T 13: QCD (Theorie) 3 / Elektroschwache Physik (Theorie)

Convenor: Andre Hoang / Michael Krämer

Zeit: Mittwoch 16:45–19:00 Raum: M109

T 13.1 Mi 16:45 M109

Study of forward jet production using $qg^* \rightarrow qg$ in kt-factorization — •Michal Deak, Krzysztof Kutak, and Hannes Jung — DESY, Hamburg, Notkestrasse 85, 22607 Hamburg

The QCD process $qg* \rightarrow qg$ in the case where the gluon carries a small of the proton's momentum and the quark caries a large fraction of the proton momentum is very important for the forward jet production at the LHC experiments. In our talk we present calculation of this process within kt factorization approach and its phenomenological implications. We simulate this process using Monte Carlo event generator CASCADE.

T 13.2 Mi 17:00 M109

Baryon operators of higher twist in QCD — Vladimir Braun[1], Alexander Manashov[1,2], and •Jürgen Rohrwild[1] — [1]Universtität Regensburg, Regensburg, Germany — [2]Sankt-Petersburg State Univ., St.-Petersburg, Russia

In hard QCD processes the effects of higher twist contributions correspond to corrections which are suppressed by powers of the hard scale and are therefore relevant if high accuracy is required. The scale dependence of a physical observable is governed by the renormalization of the higher-twist operators.

In the case of baryon operators the anomalous dimensions of the operators of twist 3 have been studied numerously and an almost complete understanding has been achieved. However, starting with twist 4 non-quasipartonic operators (i.e. operators whose twist is larger than their number of parton fields) enter the game and the number of independent operators increases significantly. Making heavy use of conformal symmetry, which prescribes the one-loop renormalization to a certain extent, we will see that the construction of an advantageous operator basis is possible and the full spectrum of anomalous dimensions can be obtained.

T 13.3 Mi 17:15 M109

Coherent Pion Production — •Dario Schalla and Emmanuel A. Paschos — TU Dortmund, Otto-Hahn-Straße 4, 44221 Dortmund

Within the analysis of neutrino oscillation experimental data a good knowledge of neutrino-nucleus scattering cross sections is required because it has direct influence on the accuracy of the results. Whilst most reaction channels are theoretically well described, coherent pion production remains quite uncertain. This process is the production of a pion by neutrinos scattering off nuclei with the nuclei not changing their quantum numbers. This happens via both charged and neutral currents. In the talk these processes will be discussed within the Gounaris-Kartavtsev-Paschos model which is based on the partially conserved axial vector current hypotheses that relates the coherent cross section to simple elastic scattering of pions and nuclei. The numerical estimations within a neutrino energy range from 1 to 10 GeV will be presented for an advanced version of the original GKP model.

T 13.4 Mi 17:30 M109

Radiative corrections to Z-boson hadroproduction in the Standard Model and its minimal supersymmetric extension — •Max Huber and Stefan Dittmaier — Max-Planck-Institut für Physik (Werner-Heisenberg-Institut), München, Germany

The high accuracy envisaged for future measurements of Z-boson production at hadron colliders has to be matched by precise theoretical predictions. We study the next-to-leading order electroweak radiative corrections to Z-boson production and compare different schemes for the implementation of the Z-boson width. In addition we discuss the leading electroweak corrections beyond $\mathcal{O}(\alpha)$. In particular, we include universal two-loop effects from $\Delta\alpha$ and $\Delta\rho$, and the leading two-loop corrections in the high-energy Sudakov regime as well as higher-order final-state photon radiation off muons in the structure function approach. Furthermore the complete supersymmetric electroweak and QCD corrections to Z-boson production within the MSSM are presented at NLO.

T 13.5 Mi 17:45 M109

Hadroproduction of W bosons in association with a jet: electroweak radiative corrections — Ansgar Denner[1], Stefan Dittmaier[2], Alexander Mück[3], and •Tobias Kasprzik[4] — [1]Paul Scherrer Institut, Villigen, Schweiz — [2]Max-Planck-Institut für Physik, München — [3]Paul Scherrer Institut, Villigen, Schweiz — [4]Max-Planck-Institut für Physik, München

Vector bosons are produced with large cross sections at hadron colliders. They are most useful for detector calibration and may also allow for a luminosity measurement. Moreover, they constitute one of the most important backgrounds for beyond the Standard Model searches. W-boson production at the Tevatron and the LHC also enables the most precise measurements of the W mass and width using distributions of the decay products and the hadronic recoil. Hence, fully differential, accurate theoretical predictions are mandatory. Within the Standard Model, we have computed the full electroweak radiative corrections at NLO to the production of a leptonically decaying intermediate W boson in association with a jet. The W resonance is consistently described using the complex-mass scheme, and all off-shell contribution are included. The calculation is fully differential and delivers the prediction of all relevant distributions using a realistic event definition. The NLO QCD corrections (mandatory for a reduction of the scale uncertainty) are also included in the same setup.

T 13.6 Mi 18:00 M109

***W*-Paar Produktion bei ILC und LHC** — Johann Kühn[1], •Falk Metzler[1], Alexander Penin[2] und Sandro Uccirati[1] — [1]Institut für Theoretische Teilchenphysik, Universität Karlsruhe — [2]Department of Physics, University of Alberta, Canada

Teilchenbeschleuniger wie LHC und ILC werden erstmals Schwerpunktsenergien jenseits der TeV-Schwelle erreichen. In diesem Energiebereich werden elektroschwache Strahlungskorrekturen von Sudakov-Logarithmen $\log(s/M_W^2)$ dominiert. Diese Logarithmen können mithilfe von Evolutionsgleichungen resummiert werden. So kann aus Einschleifenkorrekturen auf führende Zweischleifeneffekte geschlossen werden. Wir präsentierten die elektroschwachen Strahlungskorrekturen zur W-Paar Produktion bis zu nächst-nächst-führende Logarithmen in Zweischleifen-Ordnung für Hadron- und Leptonbeschleuniger.

T 13.7 Mi 18:15 M109

Higgs Pair Production at the LHC — •Marina Billoni[1], Stefan Dittmaier[1], and Alexander Mück[2] — [1]Max-Planck-Institut für Physik (Werner-Heisenberg-Institut), München — [2]Paul Scherrer Institut, Würenlingen und Villigen

Higgs pair production provides important information about the specific shape of the Higgs potential, in particular about the triple-Higgs coupling. After the discovery of a massive neutral spin-0 particle at the LHC, the next crucial test of the Standard Model (SM) consists in the experimental reconstruction of this potential. Therefore precise theoretical predictions for the different production rates of Higgs pairs are mandatory.

We focus on Higgs pair production in association with an additional vector boson at the LHC within the SM and the Minimal Supersymmetric Standard Model (MSSM). A calculation of the next-to-leading-order QCD corrections is performed in both cases reducing the scale dependences to a few percent. Within the SM, the total cross sections are less than 1 fb but show a high sensitivity to the triple-Higgs coupling. In the MSSM, we consider neutral Higgs pairs and processes involving triple-Higgs couplings. In order to account for the largest contributions of electroweak corrections, we use the loop-improved Higgs masses and couplings provided by the program `FeynHiggs`. The benchmark point SPS1a is chosen in the first instance, however different points in the $\mathrm{M_A} - \tan\beta$ plane are investigated. In some parameter regions, the cross section can be enhanced by resonances ($\mathrm{H} \rightarrow \mathrm{h\,h}$, $\mathrm{H^\pm} \rightarrow \mathrm{h\,W^\pm}$, $\mathrm{A} \rightarrow \mathrm{h\,Z}$) to the 10 fb level.

T 13.8 Mi 18:30 M109

Bestimmung der Higgsboson-Kopplungen am LHC — •Michael Rauch[1], Remi Lafaye[2], Tilman Plehn[3] und Dirk Zerwas[4] — [1]ITP, Univ. Karlsruhe, Deutschland — [2]LAPP, Université Savoye, IN2P3/CNRS, Annecy, Frankreich — [3]Institut für Theoretische Physik, Univ. Heidelberg, Deutschland — [4]LAL, Université Paris-Sud, IN2P3/CNRS, Orsay, Frankreich

Nach einer Entdeckung des Higgsbosons stellt sich als nächstes die

Frage nach dessen Kopplungen. Am LHC wird dazu eine Fülle von beobachtbaren Kanälen zur Verfügung stehen, um die verschiedenen Parameter im Higgssektor zu bestimmen. Mit Hilfe des Programmes SFitter bilden wir mögliche Messungen auf den Higgs-Parameterraum ab. SFitter konstruiert dabei zunächst eine volldimensionale Karte der log-likelihood, aus der niedriger dimensionale Grafiken von profile likelihoods oder Bayeschen Wahrscheinlichkeitsverteilungen gebildet werden können. Auch eine genaue Bestimmung der erwarteten Fehler auf die Higgsparameter ist mit Hilfe von SFitter möglich. Wir zeigen, wie eine solche Analyse von den Werkzeugen profitieren kann, die im Rahmen der Suche nach neuer Physik entwickelt wurden, und wie sich die beiden Probleme im Bereich der Statistik unterscheiden.

T 13.9 Mi 18:45 M109

Zweischleifenkorrekturen zur Kopplung des CP-ungeraden Higgs-Bosons an Photonen — Joachim Brod[1], •Frank Fugel[2] und Bernd A. Kniehl[3] — [1]Institut für Theoretische Teilchenphysik, Universität Karlsruhe, Deutschland — [2]Paul Scherrer Institut, Schweiz — [3]II. Institut für Theoretische Physik, Universität Hamburg, Deutschland

Die elektroschwachen Korrekturen der Ordnung $\mathcal{O}(G_F m_t^2)$ zu Produktion und Zerfall des CP-ungeraden Higgs-Bosons in Photonen bzw. Gluonen werden vorgestellt. Die Ergebnisse sind gültig für kleine Higgs-Masse. Zu ihrer Berechnung wurde die Methode der Asymptotischen Entwicklung angewandt. Das Auftreten der γ_5-Matrix erfordert eine zusätzliche, endliche Renormierung des pseudoskalaren Stromes.