Contribution ID: **29** Type: **Talk**

Azimuthally asymmetric BudaLund hydrodynamic model and fits to spectra, elliptic flow and asHBT

Wednesday, 14 October 2009 17:50 (30 minutes)

We present the extension of the Buda-Lund hydrodynamic model from high energy central collisions to peripherial ones. Spectra and the elliptic flow of indentified particles are described along with the azimuthal dependence of two-particle correlation function radii in the ellipsoidally symmetric generalization of the model. Theoretical predictions were tested against RHIC data. From fits to data of 20-30\% centrality class source parameters characterizing these non-central ultra-relativistic heavy ion reactions were extracted.

In the simultaneous fits we used azimuthally integrated invariant spectra of pions, kaons and protons-antiprotons measured by PHENIX in Au+Au reactions at center of mass energy of 200 AGeV. In the same reactions PHENIX extracted transverse momentum dependent elliptic flow distributions, as well. STAR data were used for azimuthally variable two-particle correlation function radii. The results show that the central temperature in 20-30\% centrality reactions is lower, then that in central ones, $T_0 = 173 \pm 2(stat) MeV$. We have found that the flow is stronger in reaction plane then out of plane. Hence, the almond shape of the reaction zone initially elongated out of plane gets elongated in-plane transverse direction by the time the particle emission reaches its maximal value. The effect is reflected by the geometrical radii in the two perpendicular directions at that time, as well, $R_g(in-plane) = 7.8 \pm 0.2(stat) fm$, $R_g(out-plane) = 7.2 \pm 0.2(stat) fm$. This is the first time that an in-plane extended source has been reconstructed from a simultaneous fit to identified particle spectra, elliptic flow and azimuthally sensitive HBT data in 200 AGeV Au+Au collisions at RHIC. Values for the strength of transverse flow, width of emission time, as well as for the longitudinal rapidity extension are provided, too.

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Session Classification: Dynamics and the Equation of State (1/2)

Track Classification: Investigating Dynamics and the EOS with Correlations