

## Proton Size



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### Abstract:

Proton is the primary building block of the “visible” universe, and its internal structure has been intensively studied since its discovery.

Today, we are facing to a serious confusion about its size, referred to as “Proton Radius Puzzle”. It is a big surprise to realize that we do not yet, even today, fully pin down the most basic characteristics of the proton after its first determination by R. Hofstadter half a century ago.

The proton size, the root-mean-square charge radius, has been so far determined by electron scattering, and hydrogen spectroscopy of the normal atoms as well as the muonic atoms. The latest determination of the proton radius using muons, 0.84 fm, disagrees by 4 % with one determined by electrons, 0.88 fm. Intensive discussions on possible reasons of this discrepancy, including critical reviews of past analysis of experimental data, have been going on, but the situation is not yet clear. Since one possible reason was suggested to be a non-identical nature of electron and muon in their interaction, this puzzle turned out to attract much attention in our physics community.

It is known that the radius determination from electron scattering data as well as hydrogen spectroscopy is somewhat model dependent. In order to diminish model dependence in the radius determination, we are going to carry out electron scattering under the kinematics of the lowest-ever momentum transfer at ELPH, Tohoku University. It is worth emphasizing here that ELPH is the only place in the world, where such a low-energy electron scattering experiment is possible.

In my talk, after a brief overview of “Proton Radius Puzzle”, I will discuss in details on the on-going electron-scattering project at our laboratory.