Aktuelle Veranstaltungen

Kolloquium

Thema: Vorstellung der Arbeitsgruppen

Datum: 06.01.20

Uhrzeit: 16:15

Ort: H6

Vortragender: Arbeitsgruppen der Physik

Inhalt:

Ansprechpartner: Fachschaft

Kolloquium Mathematische Physik

Thema: Thimble regularisation of quantum field theories

Datum: 29.11.19

Uhrzeit: 16:15

Ort: V3-201

Vortragender: Francesco di Renzo

Università di Parma
Lattice regularisation provides an effective framework for a non-perturbative definition of Quantum Field Theories. It also enables numerical computations: in the euclidean formulation, lattice QFT resembles a statistical physics problem, the functional integral defines a decent probability measure and Monte Carlo simulations are viable.

Nevertheless, this is not always the case. When a complex action is in place, we have no probability measure to start with and there is no obvious way to set up a Monte Carlo scheme. This is known as the sign problem. Among other theories, QCD with a chemical potential is plagued by a sign problem and we have no effective way to tackle the investigation of its (supposedly rich) phase diagram. A few years ago a conceptually simple technique was proposed to tame (or at least mitigate) the sign problem. The idea is to choose an alternative domain of integration within a complexified extension of the path integral. Most noticeably, there is a perfect candidate for such an alternative domain of integration: Lefschetz thimbles. These manifolds are characterised by a constant imaginary part of the action and the only residual sign problem is the one tied to the integration measure. Thimble regularisation is not only worth investigating to look for a decent Monte Carlo scheme; it is stimulating per se, and as a matter of fact the first attempts at a thimble formulation of QFT did not have computational applications as a goal. I will present an introduction to the technique, trying to highlight the conceptual challenges we have to face. In particular, I will discuss the problems that arise when we stumble into so-called Stokes phenomena and when we try to define a thimble formulation for gauge theories.

Ansprechpartner: S. Schlichting

Seminar Hochenergiephysik

**Thema:** QCD at nonzero isospin asymmetry: signatures of the BCS phase from the Dirac spectrum

**Datum:** 14.01.20

**Uhrzeit:** 14:15

**Ort:** D6-135

**Vortragender:** Francesca Cuteri

Frankfurt

We investigate the complex spectrum of the Dirac operator in 2+1-flavor QCD, at nonzero temperature and isospin chemical potential, using the extension of the Banks-Casher relation to the case of Complex Dirac eigenvalues (derived for the zero-temperature, high-density limits of QCD at nonzero isospin chemical potential), as a prescription to obtain information on the BCS gap from the 2d density of the complex Dirac eigenvalues. Such study is motivated by the prediction, from perturbation theory,
We investigate the complex spectrum of the Dirac operator in 2+1-flavor QCD, at nonzero temperature and isospin chemical potential, using the extension of the Banks-Casher relation to the case of Complex Dirac eigenvalues (derived for the zero-temperature, high-density limits of QCD at nonzero isospin chemical potential), as a prescription to obtain information on the BCS gap from the 2d density of the complex Dirac eigenvalues. Such study is motivated by the prediction, from perturbation theory, of a superfluid state of $u$ and $\bar{d}$ Cooper pairs (BCS phase) at asymptotically high isospin densities, plausibly connected via an analytical crossover to the a phase with Bose-Einstein condensation of charged pions at $\mu_I = m_\pi/2$. Further motivation comes from recent lattice observations (renormalized Polyakov loop measurements) that indicate a decrease of the deconfinement transition temperature as a function of $\mu_I$, suggesting that the deconfinement crossover smoothly penetrates into the pion condensation phase and thus favoring a scenario where the deconfinement transition connects continuously to the BEC-BCS crossover in the $(T,\mu_I)$ phase diagram.

Ansprechpartner: Ch. Schmidt

Seminar Kondensierte Materie

Thema: tba

Datum: 30.01.20

Uhrzeit: 14:15

Ort: D5-153

Vortragender: Stefano Bo

MPI for the Physics of Complex Systems

Inhalt:

Ansprechpartner: Peter Reimann

Seminar Mathematische Physik

Thema: Critical behaviour and characteristic polynomials of non-Hermitian random matrices

Datum: 23.05.19

Uhrzeit: 16:15
I will discuss some recent developments regarding the normal matrix model. In particular my interest will be in certain critical models where the limiting support of the eigenvalues can radically change its topology by slightly adjusting an external parameter. I will discuss how aspects of the model can be explicitly mapped to the study of expectations of characteristic polynomials of non-Hermitian random matrices (e.g. Ginibre or truncated unitary). Many of these averages are related to Painlevé transcendents, and by exploiting this, a precise and non-trivial asymptotic expansion of partition functions can be calculated in the critical models. This is joint work with Alfredo Deaño (University of Kent).