut helps avoid mis-labelling random $2\nu\beta\beta$ coincidences as multiplicity 2.
- Assuming a simple muon veto geometry, increasing the distance cut rejects more muon events.

- events within a trigger time window that are also within the specified distance cut are rejected
- man
- dude

2.6MeV Gamma Spectrum: distance cuts

gnarly

integration time in the CUPID array

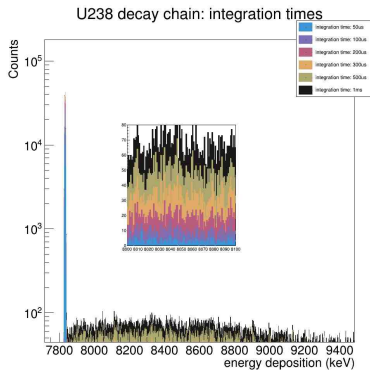- guy
- man
- dude

U238 decay chain: integration times

Figure: gnarly

$2\nu\beta\beta$ efficiency and the muon background

- guy
- man
- dude

Figure: gnarly