

# Sub-periods for 1GeV runs

Sub-period lists (production runs are before the “|” mark)

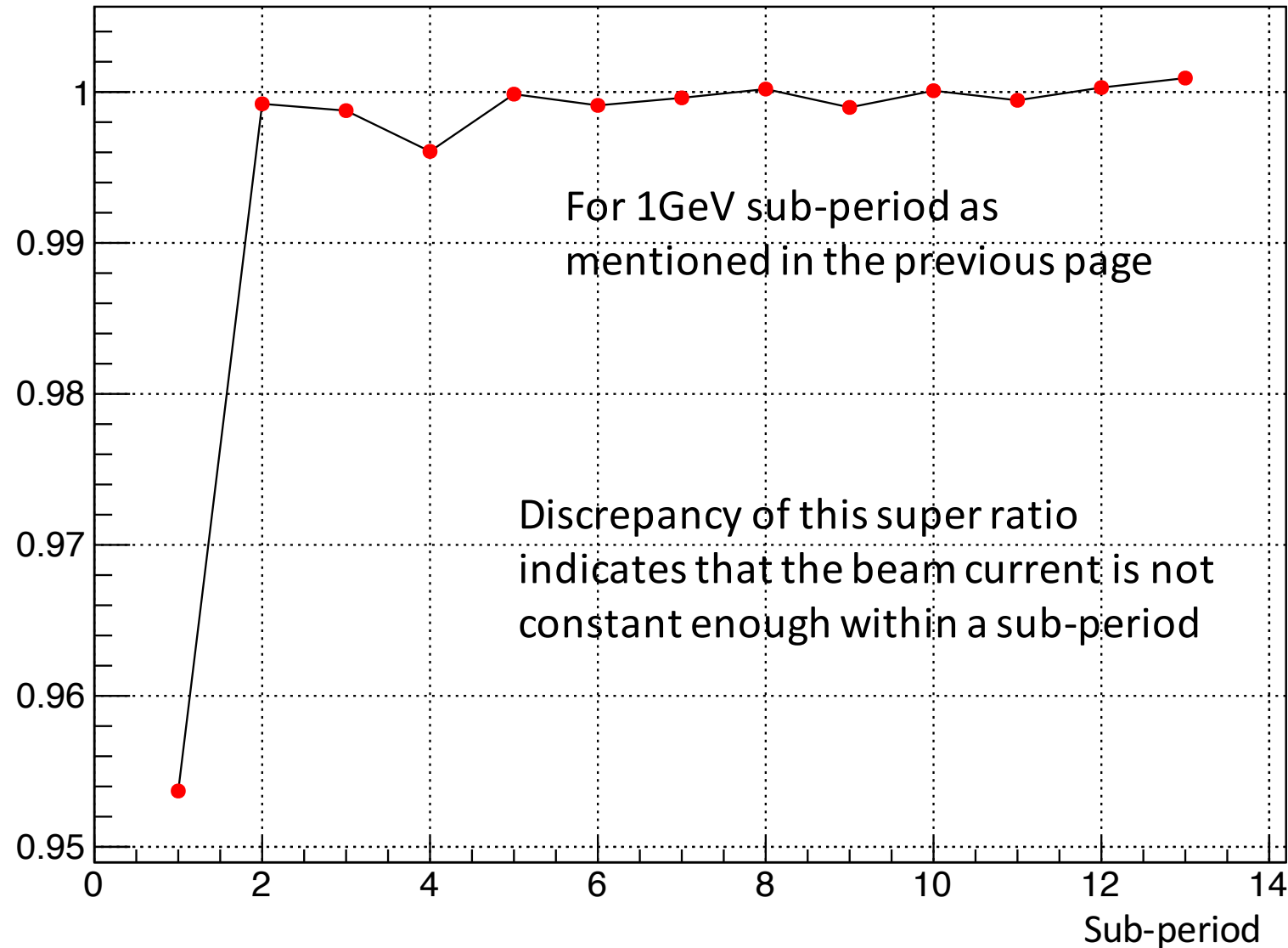
1. 1136, 1137 | 1135
2. 1155, 1158, 1159, 1160 | 1153, 1154, 1161 with ~63% live time for the production runs
3. 1201, 1202, 1203, 1205, 1206, 1207 | 1197, 1198
4. 1238, 1240, 1241, 1242, 1243 | 1237
5. 1287, 1288, 1290, 1291, 1292, 1293, 1295 | 1289, 1294
6. 1302, 1303, 1304 | 1306
7. 1308, 1309, 1310, 1311 | 1306, 1312
8. 1313, 1314, 1315, 1316 | 1312, 1317
9. 1320, 1322, 1323 | 1324 with ~86% live time for the production runs
10. 1325 | 1324, 1326
11. 1328 | 1327, 1329
12. 1331 | 1330
13. 1336, 1337, 1338, 1340, 1341 | 1339

Notice: (1) 1129 should be a target in gas out run (no gas flow rate), marked as empty target run in run list  
(2) there are production runs before 1136, but have not done event selection cuts yet, and they are before the increase of HV for the compensation of rad damage (which was done at 1125)

# Live charge ratio over live time ratio

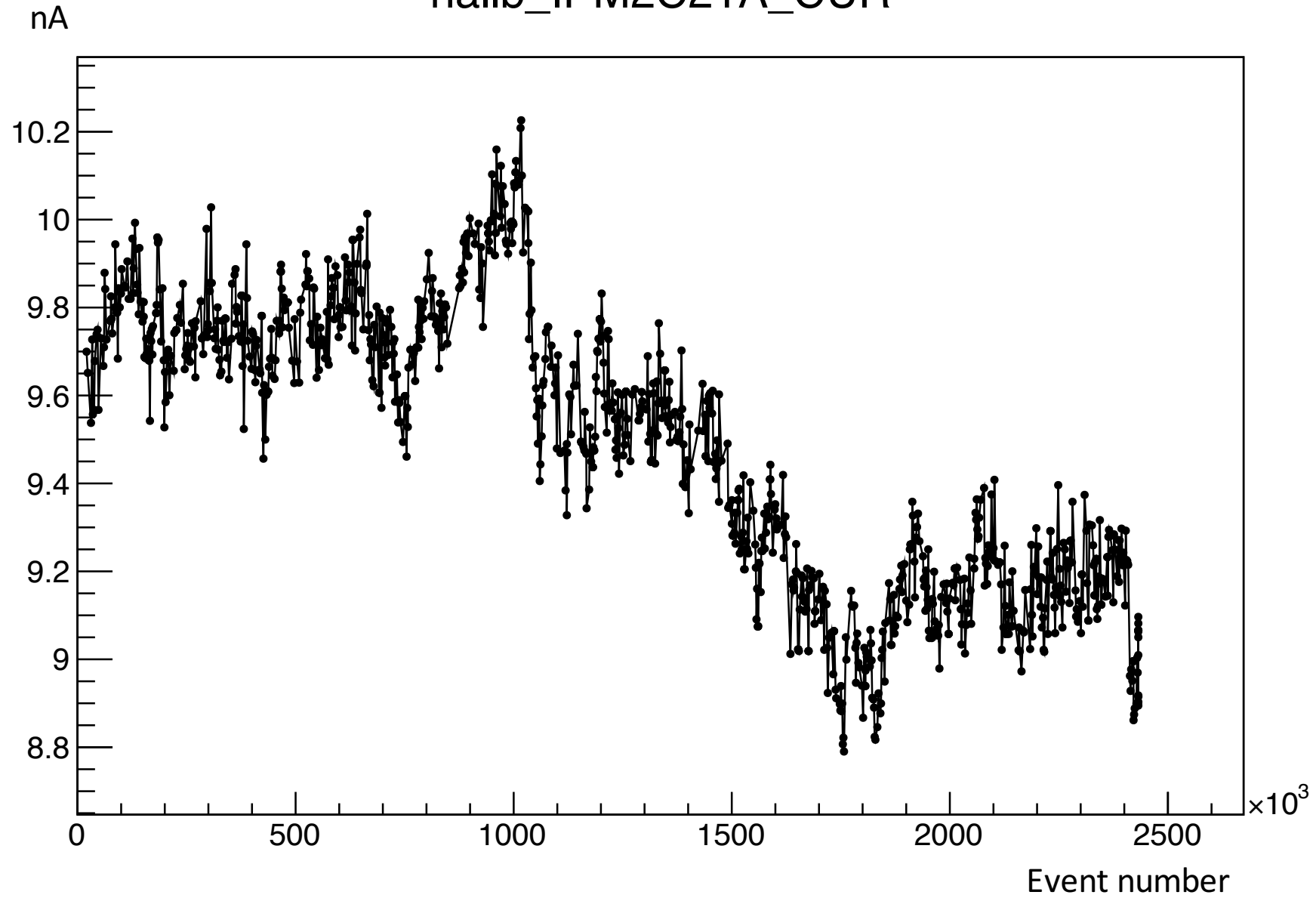
Graph

$(\text{live charge pro} / \text{live charge empty}) / (\text{live time pro} / \text{live time empty})$



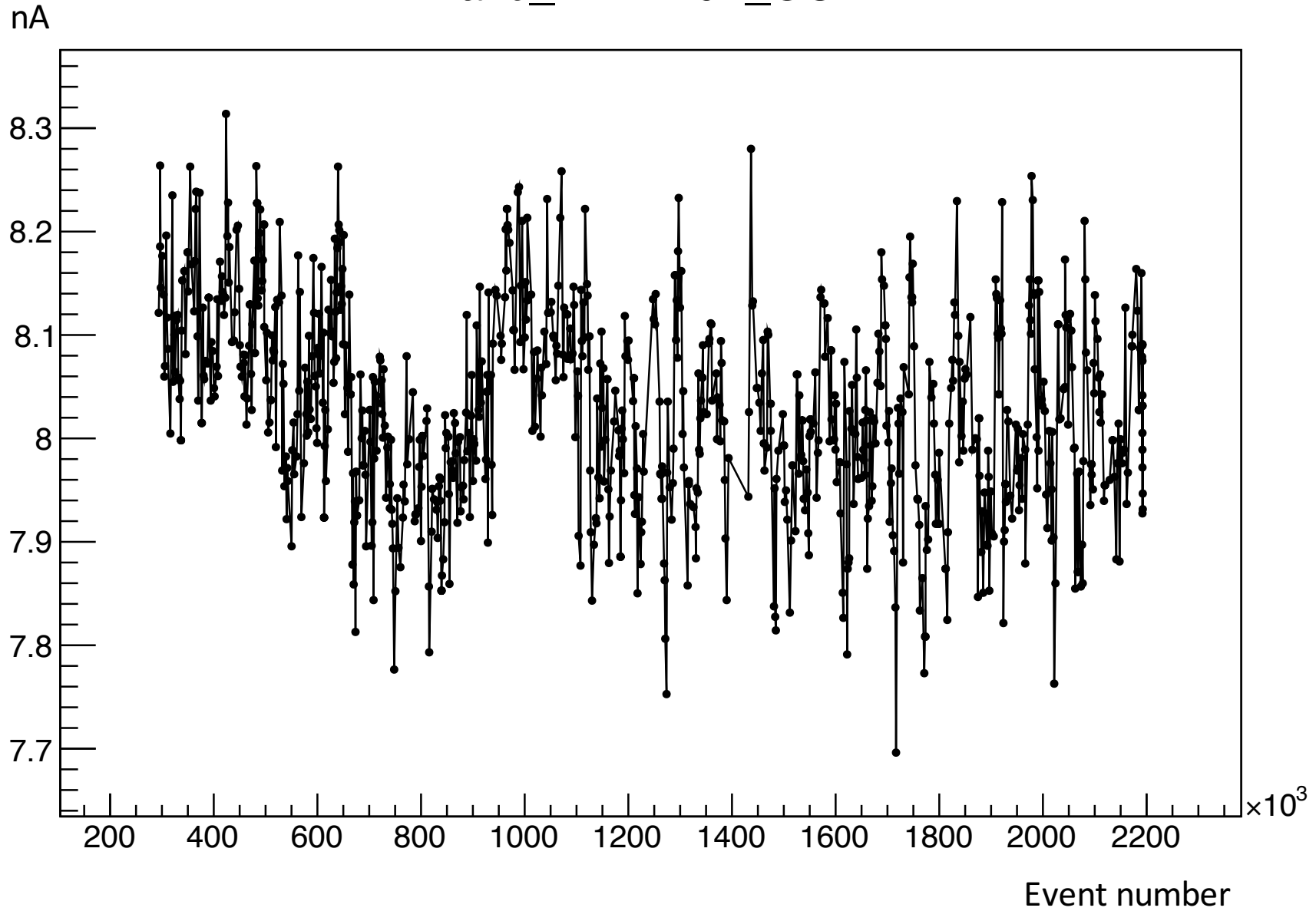
# Beam current run 1135

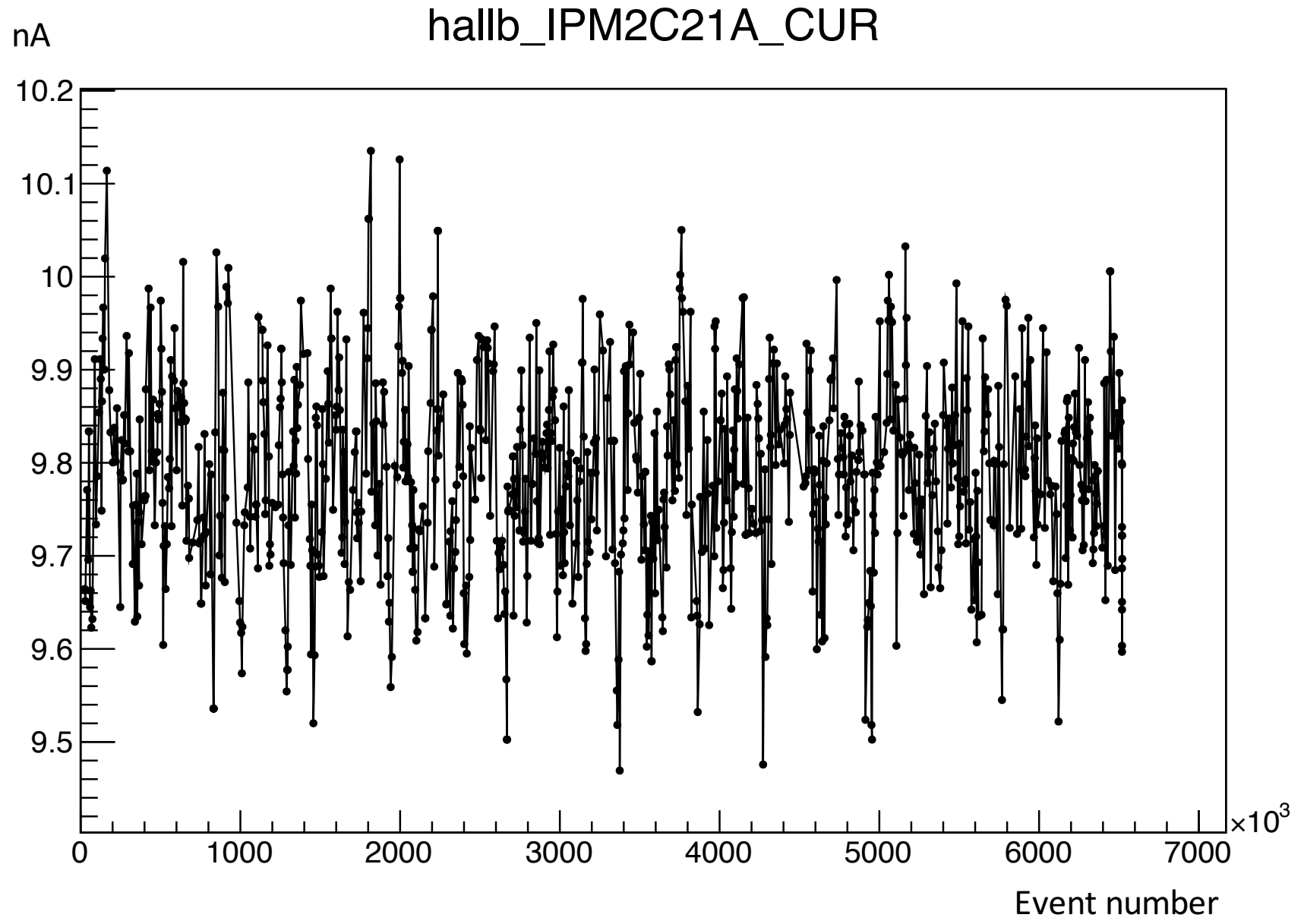
halb\_IPM2C21A\_CUR



# Beam current run 1237

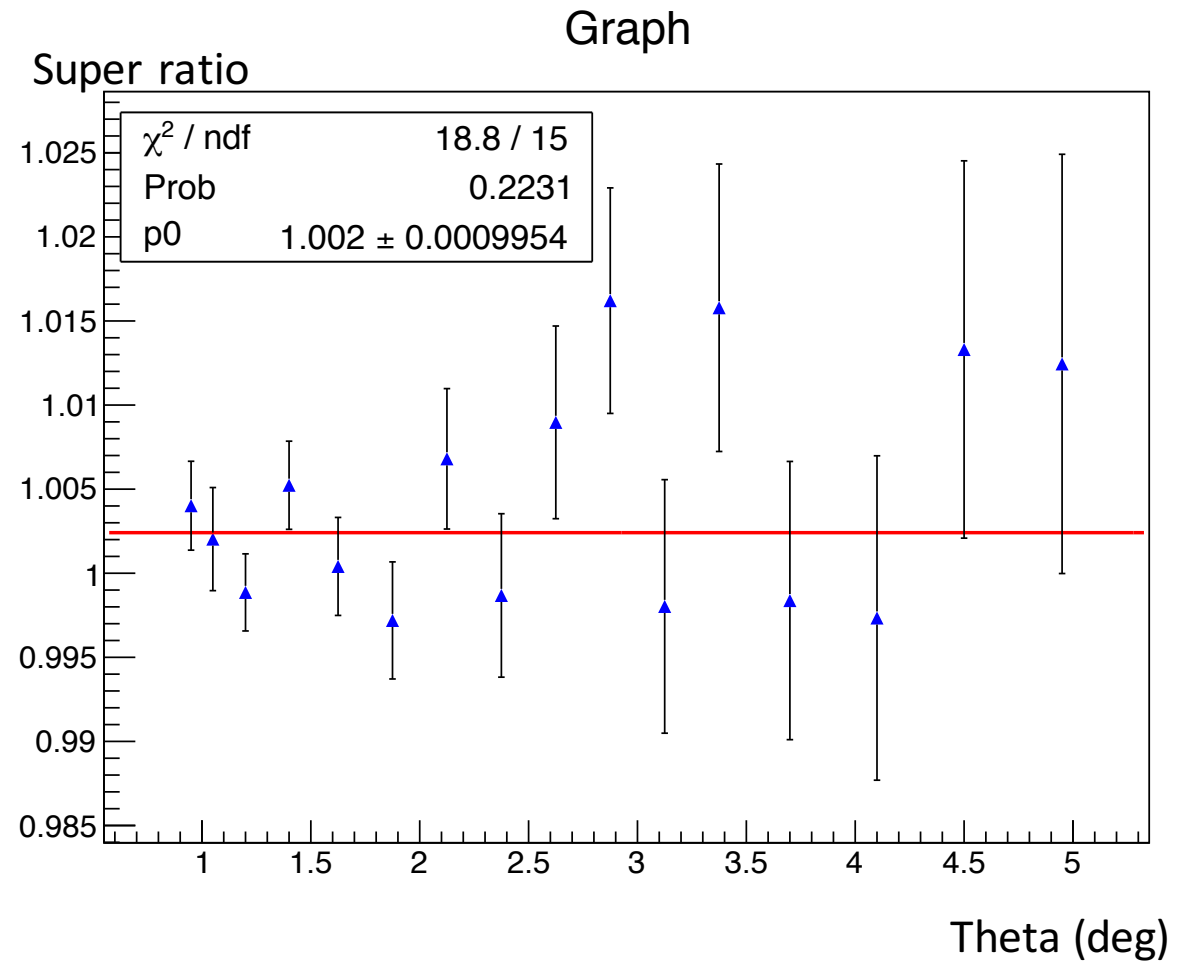
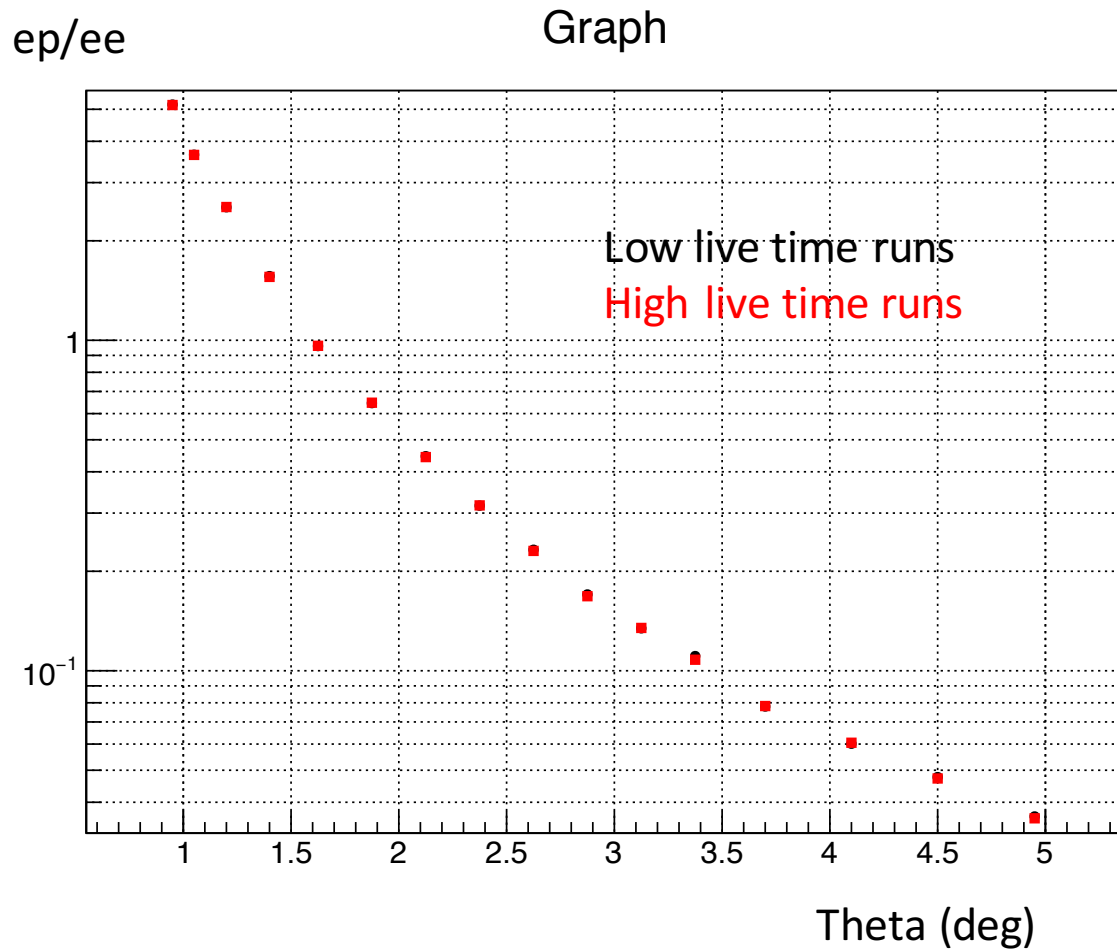
hallb\_IPM2H01\_CUR





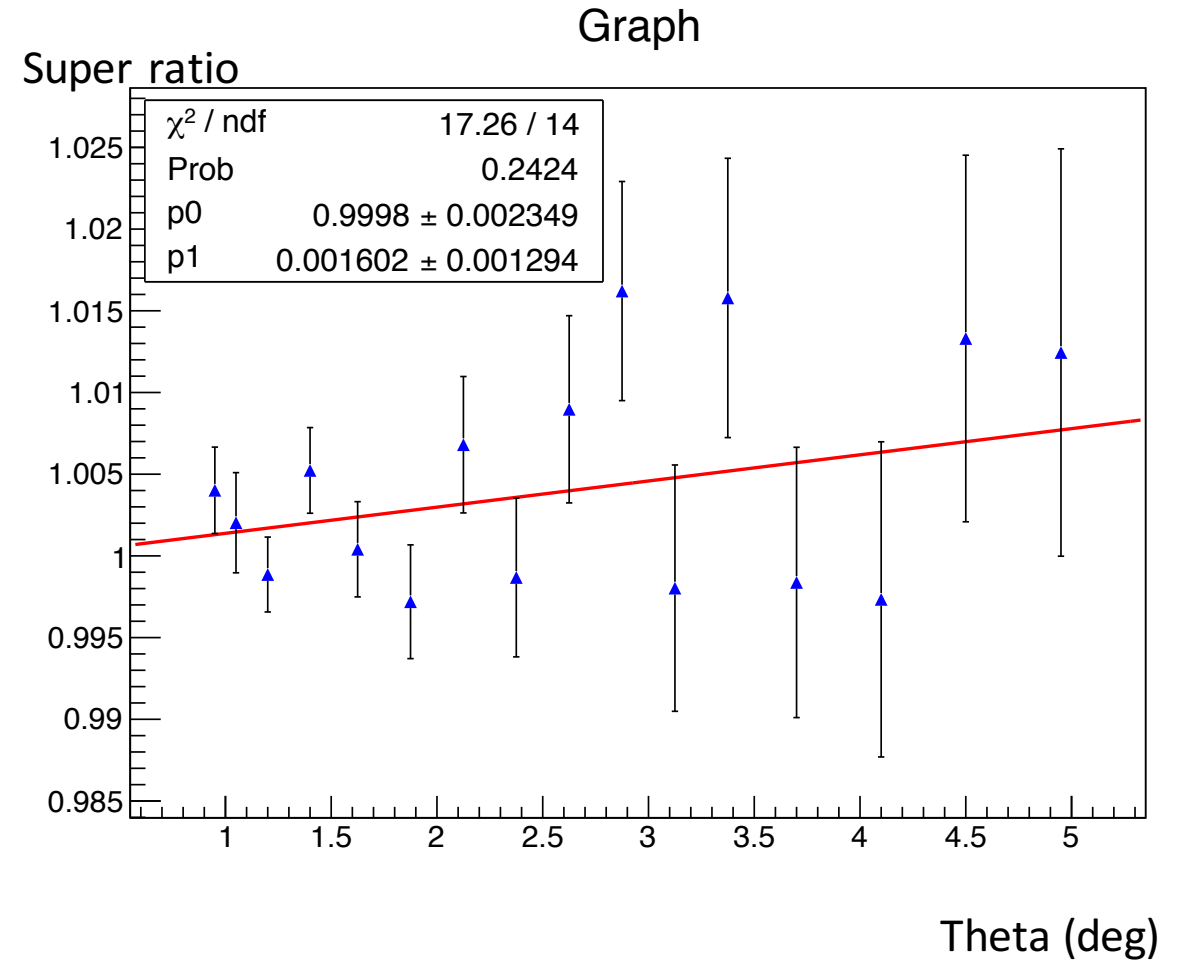
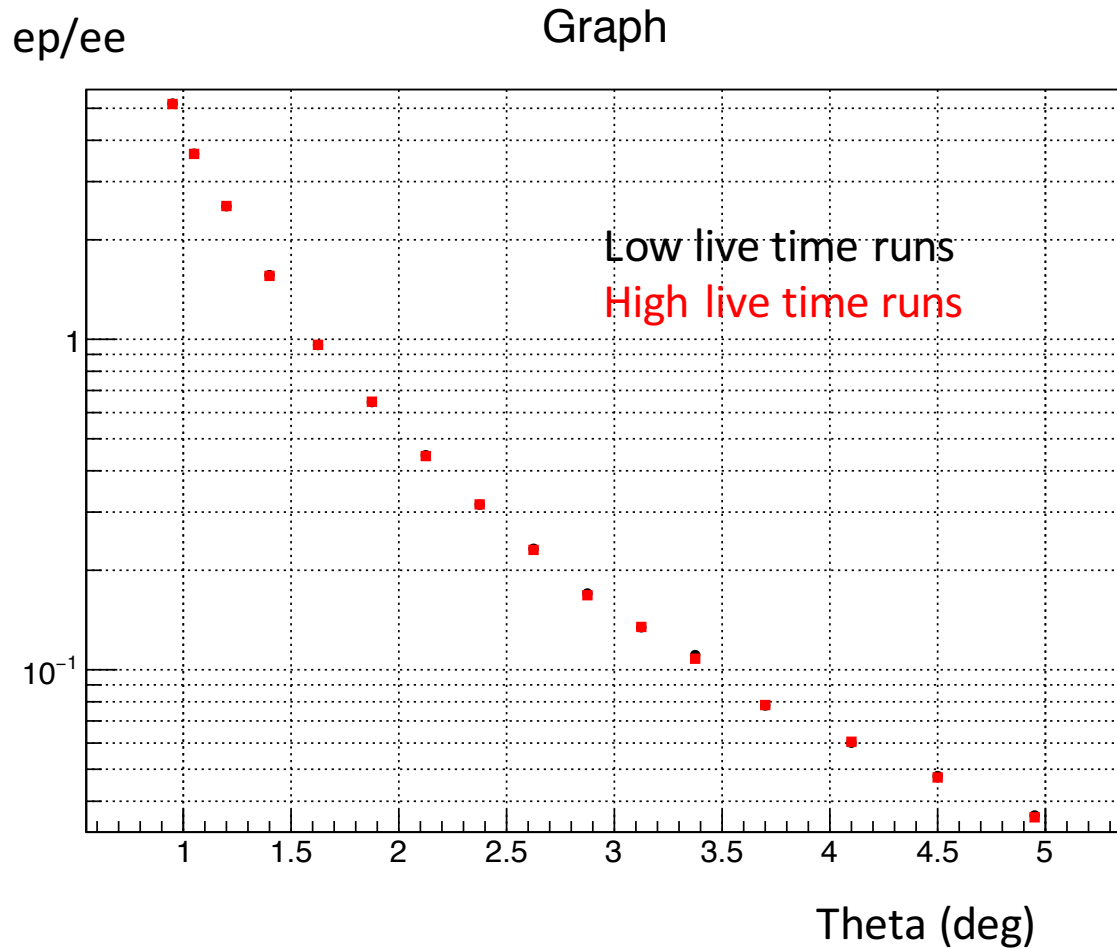
# Yield comparison for sub-periods with different live time

Using HyCal only



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Using HyCal only

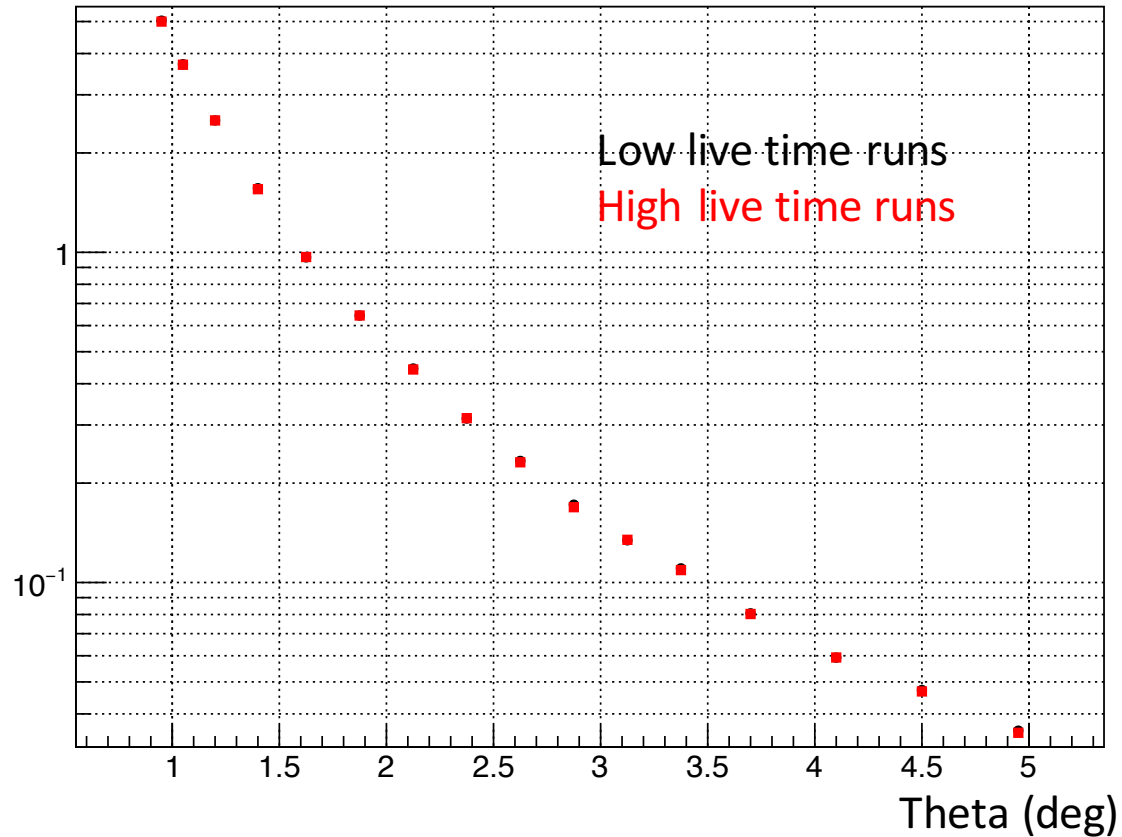


# Yield comparison for sub-periods with different live time

Using GEM, efficiency calculated and corrected for high and low live time runs **separately**

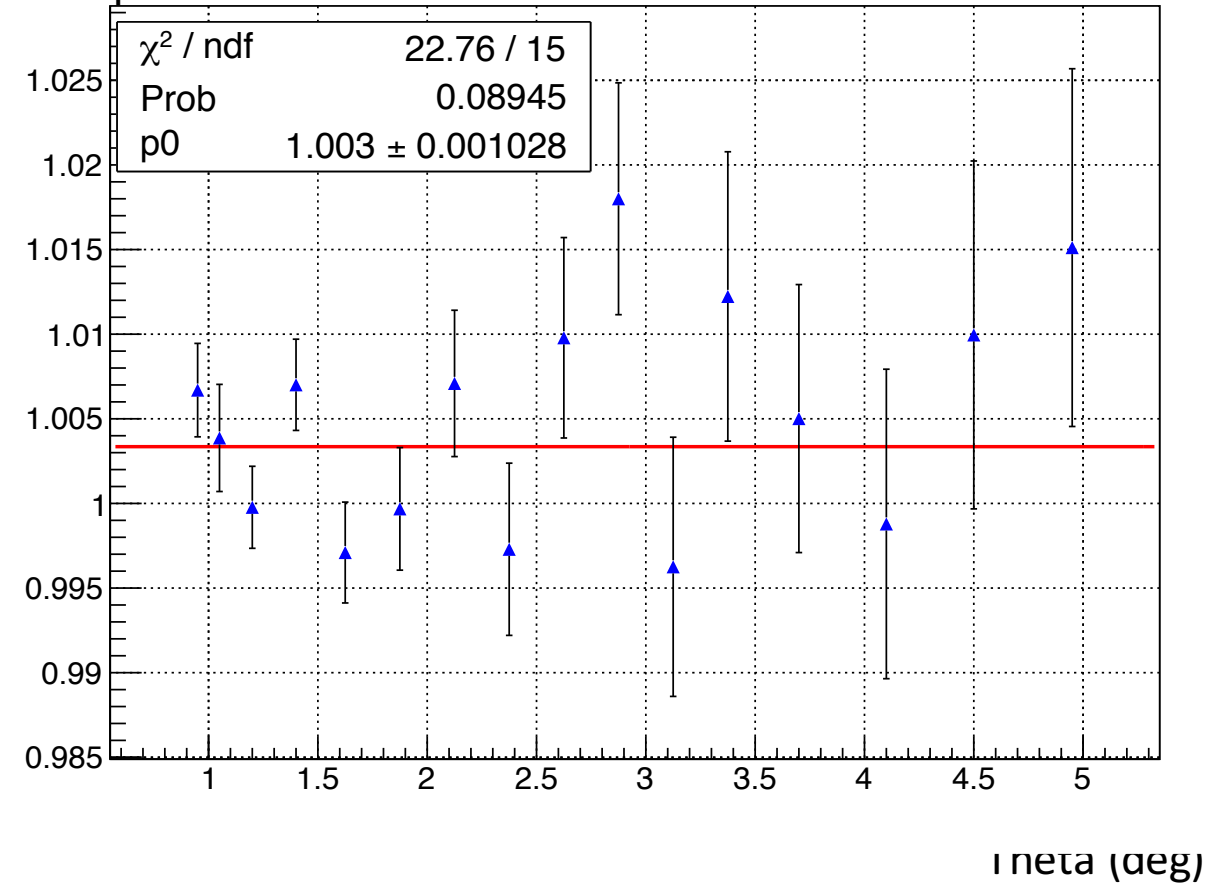
ep/ee

Graph



Super ratio

Graph



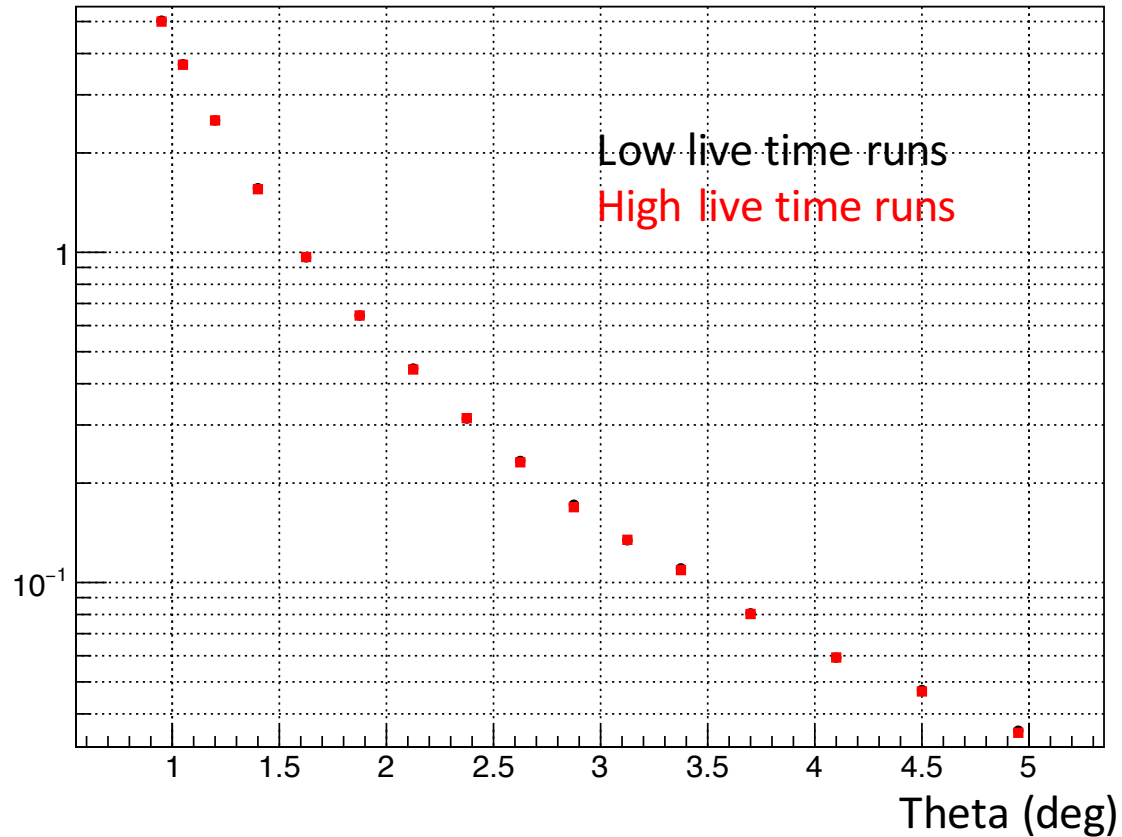


# Yield comparison for sub-periods with different live time

Using GEM, efficiency calculated and corrected for high and low live time runs **separately**

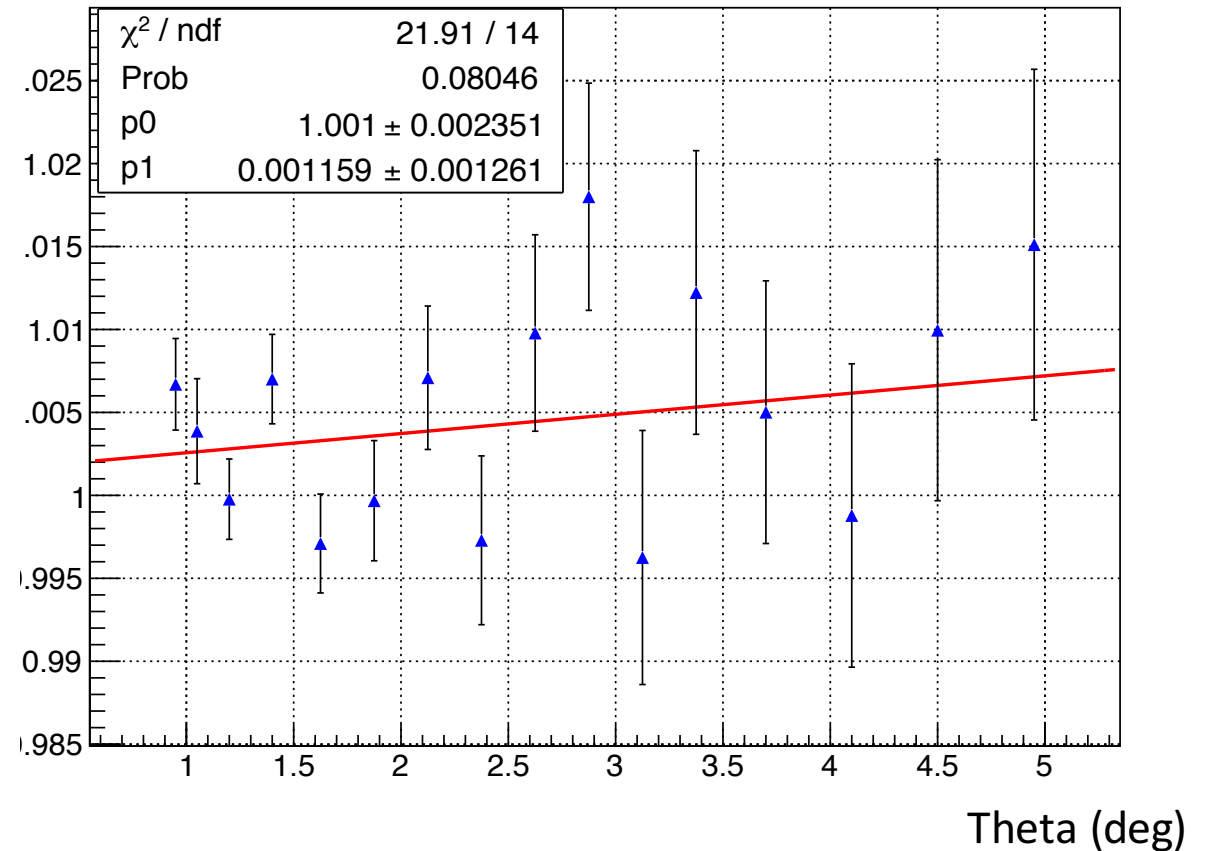
ep/ee

Graph



Super ratio

Graph



# GEM efficiency correction

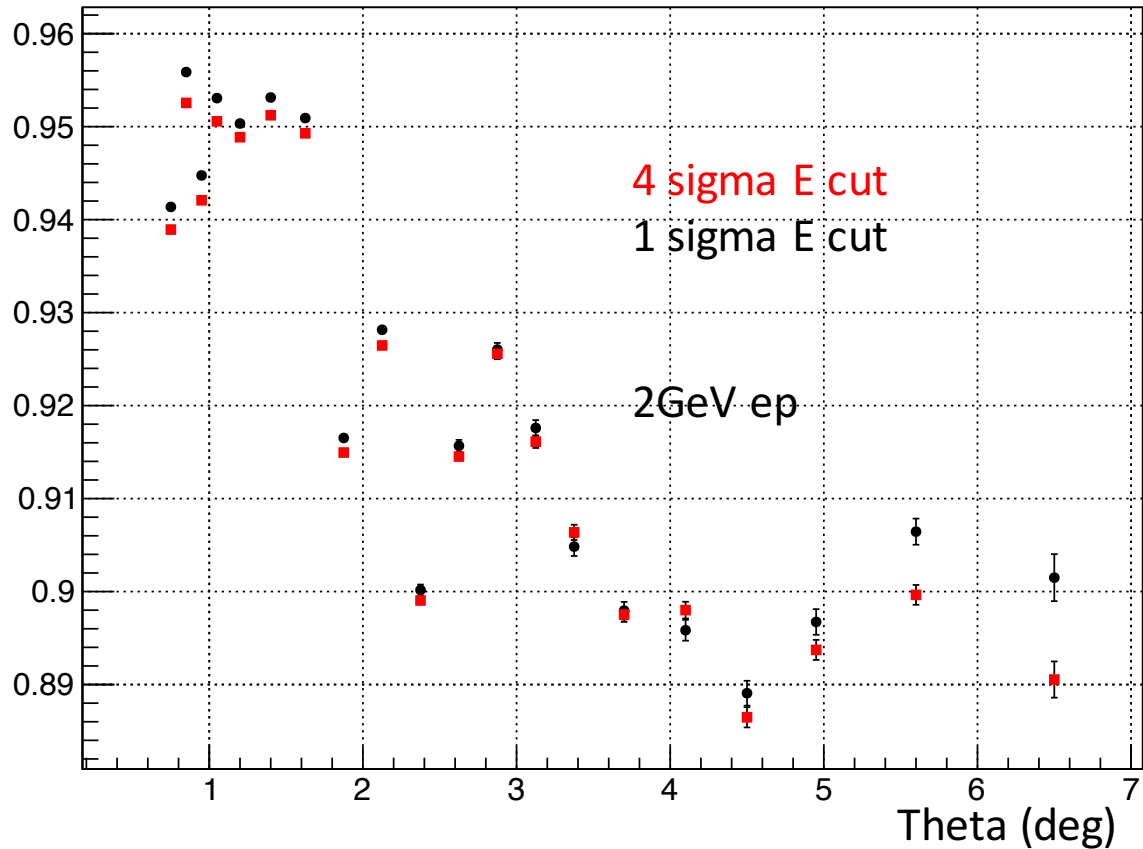
- It is possible that we can correct the GEM efficiency by doing background subtraction using the live charge ratio
  - Efficiency =  $(n_{\text{pro}} - cn_{\text{bg}})/(N_{\text{pro}} - cN_{\text{bg}})$  where  $c$  is the live charge ratio,  $n$  for GEM counts,  $N$  for HyCal counts
- We can check the efficiency dependency on the energy cut since if background is cleanly removed, the efficiency should be less sensitive on the cut

# GEM efficiency correction

No correction

Graph

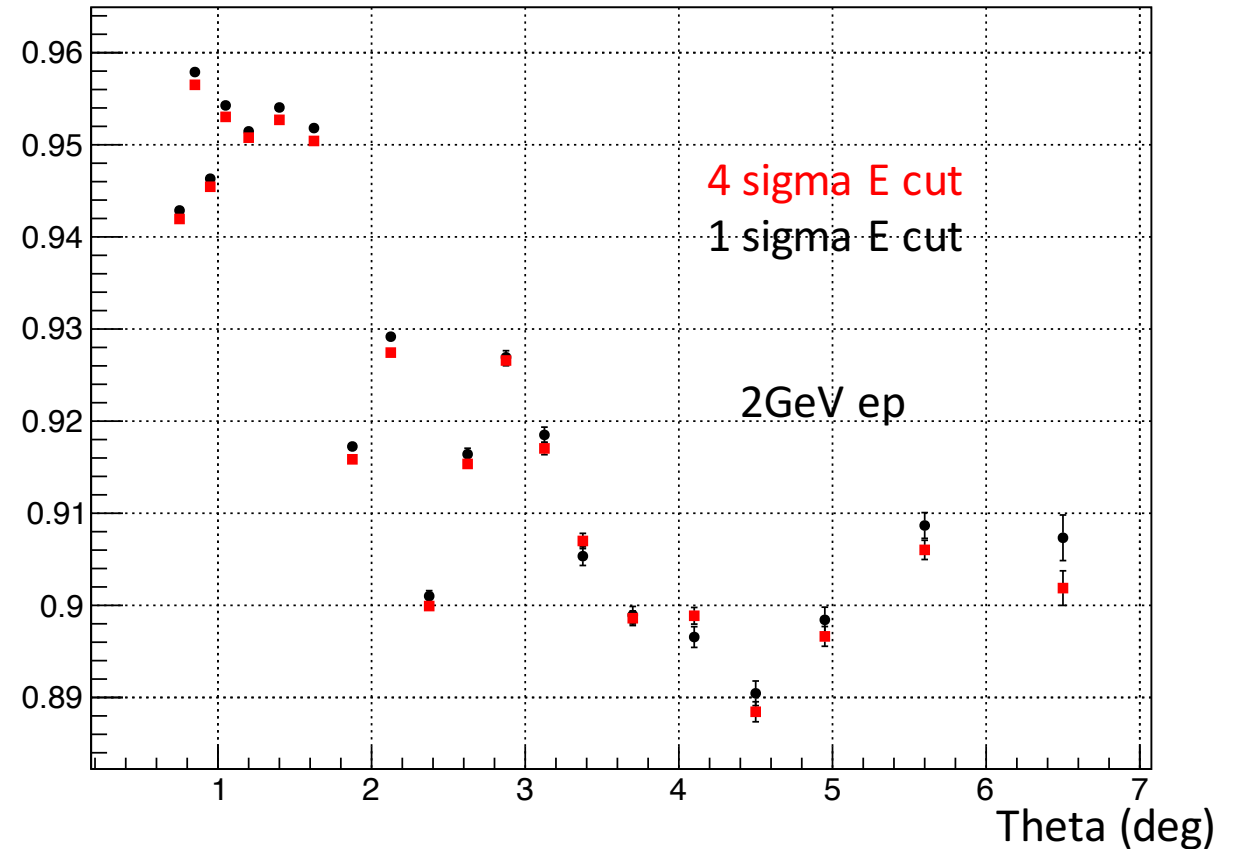
efficiency



Corrected

Graph

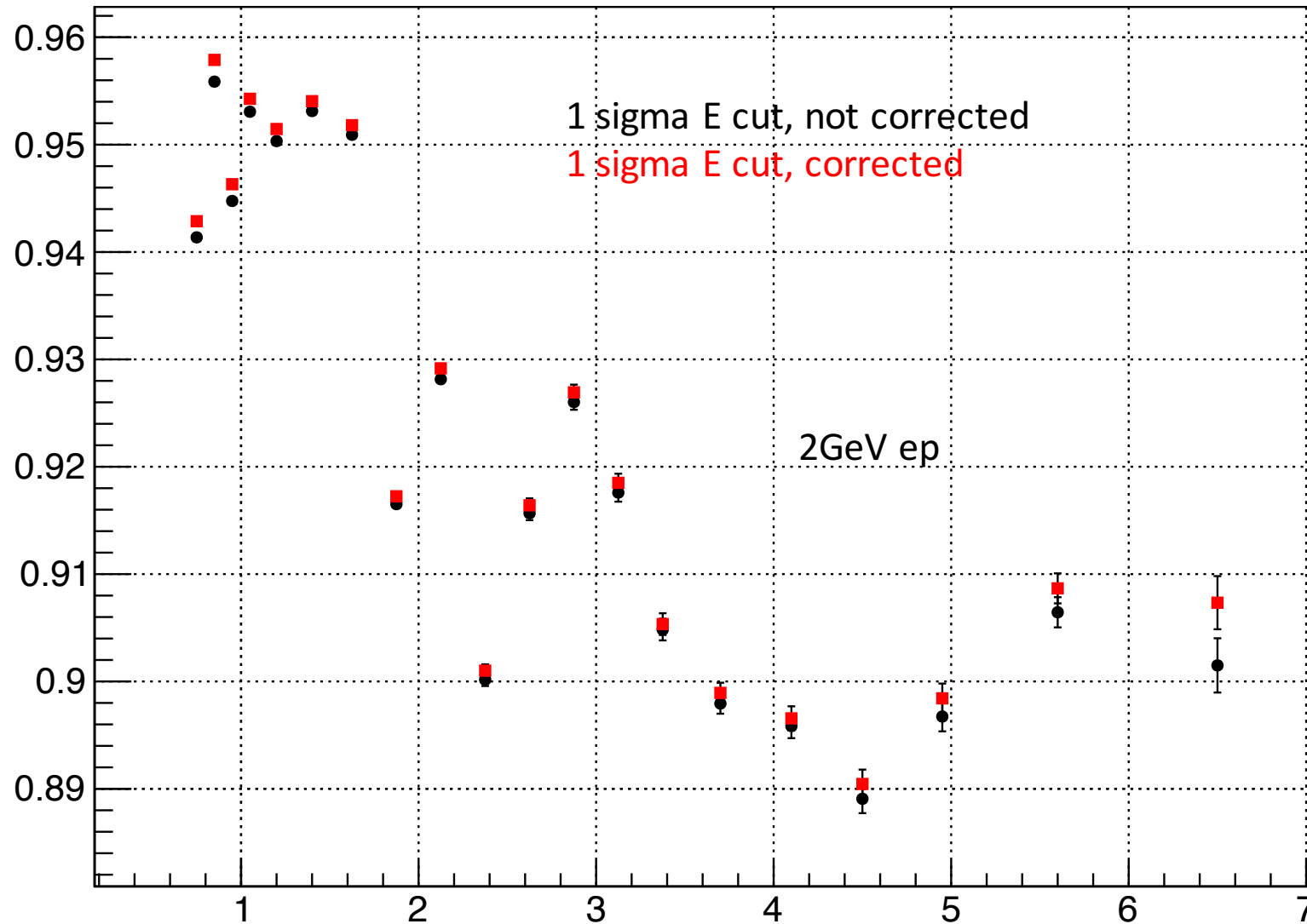
efficiency



# GEM efficiency correction

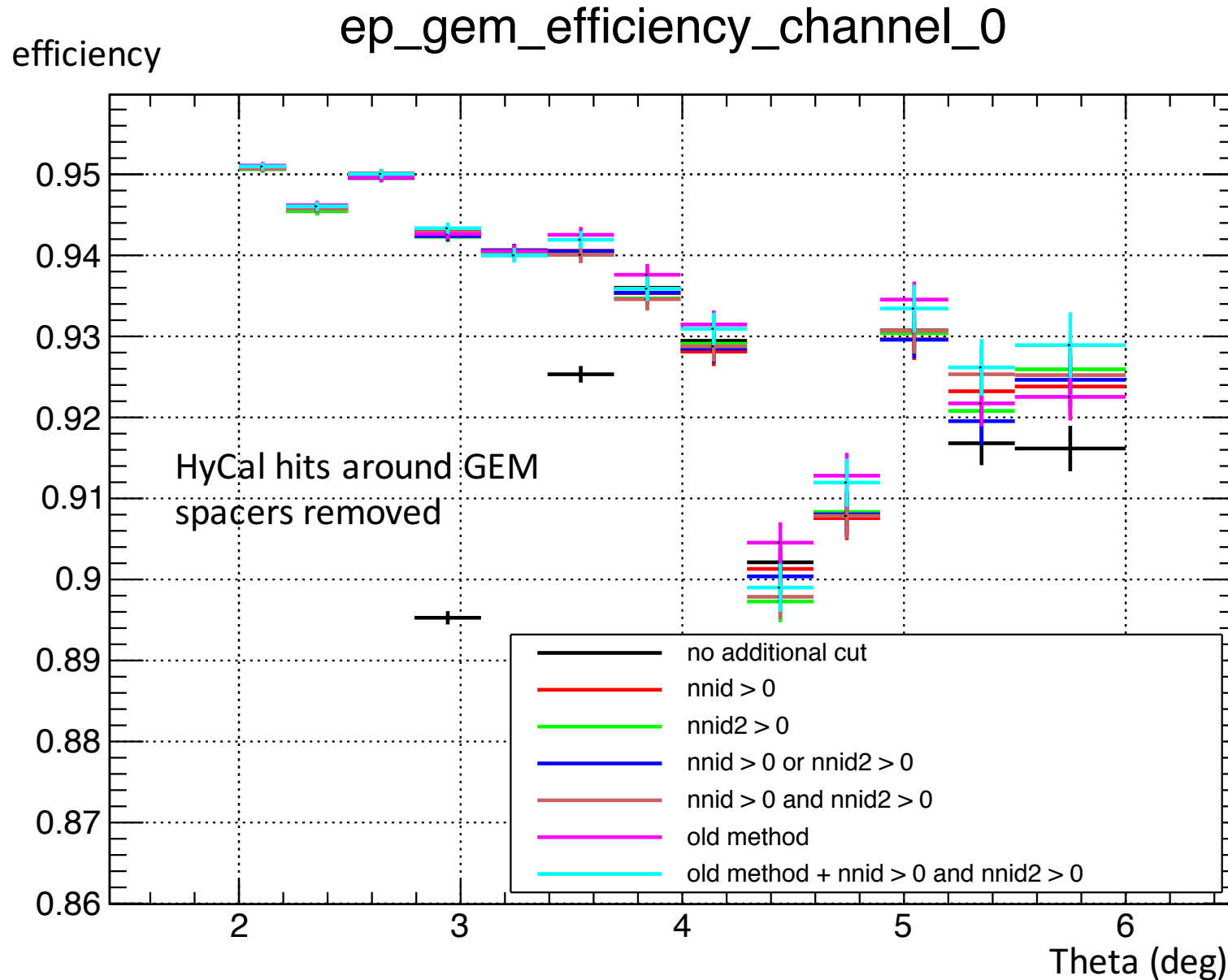
## Graph

efficiency

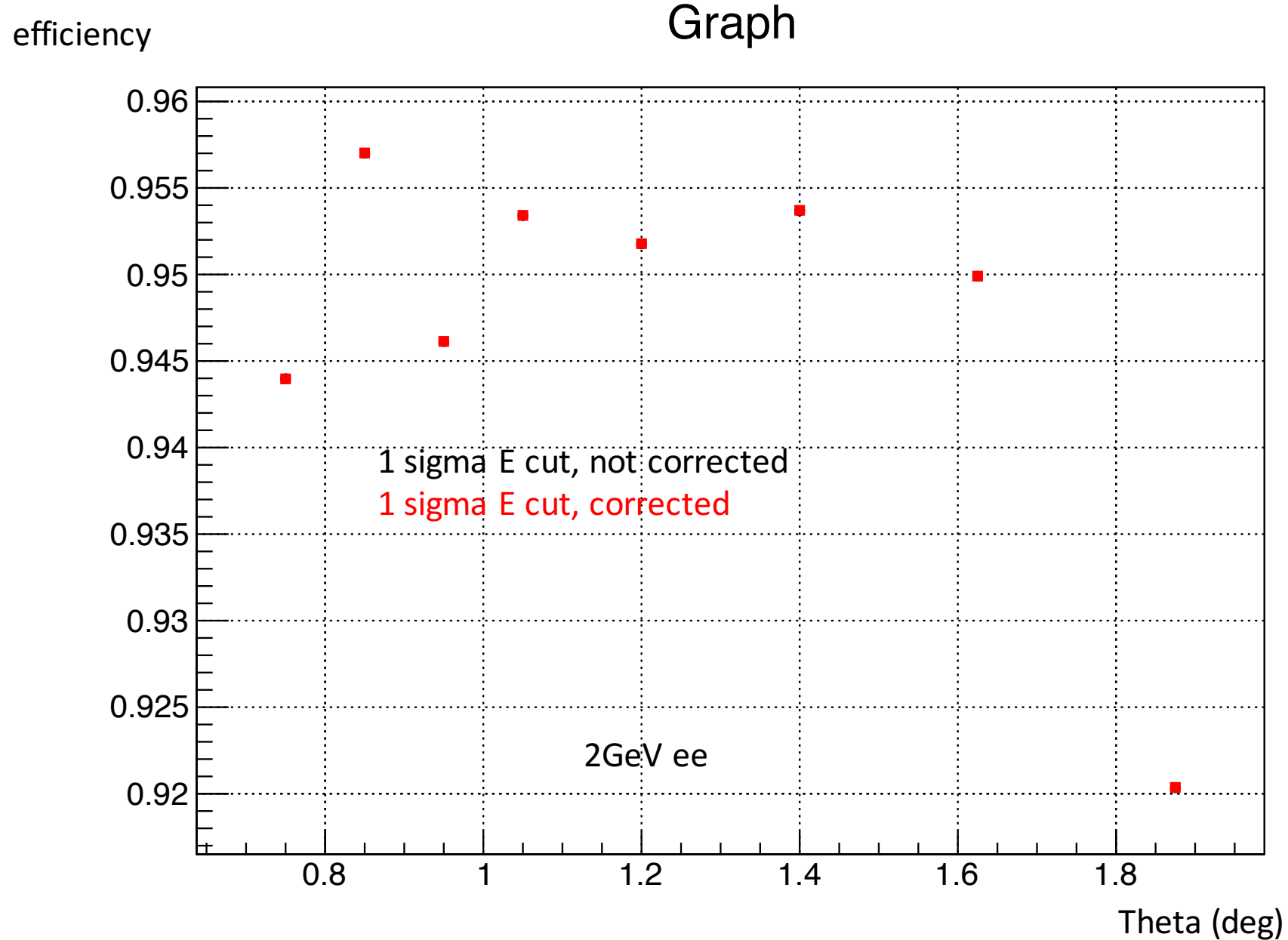


Theta (deg)

# GEM efficiency correction

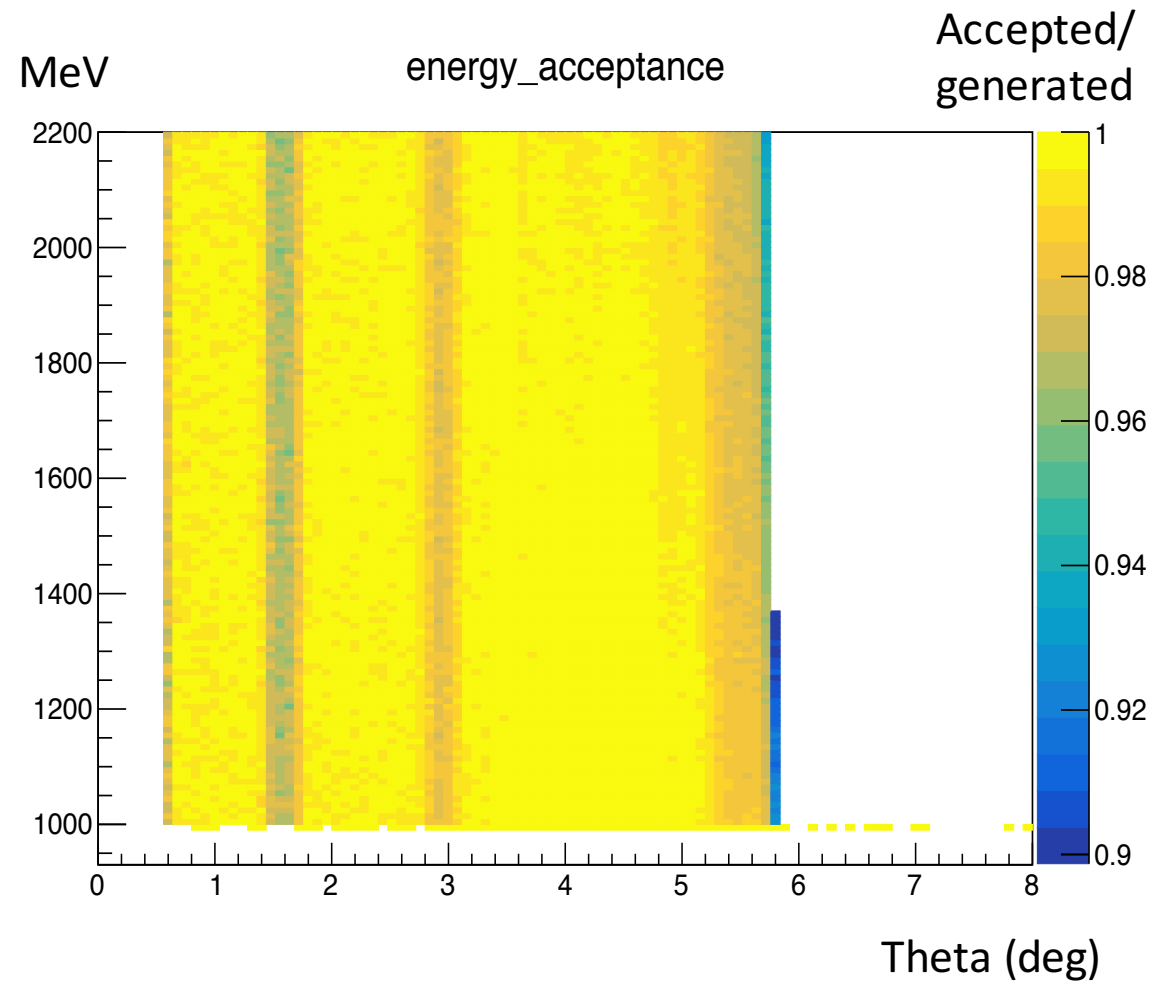
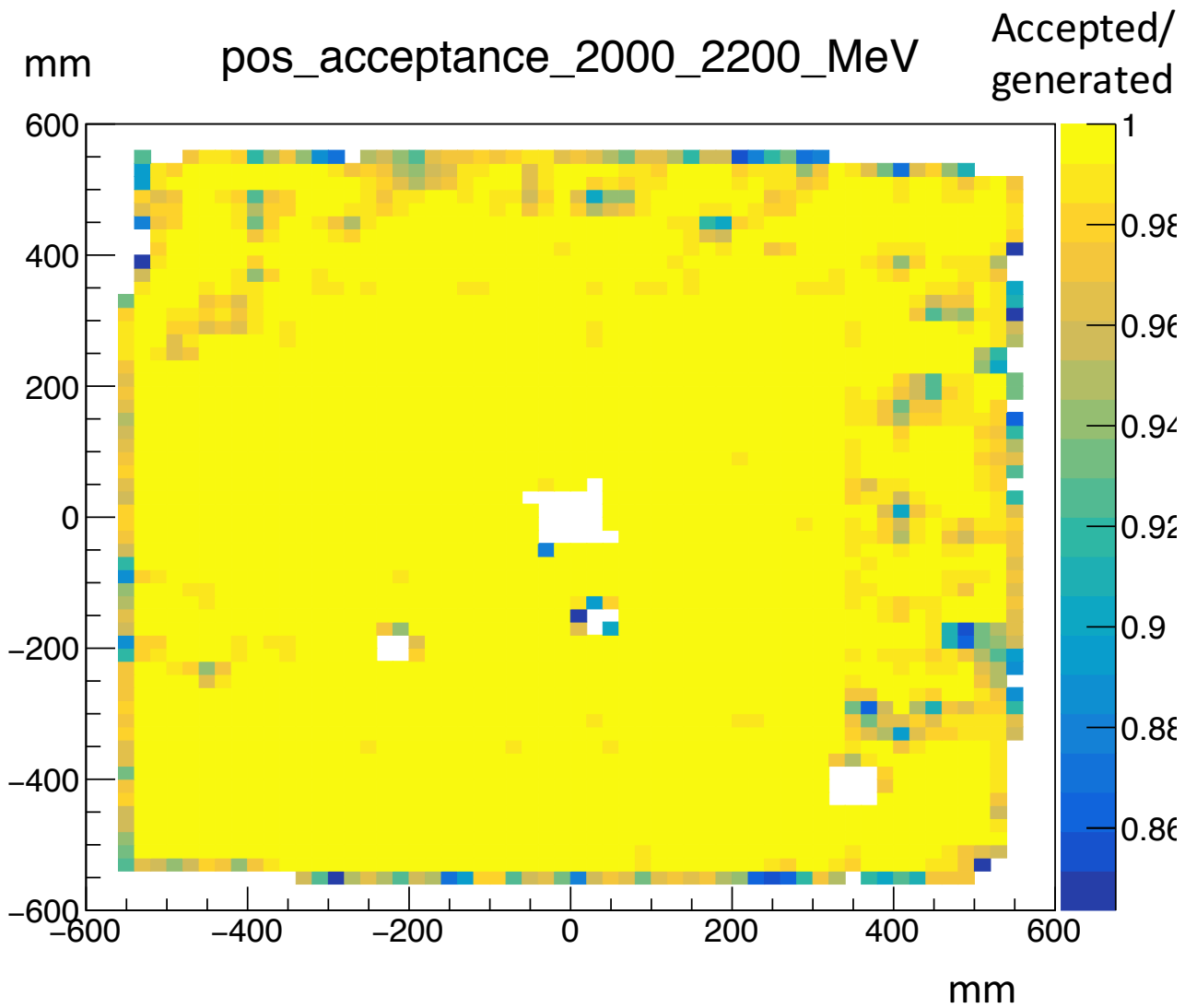


# GEM efficiency correction



# Checking the simulation

- Right now the discrepancy at large angle is that there is either more ep yield from the data or there is less ep yield from the simulation
- For the simulation, less ep may either come from:
  - the generator
  - there is some yield loss when during transportation in Geant 4, digitization and reconstruction
- To test the second point, use uniform distributed electrons in x and y and energy from 1000 to 2200 MeV and check the acceptance
- Condition of acceptance:
  - Reconstructed energy within 4 sigma (HyCal energy resolution) agreement with the vertex momentum
  - Reconstructed position within 6 sigma (HyCal position resolution) agreement with the projected hit position



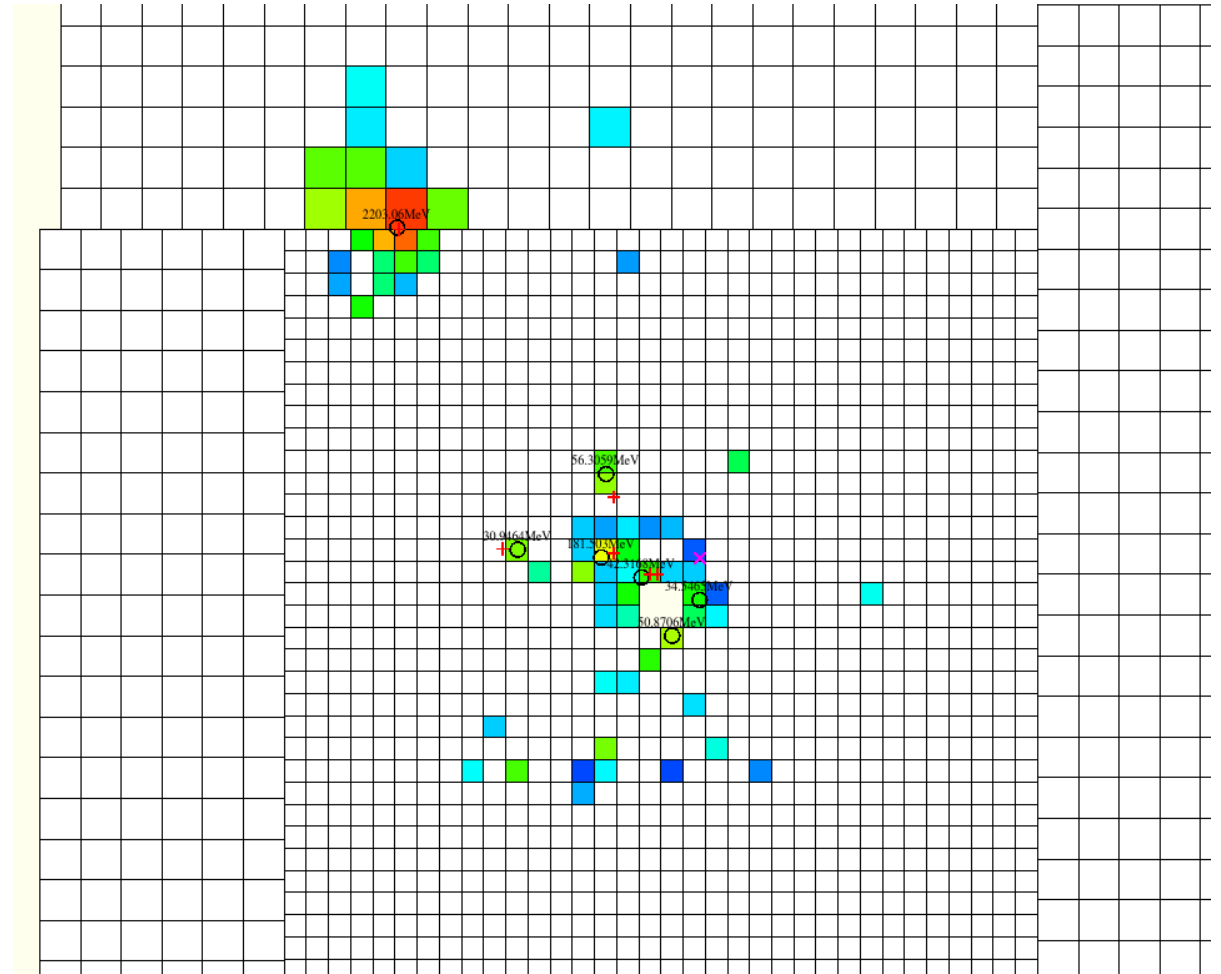
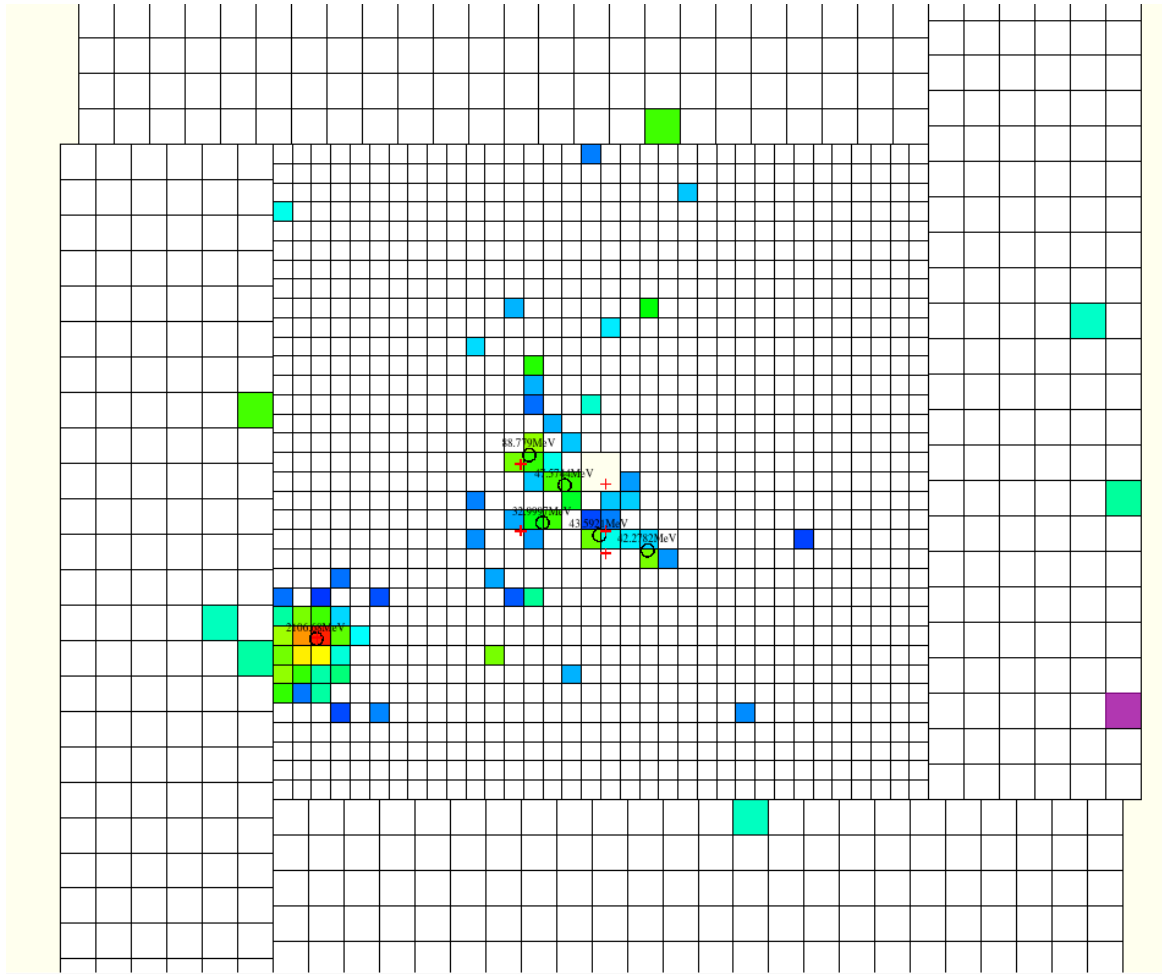




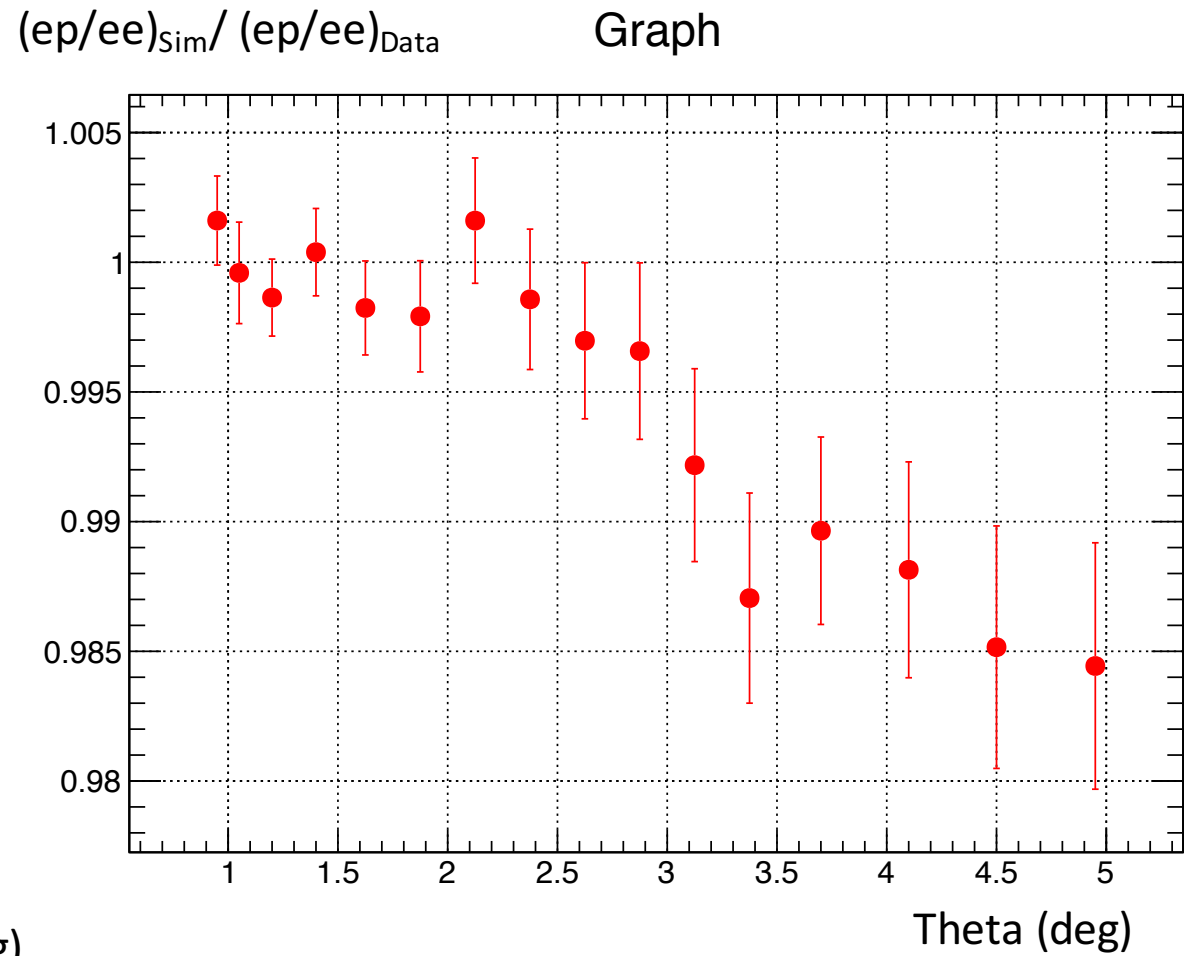
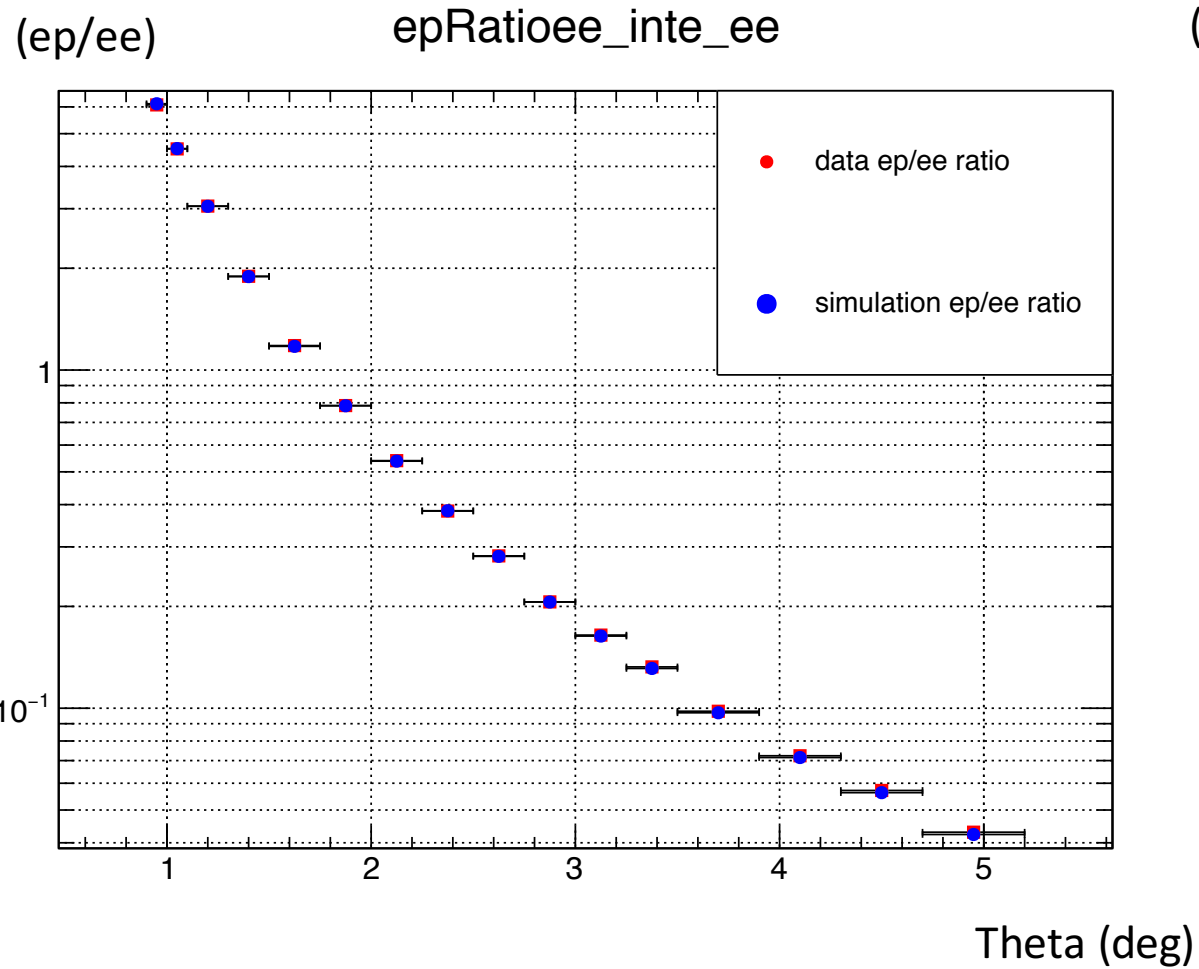
# Compare single cluster events

- It may be important to find a way to compare the radiation between the data and the simulation. But single cluster cut for ep, may not be a good cut for this comparison
  - There is pile-up in the data, but "so far" never in the simulation
  - The behavior of this cut depends on the reconstruction of low energy particle (because there is a threshold threshold for the reconstructed cluster) but we are not certain about their reconstruction in both data and simulation

# Pile-up events in data



# ep/ee ratio (1GeV)

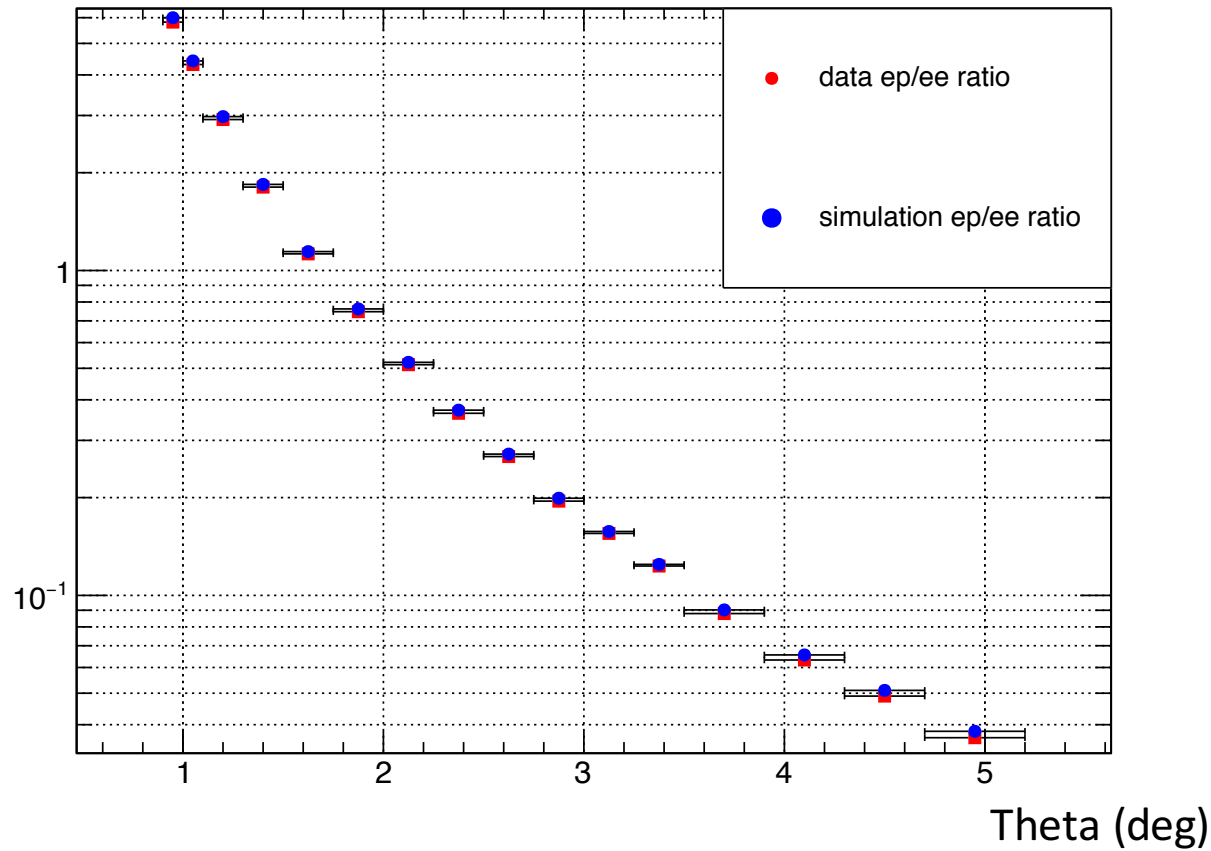


# ep/ee ratio (1GeV)

Single cluster cut applied for ep

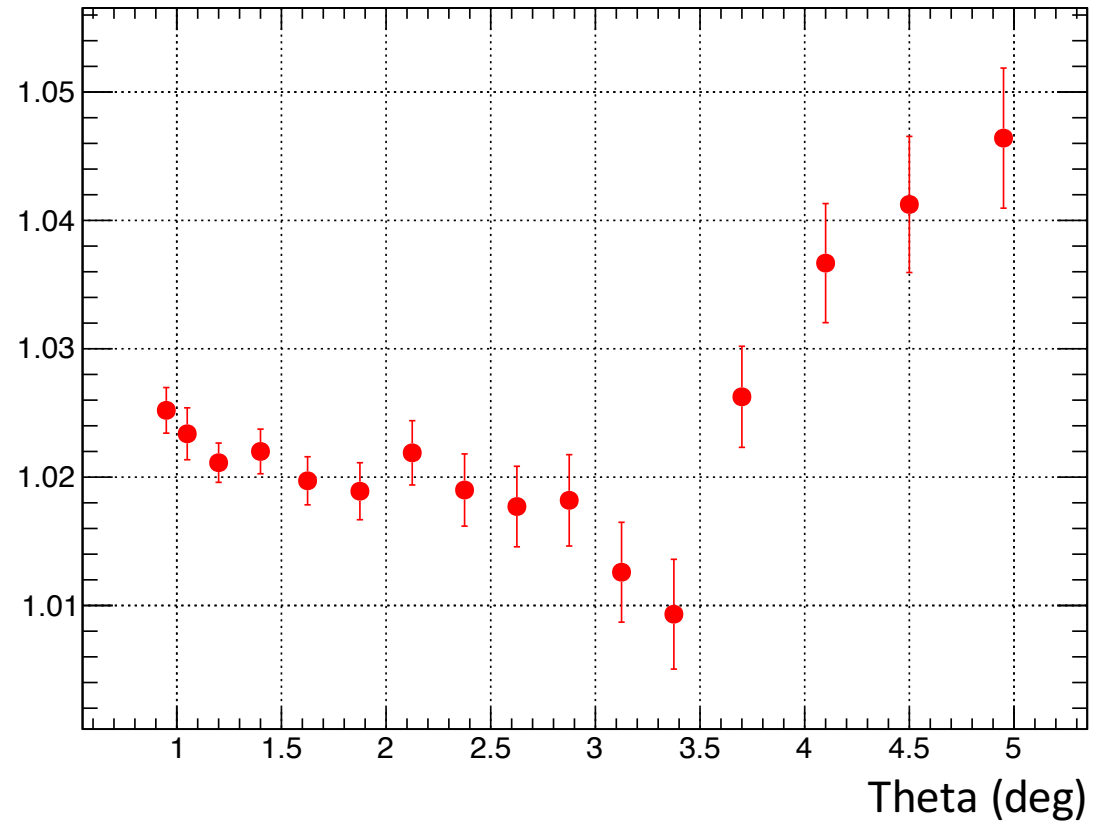
(ep/ee)

epRatioee\_inte\_ee

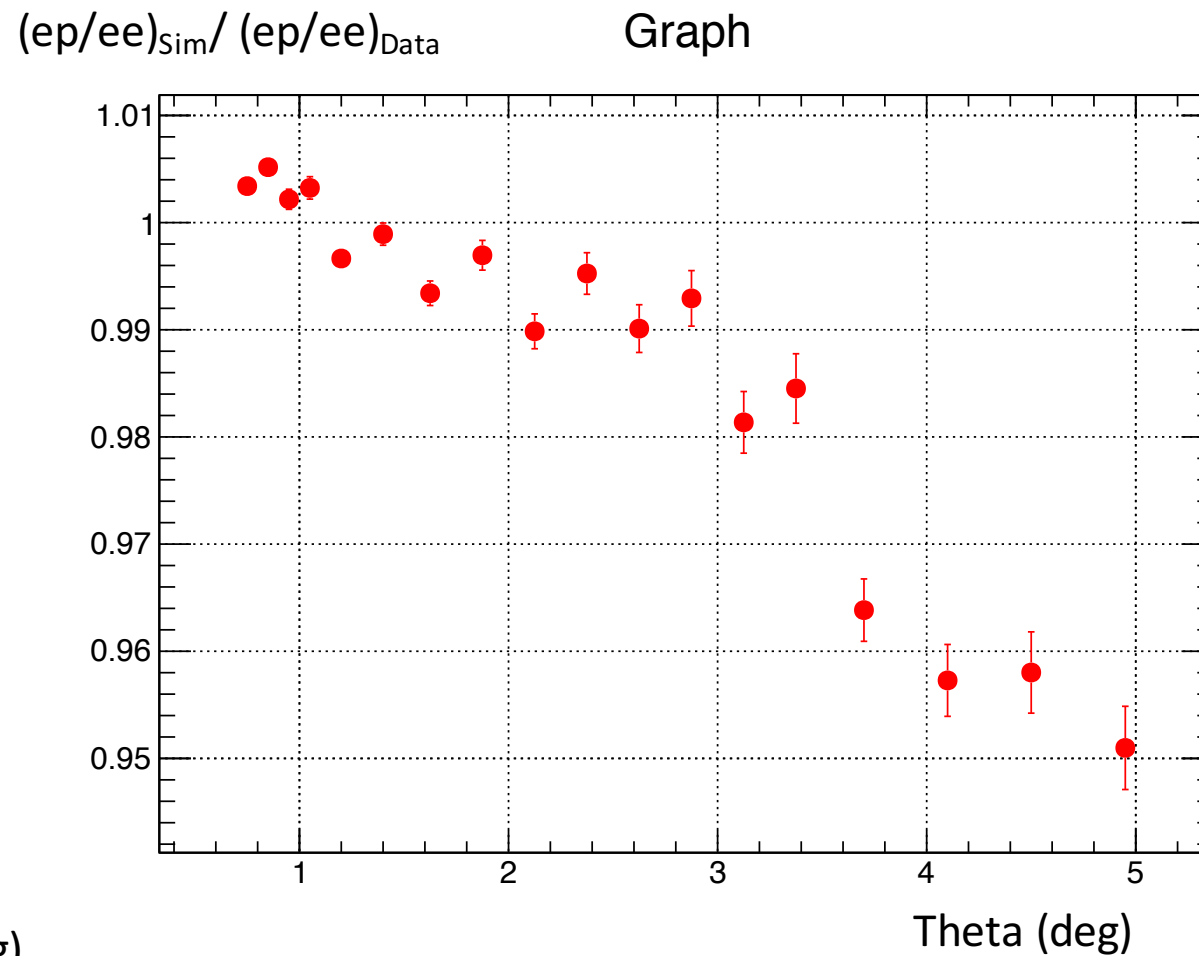
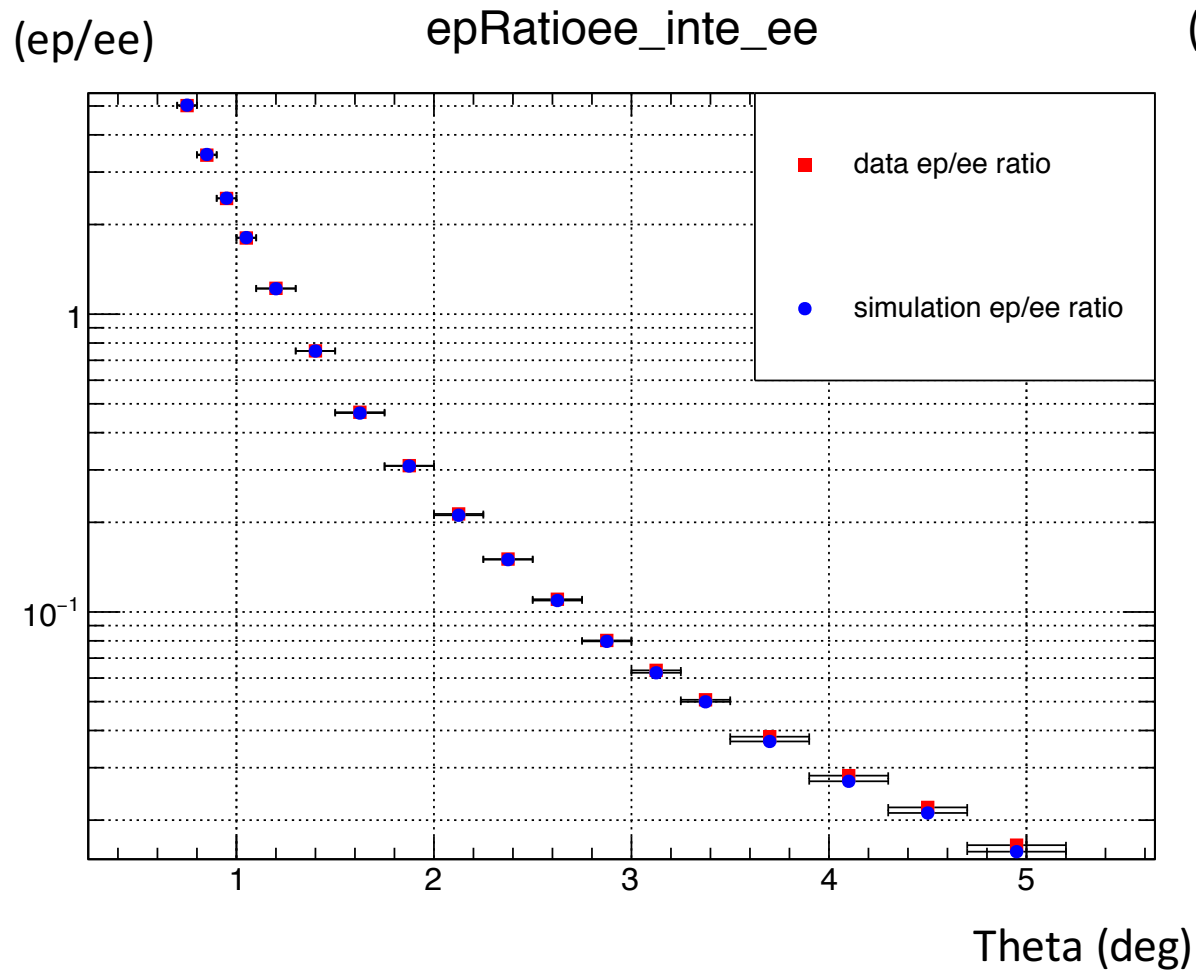


$(ep/ee)_{Sim} / (ep/ee)_{Data}$

Graph



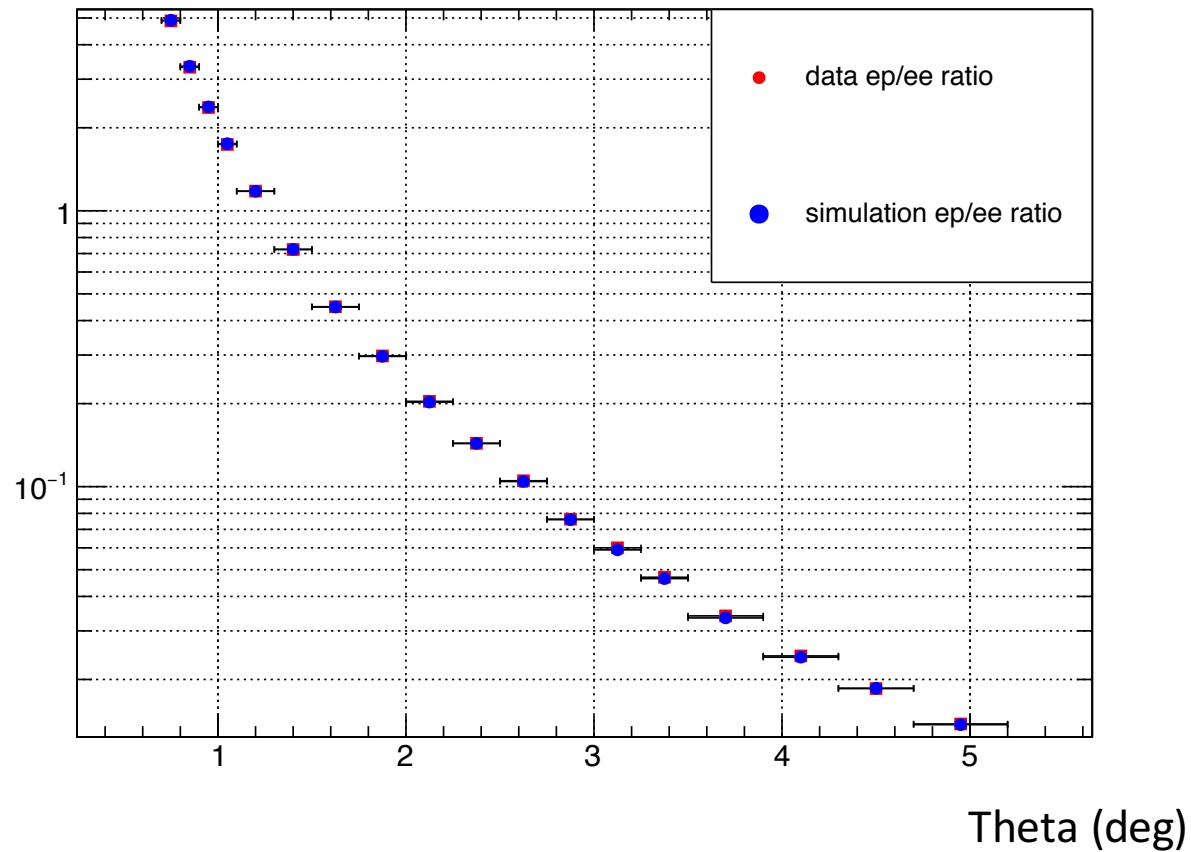
# ep/ee ratio (2GeV)



# ep/ee ratio (2GeV)

(ep/ee)

epRatioee\_inte\_ee



$(ep/ee)_{sim} / (ep/ee)_{Data}$

Graph

