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Statistical errors, efficiency and acceptance corrections in cumulants of measured net-charge ($N^+ - N^-$) distributions, a theorem from Quantitative Finance and NBD fits to the PHENIX \mbox{N^+ and N^-} distributions.

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Total charged multiplicity distributions, $P(N = N^+ + N^-)$, in p+p collisions and A+A collisions cut on centrality are well fit by Negative Binomial Distributions (NBD). Recently it was found that the individual $P(N^+)$ and $P(N^-)$ distributions in PHENIX are also well fit by NBD. A theorem from Quantitative Finance states that for integer valued Levy processes such as the difference between two Poisson or two Negative Binomial Distributions, the cumulants κ_j of $P(N^+ - N^-)$, the difference of samples from two such distributions, $P(N^+)$ and $P(N^-)$ which are both Poisson or NBD, with cumulants ${\kappa_j}^+$ and ${\kappa_j}^-$ respectively, is the same as if the $P(N^+)$ and $P(N^-)$ were statistically independent, i.e. $\kappa_j = \kappa_j^+ + (-1)^j \kappa_j^-$, so long as the distributions are not 100\% correlated. This was tested and verified with the PHENIX measurements of $P(N^+ - N^-)$, $P(N^+)$ and $P(N^-)$ from central (0-5\%) Au+Au collisions at $\sqrt{s_{NN}}$ from 7.7 to 200 GeV, leading to simplified calculations of the measured "raw" cumulants, their statistical errors and the Binomial efficiency corrections. Applications to acceptance corrections, which are complicated by correlations in both $\delta\eta$ and $\delta\phi$, will also be presented.

On behalf of collaboration:

PHENIX

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