T 505 QFT II

Zeit: Donnerstag 16:20–18:00 Raum: C2-02-176

Gruppenbericht T 505.1 Do 16:20 C2-02-176

Higgs mass bounds from renormalization flow — •Clemens Gneiting and Holger Gies — Institut für Theoretische Physik, Universität Heidelberg, Philosophenweg 16, D-69120 Heidelberg

We use a functional renormalization group (RG) equation to determine the RG flow of a Higgs-Yukawa toy model mimicking the Standard Model. We show that for a given ultraviolet cutoff a finite infrared Higgs mass range emerges naturally from the RG flow itself. In agreement with naive expectations the Higgs mass bounds become more narrow for larger cutoff values. Higgs masses outside the resulting bounds cannot be connected to any conceivable set of bare parameters in the standard-model universality class. For our results, no further physical assumptions have to be imposed in contrast to many earlier investigations that utilize validity bounds of computational techniques or unphysical instability scenarios.

Gruppenbericht T 505.2 Do 16:40 C2-02-176

The SU(2) quark-antiquark potential in the pseudoparticle approach — •Marc Wagner — Institute for Theoretical Physics III, University of Erlangen-Nürnberg, Staudtstraße 7, 91058 Erlangen

The pseudoparticle approach is a technique for numerical calculations of path integrals in noncompact gauge theories [1]. The basic idea is to represent the gauge fields by a discrete superposition of pseudoparticles and to replace the integration over all gauge fields by an integration over the amplitudes and color orientations of the pseudoparticles. We applied this technique to calculate the potential between two static quarks in SU(2) Yang-Mills theory. For small quark antiquark separations our results indicate a Coulomb-like behavior. At the same time we observe a linear confining potential for large separations.

[1] Marc Wagner and Frieder Lenz: The pseudoparticle approach for solving path integrals in gauge theories, PoS(LAT2005)315, hep-lat/0510083, 2005.

Gruppenbericht T 505.3 Do 17:00 C2-02-176

Worldline numerics — •Klaus Klingmüller and Holger Gies — Institut für Theoretische Physik, Philosophenweg 16, 69120 Heidelberg

We present a numerical method to evaluate functional determinants, as they occur in the computation of the effective action in gaussian approximation with non-perturbative coupling to background fields. With the string-inspired worldline formalism, the problem is mapped onto the path integral of a point particle, which can be evaluated with Monte Carlo techniques. This approach resolves the general problem of finding and summing over the fluctuation spectrum by computing the determinant within a single computational step. No particular symmetries of the background field are required. As an example we consider the calculation of Casimir energies and present recent results for Casimir configurations which have been inaccessible by other methods so far.

Gruppenbericht T 505.4 Do 17:20 C2-02-176

Quarkonfinement in einem SU(2) KvB-Caloron-Gas-Modell — •Philipp Gerhold, Ernst-Michael Ilgenfritz und Michael Mueller-Preussker — Institut für Physik, Humboldt-Universität zu Berlin, Newtonstr. 15, 12489 Berlin

Ein semiklassisches Modell, das die SU(2)-Gluodynamik bei endlichen Temperaturen als ein verdünntes Gas von Caloronen mit nichttrivialer Holonomie beschreiben soll, wird entwickelt und numerisch untersucht. Modellparameter sind die Caloron-Dichte, die mittlere Caloron-Grösse sowie die asymptotische Holonomie, die in Anlehnung an Gitterresultate gewaehlt werden können. Für die Confinement- und die Deconfinementphase werden das statische Quark-Antiquark-Potentials (in der fundamentalen und adjungierten Darstellung) berechnet und die Eigenschaft der Monopol-Perkolation untersucht. Besondere Aufmerksamkeit in diesem Modell erfordert die Konstruktion “guter” Multi-Caloron-Anticaloron-Feldkonfigurationen und die Wahl einer realistischen Verteilung der Abstände zwischen den Monopol-Konstituenten innerhalb eines (Anti-)Calorons, die sich an das 1-Loop-Resultat (Diakonov et al.) anschliesst.

Gruppenbericht T 505.5 Do 17:40 C2-02-176

Full phase diagram of the massive Gross-Neveu model — •Konrad Urlichs, Michael Thies, and Oliver Schnetz — Institut für Theoretische Physik III, Staudtstraße 7, D-91058 Erlangen

The Gross-Neveu model is a renormalizable quantum field theory of N species of interacting fermions in 1+1 space-time dimensions with a discrete chiral symmetry. In the large-N limit it can be solved using a mean field approach. We discuss the model at finite temperature, chemical potential and bare fermion mass. In this talk we will show that the system exhibits the spontaneous breakdown of translational symmetry at finite density for all values of the bare fermion mass. The phase diagram for finite bare mass features a kink-antikink crystal phase, which was missed in previous works, and a massive Fermi gas phase. The ansatz for the scalar mean field potential is borrowed from the theory of quasi-one-dimensional condensed matter systems like conducting polymers.

[1] Oliver Schnetz, Michael Thies, Konrad Urlichs, hep-th/0507120