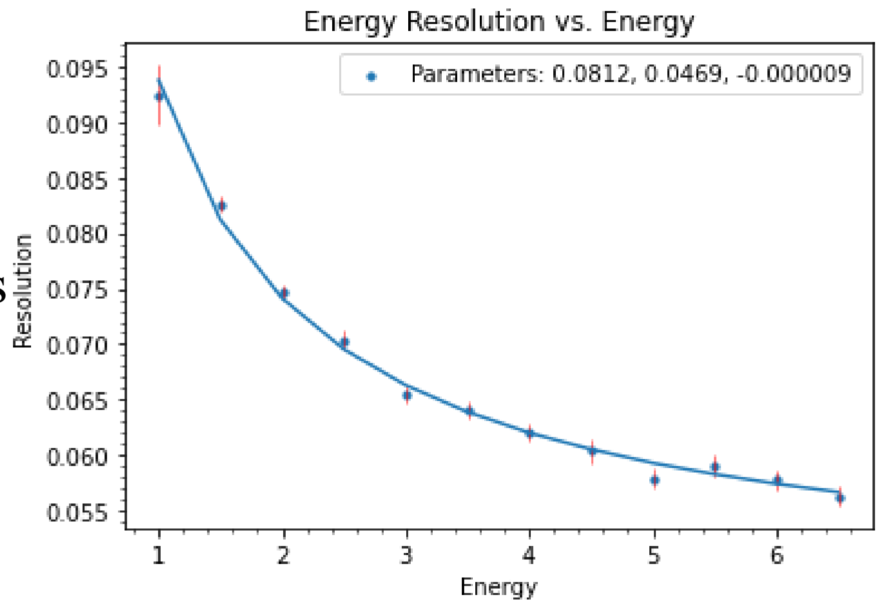
➢ Plan---from Xiaochao:

✓ run the current simulation with uniform (perfect) scintillator thickness, but with **hit_z** information

- when extracting energy resolution, instead of adding Edep = sum(all hits) Edep_z, we multiply each Edep_z by a random number r_i, which follows a normal/Gaussian distribution centered at 1 with sigma 0.01 (if 1% non-uniformity in scintillator thickness) and calculate Edep = sum (Edep_z * r_ilayer).
- Extract energy resolution as usual. For fair comparison, I think we should use the exact same algorithm to extract energy resolution, and the only difference will be coming from the non-uniformity applied in step (b).
- We can modify r_i to be Gaussian of different width, or binomial (if scintillators have two distinct thickness but the assembly team doesn't track it, so stack them randomly), or whatever the measurement shows.



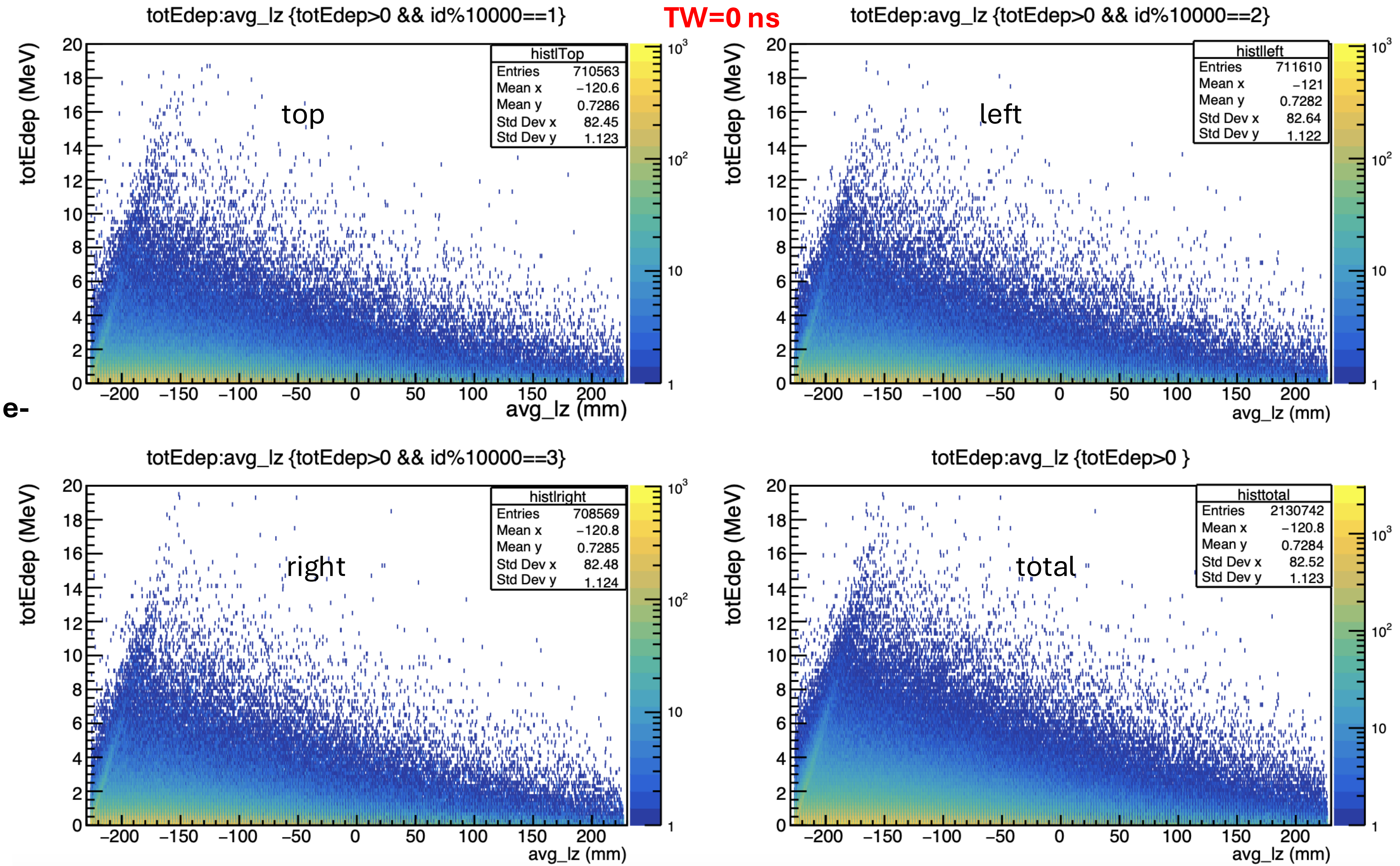
From Blane

➢ **Simulation configuration and analysis codes:** https://github.com/tianye8001/ECAL_summer_2024

Analysis:

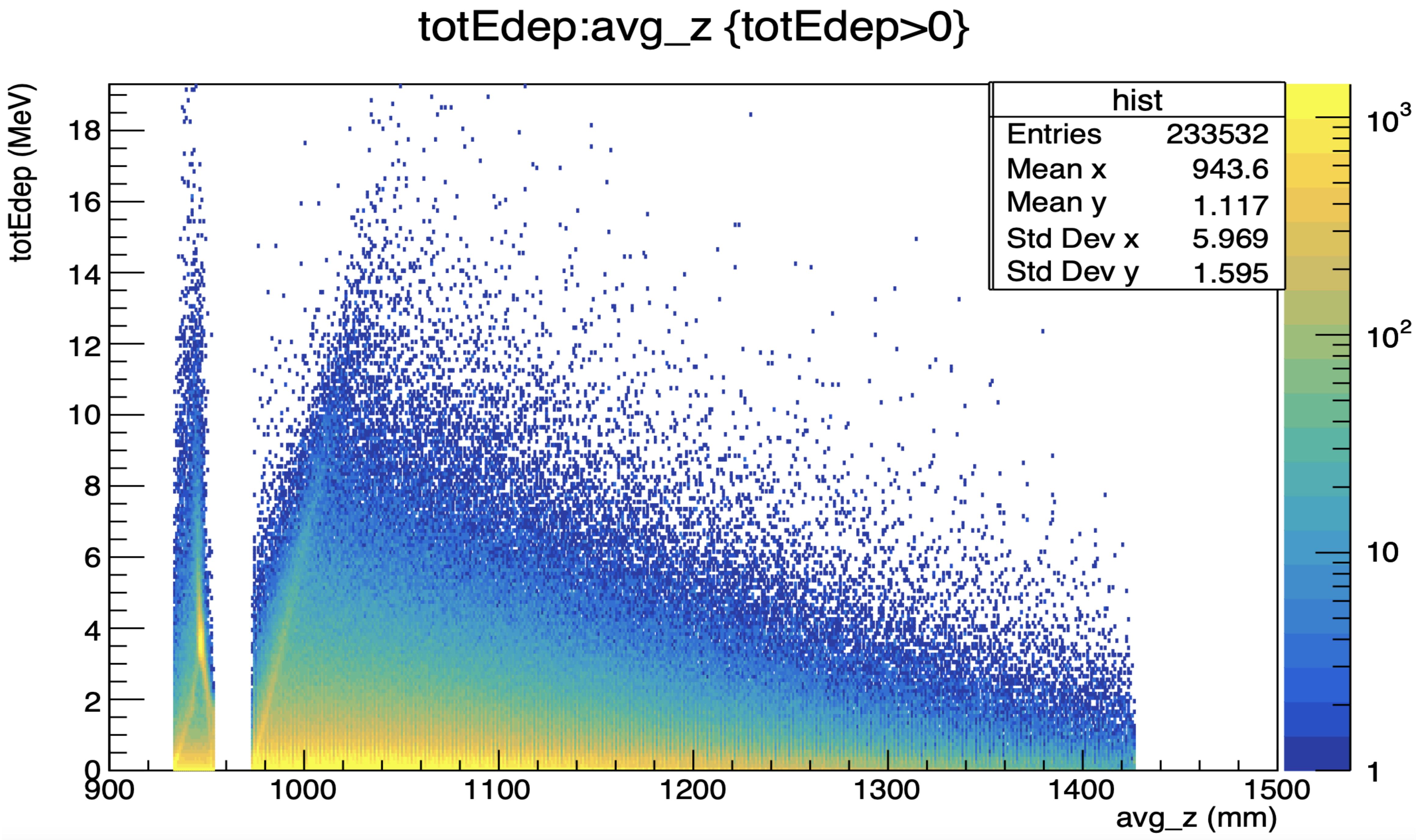
- analysis_tree_solid_ec.C----Eend_ec_sum += solid_ec_totEend->at(j). For each hit, there is a corresponding Edep for avg_lz , which can be randomized according to the above plan.
- fileReducer_ec.C-----get deposit energy in preshower and shower
- resolution.C----example code to draw energy resolution plot

TW=0 ns



1 GeV e-

(-234, 234) mm **194 layers Lead:0.05 cm Scint:0.15cm Layer thickness: Lead+scint+gap+paint=0.234 cm**

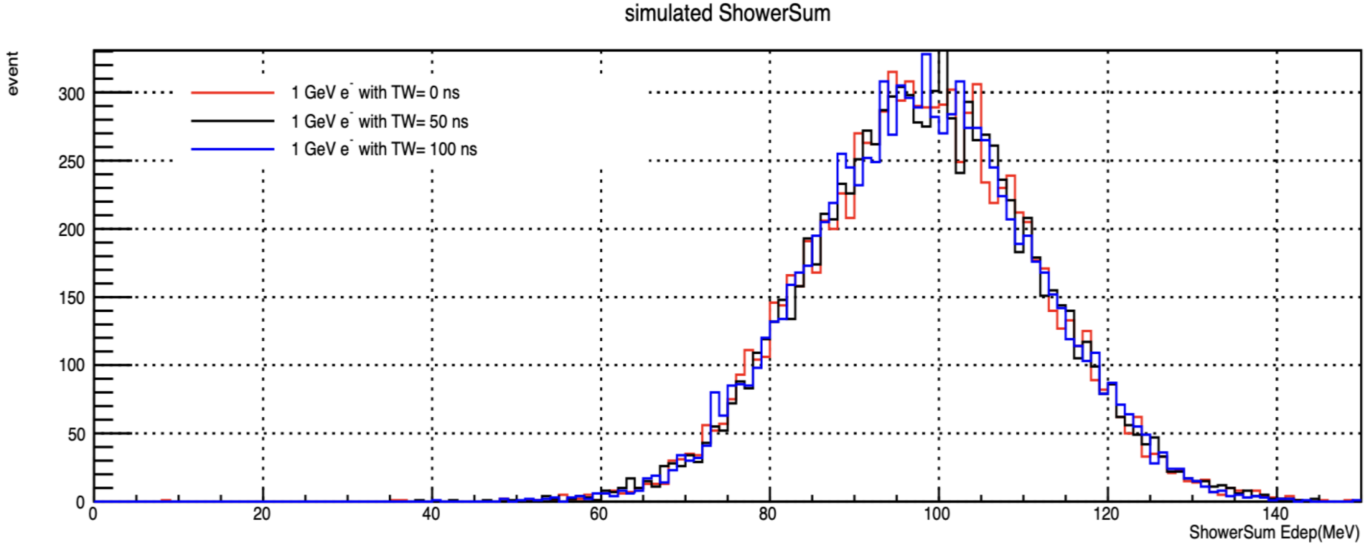


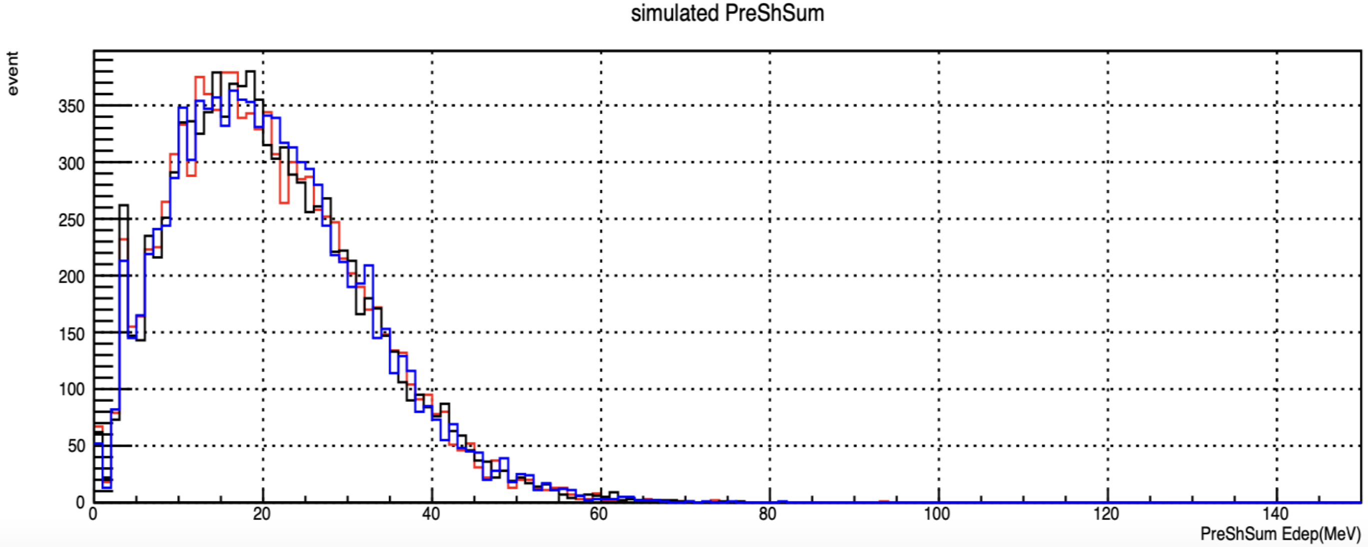
hist

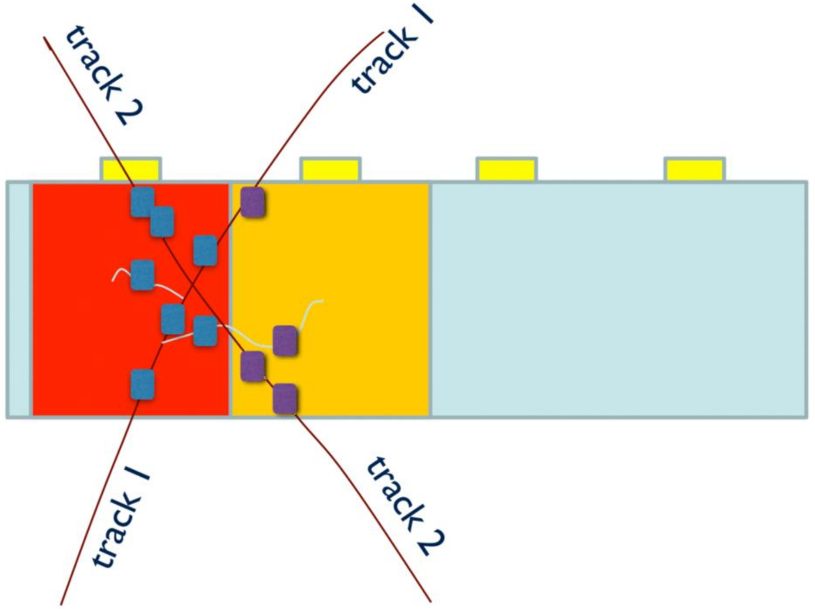
Entries	233532
Mean x	943.6
Mean y	1.117
Std Dev x	5.969
Std Dev y	1.595

Backup

Check TW windows







- Track 1 has 3 (blue) steps in the first red cell and one (purple) step in the second yellow cell.
- Track 1 also has two secondaries; the first one has one step in the red cell and the second one has two steps, one in each cell.
- Track 2 has 2 steps in each cell, within the TW of the previous steps. So its steps do not create new hits but add to the previous hits' steps.
- All the blue steps happens within the detector TW: they constitute one hit.
- All the purple steps happens within the detector TW: they constitute one hit.
- In total, we have two hits. Notice that if the second track was out of the TW, it would generate two additional hits, with two steps each in each cell.

Root Tree Draw Commands

```
[tianye@ifarm2401 script]$ root -l out.root
root [0]
Attaching file out.root as _file0...
(TFile *) 0x3a92140
root [1] solid_ec->Draw("totEdep:avg_lz>>hist(200,-234,234,2000,0,20)","totEdep>0 && id%10000 ==1","COLZ")
```