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## High-Precision Comparisons of the Fundamental Properties of Protons and Antiprotons at BASE

Monday, 11 June 2018 17:00 (30 minutes)

The Baryon Antibaryon Symmetry Experiment (BASE-CERN) at CERN's antiproton decelerator facility conducts high-precision comparisons of the fundamental properties of protons and antiprotons, such as their charge-to-mass ratios, magnetic moments and lifetimes. These experiments provide sensitive tests of charge-parity-time (CPT) invariance in the baryon sector. BASE was approved in 2013 and has since used single-particle multi-Penning-trap techniques to measure the antiproton-to-proton charge-to-mass ratio with a fractional precision of 69 p.p.t. [1]. The antiproton magnetic moment has been measured with a fractional precision of 0.8 p.p.m. [2] and subsequently at the level of 1.5 p.p.b. [3]. At our matter companion experiment BASE-Mainz, we have performed proton magnetic moment measurements with fractional uncertainties of 3.3 p.p.b. [4] and 0.3 p.p.b. [5]. By combining the data of both experiments we provide a baryon-magnetic-moment based CPT test  $g_{\bar{p}}/g_p = 1.0000000002(15)$ , which improves the uncertainty of previous experiments by more than a factor of 3000 [6]. In this talk I will review the achievements of BASE, focusing on the antiproton-to-proton charge-to-mass ratio and magnetic moment measurements conducted at BASE-CERN.

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- [2] H. Nagahama *et al.*, Nat. Commun. **8**, 14084 (2017).
- [3] C. Smorra *et al.*, Nature **550**, 371 (2017).
- [4] A. Mooser *et al.*, Nature **509**, 596 (2014).
- [5] G. Schneider *et al.*, Science **358**, 1081 (2017).
- [6] J. DiSciaccia *et al.*, Phys. Rev. Lett. **110**, 130801 (2013).

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