T 85: QCD (Theorie)

Convenor: S. Borowka, P. Marquard (QCD), A. Huss (EW)

Zeit: Mittwoch 16:45–18:45 | Raum: VSH 10

T 85.1 Mi 16:45 VSH 10

Automated Numerical Evaluation of Multi Loop Amplitudes — •Stephan Jahn — Max-Planck-Intitut für Physik, München — Technische Universität München

Amplitude calculations at higher orders in perturbation theory are a key ingredient for the success of the LHC programme and future colliders. Fully automated one-loop calculations are state of the art nowadays, while multi-loop calculations still require a lot of hand work. We present recent developments in GoSam and SecDec towards automated two-loop calculations.

T 85.2 Mi 17:00 VSH 10

Towards NLO QCD radiative corrections for the associated production of heavy quarks and vector bosons — •Felix Richard Anger, Vasily Sotnikov, and Harald Ita — Physikalisches Institut, Universität Freiburg

The production of vector bosons in association with heavy quarks constitutes an irreducible background to many processes relevant for the ongoing physics programm at the LHC, for both SM measurements and BSM searches.

In order to provide NLO QCD radiative corrections to these processes, we employ the framework of numerical generalized unitarity, where loop amplitudes are constructed by combining on-shell tree amplitudes. The latter are generated using a Berends-Giele recursion. Rational terms are obtained using an adaptation of the D-dimensional numerical unitarity approach within dimensional regularisation. Here we report our recent progress with the implementation of this process class.

T 85.3 Mi 17:15 VSH 10

Five-loop quark mass and field anomalous dimensions for a general gauge group — •Peter Marquard — DESY, Zeuthen

We present analytical five-loop results for the quark mass and quark field anomalous dimensions, for a general gauge group and in the MS scheme. We confirm the values known for the gauge group SU(3) from an independent calculation, and find full agreement with results available from large-N_f studies.

T 85.4 Mi 17:30 VSH 10

NLO QCD corrections to ZH + jet production — •Michael Schüssler[1], Robin Roth[1], Dieter Zeppenfeld[1] und Francisco Campanario[2] — [1]ITP, Karlsruher Institut für Technologie, Karlsruhe, Deutschland — [2]IFIC, University of Valencia, Paterna, Spain

The ZH process is an important contributor to the production of Higgs bosons, especially when considering decays to bottom quarks. To suppress backgrounds, the boosted phase space region is of interest which gets sizable contributions from additional jet radiation.

We discuss a fully differential calculation of ZH + jet production including leptonic decays of the Z boson at NLO QCD and its implementation in the Monte Carlo program VBFNLO. Furthermore we take a look at anomalous couplings in the EW part of the cross section.

T 85.5 Mi 17:45 VSH 10

Resummation Improved Rapidity Spectrum for Gluon Fusion Higgs Production — •Johannes Michel[1,2], Markus Ebert[2], Anna Kulesza[1], and Frank Tackmann[2] — [1]Institute for Theoretical Physics, WWU Münster, Wilhelm-Klemm-Straße 9, D-48149 Münster, Germany — [2]Theory Group, Deutsches Elektronen-Synchrotron (DESY), Notkestraße 85, D-22607 Hamburg, Germany

The rapidity spectrum for gluon fusion Higgs production is an impor-

tant observable in upcoming precision measurements at the LHC. It also enters measurements of the production cross section through the fiducial acceptance. On the theory side, perturbative corrections to the spectrum contain large logarithms that can be resummed to all orders. We show how their resummation can be performed by RG evolution in a SCET-based framework, leading to the currently most precise predictions for the Higgs rapidity spectrum. Our formalism also applies to other color-singlet production processes.

T 85.6 Mi 18:00 VSH 10

Soft gluon resummation for associated production of a massive boson with a top-antitop quark pair — Anna Kulesza[1], Leszek Motyka[2], •Daniel Schwartländer[1], Tomasz Stebel[2], and Vincent Theeuwes[3] — [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]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 for the LHC.

T 85.7 Mi 18:15 VSH 10

Soft interactions in Herwig — •Patrick Kirchgaesser, Stefan Gieseke, and Frasher Loshaj — Institute for Theoretical Physics, Karlsruhe Institute of Technology, Karlsruhe, Germany

In this talk we present a completely new model for soft interactions in the event-generator Herwig 7. The model includes diffractive scattering and a new model for soft particle production. We explain the theoretical background and discuss the implementation of the model. After a quick outline of the tuning procedure we present numerous results. The new model resolves a number of shortcomings of the old model.

T 85.8 Mi 18:30 VSH 10

Parton-Shower Effects in QCD-VVjj Production with Leptonic Decays — •Christophe Theiss and Michael Rauch — ITP/KIT, Karlsruhe, Deutschland

The production of vector bosons plus two jets is an important signature at the LHC. QCD Production, i.e. at $\mathcal{O}(\alpha_s^2)$, is the leading contribution to these processes. Also when studying electroweak production via vector-boson fusion (VBF), the corresponding QCD process is the main background and yields sizable contributions even after placing typical VBF cuts. Therefore, precise predictions for these processes are necessary.

In this talk, we present the combination of NLO QCD results with parton showers for $VVjj$ processes, including leptonic decays as well as off-shell and non-resonant contributions. To that end, we have extended the NLO QCD implementation in VBFNLO to provide an interface to parton showers via the Binoth Les Houches Accord. We discuss some details of the implementation and show results when combining with the Herwig 7 event generator.