Comparison of AZ and VR reconstruction of ECal

- Results of different clusterizations
- $\boldsymbol{\theta}$ correction for the Urqmd events

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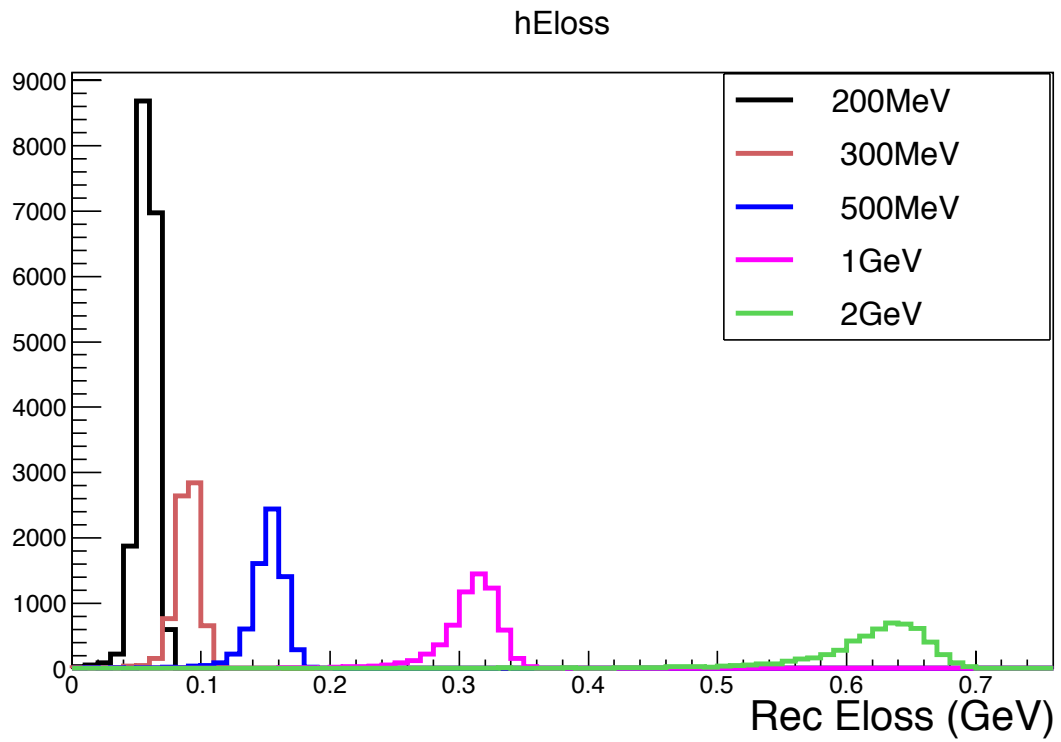
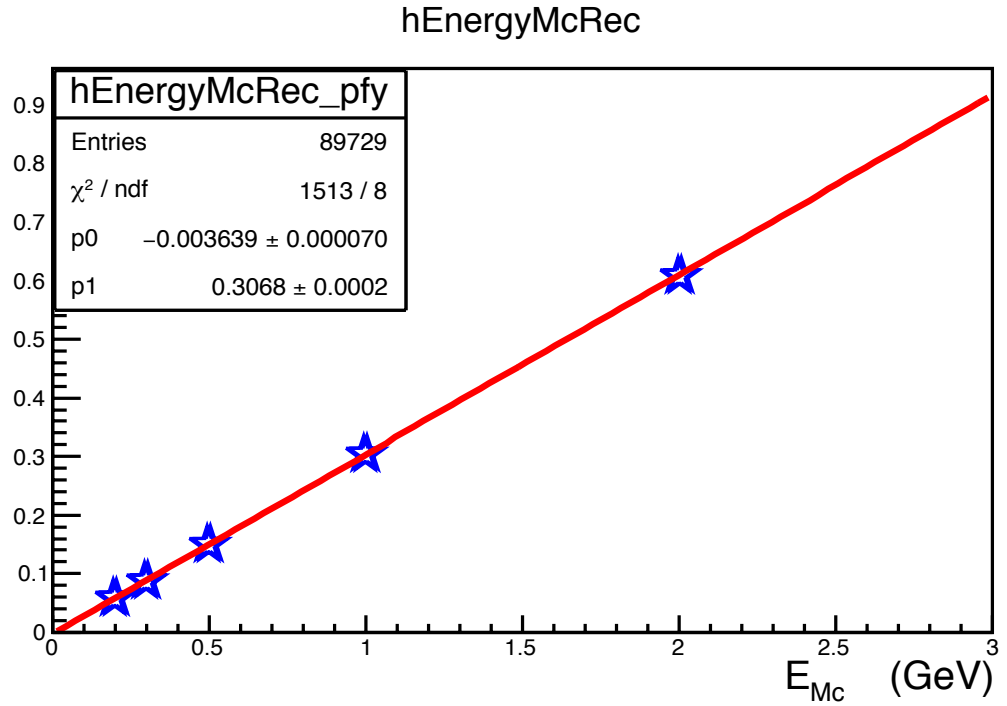
Scale of the reconstructed energy loss

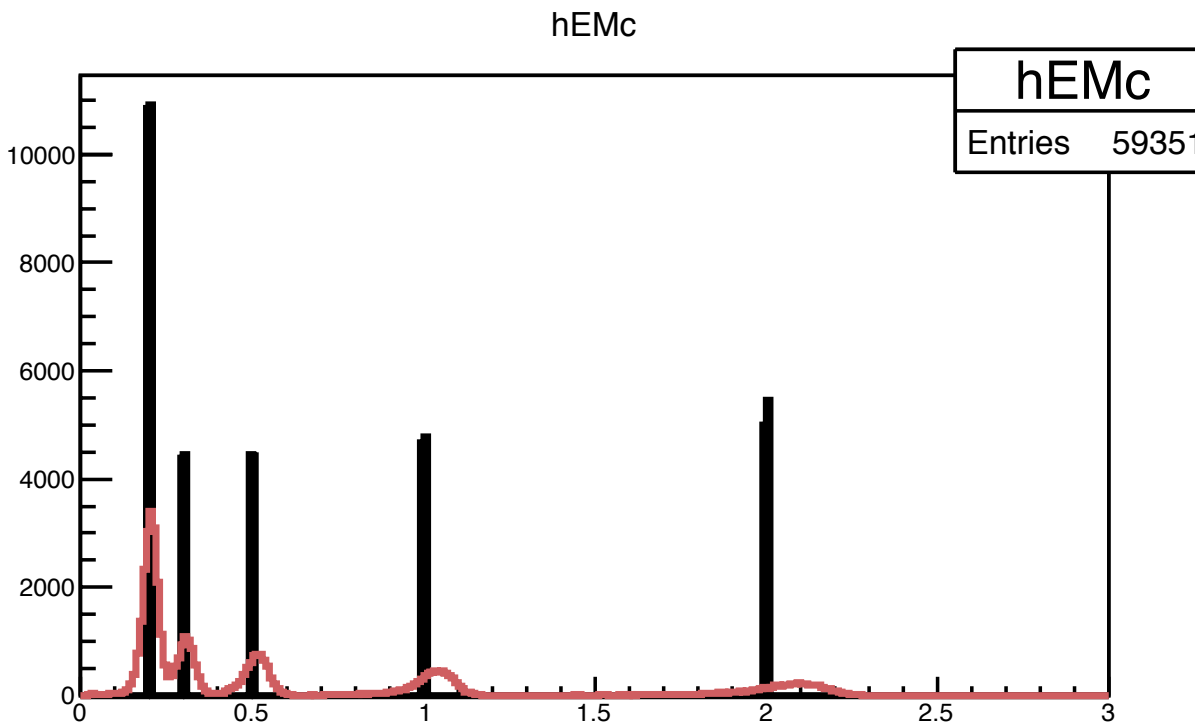
- **Box Gen Single γ**
- **Energy: 200, 300, 500MeV, 1GeV, 2GeV**
- **$32° < \theta < 146°$ $0° < \varphi < 360°$**
- **$Z = 0cm$**
- **Cut: |y|<0.5**
- **1 primary track reconstructed**

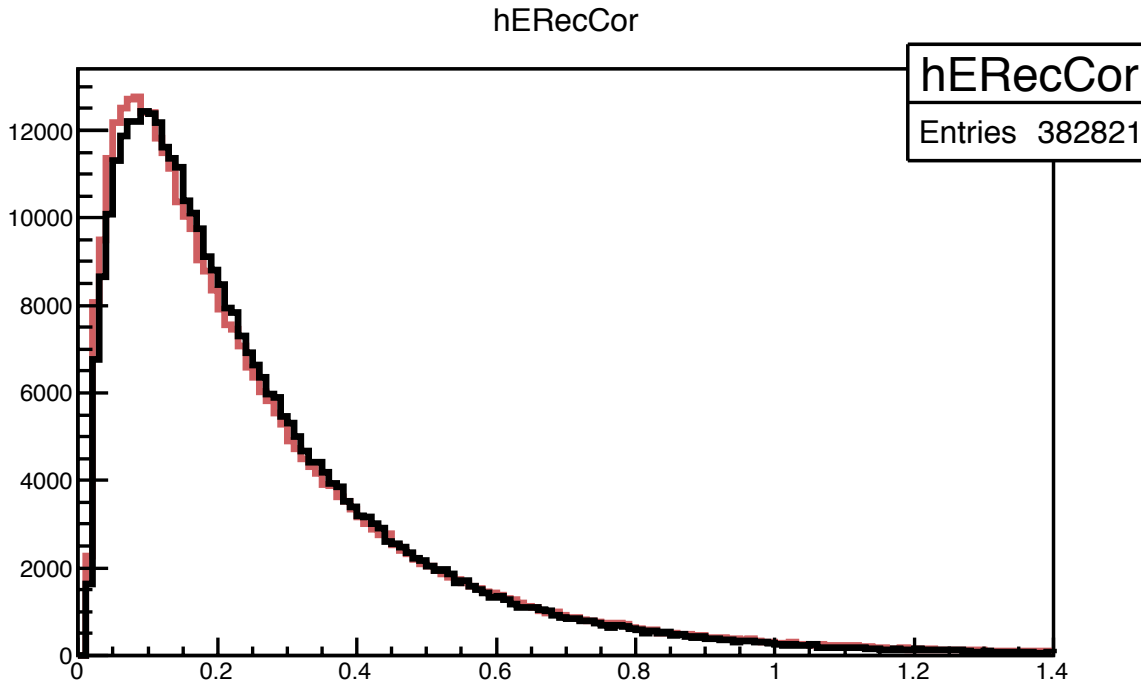


Distribution of the reconstructed energy loss



Average energy loss reconstructed as a function of generated energy





Energy generated(black line) and energy with scale(red line) for Box generator(Left) and Urqmd generator(right)

Energy non-linearity

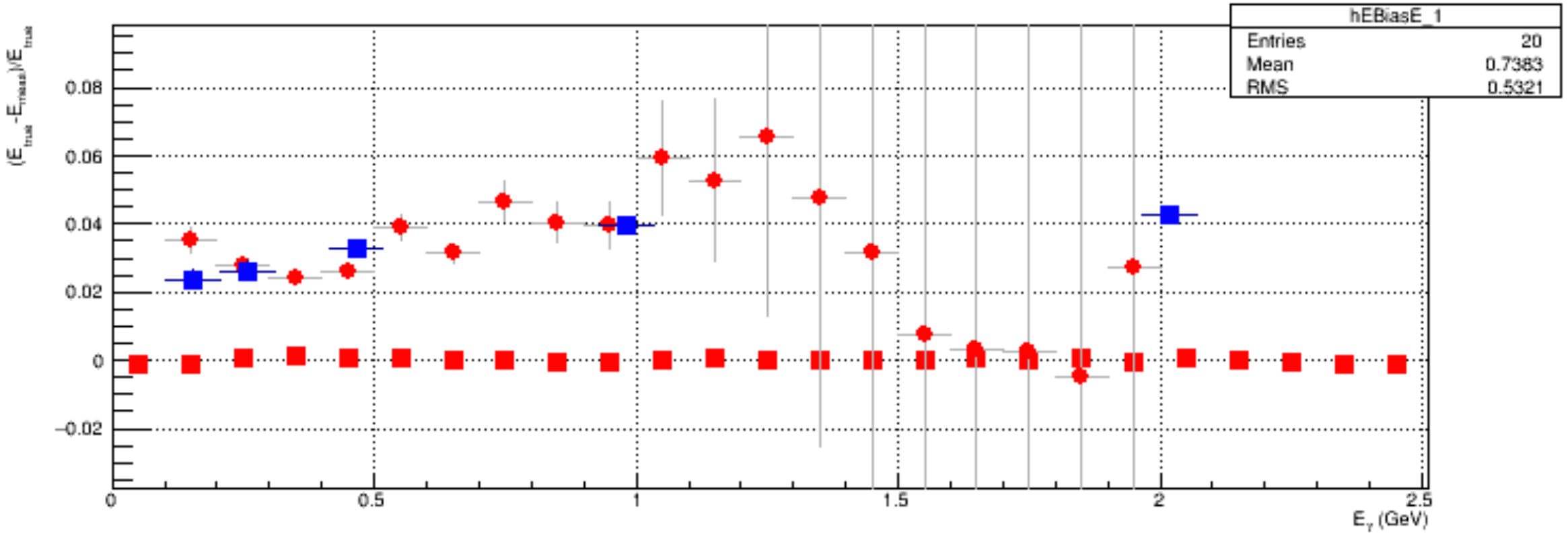
- **Urqmd Gen Gamma**
- $Au + Au \quad \sqrt{s} = 11GeV$ **b<3fm**
- **Cut: |y|<0.5, |Zvert|<50cm**
- $\frac{E_{rec}}{E_{gen}} > 0.5$
- $\frac{\Delta E}{E_{gen}} > 3\sigma \quad \sigma = \frac{0.06}{\sqrt{E_{gen}}}$

Red circle: AZ Urqmd

Blue square: AZ Single

Red square: VR Urqmd

2%-5% low energy for AZ
<2% for VR



Energy Resolution

A little smaller
Small statistics for high Energy (1000 Evts)

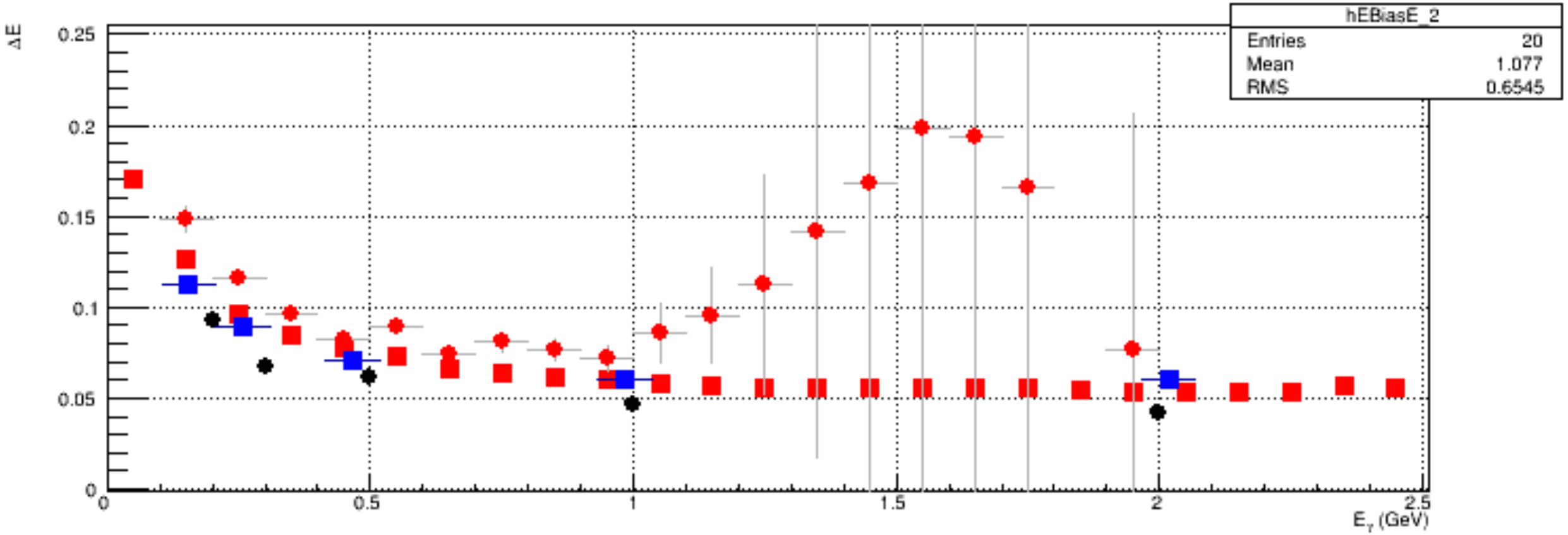
5%-15%

Red circle: AZ Urqmd

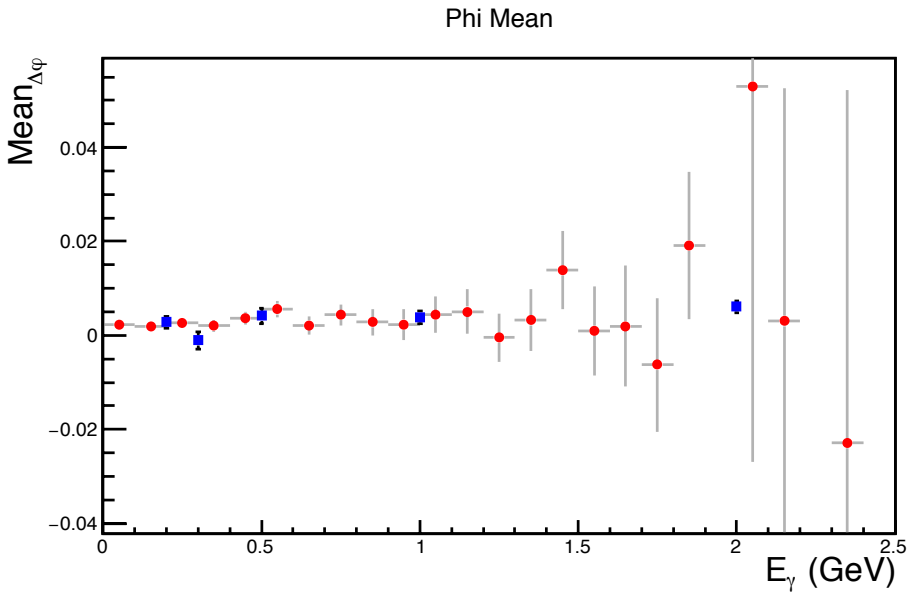
Blue square: AZ Single γ

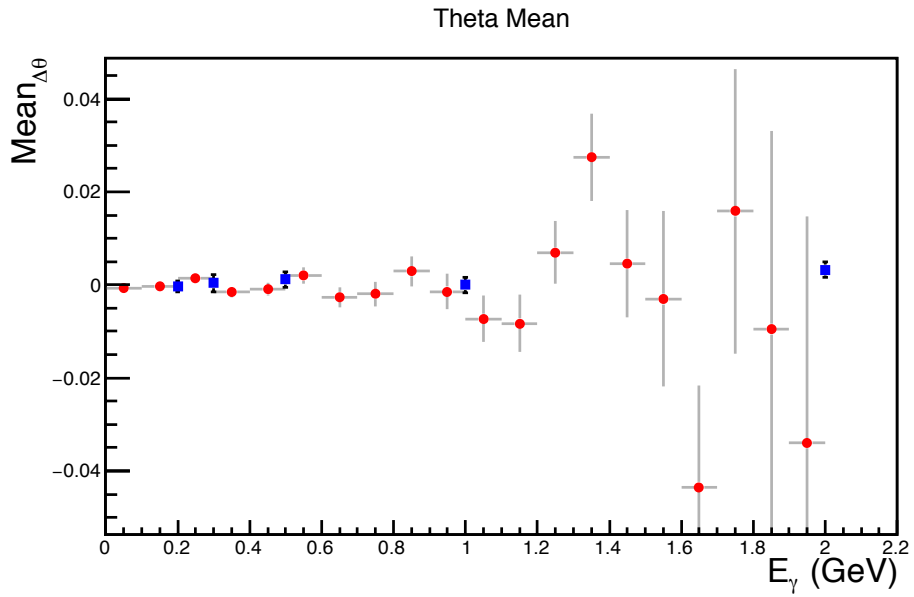
Red square: VR Urqmd

Black circle: VR Single γ

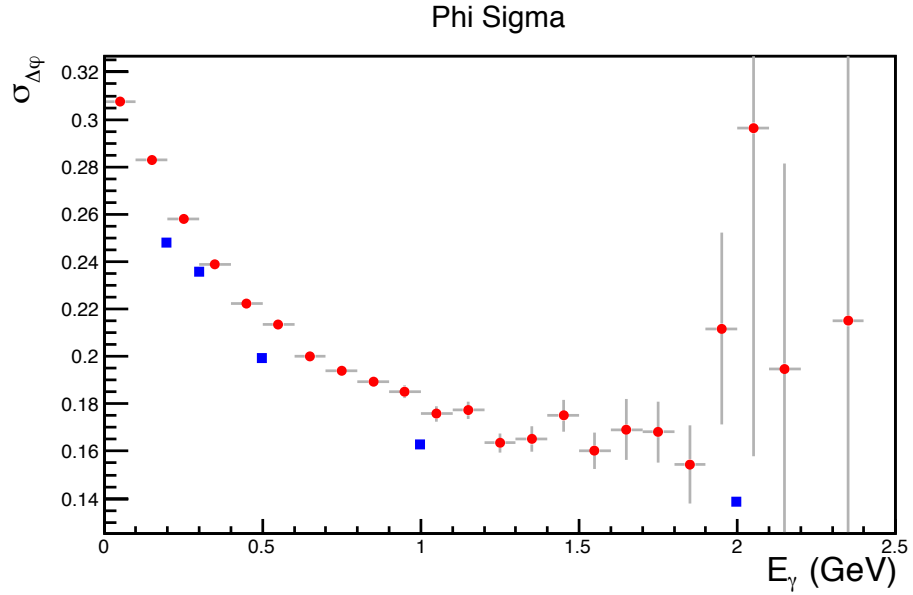


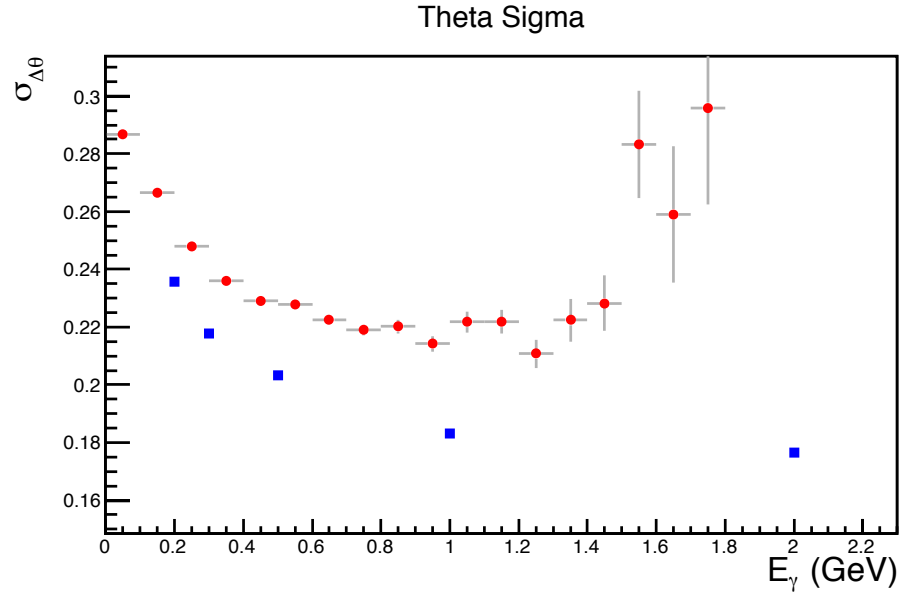
Spatial Resolution





Mean: $1\% - 2\%$

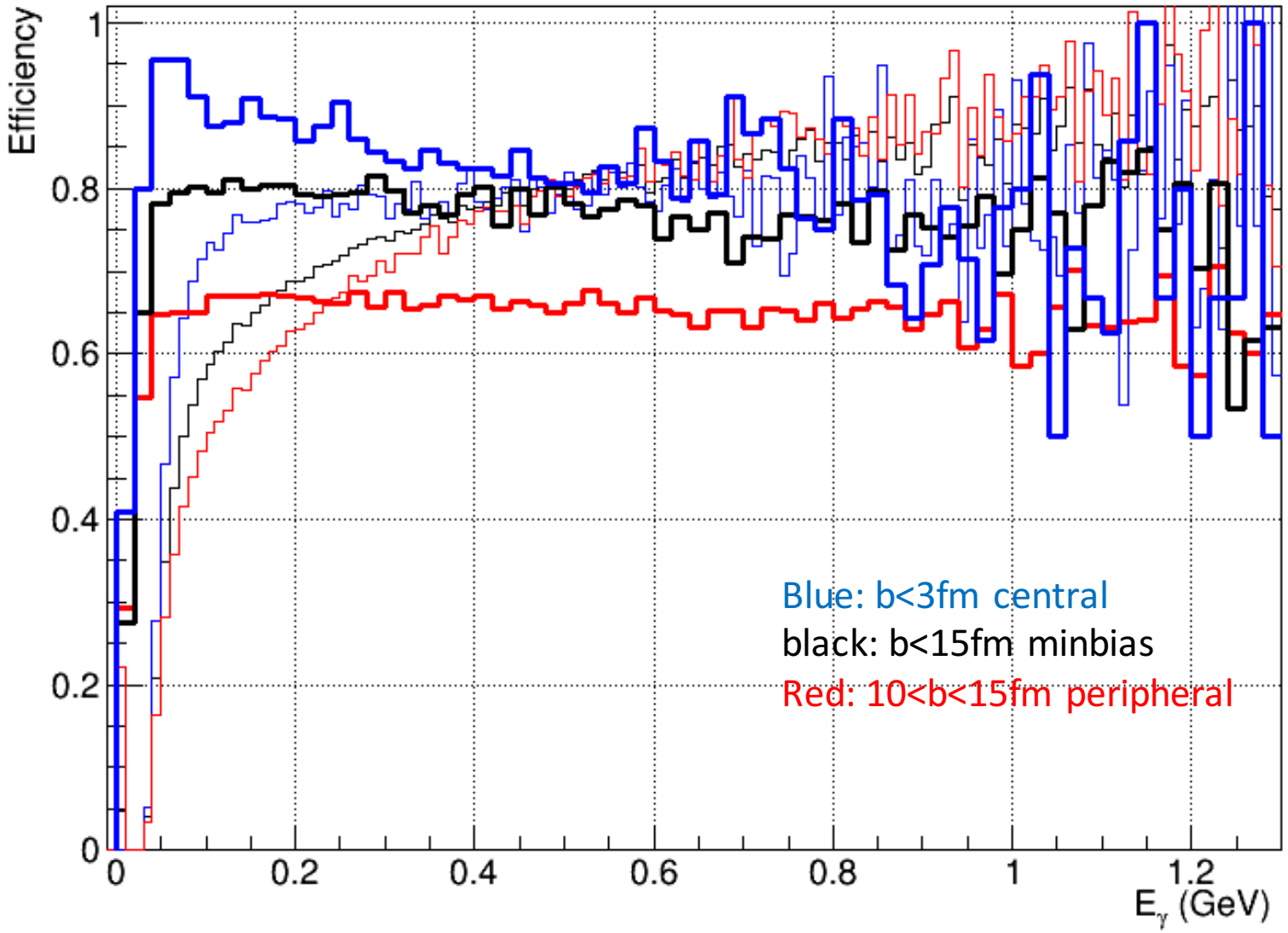




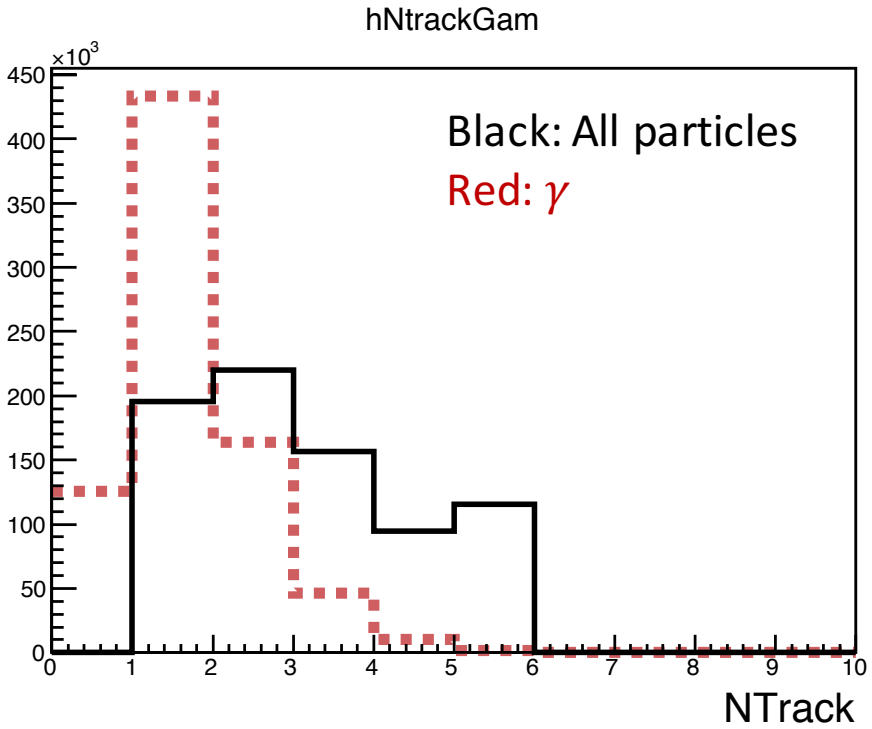
σ: $14 - 30\%$

Photon Efficiency

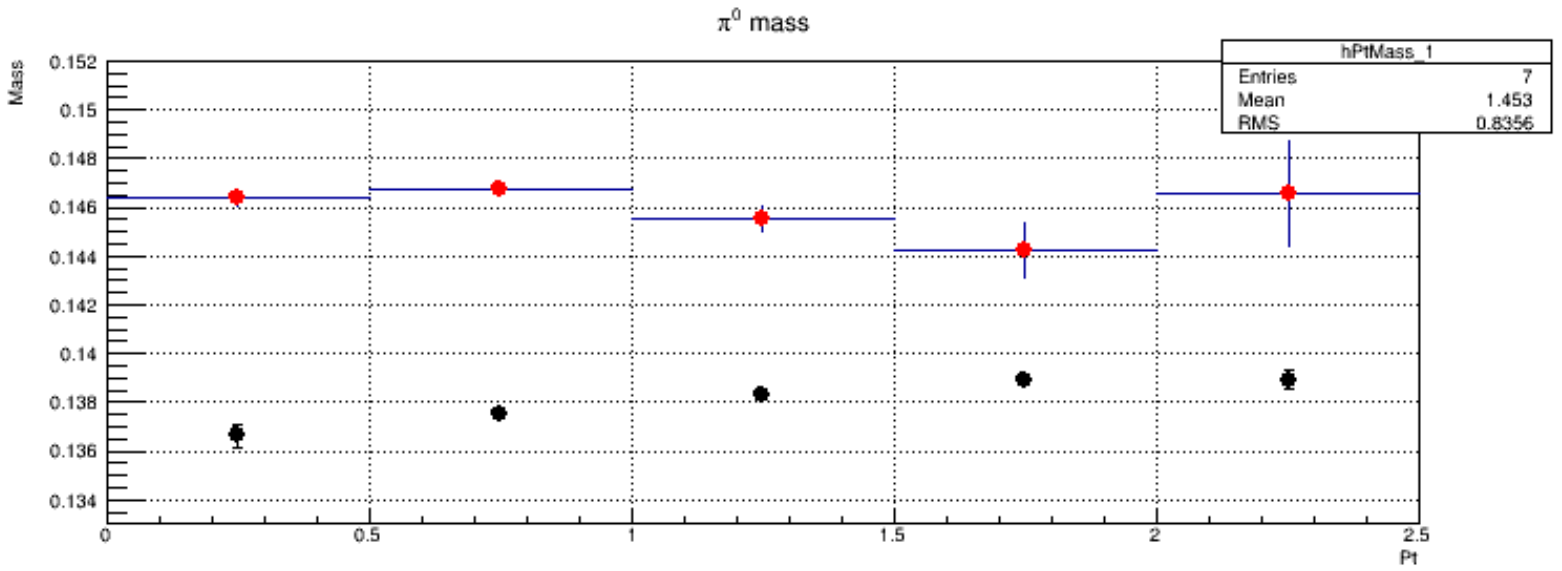
- Efficiency with basic cuts:
  - ✓ Events: UrQMD, |z-vertex| < 20 cm
  - ✓ Photons: |y| < 0.5, T < 2 ns, $N_{towers} \geq 2$ (the latter two have marginal effect on efficiency)

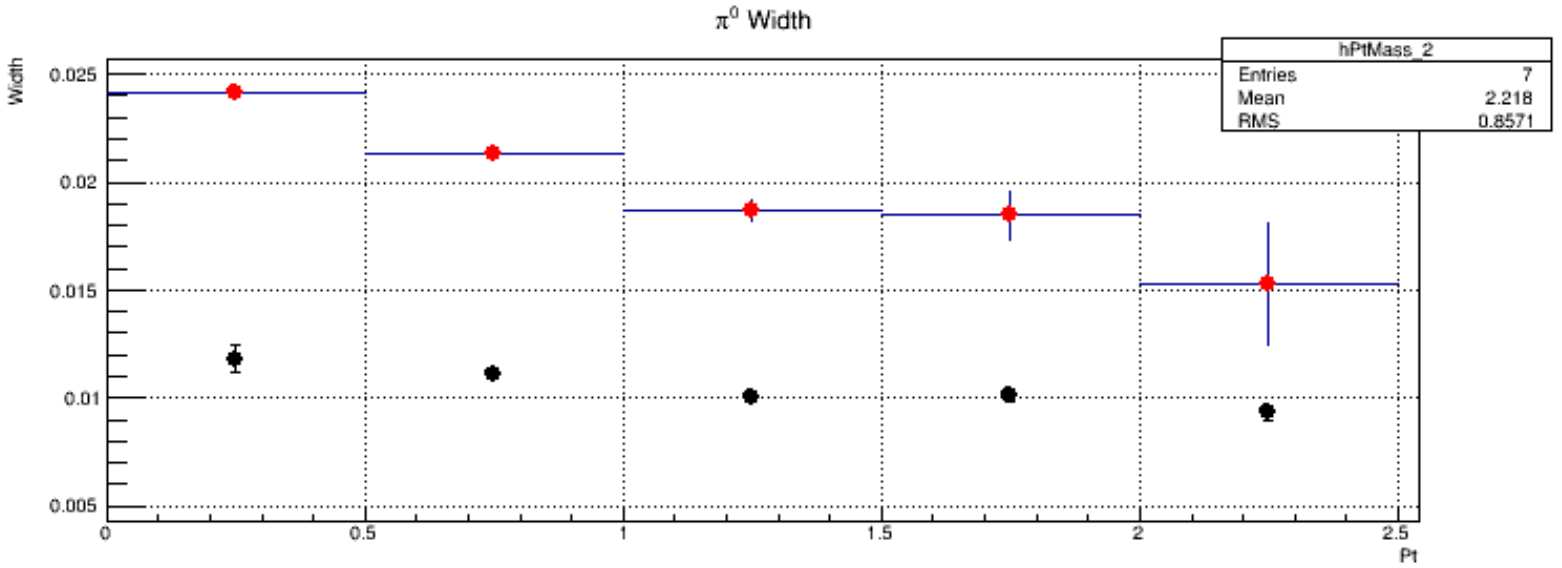


T<15ns



Pi0 centrality(b<3fm)





- **Urqmd Gen π^0**
- **$Au + Au$ $\sqrt{s} = 11GeV$ b<3fm**
- **Cut: |y|<0.5, |Zvert|<50cm**
- **E>0**

144-148Mev/c AZ

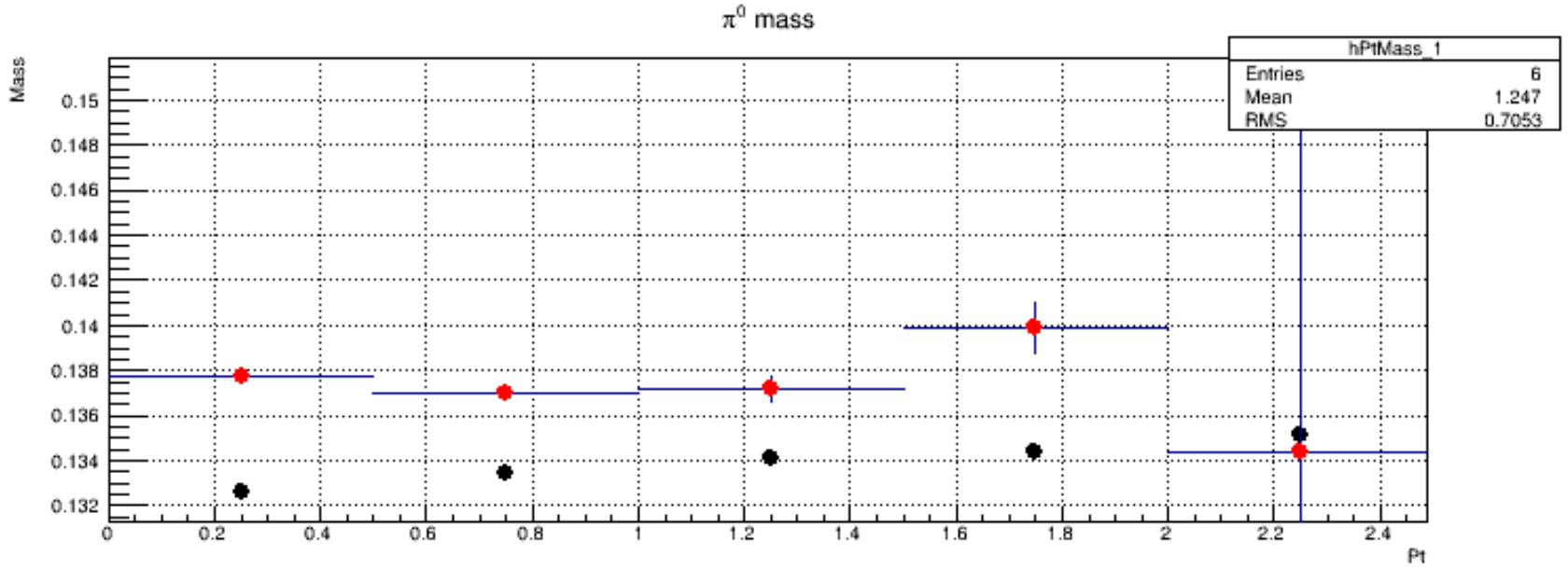
136-140MeV/c VR

0.015-0.025 MeV/c AZ

0.009-0.012 MeV/c VR

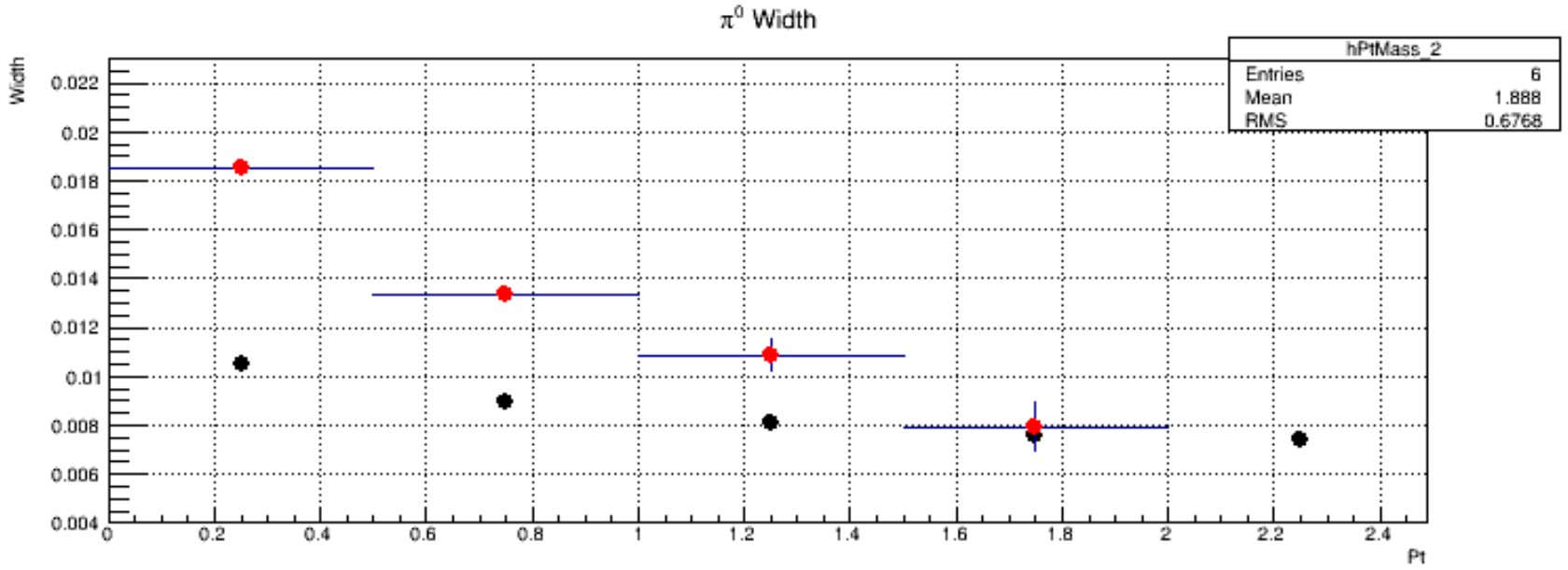
Red: AZ Black: VR

Pi0 peripheral (10<b<15fm)



134-140Mev/c AZ

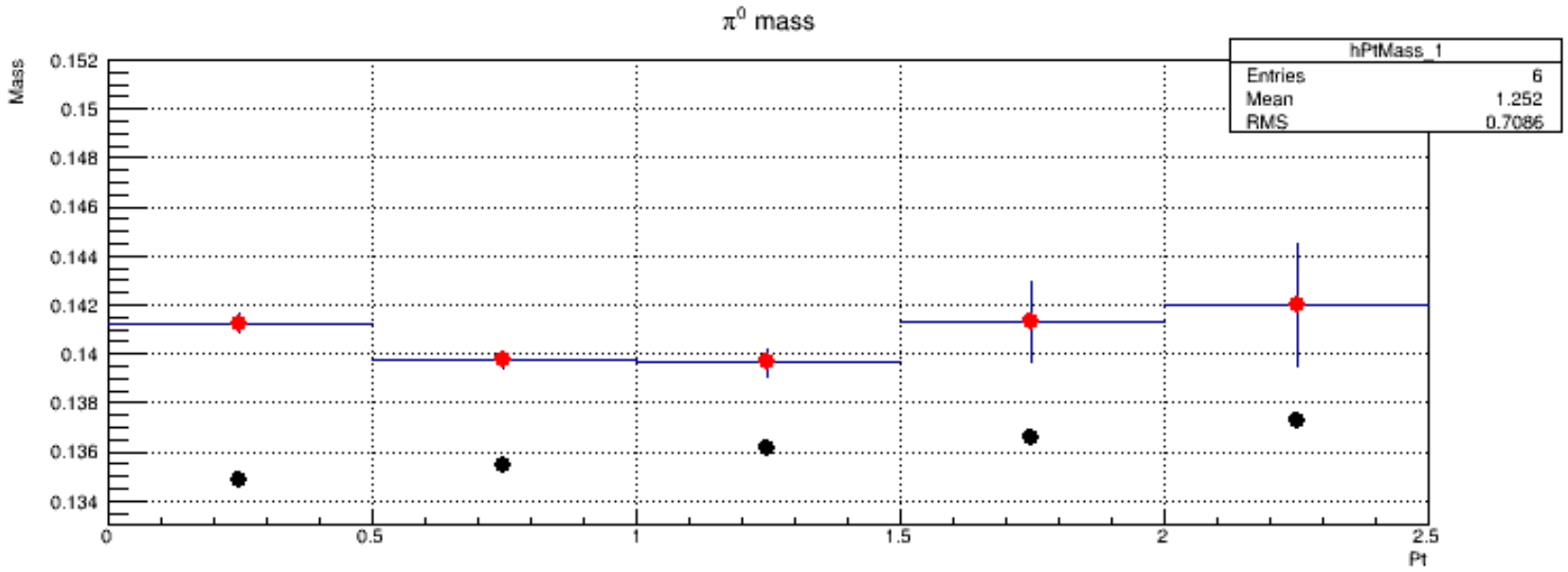
132-134MeV/c VR



0.008-0.018 MeV/c AZ

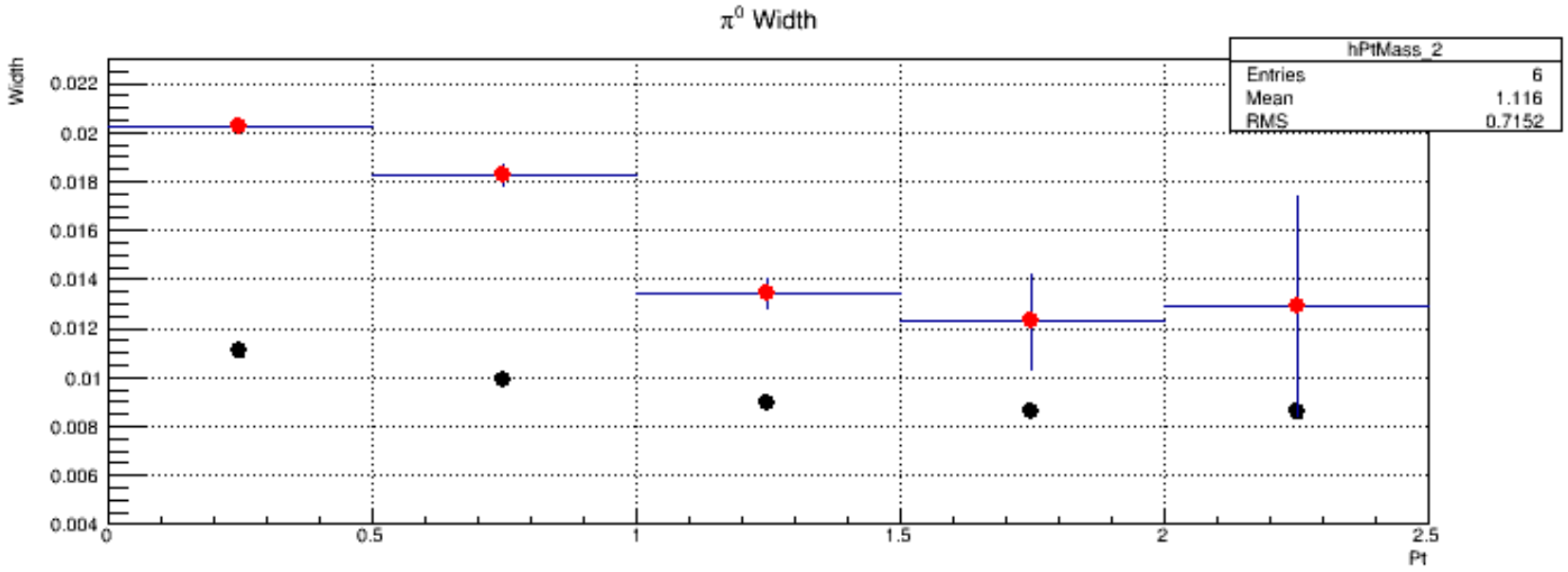
0.008-0.010 MeV/c VR

Pi0 minbias(b<15fm)



140-142Mev/c AZ

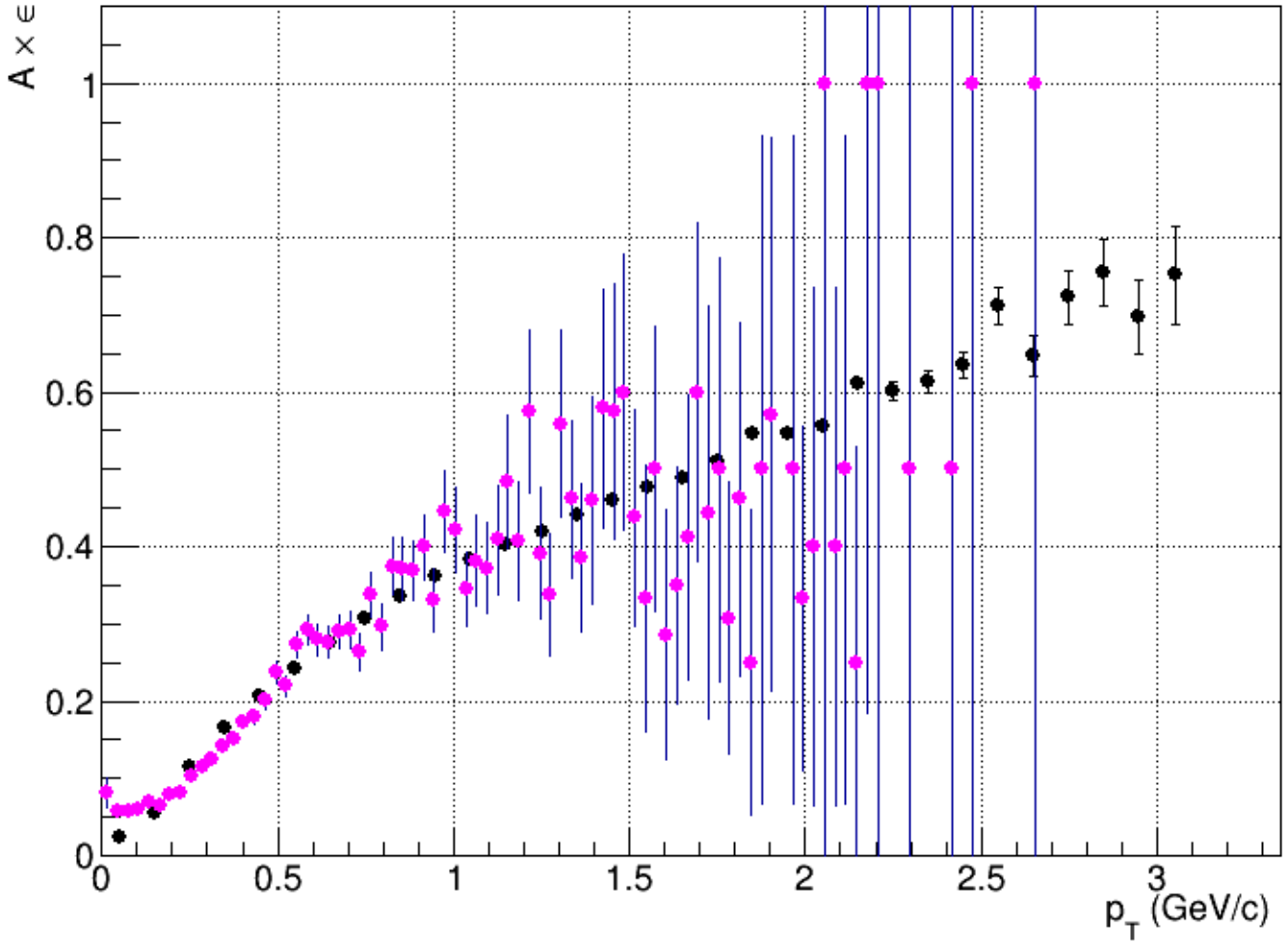
133-138MeV/c VR



0.012-0.02 MeV/c AZ

0.008-0.011 MeV/c VR

Pi0 Efficiency minbias

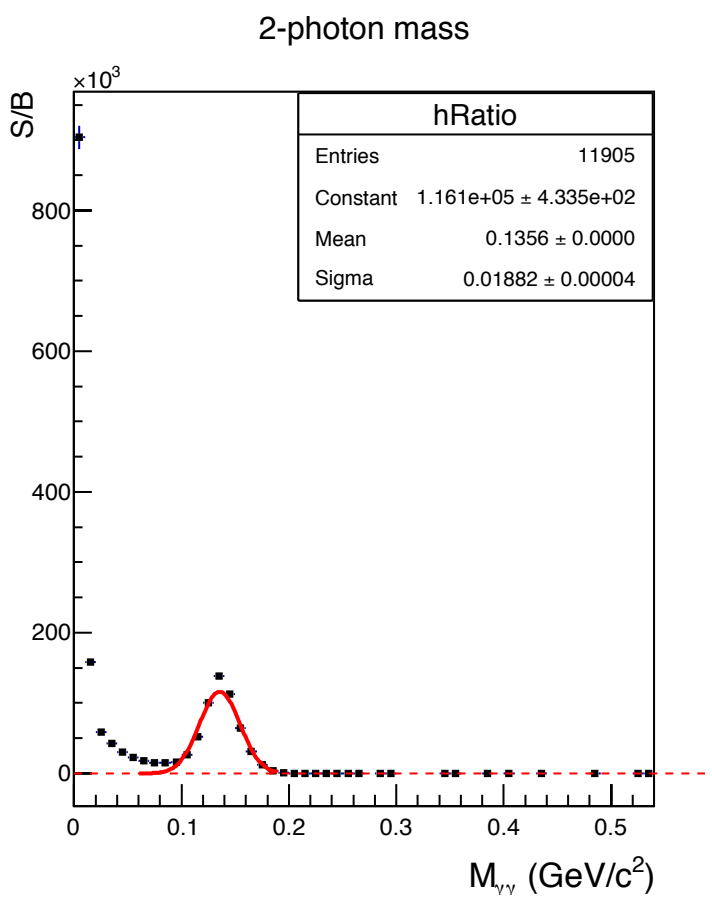


- ✓ Events: UrQMD, |z-vertex| < 50 cm
- ✓ Photons: T < 2 ns, $N_{towers} \geq 2$, $E_\gamma > 0$ MeV
- ✓ Pairs: |y| < 0.5

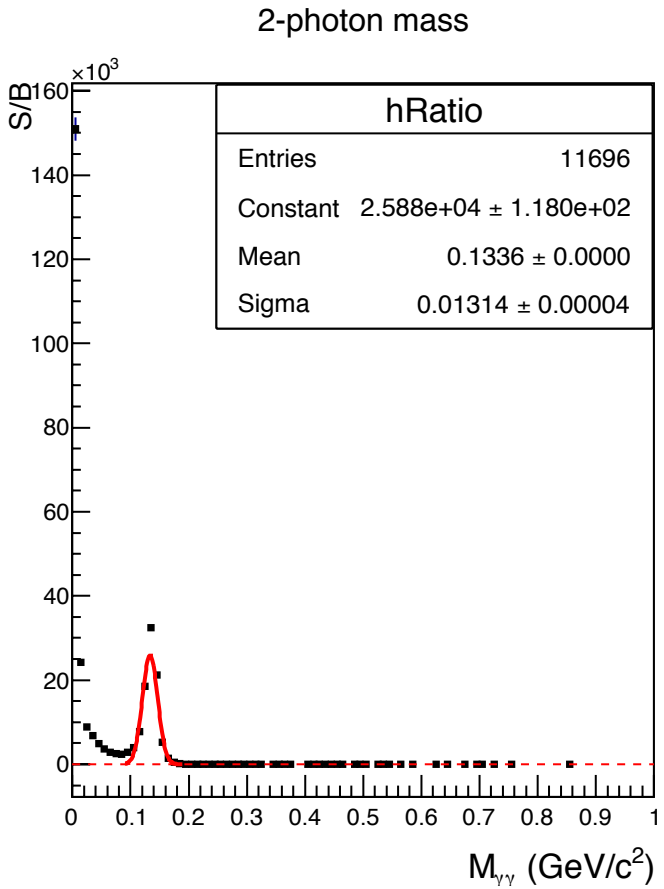
- T<15ns
- $\Delta m < 3\sigma$**(0.02)**

Theta Correction

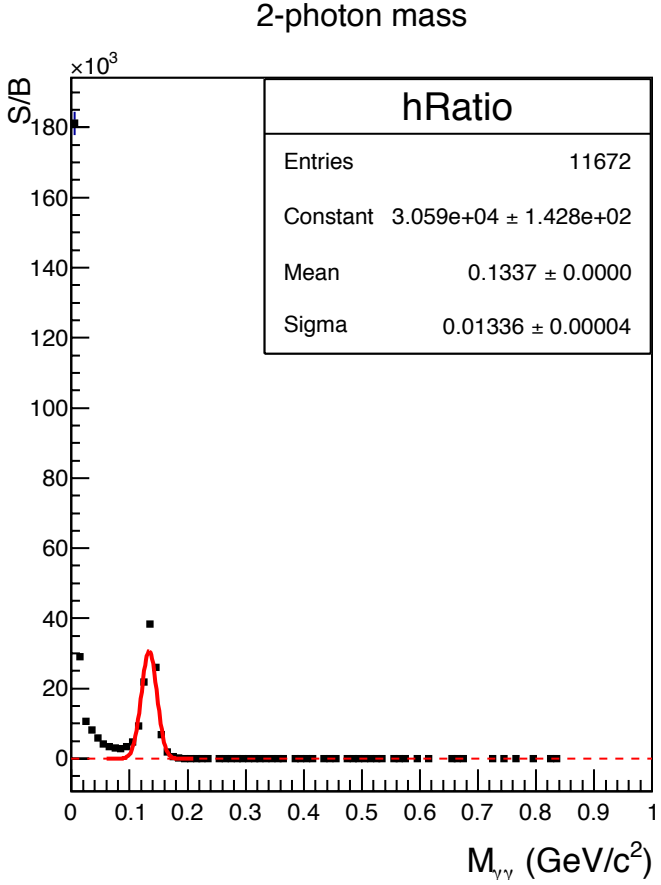
- **Box Gen**
- **EvtNum 1m**
- **Energy: 0-2GeV**
- $0° < \theta < 180°$ $0° < \varphi < 360°$
- $Z = 0cm$ $D_Z = 50cm$



No Correction



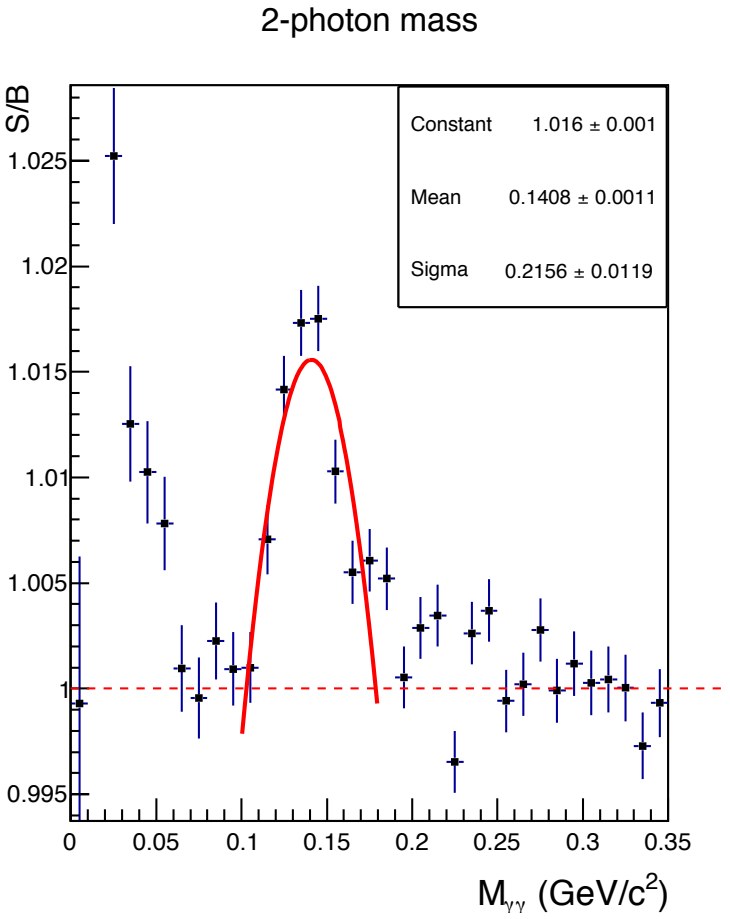
Fit function from Z distribution



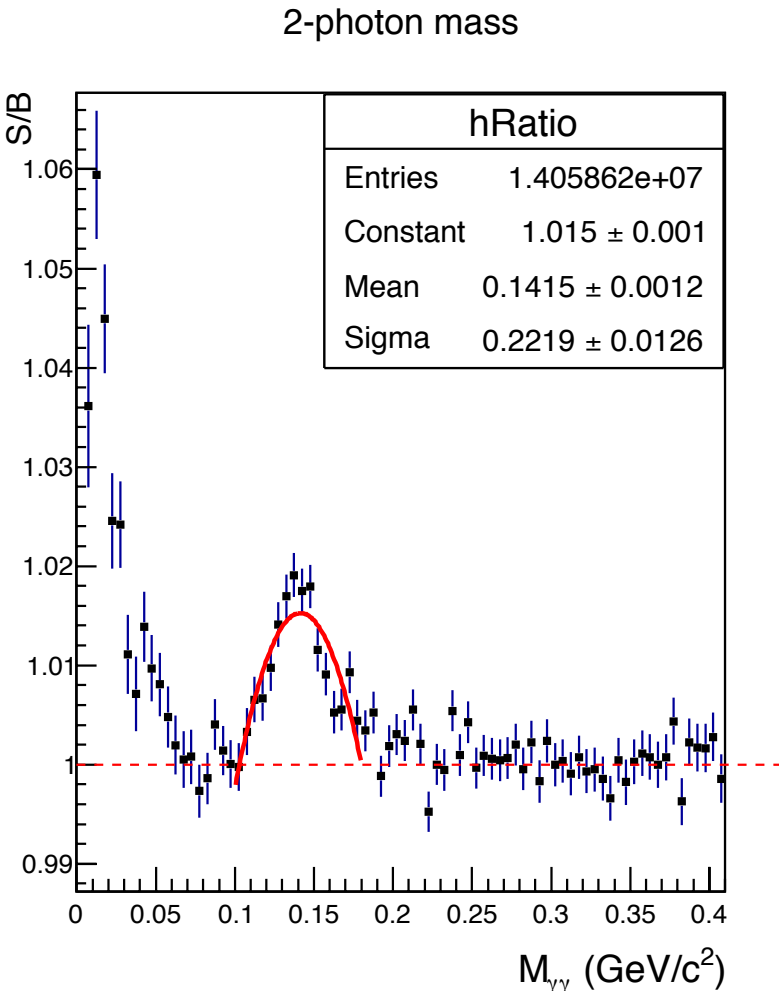
Fit function from Boyana

- **Urqmd Gen**
- $Au + Au \quad \sqrt{s} = 11GeV$ **b<3fm**

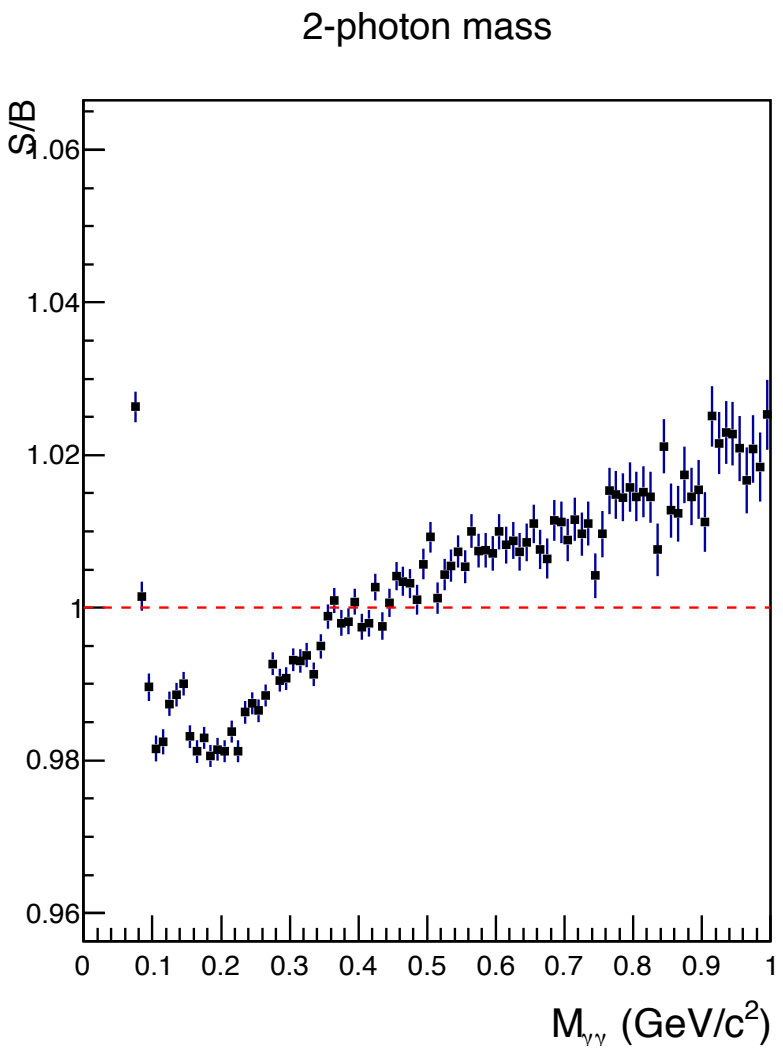
The reconstruction results is little affected by the correction



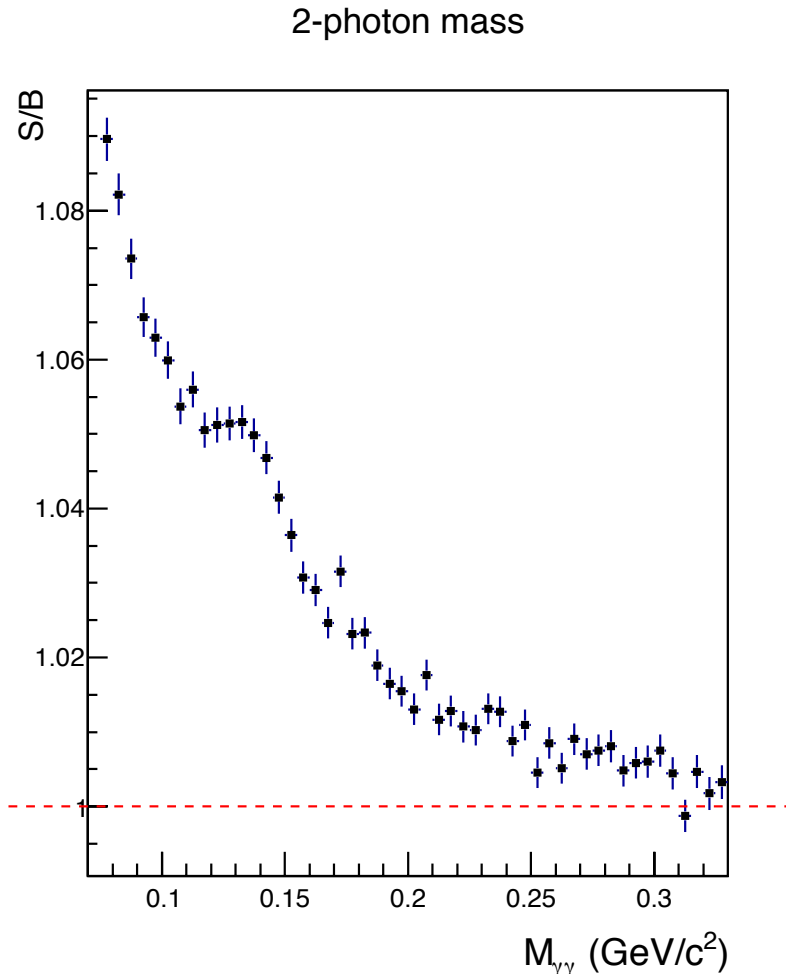
No Correction



Correction with MC data



Fit with function by Boyana



Fit function from distribution

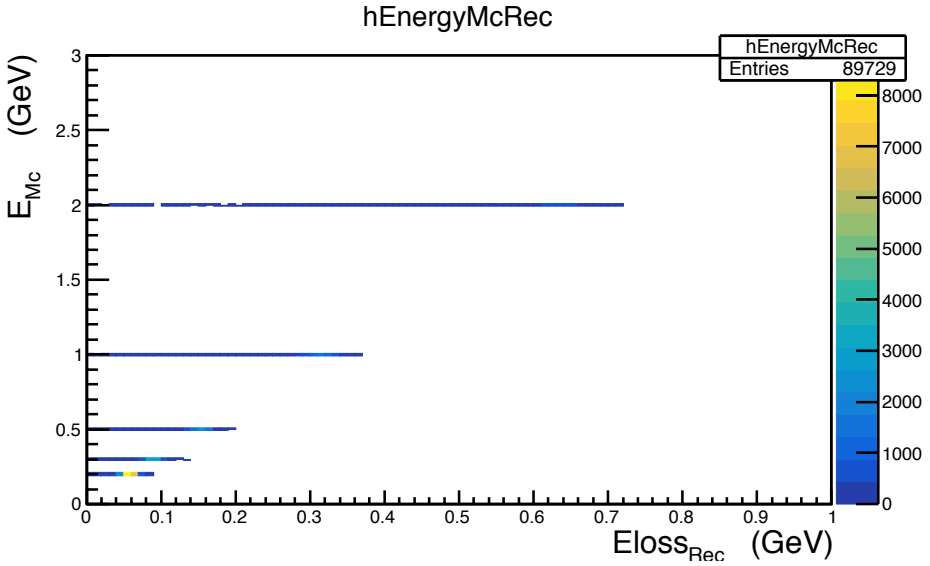
Summary

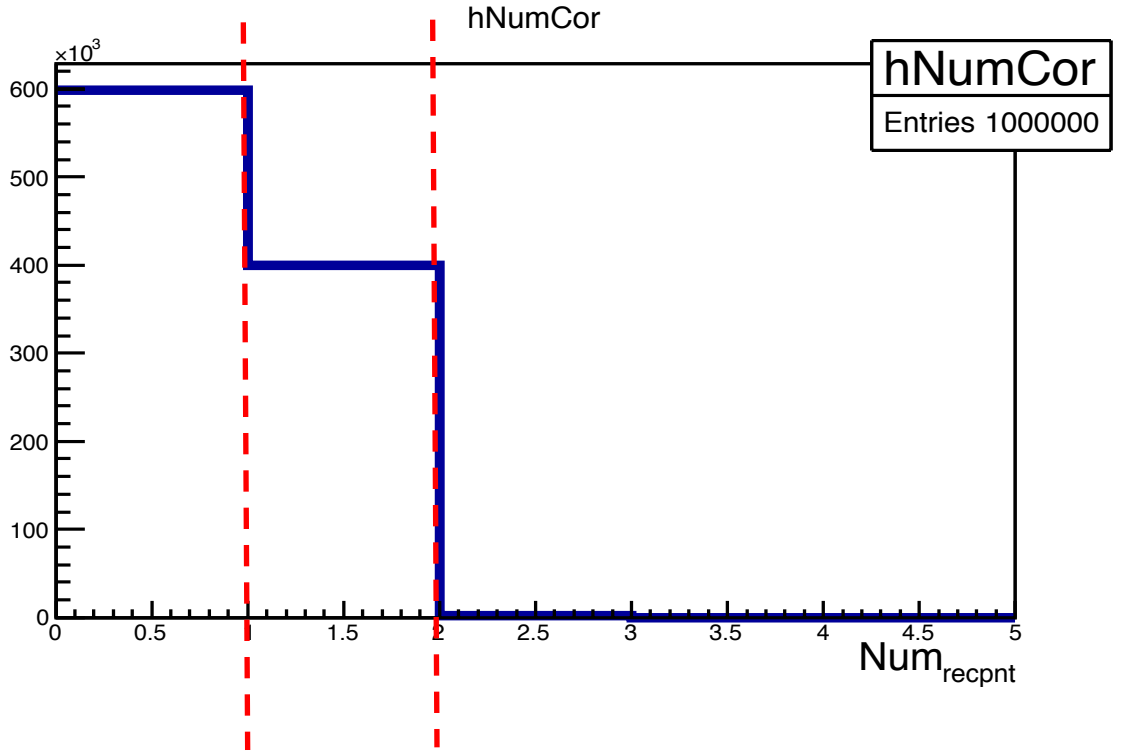
- ✓ The non-linearity of AZ clusterization is 2%-5% and is smaller than 2% for VR clusterization.
- ✓ The energy resolution is 5-15%,the resolution of AZ clusterization is a little larger than VR for low energy.
- ✓ The results of reconstruction of π^0 of AZ clustrization is worsen than VR.

- ✓ Theta correction not works for Urqmd events, more precise correction is needed.
- ✓ Theta correction is not so important for the reconstruction of π^0 of Urqmd.

Thanks for your attention!

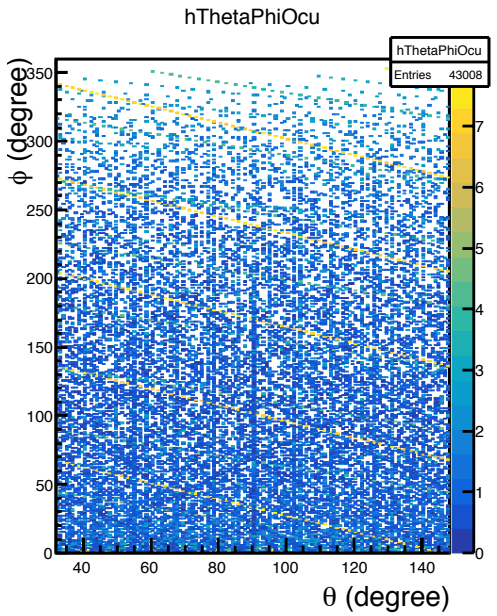
BackUp

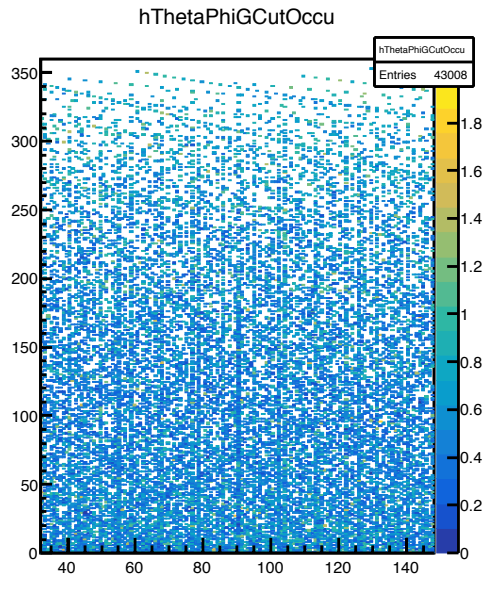


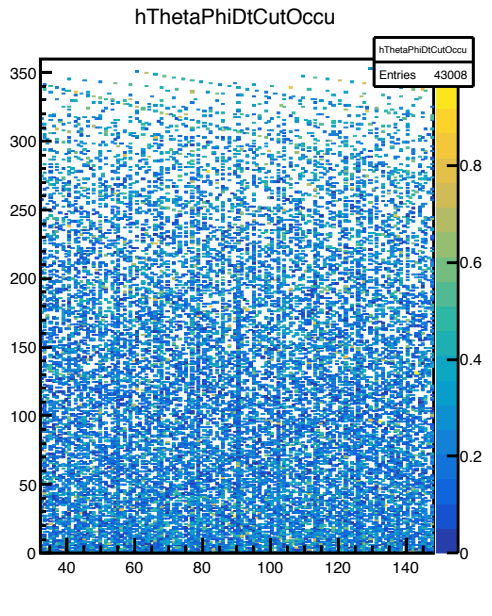


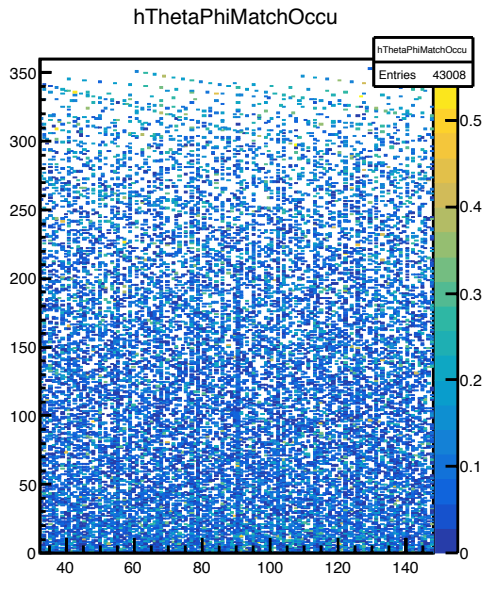
Number of hits reconstructed per event

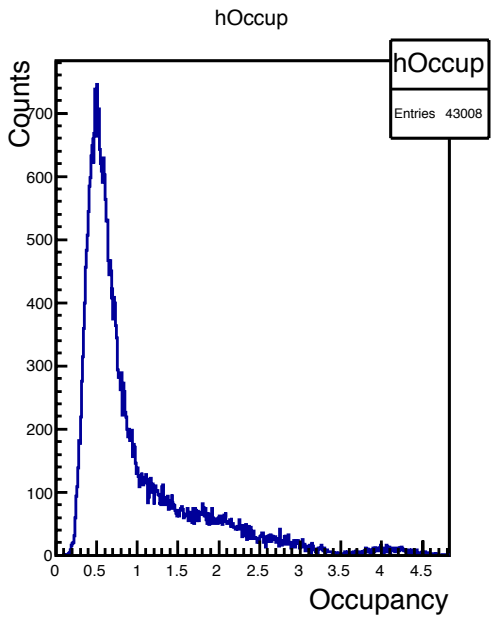
Occupancy

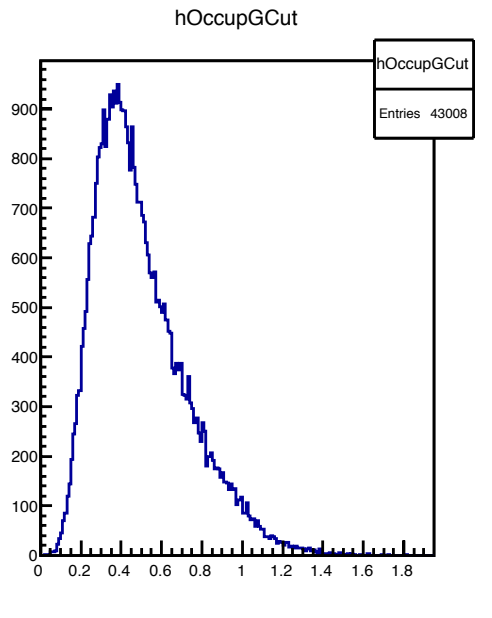

hThetaPhiOcu
hThetaPhiOcu
Entries 43008
ϕ (degree)
θ (degree)

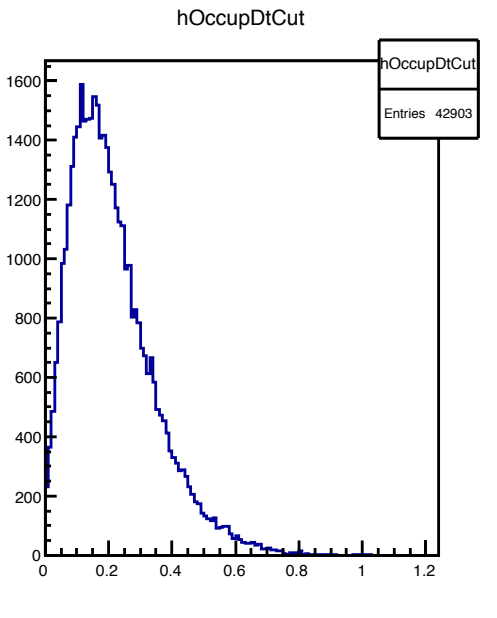

hThetaPhiGCutOccu
hThetaPhiGCutOccu
Entries 43008

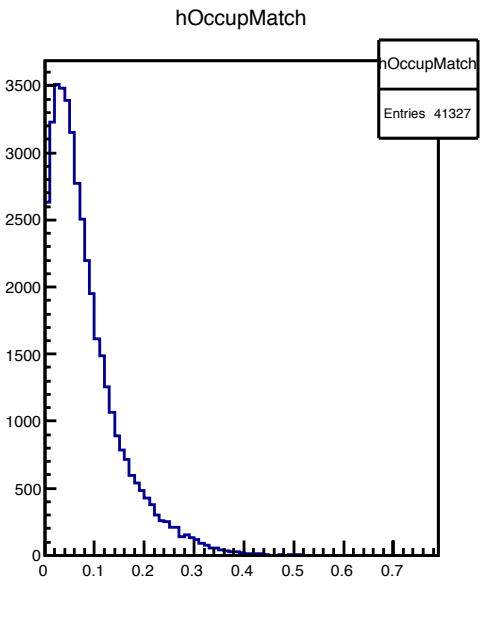

hThetaPhiDtCutOccu
hThetaPhiDtCutOccu
Entries 43008

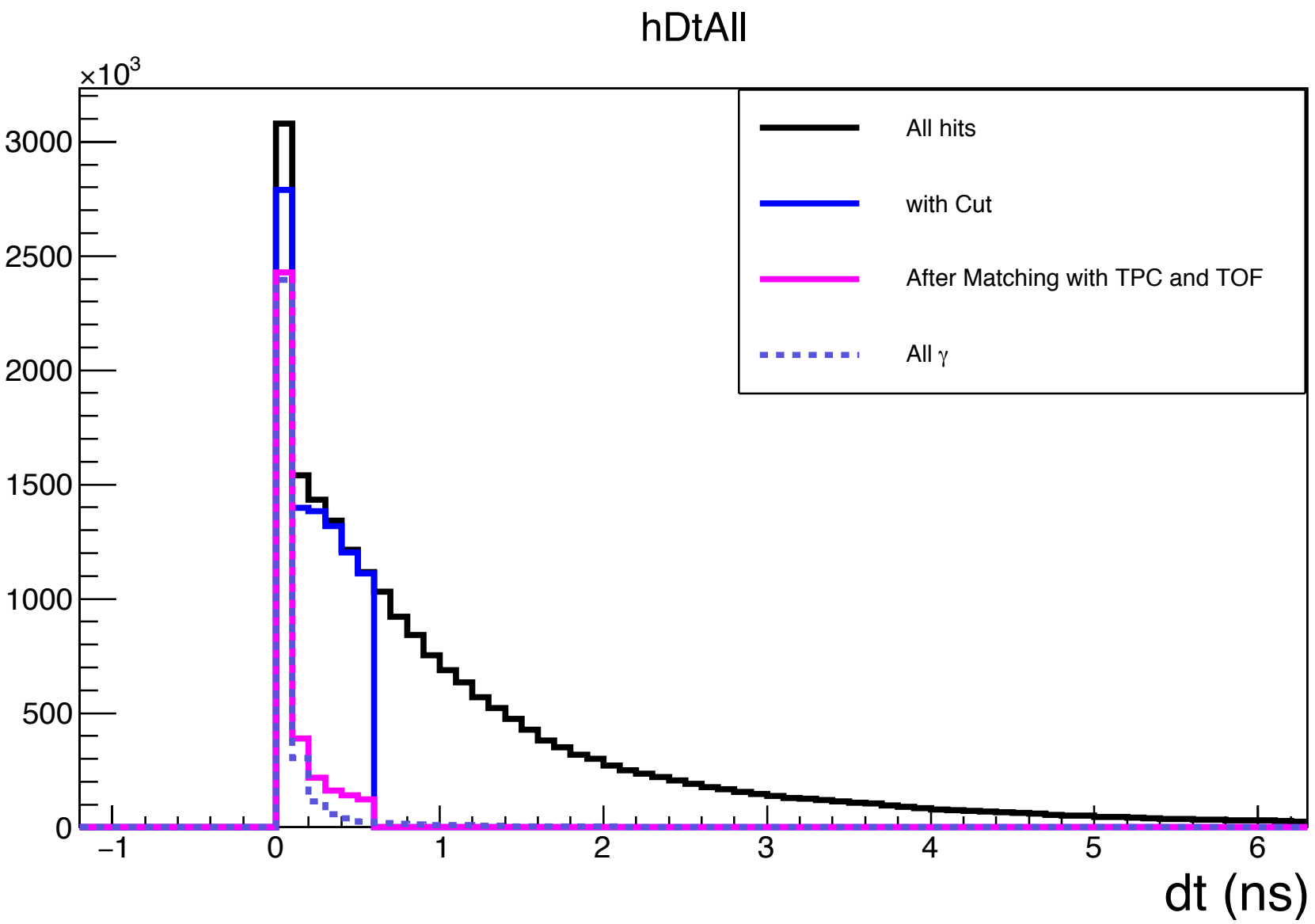

hThetaPhiMatchOccu
hThetaPhiMatchOccu
Entries 43008


hOccup
hOccup
Entries 43008
Counts
Occupancy


hOccupGCut
hOccupGCut
Entries 43008

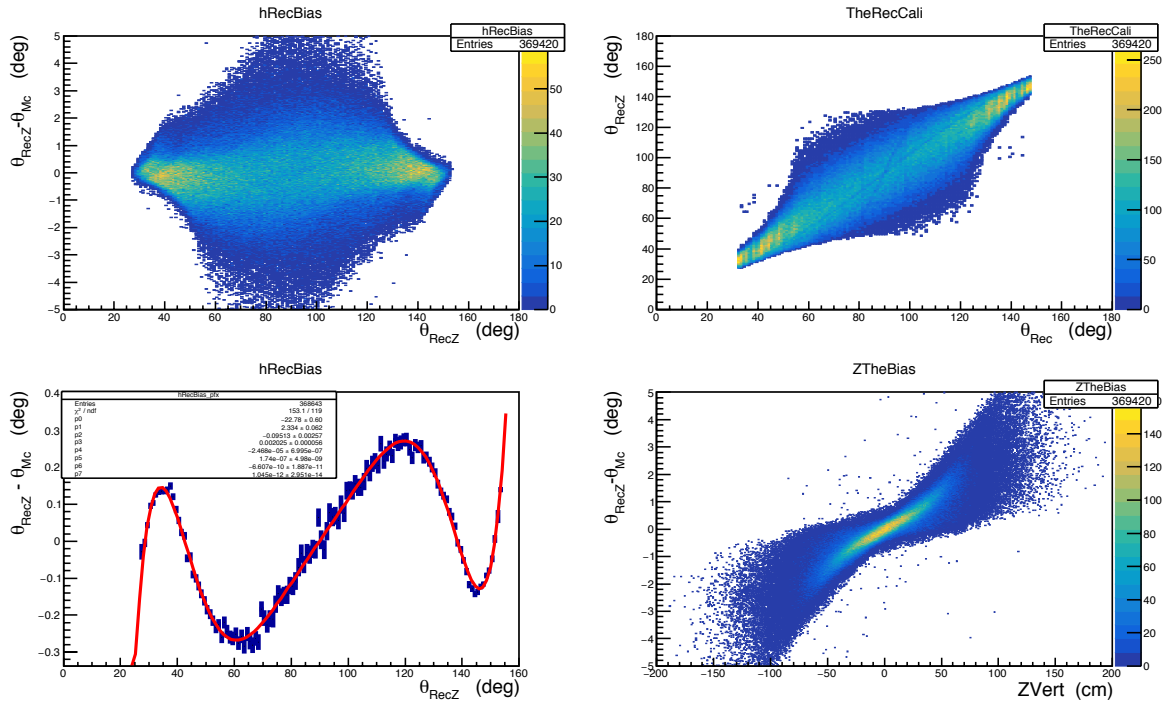

hOccupDtCut
hOccupDtCut
Entries 42903

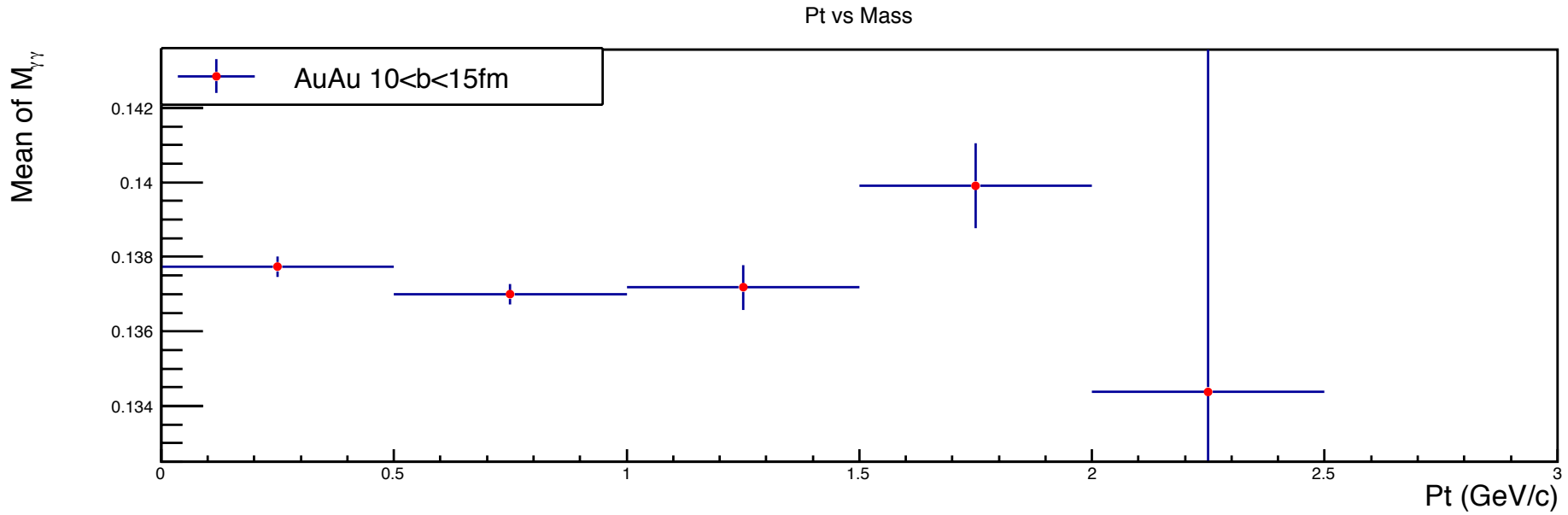

hOccupMatch
hOccupMatch
Entries 41327


hDtAll
×10^3
3000
2500
2000
1500
1000
500
0
−1
0
1
2
3
4
5
6
dt (ns)
All hits
with Cut
After Matching with TPC and TOF
All γ

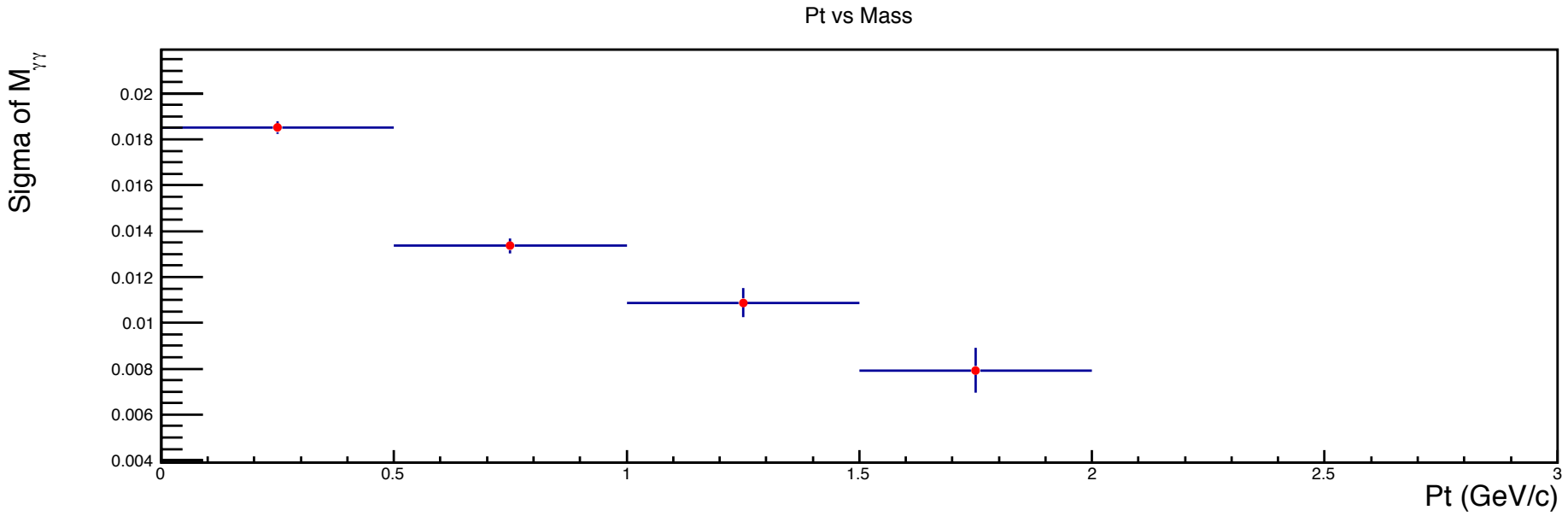
Correction by Z

		V0		Z < 0	Z > 0
z	-50	0	50	V0 + step*z[cm]	
p0	1.968	2.29722	0.197007	-0.0065844	-0.04200426
p1	-0.1953	-0.201742	-0.0501478	0.00012884	0.003031884
p2	0.006799	0.00608788	1.42E-03	1.42224E-05	-0.000093298
p3	-9.19E-05	-8.08E-05	-2.44E-05	-2.20546E-07	1.128294E-06
p4	5.51E-07	4.85E-07	1.83E-07	1.32842E-09	-0.000000006
p5	-1.25E-09	-1.07E-09	-4.63E-10	-3.49E-12	1.222122E-11




Pt vs Mass
AuAu 10<b<15fm
Mean of $M_{\gamma\gamma}$
0.142
0.14
0.138
0.136
0.134
0
0.5
1
1.5
2
2.5
3
Pt (GeV/c)

Ecut>0


Pt vs Mass
Sigma of $M_{\gamma\gamma}$
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0
0.5
1
1.5
2
2.5
3
Pt (GeV/c)