International Conference on Exotic Atoms and Related Topics and conference on Low Energy Antiprotons (EXA/LEAP 2024)



Contribution ID: 29

Type: not specified

Towards Lamb shift spectroscopy of antihydrogen atoms at the GBAR beam line

Tuesday 27 August 2024 14:00 (25 minutes)

We have proposed a spectroscopic study of antihydrogen (H) Lamb shift using a neutral antiatomic beam at keV energies. Direct spectroscopy of the n = 2 Lamb shift transition of H atoms would enable the first measurement of the antiproton (\bar{p}) charge radius. Recently, the GBAR experiment demonstrated the production of 6.1 keV H atoms via a charge exchange reaction of \bar{p} passing through a positronium cloud, which can be utilized for Lamb shift spectroscopy. An experimental setup has been developed for the GBAR experiment.

The spectrometer comprises two consecutive microwave (MW) apparatuses and a Lyman- α photon detector. Each MW apparatus has a pair of parallel plate electrodes surrounded by a box to induce the Lamb shift transition. The detector counts the remaining 2S state H atoms.

We present the development of MW apparatuses, their MW characteristics, and their commissioning using hydrogen atoms. Further, we discuss the expected precision in the Lamb shift spectroscopy for H atoms.

Author: TANAKA, T. A. (Institute of Physics, The University of Tokyo)

Co-authors: OHAYON, B. (The Helen Diller Quantum Center, Department of Physics, Technion-Israel Institute of Technology); REGENFUS, C. (Institute for Particle Physics and Astrophysics, ETH Zürich); JANKA, G. (Laboratory for Muon Spin Spectroscopy, Paul Scherrer Institute); TANAKA, K. S. (Research Institute for Science and Engineering, Waseda University); KURODA, N. (Institute of Physics, The University of Tokyo); BLUMER, P. (Institute for Particle Physics and Astrophysics, ETH Zürich); TSUKIDA, R. (Institute of Physics, The University of Tokyo); HIGUCHI, T. (Institute for Integrated Radiation and Nuclear Science, Kyoto University)

Presenter: TANAKA, T. A. (Institute of Physics, The University of Tokyo)

Session Classification: Parallel I