T 86: Elektroschwache Physik (Theorie) 1

Zeit: Mittwoch 16:45–18:45 Raum: P103

T 86.1 Mi 16:45 P103

Gluon-induced Higgs-strahlung at next-to-leading order QCD — •Lukas Altenkamp[1], Stefan Dittmaier[1], Heidi Rzehak[1,3], Robert V. Harlander[2], and Tom J.E. Zirke[2] — [1]Physikalisches Institut, Albert-Ludwigs-Universität Freiburg, D-79104 Freiburg, Germany — [2]Fachbereich C, Bergische Universität Wuppertal, 42097 Wuppertal, Germany — [3]TH Division, Physics Department, CERN, CH-1211 Geneva 23, Switzerland

The Higgs + Z-boson production is an important process for measuring the Higgs-boson properties. At NNLO, the production via two gluons becomes possible, and with $\sim 5\%$ at 14 TeV the contribution is significant and the corresponding scale uncertainty dominates the total theoretical uncertainty. I will present the QCD corrections to this sub-process in the approximation of a large top-quark mass M_T, in which the occurring two-loop integrals are calculable by an expansion in powers of M_T. To cope with the infrared singularities, the Catani-Seymour dipole subtraction algorithm has been used, leading to several separately finite contributions which have been integrated numerically in 4 dimensions. Our results show a correction of roughly 100% and have been obtained by two independent calculations which are in full agreement.

T 86.2 Mi 17:00 P103

Resummation for $gg \to HZ$ — Robert Harlander[1], Anna Kulesza[2], •Vincent Theeuwes[2], and Tom Zirke[1] — [1]Fachbereich C, Bergische Universität Wuppertal — [2]Institut für Theoretische Physik, WWU Münster

The recent discovery of a Higgs boson requires us to reach higher levels of precision in order to fully study its properties. For Higgs production accompanied by a Z-boson one of the improvements that can be made is increasing the precision of the loop induced process $gg \to HZ$. Currently, the highest level of precision for this process is NLO approximated for a high top mass. In this talk we will explore the possibility of including resummation terms in order to improve the precision of the calculations.

T 86.3 Mi 17:15 P103

Electroweak NLO corrections to $t\bar{t}H$ production at the LHC — •Michael Kordovan and Stefan Dittmaier — Albert-Ludwigs-Universität Freiburg (Germany)

The Higgs-production process $pp \to t\bar{t}H$ allows for a direct measurement of the Higgs-boson Yukawa coupling to the top quark and is therefore predestined for establishing the Standard Model Higgs boson or for giving indication for some extended Higgs sector. Aside from small effects on the total cross section, NLO electroweak corrections are significant in differential distributions, in particular for kinematics with large transverse Higgs momenta. Nevertheless, the NLO electroweak corrections to this Standard Model channel are still unknown. Remedying this shortcoming the calculation of the electroweak NLO corrections is in progress now. First partial numerical results are presented and discussed including, in particular, rapidity and transverse-momentum distributions of the outgoing particles.

T 86.4 Mi 17:30 P103

Two loop corrections to the masses of the Higgs bosons of the complex MSSM — Wolfgang Hollik and •Sebastian Passehr — Max-Planck-Institut für Physik, München, Germany

Results for the top-Yukawa-coupling enhanced two-loop corrections of $\mathcal{O}(\alpha_t^2)$ to the Higgs-boson sector of the MSSM with complex parameters have been obtained recently. On the one hand, they serve as an important crosscheck of an existing result in the real MSSM, on the other hand, they provide the possibility of new accurate predictions of phase dependencies.

In consideration of the high-precision mass measurement of a Higgs-like particle at the LHC this calculation is a significant ingredient for reducing the theoretical uncertainty of the Higgs-mass prediction in the complex MSSM.

I am going to specify the contributing class of Feynman diagrams and their evaluation for the renormalized self-energies. Finally, I am going to show numerical analyses of these contributions for the Higgs-mass spectrum in the case of real and complex parameters.

T 86.5 Mi 17:45 P103

Momentum dependent two-loop contributions to the neutral CP-even Higgs boson masses in the rMSSM — •Sophia Borowka, Gudrun Heinrich, and Wolfgang Hollik — Max-Planck-Institut für Physik, München

One of the main uncertainties remaining in the calculation of the Higgs boson masses in the real MSSM with public codes like FeynHiggs stem from the missing momentum dependent contributions at the two loop level. In this talk the exact momentum dependent two-loop corrections of order $\mathcal{O}(\alpha_s\alpha_t)$ to the neutral CP-even MSSM Higgs boson masses are presented. Some integrals which are not available in fully analytical form posed a bottleneck in previous calculations. We solved this problem by using the program SecDec 2.1 to compute two-loop topologies with up to four different mass scales numerically.

T 86.6 Mi 18:00 P103

Some four-loop corrections to the anomalous magnetic moment of the muon and the electron — •Alexander Kurz[1,2], Tao Liu[1], Peter Marquard[2], and Matthias Steinhauser[1] — [1]Institut für Theoretische Teilchenphysik, Karlsruhe — [2]Deutsches Elektronen-Synchrotron, Zeuthen

The anomalous magnetic moment of the muon a_μ and the electron a_e are determined with high experimental precision which requires high-order perturbative calculations on the theory side. In this talk we present the perturbative four-loop QED contribution induced by closed heavy lepton loops. We exploit the strong hierarchy between the tau, muon and electron masses ($m_\tau \gg m_\mu \gg m_e$) and apply the method of asymptotic expansion. This leads to an analytic expansion in the inverse heavy lepton masses which converges rapidly. In case of a_μ the expansion parameter is given by the ratio of the muon and tau lepton mass whereas for a_e both the muon and tau lepton are considered as heavy. As a further ingredient to a_μ we discuss the hadronic contribution. Using a precise parametrization of the experimental result for the total hadronic cross section in electron positron annihilation in combination with methods based on asymptotic expansion we can confirm the leading and next-to-leading order hadronic corrections present in the literature. Furthermore, new next-to-next-to-leading order results are provided.

T 86.7 Mi 18:15 P103

Two-Loop Corrections to the Muon Magnetic Moment from Fermion/Sfermion Loops in the MSSM — Helvecio Fargnoli[1], Christoph Gnendiger[2], •Sebastian Passehr[3], Dominik Stöckinger[2], and Hyejung Stöckinger-Kim[2] — [1]Universidade Federal de Lavras, Lavras, Brazil — [2]Institut für Kern- und Teilchenphysik,TU Dresden, Dresden, Germany — [3]Max-Planck-Institut für Physik, München, Germany

Two-loop corrections to the anomalous magnetic moment of the muon $(g-2)_\mu$ from fermion/sfermion loops in the MSSM have been evaluated and were published recently. These corrections are generally large since they include $\Delta\rho$ and $\Delta\alpha$. Furthermore they are logarithmically enhanced by heavy sfermion masses, therefore playing a significant role in split spectra scenarios. For that limit a compact approximation formula has been worked out. However, also for small MSSM parameters these corrections can be sizable.

In this talk I am going to specify the investigated class of Feynman diagrams and briefly outline some aspects of their evaluation and which role they play in the prediction of $(g-2)_\mu$. Finally, I am going to present numerical analyses of the new contributions in different parameter scenarios.

T 86.8 Mi 18:30 P103

Two-Loop Corrections to the Muon Magnetic Moment from Fermion/Sfermion Loops in the MSSM — •Christoph Gnendiger — Institut für Kern- und Teilchenphysik, TU Dresden

In this talk we present two-loop corrections to the muon (g-2) from fermion/sfermion loops in the MSSM. These corrections are generally large and even logarithmically enhanced for heavy sfermions. Details of the calculation are presented and a very compact formula is provided which serves as a good approximation of the full result. The discussion of the numerical behaviour includes the case of very heavy SUSY masses as well as experimentally allowed scenarios with very light SUSY masses.