Contribution ID: **71** Type: **Oral Presentation**

Microwave Spectroscopy of the Antiprotonic He-3 Hyperfine Structure

Monday, September 5, 2011 12:00 PM (20 minutes)

Antiprotonic helium is a neutral exotic atom, consisting of a helium nucleus, an electron and an antiproton. The interactions of the angular momenta and spins of these constituents cause a splitting within the principle states. The spin magnetic moment of the antiproton can be determined by comparing the measured hyperfine transition frequencies with three-body quantum electrodynamics (QED) calculations.
In 2009, for the first time these measurements were carried out with a state of antiprotonic He-3. Due to the helium nuclear spin, antiprotonic He-3 has a more complex hyperfine structure than antiprotonic He-4. Thus a comparison between theoretical calculations and the experimental results will provide a more stringent test of the theory. Two out of four super-super-hyperfine (SSHF) transition lines of the (n,L)=(36,34) state were observed. The measured frequencies of the individual transitions were in agreement with the current theoretical values within their estimated errors. The frequency difference between the two measured transitions also agrees with theoretical calculations. However, the experimental error for this difference which is crucial to be determined due to its proportionality to the antiproton magnetic moment is still very large compared to theory. Further measurements shall improve the statistics and thus reduce this discrepancy.

References:
S. Friedreich et al., Phys. Lett. B, 700 (2011) 1.
T. Pask et al., Phys. Lett. B, 678 (2009) 6.

Primary author: Ms FRIEDREICH, Susanne (SMI Vienna)

Co-authors: Mr DAX, Andreas (Department of Physics, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan); Ms S\'OT\'ER, Anna (Max-Planck-Institut f\"{u}r Quantenoptik, Hans-Kopfermann-Strasse 1, D-85748 Garching, Germany); Mr JUH\'ASZ, Bertalan (Stefan Meyer Institute for Subatomic Physics, Austrian Academy of Sciences, Boltzmanngasse 3, A-1090 Vienna, Austria); Mr BARNA, D\'aniel (Department of Physics, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan; KFKI Research Institute for Particle and Nuclear Physics, H-1525 Budapest, PO Box 49, Hungary); Mr HORV\'ATH, Desz\"o (KFKI Research Institute for Particle and Nuclear Physics, H-1525 Budapest, PO Box 49, Hungary; Institute of Nuclear Research of the Hungarian Academy of Sciences, H-4001 Debrecen, PO Box 51, Hungary); Mr WIDMANN, Eberhard (Stefan Meyer Institute for Subatomic Physics, Austrian Academy of Sciences, Boltzmanngasse 3, A-1090 Vienna, Austria); Mr CASPERS, Fritz (CERN, CH-1211 Geneva, Switzerland); Mr ZMESKAL, Johann (Stefan Meyer Institute for Subatomic Physics, Austrian Academy of Sciences, Boltzmanngasse 3, A-1090 Vienna, Austria); Mr TODOROKI, Koichi (Department of Physics, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan); Mr HORI, Masaki (Department of Physics, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan; Max-Planck-Institut f\"{u}r Quantenoptik, Hans-Kopfermann-Strasse 1, D-85748 Garching, Germany); Mr MASSICZEK, Oswald (Stefan Meyer Institute for Subatomic Physics, Austrian Academy of Sciences, Boltzmanngasse 3, A-1090 Vienna, Austria); Mr HAYANO, Ryugo (Department of Physics, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan); Mr KOBAYASHI, Takumi (Department of Physics, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan)

Presenter: Ms FRIEDREICH, Susanne (SMI Vienna)

Session Classification: 20 Years of Antiprotonic Helium

Track Classification: 20 Years of Antiprotonic Helium