Contribution ID: **27** Type: **not specified**

Chiral Phase Structure and Magentic Propeties of QCD Phase Diagram at NICA Energies

Monday, 27 February 2023 12:40 (30 minutes)

In SU(3) Polyakov linear sigma model (PLSM), in which the chiral symmetry and gluomic degrees of freedom are integrated in the hadronic and partonic phase, the QCD phase structure and its magnetic properties are analyzed in thermal and dense medium, at finite magnetic field. Both Landau quantization and magnetic catalysis are implemented so that magnetization, magnetic susceptibility and permeability have been estimated. We find that the partonic phase has higher values of magnetization, magnetic susceptibility, and permeability than the hadronic phase. We also study the chiral phase structure of: a) pseudoscalars (Jpc=0−+), b) scalars (Jpc=0++), c) vectors (Jpc=1−−), and d) axial-vectors (Jpc=1++) meson states, at finite temperature, baryon chemical potential and magnetic field. The in-medium (thermal and density) characteristics of nonet meson states normalized to the lowest bosonic Matsubara frequencies are also analyzed. We noticed that the meson masses normalized to normalized become temperature independent at characterizing critical temperatures. We observe that the chiral and deconfinement phase transitions are shifted to lower quasicritical temperatures with increasing chemical potential and magnetic field. We also find that increasing chemical potential enhances the mass degeneracy of the various meson masses, while increasing the magnetic field seems to reduce the critical chemical potential, at which the chiral phase transition takes place. Our mass spectrum calculations, at vanishing temperature, agree well with PNJL, lattice QCD calculations, QMD/UrQMD simulations, and the recent PDG compilations.

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