Contribution ID: **53** Type: **not specified**

TMD splitting functions in kT factorization and TMD parton showers

Tuesday 5 June 2018 15:05 (20 minutes)

In this talk we present two results: 1) We calculate the transverse momentum dependent gluon-to-gluon splitting function within kT-factorization, generalizing the framework employed in the calculation of the quark splitting functions in [1205.1759, 1511.08439, 1607.01507] and demonstrate at the same time the consistency of the extended formalism with previous results. While existing versions of kT factorized evolution equations contain already a gluon-to-gluon splitting function i.e. the leading order BFKL kernel or the CCFM kernel, the obtained splitting function has the important property that it reduces both to the leading order BFKL kernel in the high energy limit, to the DGLAP gluon-to-gluon splitting function in the collinear limit as well as to the CCFM kernel in the soft limit. At the same time we demonstrate that this splitting kernel can be obtained from a direct calculation of the QCD Feynman diagrams, based on a combined implementation of the Curci-Furmanski-Petronzio formalism for the calculation of the collinear splitting functions and the framework of high energy factorization. 2) We show a new calculation using off-shell matrix elements with TMD parton densities supplemented with a newly developed initial state TMD parton shower. The calculation is based on the KaTie package for automated calculation of the partonic process in high-energy factorization, making use of TMD parton densities implemented in TMDlib. The partonic events are stored in an LHE file, similar to the conventional LHE files, but now containing the transverse momenta of the initial partons. The LHE files are read in by the Cascade package for the full TMD parton shower, final state shower and hadronization from Pythia where events in HEPMC format are produced. We have determined a full set of TMD parton densities and developed an initial state TMD parton shower, including all flavors following the TMD distribution. As an example of application we have calculated the azimuthal de-correlation of high pt dijets as measured at the LHC and found very good agreement with the measurement when including initial state TMD parton showers together with conventional final state parton showers and hadronization.

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Session Classification: TMD and SCET