T 12: QCD (Theorie) 2

Convenor: Stefan Gieseke

Zeit: Dienstag 16:45–18:45 Raum: WIL-A120

T 12.1 Di 16:45 WIL-A120

Effective Field Theory Approach to Heavy Quark Fragmentation — •Michael Fickinger[1], Sean Fleming[2], Sunghoon Jung[3], Chul Kim[3,4], and Emanuele Mereghetti[5] — [1]Johannes Gutenberg Universität, Mainz, Germany — [2]University of Arizona, Tucson, USA — [3]KIAS, Seoul, Korea — [4]CERN, Geneva, Switzerland — [5]LBNL, University of California, Berkeley, USA

Fragmentation functions for hadrons containing heavy quarks are an important input for the production of heavy hadrons at collider experiments. They provide the connection between partonic and hadronic picture by describing the probability that a parton fragments into a certain hadron containing the heavy quark. I will give an introduction into heavy quark fragmentation at e+e- colliders. My focus will be on the kinematic endpoint region where the heavy hadron carries nearly half the final state energy. To describe the endpoint region I will discussed an effective field theory approach.

T 12.2 Di 17:00 WIL-A120

Higgs-Boson Production at Small Transverse Momentum — •Daniel Wilhelm — PRISMA Cluster of Excellence & Mainz Institute for Theoretical Physics Johannes Gutenberg University, Mainz, Germany

Using methods from effective field theory, we have recently developed a novel, systematic framework for the calculation of the cross sections for electroweak gauge-boson production at small and very small transverse momentum q_T , in which large logarithms of the scale ratio m_V/q_T are resummed to all orders. This formalism is applied to the production of Higgs bosons in gluon fusion at the LHC. The collinear factorization anomaly leads to the dynamical generation of a non-perturbative scale q_*, which protects the process from receiving large long-distance hadronic contributions. We present detailed numerical predictions for the transverse-momentum spectrum of the Higgs boson, finding that it is quite insensitive to hadronic effects.

T 12.3 Di 17:15 WIL-A120

Berechnung des Wirkungsquerschnittes von pseudoskalaren Higgsbosonen am LHC — Robert Harlander, •Annika Schächt, Tobias Neumann und Tom Zirke — Bergische Universität Wuppertal, D-42119 Wuppertal, Deutschland

Ein wichtiger Produktionsprozess für pseudoskalare Higgsbosonen ist die Gluonfusion. Dabei koppeln die Gluonen über eine Top-Quark-Schleife an das Higgs. Für Higgsmassen, die kleiner als die Topmasse sind, kann das Top-Quark ausintegriert werden und man erhält eine effektive Theorie. In dieser Theorie werden die virtuellen und reellen Korrekturen auf NLO QCD für Higgs + Jet Produktion in Gluonfusion berechnet. Da beide Beiträge divergent sind und numerisch über verschiedene Phasenräume integriert werden müssen, wird das Catani-Seymour Dipolsubtraktionsverfahren verwendet. Die entstehenden endlichen Beiträge können in d=4 Dimensionen mit einem Monte-Carlo Algorithmus integriert werden. Betrachtet werden pT- und y-Verteilungen auf NLO ebenso wie der inklusive Wirkungsquerschnitt mit pT-Veto auf NNLO.

T 12.4 Di 17:30 WIL-A120

2 → 4 particle phase space master integrals for Higgs boson production — •Maik Hoeschele, Jens Hoff, Alexey Pak, Matthias Steinhauser, and Takahiro Ueda — Institut für Theoretische Teilchenphysik, Karlsruhe Intitute of Technology, 76128 Karlsruhe, Germany

In the Standard Model the inclusive cross section for higgs production via gluon fusion at NNNLO demands the calculation of real corrections where up to 3 additional particles are emitted. The occuring phase space diagrams are related to the imaginary part of forward scattering diagrams, allowing for a reduction to a small set of master integrals. The reduction tables serve as building blocks for differential equations for the occuring master integrals with the soft limit as boundary condition. In the talk we consider this limit and discuss a convenient parametrization of the four-particle phase space. Furthermore we demonstrate its suitability by showing results for some exemplary integrals.

T 12.5 Di 17:45 WIL-A120

Higgs boson production at the LHC: NNLO partonic cross sections through order ϵ and convolutions with splitting functions to N^{3}LO — Maik Höschele, •Jens Hoff, Alexey Pak, Matthias Steinhauser, and Takahiro Ueda — Institut für Theoretische Teilchenphysik, Karlsruhe Institute of Technology (KIT)

This talk considers Higgs boson production at hadron colliders via gluon fusion and the computation of higher order terms in the regularization parameter ϵ. In particular, the next-to-next-to-leading order cross section needs to be evaluated including order ϵ terms. These results are used to compute all convolutions with the splitting functions entering the next-to-next-to-next-to-leading order cross section. A clear account is given on the solution of the occurring convolution integrals involving harmonic polylogarithms and generalized functions.

T 12.6 Di 18:00 WIL-A120

Higgs production in gluon fusion beyond NNLO — •Marco Bonvini — DESY, Hamburg

I will present the construction of an approximate NNNLO expression for the Higgs production in gluon fusion with finite top mass. The approximation is based on a combination of the large- and small-x behaviours, which are known from Sudakov and BFKL resummations, respectively. We find a correction of order 15% with respect to the known NNLO result at central scales, and a significant reduction of the renormalization scale uncertainty.

T 12.7 Di 18:15 WIL-A120

A subtraction scheme for double-real radiation at NNLO — •David Heymes and Michal Czakon — RWTH Aachen University - Institut für Theoretische Teilchenphysik und Kosmologie, Aachen, Germany

Higher order perturbative calculations for QCD observables are indispensable to make precise predictions for the LHC. In each part of the calculation unphysical infrared divergences appear that cancel between real and virtual corrections to the cross section. While at next-to-leading order (NLO) general algorithms exist to subtract these singularities, further difficulties arise at next-to-next-to-leading order (NNLO) accuracy. A trivial generalization to this case is not possible. We present STRIPPER, a subtraction scheme for real radiation at NNLO. The main idea is to split the double-real radiation phase-space into sectors to obtain a Laurent series in the dimensional regulator ϵ. The coefficients can be integrated numerically. This is achieved by parameterizing each sector adequately as well as exploiting the universal soft and collinear factorization properties of QCD tree-level matrix elements. This subtraction scheme can be implemented in the t'Hooft-Veltman regularization scheme, which will be discussed in this presentation.

T 12.8 Di 18:30 WIL-A120

New heavy flavor contributions to DIS at the 3-loop order: different masses and nested topologies — Jakob Ablinger[2], Johannes Blümlein[1], Carsten Schneider[2], and •Fabian Wissbrock[1] — [1]DESY — [2]RISC - JKU LINZ

We present recent results on the heavy flavor Wilson coefficients of the deep-inelastic structure function F_2 stemming from diagrams which contain both charm- and bottom-quarks. Starting at 3-loop order these contributions cannot be incorporated into the variable flavor number scheme (VFSN). We also present new results on the computation of diagrams of more advanced topologies (knotted ladder, Benz, and others) which have been obtained via the method of hyperlogarithms. They require the use of extensions to the basic formalism leading to the more general class of generalized hyperlogarithms, resp. the associated nested sums. Both the x- and Mellin N-space representations are discussed.