Comparison of thermal and chemical freeze-out conditions in 159 Gev/A Pb-Pb collisions

Giorgio Torrieri Johann Rafelski Jean Letessier

Department of Physics, University of Arizona, TUCSON 85721

[b]*Department of Physics, University of Arizona, TUCSON 85721*

[c]*LPTHE, Université Paris 7, 2 place Jussieu, F–75251 Cedex 05*

Presented by: G. Torrieri

Abstract

We study $m_\perp$ shape of hadron spectra. In our approach we allow transverse flow and freeze-out surface velocity to be different, and for high $m_\perp$ pions we also allow direct parton-parton scattering contributions. We model the transverse momentum distributions of hadrons and find a set of fireball parameters which describe with high statistical significance the transverse momentum distributions of hyperons, antihyperons, kaons and pions produced in 158 Gev Pb-Pb collisions. We compare these parameters to those describing chemical freeze-out and determined using hadron abundances. The results are used to distinguish between the sudden hadronization scenario, in which chemical and thermal freeze-out conditions coincide and no further interactions occur after hadron production, and a staged freeze-out, in which hadrons may be produced at different fireball conditions and/or be subject to interactions after chemical freezeout. Our results are consistent with the proposed sudden breakup of a $T = 143 \pm 3$ MeV supercooled QGP fireball.

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