T 86: Higgs Physik (Theorie) 2

Convenor: M. Wiesemann

Zeit: Mittwoch 16:45–18:15 Raum: VSH 06

T 86.1 Mi 16:45 VSH 06

On the Renormalization of the 2HDM — •Marcel Krause — Karlsruher Institut für Technologie (KIT), Institut für Theoretische Physik (ITP), Wolfgang-Gaede-Str. 1, 76131 Karlsruhe

The Two-Higgs-Doublet Model (2HDM) is one of the simplest extensions of the Higgs sector of the Standard Model (SM) of particle physics. In order to investigate experimental data from particle colliders and to distinguish between different extensions of the SM, precise predictions for Higgs observables are required. This necessitates also the consideration of next-to-leading order (NLO) contributions to Higgs decays as well as their renormalization. Desirable properties of any renormalization scheme that is used in practice are process-independence, gauge-independence and numerical stability of the NLO contributions. Based on several exemplary Higgs decays within the 2HDM, we compare different renormalization schemes and propose a scheme which fulfills all three desirable properties. We pay special attention to the scalar mixing angle α for the CP-even Higgs bosons and the mixing angle β for the CP-odd and charged Higgs bosons, as well as to the Z_2-symmetry-breaking mass term m_{12}.

T 86.2 Mi 17:00 VSH 06

Strong First Order Electroweak Phase Transition in the CP-Conserving 2HDM Revisited — •Philipp Basler[1], Marcel Krause[1], Margarete Mühlleitner[1], Jonas Wittbrodt[1,2], and Alexander Wlotzka[1] — [1]Karlsruher Institut für Technologie, ITP, Karlsruhe, Deutschland — [2]DESY, Hamburg, Deutschland

The generation of the observed matter-antimatter asymmetry in the universe through baryogenesis cannot be explained in the Standard Model. We therefore investigate the possibility of a strong first order phase transition in the 2-Higgs-Doublet Model (2HDM) after imposing theoretical and experimental constraints. We study the type I and II 2HDM where either of the two CP-even Higgs bosons can be the Standard Model-like Higgs boson. Our results show that there is a strong interplay between the requirement of a strong phase transition and collider phenomenology with testable implications for searches at the LHC.

T 86.3 Mi 17:15 VSH 06

Full QCD and leading Yukawa two-loop corrections to the MSSM Higgs-boson spectrum — Sophia Borowka[1], •Sebastian Passehr[2], and Georg Weiglein[2] — [1]CERN Theory Division, CH-1211, Geneva 23, Switzerland — [2]Deutsches Elektronensynchrotron DESY Notkestraße 85, D-22607 Hamburg, Germany

A high-precise prediction of the Higgs-boson mass spectrum in the MSSM is an essential ingredient to test the validity of the model. The Higgs sector of the MSSM consists of two doublet fields leading to five physical Higgs bosons.

I will present recent progress of new two-loop corrections to the Higgs masses in the MSSM with complex parameters. The new contributions contain the full lowest order QCD result including momentum dependence and gauge terms. Furthermore the leading Yukawa corrections are amended by taking into account possible complex parameters. The new results will become available through the public code FeynHiggs.

T 86.4 Mi 17:30 VSH 06

Higgs-boson masses, mixing and decays in the NMSSM — Florian Domingo[1,2], Peter Drechsel[3], and •Sebastian Passehr[4] — [1]Instituto de Física Teórica (UAM/CSIC), Universidad Autónoma de Madrid, Cantoblanco, E-28049 Madrid, Spain — [2]Instituto de Física de Cantabria (CSIC-UC), E-39005 Santander, Spain — [3]II. Institute for Theoretical Physics, University of Hamburg, D-22761 Hamburg, Germany — [4]Deutsches Elektronensynchrotron DESY, Notkestraße 85, D-22607 Hamburg, Germany

The Next-to-Minimal Supersymmetric Standard Model (NMSSM) catches increasing interest in particle physics due to its rich phenomenology. In addition to the two Higgs doublets of the MSSM a Higgs singlet enriches the particle spectrum leading to seven physical Higgs bosons. Precise predictions for the masses and mixing of these Higgs bosons is of foremost importance to validate the NMSSM. Different with respect to the MSSM is also the possibility for CP mixing in the Higgs sector at the tree level. Further constraints arise from the decays of these particles and the associated crosssections.

I will present the Higgs-boson mass spectrum for selected scenarios and explain the mixing of the Higgs bosons at higher orders in perturbation theory in the NMSSM with complex parameters. Furthermore I will report on the prediction of important decays. Finally a summary about the status of implementing all these results in the public code FeynHiggs will be given.

T 86.5 Mi 17:45 VSH 06

Phenomenology of the 125 GeV Higgs boson in the N2HDM — Margarete Mühlleitner[1], Marco O. P. Sampaio[2], Rui Santos[3,4], and •Jonas Wittbrodt[1,5] — [1]ITP, KIT, 76128 Karlsruhe, Germany — [2]Departamento de Física, Universidade de Aveiro and CIDMA, 3810-183 Aveiro, Portugal — [3]ISEL, Instituto Politécnico de Lisboa, 1959-007 Lisboa, Portugal — [4]CFTC, Universidade de Lisboa, 1749-016 Lisboa, Portugal — [5]DESY, D-22607 Hamburg, Germany

The N2HDM is based on the CP-conserving 2HDM extended by a real scalar singlet field. Its enlarged parameter space and its fewer symmetry conditions as compared to supersymmetric models allow for an interesting phenomenology compatible with current experimental constraints. In this talk, we present the phenomenology of the 125 GeV Higgs boson in this model. We performed a large scan of the N2HDM parameter space which takes into account all applicable theoretical and experimental constraints. In the N2HDM the 125 GeV state can mix with the singlet field. We find that this singlet admixture can be sizeable despite the SM-like behaviour observed at the LHC. We show how the singlet admixture affects the coupling structure and signal strengths of the 125 GeV Higgs boson and analyse how to best constrain it experimentally. Like in the 2HDM, the N2HDM features a wrong-sign regime where the gauge and bottom quark couplings are of opposite sign. We discuss how the correct and wrong sign regimes can be distinguished through measurements of the 125 GeV Higgs properties.

T 86.6 Mi 18:00 VSH 06

Light Higgs Branching Ratios in Constrained Next-to-Minimal Supersymmetry Scenarios Surveyed — •Conny Beskidt[1], Wim de Boer[1], Dmitri Kazakov[1,2], and Stefan Wayand[1] — [1]Karlsruhe Institute of Technology (IEKP) — [2]JINR, ITEP, Moscow, Russia

Within the rich particle spectrum of the next-to-minimal supersymmetric standard model (NMSSM) three scalar Higgs bosons are predicted. In many cases the second lightest Higgs represents the standard model (SM) Higgs mass with SM couplings and a mass of 125 GeV, so a light Higgs below 125 GeV is automatically generated. We provide a scan over the NMSSM parameter space for different specific NMSSM scenarios to show the allowed mass range and branching ratios of this singlet-like Higgs boson. By comparing the cross section times branching ratio with the ones of the SM-like Higgs boson, we give prospects for future searches at the LHC.