T 113: Elektroschwache Physik (Theorie) 2

Zeit: Donnerstag 16:45–18:45 Raum: P103

T 113.1 Do 16:45 P103

W^+W^- production at high transverse momenta beyond NLO — •Michael Rauch[1], Francisco Campanario[2], and Sebastian Sapeta[3] — [1]Inst. f. Theoretical Physics, Karlsruhe Institute of Technology (KIT) — [2]Theory Division, IFIC, University of Valencia-CSIC — [3]Institute for Particle Physics Phenomenology, Durham University

Pair production of W gauge bosons is an important process at the LHC. It enters many experimental measurements, both as a background, for example in new-physics searches or the determination of Higgs properties, but also as a signal process in precision studies and tests of the Standard Model. Therefore, accurate predictions for this process are necessary to exploit the full potential of the LHC.

Using the LoopSim method, we combine NLO QCD results for WW and WW+jet as well as the loop-squared gluon-fusion contribution. These are generated with VBFNLO and include leptonic decays of the W bosons with finite-width and off-shell effects.

We find that the size of the additional corrections beyond NLO can be significant and well outside of the NLO error bands given by renormalization and factorization scale variation. Applying a jet veto, we observe further negative corrections, which we relate to the presence of large Sudakov logarithms.

T 113.2 Do 17:00 P103

W^+W^+ production in association with two jets at the LHC — •Marina Billoni[1], Stefan Dittmaier[2], Patrick Motylinski[3], Stefano Pozzorini[4], and Frank Siegert[5] — [1]Universität Mainz — [2]Universität Freiburg — [3]University College London — [4]Universität Zürich — [5]TU Dresden

The same-sign di-lepton channel is not only a promising signature in the search for new physics at the Large Hadron Collider (LHC) but also it allows us to probe the quartic gauge interaction of W bosons in a high luminosity run of the LHC. Within the Standard Model the process of W^+W^+ production including leptonic W-decays always involves the production of two jets. This process has been investigated intensively in the last years by different groups.

In this talk we shortly review the existing theoretical predictions and compare them to our numerical results wherever possible. At leading order (LO) we investigate the full $2 \to 6$-process including $s/t/u$-channel contributions as well as the two different production channels of $\mathcal{O}(\alpha^6)$ and $\mathcal{O}(\alpha^4\alpha_s^2)$ and all kind of interference effects. Our LO study comprises a detailed discussion of the impact of different selection scenarios on the relative size of various contributions. At next-to-leading order we report on QCD corrections to the QCD channel, which involves gluon exchange already at LO, as well as to the purely electroweak channel, which comprises weak vector-boson scattering.

T 113.3 Do 17:15 P103

QCD corrections to $VVjj$ production at the LHC — Francisco Campanario[2], •Matthias Kerner[1], Duc Ninh Le[1], and Dieter Zeppenfeld[1] — [1]ITP, Karlsruhe Institute of Technology, Karlsruhe, Germany — [2]IFIC, University of Valencia, Paterna, Spain

The production processes of two vector bosons in association with two jets at the LHC are important since they allow to probe vector boson scattering and are sensitive to triple and quartic gauge couplings. In addition, they are also backgrounds to various searches for beyond the standard model physics. They can be classified into purely electroweak contributions of order $\mathcal{O}(\alpha^6)$ and QCD-induced channels of order $\mathcal{O}(\alpha^4\alpha_s^2)$.

In this talk, we report on the progress in implementing QCD-induced $VVjj$ production at next-to-leading order QCD into the flexible parton level Monte Carlo program VBFNLO and we present phenomenological results.

T 113.4 Do 17:30 P103

NLO electroweak and QCD corrections to WWZ production at the LHC — •Duc Ninh Le — Karlsruher Institut für Technologie, Karlsruhe, Germany

The production of WWZ at the LHC is an important process to test the quartic gauge couplings of the Standard Model as well as an important background for new physics searches. In this talk, I present the calculation of the NLO electroweak correction to this channel with on-shell gauge bosons in the final state. It is then combined with the NLO QCD correction to get the most up-to-date prediction. We study the impact of these corrections on the total cross section and some distributions. The NLO EW correction is small for the total cross section but becomes important in the high energy regime for the gauge boson transverse momentum distributions. The use of jet veto to reduce huge QCD corrections due to the quark-gluon induced channels is also discussed.

T 113.5 Do 17:45 P103

NLO QCD and EW corrections to $W\gamma$ production at the LHC — Stefan Dittmaier and •Markus Hecht — Physikalisches Institut, Albert-Ludwigs-Universität Freiburg

We present a full NLO calculation for $W\gamma$ production at the LHC including the decay and all off-shell effects of the W boson as well as photon-induced contributions. The NLO electroweak corrections are evaluated using an extension of the dipole subtraction formalism to non-collinear-safe observables which, e.g., is needed for a proper treatment of muons in the final state. In order to separate hard photons from jets in collinear configurations, we cluster photons and partons democratically and use a quark-to-photon fragmentation function à la Glover and Morgan. We provide numerical results for several distributions and analyze the impact of the different types of corrections. Finally we investigate how anomalous couplings could influence these distributions.

T 113.6 Do 18:00 P103

Electroweak NLO corrections to Wγ production at the LHC — •Christian Pasold and Ansgar Denner — Julius-Maximilians-Universität, Würzburg, Deutschland

We present a full calculation of electroweak NLO corrections to Wγ production including leptonic decays of the W boson. We take into account photon-induced contributions leading to singularities from photons inside jets. These are treated with the quark-to-photon fragmentation function. We discuss the numerical results for the total cross section and several distributions as well as the effects of non-collinear-safe final-state radiation of light fermions. In some areas of the phase space the electroweak NLO corrections amount up to ∼20 % of the leading-order cross section.

T 113.7 Do 18:15 P103

Unitarity in Vector Boson Scattering — Wolfgang Kilian[1], Jürgen Reuter[2], and •Marco Sekulla[1] — [1]University of Siegen, Department of Physics, D-57068 Siegen, Germany — [2]DESY Theory Group, D-22603 Hamburg, Germany

Quasielastic scattering processes of weak vector bosons ($W^\pm$, Z) are sensitive to deviations from the Standard Model Higgs sector. We use the ansatz of Effective Field Theories to describe New Physics (NP) contributions to Vector Bosons Scattering (VBS) via anomalous couplings and additional resonances in a model independent way. Because the Higgs unitarizes the VBS amplitude, these NP contributions will break unitarity.

In this talk I will describe how unitarity is re-established by the K-Matrix unitarisation scheme, which is implemented in the monte carlo generator WHIZARD.

T 113.8 Do 18:30 P103

NLO corrections to top-quark decay including W-boson off-shell effects — Lorenzo Basso[1,2], Stefan Dittmaier[1], and •Luisa Oggero[1] — [1]Albert-Ludwigs-Universität Freiburg — [2]IPHC Strasbourg

We study the NLO electroweak and QCD corrections to the top-quark decay width, including the W-boson decay and off-shell effects. Both the semileptonic, $t \to b\nu_e e^+$, and the hadronic, $t \to bu\bar{d}$, decays are considered.

To deal with soft and collinear divergences, we extended the one-cutoff slicing method, to properly account for the massive case. In order to check the validity of the method employed, we compare our calculation of the QCD corrections to the known results given in the literature. Furthermore we discuss the new results for the electroweak corrections and compare the full off-shell calculation against the one obtained using the narrow-width approximation.