

Physics Division Seminar

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MUSEing About the Proton Radius

Host: Paul Reimer

Monday, September 18, 2017 – 203, R150, 3:30 PM

The proton radius puzzle is the difference between the radius of the proton as measured with electron scattering and atomic hydrogen spectroscopy, and that measured in muonic hydrogen. In 2010, the CREMA Collaboration published their measurement of the proton radius $R_p = 0.8409(4)$ fm, which was made by studying the Lamb shift in muonic hydrogen. Although ten times more precise than the 2010 PDG value of $R_p = (0.877 \pm 0.007)$ fm, the CREMA result is completely incompatible with it. Until that point, the PDG value had been in good agreement with both scattering and spectroscopy results.

Since 2010, there have been many theoretical and experimental efforts to try to resolve the puzzle: the CREMA collaboration have made a series of measurements in light nuclei, the PRad experiment at JLab and Initial State Radiation experiment in Mainz have sought to measure the radius at lower momentum transfer, there have been efforts at the Max Planck Institute for Quantum Optics in Munich to remeasure the hydrogen spectroscopy lines, and meanwhile many theorists have been trying to analyze the issue from multiple perspectives. A future experiment on Muon Scattering has also recently been funded by NSF (the MUon proton Scattering Experiment, MUSE).

We will review the Proton Radius Puzzle, look at how MUSE can contribute to its resolution and examine the current status of the experiment.