

Normal beam spin asymmetries during the G^0 forward angle measurement

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Abstract

The vector analyzing power measured in elastic scattering of transversely polarized electrons from an unpolarized nucleon is directly proportional to the imaginary part of the two photon exchange amplitude. There has been recent interest in explorations of the two photon exchange amplitude, as the real part has been proposed as a possible resolution of the discrepancy between Rosenbluth separation and polarization observable measurements of the ratio of the electric to magnetic proton form factor. The vector analyzing power appears in the experiment as an azimuthal asymmetry. It has been measured previously in the SAMPLE and PVA4 experiments with different kinematics than those achievable with the G^0 apparatus. As part of the systematic checks for the G^0 forward angle measurement at TJNAF, the normal beam spin asymmetry in the G^0 detector array was measured with a 3 GeV beam incident upon a liquid hydrogen target. The experimental configuration was identical to the standard G^0 forward angle running except that the beam was transversely polarized in the plane of the accelerator. The data collected covers a range in center of mass angle from 19° to 37° , with an eight-fold azimuthal symmetry. About 30 hours of data were taken in this configuration, resulting in an extracted vector analyzing power with a precision of a few ppm, which may already be able to provide some constraint on model predictions.