

Verein zur Förderung der Theoretischen Physik in Österreich

E I N L A D U N G

zur 1. Vorlesung im Rahmen der Erwin-Schrödinger-Gastprofessur 2024

Matthias NEUBERT
(Johannes Gutenberg-Universität Mainz)

***“Factorization of non-global LHC observables
Part 1: “Resummation of super-leading logarithms”***

Abstract:

We present a systematic formalism based on a factorization theorem in Soft-Collinear Effective Theory (SCET) to describe non-global observables at hadron colliders, such as gap-between-jets cross sections. The cross sections are factorized into convolutions of hard functions, capturing the dependence on the partonic center-of-mass energy $\sqrt{s}$, and low-energy matrix elements, which are sensitive to the low scale $Q_0 \ll \sqrt{s}$ characteristic of the veto imposed on energetic emissions into the gap region between the jets. The scale evolution of both objects is governed by a renormalization-group equation, whose form we derive. With the help of this equation, we develop an EFT-based approach to the resummation of so-called “non-global logarithms”, including the “super-leading logarithms” discovered by Forshaw et al. in 2006, which only appear in hadron-collider processes.

Part 1:

By solving the evolution equation for the hard functions for arbitrary 2-to-M jet processes in the leading logarithmic approximation, we accomplish for the first time the all-order resummation of super-leading logarithms, thereby solving an old problem of quantum field theory. We study the numerical size of the corresponding effects for different partonic scattering processes and explain why they are sizable for pp-to-2 jets processes, but suppressed in H/Z and H/Z+ jet production. The super-leading logarithms are given by an alternating series, whose individual terms can be much larger than the resummed result, even in very high orders of the loop expansion. Resummation is therefore essential to control these effects. We find that the asymptotic fall-off of the resummed series is much weaker than for standard Sudakov form factors.

Zeit: Dienstag, 14.5.2024, 16:15h

Ort: Erwin-Schrödinger-Hörsaal, Boltzmanngasse 5, 5. Stock

Zoom Meeting:

Meeting ID: 933 4269 3866 Passcode: 185096

<https://univiennea.zoom.us/j/93342693866?pwd=aUpTR0VJNUhJY2Q0ajdaKzI1YWVhQ09>

gez.: A. Hoang, H. Neufeld, M. Procura

Gefördert von der Stadt Wien Kultur

Verein zur Förderung der Theoretischen Physik in Österreich

E I N L A D U N G

zur 2. Vorlesung im Rahmen der Erwin-Schrödinger-Gastprofessur 2024

Matthias NEUBERT
(Johannes Gutenberg-Universität Mainz)

***“Factorization of non-global LHC observables
Part 2: “The Glauber series”***

Abstract:

We present a systematic formalism based on a factorization theorem in Soft-Collinear Effective Theory (SCET) to describe non-global observables at hadron colliders, such as gap-between-jets cross sections. The cross sections are factorized into convolutions of hard functions, capturing the dependence on the partonic center-of-mass energy $\sqrt{s}$, and low-energy matrix elements, which are sensitive to the low scale $Q_0 \ll \sqrt{s}$ characteristic of the veto imposed on energetic emissions into the gap region between the jets. The scale evolution of both objects is governed by a renormalization-group equation, whose form we derive. With the help of this equation, we develop an EFT-based approach to the resummation of so-called “non-global logarithms”, including the “super-leading logarithms” discovered by Forshaw et al. in 2006, which only appear in hadron-collider processes.

Part 2: The super-leading logarithms arise from two soft Glauber-gluon interactions between the two colliding partons in the scattering process. Using the same formalism, we explore the contributions of multiple Glauber interactions. The “Glauber series” simultaneously incorporates large double-logarithmic corrections together with higher-order exchanges of Glauber pairs associated with the large numerical factor $(i\pi)^2$. Numerical estimates for wide-angle gap-between-jet cross sections at the parton level show that, in particular for gg scattering at relatively small vetoes Q_0 , the contribution involving four Glauber exchanges gives a sizable correction and should not be neglected. We develop a resummation approach for the terms in the Glauber series in renormalization-group improved perturbation theory, including the running of the strong coupling $\alpha_s(\mu)$. We also show that the Glauber series itself can be resummed to all orders in the large- N_c limit.

Zeit: Dienstag, 21.5.2024, 16:15h

Ort: Erwin-Schrödinger-Hörsaal, Boltzmanngasse 5, 5. Stock

Zoom Meeting:

Meeting ID: 933 4269 3866 Passcode: 185096

<https://univiennea.zoom.us/j/93342693866?pwd=aUpTR0VJNUhJY2Q0ajdaKzI1YWVVBQT09>

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