EP Seminar

SPEAKER: Stefan Ulmer

TITLE: **Challenging the Standard Model: High-Precision Comparisons of the Fundamental Properties of Protons and Antiprotons**

DATE: 20 Feb 2018, 11:00

PLACE: 503-1-001 - Council Chamber

ABSTRACT

The Baryon Antibaryon Symmetry Experiment (BASE-CERN) at CERN's antiproton decelerator facility is aiming at high-precision comparisons of the fundamental properties of protons and antiprotons, such as charge-to-mass ratios, magnetic moments and lifetimes. Such experiments provide sensitive tests of the fundamental charge-parity-time invariance in the baryon sector. BASE was approved in 2013 and has measured since then, utilizing single-particle multi-Penning-trap techniques, the antiproton-to-proton charge-to-mass ratio with a fractional precision of 69 p.p.t. [1], as well as the antiproton magnetic moment with fractional precisions of 0.8 p.p.m. and 1.5 p.p.b., respectively [2]. At our matter companion experiment BASE-Mainz, we have performed proton magnetic moment measurements with fractional uncertainties of 3.3 p.p.b. [3] and 0.3 p.p.b. [4]. By combining the data of both experiments we provide a baryon-magnetic-moment based CPT test gpbar/gp = 1.000 000 000 2(15), which improves the uncertainty of previous experiments by more than a factor of 3000 [5]. A unique antiproton reservoir trap used in BASE, furthermore allows us to set constraints on directly measured antiproton lifetime. Our current value tp>10.2a improves previous best limits by a factor of 30 [6]. In this talk I will review the achievements of BASE and will give an outlook on our future physics program. [1] S. Ulmer et al., Nature 524, 196 (2015). [2] C. Smorra et al., Nature 550, 371 (2017). [3] A. Mooser et al., Nature 509, 596 (2017) (2014). [4] G. Schneider et al., Science 358, 1081 (2017). [5] J. DiSciacca et al., Phys. Rev. Lett. 110, 130801 (2013). [6] S. Sellner et al., New. J. Phys. 19, 083023 (2017).

Organised by: M. Pepe-Altarelli, G. Unal..... **Refreshments will be served at 10h30**