Pion Phase-space Density and the Source Charge Density in 2-8 AGeV Au+Au Collisions

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Abstract

The pion freeze-out phase space density (f) in relativistic heavy-ion reactions can be estimated by combining the single particle momentum spectra (d^2N/dyp_tdp_t) with the two particle correlation parameters/radii ($\lambda, R_s, R_o, R_l, R_ol$) as follows [1]:

$$< f > (p_t, y) = \sqrt{\lambda(p_t, y)} \frac{d^2N/dyp_tdp_t}{\pi^{-3/2} E_p R_s(p_t, y) \sqrt{R_o^2(p_t, y) R_l^2(p_t, y) - R_{ol}^4(p_t, y)}} \quad (1)$$

Consistency with an equilibrium scenario may be sensitively tested by comparing f with the Bose-Einstein distribution. We will extract thermal temperatures of the system, and determine the degree to which non-thermal effects drive f away from the thermal ansatz and compare to recent reports of an intriguing universal freeze-out density at AGS and SPS energies [2]. The fine differences in the positive and negative pion spectra can also be used to infer the effective Coulomb potential of the source. Combining these data with the source radii extracted from HBT measurements can yield information about the source charge density at freeze-out.

(1) G.F. Bertsch, Phys. Rev. Lett. **72**, 2349 (1994).

(2) D. Ferenc, *et al.* hep-ph/9902342 (QM99).