Cerenkov straw layout

Acceptance, energy resolution and missing electrons study: a short update

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Resolution: methodology

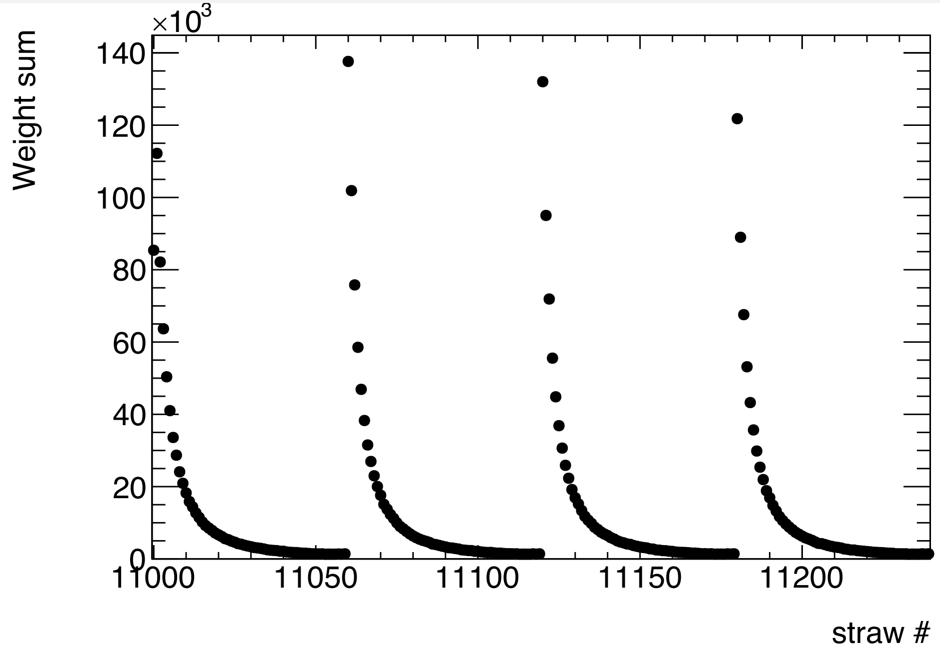
A brief word on the reconstruction

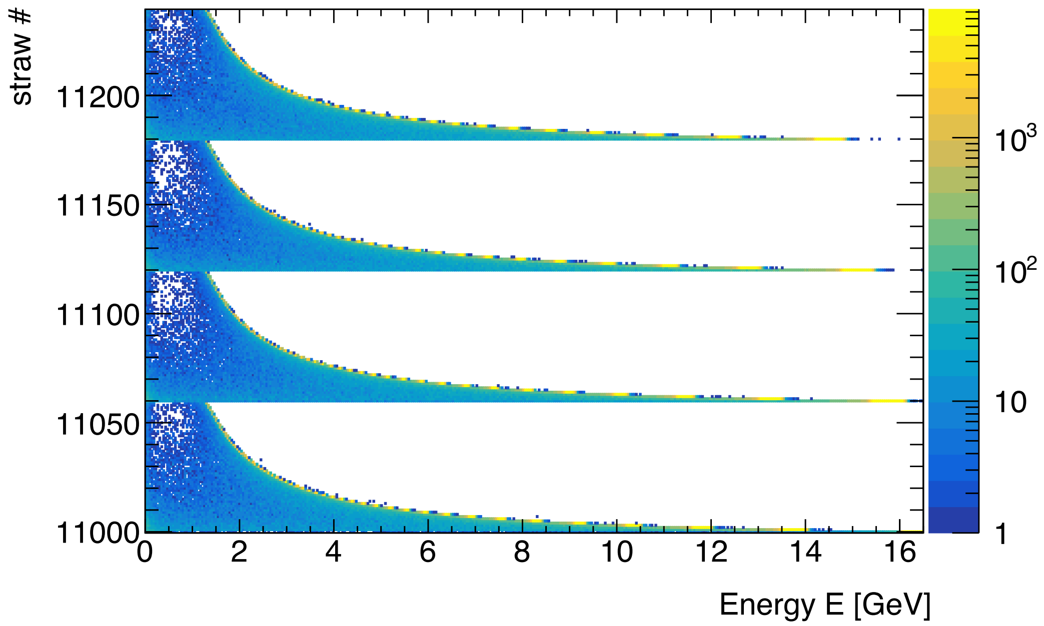
- The ”true” energy spectrum is defined as the energy spectrum crossing a virtual plane in front of the detector
- Matching between the straw hits and the front plane hits for a flat energy spectrum
- For each energy, weights are defined for the straw hits → transfer matrix
  - Weights depend on the path length inside the straws
- This transfer matrix is then used to distribute the straw hits on different energies → Energy spectrum from the straw hit spectrum (using the Compton scattering signal spectrum)

Energy resolution

- Mono energetic electrons
- The transfer matrix is applied to the straw hits → reconstructed energy spectrum
- A Crystal Ball function is fitted to extract σ_E/E

Reconstruction method

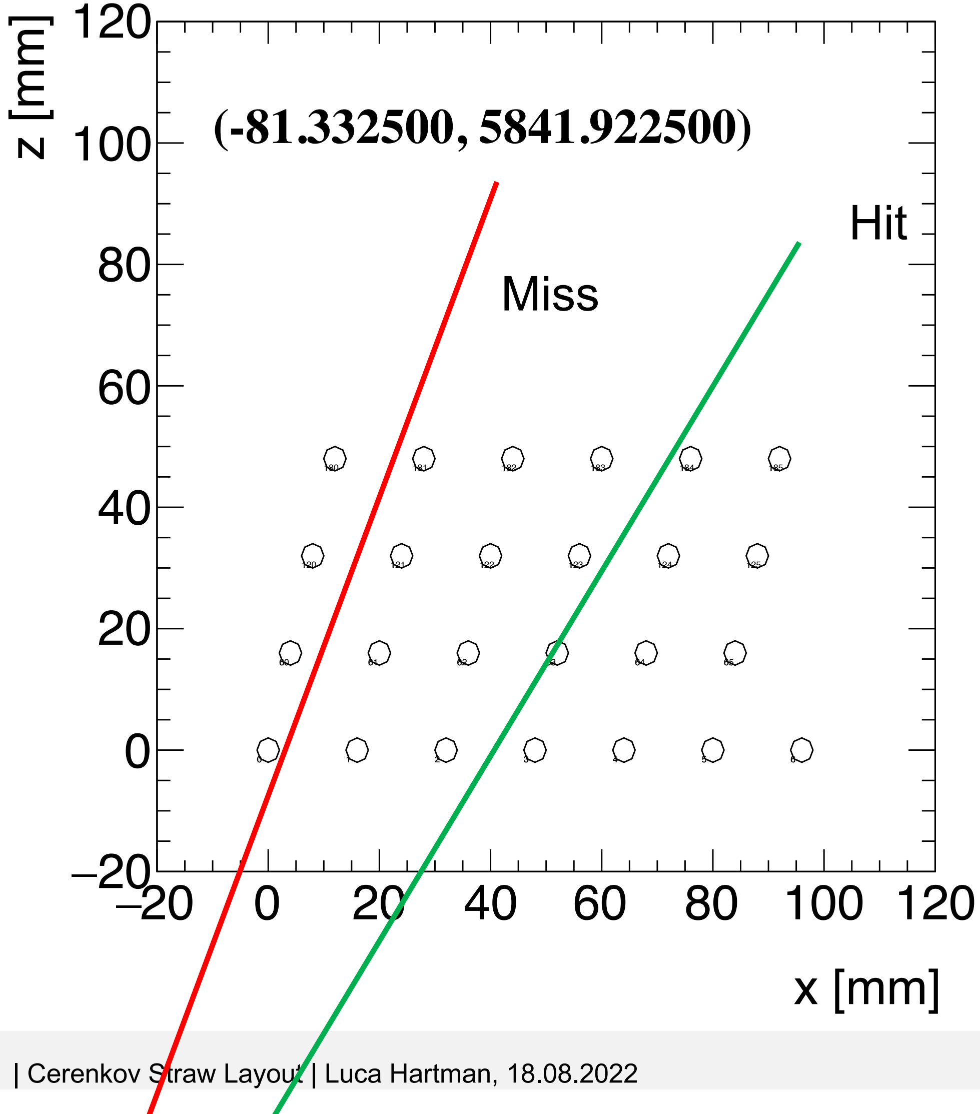


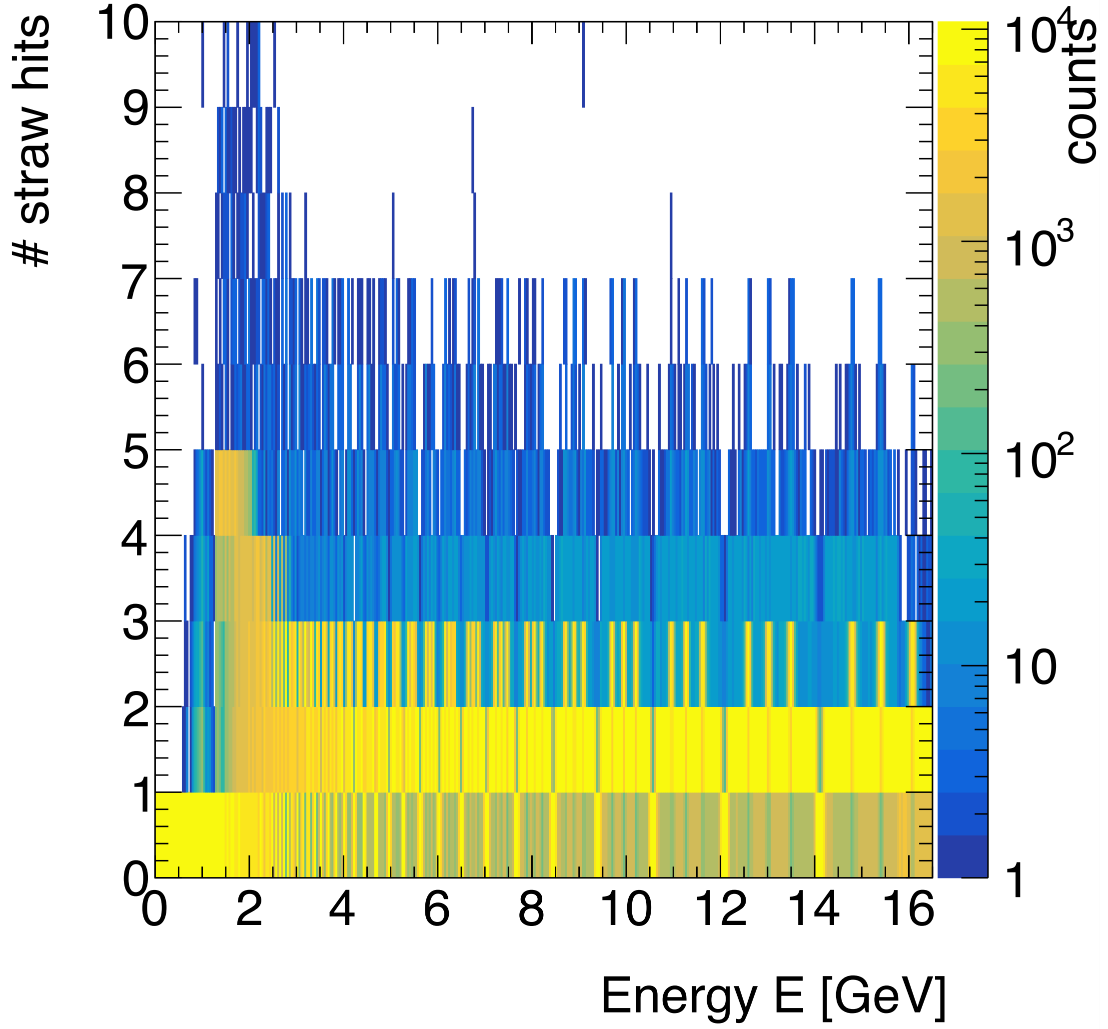


Starting configuration

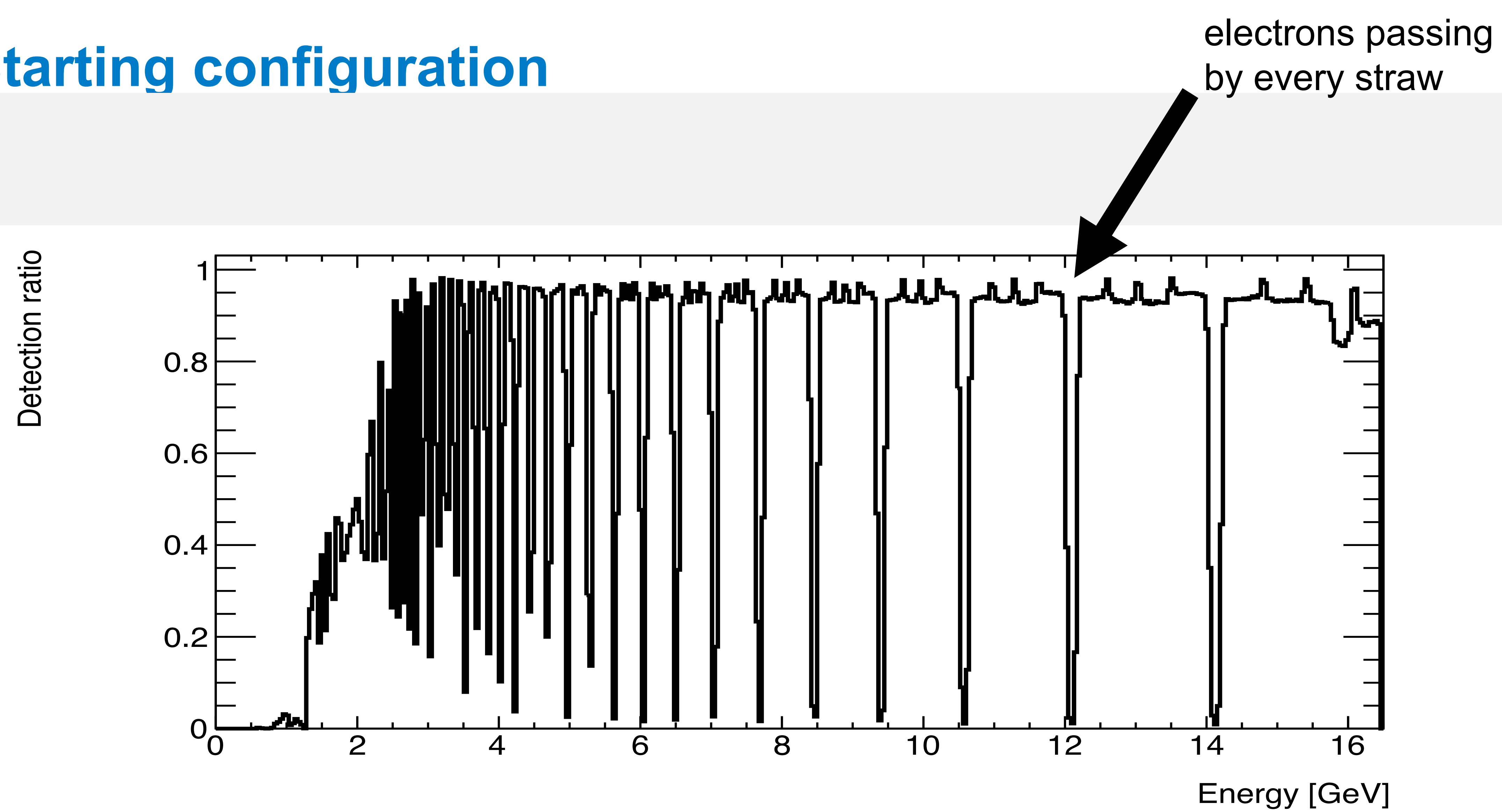
Starting configuration

16 mm X frequency, 16 mm Z frequency, 4 mm layer offset, 4 layers



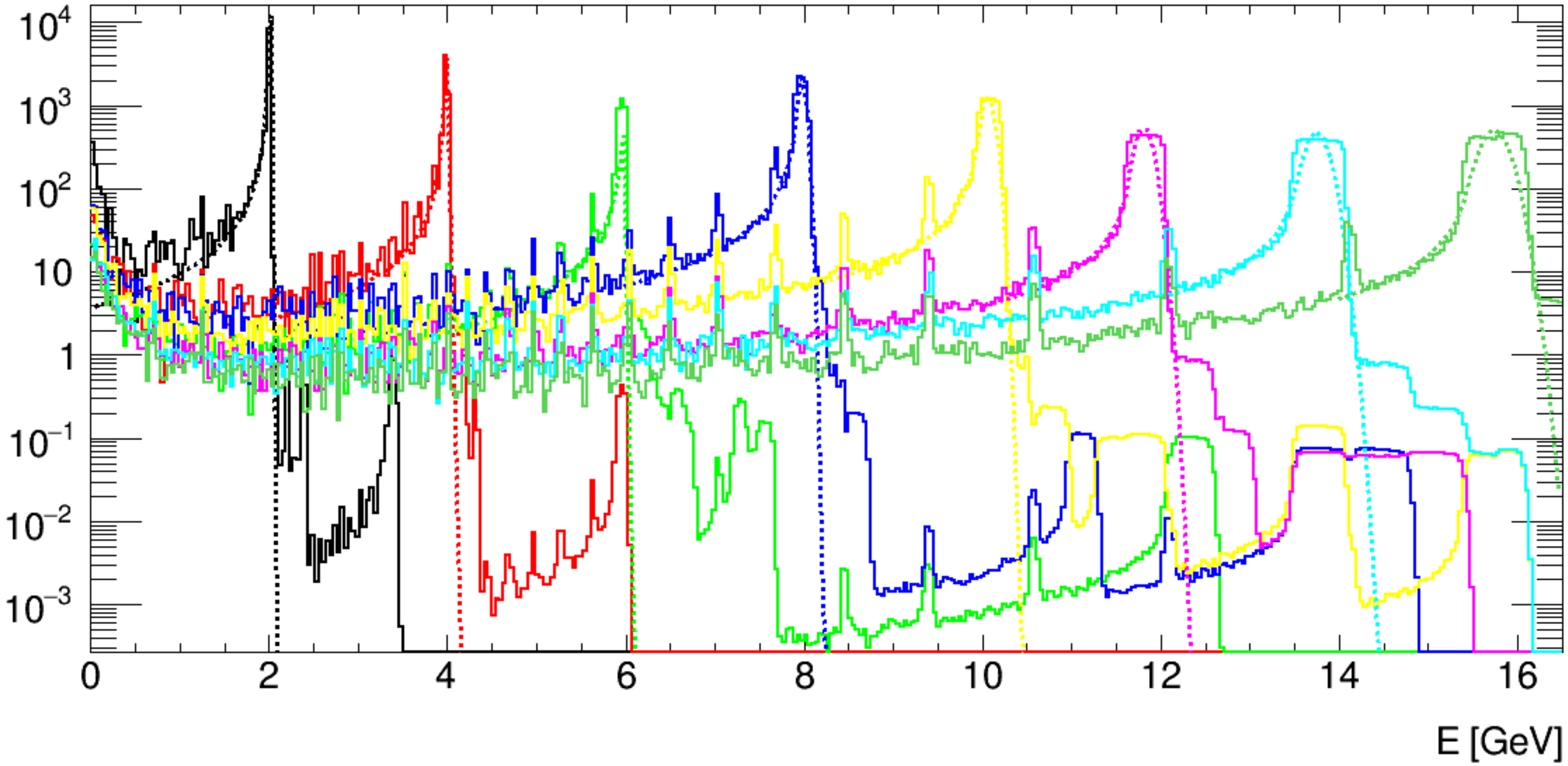


Starting configuration



Starting configuration

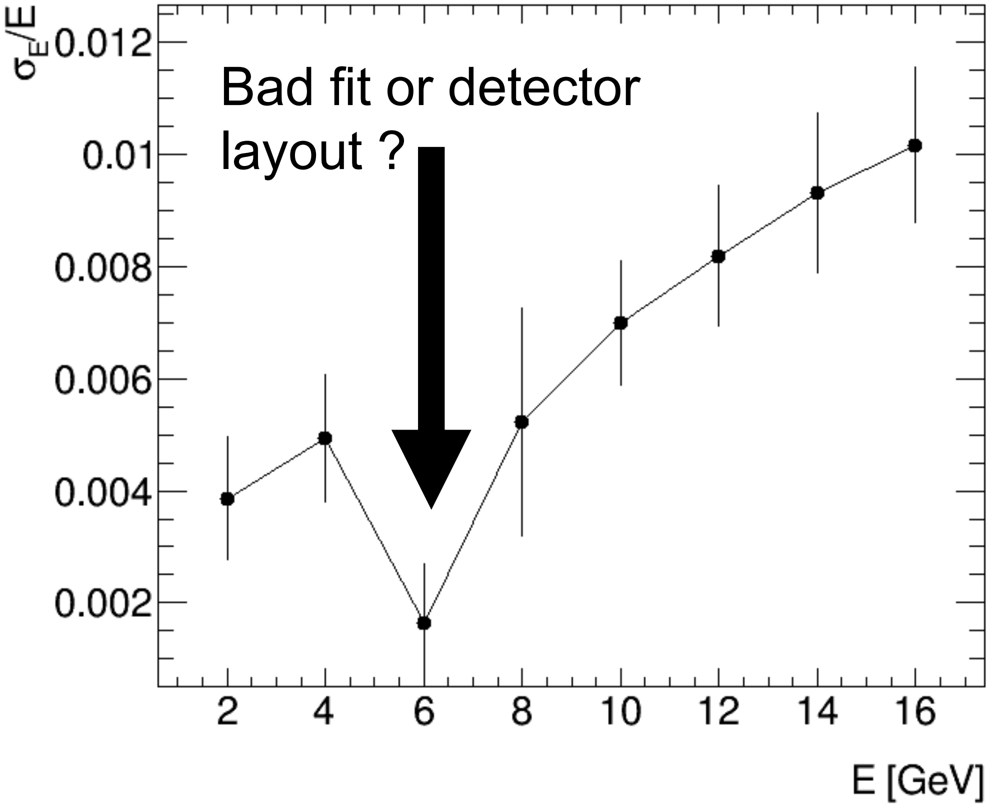
E = 2, 4, 6, 8, 10, 12, 14, 16 GeV

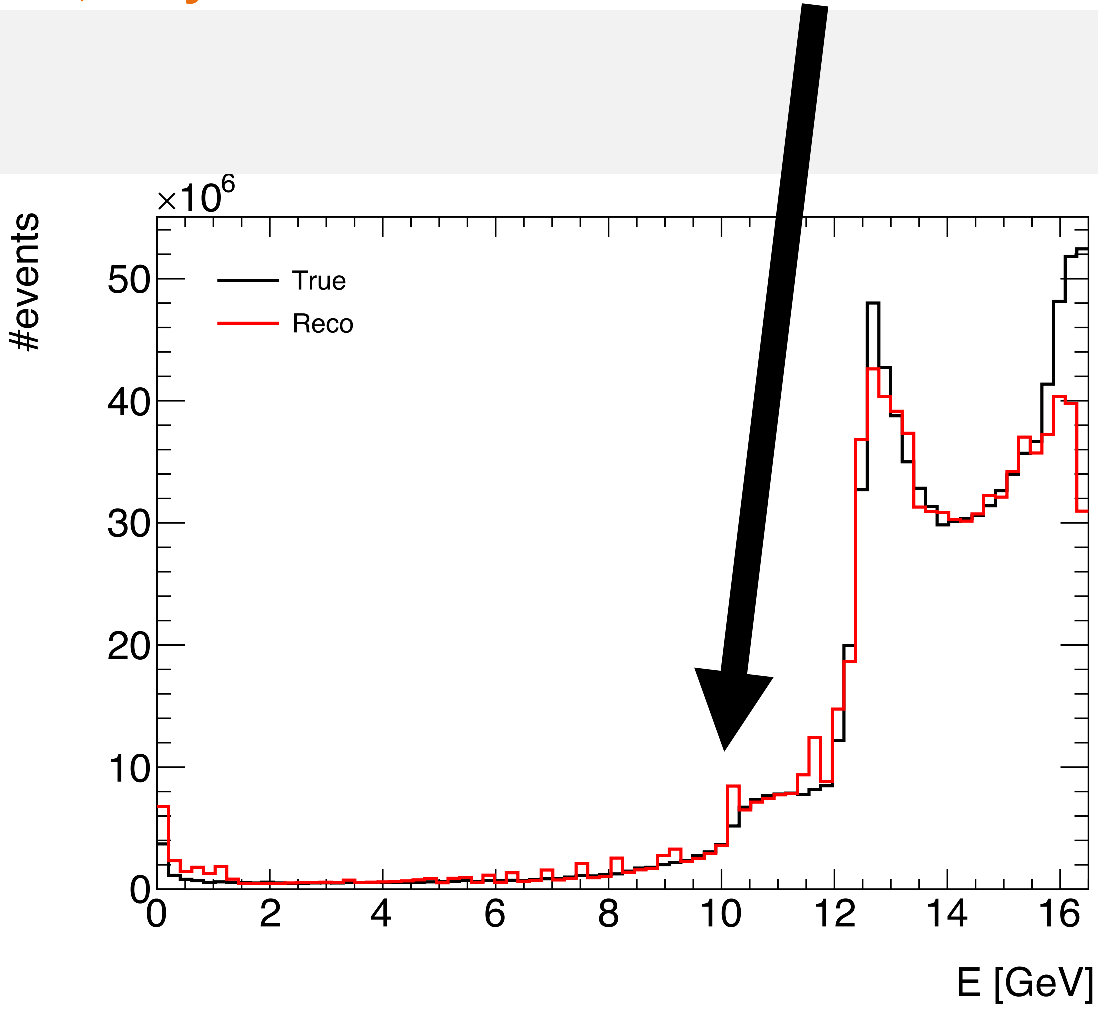


Starting configuration

16 mm X frequency, 16 mm Z frequency, 4 mm layer offset, 4 layers

Inaccuracy caused by missing electrons

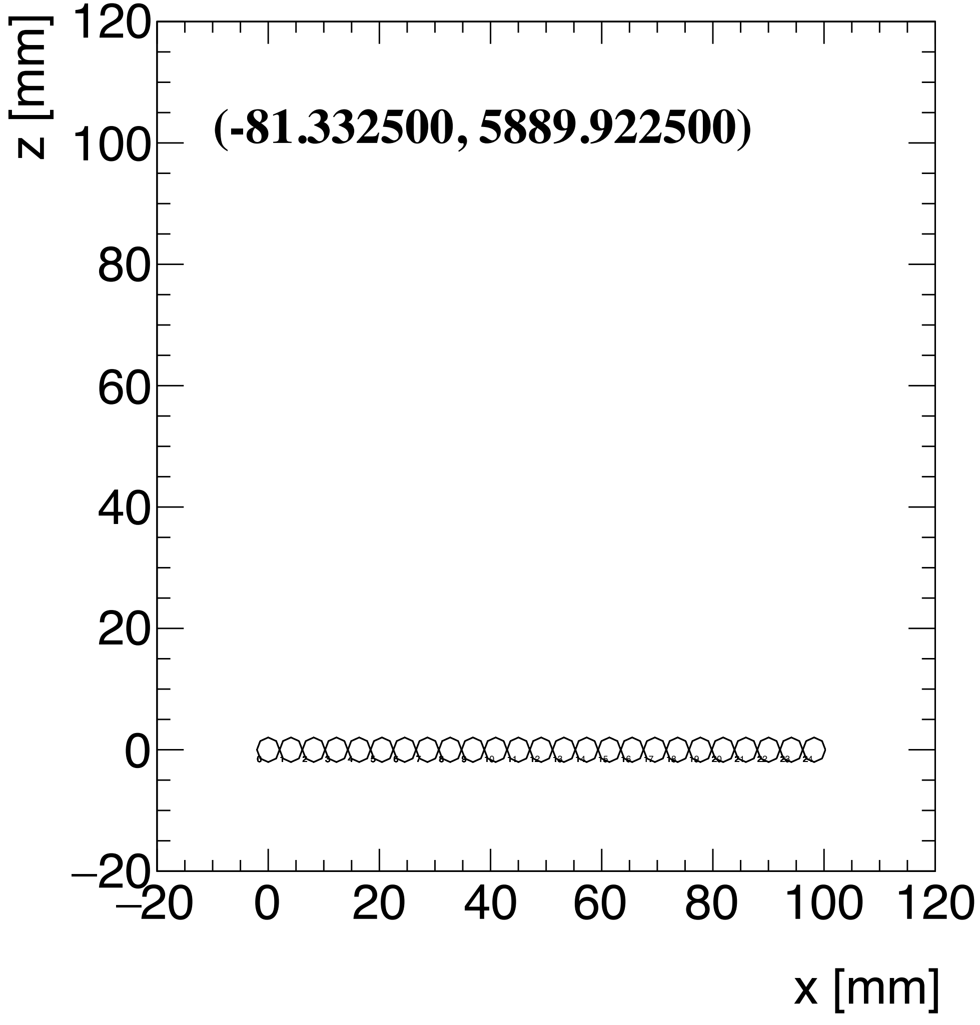


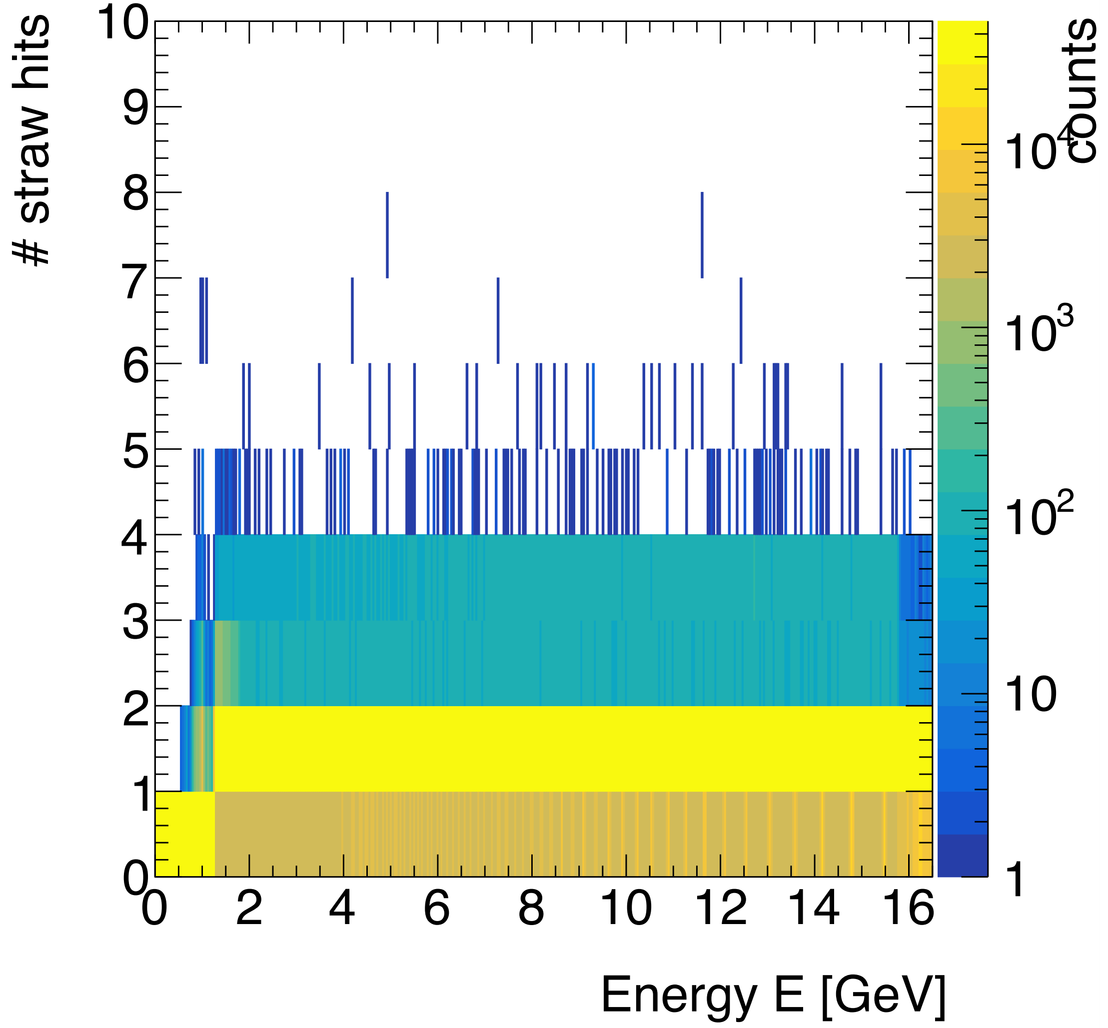


Mono-layer configuration

Mono-layer configuration

4.0924 mm X frequency, 16 mm Z frequency, 4 mm layer offset, 1 layer





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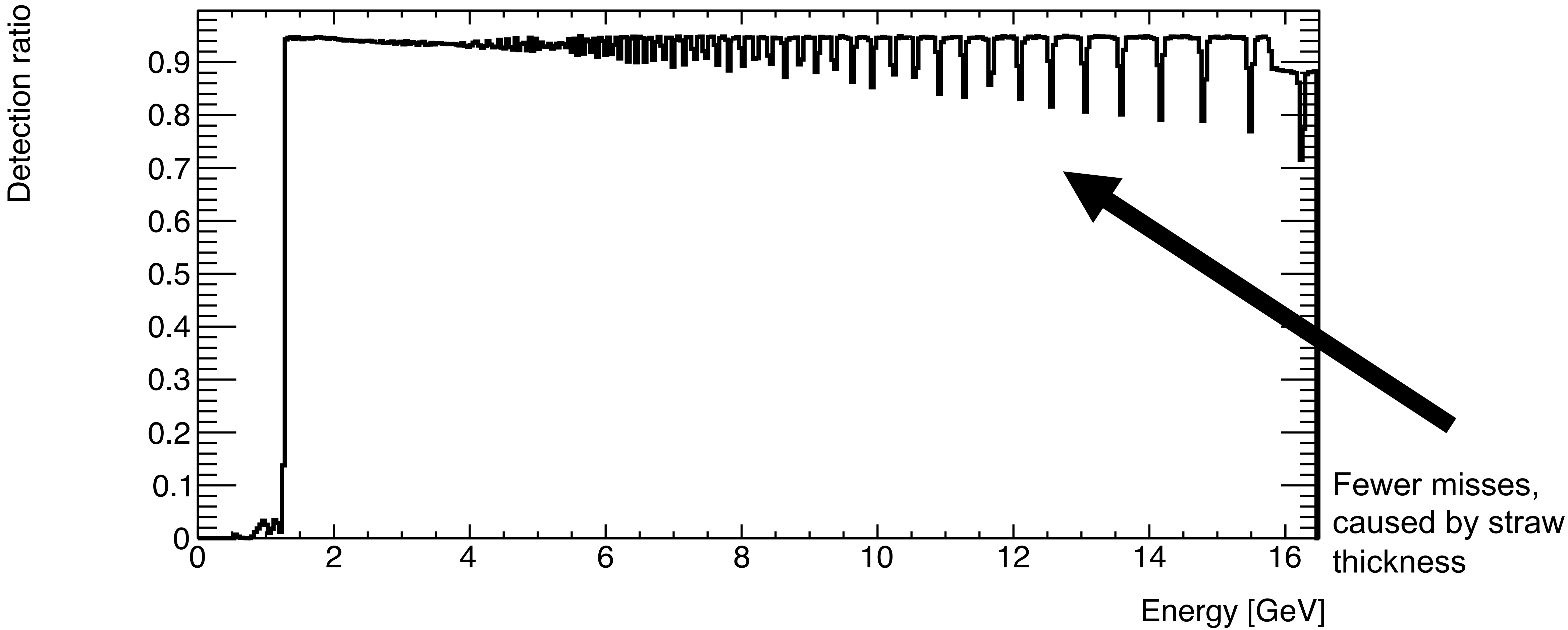

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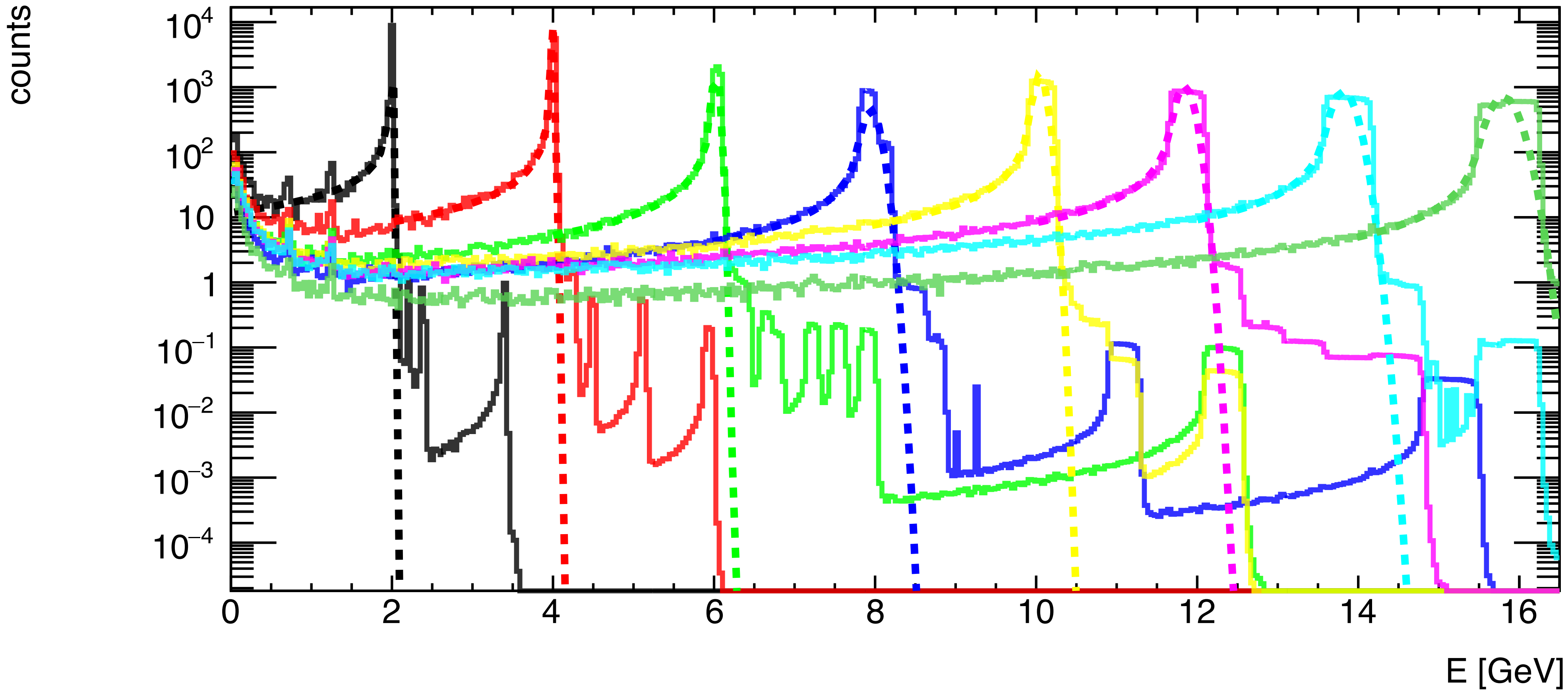
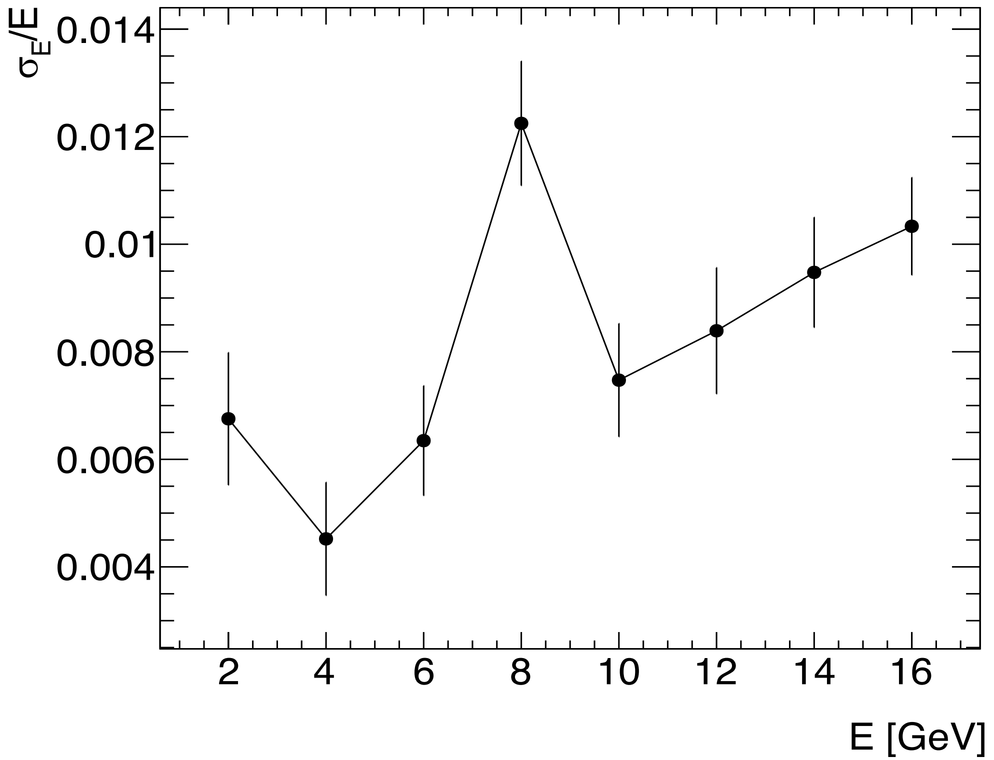
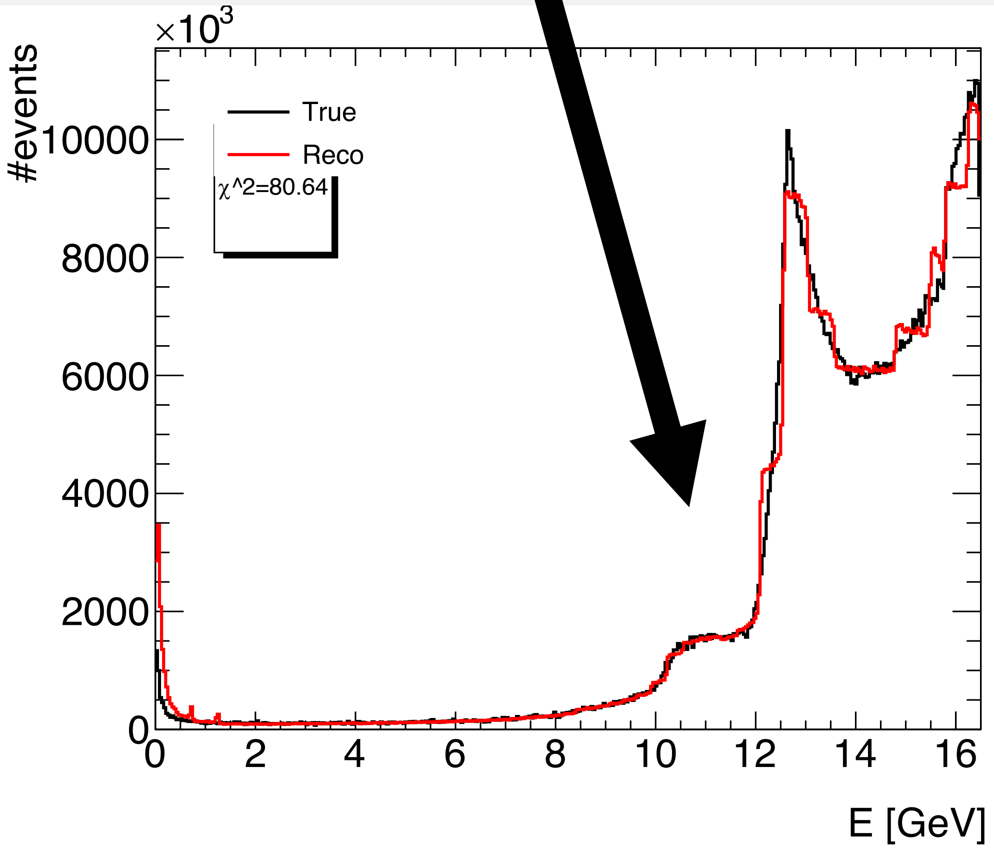


Mono-layer configuration

4.0924 mm X frequency, 16 mm Z frequency, 4 mm layer offset, 1 layer

No more spikes

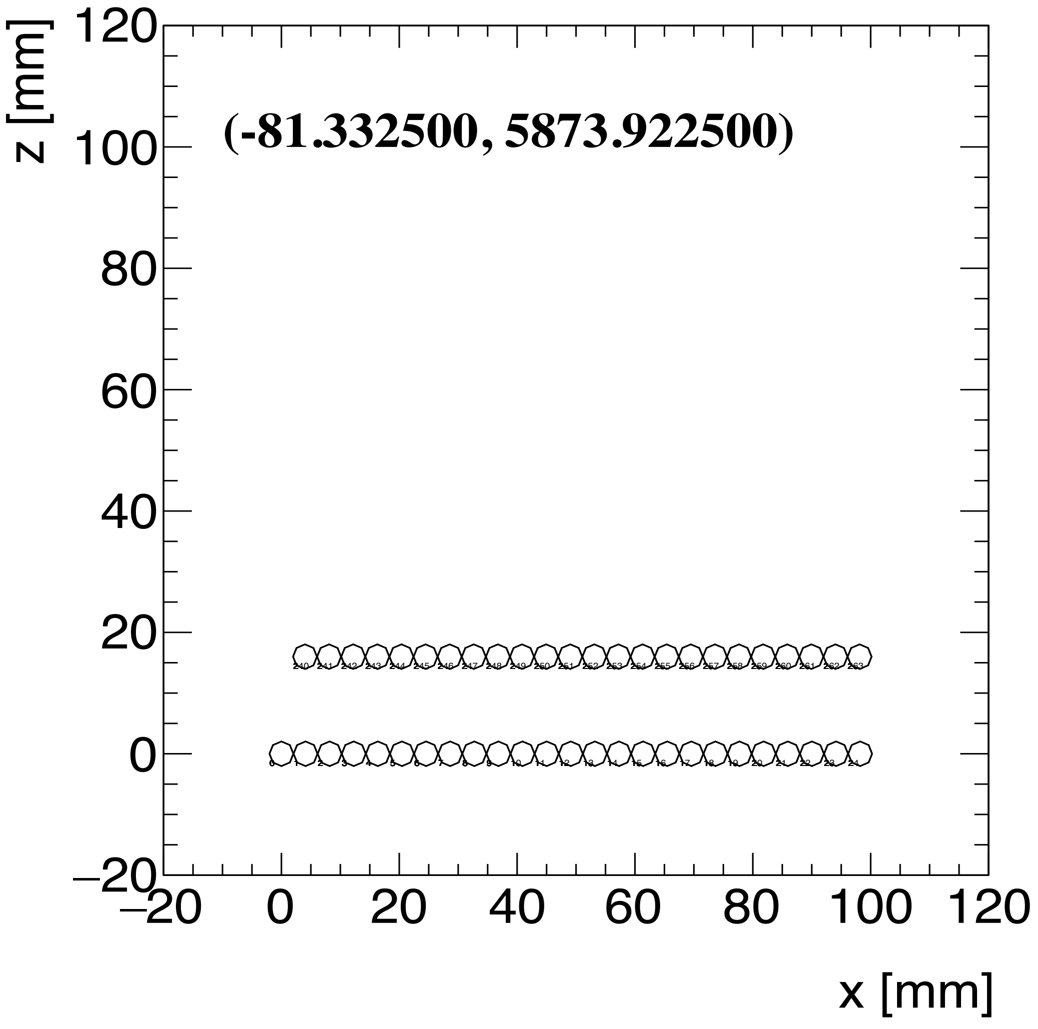


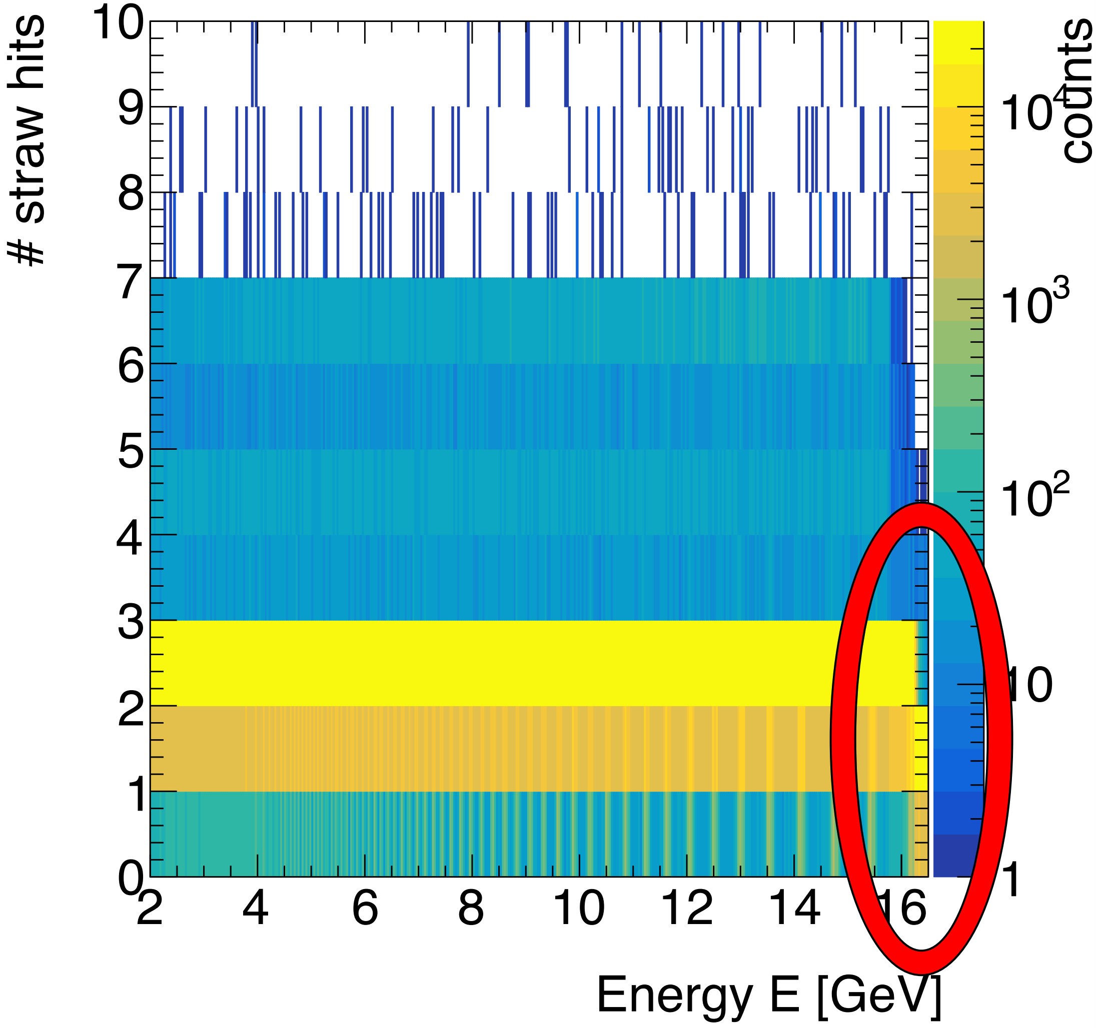


Double layer configuration

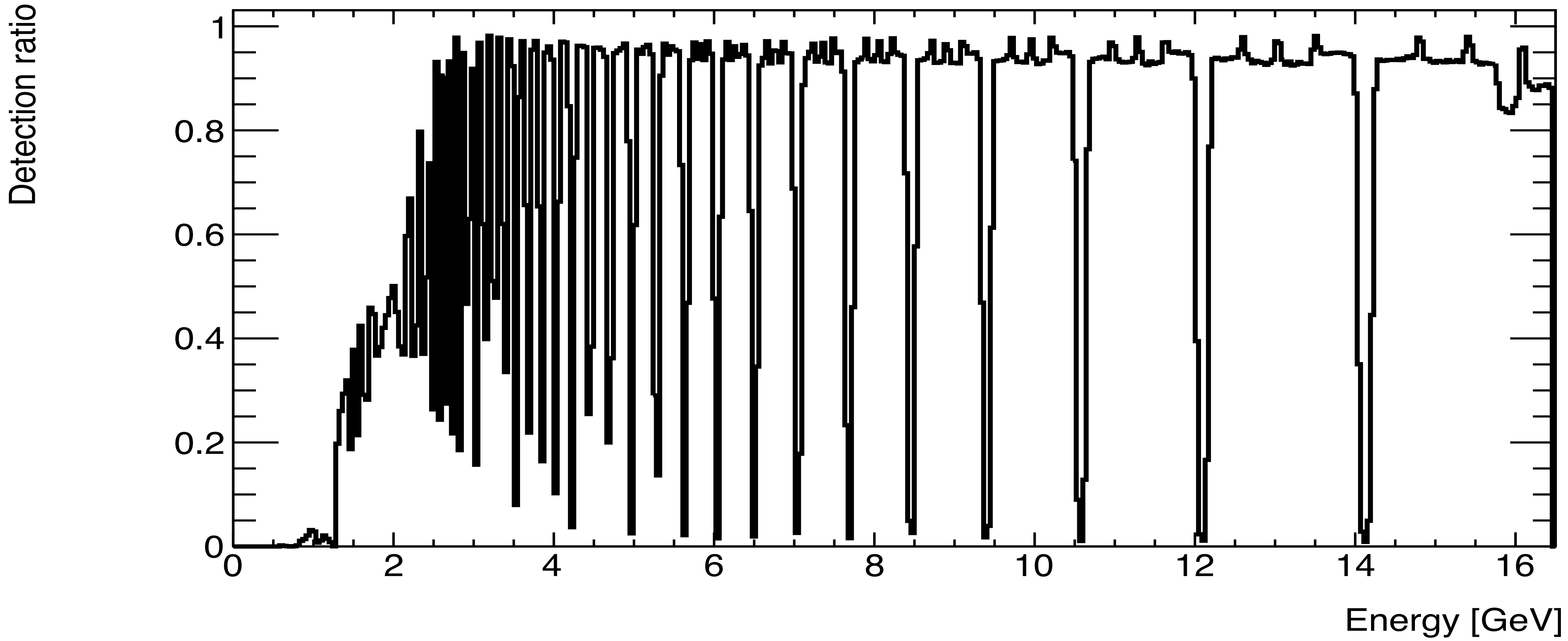
Double layer configuration

4.0924 mm X frequency, 16 mm Z frequency, 4 mm layer offset, 2 layer

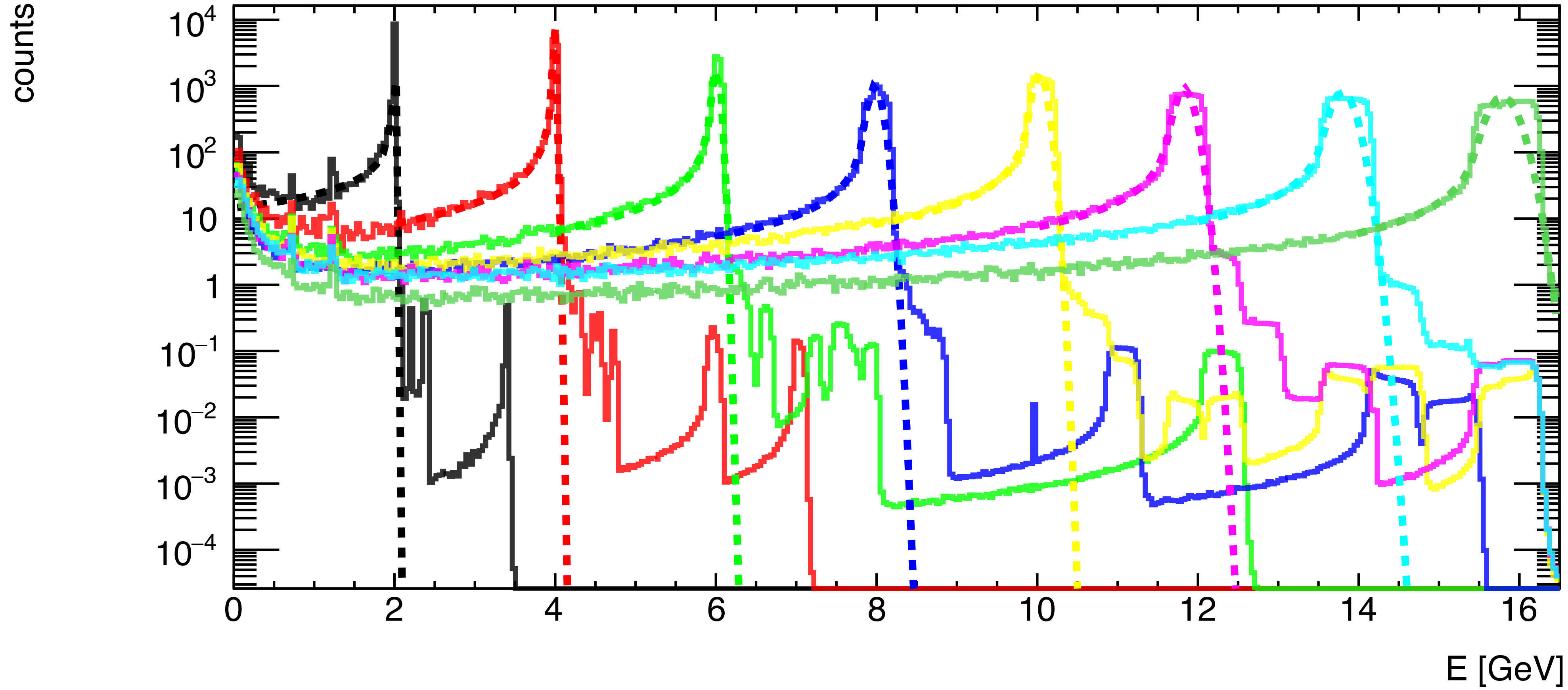




Double layer configuration

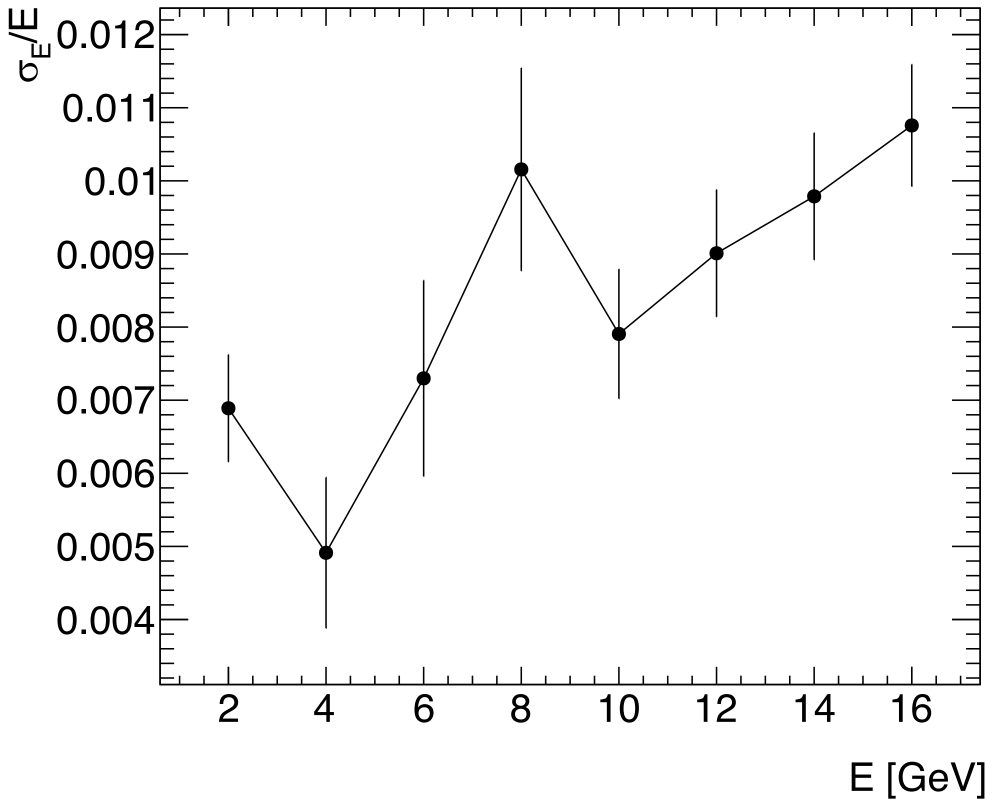


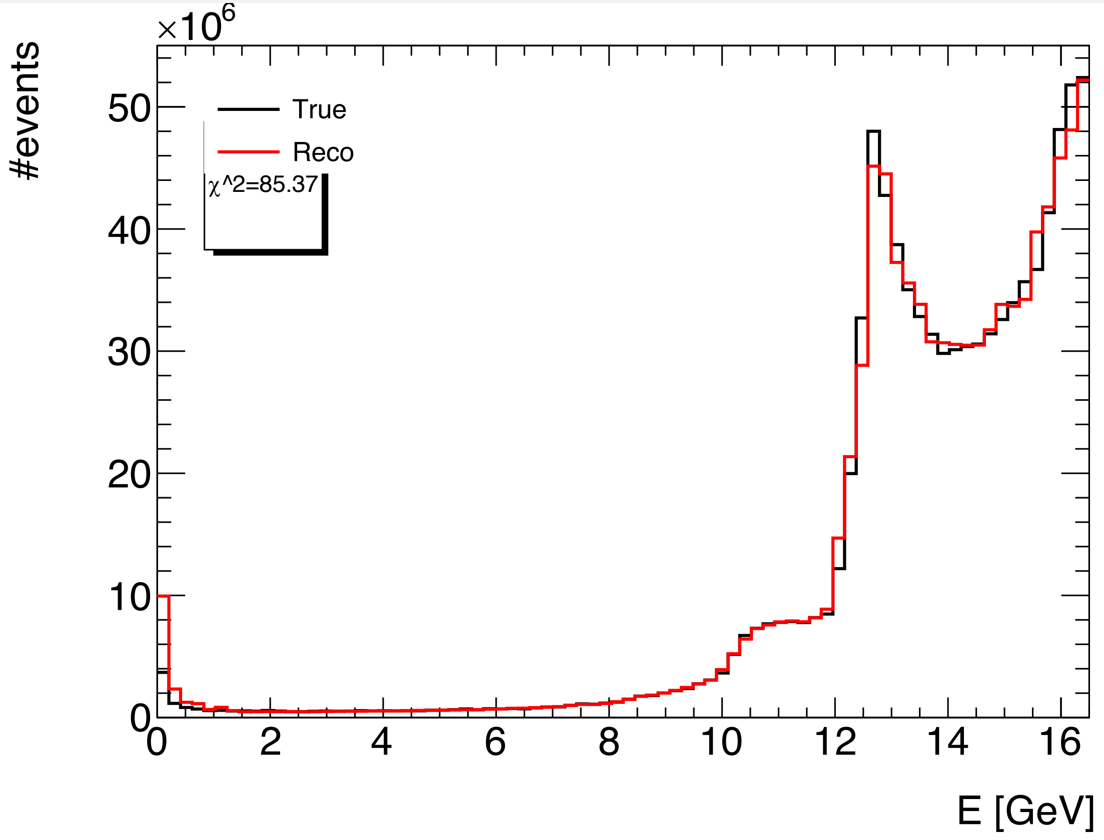
Double layer configuration



Double layer configuration

4.0924 mm X frequency, 16 mm Z frequency, 4 mm layer offset, 2 layer

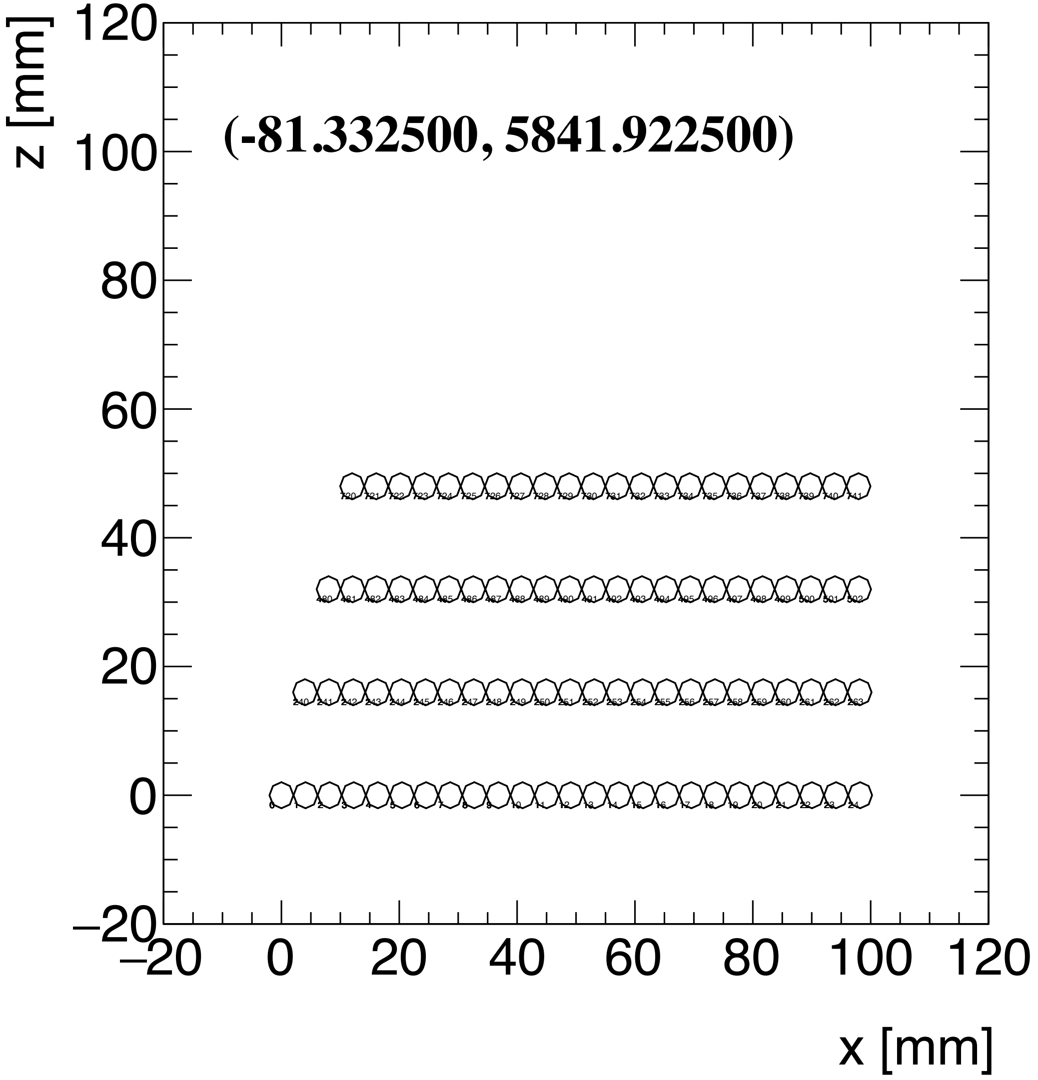


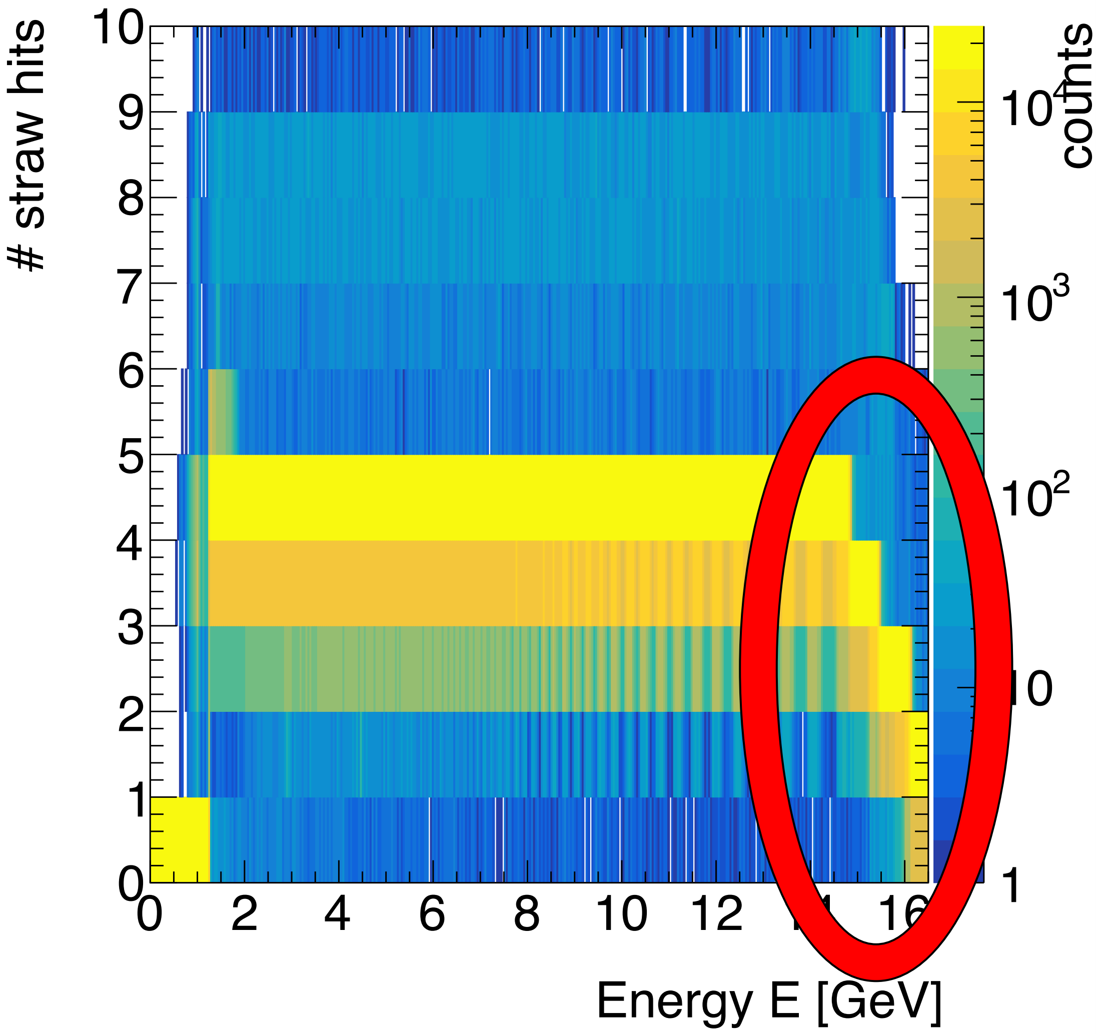


4 layers configuration

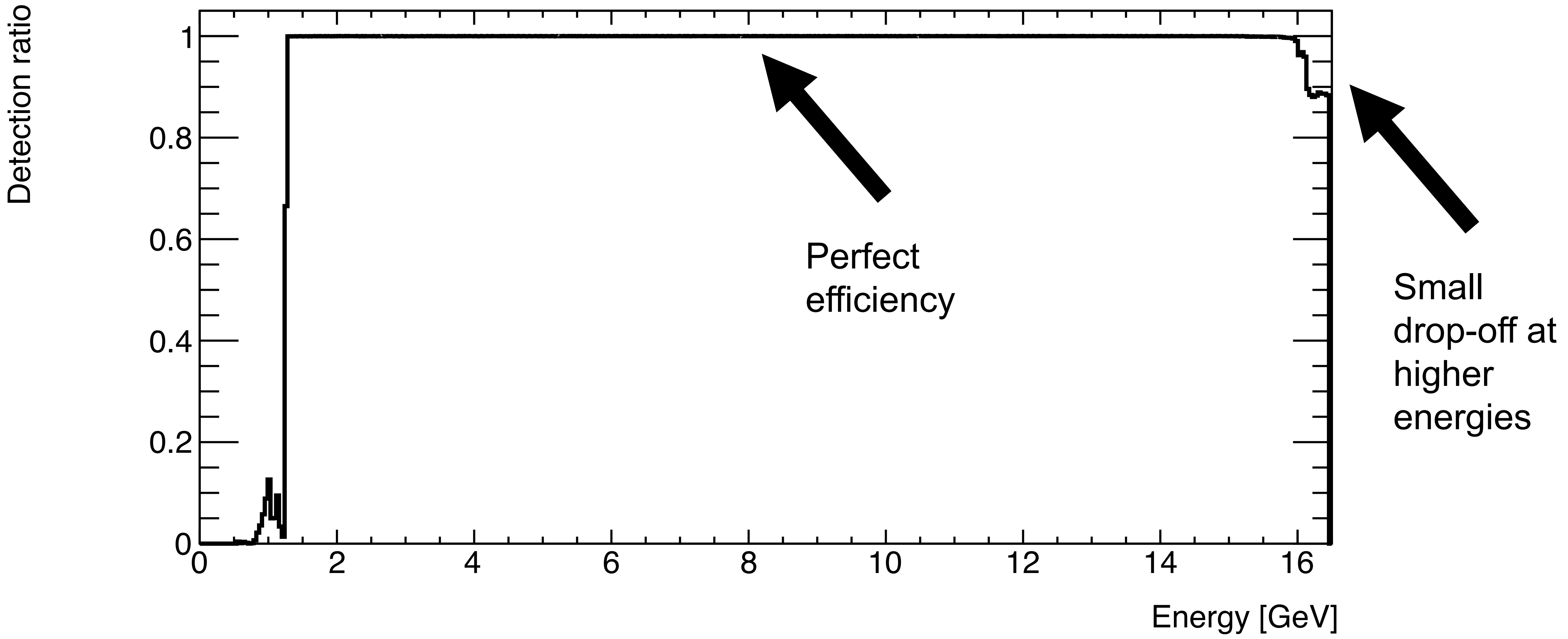
4 layers tight configuration

4.0924 mm X frequency, 16 mm Z frequency, 4 mm layer offset, 4 layer

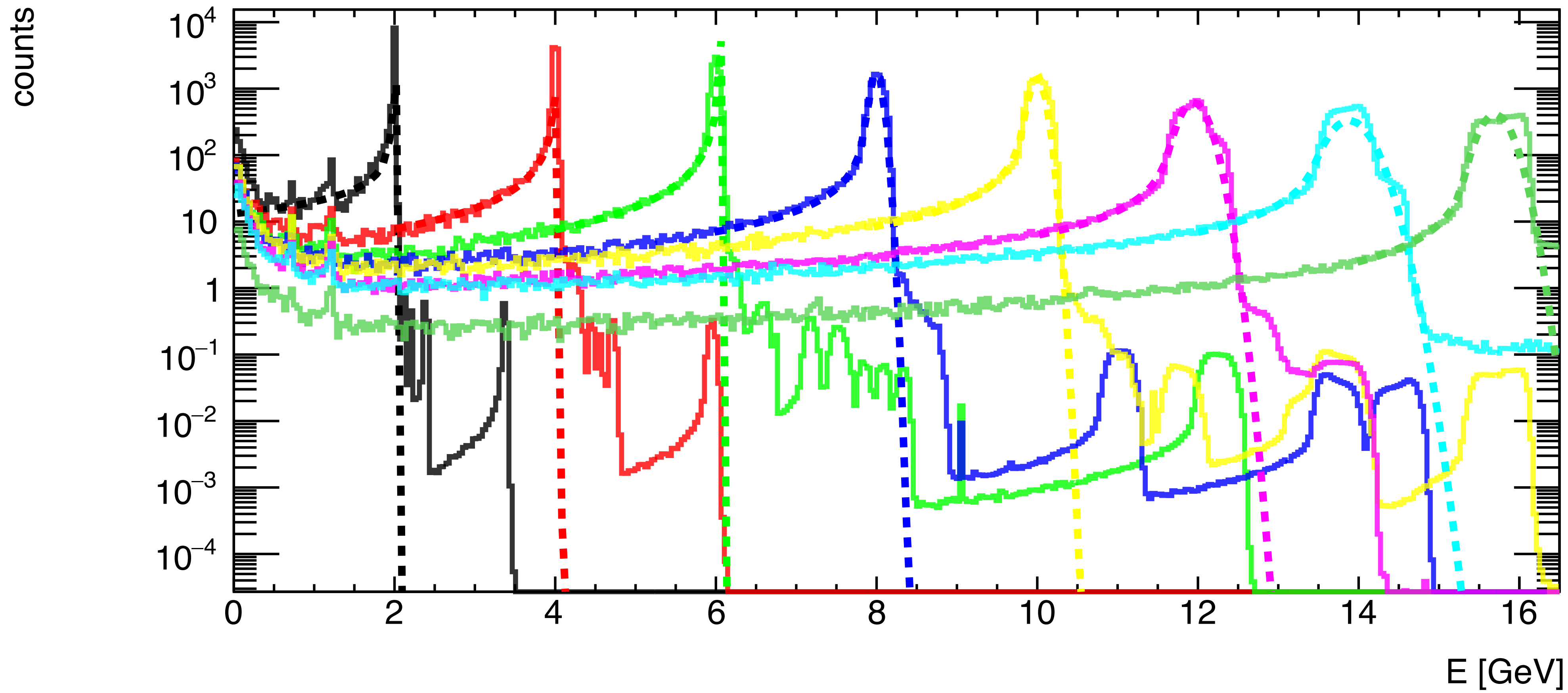




4 layers tight configuration

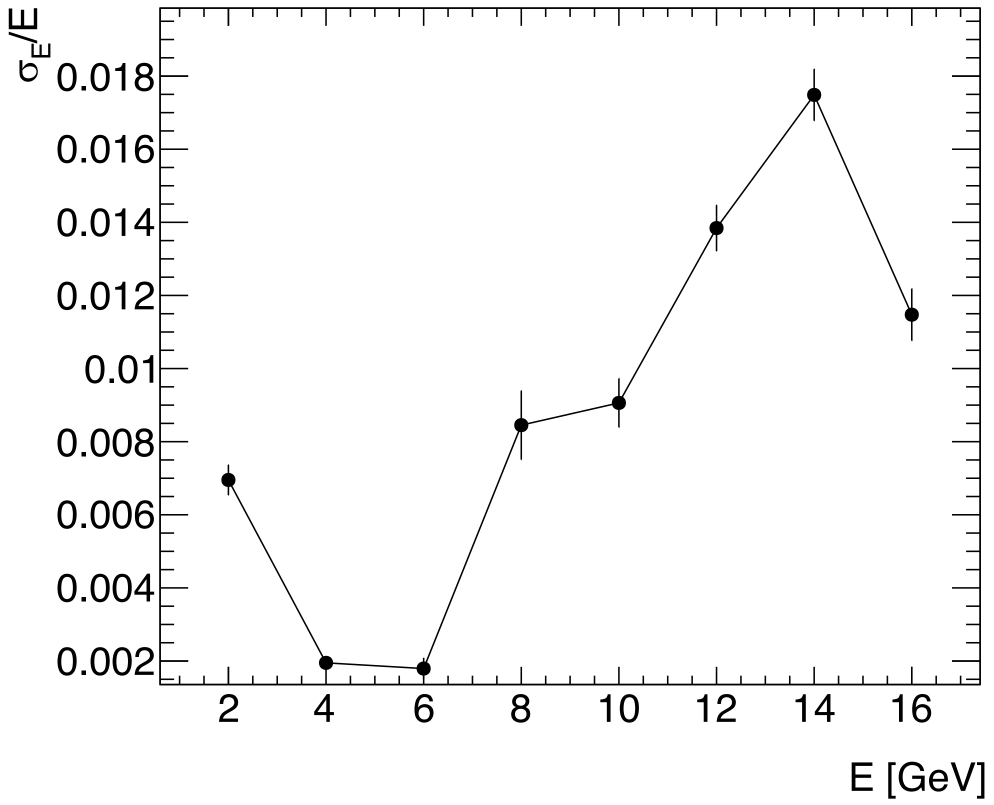


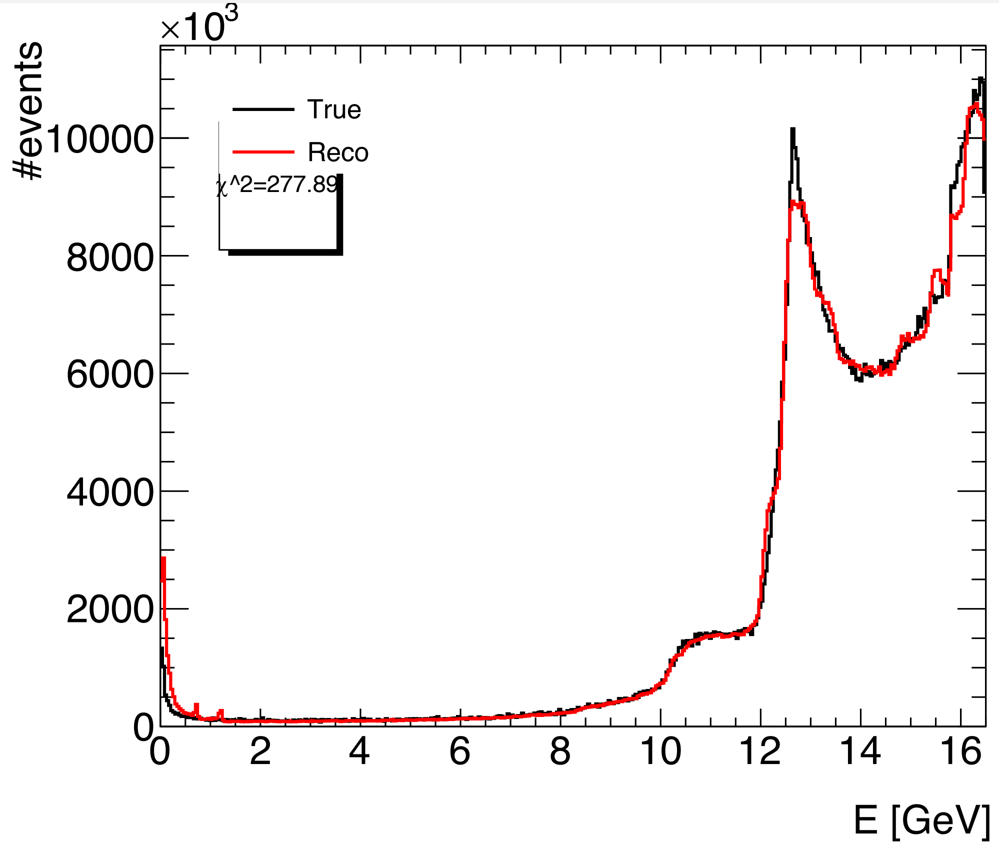
4 layers tight configuration



4 layers tight configuration

4.0924 mm X frequency, 16 mm Z frequency, 4 mm layer offset, 4 layer

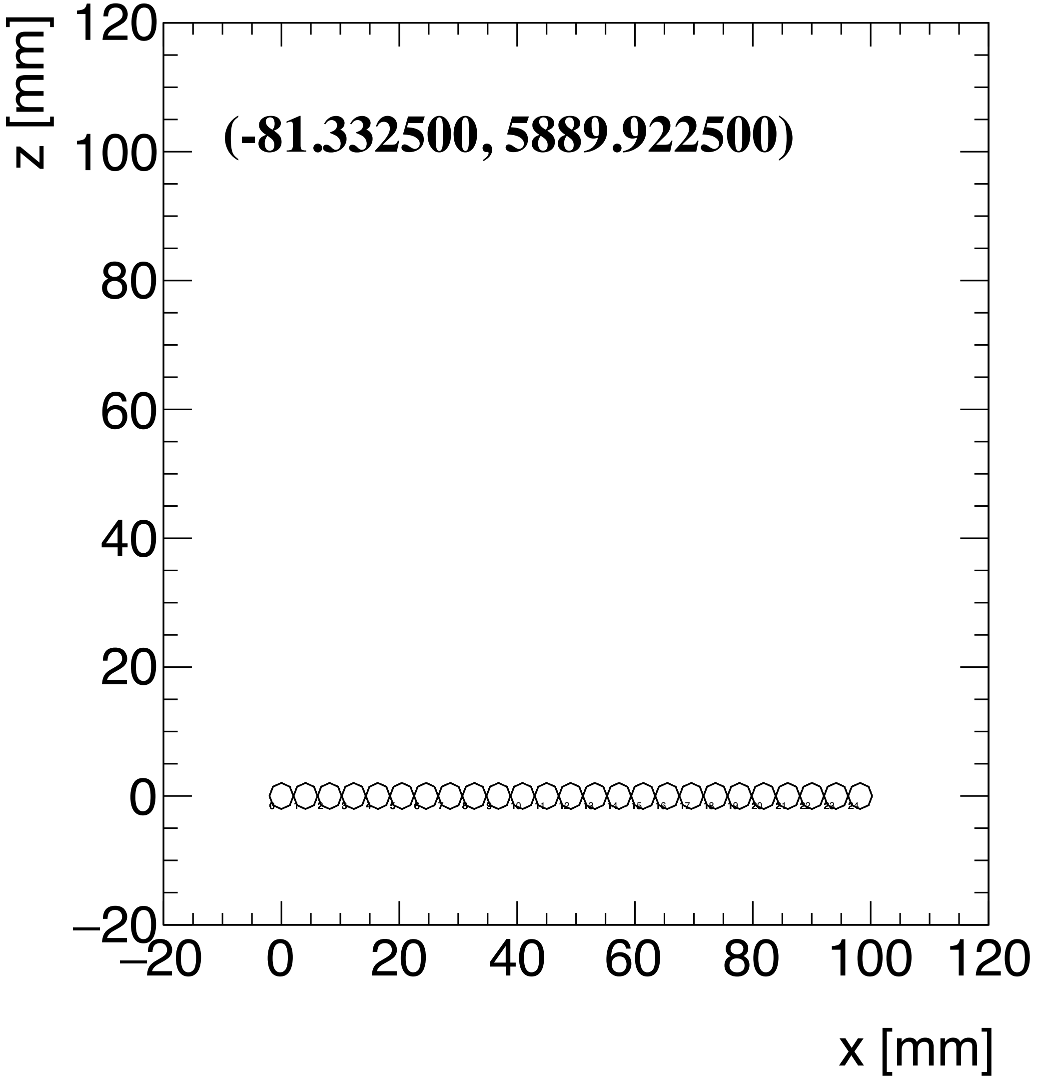


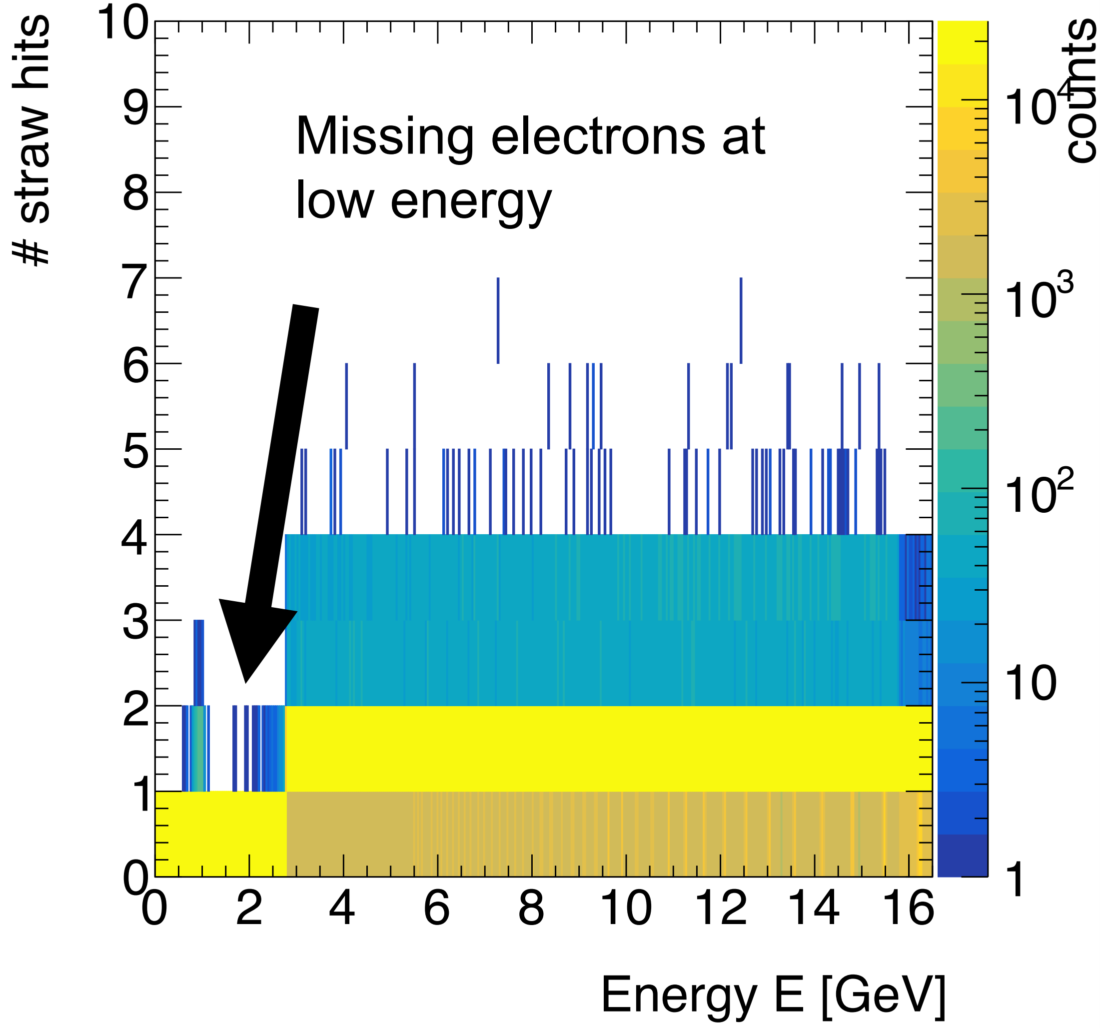


Mono layer configuration: only 100 channels

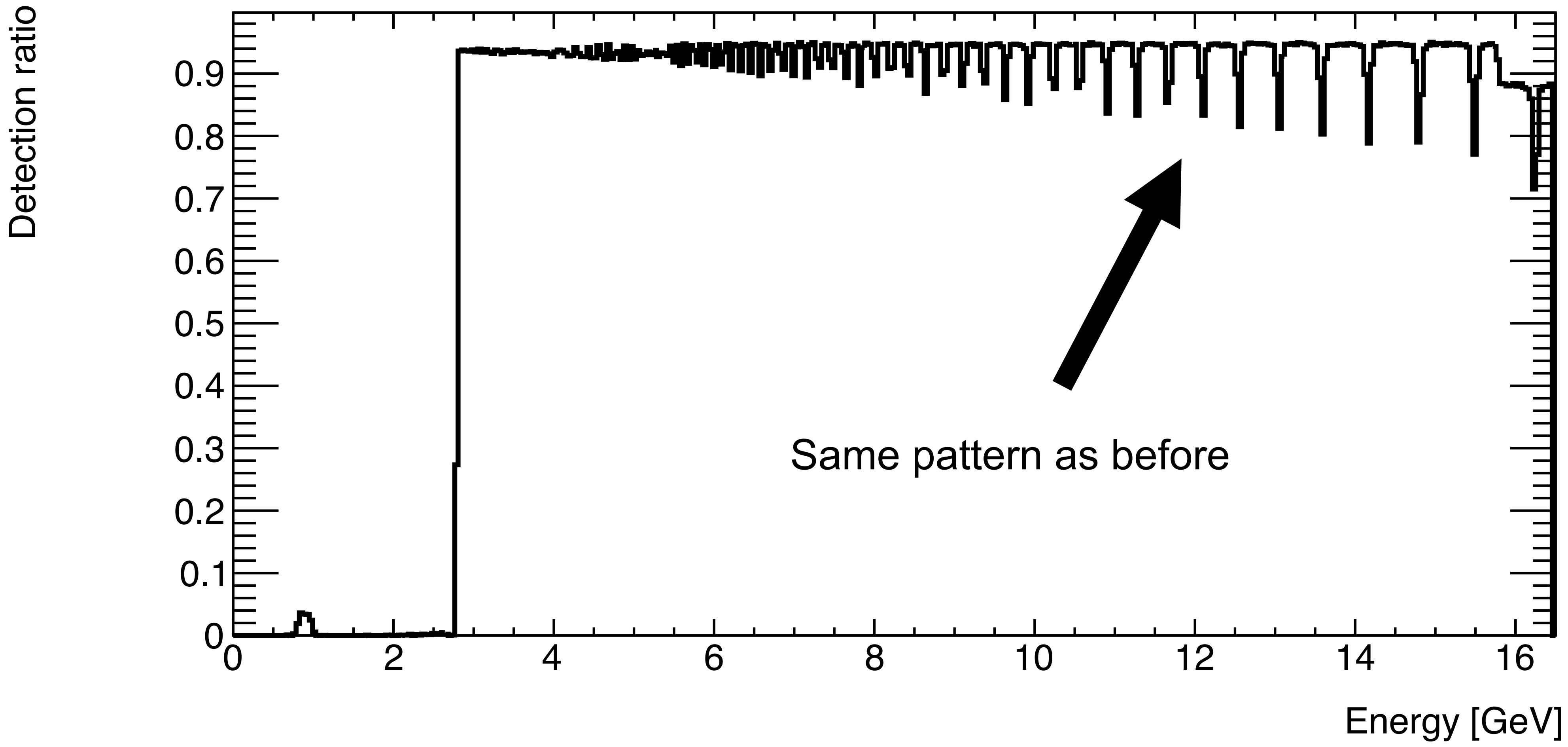
Mono-layer configuration: 100 channels

4.0924 mm X frequency, 16 mm Z frequency, 4 mm layer offset, 1 layer

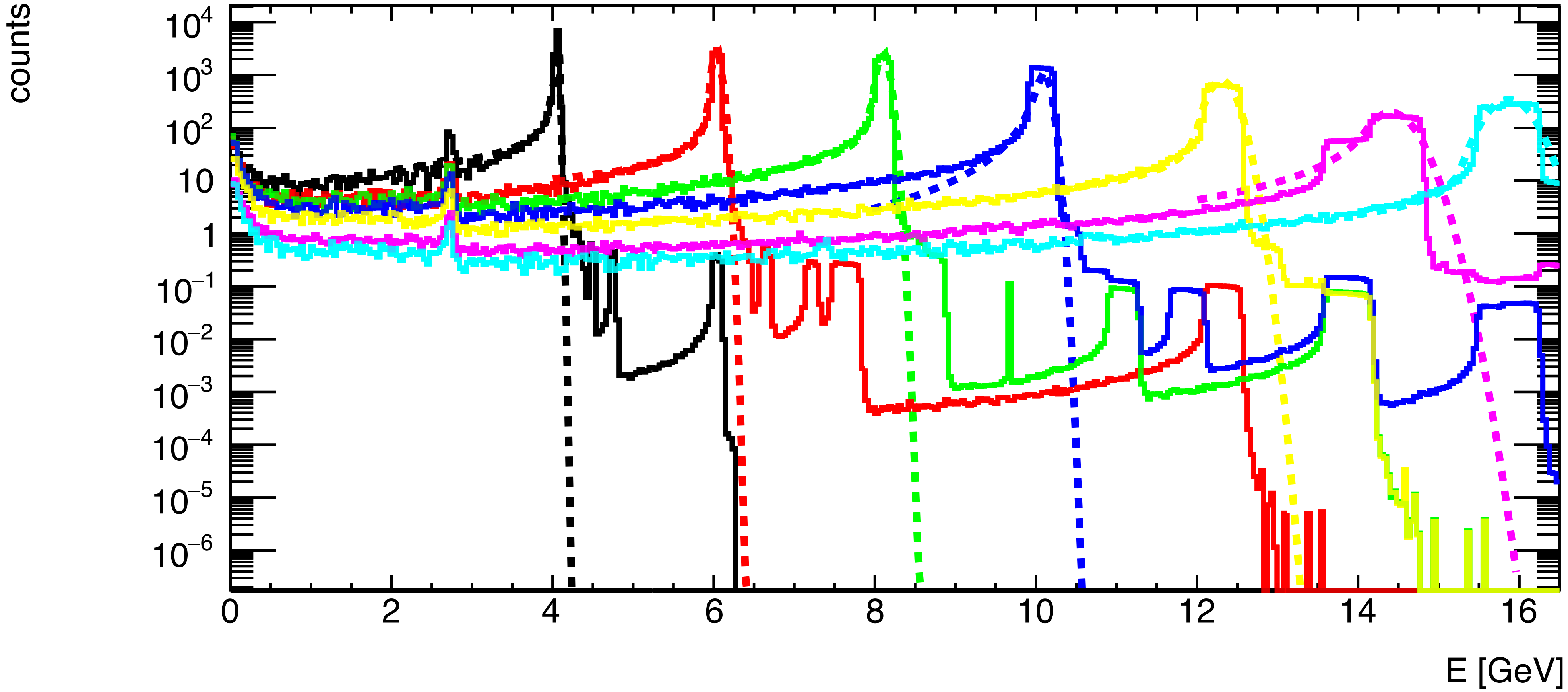




Mono-layer configuration: 100 channels

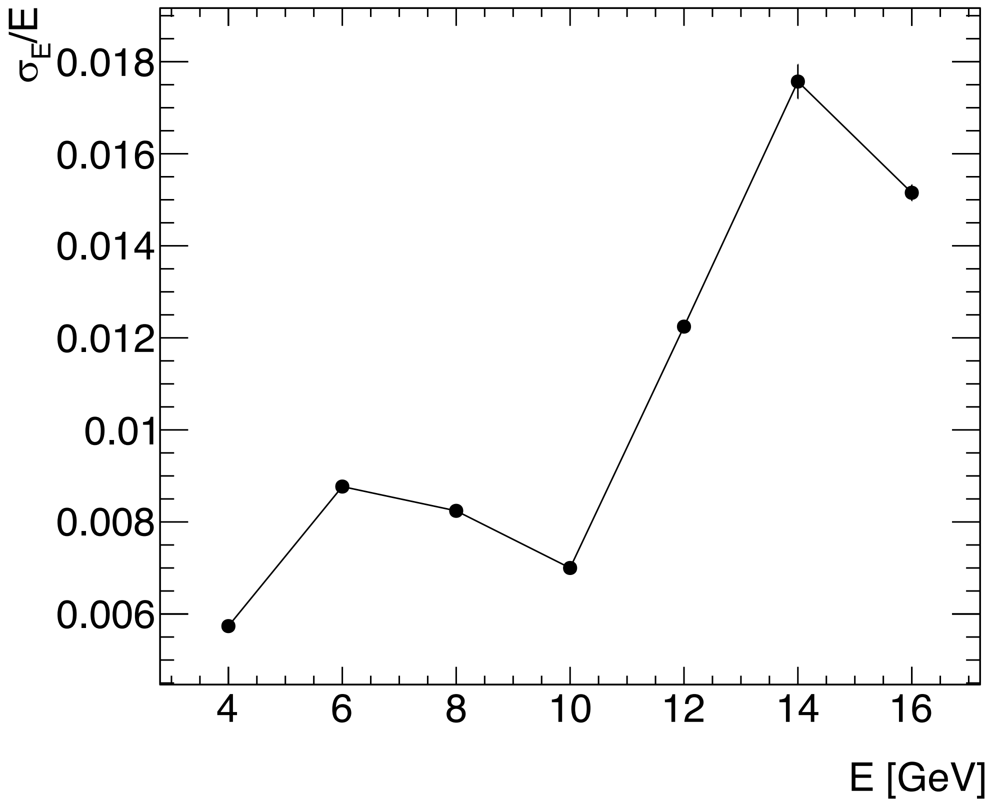


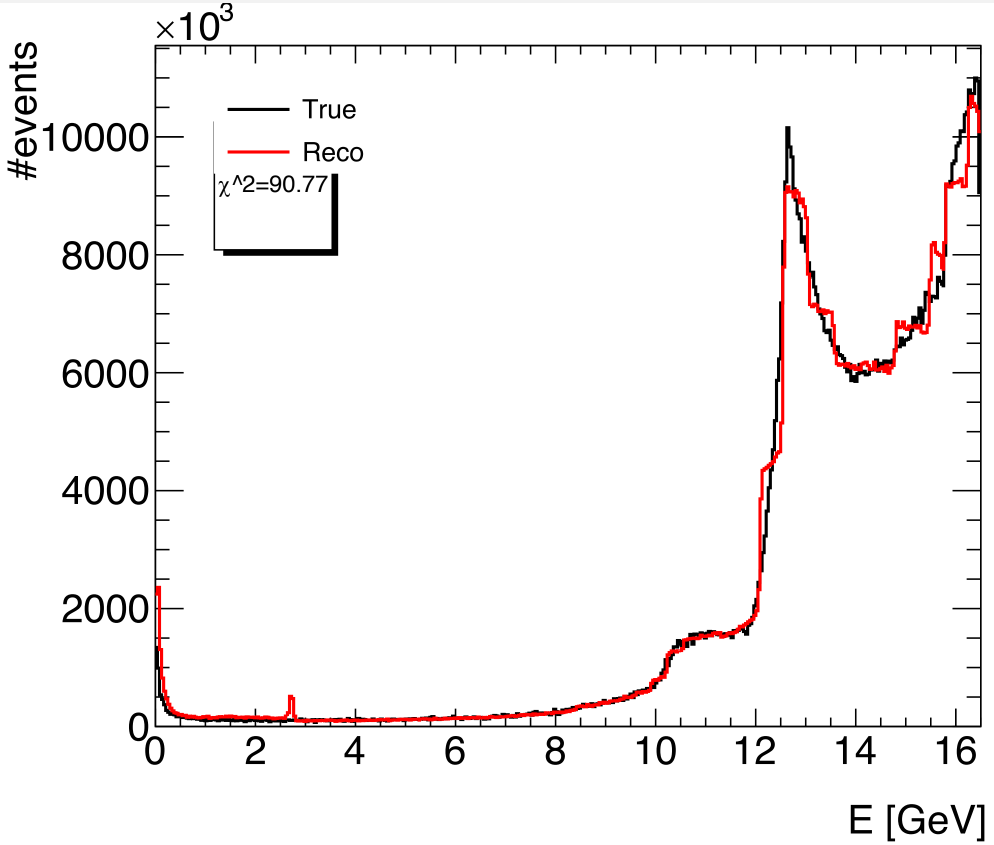
Mono-layer configuration: 100 channels



Mono-layer configuration: 100 channels

4.0924 mm X frequency, 16 mm Z frequency, 4 mm layer offset, 1 layer

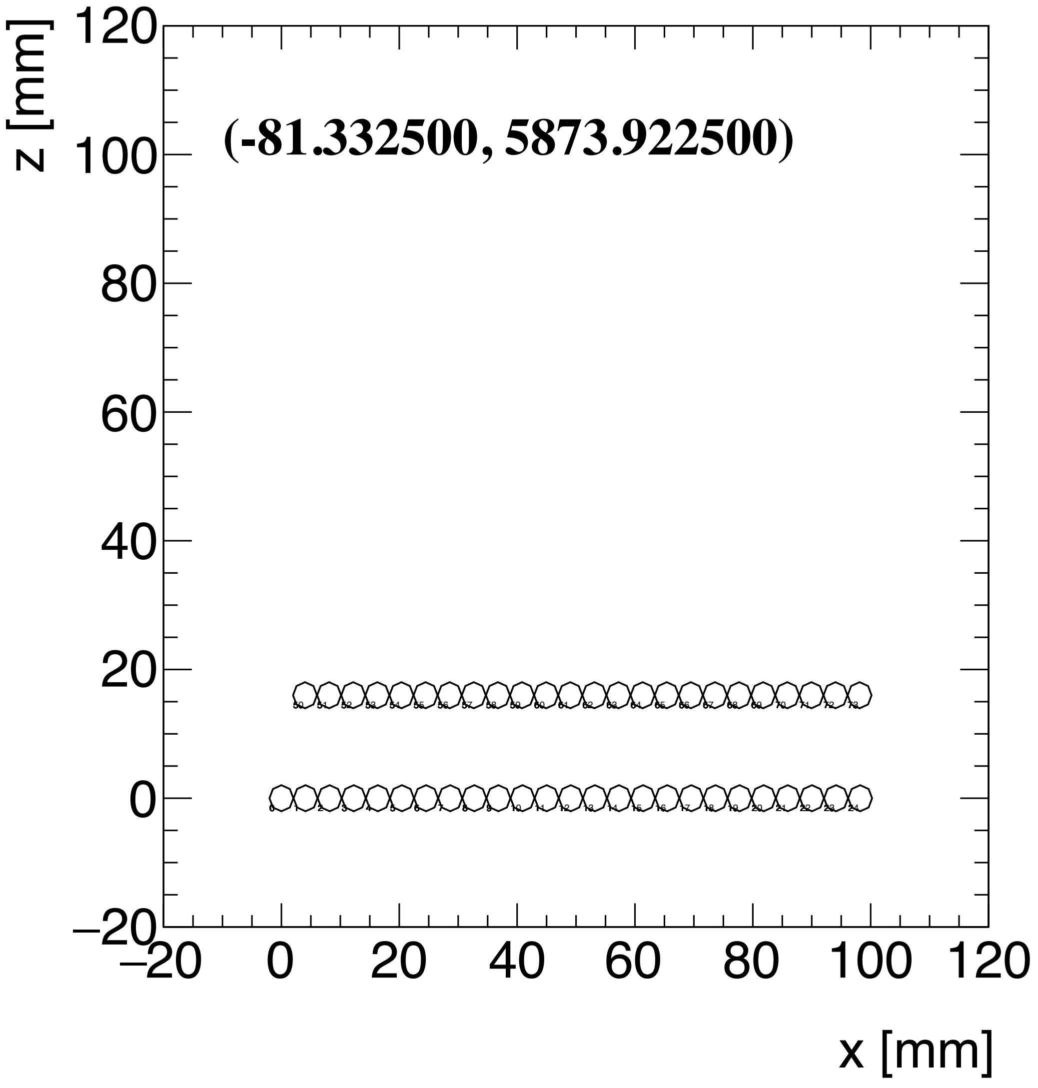




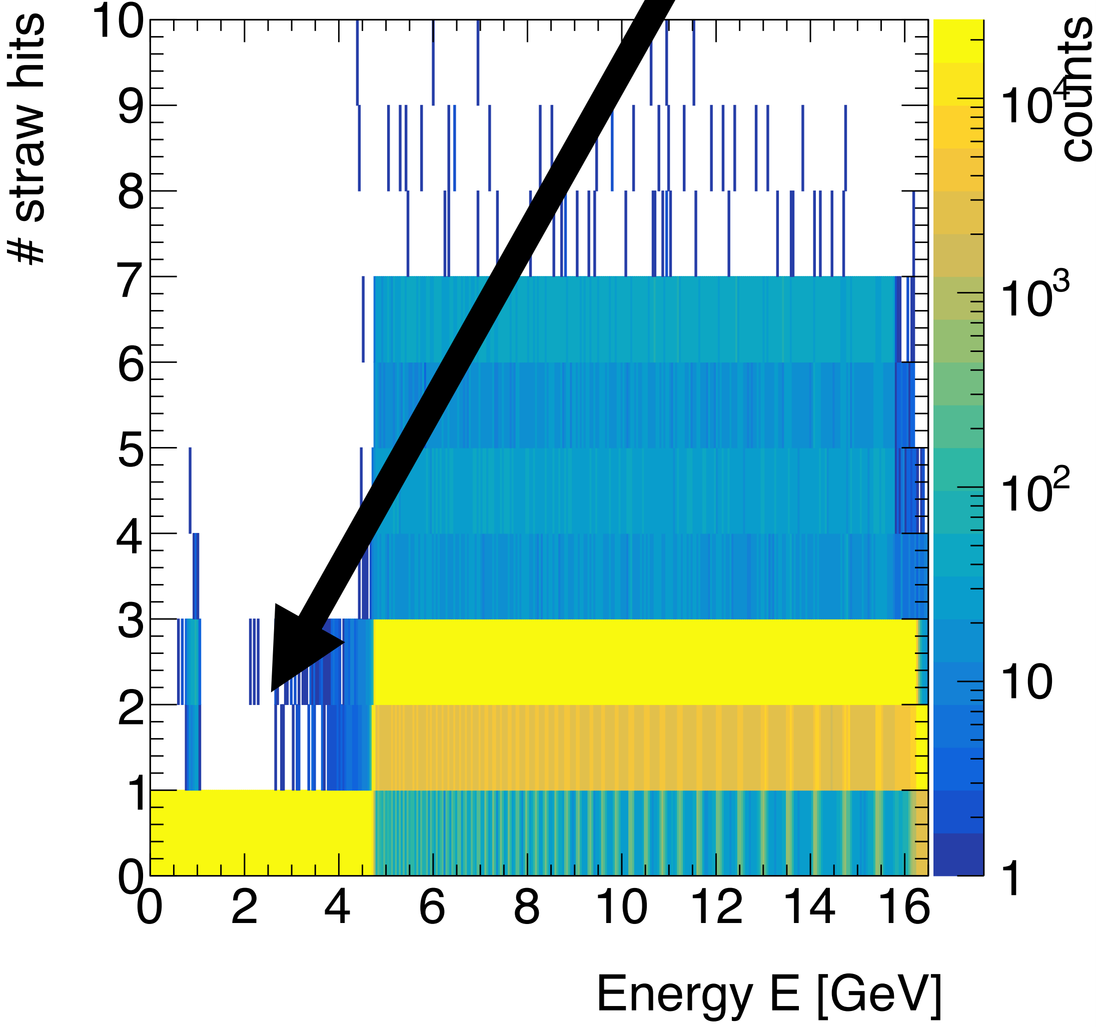
Double layer configuration: only 100 channels

Double layer configuration: 100 channels

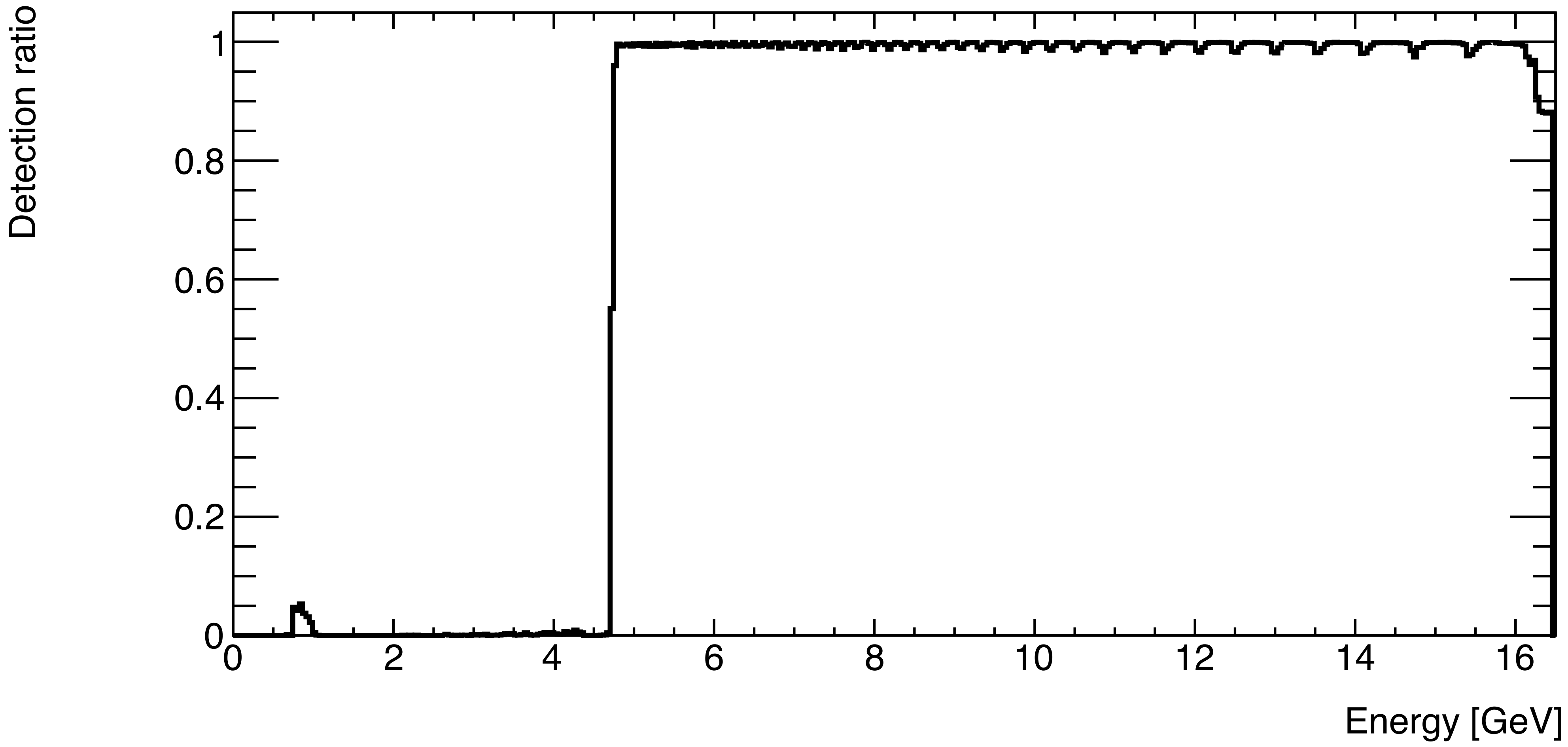
4.0924 mm X frequency, 16 mm Z frequency, 4 mm layer offset, 2 layer



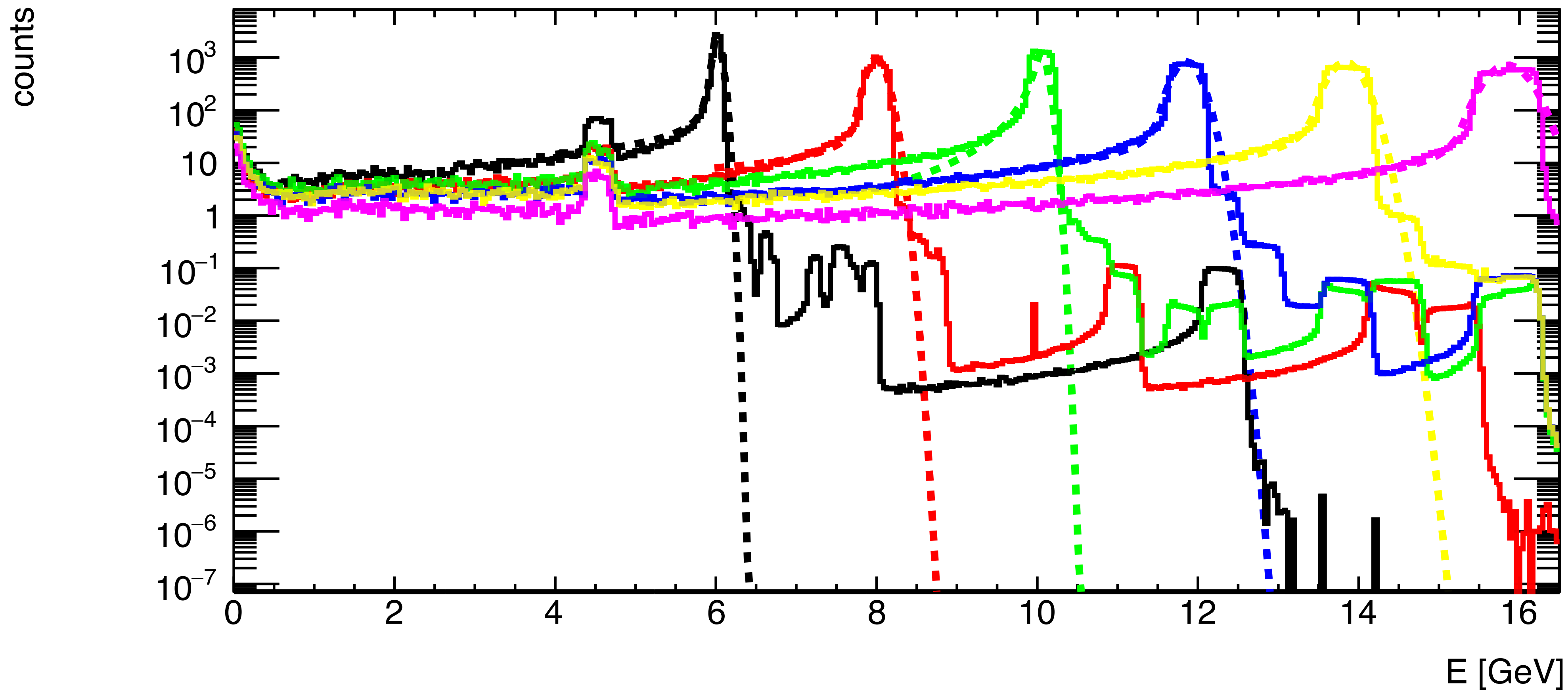
Larger zone of missing electrons



Double layer configuration: 100 channels

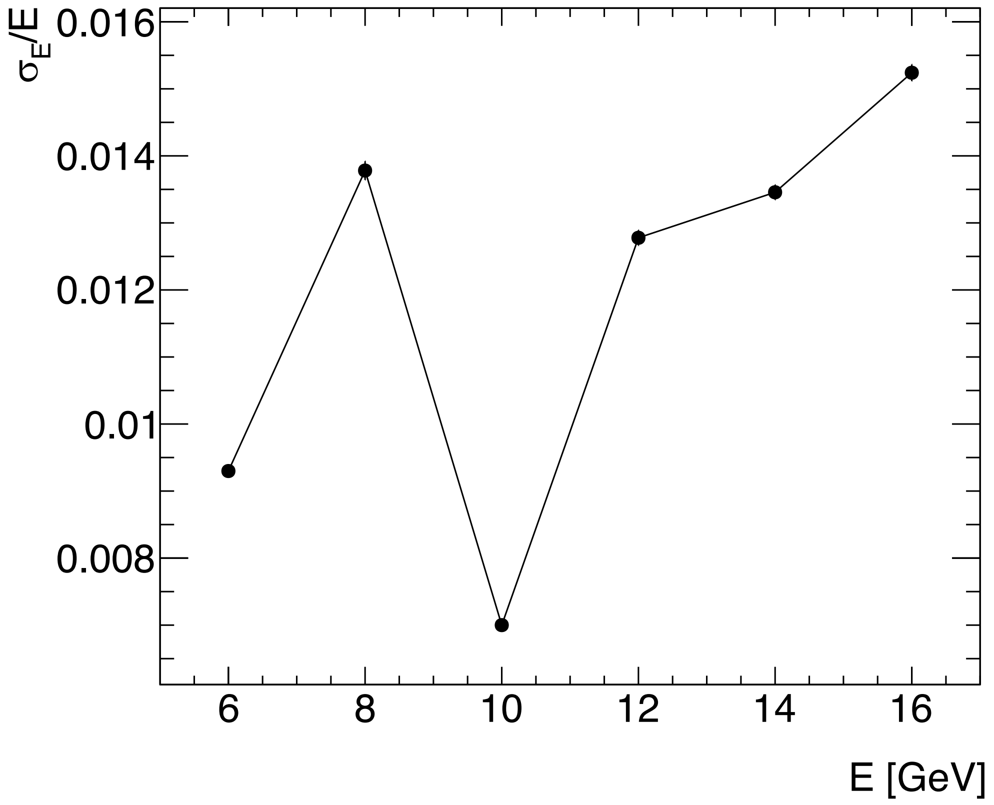


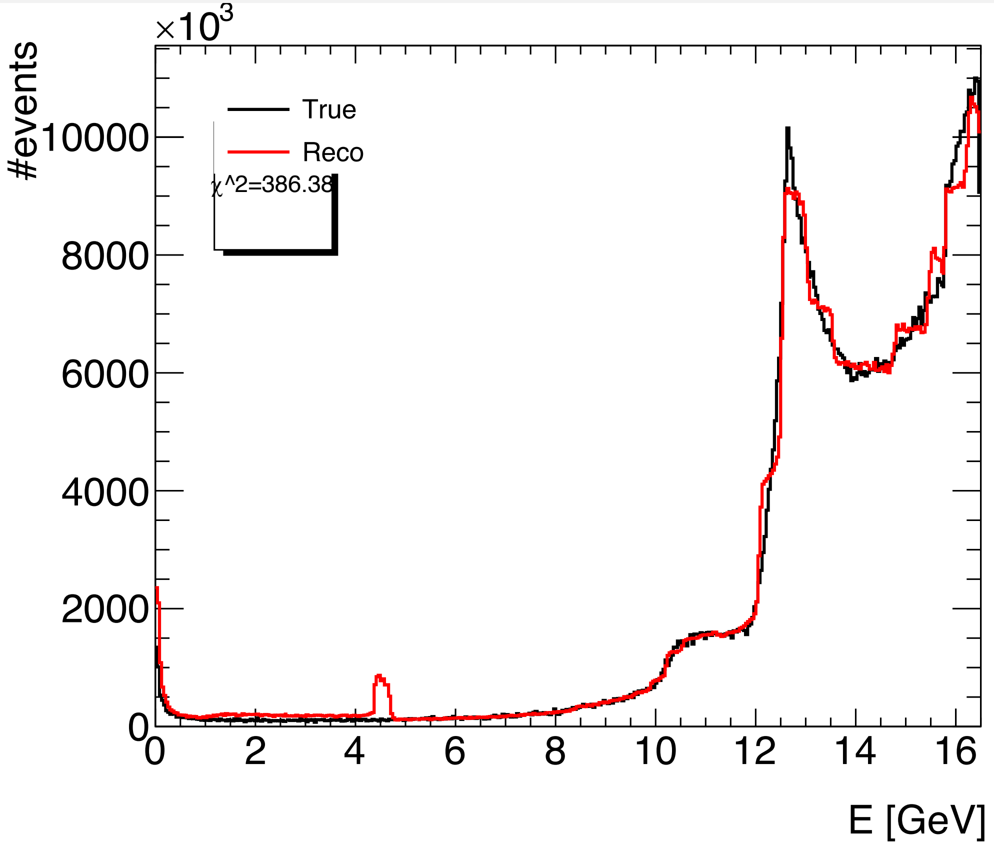
Double layer configuration: 100 channels



Double layer configuration: 100 channels

4.0924 mm X frequency, 16 mm Z frequency, 4 mm layer offset, 2 layer

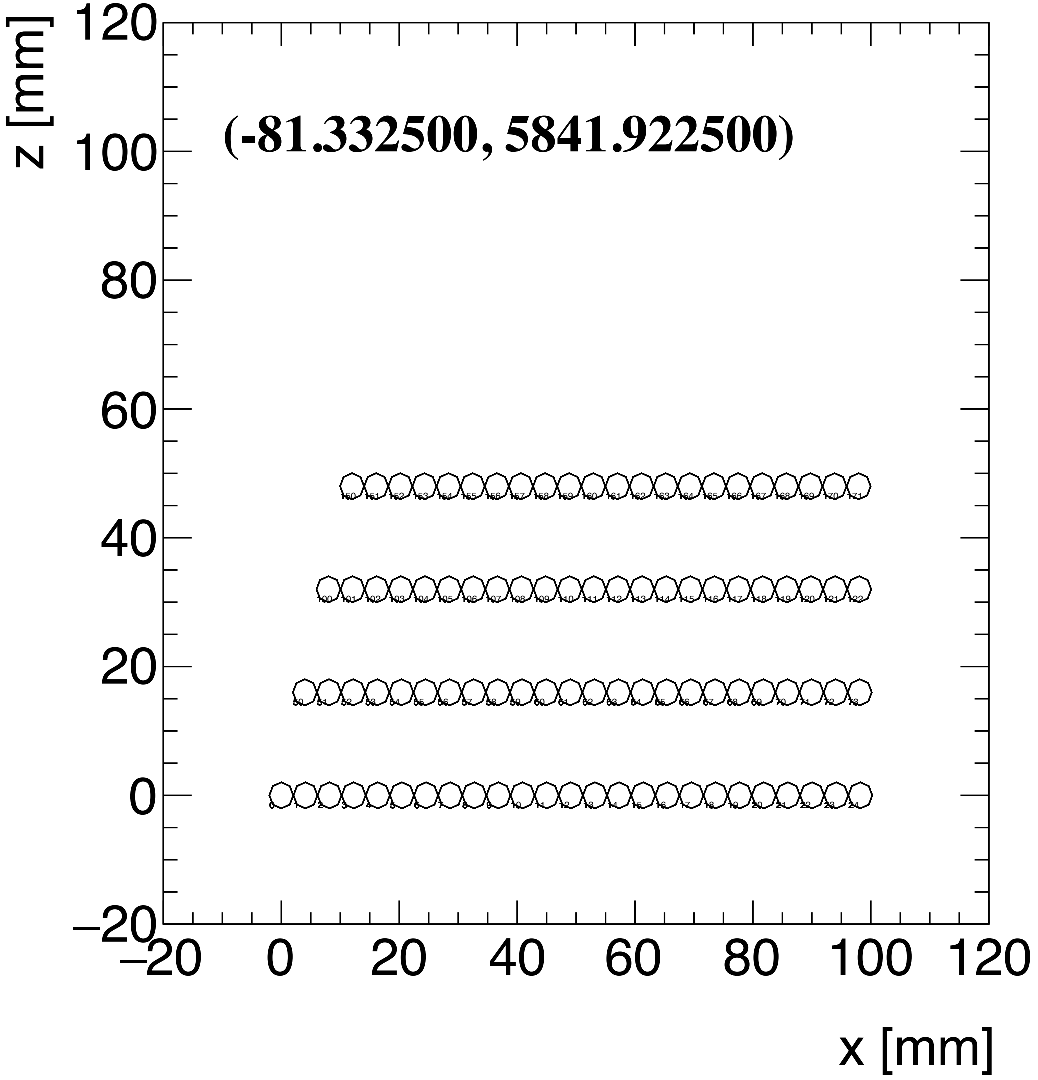


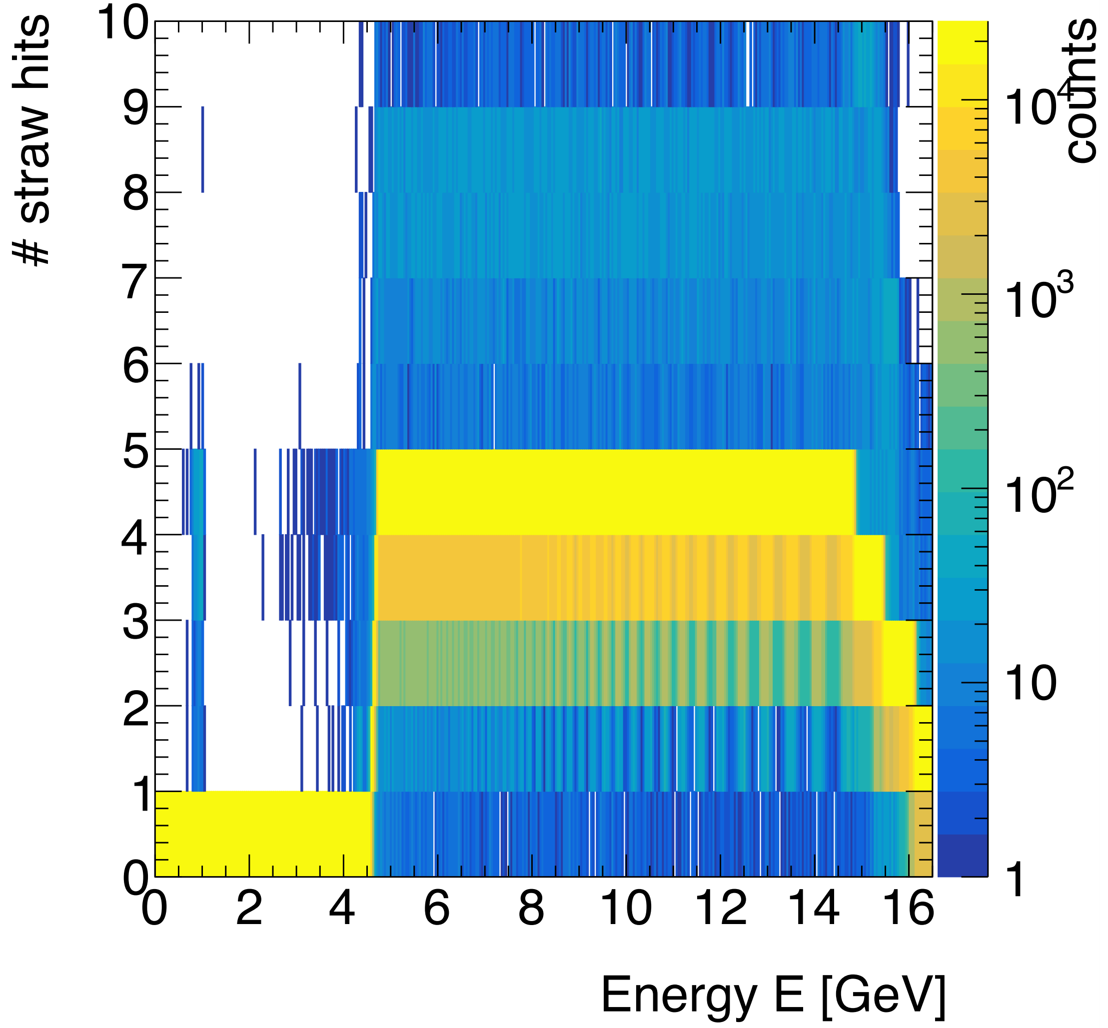


4 layers configuration: only 200 channels

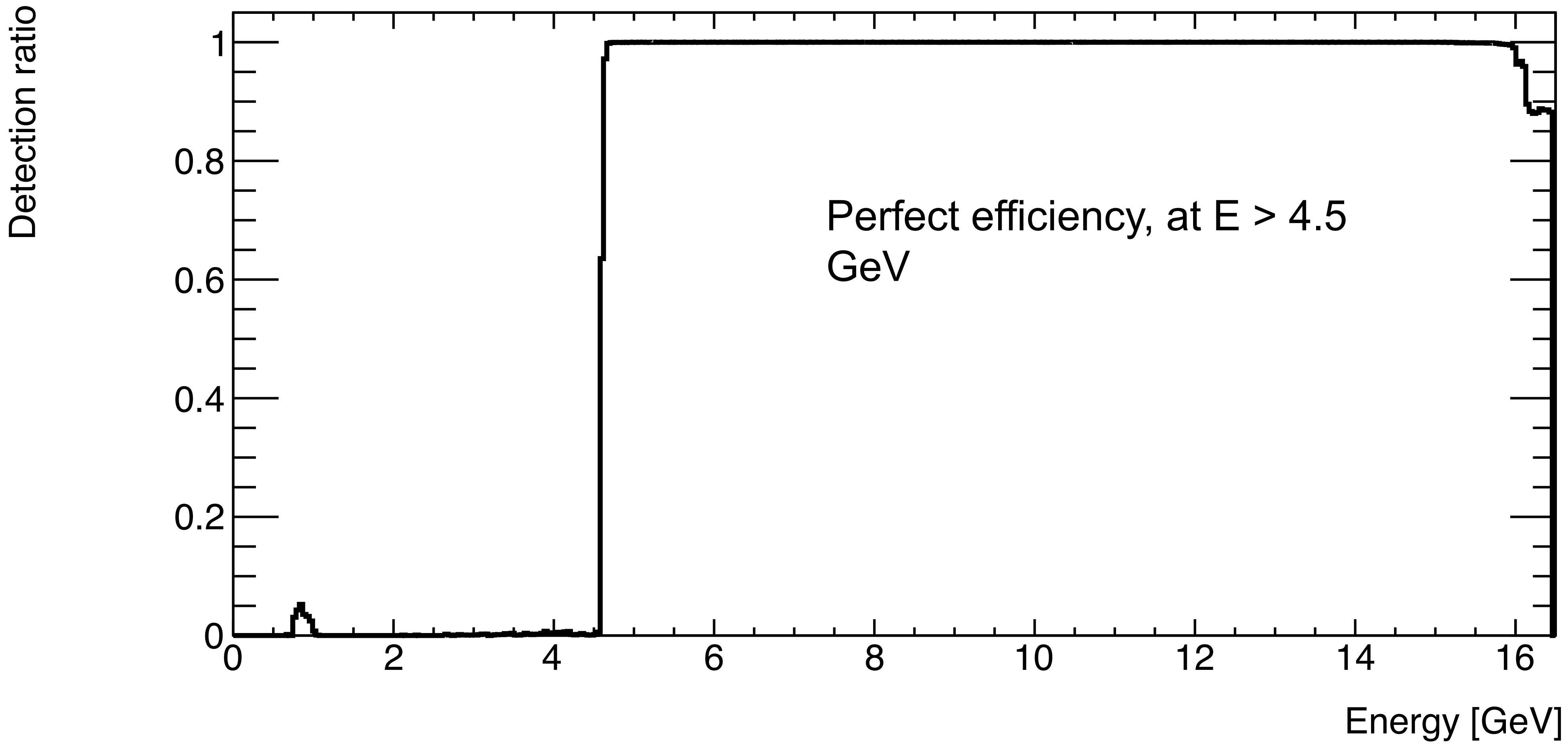
4 layers tight configuration: 200 channels

4.0924 mm X frequency, 16 mm Z frequency, 4 mm layer offset, 4 layer

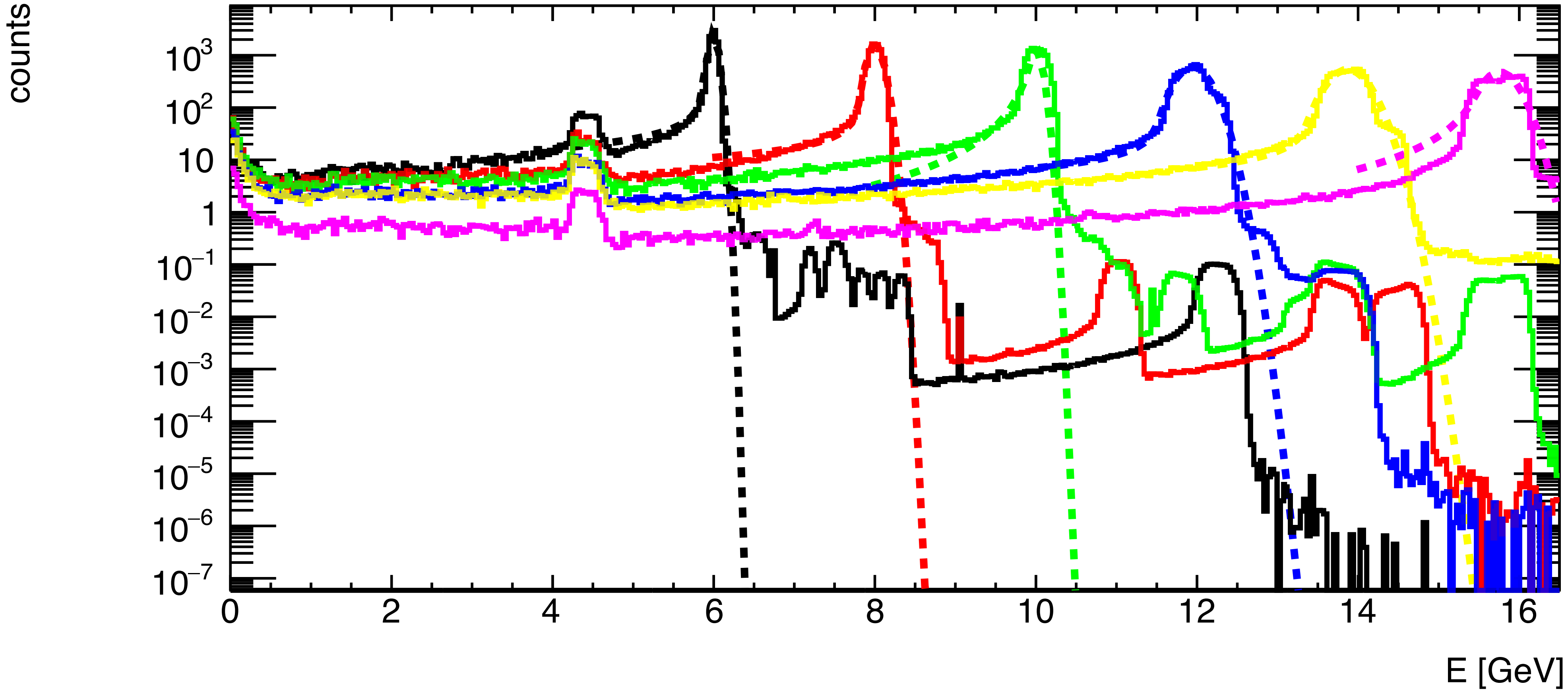




4 layers tight configuration: 200 channels

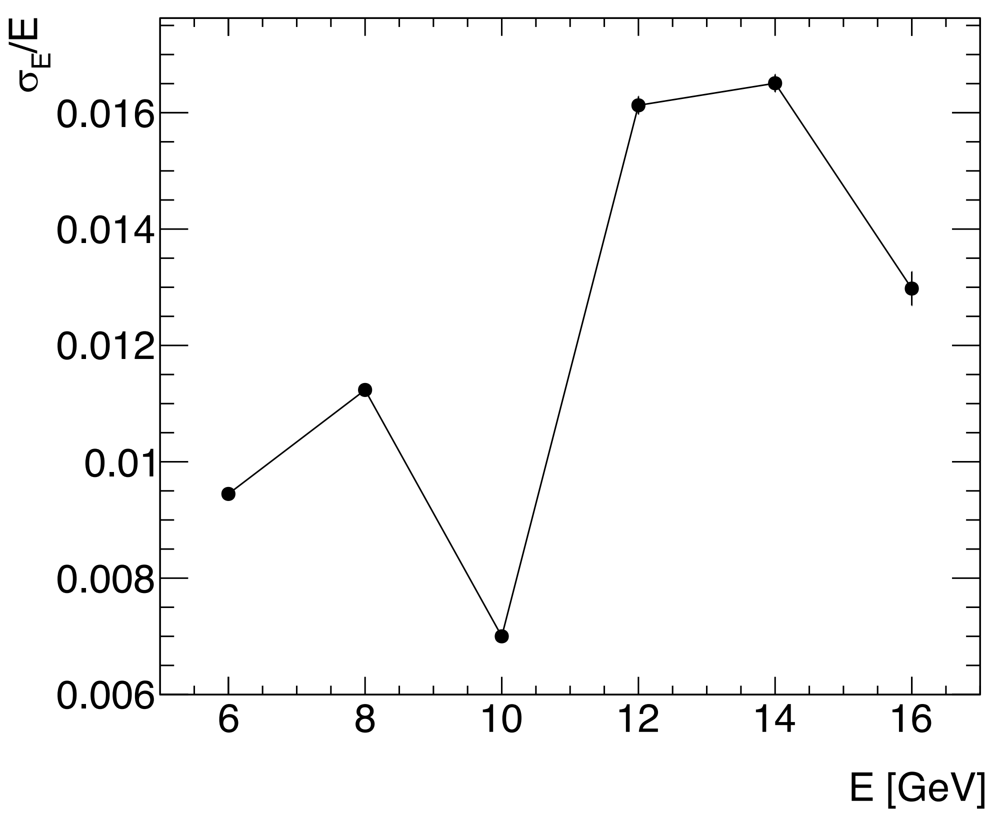


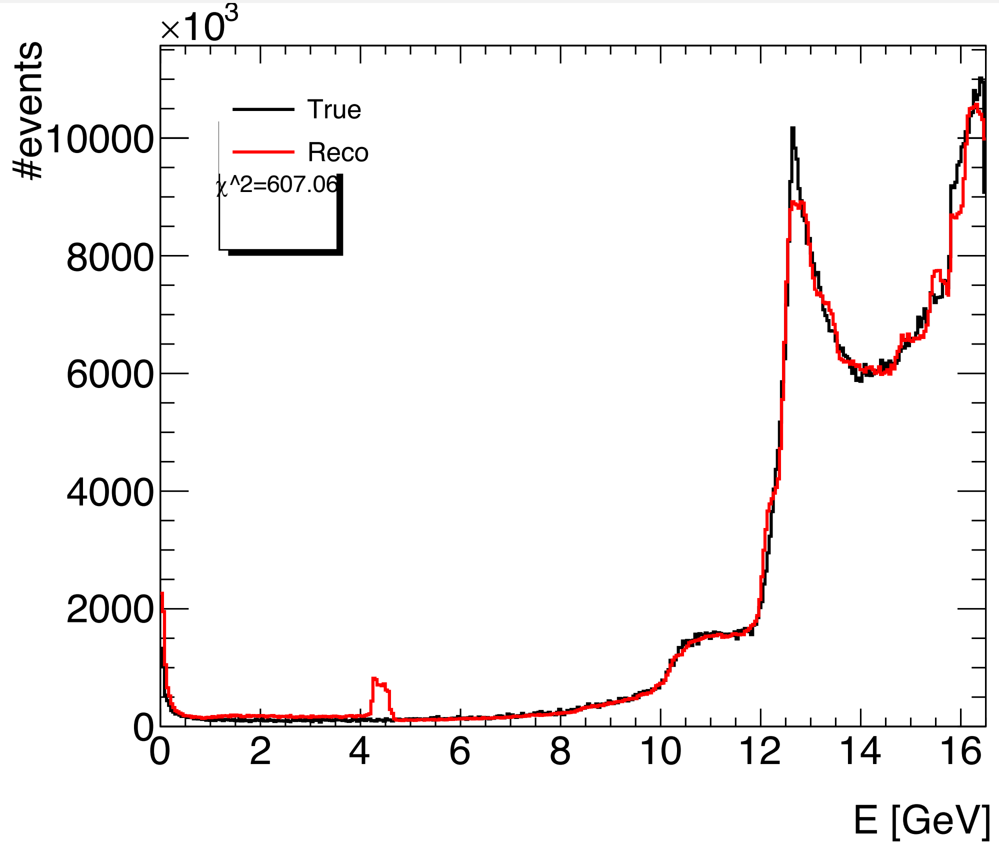
4 layers tight configuration: 200 channels



4 layers tight configuration: 200 channels

4.0924 mm X frequency, 16 mm Z frequency, 4 mm layer offset, 4 layer





Resolution: future work

Your ideas are welcome !

- **Dealing with “flat tops”** → more realistic resolution estimates at high energies
  - Using the half of the width of the top as σ_E instead of the fit
- **More energies** → would help decide if the non smooth σ_E/E curve is caused by bad fitting or by the geometry
  - Energies in step of 0.5 GeV
- **Additional straw in the high energy zone** → reduce detection rate drop-off
  - One right behind the 1st straw, but on the 3rd layer
- **Impact of systematic errors** (e.g., small straw position displacement or one malfunctioning straw)