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Emergence of resummation scales in the evolution of the QCD strong coupling and PDFs

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The QCD strong coupling (α_s) and the parton distribution functions (PDFs) of the proton are fundamental ingredients for phenomenology at high-energy facilities such as the Large Hadron Collider (LHC). It is therefore of crucial importance to estimate any theoretical uncertainties associated to them.

Both α_s and PDFs obey their own renormalisation-group equations (RGEs) whose solution determines their scale evolution.

Although the kernels that govern these RGEs have been computed to very high perturbative precision, they are not exactly known.

In this contribution, we present a procedure that allows us to assess the uncertainty on the evolution of α_s and PDFs due to our imperfect knowledge of their respective evolution kernels.

Inspired by transverse-momentum and threshold resummation, we introduce additional scales, that we dubbed resummation scales, that can be varied to estimate the uncertainty on the evolution of α_s and PDFs at any scale.

As a test case, we consider inclusive deep-inelastic-scattering structure functions in a region relevant for the extraction of PDFs.

We study the effect of varying these resummation scales and compare it to the usual renormalisation and factorisation scale variations.

In-person participation

Yes

Primary authors: HAUTMANN, Francesco; BOZZI, Giuseppe (University of Cagliari and INFN, Cagliari); BERTONE, Valerio (CEA Paris-Sclay)

Presenter: BOZZI, Giuseppe (University of Cagliari and INFN, Cagliari)

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