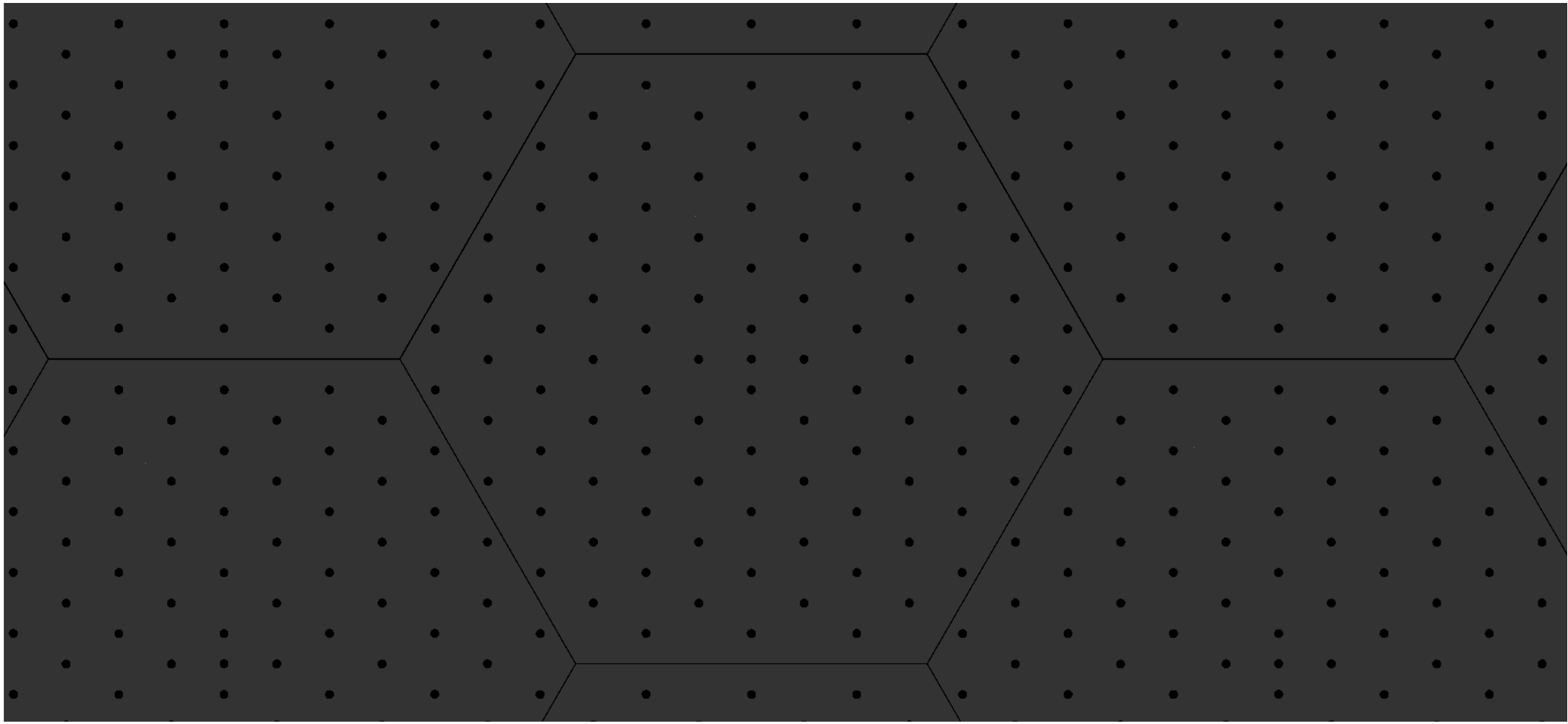
ECAL Summary 4

ECAL Energy Resolution Update

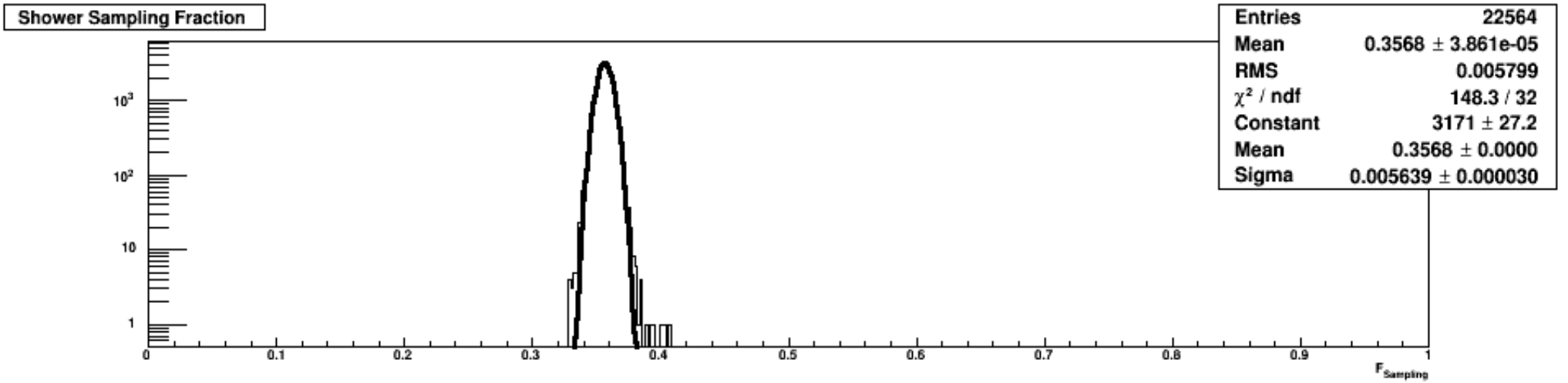
Update

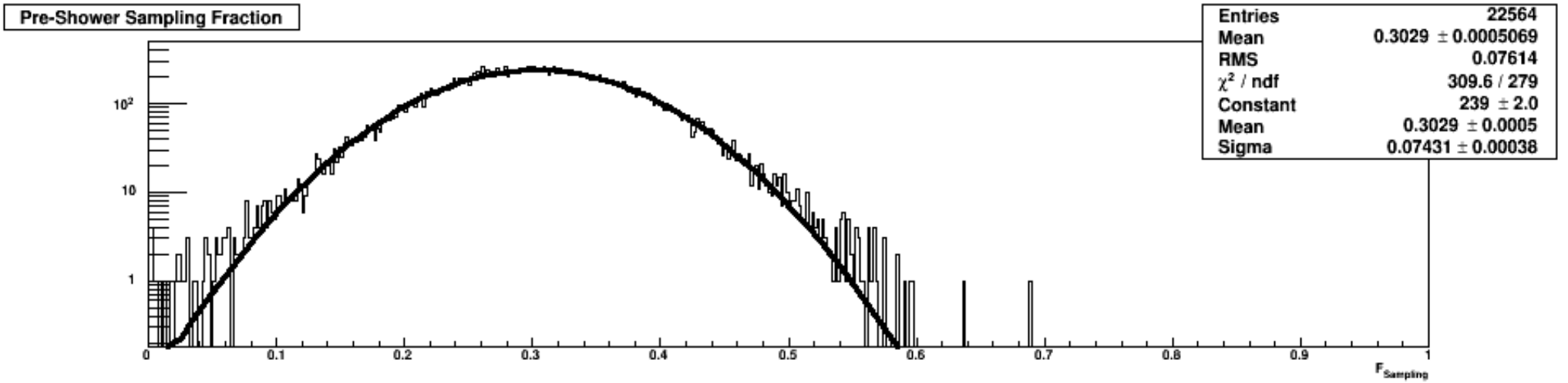
- Added fiber holes to all the ecal blocks

Fiber Holes in the G4 Geometry

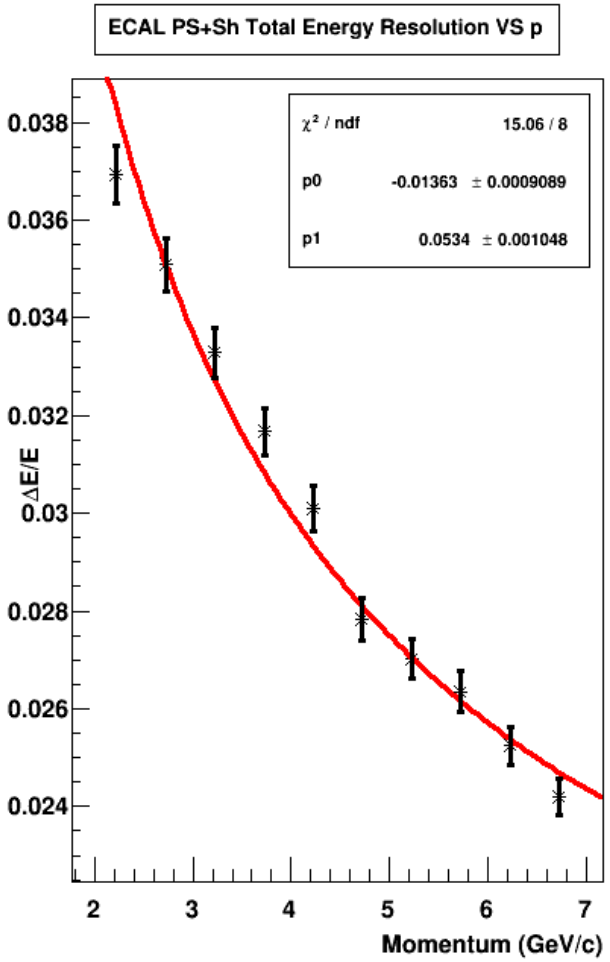


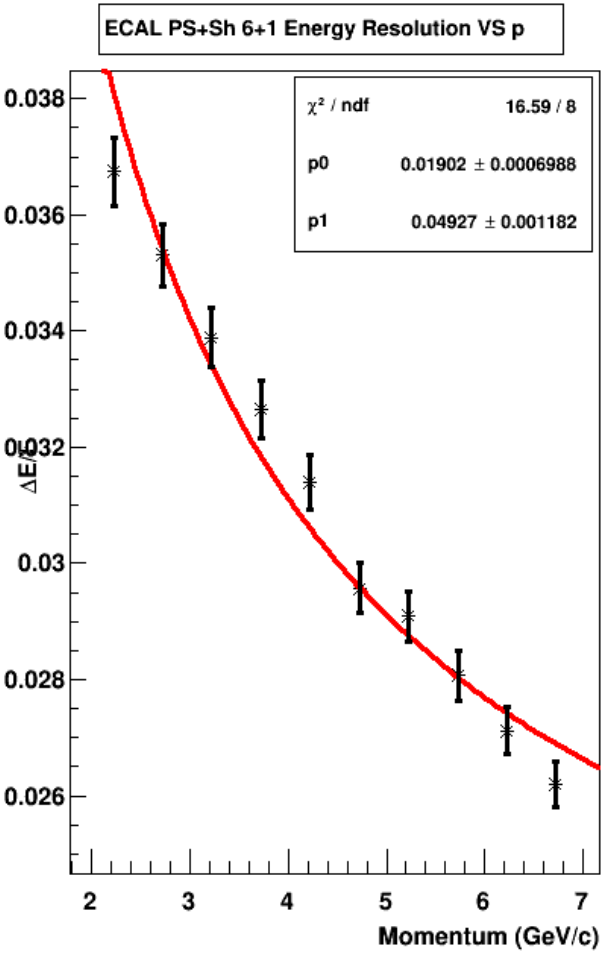
Update to Analysis

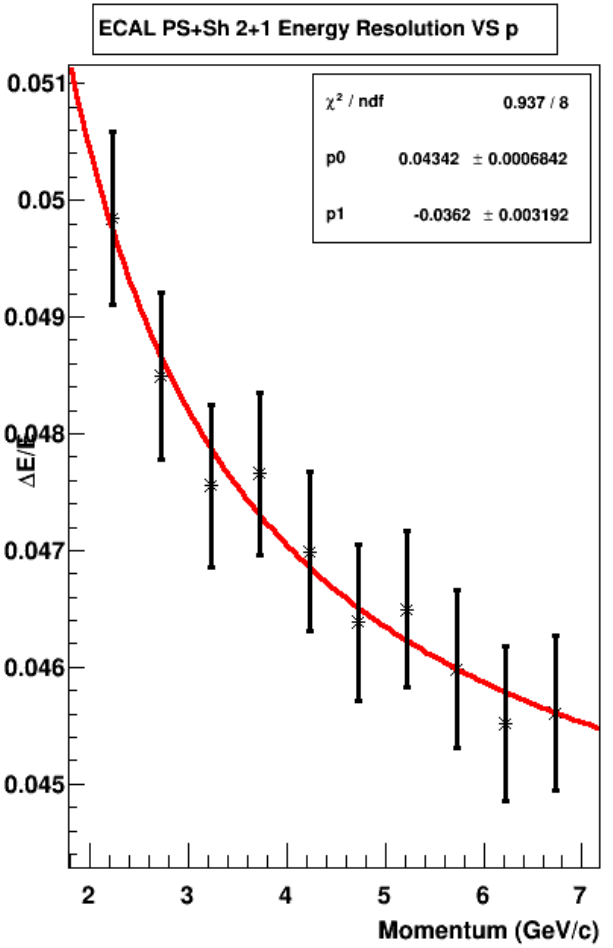




Intrinsic ECAL Energy Resolution : No Holes







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

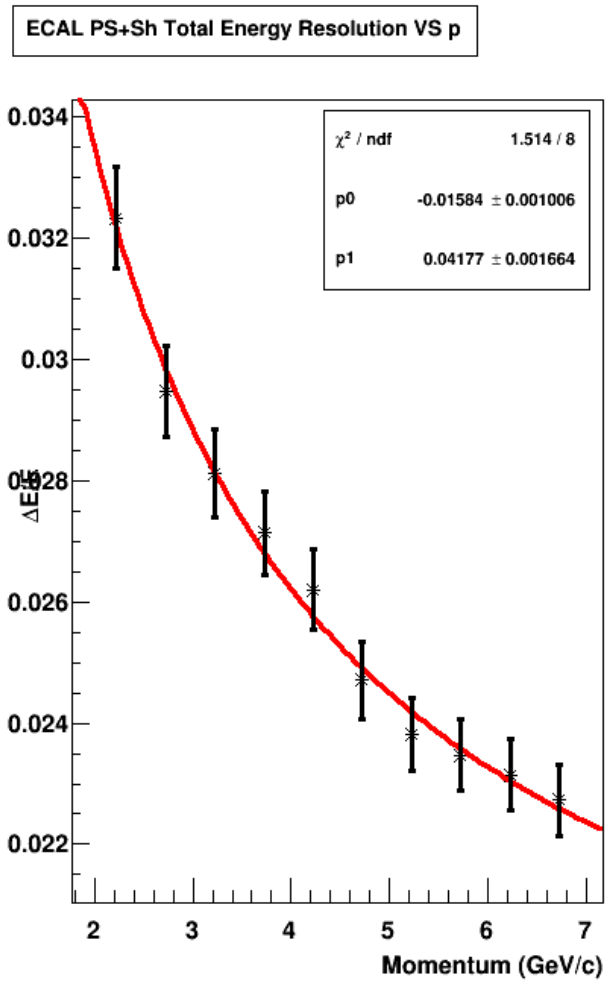
Intrinsic ECAL Energy Resolution : No Holes

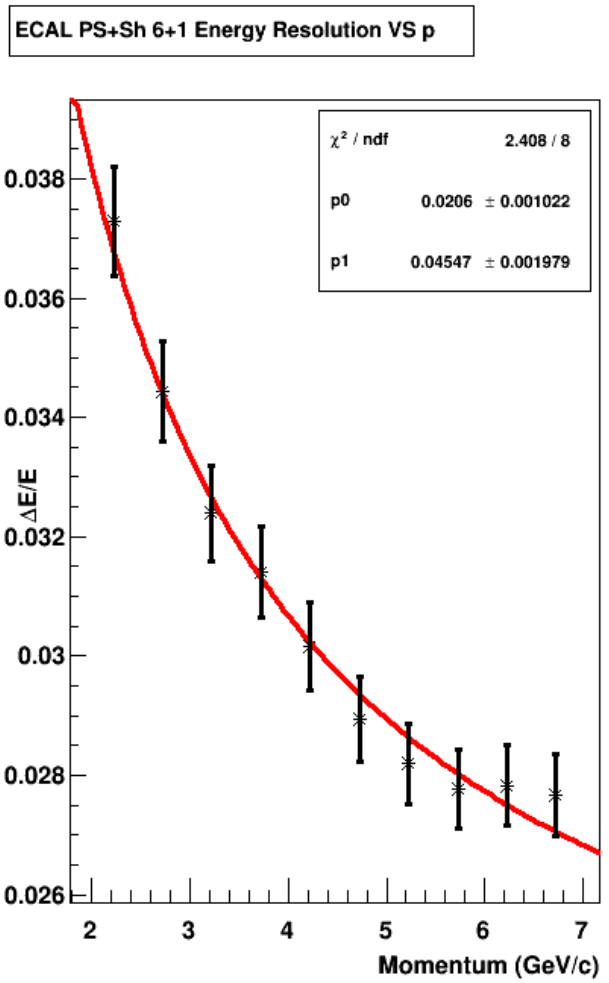
From Total Energy on ECAL		
Pf (GeV)	Resolution	Error
2.23	0.037	0.001
2.73	0.035	0.001
3.23	0.033	0.001
3.73	0.032	0.0005
4.23	0.030	0.0005
4.73	0.028	0.0004
5.23	0.027	0.0004
5.73	0.026	0.0004
6.23	0.025	0.0004
6.73	0.024	0.0004

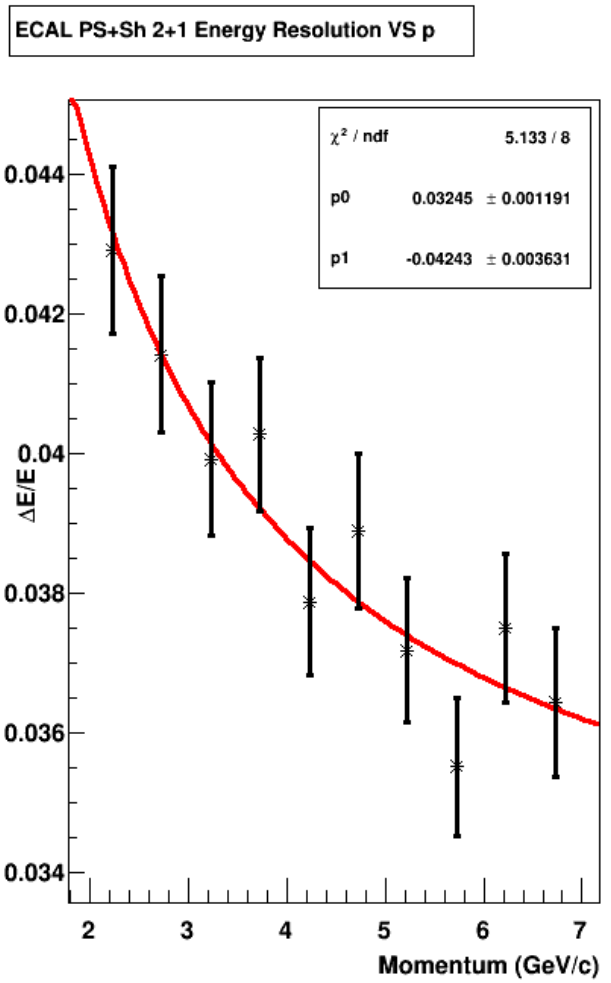
From 6+1 Clusters		
Pf (GeV)	Resolution	Error
2.23	0.037	0.0006
2.73	0.035	0.0005
3.23	0.034	0.0005
3.73	0.033	0.0005
4.23	0.031	0.0005
4.73	0.030	0.0004
5.23	0.029	0.0004
5.73	0.028	0.0004
6.23	0.027	0.0004
6.73	0.026	0.0004

From 2+1 Clusters		
Pf (GeV)	Resolution	Error
2.23	0.050	0.001
2.73	0.048	0.001
3.23	0.048	0.001
3.73	0.048	0.001
4.23	0.047	0.001
4.73	0.046	0.001
5.23	0.046	0.001
5.73	0.046	0.001
6.23	0.046	0.001
6.73	0.046	0.001

Intrinsic ECAL Energy Resolution : With Fiber Holes







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

Intrinsic ECAL Energy Resolution : With Fiber Holes

From Total Energy on ECAL		
Pf (GeV)	Resolution	Error
2.23	0.032	0.001
2.73	0.029	0.001
3.23	0.028	0.001
3.73	0.027	0.001
4.23	0.026	0.001
4.73	0.025	0.001
5.23	0.024	0.001
5.73	0.023	0.001
6.23	0.023	0.001
6.73	0.023	0.001

From 6+1 Clusters		
Pf (GeV)	Resolution	Error
2.23	0.037	0.001
2.73	0.034	0.001
3.23	0.032	0.001
3.73	0.031	0.001
4.23	0.030	0.001
4.73	0.029	0.001
5.23	0.028	0.001
5.73	0.028	0.001
6.23	0.028	0.001
6.73	0.028	0.001

From 2+1 Clusters		
Pf (GeV)	Resolution	Error
2.23	0.043	0.001
2.73	0.041	0.001
3.23	0.040	0.001
3.73	0.040	0.001
4.23	0.038	0.001
4.73	0.039	0.001
5.23	0.037	0.001
5.73	0.036	0.001
6.23	0.037	0.001
6.73	0.036	0.001

Summary

- There is no significant reduction in the intrinsic energy resolution with fiber holes
  - Only the sampling fraction has changed
- Next : Following will be tested in order,

1) Add six larger holes to above geometry

2) Add front and back support plates

3) Add supporting aluminum wrap (this may require increasing the spacing between hex block.

Increase in Sampling Fraction???

- Sampling fraction increased by 80%
  - Sampling fraction with no holes – 0.20
  - Sampling fraction with holes – 0.36
- Loss in volume due to holes – 2%
  - 97 holes each with 0.16 cm diameter and total area of a block is ~ 100 cm2
- Density ratio between lead and scint ~ 10