Contribution ID: **184** Type: **Oral talk (15 min + 5 min questions)**

PRECISION MEASUREMENT OF THE PROTON CHARGE RADIUS IN AN ELECTRON–PROTON SCATTERING EXPERIMENT

The project is motivated by the discrepancy (4%) between precise measurements of the proton charge rms-radius Rp = <RpE2>1/2 in the muonic hydrogen (μH atoms) Lamb shift experiments performed at Paul Scherrer Institute by the CREMA Collaboration (Rp = 0.84184(87) fm [1], Rp = 0.84087(39) fm [2]) and the radius determined in the electron–proton (ep) elastic scattering experiments: Rp = 0.879(5)stat(6)syst fm, A1 Collaboration at Mainz [3], and Rp = 0.875(10) fm, Thomas Jefferson National Accelerator Facility (Jefferson Lab) [4].
The experiment described in this project will use an innovative method allowing for detection of recoil protons and scattered electrons at low Q2 with high accuracy and resolution, thus leading to a completely new approach for extraction of the proton radius. The goal is to measure the ep differential cross sections in the Q2 range from 0.001 to 0.04 GeV2 with 0.1% relative and 0.2% absolute precision and to determine the proton radius with a sub-percent precision. An important advantage of the applied method is considerably lower radiative corrections inherent to the recoil proton method controlled, in addition, by the absolute measurement of the differential cross sections.
The experiment will be performed at the Mainz electron accelerator MAMI. This accelerator can provide an electron beam with practically ideal for this experiment parameters, as it was demonstrated in a special test runs. The proposal was approved by the MAMI Program Advisory Committee, and a special Agreement aimed at realization of this experiment was signed between PNPI and Institute for Nuclear Physics (Mainz).

1. R. Pohl et al., Nature 466, 213 (2010).
2. A. Antognini et al., Science 339, 417 (2013).
3. J.C. Bernauer et al., Phys. Rev. Lett. 105, 242001 (2010).
4. X. Zhan et al., Phys. Lett. B 705, 59 (2014).

The speaker is a student or young scientist

No

Section

1. Nuclear structure: theory and experiment

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Session Classification: Nuclear structure: theory and experiment