Experience from analyzing pp collisions in ALICE

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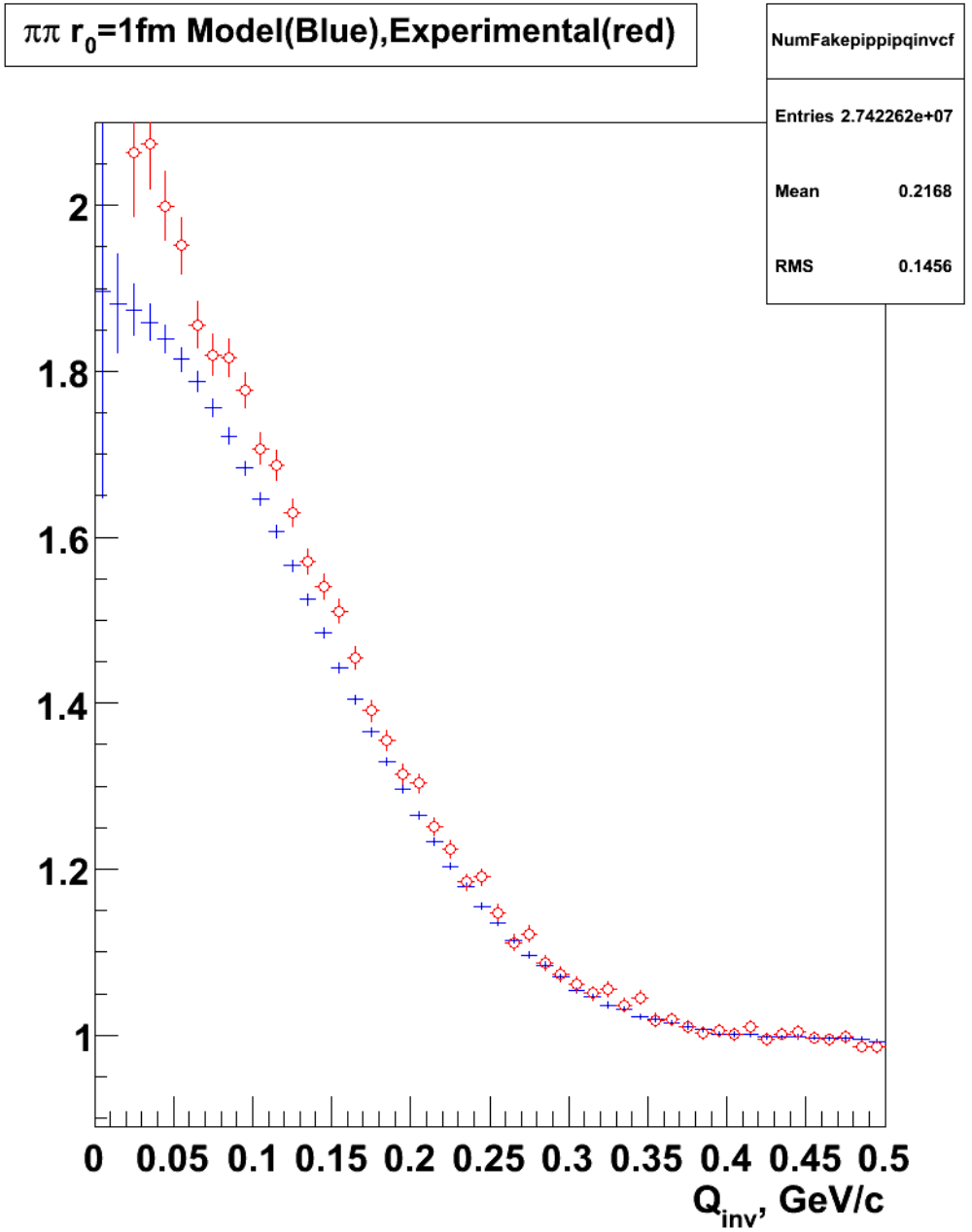
Simulations: software and input

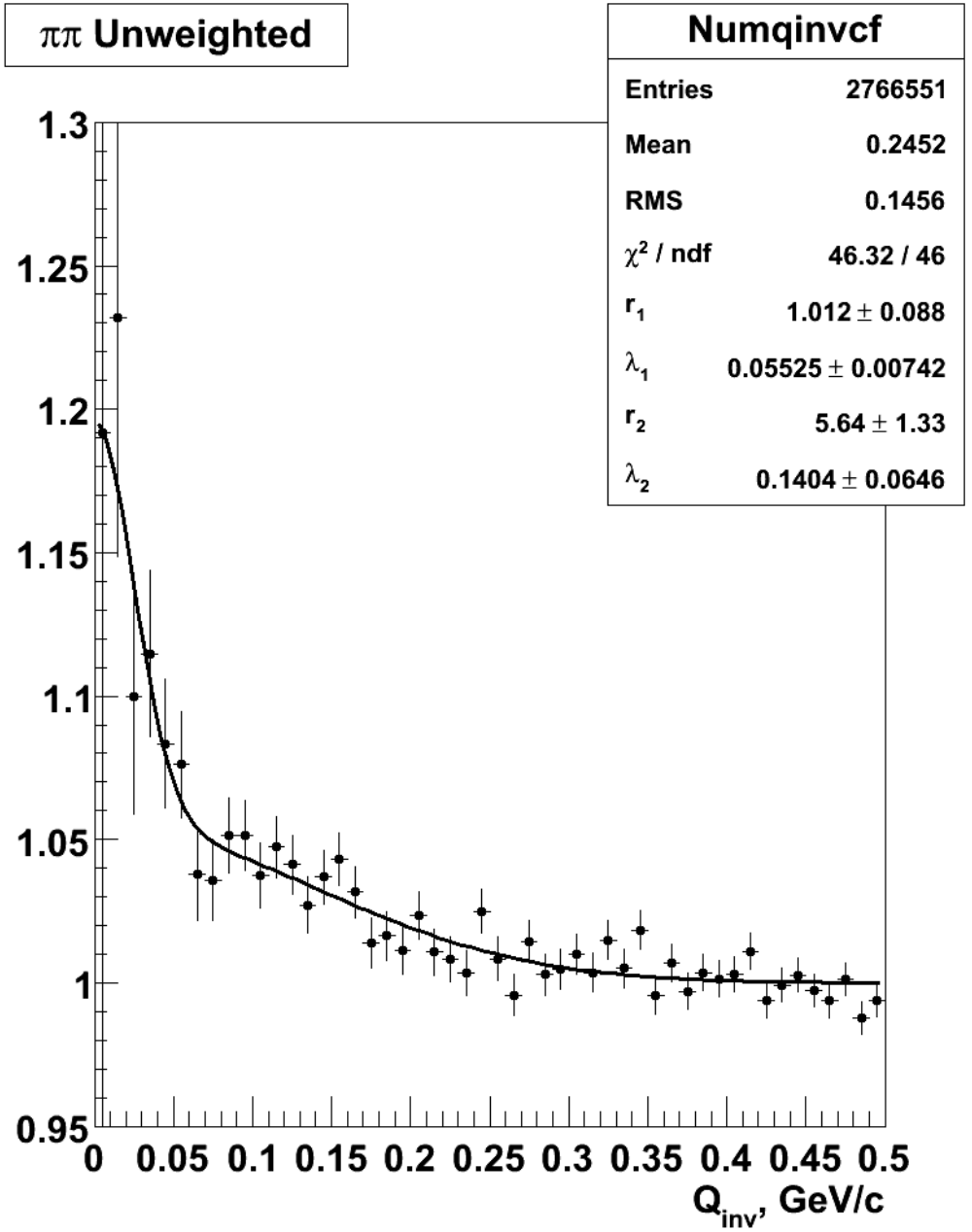
- Aliroot v4-14-Rev-01, AliFemto from svn/trunk
- PDC2007: PYTHIA pp 14 TeV

  (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:

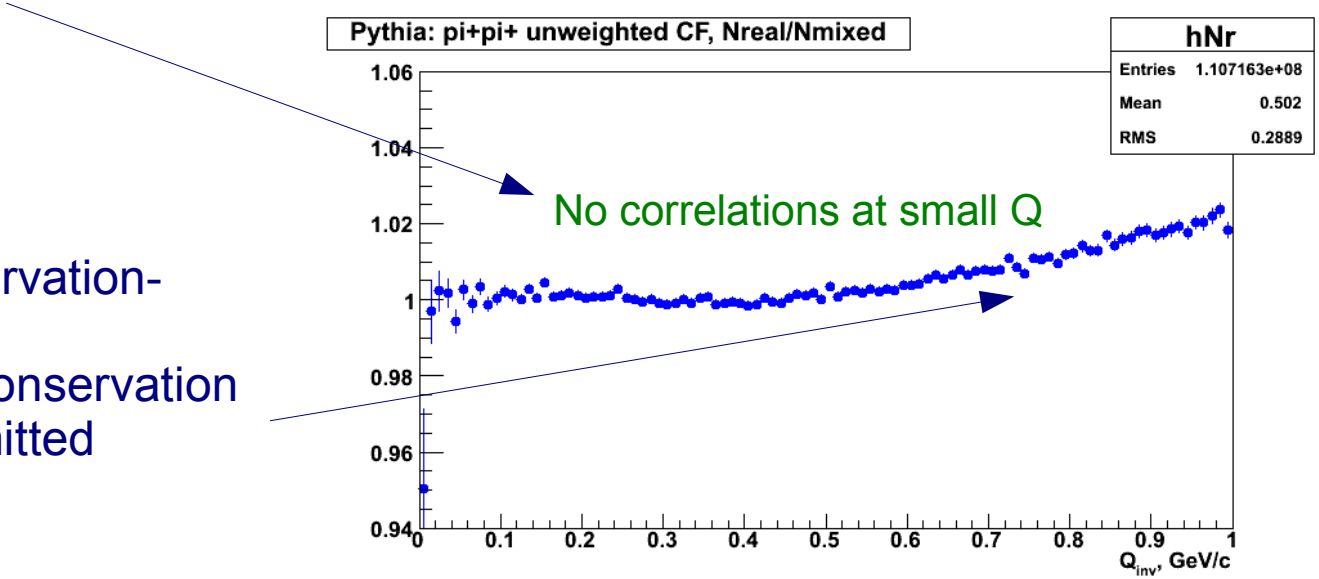
$0.1 < P_T < 1.0$ GeV/c

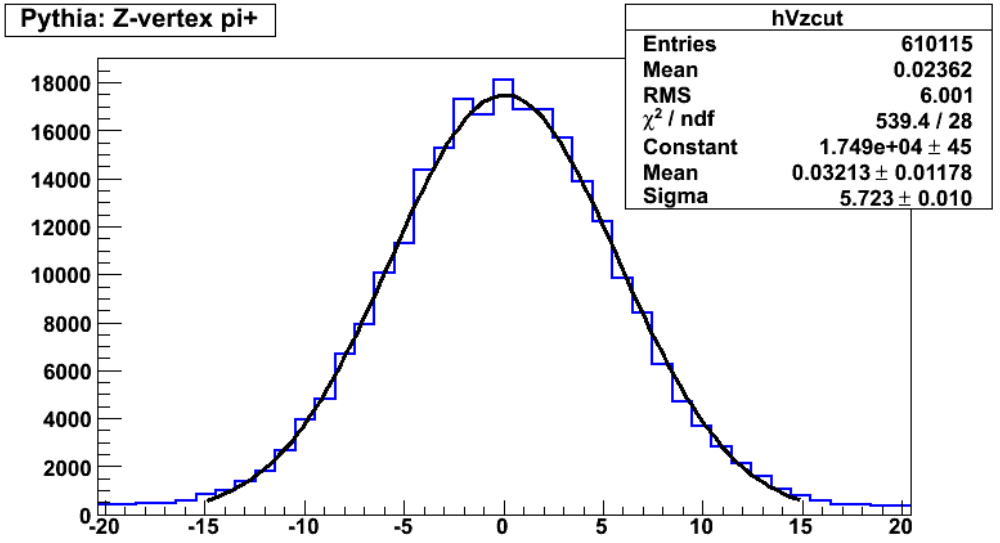
$-1. < \eta < +1.$

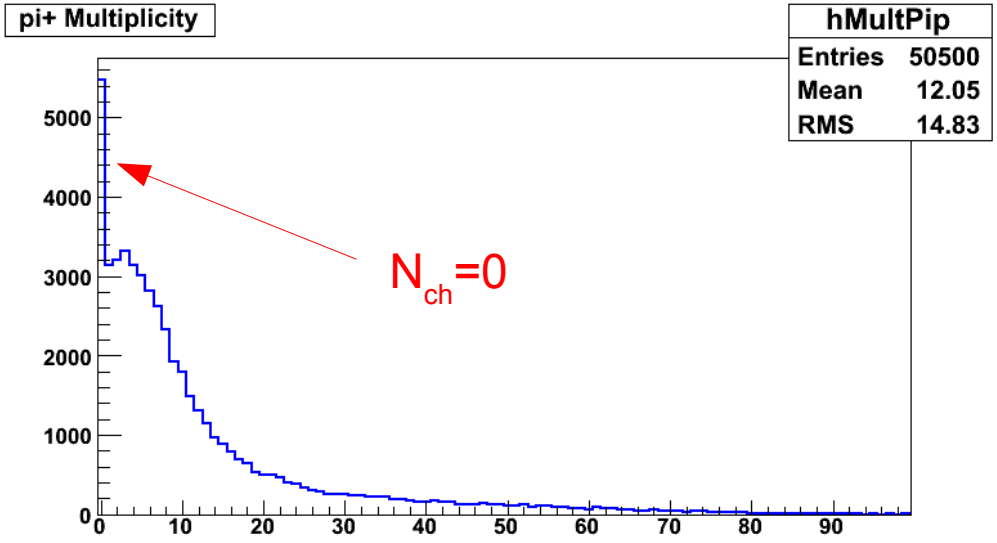
CF=Real/Mixed

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





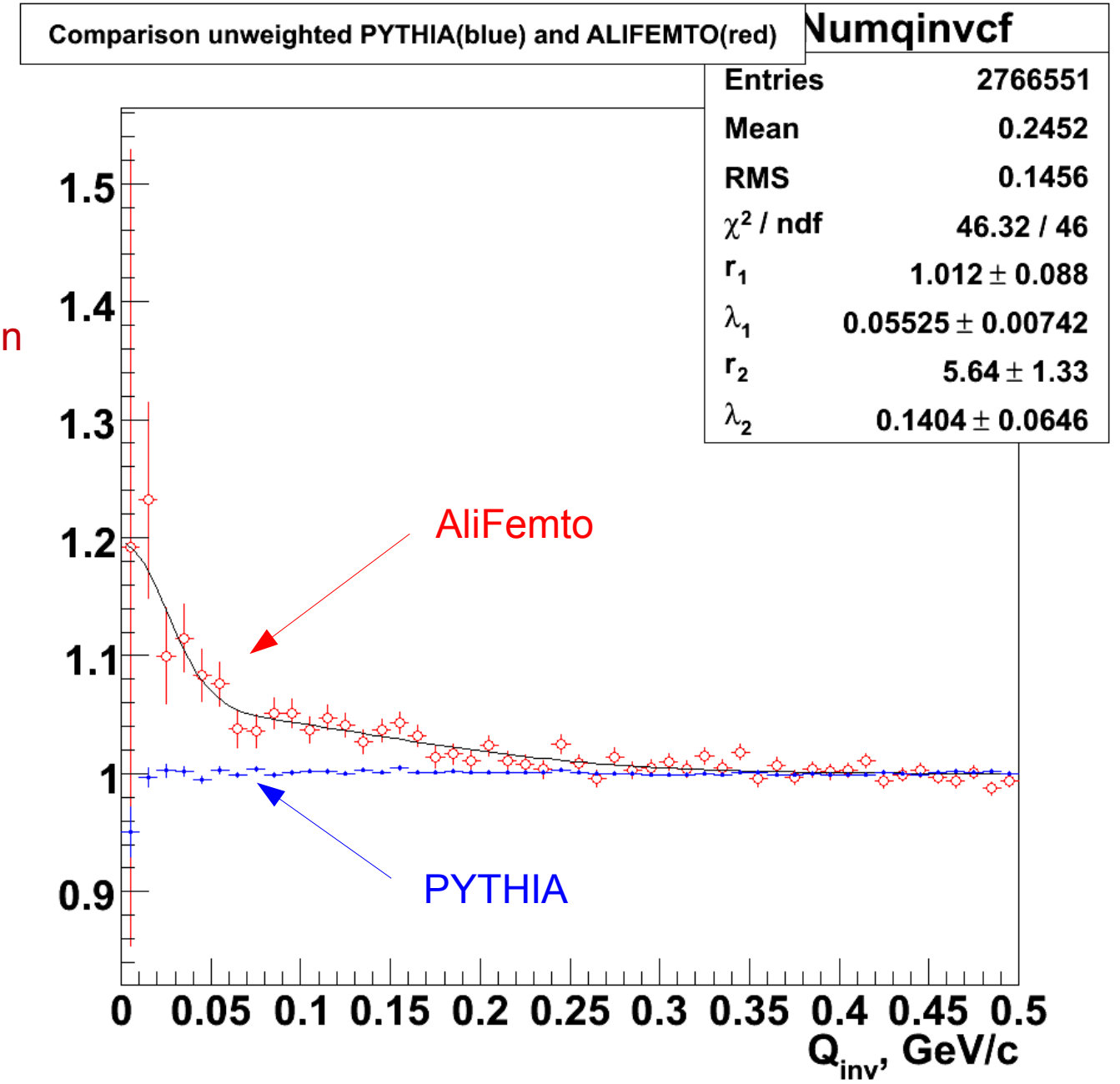


PYTHIA and ALIFEMTO

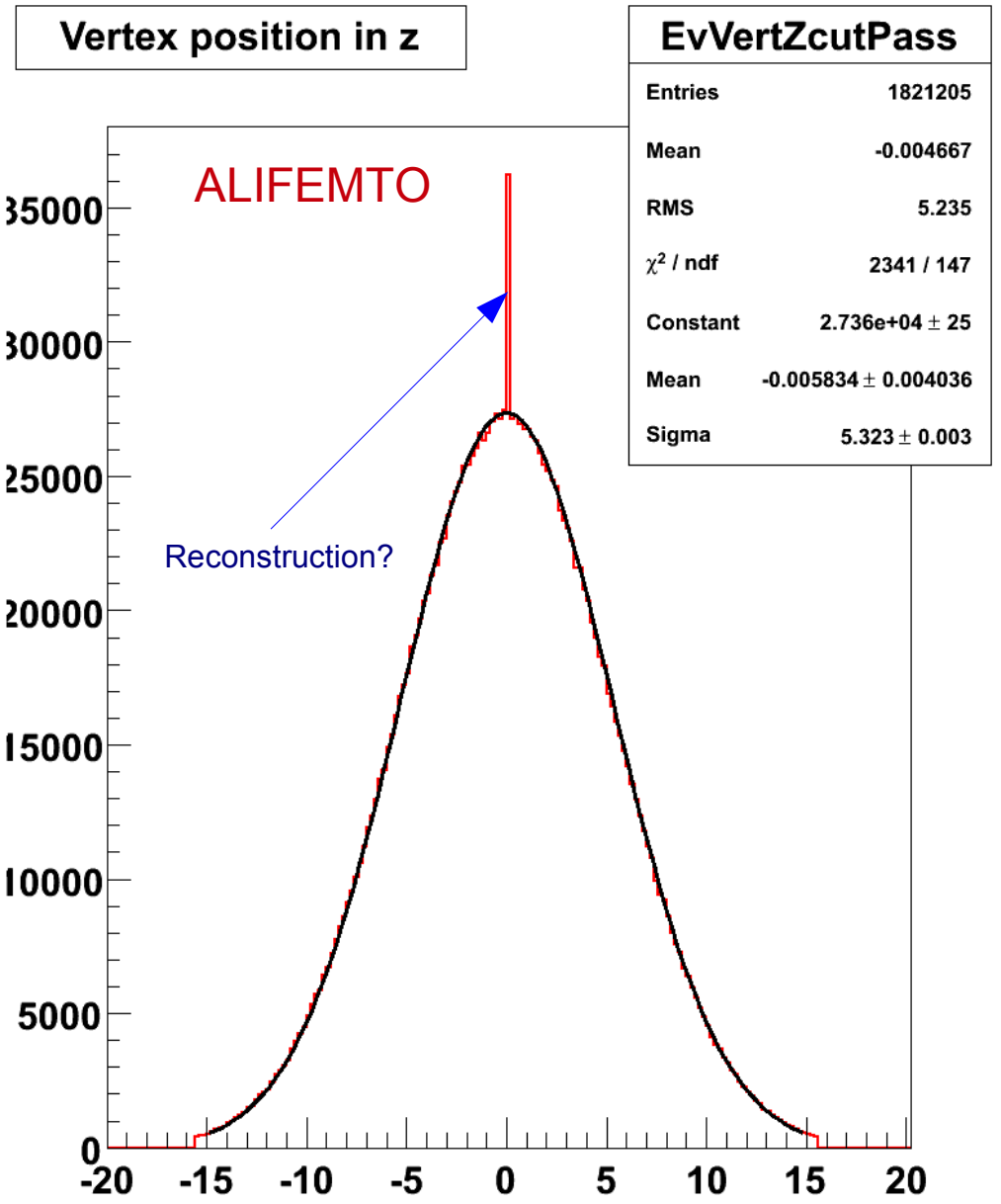
We created correlations which did not exist in PYTHIA.
CF was fitted with superposition of two Gaussian.

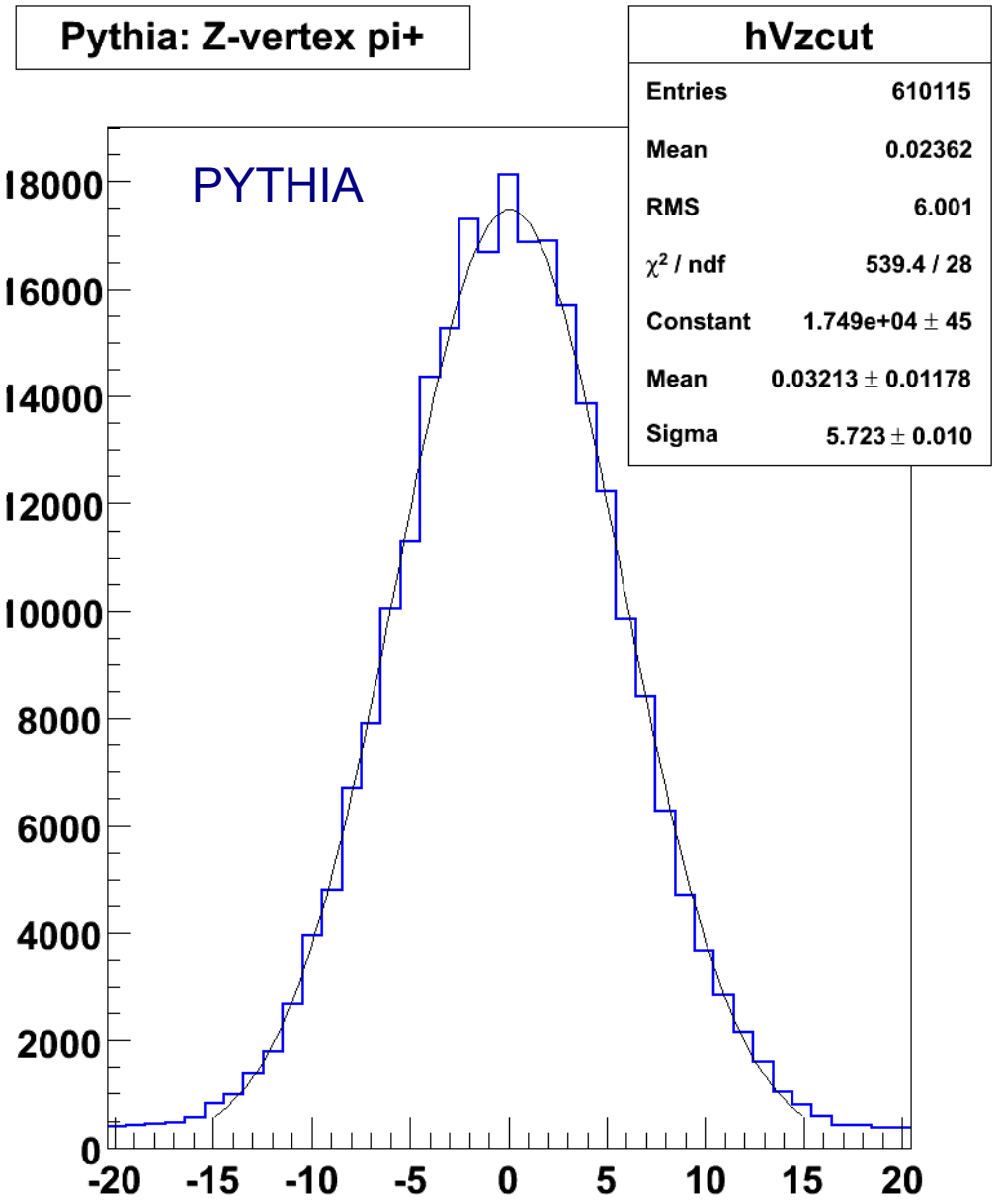
Artificial CF with direct pions and poins from resonances?

Does it come from mixing procedure?



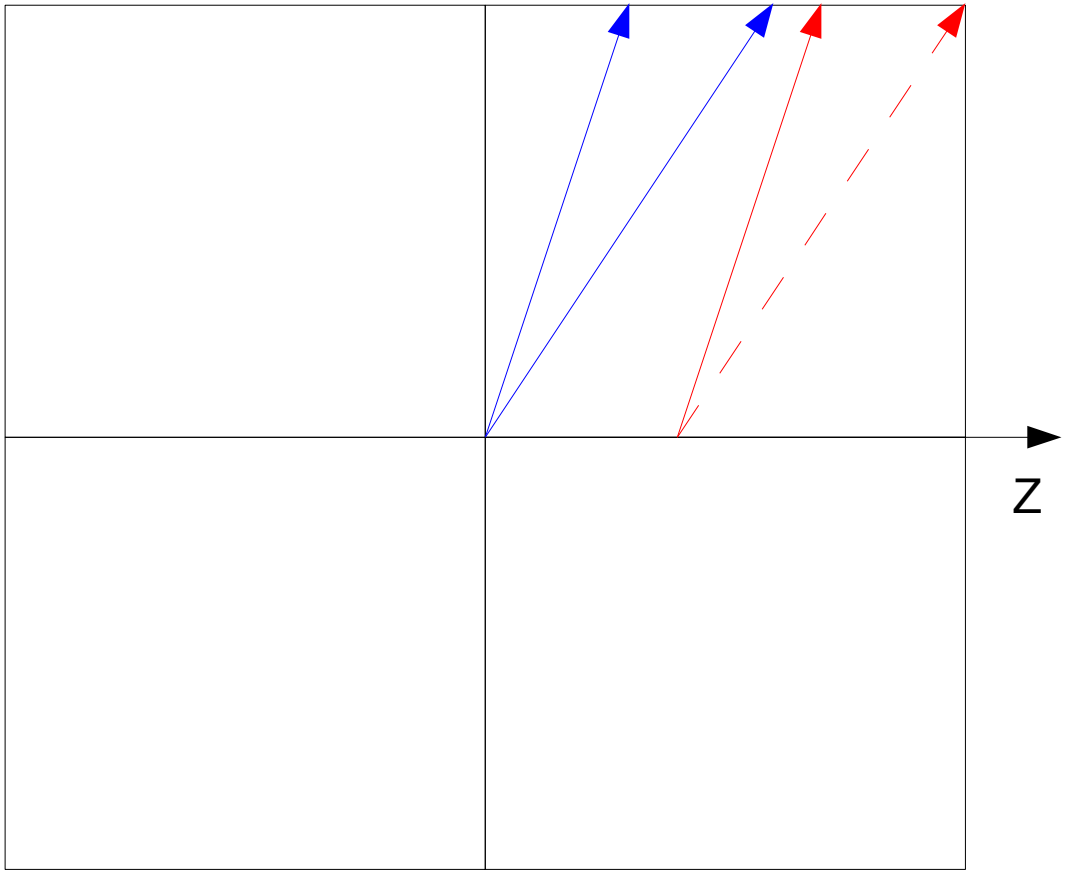
Vz: ALIFEMTO and PYTHIA





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!=0 (one is in acceptance and other is out of acceptance due to inefficiency close to edge of TPC).
We create the correlation!

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

CFs for different Vz

We can calculate correlation functions for different Z-vertex regions:

- Divide Vz onto three regions with approximately same statistics
  - Vz < -2.5 cm
  - -2.5 < Vz < 2.5 cm
  - Vz > 2.5 cm

- Divide Vz by two regions around Vz=0
  - -5.0 < Vz < 0.0 cm
  - 0.0 < Vz < 5.0 cm

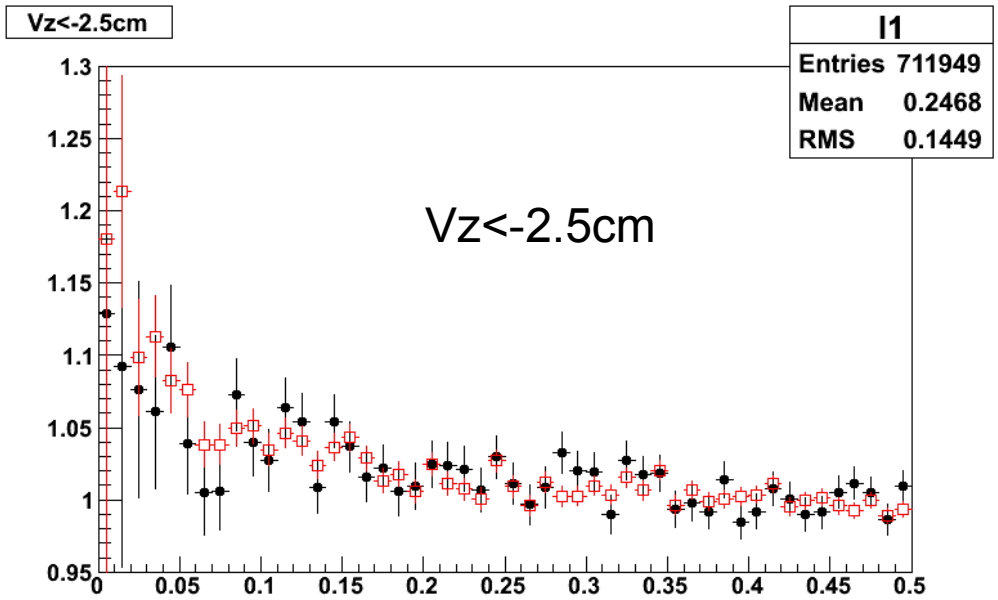
And add correlation functions from different regions according:

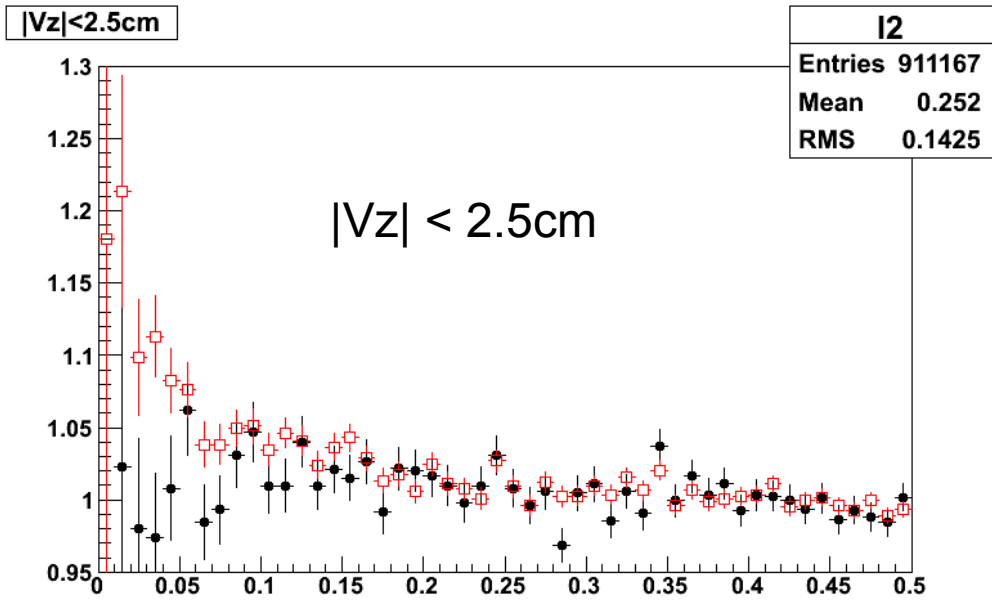
$$CF_{TOTAL} = \Sigma_{bin} (CF_1*w_1+CF_2*w_2+CF_3*w_3)/(w_1+w_2+w_3) \quad (1),$$

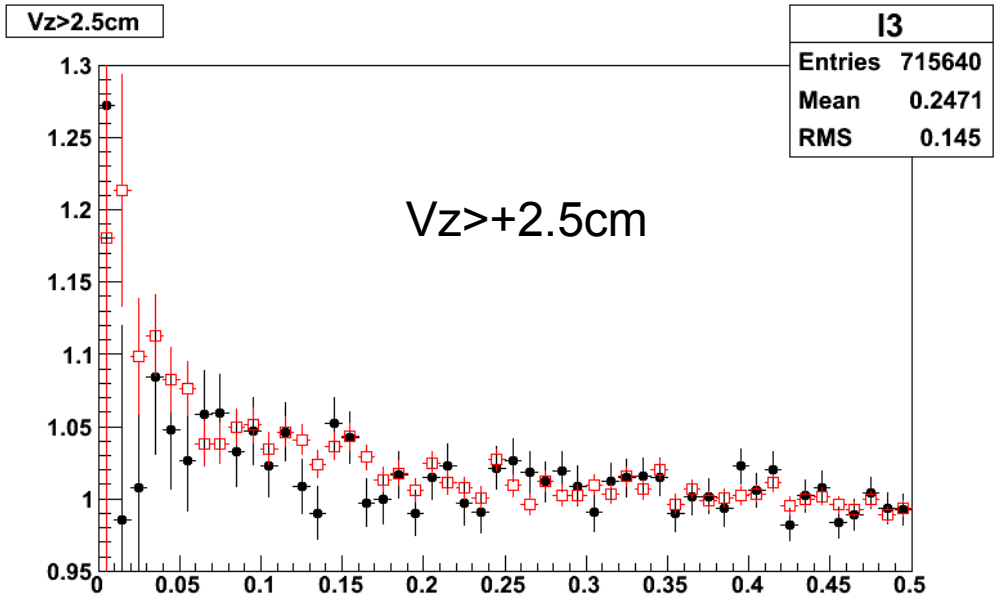
here $w=1/N$

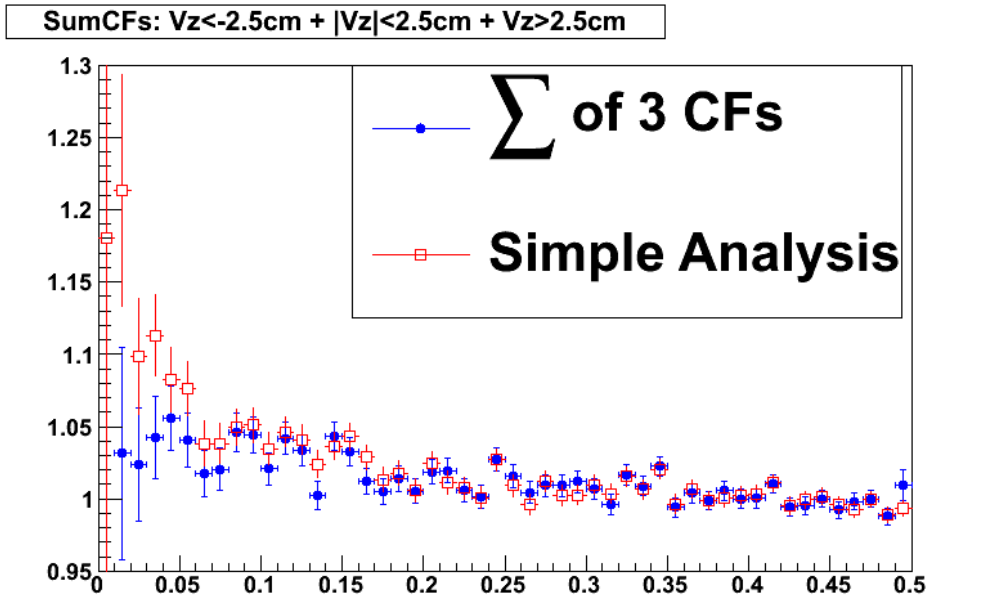
$$\Delta CF_{TOTAL} = 1/\mathrm{sqrt}(N_1+N_2+N_3) \quad (2)$$

Vz<-2.5,|Vz|<2.5,Vz>2.5 cm

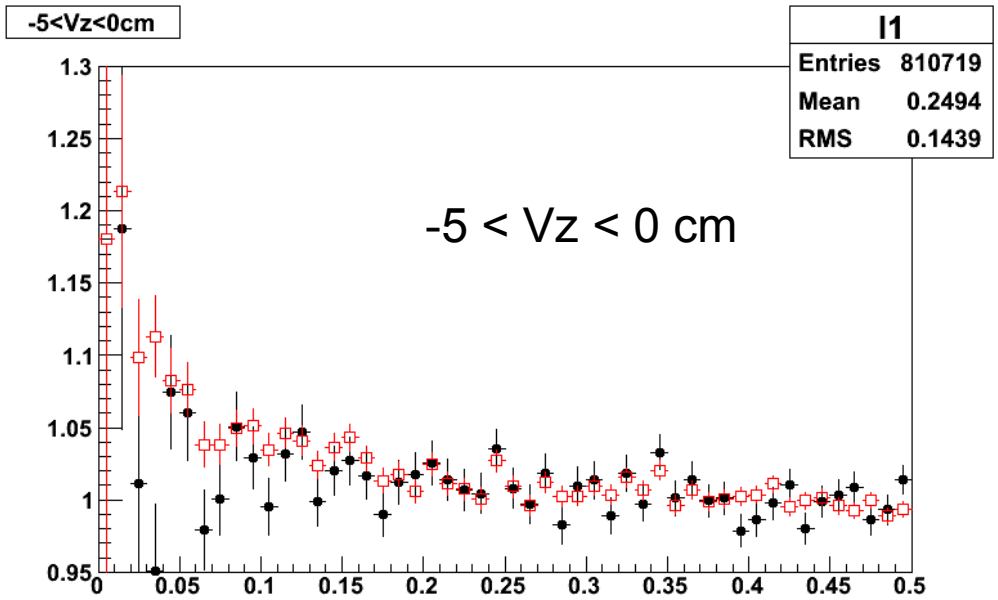


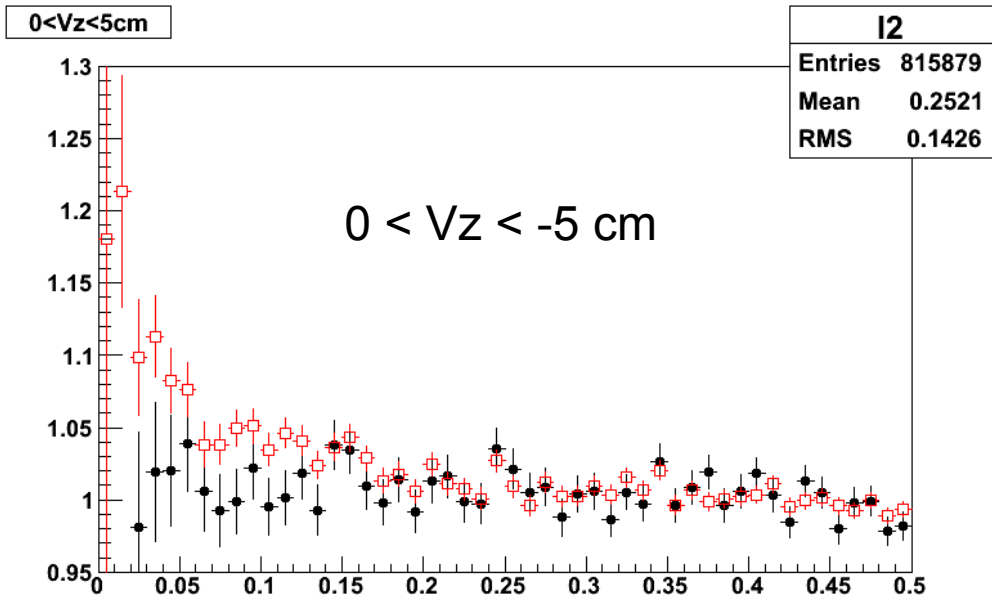


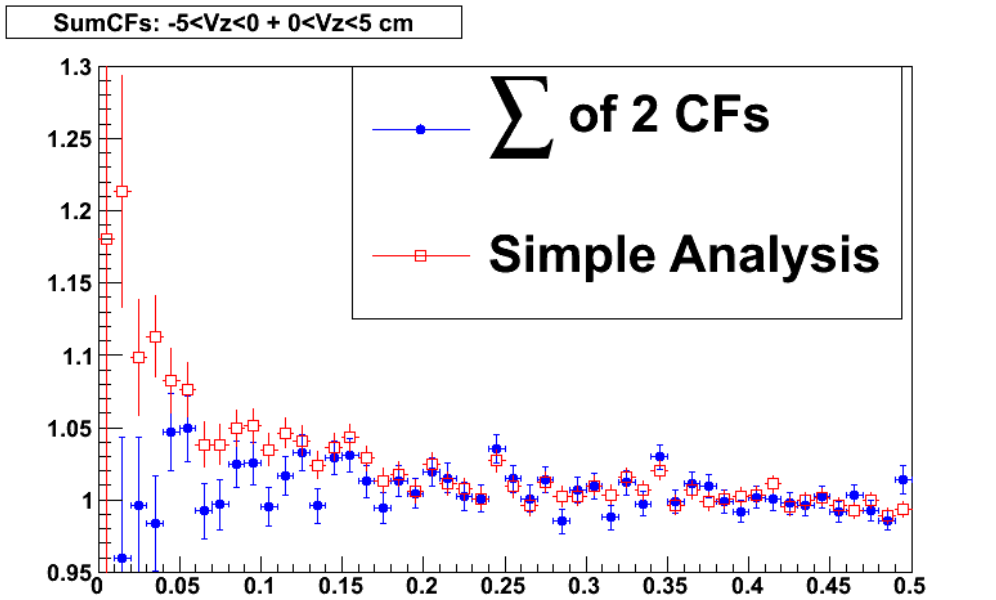


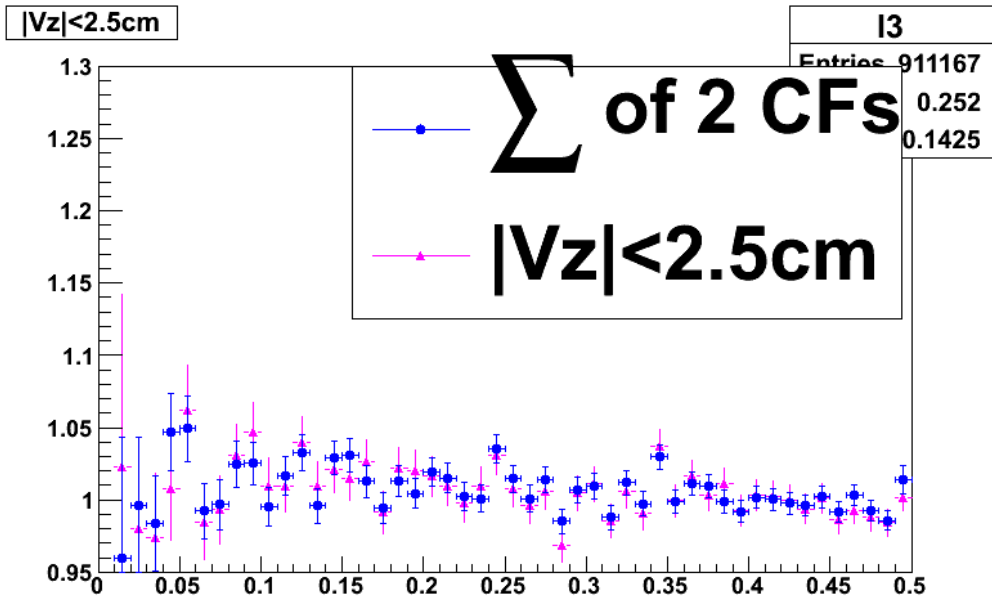


-5<Vz<0 and 0<Vz<5 cm







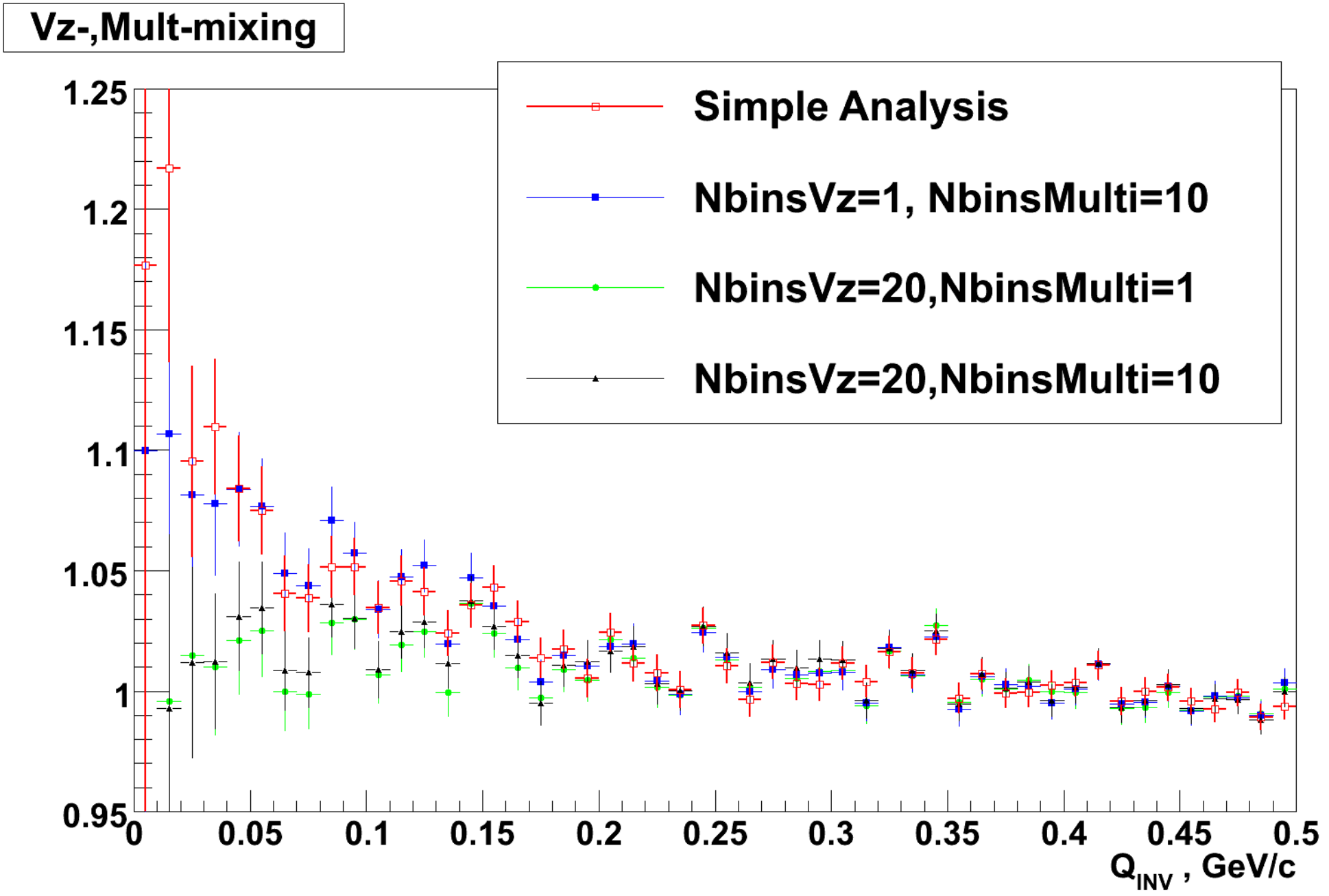


AliFemto ConfigFemtoAnalysis.C

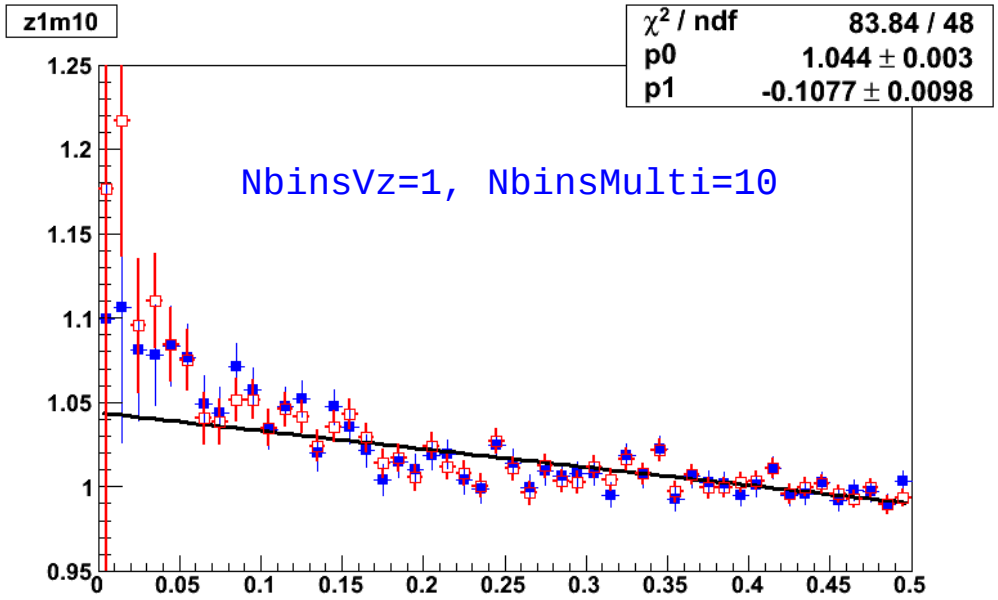
ConfigFemtoAnalysis.C

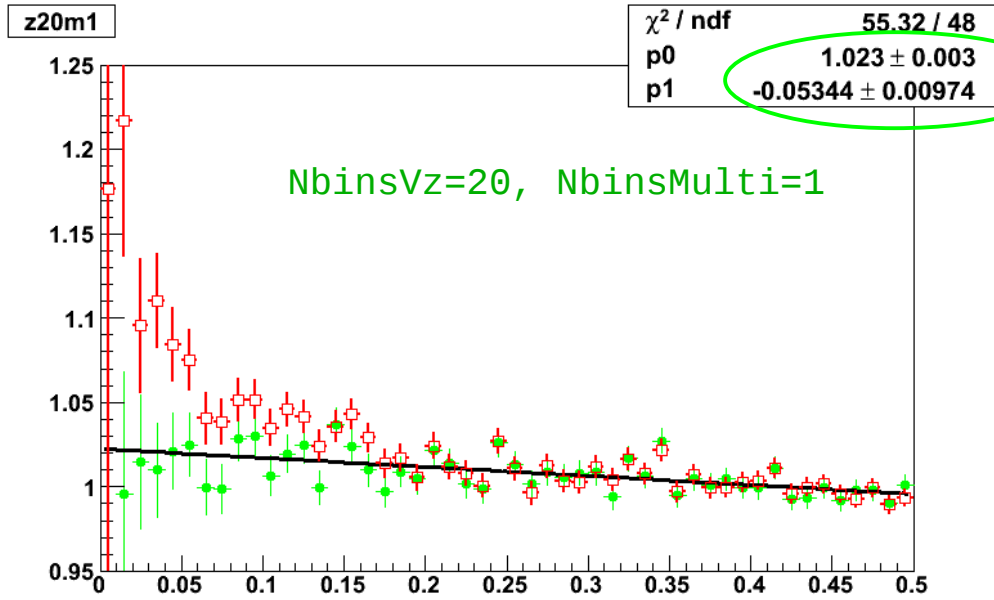
```
//#### Old ####

//Simple Analysis:

AliFemtoSimpleAnalysis* an =new AliFemtoSimpleAnalysis();


//#### New: STAR Z-vertex and 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
```

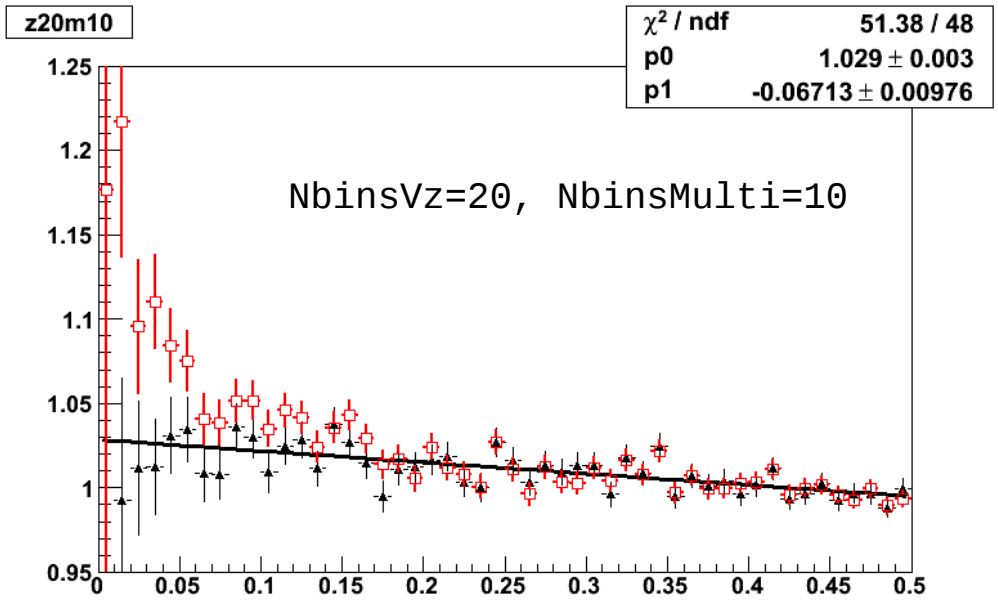
Vz and Multiplicity mixing

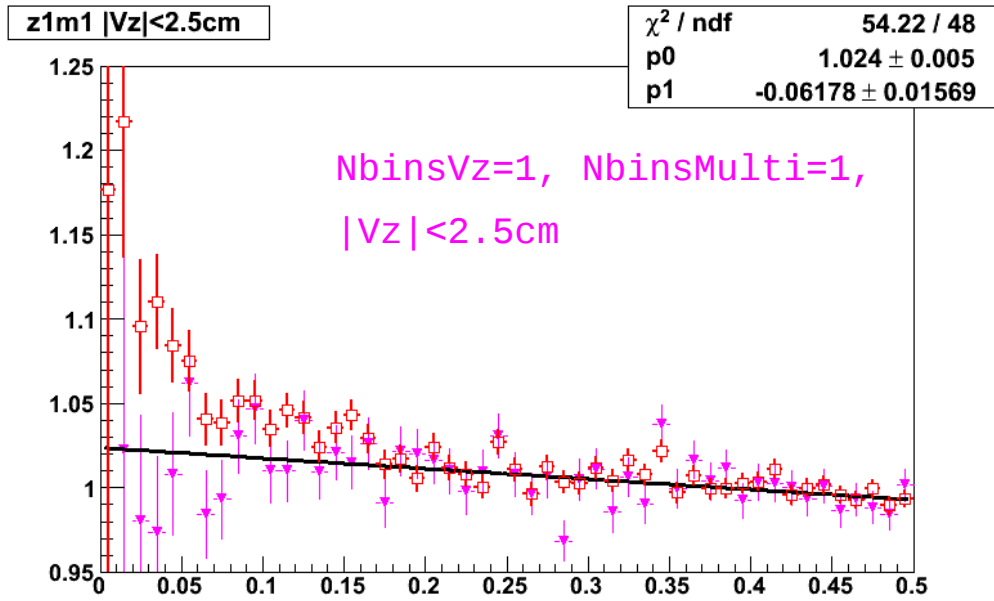


Vz,Multiplicity, and |Vz|<2.5cm









Conclusion and To Do

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

After a lot of studies we still have a slope in the CF (CF~ 1.02-0.05*Q)

- To be studied *multiplicity cut* (m>3, m>4, m>5,...)
- To be studied *rapidity cut* (-1<y<0, 0<y<+1)
- We need additional monitors (histograms):
  - Multiplicity
  - TPC efficiency: 2D plot rapidity vs Vz