



Contribution ID: 665

Type: **Parallel Talk**

Lattice-based QCD equation of state at finite baryon density

Wednesday 16 May 2018 12:30 (20 minutes)

Lattice QCD methods allow to calculate the thermodynamic observables at finite temperature and imaginary chemical potential. The Wuppertal-Budapest collaboration data [1,2] for the temperature dependence of the leading four Fourier coefficients of the imaginary part of the net-baryon density at imaginary baryochemical potential is analyzed. We demonstrate how the lattice behavior of these coefficients is naturally described by the inclusion of the repulsive, excluded volume type interactions between baryons [2], in line with earlier studies regarding conserved charges fluctuations [3,4].

We formulate a Cluster Expansion Model (CEM), which provides all higher order Fourier coefficients on the basis of the leading two coefficients [5], and allows to calculate QCD thermodynamics at non-zero chemical potentials. CEM is shown to be consistent with all the available lattice data, both at $\mu_B = 0$ and at imaginary baryochemical potential. Moreover, the radius of convergence of the Taylor expansion of the QCD pressure is found to be finite within CEM, and caused by the Roberge-Weiss like transition [6] in the complex μ_B/T plane. No evidence for the QCD phase transition at $\mu_B/T < \pi$ is found.

Finally, we present the full equation of state at finite baryon density within CEM, which can be incorporated in hydrodynamic simulations.

[1] S. Borsanyi et al. [Wuppertal-Budapest Collaboration], Talk at Quark Matter 2017 Conference, 5-11 February, Chicago, USA

[2] V. Vovchenko, A. Pasztor, Z. Fodor, S.D. Katz, H. Stoecker, Phys. Lett. B 775, 71 (2017)

[3] V. Vovchenko, M.I. Gorenstein, H. Stoecker, Phys. Rev. Lett. 118, 182301 (2017)

[4] P. Huovinen, P. Petreczky, 1708.00879

[5] V. Vovchenko, J. Steinheimer, O. Philipsen, H. Stoecker, 1711.01261

[6] A. Roberge, N. Weiss, Nucl. Phys. B 275, 734 (1986)

Content type

Theory

Collaboration

Centralised submission by Collaboration

Presenter name already specified

Author: VOVCHENKO, Volodymyr (Frankfurt Institute for Advanced Studies)

Co-authors: STOECKER, Horst (GSi); Dr STEINHEIMER, Jan; PHILIPSEN, Owe (Goethe-University Frankfurt); BORSANYI, Szabolcs (University of Wuppertal); PASZTOR, Attila (Wuppertal University); FODOR, Zoltan (BUW); KATZ, Sandor (Eotvos University)

Presenter: VOVCHENKO, Volodymyr (Frankfurt Institute for Advanced Studies)

Session Classification: Phase diagram and search for the critical point

Track Classification: Phase diagram and search for the critical point