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Production of light mesons at BABAR

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The clean environment of e^+e^- annihilation at the center-of-mass energy of about 10 GeV allows precise studies of several aspects of hadron production both in exclusive and inclusive processes.

Precise measurement of exclusive $e^+e^- \rightarrow$ hadrons cross sections are needed to improve the theory prediction of the muon anomalous magnetic moment, and for shedding light on the current ~ 3.5 sigma difference between the predicted and the experimental values. BABAR has an intensive program of studying hadronic cross sections in low-energy e^+e^- collisions, which are accessible with data taken near the Upsilon(4S) via initial-state radiation, and it has previously published results on a number of processes with two to six hadrons in the final state. Here, we report the results of cross section measurements in the energy region between the production threshold and about 4.5 GeV for the $\pi^+\pi^-\pi^0\pi^0$, the K^+K^- and $K^0_S K^0_L$ final states, and the first measurements for several other final states with two neutral kaons, obtained by BABAR.

Fragmentation functions, which describe the formation of final state particles from a partonic initial state and are directly related to the QCD phenomenon of confinement, can be effectively studied at a B factory via inclusive $e^+e^- \rightarrow$ hadrons processes. Precise knowledge of these functions is a key ingredient in accessing quantities such as the nucleon spin structure in semi-inclusive deep inelastic scattering and proton-proton collisions. Such mechanism entails a correlation between the transverse polarization of the fragmenting quark and the outgoing direction of the produced hadron. We report on measurements, performed by the Belle and BABAR collaborations, of the azimuthal asymmetries induced by the Collins effect in inclusive production of hadron pairs, in the $e^+ e^- \rightarrow h_1 h_2 X$ annihilation process, where h_1 and h_2 are pions or kaons produced in opposite hemispheres.

Summary

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