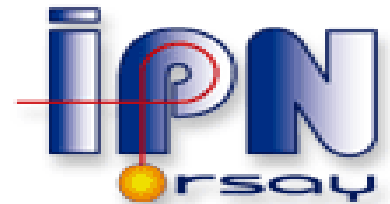


*LHE tracking with GEM:
systematic studies*

Małgorzata Sudół



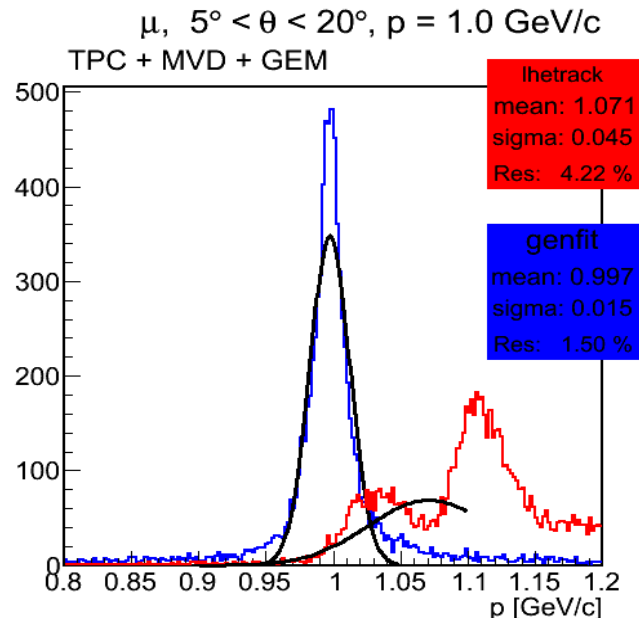
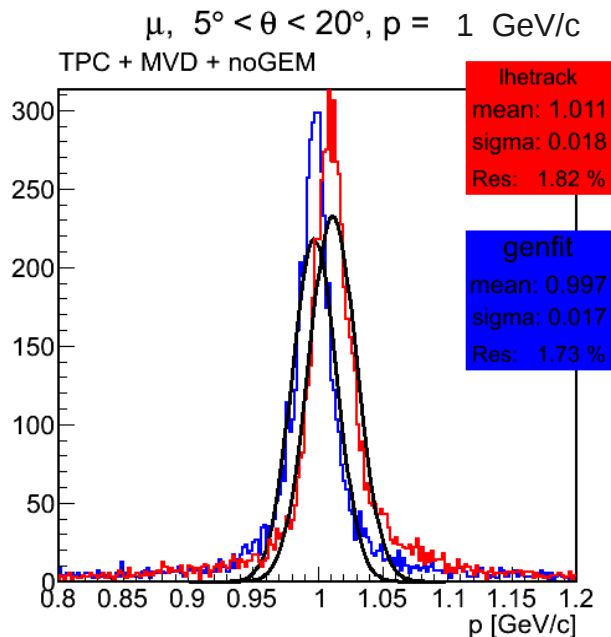
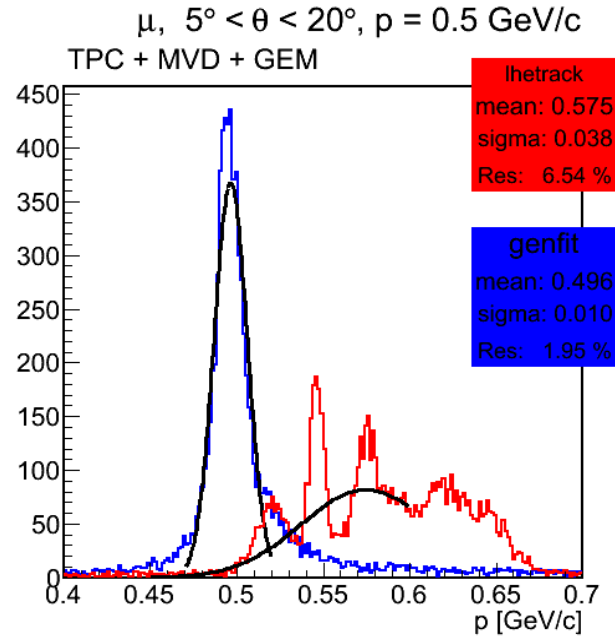
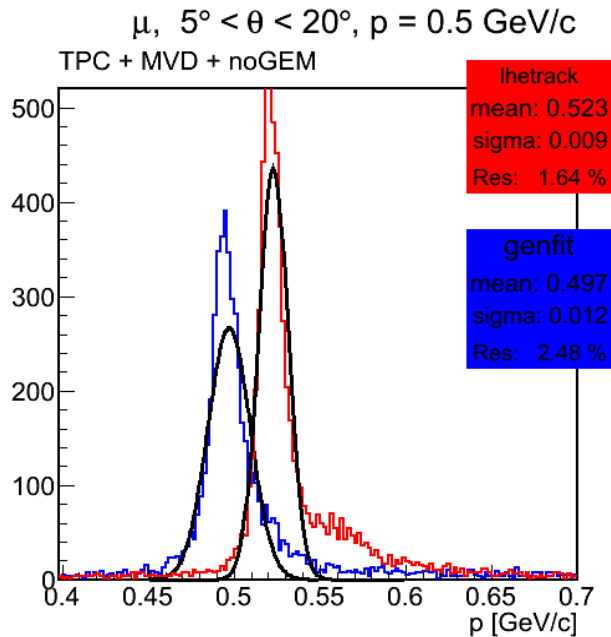
Outline

- GEM detectors inside lhetrack -> see Stefano talk
- Settings for the simulation
- Study of the momentum resolution
- Reconstruction efficiency
- Comparison TPC and STT
- Comparison with & without GEM
- Outlook

Settings of the simulation

- 1 muon per event
- 10k events for each case
- θ range (5;20)
- Full φ angle
- Momenta: 0.5, 0.8, 1, 2, 3, 5 GeV/c
- Tracking system STT or TPC

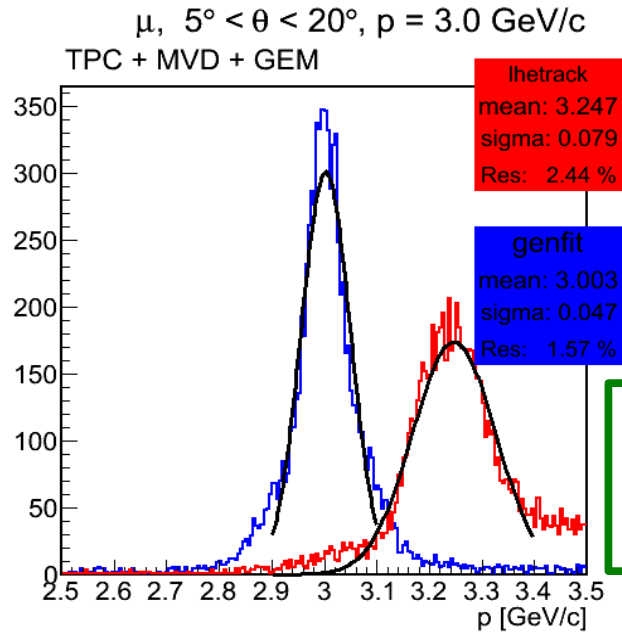
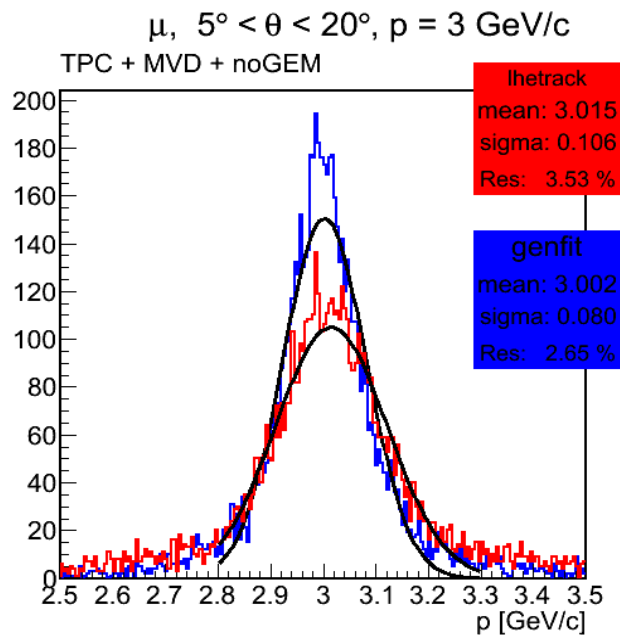
Momentum reconstruction $MVD+TPC \pm GEM$



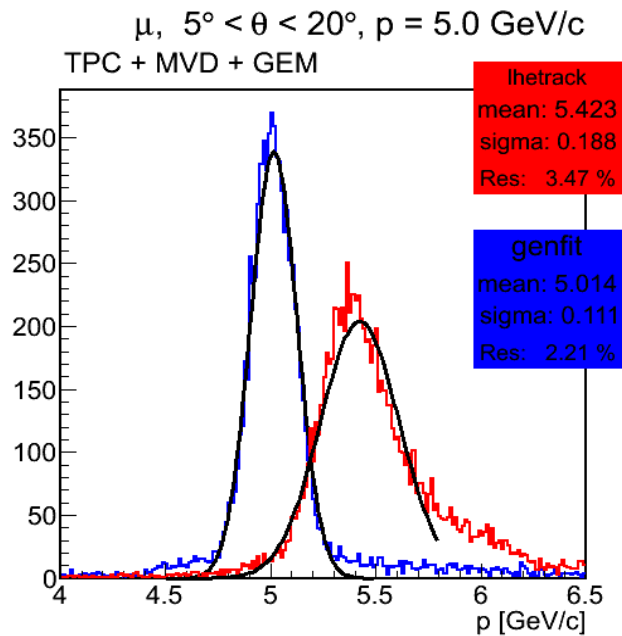
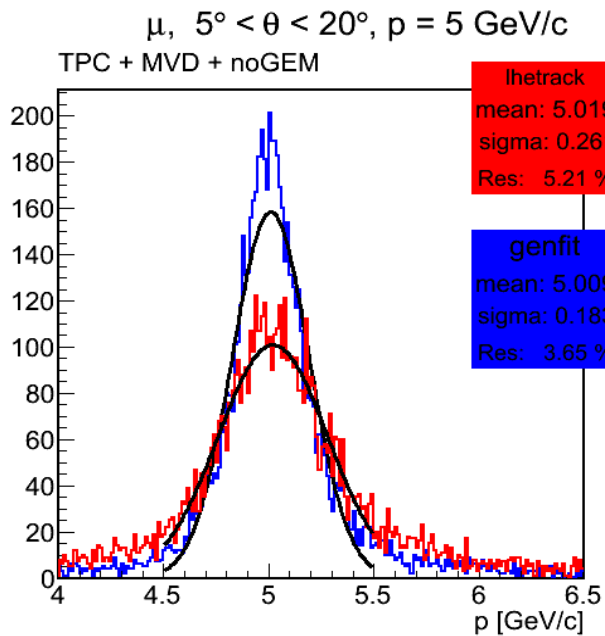
GEM inside lhetrack

- Problems with momentum
 - momentum shift
- For low momenta several structures are developing
- GEM improves resolution
- Genfit correct momenta
- Further resolution improvements with genfit

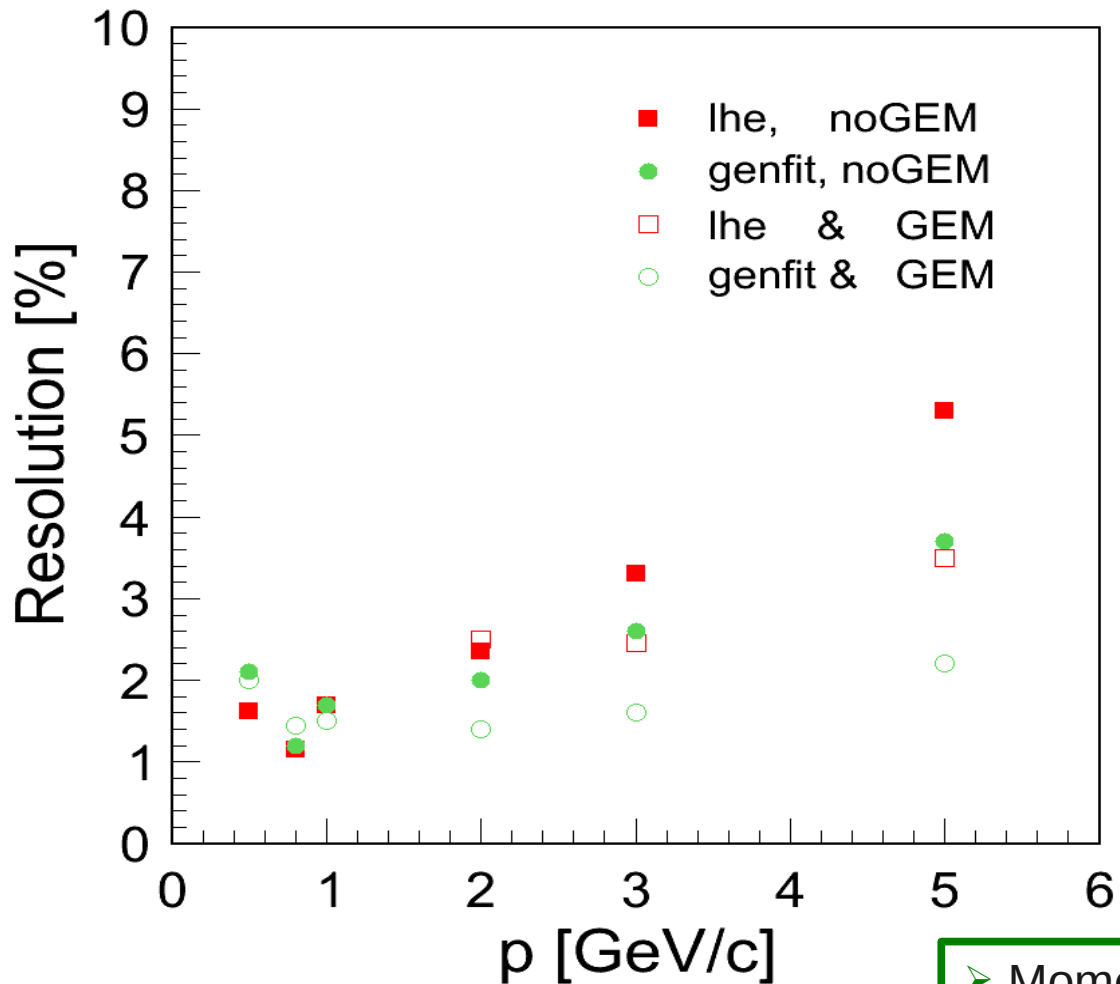
Momentum reconstruction $MVD+TPC \pm GEM$



For higher momenta constant shift of reconstructed momentum from lhetrack: 8%



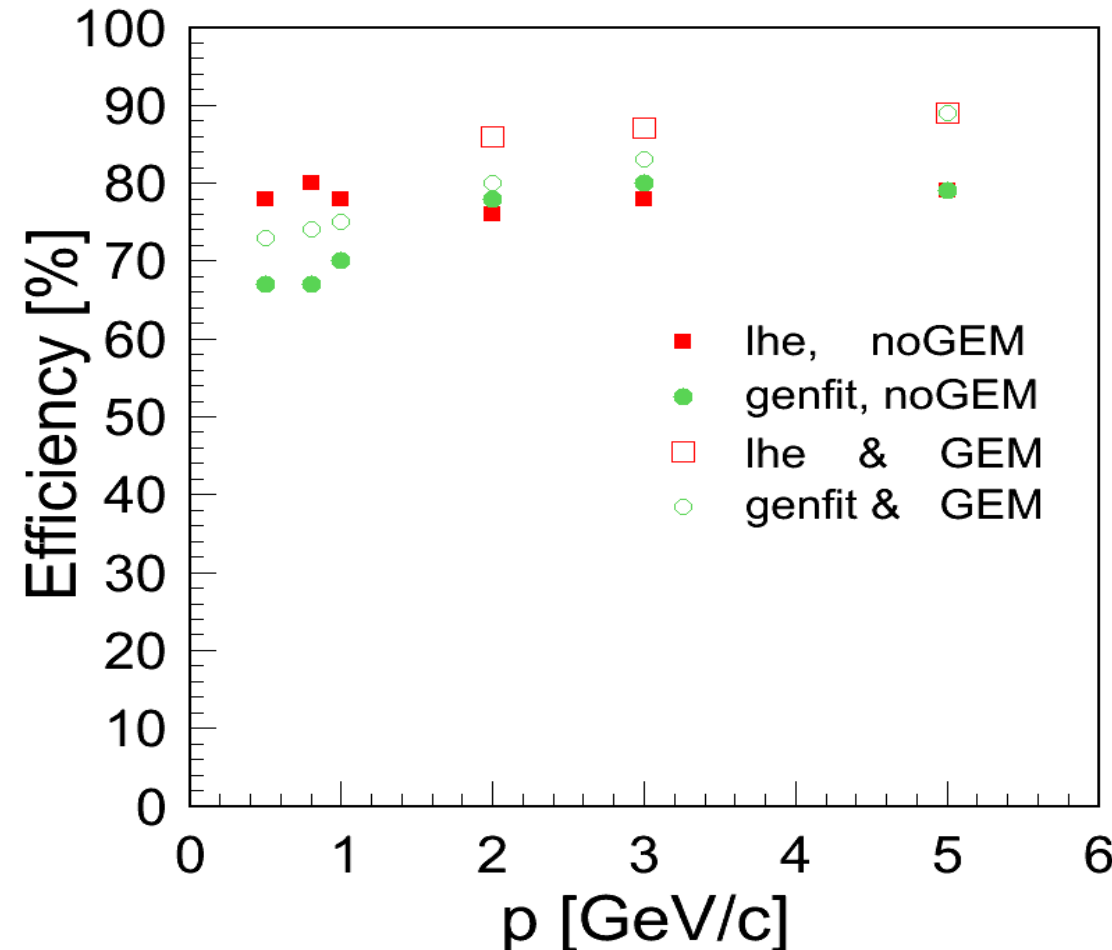
Momentum resolution: $MVD + TPC +/- GEM$



- Momentum resolution increase if GEM present.
- Additional increase of resolution with genfit.

No fit performed for low momenta ($p < 2 \text{ GeV/c}$) in case of lhetrack & GEM.

Reconstruction efficiency: *MVD + TPC +/- GEM*



Taking into account all reconstructed tracks efficiency of tracking is 99.9%.

Efficiency estimates:

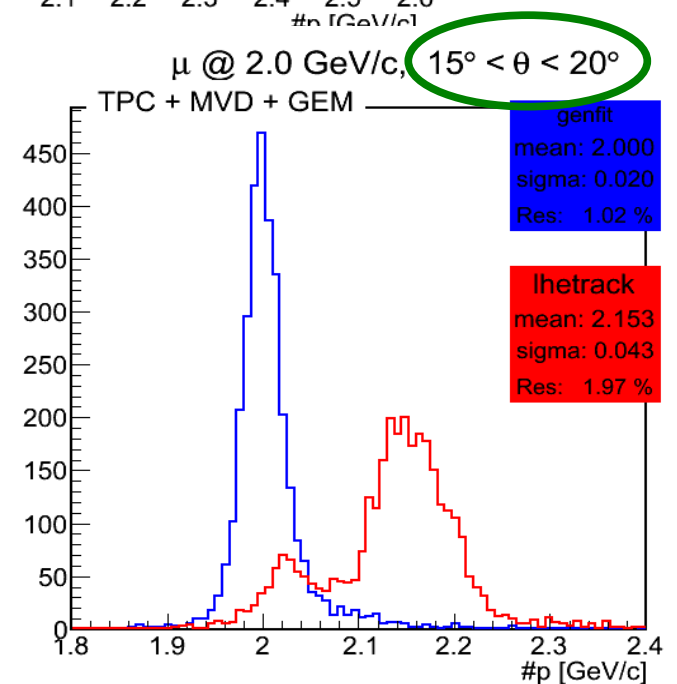
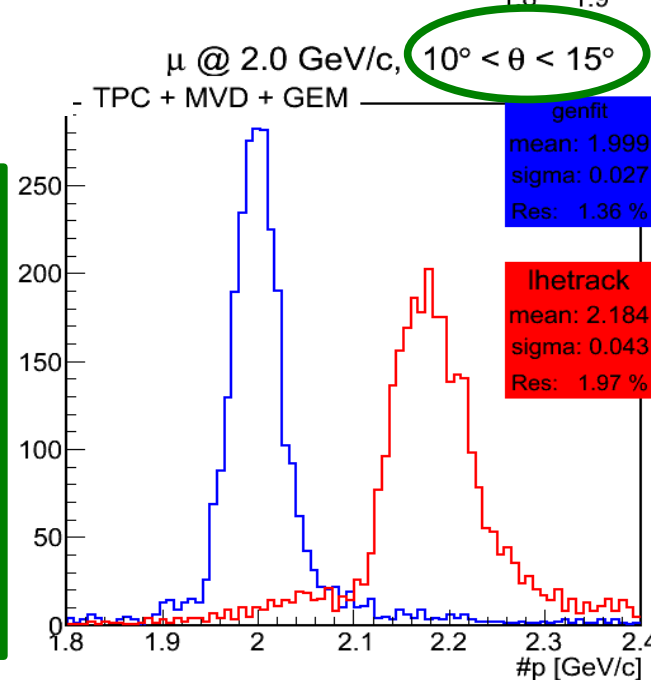
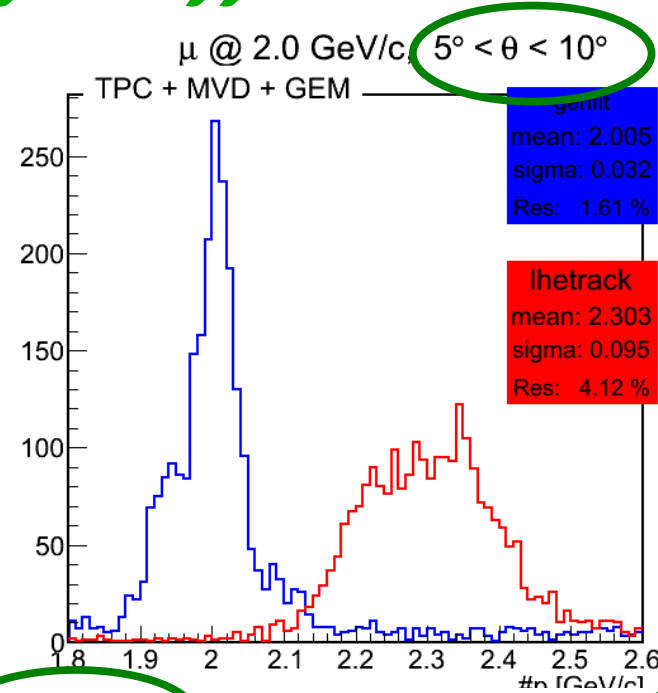
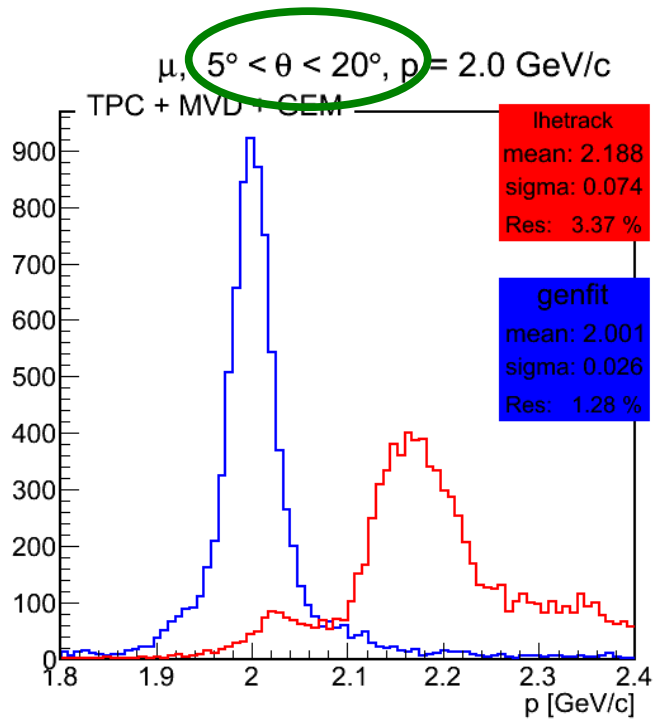
- Tracks matched with the MC tracks
- 1 reco track per event (biggest mult)
- Efficiency calculated from the Gauss fit:

$$\langle p \rangle \pm 5\sigma$$

Few % increase of the efficiency with GEM.

No fit for the low momenta ($p < 2$ GeV/c) in case of lhetrack & GEM.

Momentum resolution for different θ

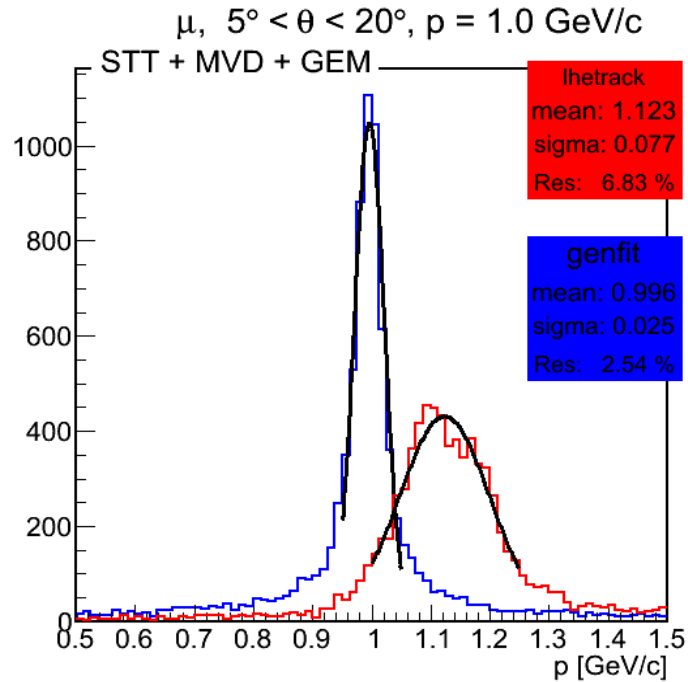
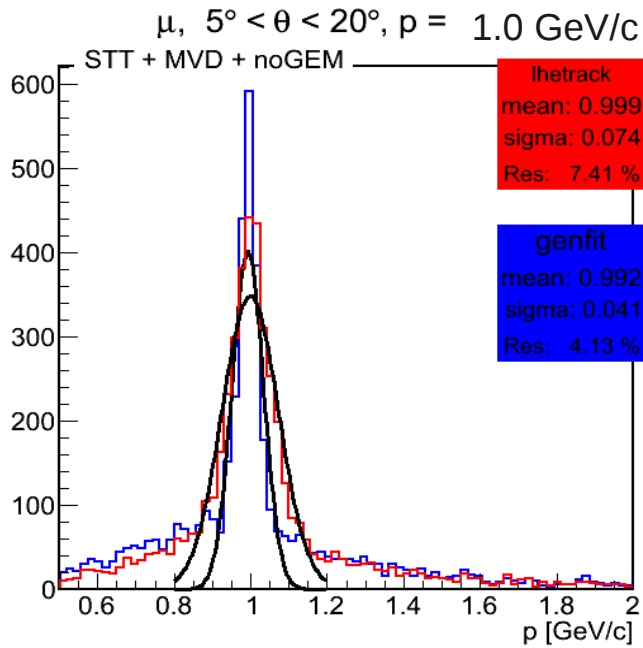


Momentum resolution of genfit is dominated by low θ angles.

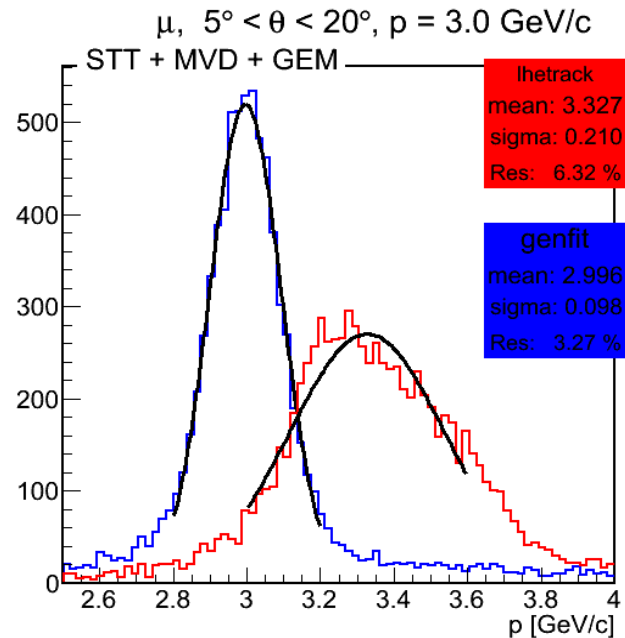
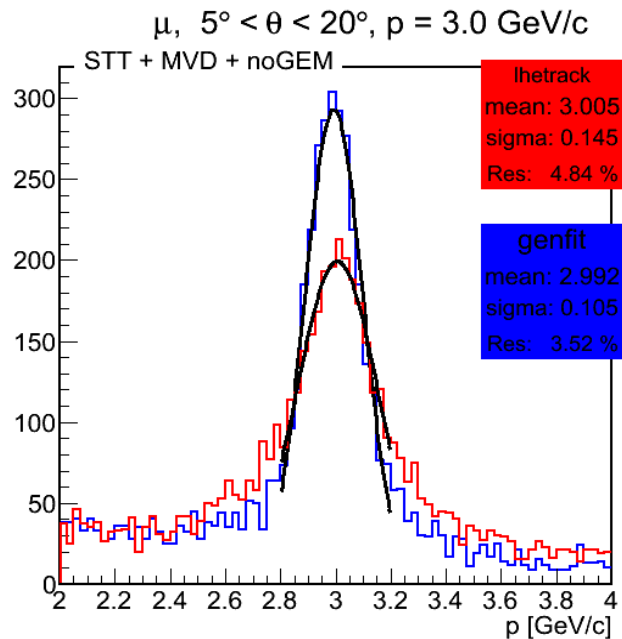
Less hits for the low angles

$5^\circ < \theta < 10^\circ$: ~ 10 – 15 hits
 $10^\circ < \theta < 15^\circ$: ~ 20 – 60 hits
 $15^\circ < \theta < 20^\circ$: ~ 60 – 100 hits

Momentum reconstruction $MVD+STT\pm GEM$

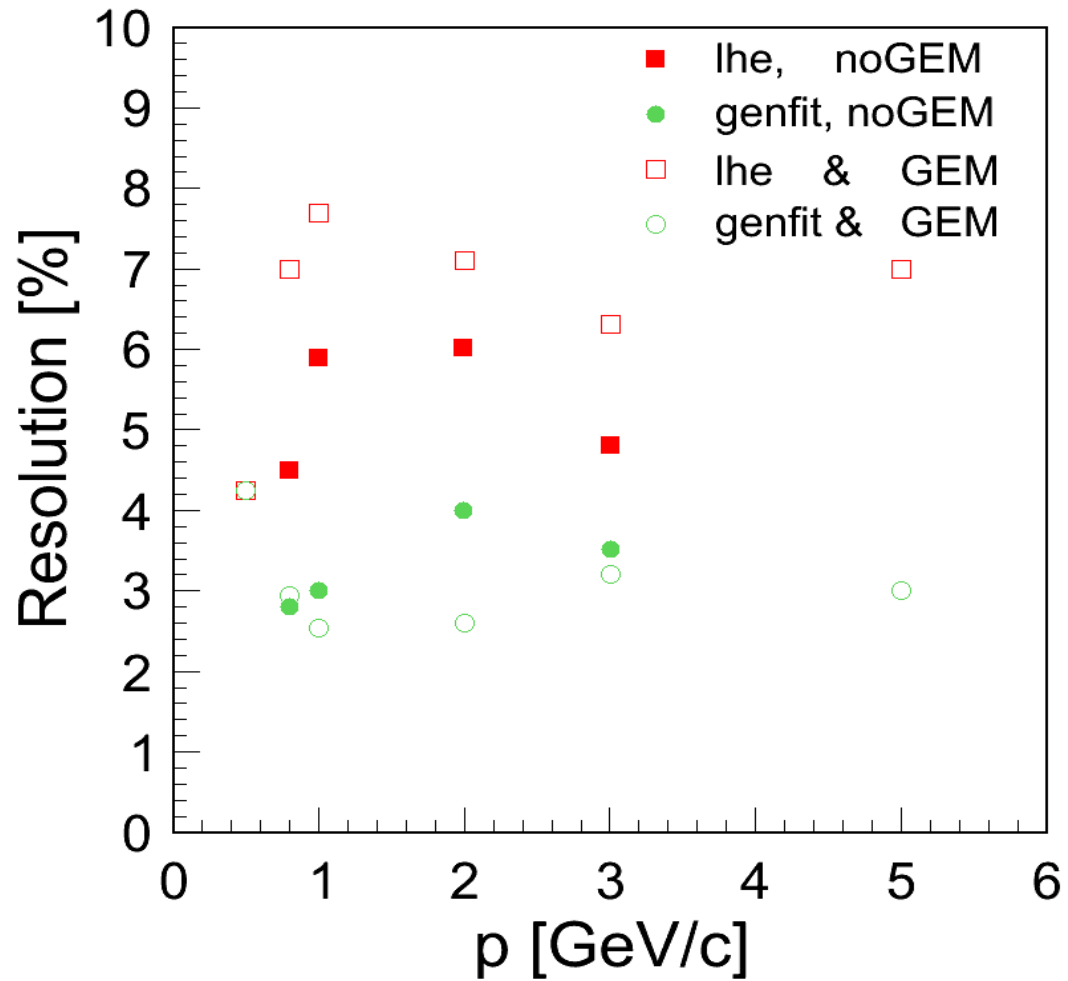


Similar observation like in case of TPC.



8% shift in the mean

Momentum reconstruction $MVD+STT\pm GEM$



to-do

- Continue systematic studies of the lhetracking
 - resolution/efficiency: momentum, θ dependence
 - STT / TPC comparison
- Collaborate with Stefano :-) for tracking with GEM
- Prepare QA macros for the lhetrack