

Dynamical Parton Distributions at NNLO

Thursday, July 16, 2009 4:30 PM (15 minutes)

Utilizing recent DIS measurements and Drell-Yan data we determine at NNLO (3-loop) of QCD the dynamical parton distribution functions of the nucleon generated radiatively from valencelike positive input distributions at an optimally chosen low resolution scale. These are compared with standard NNLO distributions generated from positive input distributions at some fixed and higher resolution scale. Although the NNLO corrections imply in both approaches an improved value of chi-square, present DIS data are still not sufficiently accurate to distinguish between NLO results and the minute NNLO effects of a few percent, despite of the fact that the dynamical NNLO uncertainties are somewhat smaller than the NLO ones and both are, as expected, smaller than those of their standard counterparts. The dynamical predictions for the longitudinal structure function of the proton become perturbatively stable already at $Q^2 = 2-3 \text{ GeV}^2$ where precision measurements could even delineate NNLO effects in the very small-x region. This is in contrast to the common "standard" approach but NNLO/NLO differences are here less distinguishable due to the much larger uncertainty bands.

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Session Classification: V. QCD at Colliders

Track Classification: QCD at Colliders