T 36: Higgs

Zeit: Dienstag 16:30–18:35 Raum: Z6 - SR 1.010

Gruppenbericht T 36.1 Di 16:30 Z6 - SR 1.010

Can we discover a light singlet-like NMSSM Higgs boson at the LHC? — •Conny Beskidt[1], Wim de Boer[1], and Dmitri Kazakov[1,2] — [1]Karlsruhe Institute of Technology (IETP) — [2]JINR, ITEP, Moscow, Russia

In the next-to minimal supersymmetric standard model (NMSSM) one expects an additional singlet-like Higgs boson with small couplings to standard model (SM) particles via mixing. Although the mass can be well below the discovered 125 GeV Higgs boson its small couplings may make it difficult to discover it at the LHC. We use a novel scanning technique to efficiently scan the whole parameter space and determine the range of cross sections and branching ratios. This allows to give perspectives for the future searches for light Higgs bosons at the LHC with luminosities up to 300 and 3000 1/fb. Specific LHC benchmark points are selected, which represent the salient NMSSM features.

T 36.2 Di 16:50 Z6 - SR 1.010

Next-to-leading order reweighting method for simulated processes of gluon fusion Higgs boson production — •Artur Gottmann[1], Josry Metwally[1], Andrew Gilbert[2], René Caspart[1], Roger Wolf[1], and Günter Quast[1] — [1]Karlsruhe Institute of Technology — [2]European Organization for Nuclear Research

The precision of the gluon fusion Higgs boson production cross section at next-to-leading order QCD plus parton shower accuracy with Powheg can be improved by treating the calculation as a multiscale problem: The calculation is split into the individual differential distributions from only the top quark, only the bottom quark and the top-bottom interference.

In Two-Higgs-Doublet models like the MSSM, where the distributions themselves in addition depend on the model parameters, this approach can be used to naturally incorporate the dependencies of the differential distributions on the model parameters into the calculation. In the MSSM all contributions to gluon fusion production, which can be associated to the Higgs-bottom quark coupling, like Δb corrections, have also been taken into account as next-to-leading order SUSY corrections. Non-considered SUSY contributions to the differential cross section have been checked to lie below 5%. This method has been exploited for the first time for the recently published search of CMS for additional neutral MSSM Higgs bosons on the LHC Run II data of 2016.

T 36.3 Di 17:05 Z6 - SR 1.010

Three-Higgs-Doublet Model with Generalized CP Symmetry — I. P. Ivanov[1], •M. Köpke[2], M. M. Mühlleitner[2], and D. Sokolowska[3] — [1]Instituto Superior Tecnico, Lisbon, Portugal — [2]KIT, Institute for Theoretical Physics, Karlsruhe, Germany — [3]University of Warsaw, Institute of Theoretical Physics, Warsaw, Poland

The flaws of the Standard Model (SM) call for new physics extensions that provide answers to (at least some of) the unsolved puzzles of the SM. These models usually come with extended Higgs sectors. Higgs extensions that are constrained by specific symmetries lead to interesting phenomenological effects. In particular, multi-Higgs models with generalized CP symmetries have become an increasingly interesting field of study. In this talk, we present the 3-Higgs-doublet model with a CP4 symmetry that has recently been proposed by Ivanov and Silva. We outline the astrophysical and phenomenological consequences of this symmetry.

T 36.4 Di 17:20 Z6 - SR 1.010

CP-odd Yukawa Couplings of the 125 GeV Higgs Boson — Margarete Mühlleitner[1], Rui Santos[2,3,4], and •Jonas Wittbrodt[5] — [1]ITP, KIT, 76128 Karlsruhe, Germany — [2]ISEL, Instituto Politecnico de Lisboa 1959-007 Lisboa, Portugal — [3]Centro de Fisica Teorica e Computacional, Universidade de Lisboa, 1749-016 Lisboa, Portugal — [4]LIP, Universidade do Minho, 4710-057 Braga, Portugal — [5]DESY, Notkestraße 85, 22607 Hamburg, Germany

While precision studies of the 125 GeV Higgs boson get underway, little is still known about a possible CP-violating pseudoscalar admixture to this state. We performed a parameter scan in one of the simplest models with a CP-violating scalar sector, the Complex 2HDM (C2HDM), including the important constraint from the electric dipole moment of the electron. We show that there are still viable scenarios where the Yukawa couplings of the 125 GeV display near maximal CP-violation. Depending on the 2HDM Yukawa type, two intriguing configurations are possible. First, the CP-even and CP-off Yukawa couplings to a given fermion can be of similar size. Second, the Higgs boson can couple as a scalar to certain fermions and as a pseudoscalar to others. These possibilities can lead to interesting observable consequences.

T 36.5 Di 17:35 Z6 - SR 1.010

Bounded-From-Below Constraints for General Higgs Potentials — I. P. Ivanov[1], •M. Köpke[2], and M. M. Mühlleitner[2] — [1]Instituto Superior Tecnico, Lisbon, Portugal — [2]KIT, Institute for Theoretical Physics, Karlsruhe, Germany

In theories with interacting scalar fields, the scalar Higgs potential must be bounded from below in order for a stable vacuum to exist. For general Higgs potentials these constraints for boundedness-from-below are difficult to derive. In the past, they were usually studied on a model by model basis and involved lengthy proofs of inequalities. In this talk, I present a method that can be applied to general Higgs potentials and carried out by a computer, resulting in analytic expressions that can be used to check for the validity of a parameter point of the model.

T 36.6 Di 17:50 Z6 - SR 1.010

Three-loop Yukawa matrix beta functions in the Standard Model and beyond — •Florian Herren[1], Luminita Mihaila[2], and Matthias Steinhauser[1] — [1]Institut für Theoretische Teilchenphysik, Karlsruhe Institute of Technology (KIT) — [2]Institut für Theoretische Physik, Universität Heidelberg

We present the calculation of Yukawa matrix beta functions to three loops in the two-Higgs-doublet model and the SM. Special emphasis is put on the problems arising in the computation of beta functions if the Lagrangian under consideration contains unphysical parameters, as is the case for the SM and 2HDMs. Furthermore, we present practical solutions to the aforementioned problems.

T 36.7 Di 18:05 Z6 - SR 1.010

$gg \to hh$ **@NLO in the high energy limit** — Joshua Davies, Go Mishima, Matthias Steinhauser, and •David Wellmann — Karlsruher Institut für Technologie (KIT), Karlsruhe, Deutschland

We consider the process $gg \to hh$ at NLO in the limit of a vanishing Higgs mass. We perform an expansion for a small top quark mass since we are interested in the high energy limit where $s, t \gg m_t$. In this limit we obtain analytic results with the help of differential equations for the master integrals.

T 36.8 Di 18:20 Z6 - SR 1.010

Higgs mass prediction in the MSSM based on a combination of fixed-order corrections and resummed bottom and tau contributions — •Ivan Sobolev[1] and Georg Weiglein[2] — [1]DESY, Hamburg, Germany — [2]DESY, Hamburg, Germany

In constrast to the Standard Model (SM) in the Minimal Supersymmetric Standard Model (MSSM) Higgs mass is a predictable quantity. Since radiative corrections are large, a very precise calculation is required to limit the theoretical uncertainty from unknown higher order corrections. In the limit of heavy superparticles radiative corrections to Higgs mass scale logarithmically with the mass of the superparticles. These large logarithms can be resummed by making use of effective field theory. However, in case of light superparticles fixed-order calculations are expected to be more precise. To profit from virtues of both methods they should be combined. This method, known as 'hybrid', is known for a while and is implemented in the publicly available code FeynHiggs. Our aim is to apply this method to corrections coming from down-type fermions, especially to tau and bottom corrections. In this talk we report on our progress in implementing this method into the code.