



University  
Mohammed I



Physique de la Matière et  
des Rayonnements  
Laboratoire



Faculté des Sciences  
Oujda

# ***ATLAS Forward Calorimeter's Analysis***

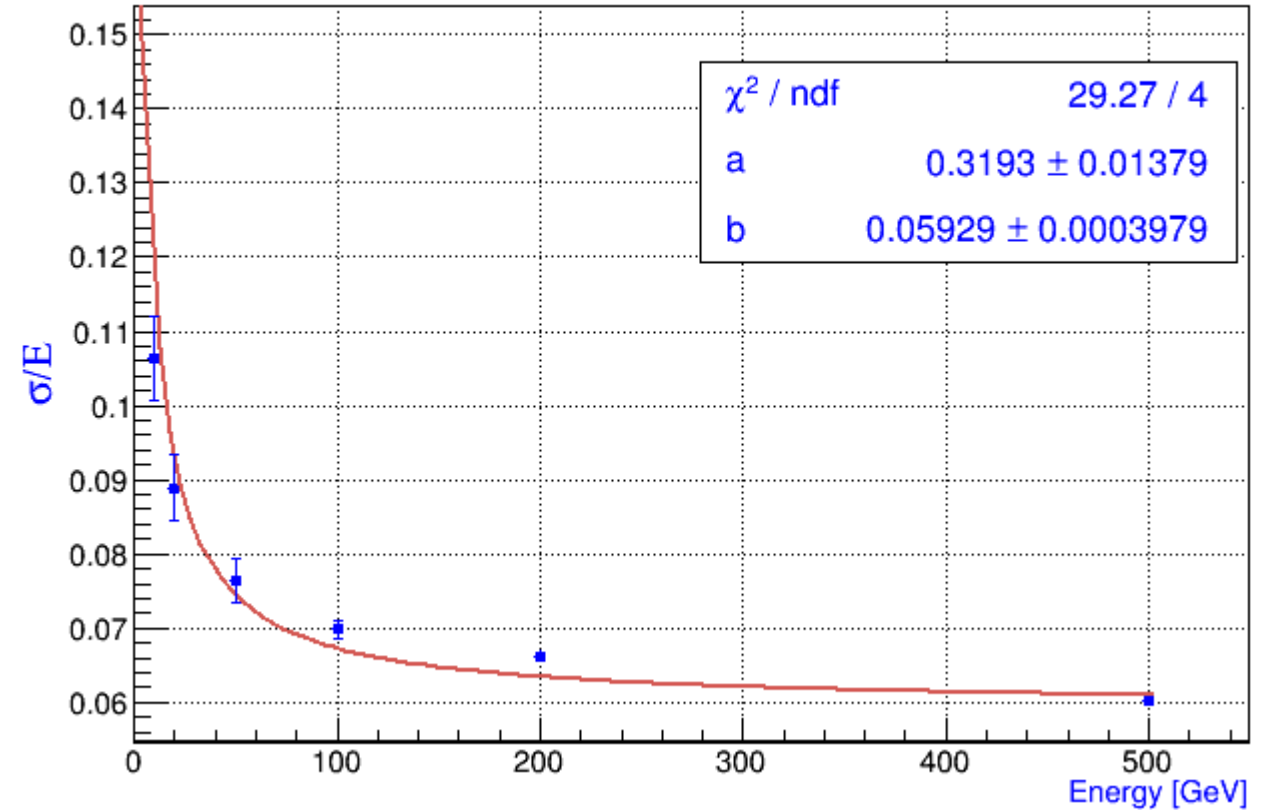
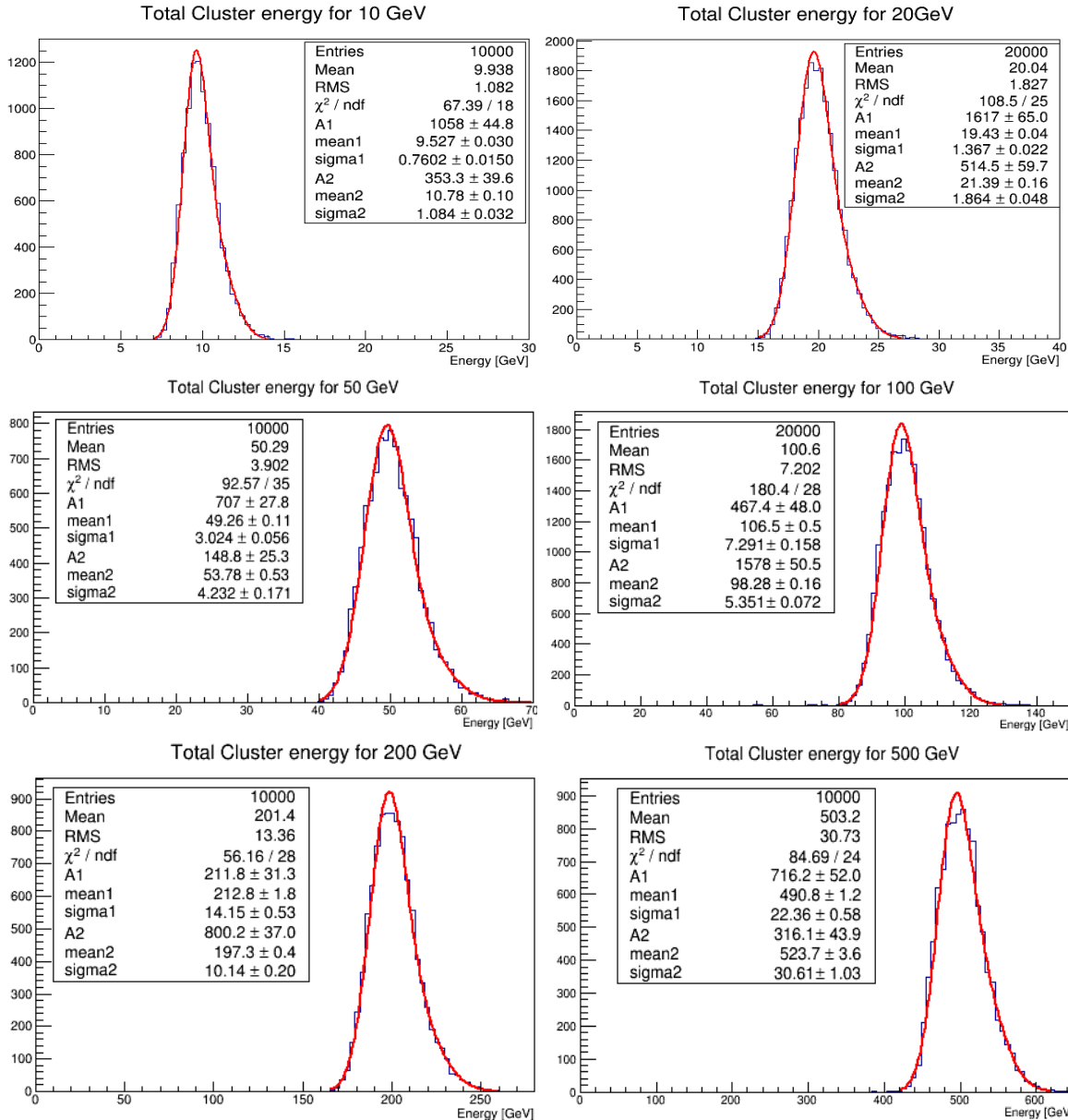
***KTH/FSO Meeting  
03/ 06/ 2016***

Malika TOUIL – Yahya TAYALATI – Bengt Lund-Jensen



# Electrons : FCal Energy Resolution

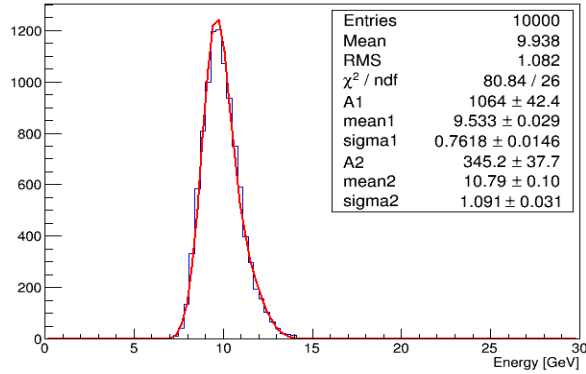
## FCal Energy Resolution



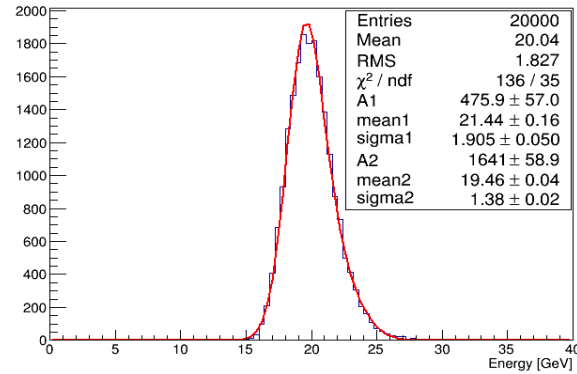


# Electrons : FCal Energy Resolution

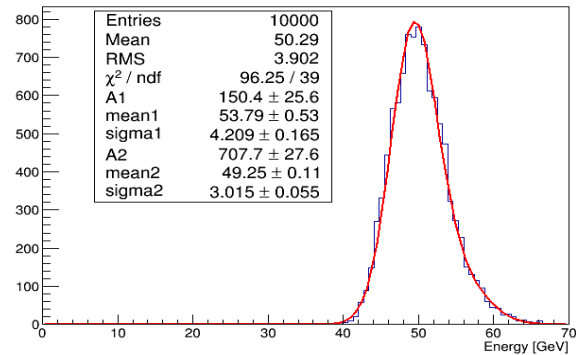
Total Cluster energy for 10 GeV



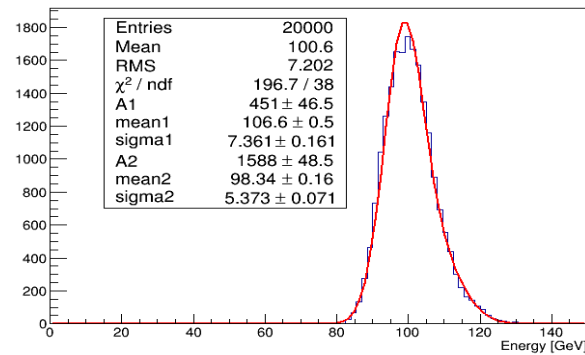
Total Cluster energy for 20 GeV



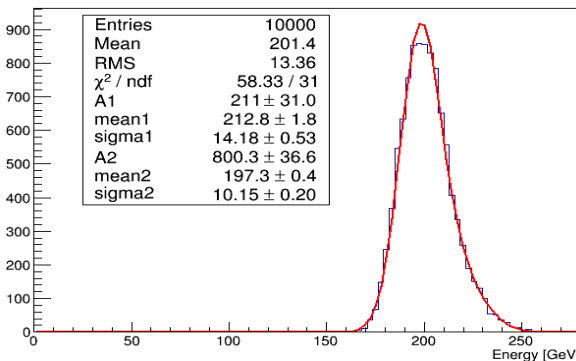
Total Cluster energy for 50 GeV



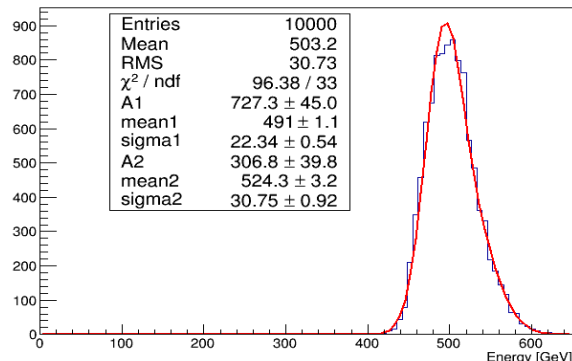
Total Cluster energy for 100 GeV



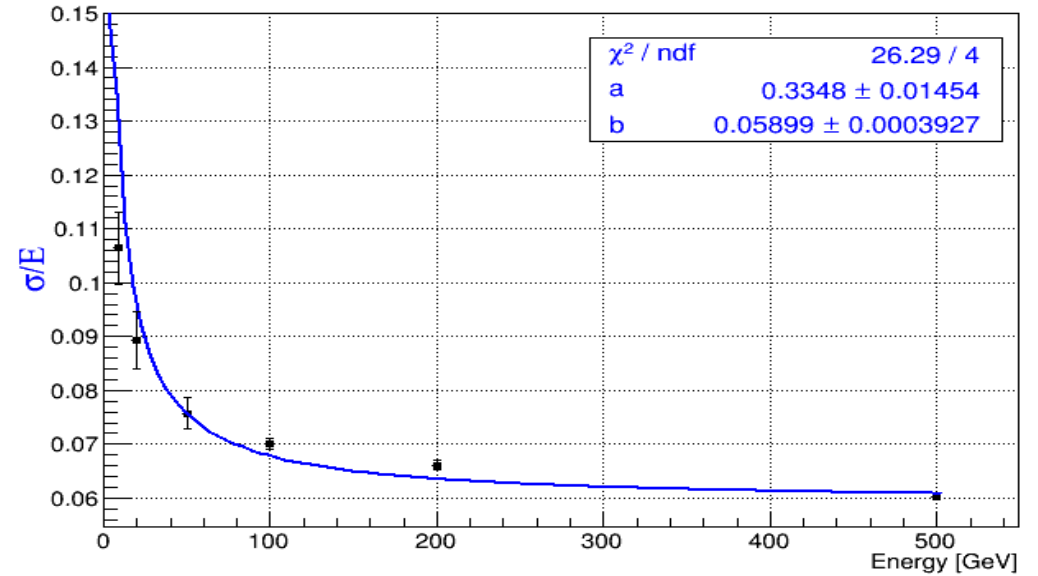
Total Cluster energy for 200 GeV



Total Cluster energy for 500 GeV



*FCal - Energy Resolution*



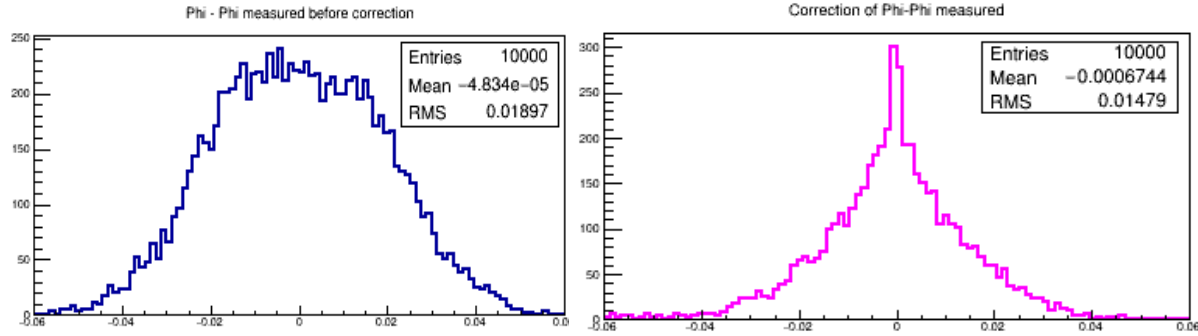
Energy [GeV]	Energy resolution
10	0.1063±0.0067
20	0.0892±0.0053
50	0.0762±0.0029
100	0.07±0.00103
200	0.0659±0.0007
500	0.06029±0.00032



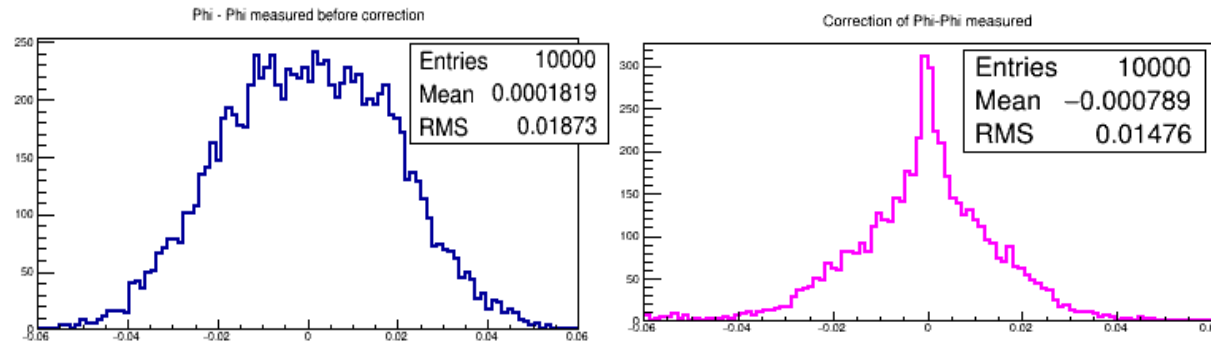
# Electrons : FCal Phi Position Resolution

$3.5 < \eta_{\text{truth}} < 4.5$

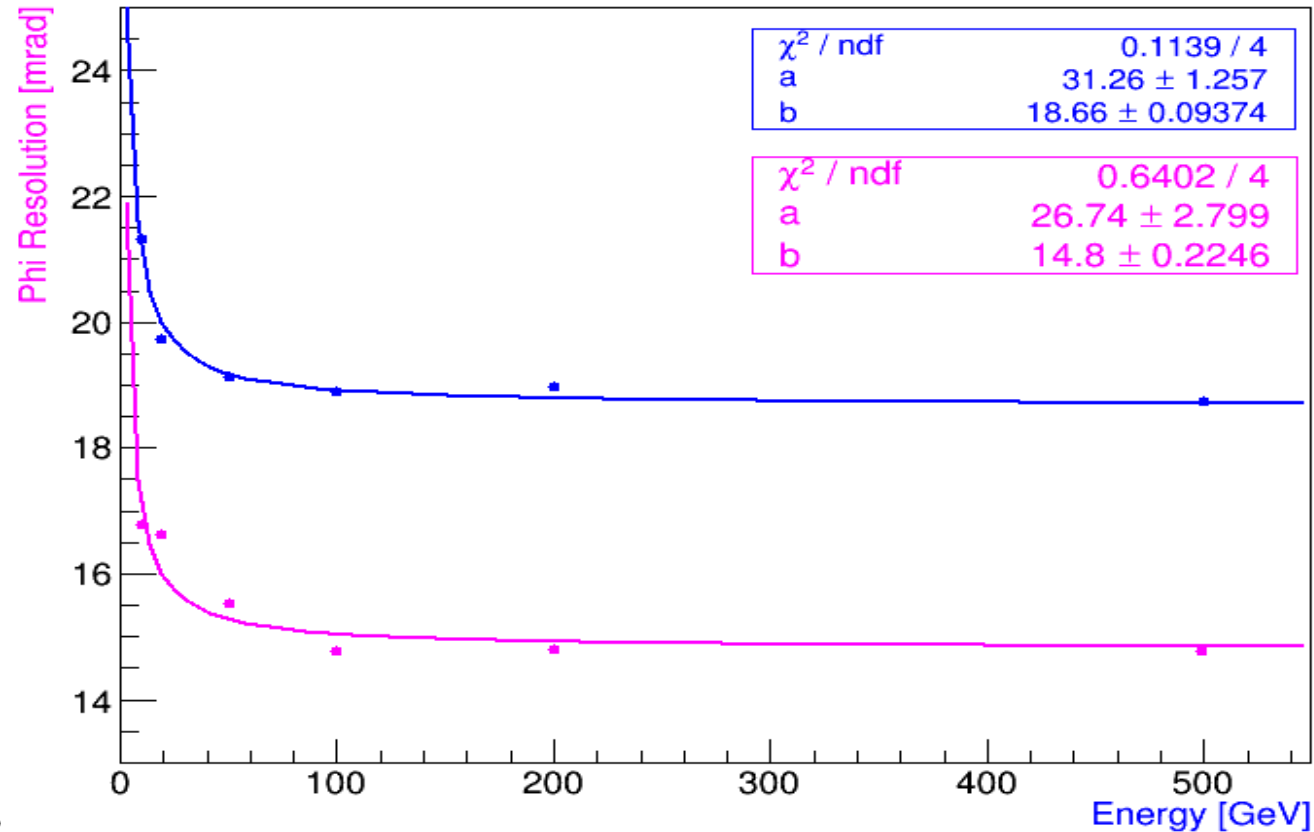
## FCal Phi Position Resolution



200 GeV



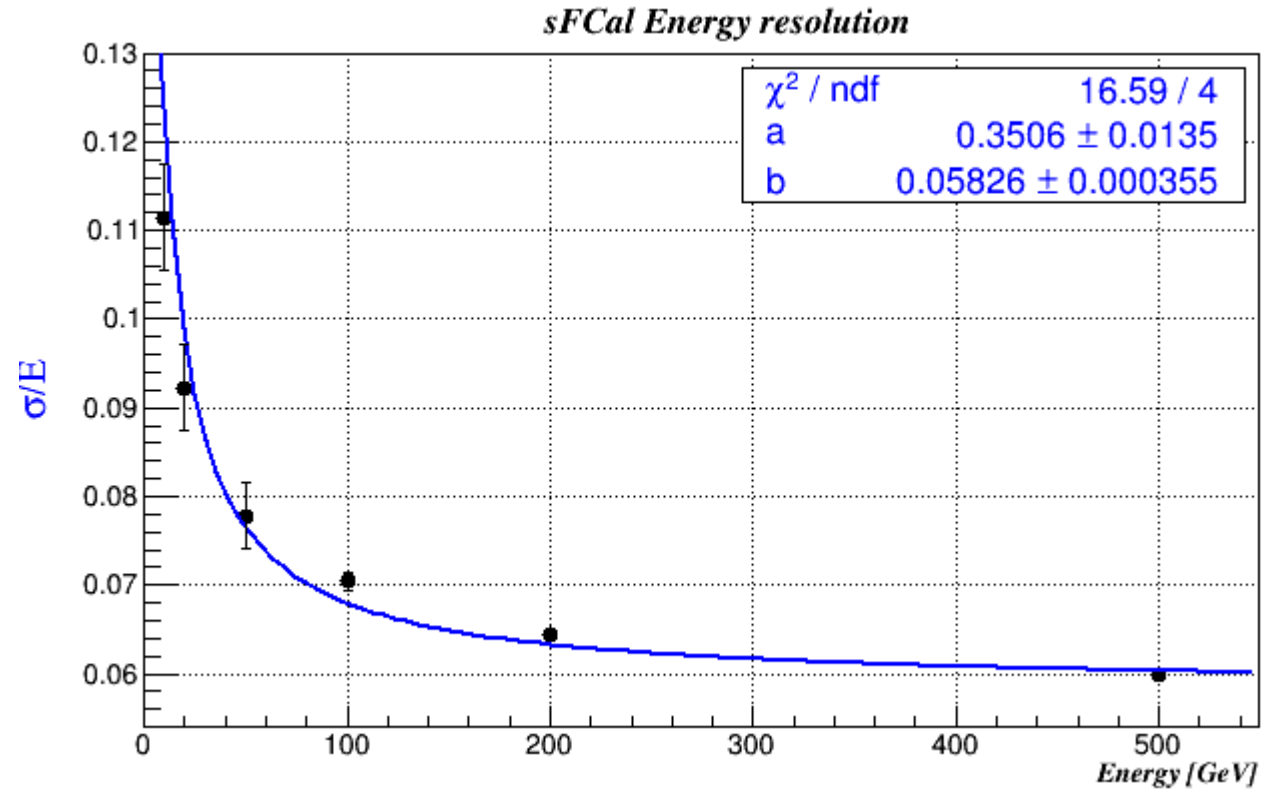
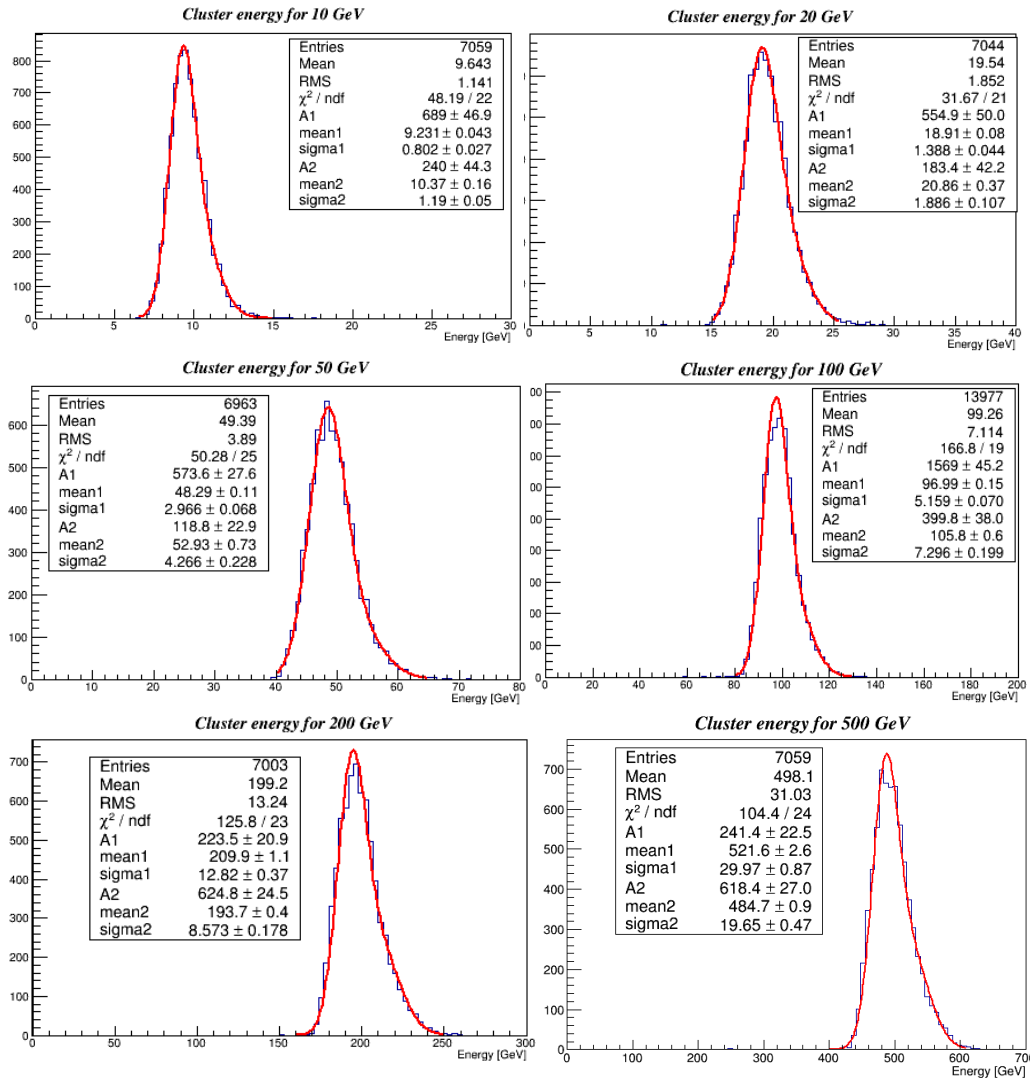
500 GeV



- Before Correction
- After Correction

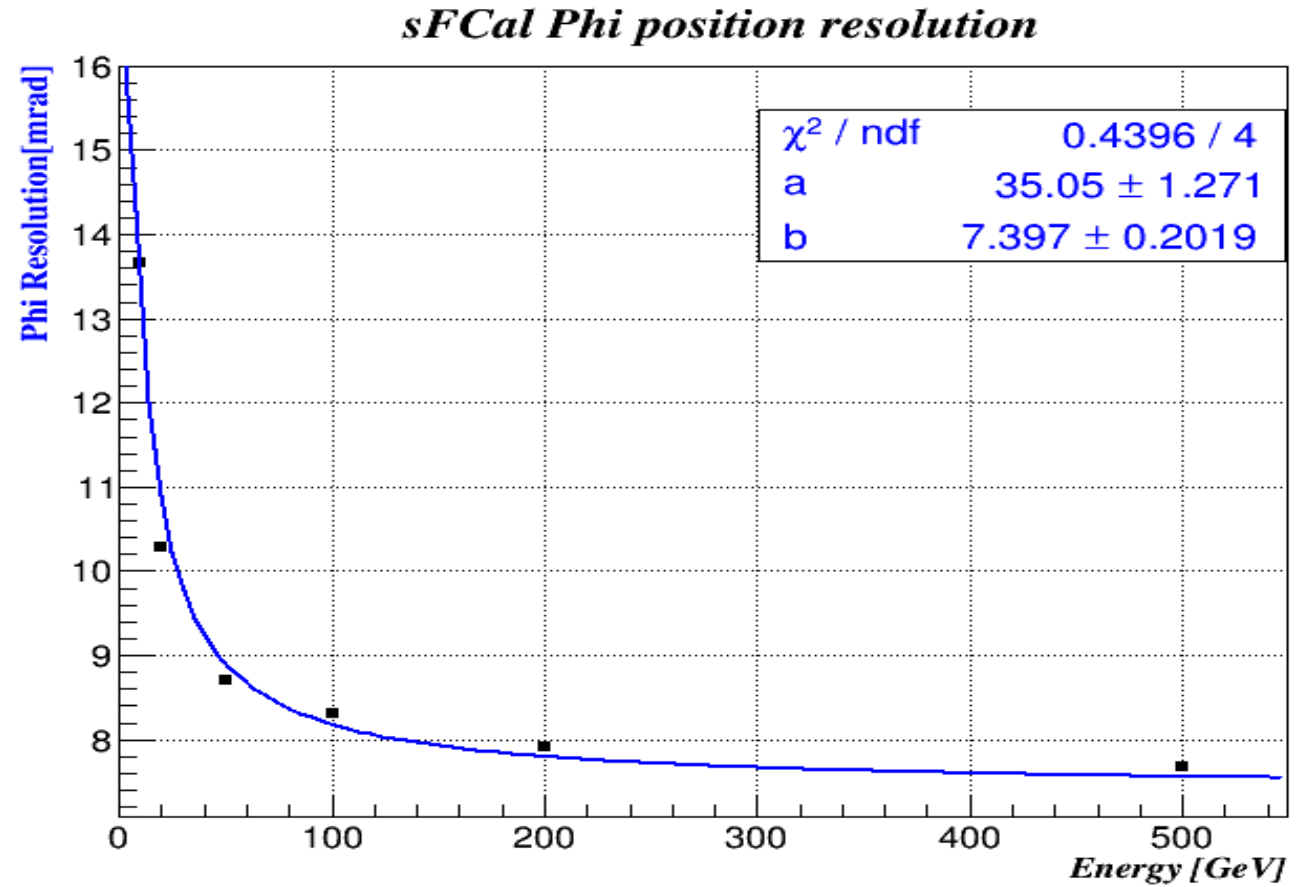
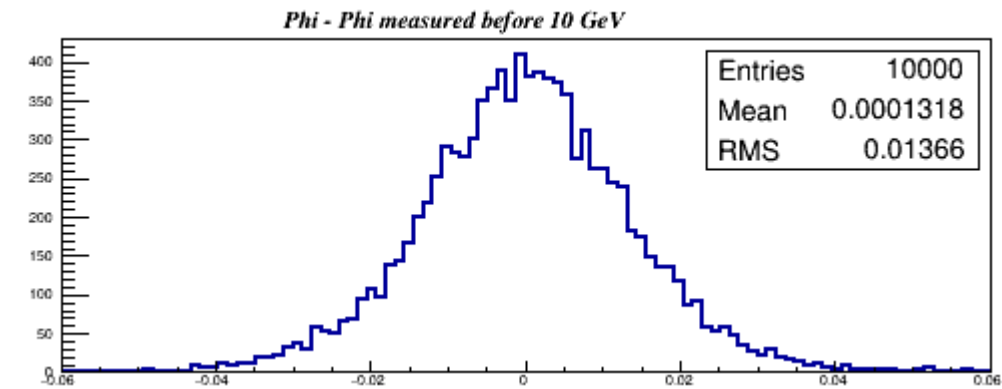
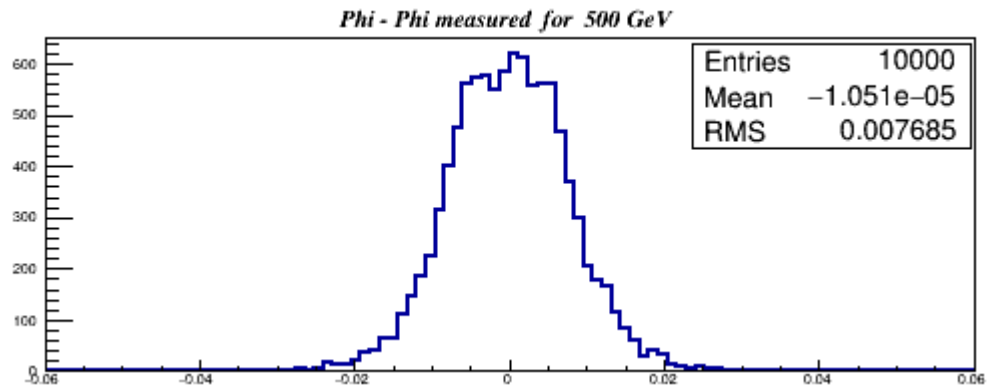


# Electrons : sFCal Energy Resolution





# Electrons : sFCal Phi Position Resolution





# Pions : FCal Energy Resolution

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FUNCTION MUST BE MINIMIZED BEFORE CALLING MINOS

MIGRAD MINIMIZATION HAS CONVERGED.

MIGRAD WILL VERIFY CONVERGENCE AND ERROR MATRIX.

FCN=5.24557e+06 FROM MIGRAD STATUS=CONVERGED 70 CALLS 71 TOTAL

EDM=1.03064e-14 STRATEGY= 1 ERROR MATRIX ACCURATE

EXT PARAMETER

NO.	NAME	VALUE	ERROR	STEP SIZE	FIRST DERIVATIVE
1	a1	7.19081e-02	6.88741e-06	6.67591e-06	-1.29042e-02
2	a2	9.01044e-02	1.21859e-05	1.06629e-05	-1.96519e-03
3	a3	8.67512e-02	3.23761e-05	3.21212e-05	3.55177e-03

FCN=5.24557e+06 FROM MINOS STATUS=SUCCESSFUL 16 CALLS 87 TOTAL

EDM=1.03064e-14 STRATEGY= 1 ERROR MATRIX ACCURATE

EXT PARAMETER

NO.	NAME	VALUE	ERROR	MINOS ERRORS	
				NEGATIVE	POSITIVE
1	a1	7.19081e-02	6.88741e-06	-6.88741e-06	6.88741e-06
2	a2	9.01044e-02	1.21859e-05		
3	a3	8.67512e-02	3.23761e-05		

Print results from minuit

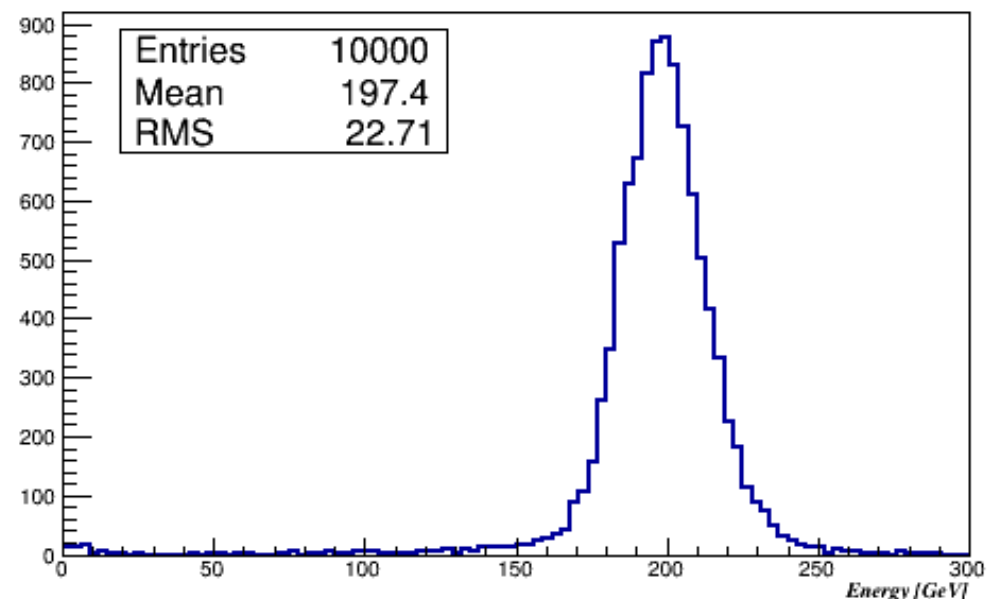
a1=0.0719081

a2=0.0901044

a3=0.0867512

chi2 / ndf = 5.24557e+06/869997 = 6.02941

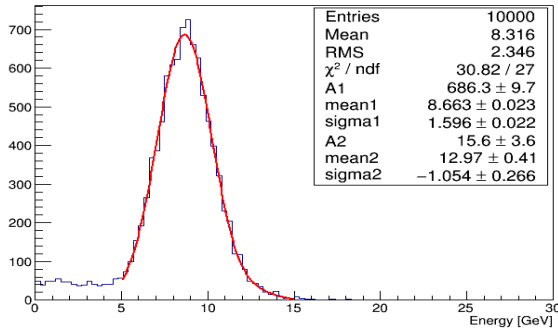
Total cluster Energy for 200 GeV



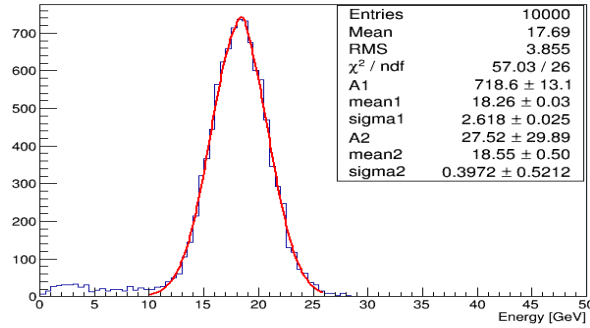


# Pions : FCal Energy Resolution

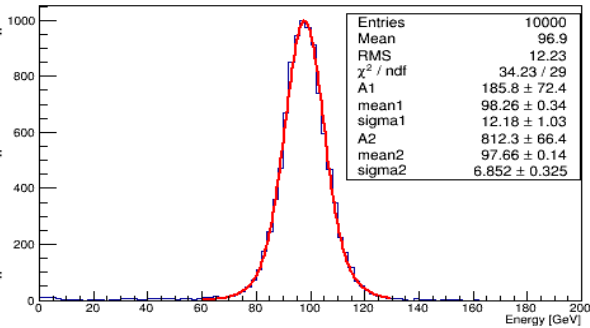
Total cluster Energy for 10 GeV



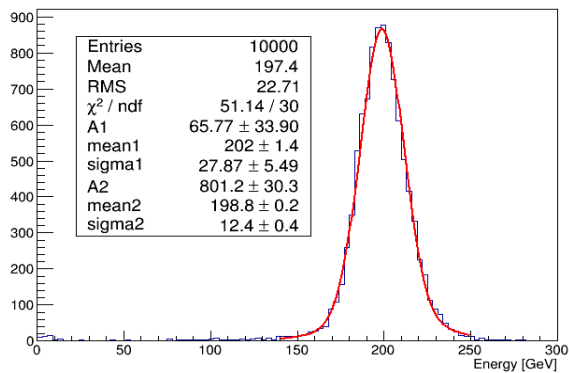
Total cluster Energy for 20 GeV



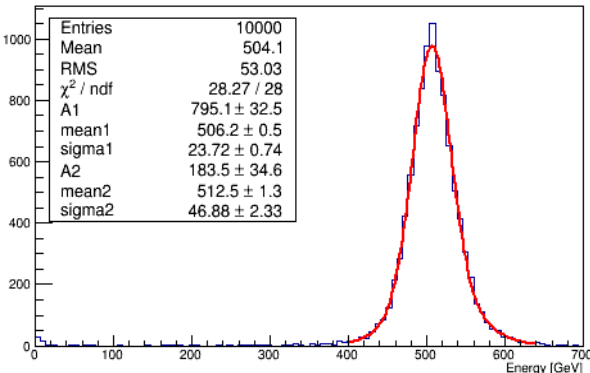
Total cluster Energy for 100 GeV



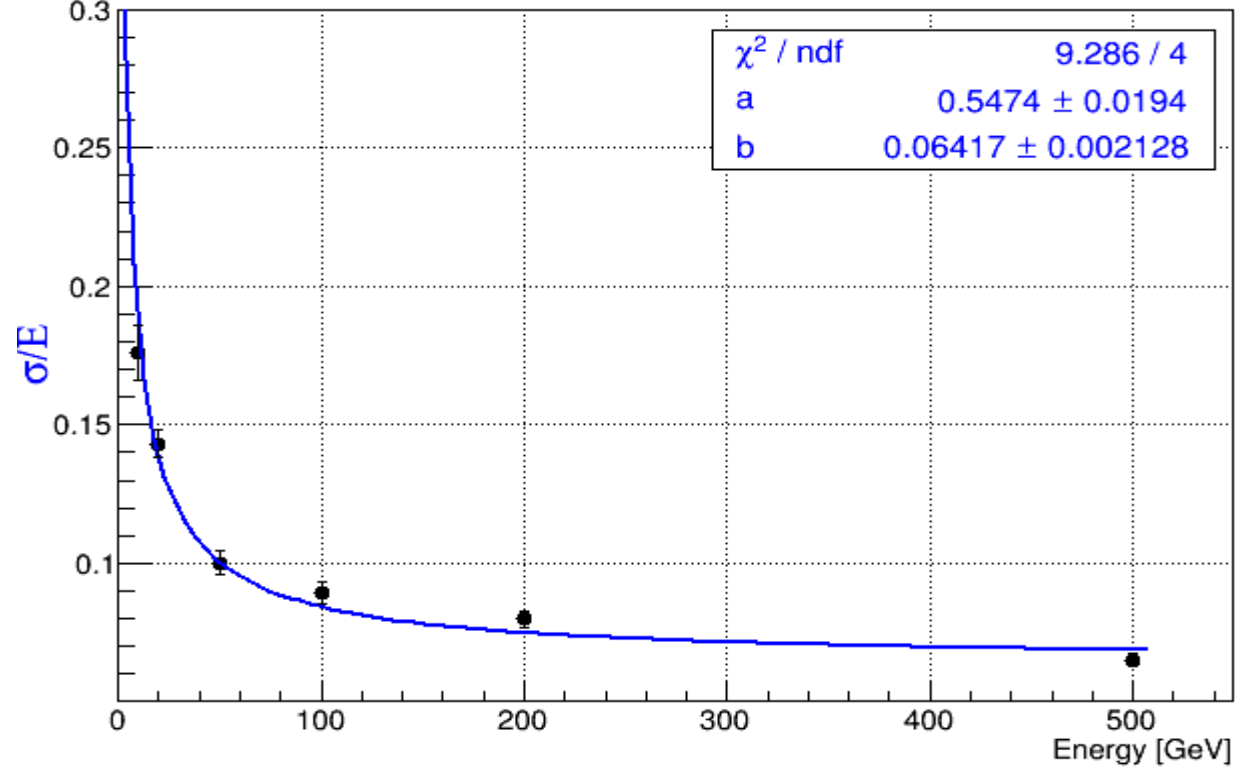
Total cluster Energy for 200 GeV



Total cluster Energy for 500 GeV



## Fcal Pions Energy Resolution

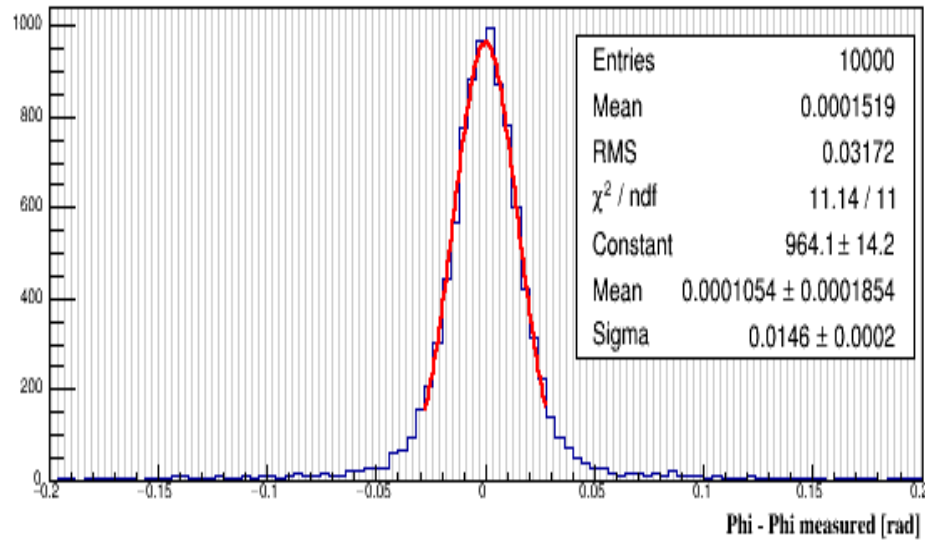






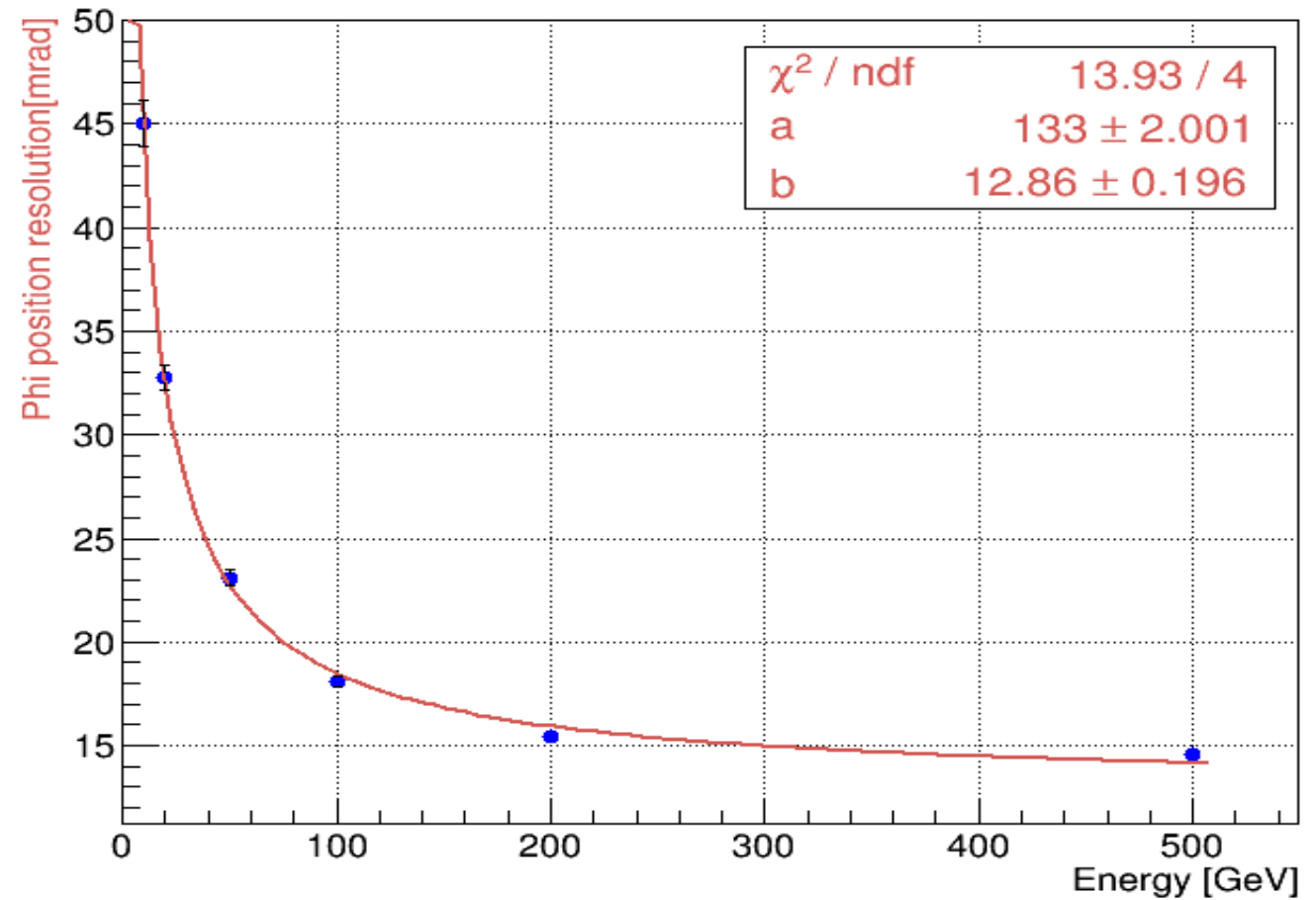
# Pions : FCal Phi Position Resolution

Difference of Phi truth - Phi measured for 500 GeV pion



- $3.5 < \eta_{\text{truth}} < 4.5$
- $0 < \varphi < 2\pi$

Fcal - Phi position Resolution for pions





# Pions : sFCal Energy Resolution

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FUNCTION MUST BE MINIMIZED BEFORE CALLING MINOS

MIGRAD MINIMIZATION HAS CONVERGED.

MIGRAD WILL VERIFY CONVERGENCE AND ERROR MATRIX.

FCN=4.63341e+06 FROM MIGRAD STATUS=CONVERGED 70 CALLS 71 TOTAL

EDM=2.85592e-14 STRATEGY= 1 ERROR MATRIX ACCURATE

EXT PARAMETER

NO.	NAME	VALUE	ERROR	STEP SIZE	FIRST DERIVATIVE
1	a1	1.91627e-01	1.76206e-05	1.61361e-05	-9.37894e-03
2	a2	1.73070e-01	2.39860e-05	1.95941e-05	3.44597e-03
3	a3	1.49162e-01	6.54339e-05	6.02638e-05	2.51129e-03

FCN=4.63341e+06 FROM MINOS STATUS=SUCCESSFUL 16 CALLS 87 TOTAL

EDM=2.85592e-14 STRATEGY= 1 ERROR MATRIX ACCURATE

EXT PARAMETER

NO.	NAME	VALUE	ERROR	PARABOLIC NEGATIVE	MINOS ERRORS POSITIVE
1	a1	1.91627e-01	1.76206e-05	-1.76206e-05	1.76206e-05
2	a2	1.73070e-01	2.39860e-05		
3	a3	1.49162e-01	6.54339e-05		

Print results from minuit

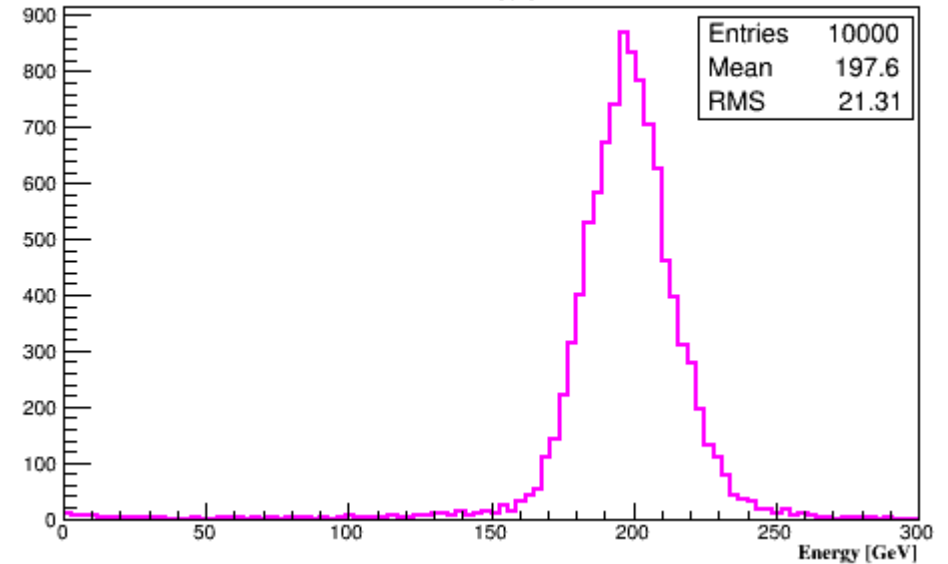
a1=0.191627

a2=0.17307

a3=0.149162

chi2 / ndf = 4.63341e+06/869997 = 5.32578

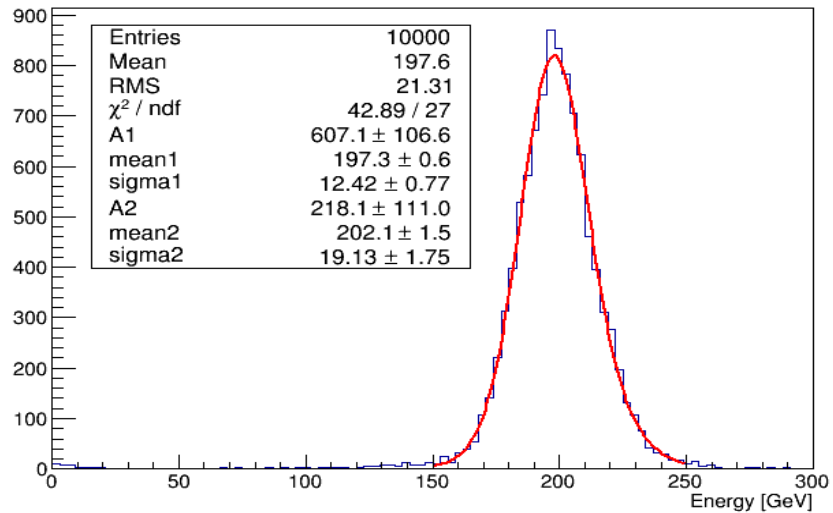
Total cluster Energy for 200 GeV - sFCal



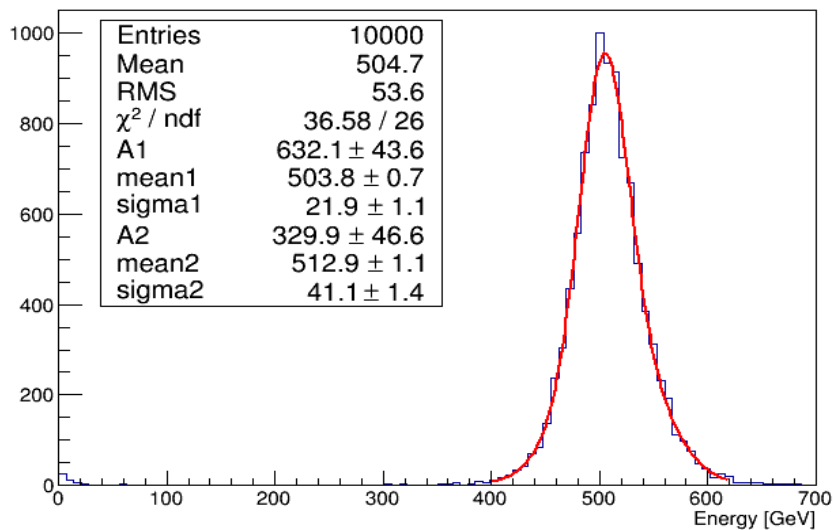


# Pions : sFCal Energy Resolution

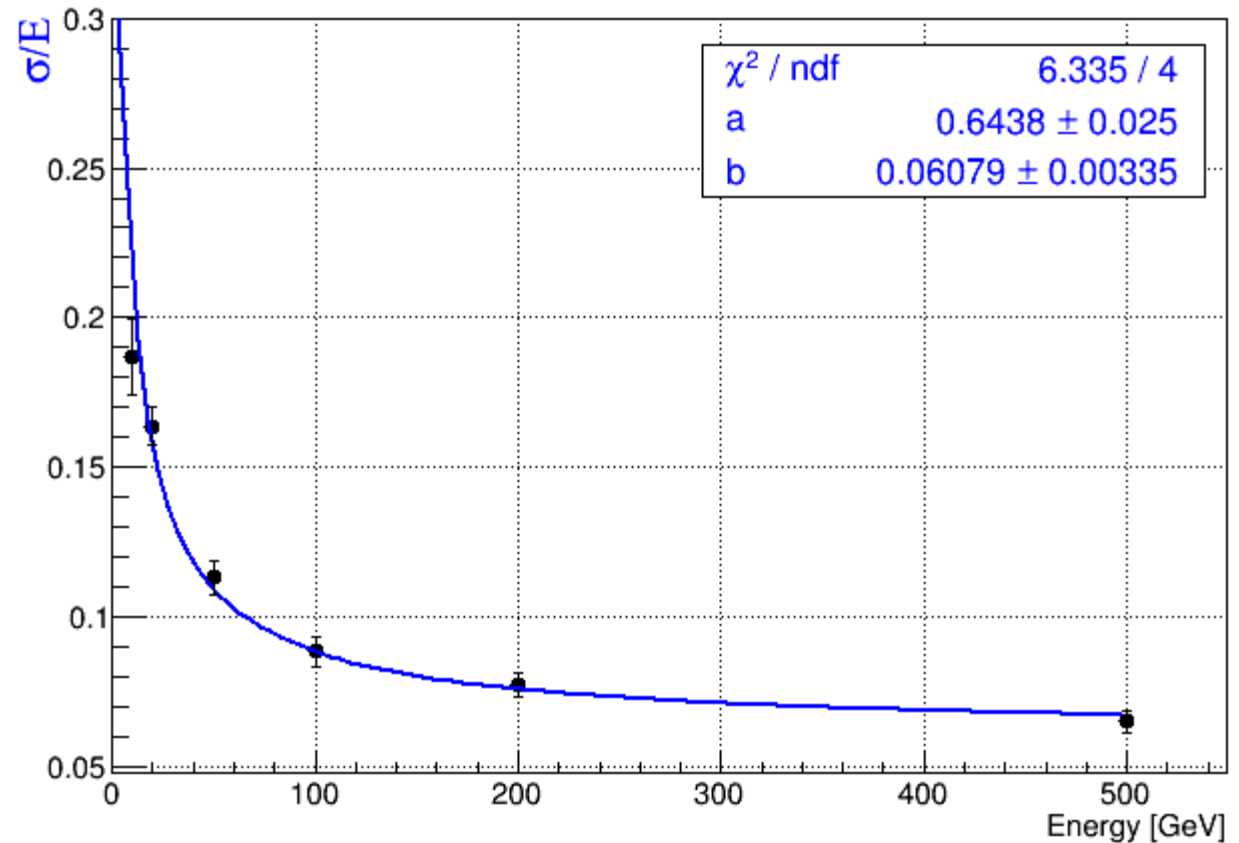
Total cluster Energy for 200 GeV



Total cluster Energy for 500 GeV



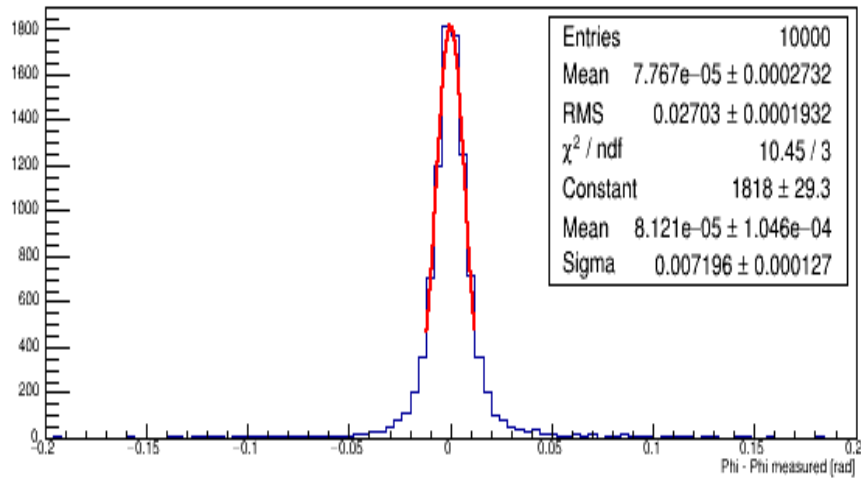
*sFCal Pions Energy Resolution*





# Pions : sFCal Phi Position Resolution

Diff Phi truth - Phi measured for 500 GeV Pions - sFCal



- $3.5 < \eta_{\text{truth}} < 4.5$
- $0 < \varphi < 2\pi$

Phi position resolution for pions at fine Granularity

