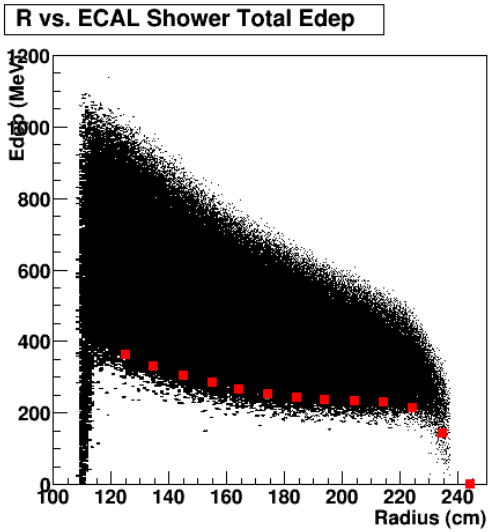
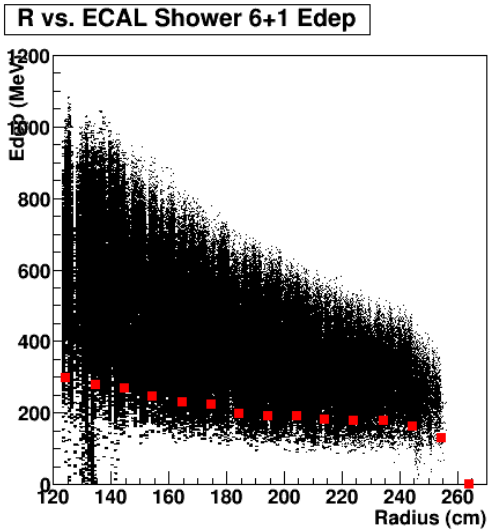
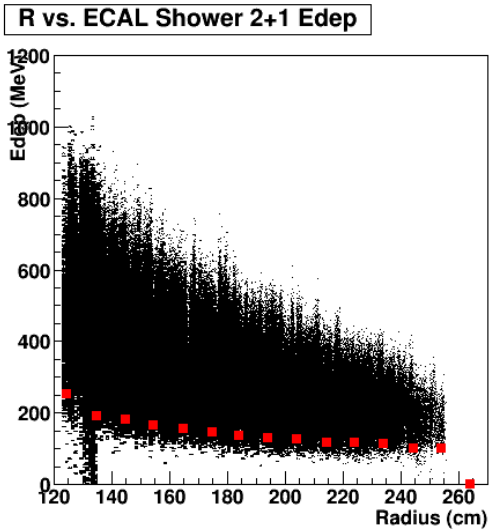
ECAL Update

Multi-PID Triggering

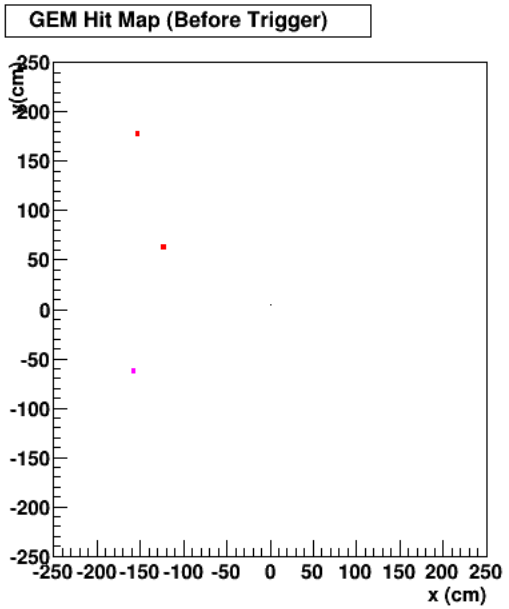
- Combined electron and Wiser pions
- Clusters are generated within 30 ns trigger windows
  - 6+1 and 2+1 clusters
- Trigger condition applied based on cluster thresholds generated from DIS signals
  - Radial dependence cluster threshold

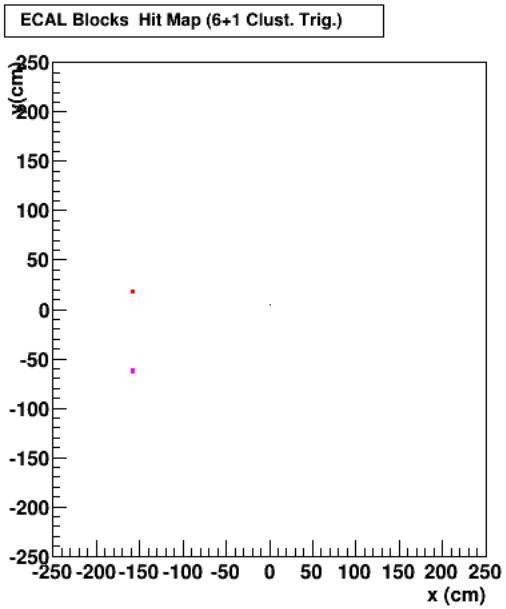


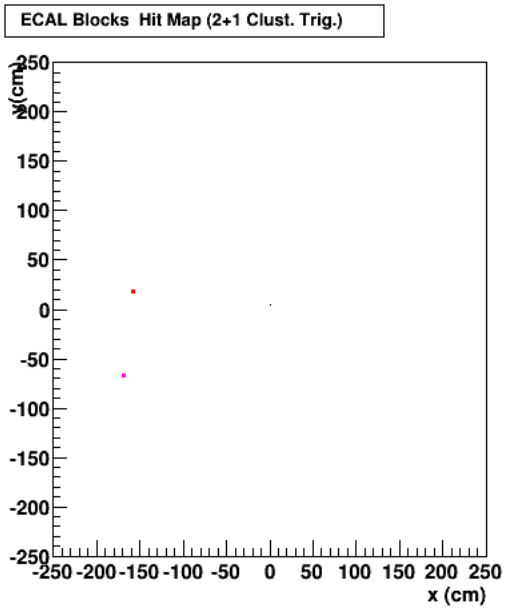


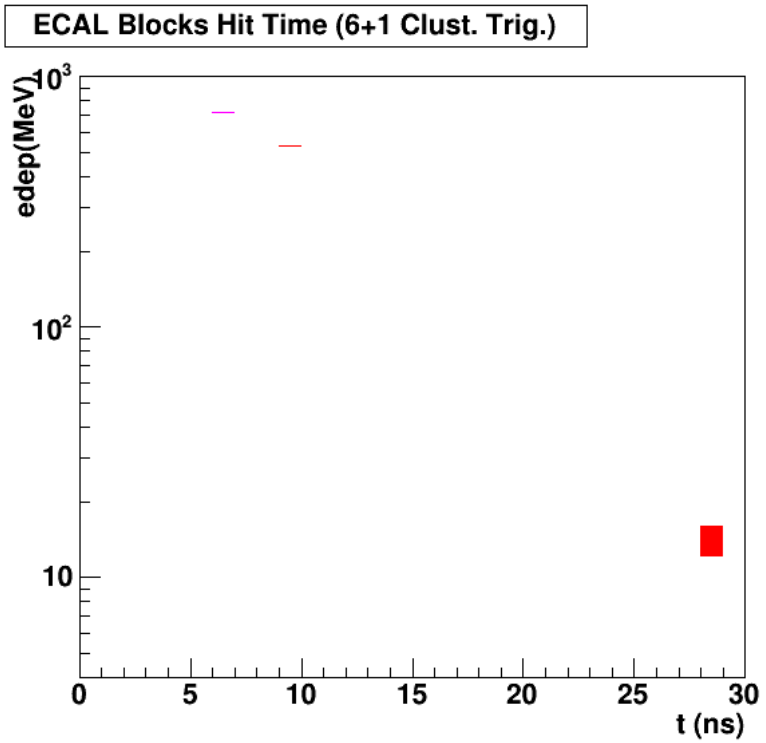


Single Trigger Window Examples







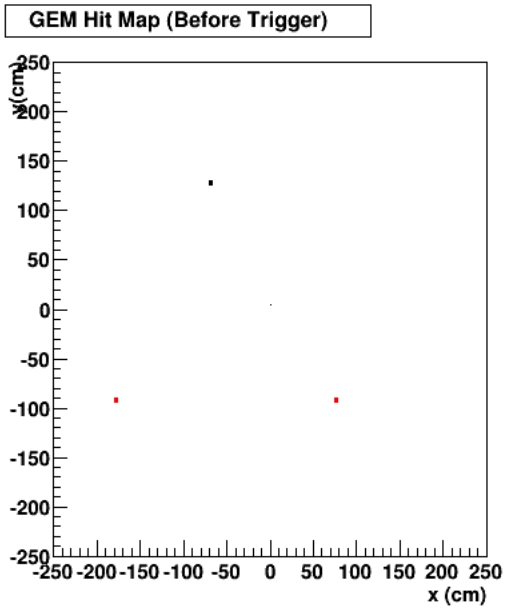


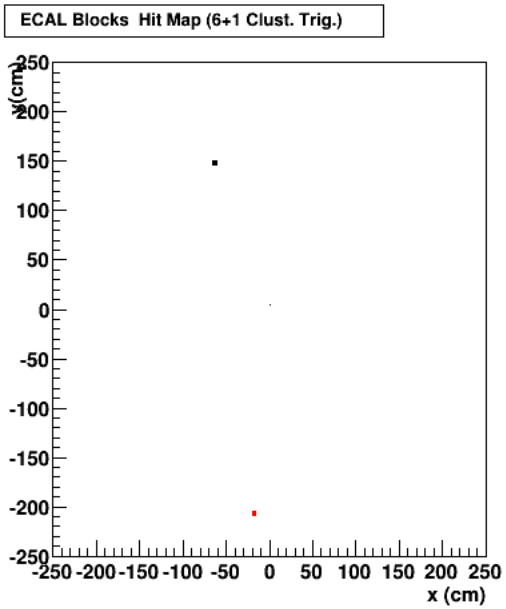
pi-: GEM [-151.41,175.74] cm, pf = 2.37 GeV, ECAL [0.00,0.00] cm, Edep = 13.25 MeV

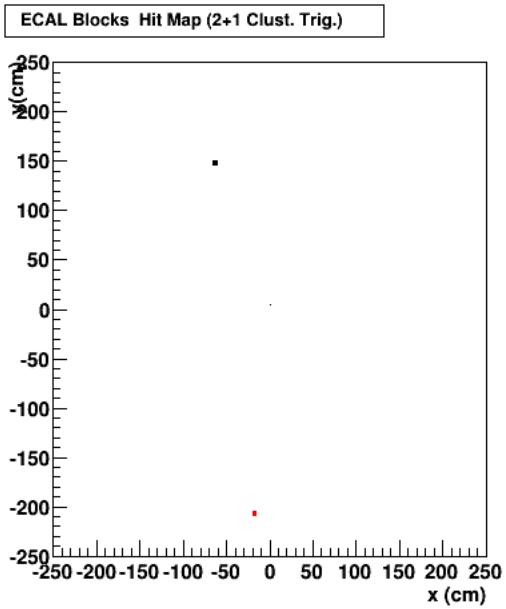
pi-: GEM [-121.01,62.23] cm, pf = 4.38 GeV, ECAL [-158.00,15.00] cm, Edep = 528.86 MeV

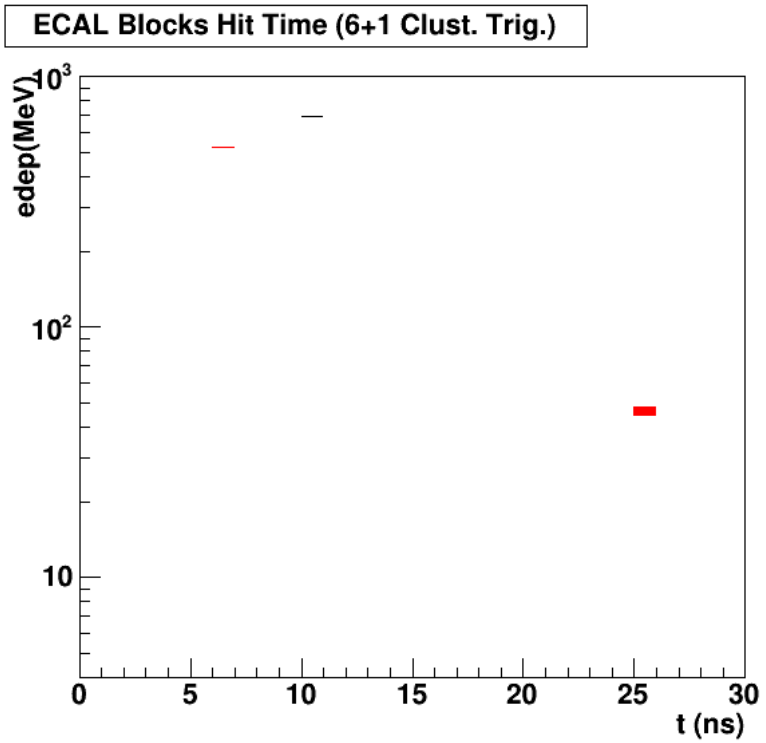
Bkg e+-: GEM [-155.55,-60.42] cm, pf = 4.29 GeV, ECAL [-158.00,-61.00] cm, Edep = 716.78 MeV

Single Trigger Window Examples







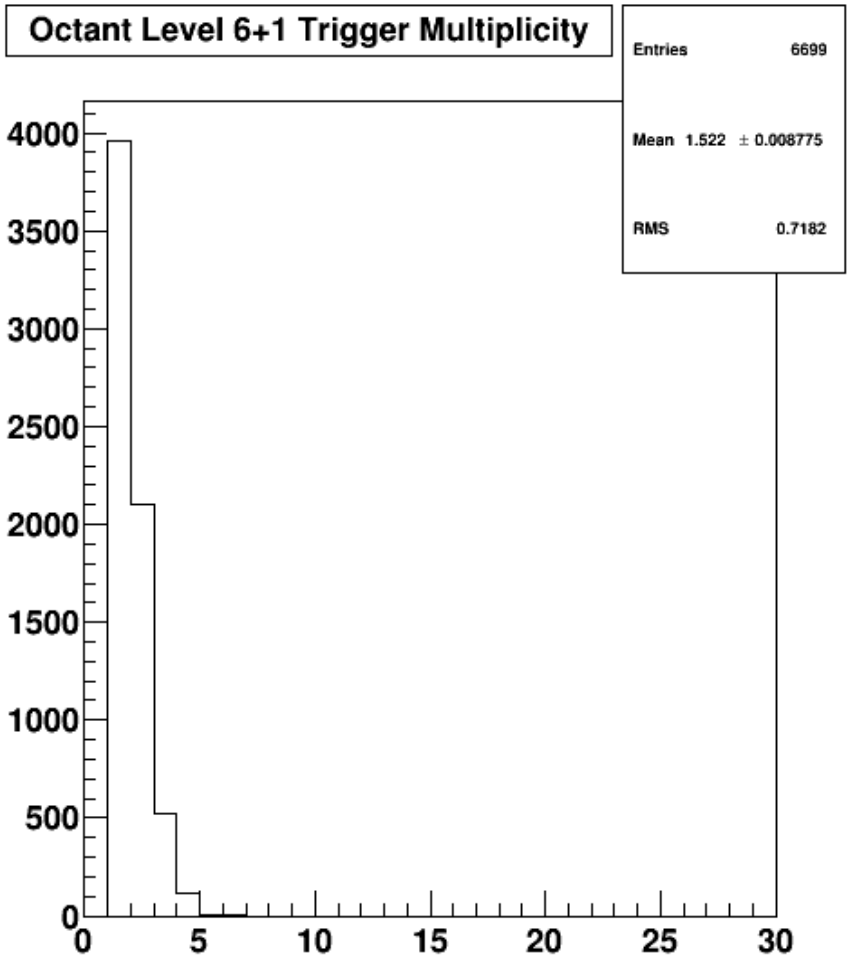


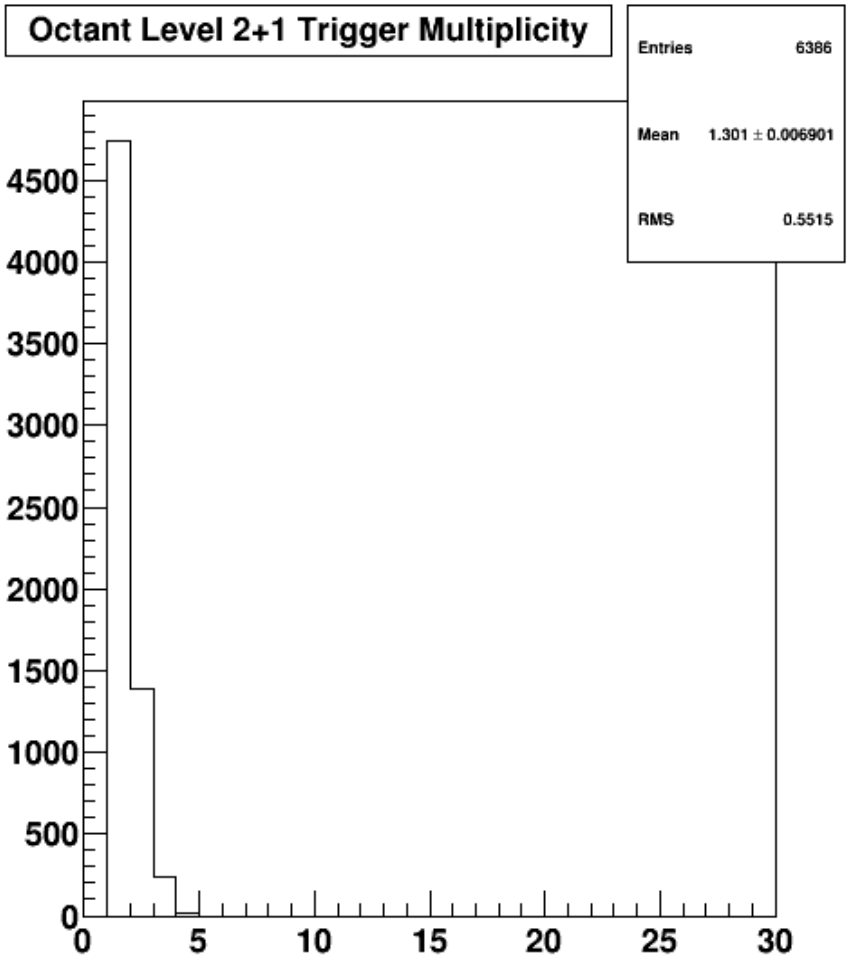
pi-: GEM [-179.60,-90.55] cm, pf = 1.93 GeV, ECAL [0.00,0.00] cm, Edep = 47.67 MeV

DIS-e: GEM [-67.72,129.21] cm, pf = 4.23 GeV, ECAL [-64.00,145.00] cm, Edep = 694.00 MeV

pi-: GEM [79.48,-94.55] cm, pf = 4.65 GeV, ECAL [-17.00,-207.00] cm, Edep = 522.04 MeV

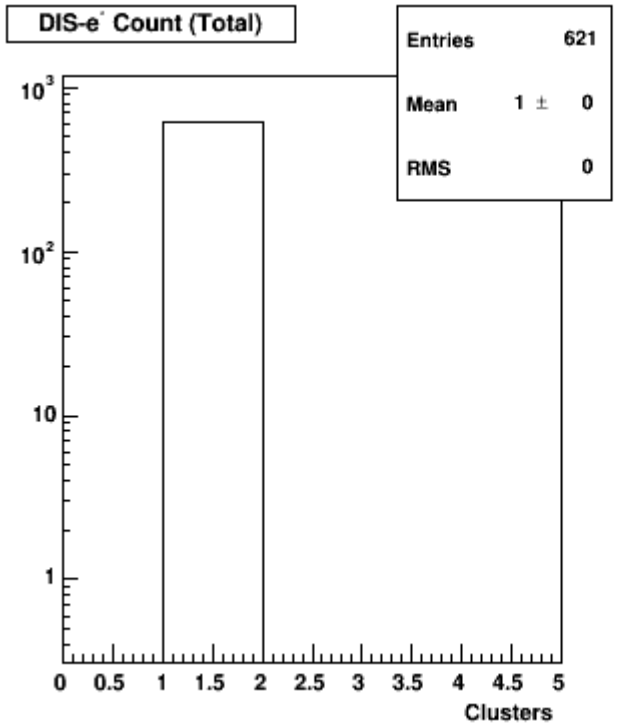
Trigger Multiplicity in Sectors

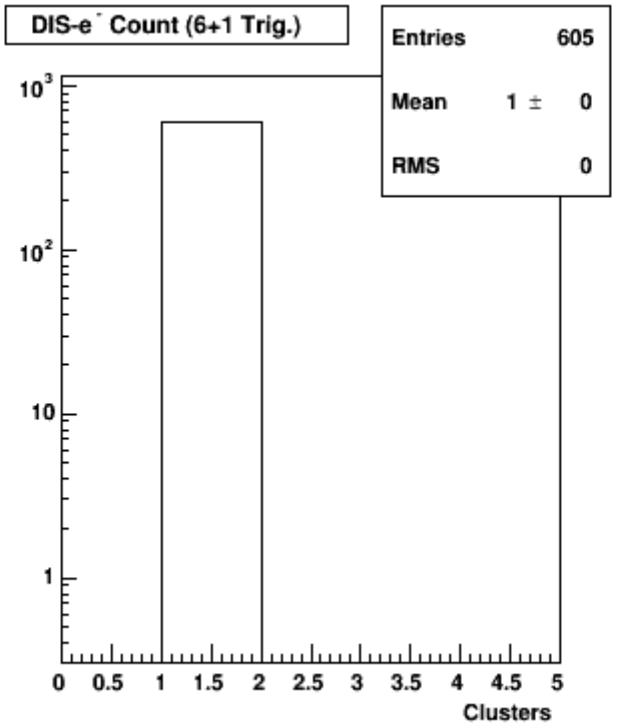


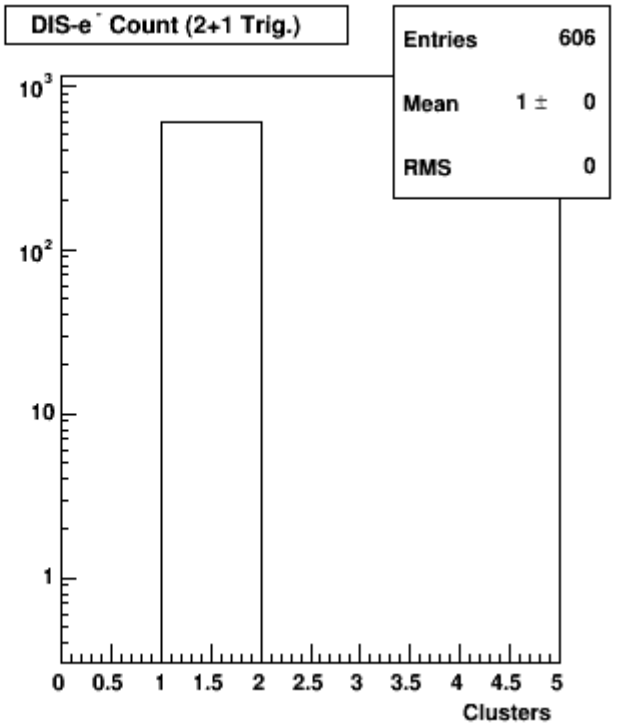


- This shows how many sectors have triggered in a 30 ns trigger window where there are electrons and pions incident on the ECAL.
- Majority of the time there will only be single octant trigger but in few instances there can be as much as 2,3,4, or 5 sectors triggered.

DIS Trigger Window Cluster Distribution

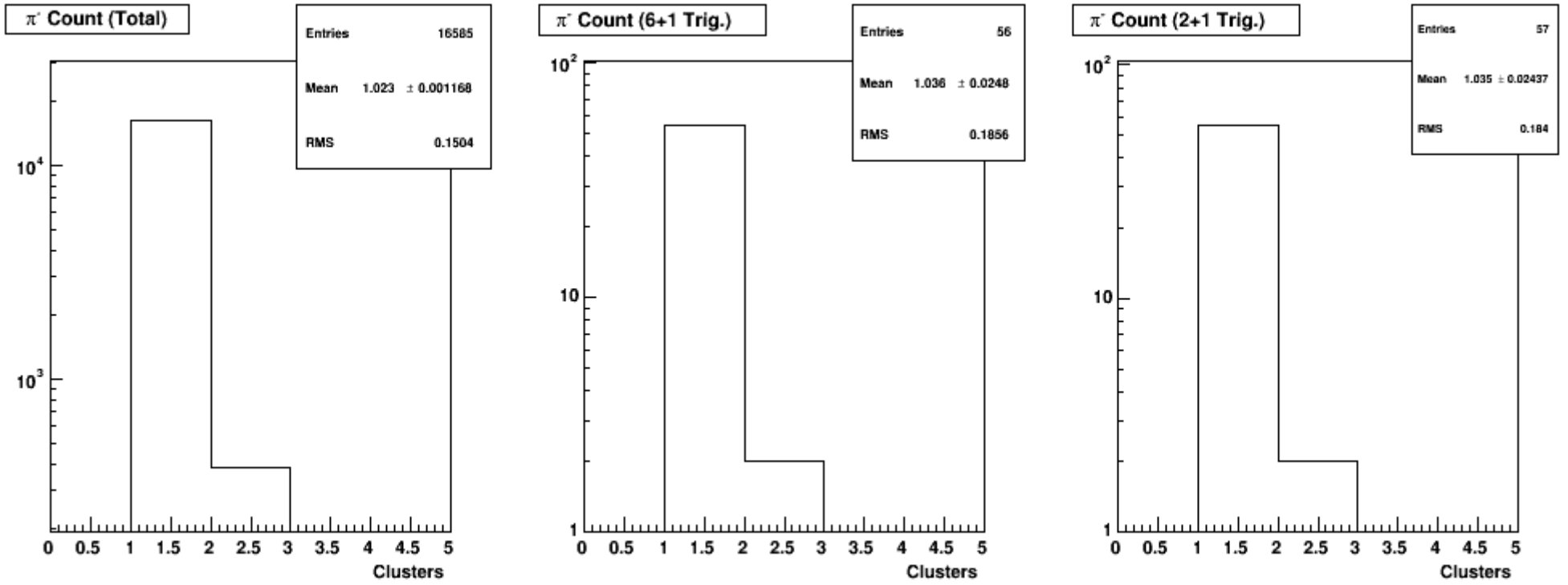






- The left plot shows DIS cluster distribution within a 30 ns trigger window
- The middle plot shows DIS 6+1 triggered cluster distribution within an 30 ns trigger window
- The right plot shows DIS 2+1 triggered cluster distribution within an 30 ns trigger window

Background (π-) in DIS Trigger Windows

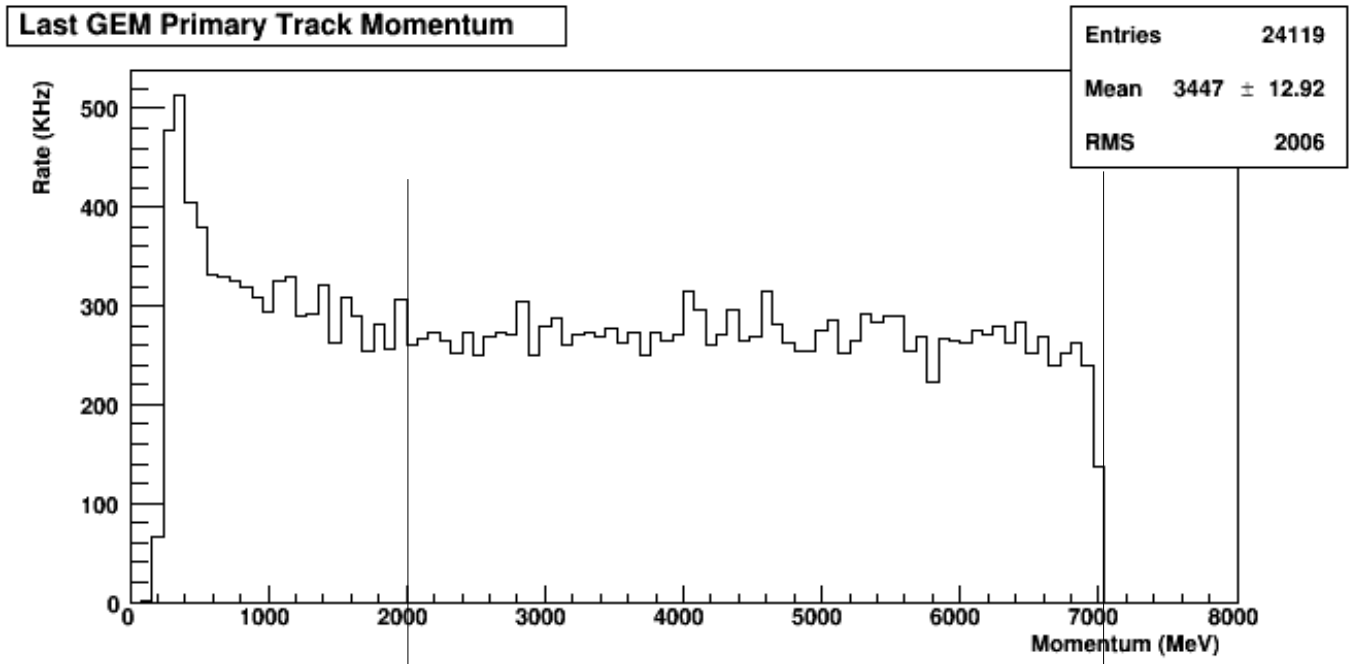


- The left plot shows pion cluster distribution within an 30 ns trigger window and as you can see most of the time there is only one pion in the 30 ns trigger window but in few instances there can be two
- The middle plot shows pion 6+1 triggered cluster distribution within an 30 ns trigger window when there is a DIS track.

Energy Resolution : Shower

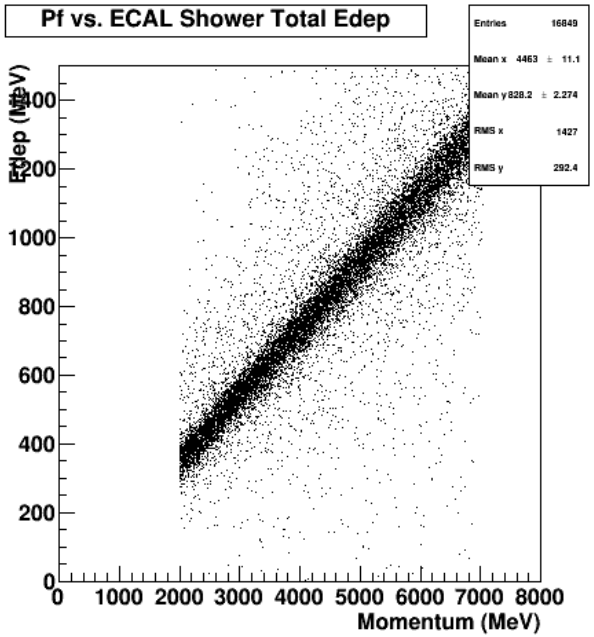
- Input flat distribution : electrons
- Use ecal cluster energy and input momentum to get
  - Energy Resolution

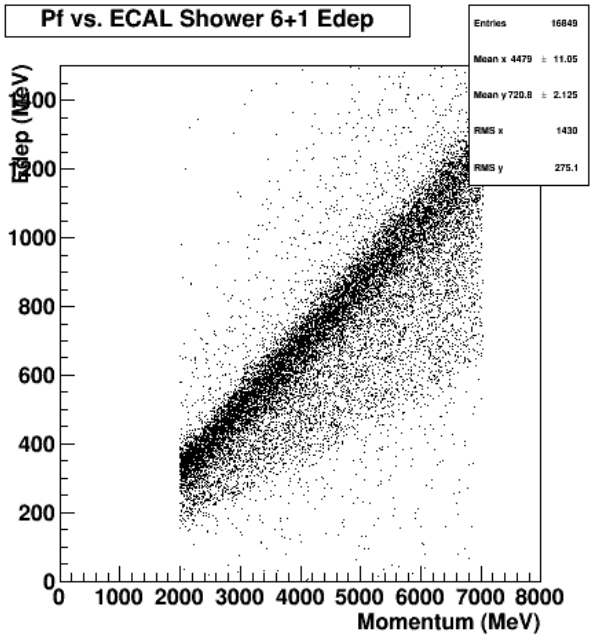
Input Flat Distribution

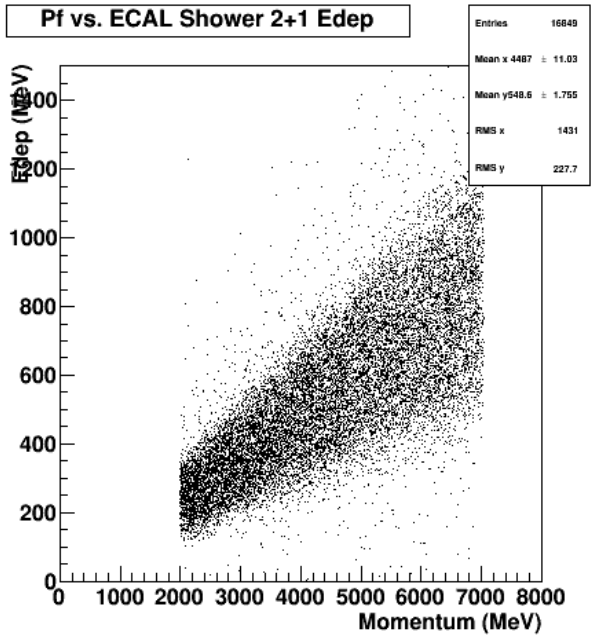


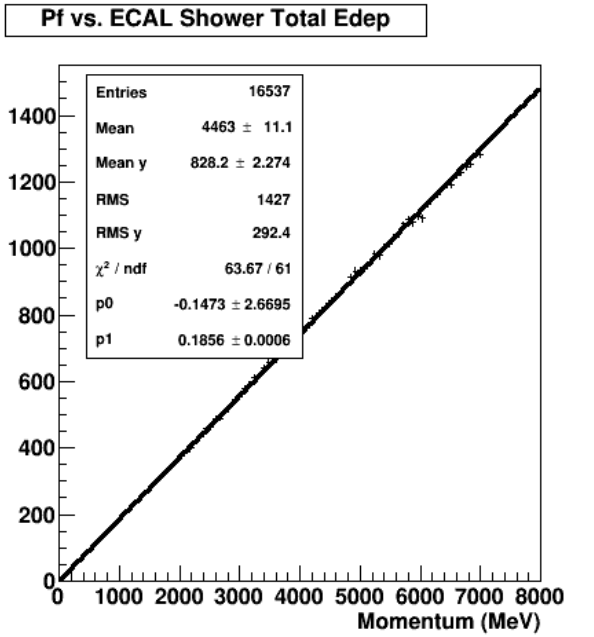
← Energy Range →

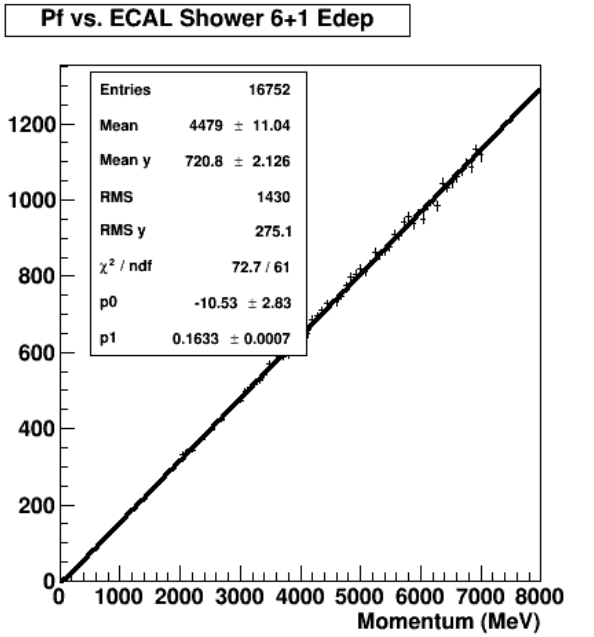
Edep Cluster Energy Calibration

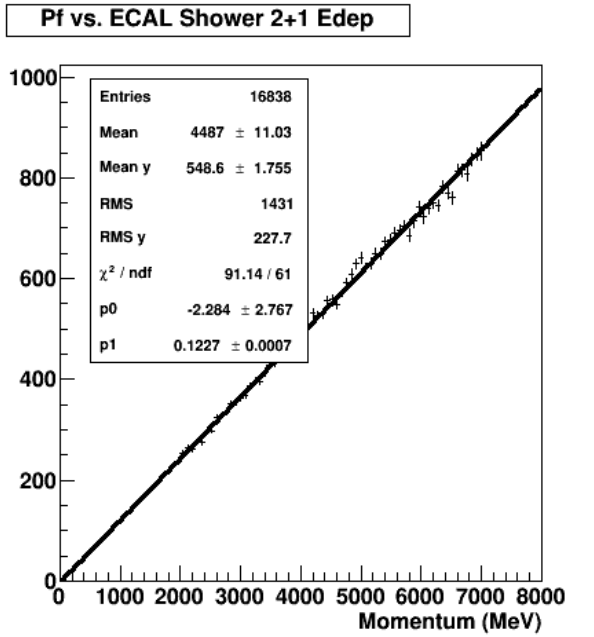




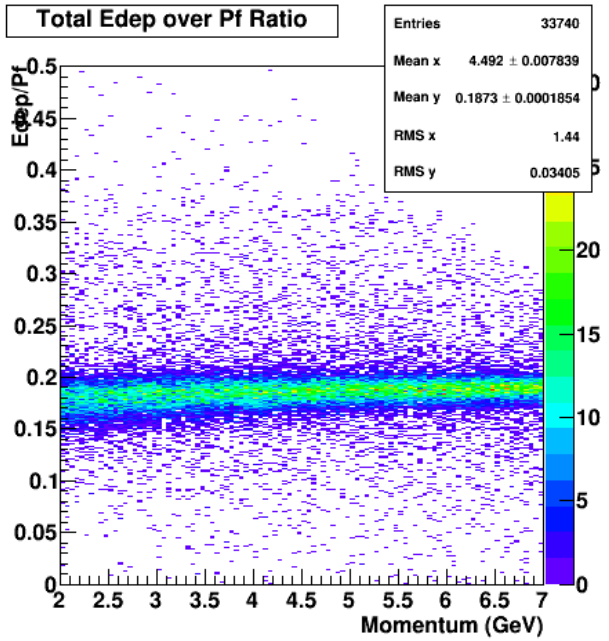


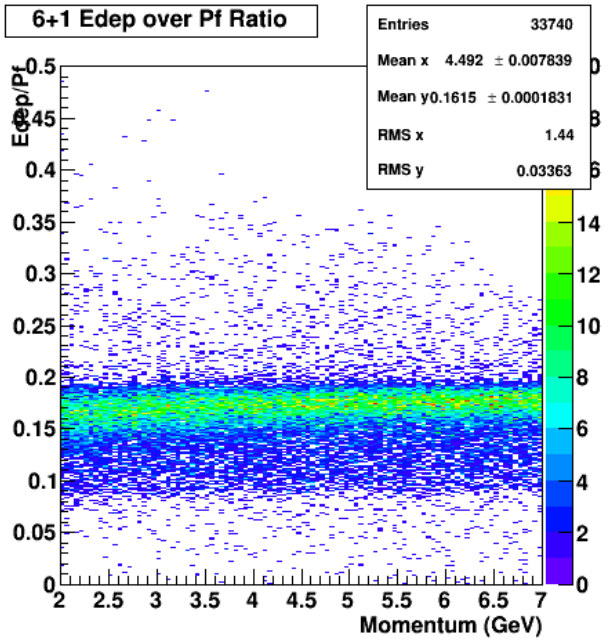


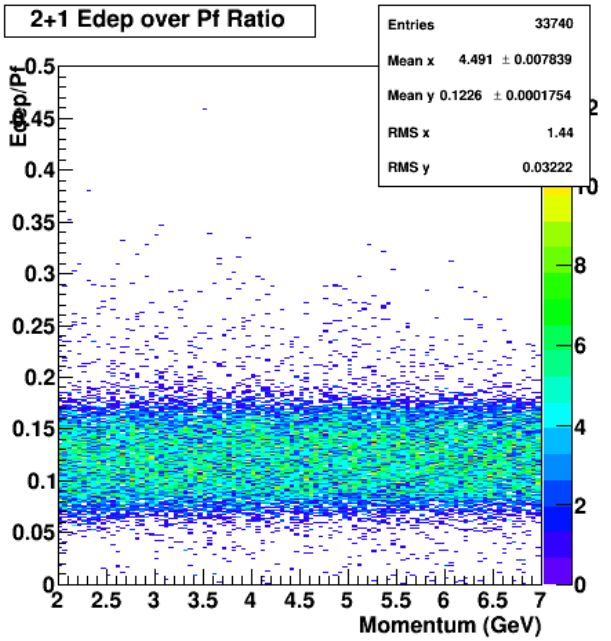




Momentum (edep) over P_f Ratio

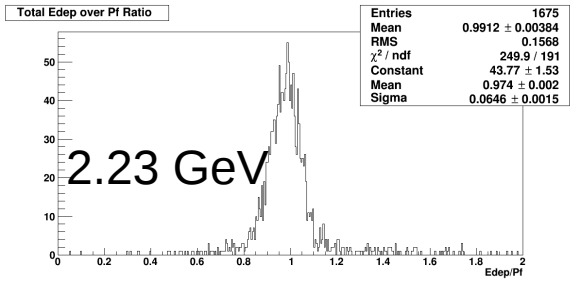


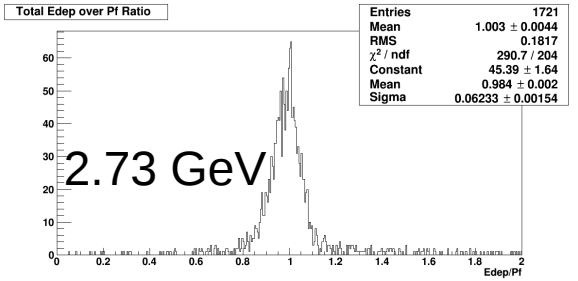


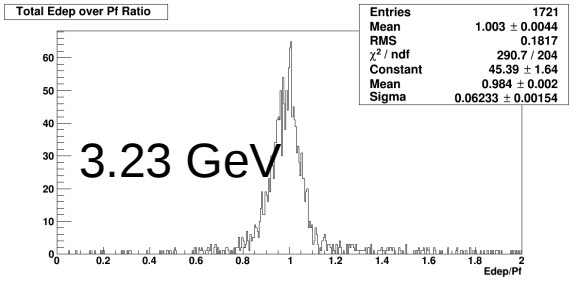


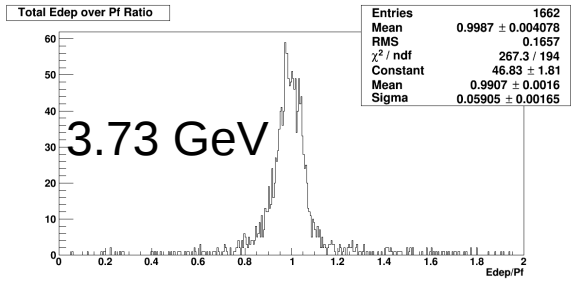
Momentum (edep) over P_f Ratio

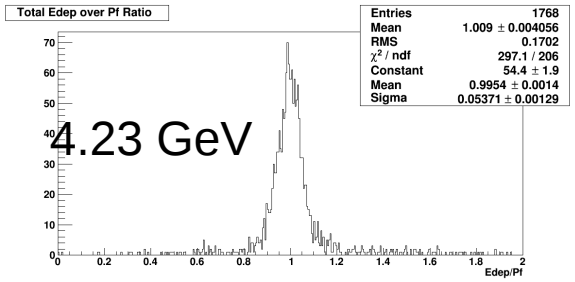
- Get the spread in edep over Pf ratio in incident energy bins
  - Energy resolution based on total energy deposit

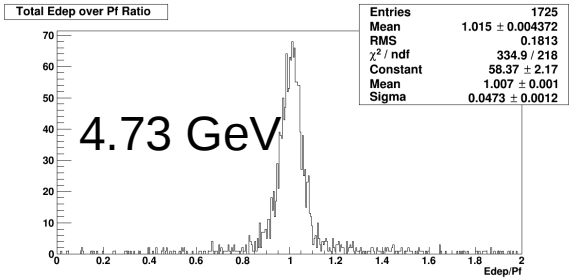


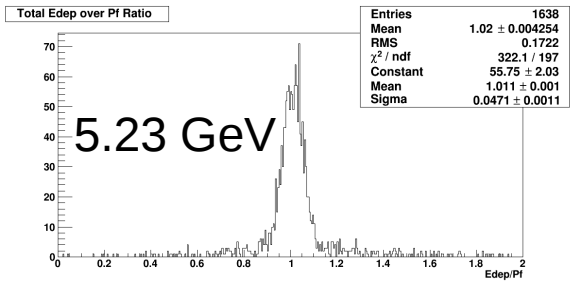


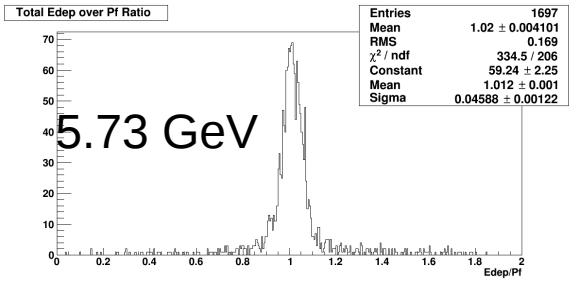


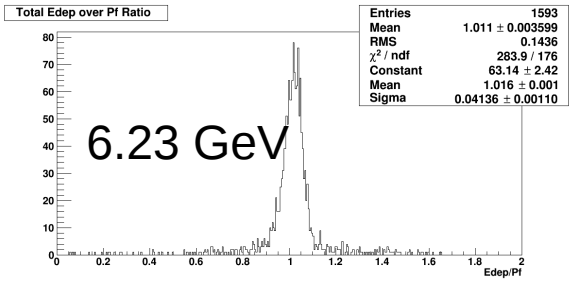




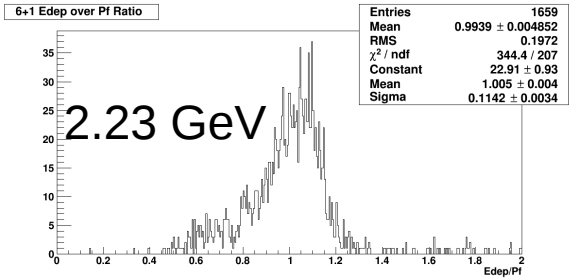


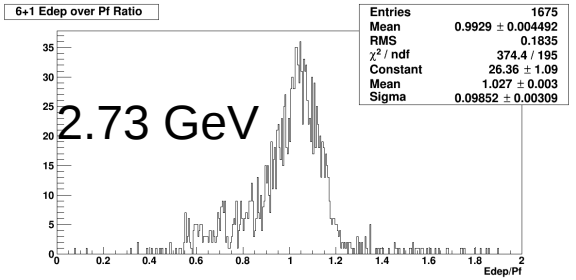


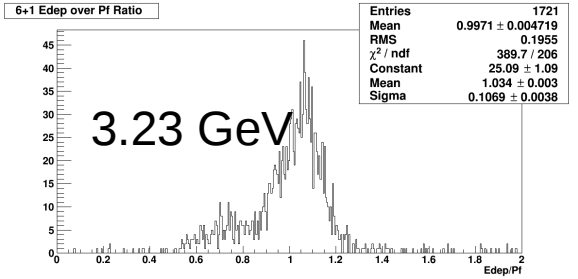


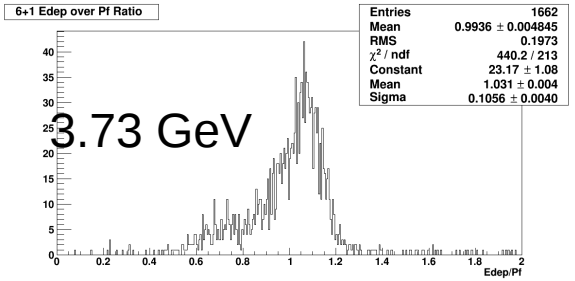


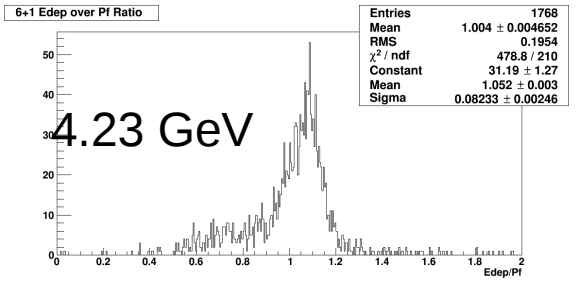
Momentum (edep) over P_f Ratio : 6+1

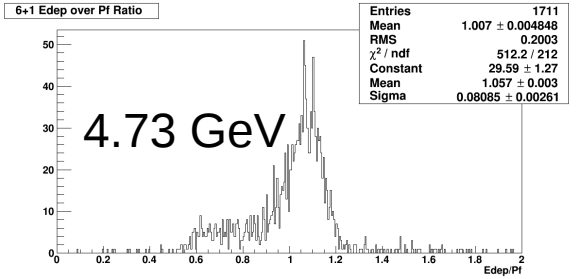


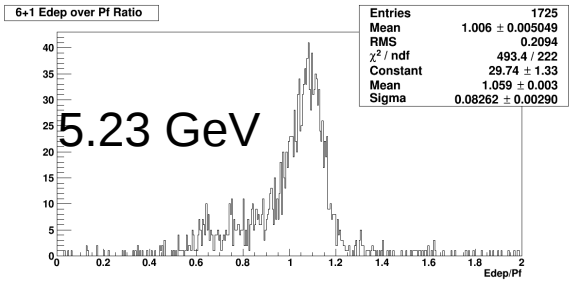


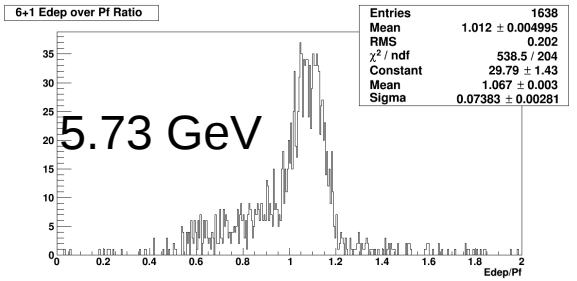


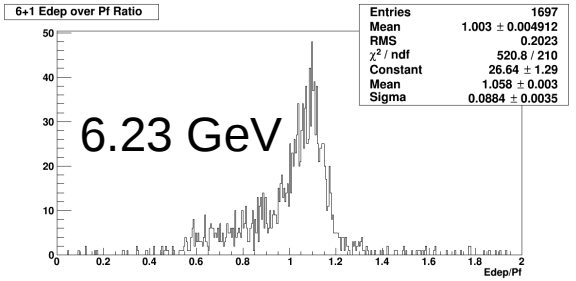




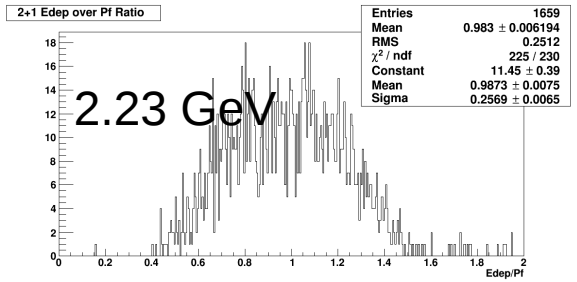


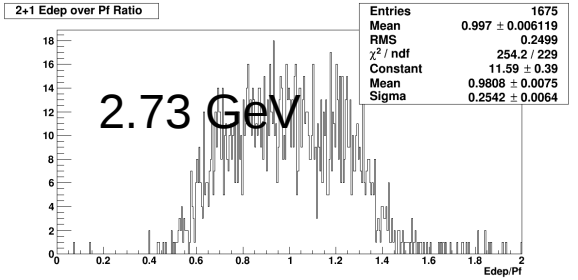


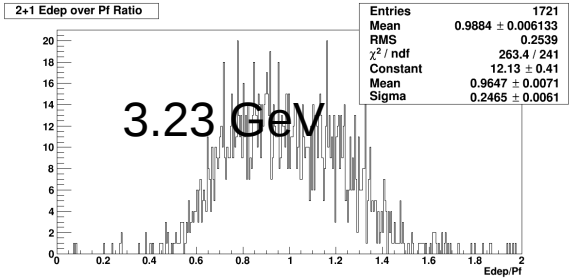


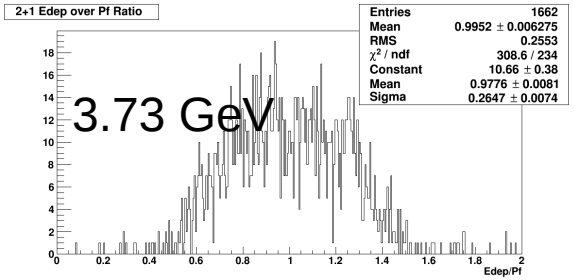


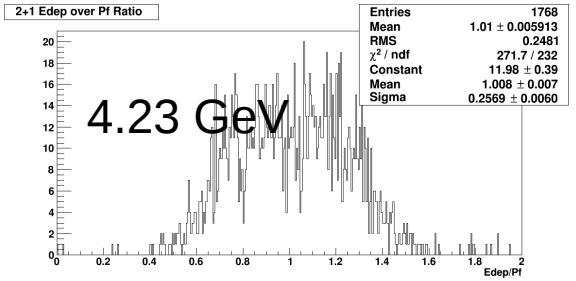
Momentum (edep) over Pf Ratio : 2+1

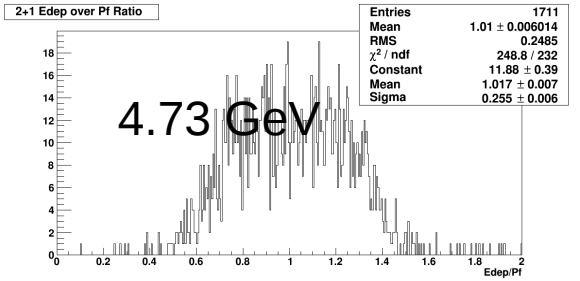


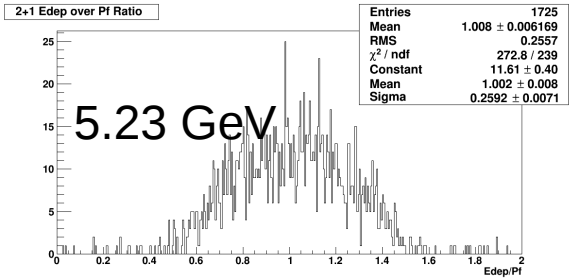


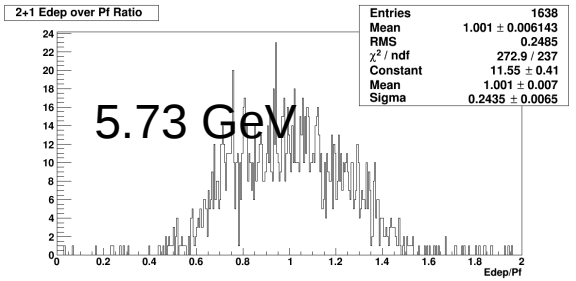


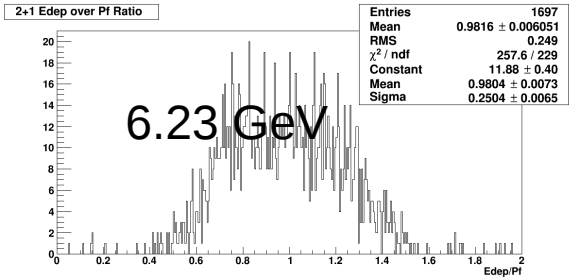




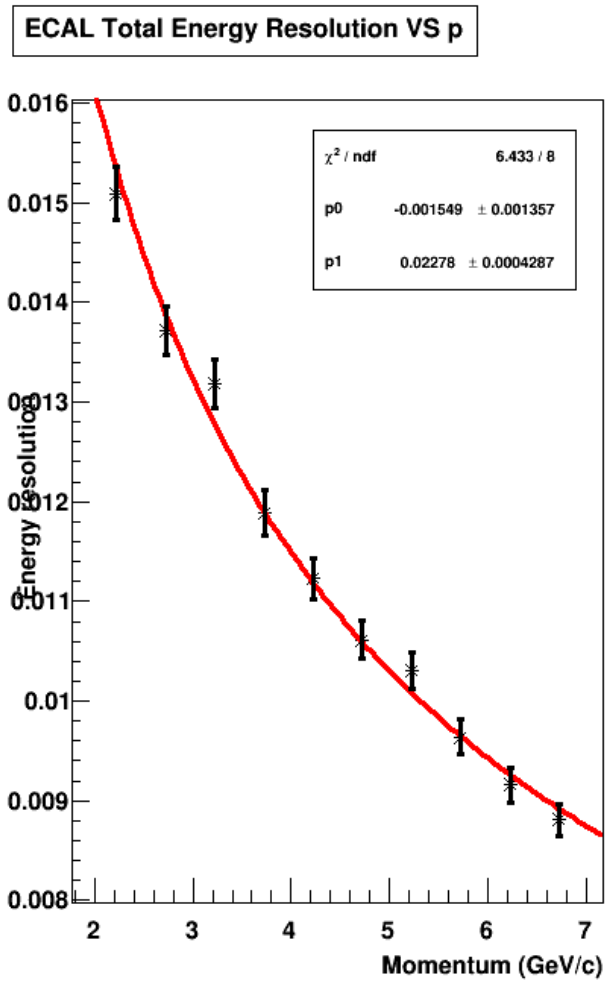


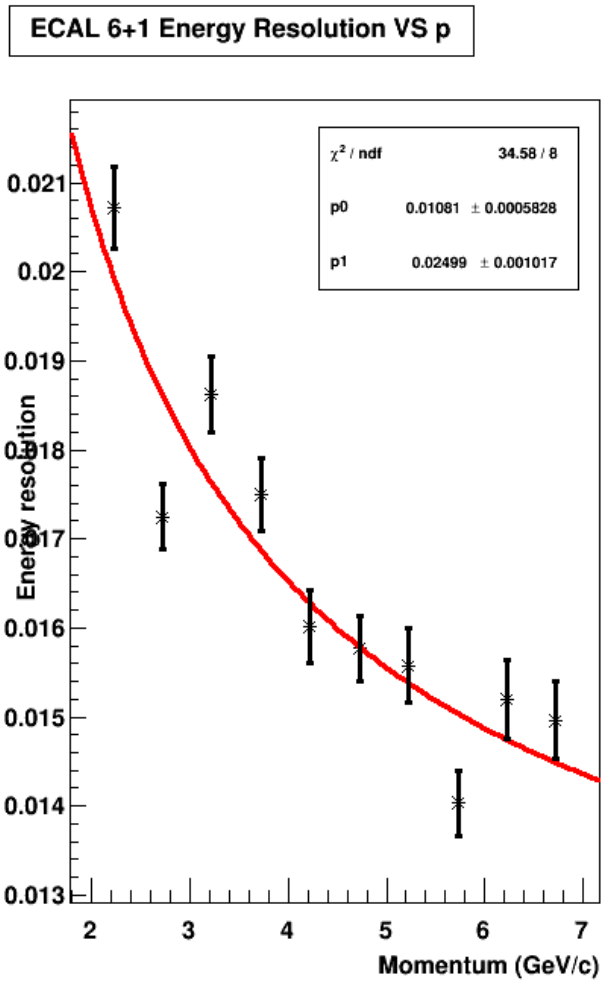


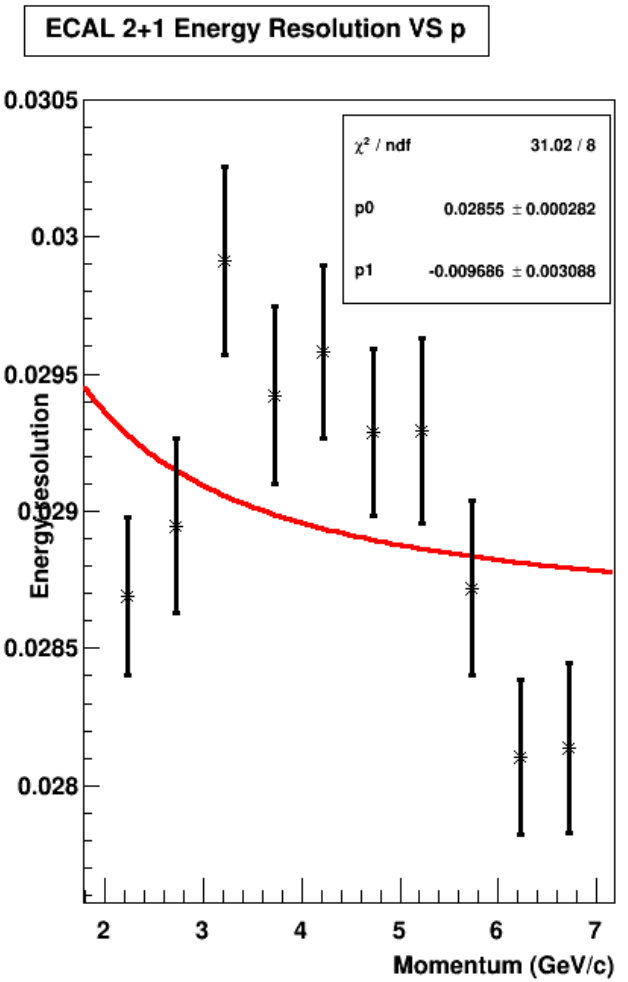




Shower Energy Resolution



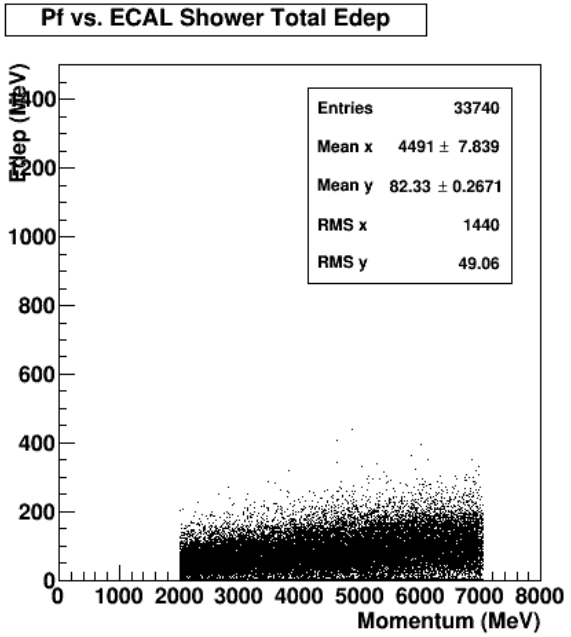


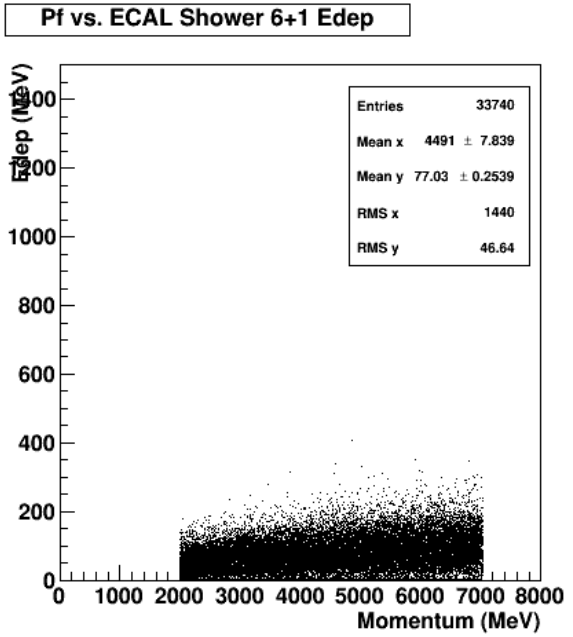


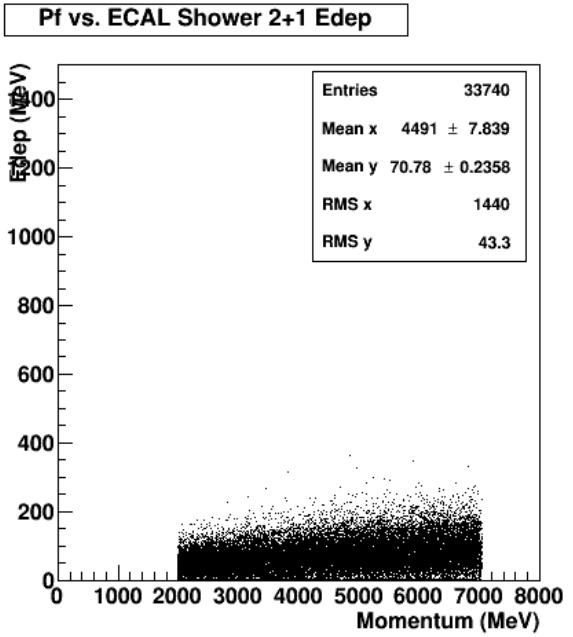
Energy Resolution : Pre-Shower

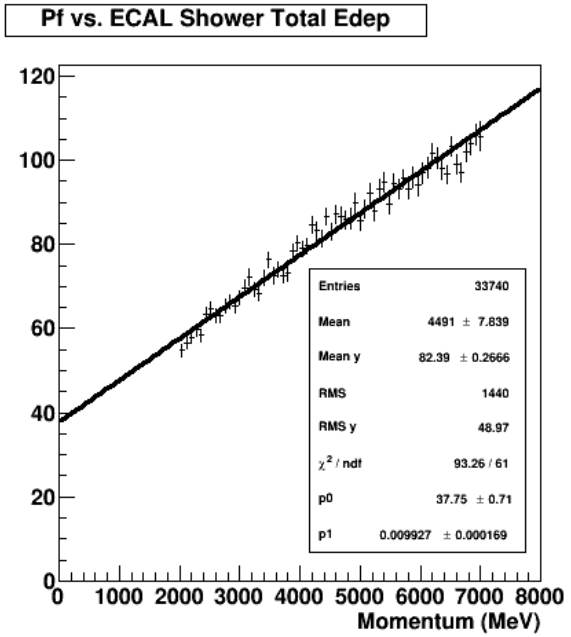
- Input flat distribution : electrons
- Use ecal cluster energy and input momentum to get
  - Energy Resolution

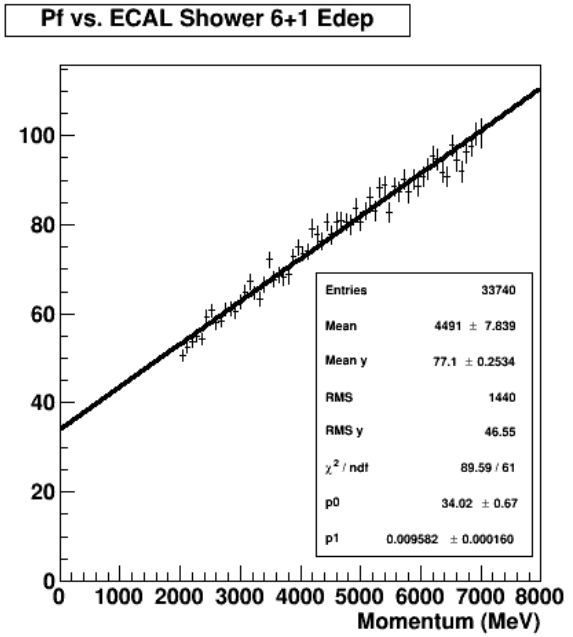
Edep Cluster Energy Calibration

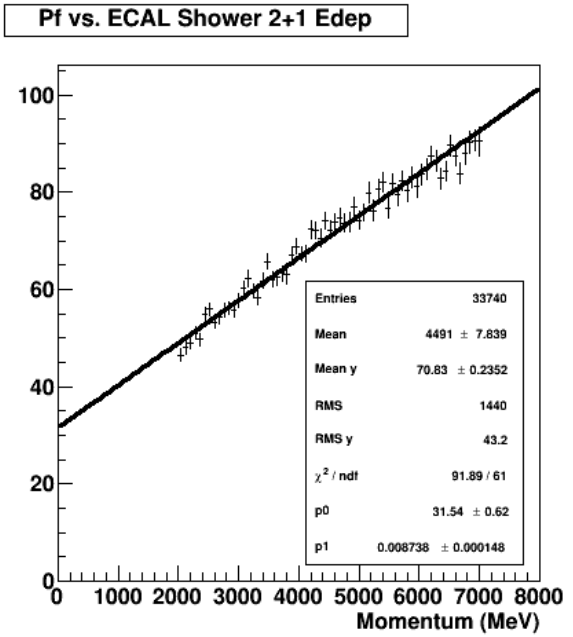




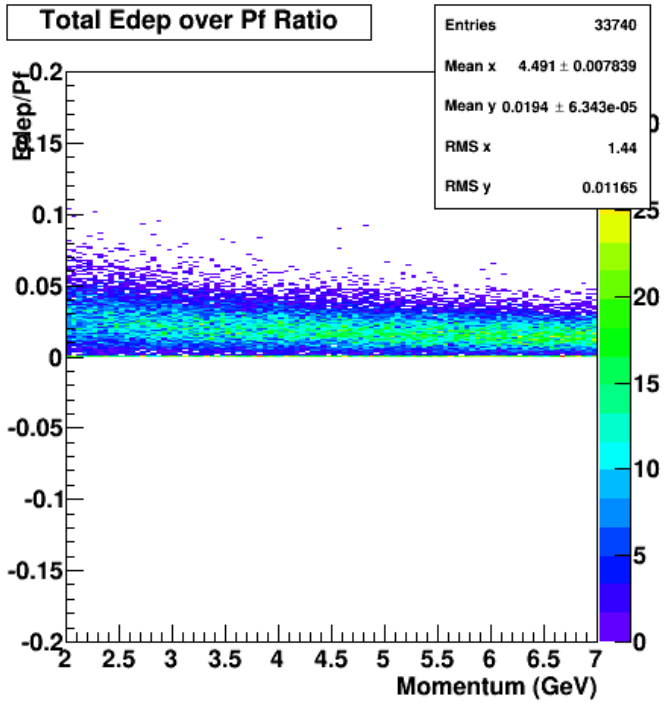


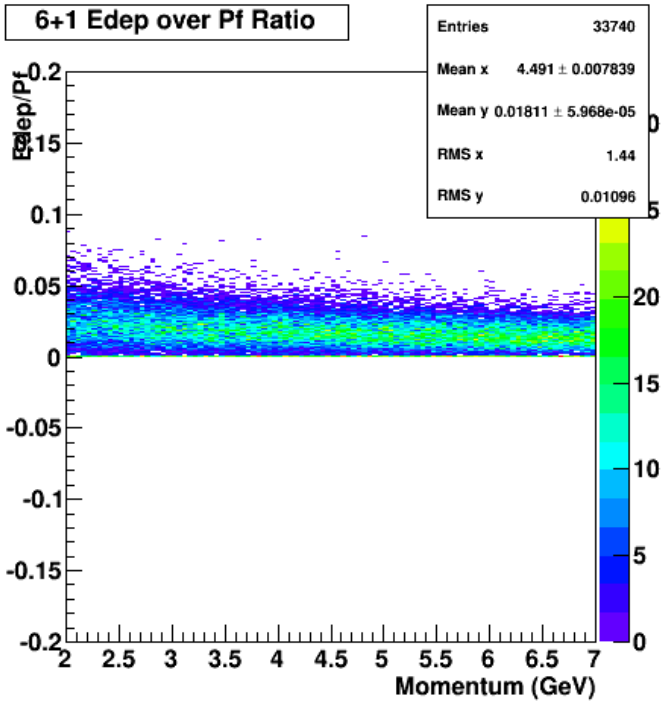


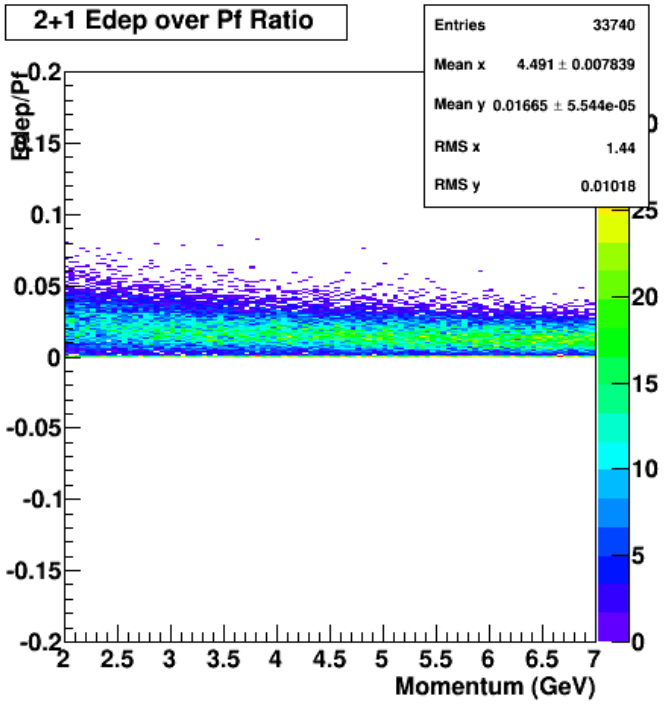




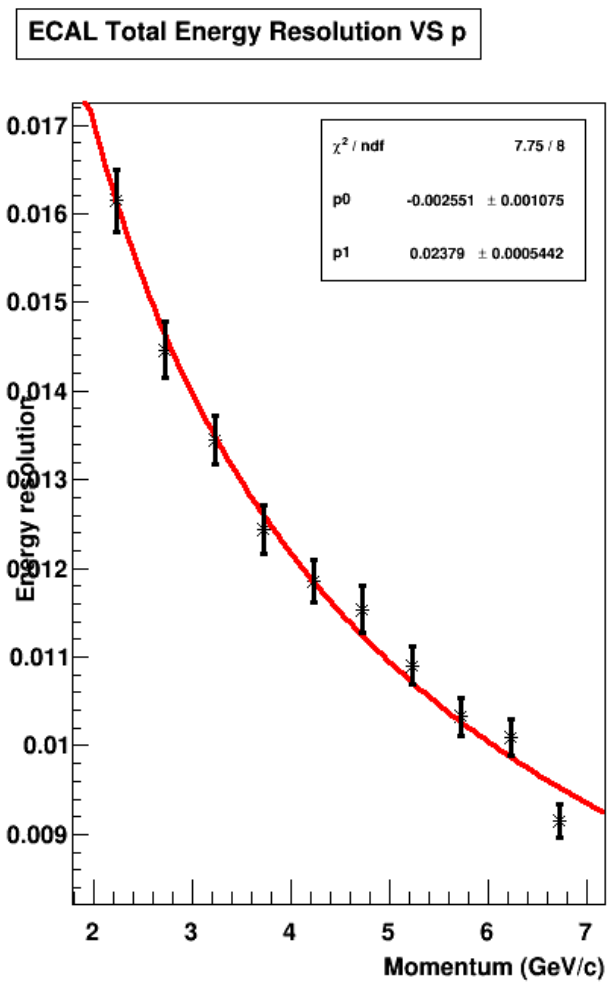
Momentum (edep) over P_f Ratio

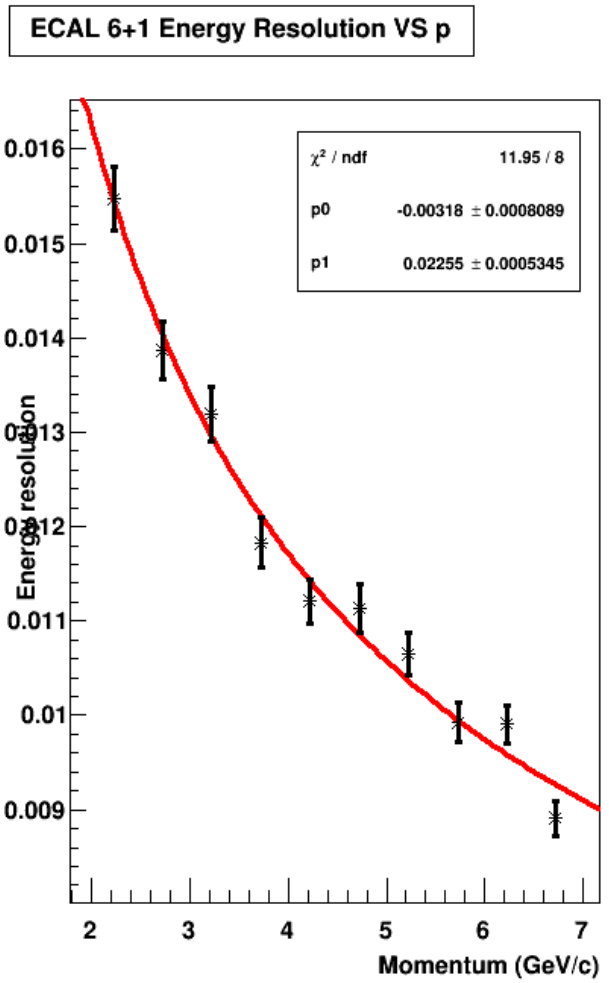


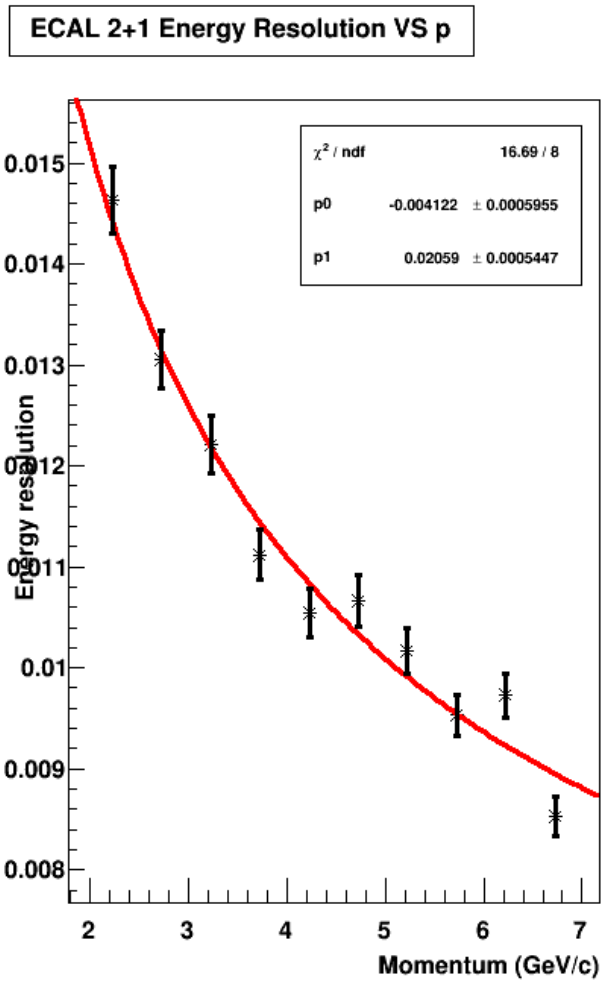




Pre-Shower Energy Resolution







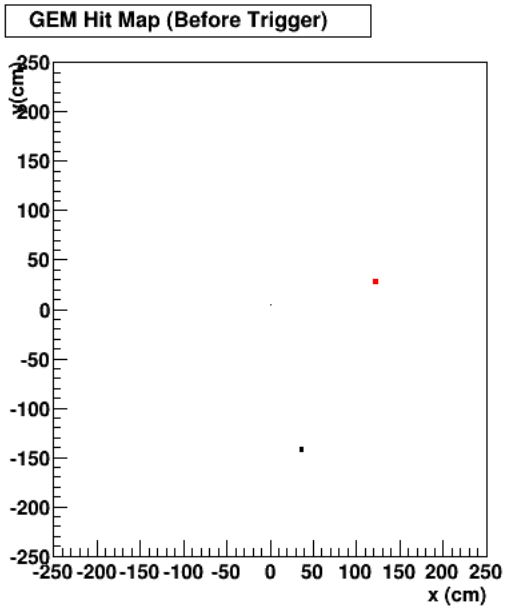
Supplementary

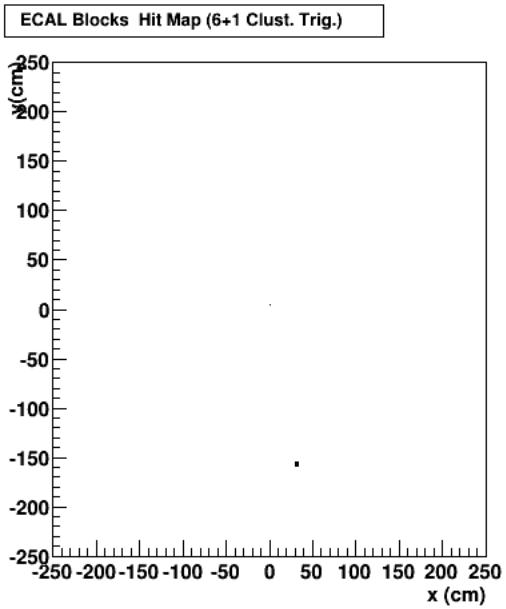
Edep Cluster Energy Calibration

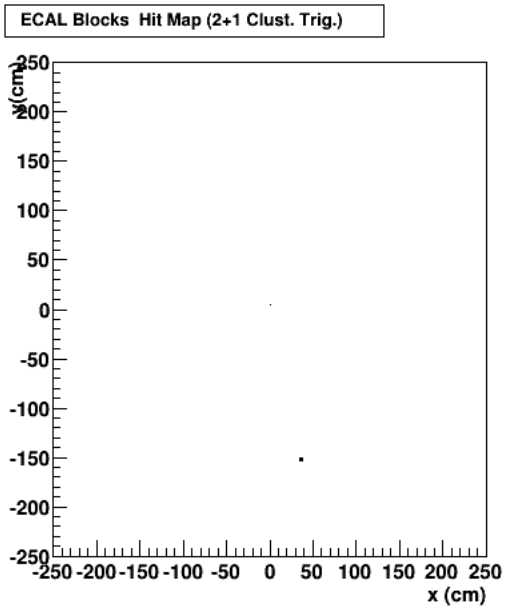
Use the calibration curves to reconstruct the incident momentum (P_f) from ECAL cluster energy deposit

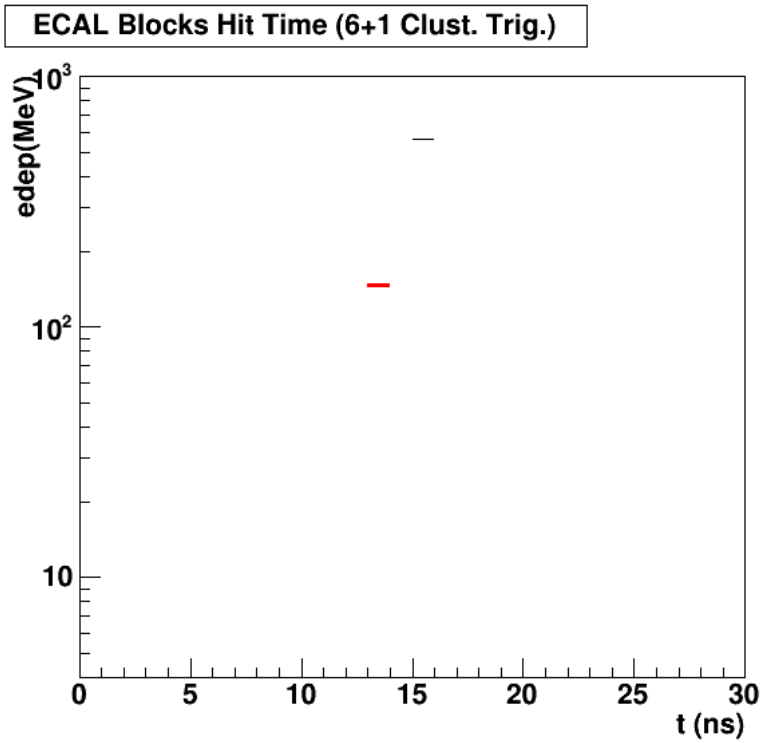
Momentum (incident) ↔ Momentum (edep)

Single Trigger Window Examples





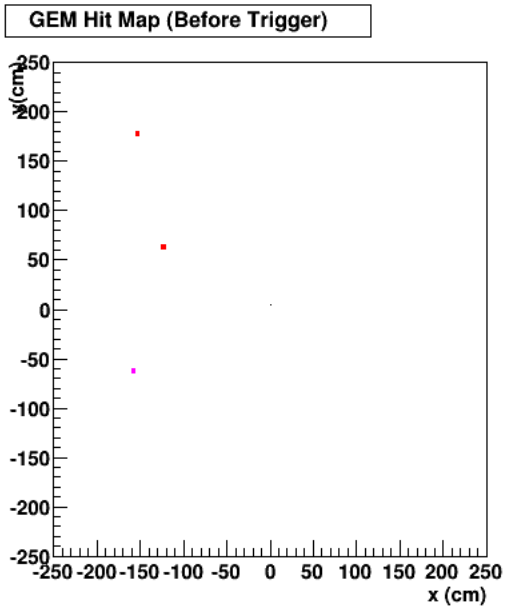


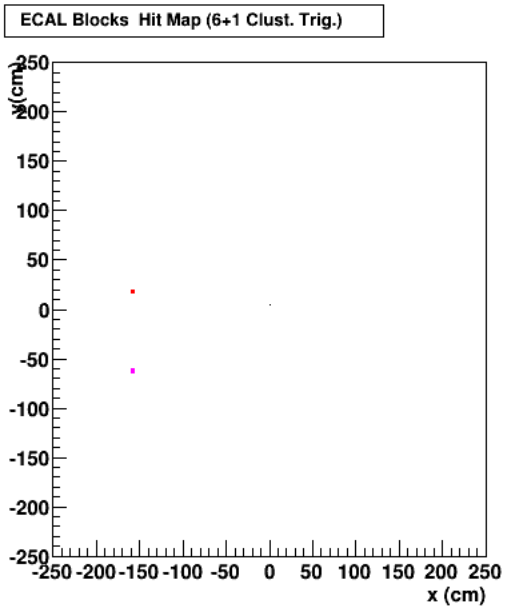


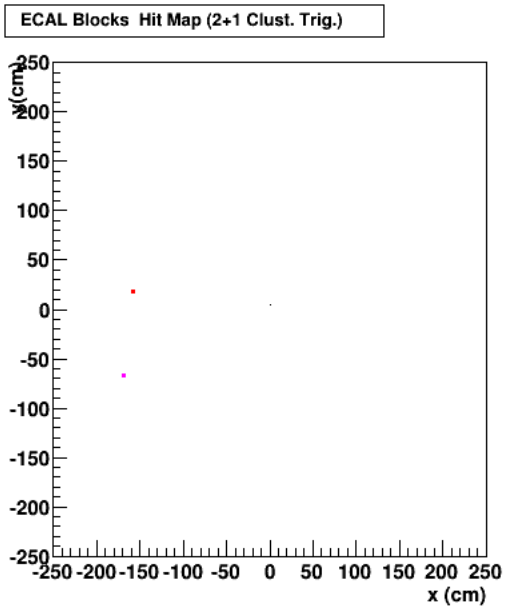
DIS-e: GEM [35.90,-143.73] cm, pf = 2.04 GeV, ECAL [30.00,-158.00] cm, Edep = 557.47 MeV

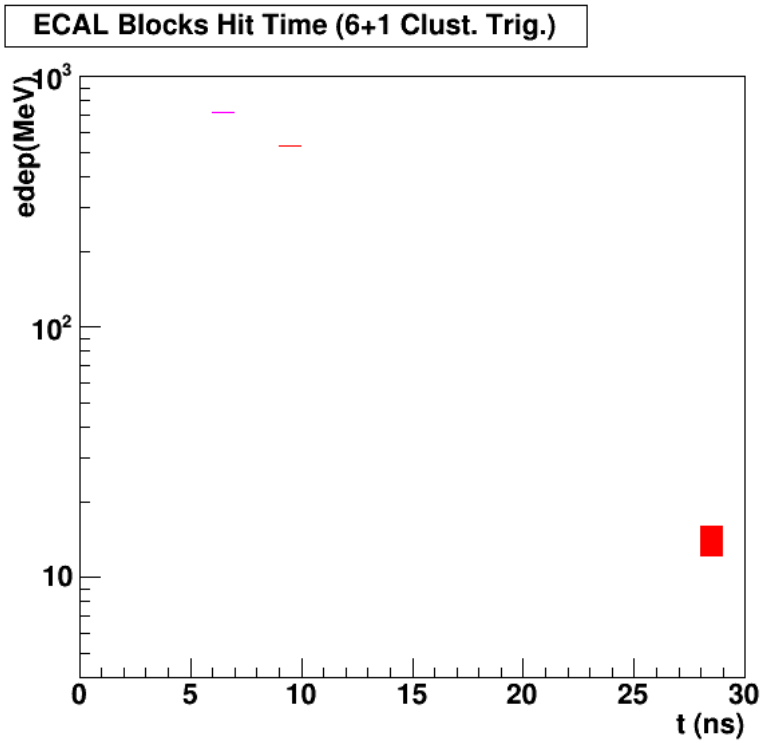
pi-: GEM [123.34,27.81] cm, pf = 2.64 GeV, ECAL [30.00,-158.00] cm, Edep = 144.68 MeV

Single Trigger Window Examples







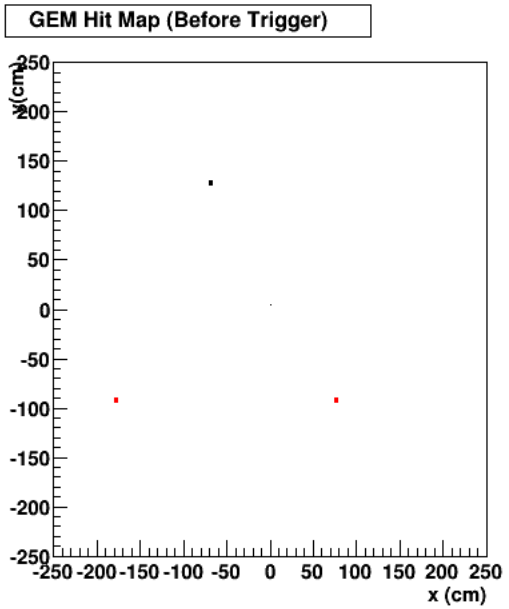


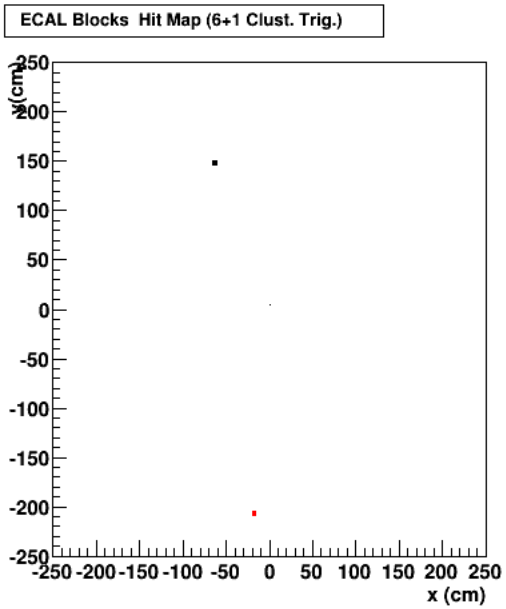
pi-: GEM [-151.41,175.74] cm, pf = 2.37 GeV, ECAL [0.00,0.00] cm, Edep = 13.25 MeV

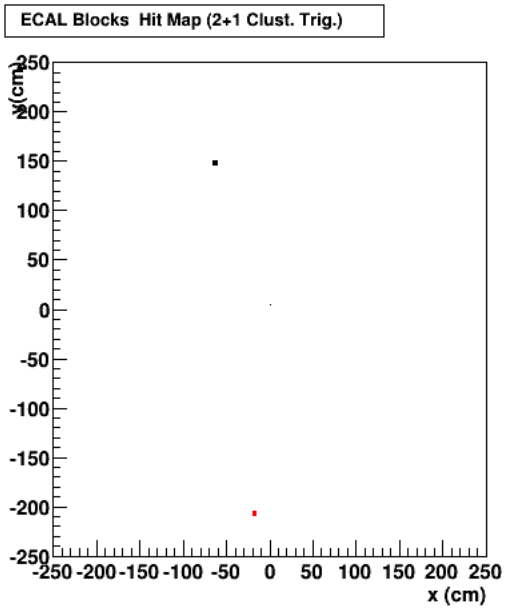
pi-: GEM [-121.01,62.23] cm, pf = 4.38 GeV, ECAL [-158.00,15.00] cm, Edep = 528.86 MeV

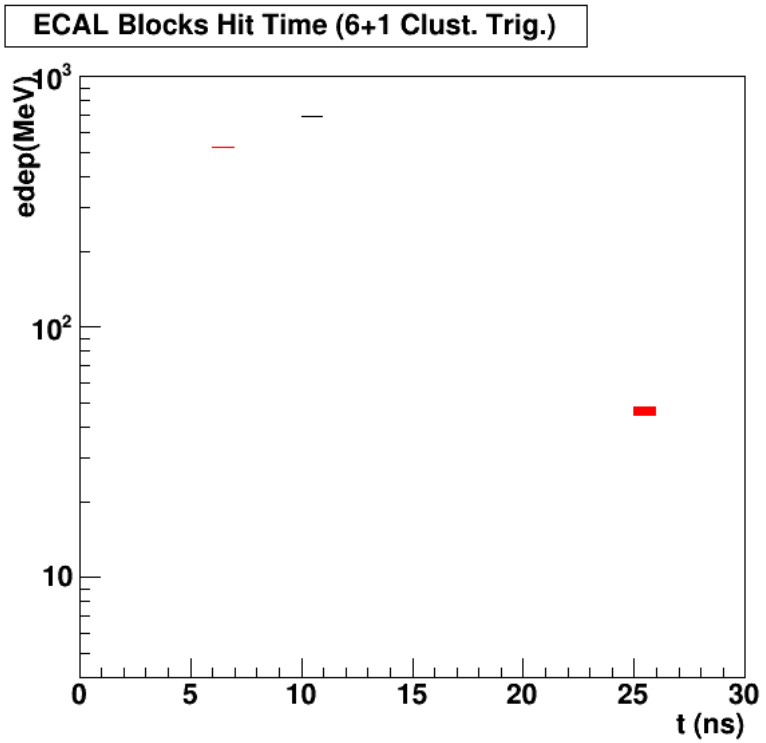
Bkg e+-: GEM [-155.55,-60.42] cm, pf = 4.29 GeV, ECAL [-158.00,-61.00] cm, Edep = 716.78 MeV

Single Trigger Window Examples









pi-: GEM [-179.60,-90.55] cm, pf = 1.93 GeV, ECAL [0.00,0.00] cm, Edep = 47.67 MeV

DIS-e: GEM [-67.72,129.21] cm, pf = 4.23 GeV, ECAL [-64.00,145.00] cm, Edep = 694.00 MeV

pi-: GEM [79.48,-94.55] cm, pf = 4.65 GeV, ECAL [-17.00,-207.00] cm, Edep = 522.04 MeV

Triggering on Electron+Pion