

DNP13-2013-020088

Abstract for an Invited Paper
for the DNP13 Meeting of
the American Physical Society

Investigating the charge of the proton¹

MICHAEL KOHL, Hampton University

It has been known from the beginnings of electron scattering that the electric charge of the proton is not pointlike. The elastic form factors characterize the distributions of charge and magnetization in momentum space and are important input for calculations of strong interaction phenomena and nuclear structure. With improvements in experimental techniques and higher precision, data have shown inconsistencies when analyzed in the single-photon exchange approximation, generating a large uncertainty particularly for the proton charge form factor at high momentum transfer. Previously neglected higher-order radiative corrections have been favored for an explanation. To quantify the role of two-photon exchange is the main purpose of the OLYMPUS experiment at DESY. In the static limit, the elastic charge form factor is related to the root-mean-square charge radius, which can also be determined from atomic hydrogen spectroscopy. Recent measurements of the proton charge radius from elastic electron scattering and from the Lamb shift in muonic hydrogen have generated the so-called proton radius puzzle. I will give an overview on the current data landscape and discuss present and future efforts to resolve the pending puzzles of the proton form factors and the proton charge radius.

¹Supported by NSF grant PHY-1207672 and by DOE Early Career Award DE-SC0003884