T 59: QCD Theory and Experiment I

Time: Wednesday 15:50–17:20   Location: HSZ/0105

T 59.1   Wed 15:50   HSZ/0105
Measurement and QCD analysis of inclusive jet production in deep inelastic scattering at ZEUS — •Florian Lorkowski — DESY, Hamburg, Germany

The measurement of cross sections of deep inelastic scattering processes at the electron-proton collider HERA is a well established tool to test perturbative QCD predictions. Additionally, they can be used to determine the non-perturbative parton distribution functions of the proton. Measurements of jet production cross sections are particularly well suited to also constrain the strong coupling constant.

In this talk, a new measurement of inclusive jet cross sections in neutral current deep inelastic scattering using the ZEUS detector at the HERA collider is presented. The data were taken during the HERA 2 period at a center of mass energy of $318\,\mathrm{GeV}$ and correspond to an integrated luminosity of $347\,\mathrm{pb}^{-1}$. Massless jets, reconstructed using the $k_\perp$-algorithm in the Breit reference frame, are measured as a function of the squared momentum transfer Q^2 and the transverse momentum of the jets in the Breit frame $p_{\perp,\mathrm{Breit}}$.

The measured jet cross sections are compared to previous measurements as well as NNLO QCD theory predictions. The measurement is used in a QCD analysis at NNLO accuracy to perform a simultaneous determination of parton distribution functions of the proton and the strong coupling constant. A significantly improved accuracy is observed compared to similar measurements of the strong coupling constant.

T 59.2   Wed 16:05   HSZ/0105
Measurement of the 1-jettiness event shape observable in DIS — Daniel Britzger[1], Sook Hyun Lee[2], and •Johannes Hessler[1] — [1]Max Planck Institute for Physics — [2]University of Michigan

A first measurement of the 1-jettiness event shape observable τ_1^b in neutral-current deep inelastic scattering is presented. The data were taken by the H1 experiment at HERA from 2003 to 2007 at a centre of mass energy of $\sqrt{s} = 319$ GeV. The triple-differential cross sections are presented as a function of the 1-jettiness τ_1^b, the virtuality of the exchanged boson Q^2 and the inelasticity of the event y. The data exhibit a sensitivity to the strong coupling constant and to resummation and hadronisation effects. The data are compared to selected predictions.

T 59.3   Wed 16:20   HSZ/0105
Fast simulations with NNLO QCD accuracy - new developments in the APPLfast project — •Lucas Kunz — Karlsruhe Institute of Technology, Karlsruhe, Germany

The calculation of theoretical predictions for hadron colliders at higher orders in perturbation theory involves computing time expensive iterative procedures. The same is true for the extraction of parton distribution functions (PDFs) from measured data. Hence, to produce results in reasonable time, a very efficient and flexible setup is needed.

The APPLfast project fulfills these requirements by linking the parton-level Monte Carlo program NNLOJET with both the APPLgrid and fastNLO grid libraries, thereby allowing for an a posteriori choice of a set of PDFs or value of the strong coupling constant. This talk will give an overview of the project, focusing on an explanation of the general logic and on possible applications rather than technical details. We will further present some first results for NNLO dijet production at the LHC, both at leading and full color.

T 59.4   Wed 16:35   HSZ/0105
The NNLO beam function for jet-veto resummation — Guido Bell[1], •Kevin Brune[1], Goutam Das[2], Marcel Wald[1], and Ding Yu Shao[3,4] — [1]Theoretische Physik 1, Center for Particle Physics Siegen, Universität Siegen, Germany — [2]Institut für Theoretische Teilchenphysik und Kosmologie, RWTH Aachen University, D-52056 Aachen, Germany — [3]Department of Physics and Center for Field Theory and Particle Physics, Fudan University, Shanghai, China — [4]ey Laboratory of Nuclear Physics and Ion-beam Application (MOE), Fudan University, Shanghai, China

The jet-veto beam function describes collinear initial-state radiation that is constrained by a veto on reconstructed jets. As the veto is imposed on the transverse momenta of the jets, the beam function is subject to rapidity divergences, and we use the collinear-anomaly framework to extract the perturbative matching kernels to next-to-next-to-leading order (NNLO) in the strong-coupling expansion. Our calculation is based on a novel framework that automates the computation of beam functions and provides the ingredients to extend jet-veto resummations to NNLL′ accuracy.

T 59.5   Wed 16:50   HSZ/0105
Numerical multi-loop calculations with pySecDec — •Anton Olsson — Karlsruhe Institute of Technology

We present new features of the program pySecDec, which can serve to calculate loop amplitudes numerically. Examples for 2-loop multi-scale integrals needed for LHC precision physics as well as 3-loop integrals relevant at a future lepton collider will be given.

T 59.6   Wed 17:05   HSZ/0105
The determination of r_0 on the CLS 2+1 ensembles — •Tom Asmussen, Roman Höllwieser, Francesco Knechtli, and Tomasz Korzec — University of Wuppertal, Wuppertal, Germany

We determine the scale r_0 for $2 + 1$ flavour QCD ensembles generated by CLS. This scale is determined from an improved definition of the static force which we measure using Wilson loops. Reweighting factors from the simulations are included in the analysis and mass derivatives have been calculated to correct for mistunings. In the end we present an analysis for r_0/a at several values of the lattice gauge coupling and perform chiral extrapolations. We also compare with the scale t_0.