T 78: BSM Higgs (Theorie)

Zeit: Mittwoch 16:45–18:30 Raum: K.11.07

T 78.1 Mi 16:45 K.11.07

Decoupling of the top-Yukawa coupling in the MSSM — •David Kunz — Institut für Theoretische Teilchenphysik, KIT, Karlsruhe

In this talk I show a method to compute the running top-Yukawa coupling in supersymmetric models with heavy mass spectrum based on the *running* and *decoupling* procedure. In order to enable this approach I computed the two-loop SUSY-QCD radiative corrections required in the decoupling process. The method has the advantage that large logarithmic corrections are automatically resummed through the Renormalization Group Equations. As phenomenological application the effects of this approach on the prediction of the lightest Higgs boson mass at three-loop accuracy has been studied. A significant reduction of the renormal- ization scale dependence as compared to the direct method, that is based on the conversion relation between the running and pole mass for the top quark has been observed. The effect of resummation of large logarithmic contributions consists in an increased prediction for the Higgs boson mass, an observation in agreement with the previous analyses.

T 78.2 Mi 17:00 K.11.07

Higgs beyond the Standard Model - an EFT approach — Gerhard Buchalla, Oscar Catà, and •Claudius Krause — Ludwig-Maximilians-Universität München, Fakultät für Physik, Arnold Sommerfeld Center for Theoretical Physics, D–80333 München, Germany

We consider the Standard Model as an effective field theory (EFT) at the electroweak scale v. At the scale $f \geq v$ we assume a new, strong interaction that breaks the electroweak symmetry dynamically. The Higgs boson arises as a composite pseudo-Nambu-Goldstone boson in these scenarios and is therefore naturally light ($m_h \sim v$). Depending on the value of $\xi = v^2/f^2$, different expansions of the EFT can be used. For $\xi = \mathcal{O}(1)$ the electroweak chiral Lagrangian should be used and the effective theory is given by a loop expansion (similar to chiral perturbation theory). In the decoupling limit, $\xi \to 0$, an expansion in canonical dimension is recovered.
In this talk I will briefly explain the systematics of these two different regimes of the EFT and then focus on the case where ξ is small but non-zero. It leads to a double expansion in ξ and $1/16\pi^2$, which captures the expected corrections of a strongly-interacting light Higgs to the Standard Model in a systematic way.

T 78.3 Mi 17:15 K.11.07

Two-Loop Higgs mass calculations beyond the MSSM with SARAH and SPheno — •Kilian Nickel[1], Florian Staub[2], and Mark Goodsell[3] — [1]Physikalisches Institut, Universität Bonn, Deutschland — [2]Theory Division, CERN, Geneva, Switzerland — [3]LPTHE, UPMC Univ. Paris 06, France

We present a recent extension to the Mathematica package SARAH which allows for Higgs mass calculations at the two-loop level in a wide range of supersymmetric models beyond the MSSM. These calculations are based on the effective potential approach. For the numerical evaluation Fortran code for SPheno is generated by SARAH. This allows to predict the Higgs mass in more complicated SUSY theories with a similar precision as most state-of-the-art spectrum generators do for the MSSM.

T 78.4 Mi 17:30 K.11.07

Precise predictions for Higgs-masses in the Next-to-Minimal Supersymmetric Standard Model (NMSSM) — •Peter Drechsel[1], Georg Weiglein[1], Sven Heinemeyer[2], and Leo Galeta[2] — [1]Deutsches Elektronen-Synchrotron (DESY), Hamburg, Germany — [2]Instituto de Física de Cantabria, Edificio Juan Jordá, Santander, Spain

The NMSSM represents an elegant and well motivated alternative description for the observed phenomenology in high energy physics. In this theory a scalar singlet together with its superpartner is added to the Higgs-sector of the Minimal Supersymmetric Standard Model (MSSM). In order to allow significant testing of the NMSSM by experiments precise predictions for the parameters of the theory are a necessity.

The talk will focus on the prediction for the Higgs-masses in the NMSSM up to 2-loop order obtained by diagrammatic methods. The numerical impact of partial contributions will be discussed as well as the validity and scope of the presented results.

T 78.5 Mi 17:45 K.11.07

Dominant two-loop corrections to the trilinear Higgs couplings in the complex NMSSM — •Hanna Hoffmann[1], Nhung Thi Dao[2], and Margarete Muehlleitner[1] — [1]Karlsruhe Institute of Technology (KIT), Karlsruhe — [2]Institute of Physics, Vietnam Academy of Science and Technology

In this talk I present our results on the $\mathcal{O}(\alpha_t, \alpha_s)$ corrections to the trilinear Higgs couplings in the complex NMSSM. I give insight into our calculation using the Feynman-diagramatic approach and our renormalization procedure. Furthermore I discuss phenomenological implications of our results.

T 78.6 Mi 18:00 K.11.07

Flavour and Electroweak Constraints on Composite Higgs Models — Christoph Niehoff, •Peter Stangl, and David Straub — Excellence Cluster Universe, TUM, Garching, Germany

Composite Higgs Models offer a unified effective description of models with new strong interactions or extra dimensions and are thus of high phenomenological interest. They can naturally account for a light Higgs Boson compatible with LHC data and at the same time are able to give a solution to the hierarchy problem without invoking supersymmetry. Testing these models through direct collider searches is difficult due to their very limited energy reach. An alternative is offered by indirect searches with precision data. We take the latter approach and constrain Composite Higgs Models by certain flavour and electroweak observables.

T 78.7 Mi 18:15 K.11.07

Studying an Effective field theory for the Higgs boson with Fittino — Philip Bechtle[1], Klaus Desch[1], Alexander Knochel[2], Michael Krämer[2], Björn Sarrazin[1], Tim Stefaniak[3], and •Uddhipan Thakur[1] — [1]Physikalisches Institut, University of Bonn, Germany — [2]Institute for Theoretical Particle Physics and Cosmology, RWTH Aachen, Germany — [3]SCIPP, University of California, Santa Cruz, USA

The study of the properties of the discovered Higgs-Boson by the ATLAS and CMS experiments opens a new window to search for the effects of New Physics. Both the magnitude and the structure of effective Higgs couplings may be altered by new physics. While a change in magnitude typically leads to modified signal rates, different coupling structure may lead to modified kinematics of the Higgs production processes at the LHC.

We study constraints on New Physics from Higgs production at the LHC in the context of an effective field theory containing dimension-6 operators. The focus of this study is on associated production of a Higgs boson with a vector boson (W,Z). We use the Fittino framework to test the sensitivity of current and future LHC Higgs measurements on such operators and study the influence of altered kinematics by employing dedicated Monte Carlo simulations.