Event-by-Event fluctuations and consequences on experimental observable at CBM-FAIR and MPD-NICA energies

VALERICA BABAN[1], ALEXANDRU JIPA[2], DĂNUŢ ARGINTARU[1]

[1]Constanţa Maritime University, [2]Bucharest University Faculty of Physics, Romania

Introduction

The evolution of strongly interacting matter created at the FAIR-NICA energies characterized by high net baryon densities and moderate temperatures is expected to occur near the boundary of the first order phase transition and probable in vicinity of the critical QCD point. A large event-by-event fluctuations of hadronic observables are expected to be the signatures of this critical point. In this work we analyze event-by-event fluctuations of observables like charge multiplicity and particle K/pi ratio.The initial state asymmetry and its effects is discussed based on centrality classes or <Npart> determined by Glauber model.

Net charge fluctuations are evaluated using,

(1) $\omega = \frac{\langle Q^2\rangle - \langle Q\rangle^2}{\langle Q\rangle}$ for +,-, ch (total)

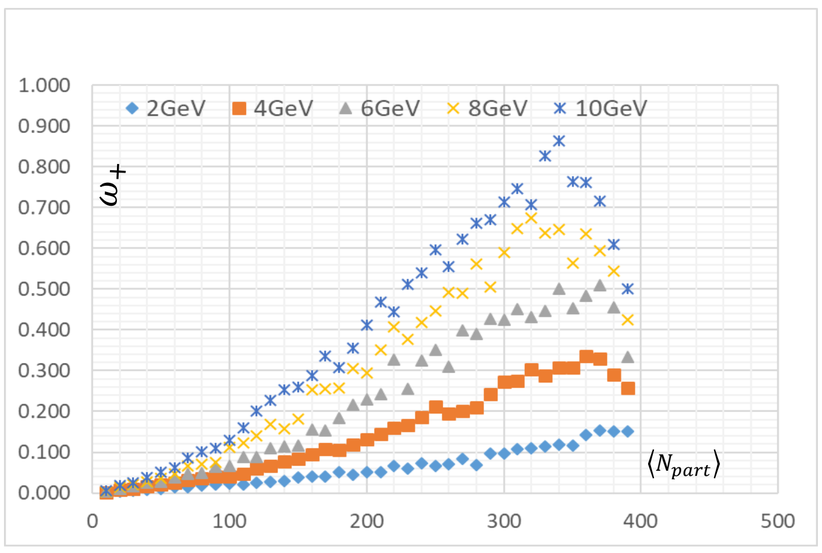
(2) $\nu_{+-dyn} = \frac{\langle N_+(N_+-1)\rangle}{\langle N_+\rangle} + \frac{\langle N_-(N_--1)\rangle}{\langle N_-\rangle} - 2\frac{\langle N_+N_-\rangle}{\langle N_+\rangle\langle N_-\rangle}$

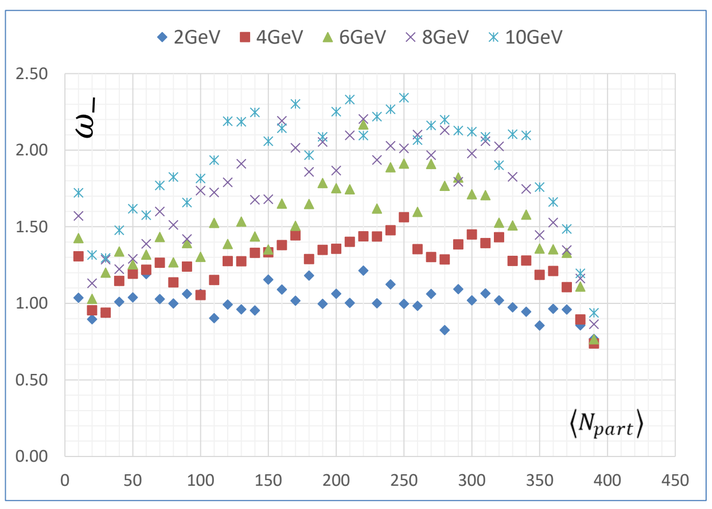
Kaon vs Pion yield fluctuations are evaluated using

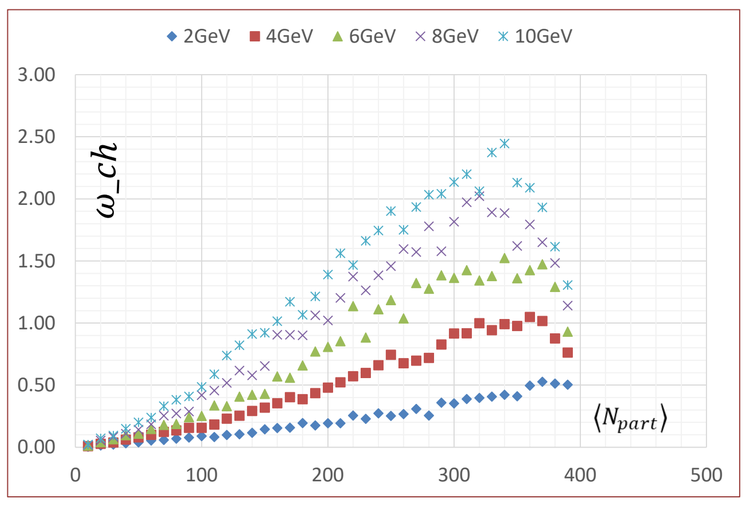
(3) $\nu_{k\pi\,dyn} = \frac{\langle N_k(N_k-1)\rangle}{\langle N_k\rangle} + \frac{\langle N_\pi(N_\pi-1)\rangle}{\langle N_\pi\rangle} - 2\frac{\langle N_kN_\pi\rangle}{\langle N_k\rangle\langle N_\pi\rangle}$

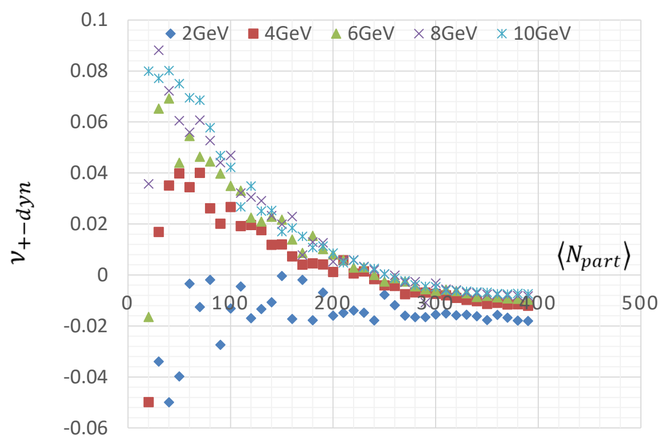
We use a sample of 500 000 minbias Au+Au events from Urqmd 3-4 in a fix target experiment at 2, 4, 6, 8, 10 GeVA

Results-Net charge fluctuations

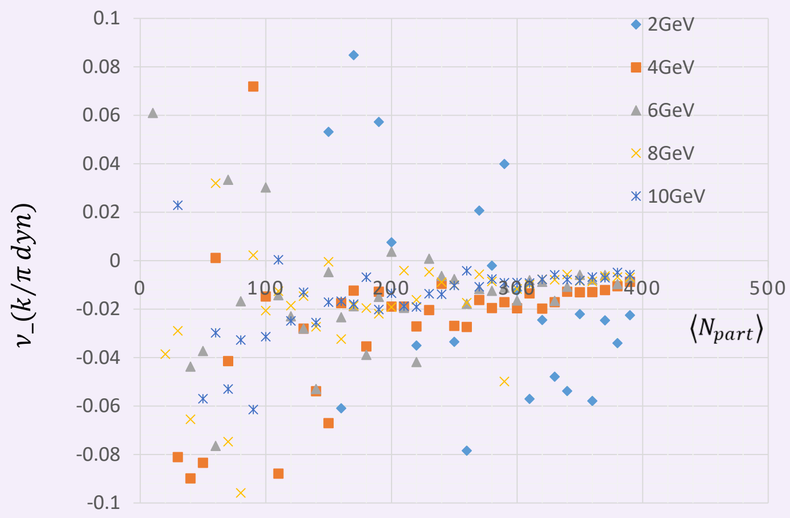




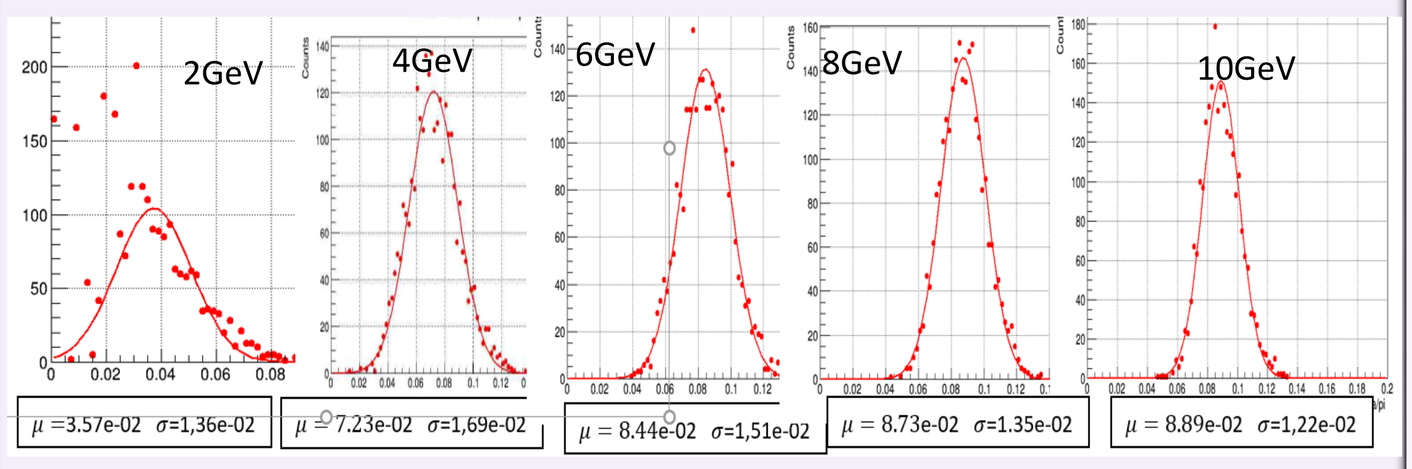


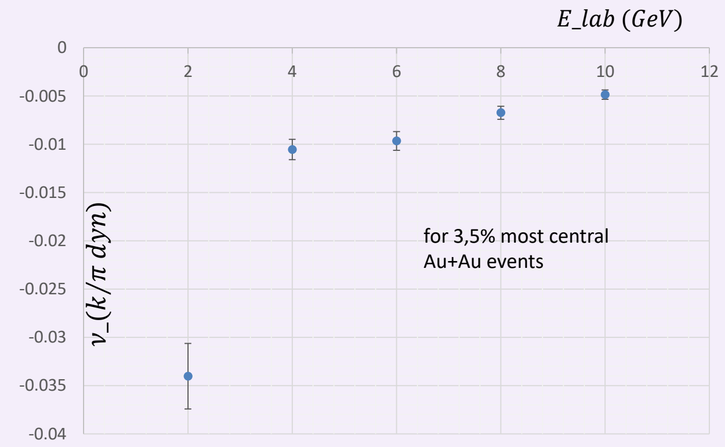


Results - Kaon vs Pion Yield Fluctuations



$\frac{K_+ + K_-}{\pi_+ + \pi_-}$ distribution for 3,5% most central events Au+Au for different beam energies





Bibliography

[1] B. Friman, C. Höhne, J. Knoll, S. Leupold, J. Randrup, R. Rapp, P. Senger (editors), The CBM Physics Book, Lecture Notes in Physics, Vol. 814 1st Edition., 2011.

[2] S. Jeon, V. Koch , Charged Particle Ratio Fluctuation as a Signal for QGP, 2000.

[3] C. Pruneau, S. Gavin, S. Voloshin, Methods for the Study of Particle Production Fluctuations,2018 .

[4] S. A. Bass, M. Belkacem, M. Bleicher, et al...Microscopic Models for Ultrarelativistic Heavy Ion Collisions ,Prog. Part. Nucl. Phys. 41 (1998) 225-370 , 1999.

[5] V.P. Konchakovski,Haussler,M.I. Gorenstein, E.L. Bratkovskaya, M. Bleicher, H. Stocker, Particle Number Fluctuations in High Energy Nucleus-Nucleus Collisions from Microscopic Transport Approaches,2006

Quark Matter 2018

The 27th International Conference on Ultrarelativistic Nucleus-Nucleus Collisions

13-19 MAY, 2018 Venezia, Italia