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The 190th HENPIC seminar by Prof. Weizhi Xiong

Title: Current Status of Proton Charge Radius Puzzle

Abstract: The proton electric charge radius (rp) is an important quantity as it characterizes the spatial distribution of the proton's charge, and is also an essential physical input for the bound-state Quantum Electrodynamics calculations for the hydrogen atomic energy levels. In 2010, an unprecedentedly precise result was obtained using a novel muonic hydrogen spectroscopy technique. Nevertheless, this result triggered the "proton charge radius puzzle" , as it was 7σ smaller than measurements from previous ep elastic scattering and ordinary hydrogen spectroscopy experiments. Despite tremendous experimental and theoretical progress since then, many issues remain unresolved, particularly in the lepton scattering field. In this talk, I will briefly review recent progress from lepton scattering experiments, with a focus on the high-precision proton charge radius experiment at Jefferson Lab (PRad). I will also introduce the recently approved PRad-II experiment, which aims to reduce the total uncertainty of rp by a factor of 4 compared to PRad. This new experiment will be able to push the precision frontier in electromagnetic interaction and contribute to new physics searches such as the violation of Lepton universality.

Summary