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Hadronic structure at a Forward Physics Facility

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Inclusive as well as exclusive forward emissions are widely recognized as excellent channels to access the nucleon structure in the high-energy/small-x regime. Here, several phenomenological analyses have been proposed so far, this allowing us to probe kinematic ranges in the intersection corners of different approaches. At large transverse momenta, a high-energy factorization (HEF) formula is established within the Balitsky-Fadin-Kuraev-Lipatov (BKFL) formalism, where the so-called unintegrated gluon distribution (UGD) drives the gluon evolution at small-x. Recent analyses on the diffractive electroproduction of ρ mesons have corroborated the underlying assumption that the small-size dipole scattering mechanism is at work, thus validating the use of the HEF formalism. Nonetheless, a significant sensitivity of polarized cross sections to intermediate values of the meson transverse momenta, where, in the case of inclusive emissions, a description at the hand of the transverse-momentum dependent (TMD) factorization starts to be most appropriate framework, has been observed. Similar studies on emissions of quarkonium states, whose theoretical description at small-x is expected to rely also on quark dipoles of larger size, would certainly help us to shed light on the interplay between HEF and TMD formalisms. In this talk I propose to address all the considered points, showing how phenomenological analyses doable at a Forward Physics Facility can accelerate progress in our understanding of the hadronic structure at small-x. Ultimately, they trace the path toward the development of a unified formalism, where both the TMD and the BFKL evolution mechanisms are consistently integrated in the definition of small-x gluon TMD distributions.

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