$\Delta\eta\Delta\phi$ correlations in p+p - comparison with UrQMD

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Two-particle correlations - introduction

Correlations are calculated by finding the difference in pseudo-rapidity and azimuthal angle between two particles in the same event.

$\Delta\eta = |\eta_1 - \eta_2|$ η transformed from LAB to CMS assuming pion mass
$\Delta\phi = |\phi_1 - \phi_2|$
The azimuthal angle is folded (to improve statistics):
if $\Delta\phi > \pi$ then $\Delta\phi = 2\pi - \Delta\phi$.

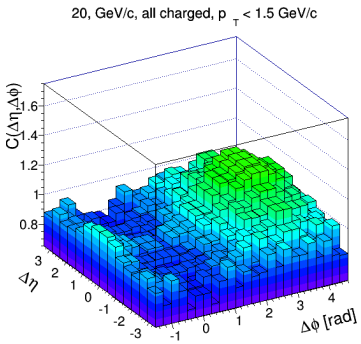
Correlation function

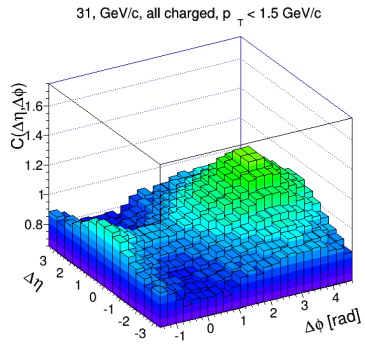
$$C(\Delta\eta, \Delta\phi) = \frac{N^{pairs}_{mixed}}{N^{pairs}_{data}} \frac{S(\Delta\eta,\Delta\phi)}{M(\Delta\eta,\Delta\phi)};$$
$$S(\Delta\eta, \Delta\phi) = \frac{d^2N^{signal}}{d\Delta\eta d\Delta\phi}; \quad M(\Delta\eta, \Delta\phi) = \frac{d^2N^{mixed}}{d\Delta\eta d\Delta\phi}$$

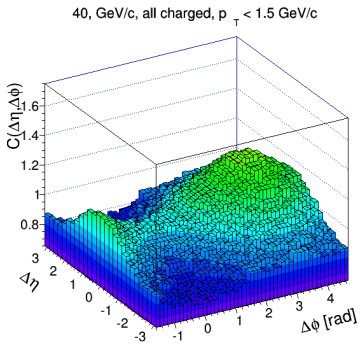
Correlation function ratio is calculated and normalized in restricted $\Delta\eta$ region: $0 < \Delta\eta < 3$.
Event and track cuts were chosen to select only inelastic interactions with particles produced in strong and EM processes within the NA61/SHINE acceptance.

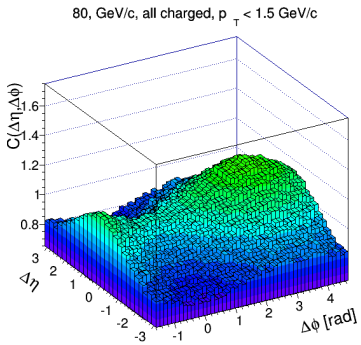
Data vs. Monte Carlo, all charged

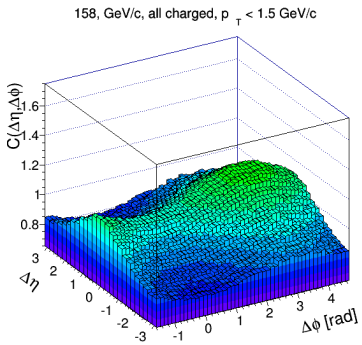
Data



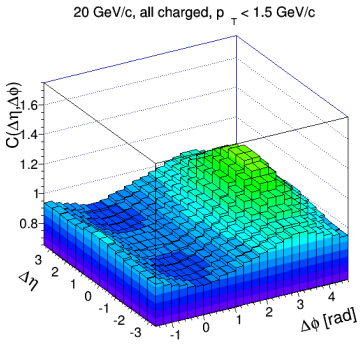


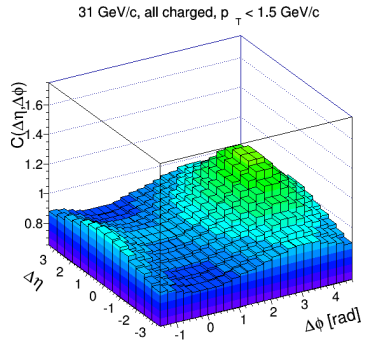


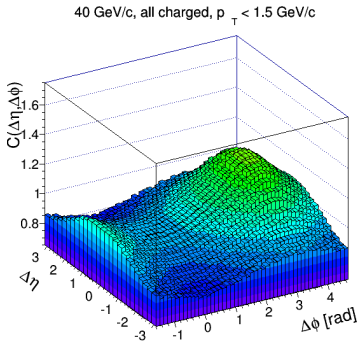


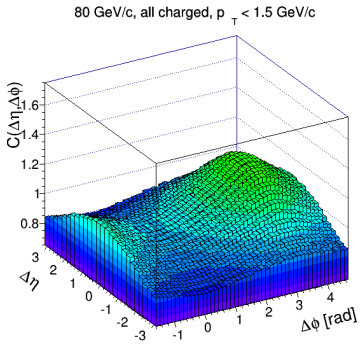


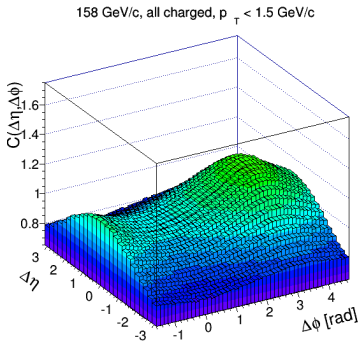
EPOS with NA61 acceptance



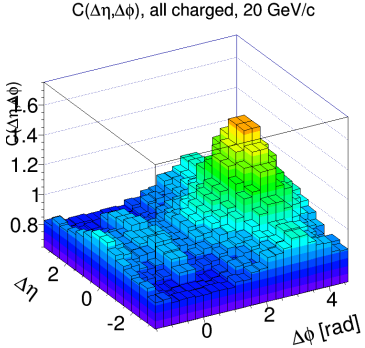


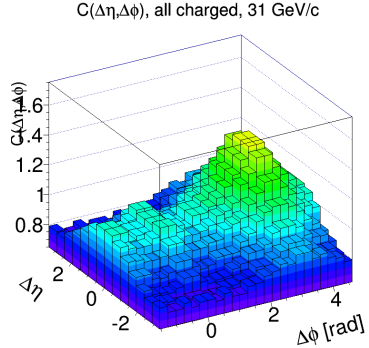


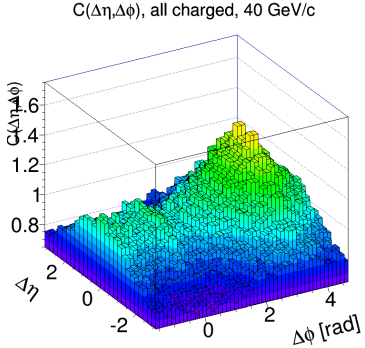


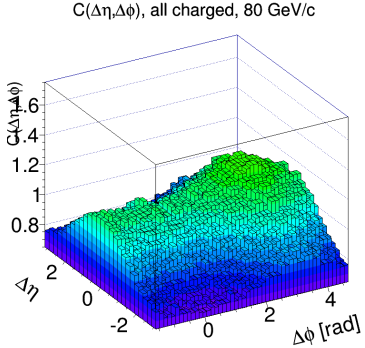


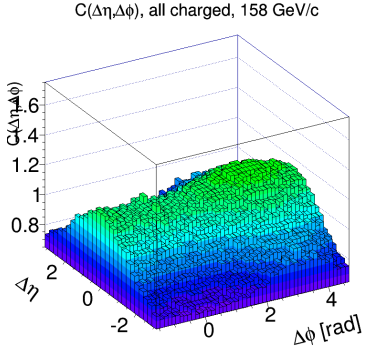
UrQMD with NA61 acceptance



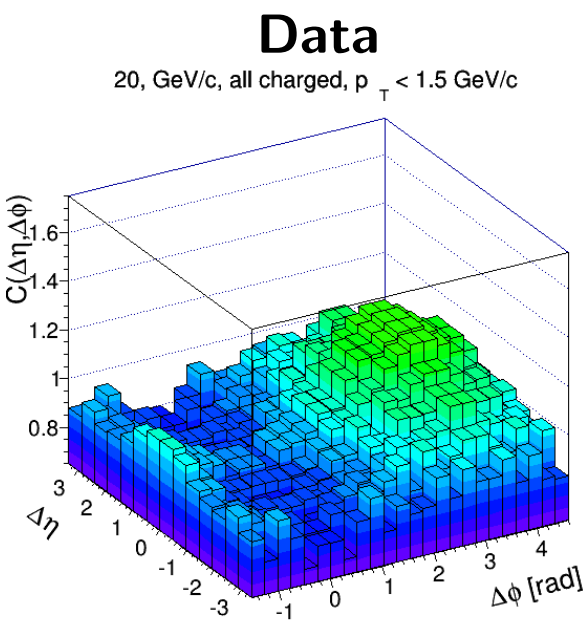


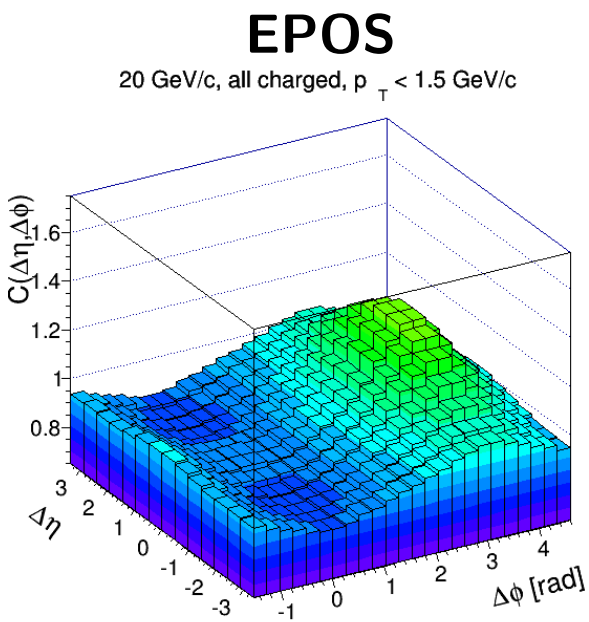


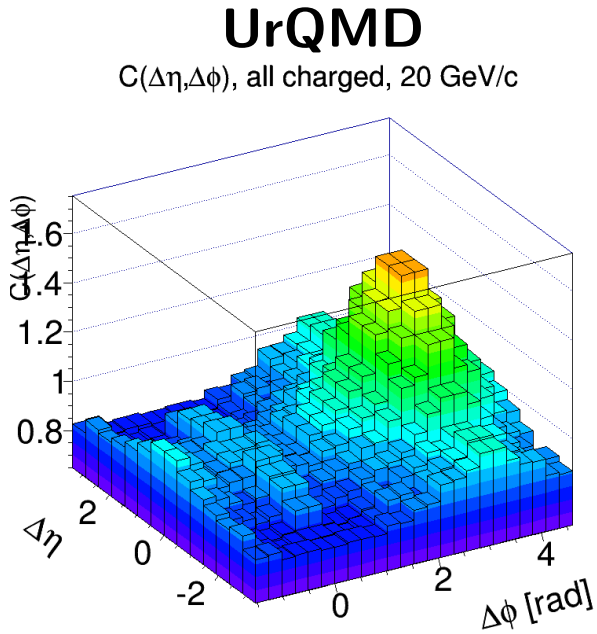




Differences example (20 GeV/c)

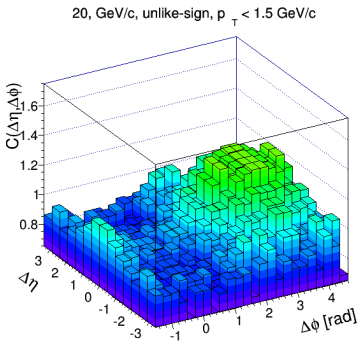


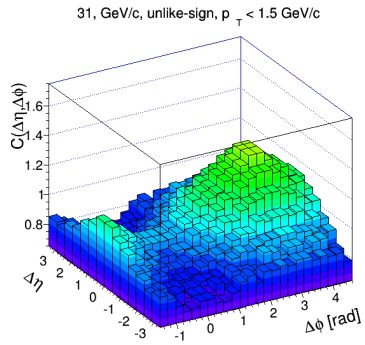


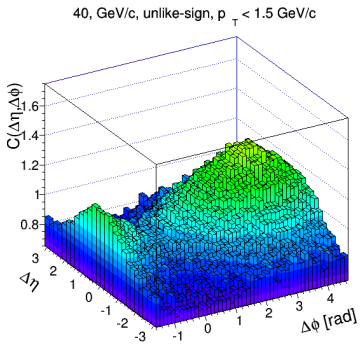


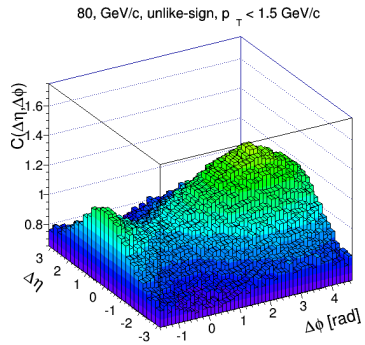
Data vs. Monte Carlo, unlike-sign

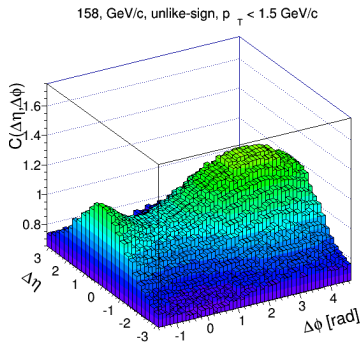
Data



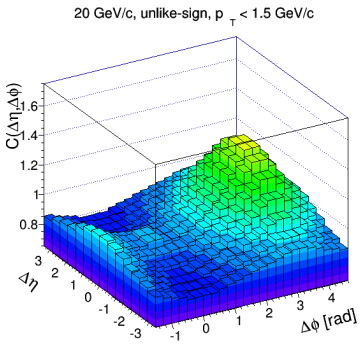


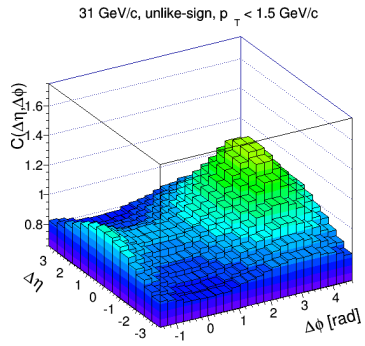


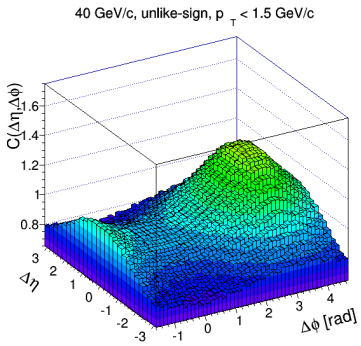


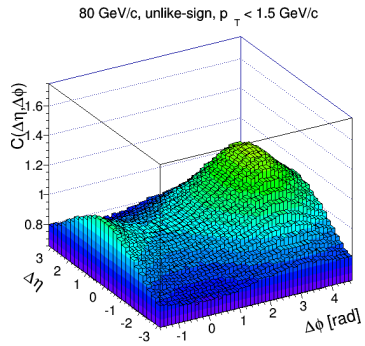


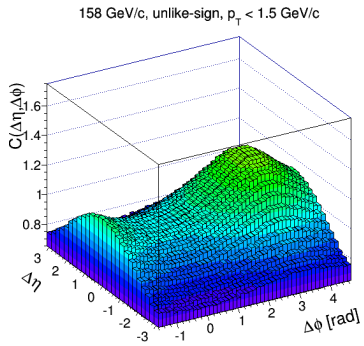
EPOS with NA61 acceptance



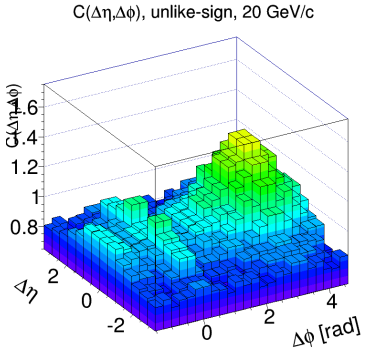


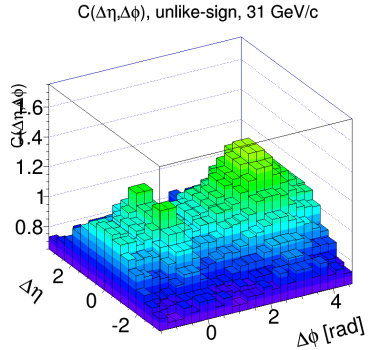


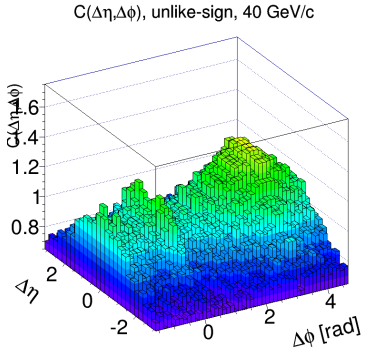


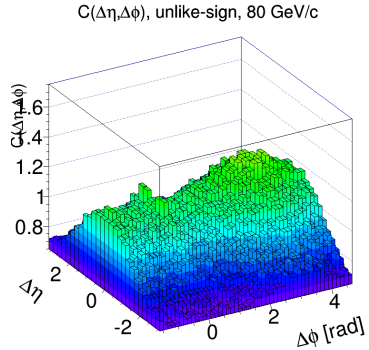


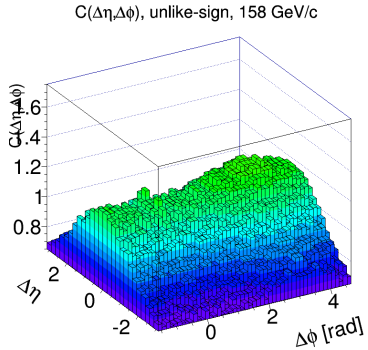
UrQMD with NA61 acceptance





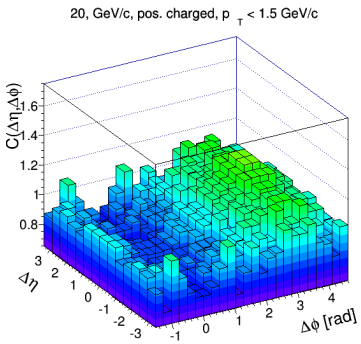


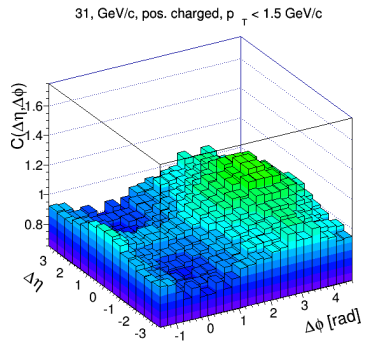


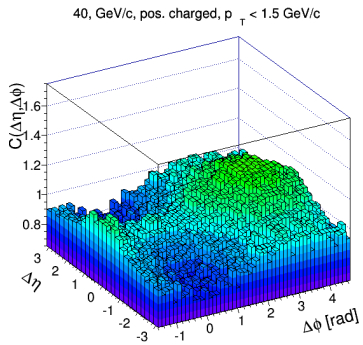


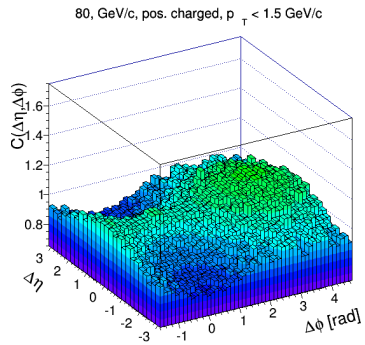
Data vs. Monte Carlo, pos. charged

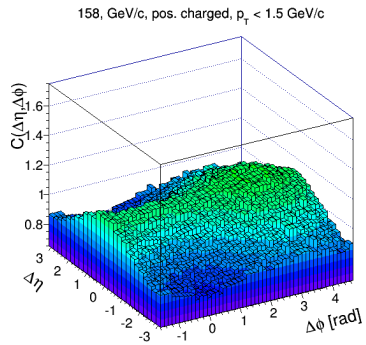
Data



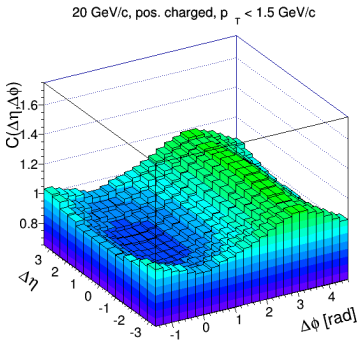


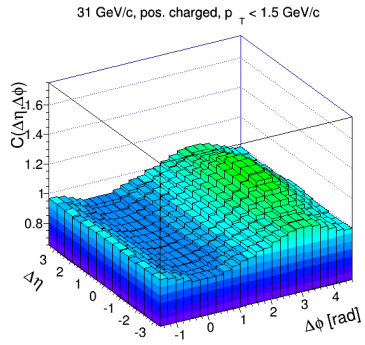


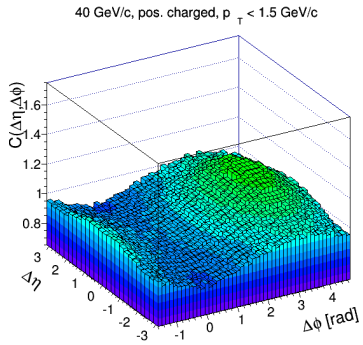


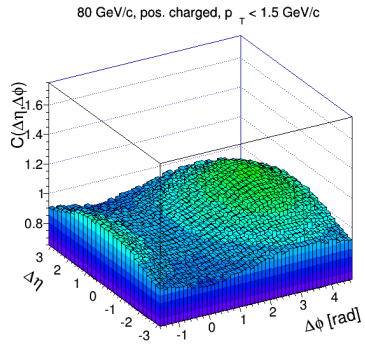


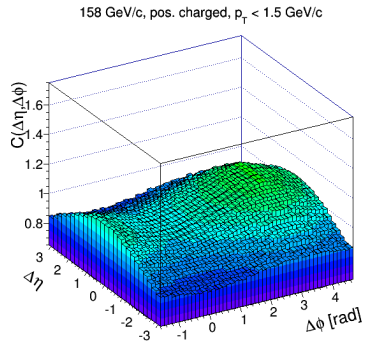
EPOS with NA61 acceptance



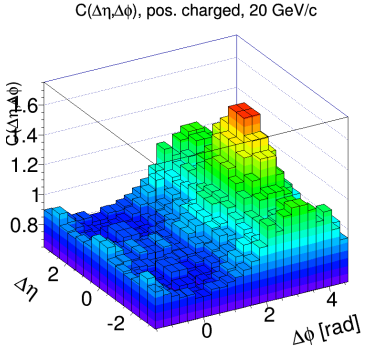


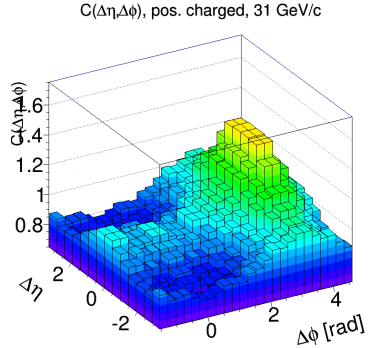


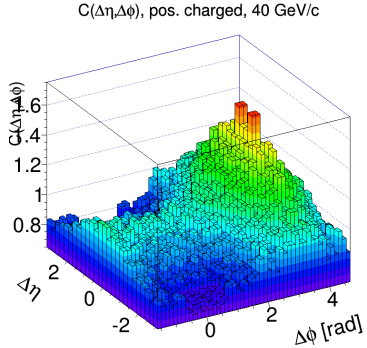


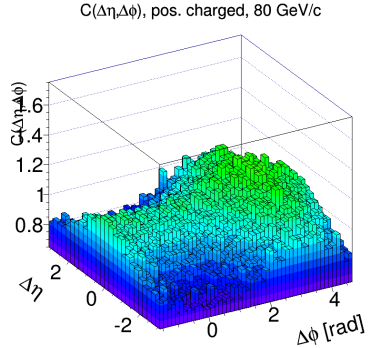


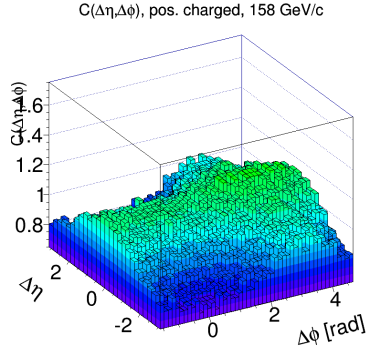
UrQMD with NA61 acceptance





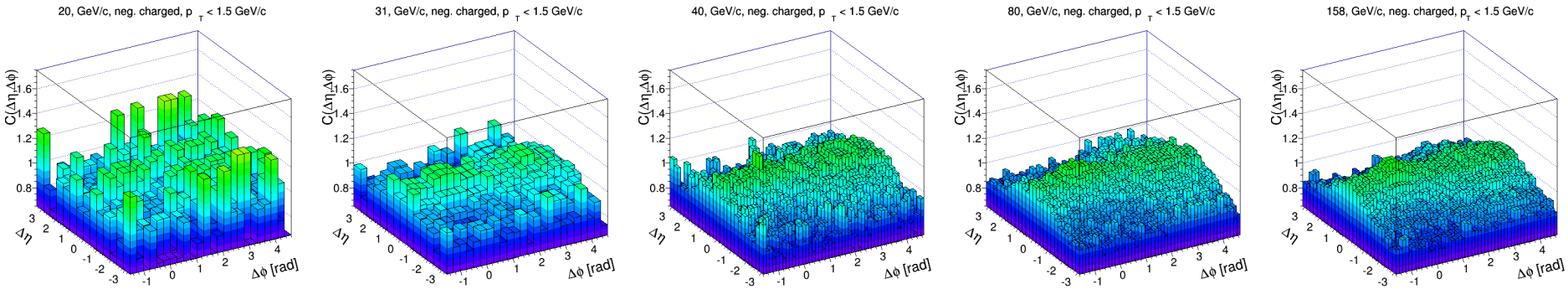




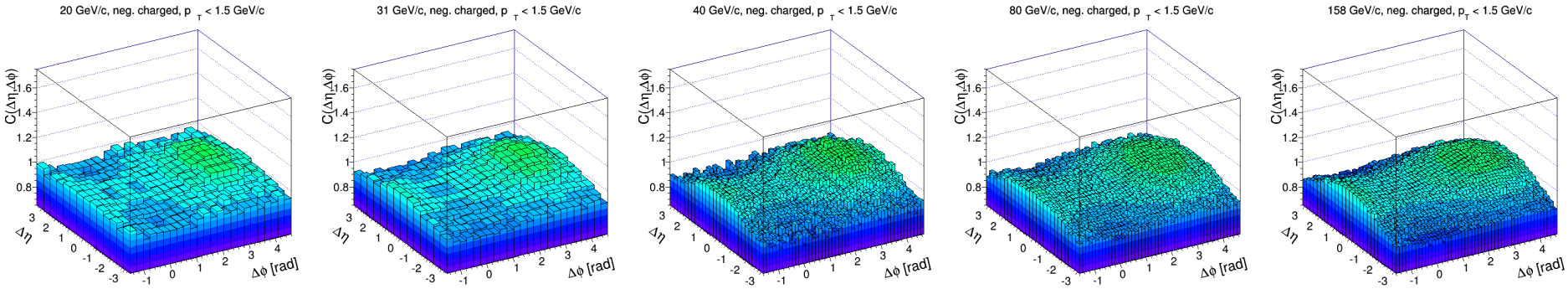


Data vs. Monte Carlo, neg. charged

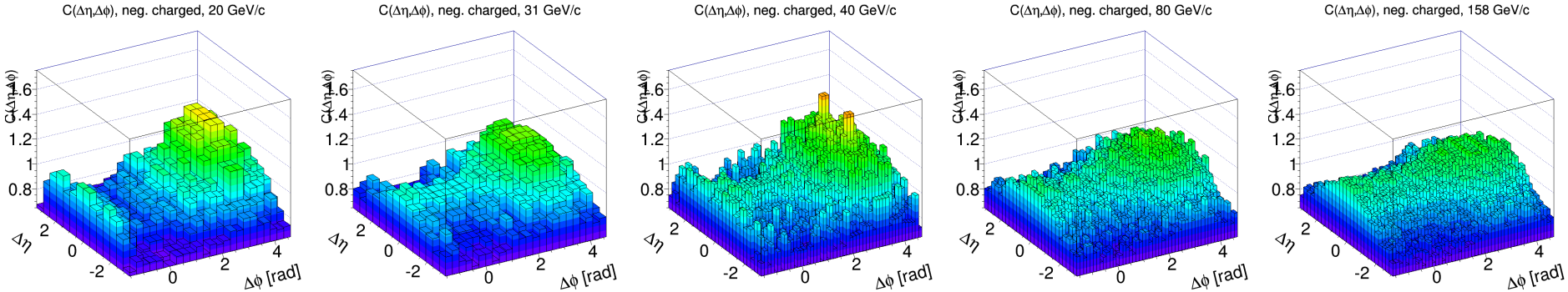
Data



EPOS with NA61 acceptance

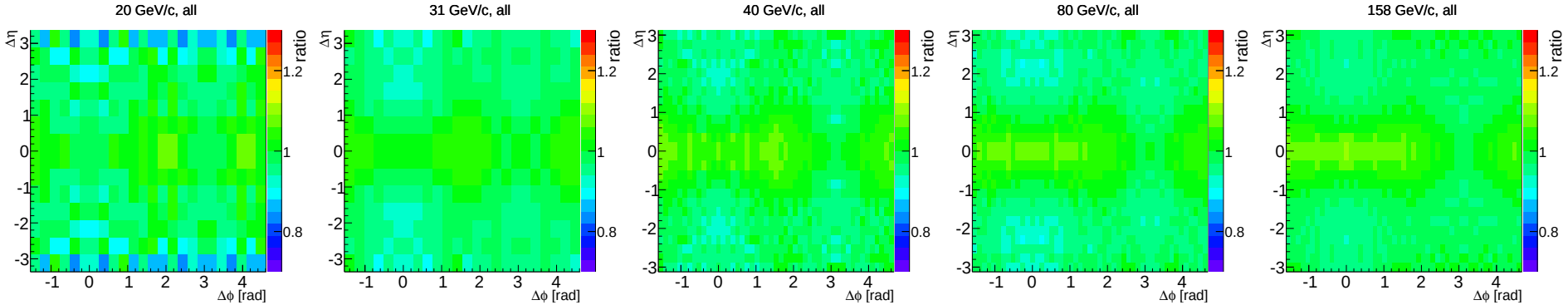


UrQMD with NA61 acceptance

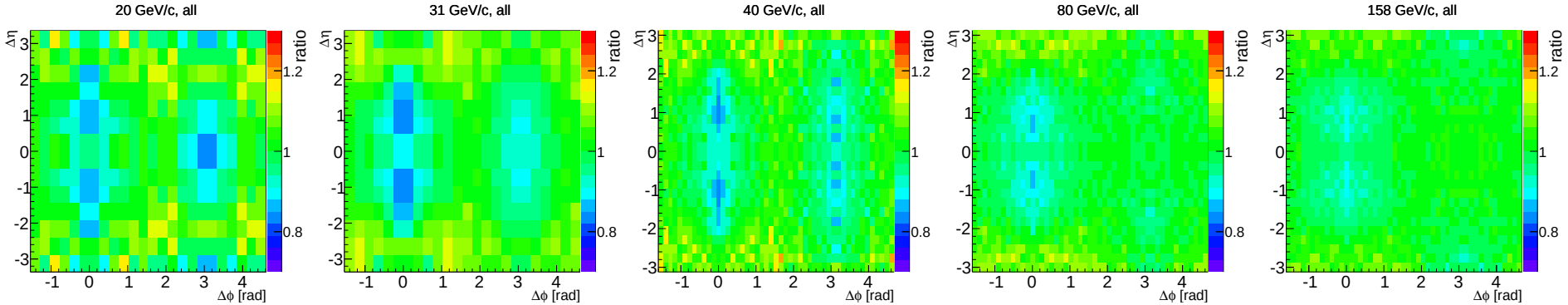


Data/MC ratios - all charged

Data/EPOS

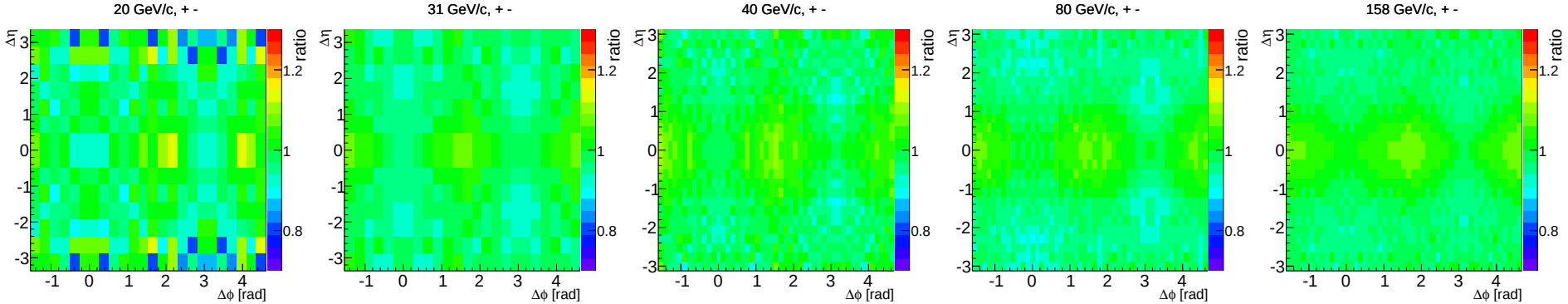


Data/UrQMD

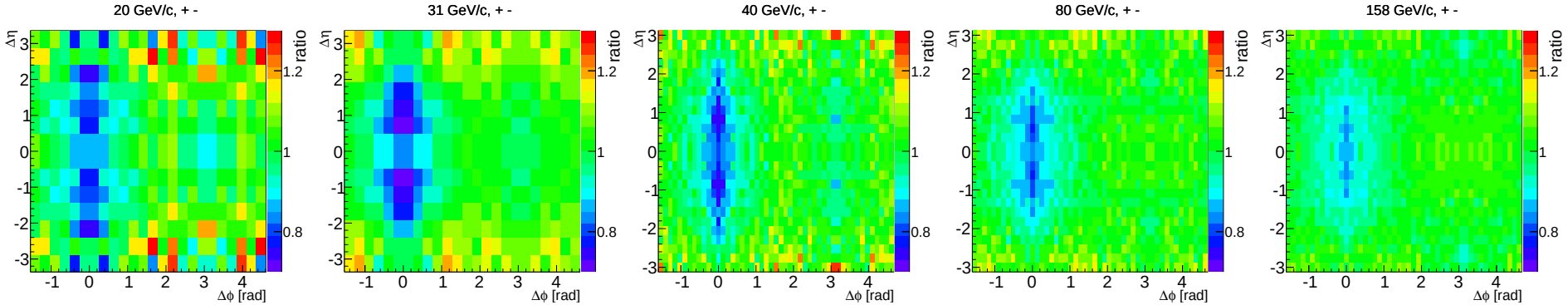


Data/MC ratios - unlike-sign

Data/EPOS

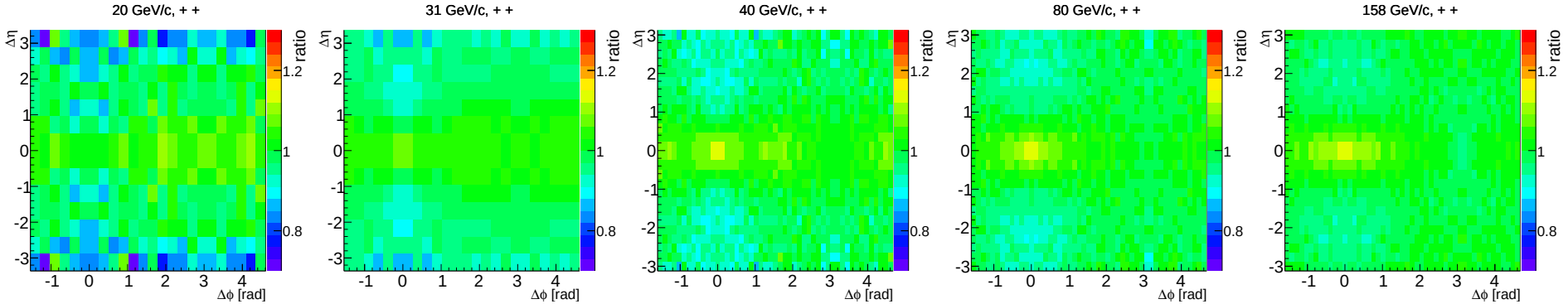


Data/UrQMD

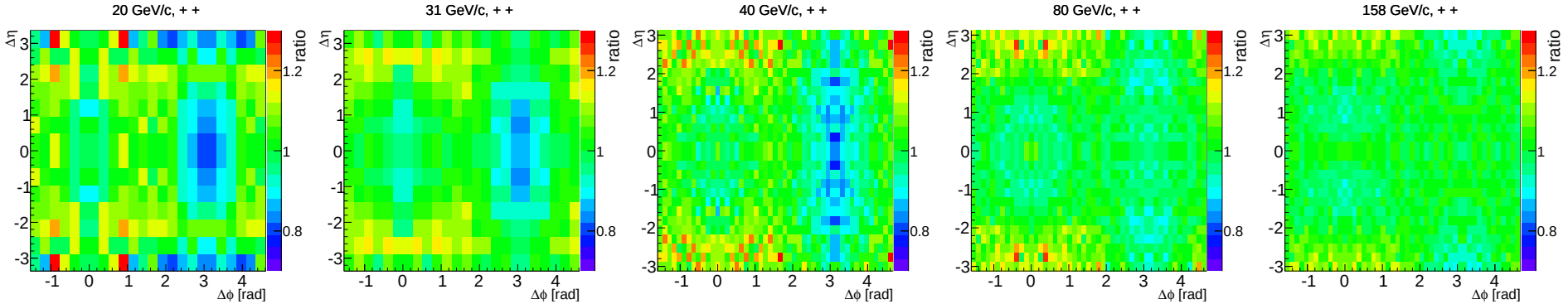


Data/MC ratios - pos. charged

Data/EPOS



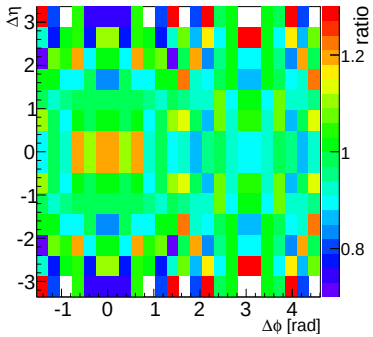
Data/UrQMD



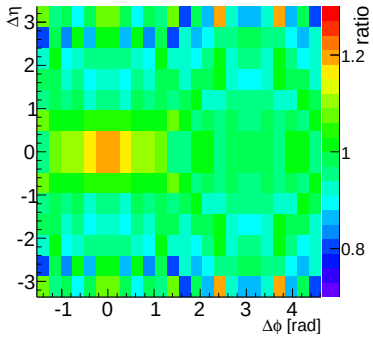
Data/MC ratios - neg. charged

Data/EPOS

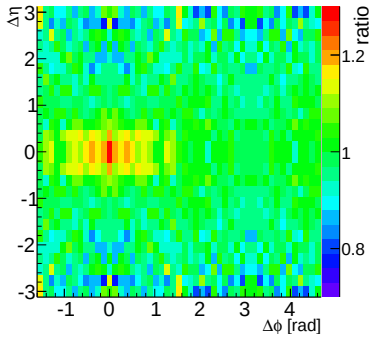
20 GeV/c, - -



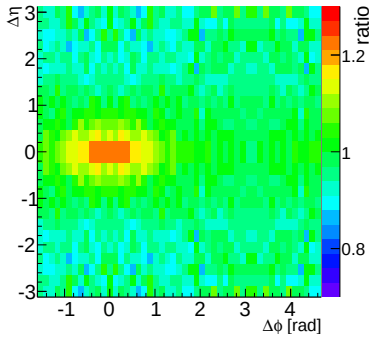
31 GeV/c, - -



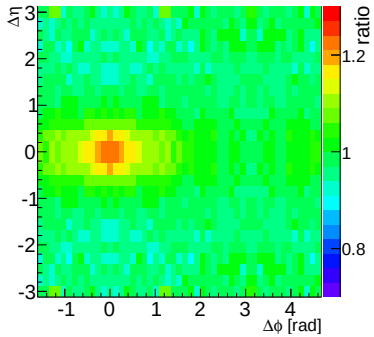
40 GeV/c, - -



80 GeV/c, - -

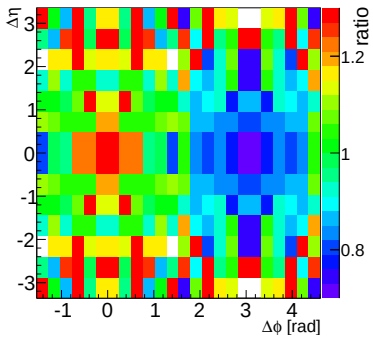


158 GeV/c, - -

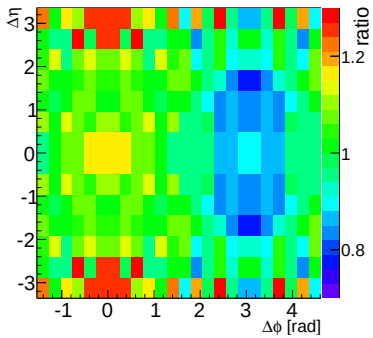


Data/UrQMD

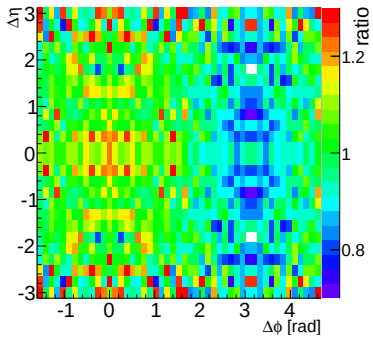
20 GeV/c, - -



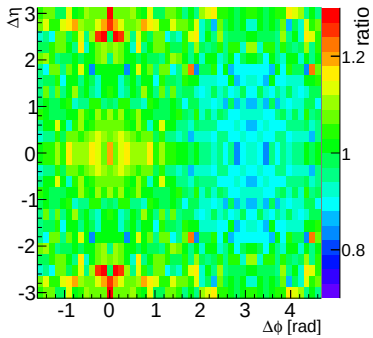
31 GeV/c, - -



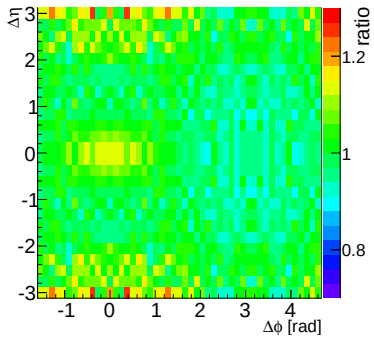
40 GeV/c, - -



80 GeV/c, - -

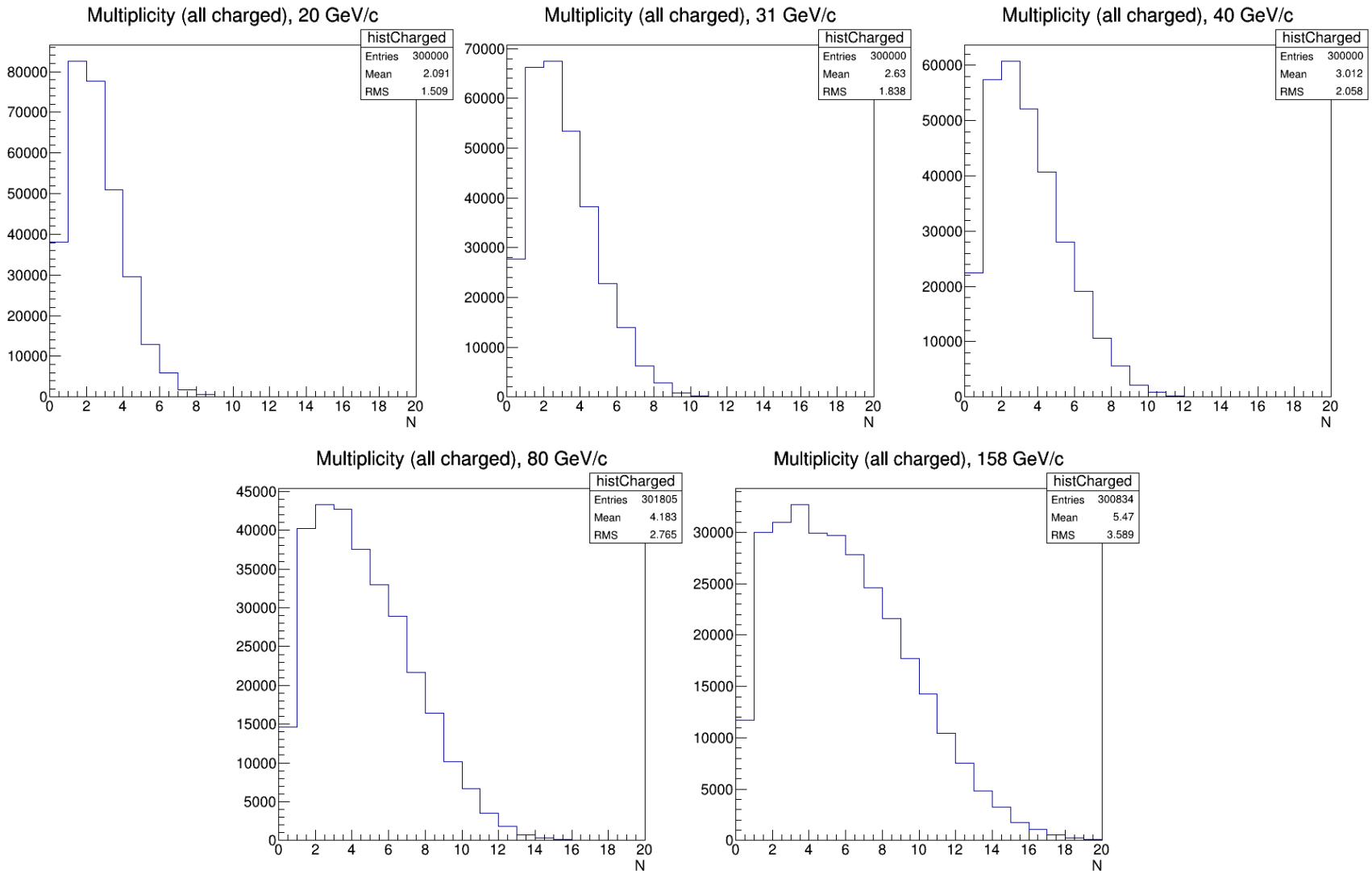


158 GeV/c, - -

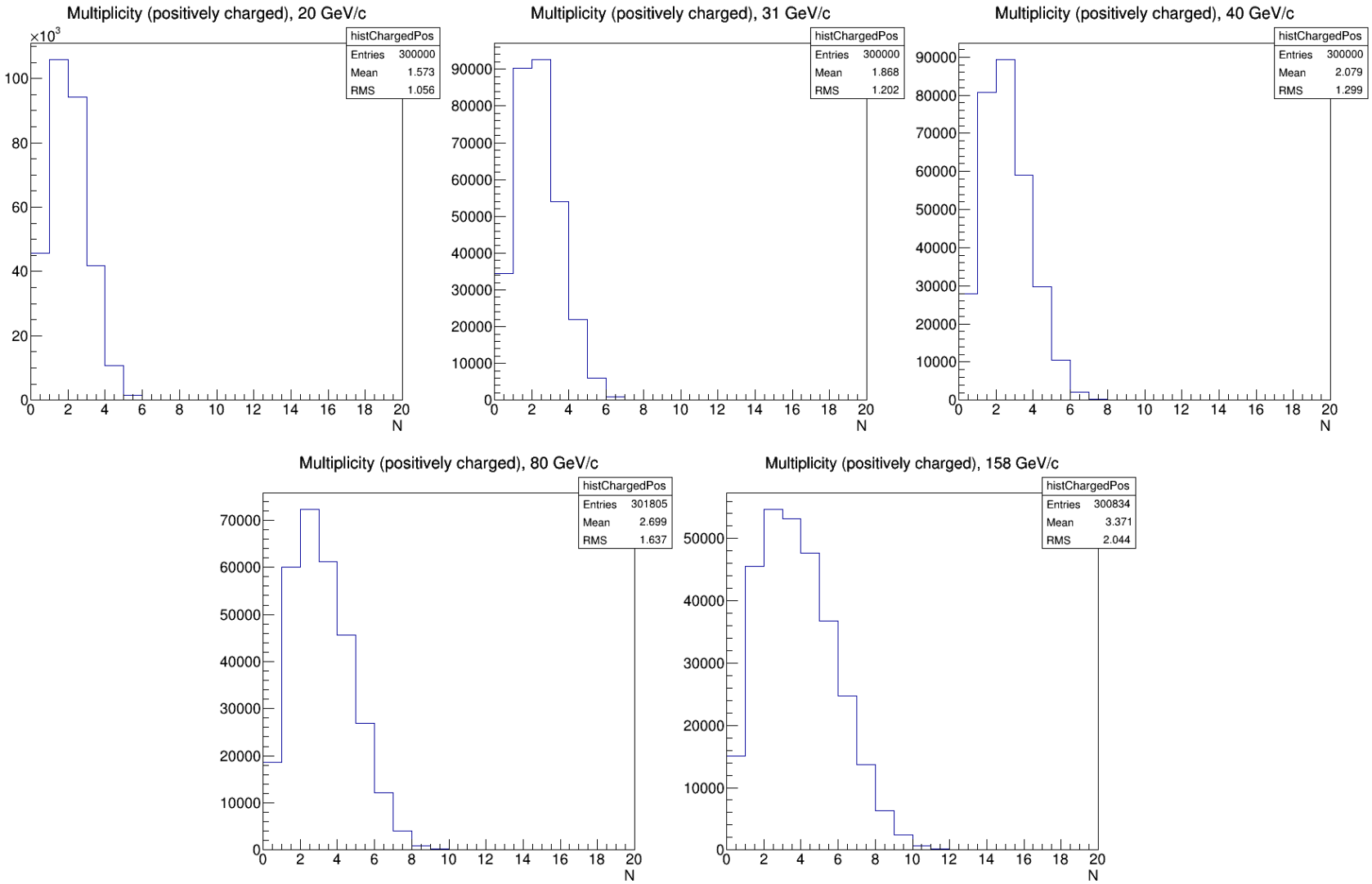


Backup slides

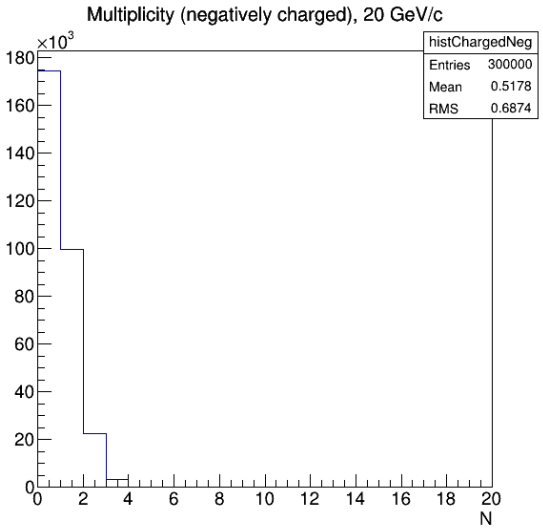
Multiplicity, all charged

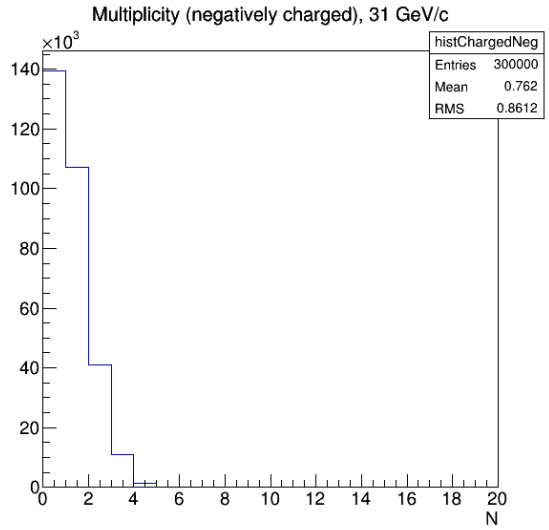


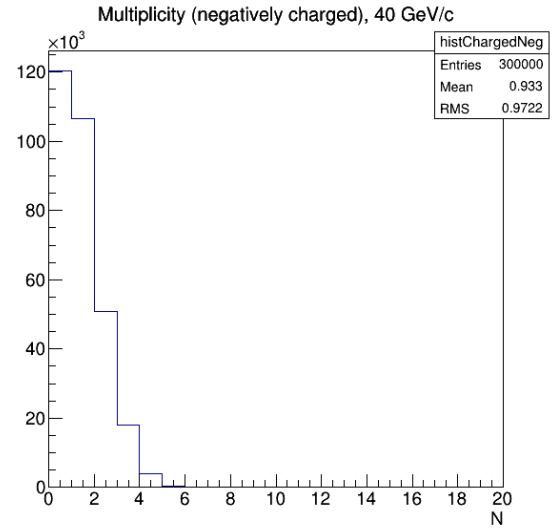
Multiplicity, pos. charged

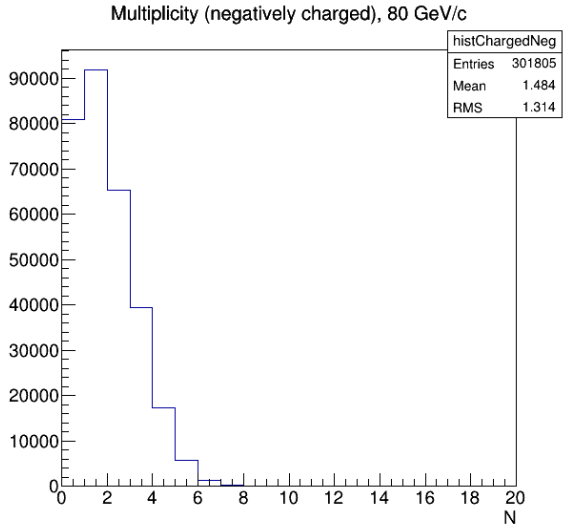


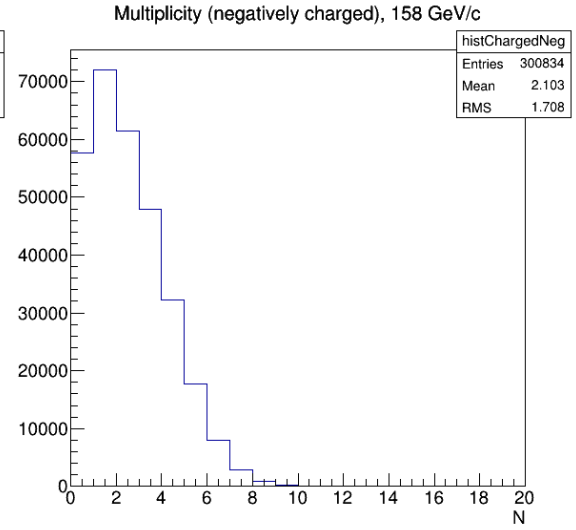
Multiplicity, neg. charged



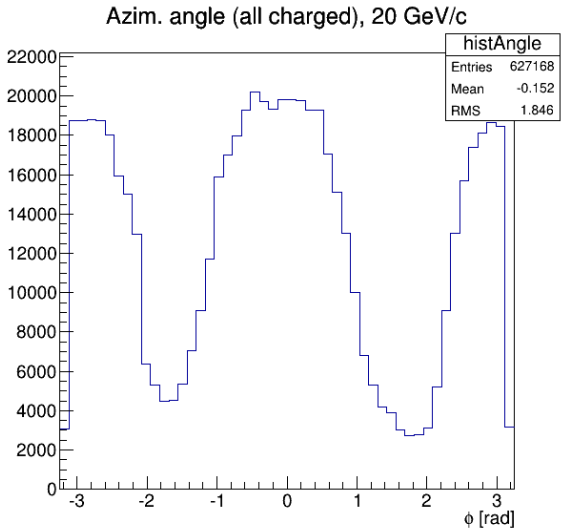


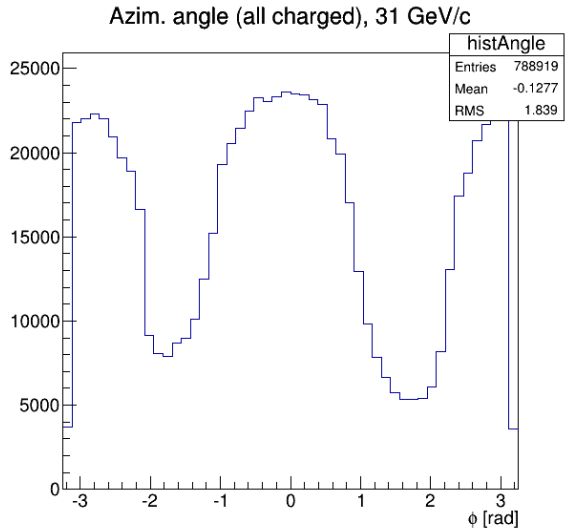


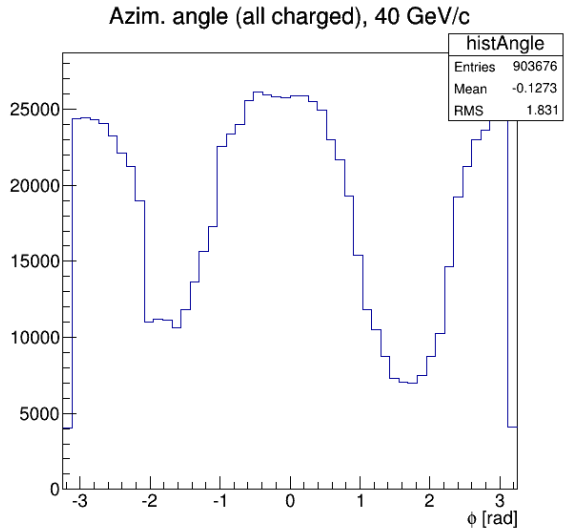


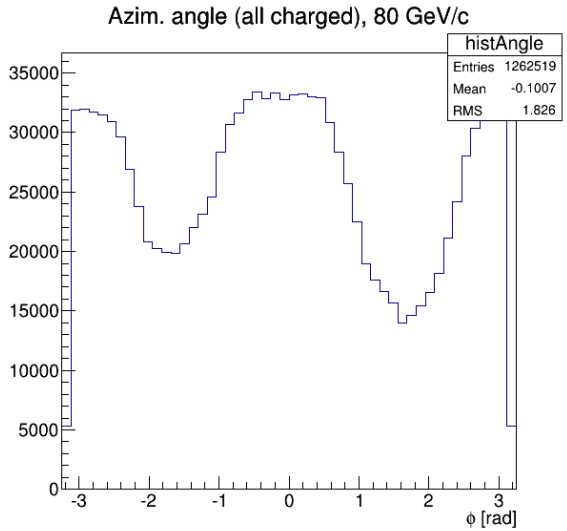


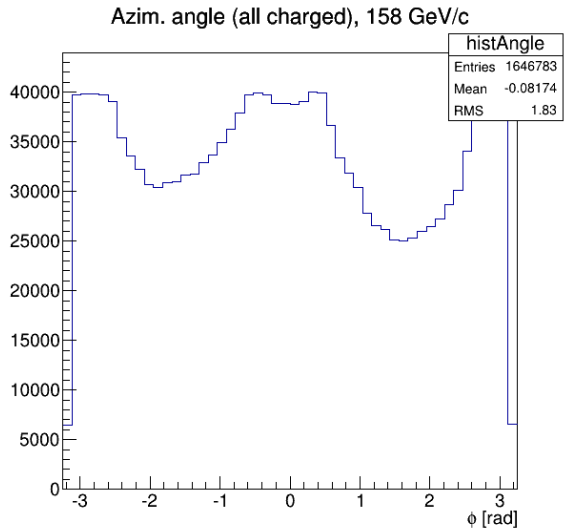
Azimuthal angle, all charged



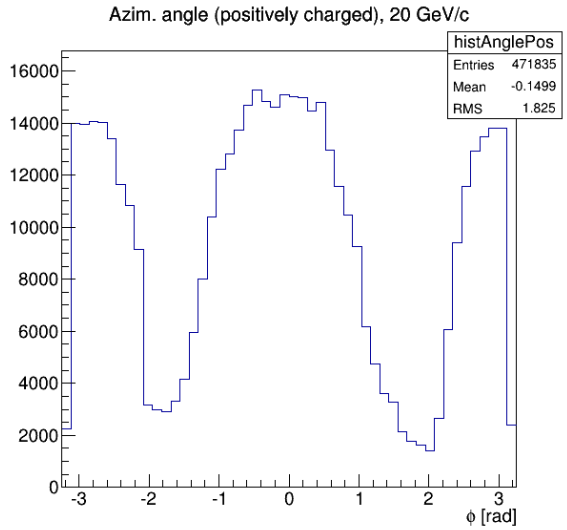


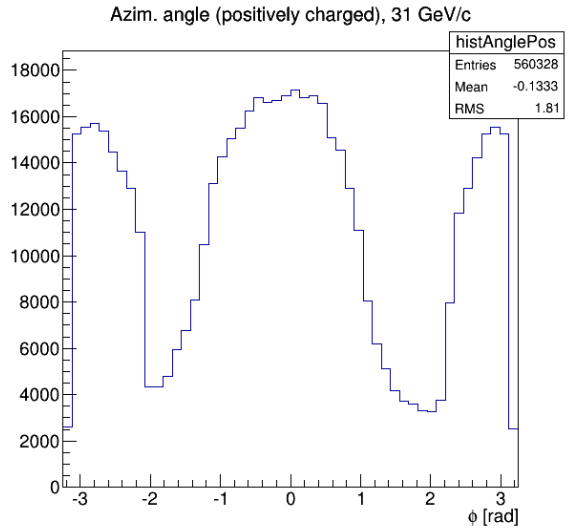


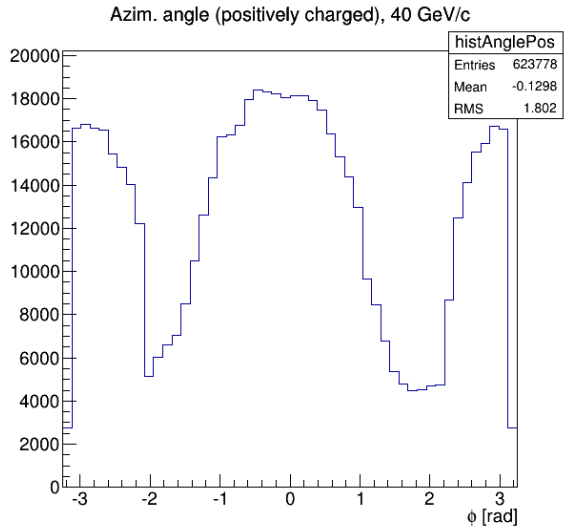


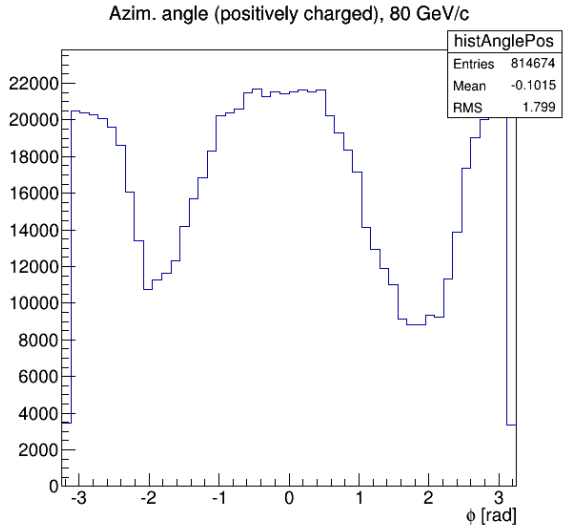


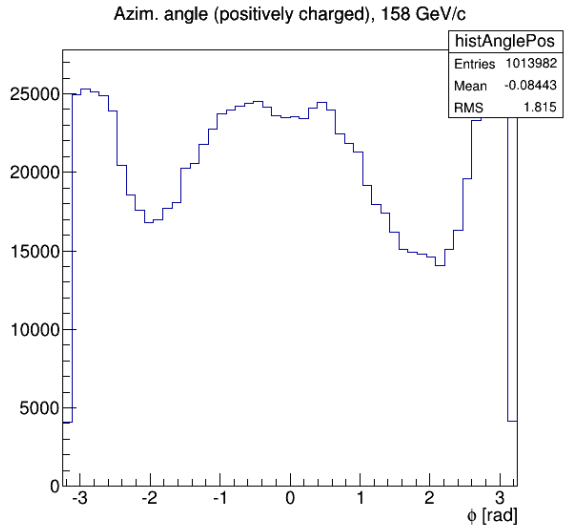
Azimuthal angle, pos. charged



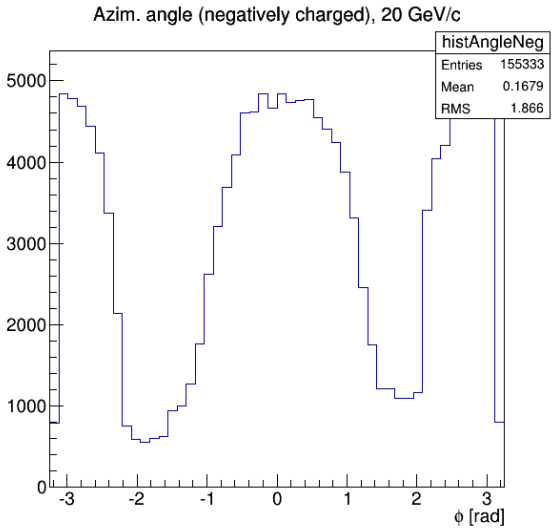


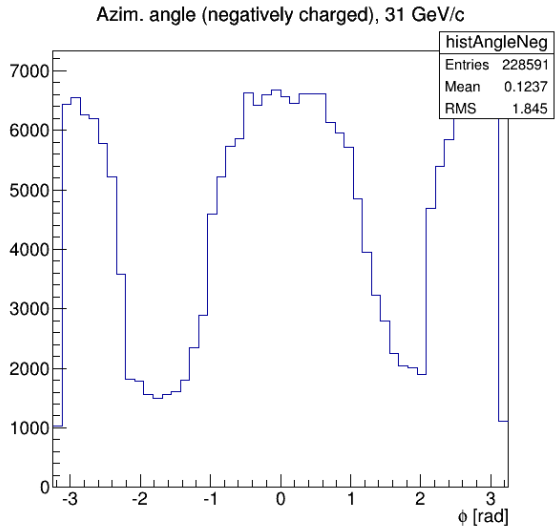


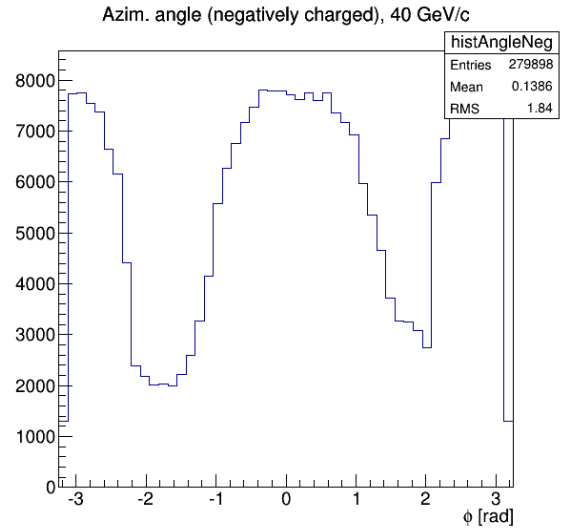


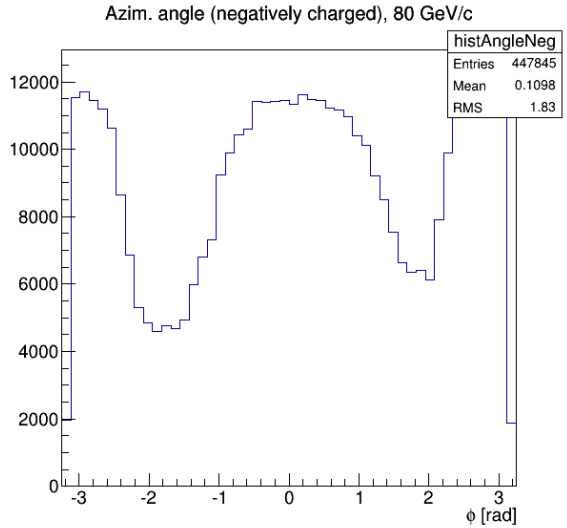


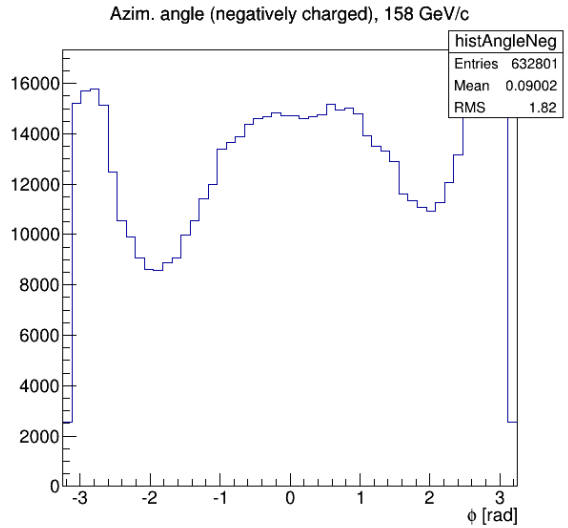
Azimuthal angle, neg. charged



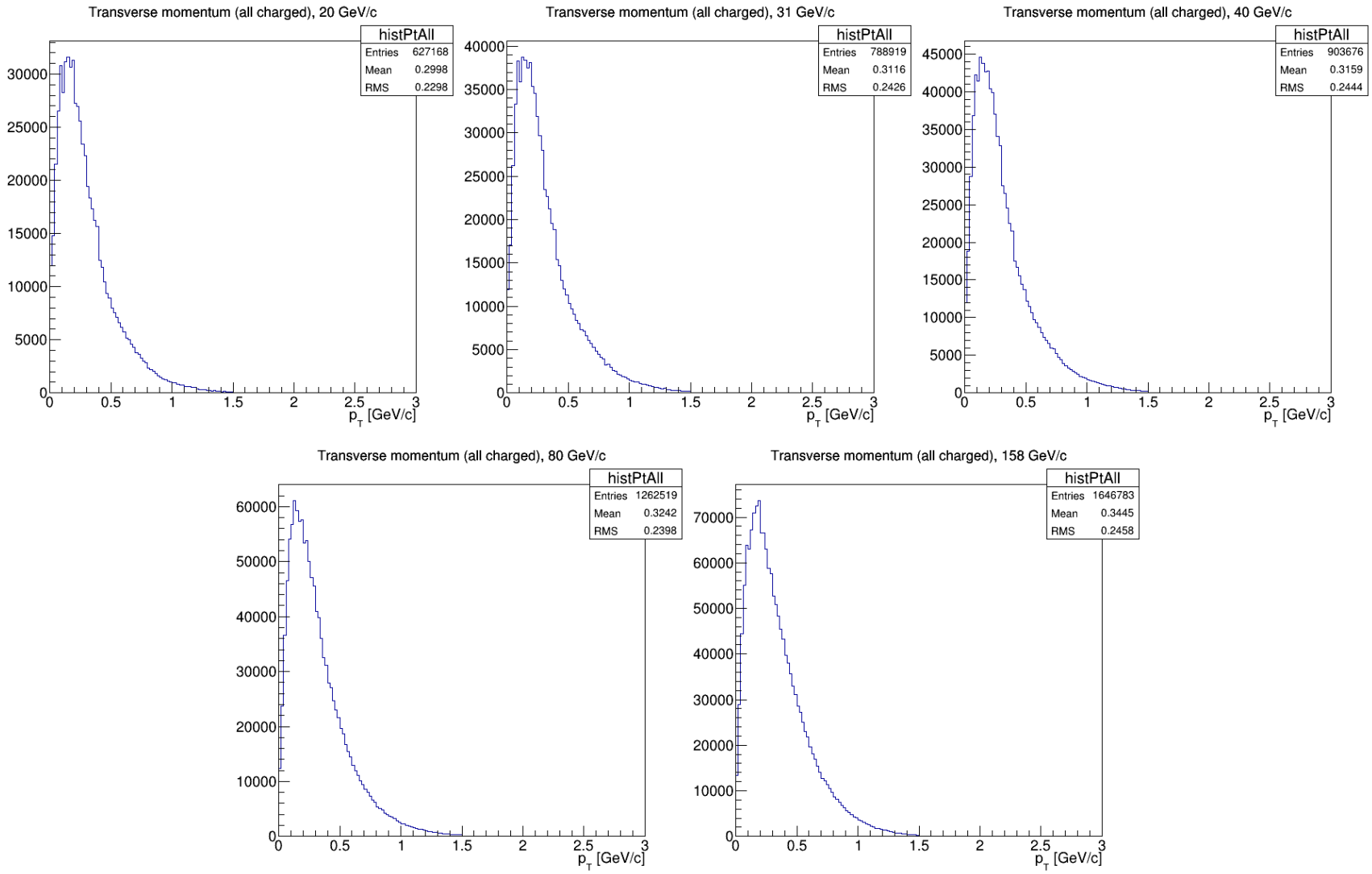




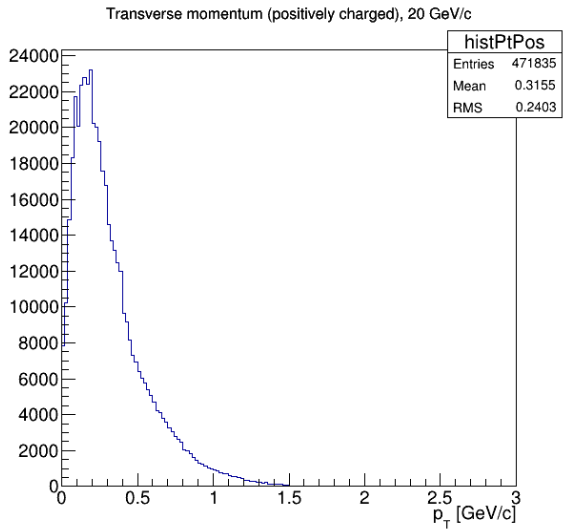


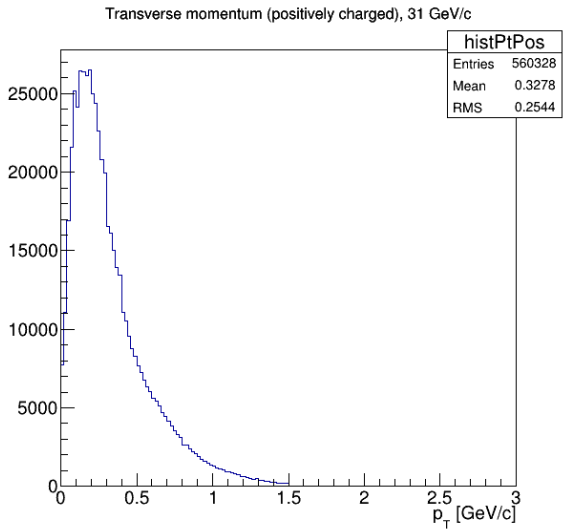


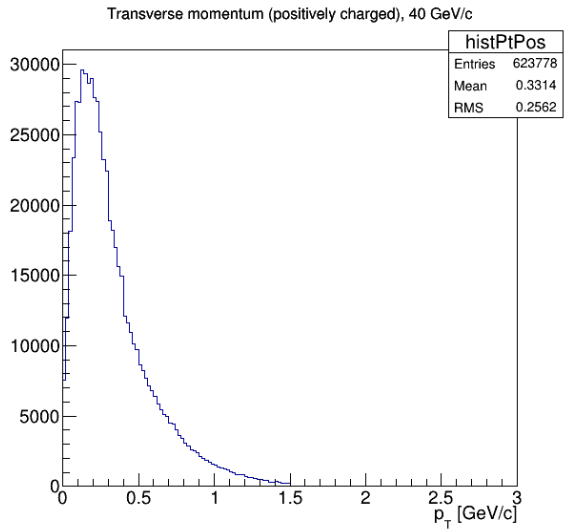
Total transverse momentum, all charged

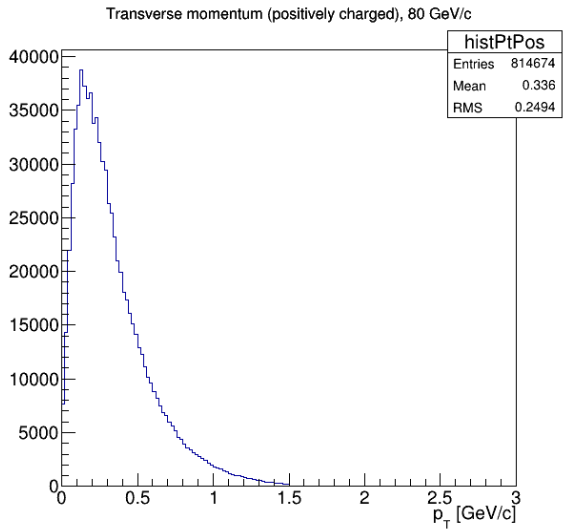


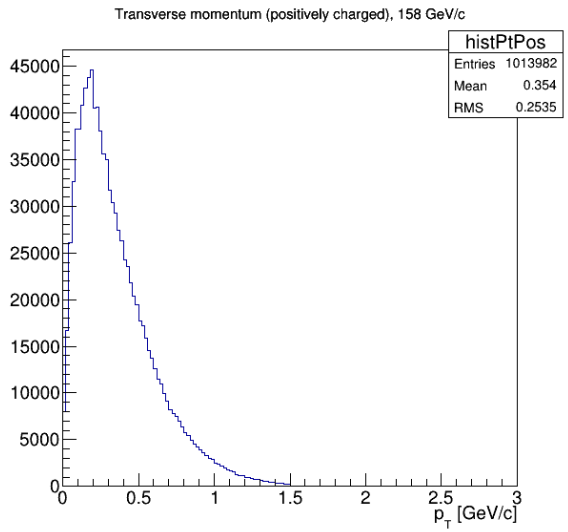
Total transverse momentum, pos. charged



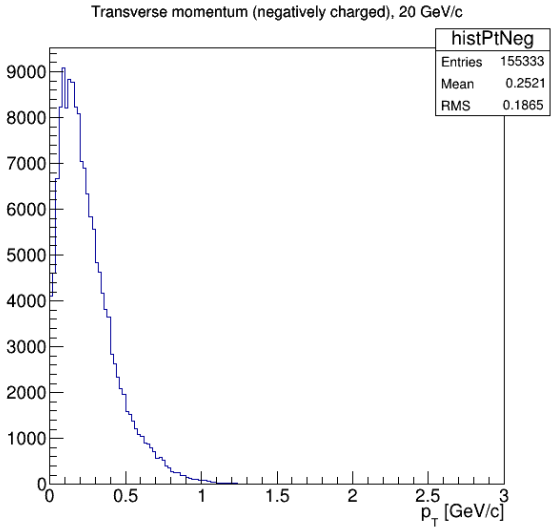


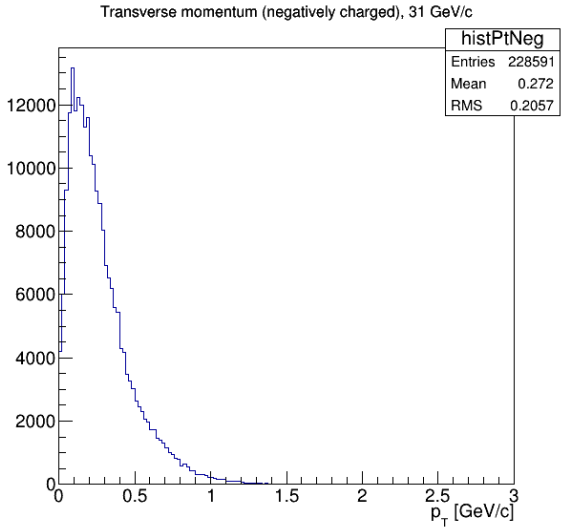


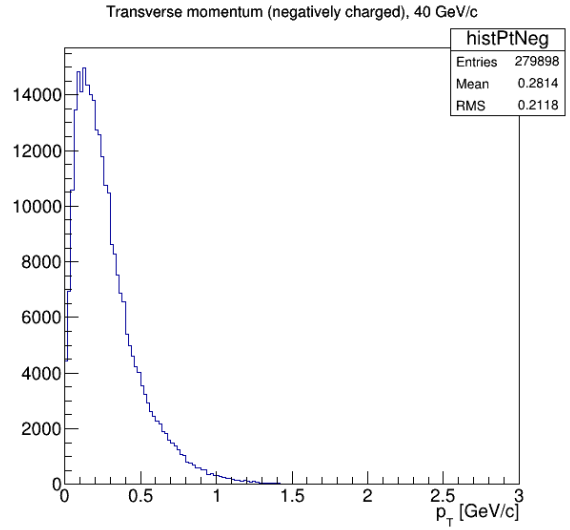


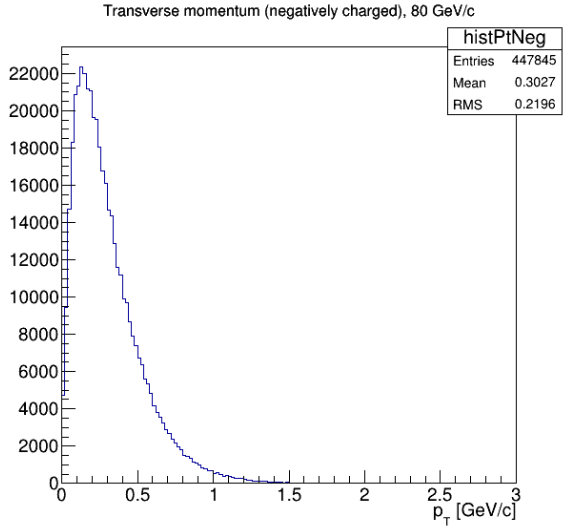


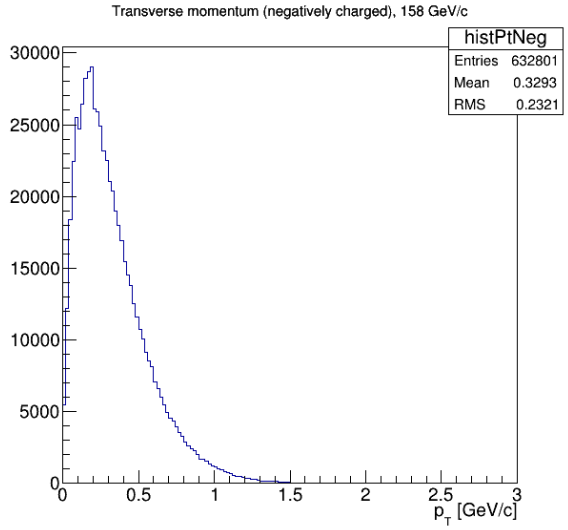
Total transverse momentum, neg. charged



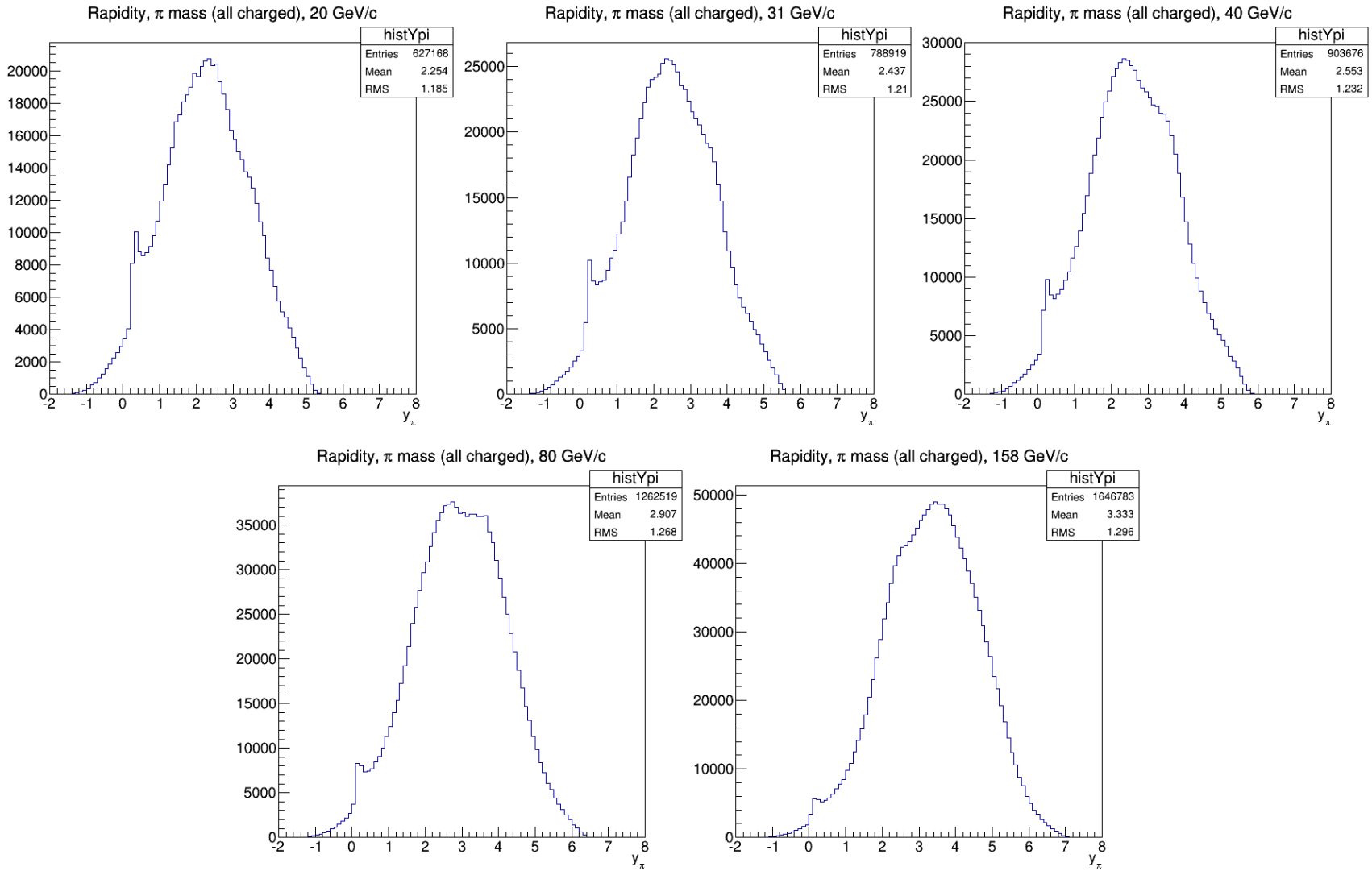




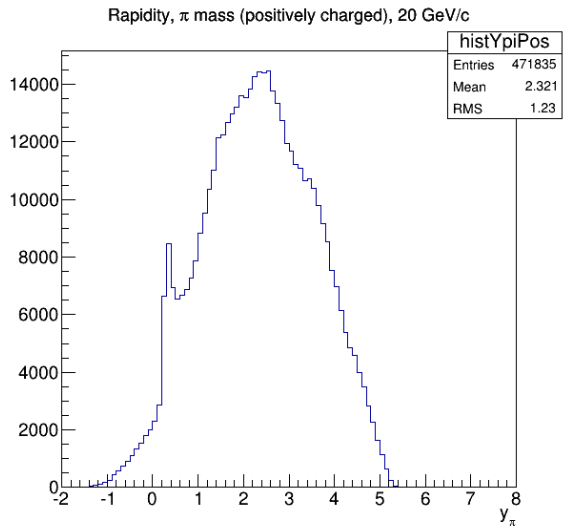


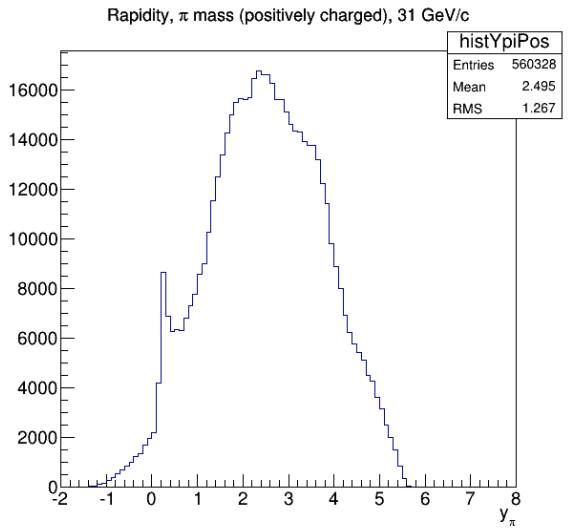


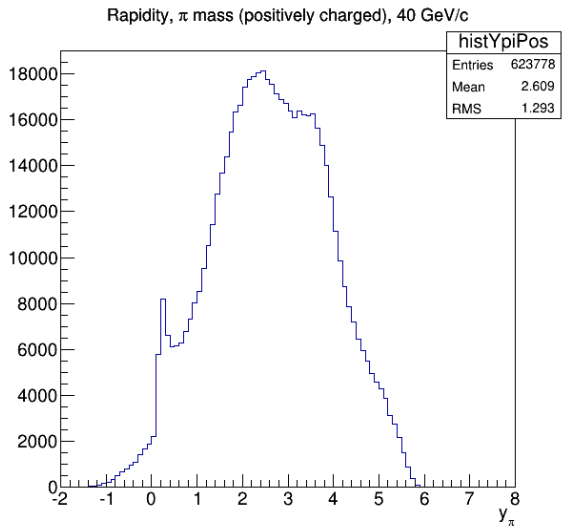
Rapidity, all charged

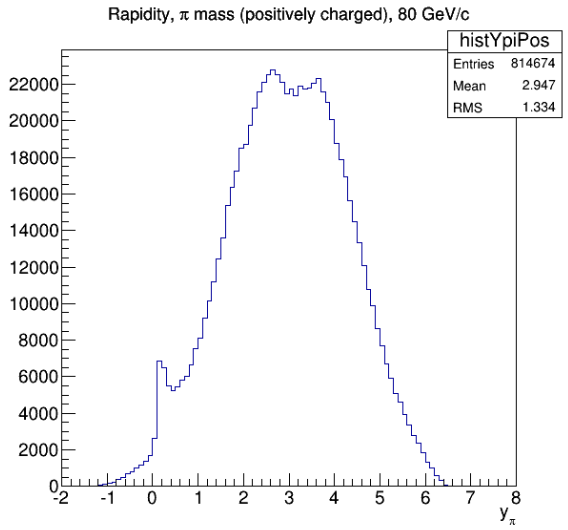


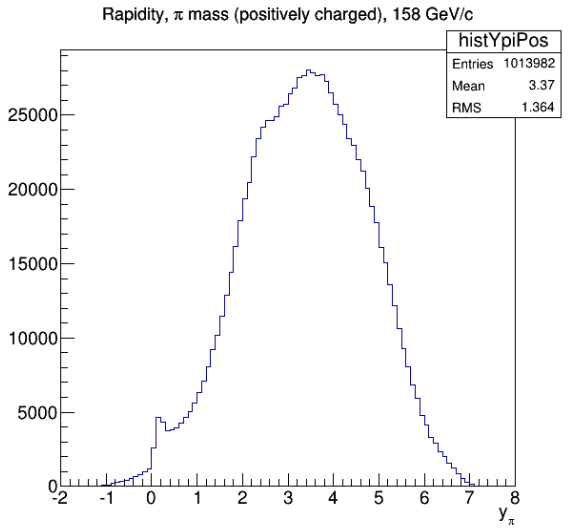
Rapidity, pos. charged



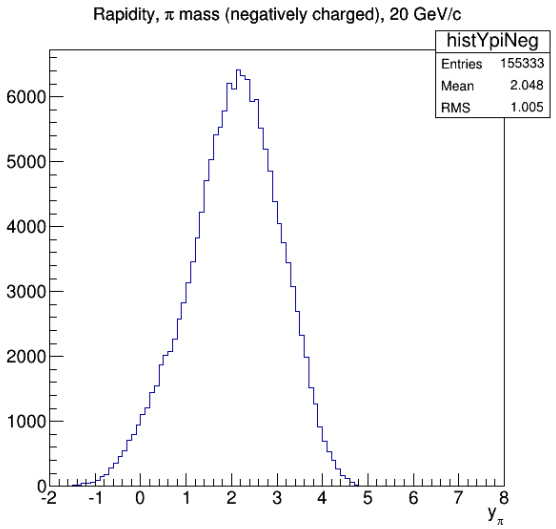


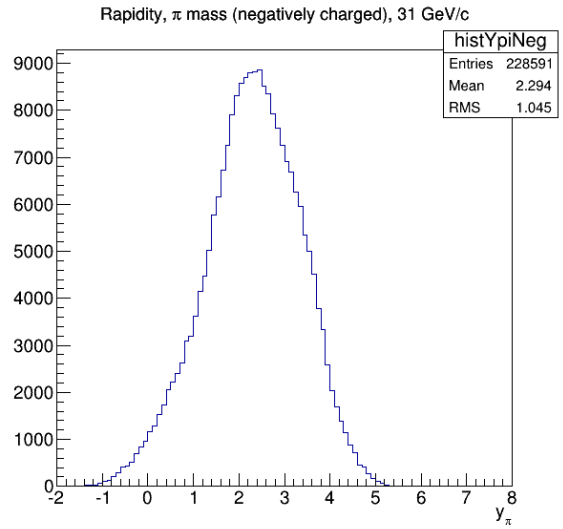


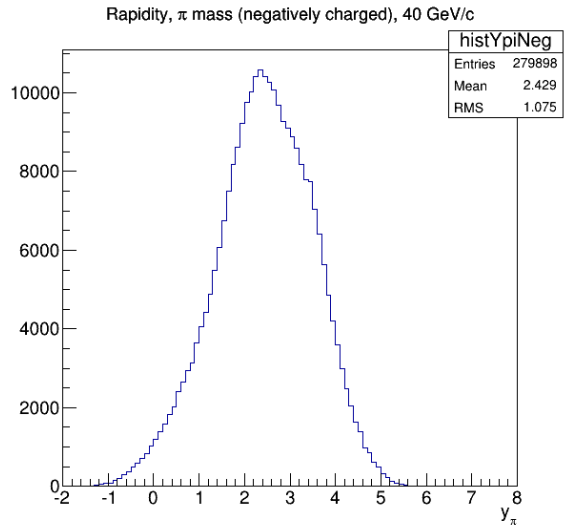


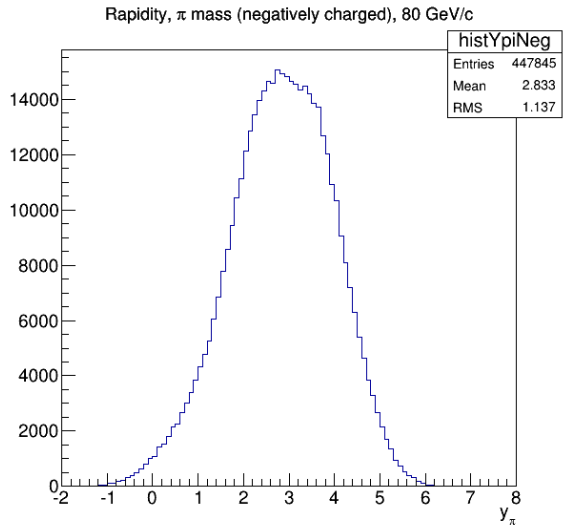


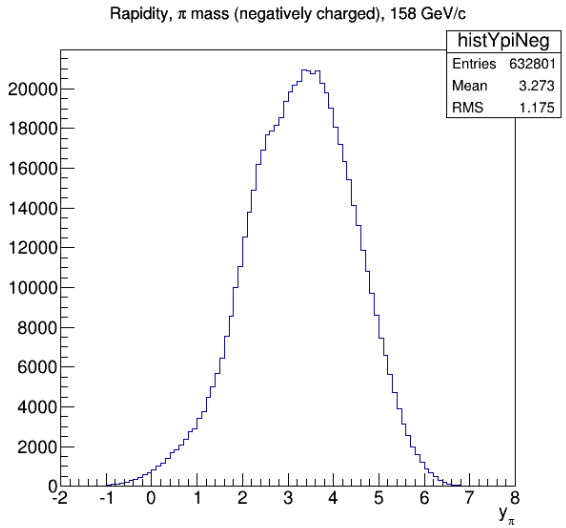
Rapidity, neg. charged



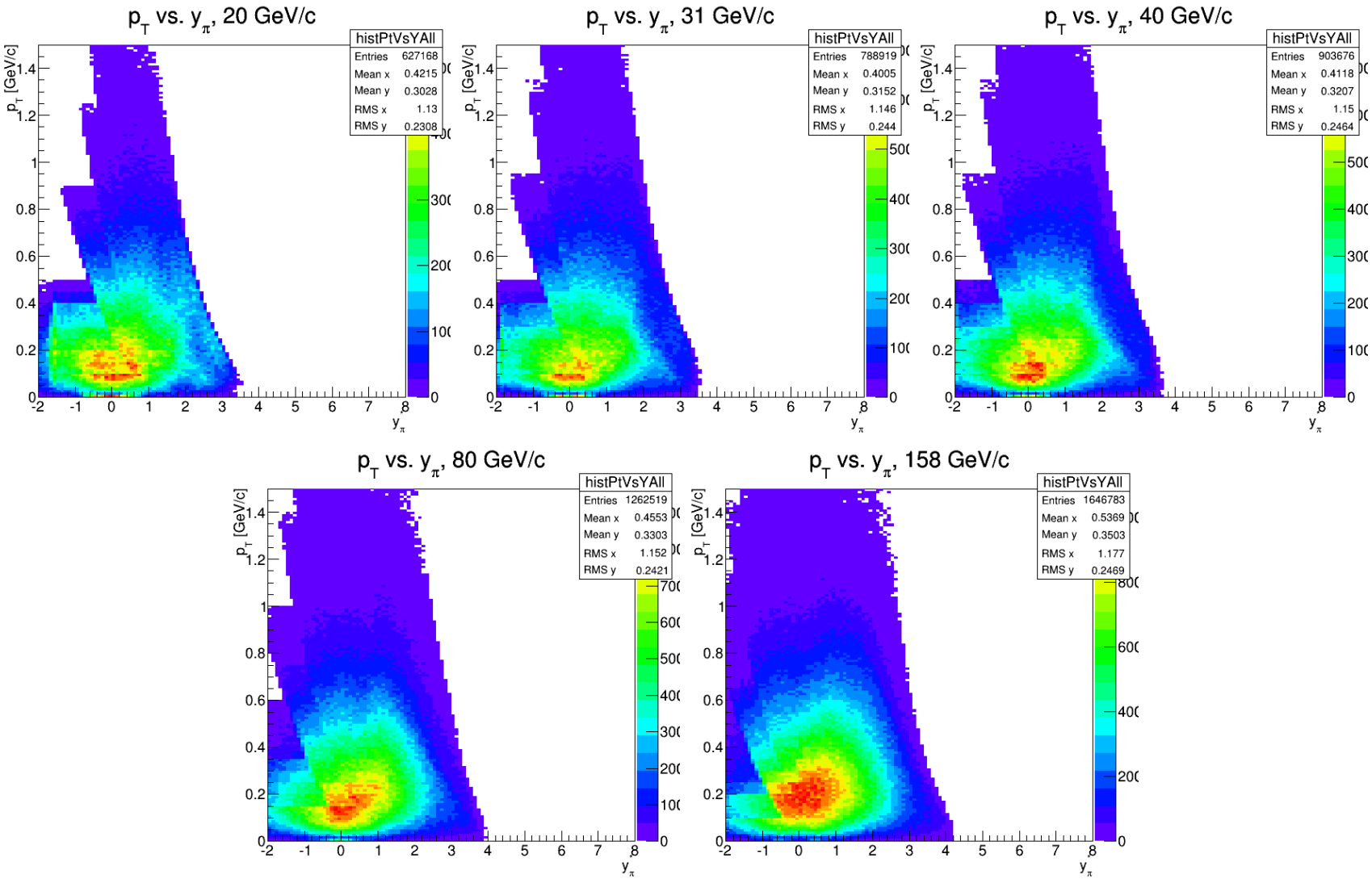




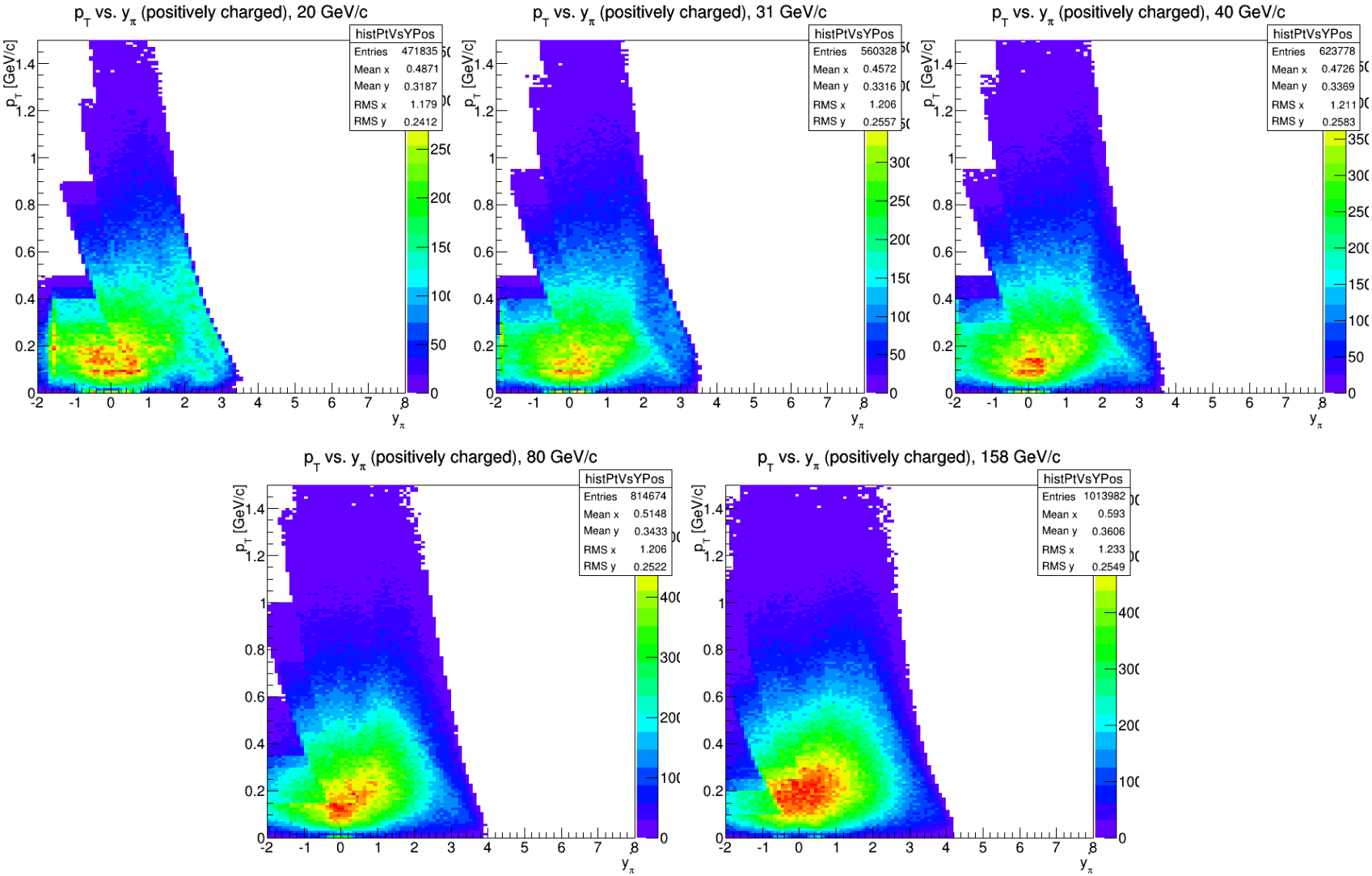




Transverse momentum vs. rapidity, all charged



Transverse momentum vs. rapidity, pos. charged



Transverse momentum vs. rapidity, neg. charged