The Proton Charge Radius Experiment at JLab [1]

Haiyan Gao

Duke University and Duke Kunshan University

On behalf of the PRad Collaboration

Motivated by the desire to resolve the proton charge radius puzzle which started in 2010, the PRad experiment (E12-11-106[2]) was performed in 2016 in Hall B at Jefferson Lab, with both 1.1 GeV and 2.2 GeV unpolarized electron beams to measure the *ep* elastic scattering cross sections at very low values of four-momentum transfer squared, Q^2, ranging from 2×10^{-4} to 6×10^{-2} $(\mathrm{GeV/c})^2$ with a sub-percent precision. The proton electric form factor is then extracted from the measured cross section in order to extract the proton charge radius. The experiment utilized a calorimetric method with a high resolution calorimeter (HyCal) that is magnet free, and two large area, high spatial resolution Gas Electron Multiplier (GEM) detectors. The experiment also used a windowless H_2 gas flow target to remove typical backgrounds from target cell windows. The systematic uncertainties of the absolute *ep* elastic scattering cross sections are also controlled by the well-known Moller scattering process, which was measured simultaneously in this experiment within similar kinematics and acceptances. In this talk, details about the experiment, the data analysis as well as the results will be presented.

[1]This work is supported in part by the NSF MRI award PHY-1229153, the U.S. Department of Energy under Contract No. DE-FG02-03ER41231, the Thomas Jefferson National Accelerator Facility and Duke University.

[2]Spokespersons: D. Dutta, H. Gao, A. Gasparian (contact), M. Khandaker.