Aktuelle Veranstaltungen

Kolloquium

Thema: **Antrittsvorlesung: Calculating the properties of extremely hot end dense matter**

Datum: 25.06.18

Uhrzeit: 16:15

Ort: H6

Vortragender: PD Dr. Christian Schmidt-Sonntag

Universität Bielefeld

Inhalt: Exploring the properties and phase structure of strong interaction matter from first principles is an extremely active and numerically intense field of research. The last 15 years have seen tremendous progress in the quality of lattice regularized Quantum Chromodynamics (QCD) calculations. It is now possible to perform QCD calculations with physical quark masses and reliable continuum extrapolations for bulk thermodynamic quantities at nonzero temperatures. A small baryon number density can be introduced by a Taylor expansion approach. In this accessible region the QCD phase diagram can now be explored in detail, with some applications to heavy ion physics and cosmology. What remains to be an important and unsolved issue are calculations at large baryon number densities. I will review recent lattice QCD results on bulk thermodynamics at nonzero temperature and small baryon number densities, which includes the equation of state as well as recent results on the density dependence of the QCD transition temperature. I will further discuss how thermal fluctuations of baryon number, electric charge and strangeness can be used to connect QCD calculations with heavy ion experiments conducted at the Relativistic Heavy Ion Collider (RHIC) in Brookhaven. Finally, I will sketch some strategies for QCD calculations that might help to go beyond a Taylor expansion and overcome the infamous sign problem that is faced in numerical QCD calculations.

Ansprechpartner: Dekan

Kolloquium Mathematische Physik

Thema: **Upper and lower Lipschitz bounds for the perturbation of edges of the essential spectrum**

Datum: 01.06.18

Uhrzeit: 16:15

Ort: V3-204

Vortragender: Ivan Veselic

TU Dortmund

Inhalt: Let A be a selfadjoint operator, B a bounded symmetric operator and $A+t B$ a perturbation. I will present upper and lower Lipschitz bounds on the function of t which locally describes the movement of edges of the essential spectrum. Analogous bounds apply also for eigenvalues within gaps of the essential spectrum. The bounds hold for an optimal range of values of the coupling constant t. This is result is applied to Schroedinger operators on unbounded domains which are perturbed by a non-negative potential which is mostly equal to zero. Unique continuation estimates nevertheless ensure quantitative bounds on the lifting of spectral edges due to this semidefinite potential. This allows to perform spectral engineering in certain situations. The talks is based on the preprint https://arxiv.org/abs/1804.07816

Ansprechpartner: G. Akemann

Seminar Hochenergiephysik

Thema: **Perturbative construction of a string-localized Dirac field in a Hilbert space representation of QED - A programme and some results.**

Datum: 13.07.18

Uhrzeit: 14:15

Ort: D5-153

Vortragender: Jens Mund

UFJF, Juiz de Fora, Brazil

Inhalt: The construction of charged physical states in QED [Morchio and Strocchi 1983/2003; Steinmann 1984] has been a difficult task due to the infrared problems related to Gauss' law, which imply that the charge cannot be localized in finite regions and that the electron is an infra-particle, i.e., it does not correspond to a discrete eigenvalue of the mass operator. I propose a new strategy for a straightforward perturbative construction of the interacting Dirac field acting in a Hilbert space, which describes the electron as an infra-particle. It is not point- but "string-localized", i.e., localized on half-rays extending to space-like infinity. The construction works in a new framework which relates the free (Gupta-Bleuler) vector potential acting in a Krein space with its string-localized version acting in the physical (positive semidefinite) subspace. I construct the string-localized scalar field chi which implements the gauge transformation between the two potentials, and consider the free string-localized "dressed Dirac field" $\exp(i e \chi) \psi$, where ψ is the free Dirac field and e is the electron charge. The adiabatic limit of its interacting version in the Epstein-Glaser perturbative scheme is my candidate for the Dirac field. My conjecture that it exists and satisfies the mentioned properties has the following basis. Firstly, it has been verified at lower orders that this field leaves the physical subspace invariant before the adiabatic limit. Therefore the weak adiabatic limit (whose existence was shown by Blanchard and Seneor) satisfies positivity by a recent result of Duch. Secondly, the field χ has the same infrared structure as the free scalar field in 2 dimensions, whose exponentiation leads to an infraparticle representation [Schroer 1963]. I expect that the same holds true for our χ in the adiabatic limit. This would mean that our free "dressed Dirac field" already describes the free (but dressed) electron as an infra-particle. Then there is no obstruction from general reasons to the conjecture that the Hilbert space of the free dressed Dirac field is the GNS space of the adiabatic limit.

Ansprechpartner: F. Karsch

Seminar Kondensierte Materie

Thema: **tba**

Datum: 28.06.18

Uhrzeit: 14:15

Ort: D5-153

Vortragender: Maria-Bernadette Riedl

Universität Bielefeld

Inhalt:

Ansprechpartner: Jürgen Schnack

Seminar Mathematische Physik

Thema: **Eigenvector-related correlation functions and their connection with generalized chiral random matrix ensembles with a source**

Datum: 11.01.18

Uhrzeit: 16:00

Ort: D5-153

Vortragender: Jacek Grela

LPTMS Université Paris-Sud

Inhalt:

We will introduce eigenvector-related correlation functions, discuss briefly their significance in dynamical Ginibre ensemble [1,2] and present asymptotic results in the large matrix size limit. Motivated by recent work [3] on joint eigenvector-eigenvalue correlation function valid for finite matrix size N in the complex and real Ginibre Ensembles, we study integrable structure of a certain generalized chiral Gaussian Unitary Ensemble with a source [4]. This model can be also interpreted as a deformation of the complex Ginibre Ensemble with an external source with additional determinant term. We present compact formulas for the characteristic polynomial, inverse characteristic polynomial and the kernel. In the case of a special source, we calculate asymptotics in the joint "bulk-edge" regime of all aforementioned objects and show their Bessel-type behaviour. References: [1] "Dysonian dynamics of the Ginibre ensemble", Z. Burda, J. Grela, M. A. Nowak, W. Tarnowski, P. Warcho?, Phys. Rev. Lett. 113, 104102 (2014) [2] "Unveiling the significance of eigenvectors in diffusing non-hermitian matrices by identifying the underlying Burgers dynamics", Z. Burda, J. Grela, M. A. Nowak, W. Tarnowski, P. Warcho?, Nucl. Phys. B 897, 421 (2015) [3] "On statistics of bi-orthogonal eigenvectors in real and complex Ginibre ensembles: combining partial Schur decomposition with supersymmetry", Y. V. Fyodorov, arXiv:1710.04699 [4] "On characteristic polynomials for a generalized chiral random matrix ensemble with a source", Y. V. Fyodorov, J. Grela, E. Strahov, arXiv:1711.07061

Ansprechpartner: Gernot Akemann

Seminar AG Zufallsmatrizen

Thema: **The Random Normal Matrix Model: Insertion of a Point Charge**

Datum: 27.06.18

Uhrzeit: 16:15

Ort: V3-201

Vortragender: Yacin Ameur

Lund University

Inhalt: We study conditional two-dimensional log-gases in the determinantal case, given that there is a point charge in the interior of the support of the equilibrium measure (the "droplet"). On a microscopic level, we obtain near the inserted charge a family of universal point-fields, depending on the strength of the charge and so on, which are characterized by special entire functions -- Mittag-Leffler functions. The charge also affects the microscopic behaviour near the boundary of the droplet, where it gives rise to a kind of balayage operation. One motivation for studying this kind of conditional point-processes is that they are closely related to the characteristic polynomial of a random normal matrix -- an object of interest for field theories and multiplicative chaos. The talk is based on joint work with Kang and Seo.

Ansprechpartner: Gernot Akemann