XXIV QUARK MATTER DARMSTADT 2014

Contribution ID: **629** Type: **Contributed Talk**

Systematics of the kinetic freeze-out properties in high-energy nuclear collisions from STAR

Wednesday, May 21, 2014 10:20 AM (20 minutes)

The main aim of the RHIC Beam Energy Scan (BES) program is to explore the QCD phase diagram which includes search for a possible QCD critical point and the phase boundary between QGP and hadronic phase.

We report the collision energy and centrality dependence of kinetic freeze-out properties from the measured mid-rapidity light hadrons (pions, kaons, protons and their anti-particles) for Au+Au collisions at the center-of-mass energy root(s_nn) = 7.7, 11.5, 19.6, 27, and 39 GeV. The STAR detector, with a large uniform acceptance and excellent particle identification is used in the data taking.
The kinetic freeze-out temperature (T_fo) and average collective velocity (beta) parameters are extracted from blast-wave fits to the identified hadron spectra and systematically compared with the results from other collision energies including those at AGS, SPS and LHC. It is found that all results fall into a correlation band in the 2-dimension (T_fo, beta) distribution: the largest value of collective velocity and lowest temperature is reached in the most central collisions at the highest collision energy.
We study the energy dependence of these freeze-out parameters and implications of the systematics as a function of beam energy are also explored for particle and antiparticle separately.

On behalf of collaboration:

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Session Classification: Thermodynamics and hadron chemistry

Track Classification: Thermodynamics and Hadron Chemistry