TWIST-3 SPIN ASYMMETRIES AND PARTON CORRELATIONS IN HIGH-ENERGY PROCESSES

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Higher twist effects in high-energy processes are known as a power-suppressed contribution compared with the leading twist-2 contribution. For some spin-dependent processes, however, the twist-2 contribution is absent and the twist-3 term becomes a leading contribution. Transverse single spin asymmetries (SSA) observed in many semi-inclusive processes such as hadron or jet production in proton-proton collisions, $p^\uparrow p \to hX$ ($h = \pi, K, \eta$, jet, etc.), and semi-inclusive deep-inelastic scattering, $ep^\uparrow \to ehX$, are such examples in the collinear factorization in perturbative QCD. Those twist-3 effects can be represented by using relevant multi-parton (quark-gluon or purely gluonic) correlation functions which do not have probability interpretation unlike the ordinary twist-2 parton densities and fragmentation functions. Accordingly, description of SSA provides us with a unique opportunity to test theoretical frameworks for hard inclusive processes and to understand hadron structure beyond the conventional parton picture. For the last decade, the nature of the twist-3 cross sections have been understood in great detail, and there have been some clues to interpret experimental data at the world facilities such as DESY, CERN, J-Lab., and BNL-RHIC in terms of this framework. In this talk I will summarize a current status of our understanding on the twist-3 spin asymmetries.