

XVII Polish Workshop on Relativistic Heavy-Ion Collisions: Phase diagram and Equation of State of strongly interacting matter



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Chemical Freeze-out in the QCD Phase Diagram

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After a short introduction to the structure of the QCD phase diagram and the status of its exploration, we focus on the discussion of chemical freeze-out (cfo) in the temperature - chemical potential and temperature - density planes. While in the meson-dominated part of the phase diagram the cfo appears to be tied to the hadronization and chiral symmetry breaking, we present a new insight for understanding cfo in the baryon-dominated region for heavy-ion collision experiments at energies below about 8 GeV in the nucleon-nucleon center of mass system. There, the cfo appears strongly correlated with the Mott transition lines for light nuclear clusters such as alpha particles. We discuss cfo as “inverse Mott dissociation” in the QCD phase diagram and argue that a microscopic formulation of this non-equilibrium process can be given within the Zubarev approach of the non-equilibrium statistical operator [1,2,3].

[1] D. Blaschke et al., Cluster production and the chemical freeze-out in expanding hot dense matter, arXiv:240801399

[2] O. Vitiuk et al., Nonequilibrium phenomenology of identified particle spectra in heavy-ion collisions at LHC energies, arXiv:2409.09019

[3] G. Röpke et al., Heavy element abundances from a universal primordial distribution, arXiv:2411.00535

Author: BLASCHKE, David

Co-authors: Dr DÖNIGUS, Benjamin (University of Frankfurt); Prof. RÖPKE, Gerd (University of Rostock); VITIUK, Oleksandr (University of Wrocław); Dr LIEBING, Simon (TU Bergakademie Freiberg)

Presenter: BLASCHKE, David

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