NWS18-2018-000038

Abstract for an Invited Paper
for the NWS18 Meeting of
the American Physical Society

Pions and the Proton Sea[1]

MARY ALBERG, Seattle University and University of Washington

Light quark sea asymmetry, an excess of dbar quarks over ubar quarks in the proton, has been confirmed by deep inelastic scattering and Drell-Yan experiments. However, no satisfactory theoretical explanation has been proposed for the momentum dependence of the ratio dbar/ubar. New measurements of the ratio have been made by the SeaQuest experiment, and we await final results of their analysis. The pion plays an important role in nuclear physics, as the mediator of the long-range nucleon force, and as the representative of dynamical symmetry breaking. A pion cloud provides a natural explanation of the proton sea asymmetry. We make precise predictions, based on the pion cloud idea, for the final results of the SeaQuest experiment. We use light cone perturbation theory and experimental constraints on a chiral Lagrangian so that the relevant Fock-space components of the nucleon wave function are computed with reasonable accuracy. We compare our results to existing experimental information from experiment E866, and make predictions, including uncertainties, for future experimental measurements. The SeaQuest results will either confirm or rule out the idea that the pion cloud is the origin of the proton's light quark sea asymmetry.

In collaboration with Gerald A. Miller, University of Washington

[1]This work is supported by the US National Science Foundation under Grant No. 1516105, and the US Department of Energy Office of Science, Office of Nuclear Physics, under Grant No. DE-FG02-97ER-41014.