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A measurement of the Lamb shift in atomic hydrogen: Towards a resolution of the proton-radius puzzle[1]

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A measurement almost a decade ago of the n=2 Lamb shift in muonic hydrogen allowed for a precise determination of the proton rms charge radius. This radius, however, showed a strong disagreement with radii determined from regular atomic hydrogen spectroscopy and electron scattering, and the disagreement has become known as the proton-radius puzzle. Here, we report on a new high-precision measurement of the atomic hydrogen n=2 Lamb shift. The measurement uses a new technique (Frequency Offset Separated Oscillatory Fields, or FOSOF), which is an innovation on the Ramsey technique. The measurement makes a precise determination of the proton charge radius, and this determination can be directly compared to the analogous determination using muonic hydrogen.

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