Truncated Mean: Status and Future

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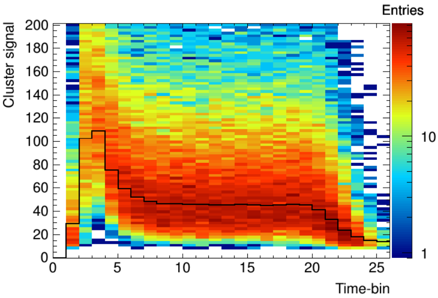
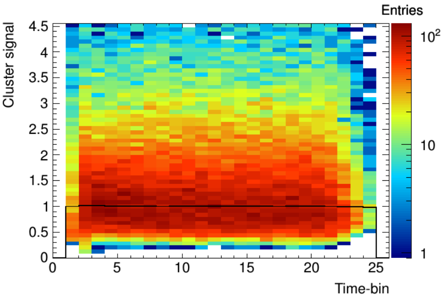
ALICE

Starting Point: Xiangou

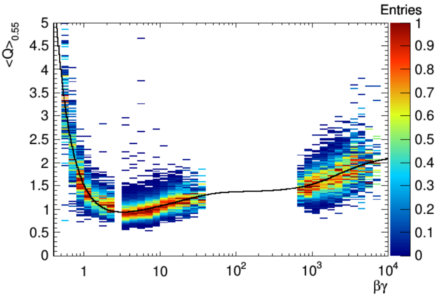
- idea:
  - after calibration time-bin signals / cluster signals follow Landau distribution
  - cut away large signals in accordance with truncation factor
    $\rightarrow$ gaussian distribution
  - requires time-bin calibration

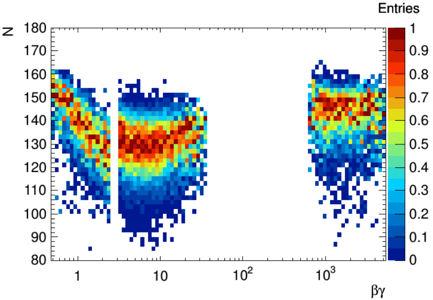




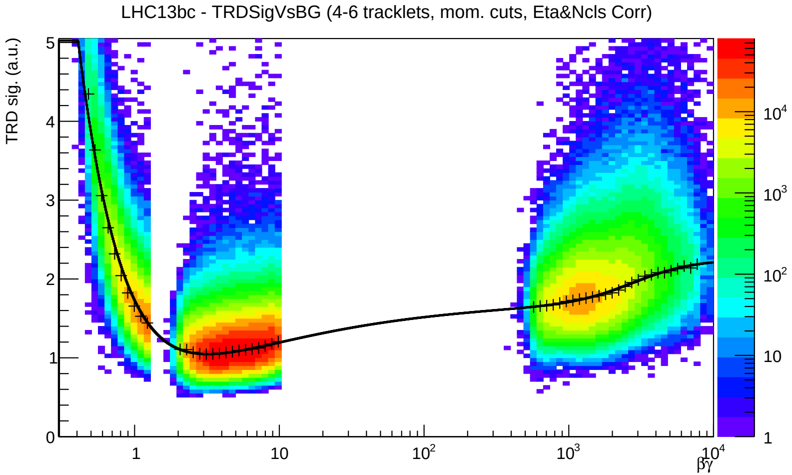
Starting Point: Xiangou

- determine most probable TM signal by fitting gauss for each $\beta\gamma$ slice
- interpolate missing $\beta\gamma$ slices by fitting Aleph+TR function to this MPV

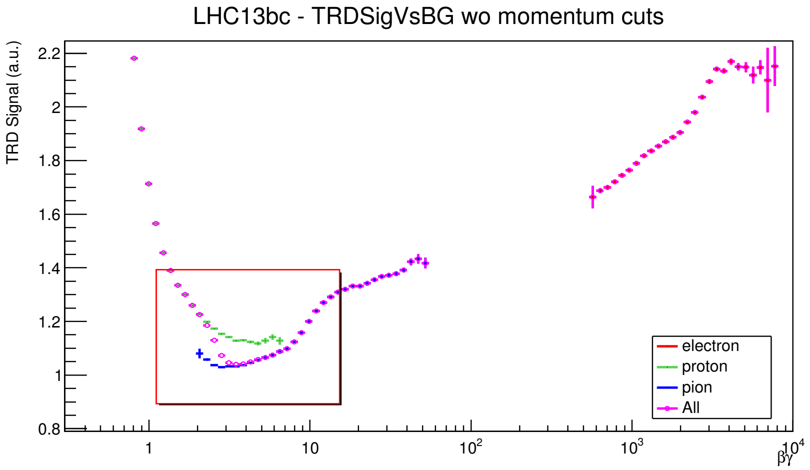




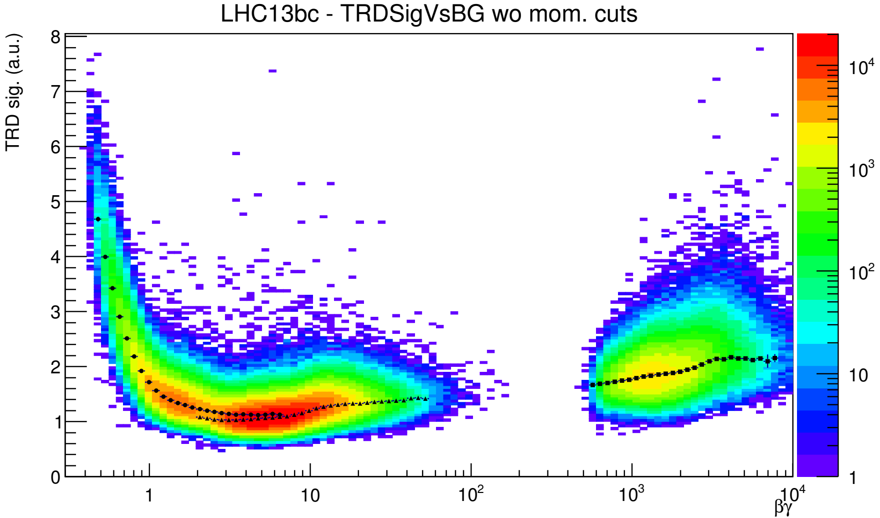
Current with all corrections and momentum cuts (4-6 tracklets)



Current wo corrections and momentum cuts (6 tracklets only)



Current wo corrections and momentum cuts (6 tracklets only)



- Width of signal depends dominantly on number of cluster $\approx \frac{1}{\sqrt{N}}$, therefore fit gaussian to deviation from MPV

$$\frac{TMSignal(\beta\gamma, \eta, NCluster, Centrality, ...)}{MPVFit(\beta\gamma)}$$

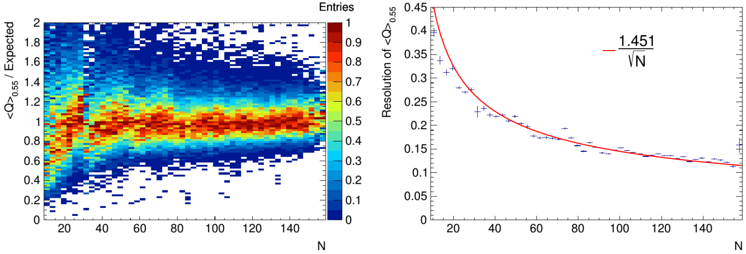
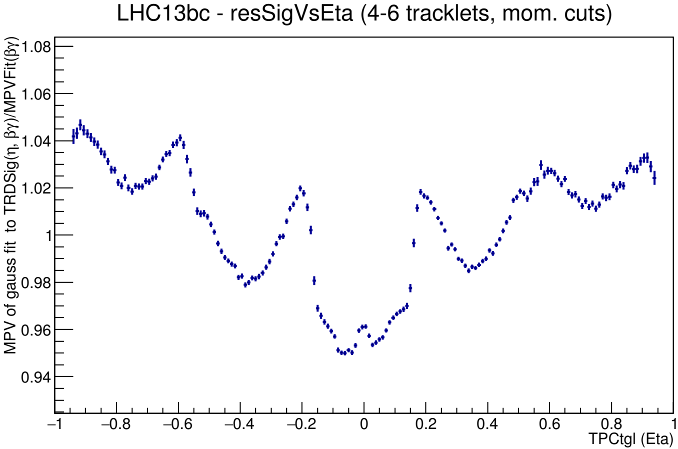


Figure 5.9: (*Left*) Scaled truncated mean signal and (*right*) the signal resolution as a function of the number of clusters.

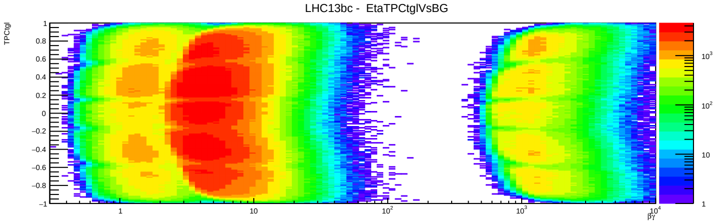
First Problems

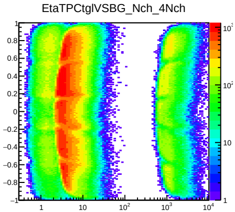
- signal distribution is not really gaussian
  - solution: gauss fits only consider upper half of signals
  - but: still not really gaussian (reduced χ^2 especially for pions sometimes around 20 or greater)
  - result: better estimator of MPV, difference to full gaus (max dev. around 5$\%$ and increased width)
- momentum cuts required (see above) (proton-pion)
- parametrization fit is unstable

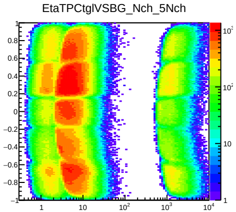
- eta dependence in signal (around 5%)

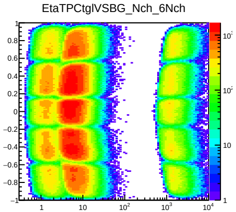


- eta dependence introduces bias in AlephFit



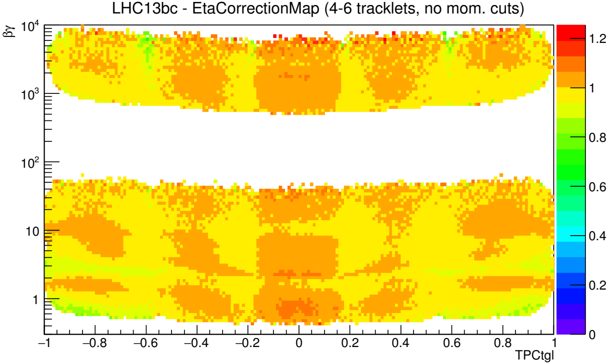




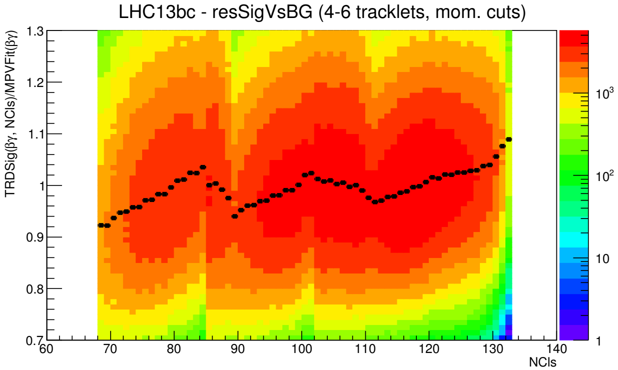


First Problems: eta dependence (Lukas, Yvonne, Florian)

- solution: eta map
- problem: correct to which value (Fit?, Mean?, BinMean?)
- reason? path length dependence?

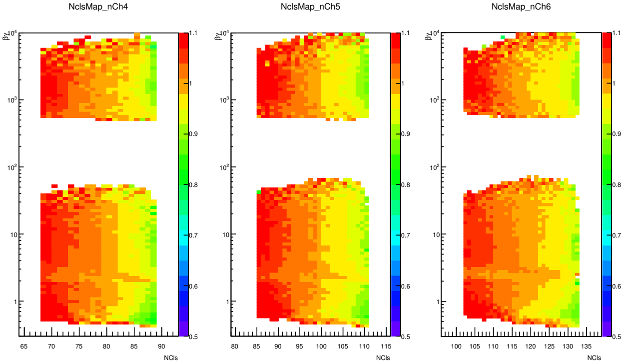


- signal increases in each chamber with increasing cluster number (TRD meeting 22.06)



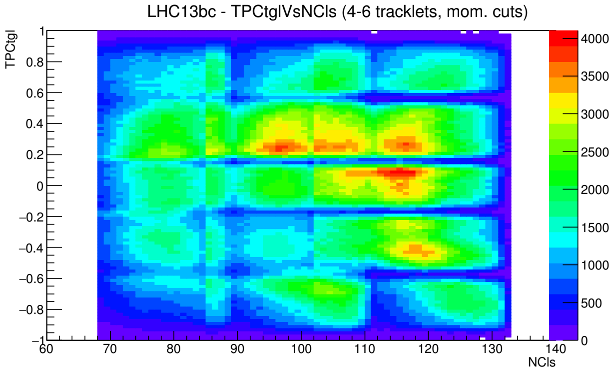
Next Problems: cluster dependence

- solution: cluster map
- problem: correct to which value (Fit?, Mean?, BinMean?), corrections independent?
- reason: path length dependence?

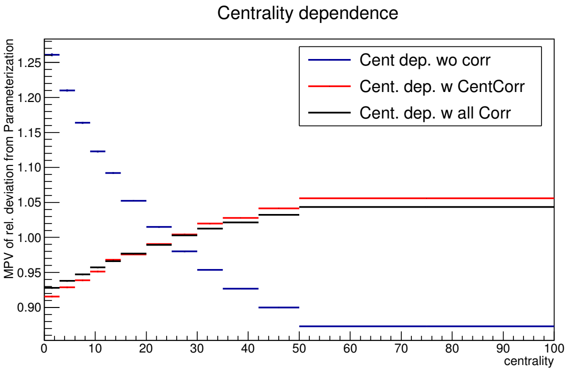


Next Problems: cluster dependence

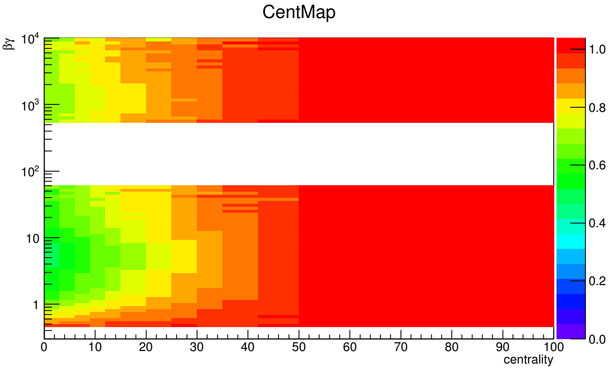
- solution: cluster map
- problem: correct to which value (Fit?, Mean?, BinMean?), corrections independent?
- reason: path length dependence?



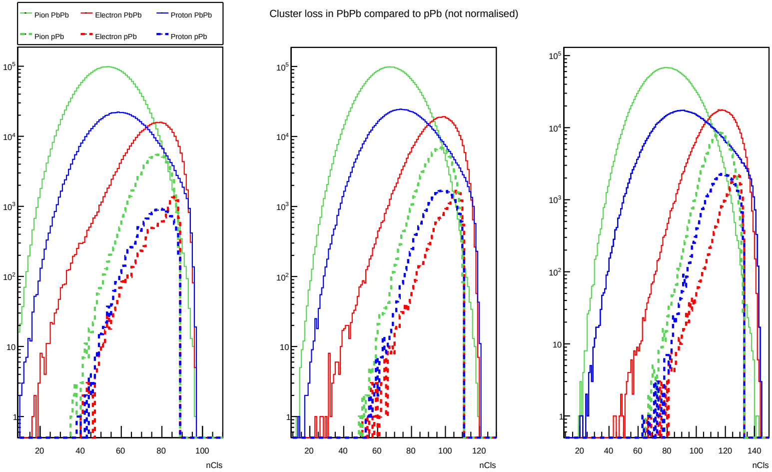
- signal increases with increasing central collisions



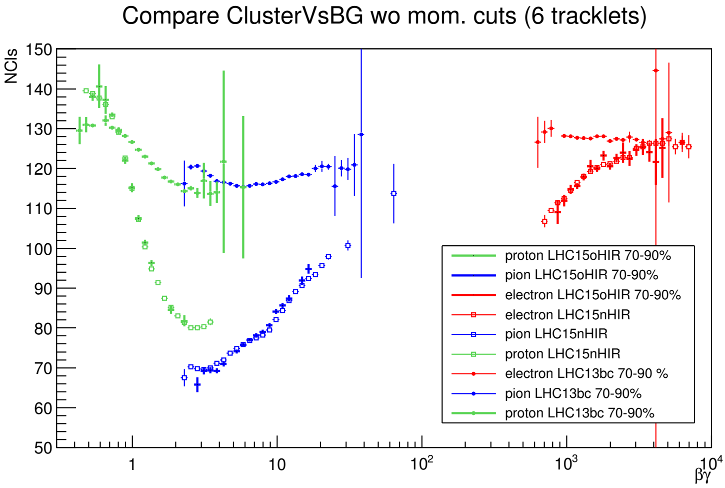
- solution: centrality map
- problem: correct to which value (most peripheral Bins?), corrections independent?

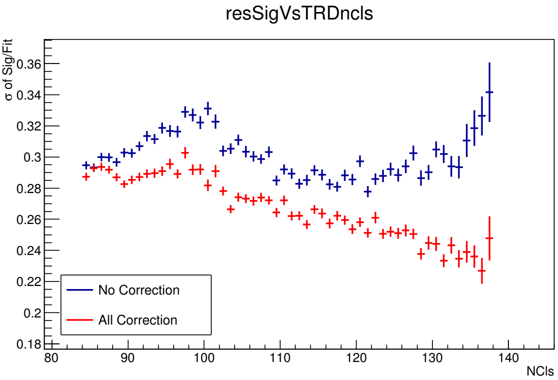


Cluster loss in PbPb compared to pPb (not normalised)



Recent Problems: cluster loss in LHC15n/o + bad resolution



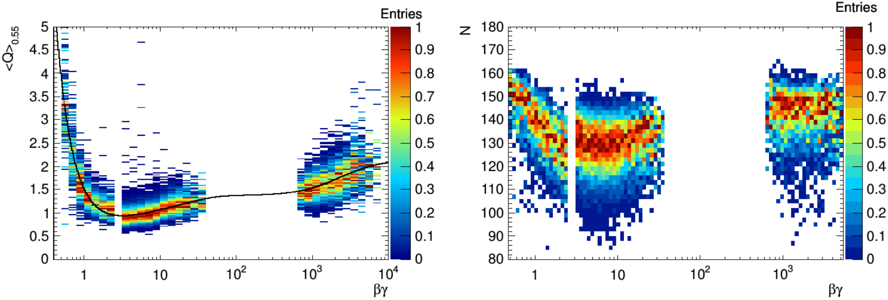

resSigVsTRDncls
σ of Sig/Fit
0.36
0.34
0.32
0.3
0.28
0.26
0.24
0.22
0.2
0.18
80
90
100
110
120
130
140
NCls
No Correction
All Correction

Recent Problems: cluster loss in LHC15n/o + bad resolution

- checks
  - gain? first checks by Luisa indicates no significant effect
  - intensity? no significant impact
  - in LHC15o centrality small effect – peripheral data correspond to LHC15n
- next steps?

backup slides

PhD thesis Xiangou



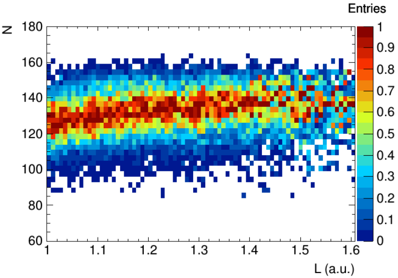


Figure 5.8: Number of clusters as a function of the particle path length in the TRD.

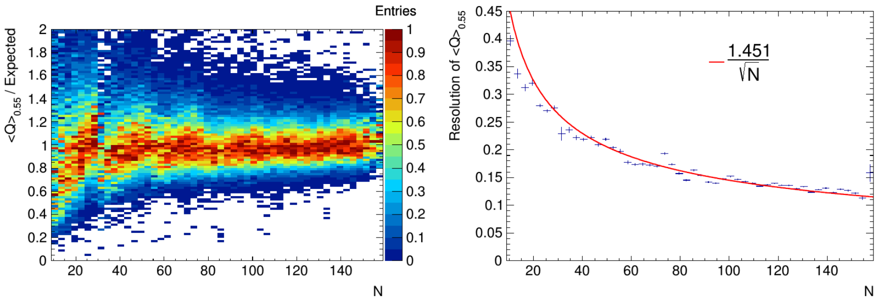
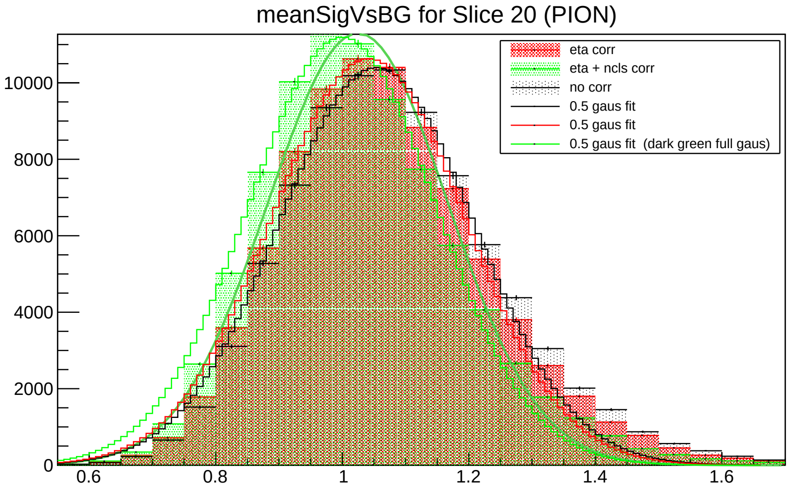
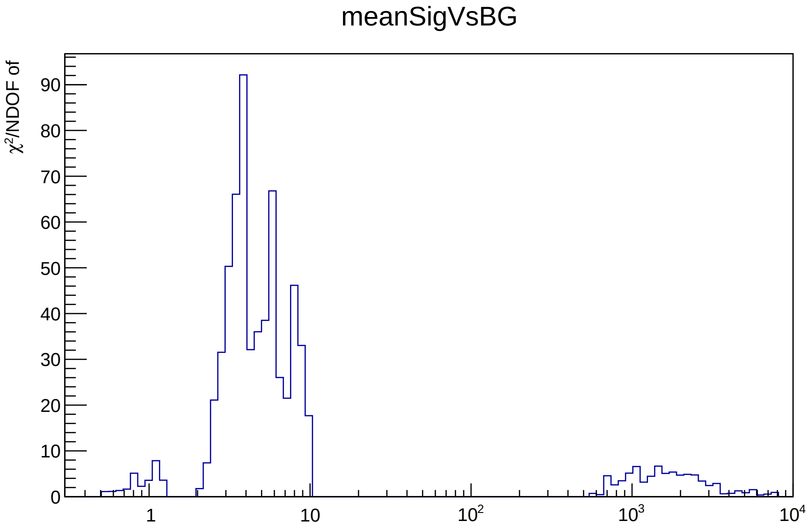


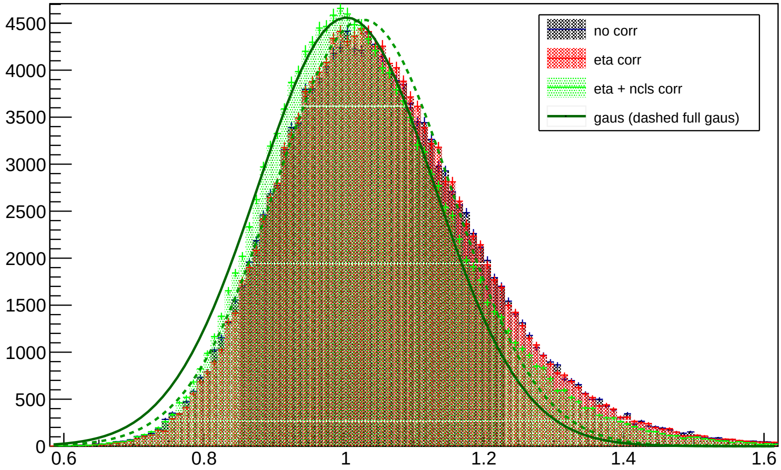
Figure 5.9: (*Left*) Scaled truncated mean signal and (*right*) the signal resolution as a function of the number of clusters.

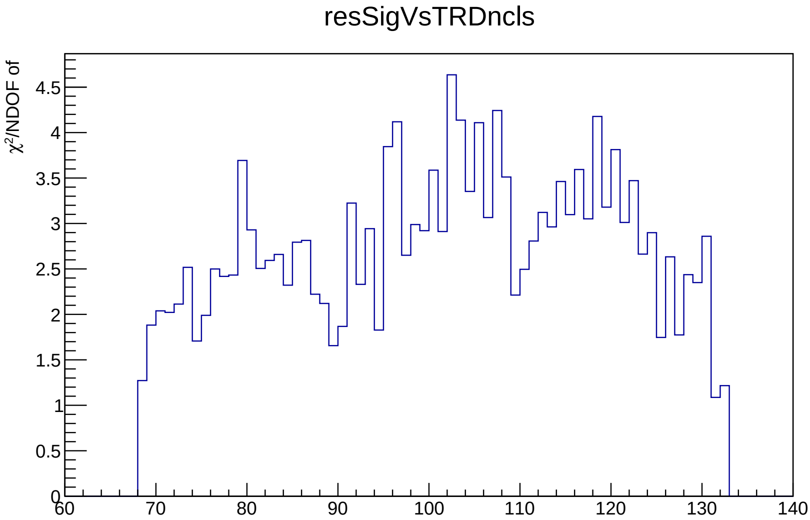
Gauss fit to slices



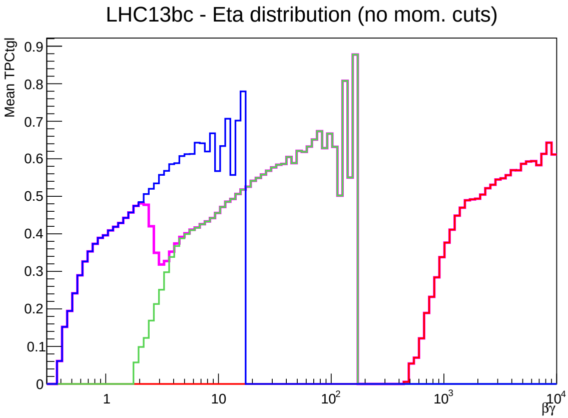
Gauss fit to slices



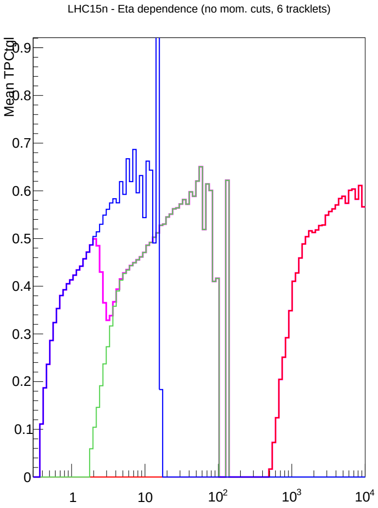

4500
4000
3500
3000
2500
2000
1500
1000
500
0
0.6
0.8
1
1.2
1.4
1.6
no corr
eta corr
eta + ncls corr
gaus (dashed full gaus)


resSigVsTRDncls
χ²/NDOF of
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
60
70
80
90
100
110
120
130
140

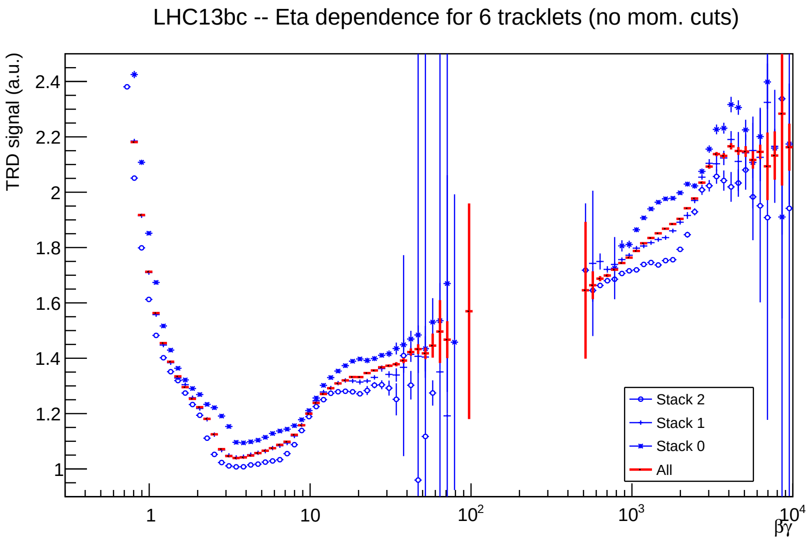
Eta Dependence



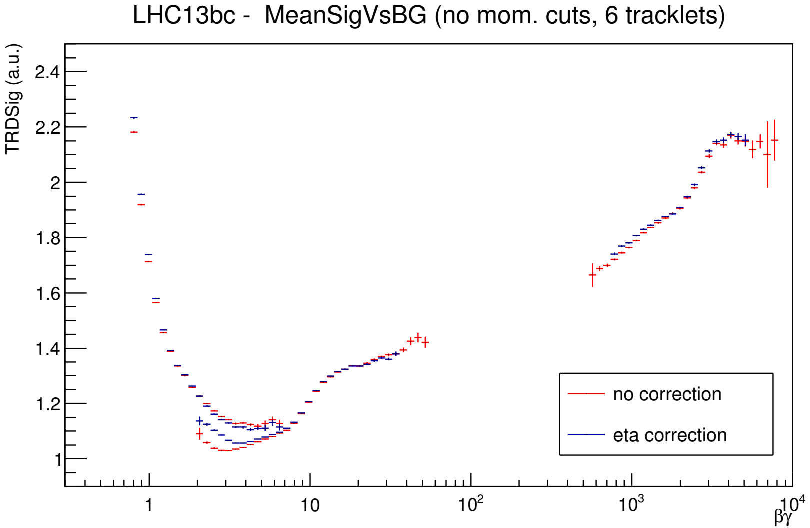
Eta Dependence



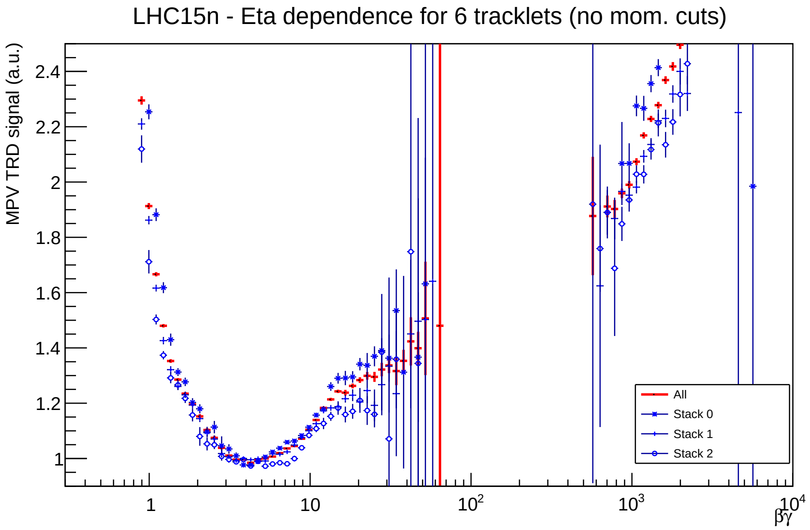
Eta Dependence

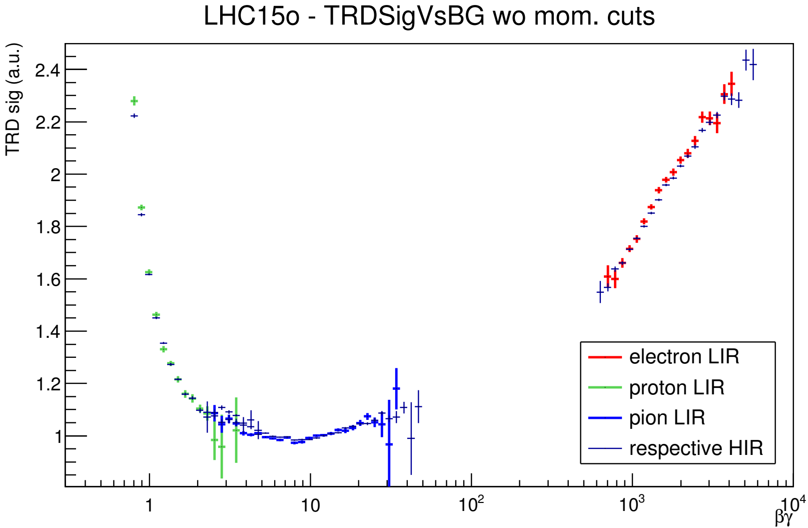


Eta Dependence

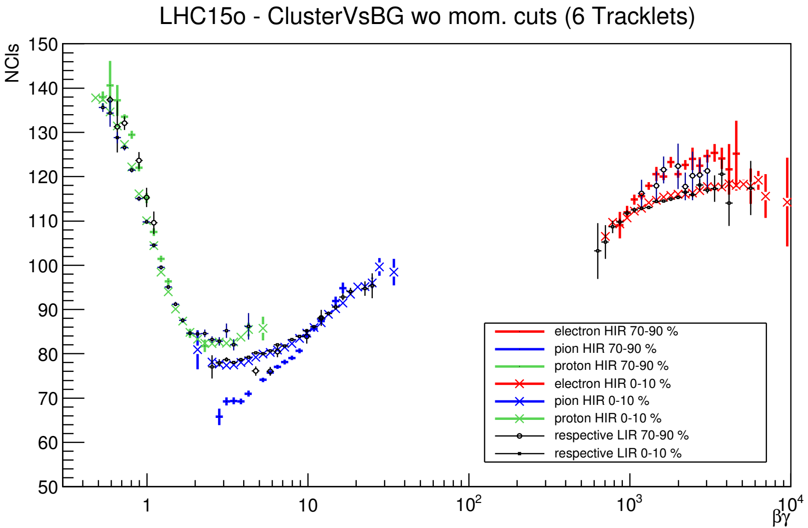


Eta Dependence

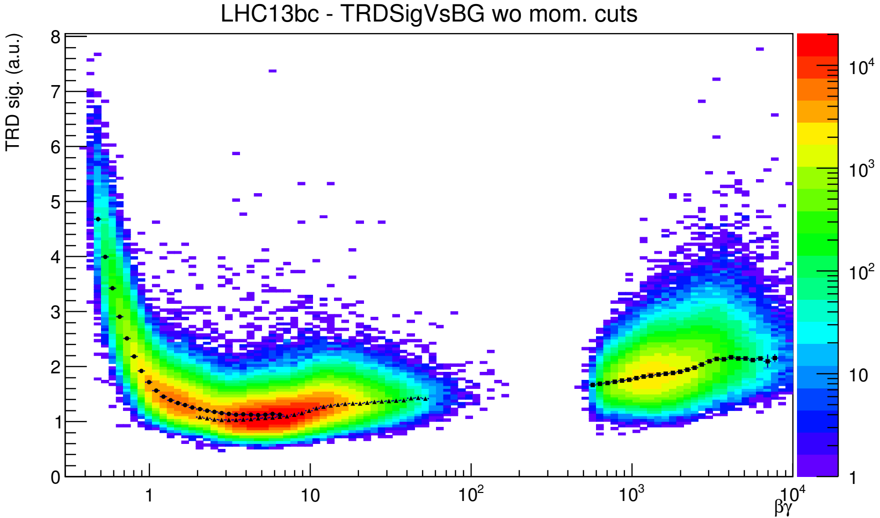



LHC15o - TRDSigVsBG wo mom. cuts
TRD sig (a.u.)
2.4
2.2
2
1.8
1.6
1.4
1.2
1
1
10
10^2
10^3
10^4
βγ
electron LIR
proton LIR
pion LIR
respective HIR

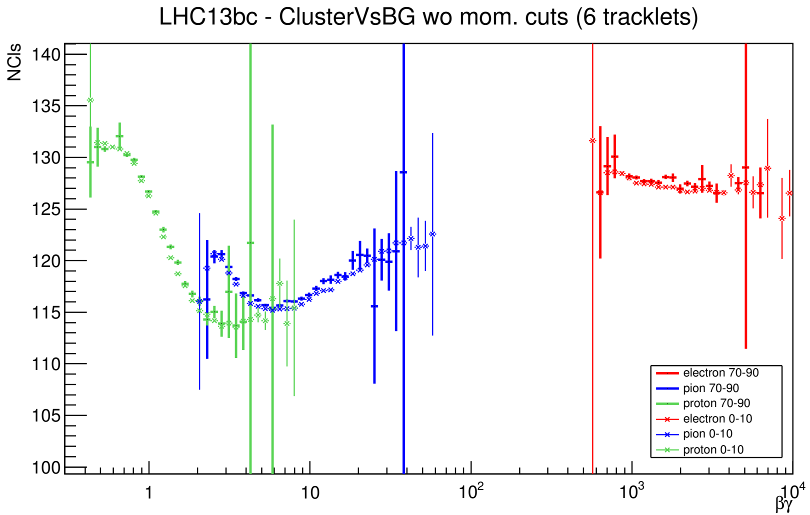
LHC15o – Cluster (Centrality Intensity)



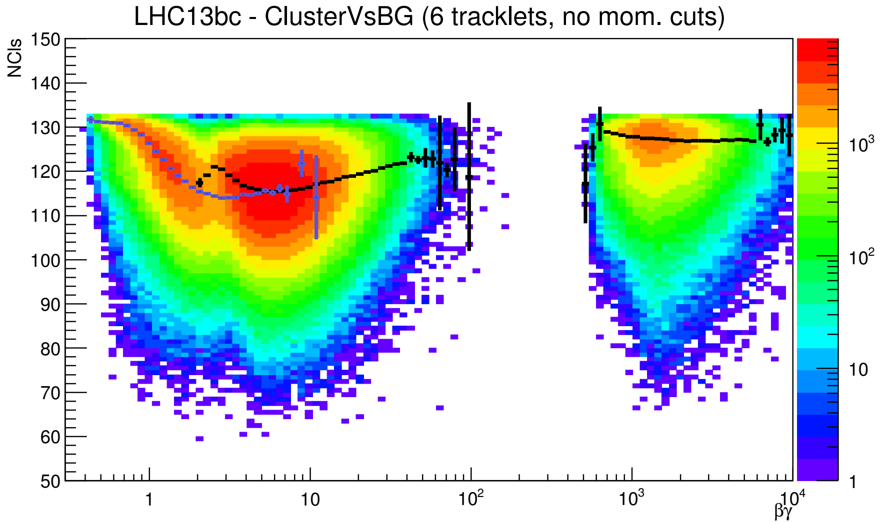
LHC13bc – MPVFit

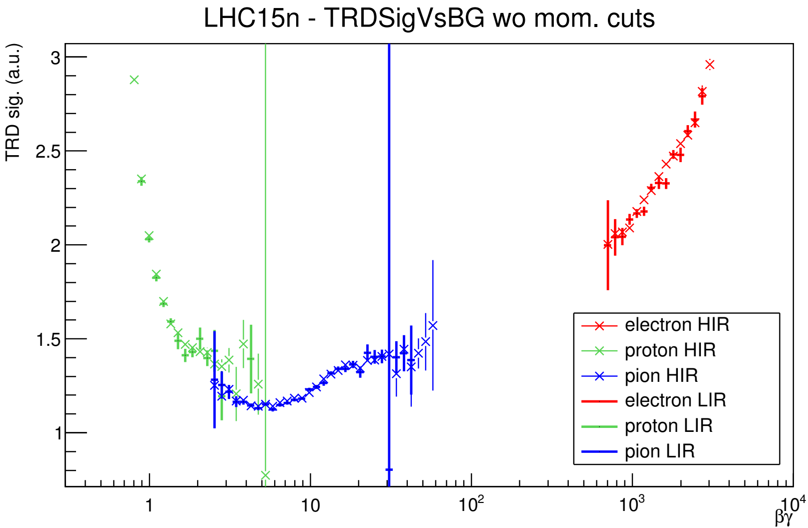


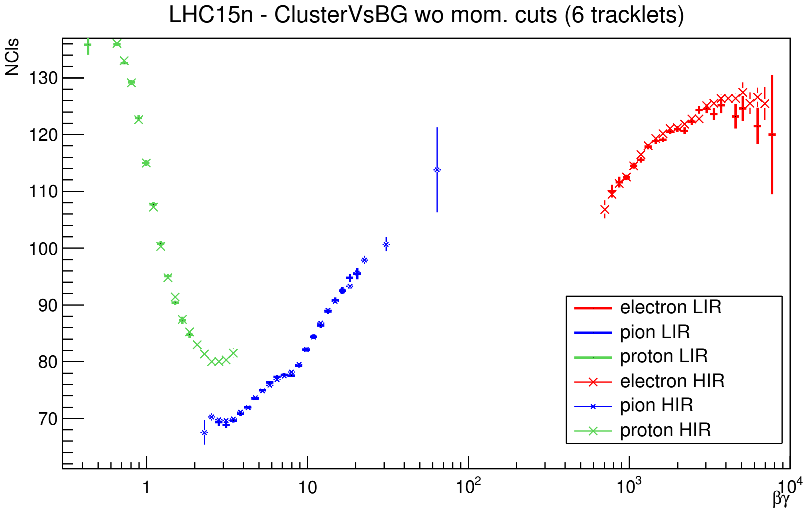
LHC13bc – Cluster



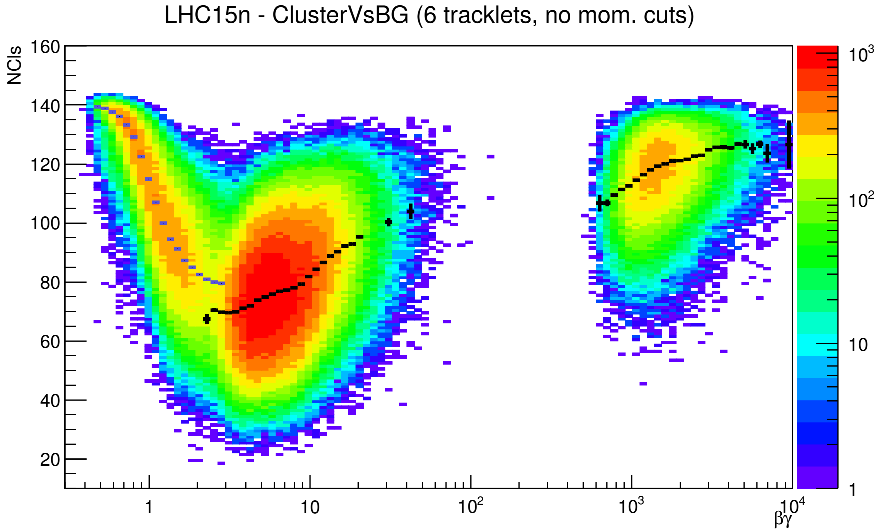
LHC13bc – Cluster



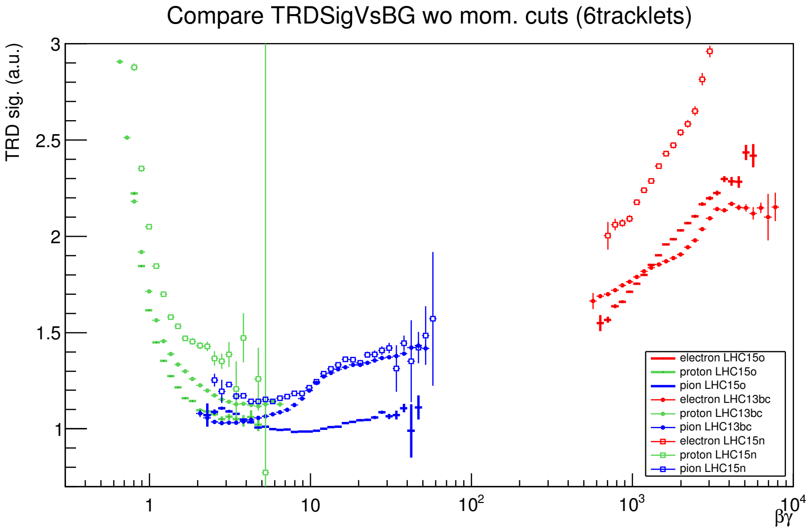

LHC15n - TRDSigVsBG wo mom. cuts
TRD sig. (a.u.)
3
2.5
2
1.5
1
1
10
10^2
10^3
10^4
βγ
electron HIR
proton HIR
pion HIR
electron LIR
proton LIR
pion LIR


LHC15n - ClusterVsBG wo mom. cuts (6 tracklets)
NCls
130
120
110
100
90
80
70
1
10
10^2
10^3
10^4
βγ
electron LIR
pion LIR
proton LIR
electron HIR
pion HIR
proton HIR

LHC15n – Cluster



Compare MeanSigVsBG



- charge dependence