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Adding quark spin effects to Pythia string fragmentation

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Being motivated mainly by the LHC physics, the currently used Monte Carlo Event Generators (MCEGs) lack of the quark spin degree of freedom in their hadronization models. In the recent years, however, the importance of quark spin related effects in hadronization such as the Collins effect has been brought to light by a vivid theoretical and experimental activity. Remarkably, global analyses of Collins asymmetries in SIDIS measured by HERMES, COMPASS and JLAB experiments and the corresponding asymmetries measured in e^+e^- annihilation to hadrons by BELLE, BABAR and BESIII experiments, have allowed for the extraction of both the transversity PDF, describing the transverse polarization of quarks in a transversely polarized nucleon, and the Collins fragmentation function, which describes the fragmentation of a transversely polarized quark in an unpolarized hadron.
To guide the interpretation of SIDIS and e^+e^- data as well as to make predictions for experiments at future facilities such as the EIC, a MCEG capable of reproducing quark spin effects in hadronization is necessary. To achieve this goal, we have started a systematic implementation of spin effects in the hadronization part of the Pythia 8 event generator for the polarized SIDIS process via the external package StringSpinner, which is publicly available. Spin effects are enabled for pseudoscalar meson production by using the string+$^3P_0$ model of polarized quark fragmentation and parametrizations of the transversity PDFs.
This talk is dedicated to a recent major development of StringSpinner which allows for the introduction of vector meson production and decay in the polarized Pythia 8 string fragmentation. After being validated, the package is used to simulate the Collins and dihadron asymmetries in SIDIS and a comparison with currently available data is shown.

In-person participation

Yes

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