

Stony Brook University
The Graduate School

Doctoral Defense Announcement

Abstract

(Studies in Perturbative QCD)

By

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The calculation of high-energy cross sections in perturbative quantum chromodynamics (QCD) for hadronic collisions involves the factorization of long- and short-distance effects. Sensitivity to long-distance dynamics is enhanced by powers of logarithms whenever there is an incomplete cancellation of parton emission and virtual corrections. In such situations, it is useful to organize, or resum, these corrections to all orders in perturbation theory. Correspondingly, in partonic scattering or production amplitudes, it is necessary to organize poles that arise in dimensional regularization. The resummation of these poles and related logarithmic enhancements is well-understood for inclusive reactions mediated by electroweak interactions, such as the Sudakov form factor and in Drell-Yan processes. Their structure at arbitrary level is known to be determined by a handful of anomalous dimensions. The situation for QCD hard scattering processes containing four or more partons is more complex. Resummation beyond leading logarithms or poles requires a matrix of additional anomalous dimensions. These matrices are found from the renormalization of the vacuum matrix elements of products of Wilson lines, one for each external parton in the underlying process.

In this talk, we will investigate the structure of the two-loop anomalous dimension matrix. We will find that for every hard-scattering process involving only massless partons, this matrix is proportional to the one-loop matrix.

Date: May 09, 2007

Time: 10 am

Place: Math Tower, Room 6-125

Program: Physics

Dissertation Advisor: Prof. George Sterman