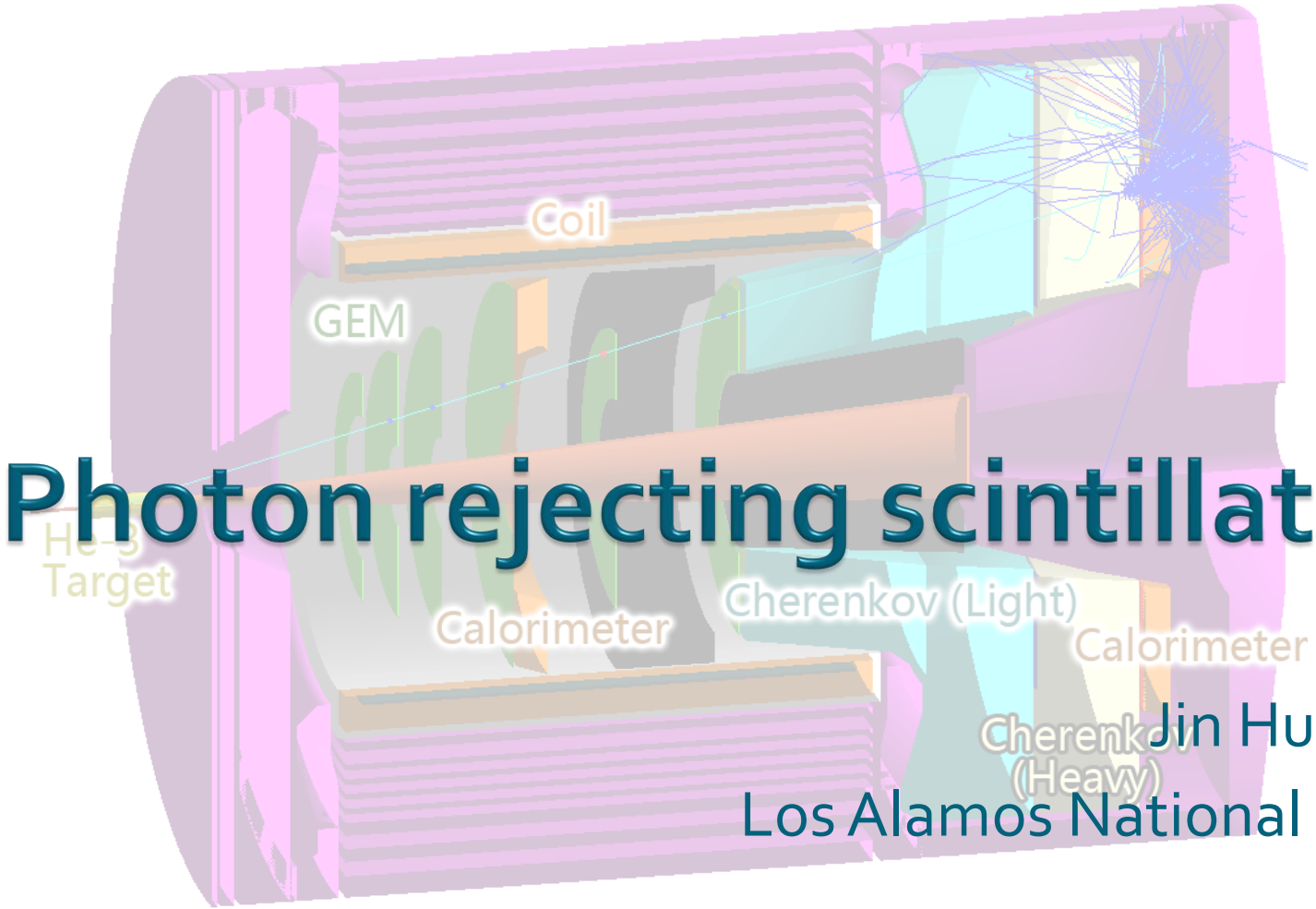

Photon rejecting scintillator

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Generic discussion

- Add scintillator before preshower to reject photons VS electron
  - Interested energy range 1~few GeV (photon rate drop quickly)
  - Need to be simple & fast for trigger implementation
- Generic rate for single photon on stand alone scintillator:
  - Prob. for photon energy dep = $1-\exp(-L/L_0)$
  - Where L_0 ~ 55 cm for scintillator
  - Simulated by Zhiwen:

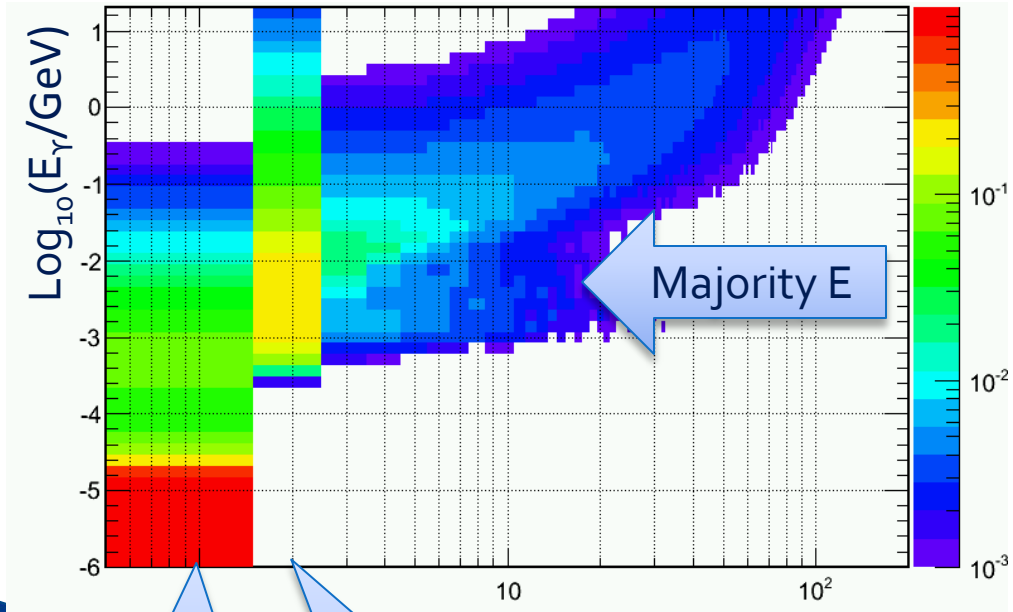
Zhiwen's simulation

10cm	22%
5cm	14%
2cm	5%
1cm	3.3%
0.5cm	2.3%
0.25cm	0.65%

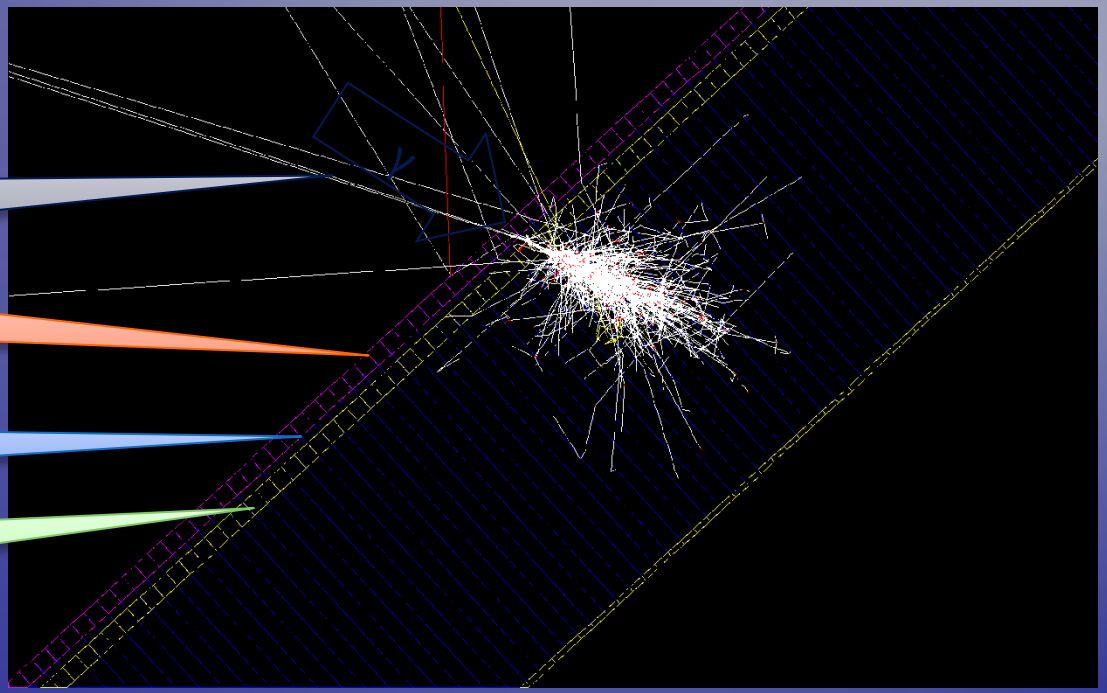
From last week - Radiation dose is OK

- Before the preshower Pb and without protection from lower energy EM background
- Turn out to be not very bad since photon penetrate more depth

Ratio of energy deposition in active layers from a input photon



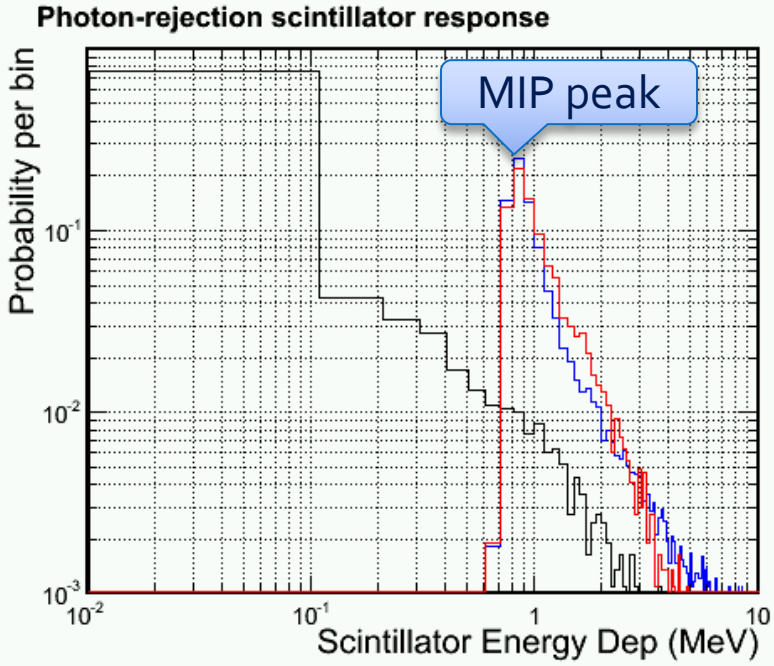
Geant4 Simulating scintillator before preshower

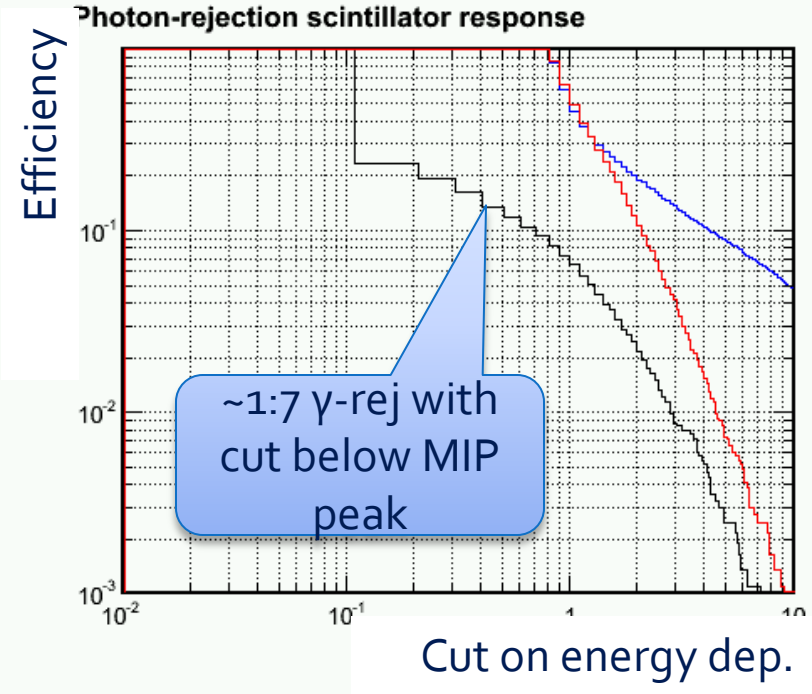


Simulated efficiency & rejection

- Electron
- Pion
- Photon

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



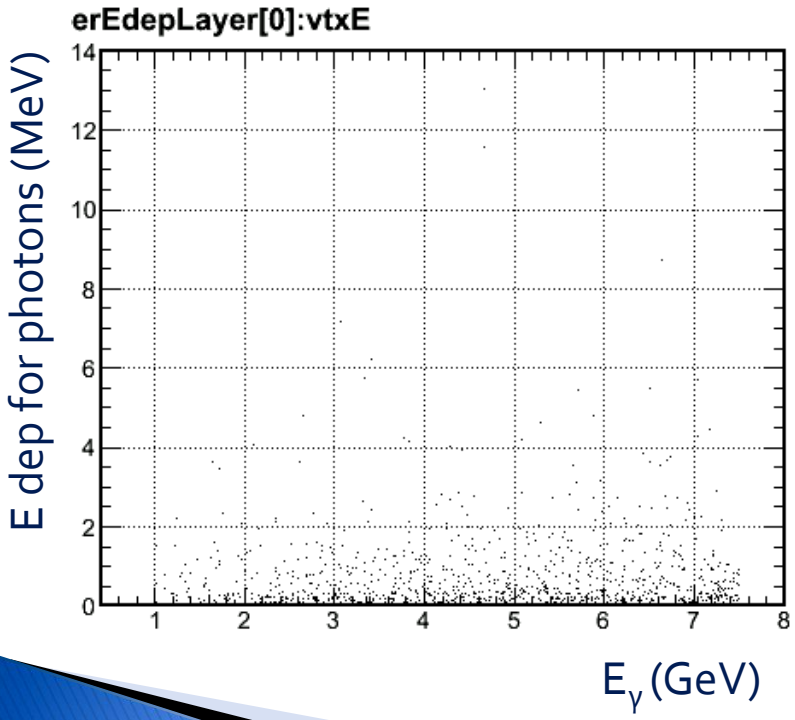


Cut on energy dep.

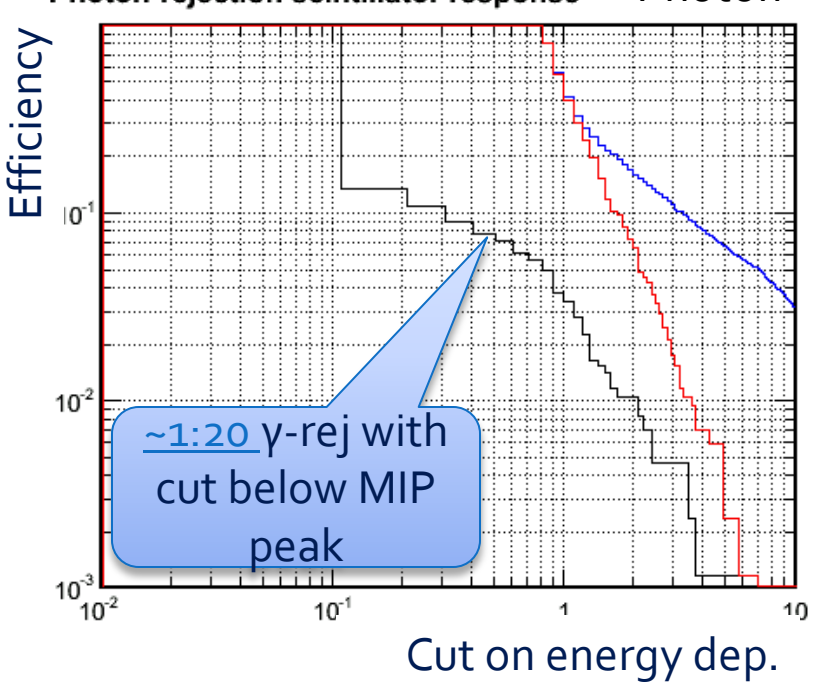
Simulated efficiency & rejection

- 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



Discussion

- Photon rejection:
  - 1:20 (1-2 GeV)
  - 1:7 (full E range)
  - Cut well below MIP peak
- Back scattering from calorimeter is significant
- We can try
  - Move scintillator away from preshower?
    - Ex. put it before the heavy gas cherenkov
  - Use two layer of scintillator to rej backscattering?
    - Probably not efficient
- More to study
  - Background level – plan to use background imbedding
  - Correlated photon background from π^0 delay
  - Energy deposition to trigger level smearing