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Hadron Formation in Relativistic Nuclear Collisions and the QCD Phase Diagram

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We analyze hadrochemical freeze-out in central Pb+Pb collisions at CERN SPS and LHC energies. We determine the effects of baryon and antibaryon annihilation and/or regeneration occuring during the final cascade expansion stage of the collisions, deriving survival factors for each hadronic species and all energies considered, by employing the UrQMD hybrid model(1,2). These survival factors are shown to resemble the observed pattern of data deviation from the statistical equilibrium calculations with the statistical hadronization model(1). We apply them in the SHM data analysis, obtaining a novel form for the hadronic freeze-out curve(3). The points in the T - mu(B) plane obtained at each energy now follow closely the parton-hadron phase boundary that was recently predicted by lattice QCD(4)at finite baryochemical potential, up to about 450MeV. We conclude that with this novel method of taking accout for the distortions of the chemical equilibrium established during (or directly after) hadronization, in the course of the subsequent hadronic expansion phase, the SHM data analysis now confirms the QCD predictions at finite mu(B).

[1] F.Becattini et al., Phys.Rev.C85(2012)044921; [2] J.Steinheimer et al., arXiv:1203.5302(nucl-th); [3] F.Becattini et al., arXiv:1212.2431(nucl-th); [4] G.Enrodi et al., JHEP 1104(2011)001;