Simulation Updates

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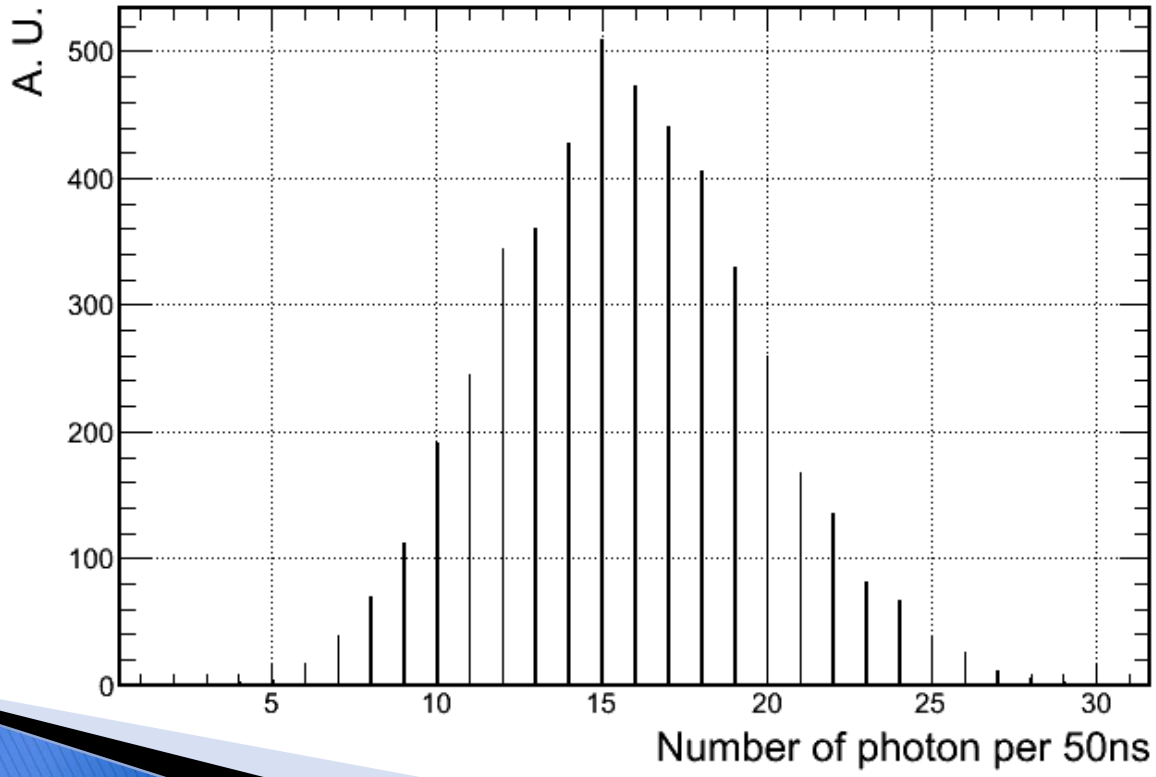
SIDIS Large Angle EC

Calorimeter background simulation

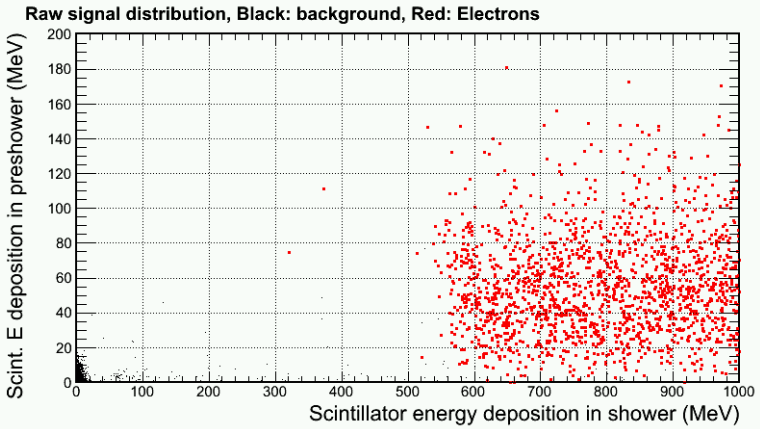
1. Simulate background at front surface of calorimeter (Zhiwen) and look at the most inner radius (highest background)
2. Simulate calorimeter response to a wide range of background particle
3. Combine above two sum over all contributions (EM, DIS, pio, pi+,pi-) -> background distribution
4. Imbed into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

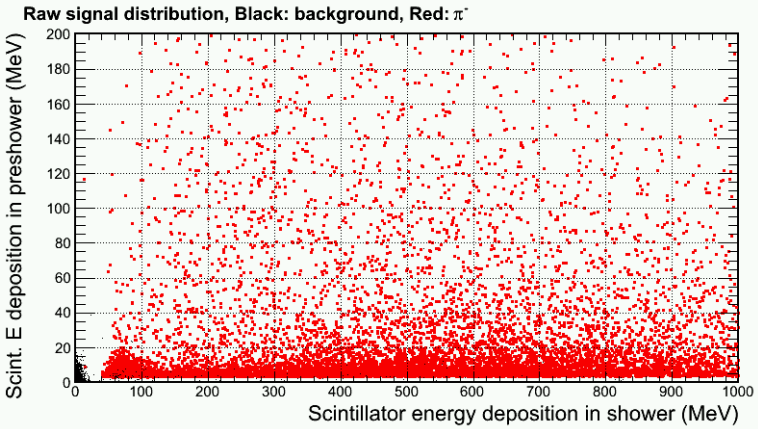
Dominant background

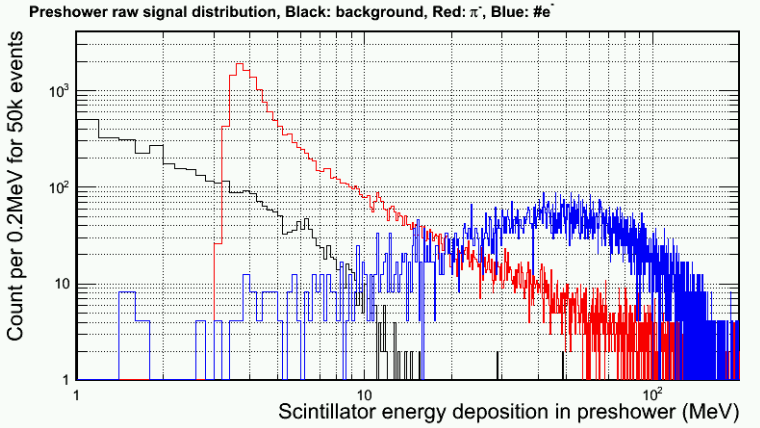
- 0.3 GHz low energy photon for inner-R 1+6 hexagon clusters
- But well shielded by 2-X0 preshower absorber

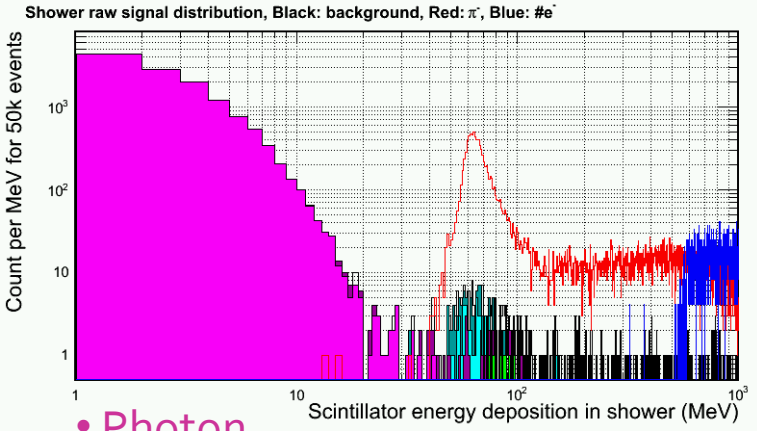


Background distribution



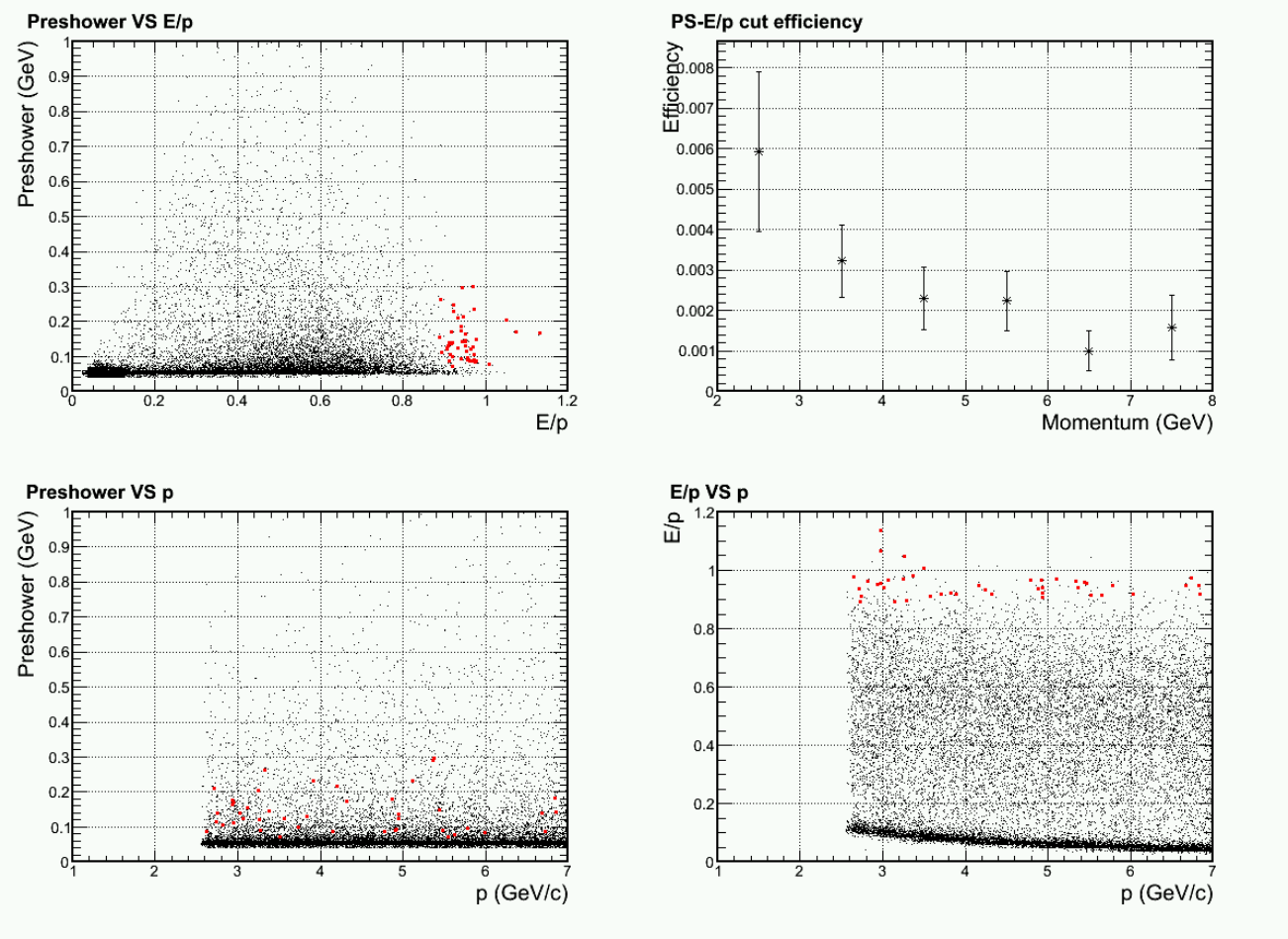




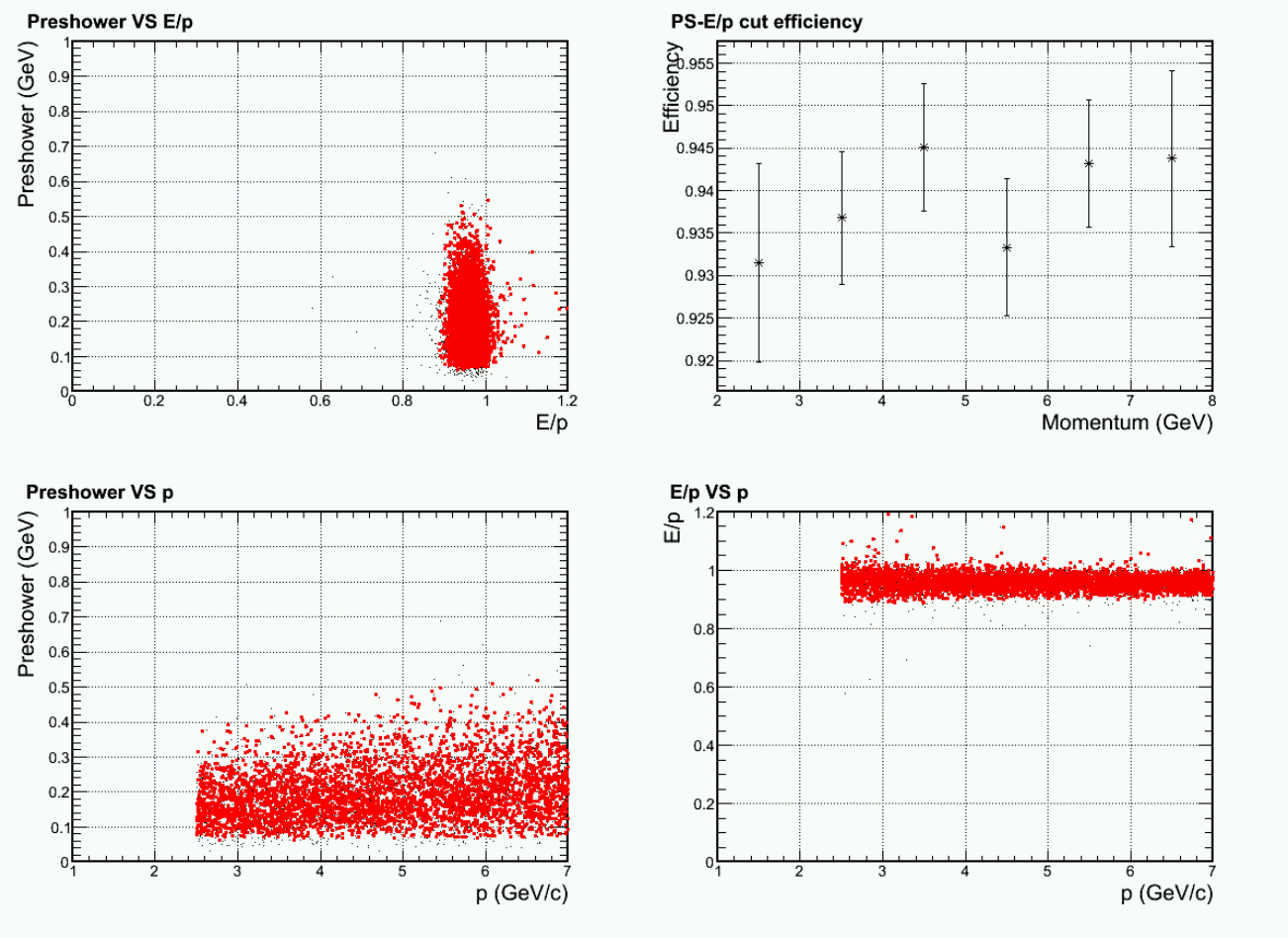


- Photon
- Electron
- Pion

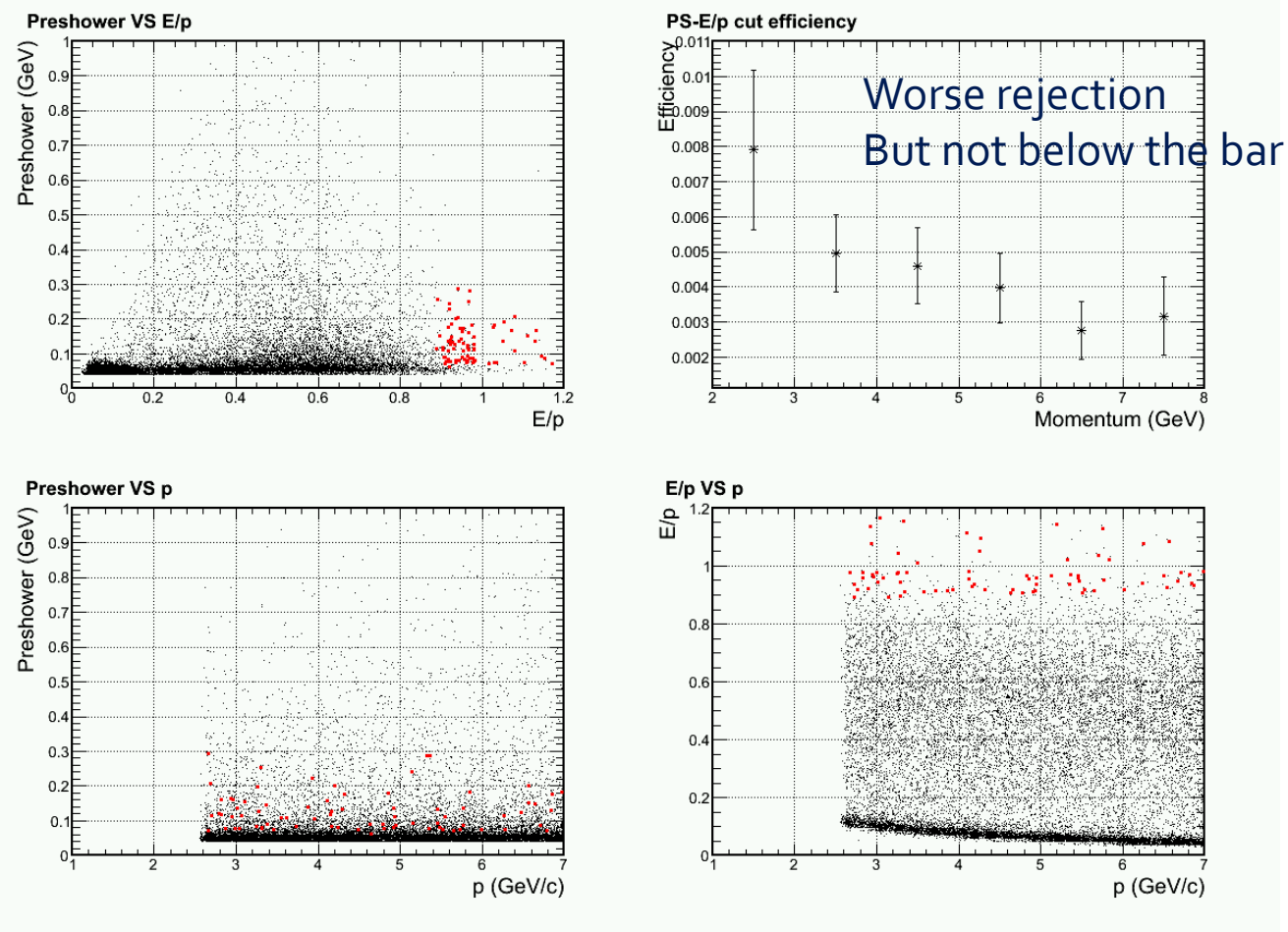
Pion rejection w/o background @ 94% electron eff



w/ background (inner-R) Electron efficiency



w/ background (inner-R)
Pion efficiency (1/rejecton)



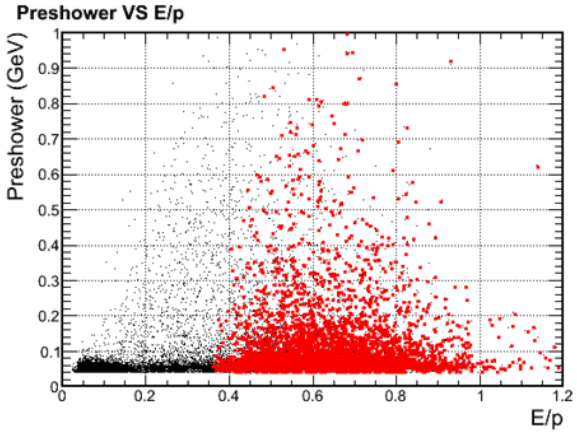
Trigger turn-on curve

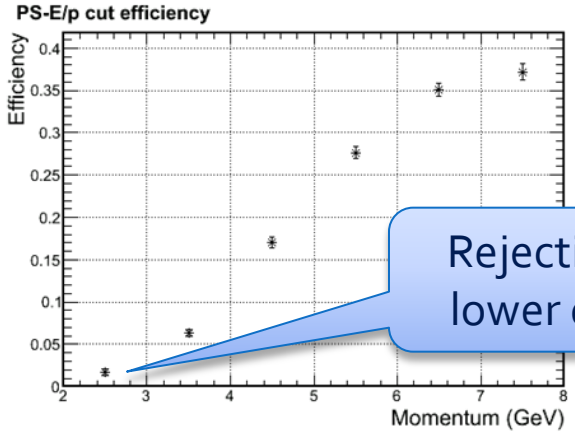
- Proposed trigger rate and rejection

$$T_L^e(11\ \mathrm{GeV}) = Y_L^e + Y_L^\gamma + \frac{Y_L^h}{R_{LC}} = 11 + 51.5 + \frac{55.6}{20} = 65\ \mathrm{kHz}$$

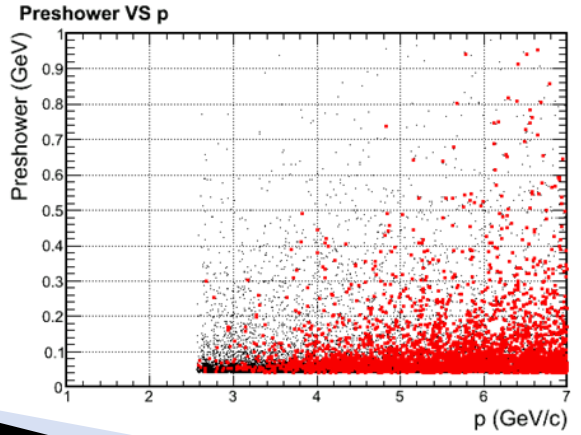
- Pion rejection needed ~ 20:1, but I think can be relaxed
- Additional photon rejection help more
- Single-Shower 1+6 cluster trigger tested
  - Full background spectrum considered
  - Cut on shower energy deposition > 2.6 GeV
  - Very high electron trigger efficiency

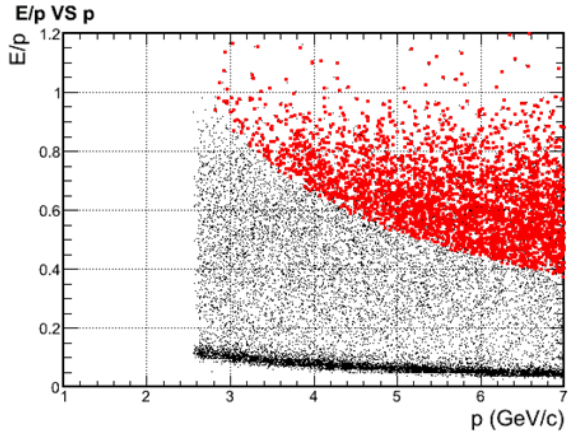
Pion turn-on curve
Single-Shower trigger > 2.6 GeV





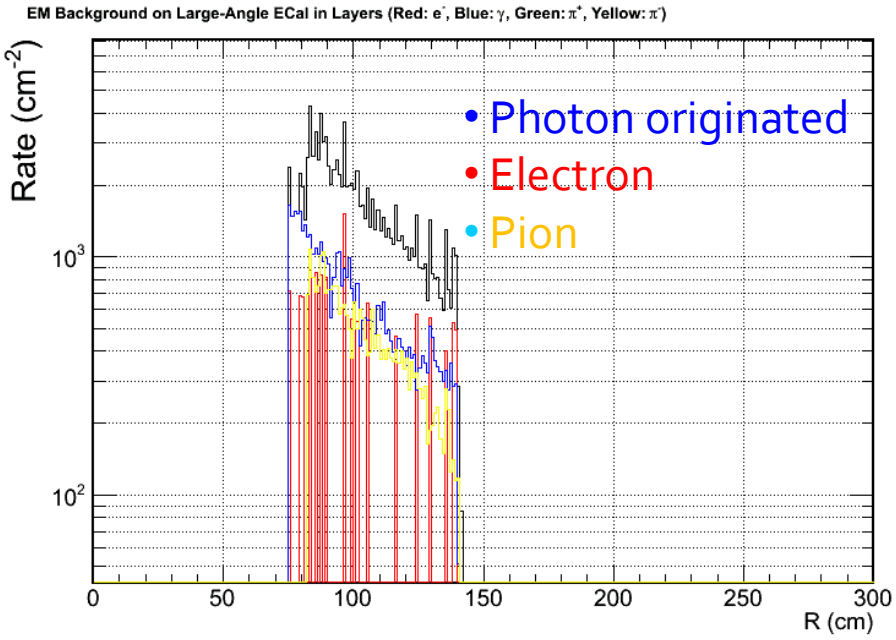
Rejection > 20:1 for lower energy pions

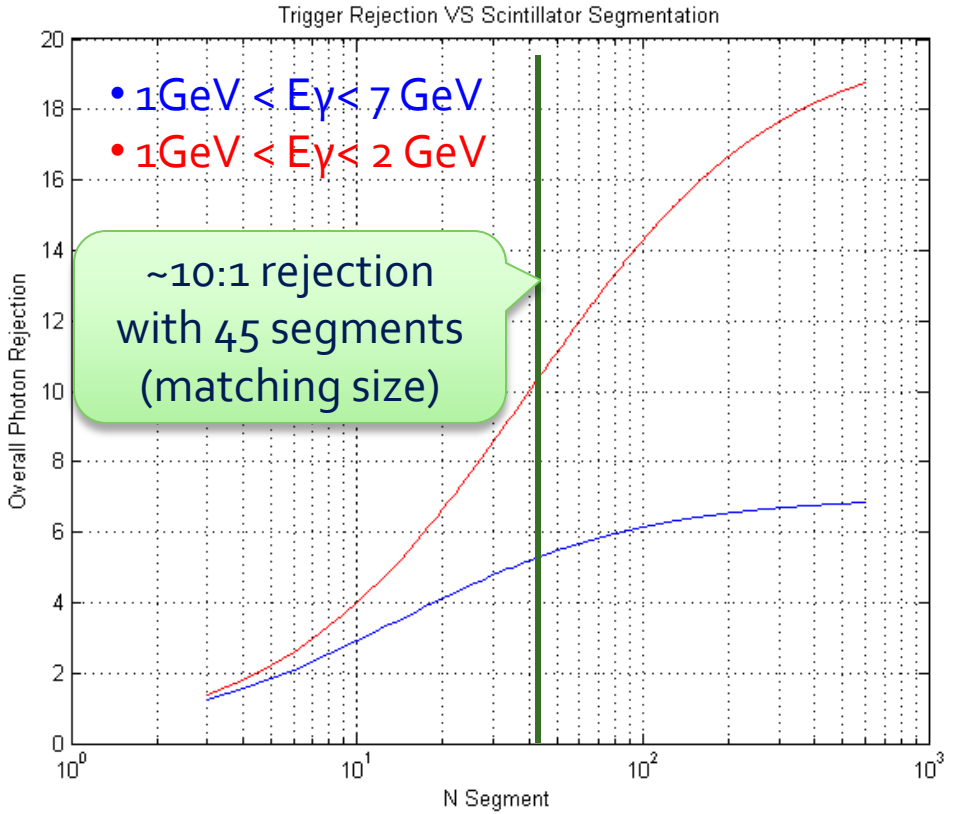




What if we also want to rejection photons? - Add a scintillator pad

Scintillator MIP rate

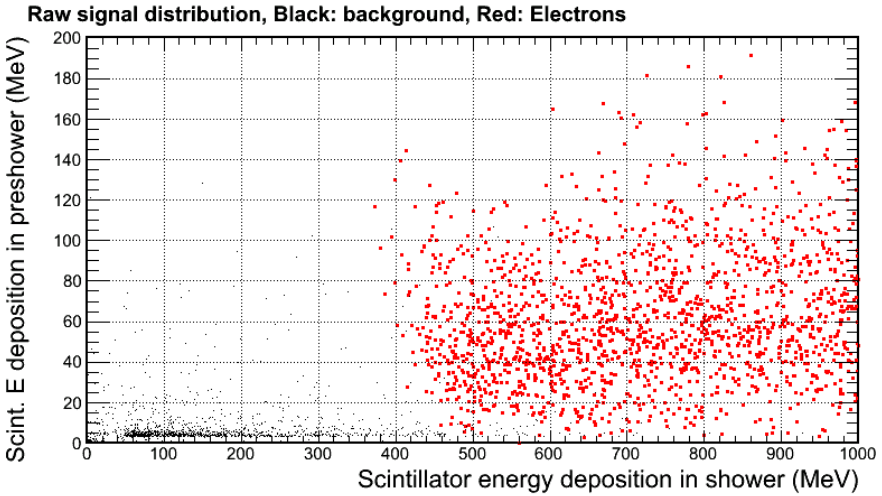


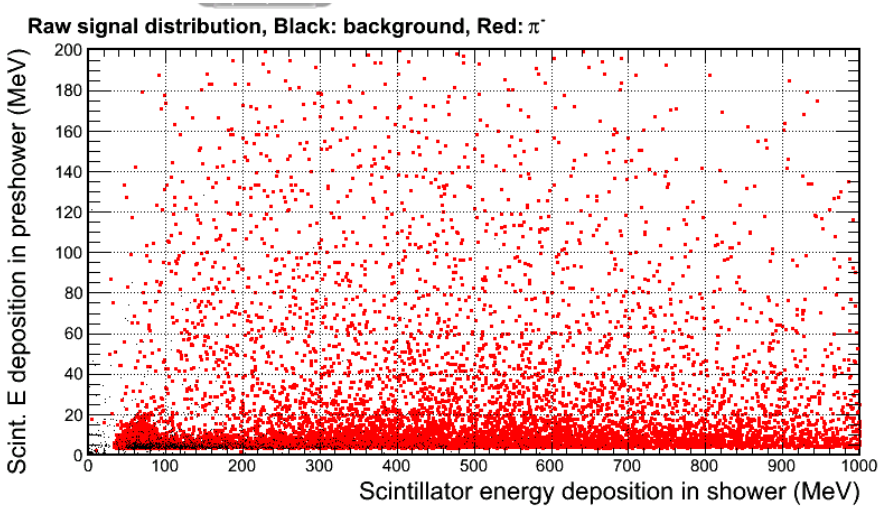


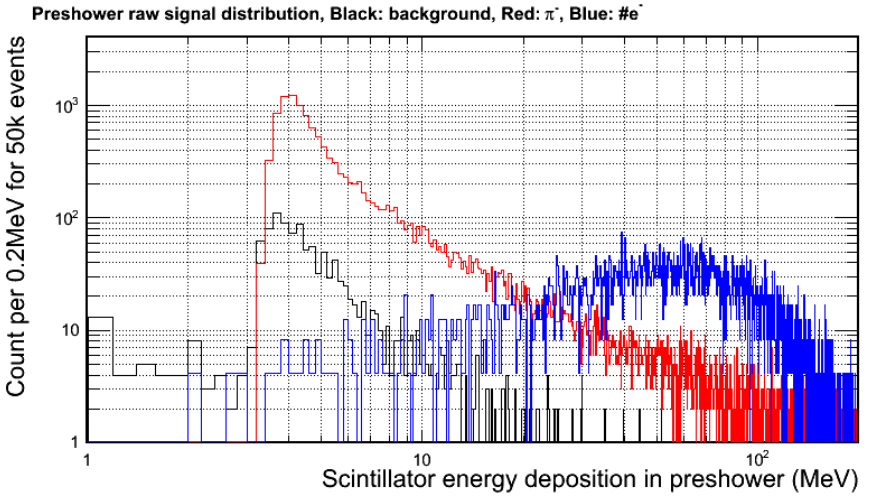
PVDIS Calorimeter

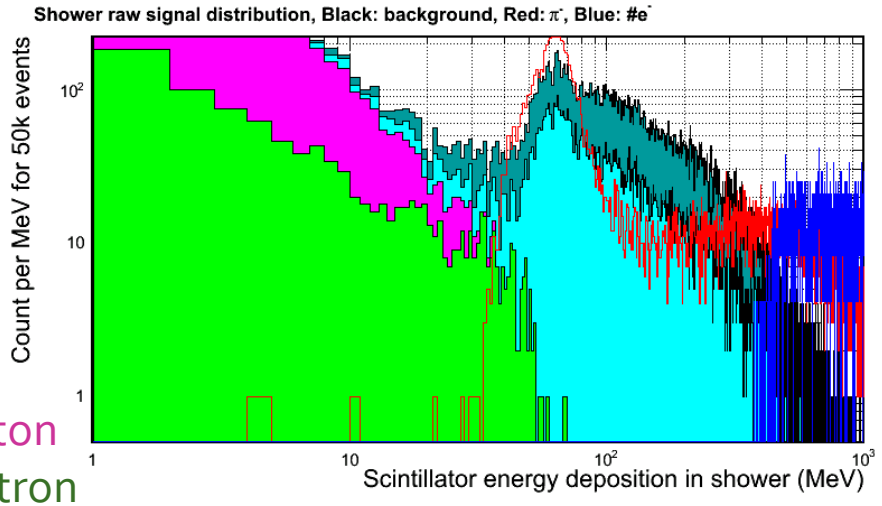
- Simulated using Apr 2012 BaBar baffle
- Still trying tricks to improve performance

Why it is hard – lots of deep pions



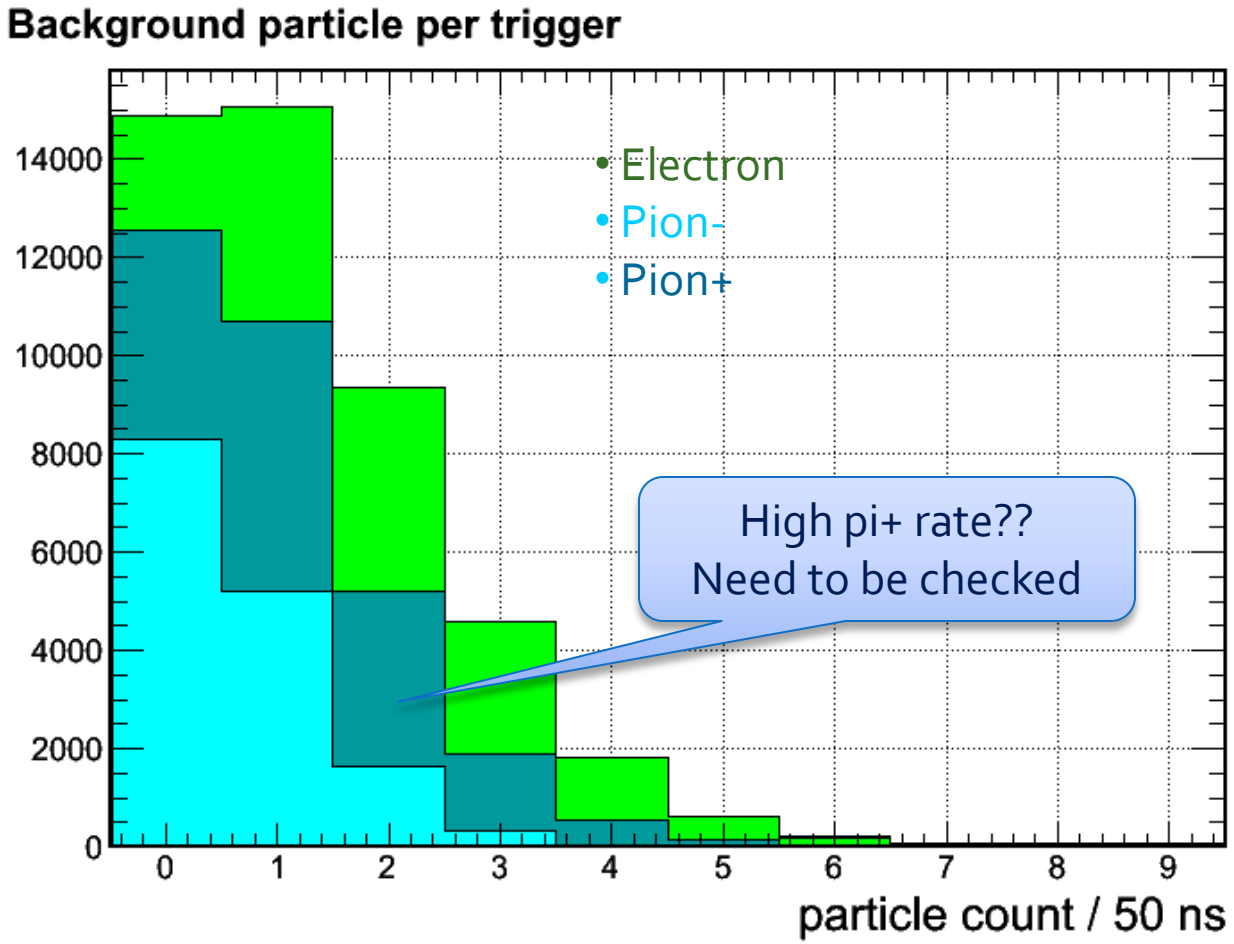




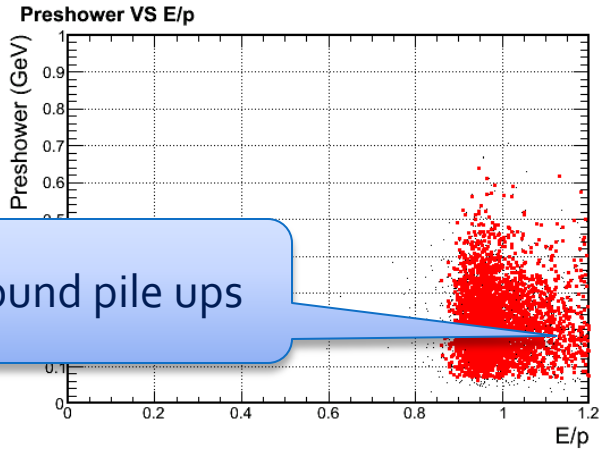


- Photon
- Electron
- Pion- Pion+

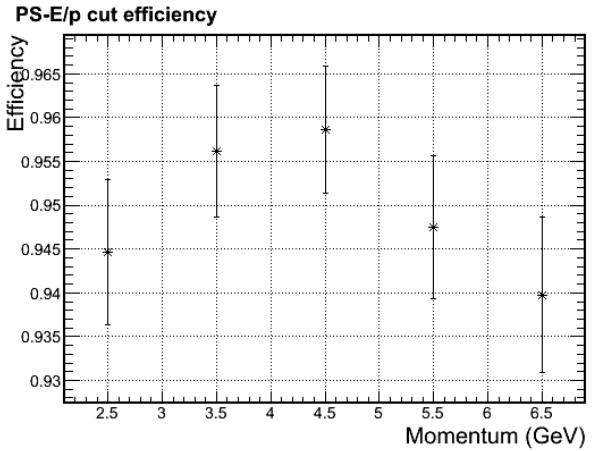
Per-event pion rate for 1+6 hexagon cluster at inner radius

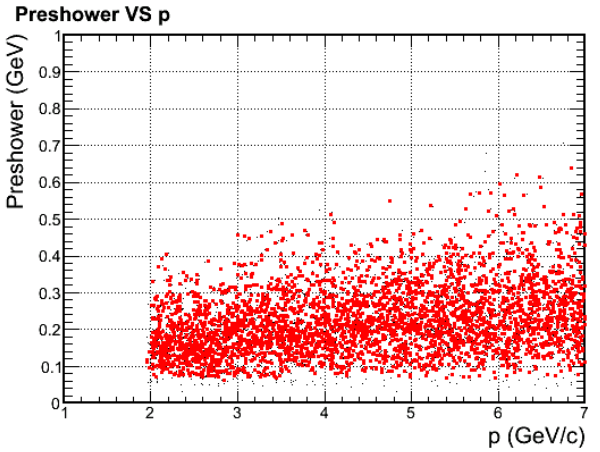


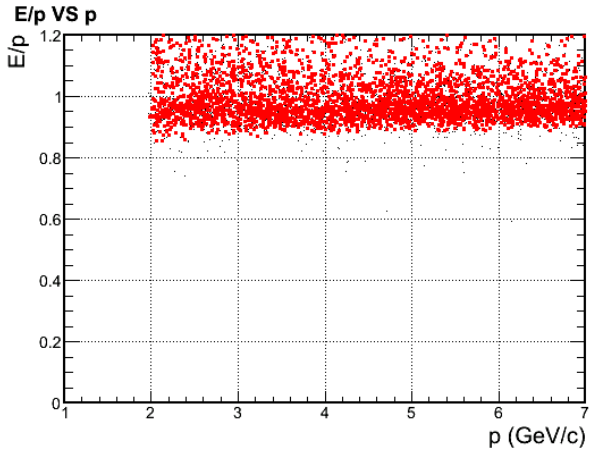
Electron efficiency w/ background at inner radius. Ignore gamma and pi+ bgd



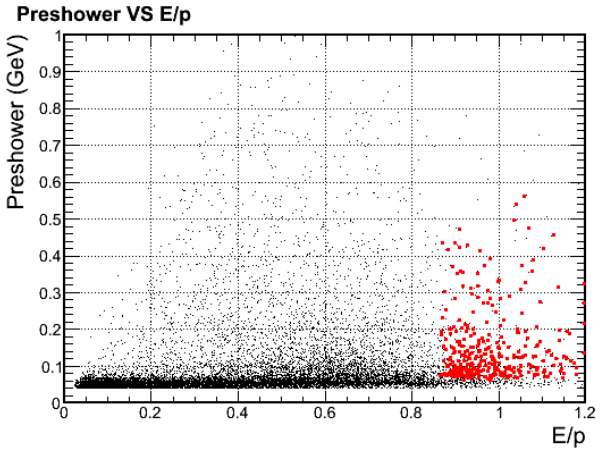
Background pile ups

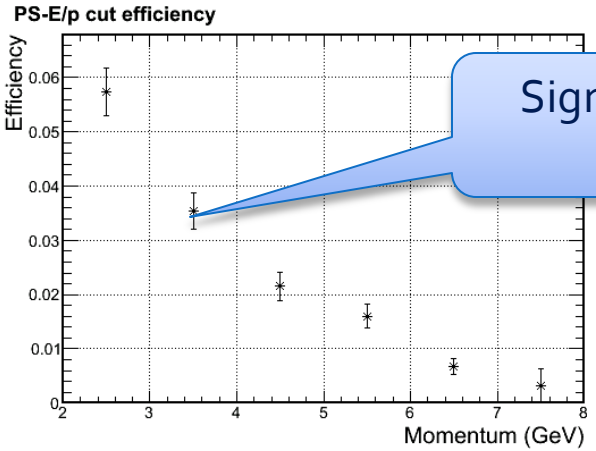




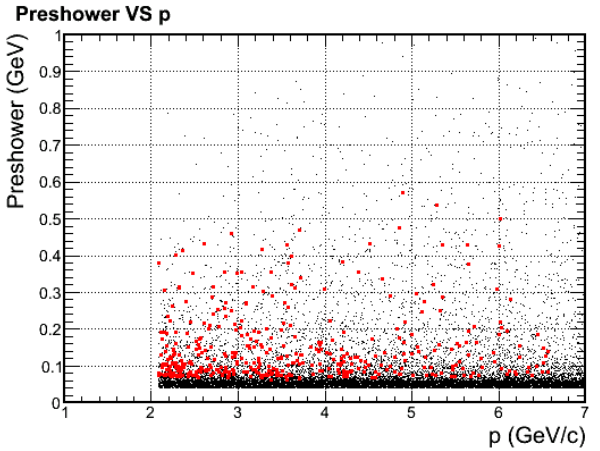


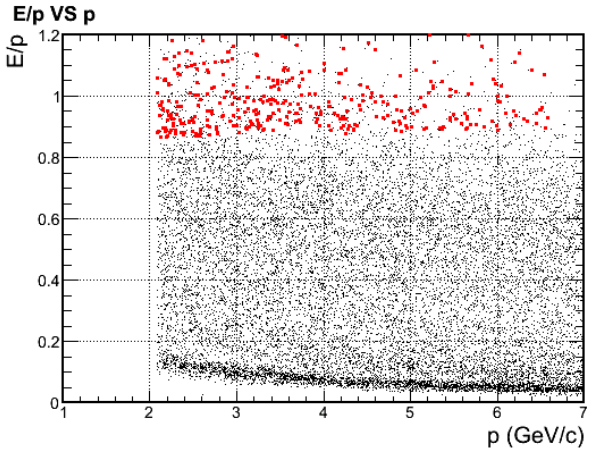
Pion efficiency w/ background at inner radius. Ignore gamma and pi+ bgd





Significant drop in rejection





What we can further try

- Position or kinematic dependent trigger threshold and cut threshold
- Use track multiplicity to assist calorimeter cuts