

Simulation for Proton Charge Radius (PRad) Experiment at Jefferson Lab¹

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For the PRad Collaboration

To get a better understanding of the “Proton Charge Radius Puzzle” , i.e. 7σ discrepancy between the proton charge radius from muonic hydrogen lamb shift measurements and that from the atomic hydrogen lamb shift and e-p elastic scattering measurements, the PRad experiment (E12-11-106²) was proposed and performed with 1.1 and 2.2 GeV unpolarized electron beam in Hall B at Jefferson Lab.

The experiment was aiming to extract the form factor and the charge radius of proton by simultaneously measuring e-p elastic scattering cross section and Moller cross section at very low Q^2 (2×10^{-4} to 10^{-1} GeV²) region, with sub-percent precision. One high-efficiency and high-resolution calorimeter (HyCal) and two Gas Electron Multiplier (GEM) chambers were used in the experiment. One windowless hydrogen gas flow target was used as well to better control the background.

Based on the above, this talk will present details of the simulation and background study for the PRad experiment as well as some preliminary results.

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