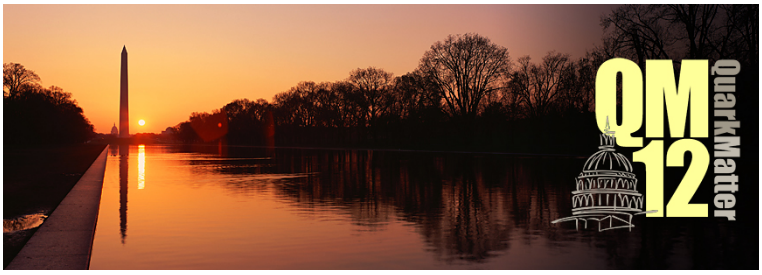

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Chiral phase transition in a dynamical linear sigma model.

Thursday 16 August 2012 16:00 (2 hours)

One of today's main goals in high energy physics is the exploration of the phase diagram of nuclear matter. On the theoretical side, much effort has been put into the investigation of quantum chromodynamics (QCD), its phase diagramm and symmetries.

An important property of the QCD Lagrangian is its approximate chiral symmetry in the light-quark sector. At low temperatures and density this approximate symmetry is also spontaneously broken, while at higher temperatures and/or densities a chiral-symmetry restoring phase transition is expected. Collider experiments at LHC (CERN) probe the phase diagramm at high energy densities and low chemical and baryon chemical potentials, where the chiral phase transition is expected to be a cross over. Future experiments at FAIR (GSI) probe the region with high chemical potential, where a lower-order phase transition is expected.

We use a dynamical 3+1D linear sigma model with constituent quarks to examine the evolution of equilibrium and non-equilibrium scenarios. In a first attempt we employ a mean-field ansatz which reproduces the thermodynamical properties of the linear sigma model. To investigate fluctuating observables like the quark- and baryon-density at and near the phase transition, the model is extended with scattering processes between the quark quasi-particles and the chiral fields. For further improvments, we plan to include an effective Polyakov-loop to model effects of the confienment.

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