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Monte Carlo Approach to Fragmentation Functions Using the NJL-jet Model

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The recently developed NJL-jet model provides a microscopic description of both favored and unfavored quark fragmentation functions within a Monte Carlo framework based on the the original quark-cascade hadronization picture of Field and Feynman. The effective chiral quark model of Nambu and Jona-Lasinio (NJL) has been used to calculate the input elementary hadron emission probabilities. The model has been first used to calculate the unpolarized integrated fragmentation functions of light and strange quarks to pions, kaons, vector mesons, nucleons, and antinucleons, where the employment of the Monte Carlo approach allowed for a detailed analysis of various aspects of the hadronization process, such as the influence of the vector meson production and decays on the measured pseudoscalar meson fragmentations. The model has also been extended to calculate the transverse momentum dependent fragmentation functions of both unpolarized and transversely polarized quarks, as well as the quark dihadron fragmentation functions. Moreover, using these results along with NJL calculated transverse momentum dependent unpolarized quark distributions in the nucleon, the Monte Carlo generator has been expanded to describe the unpolarized semi- inclusive deep inelastic scattering (SIDIS), and it has been used to determine the average transverse momentum squared of the produced hadrons measured in SIDIS.