D^+ Signal in pp @8TeV

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Outline

- Introduction
- Analysis Details
- Data Sample
- Quality Assurance
  - ITS Tracks
  - PID TOF
  - PID TPC
- D^+ Signal in Various P_T Bin

Motivation

- Heavy quarks produced in the initial stage of collision, so they are well suited probe for studying the properties of QGP.

- D mesons are the lightest particle containing charm quarks. They are often studied to gain knowledge on the weak interaction.

- pp collisions provide a baseline for heavy ion studies.

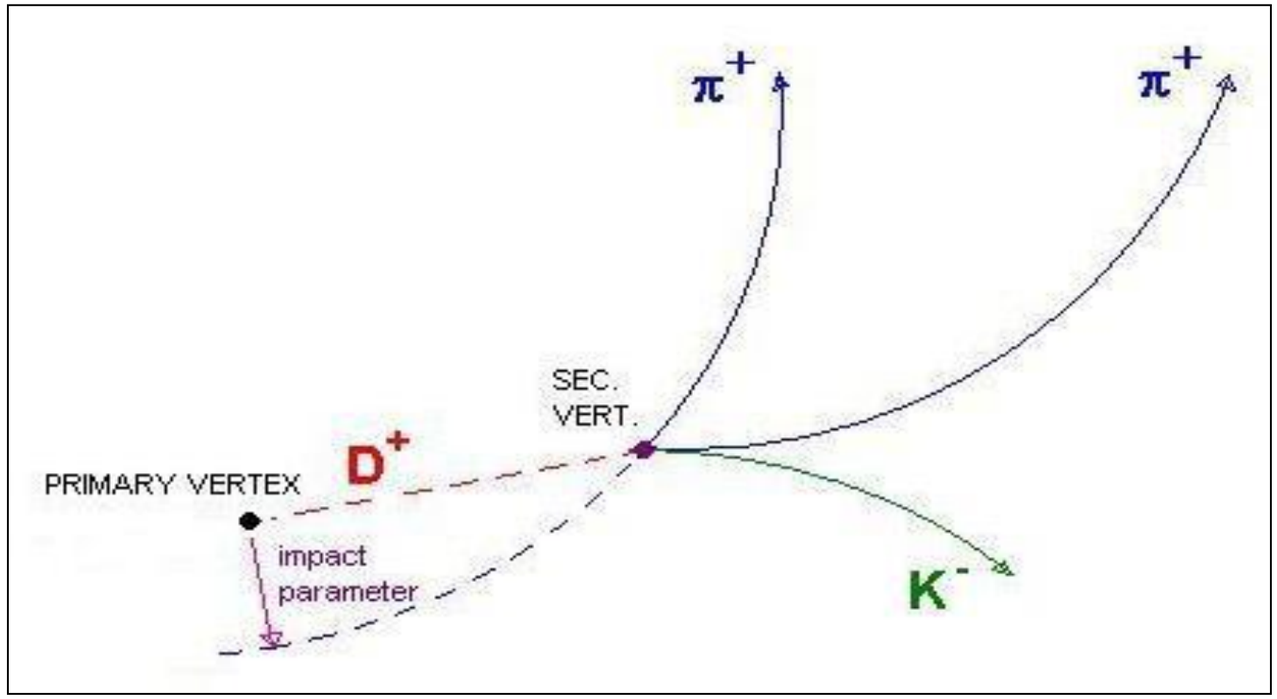
D^+ reconstruction through invariant mass calculation

- **Invariant Mass**

Mass (D^+) = 1.869.62 ± 0.20 GeV/c2

Branching Ratio = 9.22 ± 0.21%

$$M = \sqrt{\left(\sum E\right)^2 - \left(\sum p\right)^2}$$



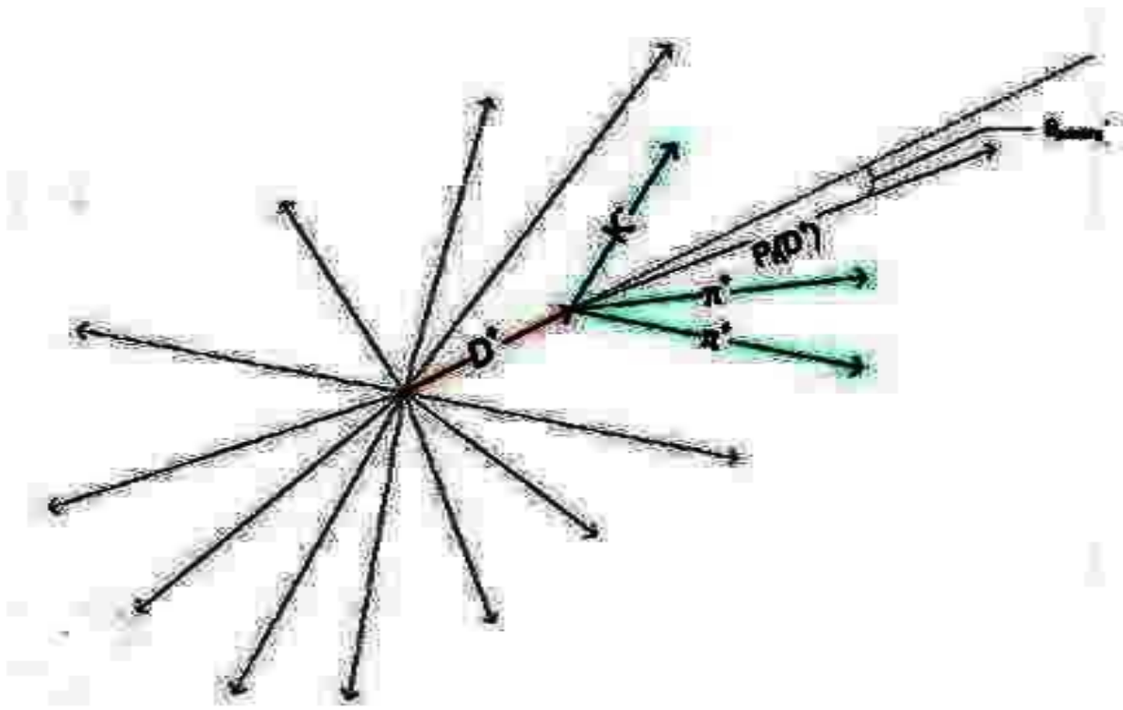
There are other decay channels for D^+ .But we are here considering this because the branching ratio is higher for this particular channel.

To maximize the statistical significance, we use several cut variables

- **Cos(Θ_{point})** Θ_{point} is pointing angle b/w the direction of the reconstructed D meson momentum and the line connecting the primary and secondary vertices.

If the found vertex really corresponds to a D-meson decay vertex,

then $\Theta_{point} \sim 0$ and
$\cos(\Theta_{point}) \sim 1$



❖**Decay Length** dl; decay length is the distance between the primary and secondary vertices given as

$$dl = \sqrt{(x_s - x_0)^2 + (y_s - y_0)^2 + (z_s - z_0)^2}$$

The signal candidates are characterized by larger values of **dl** according to the fact that they come from displaced decay vertices.

❖Sum of the squares of the three impact parameters with respect to the primary vertex given as;

$$Sumd_o^2 = \sum_{i=1,2,3} d_{0,i}^2 = d_{0,K}^2 + d_{0,\pi}^2 + d_{0,\pi}^2$$

where $d_{0,i}$ is the distance of closest approach of the track to the primary vertex in the transverse plane

❖Quality of the found secondary vertex is definedas:

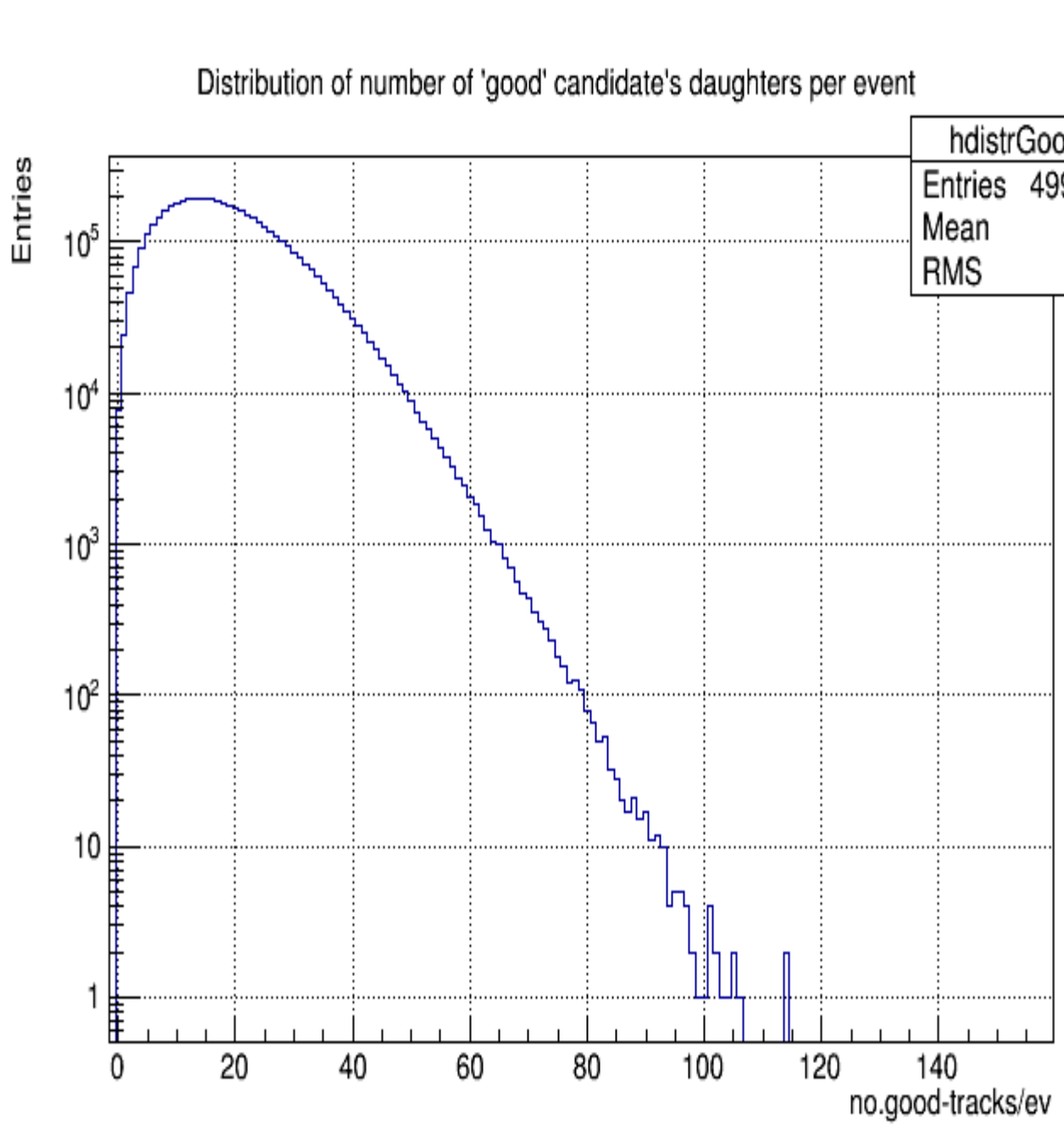
$$\sigma_{SecVert}^2 = d_1^2 + d_2^2 + d_3^2$$

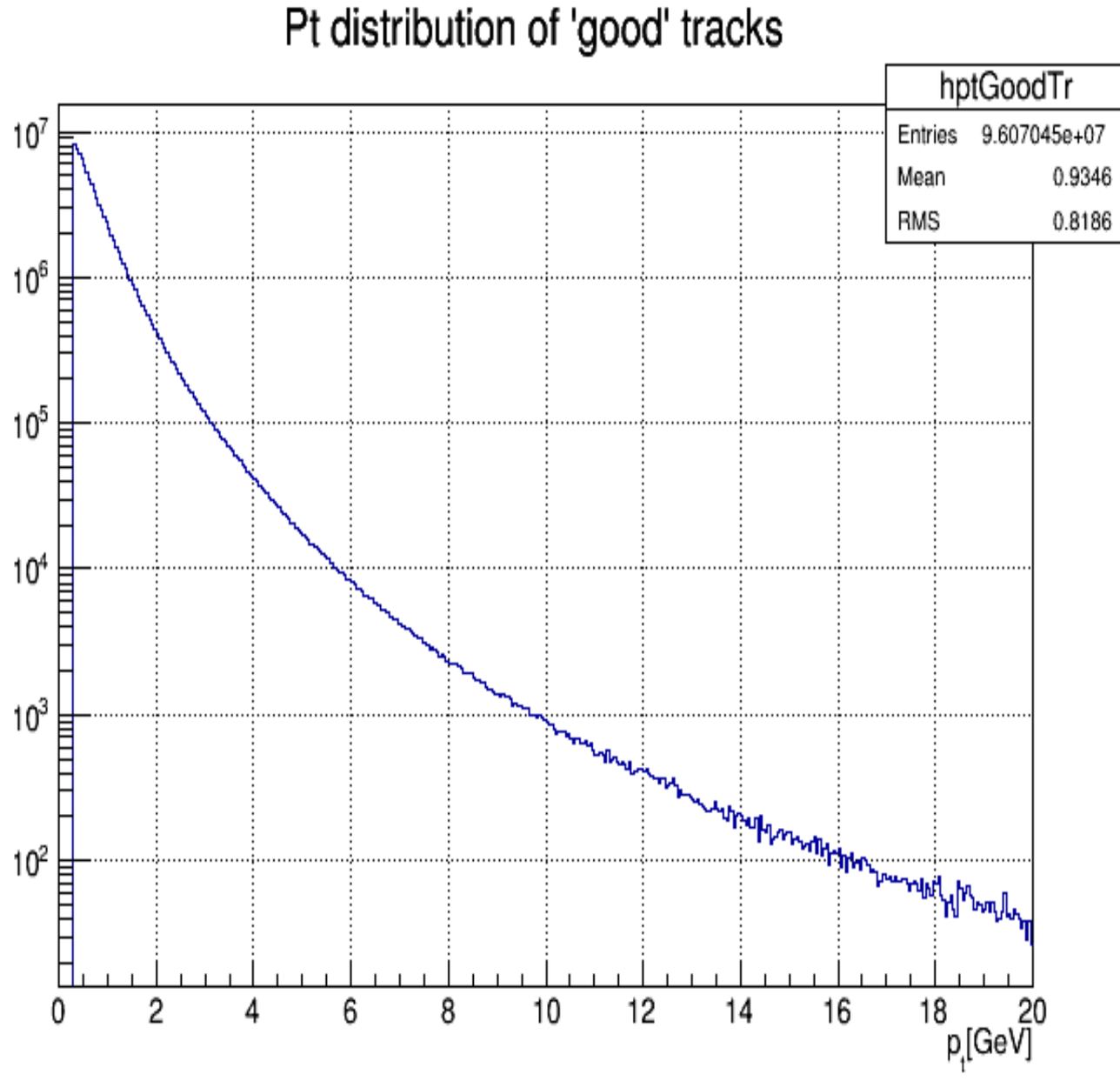
Which measures the track dispersion around the secondary vertex.

Analysis details: Data Sample

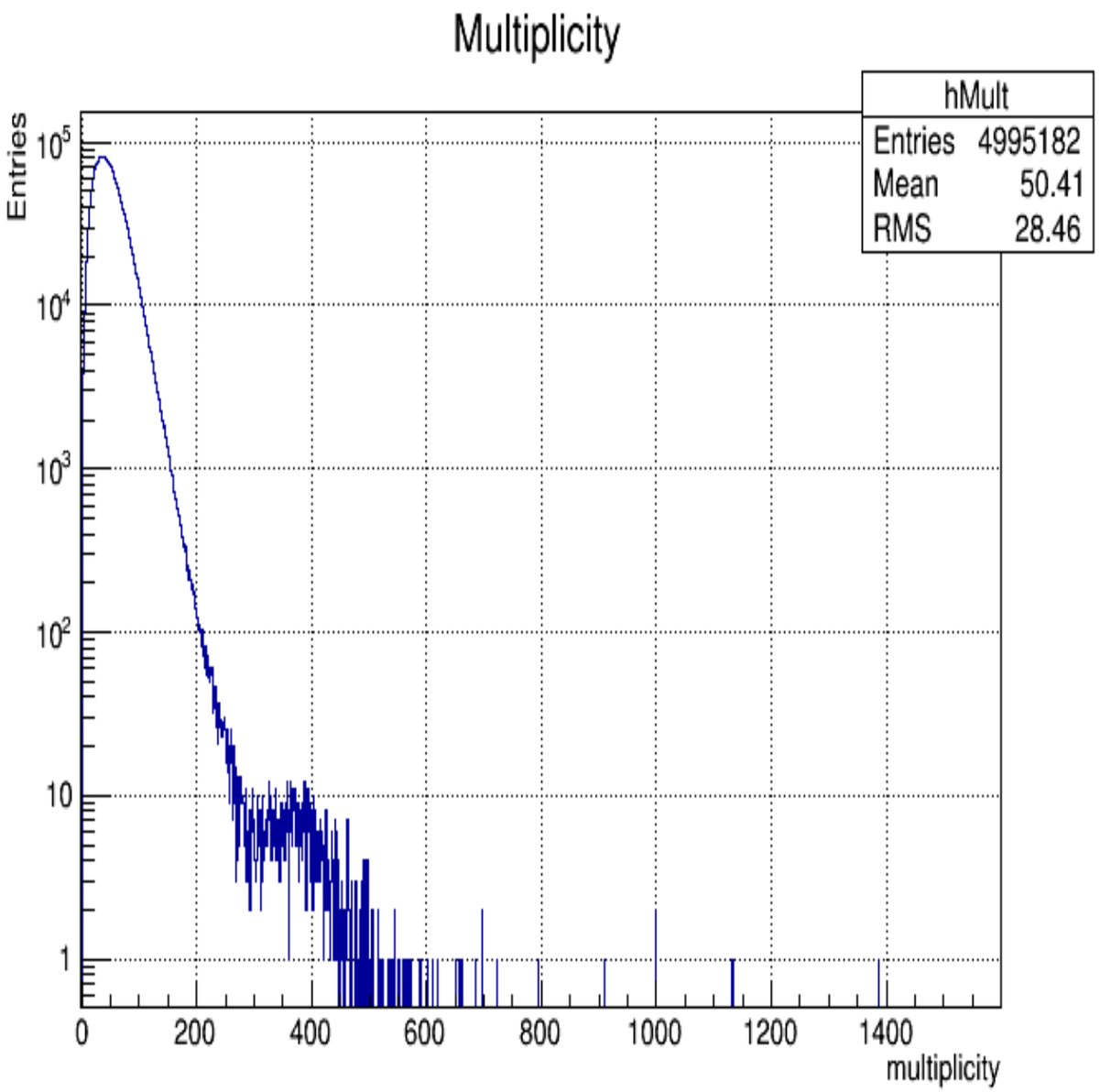
- LHC12 c
  - pass1/AOD.
  - No. of normalized events = 13.79 M
- LHC12f
  - pass1/AOD.
  - No. of normalized events = 5.19 M
- Trigger used: EMCAL

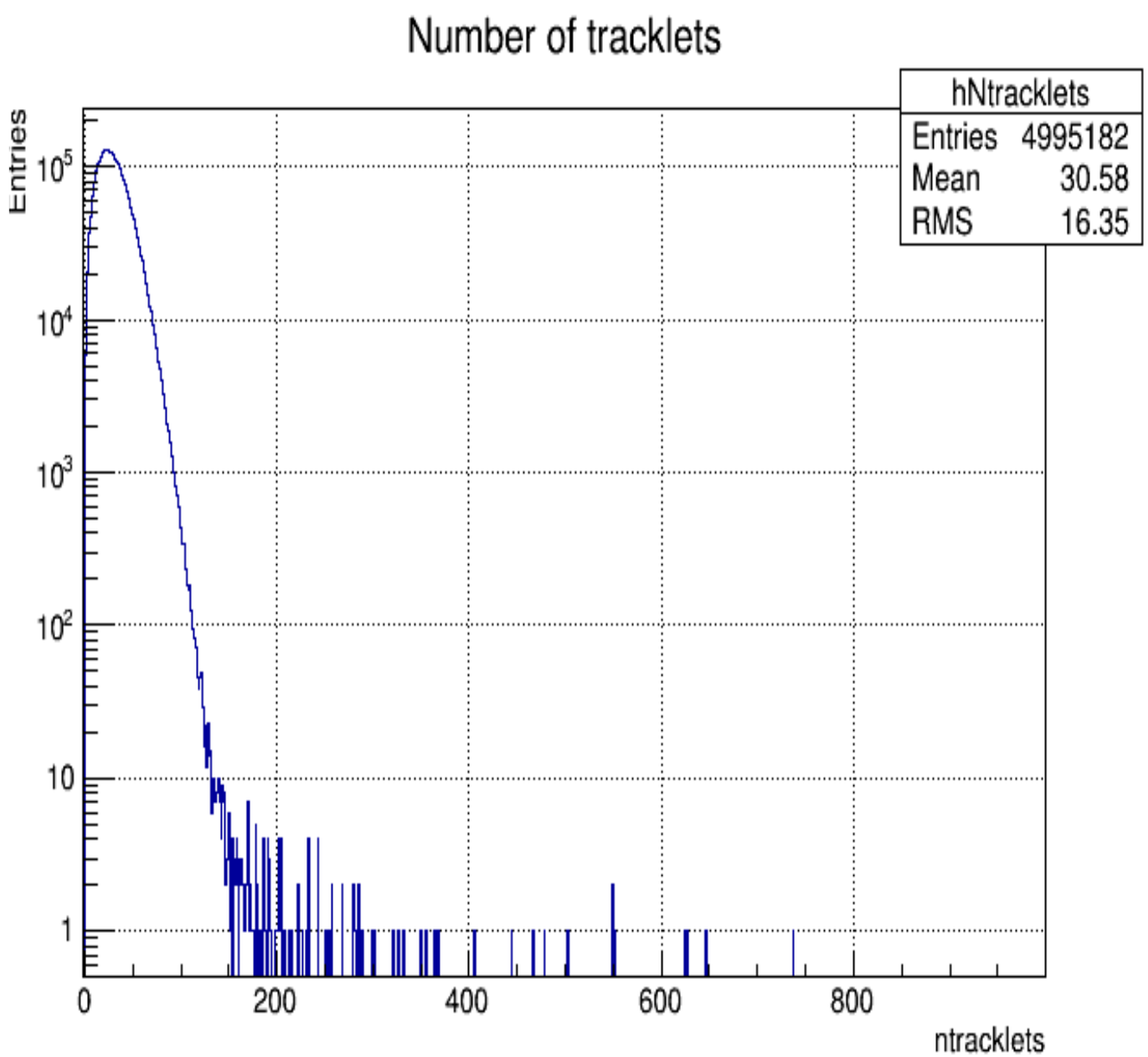
Distributions





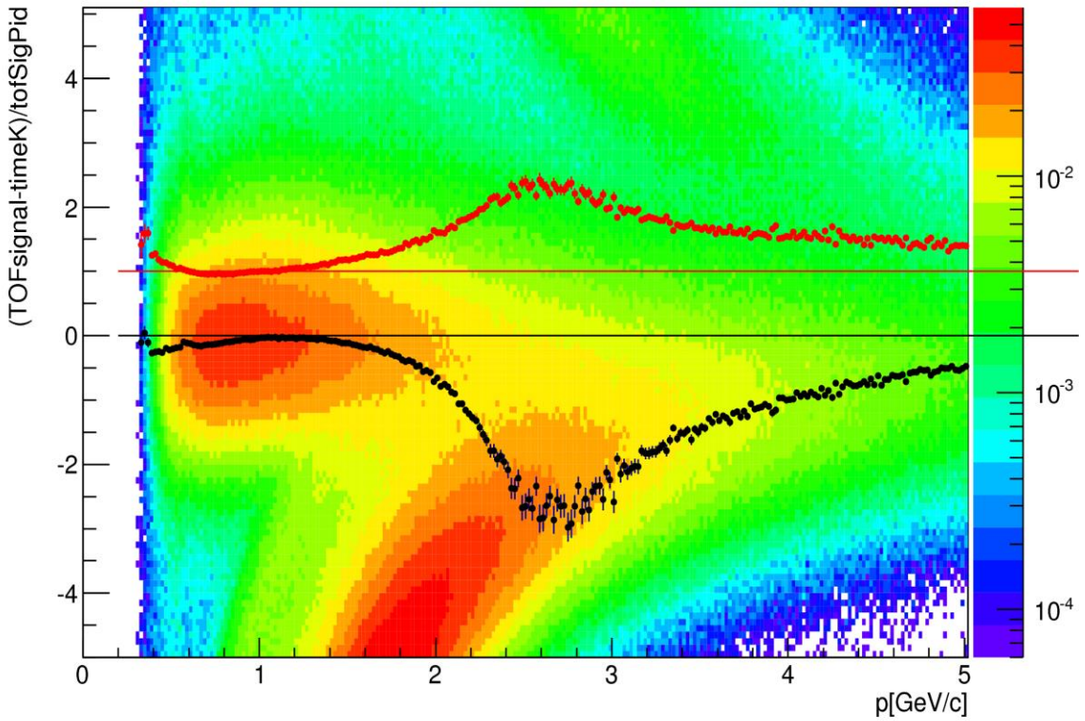
Multiplicity



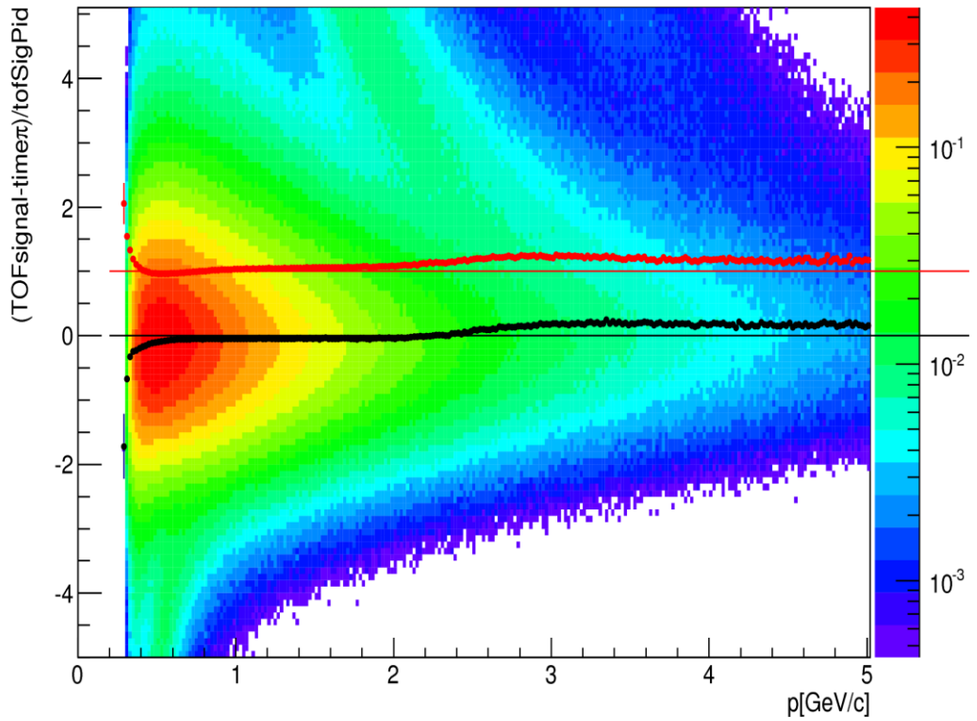


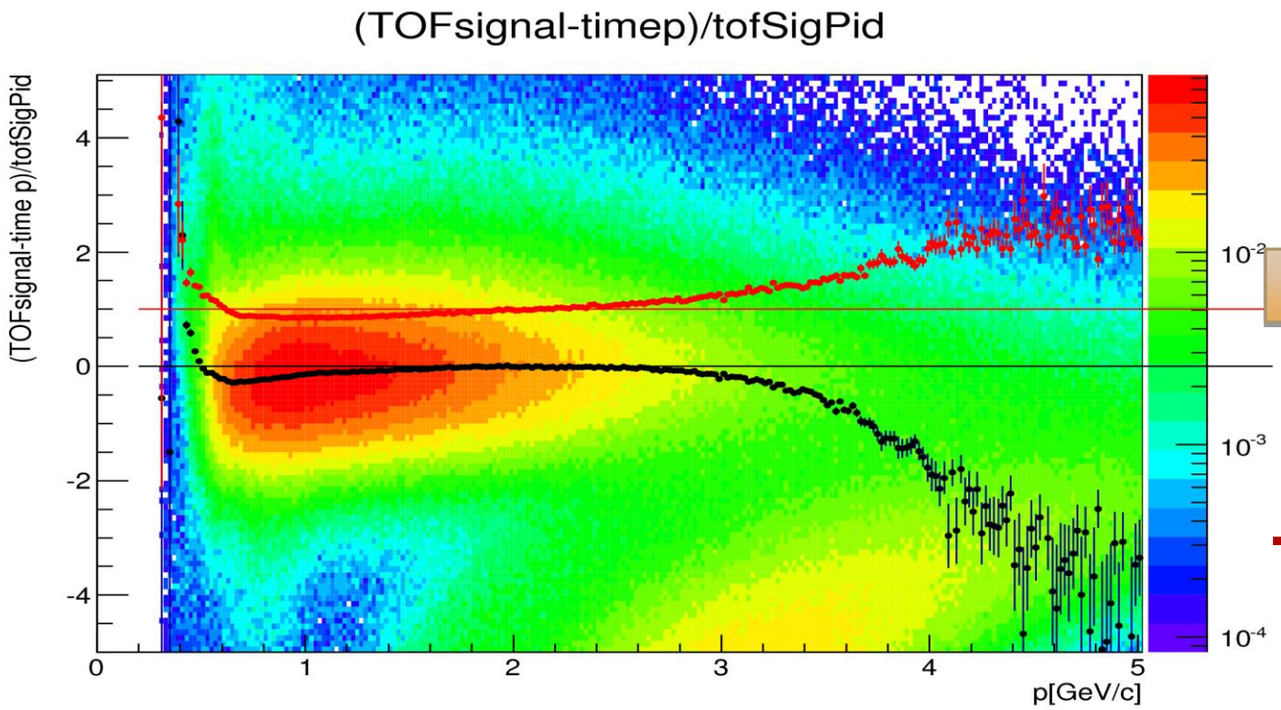
PID from TOF

Kaon



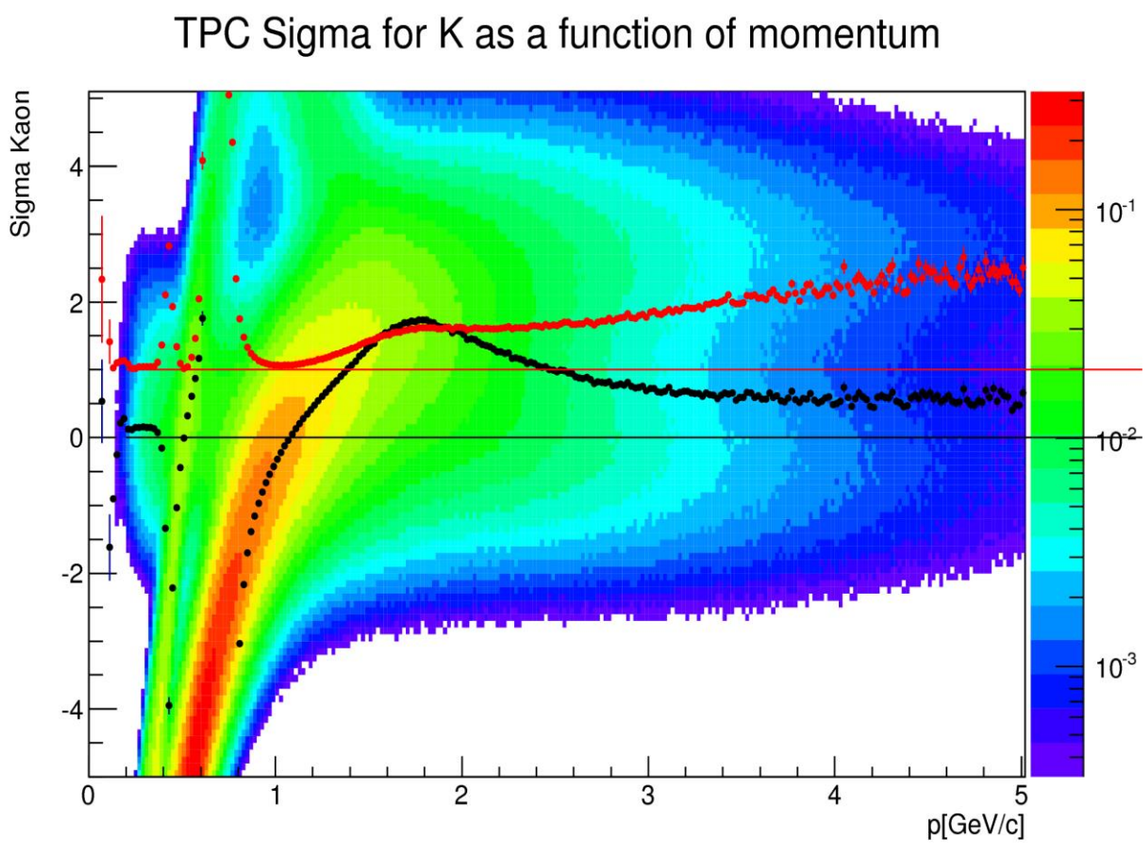
pion

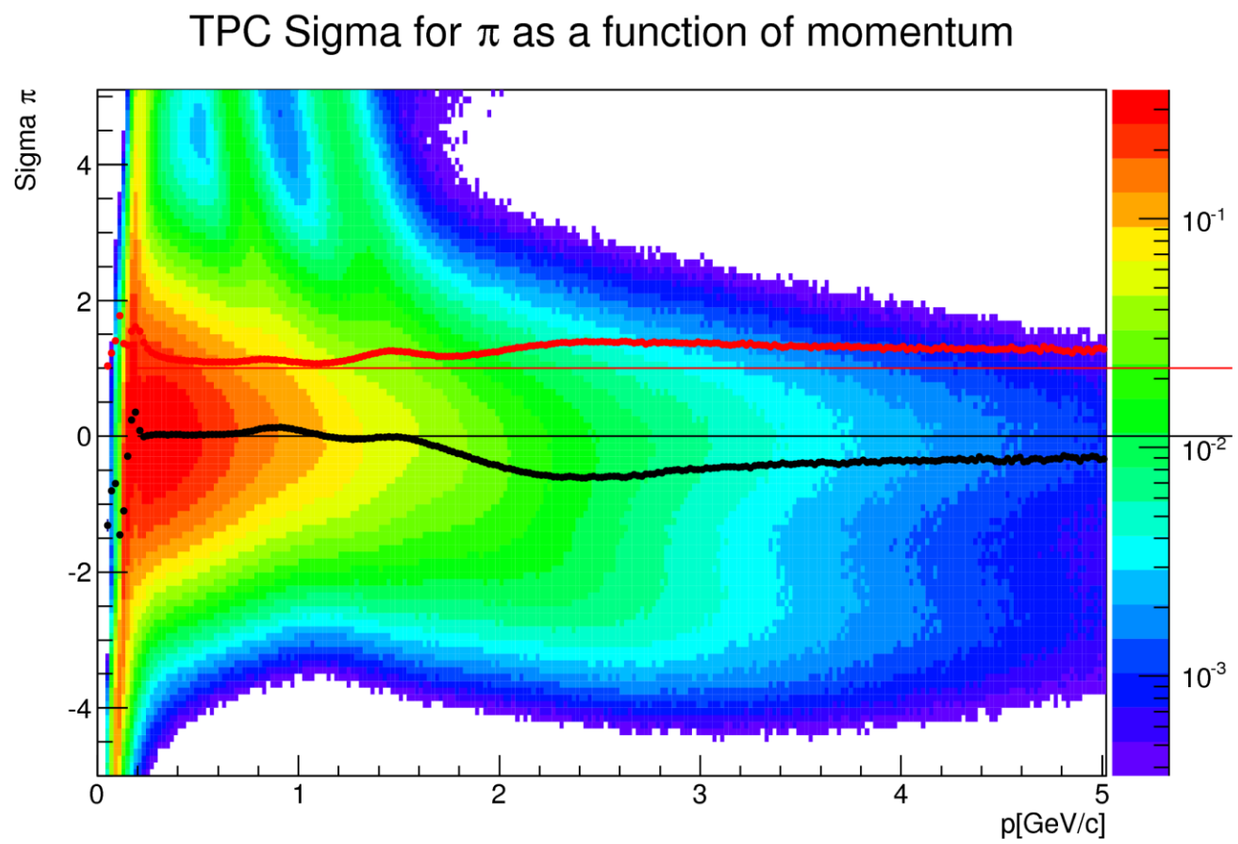


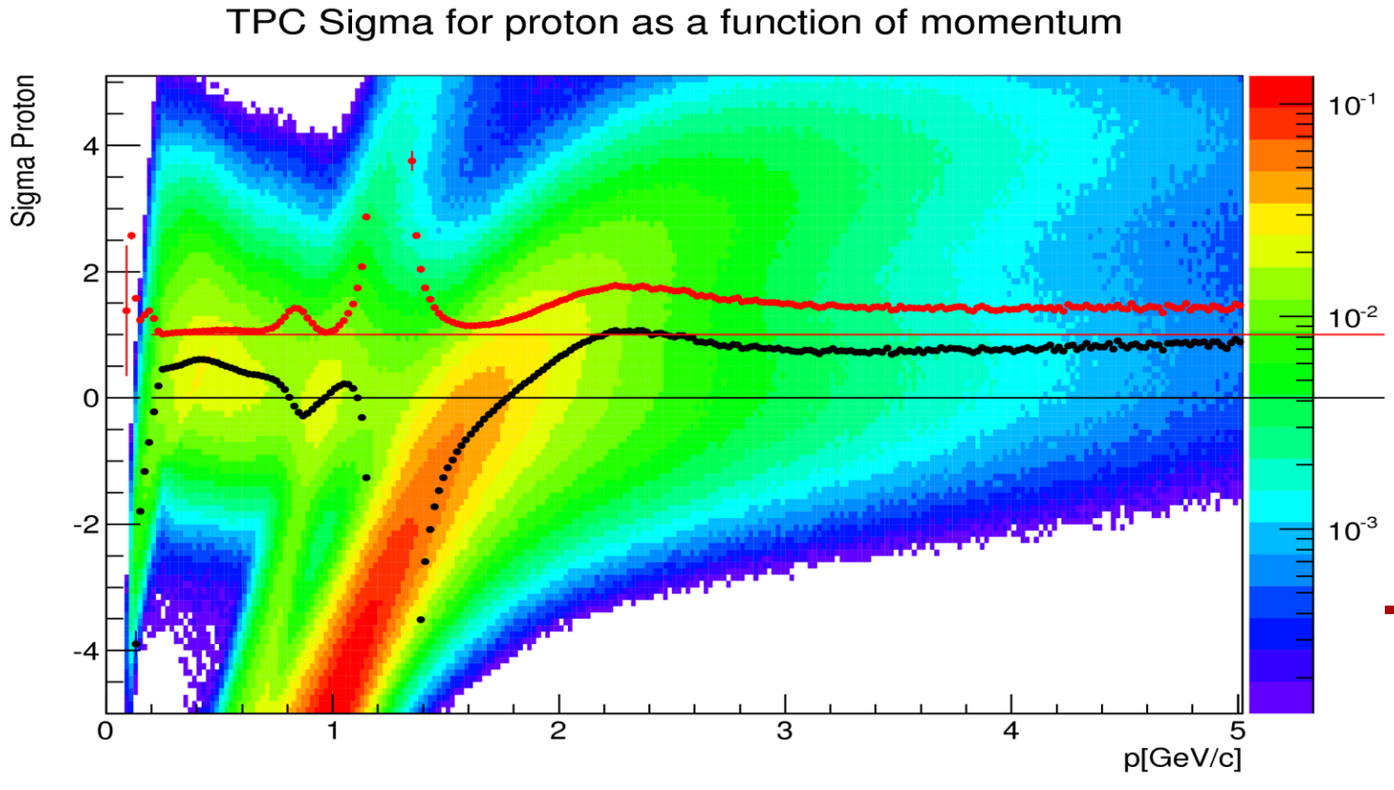


Proton

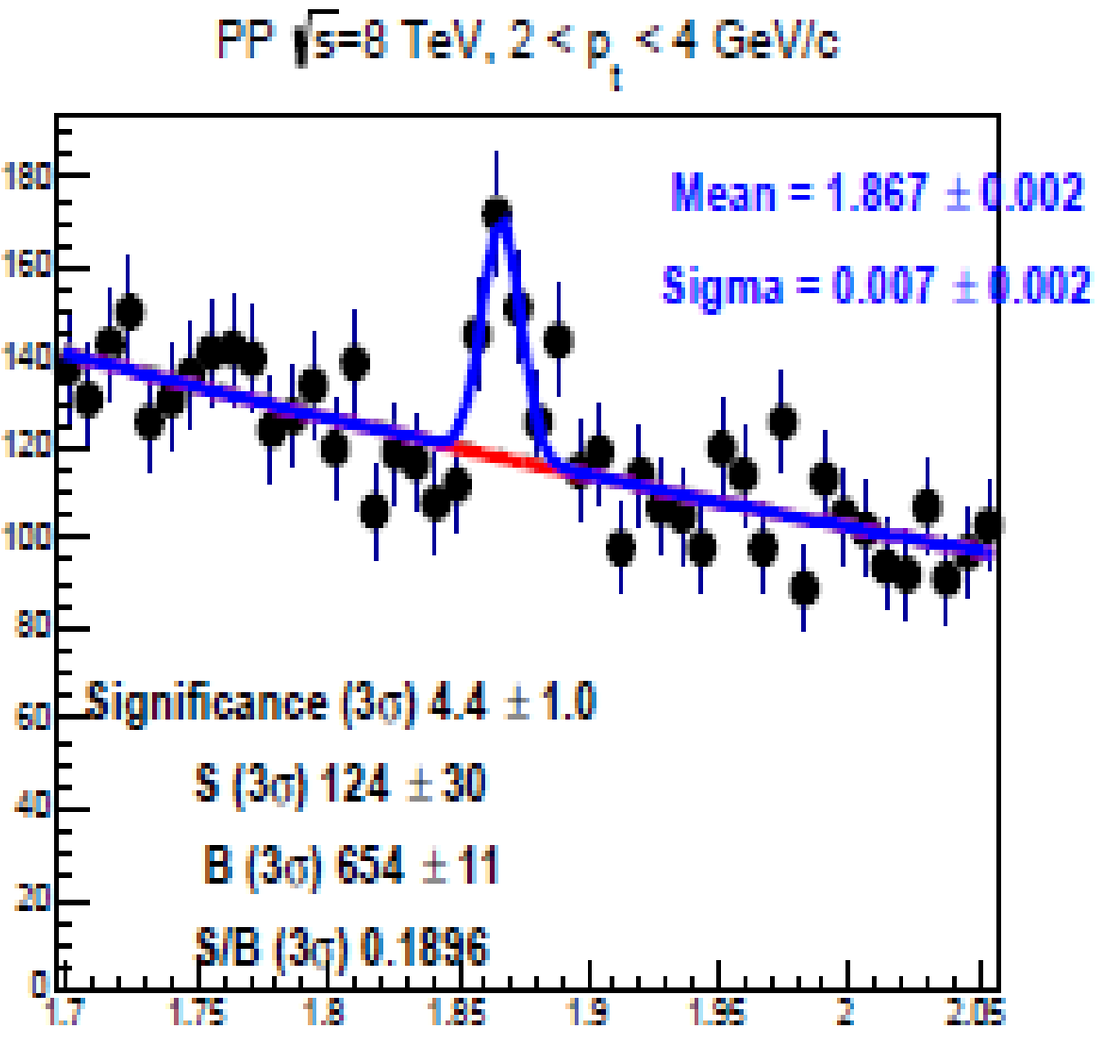
TPC pid

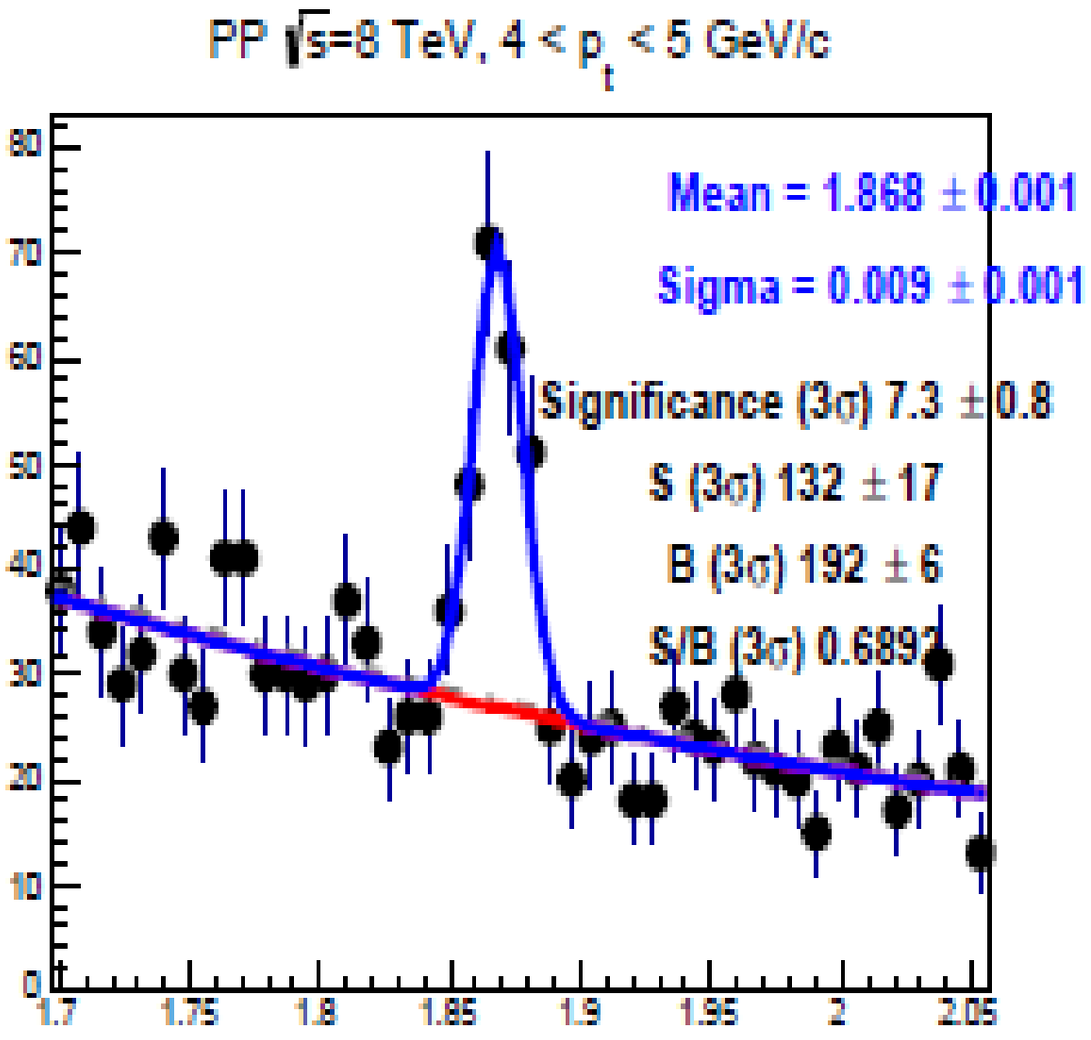

TPC Sigma for K as a function of momentum
Sigma Kaon
p[GeV/c]


TPC Sigma for π as a function of momentum
Sigma π
p[GeV/c]

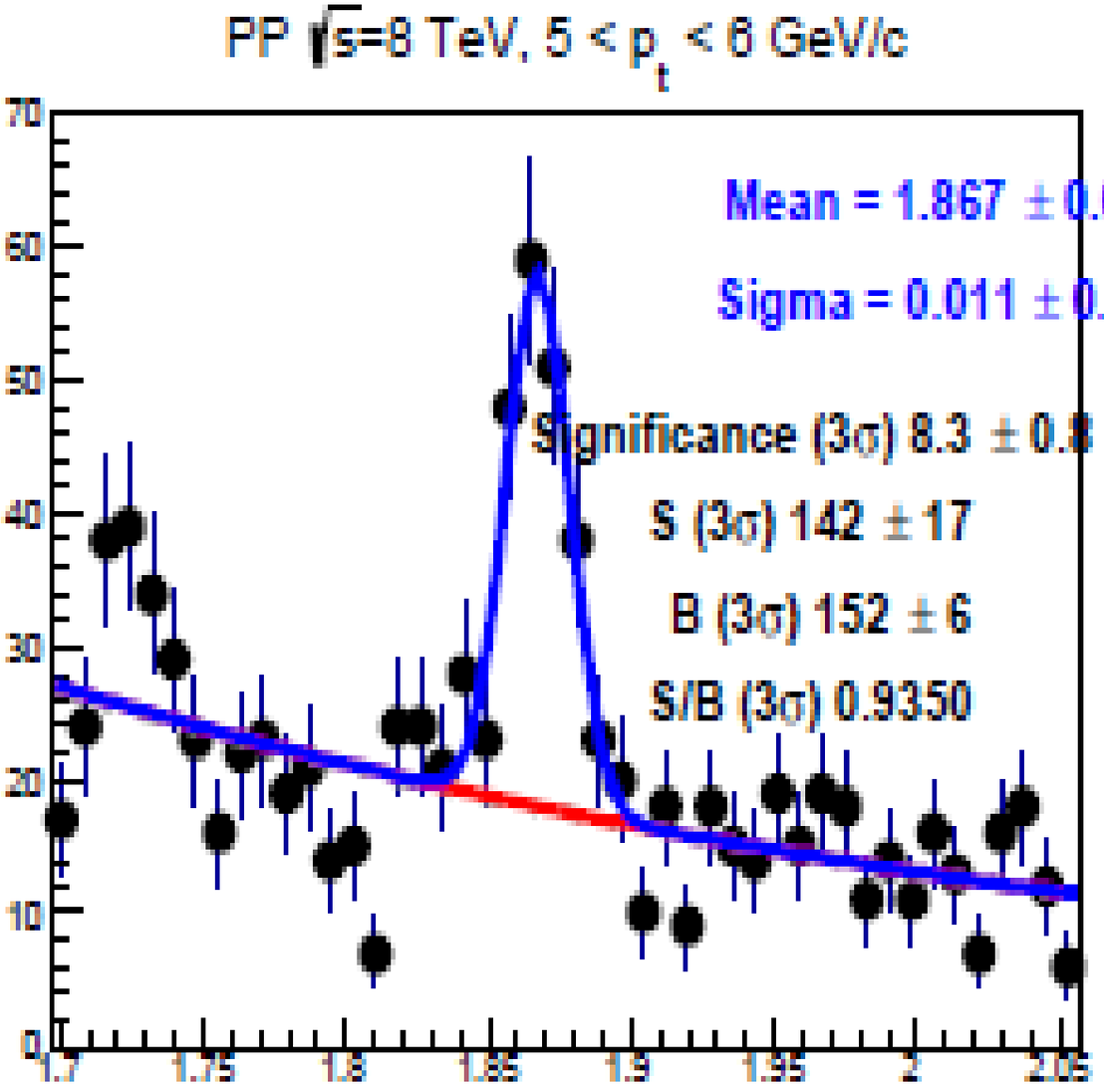

TPC Sigma for proton as a function of momentum
Sigma Proton
p[GeV/c]

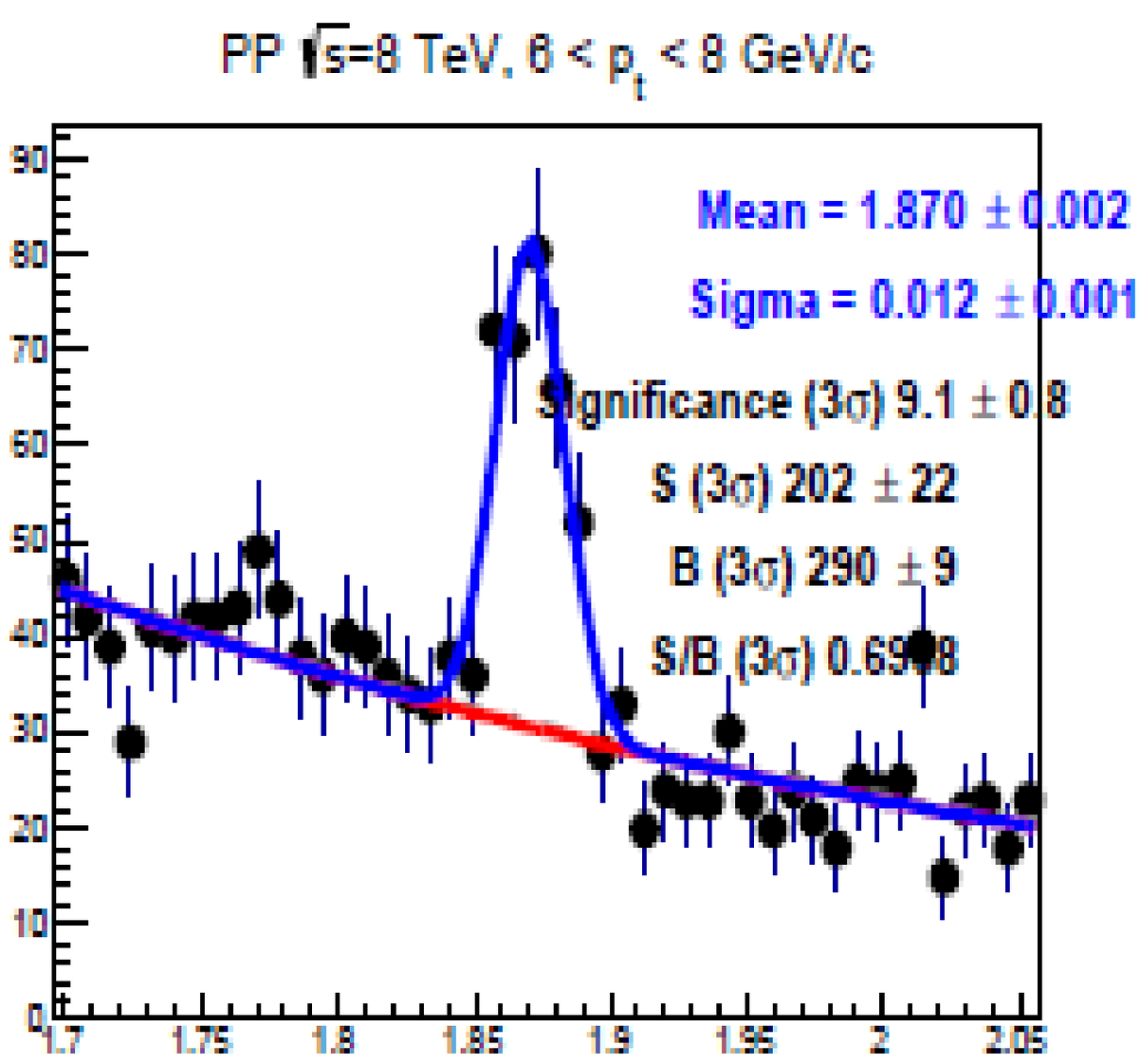
Mass Spectra for LHC12c and LHC12f for different Pt bins



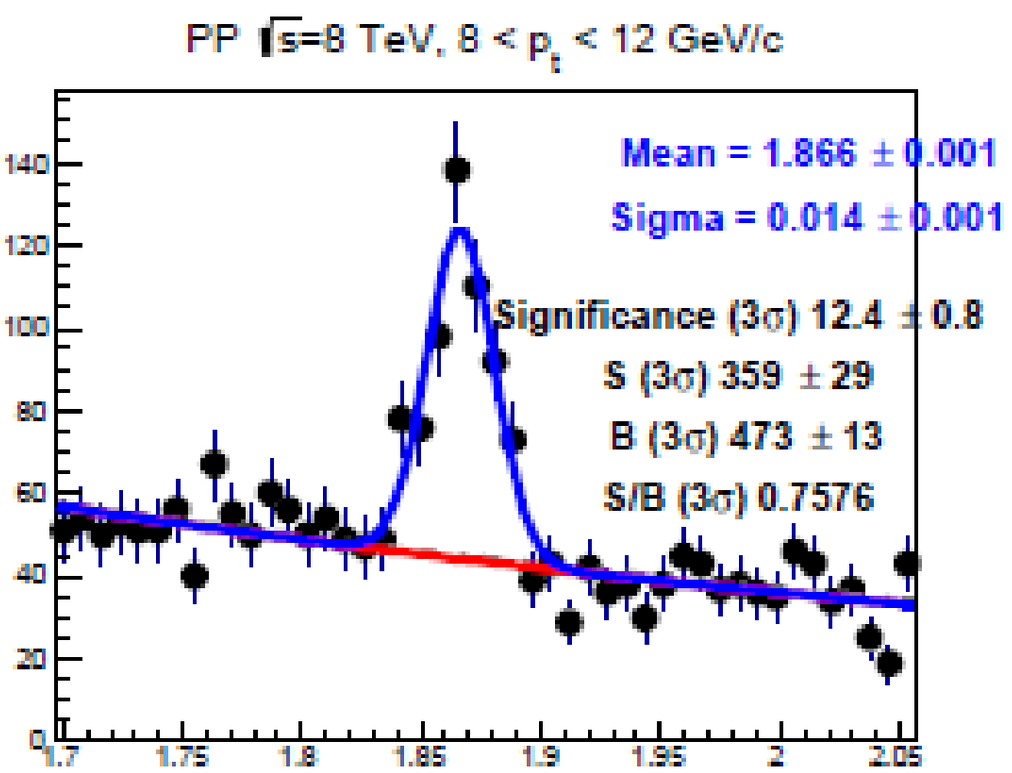


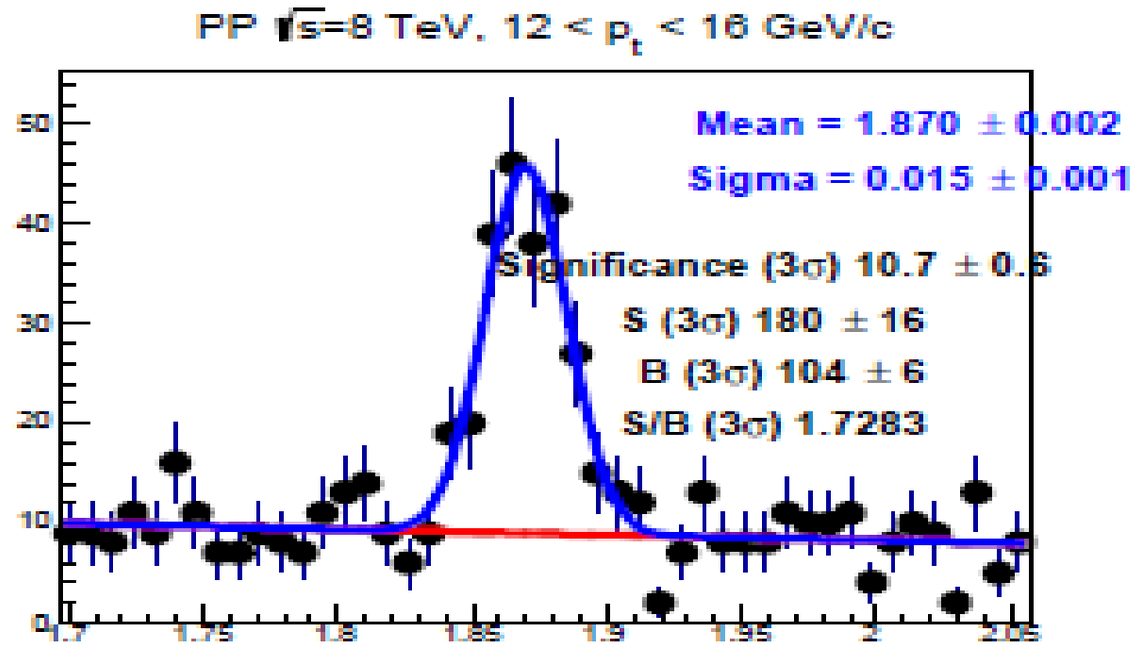
Mass Spectra for LHC12c and LHC12f for different Pt bins

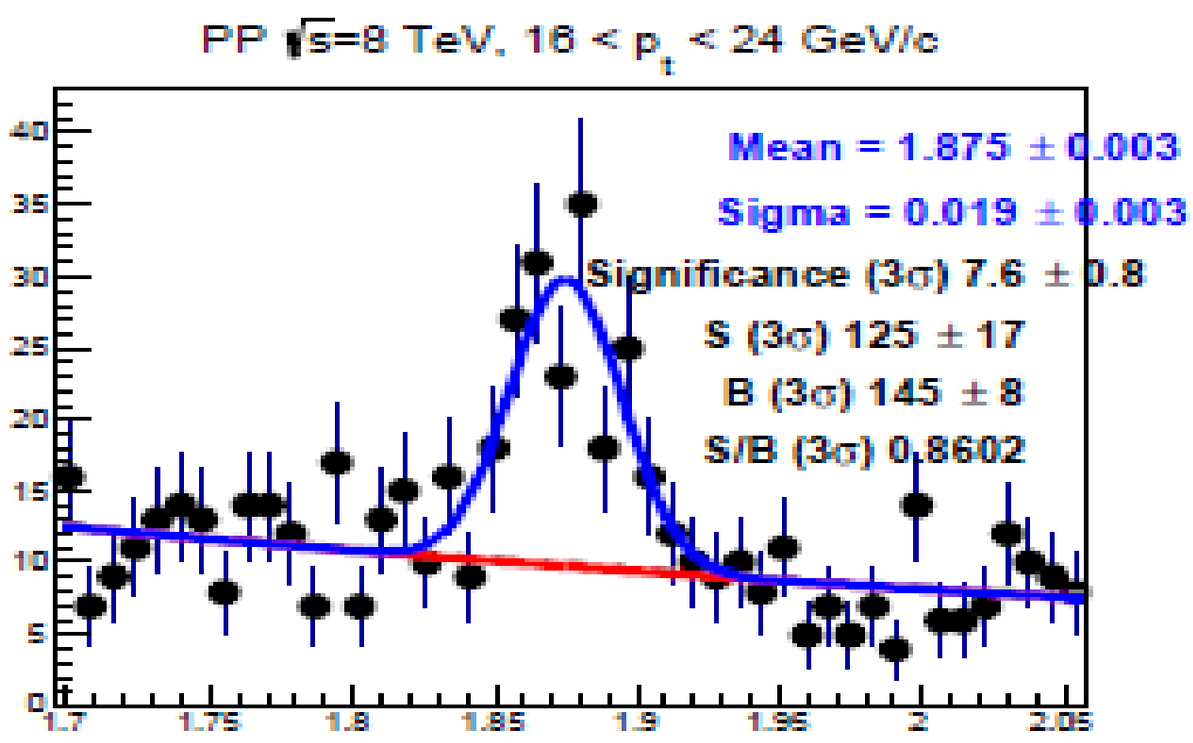




Mass Spectra for LHC12c and LHC12f for different Pt bins







Summary and Outlook

- 19.67 M events analyzed to check the quality of the data.

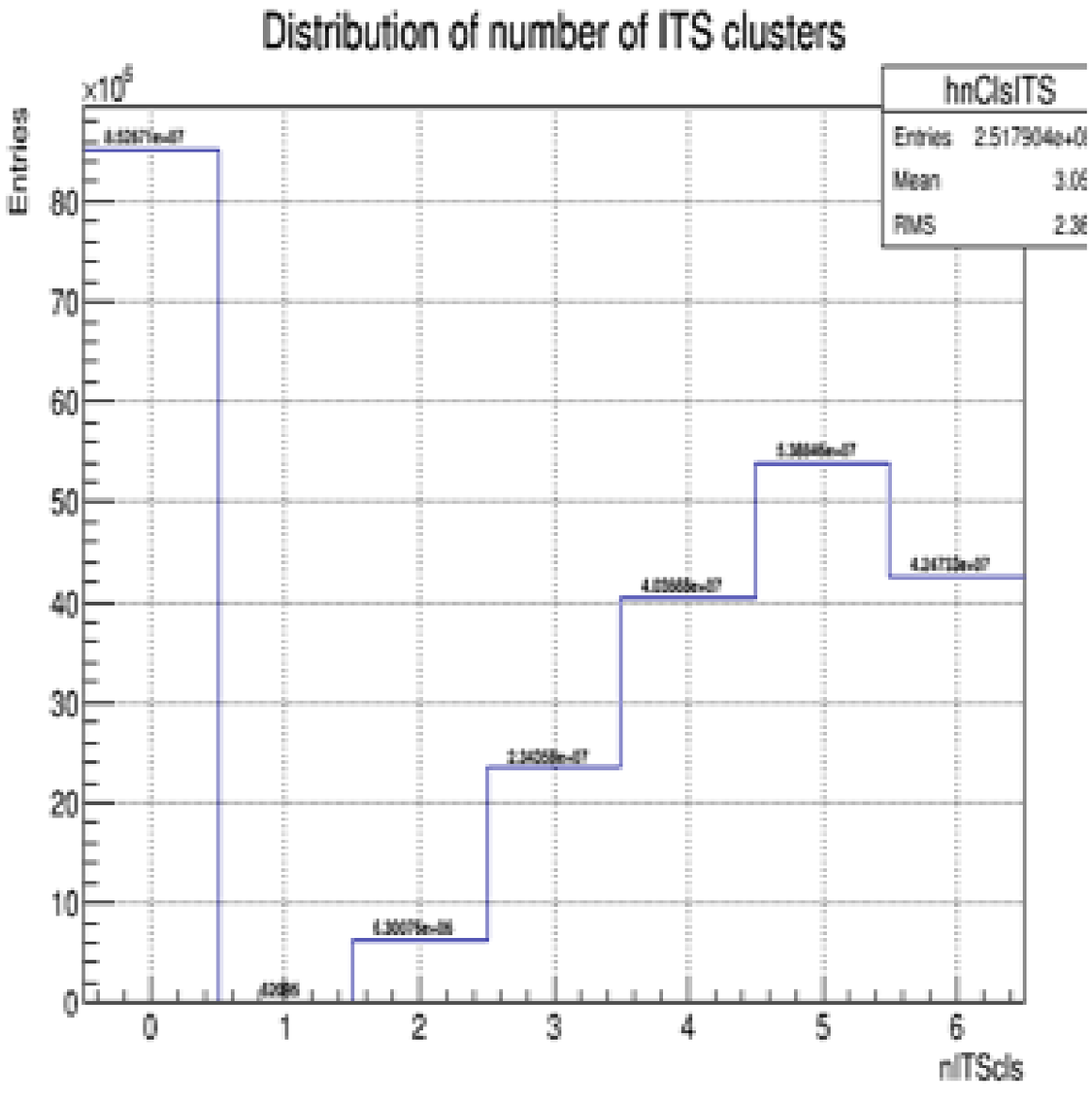
- ITS tracks and TOF Pid seems to be ok, whereas TPC Pid is no ok, needs TPC splines.

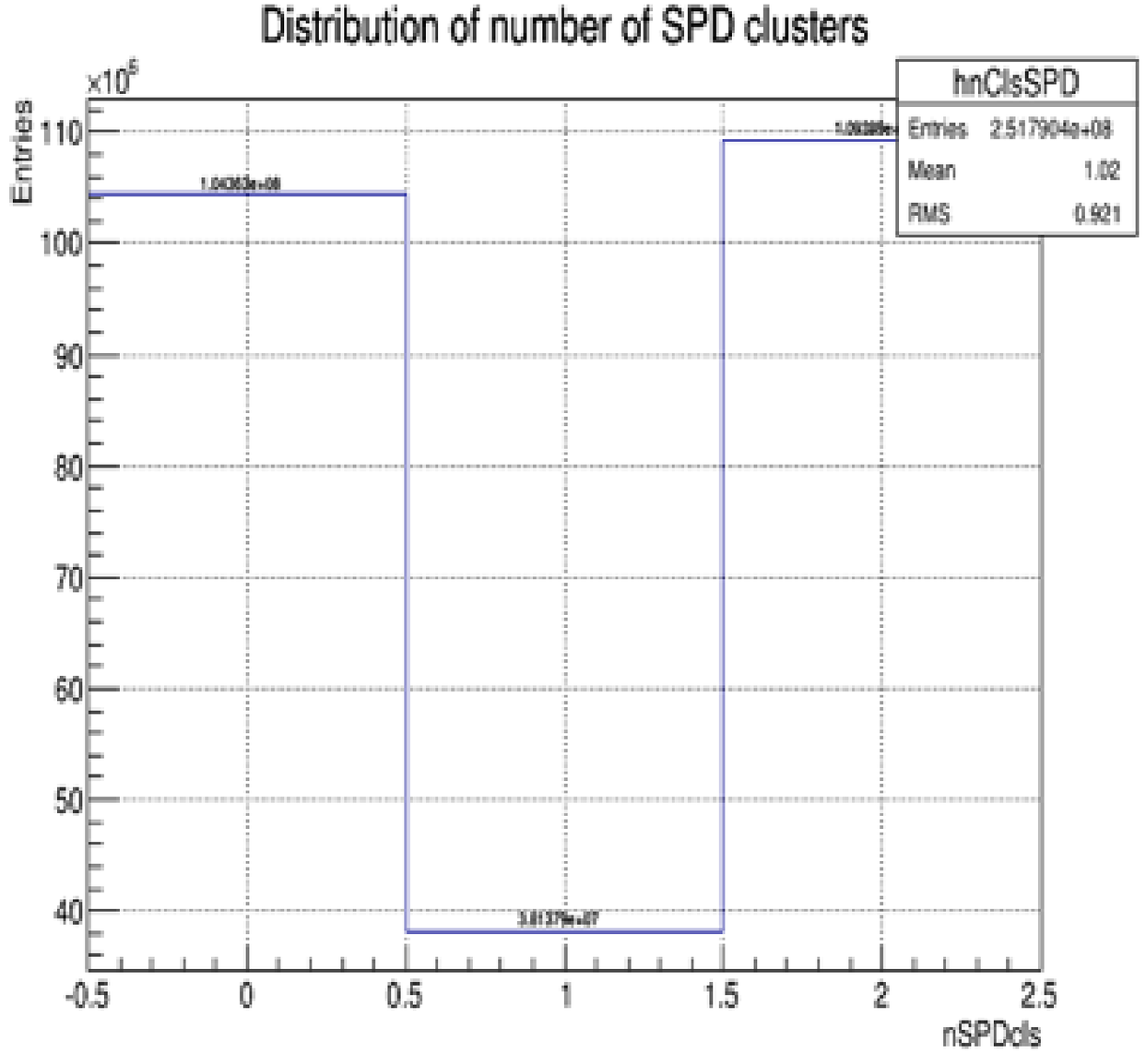
- Good signal and significance for different p_T bins (2-4, 4-5, 5-6, 6-8, 8-12, 12-16, 16-24) have been observed.

- Looking forward for the D^+ signal for the optimized cuts and also check the minimum bias events.

THANKS……

QA: ITS Tracks for LHC12f AOD





TOF Performance