



'2+1' correlation – Tagging of Back to Back Jets



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Motivation

- Azimuthal correlations – initial stages of the collision
– sensitive to initial state and evolution of the system.
- Aim: study jet –medium interaction using back to back jets, dijets tagged by using 2+1 correlation

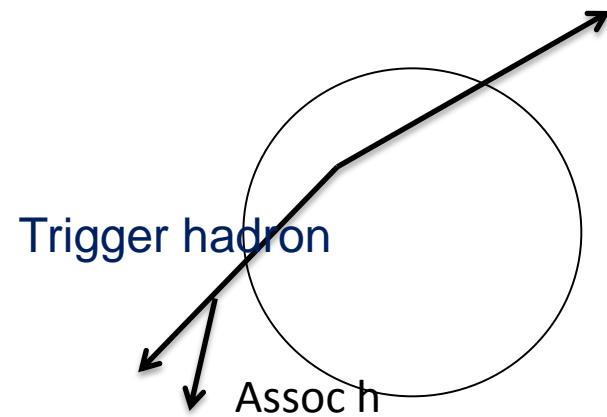
Analysis Method

- Select only events with 2 back-to-back high-pT hadrons (in the ϕ - space) .
- Then in the 2-D space, the azimuthal distribution of lower particles around the two high-pT hadrons is plotted.

$$C(\Delta\phi, \Delta\eta) = \frac{d^2 N_{same}(\Delta\phi, \Delta\eta)}{d\Delta\phi d\Delta\eta} \bigg/ \frac{d^2 N_{mixed}(\Delta\phi, \Delta\eta)}{d\Delta\phi d\Delta\eta}$$

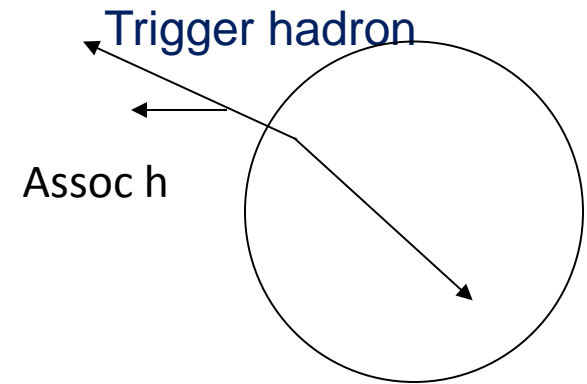
How's it different from di-hadron correlation?

Select events that have two back to back high- p_T hadrons



Those triggers whose path lengths are comparable in the dense medium.

VS.



Removes some events where hard-scattering occurs near surface but not tangential (large difference between path lengths)

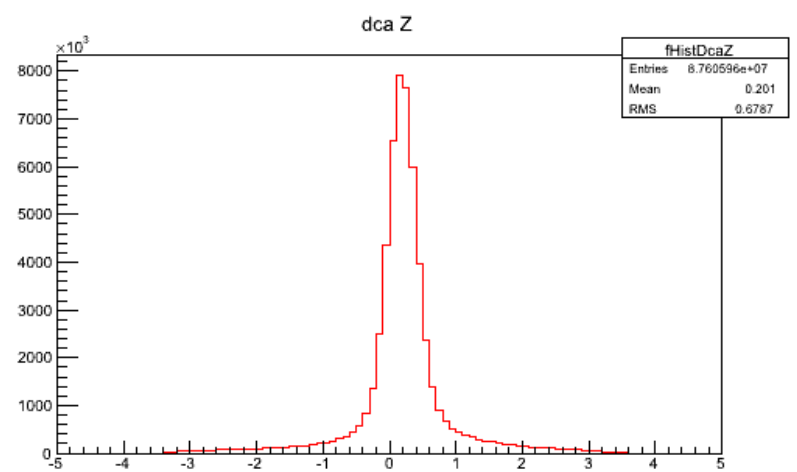
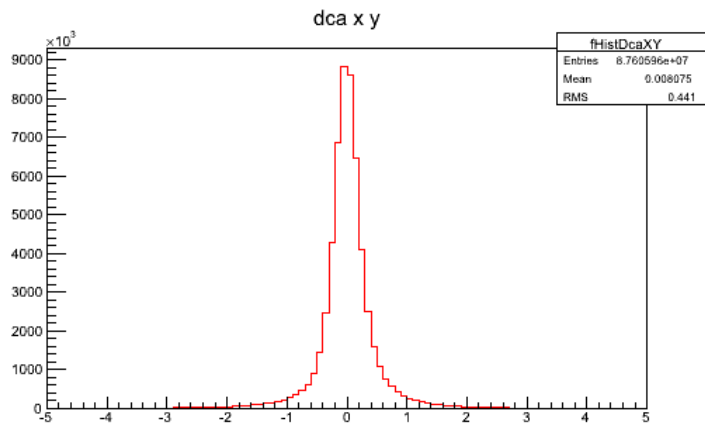
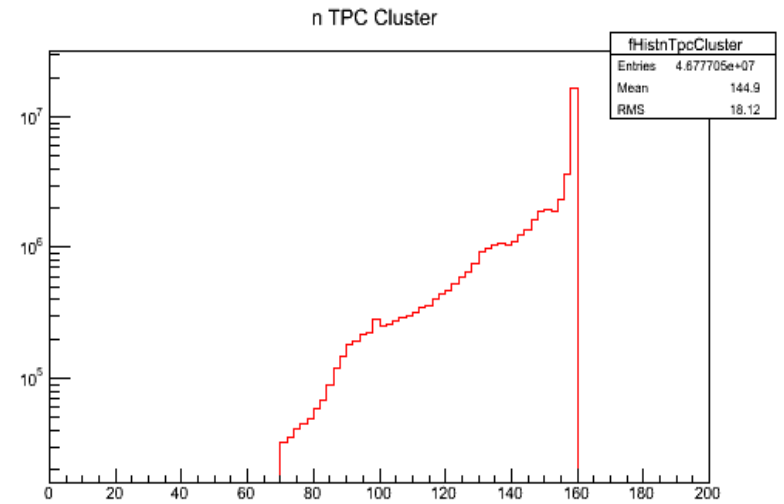
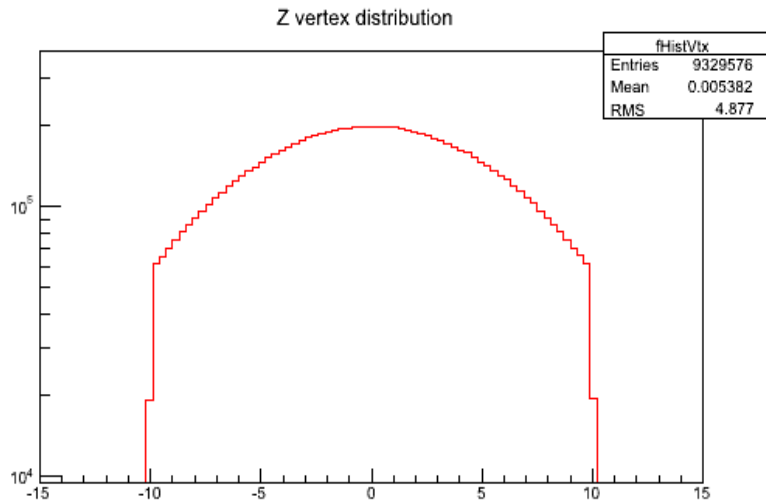
Back to back triggers – only those jets are chosen which occur near the surface and go tangentially, or are punch-through jets.

Analysis

Data set and Cuts Applied

- p + Pb @ 5.02TeV, LHC13b Pass2, AOD126.
LHC13c pass1, AOD126 - kINT7 triggered
- Pb + Pb @ 2.76TeV, LHC10h, Pass2, AOD086, kMB trigger.
- Reconstructed vertex within $|vtx-z| < 10$ cm chosen.
- Centrality selection using VO: 0-20% centrality
- Track Cuts:
 - Filterbit 768 in p-Pb, 272 in Pb-Pb
 - $|\eta| < 1.2$
 - Prim trig $8 < pT < 10$, Sec Trig : $4 < pT < pT_{trig1}$
 - $\phi_1 - \phi_2 - \pi < 0.2$
 - Associated particle : $1 < pT < pT_{trig1/2}$

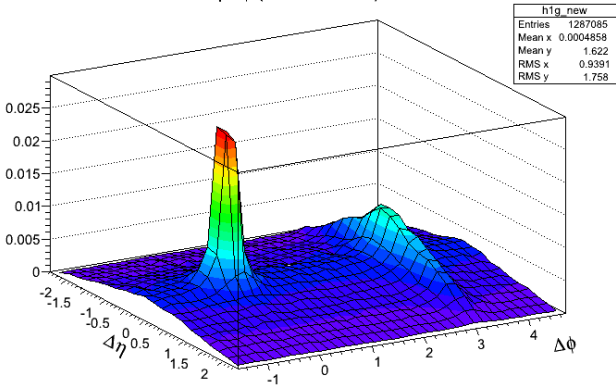
QA Plots



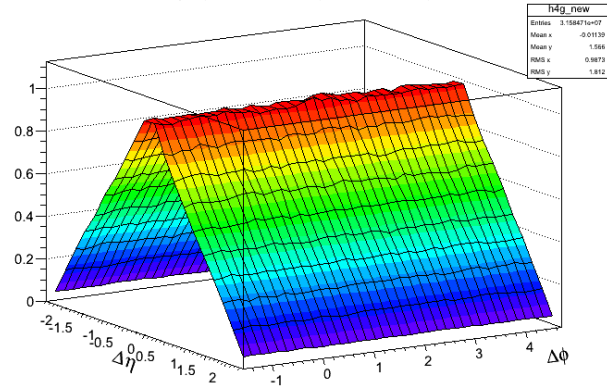
p-Pb 1) W.r t the Primary trigger particle

2) w.r.t the secondary trigger particle

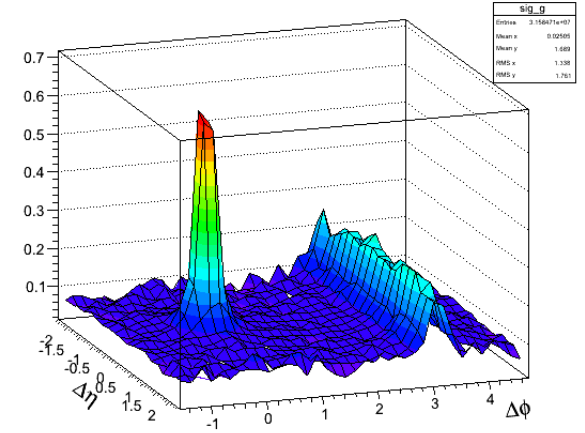
$\Delta\eta$ - $\Delta\phi$ (same events)



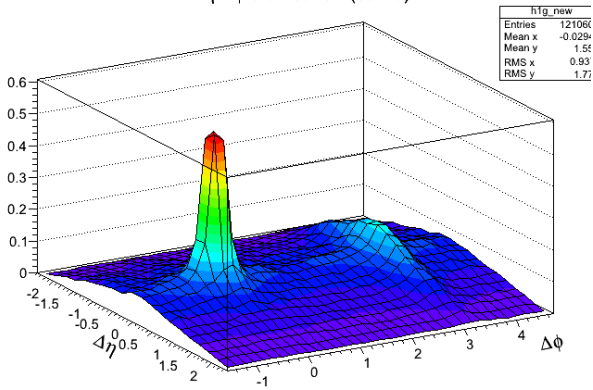
$\Delta\eta$ - $\Delta\phi$ distribution (mixed event)



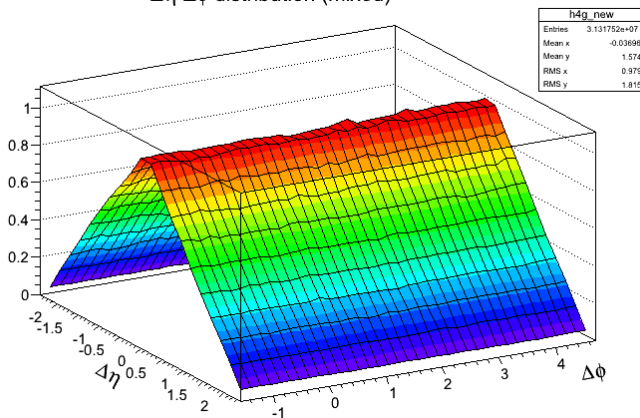
sig/bkg



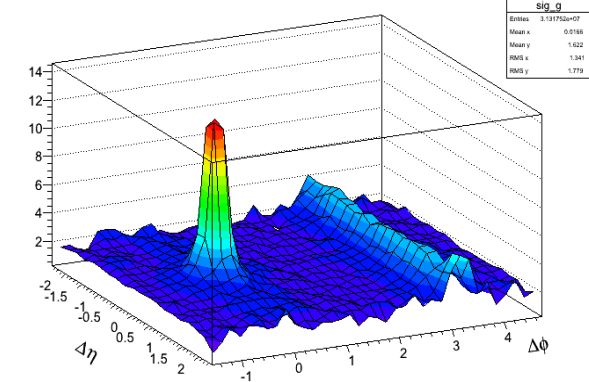
$\Delta\eta$ - $\Delta\phi$ distribution (same)



$\Delta\eta$ - $\Delta\phi$ distribution (mixed)



sig/bkg

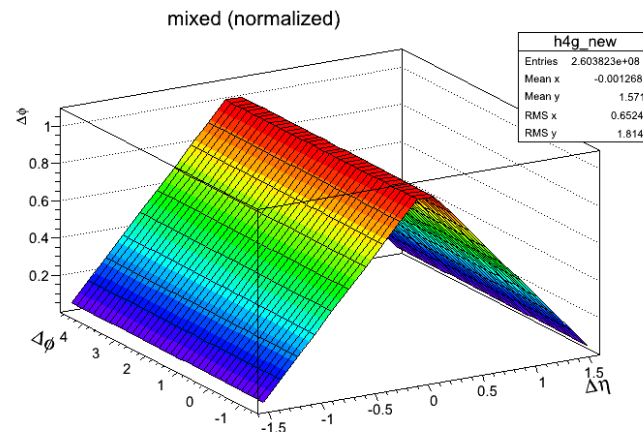


1) Same events.

No. of trigger particles in the given p_T range is obtained, and per trigger yield is calculated.

2) Mixed events.

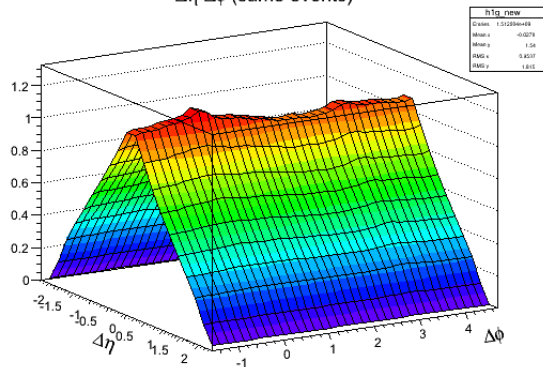
The normalization factor is chosen such that it is unity for pairs where both particles are going into approximately the same direction (i.e.the value is unity for the bin $\Delta\phi \in [H\Delta\phi, H\Delta\phi + \Delta\phi]$).



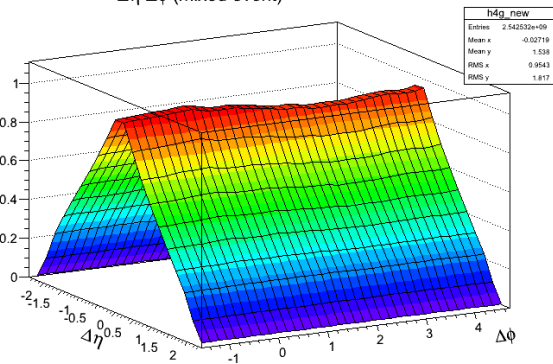
Pb-Pb 1) W.r t the Primary trigger particle

2) w.r.t the secondary trigger particle

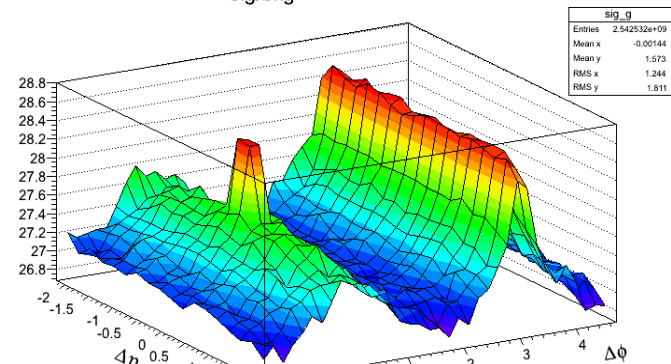
$\Delta\eta$ - $\Delta\phi$ (same events)



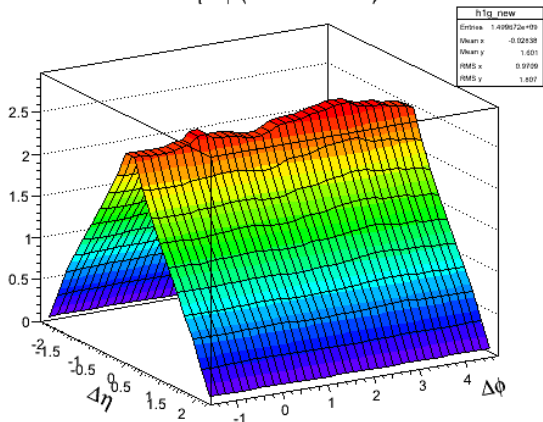
$\Delta\eta$ - $\Delta\phi$ (mixed event)



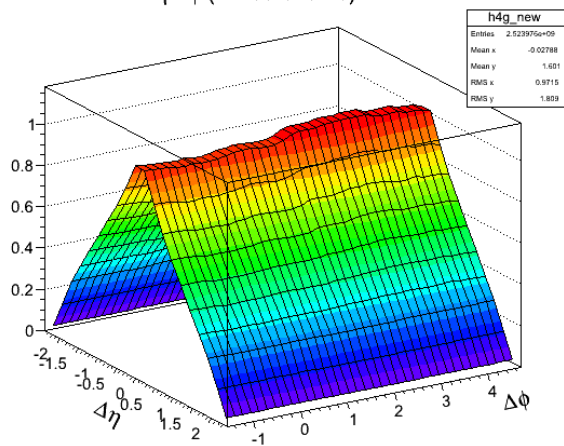
sig/bkg



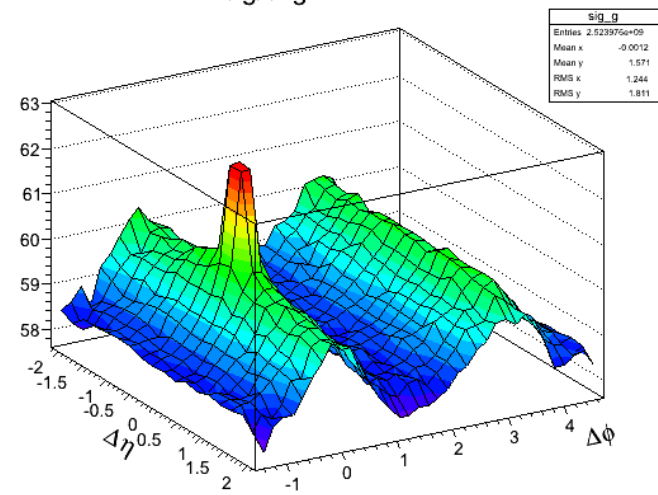
$\Delta\eta$ - $\Delta\phi$ (same events)



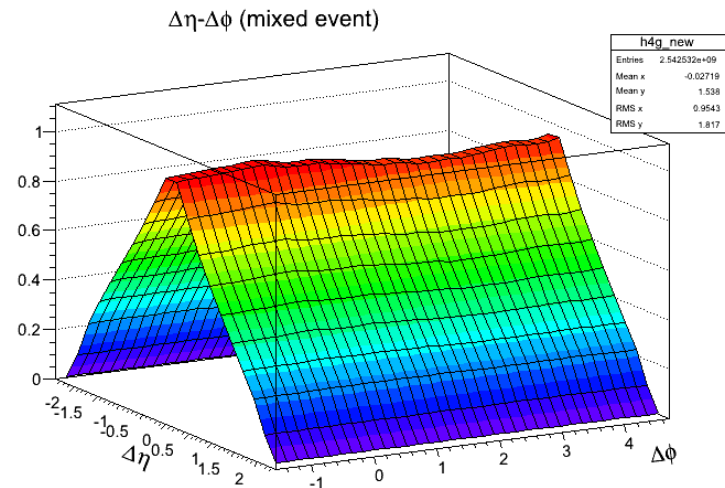
$\Delta\eta$ - $\Delta\phi$ (mixed events)



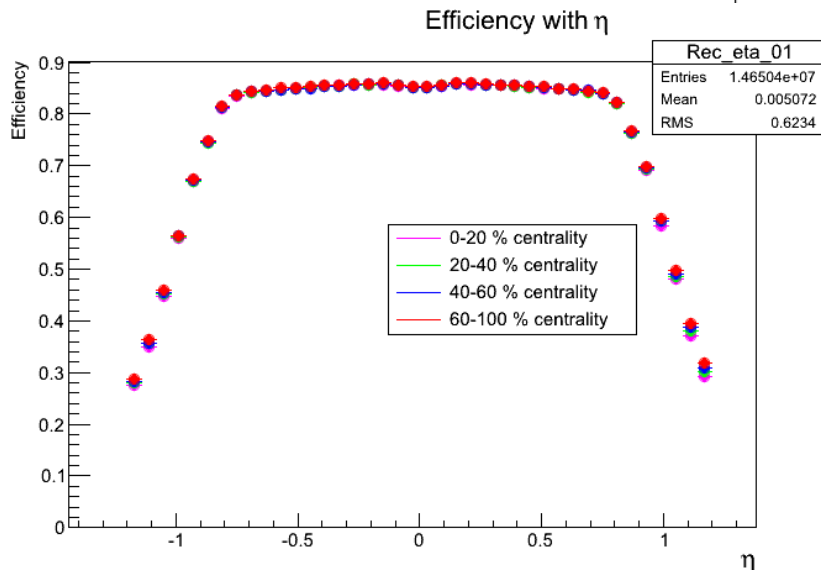
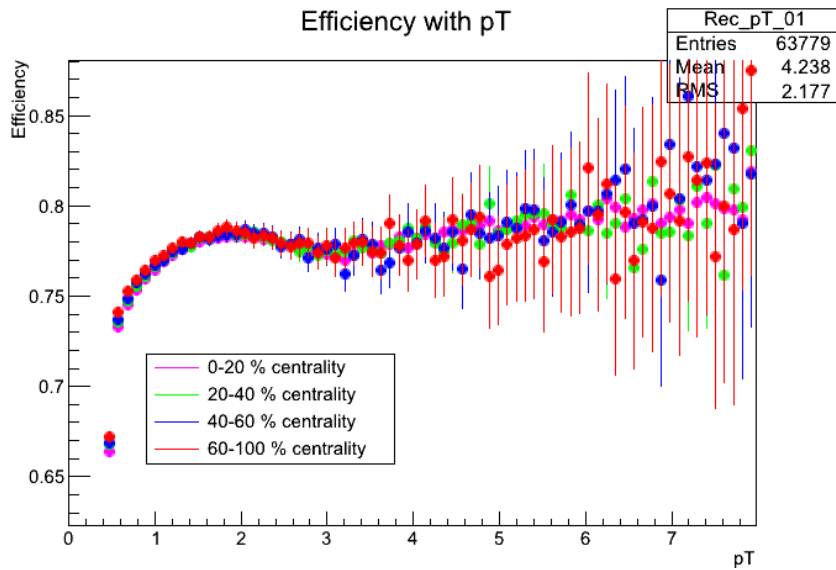
sig/bkg



- Mixed Event Distribution – not flat .
- As two triggers are used- it is no more a 2-P correlation. Mixed Event for 3P correlation to be done.
- For the event mixing class – in addition to z vertex and centrality – event plane(?).



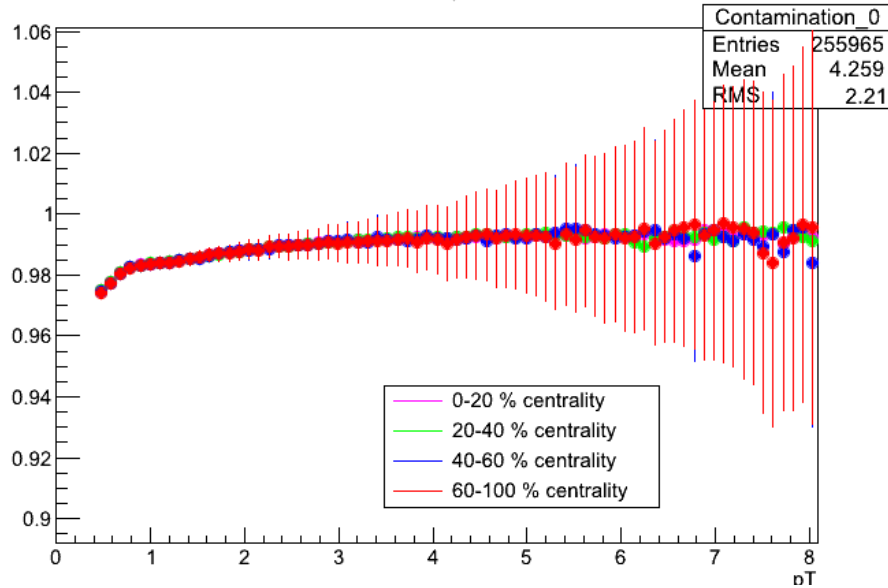
Single track efficiency correction



- Ratio of the number of accepted tracks from primary particle (reconstructed level) to number of all primary particle (kinematic level).
- LHC13b2 – DPMJET
- Hybrid Tracks – AOD FilterBit 768
- $|\eta| < 1.2$, $pT < 8\text{GeV}$.

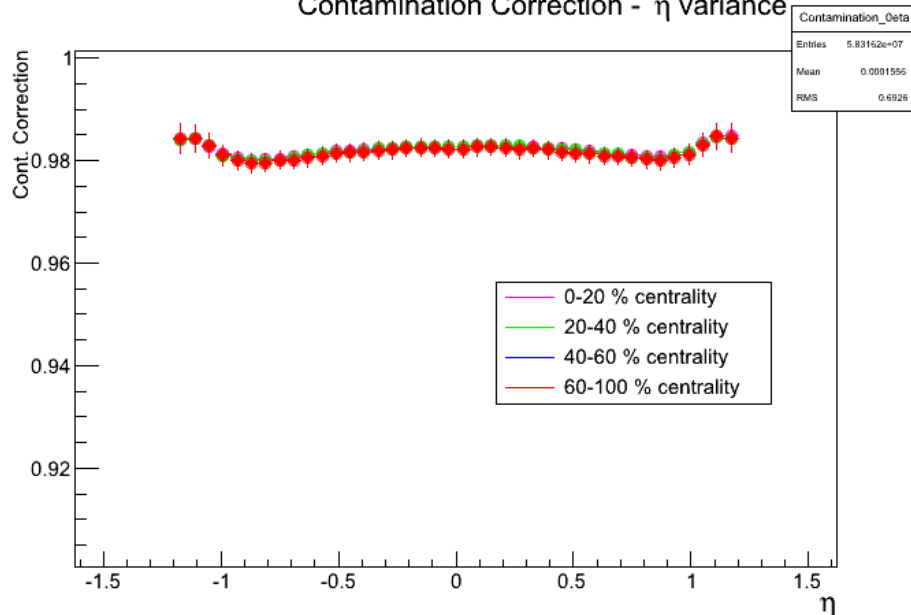
Contamination correction

Contamination pT variance



Ratio of reconstructed tracks coming only from primary particles to all the reconstructed tracks.

Contamination Correction - η variance



Summary and To Do...

- Mixed event analysis for '2+1' correlation needs to be looked at carefully, obtain a flat distribution.
- Preliminary results on '2+1' correlation, on one pT interval was shown.
- Have to look at asymmetric triggers (larger pT difference between primary and secondary triggers) – control the surface bias, and thus the in-medium path length traversed by the parton.
- Study the path length effects on the energy loss - looking at the final energies of each side in p-Pb, and Pb-Pb.