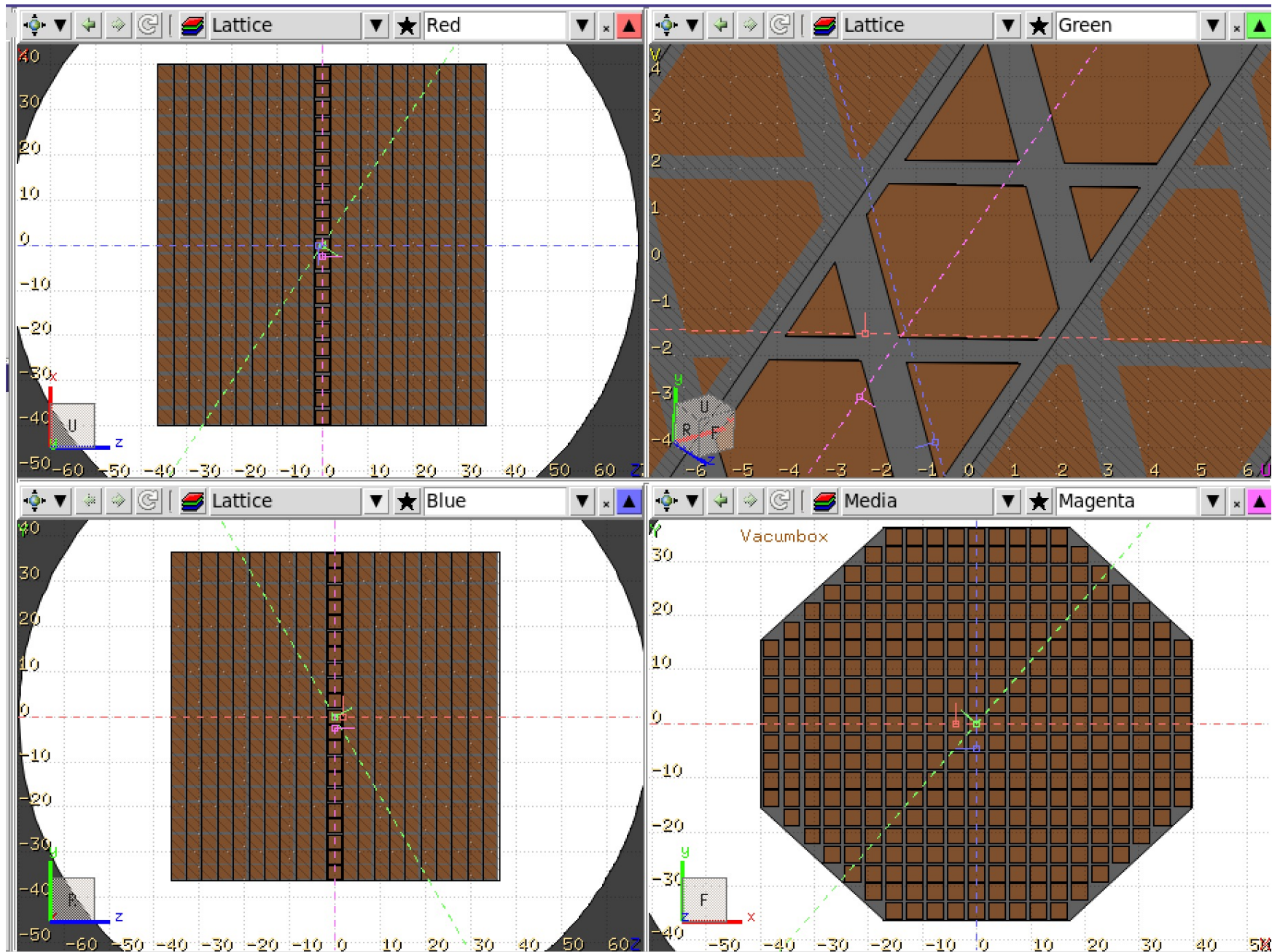


## Calo HERD «quasi» standard (FLUKA)



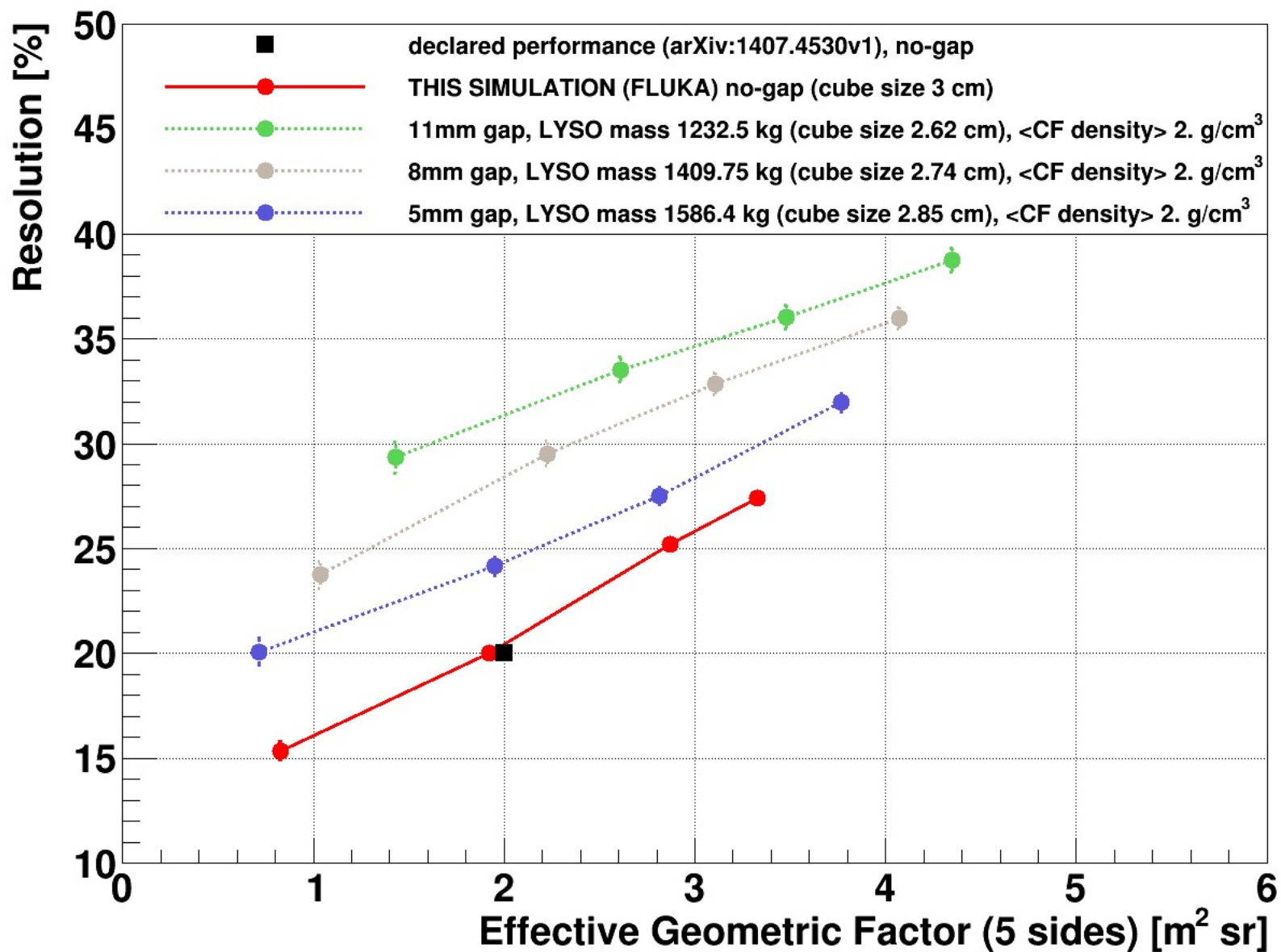
## **Calorimeter parameters**

- LYSO density: 7.4 g/cm<sup>3</sup>
- Total LYSO mass: 1498 kg (n. crystals = 7497)
- Cube size: 3 cm
- Gap X: 0.8 cm
- Gap Y and gap Z: 0.5 cm
- Average carbon fiber gap density: 0.67 g/cm<sup>3</sup>
- Calorimeter total geometric factor (zenith angle < 90°): 4.49 m<sup>2</sup> sr

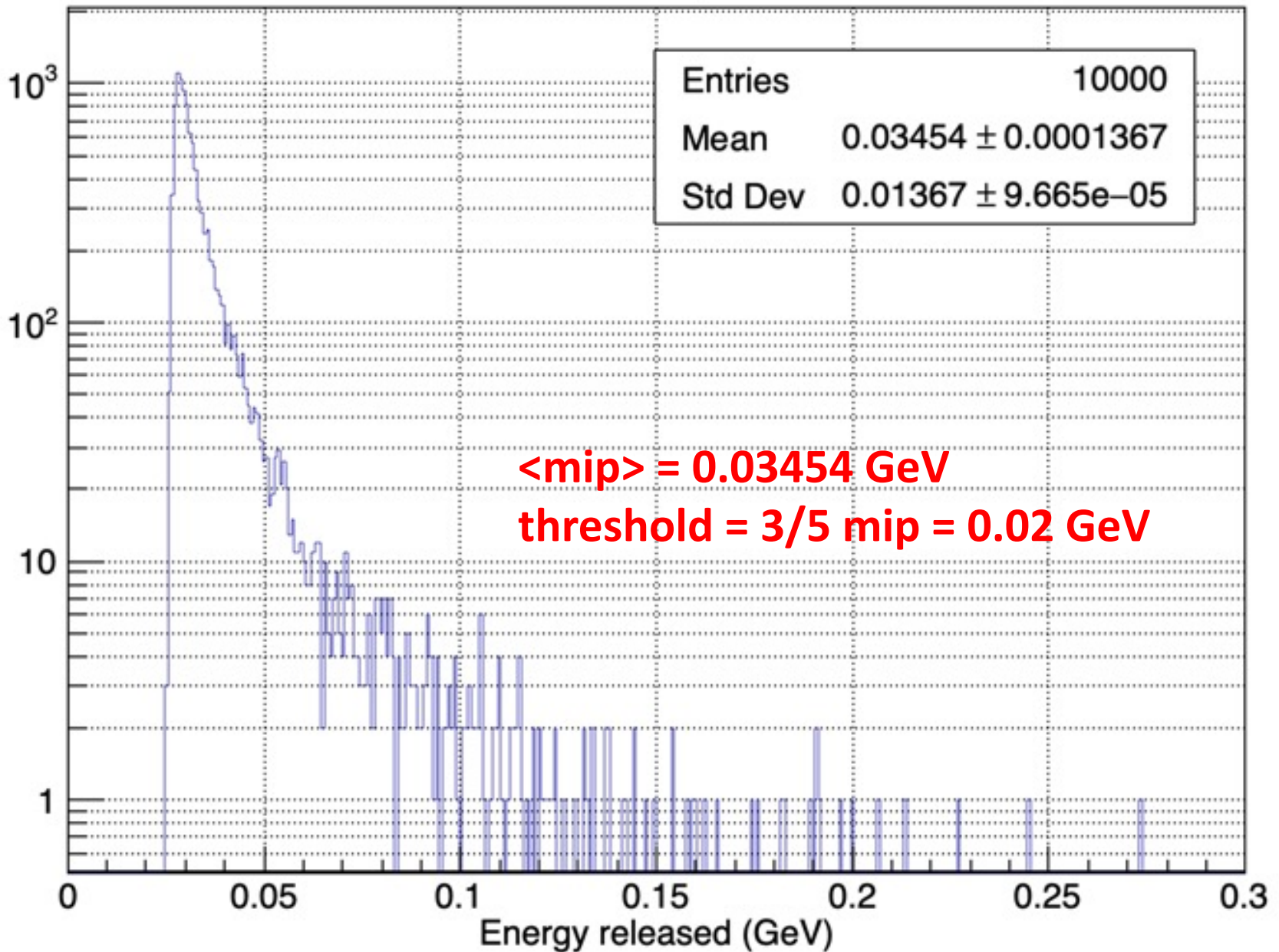
## **Nuclei basic selection criteria**

1. Number of crystals over threshold > 60
2. Axis length in fiducial volume > 20 cm (fiducial edge 4 cm)
3. Maximum of the shower development inside fiducial volume  
(selection criteria are NOT optimized)

## LYSO calorimeters (1850 kg - $21 \times 21 \times 21$ ): proton at 1 TeV

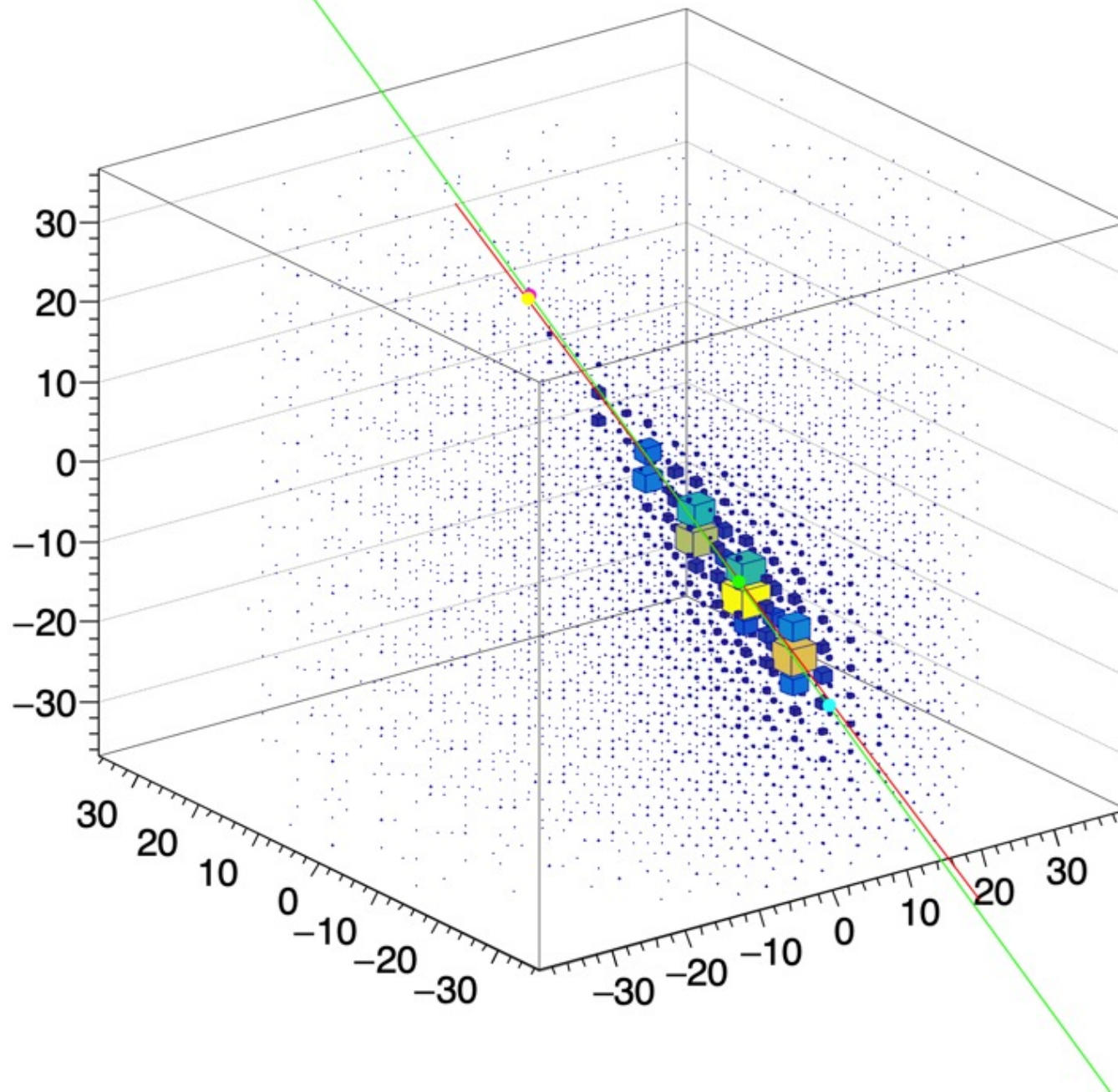


# 100 GeV muons, 3 cm LYSO

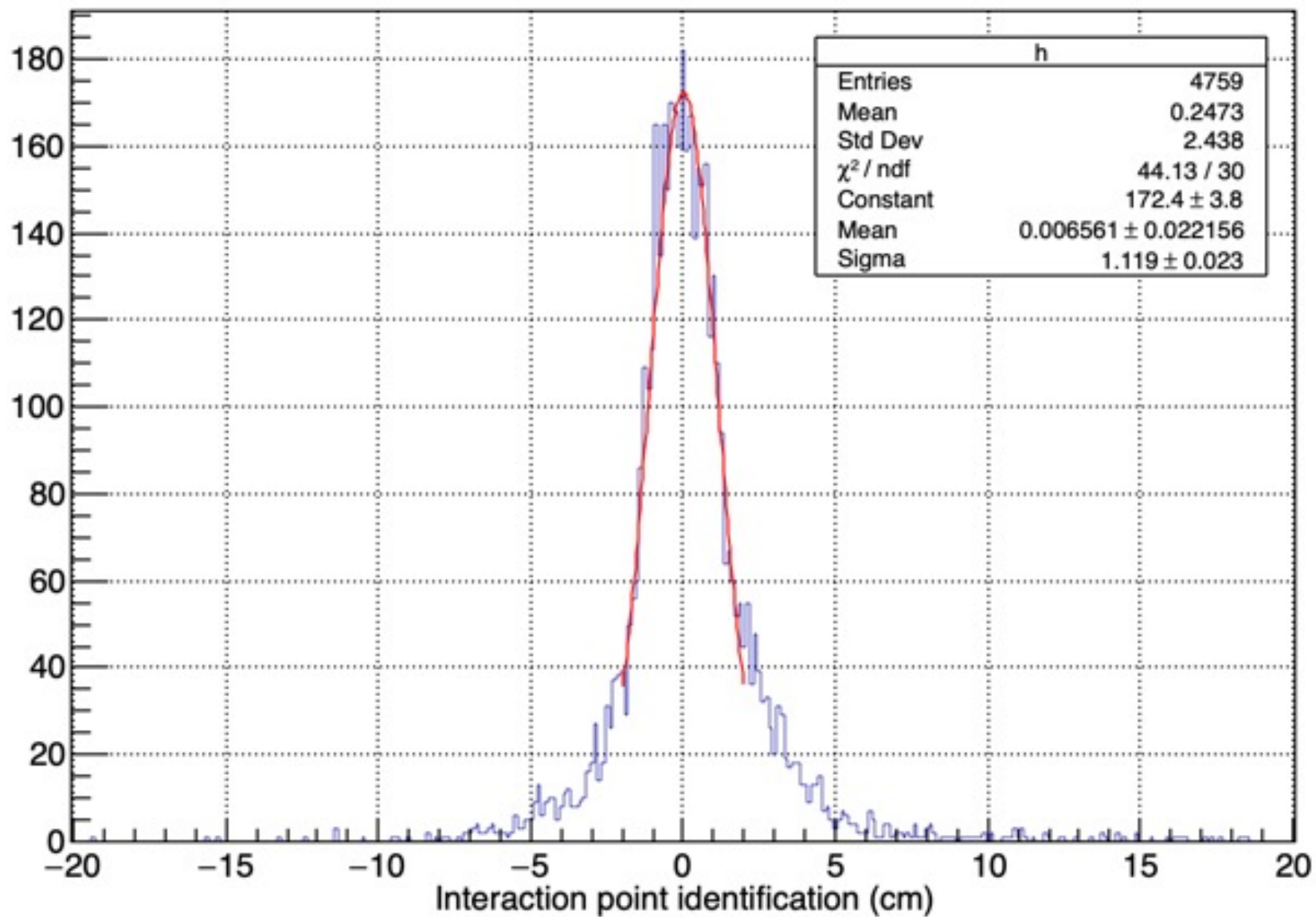




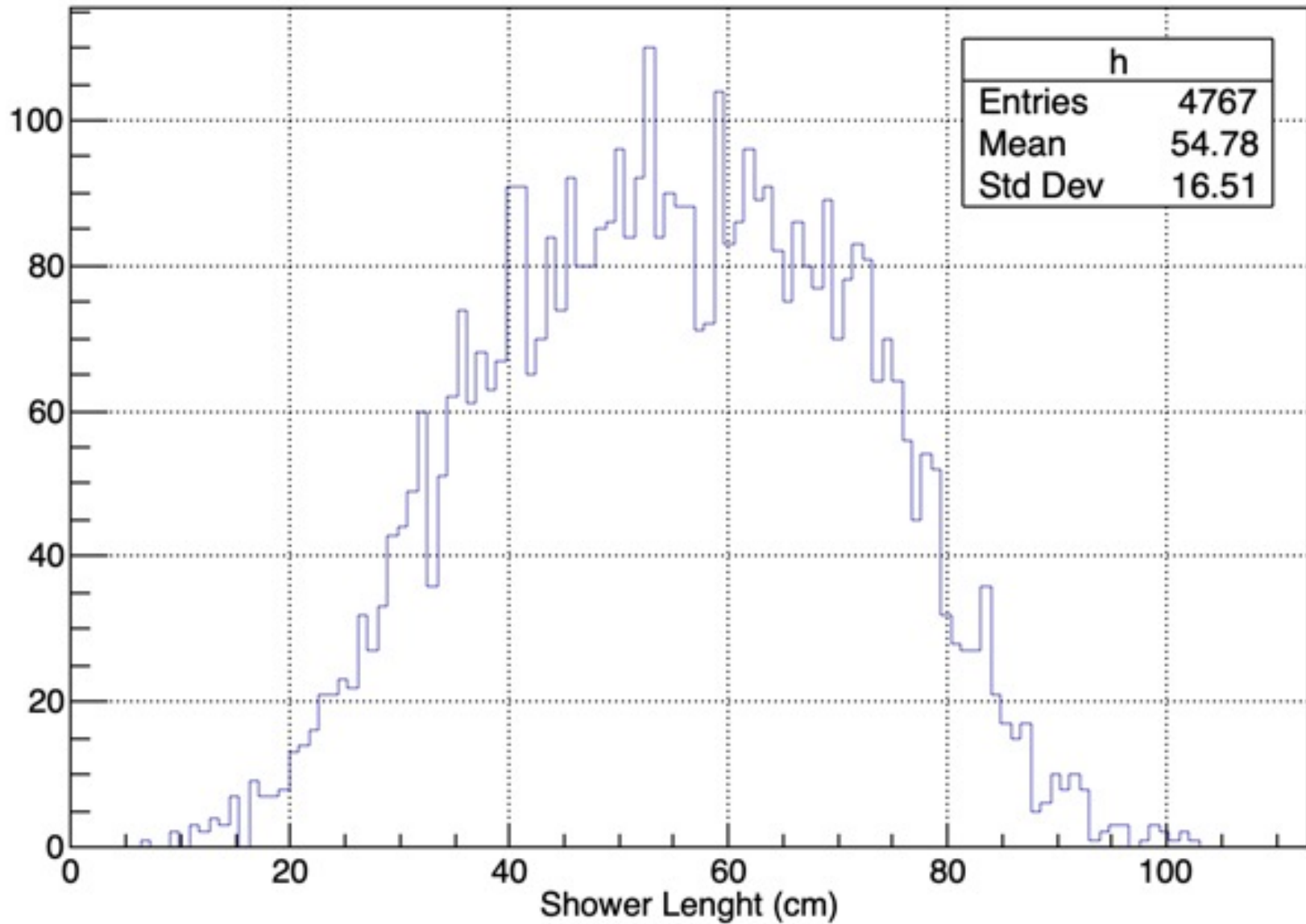
# Proton 1 PeV



# Proton 10 TeV



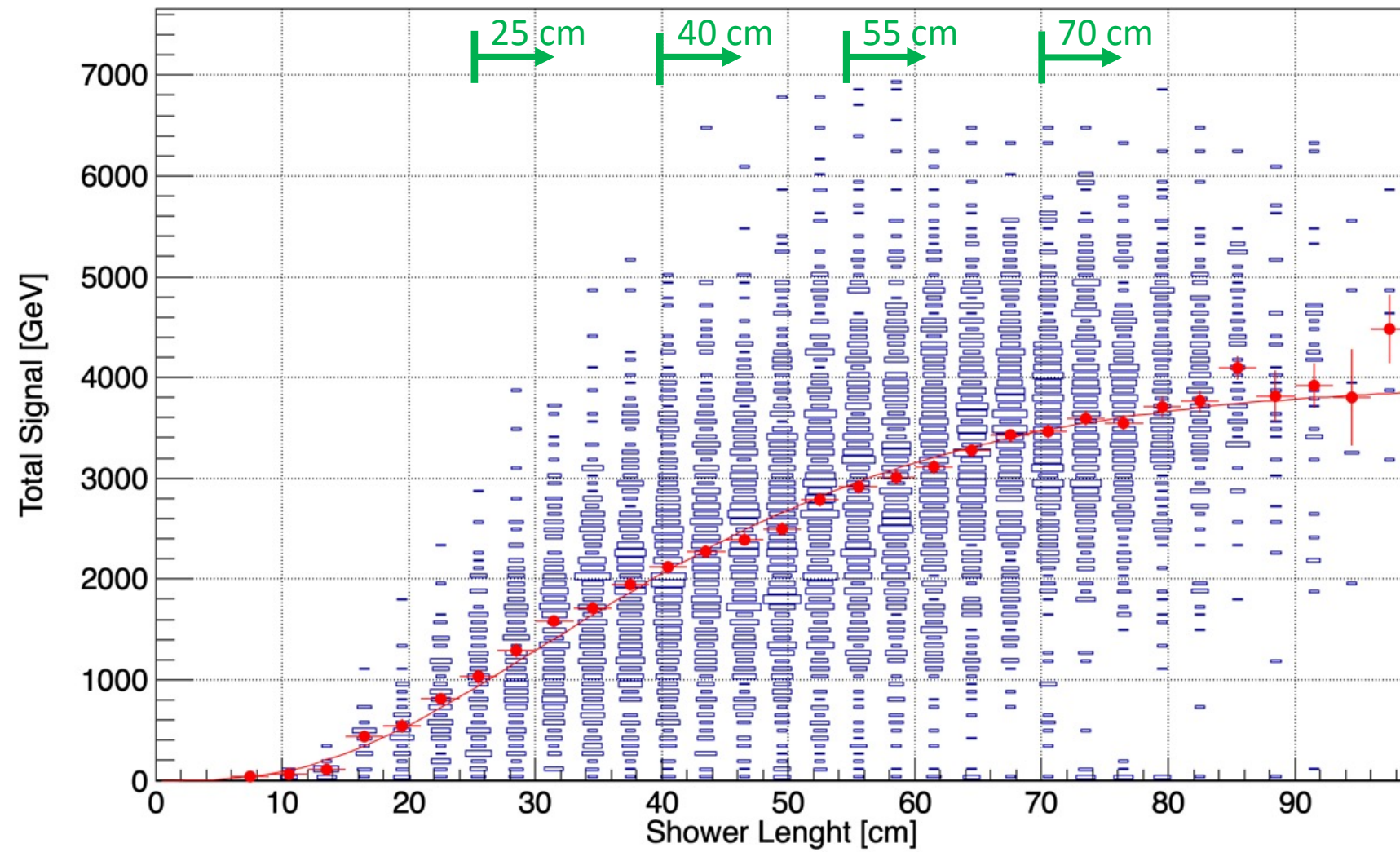
# Proton 10 TeV



**Selection efficiency: 44.9%**

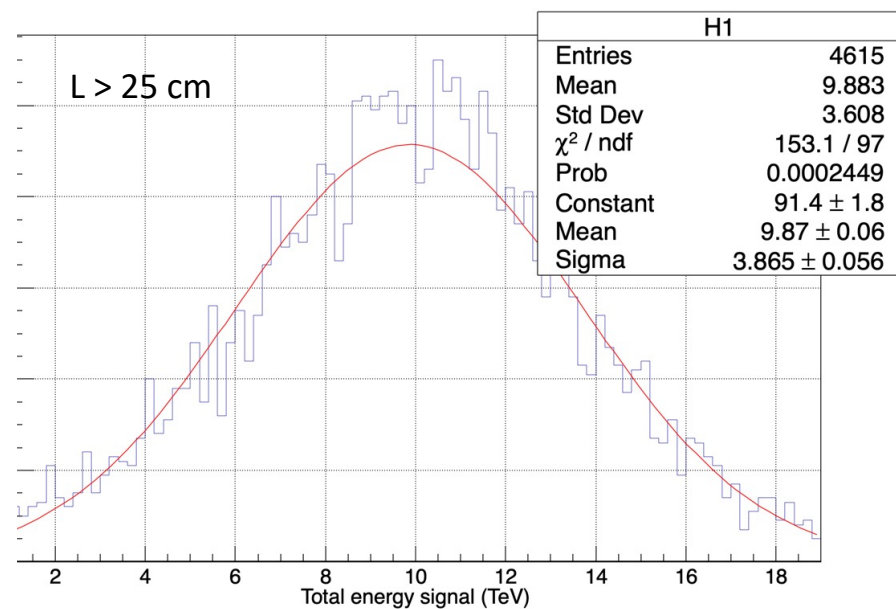
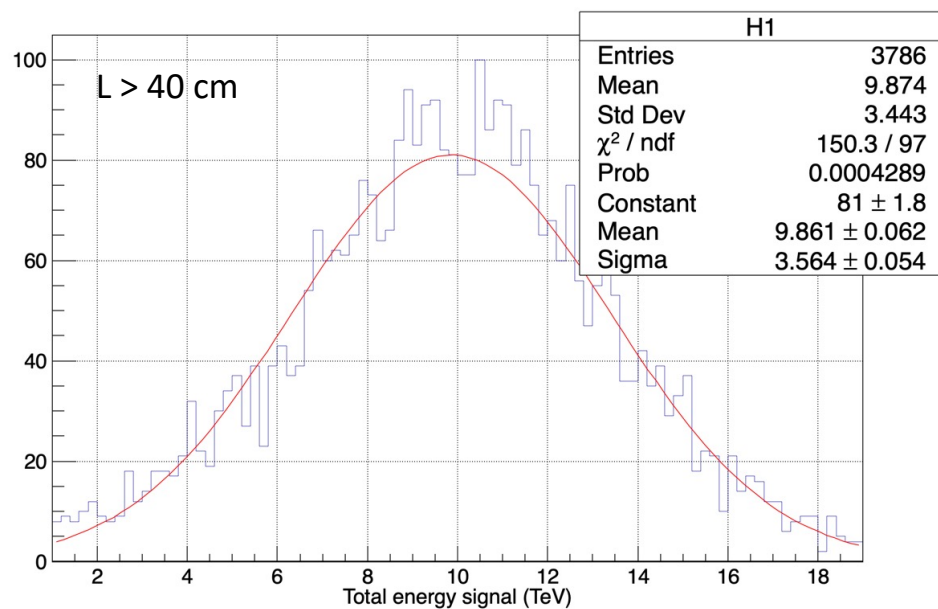
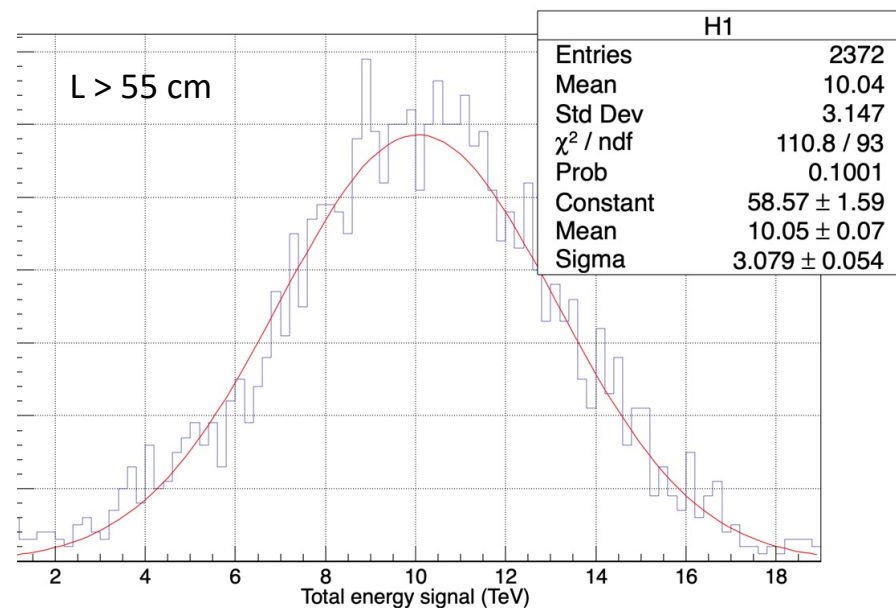
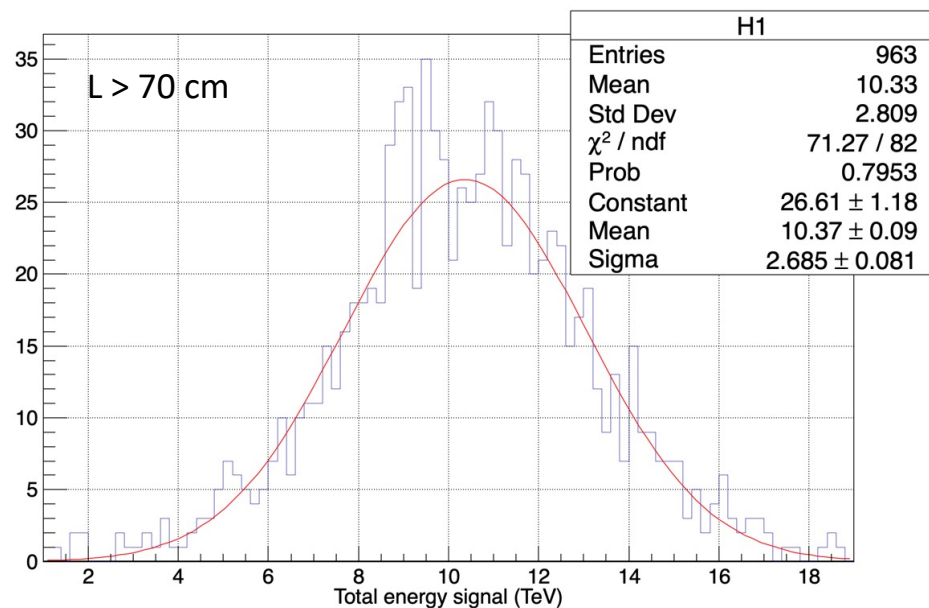
**Effective Geometrical Factor. 2.01 m<sup>2</sup> sr**

# Proton 10 TeV

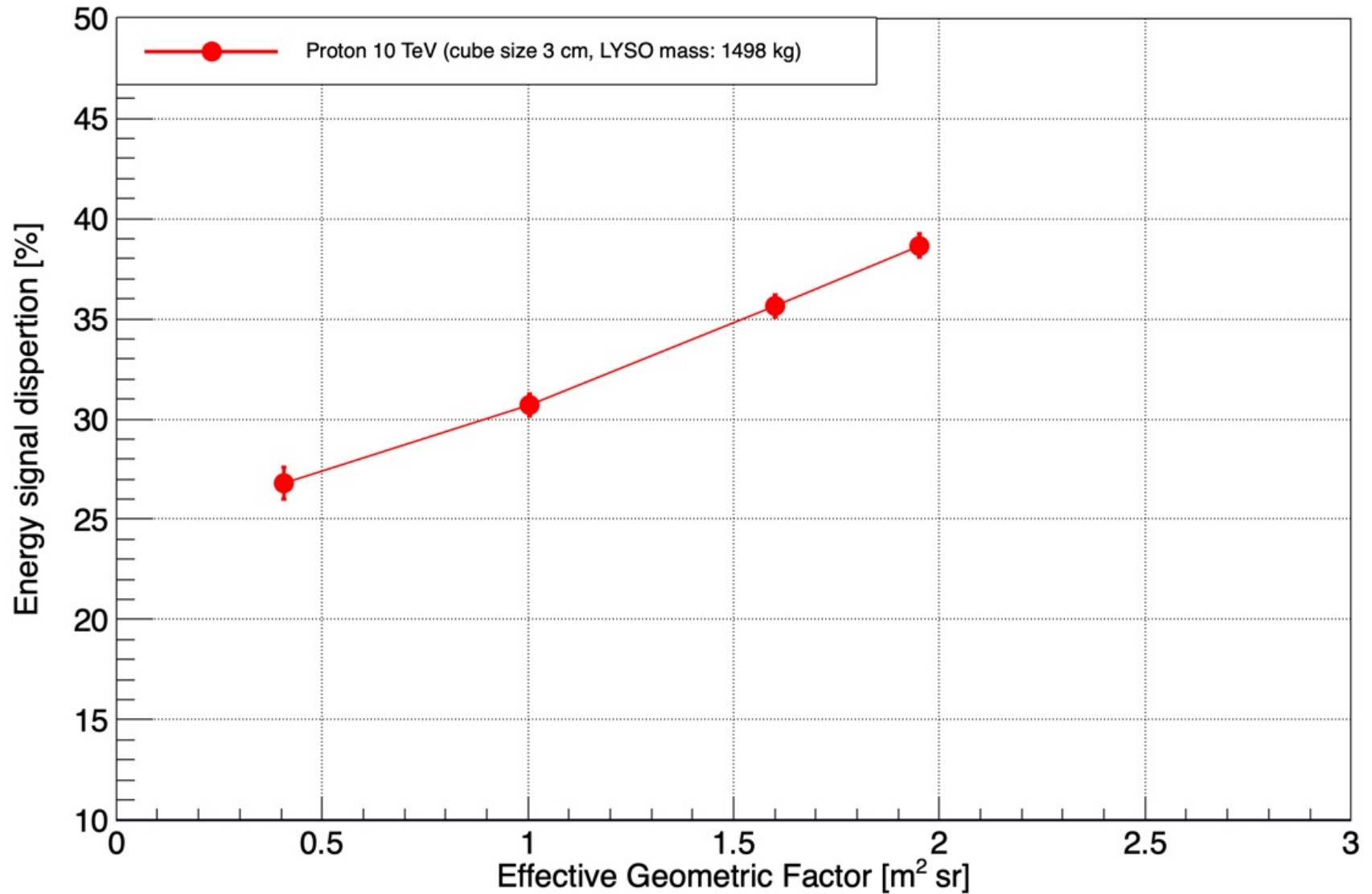




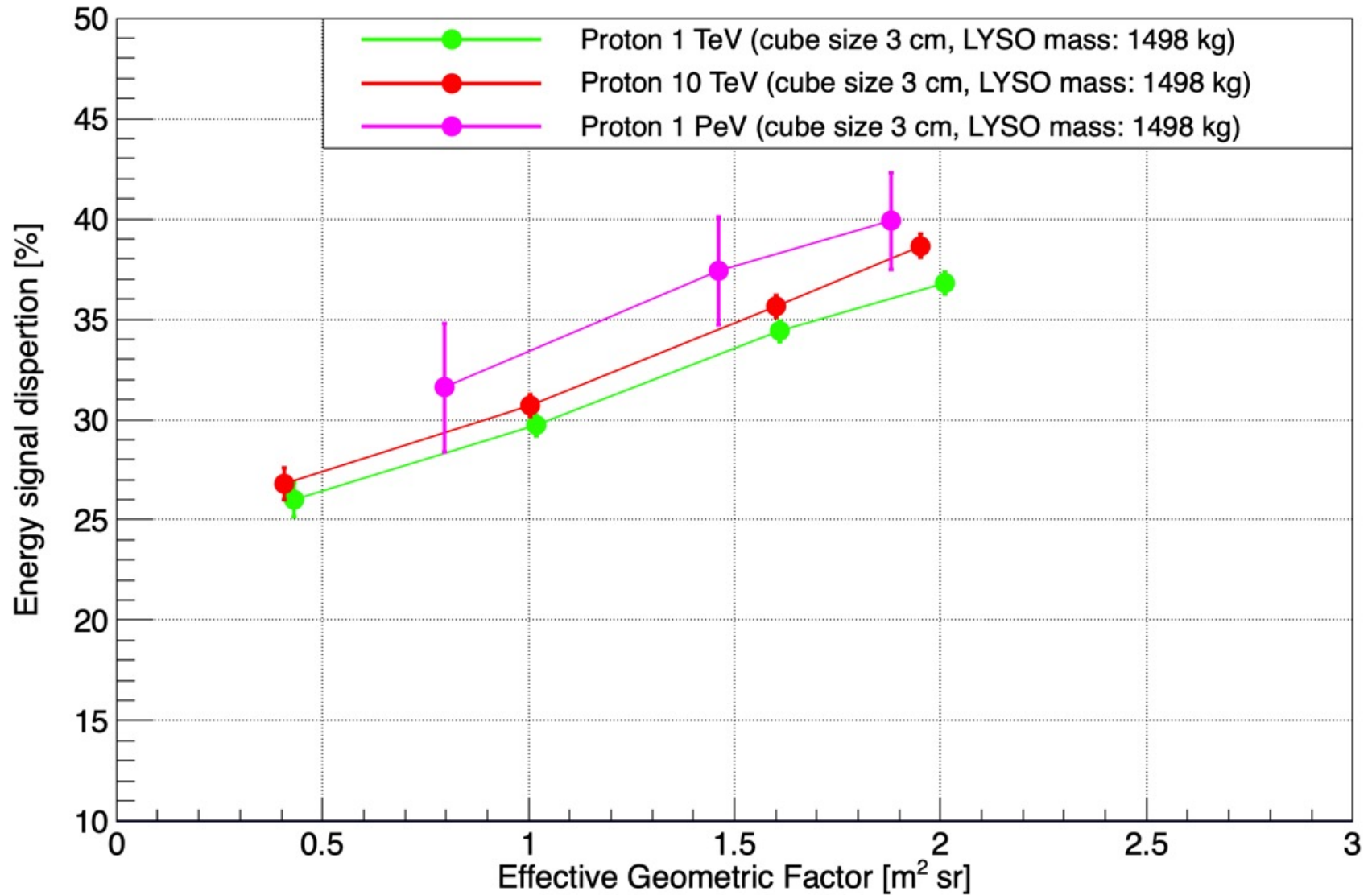
# Proton 10 TeV

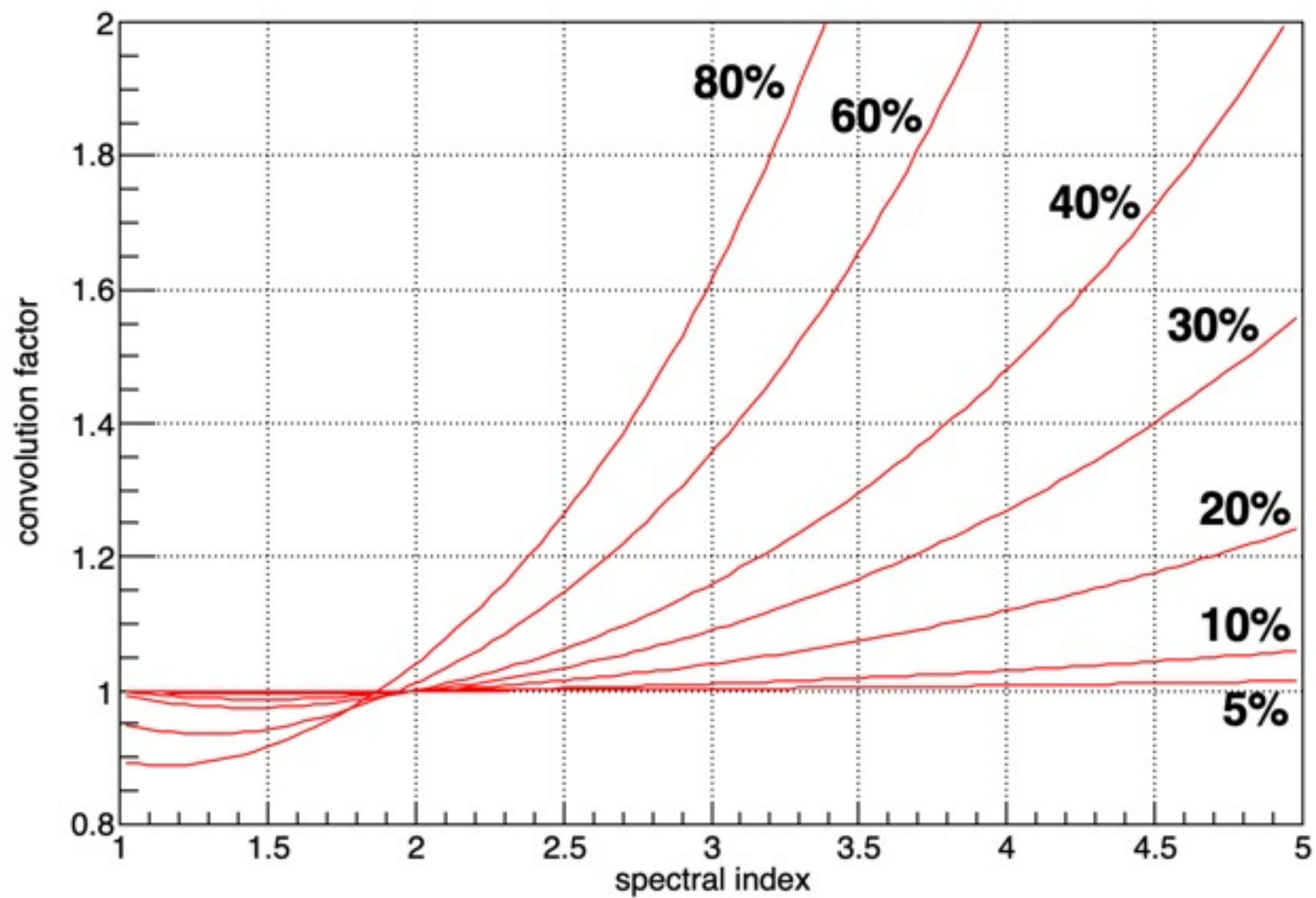


# HERD calorimeter

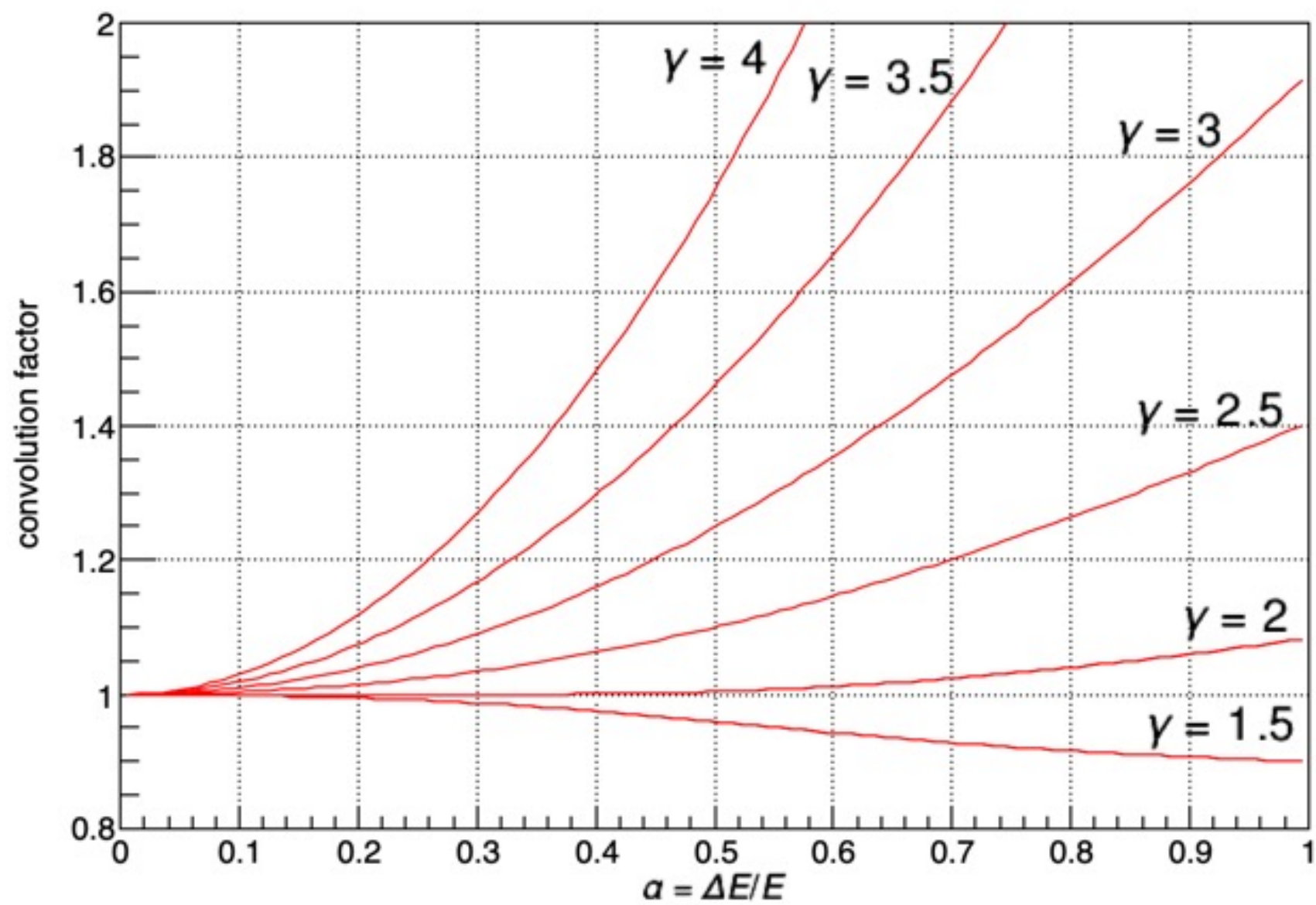


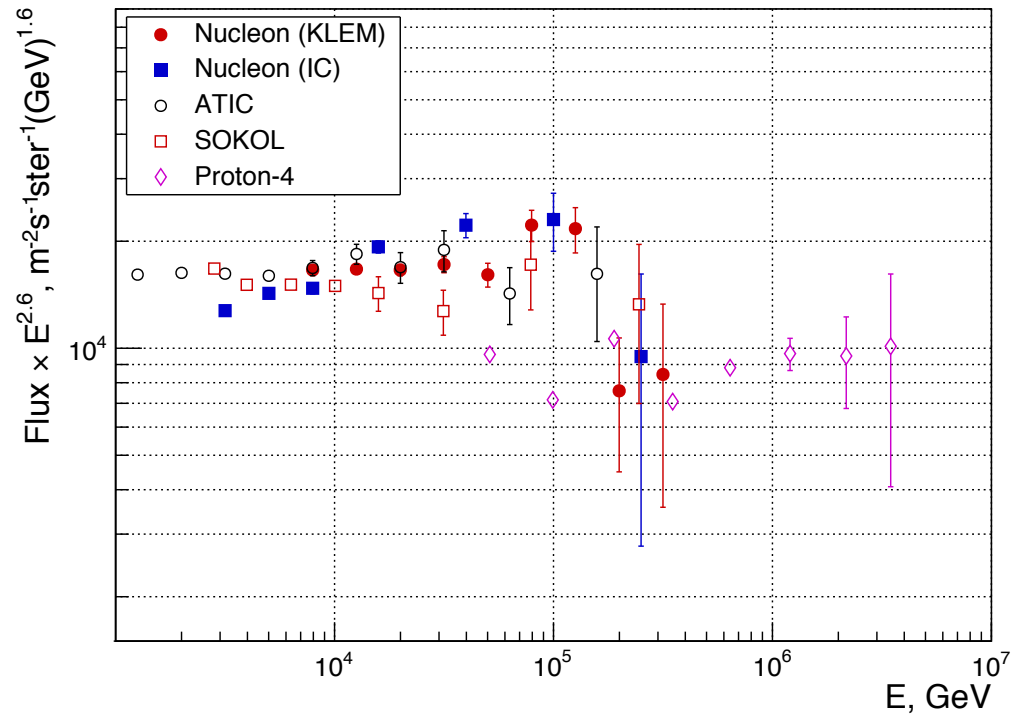
# HERD calorimeter











**Figure 12.** All-particle spectrum measured by the KLEM system and by the calorimeter in comparison with the results of other direct measurement experiments: ATIC [7]; Sokol [28]; Proton-4 [29].

above  $10^5$  GeV;  $J \times E^{2.6} \sim 10^4$

$$E_N = \left( \frac{10^4 \times T \times GF}{1.6 \times N} \right)^{1/1.6}$$

T = 10 years

GF = 1  $\text{m}^2$  sr

N = 100

$\rightarrow E_N = 2.7$  PeV

N = 1000

$\rightarrow E_N = 644$  TeV

N = 10000

$\rightarrow E_N = 153$  TeV

# HERD calorimeter

