HK 5 Theorie

Zeit: Freitag 14:00–16:00 Raum: TU MA005

HK 5.1 Fr 14:00 TU MA005

Goldstone boson condensation in the color-flavor locked phase — •Michael Buballa — Institut für Kernphysik, TU Darmstadt

It is generally believed that strongly interacting matter at low temperatures and very high densities is a color superconductor in the color-flavor locked (CFL) phase. The situation is less clear at "moderate" densities which could be relevant, e.g., for the interiors of neutron stars. Based on low-energy effective theories it has been suggested that, as a consequence of the stress posed by the strange quark mass, the CFL phase should eventually become unstable to the formation of pion or kaon condensates. On the other hand, various so-called gapless color-superconducting phases have been found in recent NJL model studies, which, however, neglect the possibility of Goldstone condensates. In this talk we present an NJL-type model which has been extended to include this possibility by allowing for pseudoscalar diquark condensates in addition to the scalar ones which constitute the CFL phase. We show that the results obtained within this model, e.g., the dependence of the free energy in the Goldstone condensed phases on quark masses or charge chemical potentials are in good qualitative – in most cases even quantitative – agreement with the low-energy effective theory approach. The phase structure emerging from this model is discussed.

HK 5.2 Fr 14:15 TU MA005

Density perturbations in heavy ion collisions arround the critical point — •Kerstin Paech and Adrian Dumitru — Institut für Theoretische Physik, JWG Universität Frankfurt am Main

We introduce a model for the real-time evolution of a relativistic fluid of quarks coupled to non-equilibrium dynamics of the long wavelength (classical) modes of the chiral condensate. We solve the equations of motion numerically in 3+1 space-time dimensions. Starting the evolution at high temperature in the symmetric phase, we study dynamical trajectories that either cross the line of first order phase transitions or evolve through its critical endpoint. For those cases, we study the formation of density perturbations.

HK 5.3 Fr 14:30 TU MA005

Baryonische Resonanzen und das QCD-Phasendiagramm in einem chiralen SU(3) Modell — •Gebhard Zeeb, Detlef Zschiesche und Stefan Schramm — Institut für Theoretische Physik, J.W.Goethe-Universität, Robert-Mayer-Str. 10, 60054 Frankfurt am Main

Wir untersuchen das QCD Phasendiagramm eines hadronischen chiralen SU(3)×SU(3) Modells. Es wird der Einfluss unterschiedlicher skalarer bzw. vektorieller Ankopplung der baryonischen Resonanzen sowie verschiedener Varianten der Ankopplung des Dilaton-Feldes (Gluonen-Kondensat) auf das Phasenübergangsverhalten diskutiert. Den Ergebnissen werden auch Phasendiagramme aus Gitter-QCD-Rechnungen gegenübergestellt.

HK 5.4 Fr 14:45 TU MA005

Hadron Resonances on the Lattice — •Christian Hagen, Christof Gattringer, and Andreas Schäfer — Institut für Theoretische Physik, Universität Regensburg

We study baryons on the lattice with a special focus on excited states. For that purpose we construct several interpolators which differ in their Dirac structure. These interpolators are built from Jacobi smeared quarks with different widths to construct operators with different spatial wave functions. We then calculate all cross correlations and use the variational method to determine which combinations of operators have best overlap with ground and excited states. Our approach yields promising results for the nucleon, Ξ and Σ. Hopefully, first results for the Θ^+ channel (pentaquark) will be available at the time of the conference.(Supported by BMBF)

HK 5.5 Fr 15:00 TU MA005

$I = 2$ pion scattering length with chirally improved fermions — •Dieter Hierl, Christof Gattringer, and Andreas Schäfer — University of Regensburg

We report on a lattice calculation of the pion scattering length in the $I = 2$ channel using the chirally improved lattice Dirac operator. The scattering length is extracted by using the standard finite volume technique of Lüscher. We use different lattice sizes and discuss several extrapolations to the chiral limit. Finally we compare our results with the latest experimental data.

Supported by BMBF and DFG.

HK 5.6 Fr 15:15 TU MA005

Breite Quasiteilchen in heißer QCD — •André Peshier — Institut für Theoretische Physik, Universität Giessen, Germany

Betrachtet werden stark wechselwirkende Vielteilchensysteme oberhalb der Übergangstemperatur $T_c \sim 200\,\mathrm{MeV}$. Es wird argumentiert, daß aus bekannten thermodynamischen Eigenschaften Rückschlüsse auf spektrale Kenngrößen der Anregungen gezogen werden können. Dies erlaubt insbesondere eine Aussage über die Partonenbreiten nahe T_c, welche bislang nur parametrisch abgeschätzt werden konnten. Das resultierende neue physikalische Bild – 'Quasiteilchen' mit teilweise großen Breiten – liefert interessante Implikationen für eine Reihe experimentell relevanter Größen wie Wirkungsquerschnitte und Transportkoeffizienten.
Gefördert durch BMBF.

[1] A. Peshier, Phys. Rev. D70 (2004) 034016.

HK 5.7 Fr 15:30 TU MA005

In-medium four-quark condensates — •Stefan Leupold — Institut für Theoretische Physik, Universität Giessen, Germany

It is well-established for the vacuum case that in the large-N_c limit four-quark condensates factorize into products of the two-quark condensate. Here N_c denotes the number of colors. It is shown that in the combined large-N_c and linear density approximation four-quark condensates do not factorize in a medium of pions (finite temperature system) but do factorize in a medium of nucleons (nuclear system).

HK 5.8 Fr 15:45 TU MA005

Densitiy Dependence of Four-Quark Condensates: Evaluation of QCD Sum-Rules for the Nucleon and Light Vector Mesons — •Ronny Thomas[1,2], Sven Zschocke[1,2], and Burkhardt Kämpfer[1] — [1]Forschungszentrum Rossendorf, Dresden, Germany — [2]TU Dresden, Germany

QCD sum-rules for the nucleon and the light vector mesons are revisited with emphasis on the role of four-quark condensates. Often the factorization hypothesis is used to predict hadronic properties at finite baryon density. Distinct occurence of the four-quark condensates in sum-rules for the nucleon and light vector mesons imply further understanding of their density dependence. Prospects to constrain some four-quark condensates by di-electron measurements at HADES are discussed.