T 37: Theorie: QCD / Top-Physik / Elektroschwache Physik

Zeit: Dienstag 16:30–19:00 Raum: Z6 - SR 1.013

T 37.1 Di 16:30 Z6 - SR 1.013

NLO and off-shell effects in top quark mass determinations — Gudrun Heinrich[1], Andreas Maier[2], Richard Nisius[1], Johannes Schlenk[3], Markus Schulze[4], •Ludovic Scyboz[1], and Jan Winter[5] — [1]Max-Planck-Institut für Physik, München, Germany — [2]Experimental Physics Department, CERN, Geneva, Switzerland — [3]IPPP, University of Durham, Durham, UK — [4]Humboldt-Universität zu Berlin, Institut für Physik, Berlin, Germany — [5]Department of Physics and Astronomy, Michigan State University, East Lansing, USA

While systematic experimental uncertainties are better understood in top measurements at LHC, it is not clear how the non-doubly resonant and non-factorizable contributions to the final state $pp \to W^+W^-b\bar{b} \to (e^+\nu_e)(\mu^-\bar{\nu}_\mu)b\bar{b}$ influence the determination of the top mass. Several narrow-width approximations with different descriptions of the top decay are compared to the full NLO prediction for $W^+W^-b\bar{b}$ production, namely the direct top decay at LO and NLO accuracy as well as via a parton shower. To take the equivalent of an experimental analysis as a benchmark, the different theoretical descriptions are used to calibrate template fit functions and estimate the offset in the top mass determination from pseudo-data.

T 37.2 Di 16:45 Z6 - SR 1.013

NLO QCD Predictions for $Wb\bar{b}$ Production in Association with Jets at the LHC — Felix Anger, Fernando Febres Cordero, Harald Ita, and •Vasily Sotnikov — Albert-Ludwigs-Universität Freiburg, Freiburg, Germany

We present NLO QCD predictions for $Wb\bar{b}$ production in association with up to three light jets at the LHC. We compute in the four-flavor scheme with a non-vanishing bottom-quark mass. The matrix elements are obtained with a new version of the BlackHat library, which is upgraded to handle massive particles.

T 37.3 Di 17:00 Z6 - SR 1.013

NLO QCD predictions for Z+Photon+jets production — •Johannes Krause and Frank Siegert — TU Dresden, Institut für Kern- und Teilchenphysik

We present next-to-leading order QCD results for Z+gamma production, including additional jets. Besides a comparison to recent experimental data and the discussion of uncertainties and scales, we also show a possibility to remove the overlap between Z+gamma processes and Z+jets due to additional final state radiation.

T 37.4 Di 17:15 Z6 - SR 1.013

Associated production of a top quark pair with a W or Z boson at the LHC at NNLL+NLO — Anna Kulesza[1], Leszek Motyka[2], •Daniel Schwartländer[1], Tomasz Stebel[3], and Vincent Theeuwes[4] — [1]Institute for Theoretical Physics, WWU Münster, D-48149 Münster, Germany — [2]Institute of Physics, Jagellonian University, S. Łojasiewicza 11, 30-348 Kraków, Poland — [3]Institute of Nuclear Physics PAN, Radzikowskiego 152, 31-342 Kraków, Poland — [4]Department of Physics, SUNY Buffalo, 261 Fronczak Hall, Buffalo, NY 14260-1500, USA

The measurements of associated production of a vector or a scalar boson with a top-antitop quark pair provide an important test for the Standard Model at the LHC.

In particular these are the key processes to measure the top quark properties. Furthermore they are very relevant in searches for new physics, both as being directly sensitive to it and as providing an important background.

While NNLO calculations for this particular type of 2 to 3 processes are currently out of reach, a class of corrections beyond NLO can be taken into account with the help of resummation methods. In this talk we consider an application of soft gluon resummation in Mellin space to these processes at hadron colliders and discuss numerical predictions at NNLL matched to NLO precision for the LHC.

T 37.5 Di 17:30 Z6 - SR 1.013

Four-jet and three-jet plus gamma DPS production in pp and pA collisions at the LHC — •Oleh Fedkevych and Anna Kulesza — Institut für Theoretische Physik, Wilhelm-Klemm-Straße 9, 48149 Münster, Deutschland

In spite of the recent progress in both theoretical and experimental studies many aspects of *proton-proton* (pp) and *proton-nucleus* (pA) collisions still require a detail investigation. At high collision energies, the probability of simultaneous scatterings of different pairs of partons, contributing to the same inelastic event, has to be considered. In particular, *double parton scattering* (DPS) processes can also play a dominant role for some specific kinematic regions of multi-jet production.

In this talk we will discuss the DPS contribution to four-jet and three-jet plus gamma production in pp and pA collisions as well as its dependence on different kinematical cuts and different phenomenological assumptions.

T 37.6 Di 17:45 Z6 - SR 1.013

New Features in `pySecDec` — •Stephan Jahn — Max-Planck-Institut für Physik, Muenchen, Deutschland

The evaluation of master integrals is an important step in the computation of higher-order corrections. Direct numerical integration of multi-loop-integrals is usually impossible due to intrinsic divergences. The program `pySecDec` computes solutions by extracting dimensionally regularized divergences prior to numerical integration. In this talk, we present the latest new features of `pySecDec`.

T 37.7 Di 18:00 Z6 - SR 1.013

Automation of QCD at NLO: $pp \to Zj + X$ as a toy example — •Pascal Stienemeier, Jürgen Reuter, Vincent Rothe, and Christian Weiss — DESY Theory Group, Notkestr. 85, D-22607 Hamburg, Germany

In order to cope with increased experimental accuracy of the LHC era, the accuracy of theoretical predictions has to be increased as well. For this task, sophisticated tools for automated computation, namely matrix-element generators and Monte-Carlo event generators, have to take next-to-leading order effects into account.

A hadronic initial state like protons at the LHC however incorporates computational challenges such as infrared initial state divergences. A possibility to substract these divergencies is the Frixione-Kunszt-Signer (FKS) subtraction scheme whose implementation in Whizard is currently being validated.

In this talk I will show details of the implementation and validation of the FKS subtraction, particularly the initial state splittings and regions, using as a prime example computed by Whizard the simplest process where all these components are needed, namely $pp \to Zj + X$ at QCD NLO.

T 37.8 Di 18:15 Z6 - SR 1.013

Integrating double soft emissions for NNLO computations — •Maximilian Delto and Kirill Melnikov — Institut für Theoretische Teilchenphysik, Karlsruhe Institute of Technology (KIT)

We will describe an analytic calculation of the phase-space integral of the double soft eikonal function in dimensional regularisation required for fully-differential next-to-next-to-leading order computations in QCD. We will consider cases when the radiating partons are in a back-to-back kinematics, relevant for Drell-Yan and Higgs production, and when the radiating partons are at an arbitrary angle, relevant e.g. for DIS and weak boson fusion processes.

T 37.9 Di 18:30 Z6 - SR 1.013

Two mass contributions to three loop operator matrix elements and the variable flavour number scheme — Johannes Blümlein[1], Abilio De Freitas[1], Carsten Schneider[2], and •Kay Schönwald[1] — [1]DESY, Zeuthen, Deutschland — [2]RISC, Johannes Kepler Universität Linz, Österreich

Beginning at three loop order, massive operator matrix elements receive contributions from irreducible diagrams containing two different masses, i.e. the charm and bottom quark. Since their mass ratio $m_c^2/m_b^2 \sim 1/10$ is non-negligible, both have to be decoupled together.

We show the implications of the simultaneous decoupling for the variable flavor number scheme and present the three loop, two mass contributions to the pure singlet and gluonic operator matrix element.

T 37.10 Di 18:45 Z6 - SR 1.013

More efficient parameterization of phase-space in `WHIZARD` — •Manuel Utsch[1], Wolfgang Kilian[1], Thorsten Ohl[2], Jürgen

Reuter[3], and Simon Brass[1] — [1]Department Physik, University of Siegen, D-57068 Siegen, Germany — [2]Institut für Theoretische Physik und Astrophysik, University of Würzburg, D-97074 Würzburg, Germany — [3]Theory Group, DESY Hamburg, D-22603 Hamburg, Germany

Monte Carlo integration of transition matrix elements requires the use of variance reduction techniques in order to produce reliable results. The event generator `WHIZARD` uses a Multi-Channel approach which makes use of several parameterizations of phase-space and appropriate mappings of random numbers to invariant masses and angles. Processes with large numbers of final state particles lead to a vast number of possible phase-space parameterizations. We describe a new, efficient implementation of the algorithm for the construction of phase-space parameterizations and present results for the obtained speed-up.