Simulation Updates

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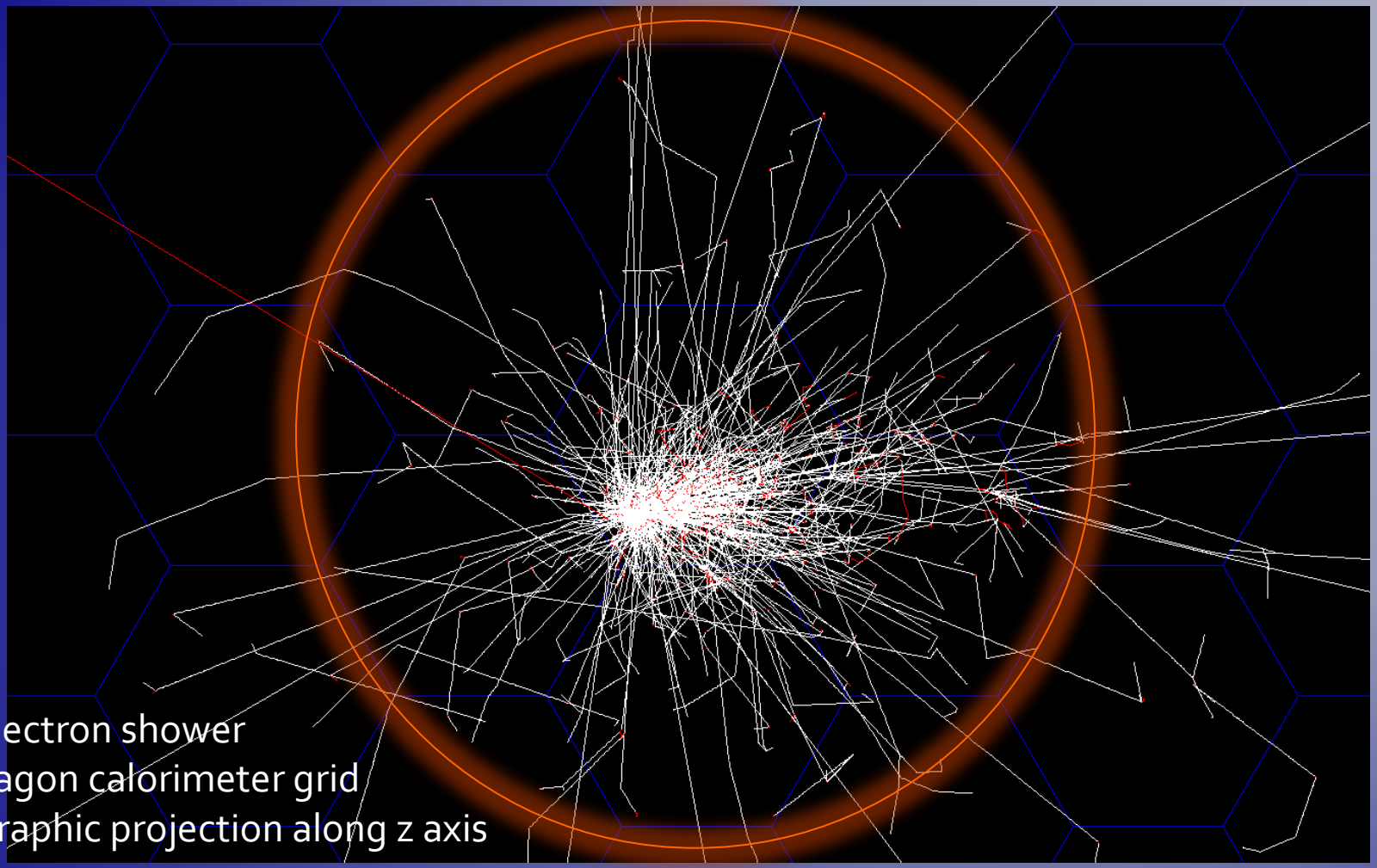


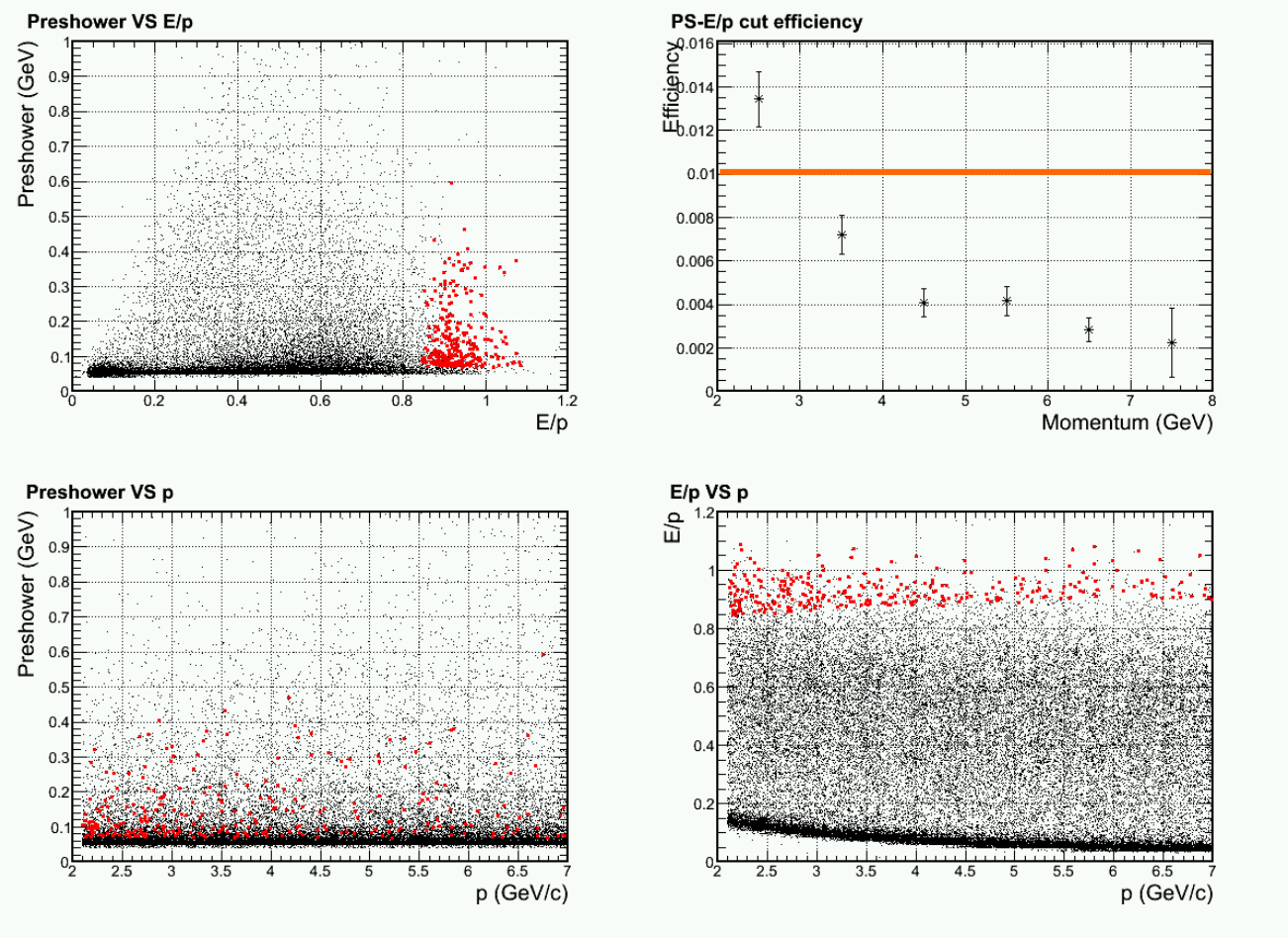
3GeV electron shower
On hexagon calorimeter grid
Orthographic projection along z axis

Hexagon Calorimeter Simulation

- Side size = 6.25 cm, default layering
- Provide nice shower area cuts – can be used in both
  - clustering – contains ~96% of shower energy
  - FPGA-based pattern trigger (HEX 1+6 trigger)

Pion rejection with HEX 1+6 clustering

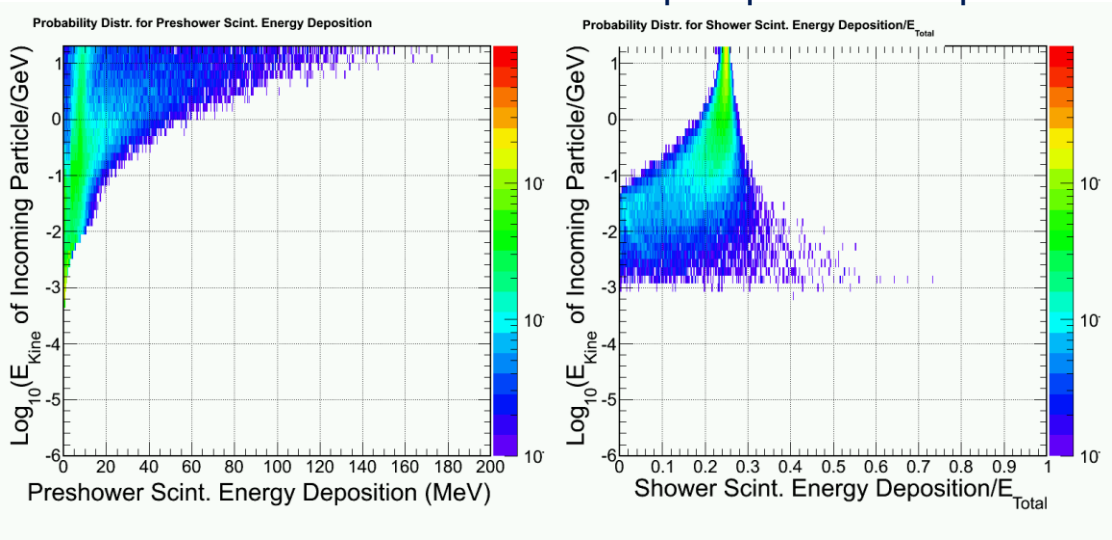
PVDIS configuration, no background, >94% electron efficiency for all p-bins

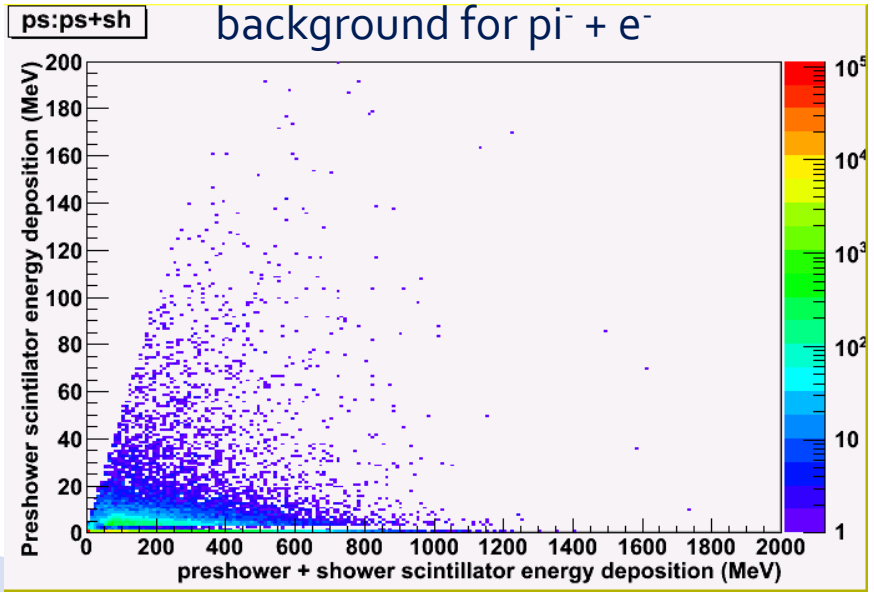


Background simulation

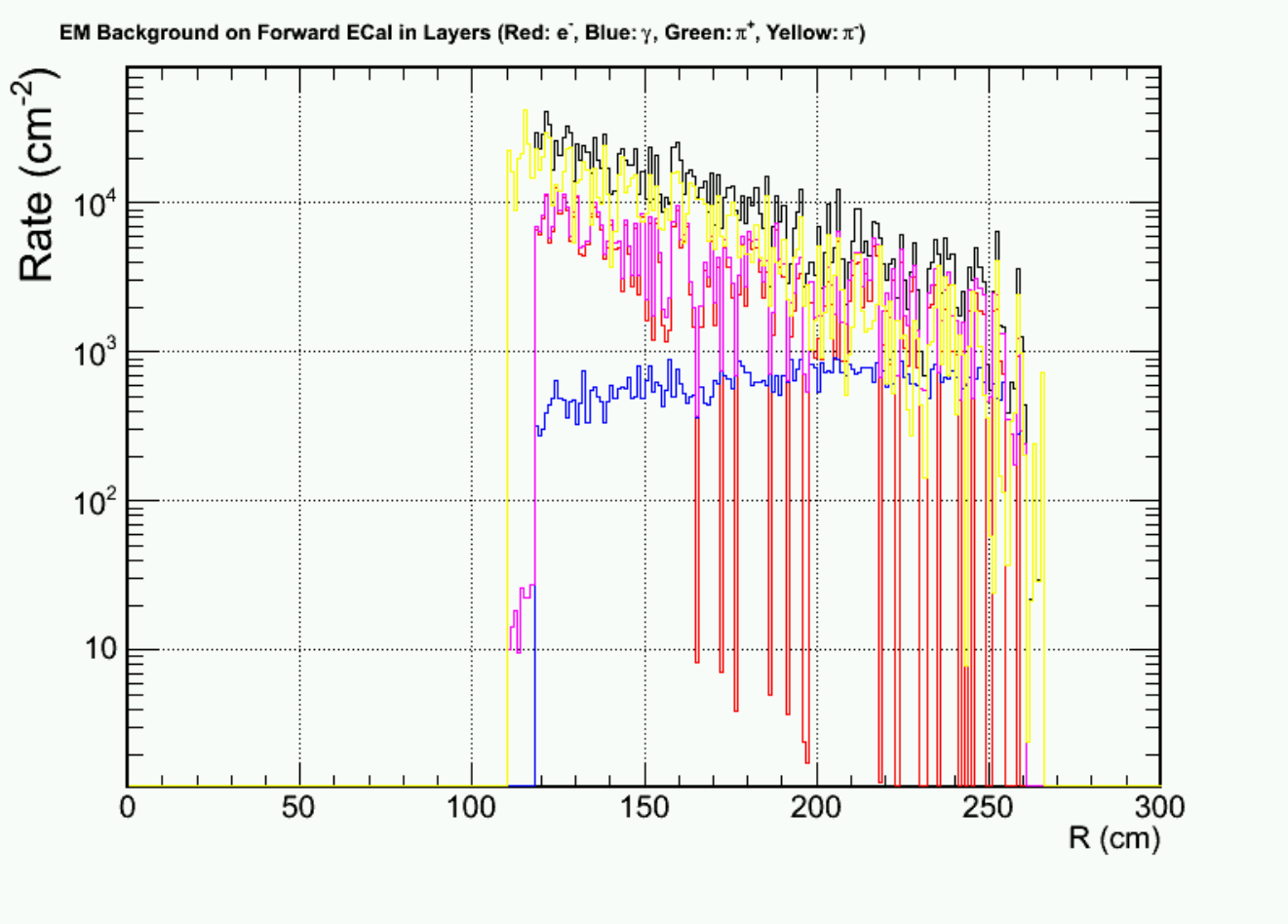
1. Simulate background at front surface of calorimeter (Zhiwen)
2. Simulate calorimeter response to a wide range of background particle
3. Combine above two sum over all contributions (EM, DIS, pio, pi+,pi-) -> background distribution
4. Imbed into the signal simulation (high energy e, pi), assuming a 50ns coincidental window

Example: photon response



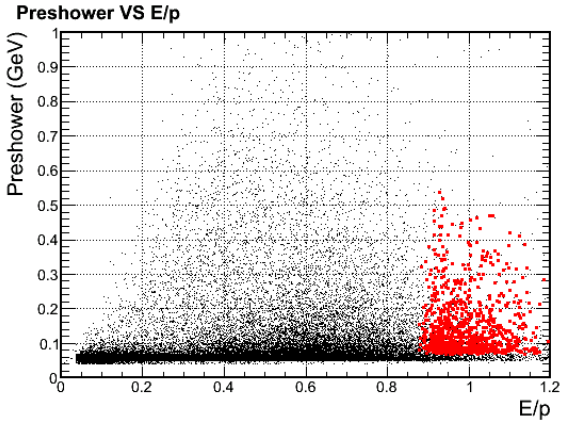


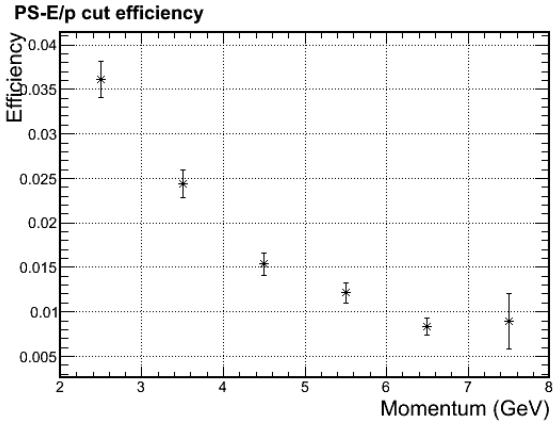
For PVDIS , MIP rate distribution Dominated by pion and electrons

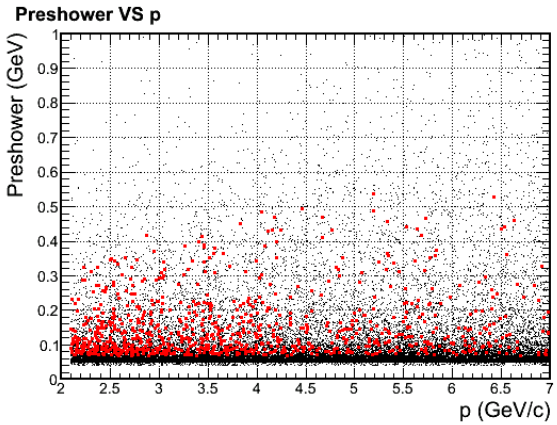


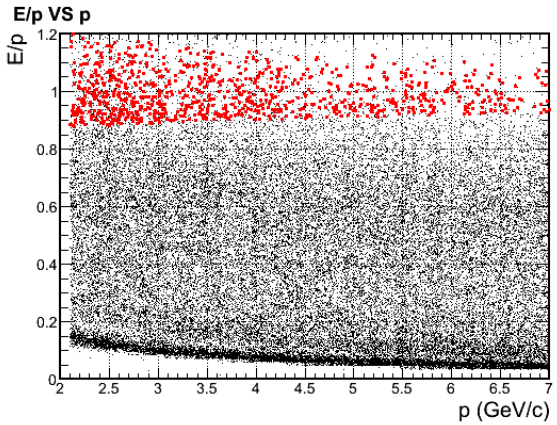
The result is still under check

- Simulated 1+6 shower cluster + $(10cm)^2$ preshower for pion + electron bgd (do we still have direct photon sight on baffle?)
- It did lead to significant change in pion rejection due to pile ups

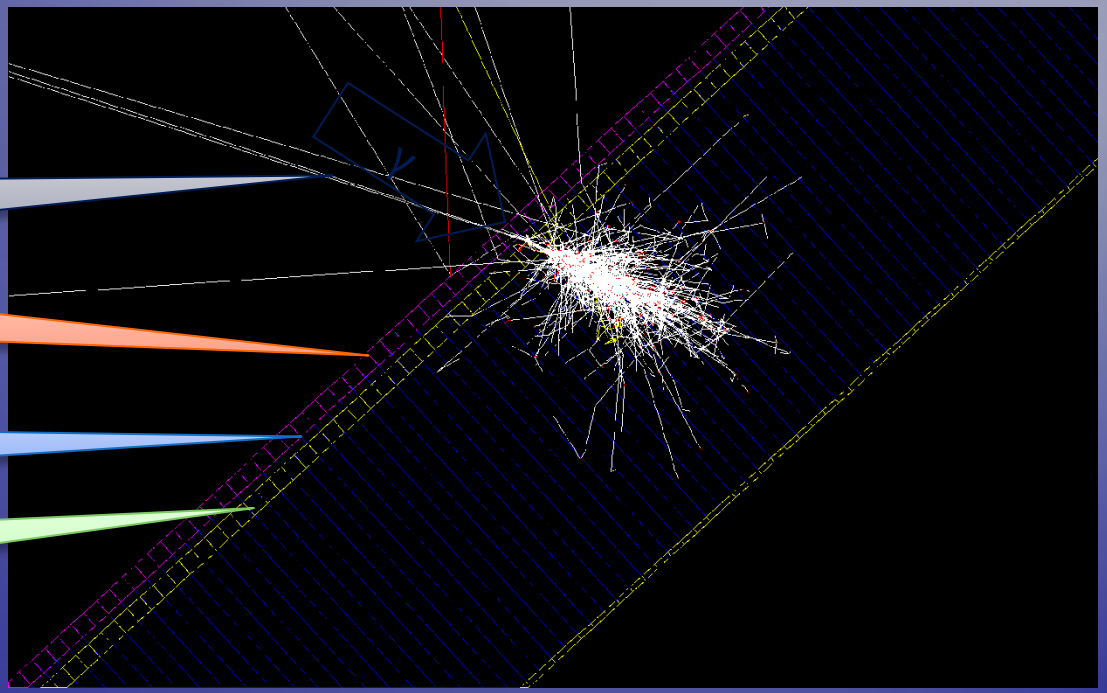








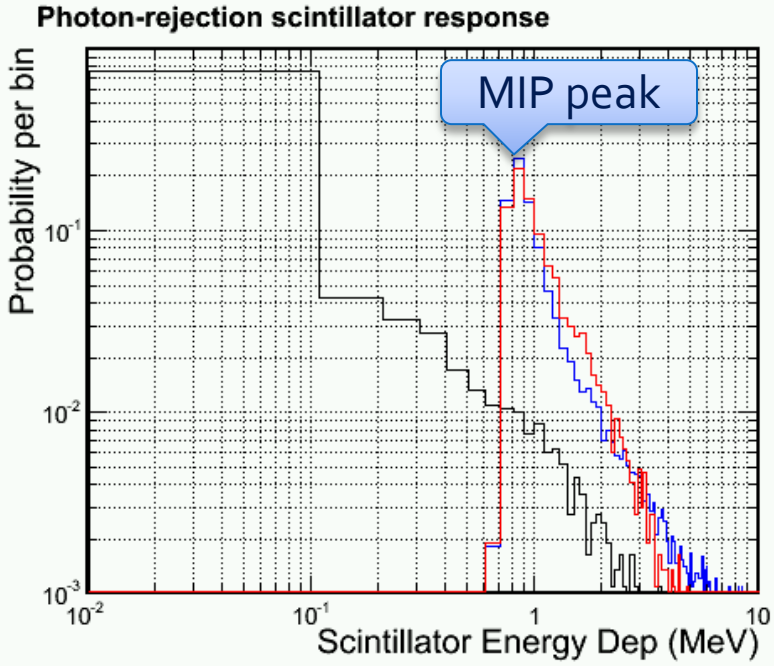
(From Jan) Geant4 Simulating scintillator before preshower

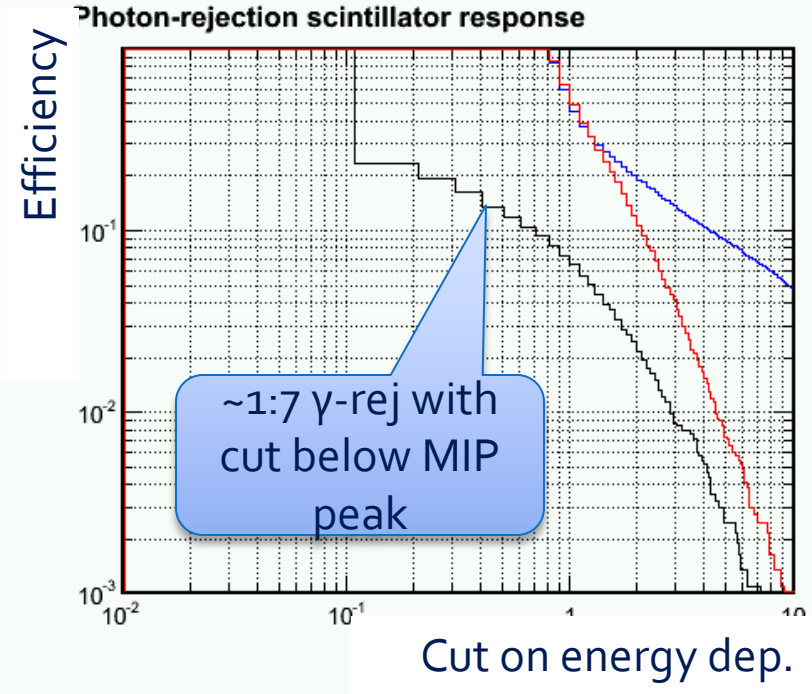


Simulated efficiency & rejection

- Electron
- Pion
- Photon

Energy range: 1-7 GeV, flat phase space for SIDIS-forward



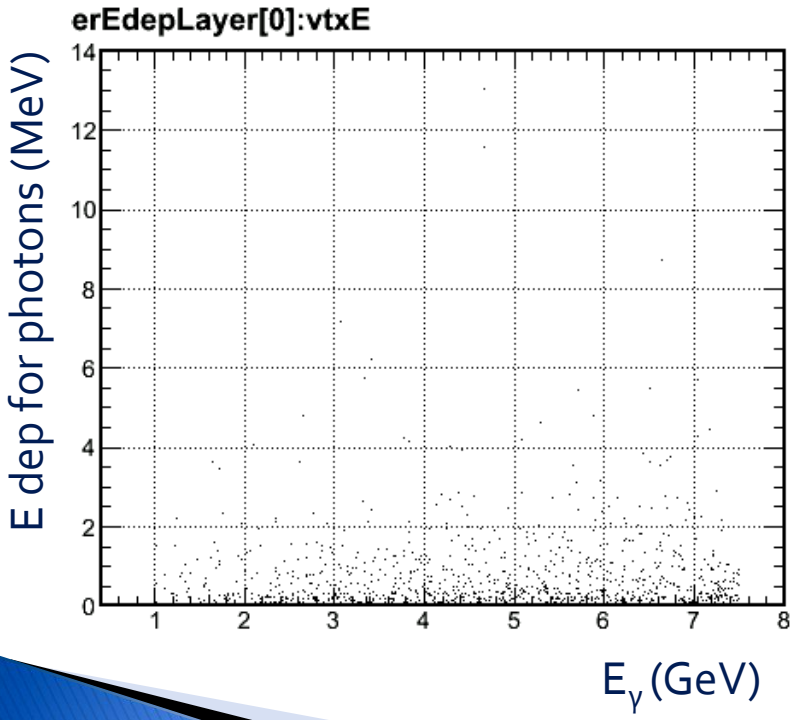


Cut on energy dep.

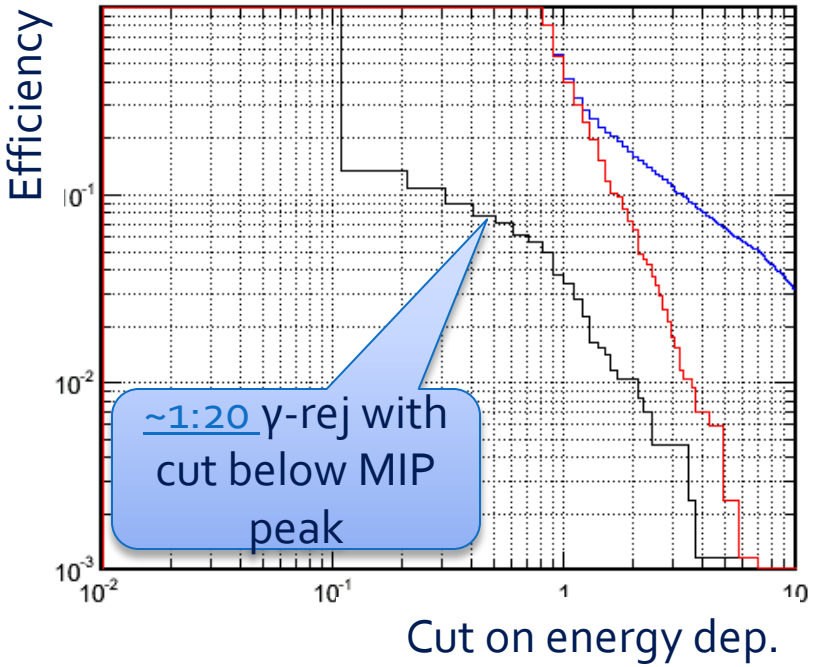
Simulated efficiency & rejection

- Most photon focus on lower energy side (π_0 decay)
- And lower energy photon produce less back scattering
- Therefore, do the study again with $1<E_\gamma<2$ GeV

- Electron
- Pion
- Photon

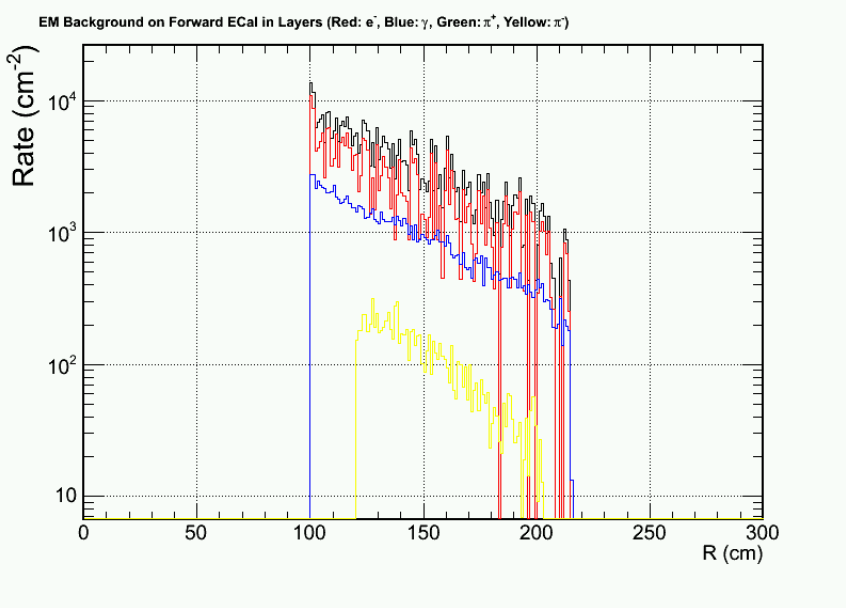


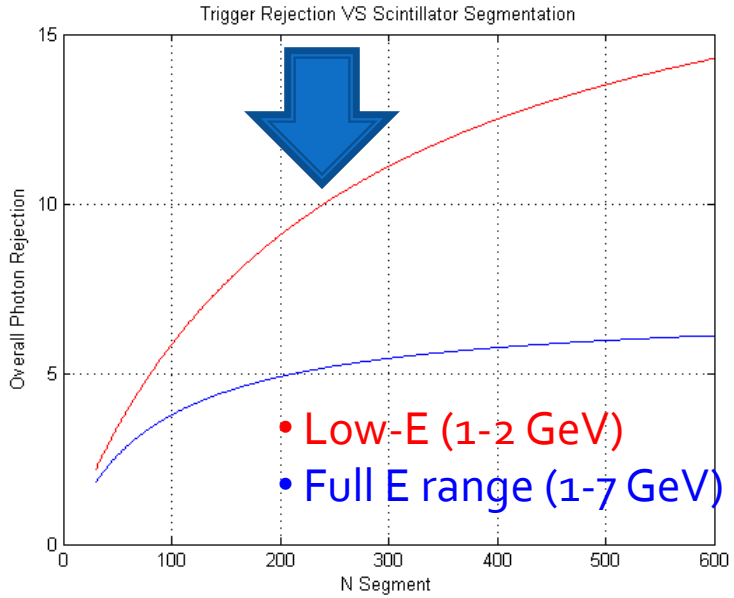
$1<E_\gamma<2$ GeV



Pile up on background

- Also from Jan: MIP rate on scintillator is 20% for 60 segments, which dominate the rejection
- More fine segmentation pursued
- Suggest sector shape, better match shower triggers





How signal looks like