Experience from analyzing pp collisions in ALICE

Konstantin Mikhaylov

ITEP, Moscow

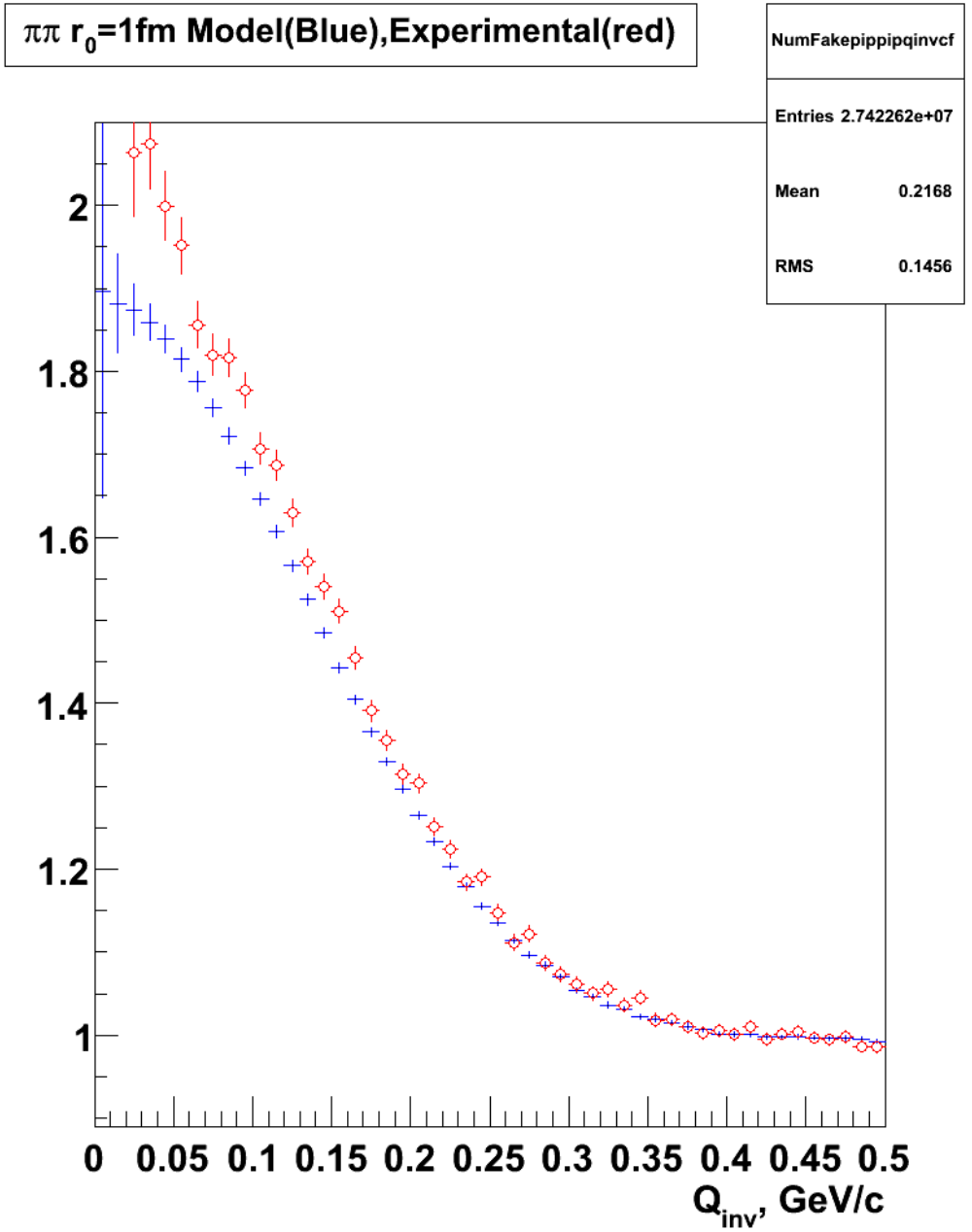
Simulations: software and input

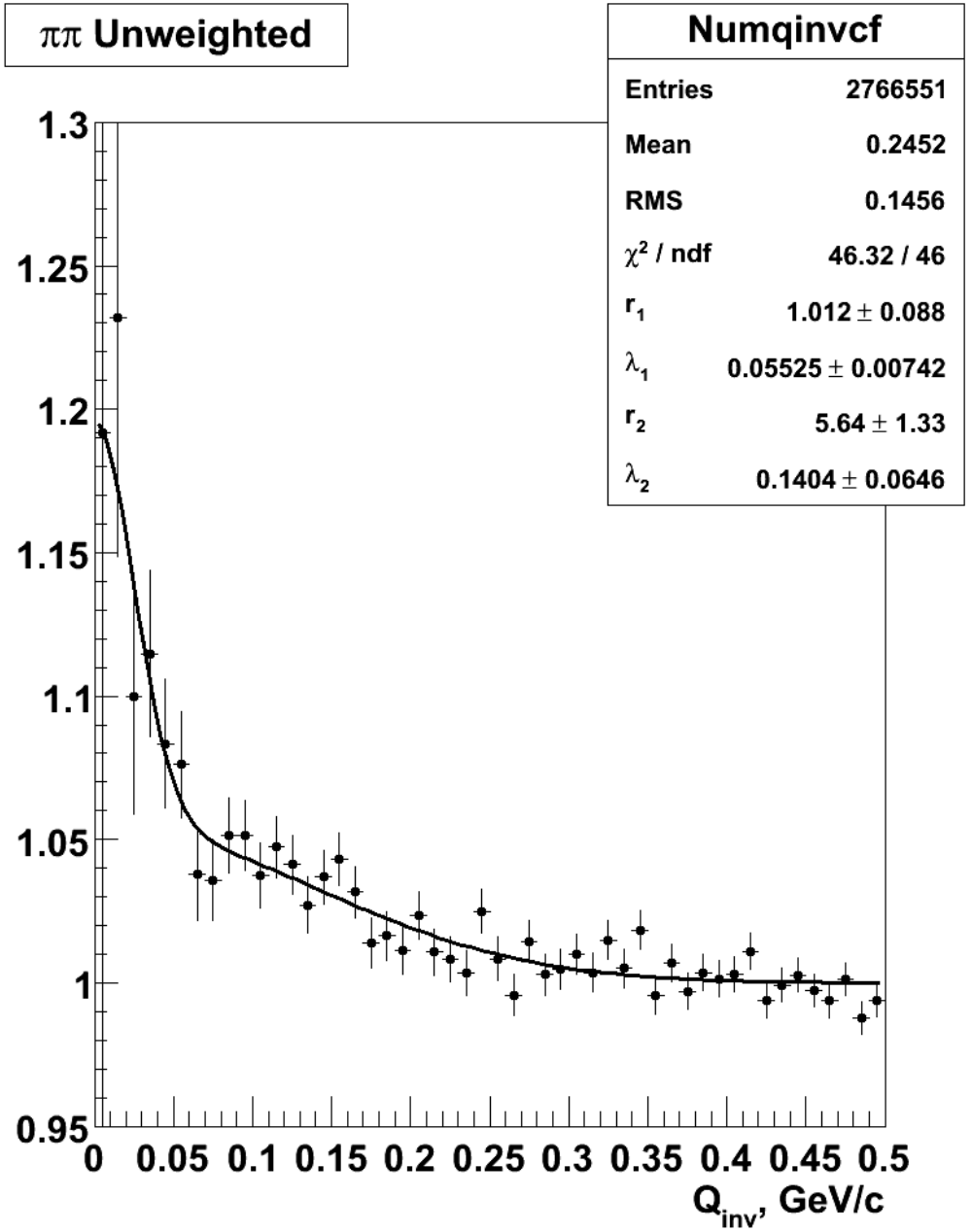
- Aliroot v4-14-Rev-01, AliFemto from svn/trunk
- PDC2007: PYTHIA pp 14 TeV

  (the pp events simulated at the request of the V0 group with no ITS refit requirement: /alice/sim/PDC_07/LHC07f/1600)*

- AliRoot local analysis *(~2*10^6 events)*
  - 1D $\pi^+\pi^+$ correlations
  - $0.1 < P_T < 1.0$ GeV/c
  - Standard cut on splitting-merging
  - Influence of Vz, Multiplicity, Particle collection on the correlation function
- Pythia direct analysis *(read galice.root ~7*10^5 events)*
  - 1D $\pi^+\pi^+$ correlations
  - $0.1 < P_T < 1.0$ GeV/c, $|\eta|<1$

AliFemto Simple Analysis





PYTHIA direct events

$\pi^+\pi^+$ correlation function

Cuts:

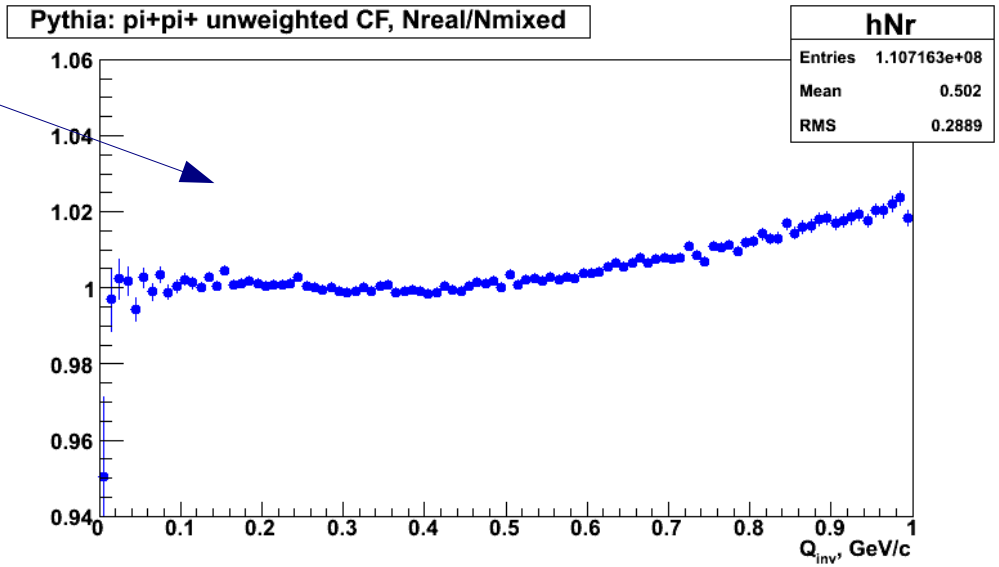
$0.1 < P_T < 1.0$ GeV/c

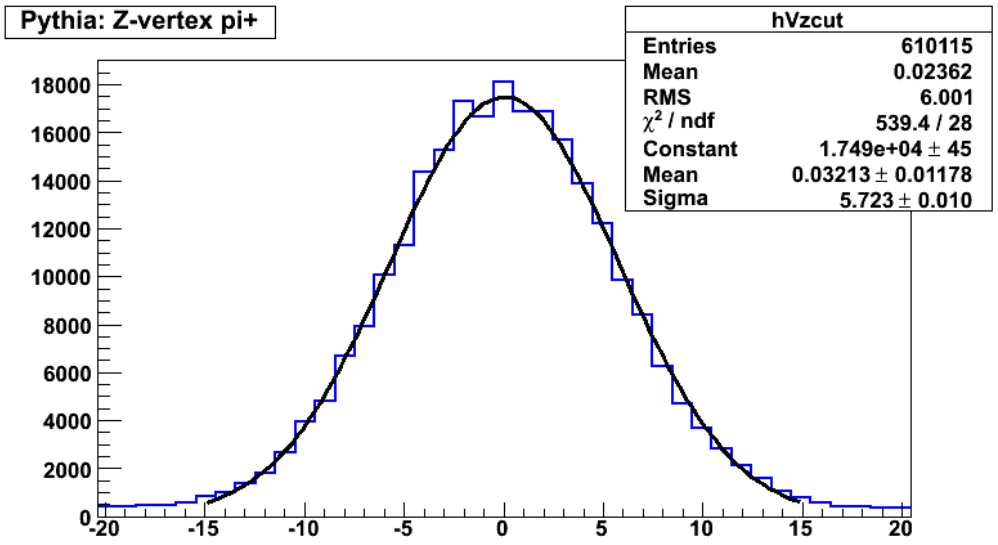
$-1. < \eta < +1$

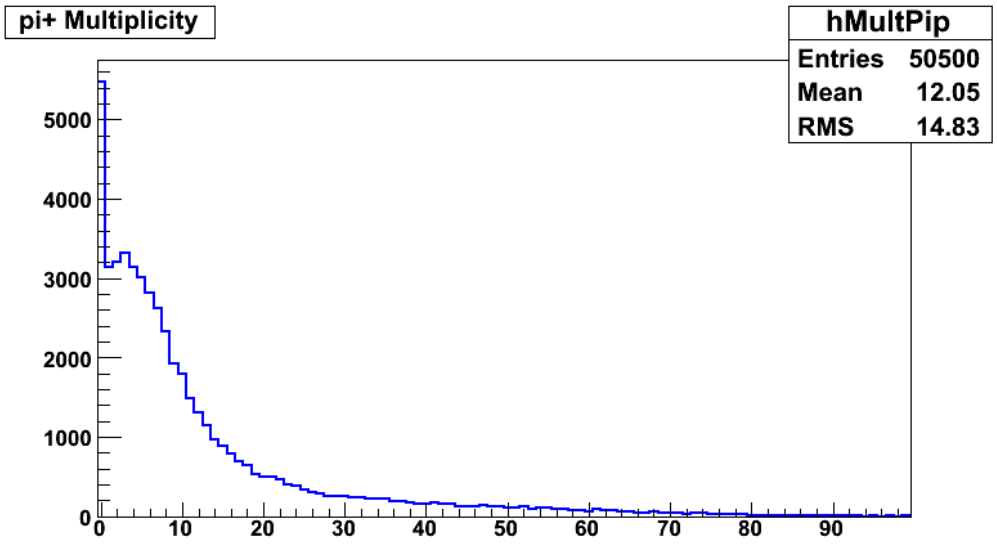
CF=Real/Mixed

Energy and Momentum Conservation-Induced Correlations:

Due to energy-momentum conservation probability of two particle emitted at same direction is smaller than in opposite direction



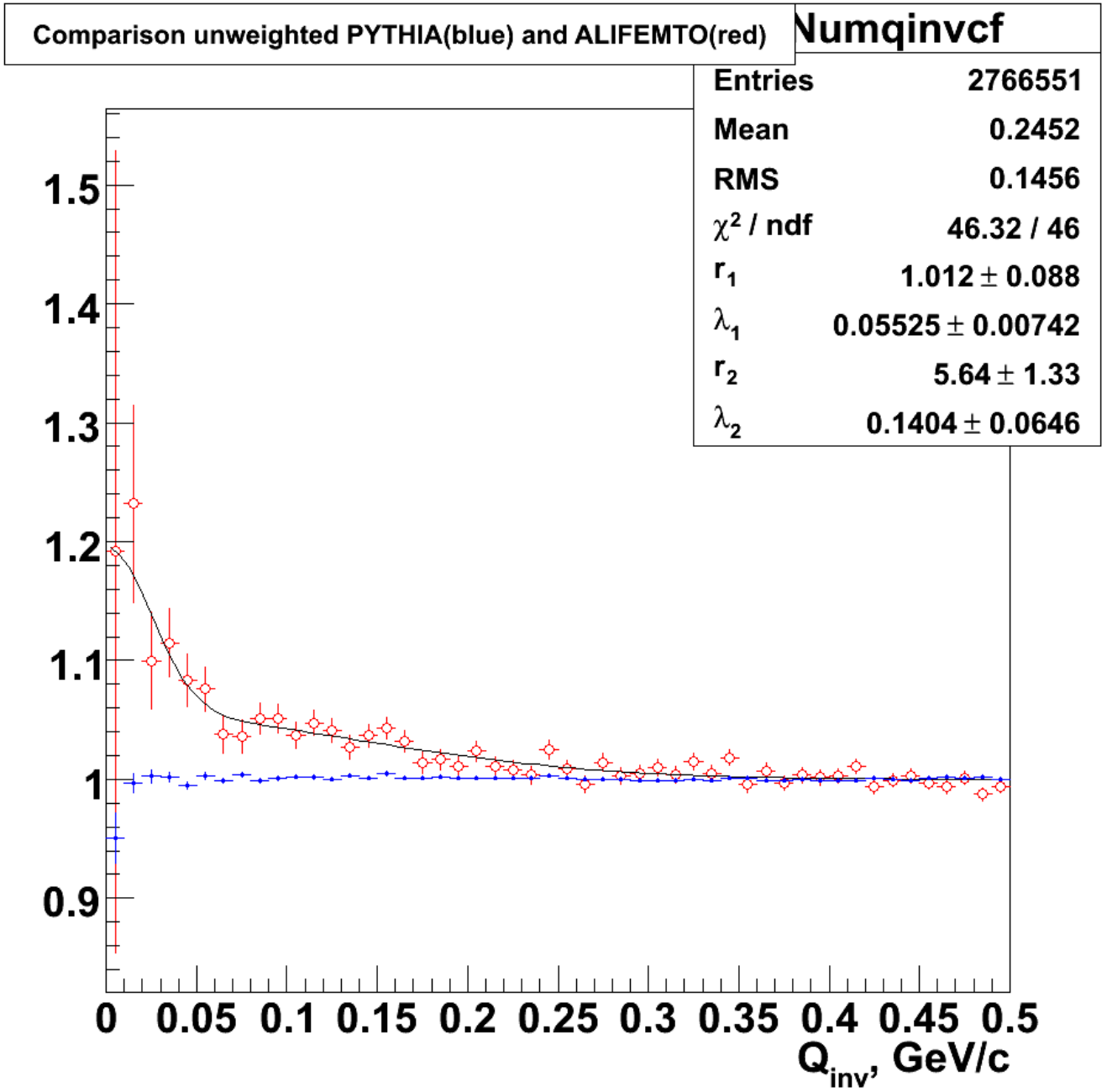




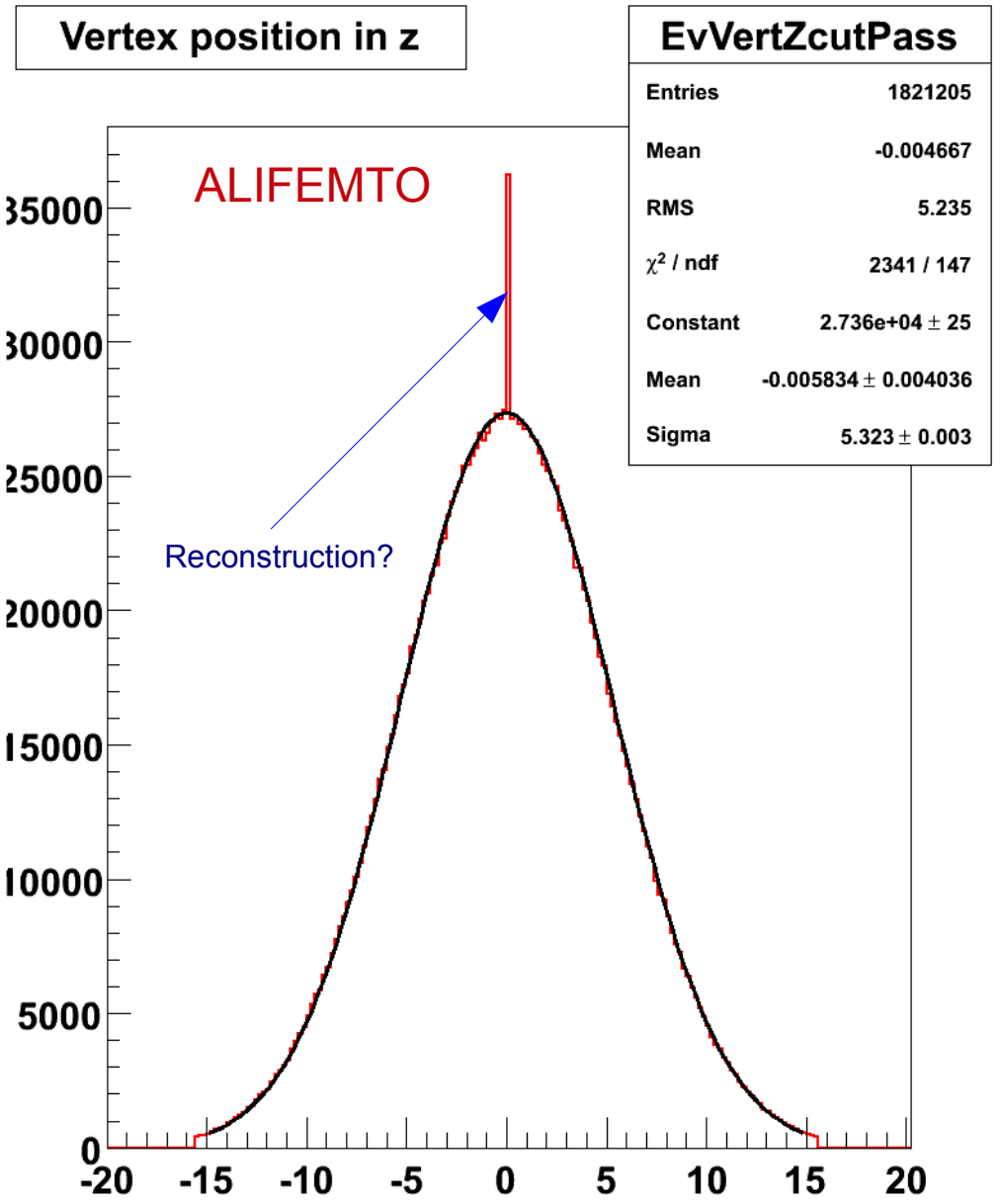
PYTHIA and ALIFEMTO

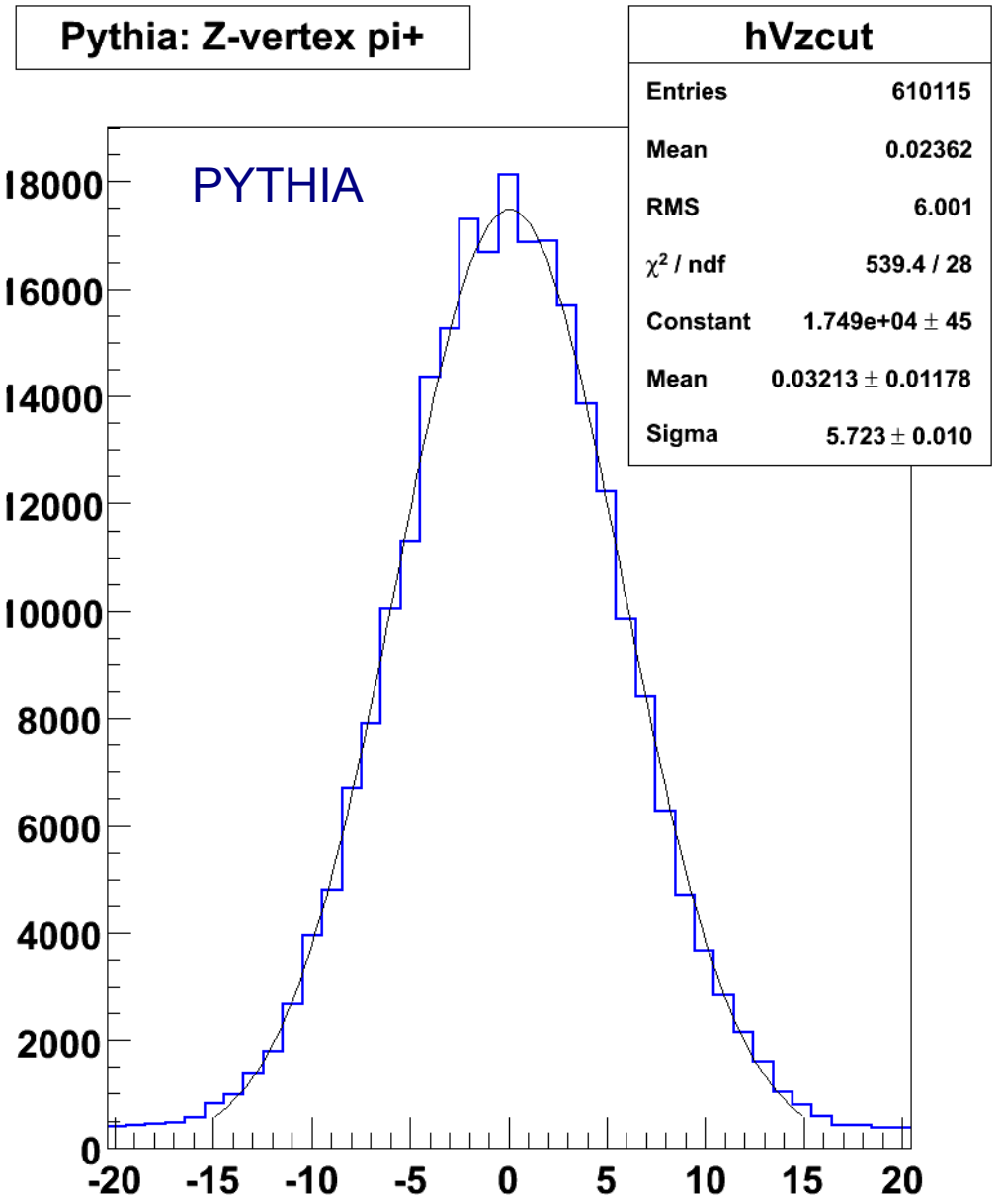
We created the correlation which does not exist in PYTHIA.

Does it come from mixing procedure?



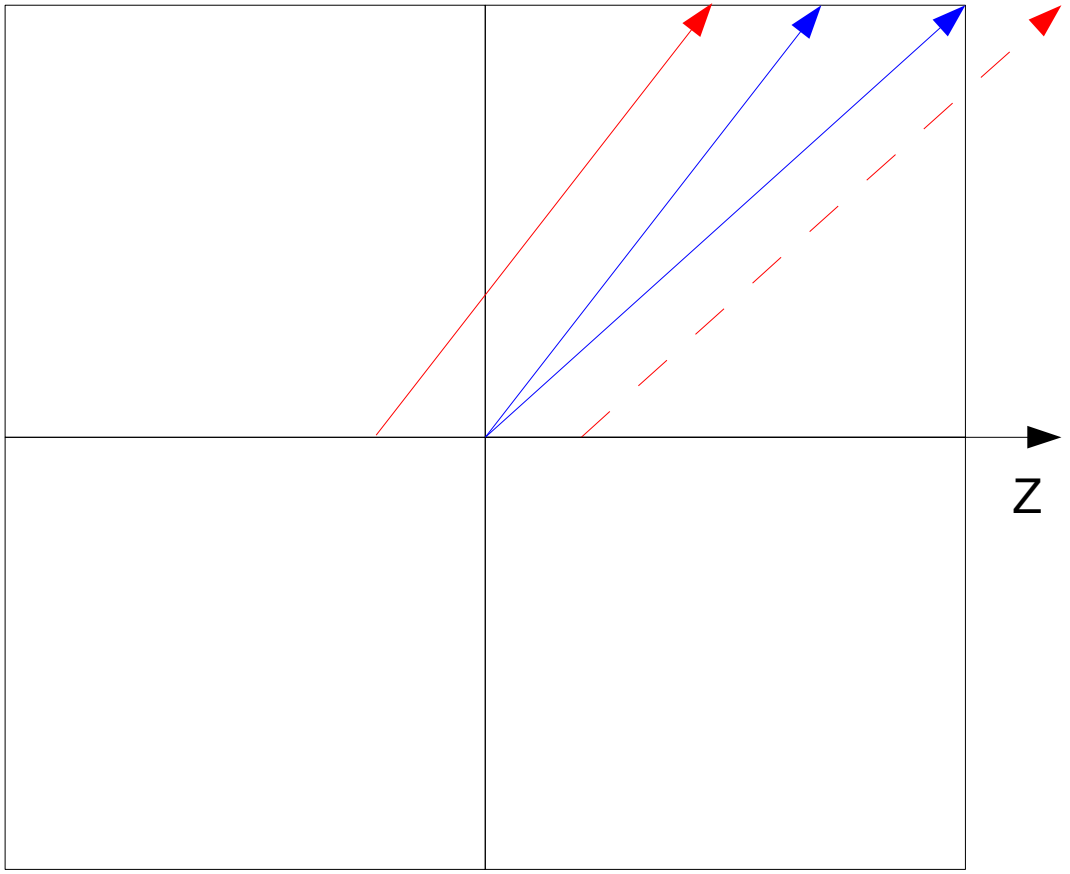
Vz: ALIFEMTO and PYTHIA





Acceptance for mixed events

TPC size is equal 2.5m
Collision point distribution is Gaussian with sigma ~5.5cm
Does it important for correlation function(mixing)?



TPC

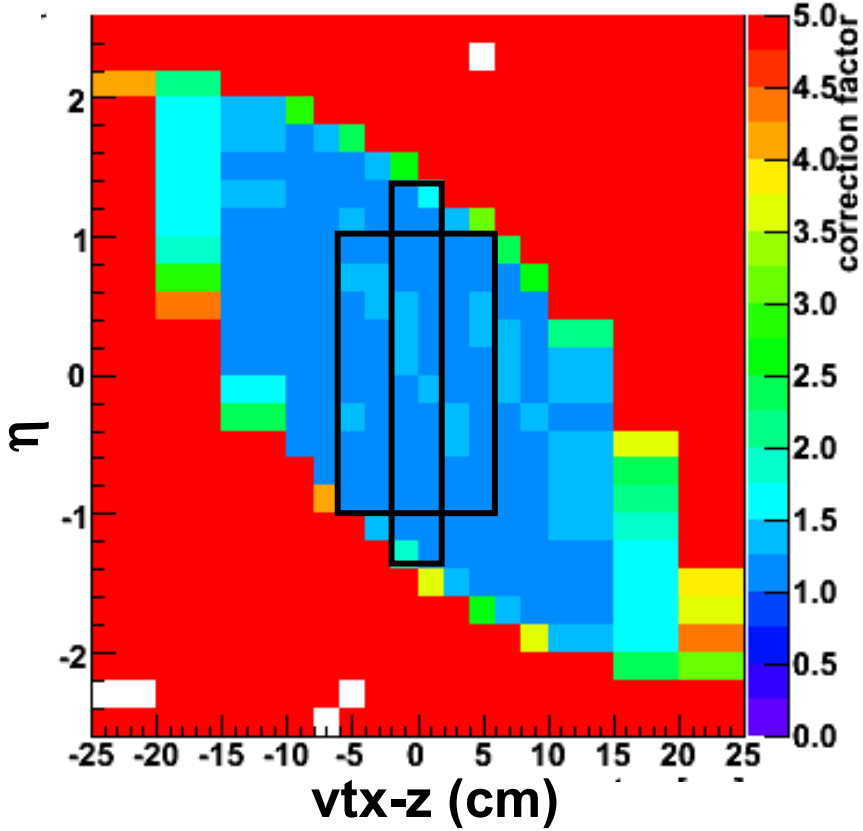
Blue is real pair with Z=0 (both particles are in acceptance).
Red is mixed pair with different Z's (one is in acceptance and other is out of acceptance).
We create the correlation!

Solution: mix only events which have a very similar z-vertex position!

Acceptance

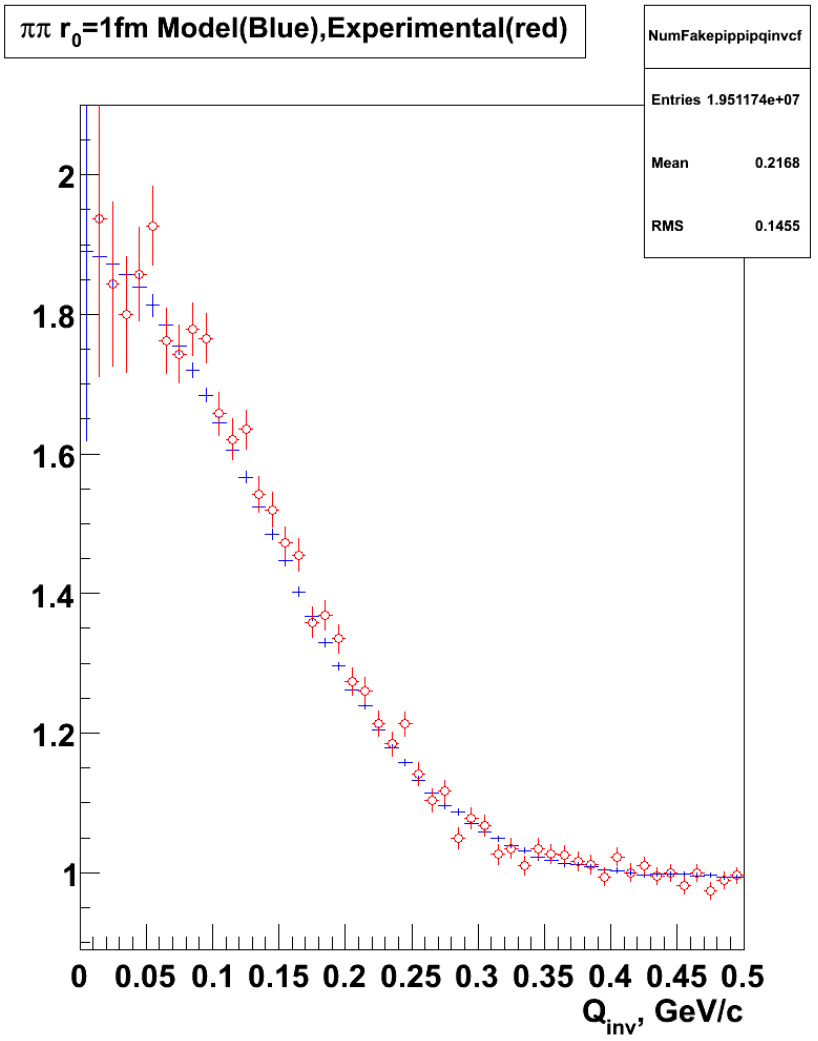
- Events at any position in the chosen vertex range have to accept the whole phase space (η) accessed in the analysis
- Trade-off between statistics (vtx-range) and accessible phase space
- |η| < 1.0 → |vtx-z| < 6 cm
- |η| < 1.4 → |vtx-z| < 10 cm

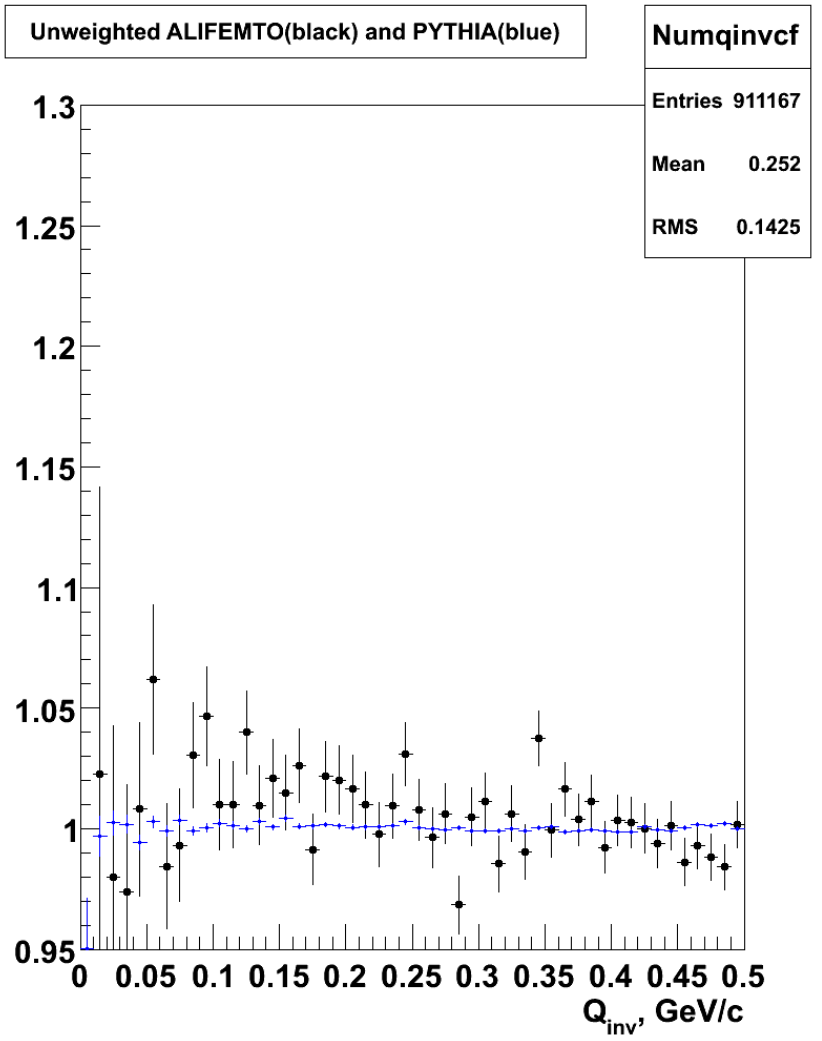
Tracking efficiency correction



Cut on Vz(±2.5cm)

mec->SetVertZPos(-2.5,2.5);





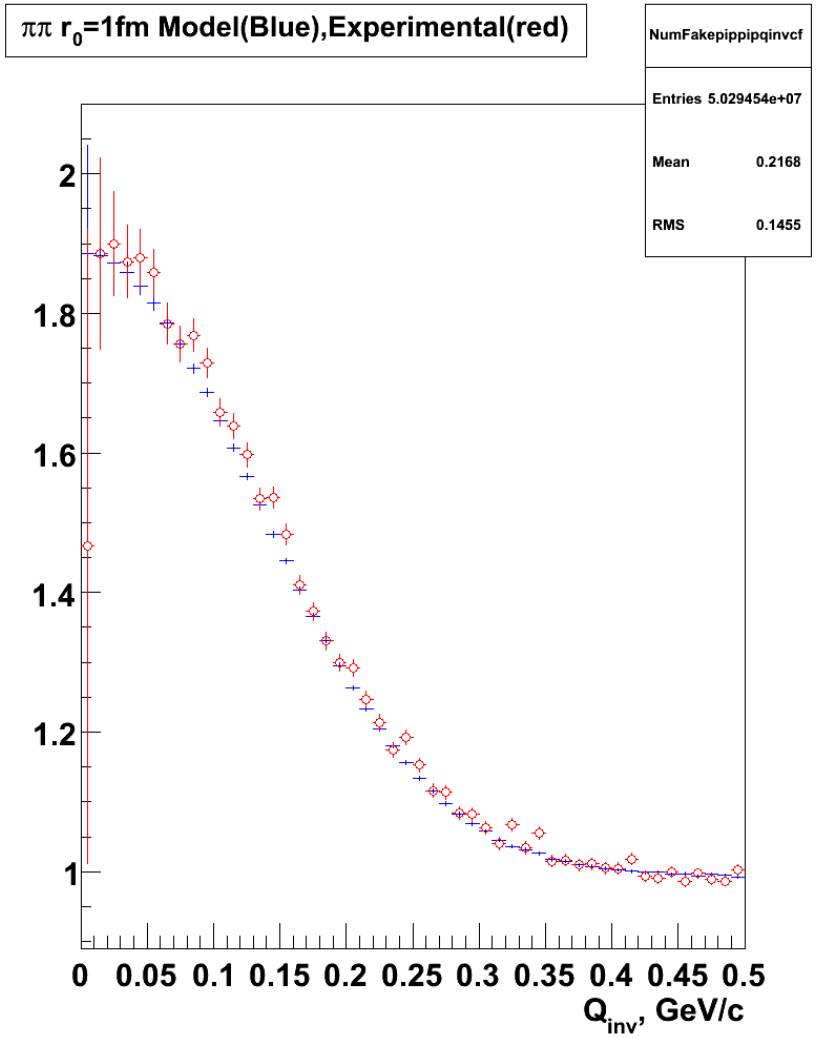
AliFemto ConfigFemtoAnalysis.C

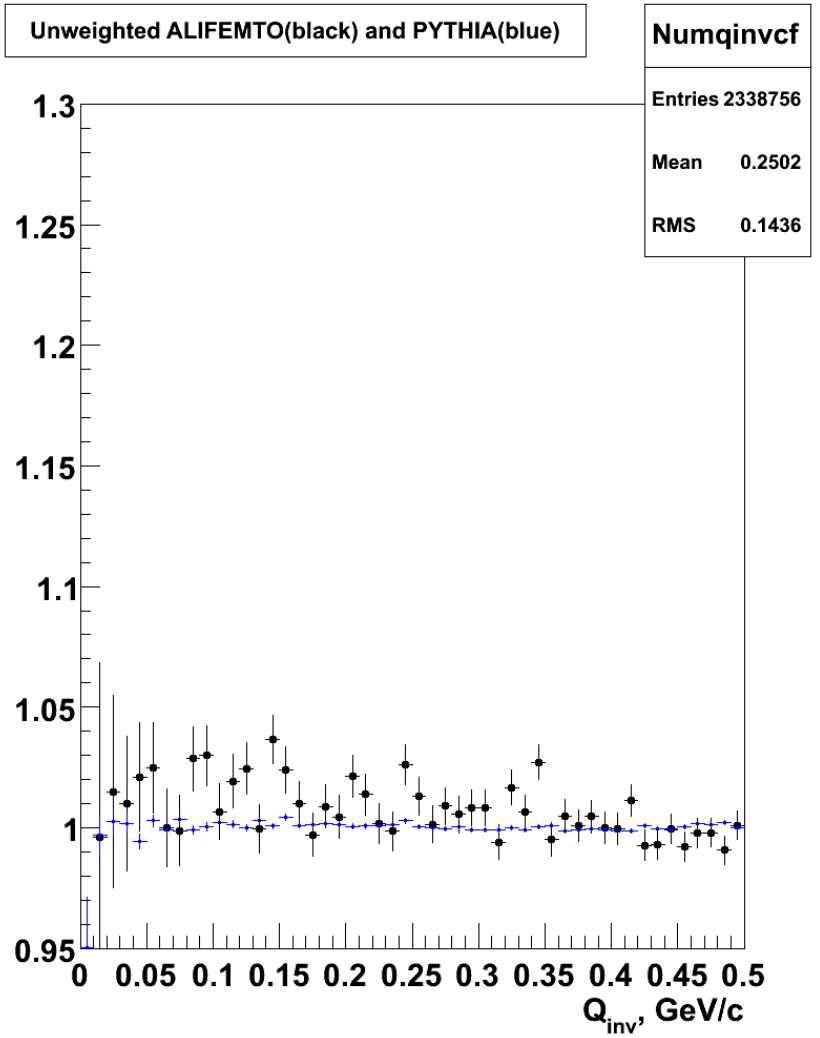
ConfigFemtoAnalysis.C

```
//#### Old ####

//Simple Analysis:

AliFemtoSimpleAnalysis* an =new AliFemtoSimpleAnalysis();


//#### New: STAR Vz, multiplicity mixing procedure####

//With z-vertex mixing:

AliFemtoVertexMultAnalysis *an =

                        new AliFemtoVertexMultAnalysis(NbinsVz, -15.6, 15.6, NbinsMulti, 2, 100);

an->SetNumEventsToMix(10);//Number of events to mix

an->SetMinSizePartCollection(2); //Minimum number of particles in event after all cuts


//Test with different cut parameters

//#1 NbinsVz=20 ,NbinsMulti=1

//#2 NbinsVz=1, NbinsMulti=10

//#3 Combined : NbinsVz=20 and NbinsMulti=10
```

Mixing: Z-vertex (20 bins)

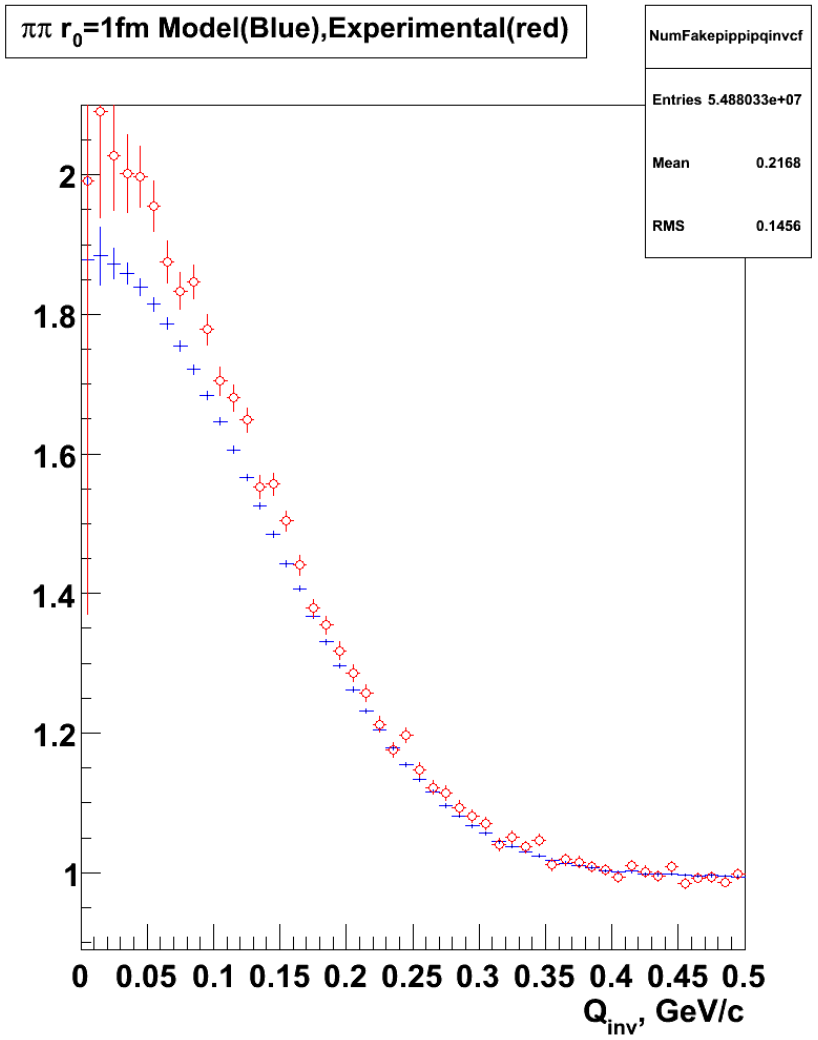
```
AliFemtoVertexMultAnalysis *an = new AliFemtoVertexMultAnalysis(20, -15.6, 15.6, 1, 2, 100);
an->SetNumEventsToMix(10);
an->SetMinSizePartCollection(2);
```

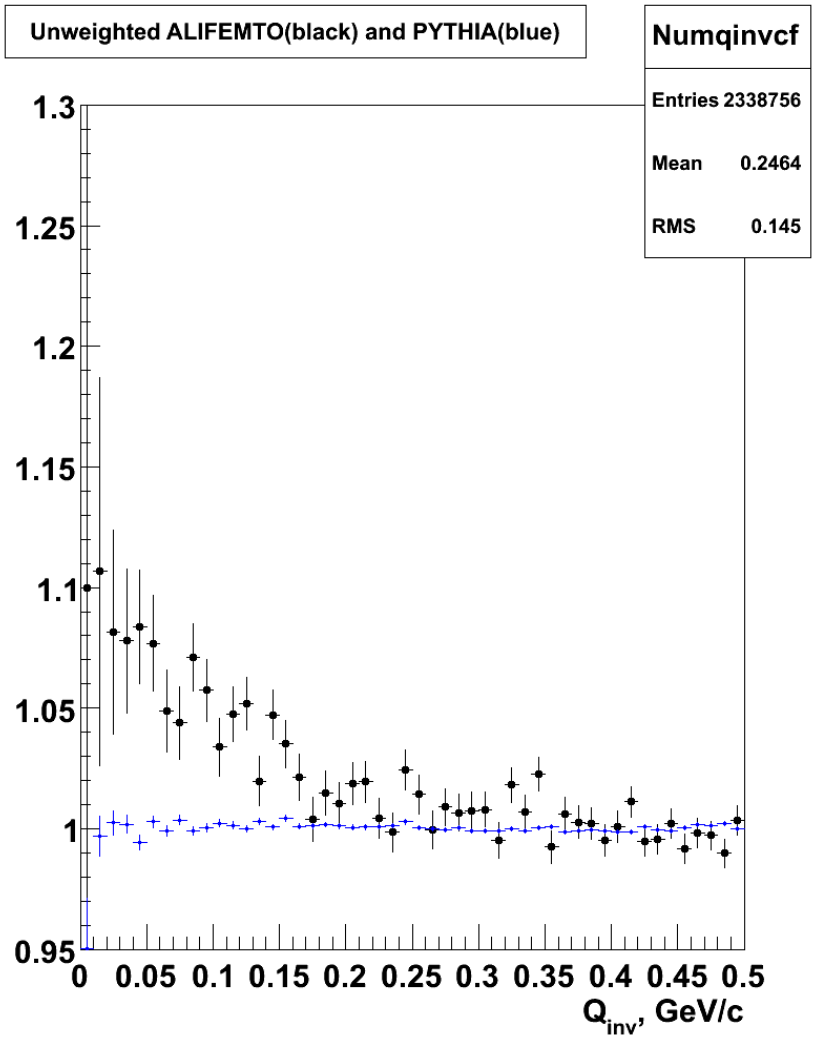




Mixing: Multiplicity(10 bins)

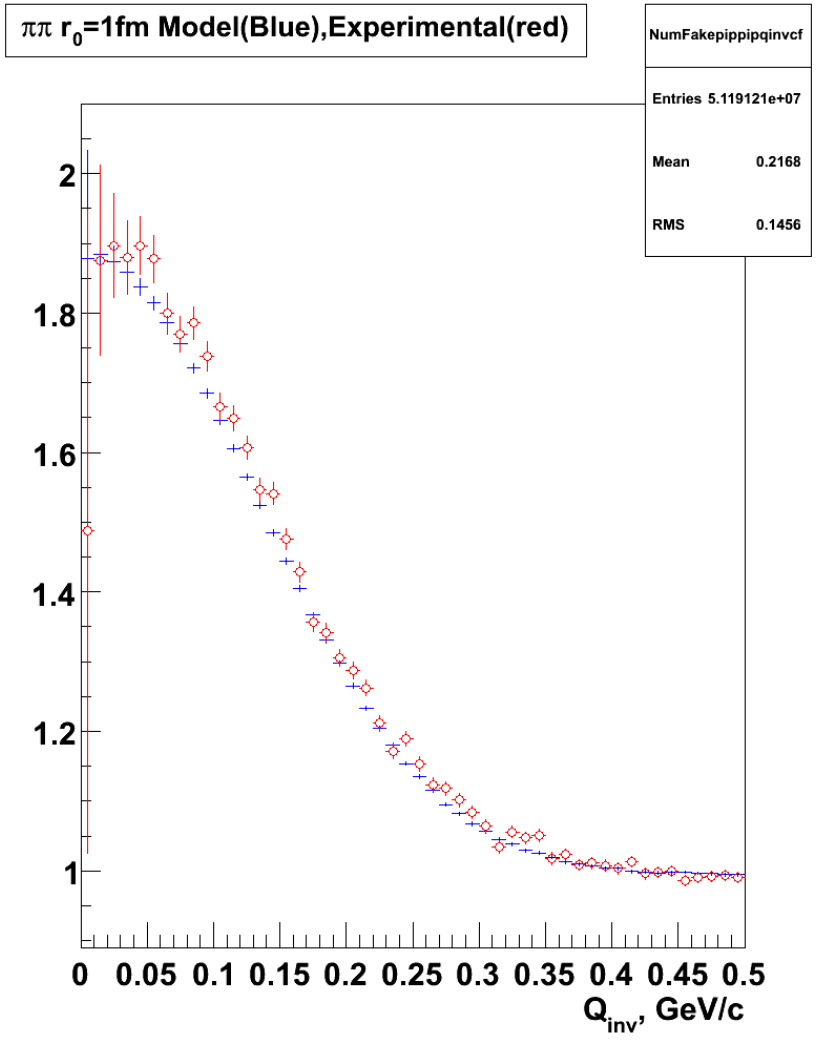
```
AliFemtoVertexMultAnalysis *an = new AliFemtoVertexMultAnalysis(1, -15.6, 15.6, 10, 2, 100);//10 bins on multiplicity
an->SetNumEventsToMix(10);
an->SetMinSizePartCollection(2);
```

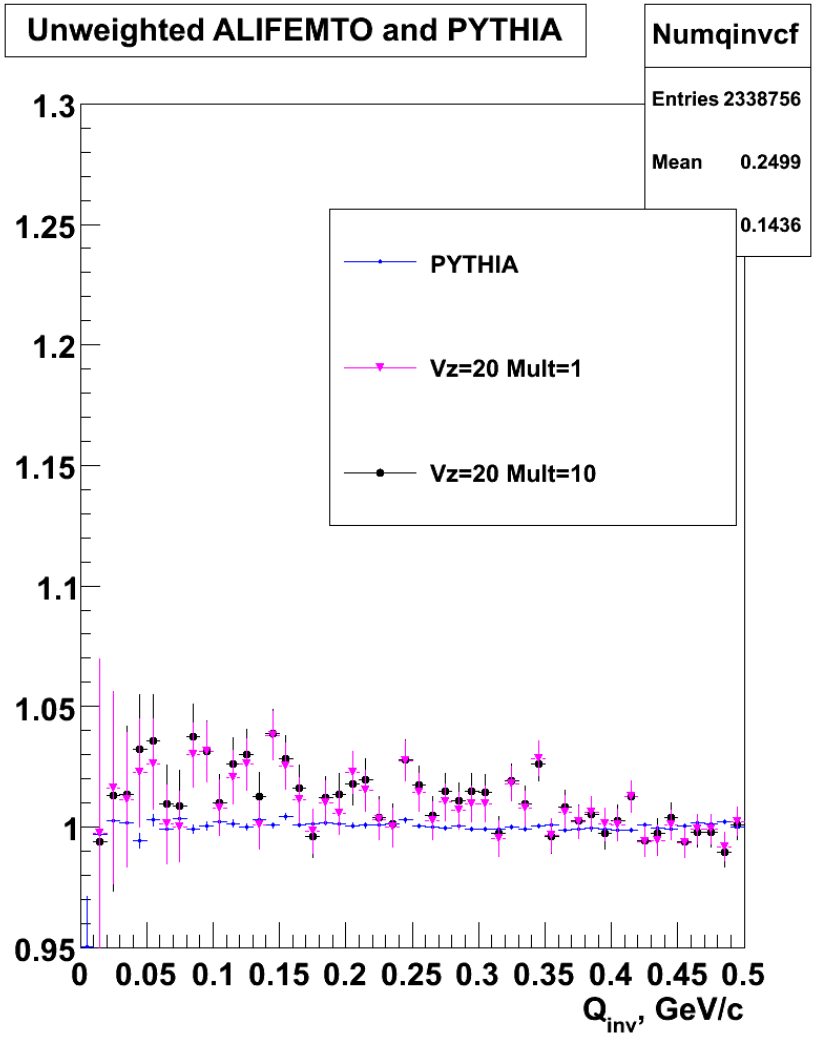




Combined: Vz+Mult (20+10bins)

```
AliFemtoVertexMultAnalysis *an = new AliFemtoVertexMultAnalysis(20, -15.6, 15.6, 10, 2, 100);
an->SetNumEventsToMix(10);
an->SetMinSizePartCollection(2);
```





Conclusion

- Vz,mutiplicity mixing procedure is very important
- Only events with at least two particle should be taken into analysis
- Vz mixing is most important in case of pp collision at 14TeV