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Fragmentation Functions beyond Next-To-Leading Order

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With the ever increasing amount of precise data available for hadron production processes, the perturbative QCD framework is being extended to explore effects and corrections that go beyond the next-to-leading order (NLO) accuracy. Fixed order calculations at next-to-next-to-leading order (NNLO) are becoming the new necessary standard required for precision predictions and, consequently, the analysis of the non-perturbative structure of the hadron has to align to this standard. Moreover, relevant effects specific to some kinematical regions, such as the small-x and large-x regions in Semi-Inclusive electron-positron Annihilation (SIA), can be investigated through the means of resummation techniques and can be also included in the analysis of final state parton distribution functions. In this talk we present a first analysis of parton-to-pion fragmentation functions at next-to-next-to-leading order based on single-inclusive pion production in electron-positron annihilation, together with its extension to the small-x region where an all order resummation of large logarithmic contributions has to be included to further extend the lower cuts on the fit's domain.

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