T 39: Higgs-Physik (Theorie) 1

Convenor: M. Wiesemann

Zeit: Dienstag 11:00–12:30   Raum: VSH 06

T 39.1 Di 11:00 VSH 06

Hadronic Higgs Decay to order α_s^4 — Joshua Davies, Matthias Steinhauser, and •David Wellmann — Institut für Theoretische Teilchenphysik, Karlsruher Institut für Technologie (KIT), D-76128 Karlsruhe

In this talk, we present analytic results for the total cross section for the decay of the Standard Model Higgs Boson into hadrons up to the fourth order in the strong coupling constant. We complement the results available in the literature with top-quark-induced correction terms which are taken into account by means of an effective-field-theory approach.

T 39.2 Di 11:15 VSH 06

Exclusive radiative Higgs decays in the Standard Model and beyond — •Stefan Alte — PRISMA Cluster of Excellence and Mainz Institute for Theoretical Physics, Johannes Gutenberg University, 55099 Mainz

We present a detailed analysis of the rare exclusive Higgs-boson decays $h \to MV$ into a single meson M and an electroweak gauge boson $V = Z, W, \gamma$. We discuss these decays within the Standard Model and investigate the possibility of using these processes as probes for non-standard Higgs couplings. To this end, we employ an effective Lagrangian with modified Higgs couplings to account for possible new-physics effects in a model-independent way. We show that measurements of the decays $h \to MZ$ can be used to extract information about the CP-even and CP-odd $h\gamma Z$ couplings. Some of the $h \to MW$ decay modes exhibit a very strong dependence on the flavour-changing Higgs couplings involving the top quark. The decays $h \to M\gamma$ can serve as probes of the light-quark Yukawa couplings.

T 39.3 Di 11:30 VSH 06

NLO QCD-Korrekturen zur Higgspaarproduktion via Gluonfusion — •Seraina Glaus — Theorie-Gruppe LTP, PSI, Schweiz

Die gemessenen Eigenschaften des unlängst am CERN detektierten Teilchens weisen darauf hin, dass es sich um das langgesuchte Higgsboson des Standardmodells handeln könnte. Jedoch lassen die theoretischen und experimentellen Unsicherheiten Zuordnungen zu anderen erweiterten Modellen zu. Deshalb ist es von ausschlaggebender Bedeutung, die Eigenschaften des Teilchens zu bestimmen. Die Bestimmung des Higgspotentials spielt eine zentrale Rolle, um zu prüfen, ob dieses Teilchen verantwortlich für die elektroschwache Symmetriebrechung ist. Zur Messung des Higgspotentials, muss die Selbstwechselwirkungsstärke zwischen Higgsbosonen direkt bestimmt werden. Dies ist einzig über Higgspaarproduktion als erster Schritt für die trilineare Kopplung möglich. Der dominante Prozess der Higgspaarproduktion ist die loop-induzierte Gluonfusion über eine Top- und Bottomquarkschleife. In dieser Arbeit werden die NLO QCD-Korrekturen unter Berücksichtigung der vollen Top- und Bottomquarkmassen-Abhängigkeit im Rahmen des Standardmodells berechnet. Die relevanten Zwei-Loop-Integrale können nur numerisch berechnet werden. Zum Zweck der Extraktion der ultravioletten, infraroten und kollinearen Divergenzen der Matrixelemente wird eine geeignete Endpunktsubtraktion der 6-dimensionalen Feynman-Integrale und eine semi-analytische Integrati-

on der Endpunktbeiträge durchgeführt. Zur Behebung der numerischen Instabilitäten der regularisierten Feynman-Integrale oberhalb der virtuellen Schwellen, wird der extensive Integranden partiell integriert.

T 39.4 Di 11:45 VSH 06

Constraining the Higgs trilinear coupling from single-Higgs processes in the SMEFT — Stefano Di Vita[1], Christophe Grojean[1,2], Giuliano Panico[3], Marc Riembau[1,3], and •Thibaud Vantalon[1,3] — [1]DESY, Notkestrasse 85, D-22607 Hamburg, Germany — [2]Institut für Physik, Humboldt-Universität zu Berlin, D-12489 Berlin, Germany — [3]IFAE, Barcelona Institute of Science and Technology (BIST) Campus UAB, E-08193 Bellaterra, Spain

In scenarios where the only anomalous contribution to single-Higgs observables originates from the Higgs cubic self coupling, it has been recently noticed that the bounds on the Higgs trilinear from those observables might complement and compete with the constraints coming from double Higgs production. We study to what extent this statement holds true when one considers a general deviation on Higgs couplings in the EFT framework. We show that inclusive observables are not enough to isolate the Higgs trilinear effect from the other deviations. However, we present a strategy to disentangle this flat direction using the kinematic information in the differential cross sections.

T 39.5 Di 12:00 VSH 06

New physics effects in gluon-induced Higgs-Z production — •Jonas Klappert — RWTH Aachen, Aachen, Germany

The associated Higgs-Z boson production via gluon fusion could be a candidate process in the search for new physics due to its loop-mediated nature. To systematically analyze this process, we have created a framework which consists of the automatic calculation of helicity amplitudes and the numerical evaluation of cross-sections and transverse momentum distributions. We have studied the influence of effective operators of dimension 5 and 6 and an additional vector-like top quark partner at the LHC and compared these results to the SM.

T 39.6 Di 12:15 VSH 06

Higgs production in association with off-shell top–antitop pairs at NLO EW and QCD at the LHC — •Mathieu Pellen and Ansgar Denner — Universitaet Wuerzburg, Wuerzburg, Germany

As the Higgs production in association with top-antitop pairs is about to be measured at the LHC, precise and realistic predictions are of prime importance. We present NLO electroweak (EW) corrections to the full process where all interference, off-shell and non-resonant contributions are taken into account. The EW corrections turn out to be below one per cent for the integrated cross section but can exceed 10% in certain phase-space regions. The results of the full computation are supported by two calculations in the double-pole approximation. These also allow to infer the effect of off-shell contributions. Finally, we provide combined predictions featuring both NLO EW and QCD corrections in a common set-up. The methods used and some exemplary results will be presented.