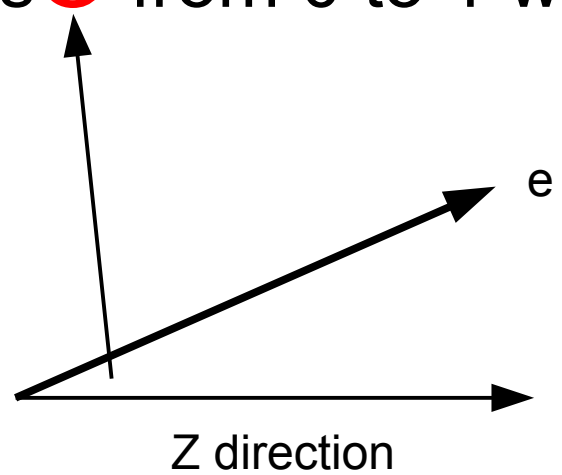
Electron energy scale vs. incident angle

Samples

- Single electron for both ND and FD
  - Fixed energy to 2 GeV
  - Fixed vertex to Vx=0cm, Vy=0cm, Vz=200cm
  - Varied cosθ from 0 to 1 with 0.1 per step



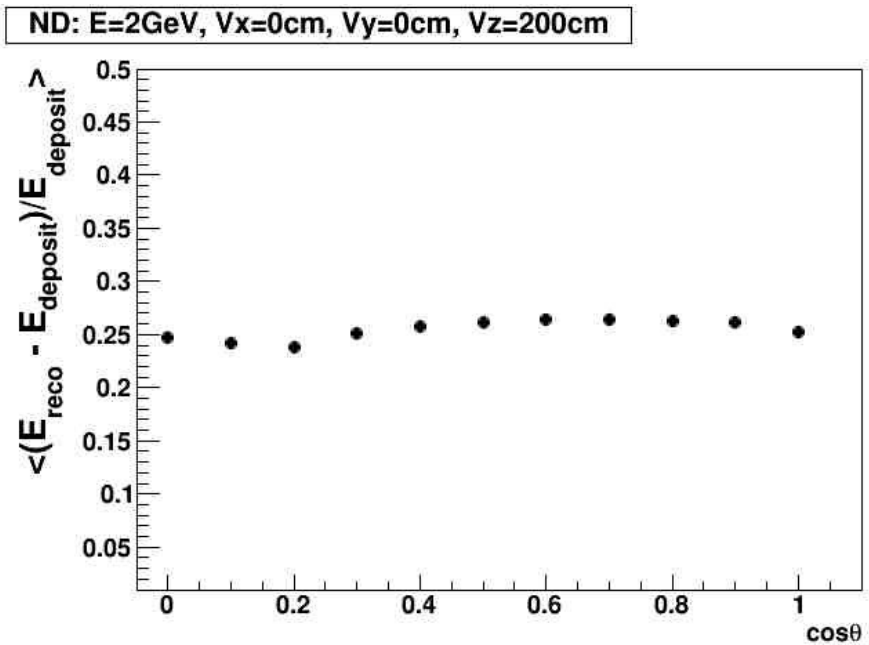
Some definitions

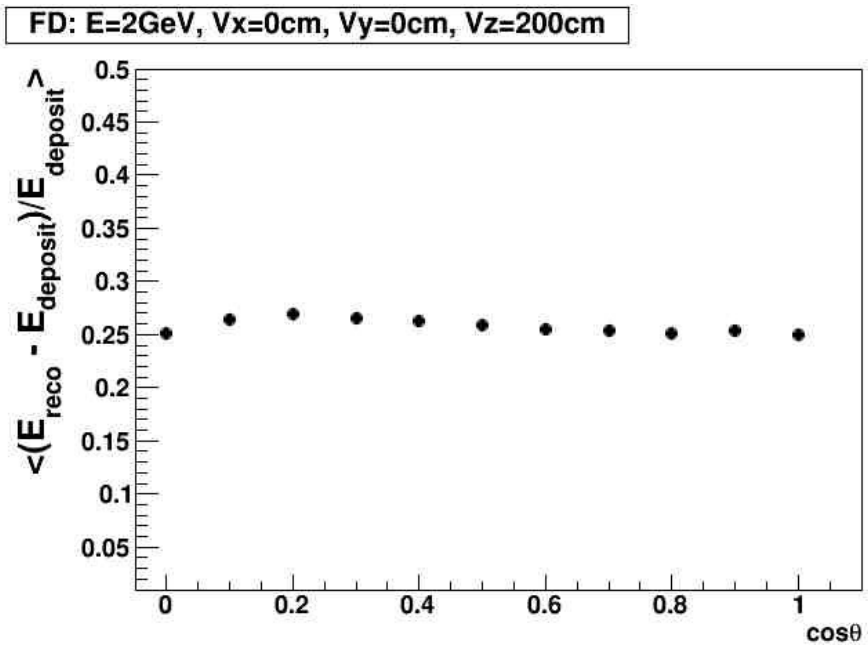
- Ereco
  - Sum energy for all cells associated to slice
- Edeposit
  - Sum energy for all true cells deposited in detector
- Etrue
  - True energy, 2 GeV is fixed for the present study

Ereco vs. Edeposit

- The difference between Ereco and Edeposit represents how well does calibration work
- General calibration
  - Attenuation for fiber
  - HV stability for APD
  - Overall adjustment

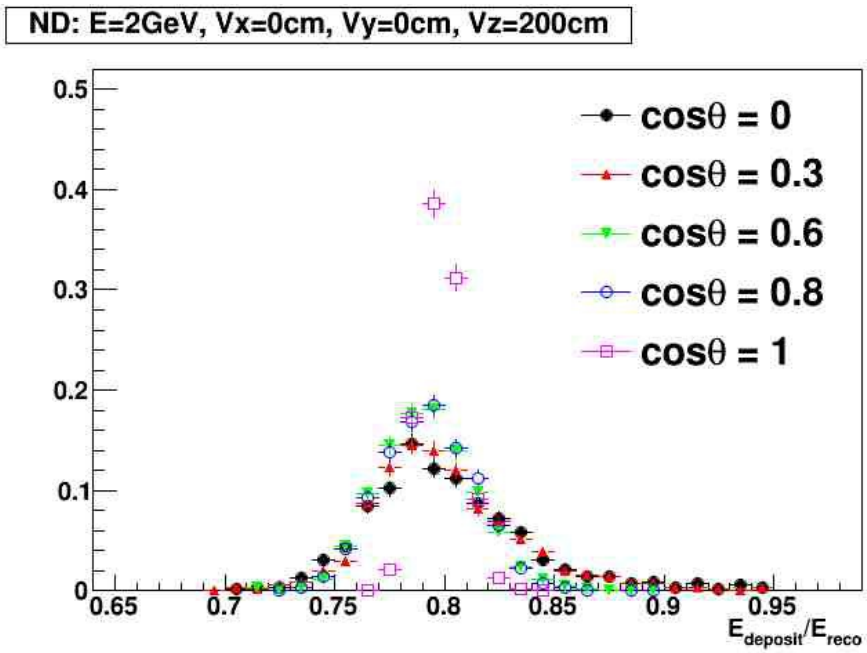
<(Ereco-Edeposit)/Edeposit> vs. cosΘ

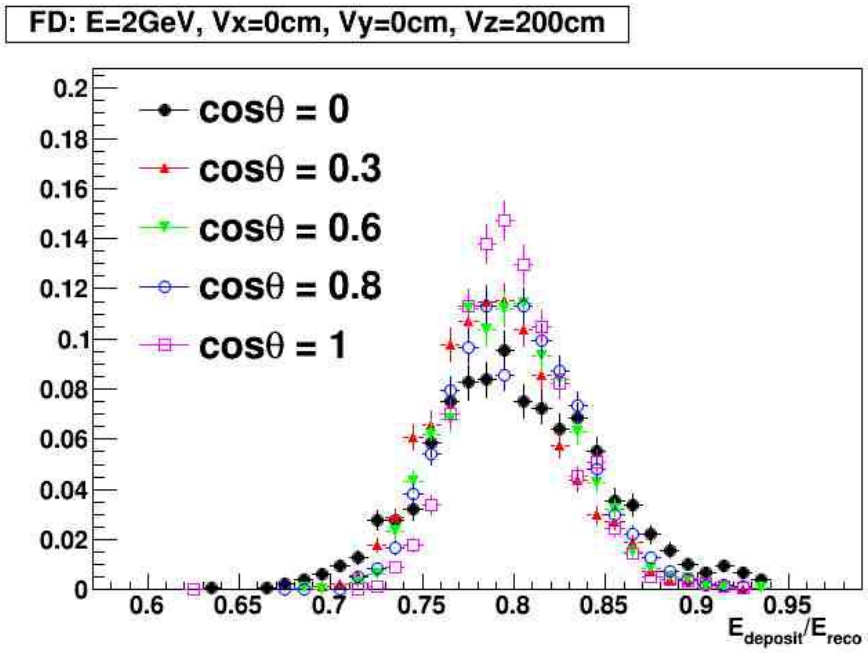




1. The difference between Ereco and Edeposit has no visible dependence on cosΘ
2. The Ereco is over-corrected by ~25%

Edeposit/Ereco



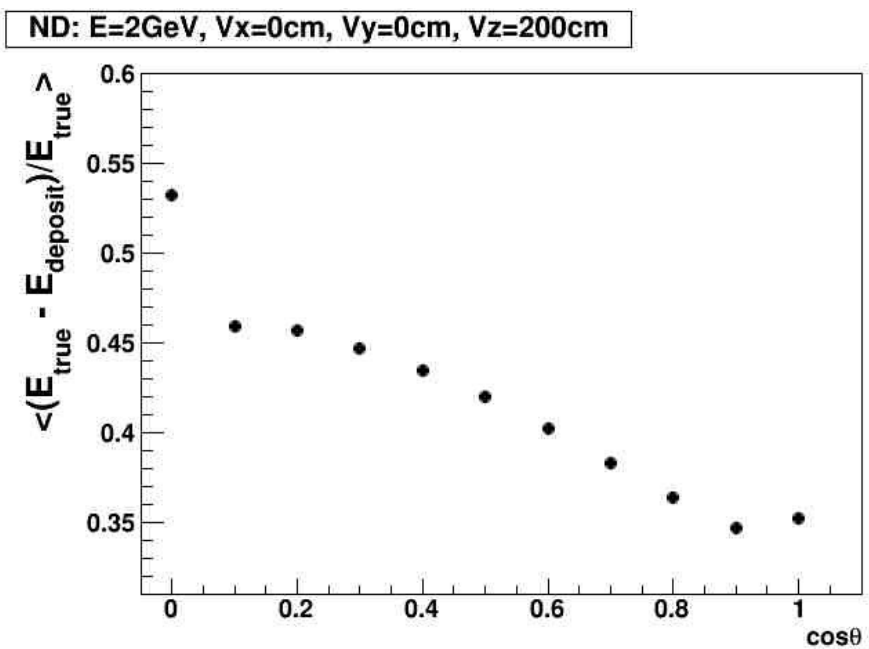


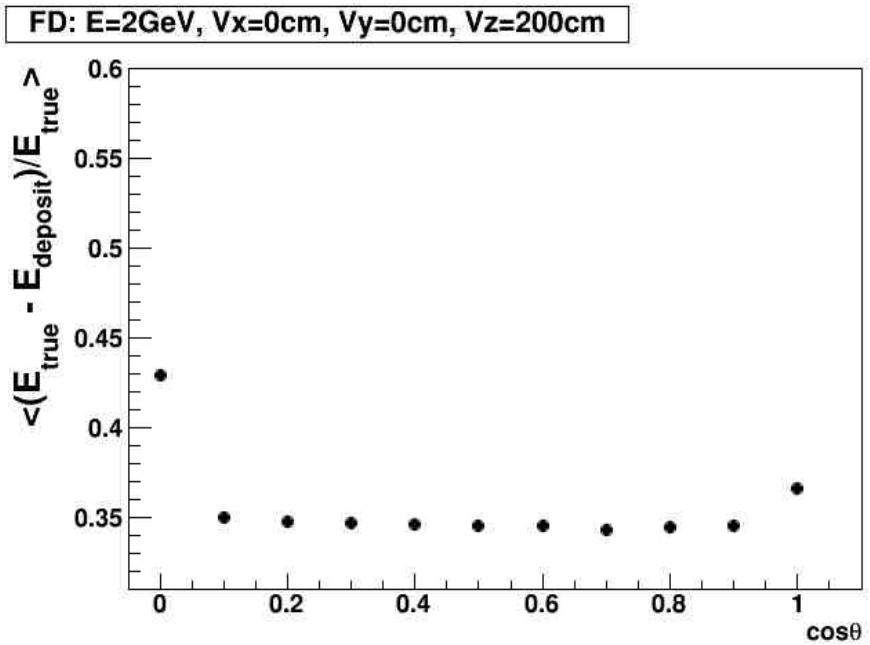
Need scale the Ereco by ~0.8 to match Edeposit.

Etrue vs. Edeposit

- The difference between Etrue and Edeposit represents how much energy is lost
  - Electron showers partially in the detector
  - Energy loss in the dead material (plastic,glue)

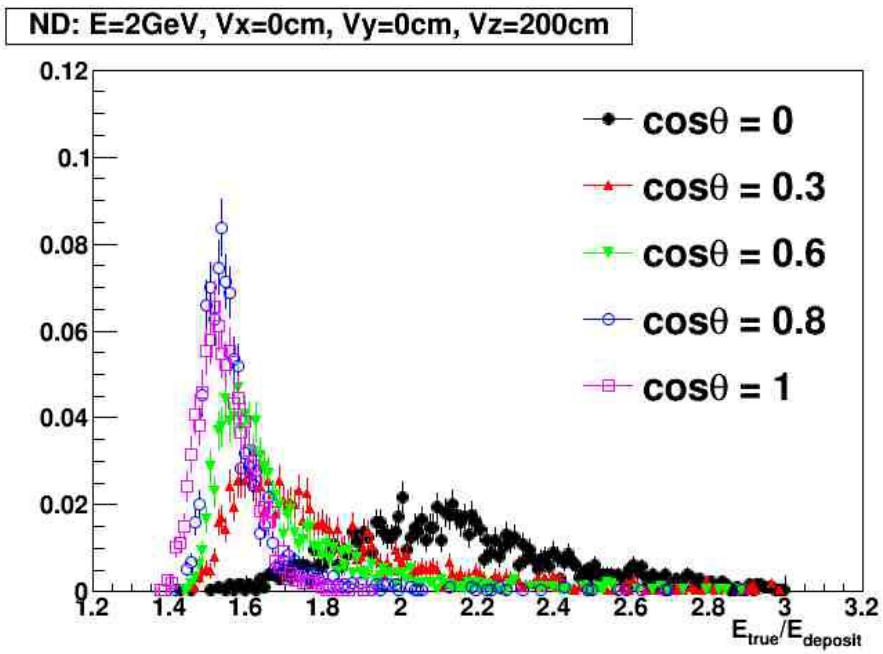
<(Etrue-Edeposit)/Etrue> vs. cosΘ

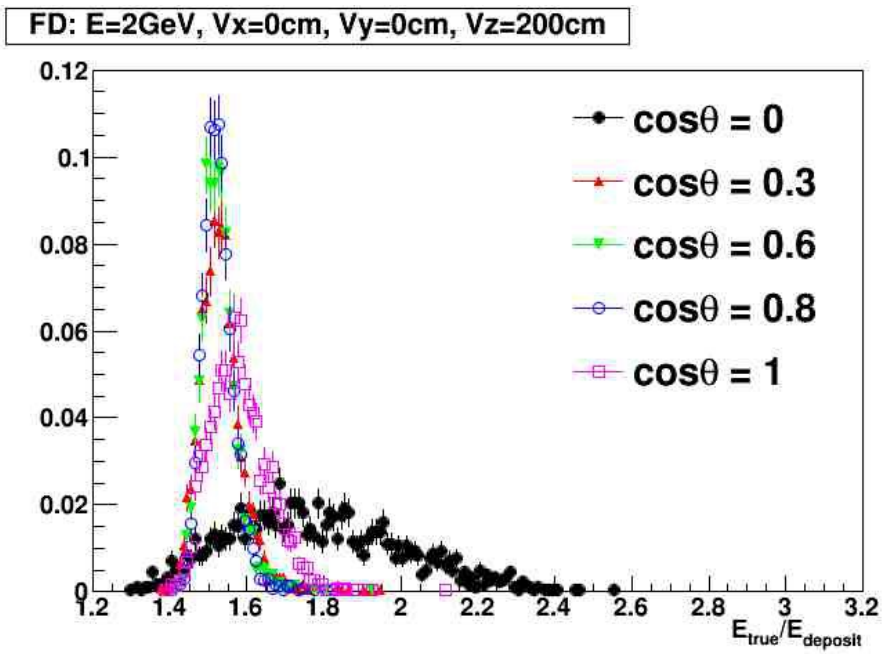




1. The difference between Etrue and Edeposit has visible dependence on cosΘ in ND, where the major reason would be partial showering
2. For FD, the dead material effect shows up at cosΘ~1

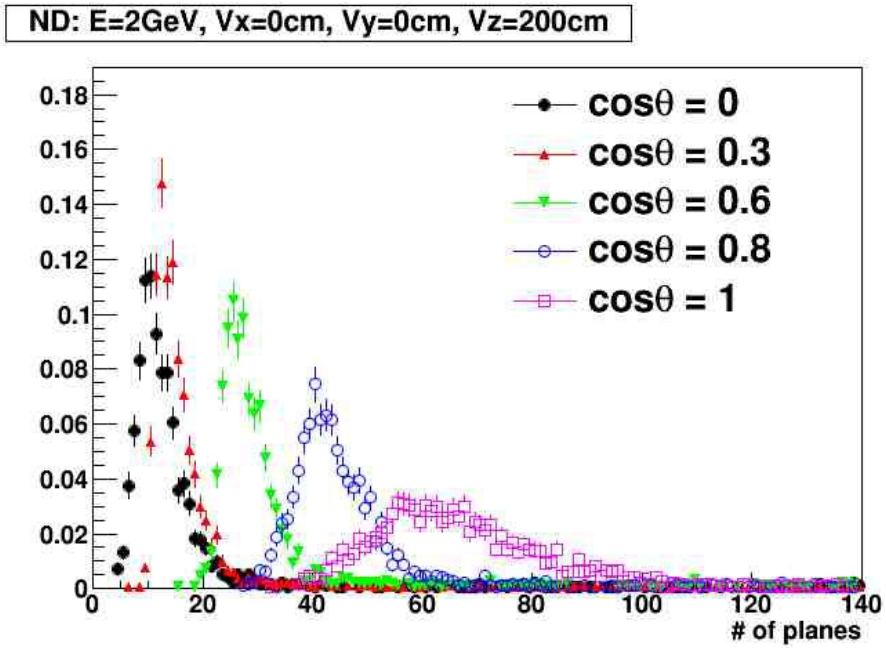
Etrue/Edeposit

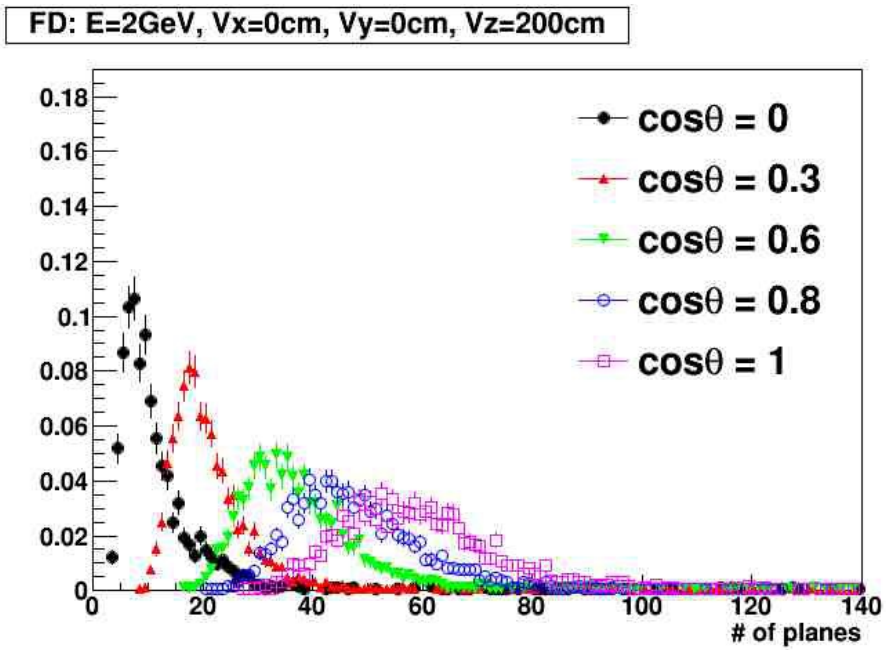




Need scale the Edeposit by ~1.5 to match Etrue.

of planes





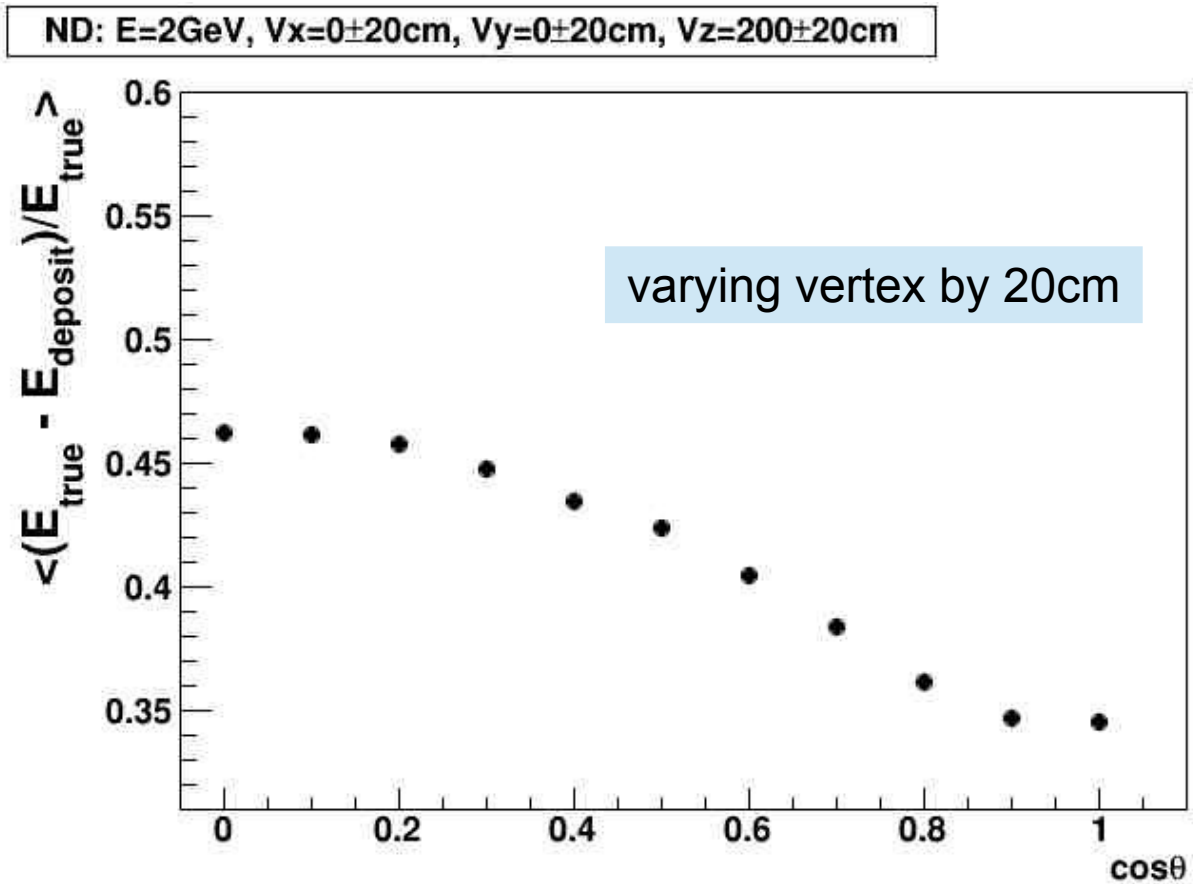
Moving to high cosΘ region, going through more plastic layers, which would compensate the energy loss in the integrated length in the small cosΘ region.

Summary

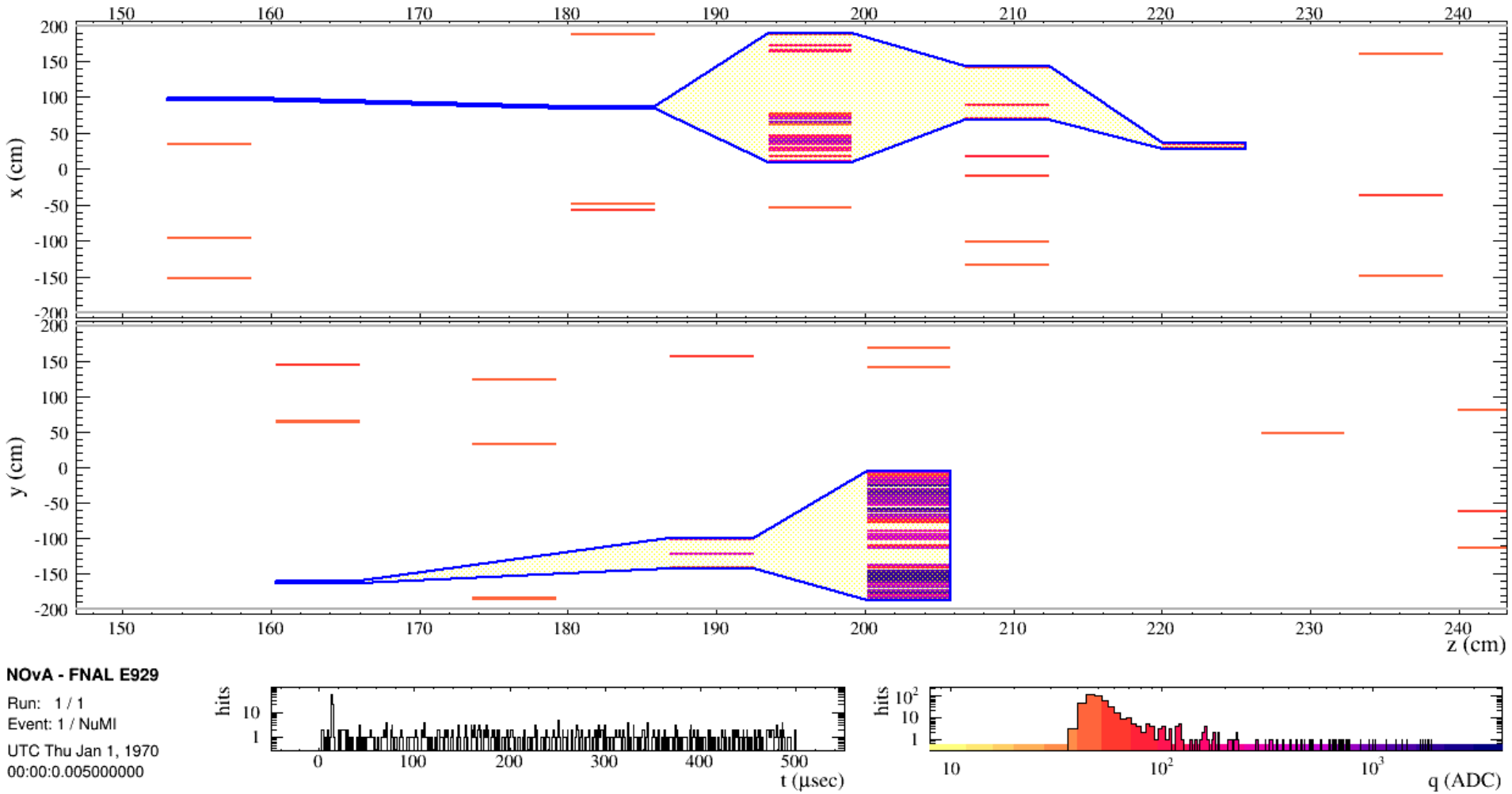
- Current calibration over-corrected the reconstructed energy, ~0.8 need be used to adjust that energy to match deposited energy.
- No visible dependence on the incident angle for energy difference between deposit energy and reconstructed energy for both ND and FD.
- There is visible dependence on the incident angle for the ND energy loss, which is mainly due to limited detector size where electrons just shower partially inside the detector. This has to be taken into account when applying the FD energy scale to ND.

back-up

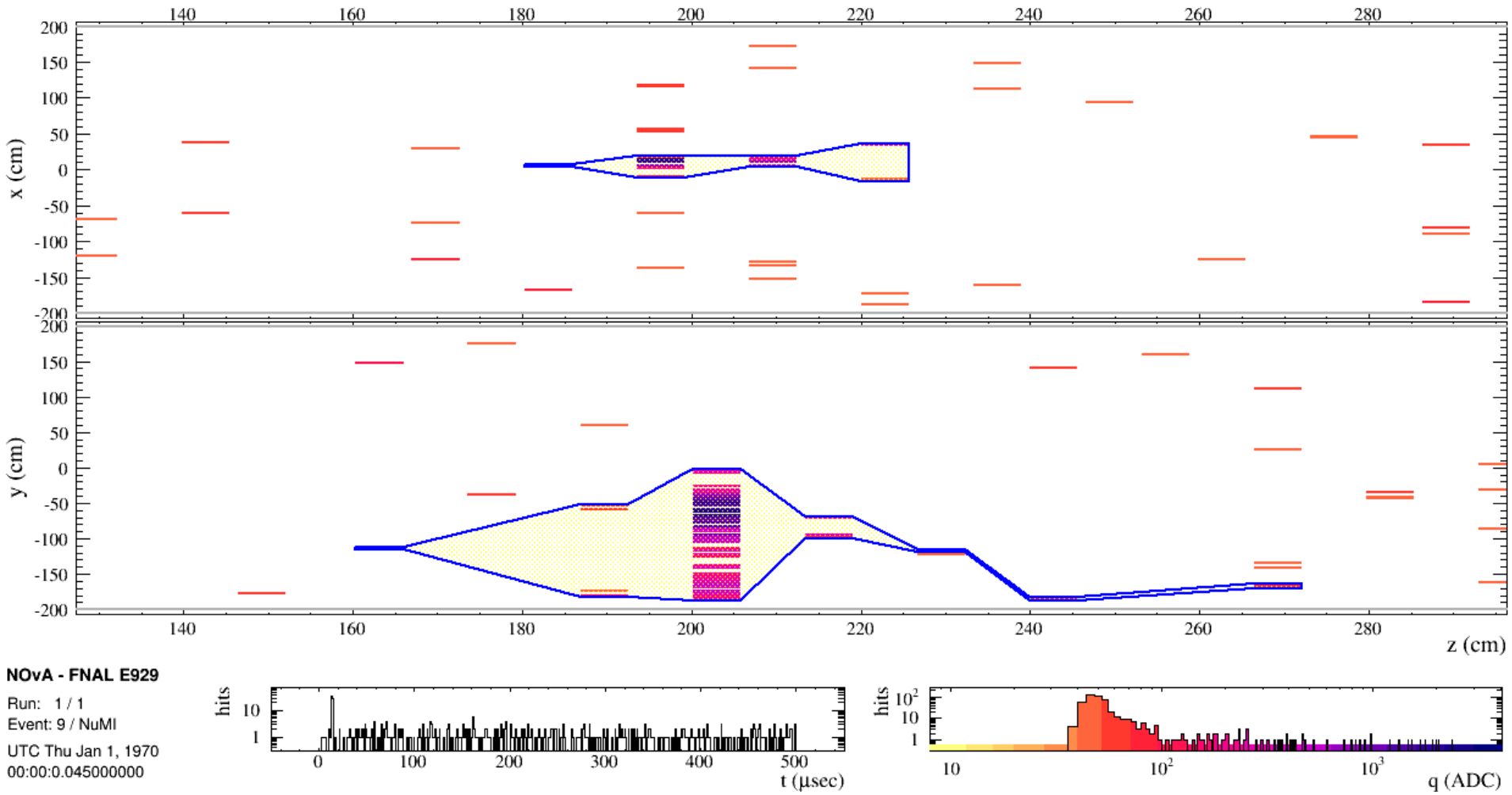
<(Etrue-Edeposit)/Etrue> vs. cosΘ



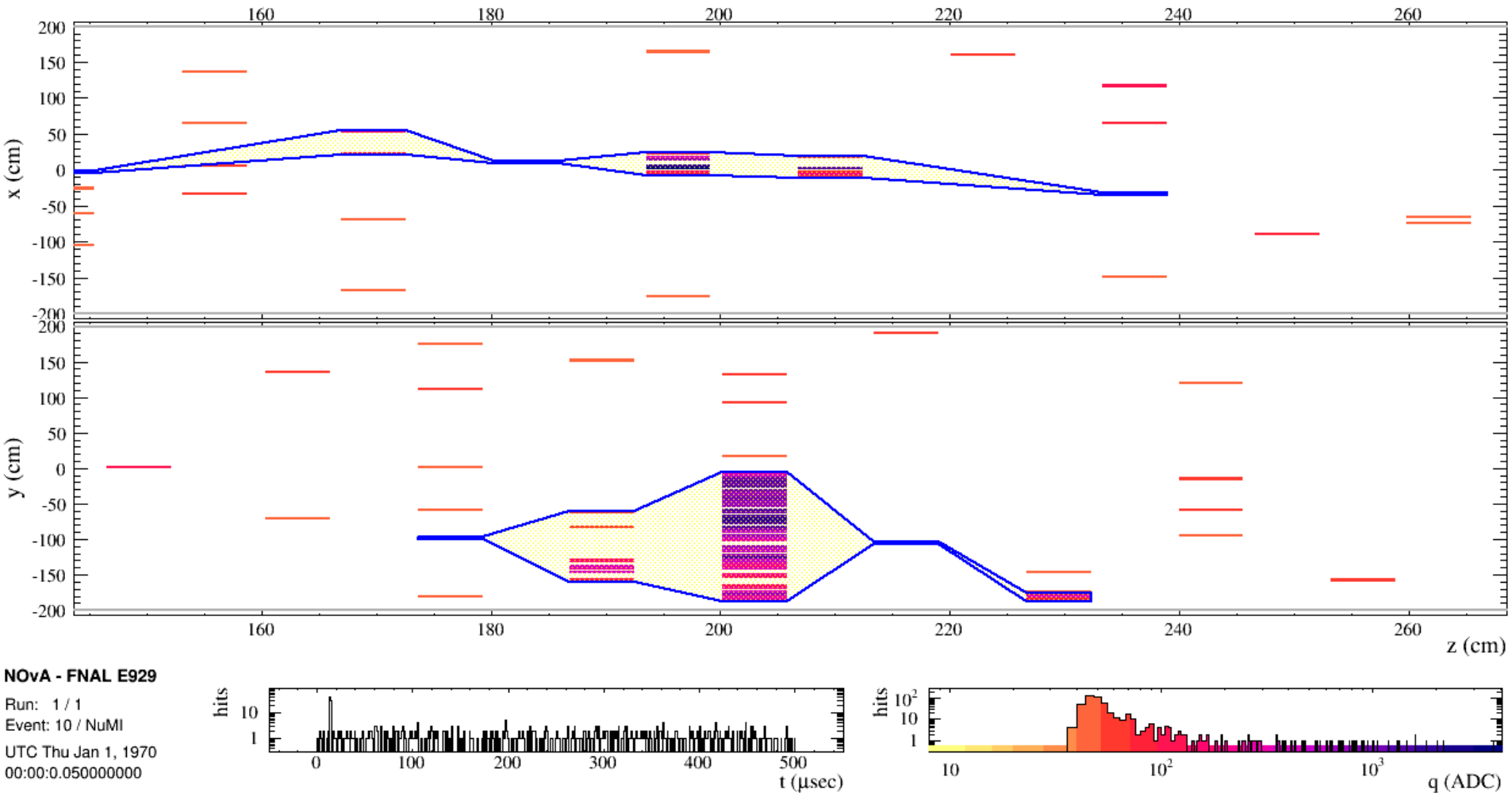
cosΘ=0 ND event with 11 planes for slice



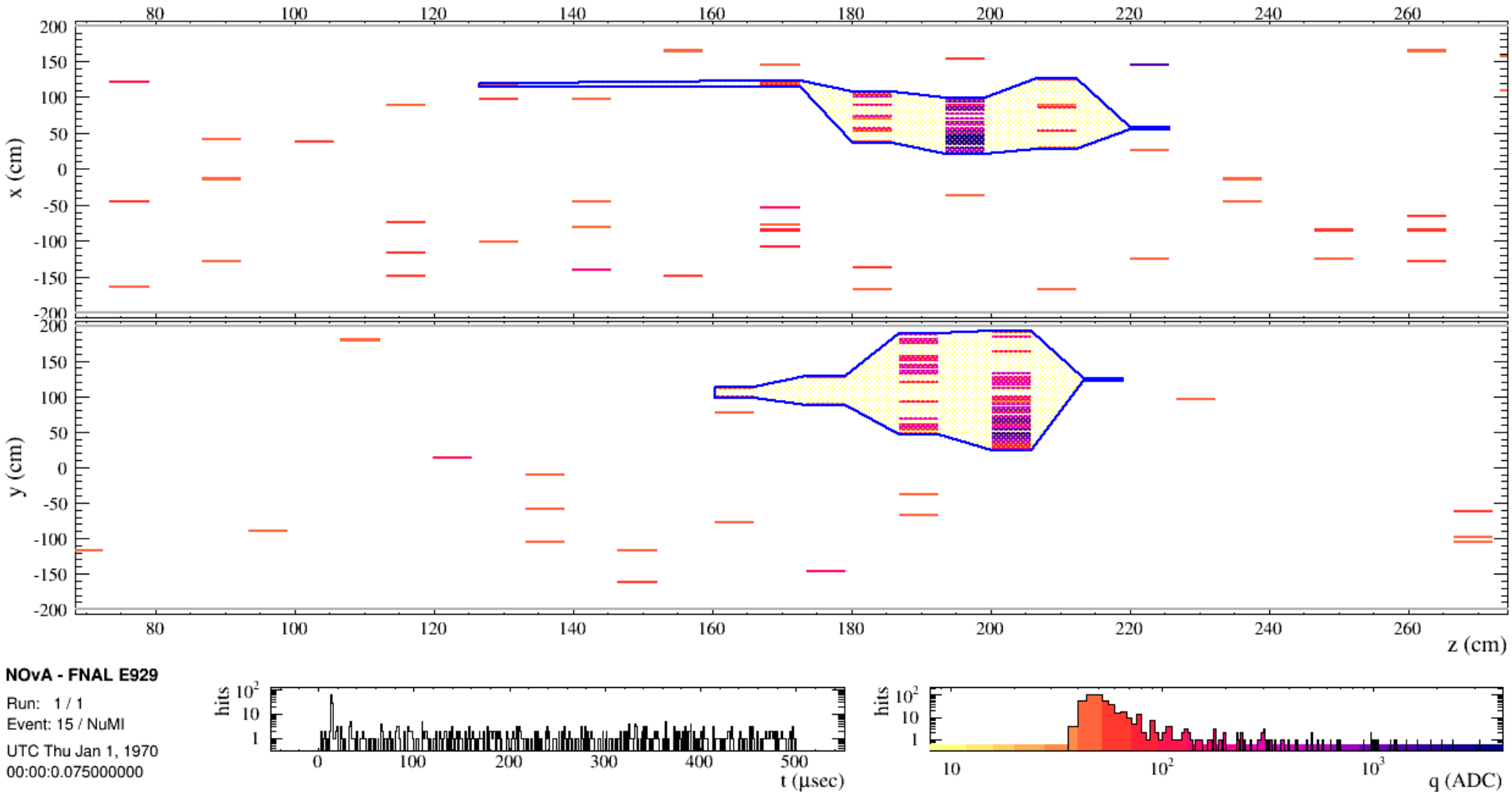
cosΘ=0 ND event with 17 planes for slice



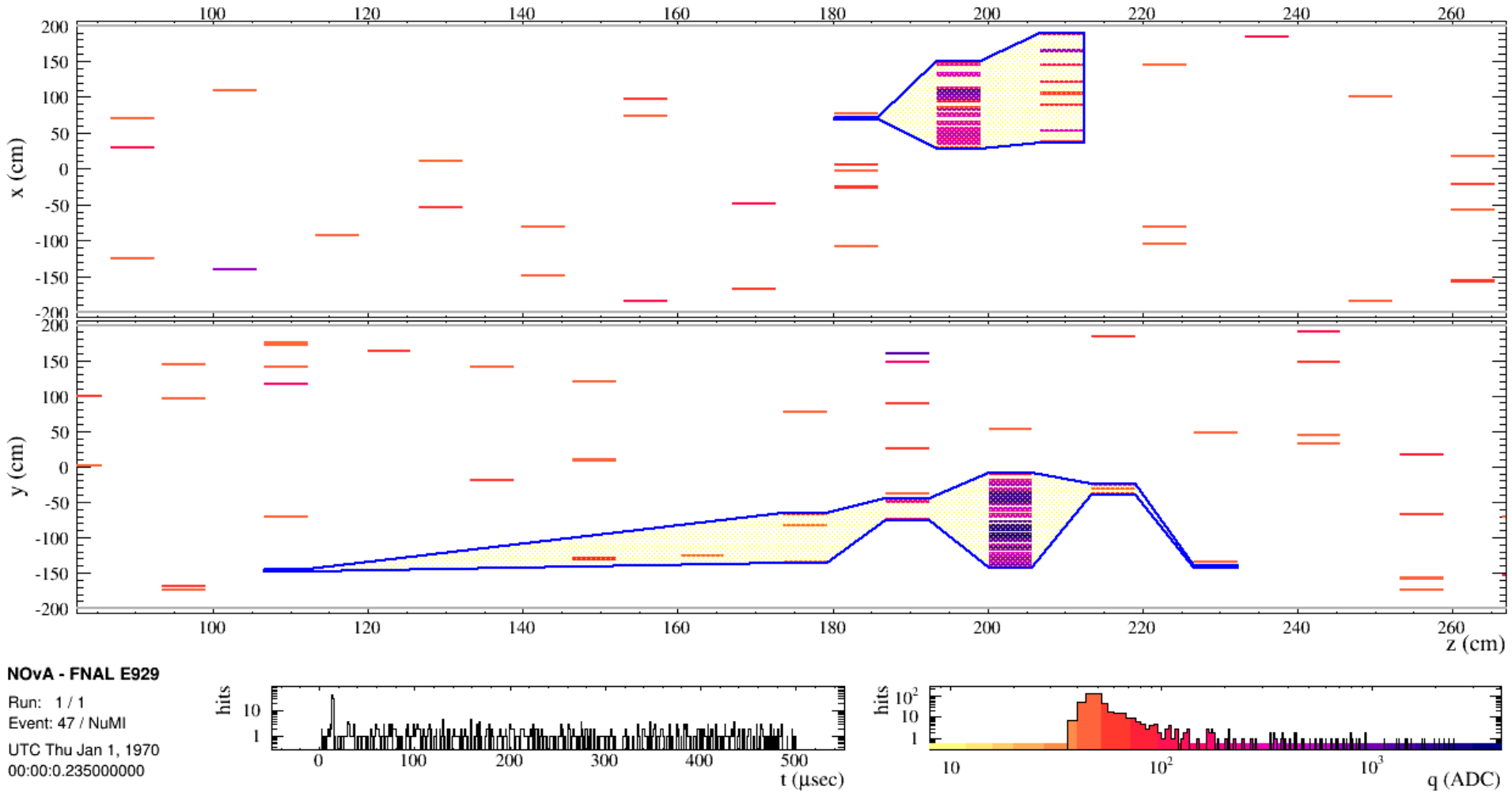
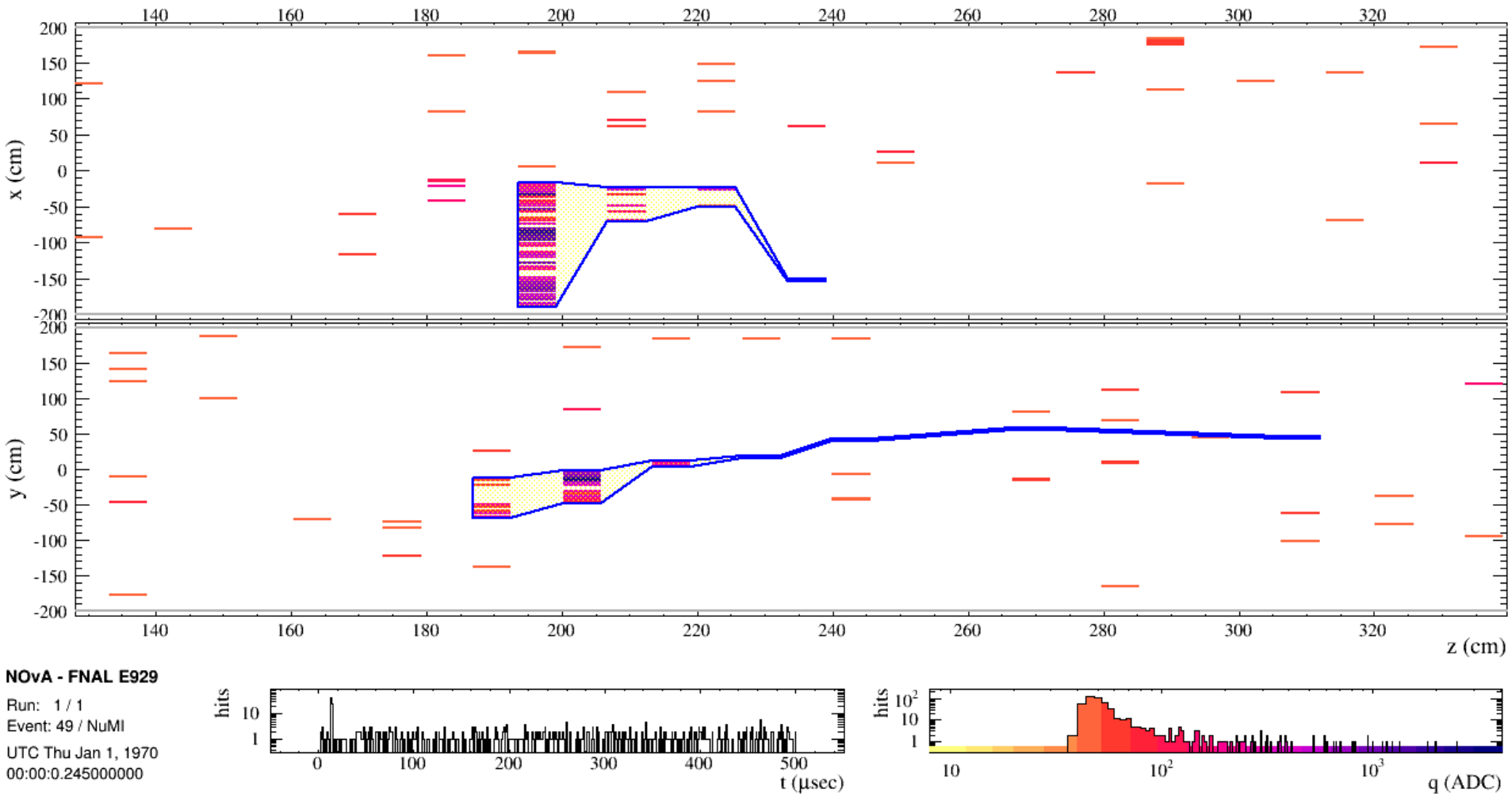
cosΘ=0 ND event with 15 planes for slice



cosΘ=0 ND event with 15 planes for slice



cosΘ=0 ND event with 19 planes for slice



cosΘ=0 ND event with 19 planes for slice