Pseudorapidity Fluctuations in Relativistic Nuclear Interactions

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Introduction:

The collisions of nuclei or hadrons moving at relativistic energies are the only tools to produced very hot and dense nuclear matter in the laboratory. The most important ones are the RHIC and LHC facilities in view of quark-gluon-plasma (QGP) production, that is believed to be existed a few micro seconds after the BIGBANG. The hot and dense matter produced in such collisions is subsequently makes transition into hadrons which are detected by the various detectors. The study of global observables such as pseudorapidity(η), multiplicity and transverse momentum(p_t) and their fluctuations, mainly on event-by-event basis may yield very useful information about the system produced and also about the dynamics of multiparticle production[1-2].

Results and Discussion:

Present study is an attempt to look for the event-by-event η fluctuations in ^{16}O-AgBr interactions at 60 and 200 A GeV/c. It has been suggested that the study of events with large multiplicity to look for the fluctuations may be useful to wipe out the statistical fluctuations and the observed fluctuations that remained would be of dynamical origin. The method proposed by M. Gazdzicki and S. Mrowczynski[3]. The variable that is used to measure such fluctuations, is defined as $\Phi = \sqrt{\frac{<Z^2>}{<N_{Total}>}} - \sqrt{\overline{z^2}}$, where $<Z^2>$ and $< N_{total}>$ represents the event average of the η and the multipliicty. The detailed of the analysis can be found in the reference. figure 1 depicts the variations of the variable Φ with <N>, the average multiplicity of the classes of the vents selected on the baisis of the number of relativistic charged particles intervals as given in Table 1. The results have been obtained for the experimental and AMPT simulated data.

Interactions	Experimental <N>	Experimental Φ	AMPT <N>	AMPT Φ
^{16}O-AgBr at 60A GeV/c	59.52	5.49±0.077	54.55	5.49±0.066
	68.77	5.08±0.084	63.34	5.01±0.062
	77.99	4.77±0.087	74.22	4.42±0.055
	86.22	4.35±0.087	83.54	4.09±0.077
	98.12	4.07±0.087	101.22	3.69±0.058
^{16}O-AgBr at 200A GeV/c	64.55	5.12±0.075	61.44	5.12±0.070
	72.22	4.84±0.087	71.11	4.44±0.081
	83.44	4.34±0.083	80.55	4.14±0.057
	94.38	3.90±0.077	91.36	3.50±0.067
	110.42	2.82±0.052	104.41	2.52±0.042

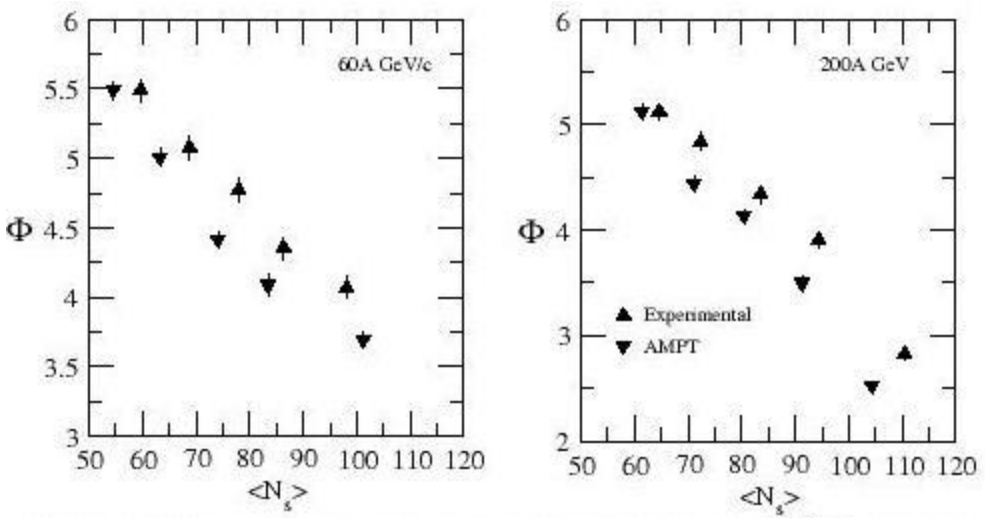

Figure.1 Variation of ϕ with <N$_s$> for the experimental and simulated data on ^{16}O-AgBr interactions

Conclusions:

These are preliminary results of the present analysis. The non-zero values of Φ shows the presence of e-by-e η fluctuations and correlated production of particles in the data. The AMPT data supports the experimental one.

References

1. Masayunki et al., PRL 85 (2000) 2072
2. G. Bhoumic et al., EPJA 52 (2016)7
3. A. Gazdzicki, S. Mrowczynski, Z. Phys. C. 54(1992) 127

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