

Abstract Submitted
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Studying the Proton Radius Puzzle with μp Elastic Scattering¹

KATHERINE MYERS, Rutgers University, MUSE COLLABORATION — The Proton Radius Puzzle refers to the disagreement between the proton charge radius as determined from muonic hydrogen and the radius determined from atomic hydrogen level transitions and ep elastic scattering form factor data. The discrepancy of 7σ is not yet explained, and though numerous resolutions have been proposed there is no generally accepted resolution to the puzzle. The MUon proton Scattering Experiment (MUSE) Collaboration plans to simultaneously measure ep and μp scattering at the Paul Scherrer Institute, testing the interesting possibility that ep and μp scattering are different. The experiment will also measure scattering with both polarities of e and μ , directly measuring two-photon exchange effects. In scattering experiments, the proton radius comes from an extrapolation of the form factor slope at low Q^2 as $Q^2 \rightarrow 0$. We plan to measure in the kinematic region of $Q^2 = 0.002 - 0.07 \text{ GeV}^2$, and determine the relative cross sections to a few tenths of a percent. This should allow the proton radius to be extracted at the level of ~ 0.01 fm, similar to previous ep measurements. An overview and potential impact of this proposed experiment will be presented.

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