

HAW14-2014-000610

Abstract for an Invited Paper
for the HAW14 Meeting of
the American Physical Society

Opportunities with polarized beam & target

YOSHIYUKI MIYACHI, Yamagata University

Single spin asymmetries in Drell-Yan (DY) scattering, which are going to be measured in the present and planned polarized DY experiments, gain further insight into the internal structure of the nucleon. For the novel Sivers distribution function, the possible sign change in DY and Semi-Inclusive Deep-Inelastic-Scattering (SIDIS) may be confirmed for the first time, which is a critical test of the transverse momentum dependent (TMD) factorization in QCD, and precise information on the sea quarks, which are less sensitive in DIS, will be obtained. Since DY is one of the cleanest hard scattering processes, where no hadron fragmentation involved, it does not require information on hadron fragmentation functions (FF) to extract TMD PDF from the observed azimuthal amplitudes, where TMD PDF appears along with a corresponding FF in the case of SIDIS. Various azimuthal amplitudes of un-polarized cross section and singly-polarized or doubly-polarized cross section asymmetries in SIDIS have been measured. Double spin asymmetry in DY where beam and target are polarized is another unique tool to study TMD PDFs directly and it is a complementary measurement to SIDIS toward the complete description of the nucleon. Single spin asymmetries of the W-production cross section in the polarized proton-proton collision, recently measured at the RHIC/spin program, indicate the possible quark flavor symmetry violation in the polarized light-sea. Similar flavor asymmetry in the un-polarized light-sea, known as violation of the Gottfried sum rule, is currently studied at the on-going DY experiment SeaQuest at Fermilab. The observed flavor asymmetries can be a key to understand non-perturbative structure of the nucleon. With double spin asymmetry measurements in longitudinally polarized DY the flavor asymmetry in the polarized sea can be confirmed. In the presentation, physics cases which can be studied in doubly polarized DY and related topics will be discussed.