Cerenkov Detectors for LUXE Compton System

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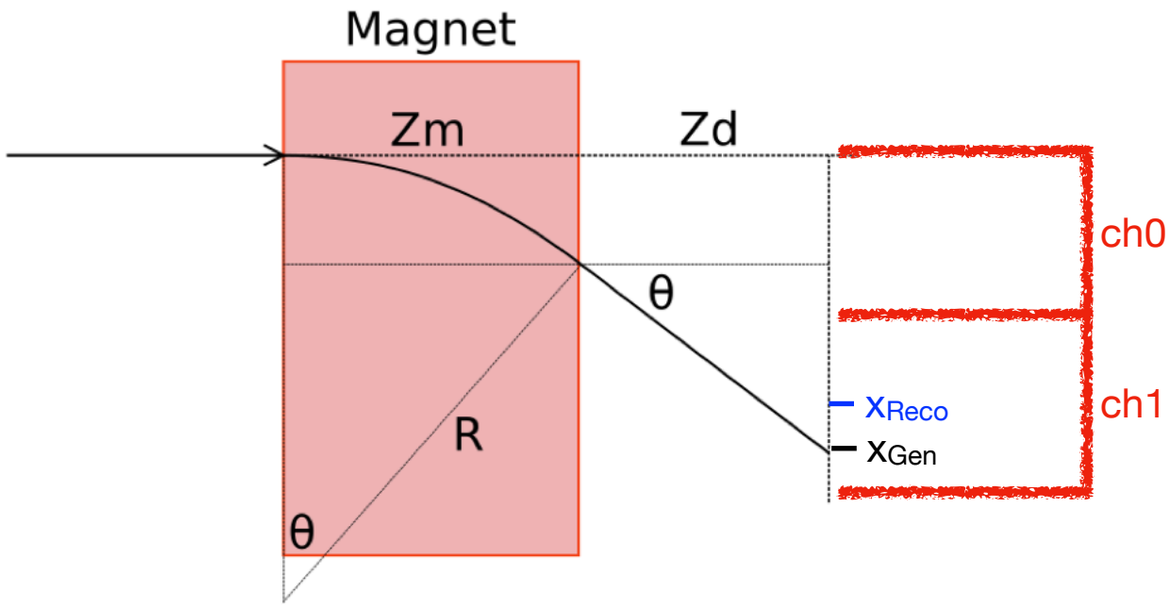
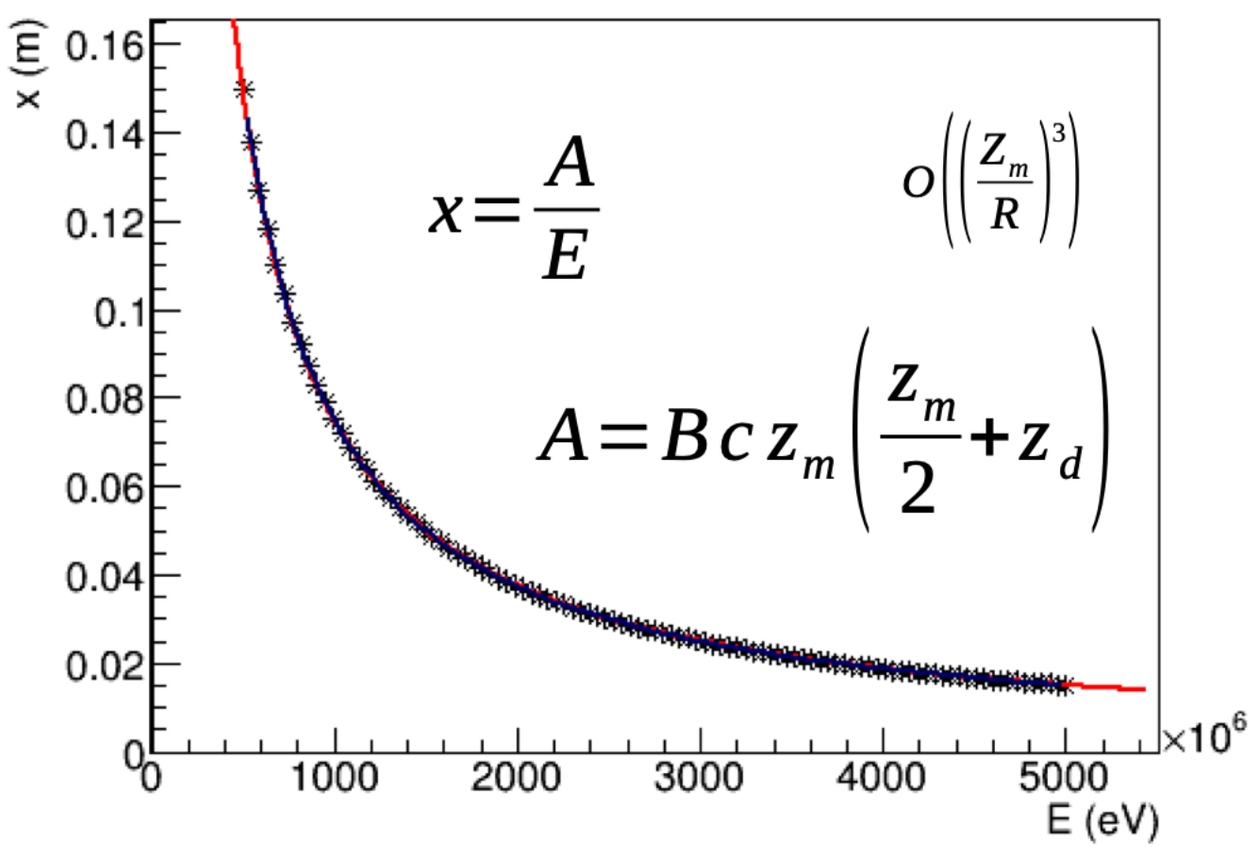
HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

DESY.

Performance estimate: Response

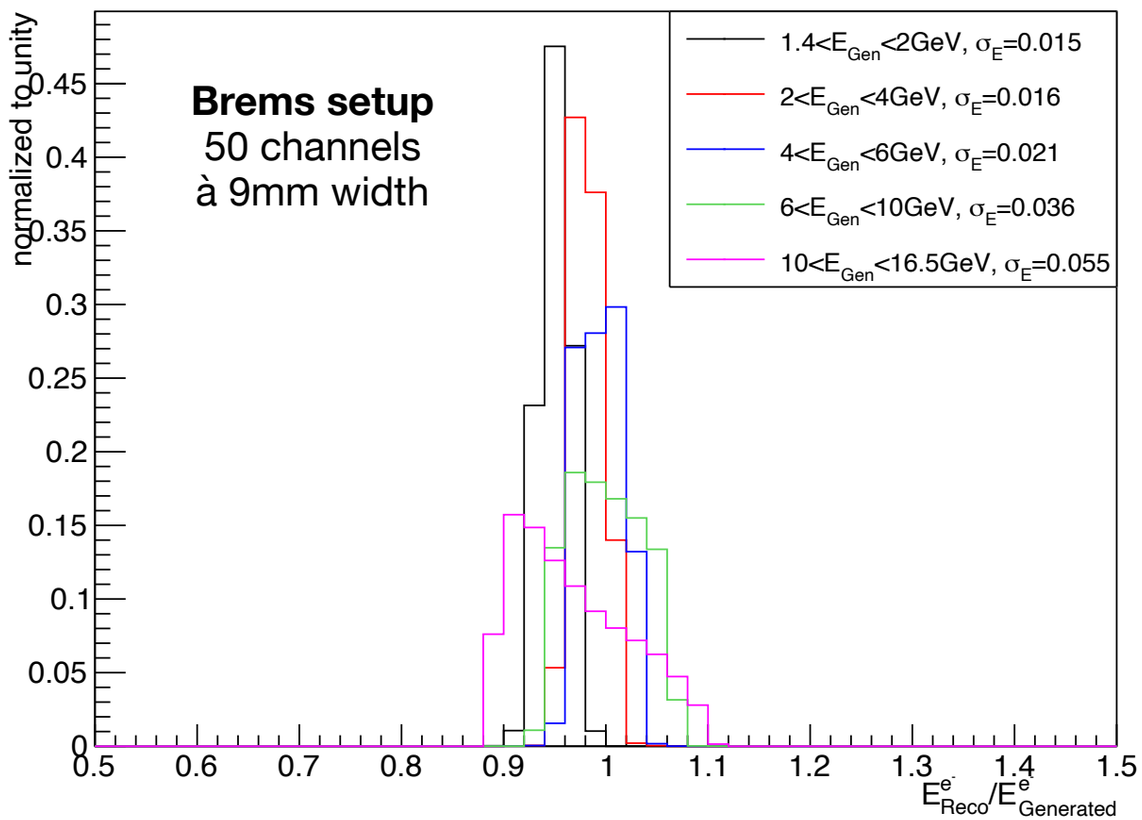
from Sasha's slides

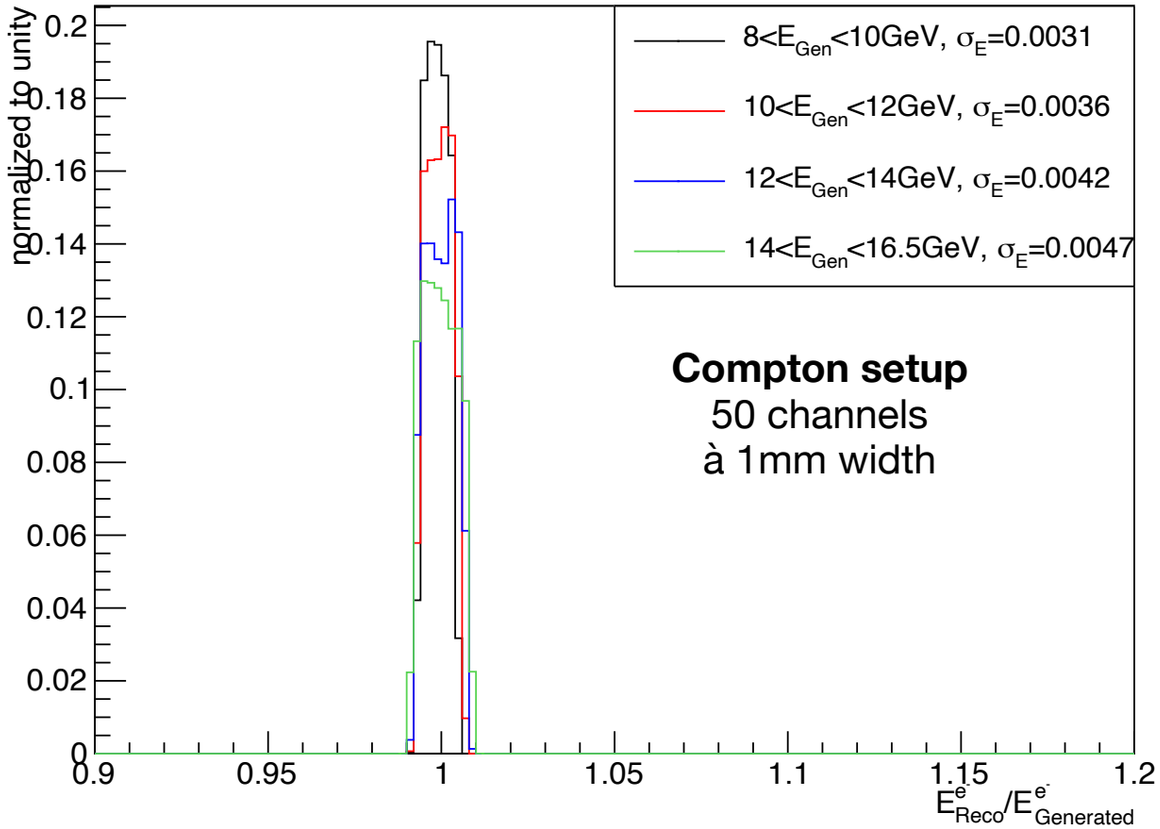




- for the CDR need quantitative performance estimates
- electron energy "Response"= E_{Reco}/E_{Gen}
- simple estimate: E_{Reco} is the energy calculated for the center position of the channel that was hit
- assuming constant dipole field

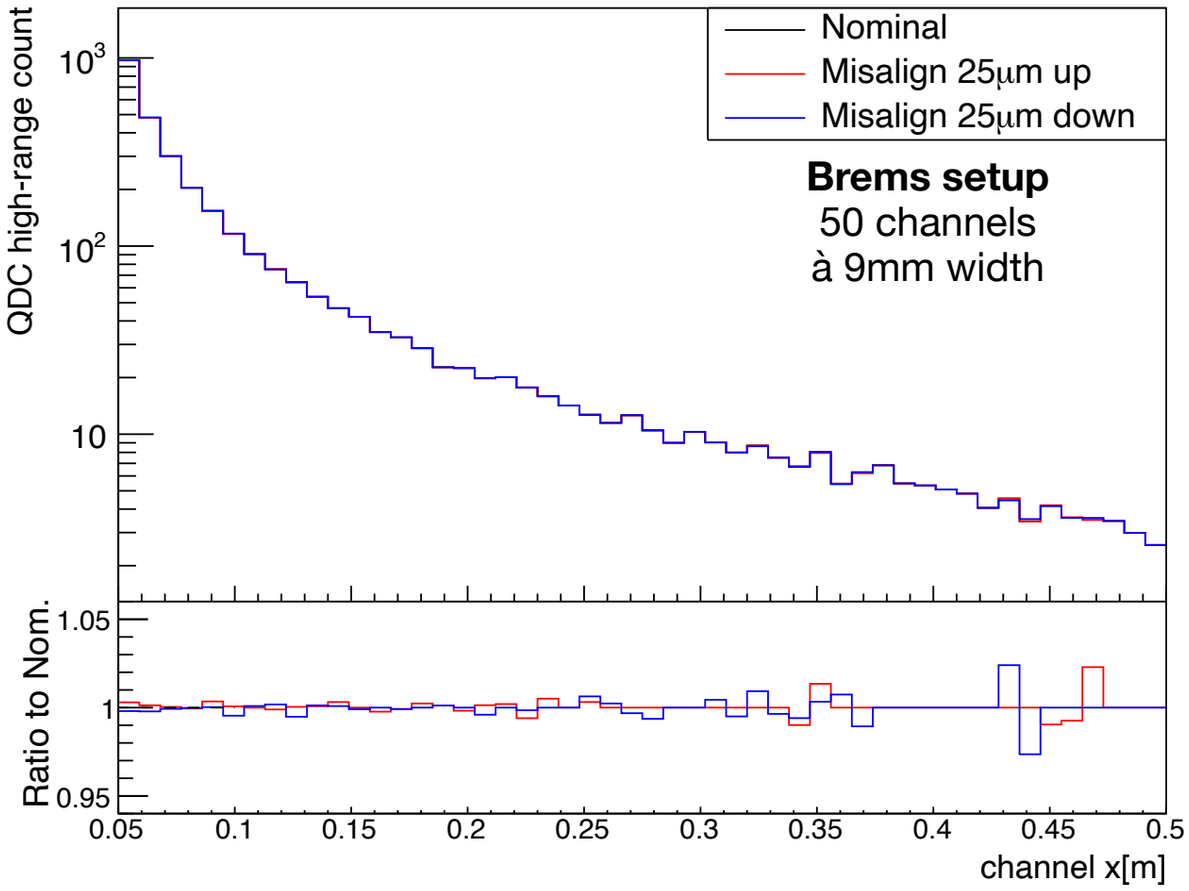
Performance estimate: Response

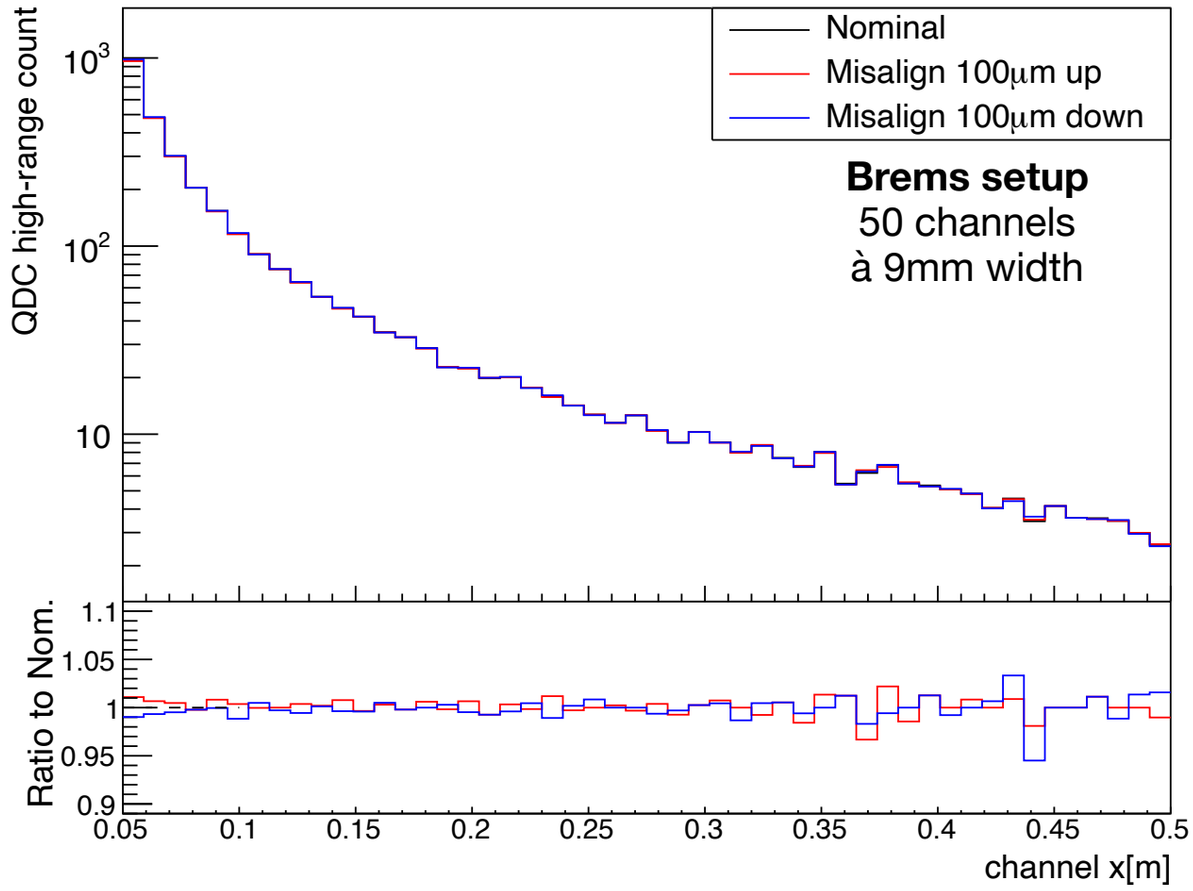




- Response for different generated electron energies
- estimate σ_E by taking the RMS
- increasing width for increasing E_{Gen}: expected for magnet spectrometer (E(x) is hyperbola)
- skew for Brems: at high energies have very steep slope, bin center is a biased estimate
- lower width for finer segmentation

Alignment: Brems setup

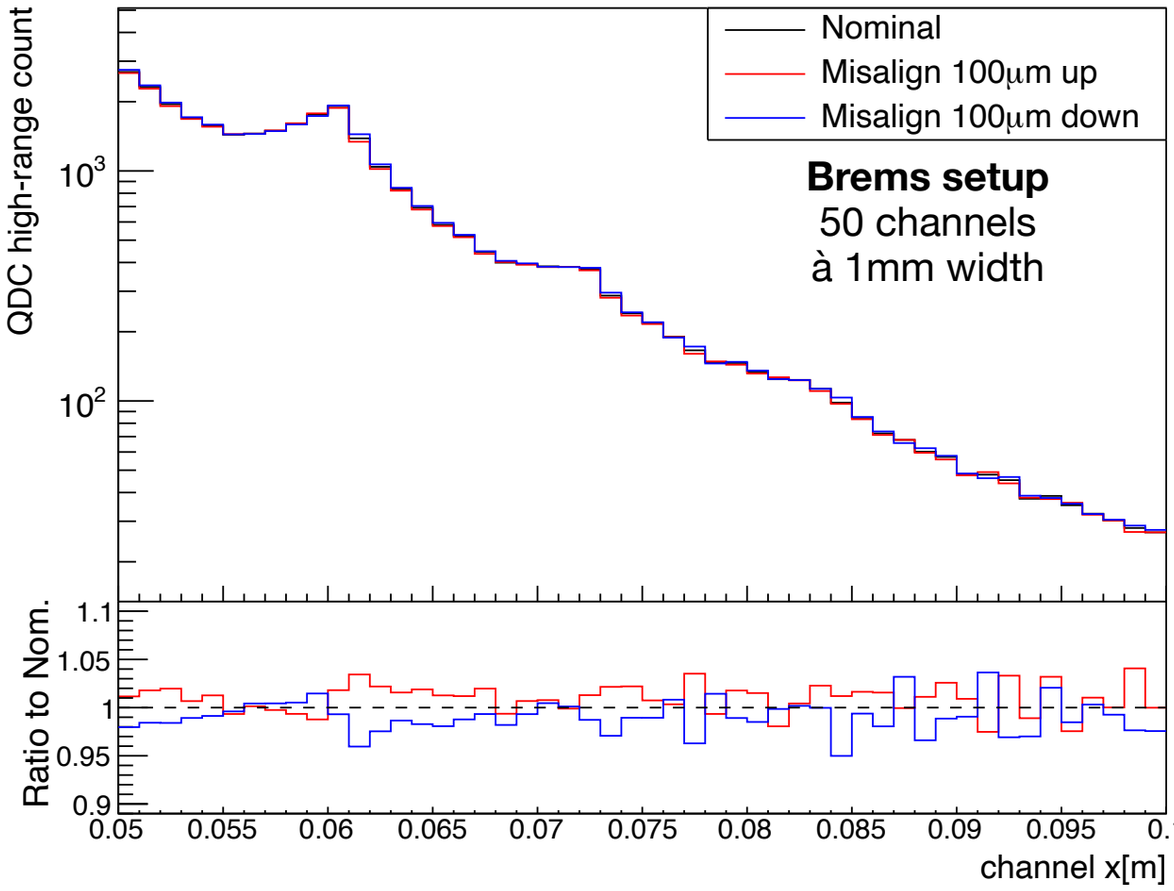


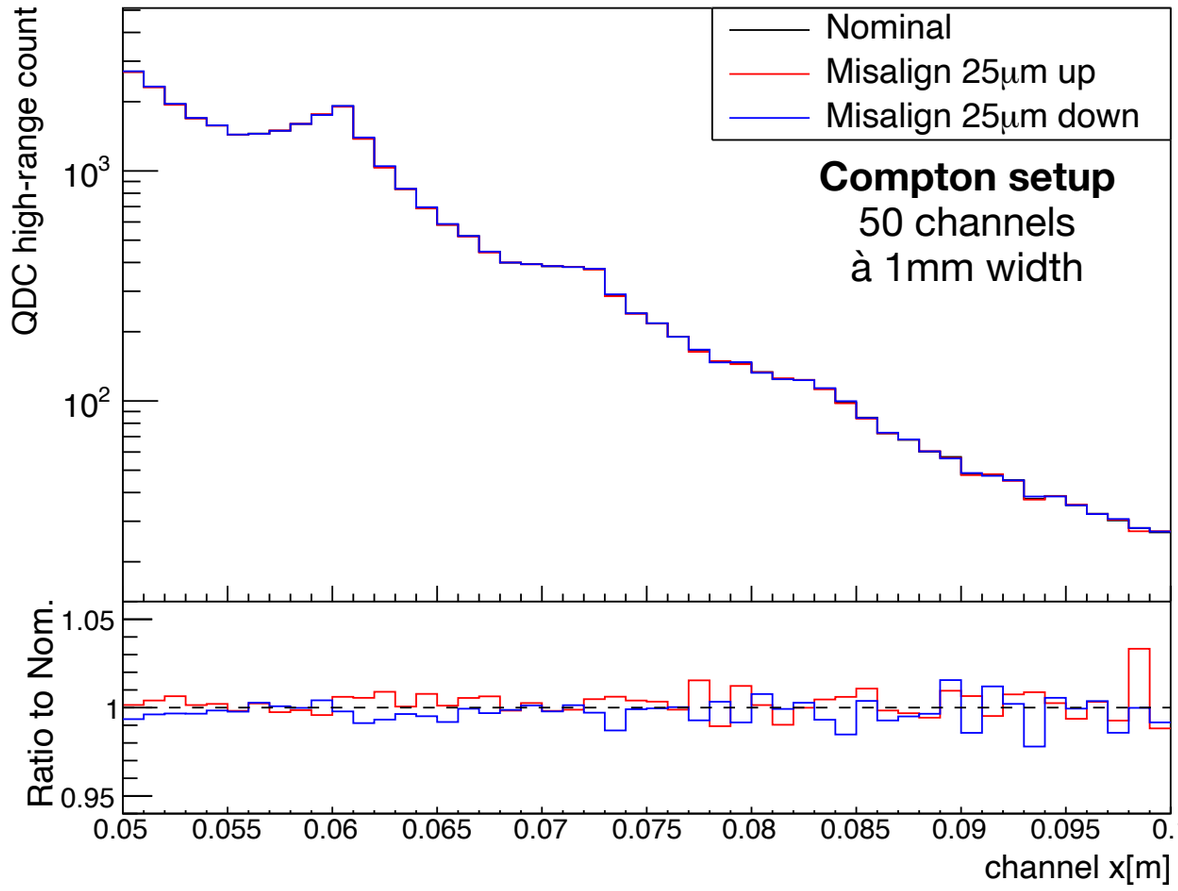


- estimate the effect of mis-alignment on our measurements (using lcpolmc)
- mis-alignment only in x-direction (detector to beam-axis)
- recommendation for CDR is 25micron alignment precision
- also looked at 100micron mis-alignment

Brems setup: ≤ 1% uncertainty due to mis-alignment

Alignment: Compton setup





- Compton setup has finer segmentation, mis-alignment has slightly more effect
- for 100μm: 2-3% variation in the energy spectrum
- for 100μm: ~1% variation in the energy spectrum

Trident setup: ~1% uncertainty from alignment