detector seminar

SPEAKER: Oleg Kiselev

TITLE: **A hydrogen-filled TPC as an active target for a proton-radius measurement at CERN**

DATE: 15 Feb 2019, 11:00

PLACE: 40-S2-A01 - Salle Anderson

ABSTRACT

The physics of the proton as the charged nuclear building block of matter is at the core of interest in the quest for understanding nature. We plan to construct a prototype of the active target detector for the μ-p elastic scattering experiment at the COMPASS facility at CERN, aiming at a measurement of the proton radius with about a factor 10 smaller uncertainty on the electromagnetic corrections compared to electron scattering, and thus contributing to solve the so-called „proton radius puzzle“. The application of an active target technology in particle and nuclear physics attracted high attention in recent years due to the difference to a classical TPC, i.e. the detector gas also serves as the reaction target. A reaction can occur anywhere within the detector's active volume and these reactions can be measured over a broad range of energies for many types of beam. The vertex of the reaction and the parameters of the recoil particles can be determined on an event-by-event basis with very high efficiency and solid angle coverage, and with very low energy thresholds. We propose the usage of a high-pressure hydrogen-filled ionization chamber that has no gaseous amplification, leading to the best possible energy resolution is a key feature of the detection setup.The measurement of the proton radius is done via muon-proton scattering. Last year, a test experiment with a small-size active target prototype has been performed, demonstrating the feasibility of the proposed experiment. The experimental concept of the future experiment and few preliminary results of the test experiment 2018 will be presented. Details of other active targets together with the experimental results using those detectors will be shown as well.

Organised by: Burkhard Schmidt