T 11: QCD (Theorie) II

Convenor: Michal Czakon

Zeit: Donnerstag 16:45–19:00 Raum: 30.23: 10-1

T 11.1 Do 16:45 30.23: 10-1

Double hard QCD processes — •Daniel Ostermeier and Andreas Schäfer — Institut für Theoretische Physik, Universität Regensburg

To describe the so-called "underlying event" in collisions at LHC one has to substantially extent the techniques of collinear perturbative QCD. At these high energies multiple semi-hard reactions can occure in a single proton-proton collision at which point the transverse structure of hadrons (more precisely GPDs and generalized GPDs) becomes relevant. A distinct contribution from double-hard events was already isolated in cross sections measured at Tevatron long ago.

Based on earlier theory work, we have analysed in detail the double Drell-Yan process in proton-proton collisions, which seems to be the theoretically easiest process. This implied among other steps a generalization of the concept of soft factors from the case of standard single parton scattering to double hard processes. We give definitions of the soft factors for two parton distributions and present the results for corrections to the soft factors up to one-loop level in perturbation theory. This work was supported by BMBF.

T 11.2 Do 17:00 30.23: 10-1

W-, Z-, und Higgs-Boson Produktion bei kleinen transversal Impulsen — •Daniel Wilhelm — Institut für Physik (THEP), Johannes Gutenberg-Universität, D-55099 Mainz, Germany

Der Wirkungsquerschnitt für den Drell-Yan Fall (W- und Z-Boson) lässt sich in soft-collinear-effective-theory (SCET), mit Hilfe von generalisierten Parton Verteilungs Funktionen (PDF) direkt im p_T-Raum herleiten. Dabei werden große Logarithmen mit Renormierungs-Gruppen-Methoden aufsummiert. Anhand der Menge an Präzisionsdaten, lässt sich diese Methode auf ihre Genauigkeit überprüfen.

Die Herleitung im Falle der Higgs-Boson Produktion, lässt sich nahezu analog durchführen und liefert somit eine gute theoretische Vorhersage für die Experimente am LHC.

T 11.3 Do 17:15 30.23: 10-1

Light gluino effects in thrust at NNLL order — •Simon Gritschacher, Andre Hoang, and Vicent Mateu — MPI for Physics, Munich, Germany

Recent progress in computations of event shape distributions have reduced uncertainties in the strong coupling from fits to available experimental data to the percent level. It is therefore reasonable to ask for possible effects of new physics.

We consider the effects of light gluinos in the thrust distribution at the NNLL order level in the framework of Soft-Collinear-Effective-Theory (SCET). This involves modifications of the standard QCD renormalization group evolution and the computation of additional corrections to the hard, jet and soft functions that appear in the SCET factorization theorem.

T 11.4 Do 17:30 30.23: 10-1

$O(T_F^2)$ **Contributions to the Heavy Flavor DIS Wilson Coefficients at** $O(\alpha_s^3)$ — Johannes Bluemlein[1], Carsten Schneider[2], and •Fabian Wissbrock[1] — [1]DESY Zeuthen — [2]RISC Linz

The precise knowledge of the heavy flavor corrections to deep-inelastic scattering is instrumental for both the measurement of $\alpha_s(M_Z^2)$ and the extraction of the parton densities to be used at the LHC. The current accuracy of the data requires next-to-next-to leading order corrections. In this talk we report on first results for the contributing 3-loop graphs, which contain two massive fermion lines ($m_1 \neq m_2; m_1 = m_2$). For this calculation new summation technologies are developed and combined with efficient methods to establish and solve the corresponding difference equations. The results can be expressed in terms of harmonic sums, harmonic polylogarithms and generalizations thereof. The application of generalized hypergeometric function representations and their generalizations turns out to be essential in these calculations.

T 11.5 Do 17:45 30.23: 10-1

The Wilson Coefficients of Heavy Quark Production in Charged Current DIS in Mellin and x-Space to $O(\alpha_s^2)$ — •Alexander Hasselhuhn, Johannes Blümlein, and Fabian Wissbrock — DESY, Zeuthen

The charged current heavy flavor Wilson coefficients to first and second order in the strong coupling constant are computed for large momentum transfer.

At leading order, also the power corrections in (m^2/Q^2) are given. We derive representations in x- and Mellin-space for phenomenological analyses. These are of importance for the extraction of the strange quark distribution functions and allow for an efficient analysis of the DIS charged current world data.

T 11.6 Do 18:00 30.23: 10-1

Numerical NLO QCD calculations - Subtraction method for the virtual contributions — •Christian Reuschle — Institut für Physik, Universität Mainz, D-55099 Mainz, Germany

This talk reports on a previously published algorithm for the numerical calculation of one-loop QCD amplitudes. The algorithm consists of subtraction terms, approximating the soft, collinear and ultraviolet divergences of one-loop amplitudes and a method to deform the integration contour for the loop integration into the complex space. It is formulated at the amplitude level and does not rely on Feynman graphs. Therefore all required ingredients can be calculated efficiently using recurrence relations.

The talk will concentrate on the subtraction terms by first reviewing the dipole subtraction method for the real emission contributions of a next-to-leading order QCD calculation and then showing how this is extended to the virtual contributions, i.e. the one-loop QCD amplitudes. It will be discussed how to derive local subtraction terms for the soft, the collinear and the ultraviolet regions of the one-loop integration and that these can be formulated on the amplitude level rather than on a Feynman diagrammatic level. This allows one to efficiently implement the subtraction terms using recurrence relations, in order to construct one-loop integrands which are locally finite and can be integrated numerically. Examples of standard QCD processes will be considered in order to demonstrate the validity of the method.

T 11.7 Do 18:15 30.23: 10-1

Alternative NLO-QCD subtraction method using Nagy-Soper scheme — Michał Czakon, Michael Krämer, and •Michael Kubocz — Institut für Theoretische Teilchenphysik und Kosmologie - RWTH Aachen

We present preliminary results of our implementation of a new NLO subtraction formalism based on Nagy-Soper parton showers within the framework of HELAC. We show numerical comparisons with existing dipole subtraction methods.

T 11.8 Do 18:30 30.23: 10-1

Automating the MENLOPS approach in Sherpa — Stefan Hoeche[1], Frank Krauss[2], •Marek Schoenherr[3], and Frank Siegert[4] — [1]Stanford Linear Accelerator Center, Stanford University, Stanford, USA — [2]Institute for Particle Physics Phenomenology, University of Durham, Durham, United Kingdom — [3]Institut fuer Kern- und Teilchenphysik, Technische Universitaet Dresden, Dresden, Germany — [4]Physikalisches Institut, Albert-Ludwigs-Universitaet Freiburg, Freiburg, Germany

The MENLOPS approach combining the ME+PS approach, merging sequences of tree-level matrix elements into inclusive event samples, with the Powheg method, matching exact NLO matrix elements with parton showers, and its automated implementation in the Sherpa event generator are discussed. Further, the benefits of this approach in describing lepton and hadron collider data are exemplified and the theoretical accuracy of observables calculated using the resulting event samples is assessed.

T 11.9 Do 18:45 30.23: 10-1

Dipole Showers and Automated NLO Matching in Herwig++ — •Simon Plätzer[1] and Stefan Gieseke[2] — [1]DESY Theorie Gruppe — [2]Institut für Theoretische Physik, KIT

We report on recent results obtained from the dipole-type shower and NLO matching implementation in Herwig++. Within the framework, dipole subtraction and NLO matching along the lines of MC@NLO or POWHEG are carried out automatically.