T 13: Quantenfeldtheorie und Gittereichtheorie (Theorie)

Zeit: Montag 11:00–12:00 Raum: VMP8 SR 106

T 13.1 Mo 11:00 VMP8 SR 106

On the Eigenvalue Spectrum of (Staggered) Domain Wall Fermions — Christian Hoelbling[1] and •Christian Zielinski[2,1] — [1]Department of Physics, University of Wuppertal, Germany — [2]Division of Mathematical Sciences, Nanyang Technological University, Singapore

We explore spectral properties of staggered domain wall lattice fermions, which were recently proposed by Adams [Phys. Lett. B699 (2011) 394–397]. They differ from the usual domain wall fermion construction by replacing the Wilson kernel with the novel staggered Wilson Dirac operator. In both cases one formulates fermions with approximate chiral symmetry in d dimensions by means of massive interacting fermions in $d+1$ dimensions. In the limit of large extents of the extra dimension N_s, the low-energy effective d-dimensional Dirac operator approaches the overlap operator with an exact chiral symmetry. In this work we investigate the eigenvalue spectra of both the d-dimensional effective operators and the $(d+1)$-dimensional bulk operators for $d = 2, 4$. We implement several variations of the original proposal and examine the dependence on N_s, various degrees of gauge link smearing and different topological sectors.

T 13.2 Mo 11:15 VMP8 SR 106

Regularization of ultraviolet divergence for a particle interacting with a scalar quantum field — •Oleg Skoromnik[1], Ilya Feranchuk[2], Dung Lu[2], and Christoph Keitel[1] — [1]Max Planck Institute for Nuclear Physics — [2]Belarusian State University

When a non-relativistic particle interacts with a scalar quantum field, the standard perturbation theory leads to a dependence of the energy of its ground state on an undefined parameter "momentum cut-off" due to the ultraviolet divergence. We show that the use of non-asymptotic states of the system results in a calculation scheme in which all observable quantities remain finite and continuously depend on the coupling constant without any additional parameters. It is furthermore demonstrated that the divergence of traditional perturbation series is caused by the energy being a function with a logarithmic singularity for small values of the coupling constant.

[1] O. D. Skoromnik, I. D. Feranchuk, D. V. Lu and C. H. Keitel, Phys. Rev. D Accepted (2015)

T 13.3 Mo 11:30 VMP8 SR 106

A new sphaleron in SU(3) Yang-Mills-Higgs theory — •Pascal Nagel and Frans Klinkhamer — Karlsruher Institut für Technologie (KIT), Karlsruhe, Deutschland

The sphaleron solution S is known to contribute to baryon-number violation within the electroweak Standard Model. To gain further insight into the nonperturbative dynamics of QCD (and GUTs), we study a new sphaleron solution of SU(3) Yang-Mills-Higgs theory, the solution $\widehat{S}$. Two independent numerical approaches yield solutions of the reduced field equations and a surprising structure of the energy barrier in configuration space.

T 13.4 Mo 11:45 VMP8 SR 106

Lepton-photon interactions in external background fields — •Ibrahim Akal[1] and Gudrid Moortgat-Pick[2] — [1]Theory Group, Deutsches Elektronen-Synchrotron DESY, Notkestraße 85, D-22607 Hamburg, Germany — [2]II. Institute for Theoretical Physics, University of Hamburg, Luruper Chaussee 149, D-22761 Hamburg, Germany

We investigate lepton-photon interactions in a class of generalized external background fields with periodic plane-wave character. Considering the full interaction with the background, S-matrix elements are calculated exactly. We apply those general expressions to interaction schemes like Compton scattering in specific field configurations, as for instance provided in modern laser facilities, or in high intense regions of future linear colliders. Results are extended to the case of frontal colliding high-energy field photons with leptons such that new insights beyond the usual soft terms become accessible.