Longitudinal Freeze-out Length in Bjorken Hydrodynamics

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Abstract

Compared to the hadron gas, the quark-gluon plasma has a much greater pressure which may be detected by a correspondingly much larger freezeout volume. To investigate how the freezeout volume depends on the initial pressure and state, we study the longitudinal freezeout length in an expanding quark-gluon plasma in Bjoken hydrodynamics. In an expanding homogeneous medium, the longituduinal freezeout length is proportional to the 3/4 power of pressure. However, if it goes through the mixed phase at the critical temperature, the longitudinal freezeout length is anomalously enhanced. This suggest that in RHIC, there will be a discontinous change in the slope in the plot of the longitudinal freezeout length versus the initial energy density, at the point where the initial energy density passes through the mixed phase. This is partly borne out in the recent NA44 measurement of the HBT correlation which suggest a possible signature of phase transition in central Pb-Pb collisions at 158 GeV/A.

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