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Measurement of charged particle multiplicity fluctuation and correlation length at RHIC-PHENIX

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The multiplicity distributions of charged particles in various pseudorapidity intervals ($\delta\eta < 0.7$) are measured from Au+Au collisions at $\sqrt{s_{NN}} = 200GeV$. A fit result of the multiplicity distribution by the negative binomial distribution (NBD) will be presented as a function of pseudorapidity intervals in some centrality bins. NBD is described as:

$$P_n^{(k)} = \frac{\Gamma(n+k)}{\Gamma(n-1)\Gamma(k)} \left(\frac{\mu/k}{1+\mu/k} \right) \frac{1}{(1+\mu/k)}, \tag{1}$$

where μ is average multiplicity in a given pseudorapidity interval. NBD corresponds to the Bose-Einstein distribution [Eq. (2)] when one of the coefficient k equal to 1. It means that the multiplicity distribution described by the NBD is interpreted by the multiple Bose-Einstein distribution.

$$P_n = n^n/(1+\mu)^{n+1}. \tag{2}$$

The two particles Bose-Einstein correlation length can be extracted from the dependence of pseudorapidity interval of NBD parameter k by

$$k(\delta\eta) = k_0 \frac{\delta\eta/2\xi}{[1-(\xi/\delta\eta)(1-e^{-\delta\eta/\xi})]}, \tag{3}$$

where ξ is correlation length and k_0 corresponds to the correlation strength. In this talk, the behavior of the correlation length around the QCD phase transition will be discussed.