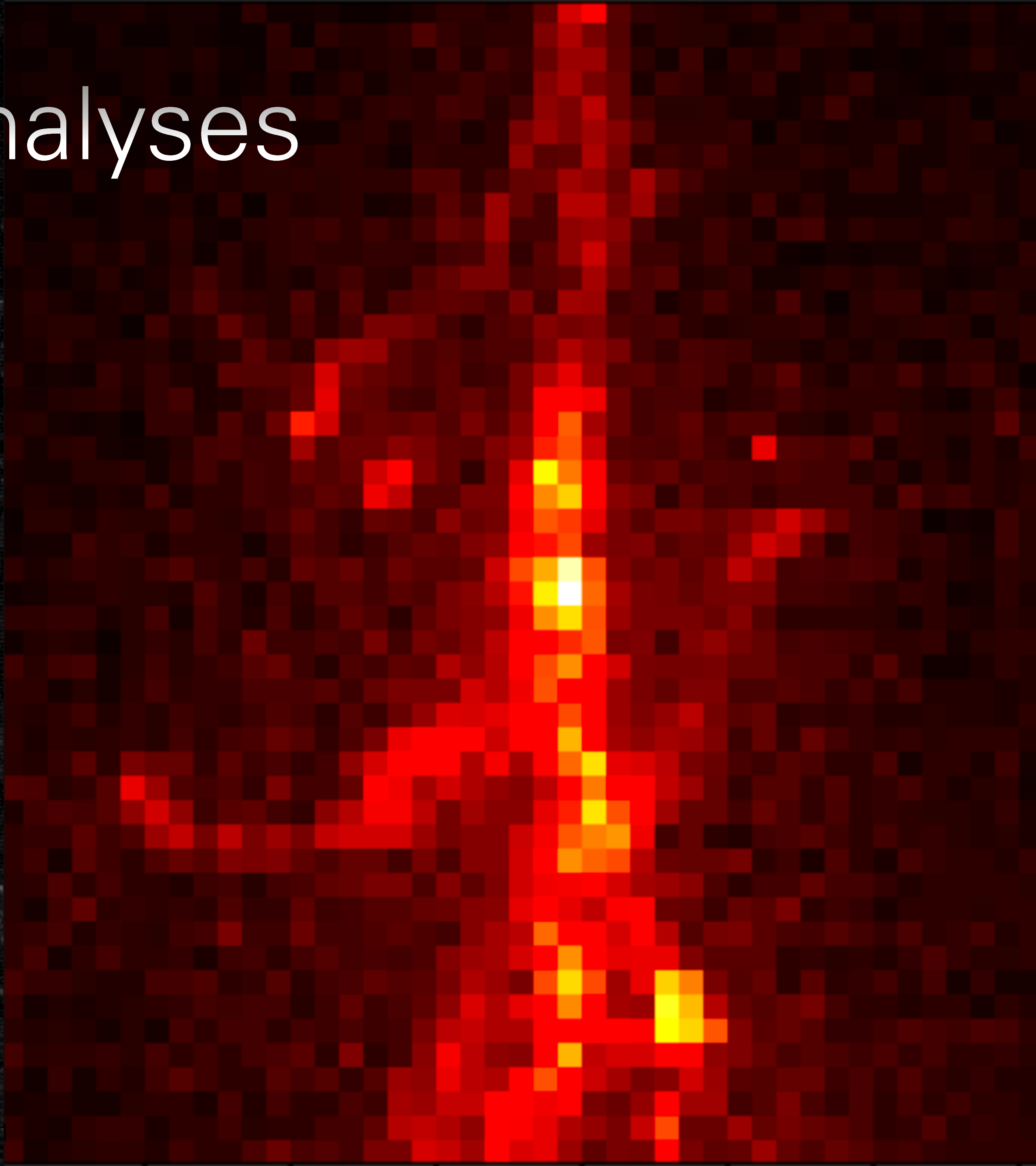


# BTF Simulations and analyses

Samuele Lanzi - 12 Mar 2026 - RIPTIDE meeting



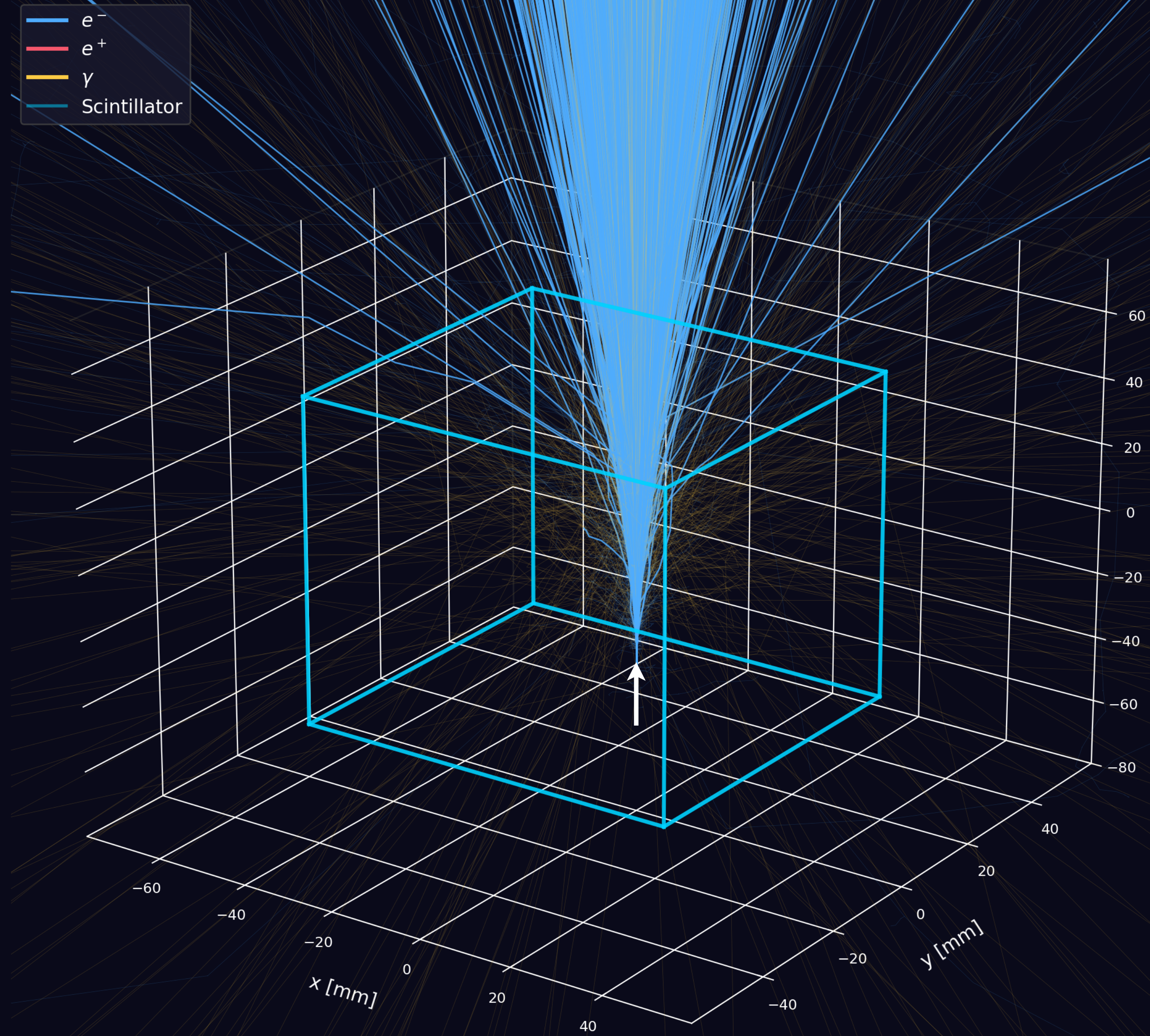
# Simulations

# Electrons

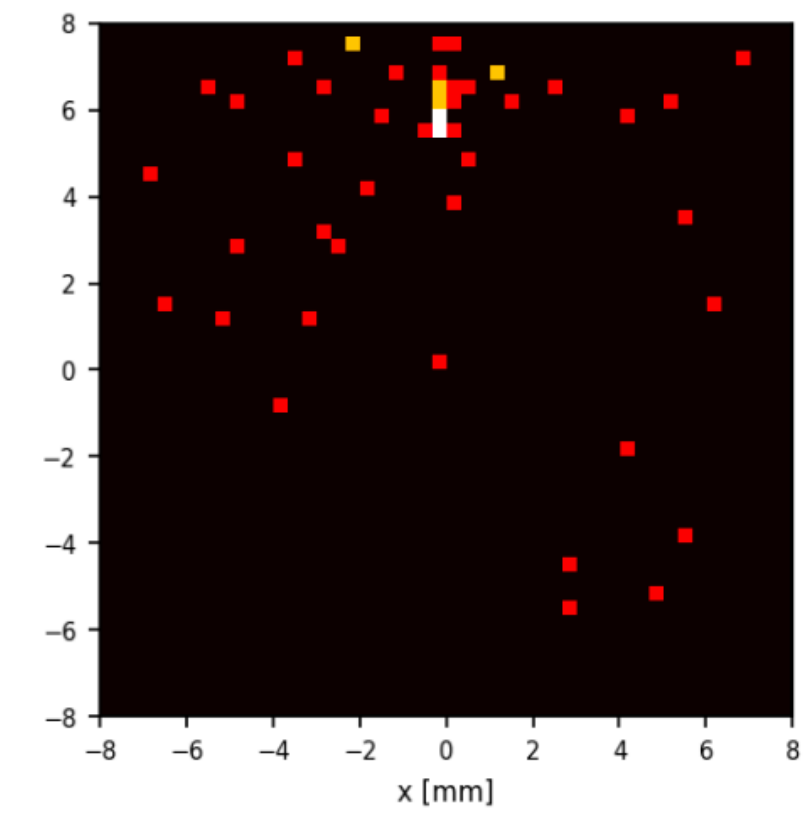
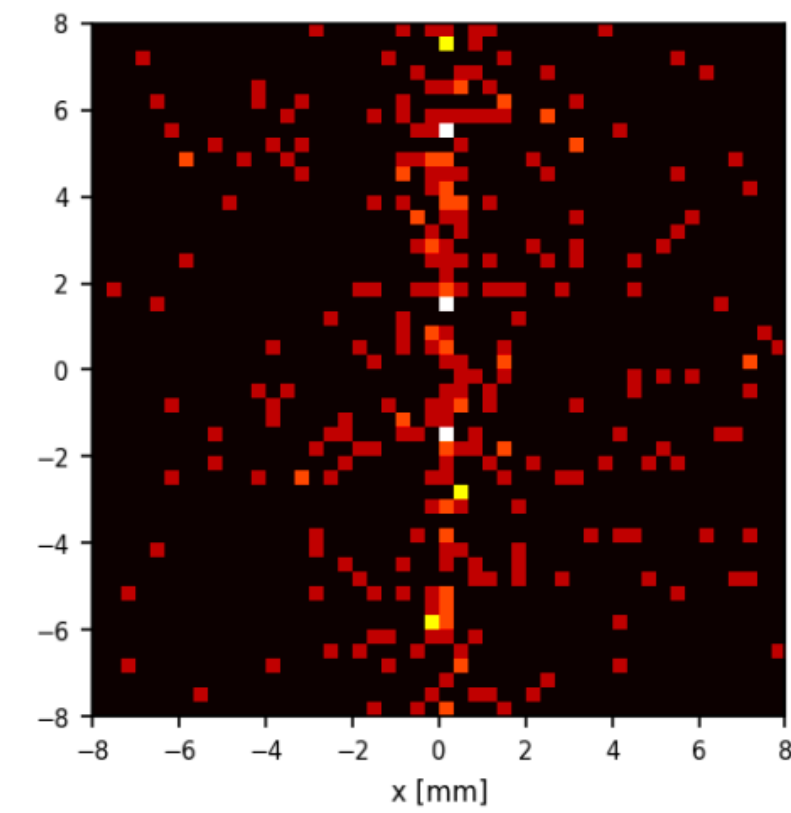
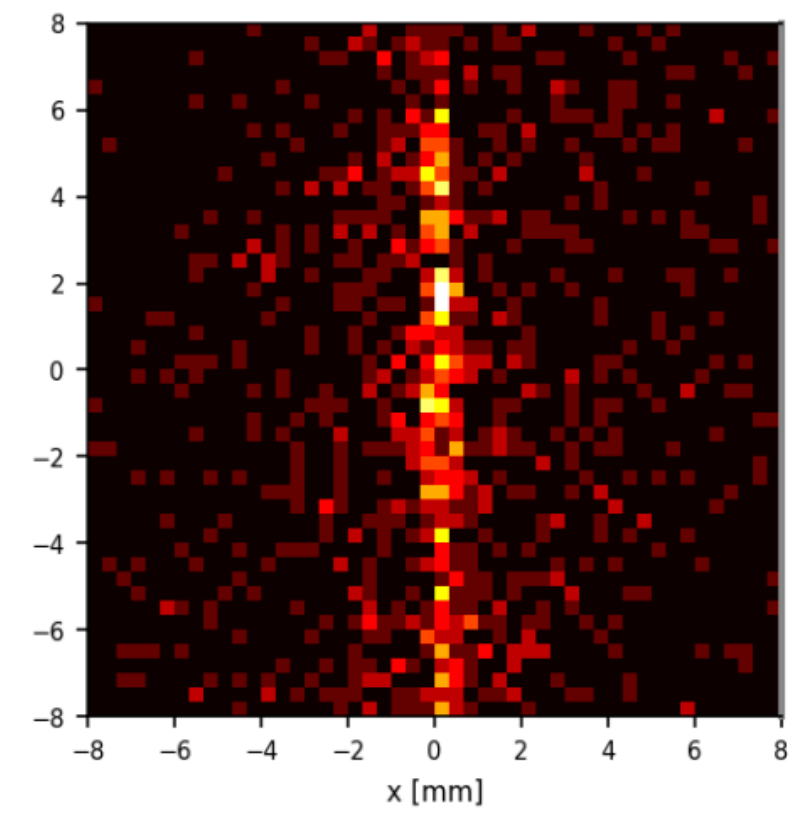
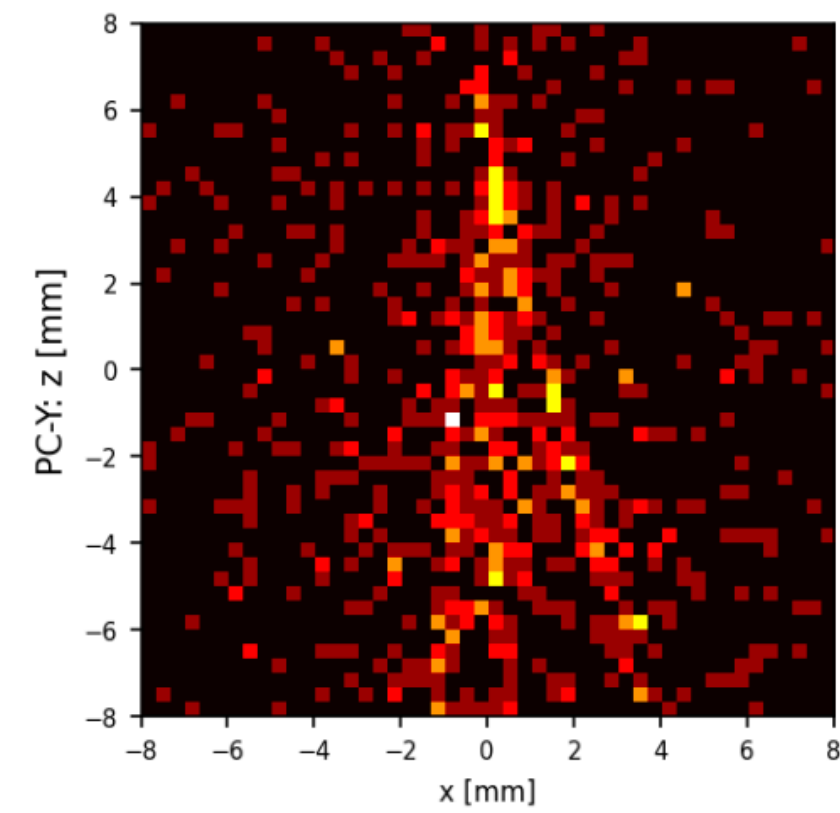
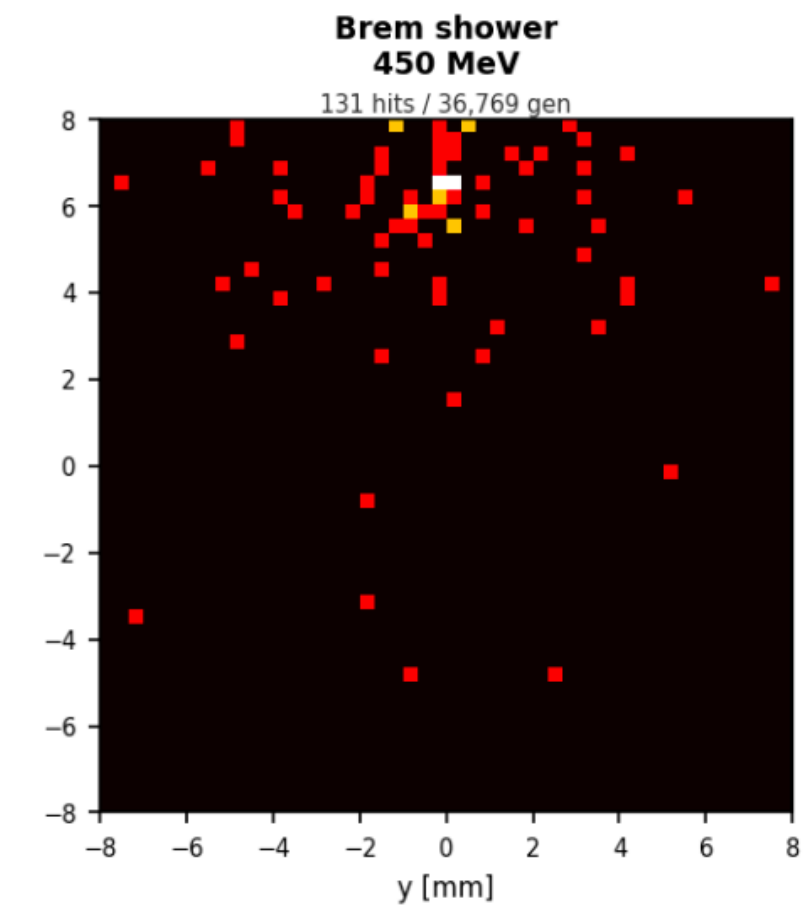
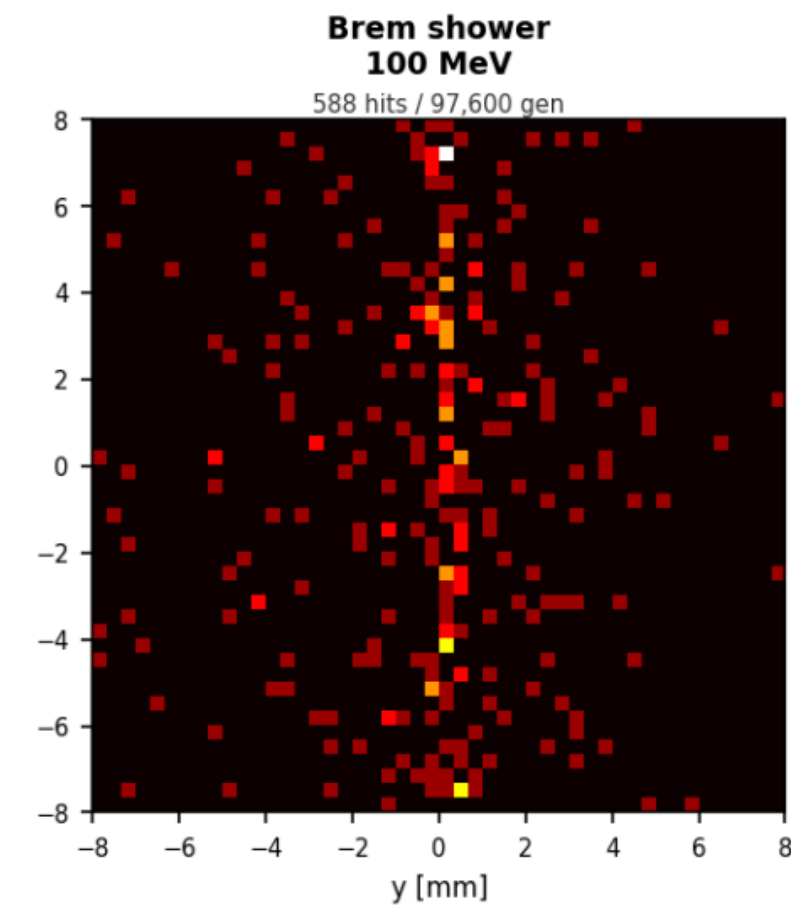
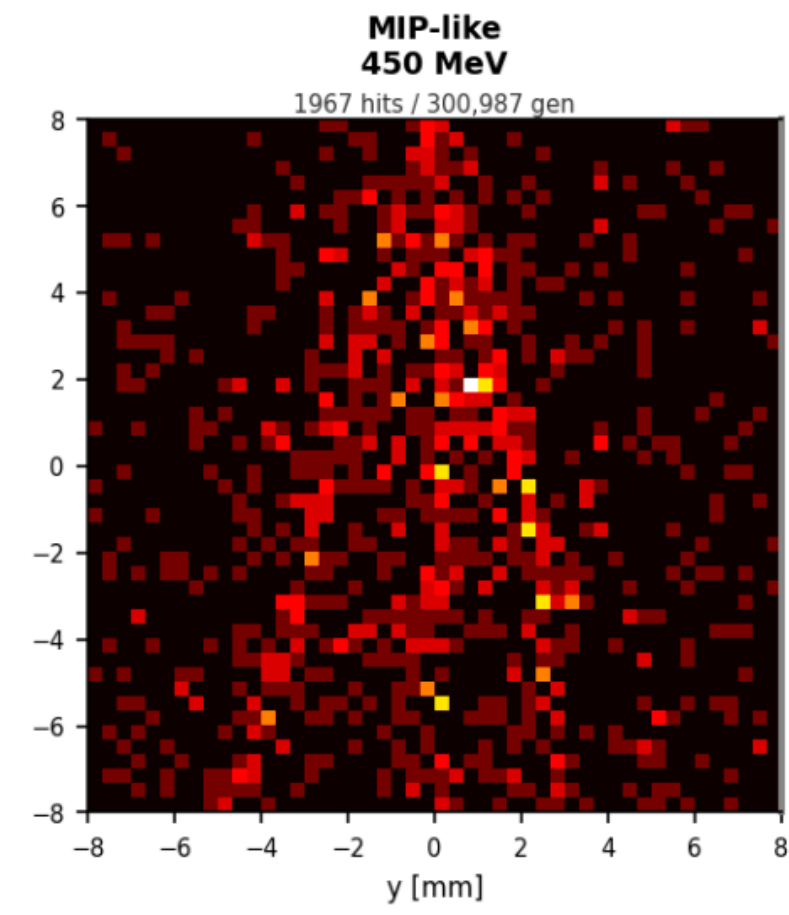
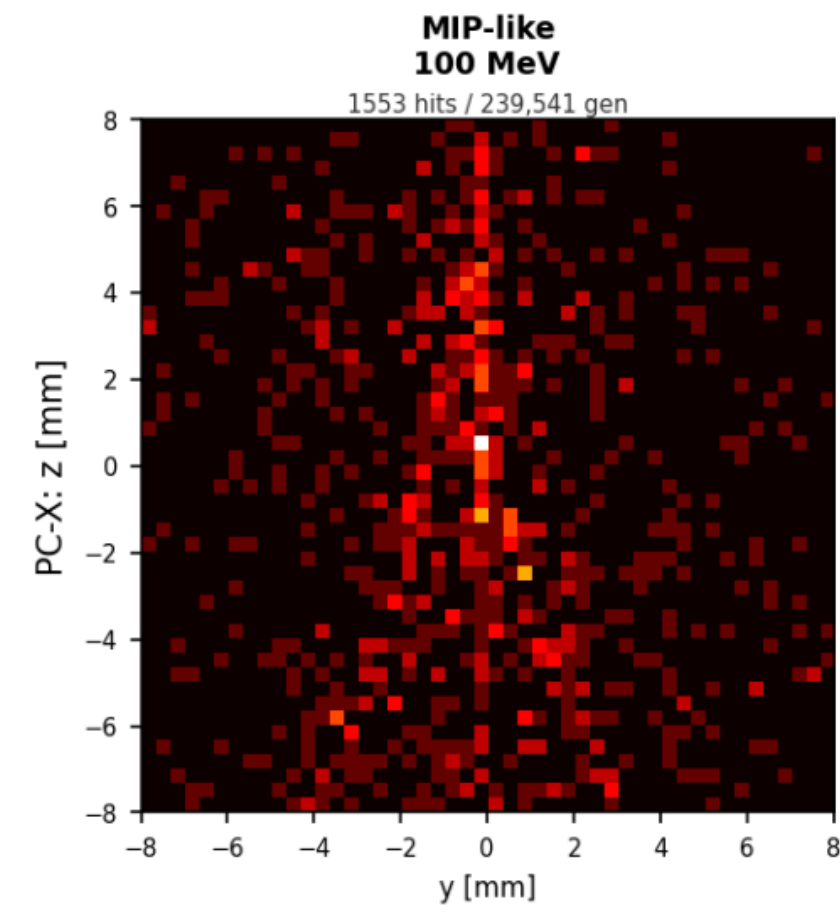
Two datasets were simulated:

- 1024 electrons 100/450 MeV in BC408
- 128 electrons 100/450 MeV in CsI

$e^-$  tracks in PVT scintillator — 100 MeV, 1024 events

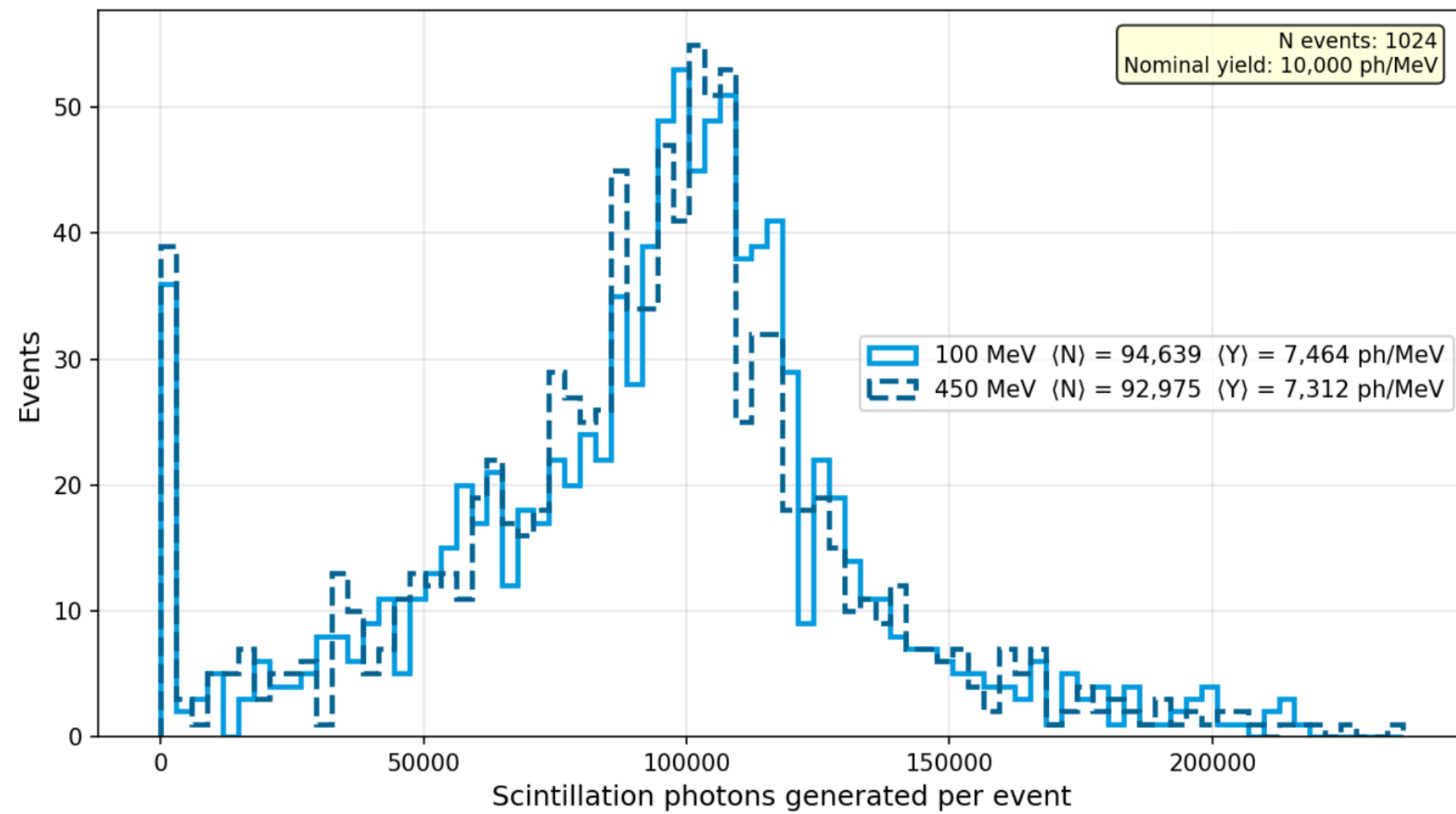


# BC408 events analysis

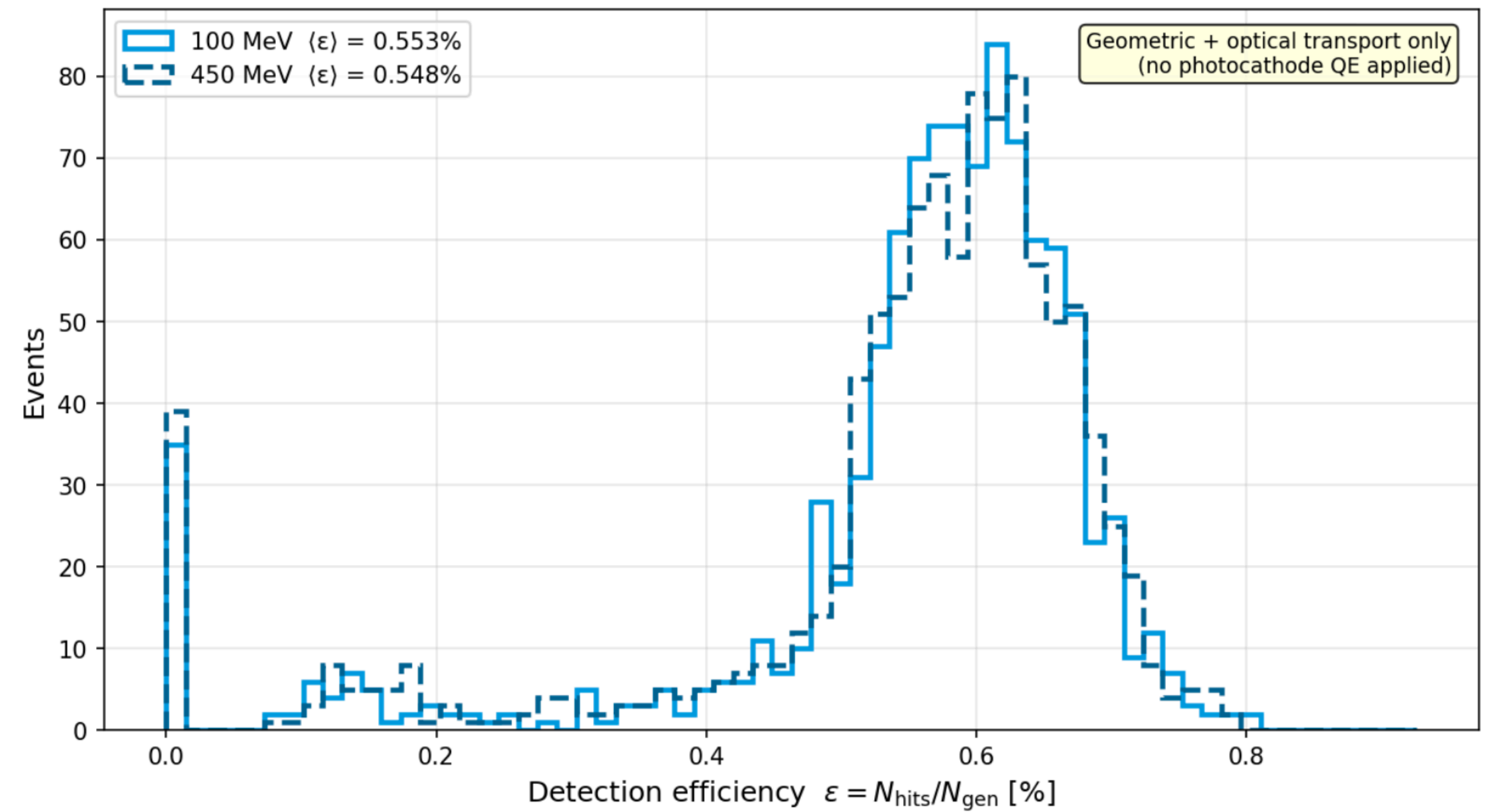


# BC408 events analysis

Scintillation photons generated per event —  $e^-$  in BC408 (PVT)

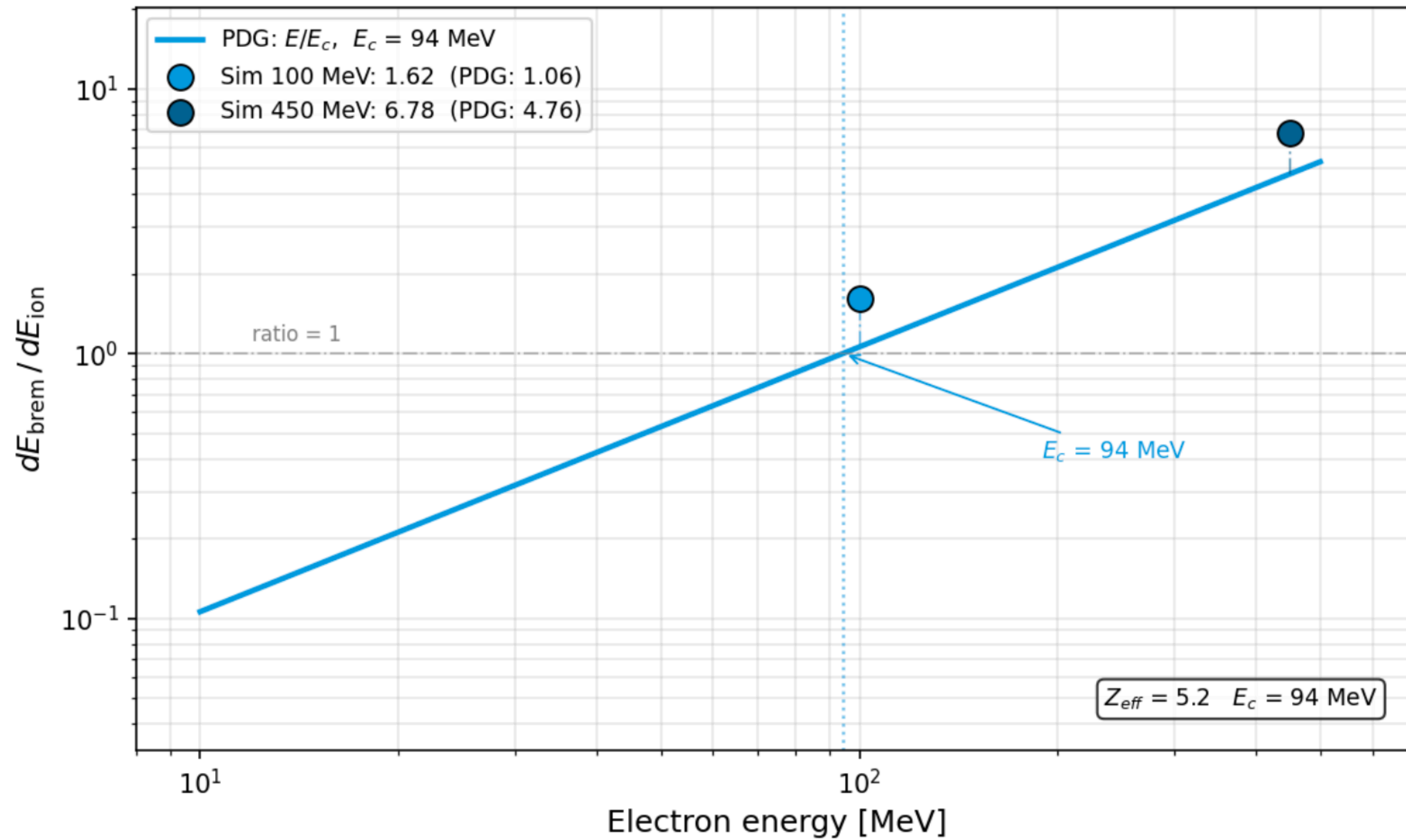


Photon detection efficiency —  $e^-$  in BC408 (PVT)

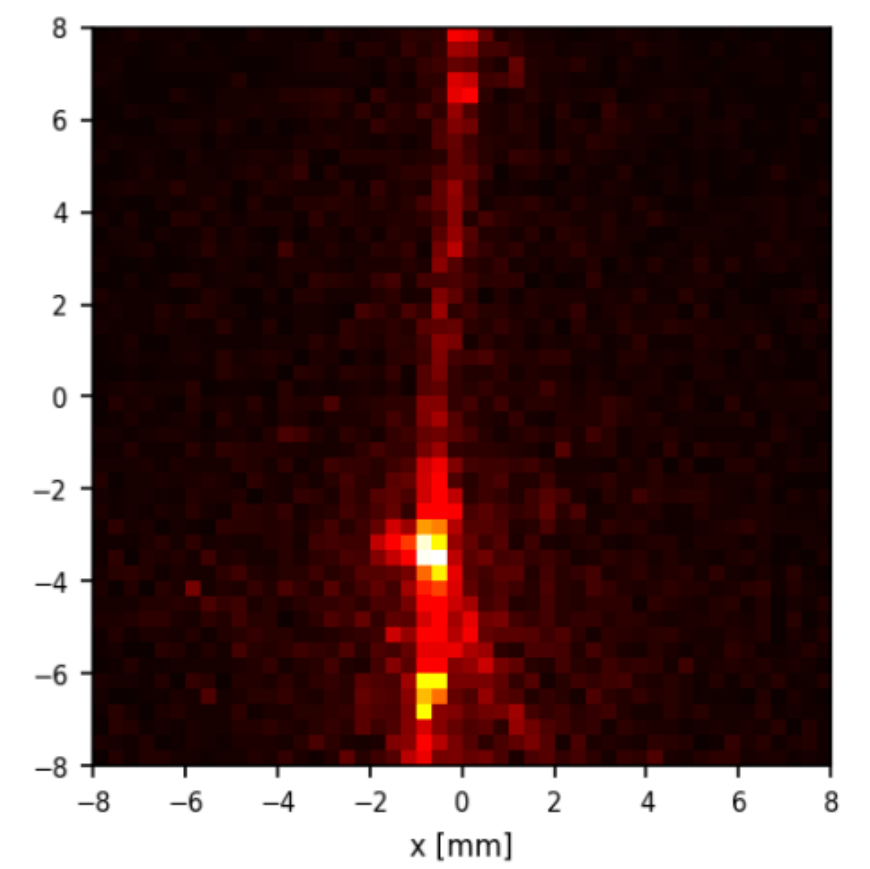
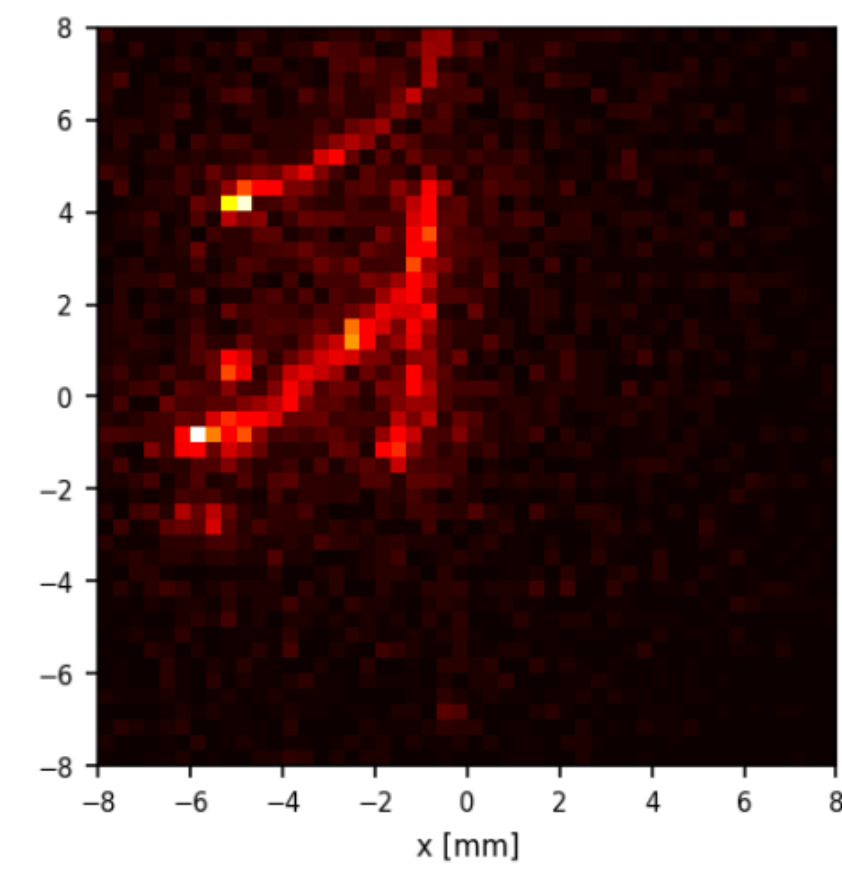
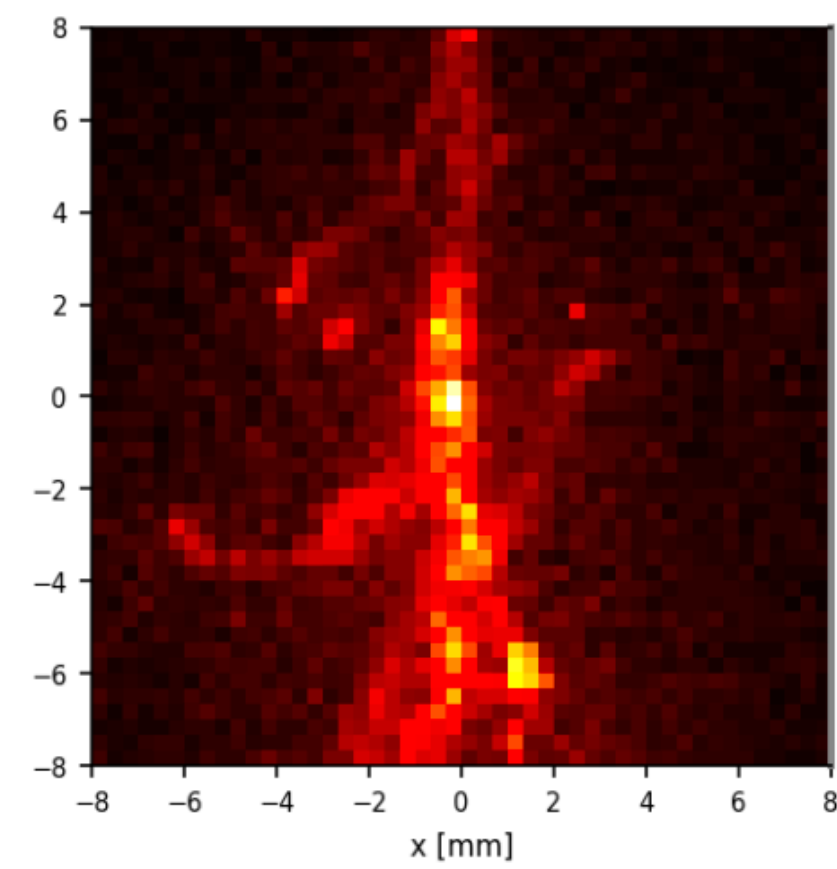
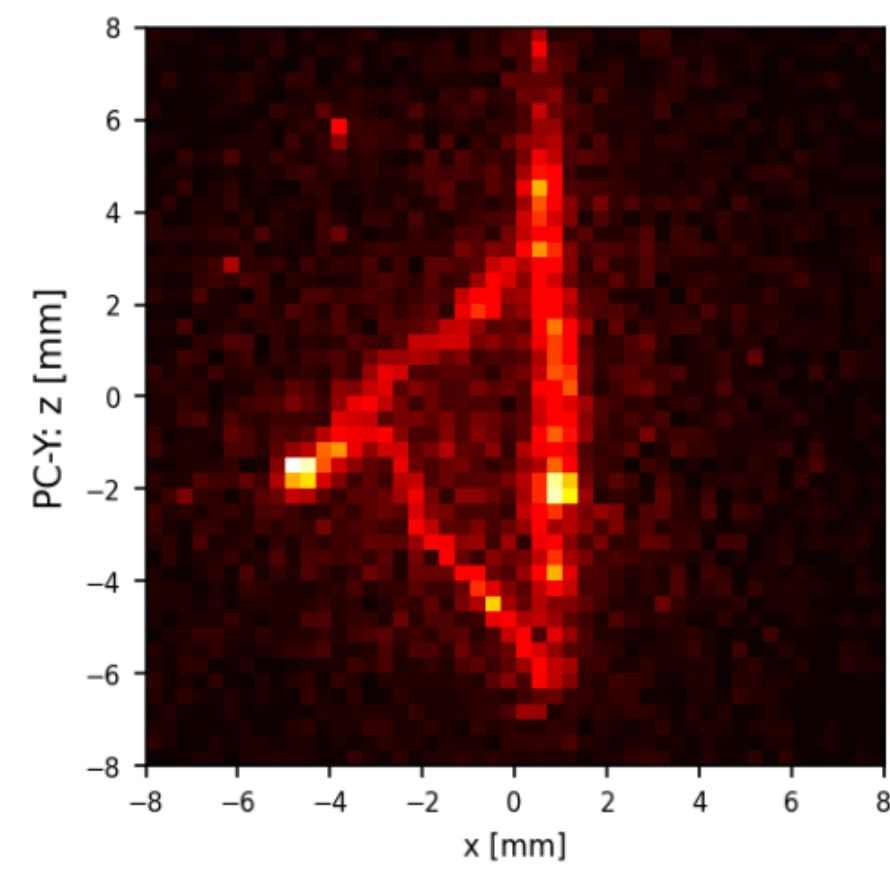
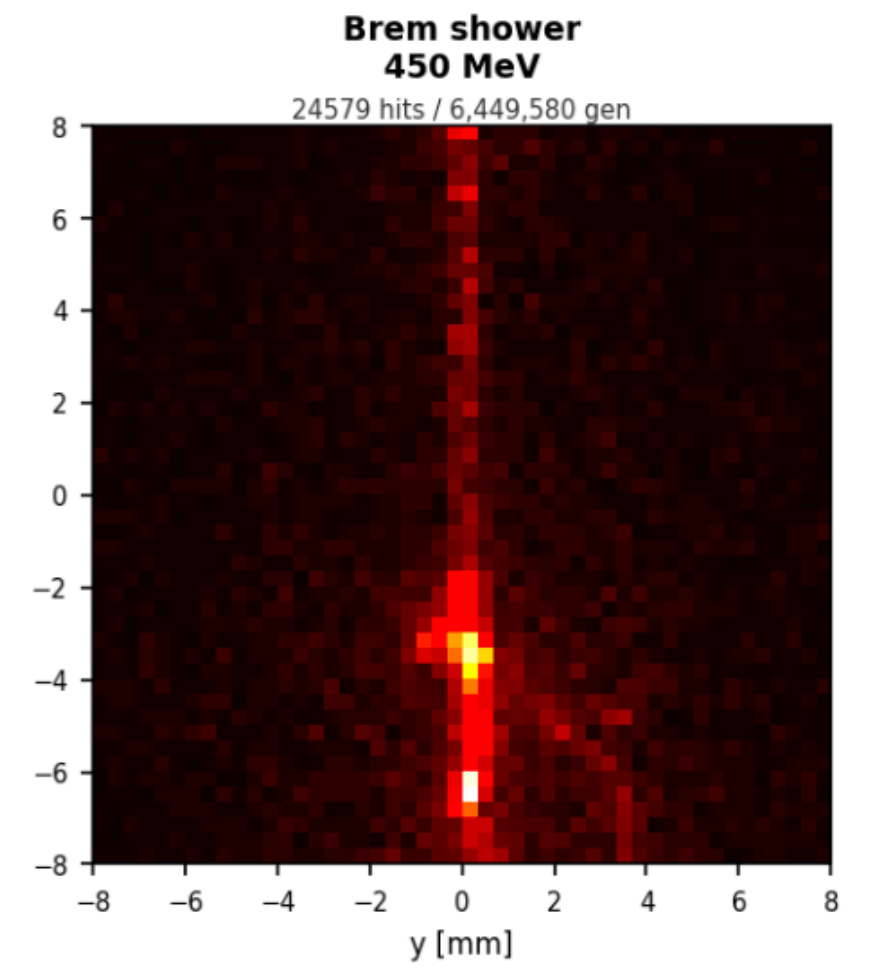
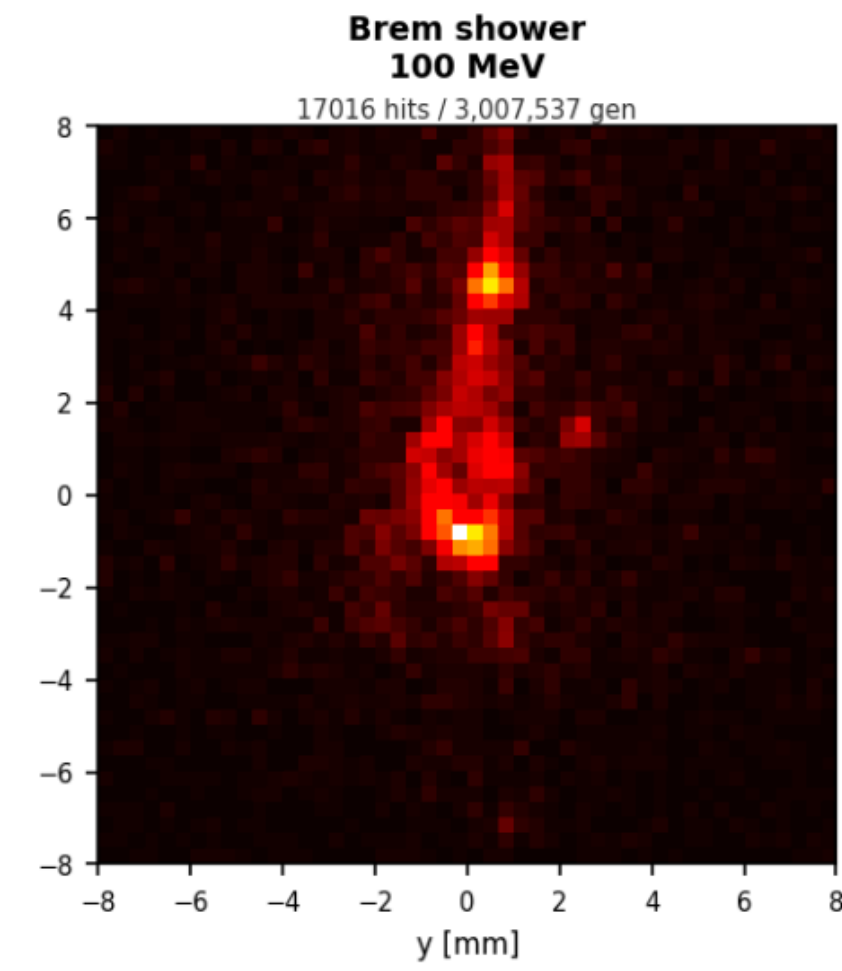
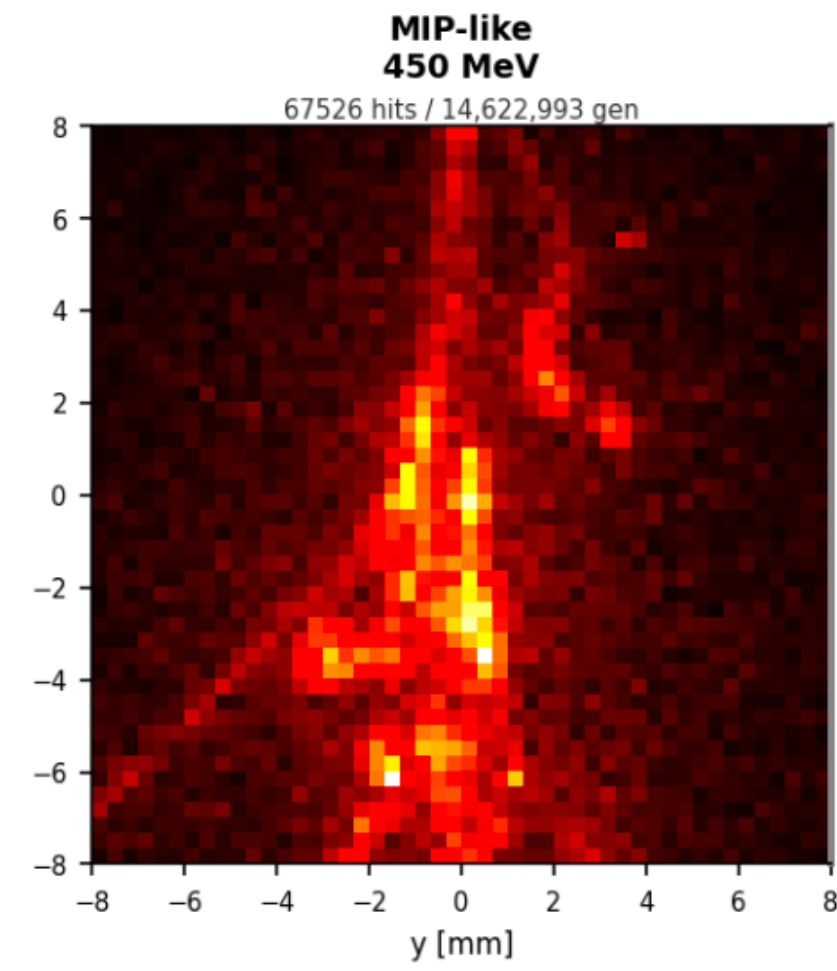
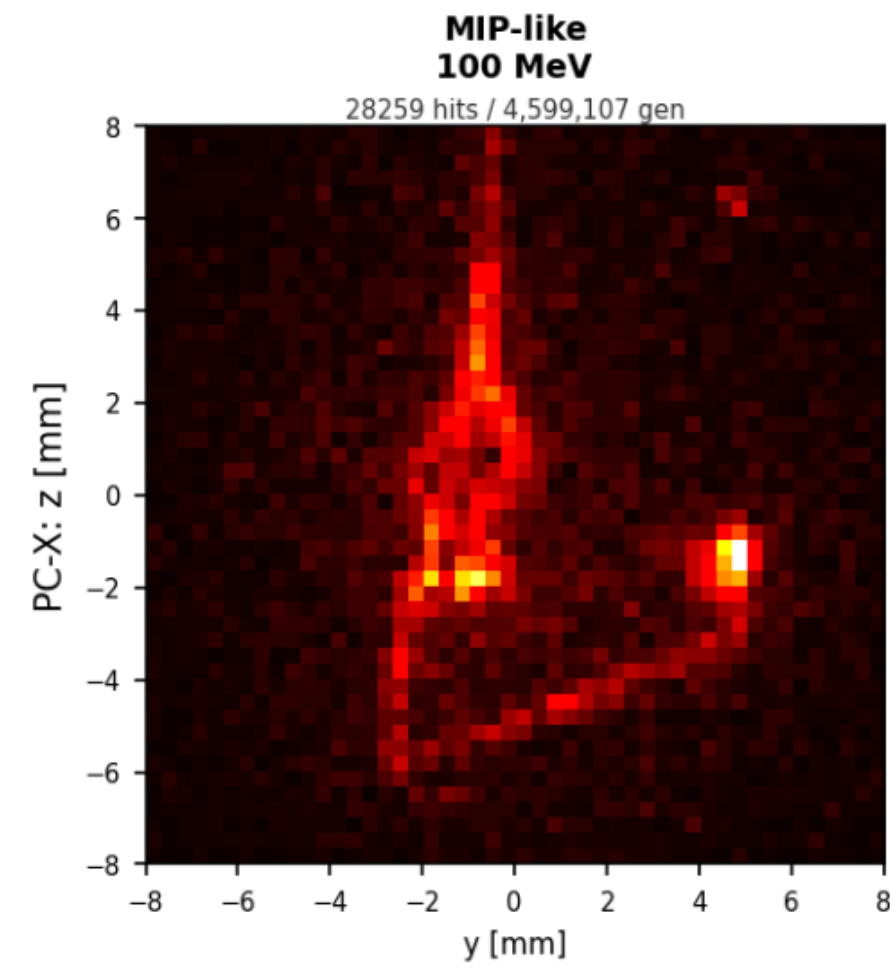


# BC408 events analysis

$dE_{\text{brem}}/dE_{\text{ion}}$  vs energy — BC408 (PVT)  
PDG formula  $E/E_c$ ,  $E_c = 610/(Z_{\text{eff}} + 1.24)$  MeV

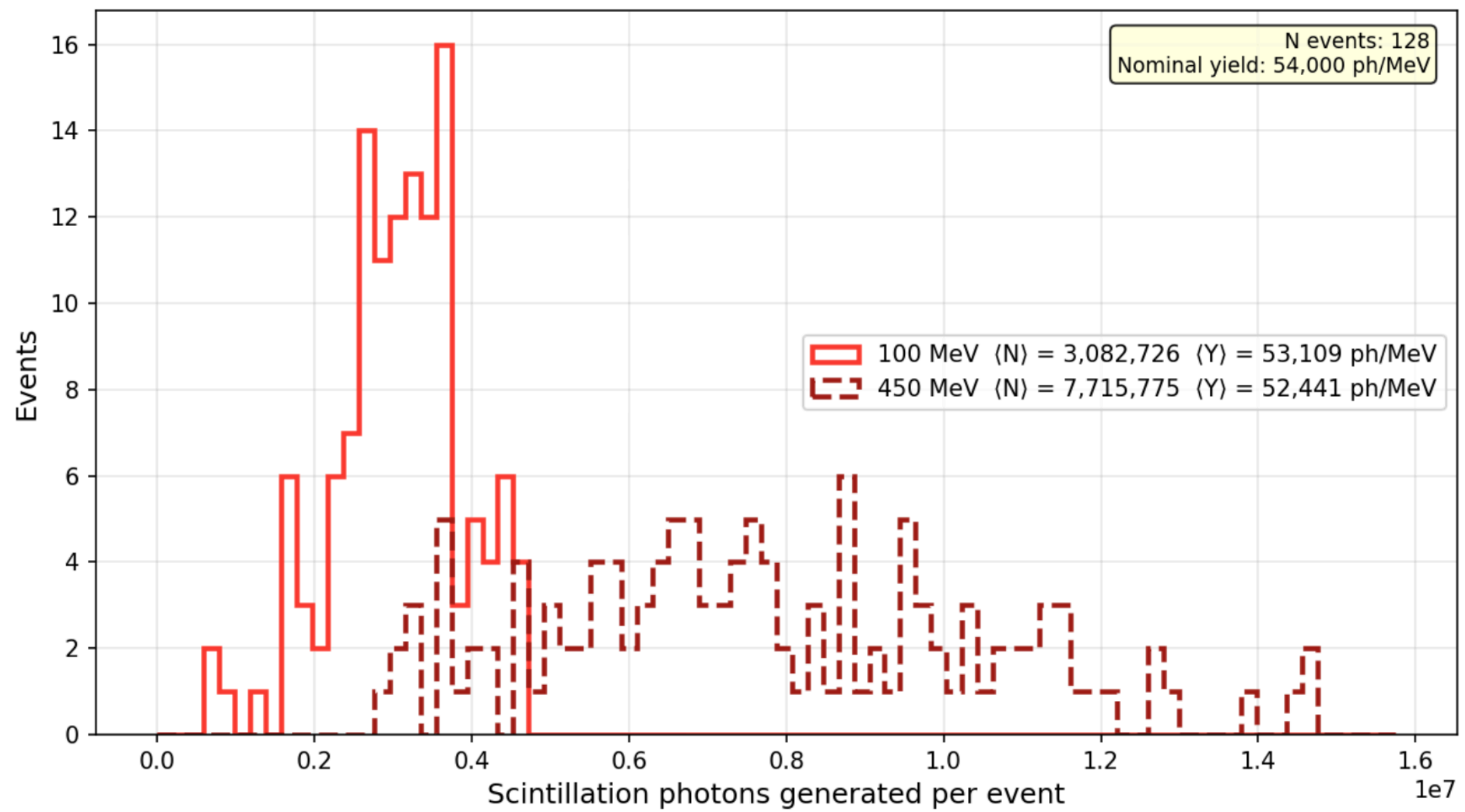


# Csl events analysis

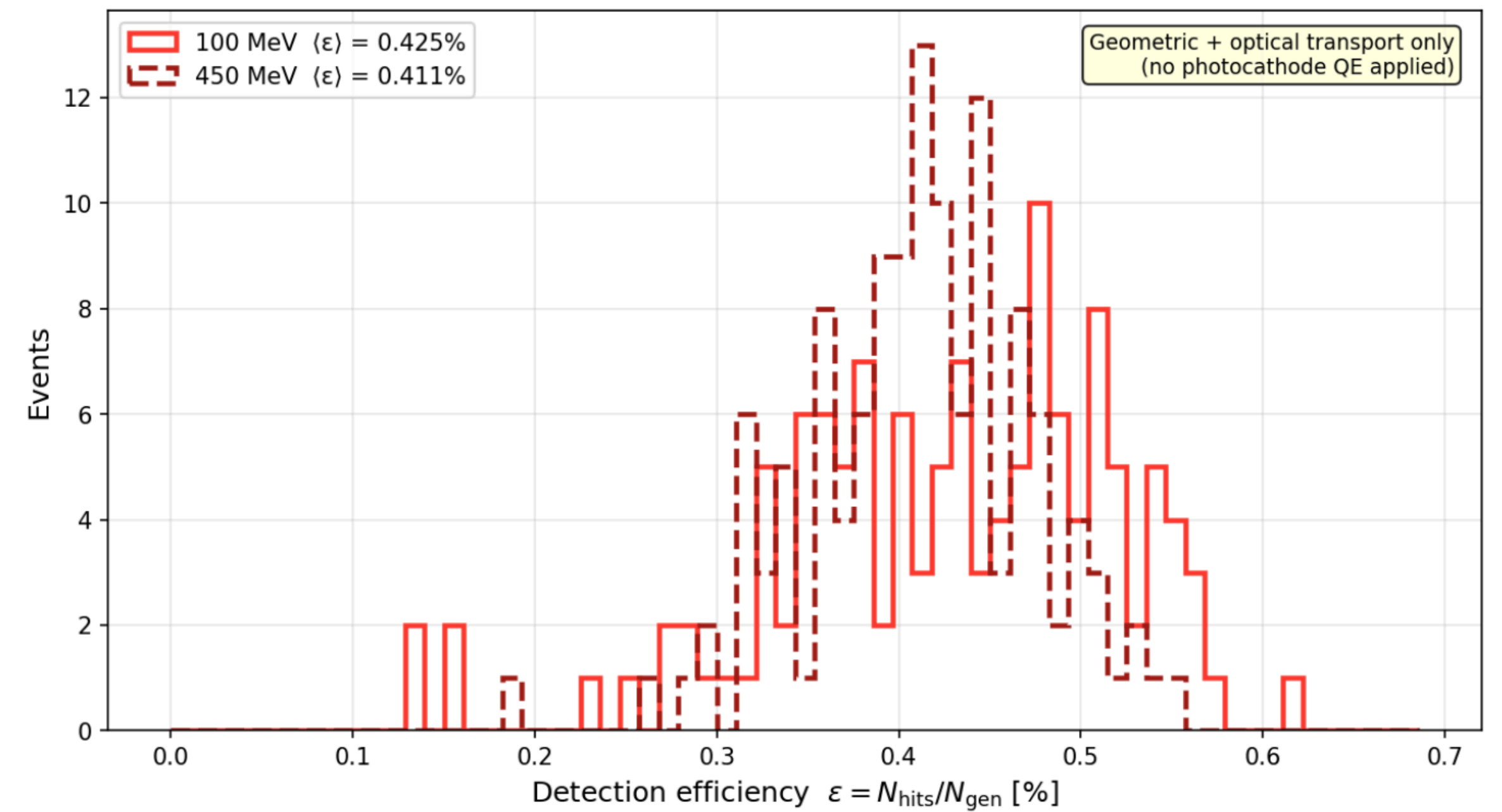


# Csl events analysis

Scintillation photons generated per event —  $e^-$  in CsI(Tl)

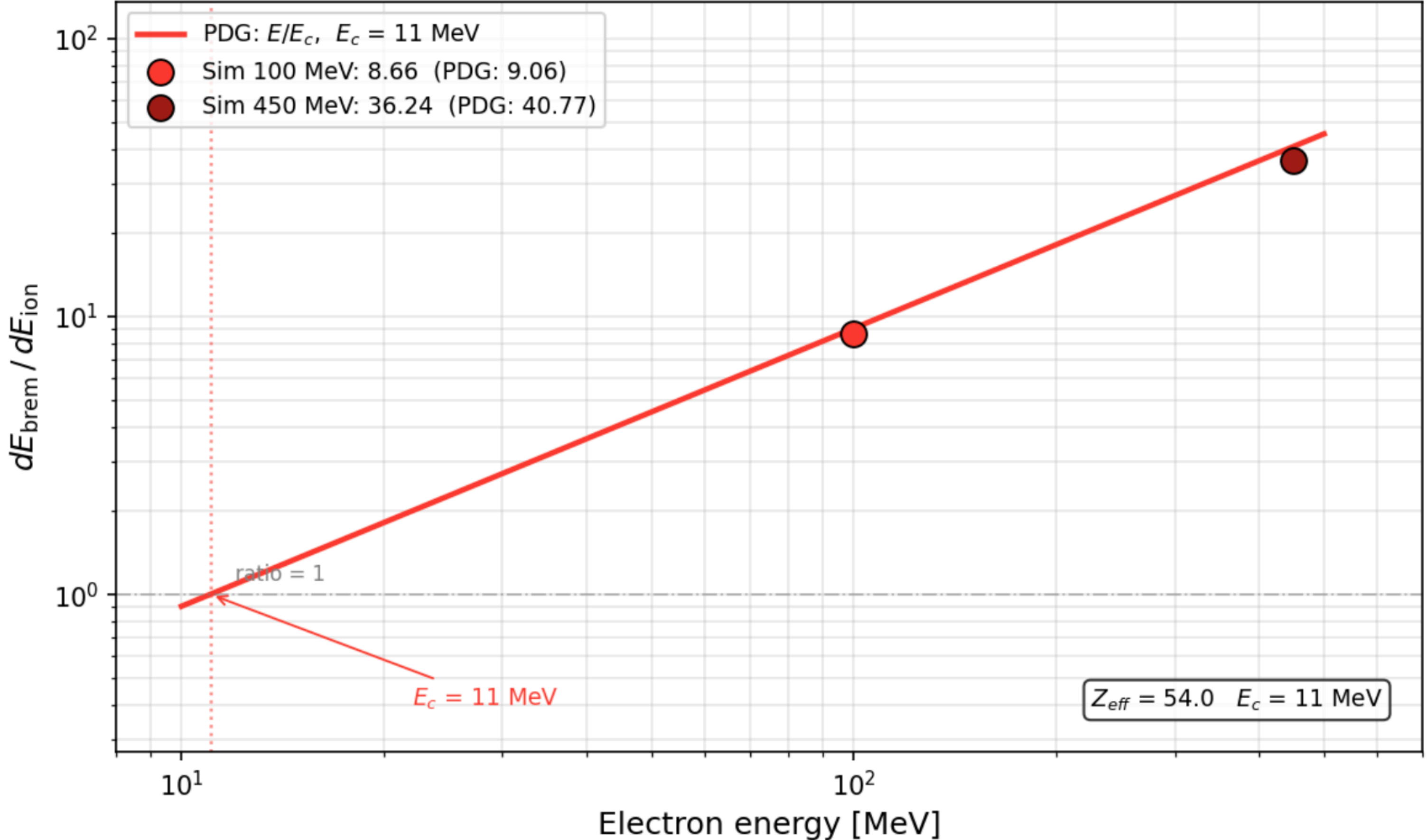


Photon detection efficiency —  $e^-$  in CsI(Tl)



# Csl events analysis

$dE_{\text{brem}}/dE_{\text{ion}}$  vs energy — Csl(Tl)  
PDG formula  $E/E_c$ ,  $E_c = 610/(Z_{\text{eff}} + 1.24)$  MeV

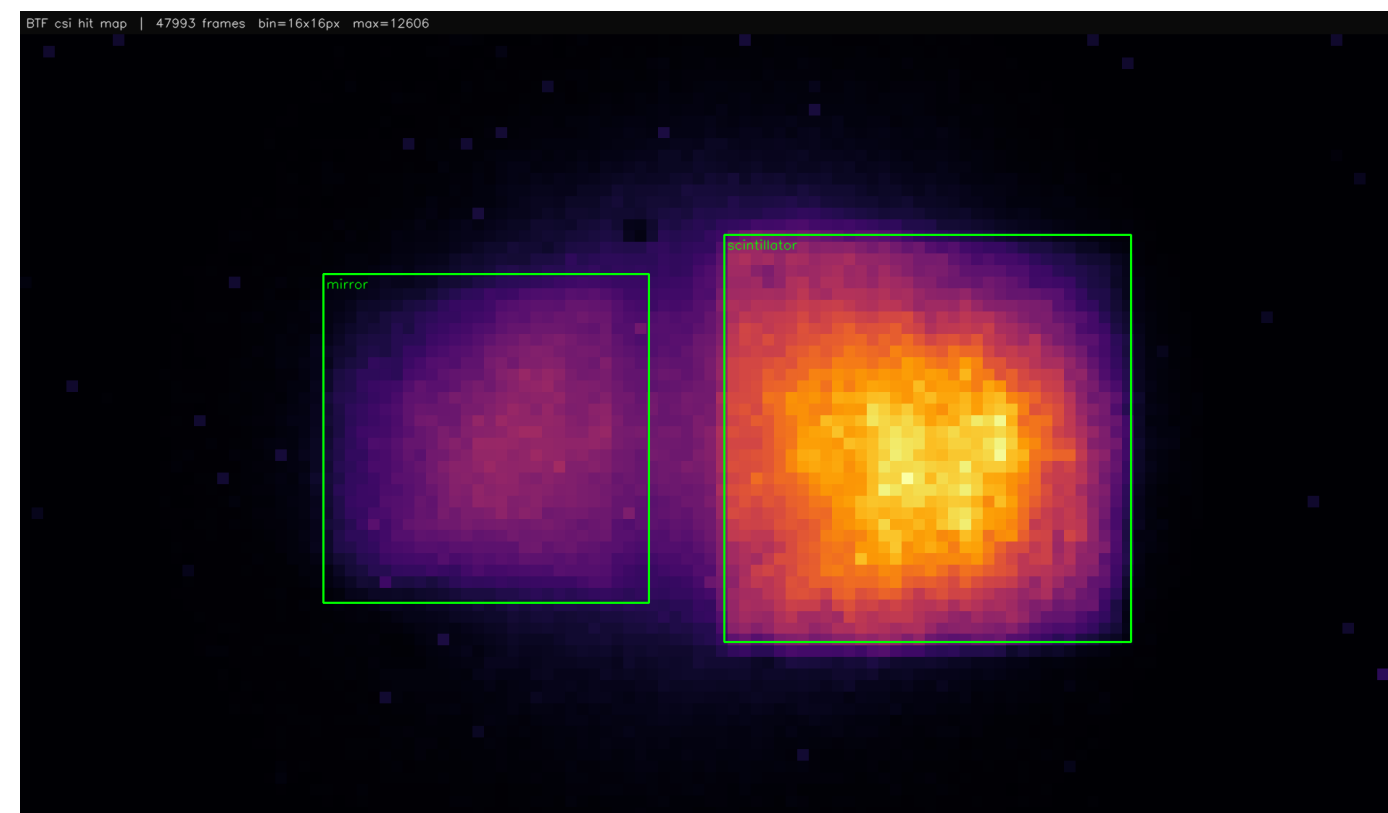


# **BTF Data**

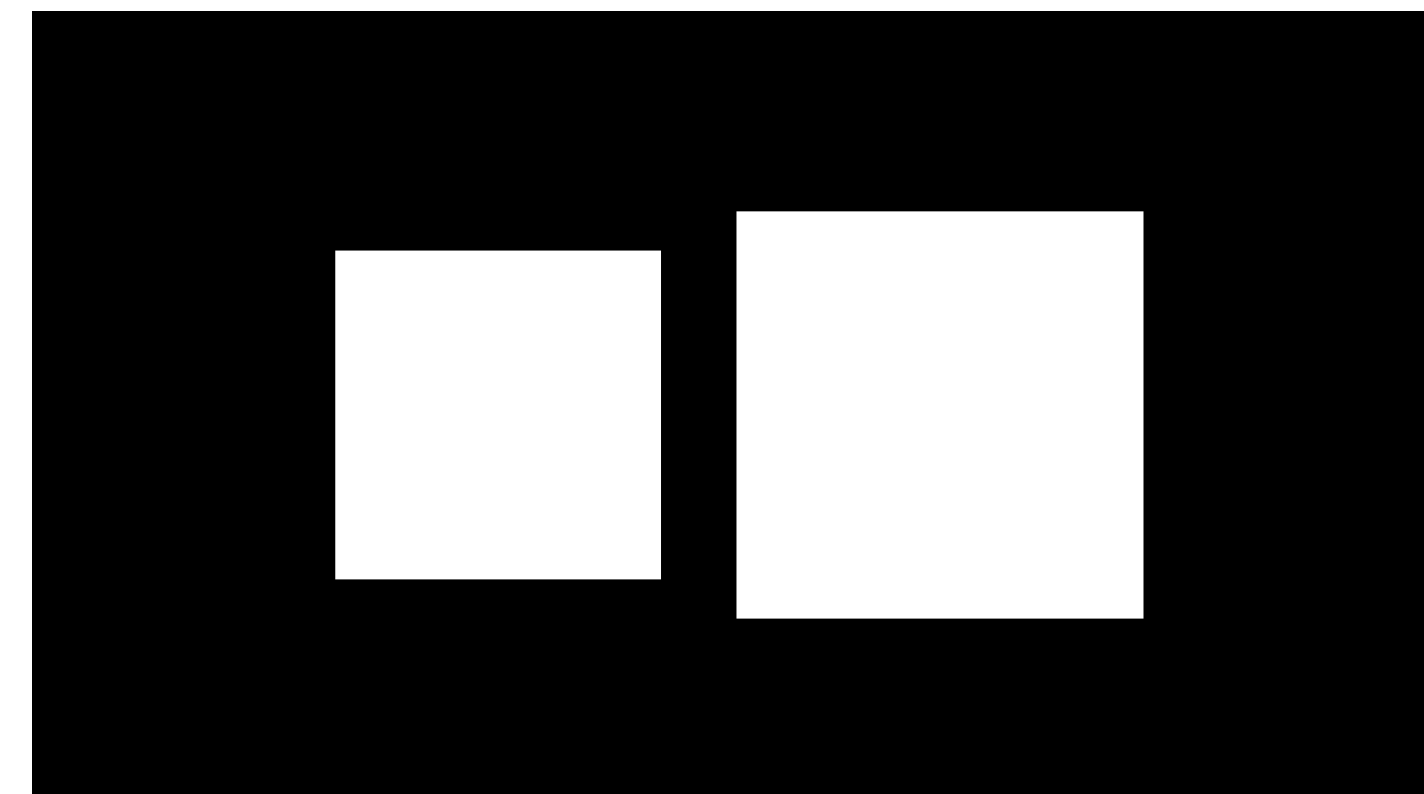
# Dataset scan

	Acquisition directories	Period
CsI	2026_02_12_05 ... _08	12 Feb 2026
BC408	2026_02_10_21 ... 2026_02_11_04	10–11 Feb 2026

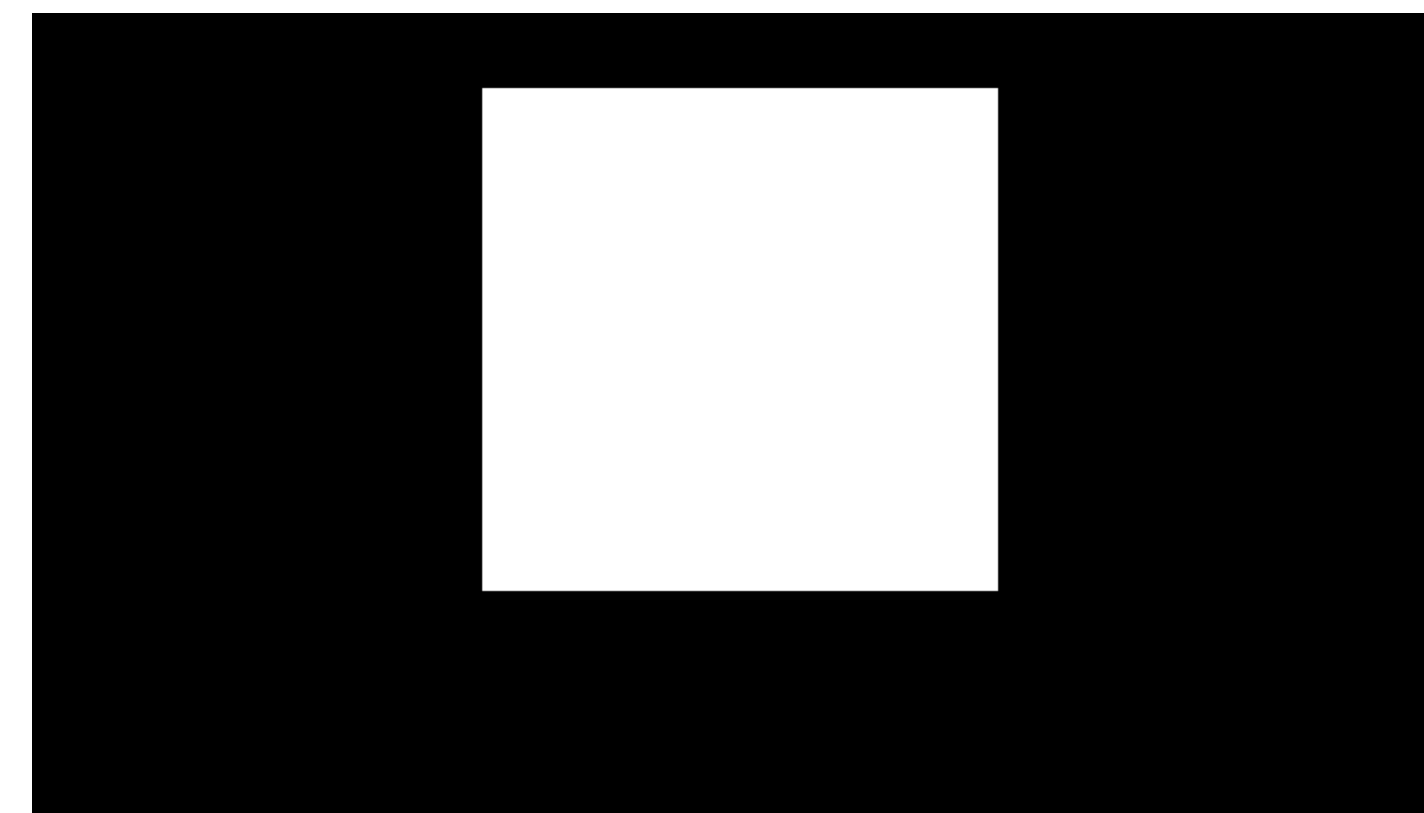
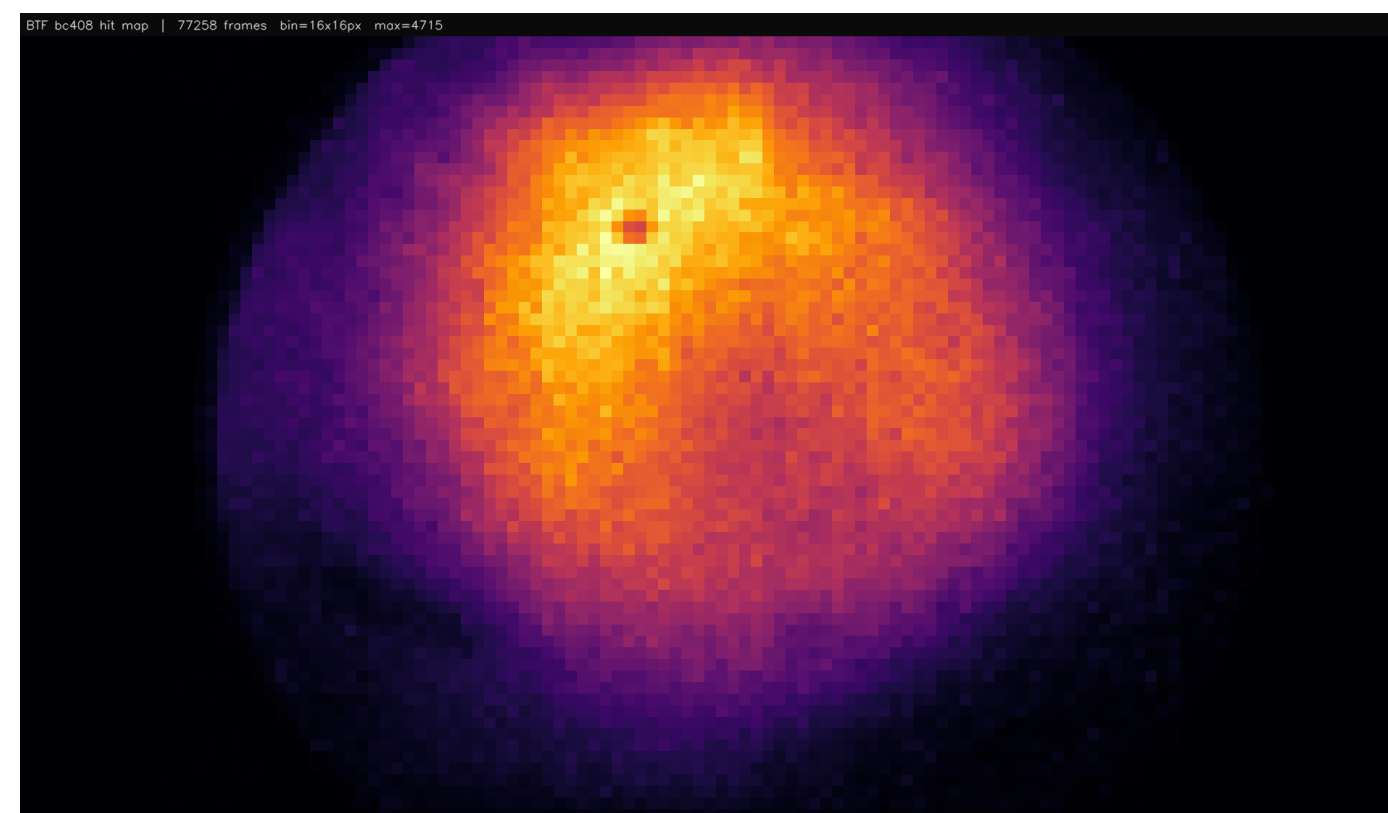
**CsI + mirror  
mask**



Sum of all images subtracting dark and flat field



**BC408 mask**



# Signal selection using the blob number

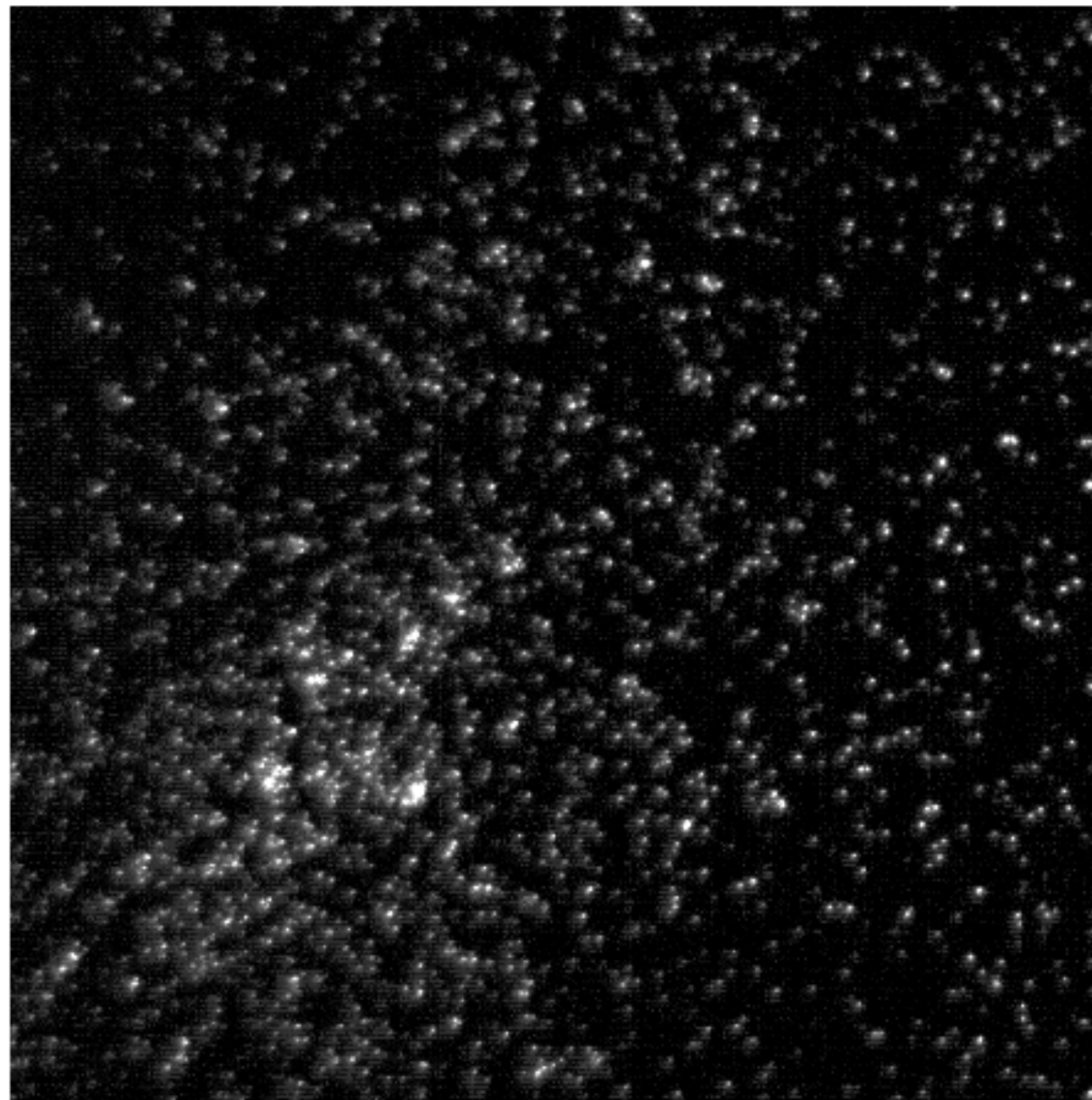
[Blob detection / trigger classification]

`cv::connectedComponentsWithStats(...)`

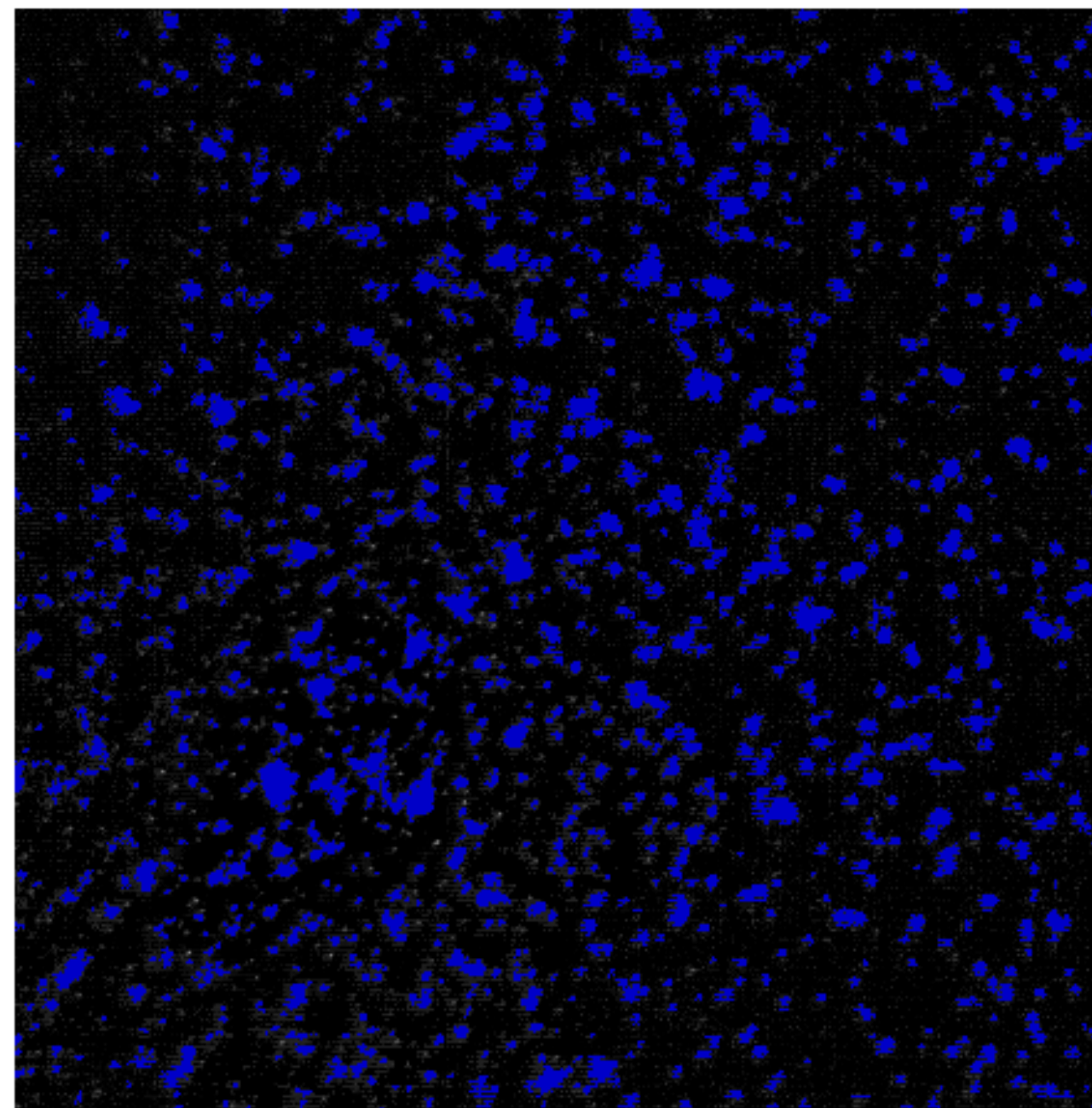
CsI : fixed threshold (T=8 ADU) + 8-connected components  
signal if blobs\_mirror $\geq$ 30 OR blobs\_scint $\geq$ 30

BC408: fixed threshold (T=5 ADU) + 8-connected components  
min\_area=4 px - signal if blobs $\geq$ 80

2026\_02\_12\_07\_r03\_t001237\_mirror.tif



CsI mirror spots=1035 (thr=36)



Mode: csi  
Processed: 47993 / 47993  
With signal: 2034

~4%

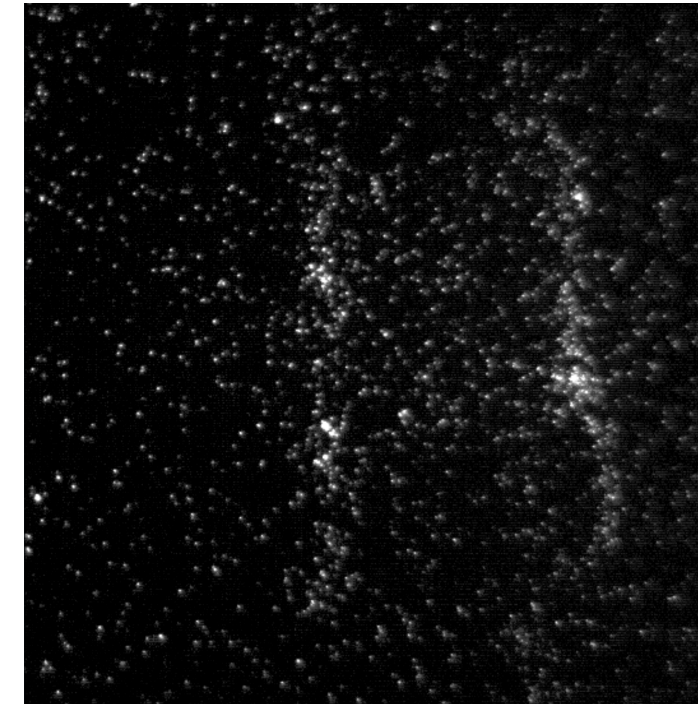
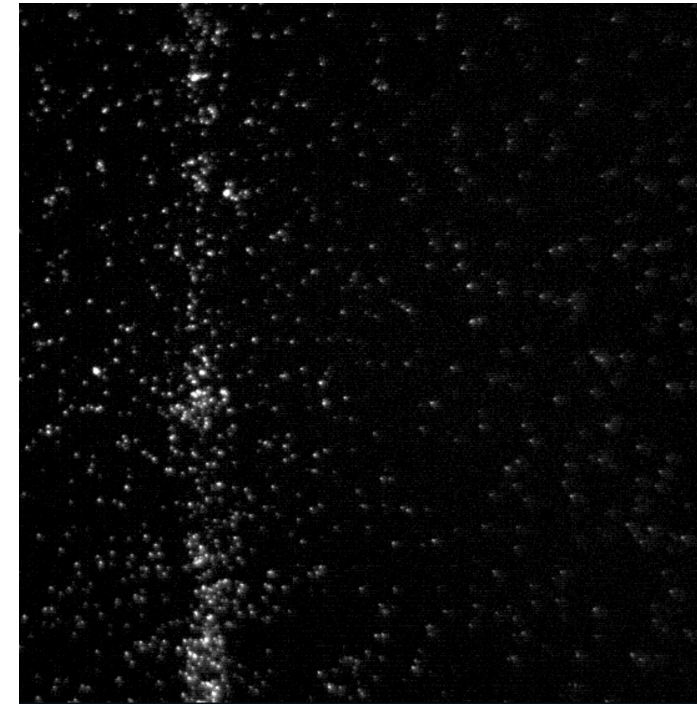
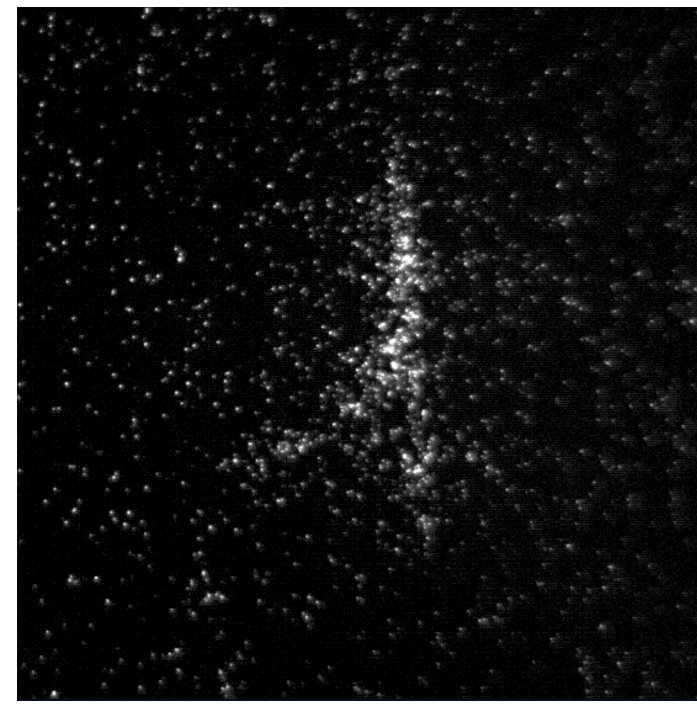
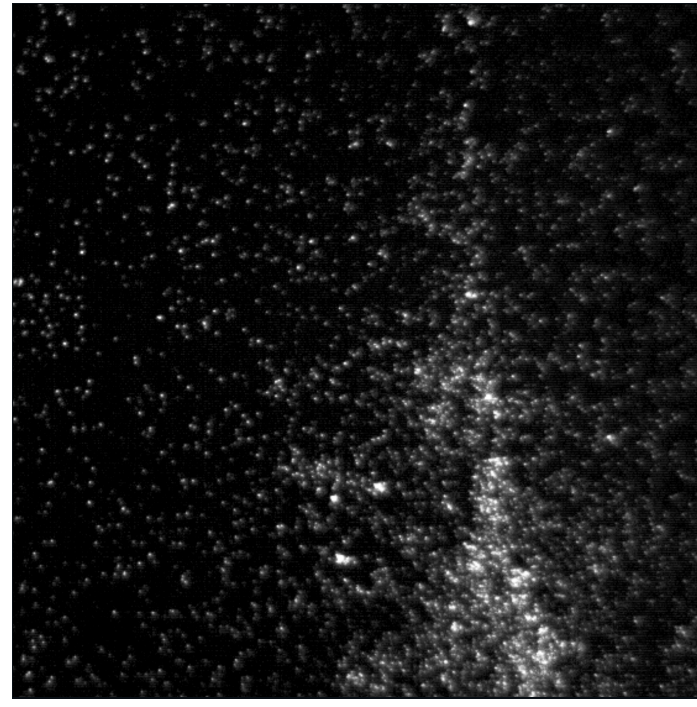
Mode: bc408  
Processed: 77258 / 77258  
With signal: 352

~0.5%

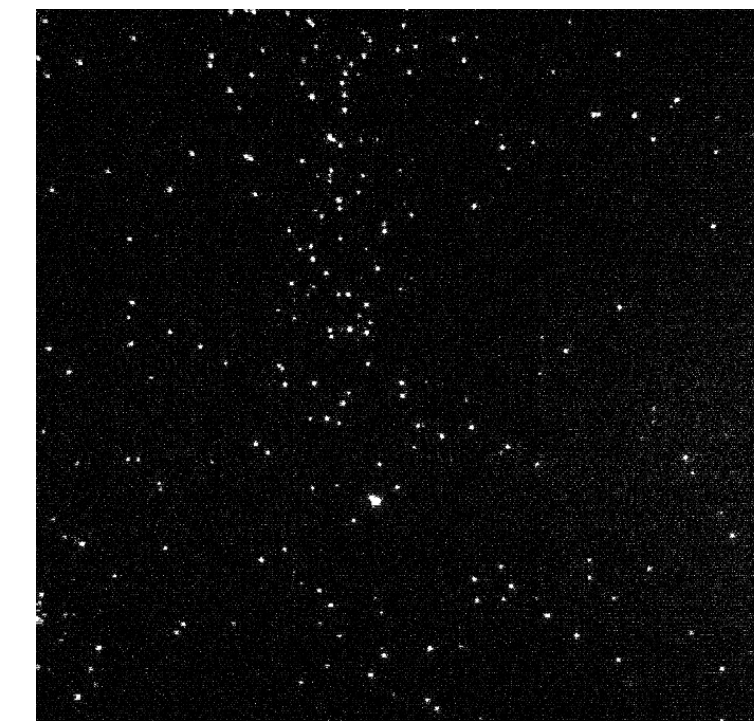


# Examples of signal in Csl and BC408

Csl

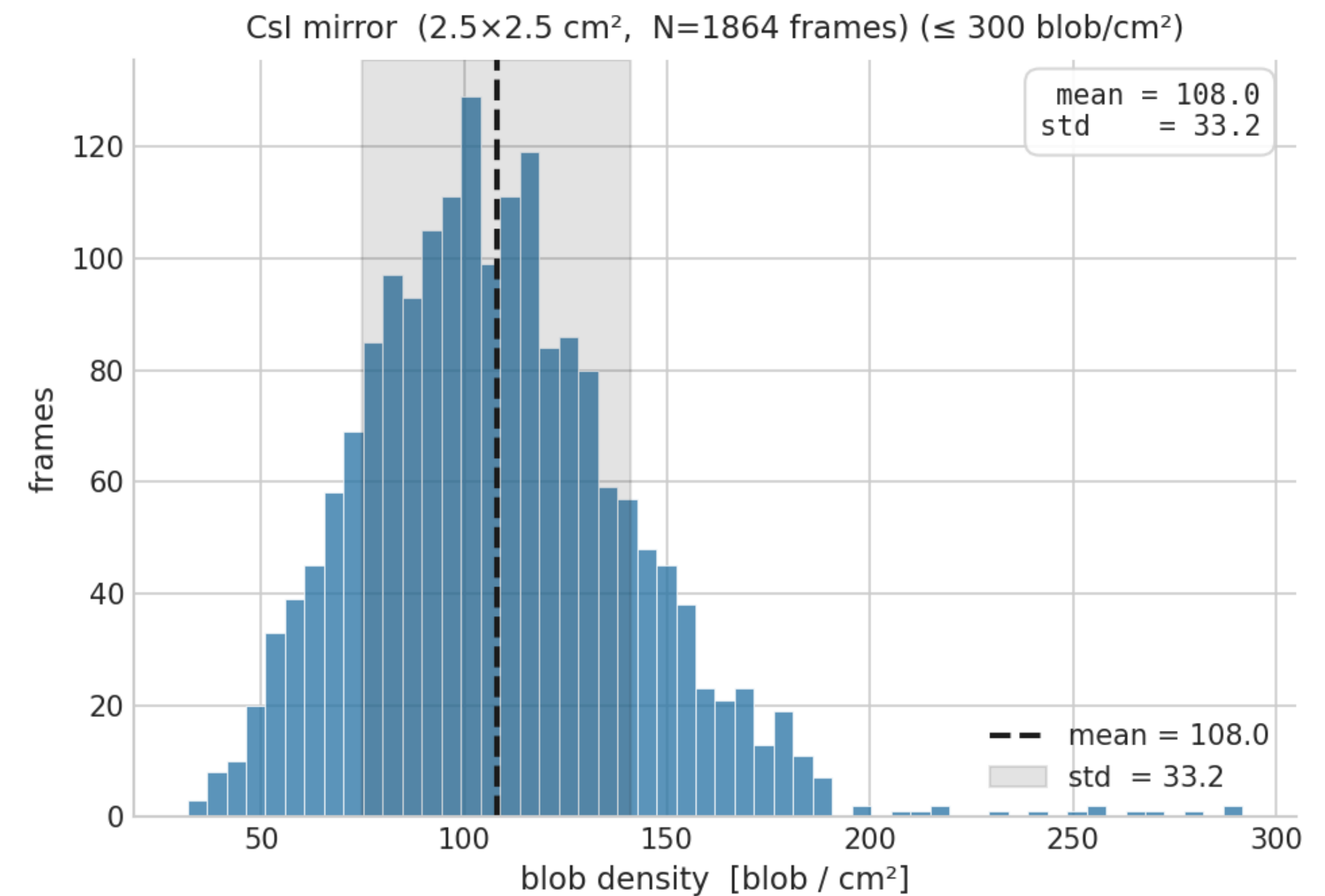
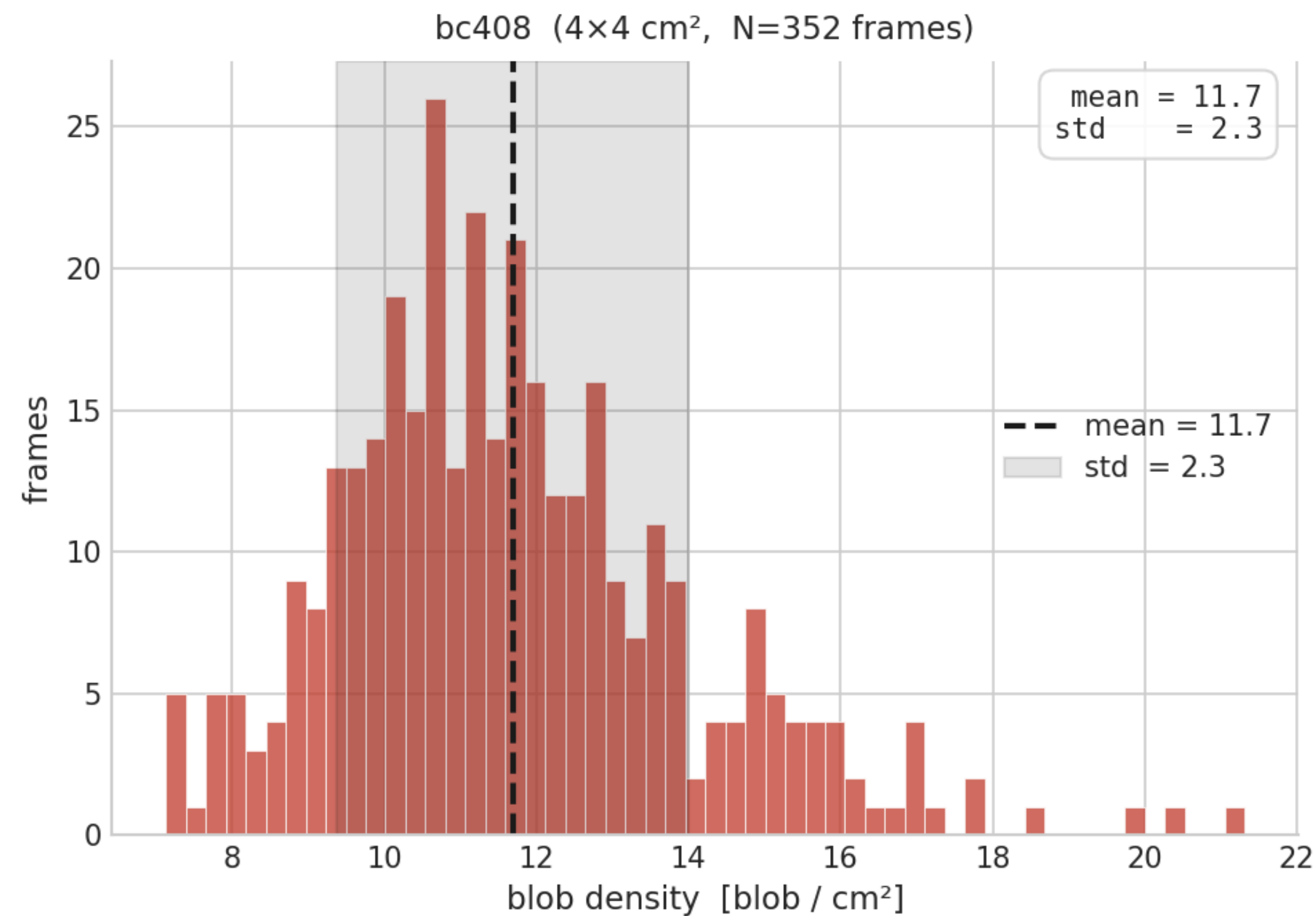


BC408



# Analysis of blob number and MC comparison

Blob density distribution [blob / cm<sup>2</sup>]



The ratio of the number of blobs per cm<sup>2</sup> between the Csl and BC408 images is a factor of  $\sim 10$ , consistent with the expectations from Monte Carlo simulations

# Conclusions

- Simulated tracks also for Csl(TI) and continued the two analyses
- First analysis of the BTF dataset for BC408 and Csl number of blobs and comparison with MC dataset
- Next steps: Angle reconstruction in 2d since the track in the mirror is really faint