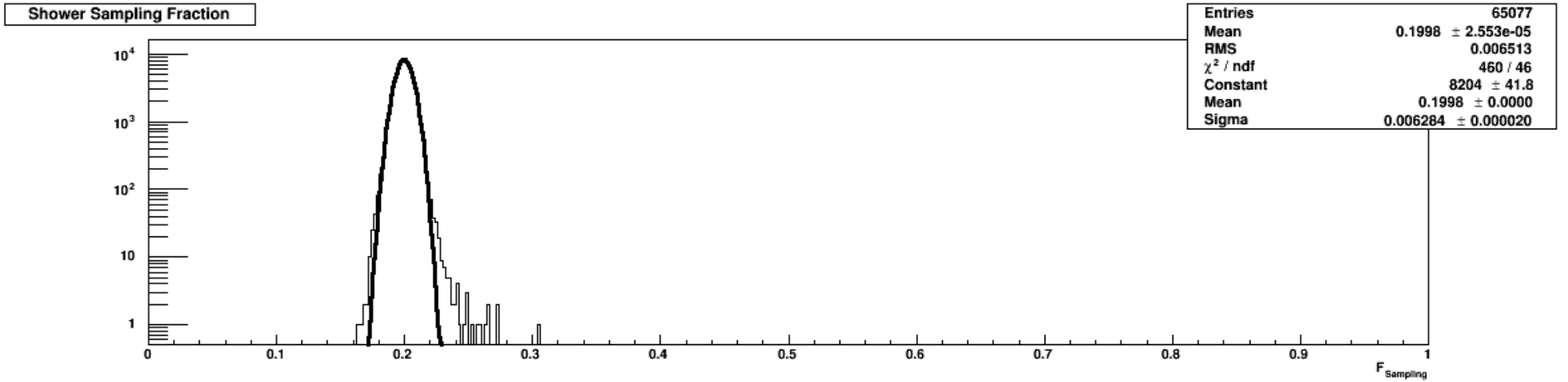
ECAL Summary 3

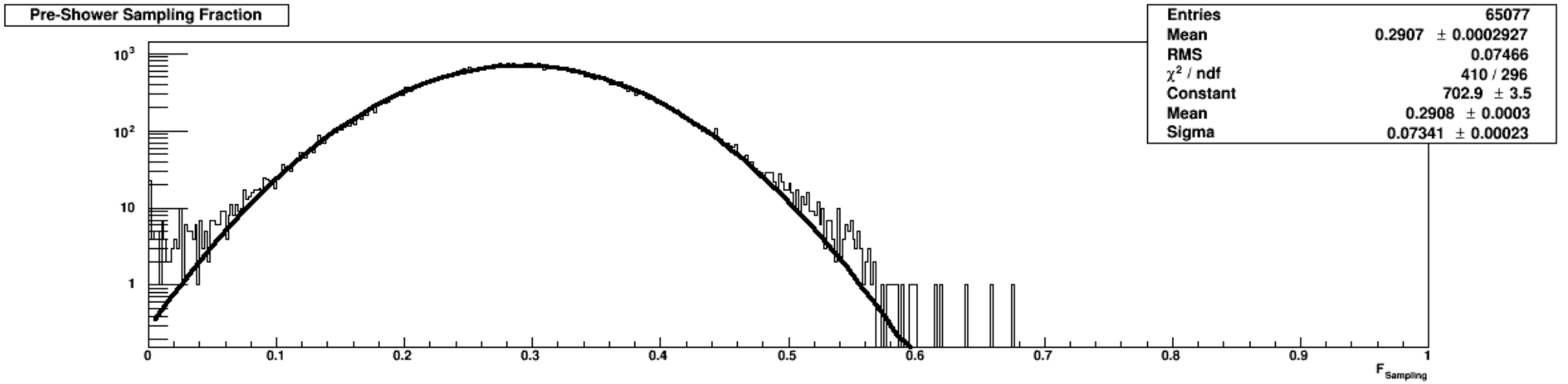
ECAL Energy Resolution and Efficiency

Update

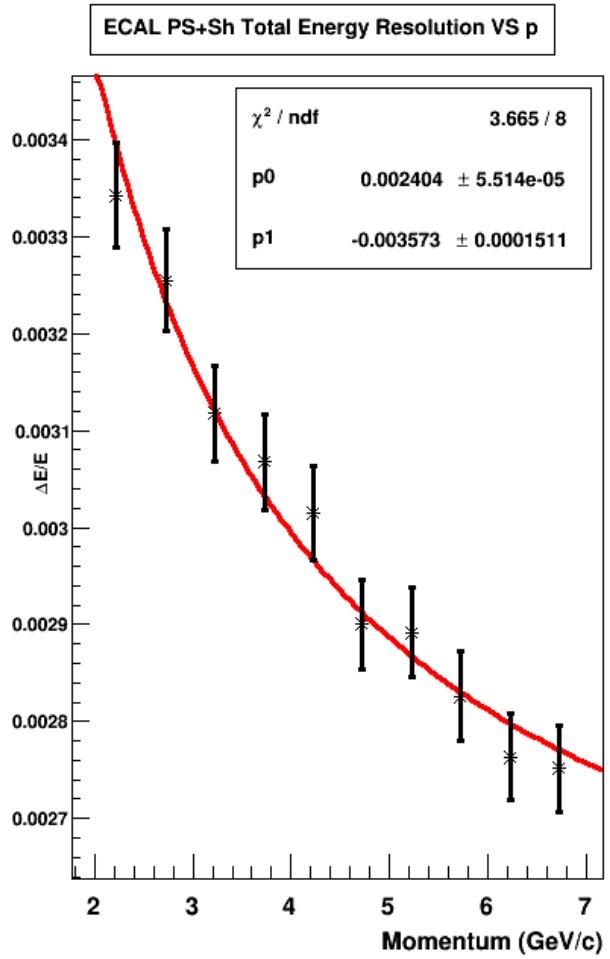
- I have been using realistic numbers for calibrated energy deposit in the PS
  - Get actual edep on the PS lead absorber
  - Get PS scint energy deposit
- I replaced this by sampling fraction for PS

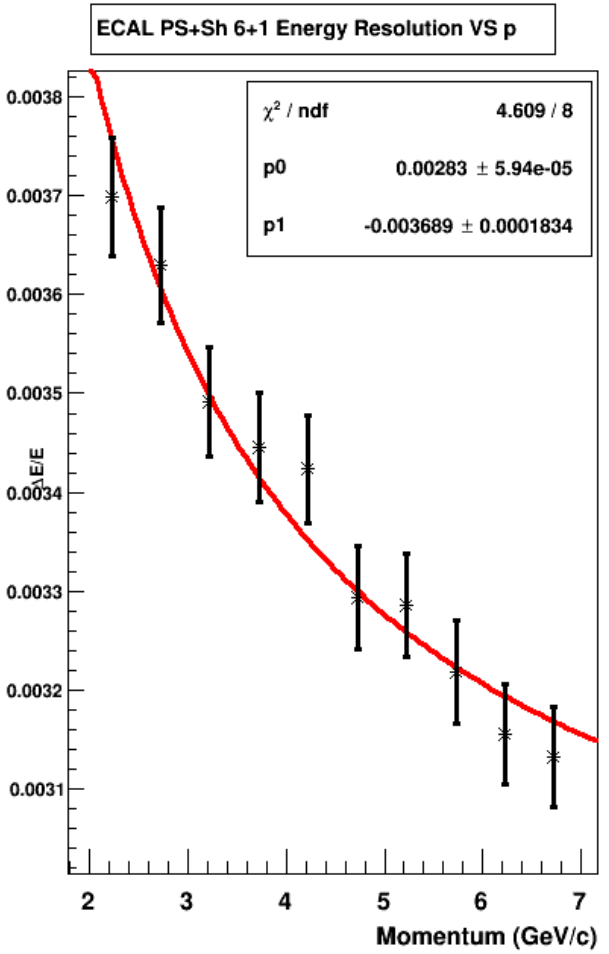
Update to Analysis

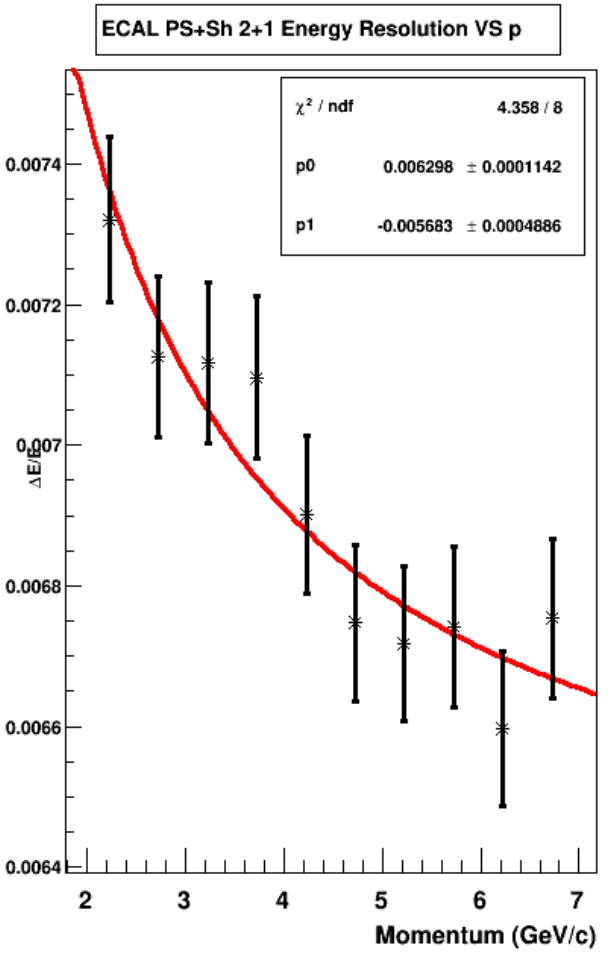




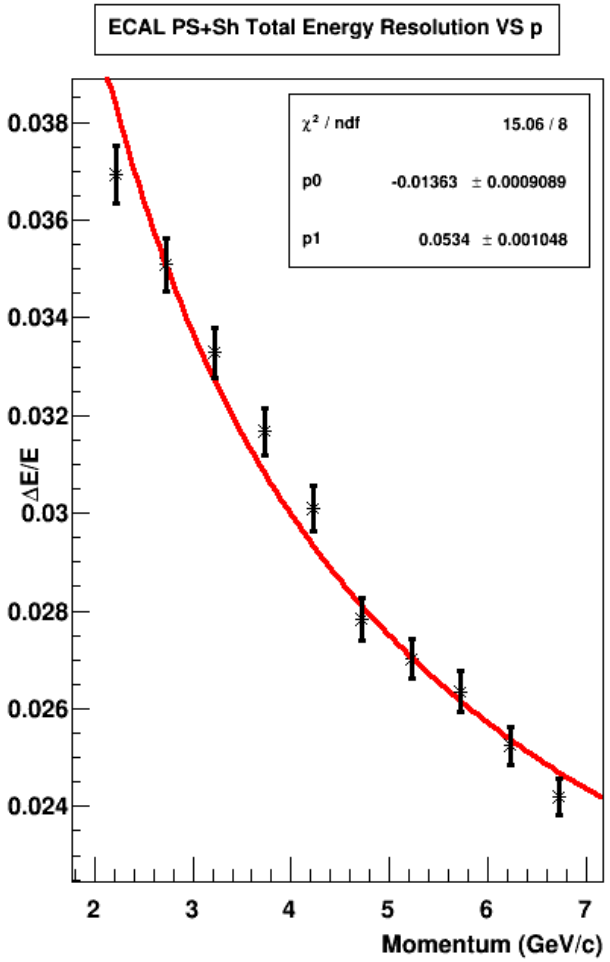
Intrinsic ECAL Energy Resolution : Using Simulated Lead Energy Deposit

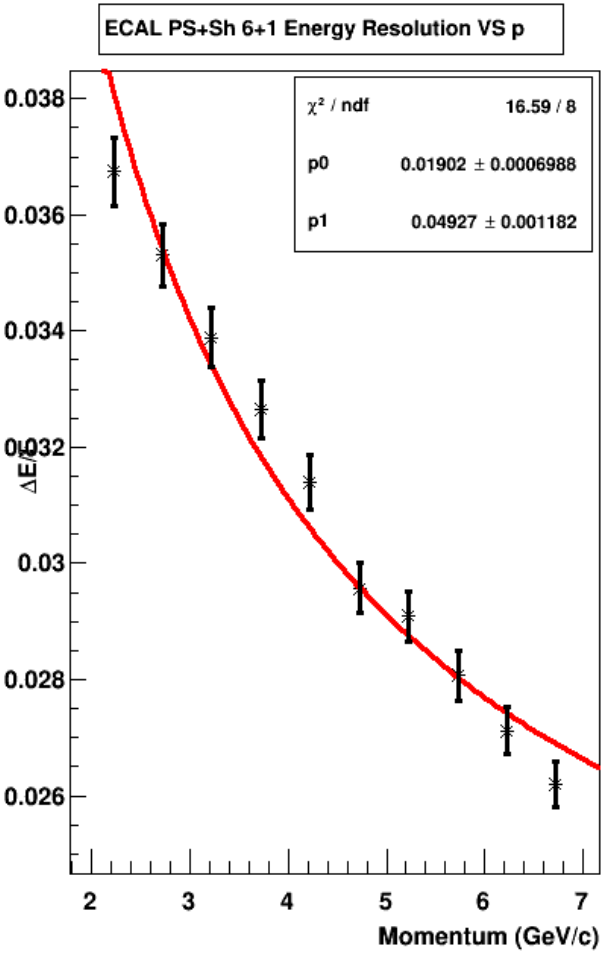


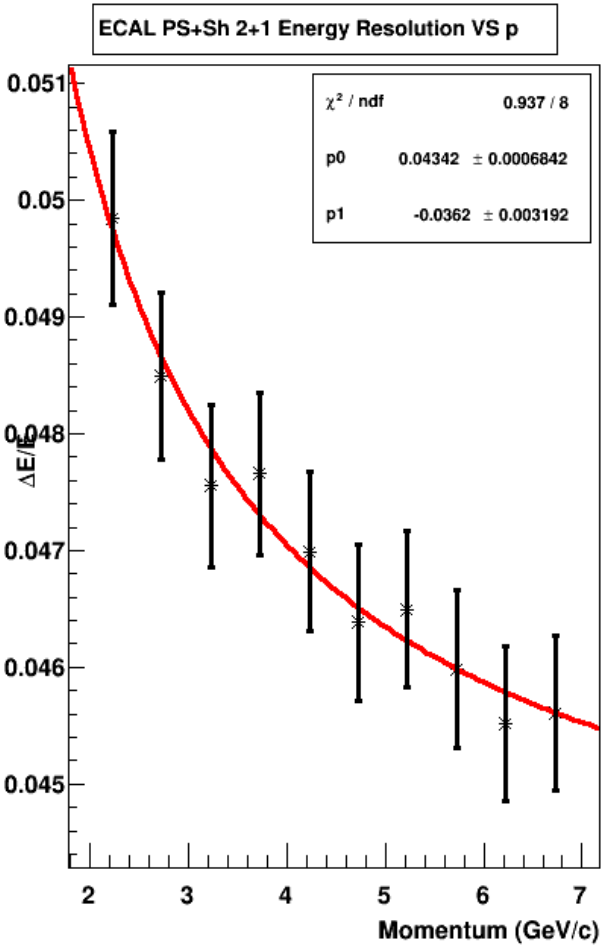




Intrinsic ECAL Energy Resolution : Using Sampling Fractions







Based on calibrated energy deposit in the ECAL
using sampling fractions for Shower and Pre-Shower

Intrinsic ECAL Energy Resolution : After

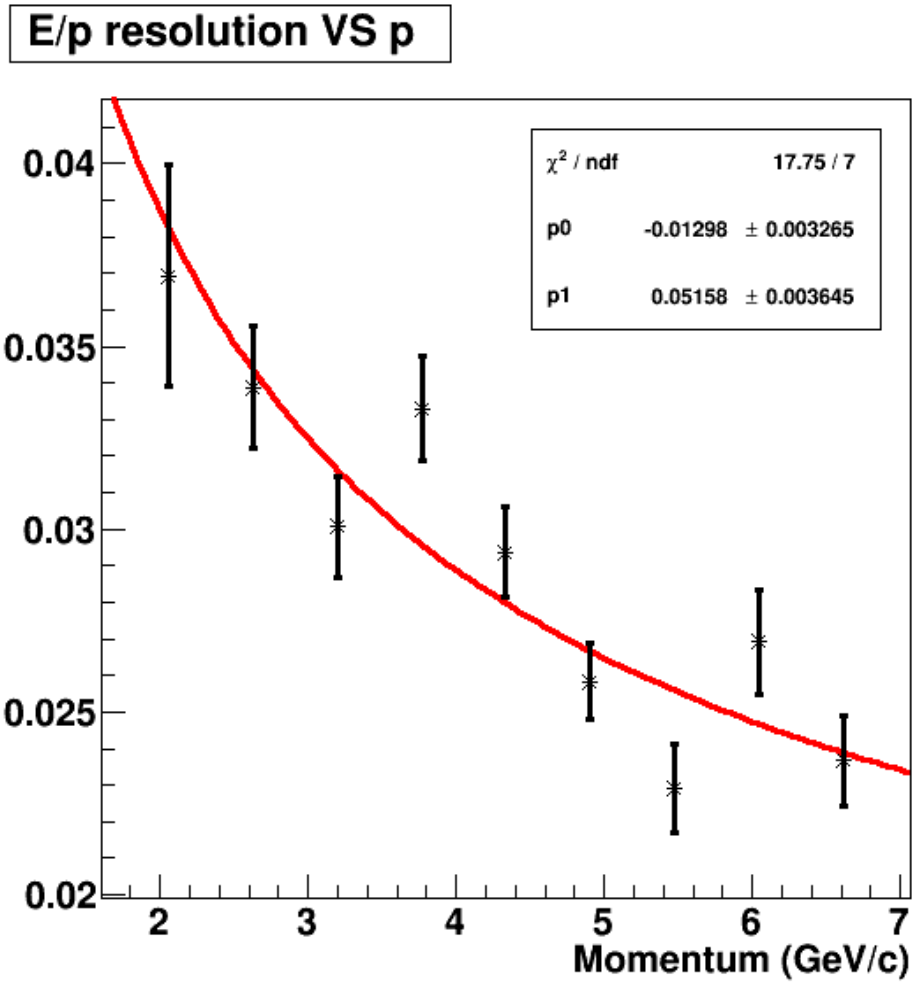
From Total Energy on ECAL		
Pf (GeV)	Resolution	Error
2.23	0.037	0.00058
2.73	0.035	0.00054
3.23	0.033	0.00051
3.73	0.032	0.00049
4.23	0.030	0.00046
4.73	0.028	0.00042
5.23	0.027	0.00041
5.73	0.026	0.00041
6.23	0.025	0.00039
6.73	0.024	0.00037

From 6+1 Clusters		
Pf (GeV)	Resolution	Error
2.23	0.037	0.00058
2.73	0.035	0.00054
3.23	0.034	0.00051
3.73	0.033	0.00049
4.23	0.031	0.00047
4.73	0.030	0.00044
5.23	0.029	0.00043
5.73	0.028	0.00042
6.23	0.027	0.00040
6.73	0.026	0.00039

From 2+1 Clusters		
Pf (GeV)	Resolution	Error
2.23	0.050	0.00074
2.73	0.048	0.00071
3.23	0.048	0.00069
3.73	0.048	0.00070
4.23	0.047	0.00068
4.73	0.046	0.00067
5.23	0.046	0.00067
5.73	0.046	0.00068
6.23	0.046	0.00066
6.73	0.046	0.00066

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

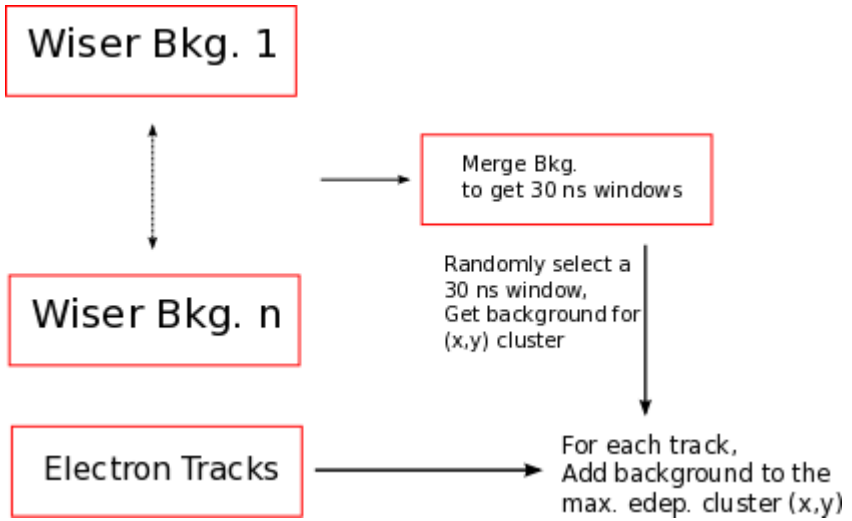
- Jin's estimation was based on ecal (ps+sh) calibrated energy deposition



Energy Resolution with Wiser Background

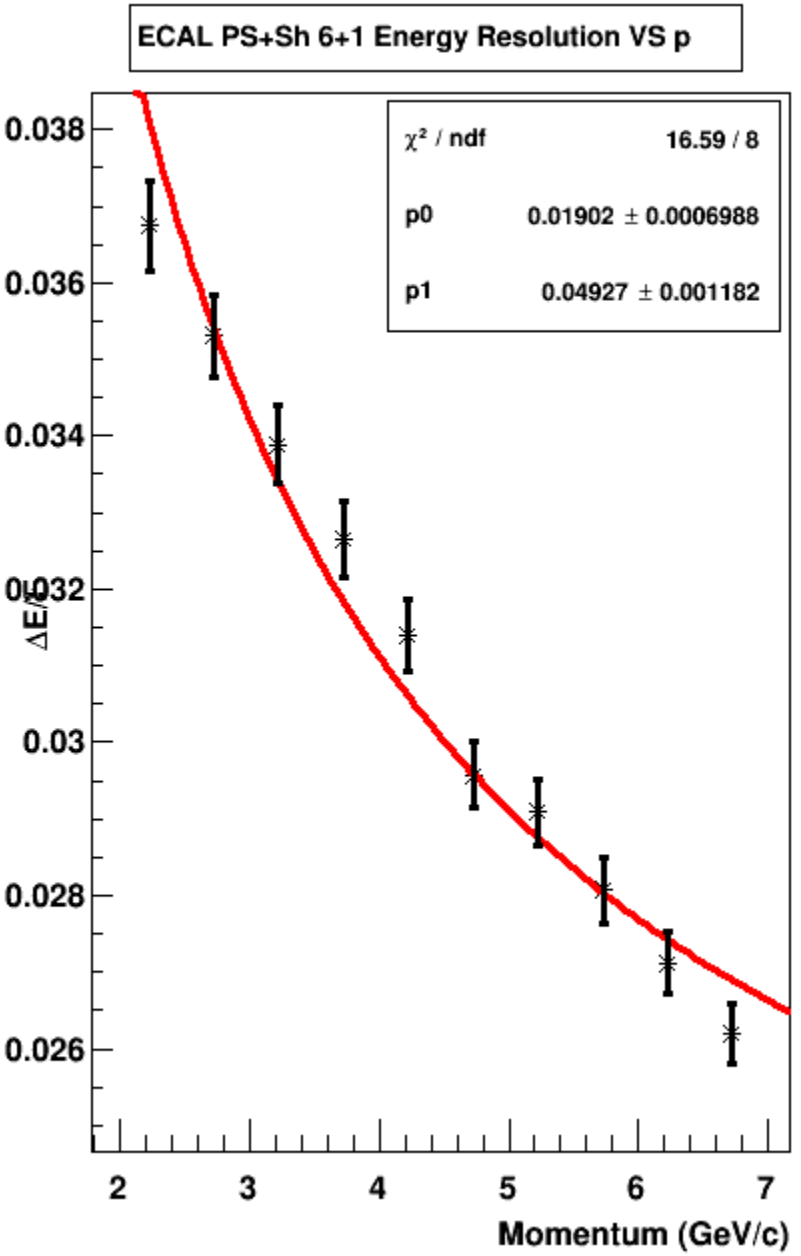
How Backgrounds are Added?

- Generate Wiser backgrounds using cross-section weighted Wiser generators (no rate weighting on uniform pions)
- Based on the rate , merge background in time space assuming Poisson distr.



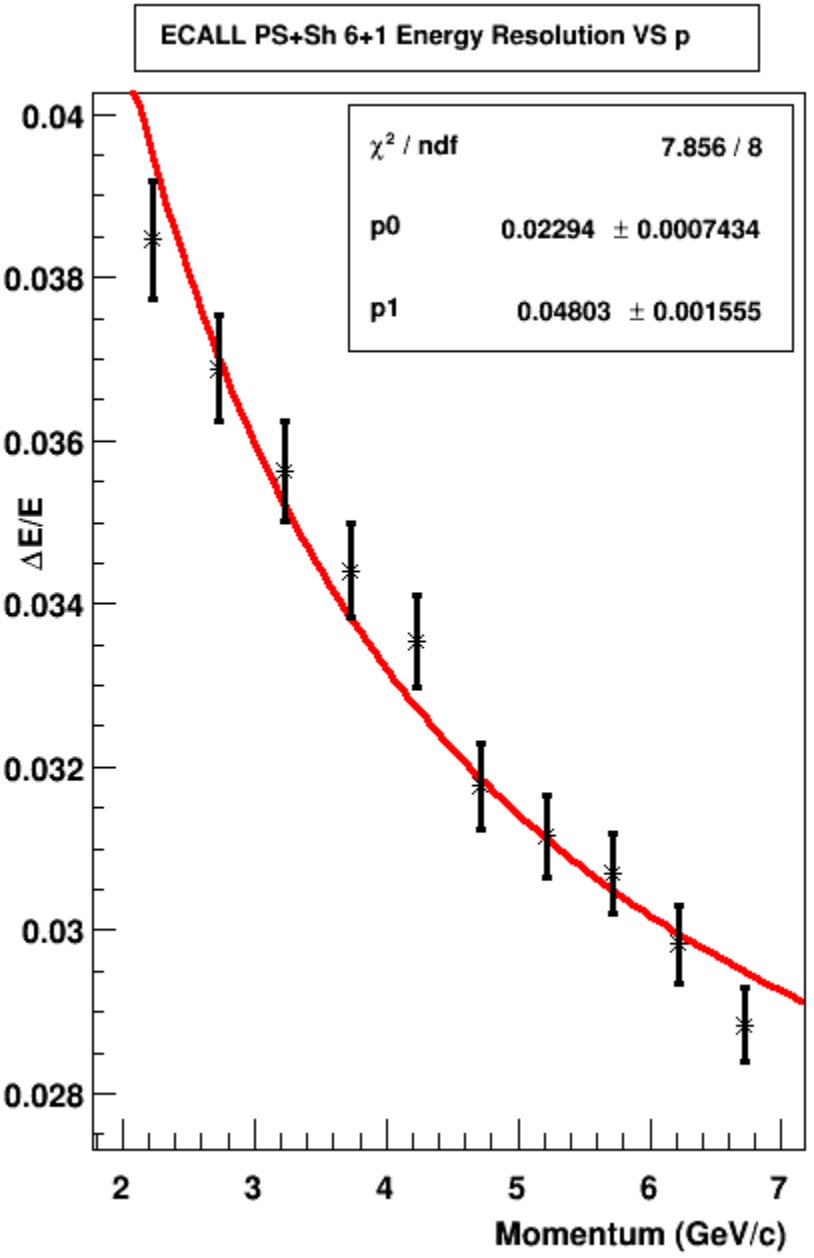
ECAL Energy Resolution with No Bkg.

From 6+1 Clusters		
Pf (GeV)	Resolution	Error
2.23	0.037	0.00058
2.73	0.035	0.00054
3.23	0.034	0.00051
3.73	0.033	0.00049
4.23	0.031	0.00047
4.73	0.030	0.00044
5.23	0.029	0.00043
5.73	0.028	0.00042
6.23	0.027	0.00040
6.73	0.026	0.00039



ECAL Energy Resolution with Wiser Bkg.

From 6+1 Clusters		
Pf (GeV)	Resolution	Error
2.23	0.038	0.00072
2.73	0.037	0.00066
3.23	0.036	0.00062
3.73	0.034	0.00058
4.23	0.034	0.00056
4.73	0.032	0.00052
5.23	0.031	0.00051
5.73	0.031	0.00050
6.23	0.030	0.00048
6.73	0.029	0.00046

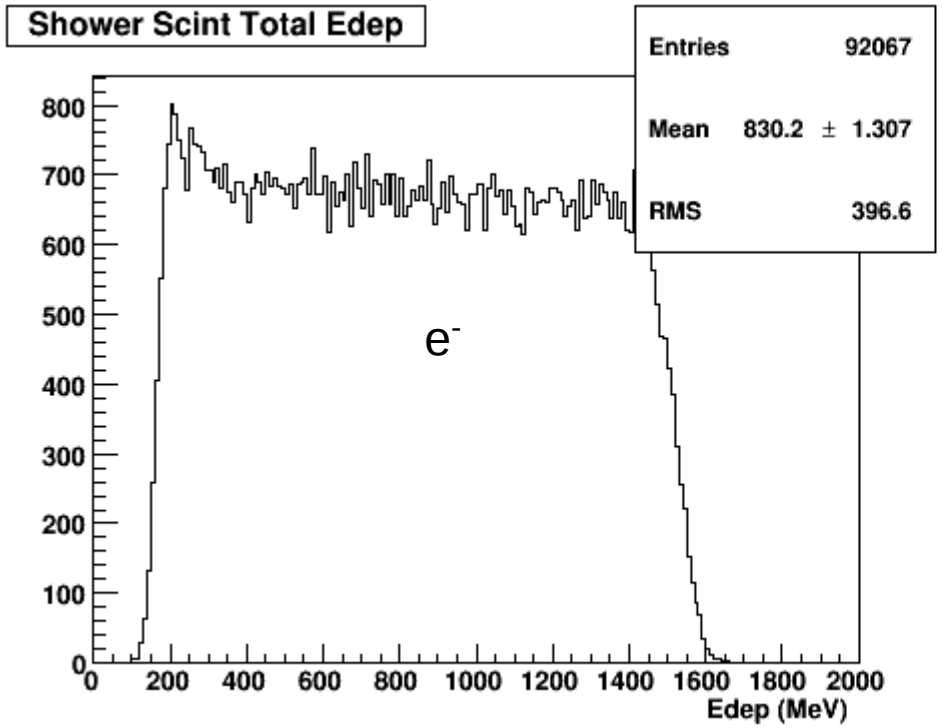


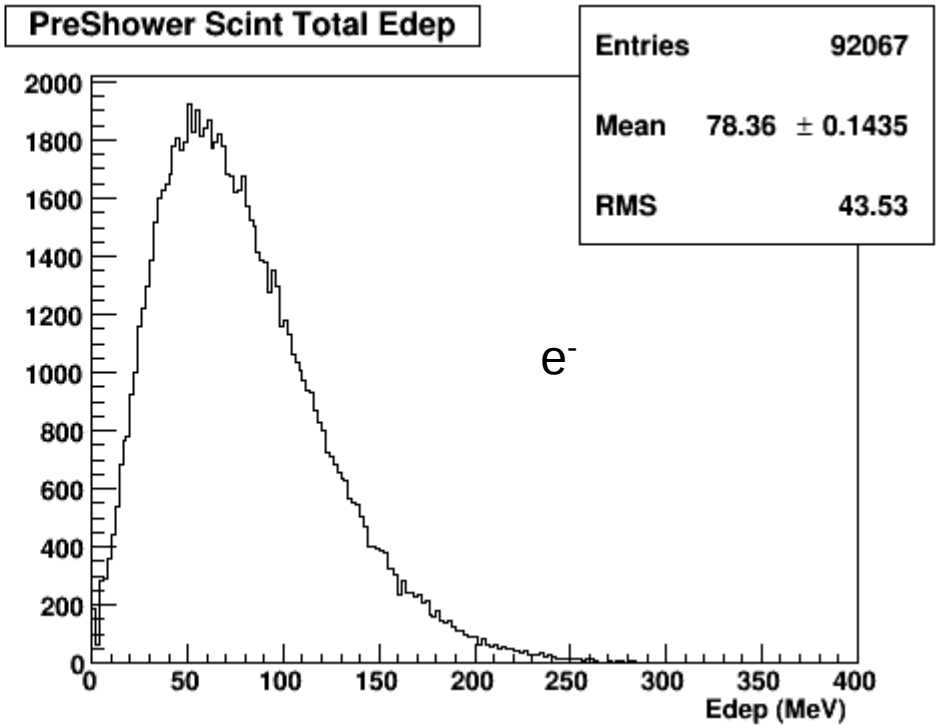
Summary

- Need to a better approximation for PS energy calibration
- Next : Proper efficiency study is on-going

MIP Cut on the Pre-Shower

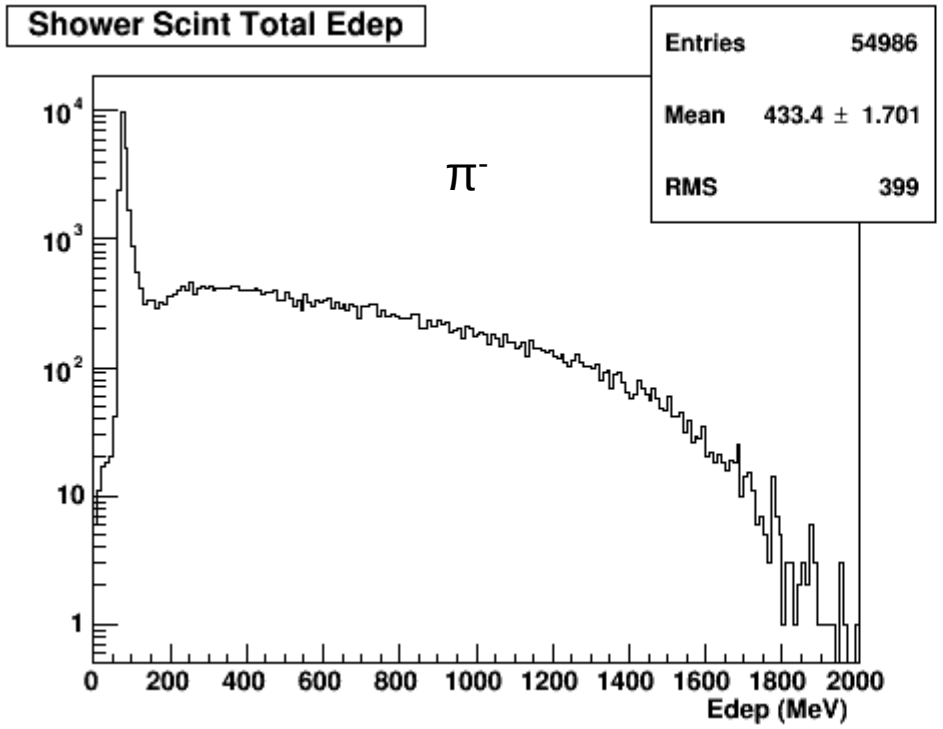
- Electron deposit energy in the PS differently compared to pions
- Due to Pions act like a MIP most of the time PS cut just above a MIP can reject pions

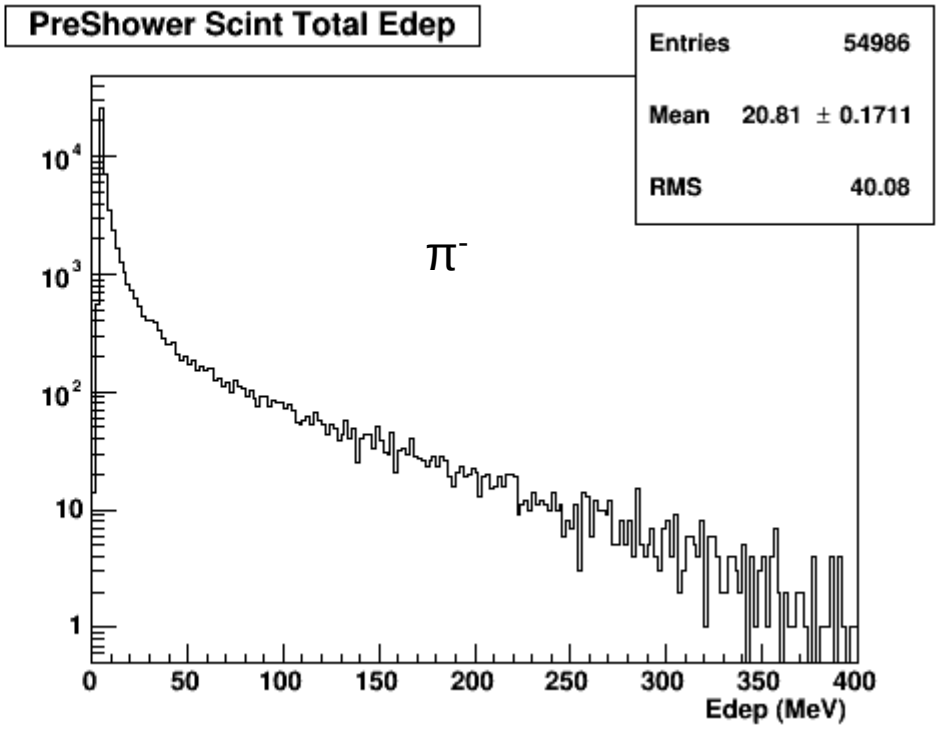




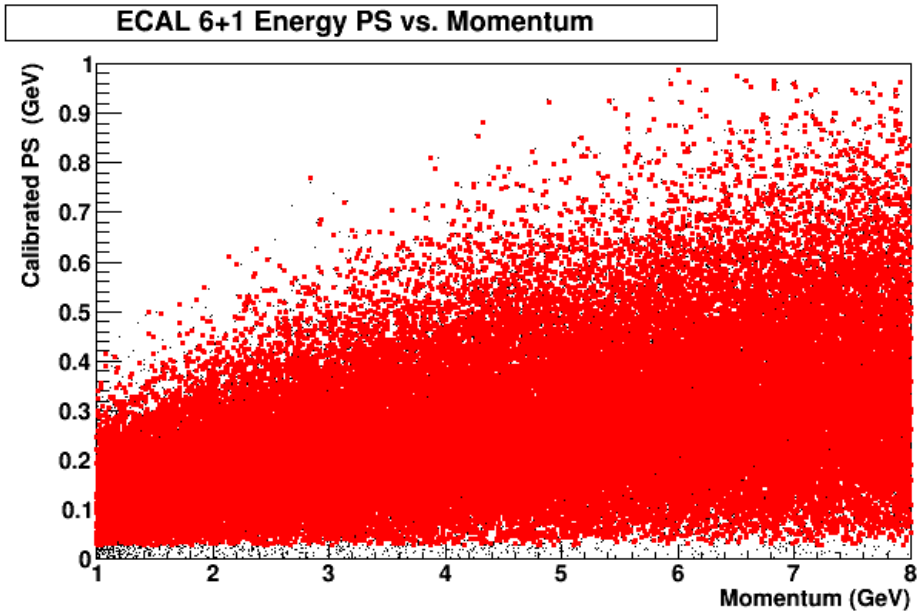
MIP Cut on the Pre-Shower

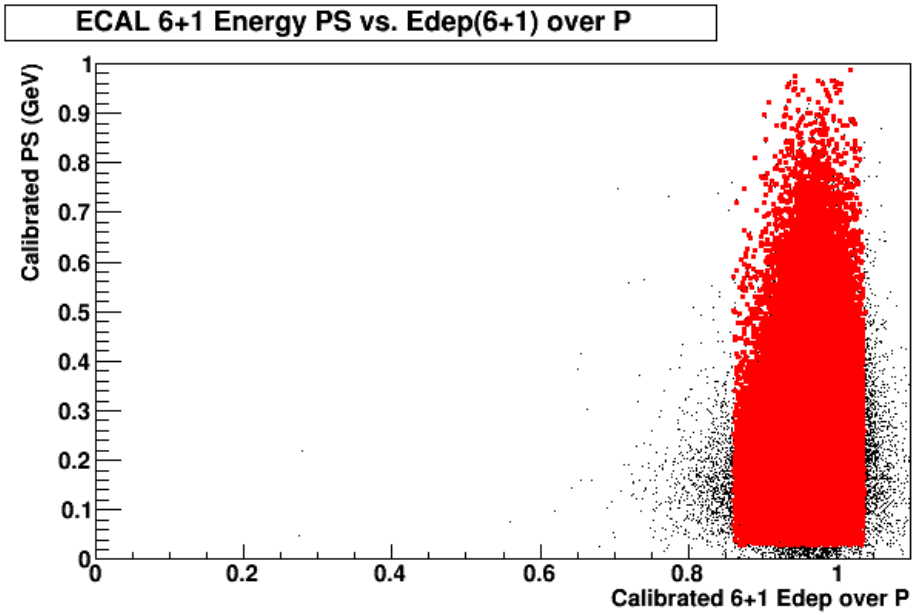
- Electron deposit energy in the PS differently compared to pions
- Due to Pions act like a MIP most of the time PS cut just above a MIP can reject pions
- Apply a MIP cut to select edep greater than MIP
  - MIP is about 7 MeV

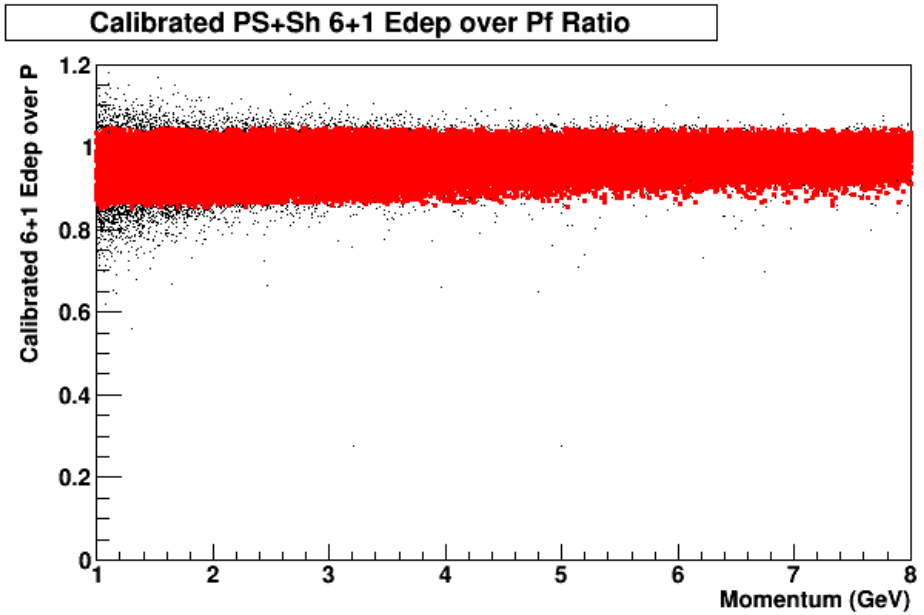


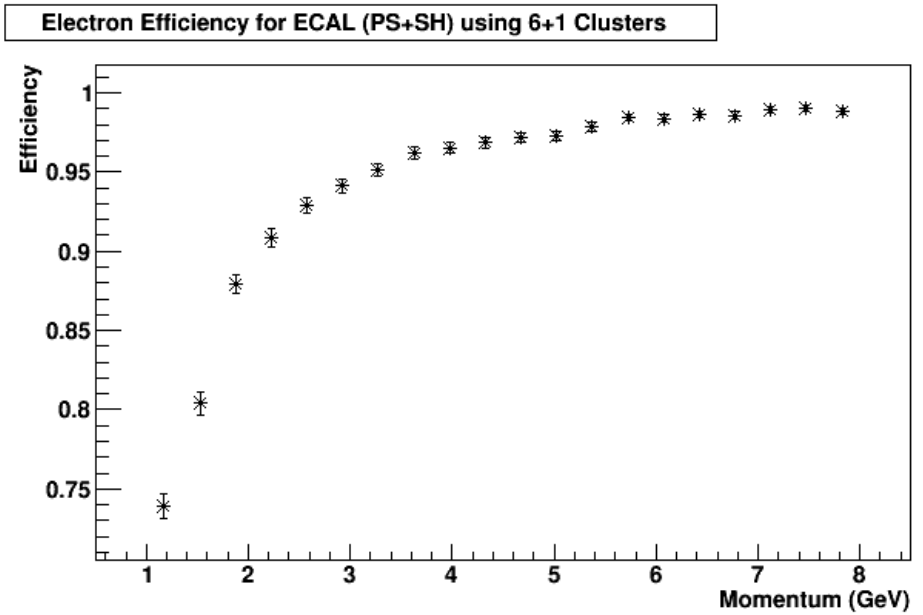


Efficiency : Electrons

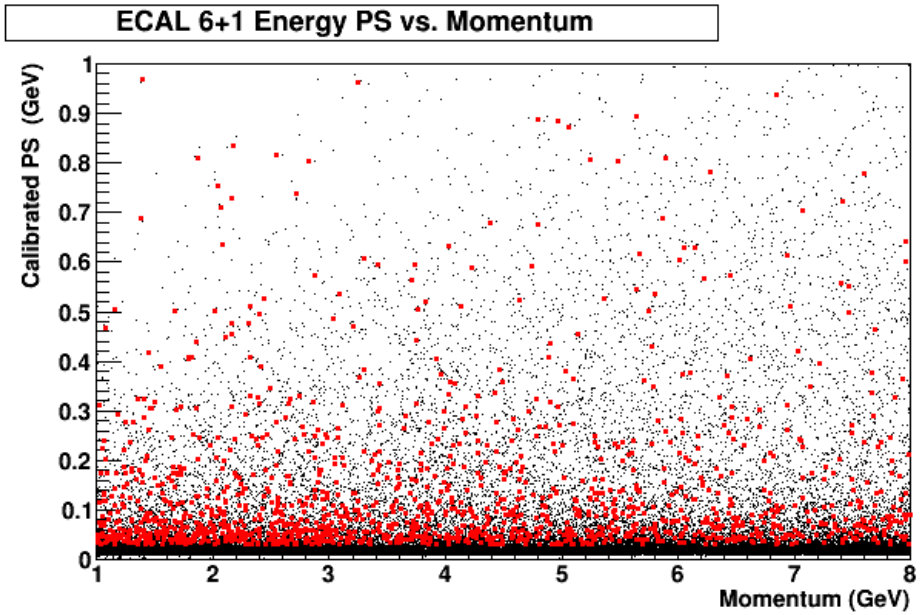


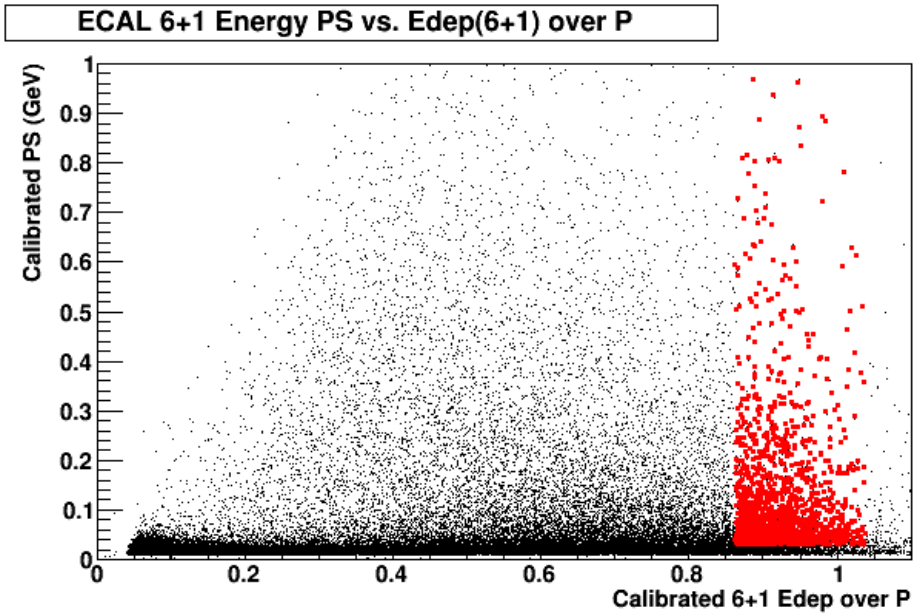


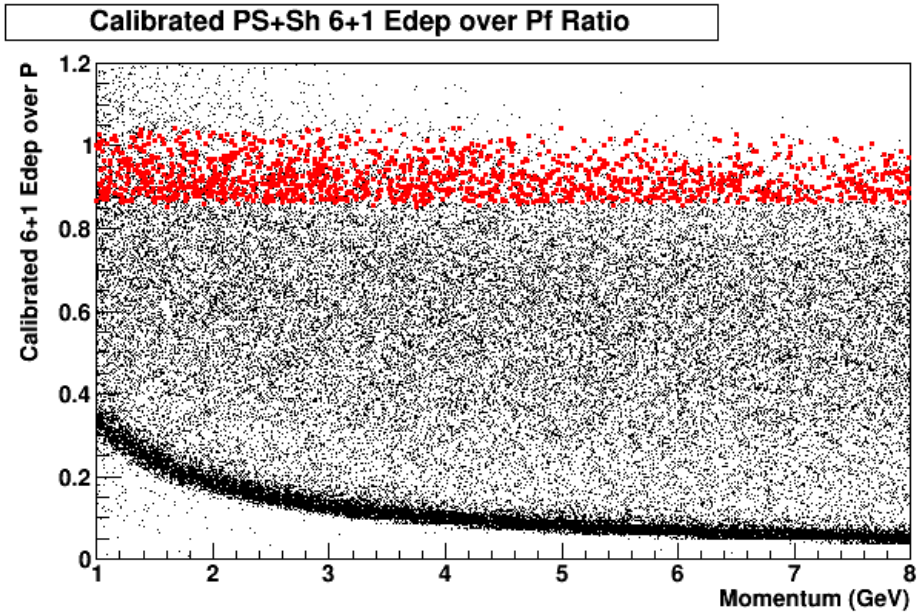


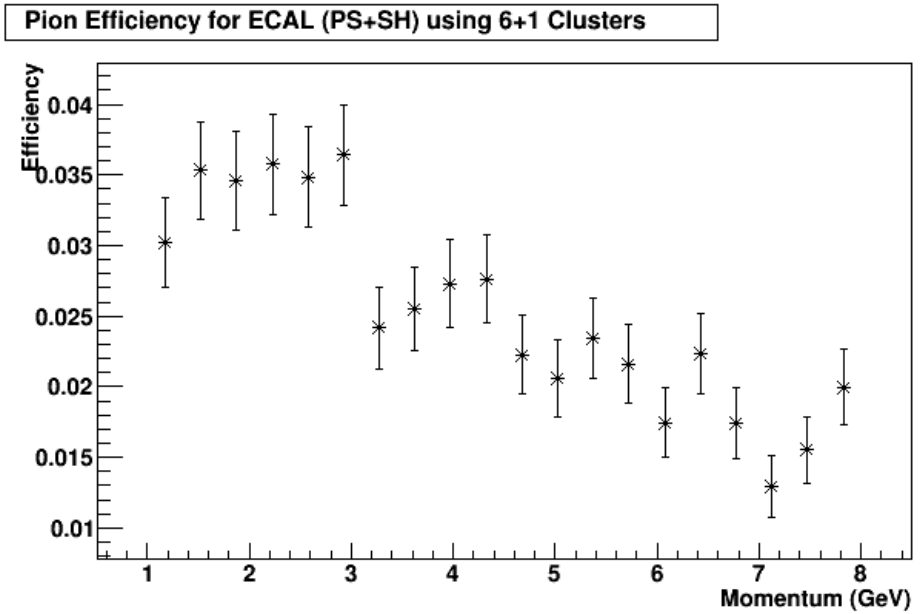


Efficiency : Pions

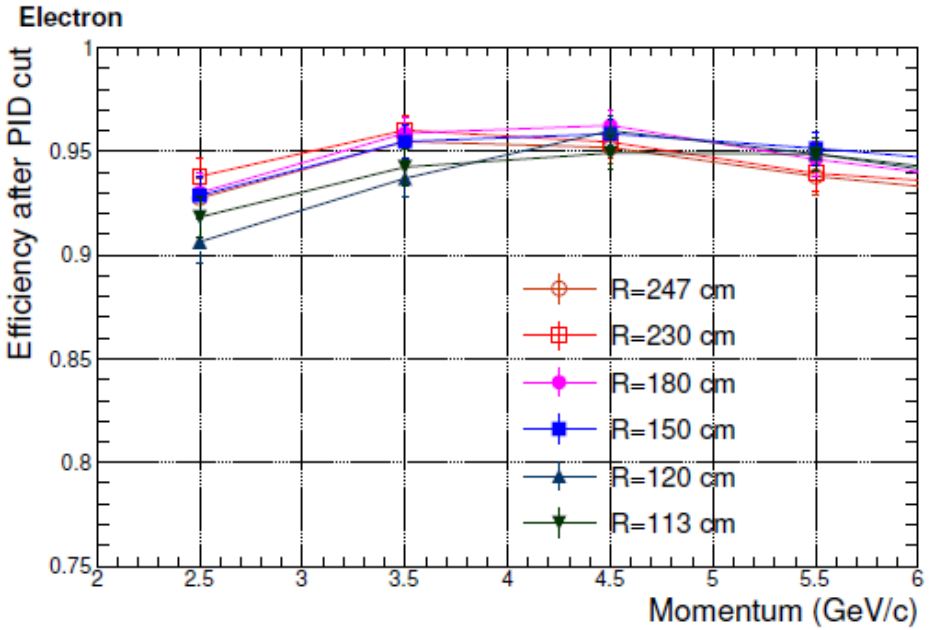


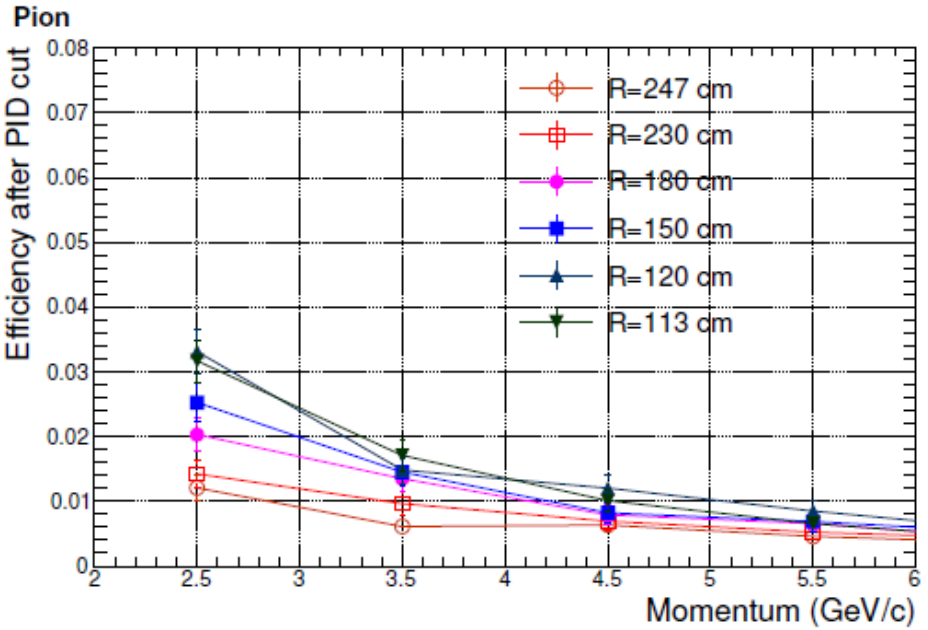






From preCDR


Electron
Efficiency after PID cut
Momentum (GeV/c)
R=247 cm
R=230 cm
R=180 cm
R=150 cm
R=120 cm
R=113 cm


Pion
Efficiency after PID cut
Momentum (GeV/c)
R=247 cm
R=230 cm
R=180 cm
R=150 cm
R=120 cm
R=113 cm

Efficiency Numbers

Electrons		
Momentum (GeV)	Efficiency	Error
1.18	0.74	0.008
1.53	0.80	0.007
1.88	0.88	0.006
2.23	0.91	0.005
2.58	0.93	0.005
2.93	0.94	0.004
3.28	0.95	0.004
3.63	0.96	0.004
3.98	0.97	0.003
4.33	0.97	0.003
4.68	0.97	0.003
5.03	0.97	0.003
5.38	0.98	0.003
5.73	0.98	0.002
6.08	0.98	0.002
6.43	0.99	0.002
6.78	0.99	0.002
7.13	0.99	0.002
7.48	0.99	0.002
7.83	0.99	0.002

Pions		
Momentum (GeV)	Efficiency	Error
1.18	0.03	0.003
1.53	0.04	0.003
1.88	0.04	0.003
2.23	0.04	0.004
2.58	0.04	0.004
2.93	0.04	0.004
3.28	0.02	0.003
3.63	0.03	0.003
3.98	0.03	0.003
4.33	0.03	0.003
4.68	0.02	0.003
5.03	0.02	0.003
5.38	0.02	0.003
5.73	0.02	0.003
6.08	0.02	0.002
6.43	0.02	0.003
6.78	0.02	0.003
7.13	0.01	0.002
7.48	0.02	0.002
7.83	0.02	0.003

Summary

- Energy resolution agrees with Jin's original analysis within 1 %
- PID efficiency agrees well with the preCDR
  - But I have not yet included backgrounds

Input Flat Distribution