

Energy calibration

BULKID-DM meeting
Ferrara, 1-2 July 2025

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Viable options

- Energy scale calibration (radioactive sources)

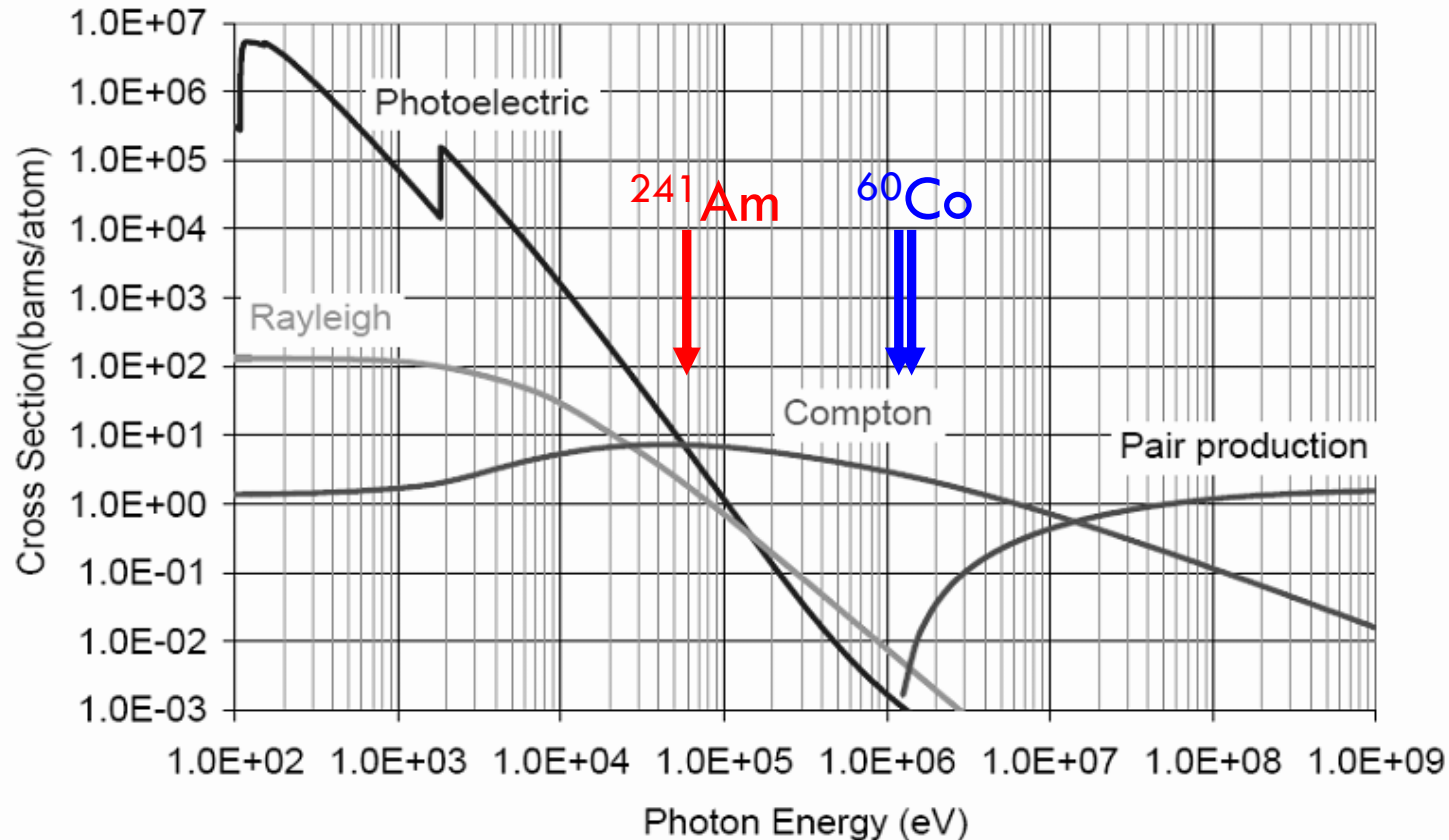
- X-rays (59.5 keV) from ^{241}Am
- γ -rays (1,17, 1.33 MeV) from ^{60}Co , ^{192}Ir
- internal background (see M. Folcarelli's)



- Detector stability monitor

- NIR led emission ($\lambda \gtrsim 1.2 \mu\text{m}$, so as to have LED bulk events)
- ...

Absorption cross section on Si



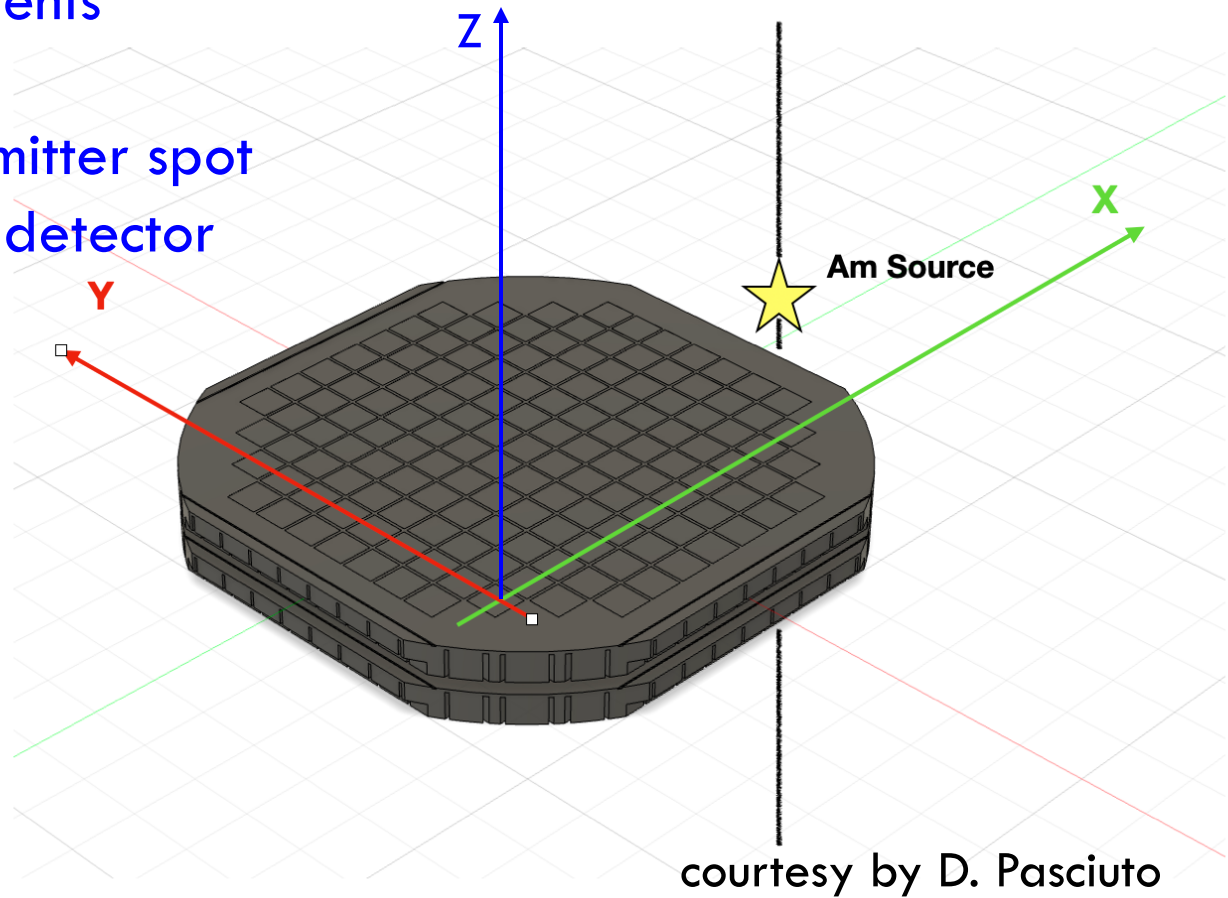
Total absorption length $(\mu\rho)^{-1}$ (Rayleigh not included)

- 1.5 cm @ 60 keV ($\sigma_{\text{phel}} \approx \sigma_{\text{Compton}}$) → ~50% one-die events 😊
- 7.4 cm @ 1.2 MeV ($\sigma_{\text{phel}} \ll \sigma_{\text{Compton}}$) → only multi-die events 😞

Geant4 simulation

- X-ray generation

- statistics of 10^7 events
- $E_x = 59.5$ keV
- 1 cm-long x-ray emitter spot
- located aside the detector at a side center
- isotropic emission

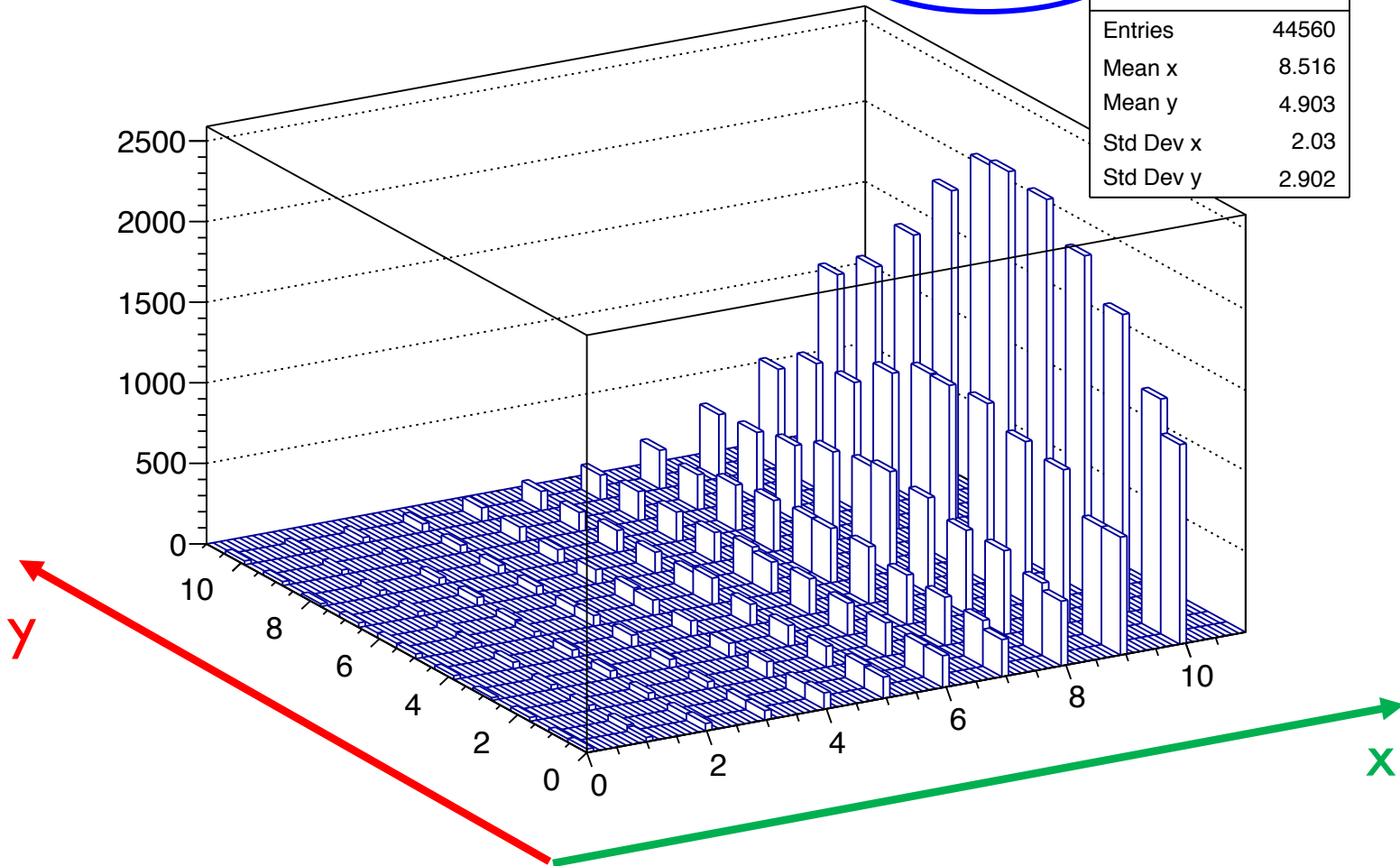


2d-occupancy profile

central stack

yavg:xavg {nCell==1 && zavg==10}

Entries	44560
Mean x	8.516
Mean y	4.903
Std Dev x	2.03
Std Dev y	2.902

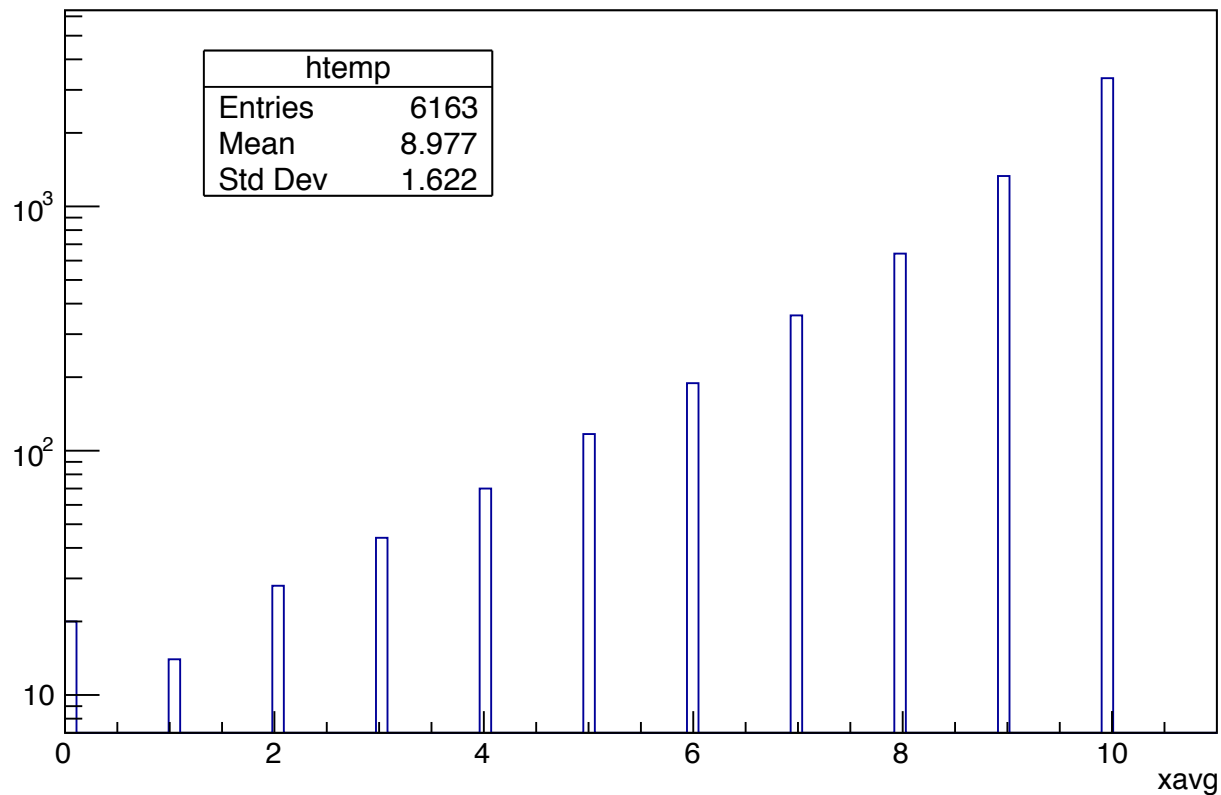


1 d-occupancy (x-projection)

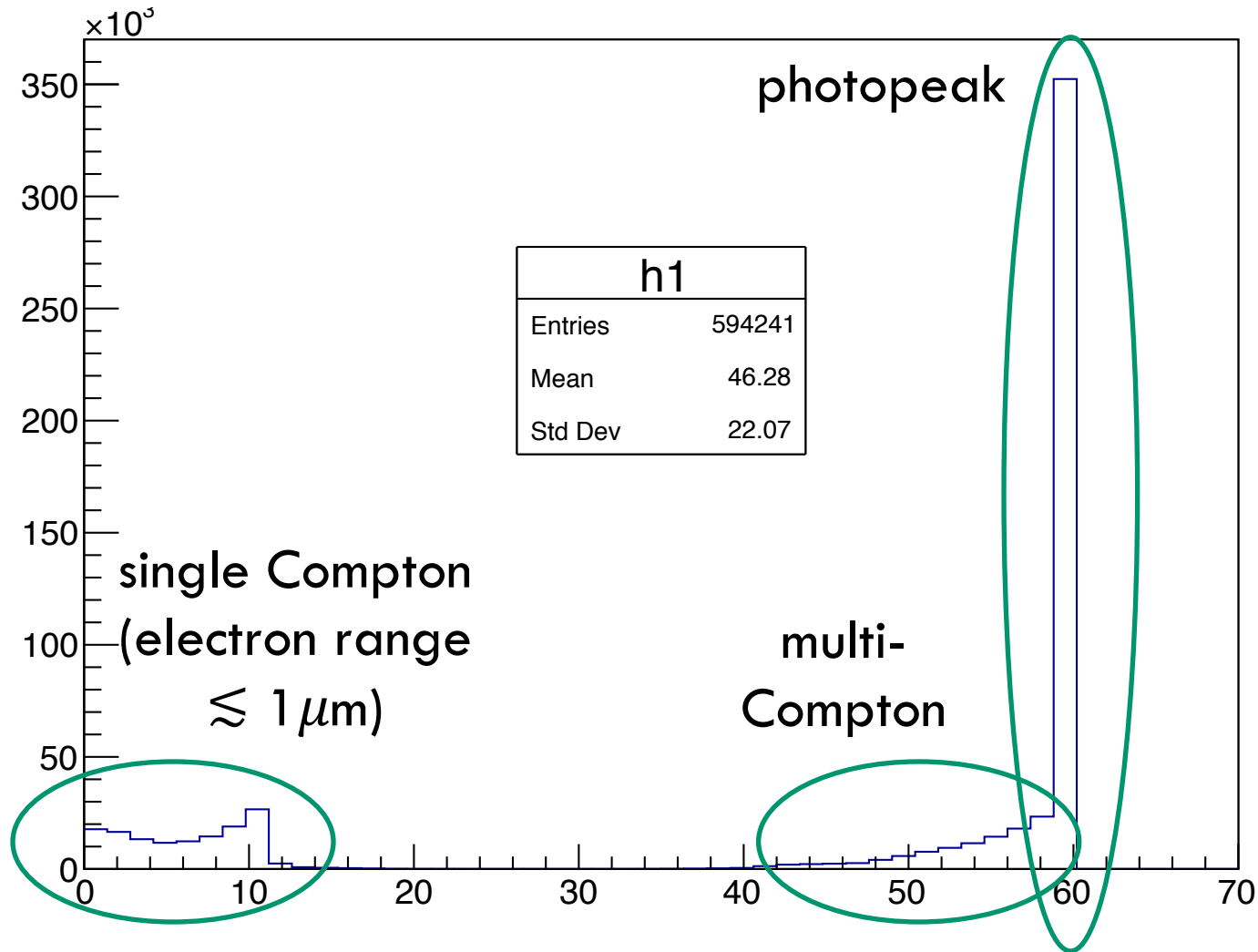
side voxels

(attenuation along x as a result of x-ray absorption and geometry)

xavg {yavg==5 && zavg==7 && nCell==1}



Single-die energy spectrum



Source activity, rates, pile-up, ...

Activity (kBq)	Surface rate (s ⁻¹)*	Bulk rate (s ⁻¹)**	Surface pile-up (%)***	Run duration (h)****
1	0.44	0.02	0.13	14.0
2	0.88	0.04	0.26	7.0
3	1.32	0.06	0.39	4.7
10	4.40	0.2	1.3	1.4
100	44.0	2.0	12.3	0.14

* collected on the outermost die (the one in front of the source)

** collected on the innermost die

*** computed based on 3ms readout

**** time needed to gather at least 1000 events on innermost dice

Source position control

