Method for robust extraction of proton charge radius from electron-proton-scattering experiments [1]

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A lot of efforts have been devoted to the measurements of the radius of the proton charge distribution (R), but results from different experiments and/or analyses have sizable differences. In high-precision muonic hydrogen Lamb shift experiments, R was measured to be 0.8409 ± 0.0004 fm, while typical global data analyses of the electron-proton (ep) scattering experiments yielded $R = 0.879 \pm 0.009$ fm. This difference has been known as the proton radius puzzle. Some recent global ep-scattering-data analyses found $R \approx 0.84$ fm, but the fitting methods used by them were criticized by other literature. We formulated a robust fitting method to find the "real" R in upcoming ep-scattering experiments. Comprehensive tests have been carried out using the binning and statistical uncertainties of the PRad experiment (E12-11-106[2]). In this talk, we will discuss the details of this method and present the test results.

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