Contribution ID: **21** Type: **not specified**

Towards a unified equation of state for quark/hadron matter

Wednesday, September 30, 2015 11:20 AM (40 minutes)

The investigations exploring the phase boundary between hadronic matter and the quark-gluon plasma are in the dilemma that a proper theoretical basis is missing: a unified approach which can describe both phases on the same footing and deal properly with the transition between them. We suggest that a cluster virial expansion for quark-nuclear matter [1] formulated within the Φ–derivable approach [2] to many particle systems with strong correlations can fill this gap.

We define a generic form of Φ–functionals that is fully equivalent to a selfconsistent cluster virial expansion up to the second virial coefficient for interactions among the clusters. As examples we consider nuclei in nuclear matter and hadrons in quark matter, with particular attention to the case of the deuterons in nuclear matter and mesons in

quark matter. We derive a generalized Beth-Uhlenbeck equation of state for two-particle states in quark matter [3], and outline how the quasiparticle virial expansion is extended to include arbitrary clusters. The approach is applicable to nonrelativistic potential models of nuclear matter as well as to relativistic field theoretic generalizations of models for quark/nuclear matter like the string-flip model [4].

It is particularly suited for a description of cluster formation and dissociation in dense hadronic matter in compact star interiors and in heavy ion collisions such as planned for FAIR and NICA.

[1] D. Blaschke, Cluster virial expansion for quark and nuclear matter, arxiv:1502.06279

[2] G. Baym, L.P. Kadanoff, Phys. Rev. 124, 287 (1961); G. Baym, Phys. Rev. 127, 1391 (1962).

[3] D. Blaschke et al., Generalized Beth-Uhlenbeck approach Ann. Phys. 348, 228 (2014).

[4] G. Roepke, D. Blaschke, H. Schulz, Pauli quenching effects in a simple string model of quark/nuclear matter, Phys. Rev. D 34, 3499 (1985).

Primary author: BLASCHKE, David (University of Wroclaw)

Co-authors: Mr DUBININ, Aleksandr (University of Wroclaw); Mr BASTIAN, Niels-Uwe (University of Wroclaw)

Presenter: BLASCHKE, David (University of Wroclaw)