JLab Experiment E12-07-105

Scaling Study of the L-T Separated Pion Electroproduction Cross Section at 11 GeV

Spokespersons: T. Horn, G. Huber

The pion occupies a special role in nature. It is the lightest quark system, with a single valence quark and a single valence antiquark. It is also the particle responsible for the long range character of the strong interaction that binds the atomic nucleus together. A general belief is that the rules governing the strong interaction are left-right, i.e. chirally, symmetric. If this were true, the pion would have no mass. The chiral symmetry of massless QCD is broken dynamically by quark-gluon interactions and explicitly by inclusion of light quark masses, giving the pion mass. The pion is thus seen as the key to confirm the mechanism that dynamically generates nearly all of the mass of hadrons and central to the effort to understand hadron structure. This experiment is aimed to confirm the potential of pion measurements both for studies of the pion structure itself and of the 3D structure of the proton, in terms of spatial imaging (tomography). In particular, **E12-07-105** will probe if the measurements to map the spatial extension of the charged pion can be utilized to enable 3D spatial tomography of light quarks.

The **E12-07-105** experiment is an exclusive measurement of the L/T separated pion electroproduction cross section aimed to probe conditions for factorization of deep exclusive measurements for charged pions in GPD studies and the pion form factor. It will make precision measurements of the L/T separated pion electroproduction cross sections to the highest achievable value of Q^2 at the 12 GeV Jefferson Lab, ~9 GeV^2. Fully separated cross sections are essential for understanding dynamical effects and interpretation of non-perturbative contributions in experimentally accessible kinematics. These data will play an important role in pion form factor extractions, and may provide experimental evidence allowing for interpretation of pion production data in the handbag formalism.