List of major problems

- Inelastic ep contamination
- Testing and comparing new ep generator
- Simulation near transition region
- GEM efficiency
- HyCal trigger efficiency

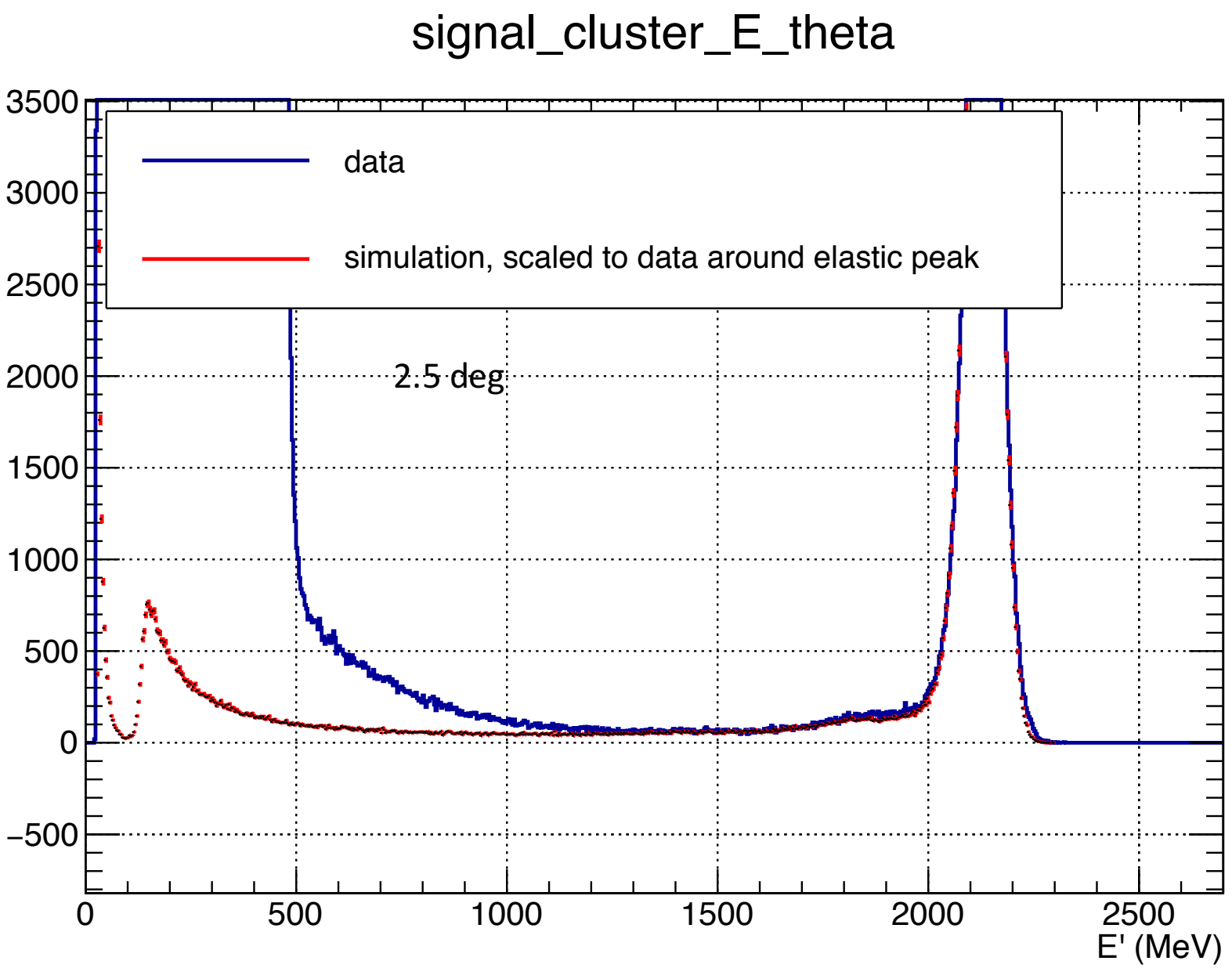
Inelastic ep generator

- Chao Peng has developed an inelastic ep generator based on the Peter Bosted fit
- Include internal radiation
- Can generate scattered electron from inelastic ep channels from 0.3 to 7.5 deg for our 2GeV data

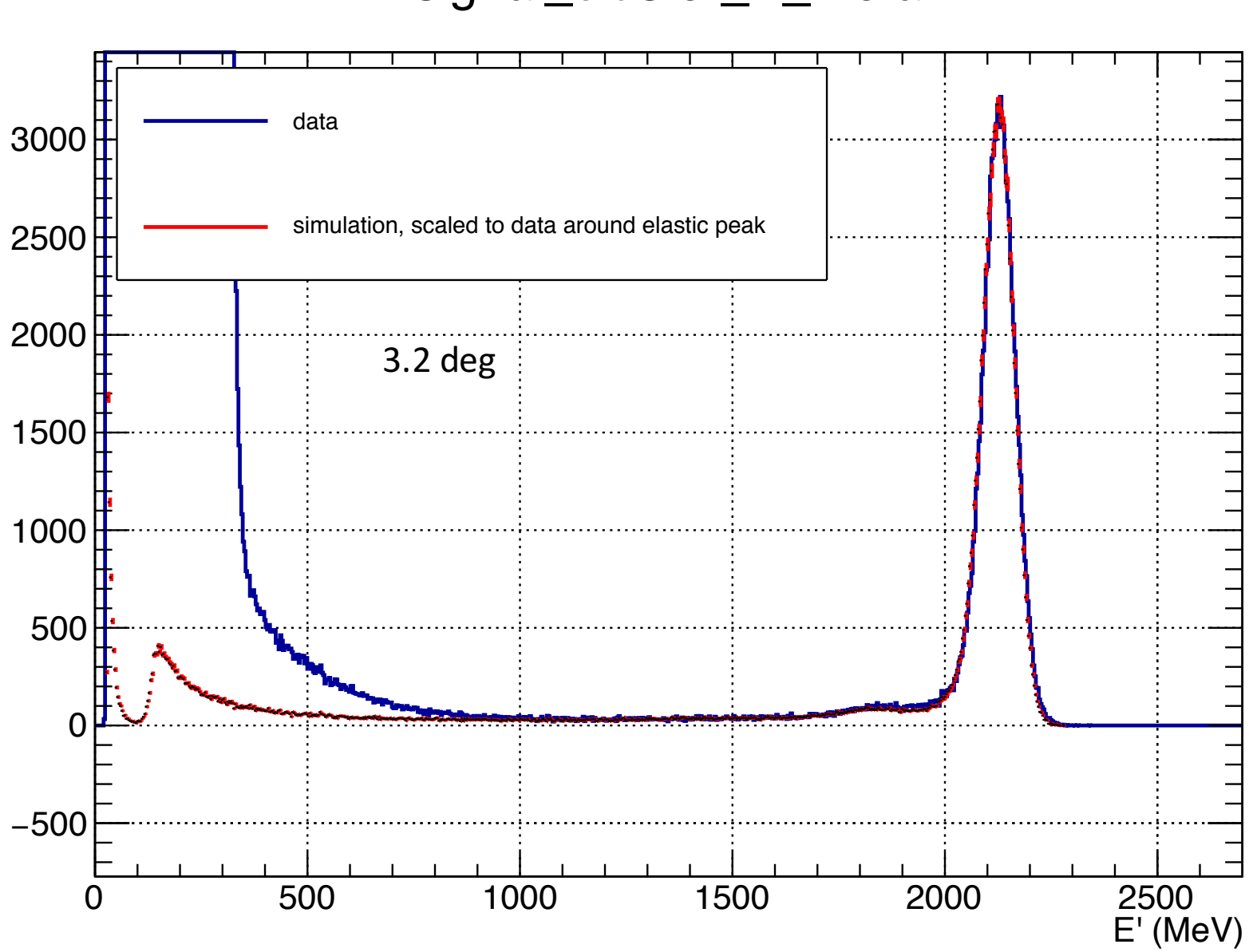
- Only 2GeV at the moment and cannot generate photon

- It is tested and compared with the data, got reasonably good agreement

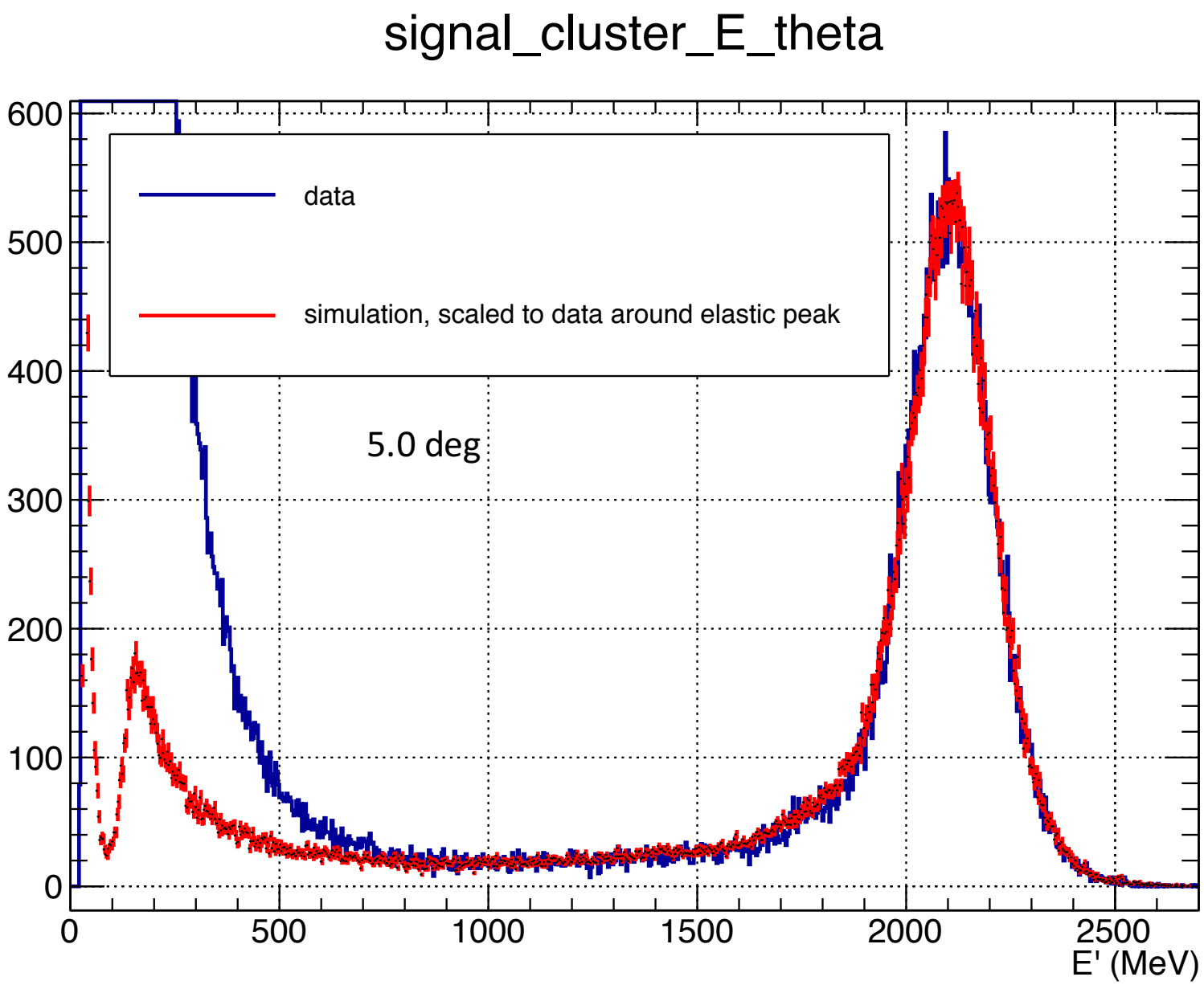
Inelastic ep generator



Inelastic ep generator

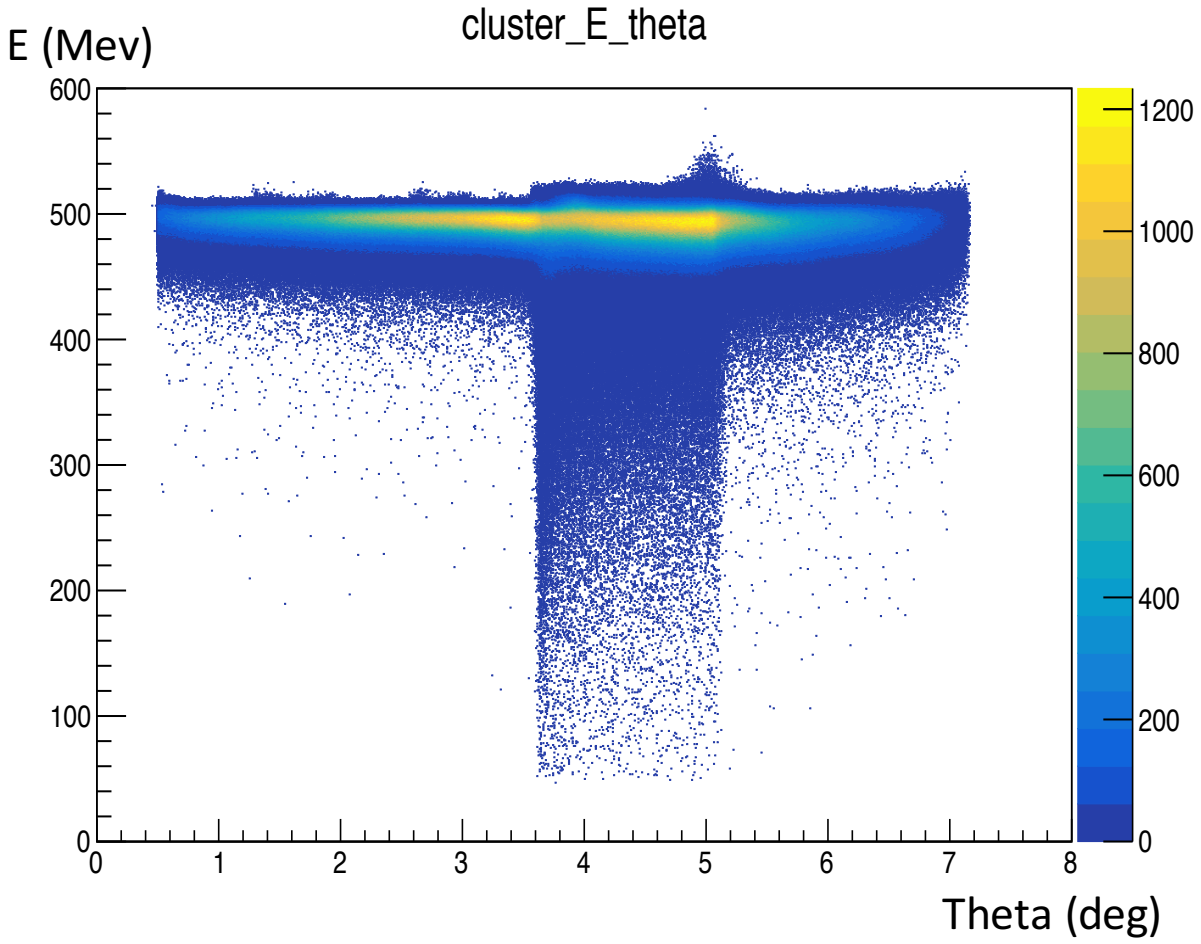


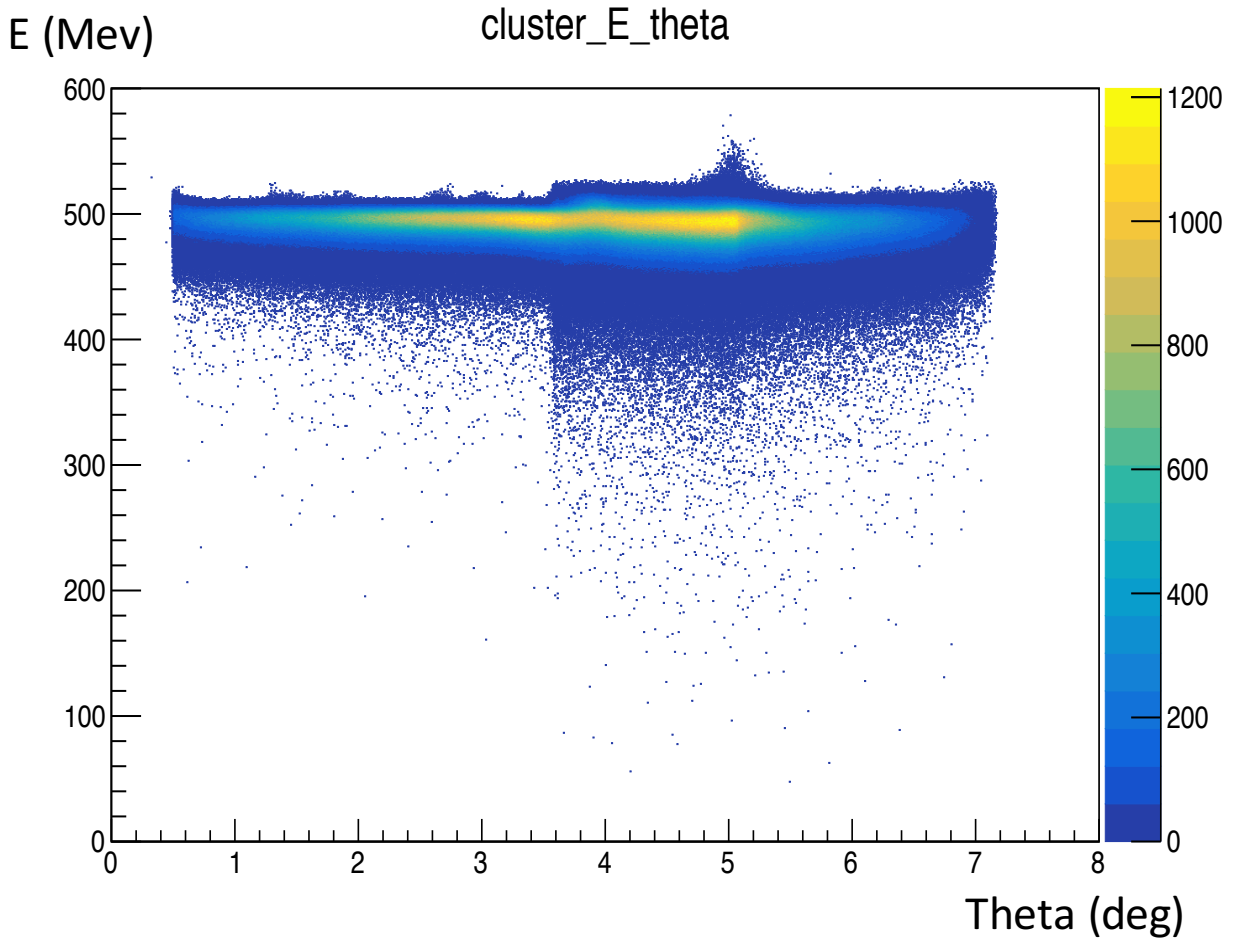
Inelastic ep generator



Simulation near transition region

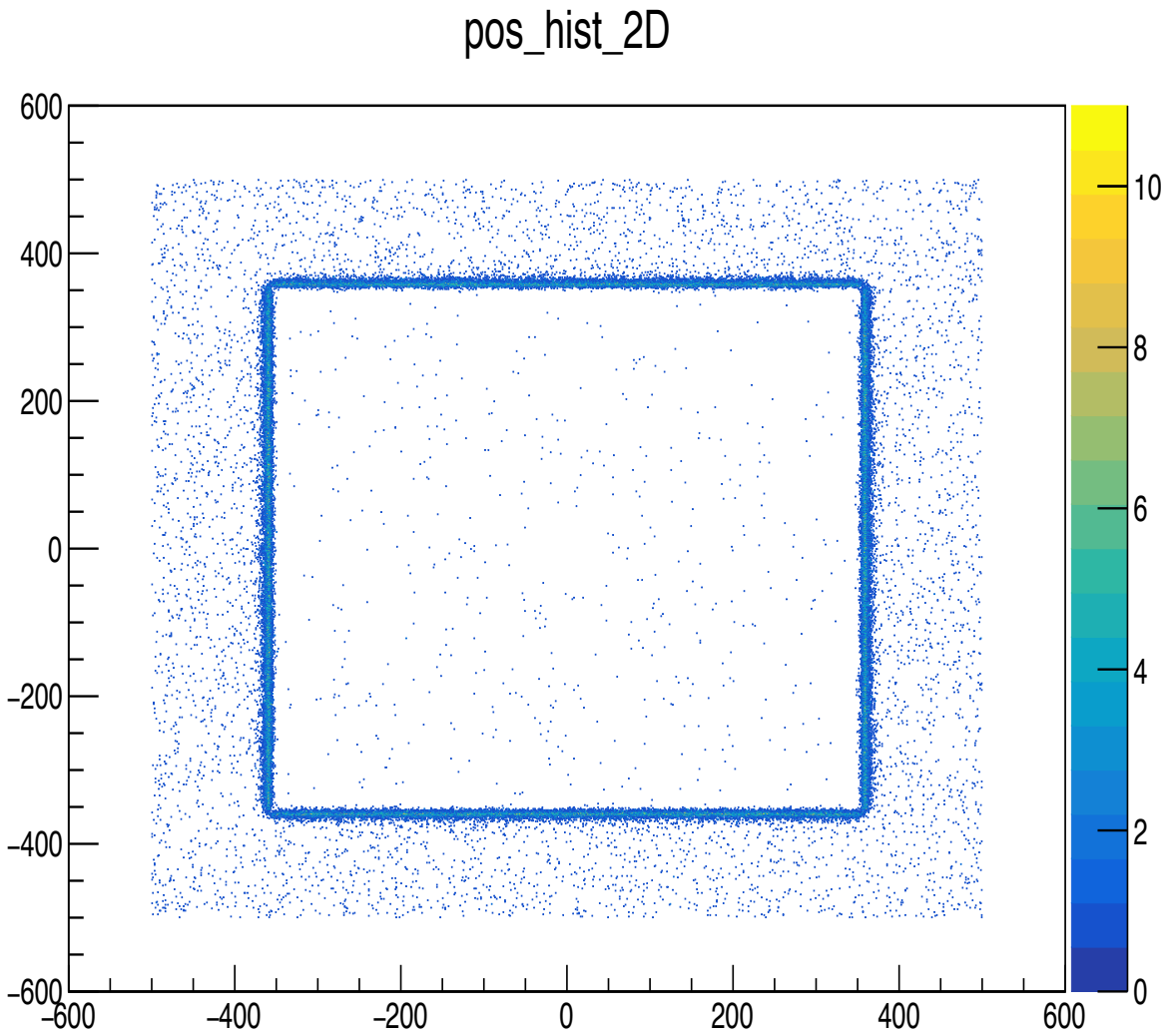
- Gu Chao has solved the issue of the leakage around the transition region in the simulation
- LG has larger taill than PWO may due to the fact that LG modules have 15 X_0 while PWOs have 20 X_0

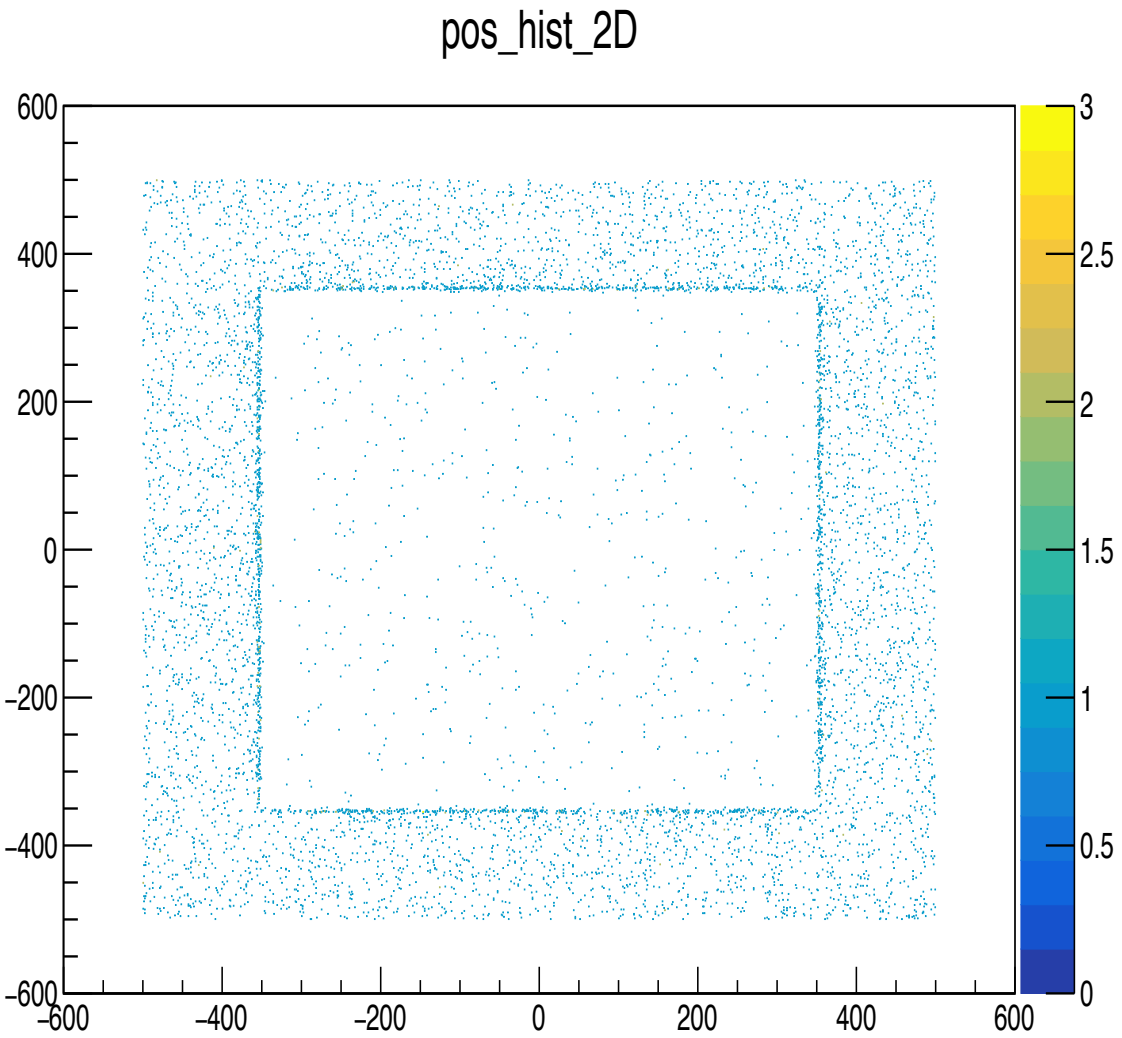




Simulation near transition region

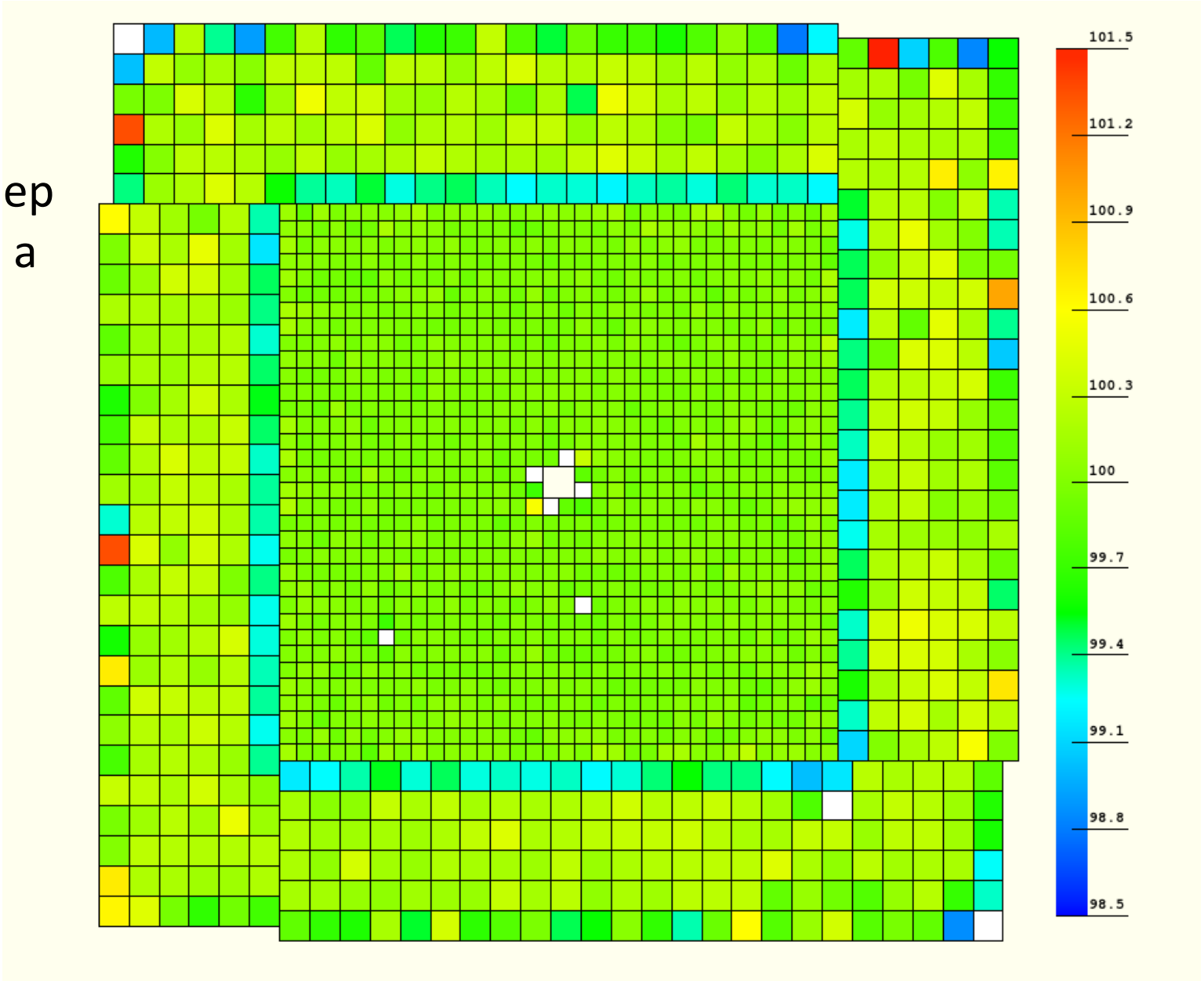
Hit position on HyCal with total energy deposition < 400 MeV





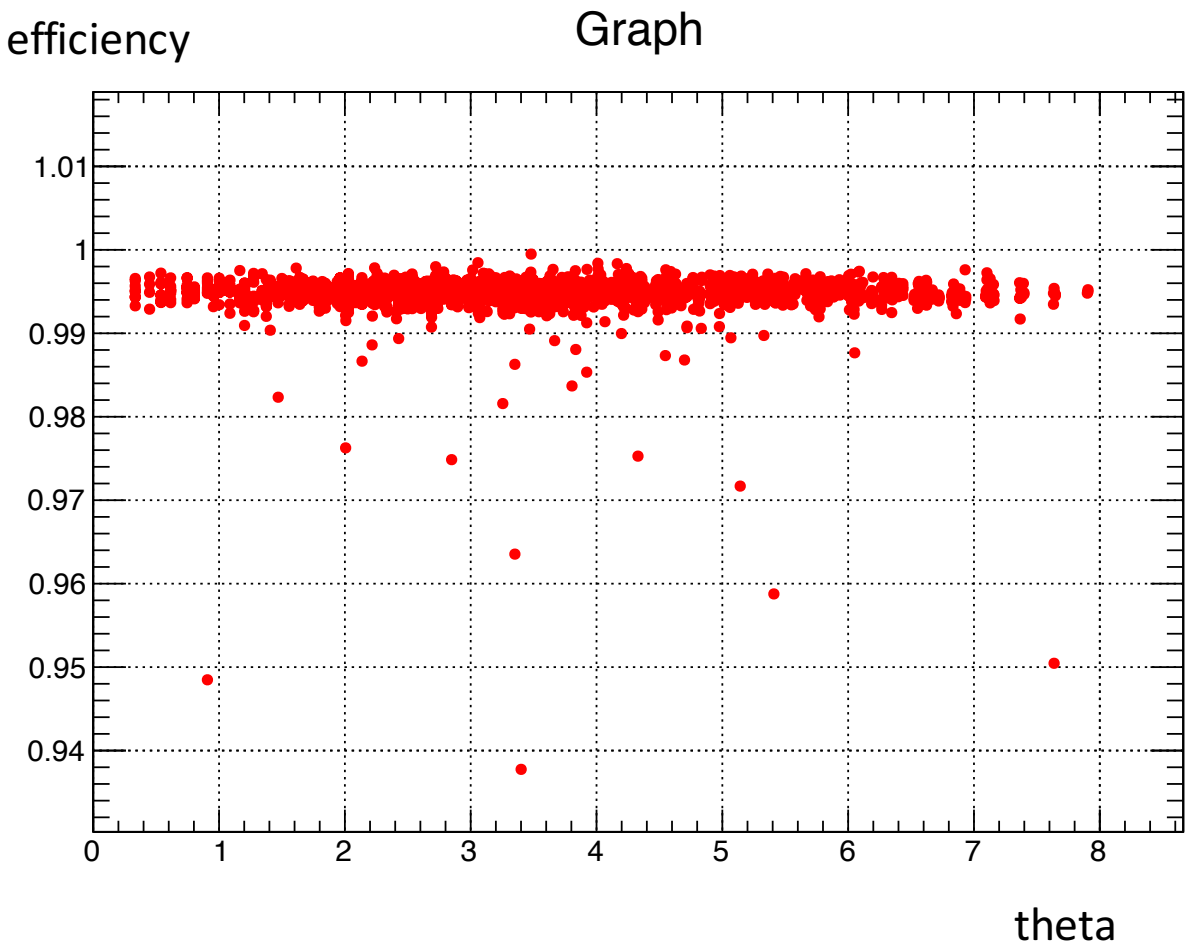
Simulation near tansition

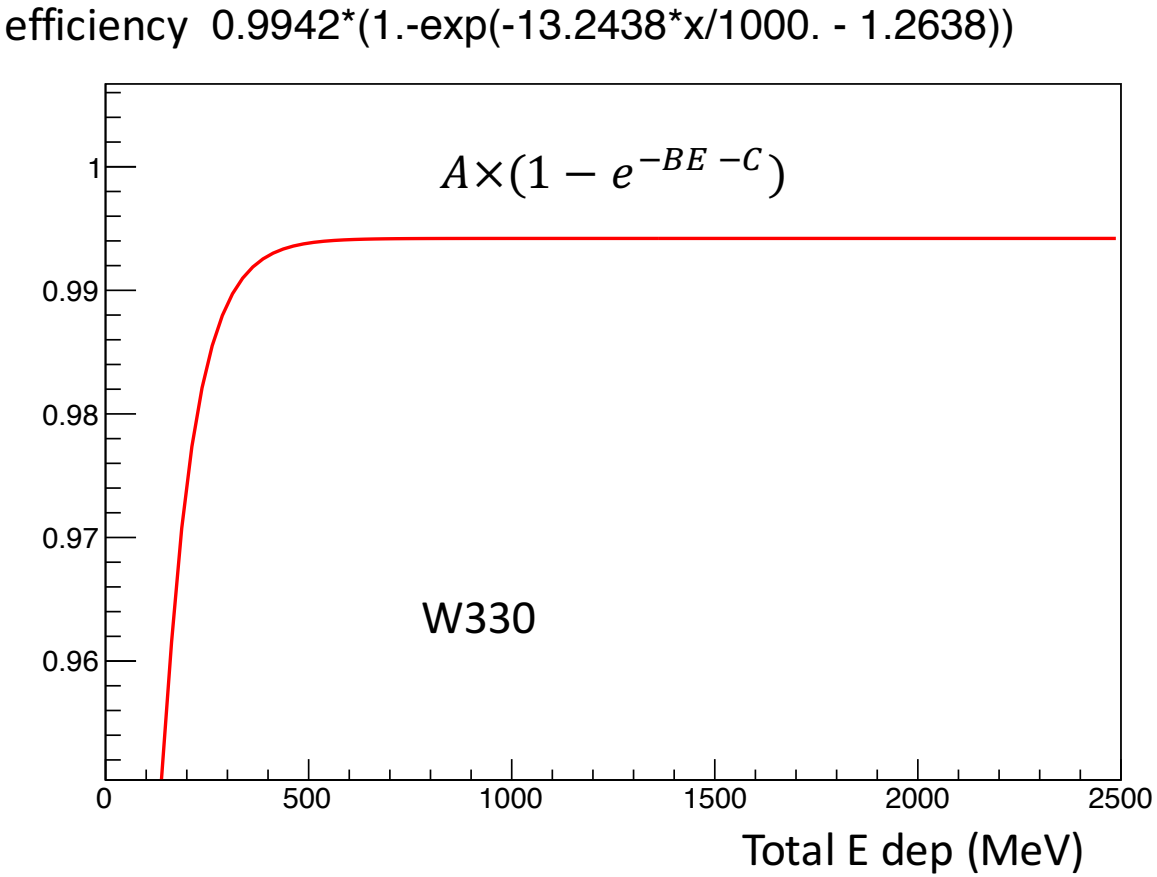
- After the fix for the energy leakage in the simulation, the ep elastic peak position is shifted a bit
- I have fine tuned the MC calibration constants, will distribute the table after the meeting



Trigger efficiency as a function of scattering angle theta

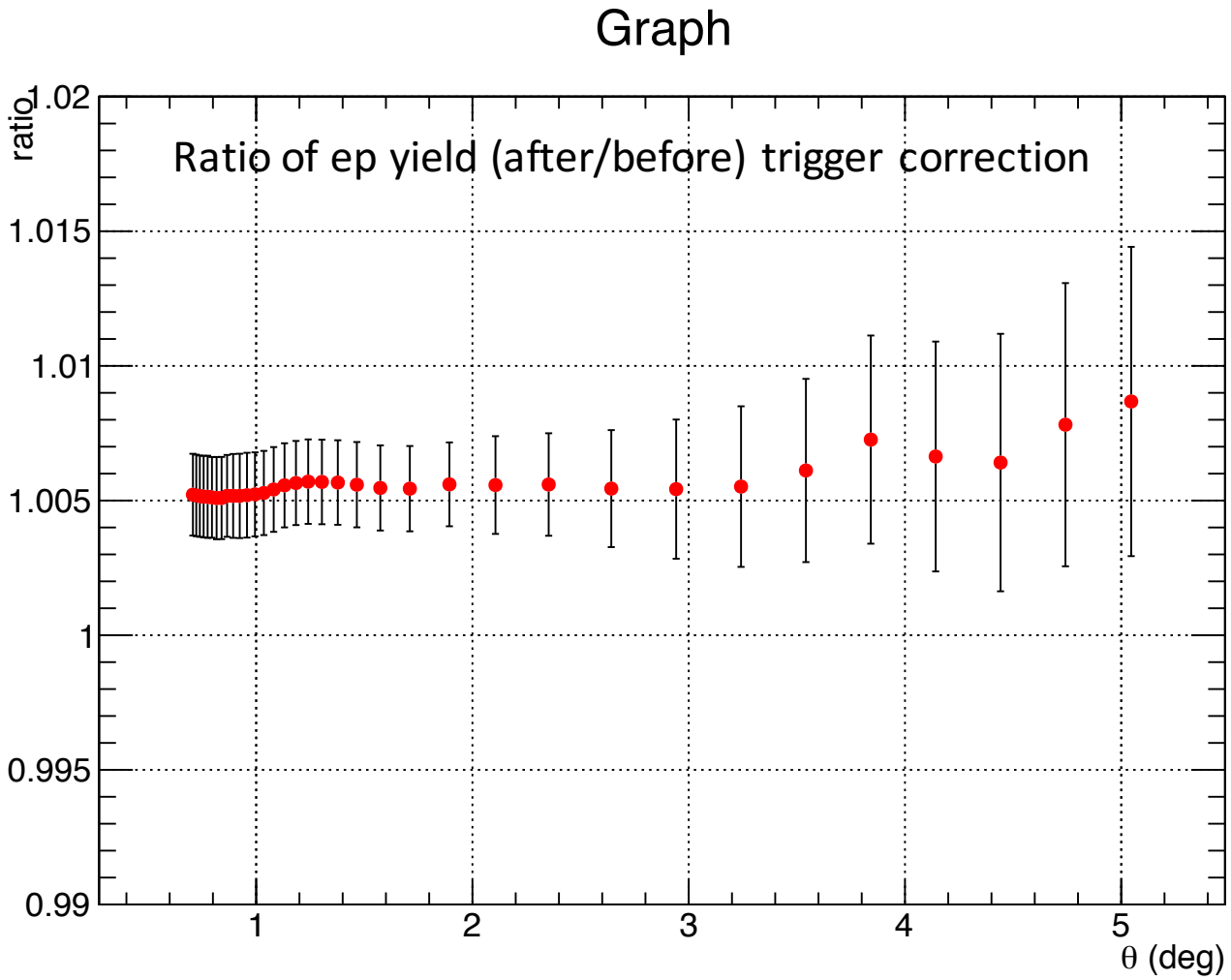
- Trigger efficiency seems to be reasonably uniform and quickly reaching saturation
- In the extreme case, if the efficiency is totally uniform and energy independent, it will only scale the yields and will be completely cancelled out in the ep/ee ratio





Trigger efficiency

- HyCal is triggered by total sum of energy deposition
- We shoot photon beam on HyCal module by module to measure the trigger efficiency, which is similar to the ep case



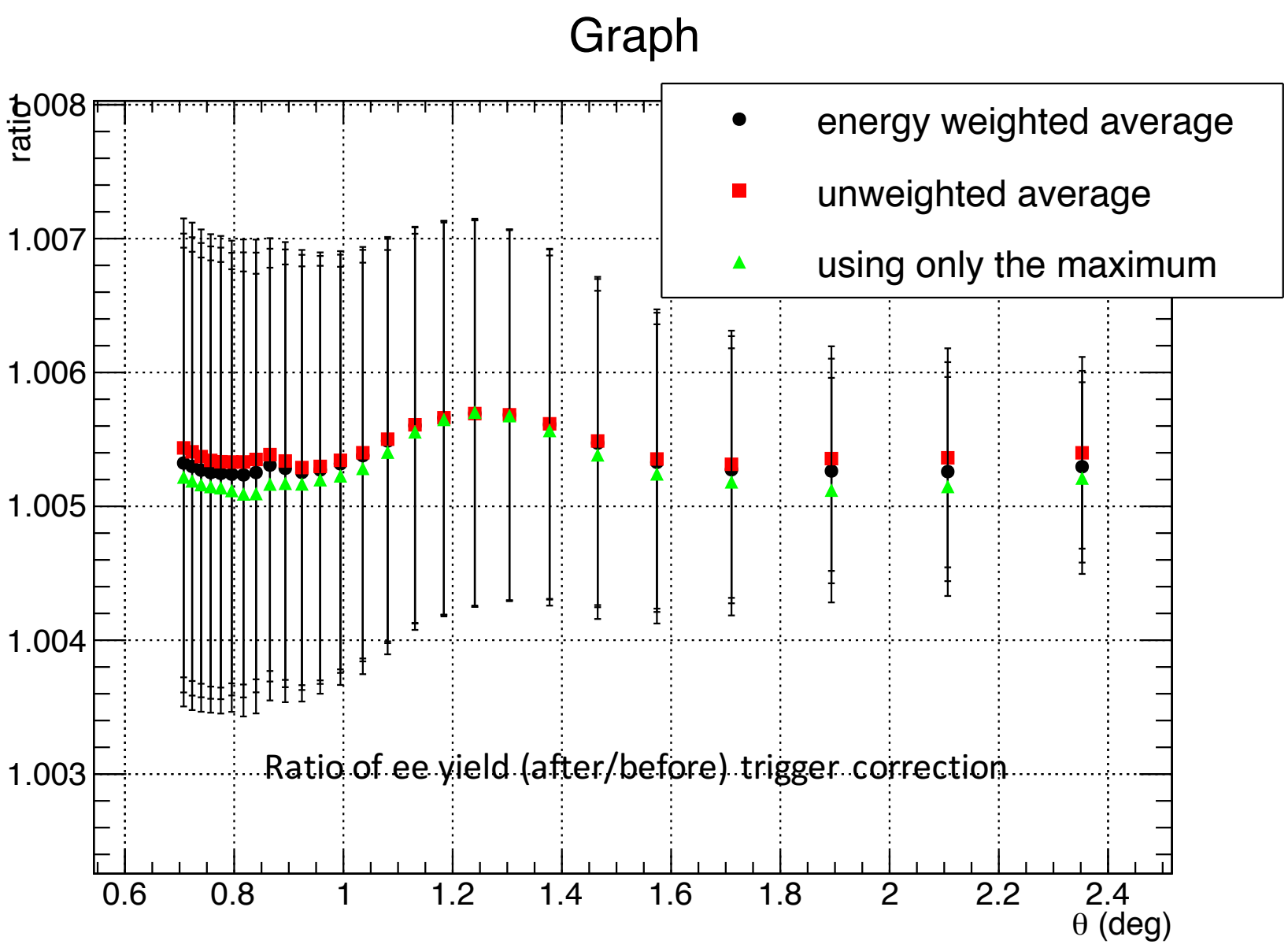
Trigger efficiency

- Trigger efficiency for ee is less trivial because the total energy deposition is split by the two clusters, which hit two different modules with different efficiencies
- Trigger efficiency should depend on the sum of the two cluster energy, because they reach HyCal almost at the same time (differ by a few ns)
- Assuming the efficiency for ee can be decomposed as

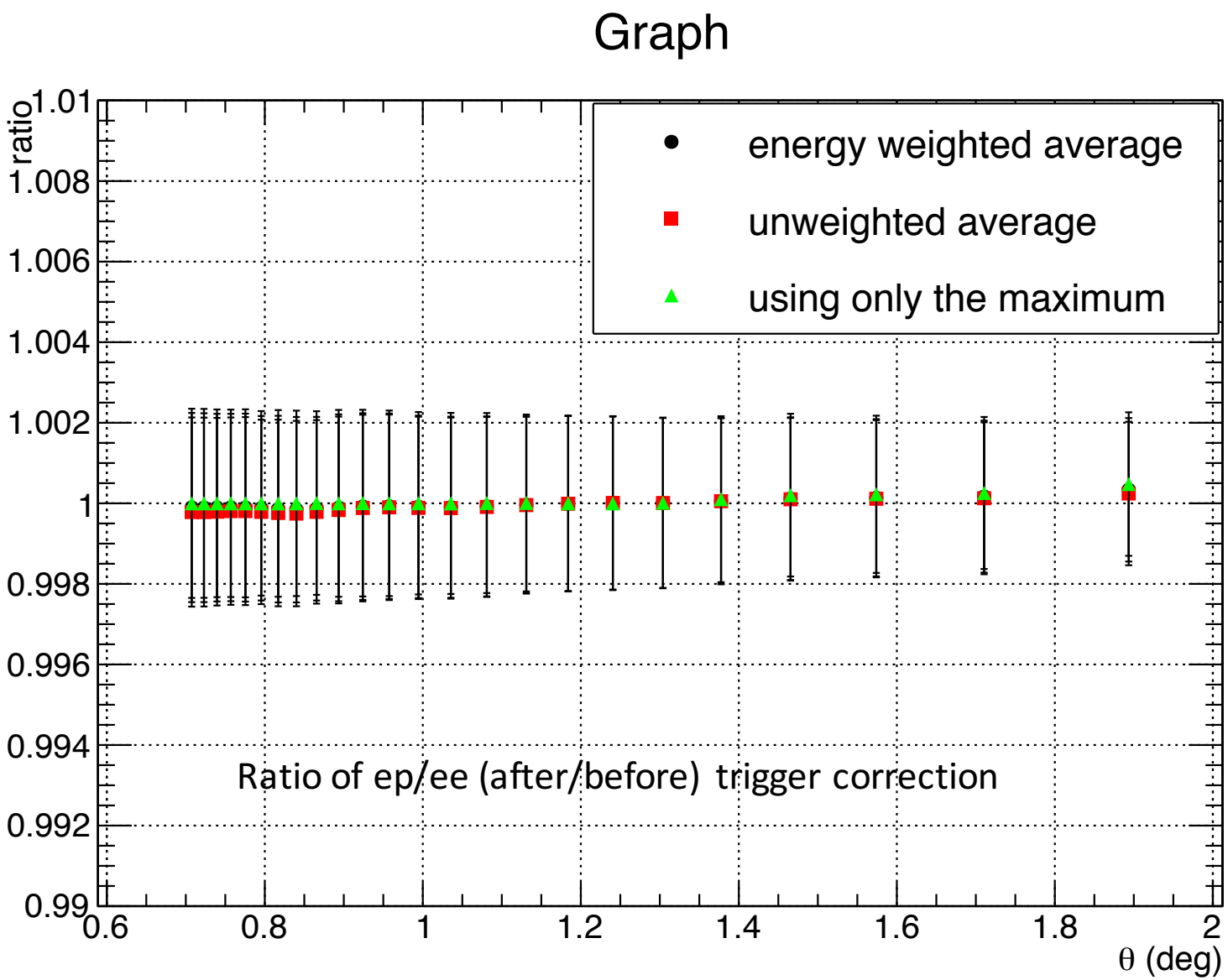
$$Trigger\ efficiency\ for\ ee = \sum w_i \times T_i(total\ E\ dep)$$

- I want to check the sensitivity of the results on the weights (w_i)
  - The energy weighted average $w_i = E_i$ / (total E)
  - Unweighted average w_i = ½
  - Using only the larger one, $w_1 = 1$, $w_2 = 0$ if $E_1 > E_2$

Trigger efficiency



Trigger efficiency



Trigger efficiency

- One concern: we measured the trigger efficiency using 1GeV photon beam. When moving from 1GeV to 2GeV, we lower the HV so that HyCal gain is lowered by half. Can you still use the trigger efficiency without modifications?