Contribution ID: **652** Type: **Parallel Talk**

The QCD equation of state at finite density, from the known to the unknown

Tuesday 15 May 2018 15:20 (20 minutes)

The theory of quantum chromodynamics (QCD) is expected to have a rich phase structure at finite chemical potential and temperature. Its study is a central topic of high energy nuclear physics. Theoretical studies employing lattice QCD methods have already established that the transition from hadrons to quarks proceeds as a smooth crossover in the case of vanishing net baryon number density. At very large net baryon densities and low temperatures, astrophysical observations have become more important in constraining the QCD Equation of State. Nuclear matter ground-state properties as well as properties of compact stars and their violent mergers will serve to determine the equation of state at several times nuclear ground-state density.

In this talk I will present the first calculation
of the QCD phase strcuture and thermodynamics which is shown to be consistent with lattice QCD
results at small barychemical potential as well as nuclear matter properties
and known constraints from compact star observations[1,2].
In this context I will discuss the most relevant properties and constraints which should
be satisfied by any model which attempts to predict the QCD phase structure.
Furthermore, I will present results on the baryon number susceptibilities calculated with this
model and discuss how nuclear interactions may strongly influence the measured
baryon number fluctuations in nuclear collisions at low beam energies [1].
Finally, I will also address similarities and differences between the matter created in heavy ion collisions
and in mergers of compact stars and how both can be described in a unified framework [3].

[1] A.Mukherjee, JS and S.Schramm, Phys. Rev. C 96, no. 2, 025205 (2017)

[2] A.Mukherjee, S.Schramm, JS and V. Dexheimer, arXiv:1706.09191 [nucl-th].(accepted for pulication in Atronomy & Astrophysics)

[3] M.Hanauske, JS et al., J. Phys. Conf. Ser. 878, no. 1, 012031 (2017).

Content type

Theory

Collaboration

Centralised submission by Collaboration

Presenter name already specified

Primary author: Dr STEINHEIMER, Jan

Co-authors: MUKHERJEE, Ayon; SCHRAMM, Stefan; DEXHEIMER, Veronica (Kent State University); STOECKER, Horst (GSi)

Presenter: Dr STEINHEIMER, Jan

Session Classification: High baryon density and astrophysics

Track Classification: High baryon density and astrophysics