T 17: Beyond the Standard Model (Theorie) 3

Convenor: Jürgen Reuter

Zeit: Mittwoch 16:45–18:45 Raum: VG 3.102

T 17.1 Mi 16:45 VG 3.102

Asymptotically safe gravitons at the LHC7 — Gudrun Hiller[1], •Jan Philipp Dabruck[1], Daniel Litim[2], and Maximilian Demmel[1] — [1]Technische Universität Dortmund — [2]University of Sussex

We give a short introduction to asymptotically safe quantum gravity. The impact of an ultraviolet fixed point is studied assuming that large extra dimensions are realized. In this scenario the fundamental Planck scale is TeV-sized. This gives the opportunity to investigate quantum effects of gravitation at present collider experiments. We present results on Monte Carlo simulations of real graviton emission in $pp \to j + \not{E}$ at the LHC @ 7 TeV.

T 17.2 Mi 17:00 VG 3.102

Can there still be chiral fermions beyond the Standard Model? — •Alexander Knochel — ITP Heidelberg

I discuss the current theoretical and phenomenological constraints on additional chiral fermions beyond the three Standard Model generations of quarks and leptons. While the conventional fourth generation is virtually ruled out from Higgs searches, direct searches and perturbativity, other fermion representations are still in better shape in this respect. We derive the bounds on Higgs masses and exotic fermion masses from perturbativity and vacuum stability, and relate the different scenarios to current Higgs searches at the LHC.

T 17.3 Mi 17:15 VG 3.102

SU(3)-Flavons in Pati-Salam-GUTs — •Florian Hartmann, Wolfgang Kilian, and Karsten Schnitter — Universität Siegen, Deutschland

Pati-Salam GUTs are a first step in the direction of a complete fermion unification. As left-right-symmetric extensions of the SM they contain a right-handed neutrino. In addition the symmetry leads to a correlation between leptons and quarks. Thus they provide a framework to study mechanisms generating flavour structures simultaneously in quark and lepton sector.

We study a SU(3) flavour symmetry and show how the spontaneous breaking of this symmetry by flavons may generate tribimaximal mixing for the leptons as well as nearly diagonal mixing in the quarks. Within this framework we present a supersymmetric model containing flavoured Higgs fields which may lead to a matter-Higgs-unification. We investigate which flavon representations are useful in constructing models leading to the desired CKM- and PMNS-mechanisms. Furthermore we discuss the problems of this approach and present possible solutions.

T 17.4 Mi 17:30 VG 3.102

Electroweak Corrections to Decoupling Coefficients in the Minimal Supersymmetric Standard Model — •David Kunz, Luminita Mihaila, Jens Salomon, and Matthias Steinhauser — Institut für Theoretische Teilchenphysik, KIT

By integrating out all the heavy particles one can derive an effective theory, which has the same low-energy predictions as the full theory, but contains only light particles. In order to calculate the effective Lagrangian density, one has to rescale fields and parameters by multiplicative factors, the so-called decoupling coefficients.

In this talk, results for the decoupling coefficient of the top quark mass up to order $\alpha_s\alpha$ and α_s^2 are presented, where the Minimal Supersymmetric Standard Model is considered as full and Quantum Chromo Dynamics as effective theory. We discuss both the two-loop calculation and the on-shell renormalization of the parameters and fields.

The new corrections allow the study of electroweak effects on the decoupling procedure and the implifications to the top quark mass at the scale of Grand Unified Theories.

T 17.5 Mi 17:45 VG 3.102

Decoupling relations and coefficient functions in SUSY-QCD to three loops — •Alexander Kurz, Matthias Steinhauser, and Nikolai Zerf — TTP Karlsruhe

A method to calculate decoupling relations between parameters of SUSY-QCD and of QCD is presented. It allows the computation of the decoupling constant of the strong coupling up to $O(\alpha_s^3)$ which constitutes an important ingredient in the relation between $\alpha_s(M_Z)$ and $\alpha_s(M_{GUT})$. With the help of a low-energy theorem the calculated decoupling constant can be related to the effective coupling of the scalar Higgs boson to gluons. Similar considerations for the electromagnetic coupling leads to the decay rate of a Higgs boson to photons.

T 17.6 Mi 18:00 VG 3.102

Phenomenology of the constrained Exceptional Supersymmetric Standard Model (cE6SSM) — •Alexander Voigt — Institut für Kern- und Teichenphysik

The constrained Exceptional Supersymmetric Standard Model (cE6SSM) is an extension of the MSSM based on an E_6 gauge group, motivated by Grand Unification and the μ problem. It predicts a Z' and Leptoquarks in addition to the usual SUSY particles.

In this talk a phenomenological study of the cE6SSM with high precision is presented, including benchmark points reachable at the LHC in 2012 and parameter exclusion by current experimental data.

T 17.7 Mi 18:15 VG 3.102

Constraints on SUSY Breaking in SUSY SU(5) — •Karsten Schnitter — Universität Siegen, Deutschland

Supersymmetric Grand Unified Theories (GUTs) are among the most prominent extensions of the Standard Model. However, the GUT symmetry as well as the SUSY must be broken such that the MSSM emerges at the electroweak scale. We consider the minimal SUSY SU(5) model where the SUSY breaking is parametrized by soft terms. We show that the SU(5) breaking imposes constraints on the soft couplings and discuss the resulting conditions. As these conditions must be met by any SUSY breaking mechanism they provide a tool in the exploration of those models.

T 17.8 Mi 18:30 VG 3.102

Supersymmetric E_6 Spectra from an $\mathbb{R}^2/632$ Orbifold — •Felix Braam[1], Alexander Knochel[2], Jürgen Reuter[3], and Daniel Wiesler[3] — [1]Phys. Institut, Hermann-Herder-Str. 3, 79104 Freiburg — [2]ITP, Philosophenweg 19, 69120 Heidelberg — [3]DESY Theorie, Notkestr. 85, 22607 Hamburg

We present a supersymmetric TeV-scale theory with a matter content filling complete E_6 multiplets arising from an orbifold construction with E_6 constituting the gauge group in the bulk of the extra dimensions. The main focus lies on the structures linking the Lagrangian parameters at the orbifold compactification scale to the TeV-scale spectra as well as their algorithmic realization in the automated spectrum generator `EXSPECT`. Among the most interesting features in this setup are the multi-scale gauge coupling unification scheme, top-bottom Yukawa unification, and its implications on the vacuum structure breaking the electroweak symmetry. In order to find solutions on the high-dimensional space of input parameters incorporating the aforementioned aspects, we use Monte-Carlo Markov-Chain techniques. The first results obtained with this method as well as a phenomenological study of the production of the heavy neutral gauge boson at the LHC for these cases will conclude our discussion.