649th ASRC Seminar

Date：13：30 ～15：00 Tuesday, November 1

Location： 302 Meeting Room, ASRC Bldg.

Speaker：Prof. Toshimi SUDA
(Tohoku University)

Title：Precision determination of the proton charge radius by elastic electron scattering at an ultra-low Q^2 region

Abstract: The sizable difference of the proton charge radius derived from electron scattering and the Lamb-shift measurement of muonic hydrogen caused a considerable confusion in our community, and have been triggering intensive discussions about its possible reasons. The problem is not yet settled even today, and it is called as “Proton Radius Puzzle”.

In the seminar, I will discuss our project of electron scattering experiments off proton using a 60 MeV electron linac of Tohoku University. Elastic electron-scattering cross section will be measured in the lowest-ever momentum transfer region, Q^2 = 0.0003 - 0.005 $(GeV/c)^2$, and the charge form factor, $G_E(Q^2)$, is extracted by using the Rosenbluth separation technique. Since the charge radius is defined as a derivative of $G_E(Q^2)$ at $Q^2 = 0$, this project will provide the least model-dependent proton charge radius ever determined by electron scattering, which will be crucial to understand the puzzle. Such study including the Rosenbluth separation needs an energy-variable low-energy electron accelerator, and our “old“ low-energy electron linac of Tohoku University just fits the purpose.

In my talk, I will firstly review “Proton Radius Puzzle” and discuss the experimental methods so far employed to determine the proton charge radius. Then I will discuss the details of our project which is now underway at Tohoku University. Since the $G_E(Q^2)$ value changes only 1% in this Q^2 region, a key to success of this project is to control systematical uncertainties of the experimentally determined charge form factor to the level of 10^{-3}.

なお、今回のセミナーは、第54回「原子核ハドロン物理セミナー」を兼ねております。また**KEK J-PARC**素粒子原子核セミナーとの共催です。セミナー内容は

•http://silver.j-parc.jp/hadron/hadron_seminar/index.html
でご覧になれます。

＜Contact＞
Kiyoshi Tanida (81-5361)
Advanced Science Research Center