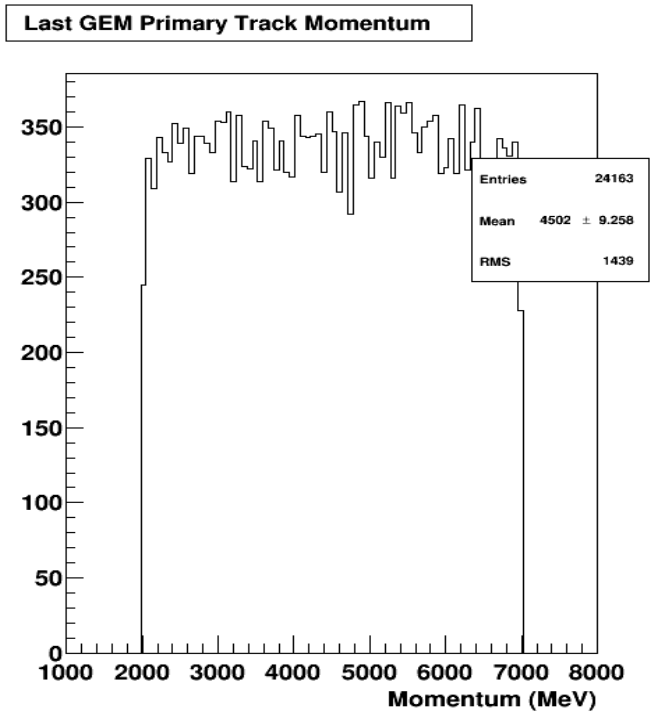
ECAL PID Efficiency 1

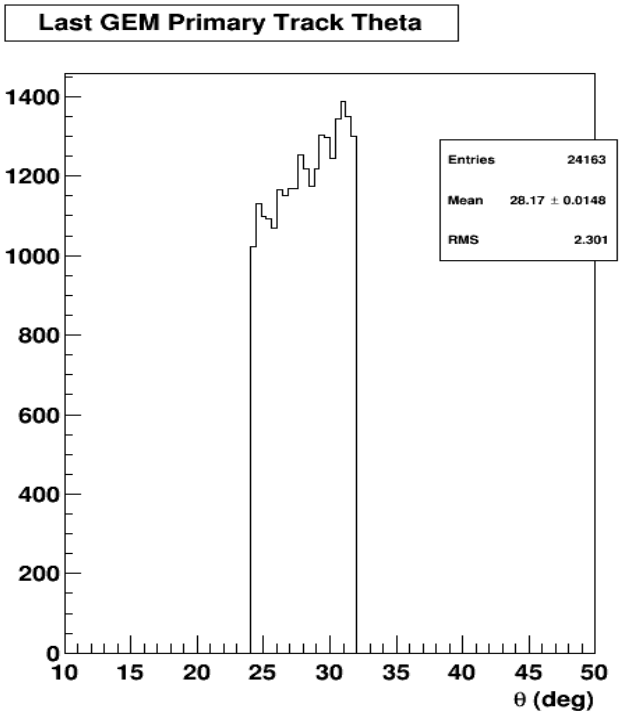
PID Efficiency Simulation

- Input flat distribution : electrons
- No radiative effects in the target
- Setup only include ECAL and sensitive detector replacing last GEM in vacuum medium.
- Use ecal cluster energy and input momentum to get energy resolution for shower only and pre-shower + shower combination

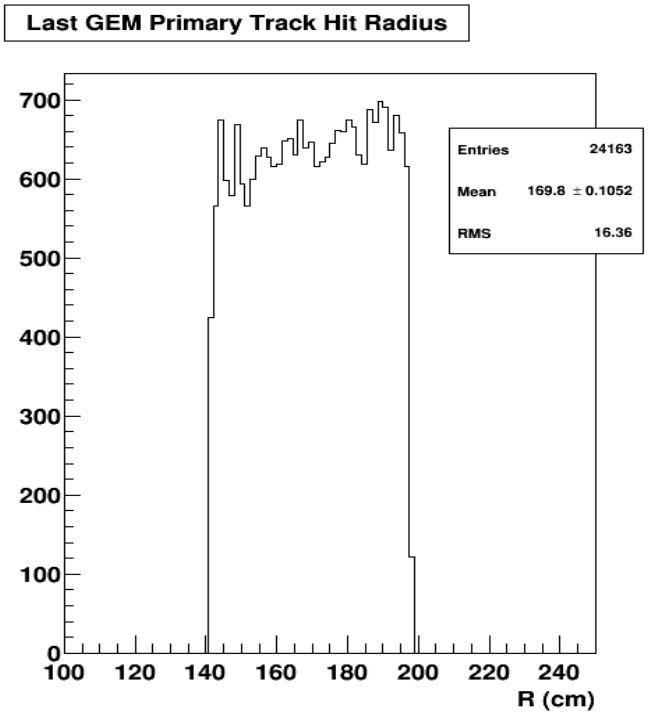
Input Flat Distribution



Input Momentum



Input Angle



Input Radius

ECAL Energy Calibration

Calibrated Energy on Shower = sh_edep_scint * sampling_fraction

Calibrated Energy on PreShower =

ps_edep_scint + ps_edep_lead

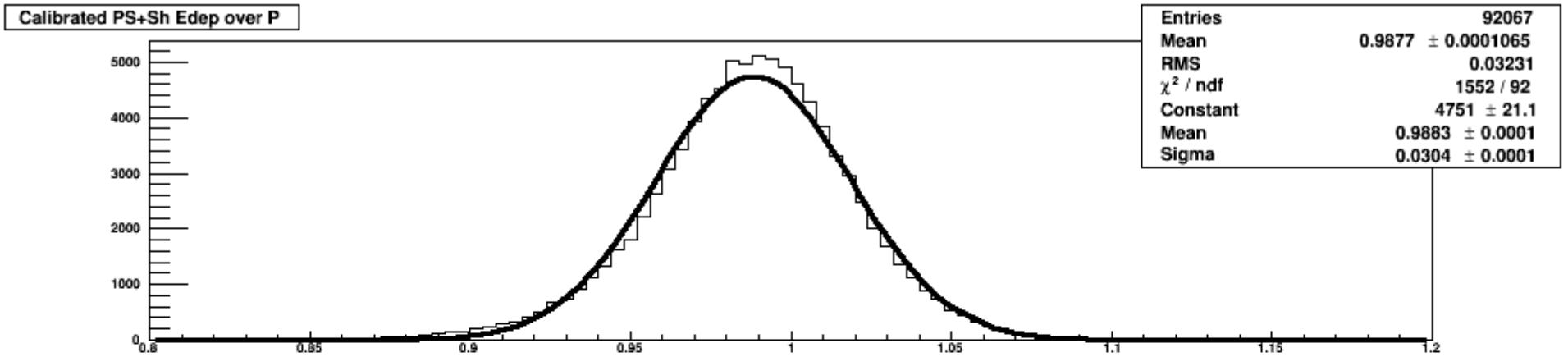
Calibrated Total Energy =

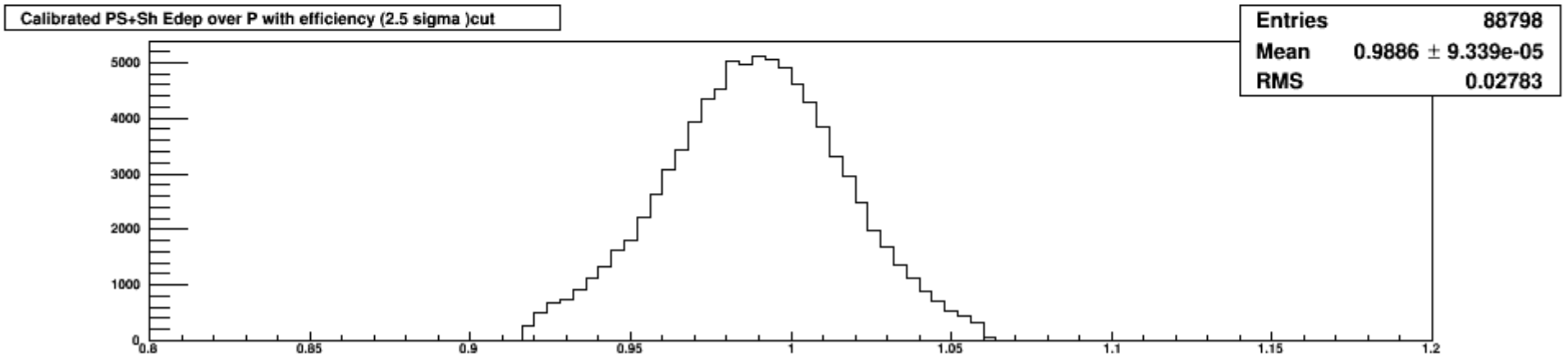
Calibrated Energy on Shower + Calibrated Energy on PreShower

Note :

- sampling_fraction obtained from simulation
- Energy deposit on lead in shower and pre-shower are recorded in the simulation

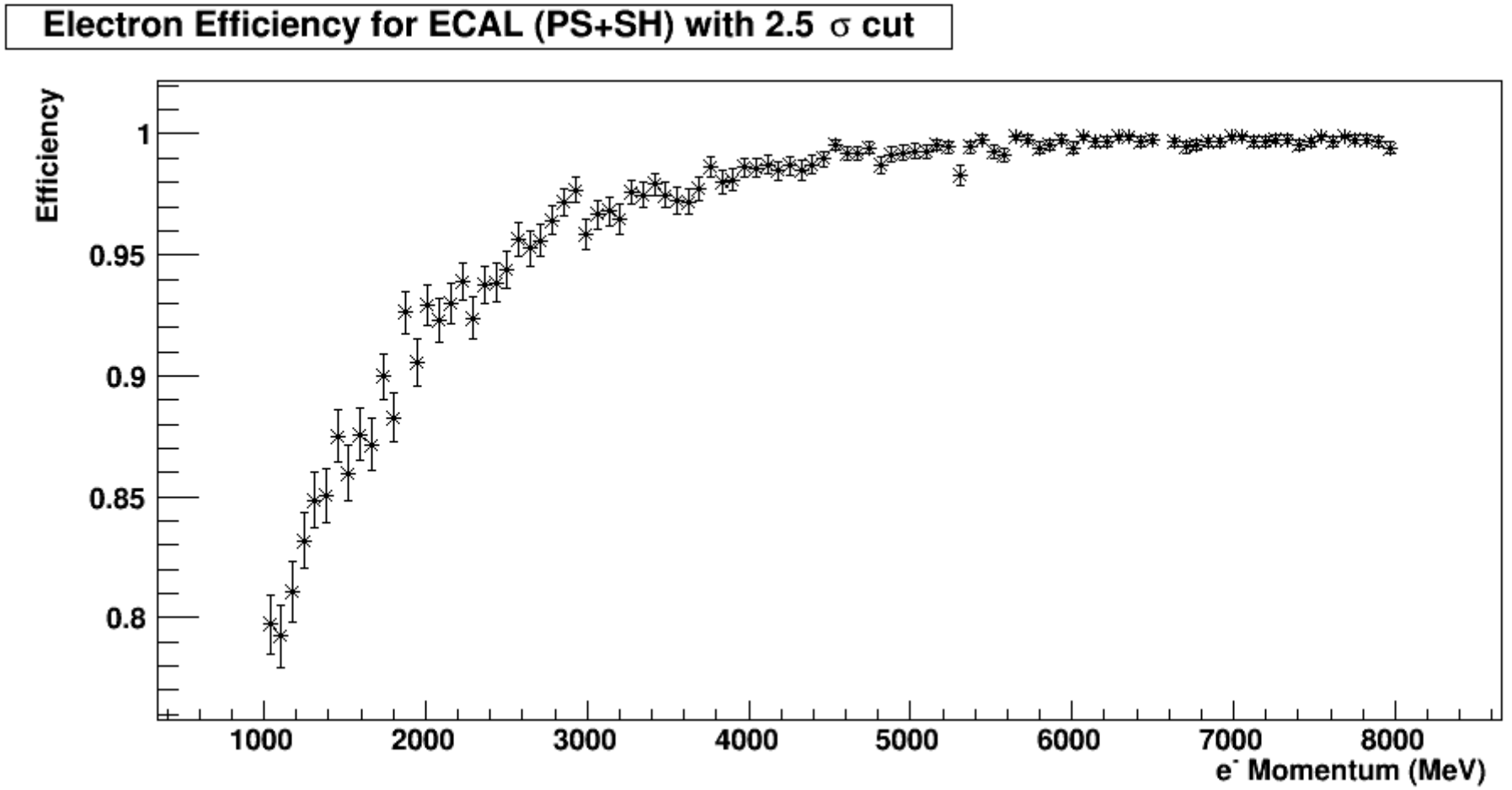
e^- Calibrated Energy over Pf Ratio



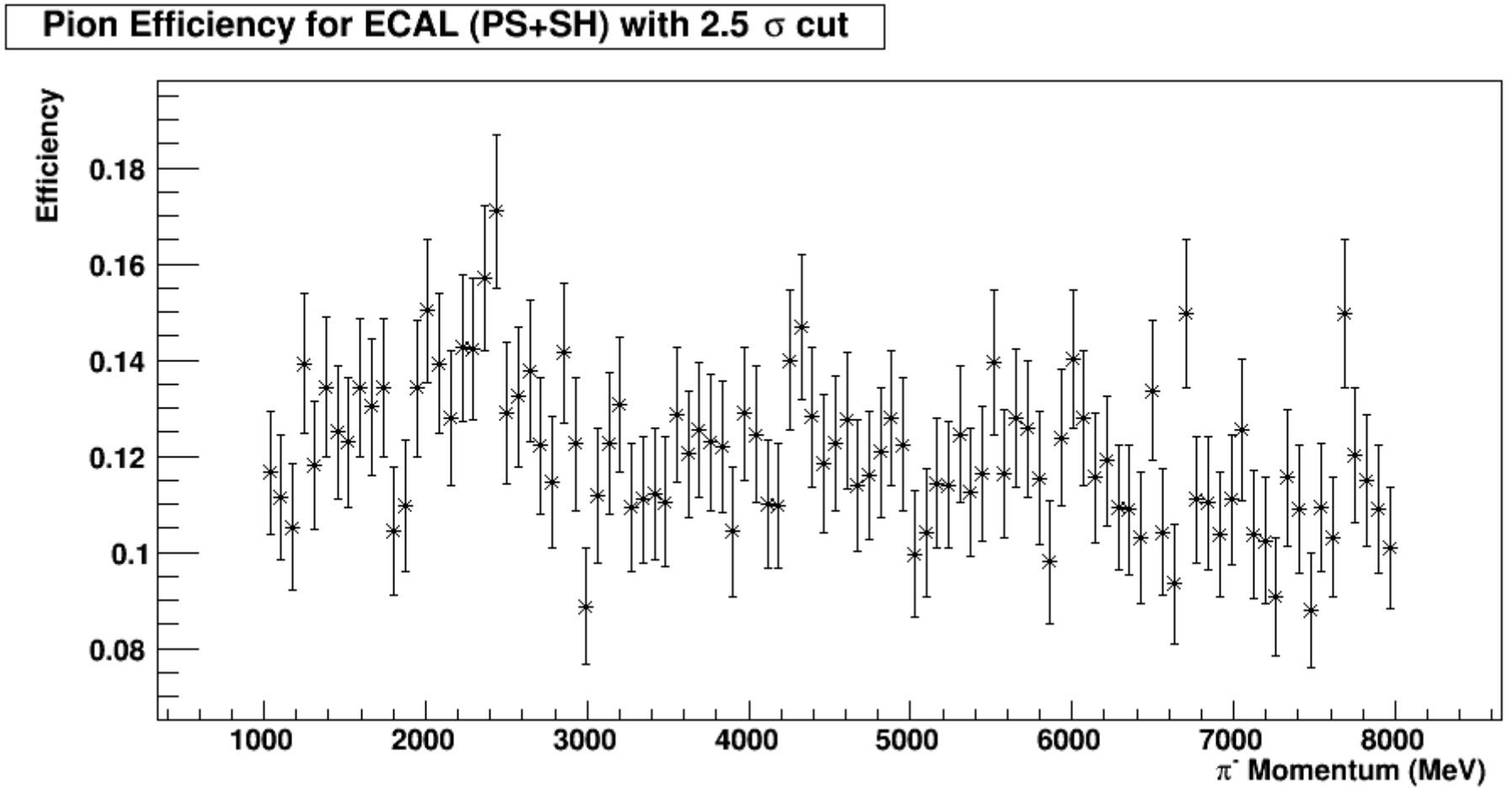


- A 2.5 σ cut applied to select e^- events
- Ratio of above cut selected e^- over total e^- events is the ECAL efficiency

e^- Efficiency

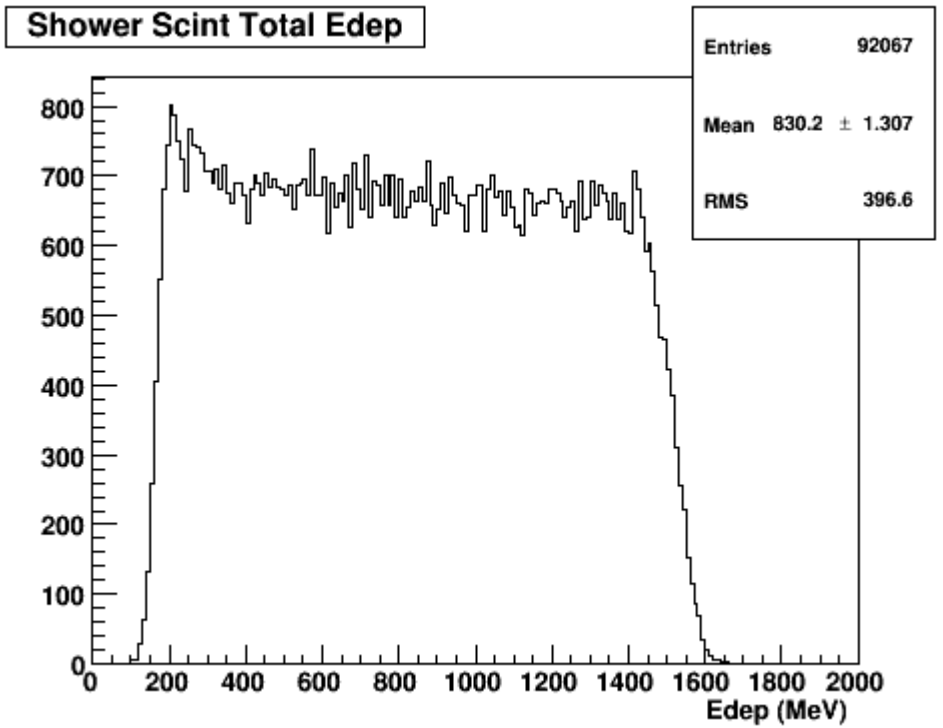


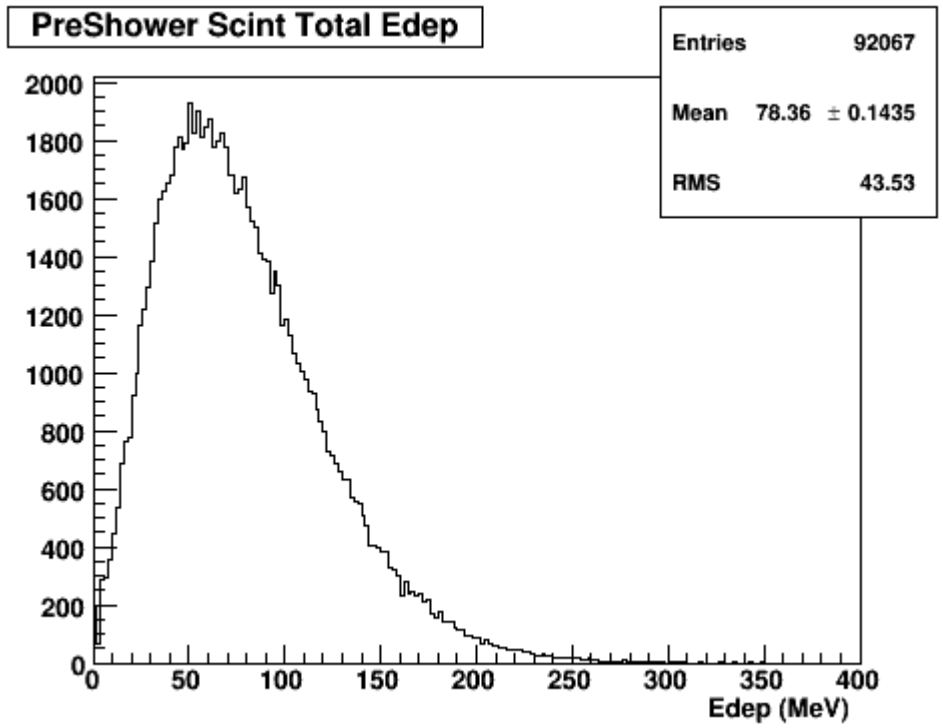
π^- Efficiency



MIP Cut on the Pre-Shower

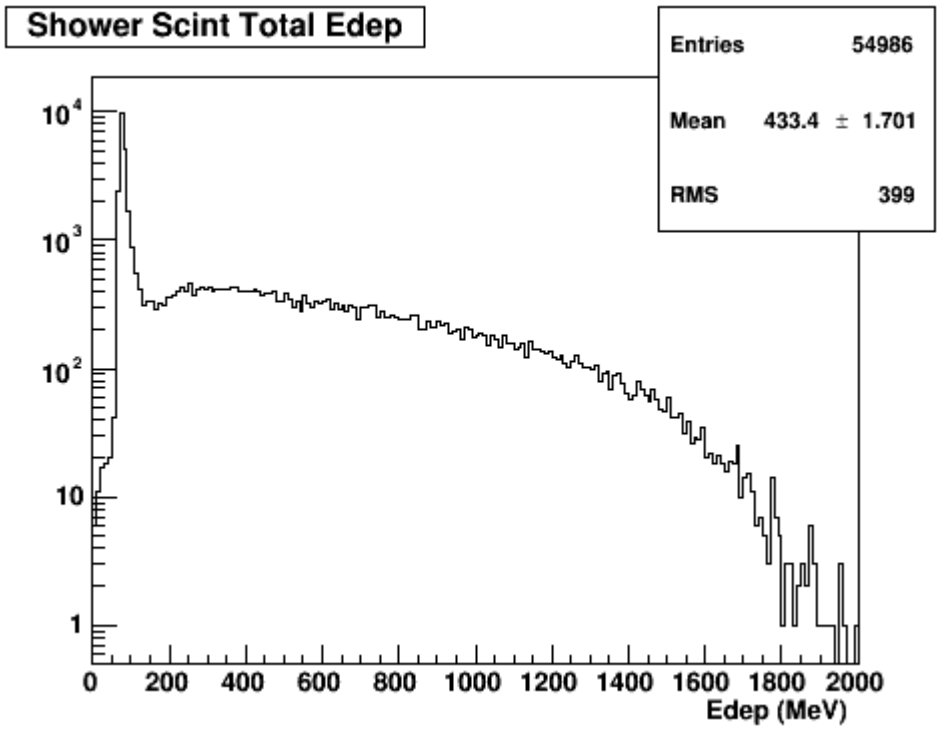
- Electron deposit energy in the PS differently compared to pions
- Due to Pions act like a MIP most of the time PS cut just above a MIP can reject pions

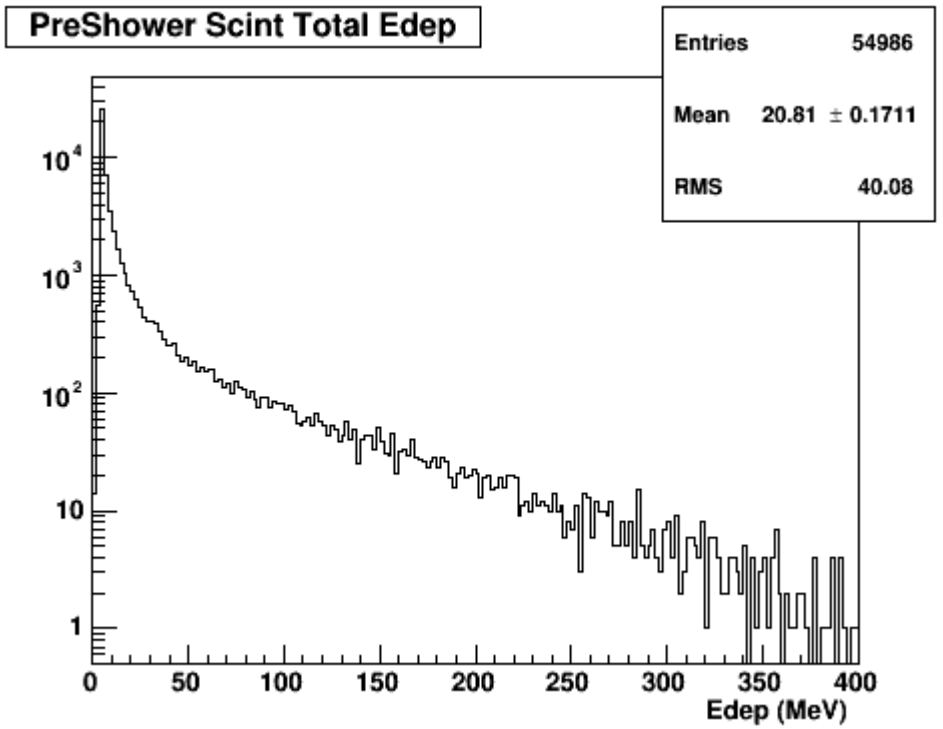




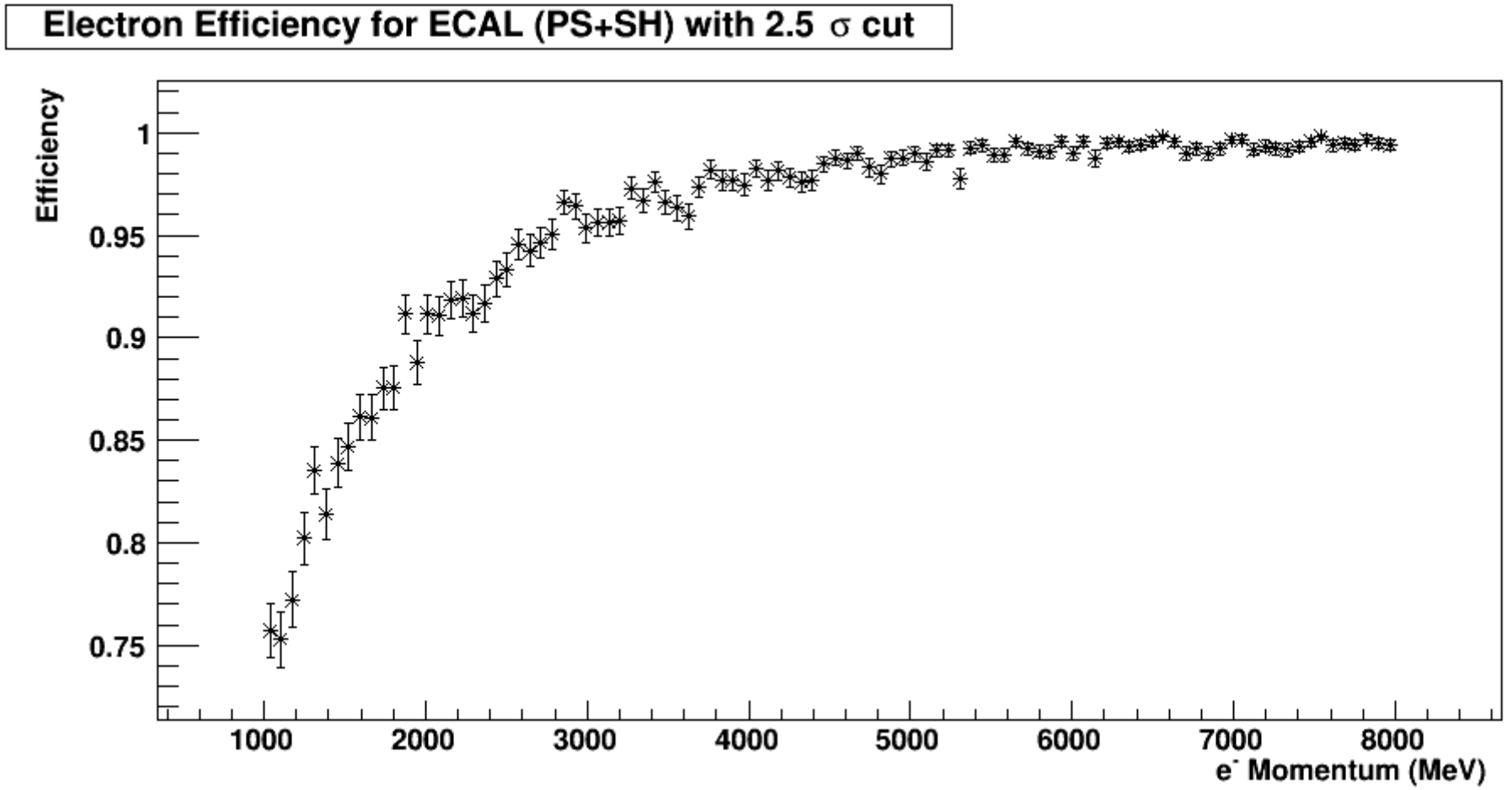
MIP Cut on the Pre-Shower

- Electron deposit energy in the PS differently compared to pions
- Due to Pions act like a MIP most of the time PS cut just above a MIP can reject pions
- Apply a MIP cut to select edep greater than MIP + 2.5
  - MIP cut is to 6 MeV

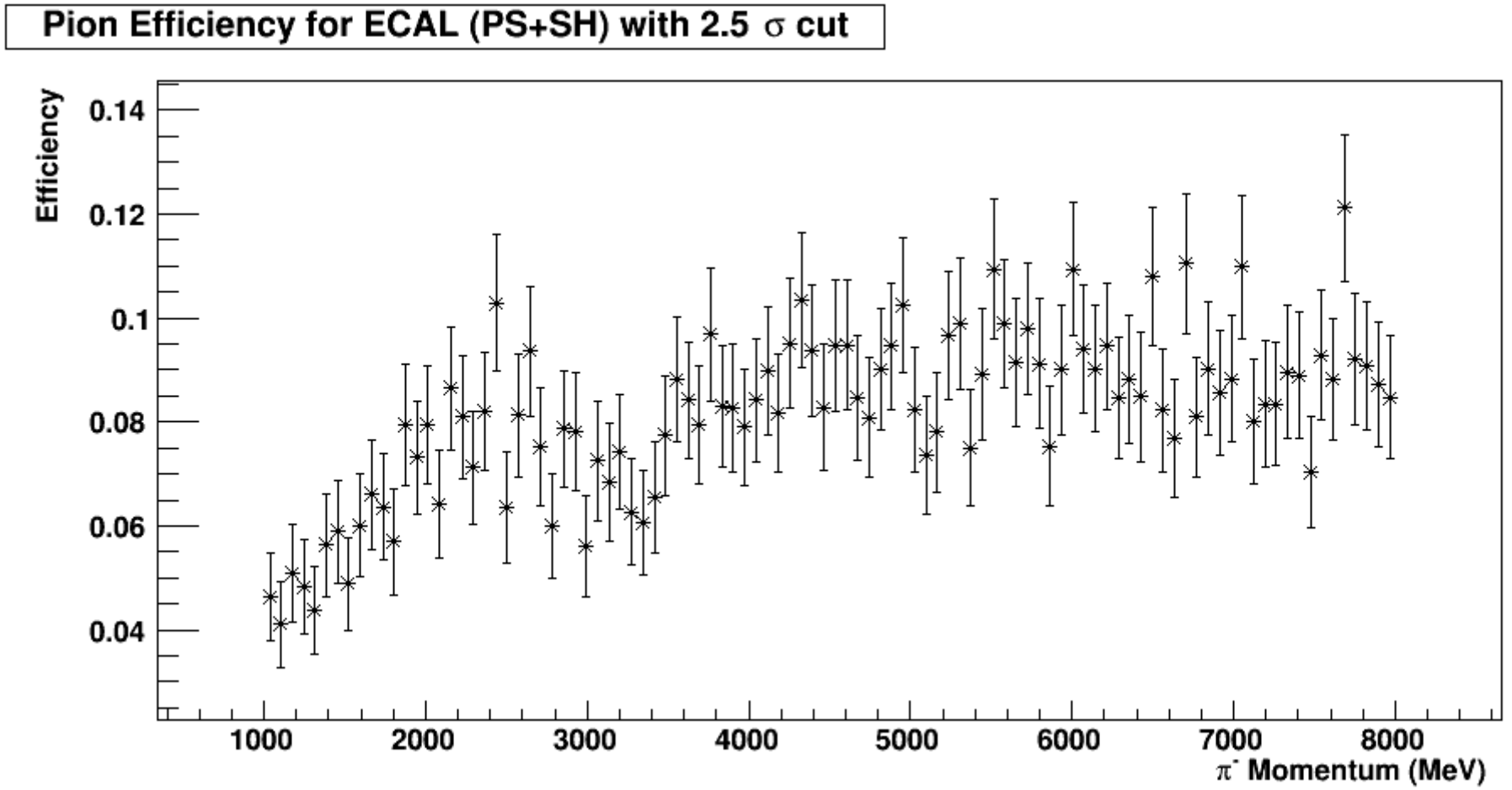




e^- Efficiency with PS MIP Cut

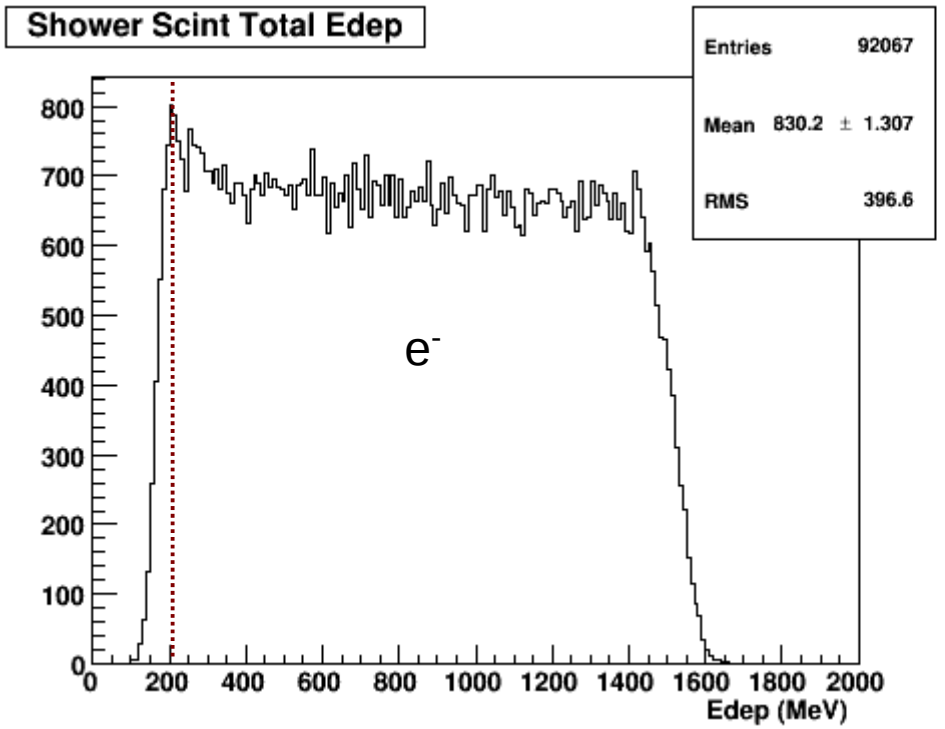


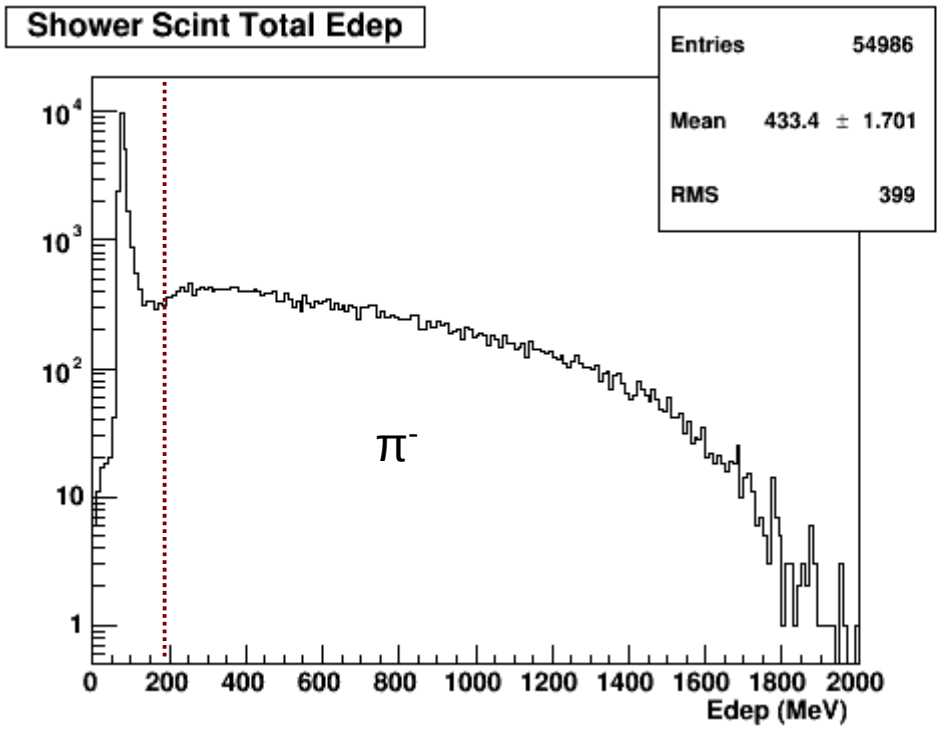
π^- Efficiency with PS MIP Cut



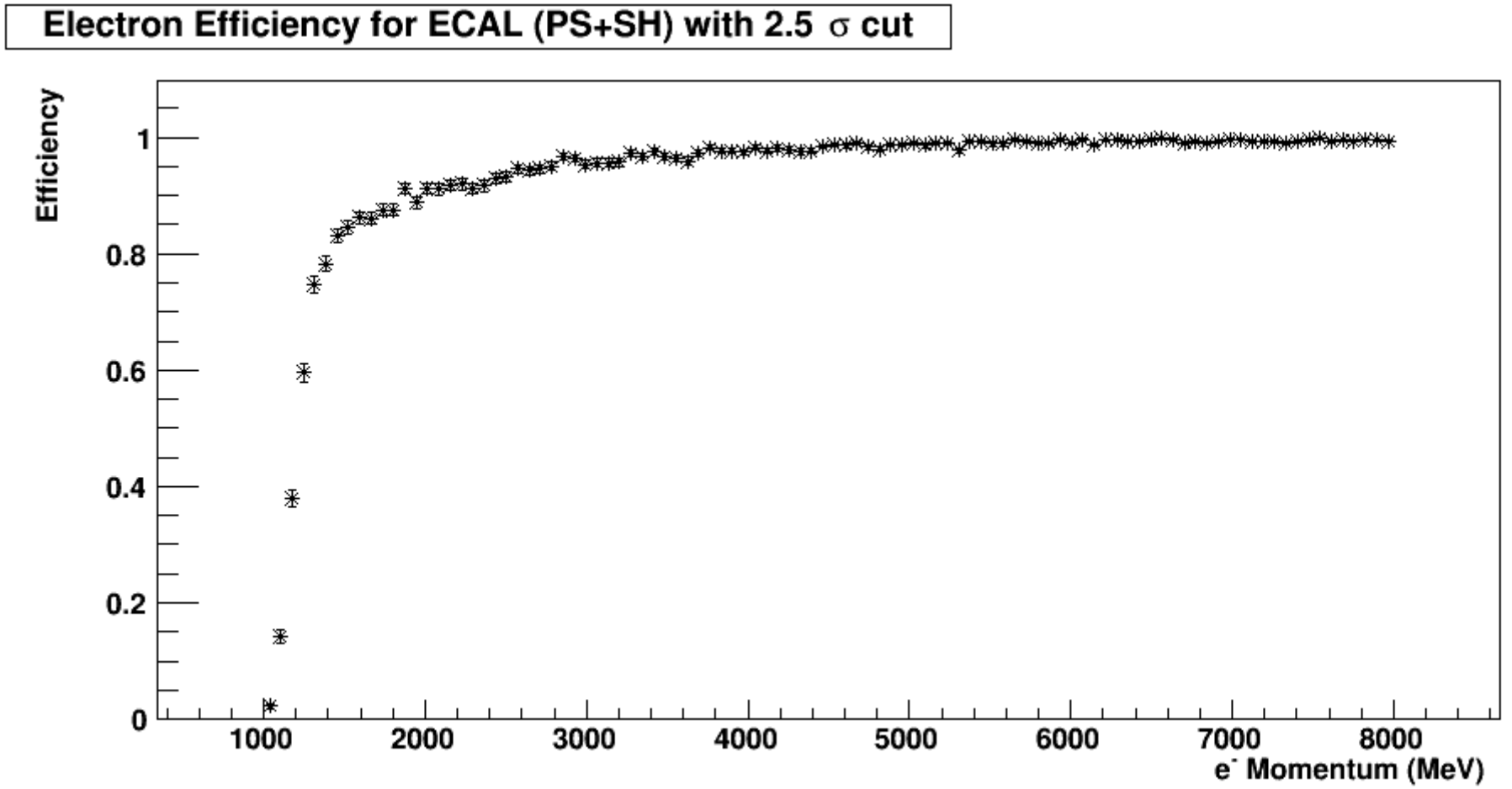
Additional Shower Threshold Cut

- A cut on the scintillator energy deposit in the shower
  - Set to 200 MeV

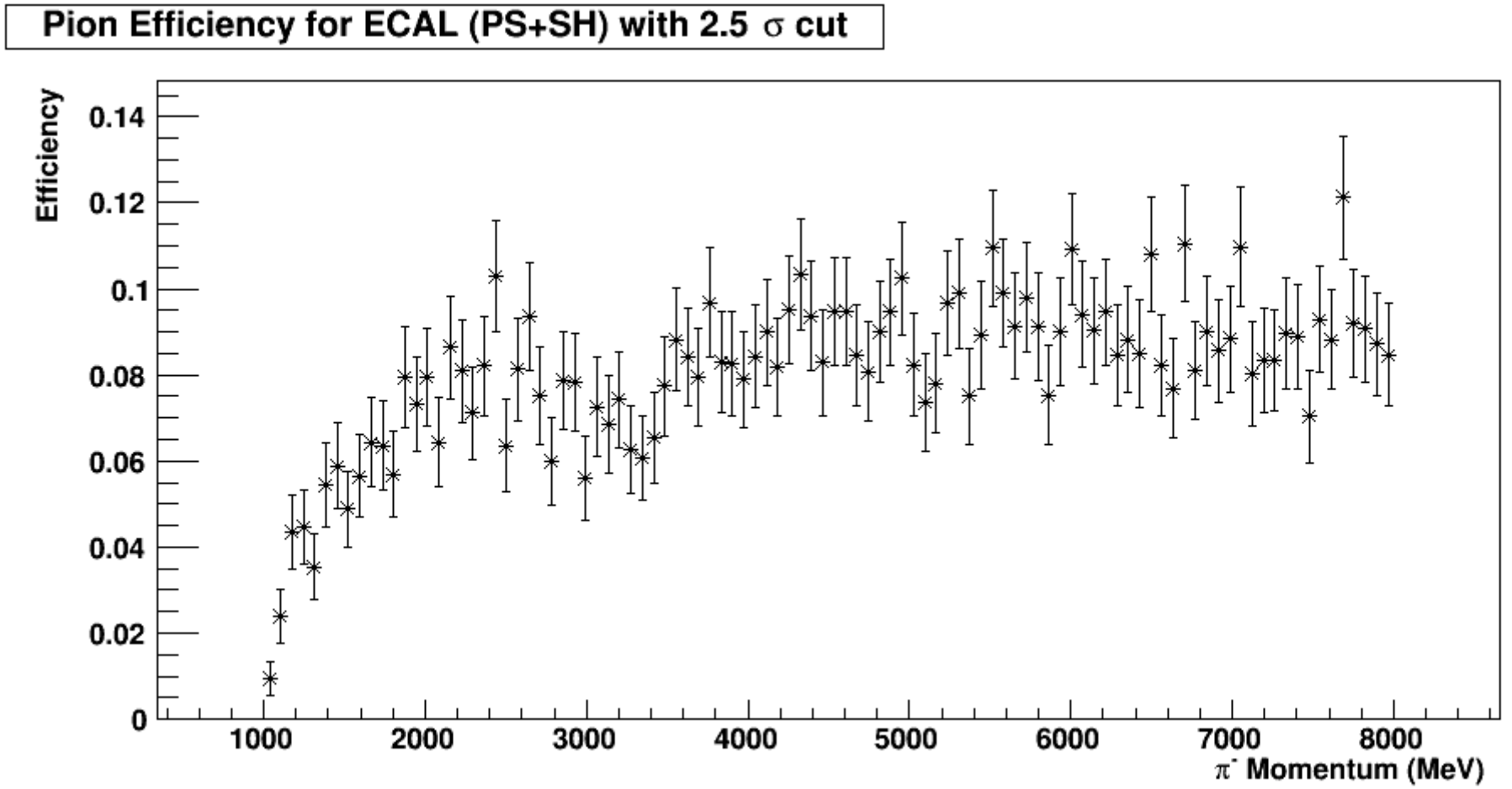




e^- Efficiency with PS MIP Cut and Sh. Cut

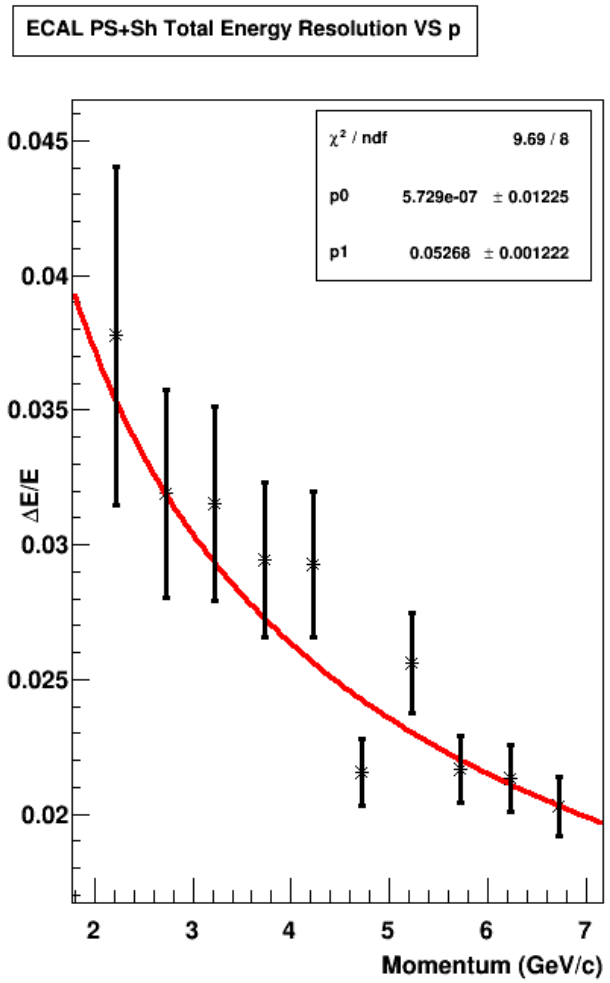


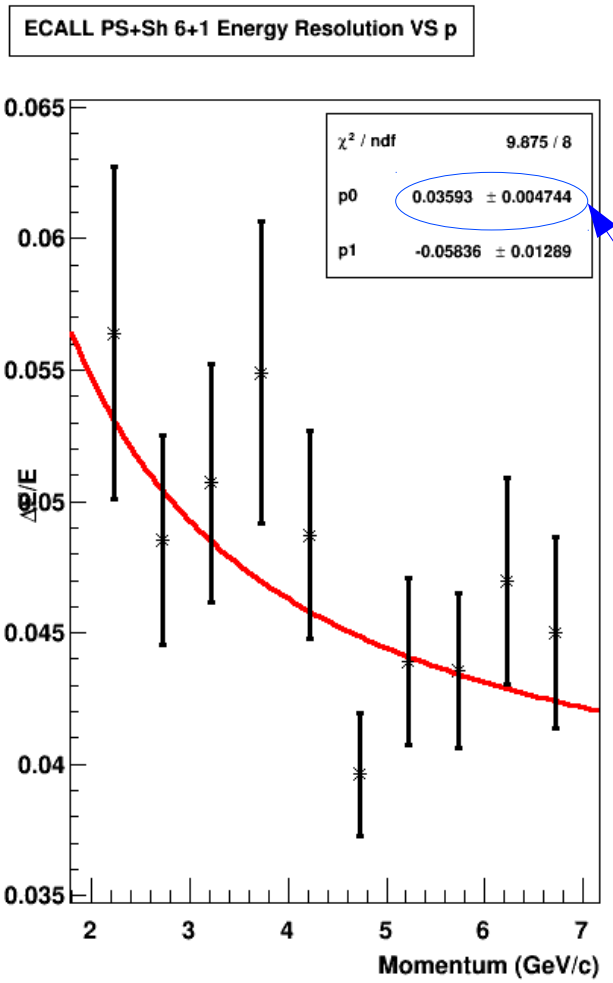
π^- Efficiency with PS MIP Cut and Sh. Cut



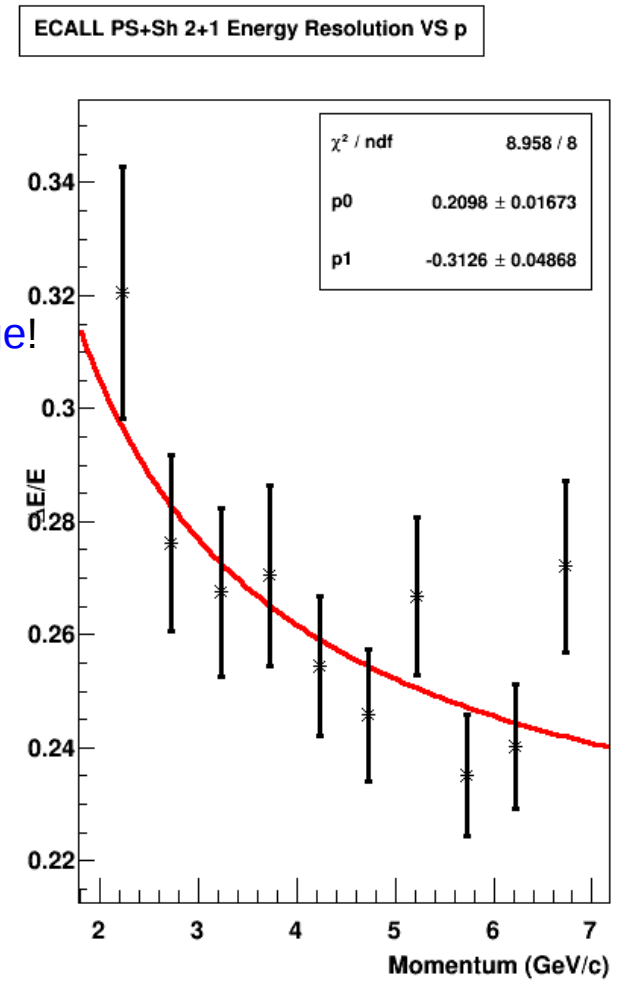
Supplementary Slides

Intrinsic ECAL Energy Resolution





Large!



Based on calibrated energy deposit in the ECAL

Shower Energy Resolution

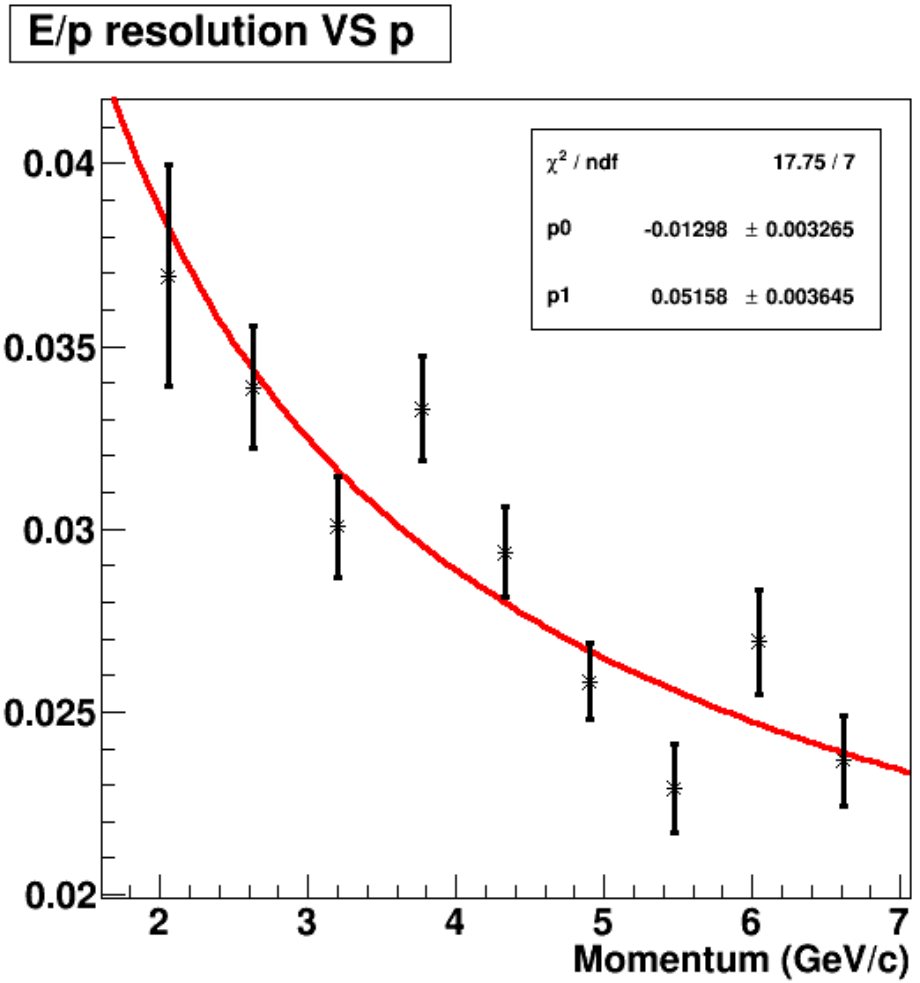
From Total Energy on ECAL		
Pf (GeV)	Res (%)	Error (%)
2.23	0.038	0.006
2.73	0.032	0.004
3.23	0.032	0.004
3.73	0.029	0.003
4.23	0.029	0.003
4.73	0.022	0.001
5.23	0.026	0.002
5.73	0.022	0.001
6.23	0.021	0.001
6.73	0.020	0.001

From 6+1 Clusters		
Pf (GeV)	Res (%)	Error (%)
2.23	0.056	0.006
2.73	0.049	0.004
3.23	0.051	0.005
3.73	0.055	0.006
4.23	0.049	0.004
4.73	0.040	0.002
5.23	0.044	0.003
5.73	0.044	0.003
6.23	0.047	0.004
6.73	0.045	0.004

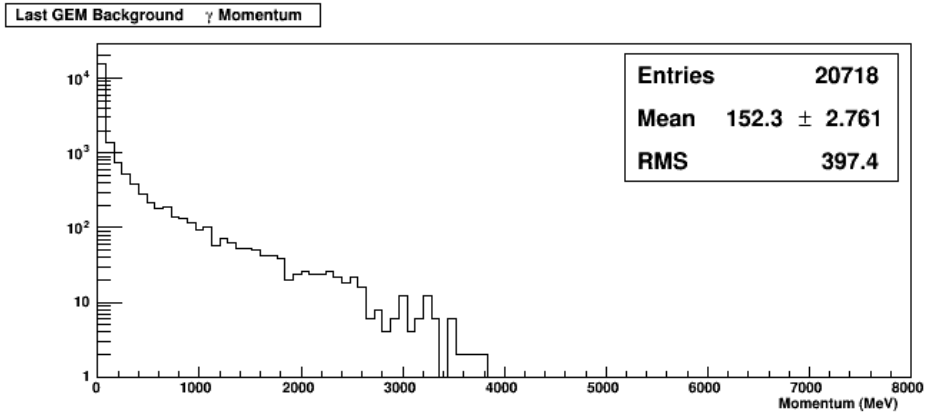
Note :
The main difference between total energy based energy resolution and 6+1 cluster based energy resolution is the constant term is larger when 6+1 clusters are considered.

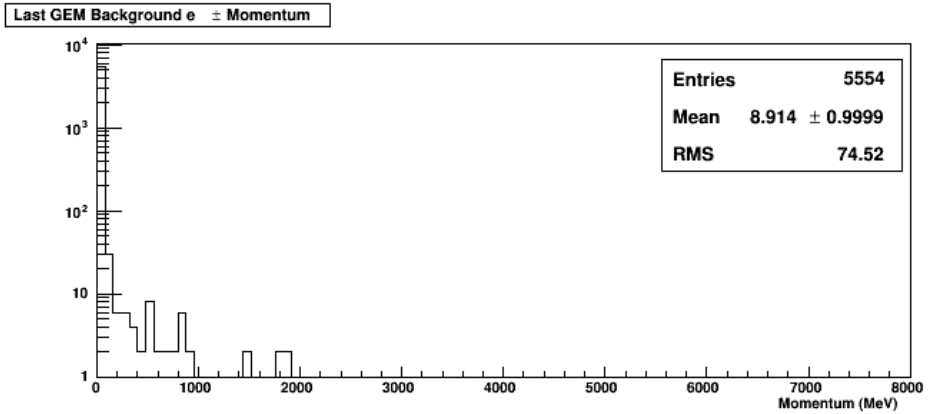
Jin's Energy Resolution (with No Phot. Elec.)

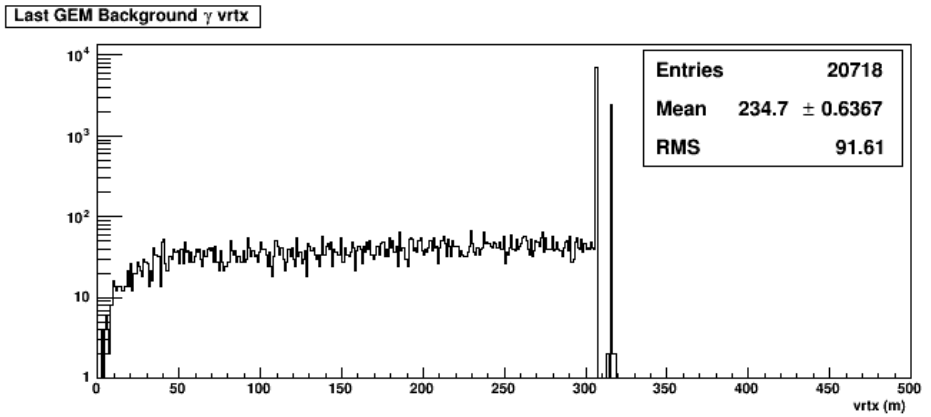
- Jin's estimation was based on ecal (ps+sh) calibrated energy deposition
  - No Photon fluctuations included

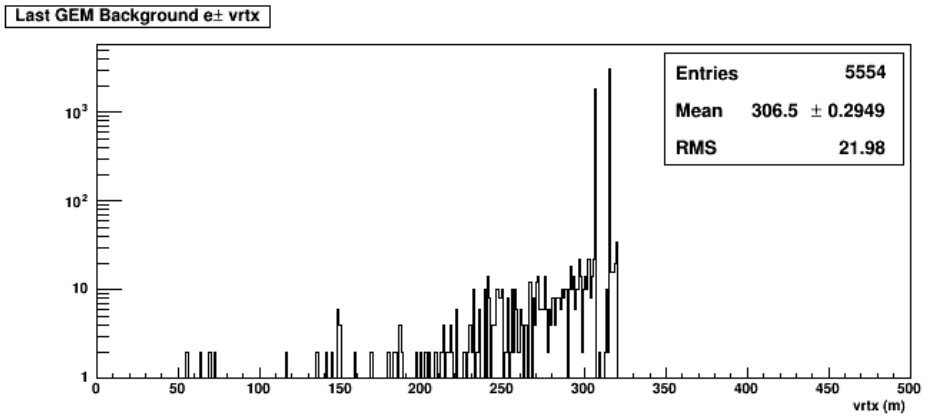


Background due to Radiative Effects



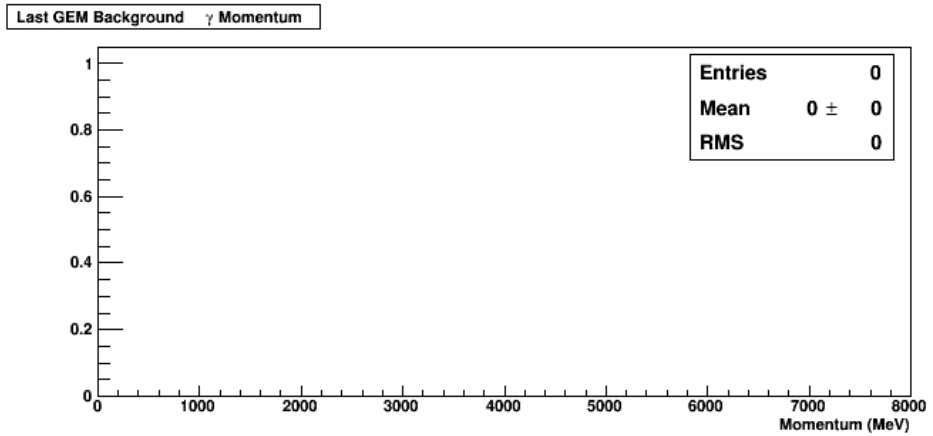


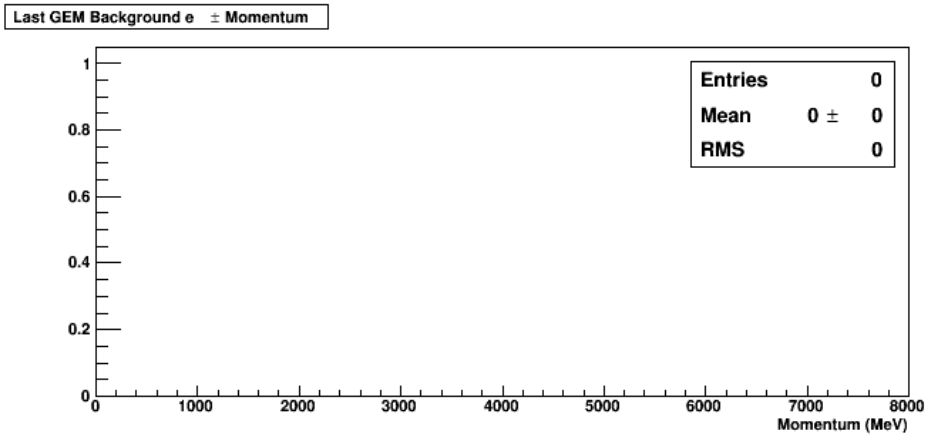


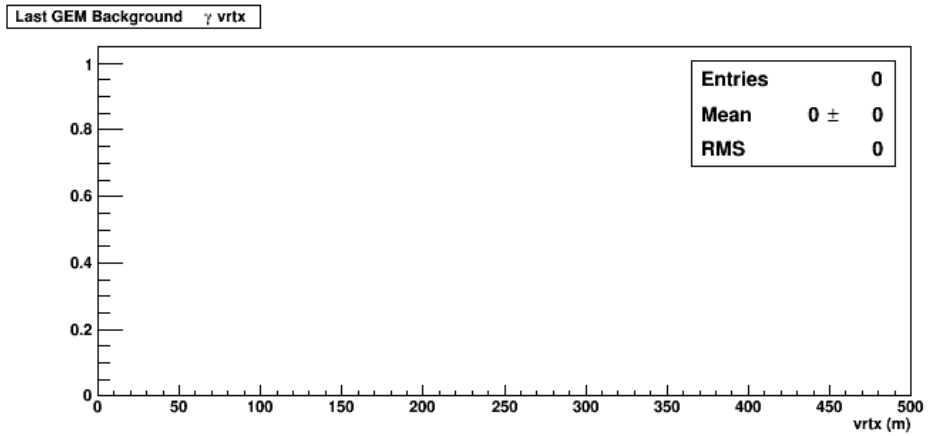


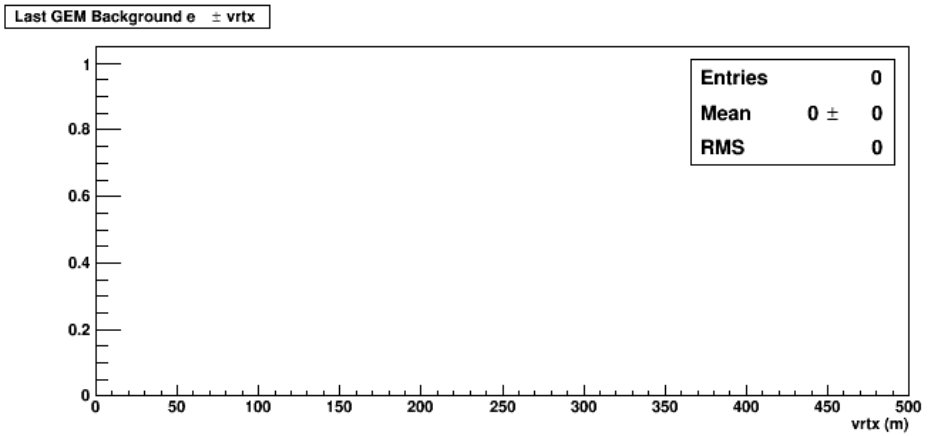
Simulation included empty target geometry, last 2 GEMs, and ECAL in air medium

Background due to Radiative Effects









Simulation only include ECAL and sensitive detector replacing last GEM in vacuum medium

Energy Deposit Distribution on ECAL : Before