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Challenging the Standard Model by High-Precision Comparisons of the Fundamental Properties of the Antiproton and the Proton

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The Standard Model (SM) is the theory that describes Nature's particles and fundamental interactions, although without gravitation. However, this model is known to be incomplete which inspires various searches for new physics. Among them are tests of charge, parity, time (CPT) invariance that compare the fundamental properties of matter/antimatter conjugates at lowest energy and with greatest precision. The BASE collaboration [1] at the antiproton decelerator of CERN targets high-precision comparisons of the fundamental properties of antiprotons and protons, namely, charge-to-mass ratios and magnetic moments. To perform these tests we have developed an advanced Penning trap spectrometer which enabled the most precise measurement of the proton magnetic moment with a fractional precision of 3.3 parts in a billion [2], the most precise comparison of the proton-to-antiproton charge-to-mass ratio, with a fractional precision of 69 parts in a trillion [3], as well as the most precise measurement of the magnetic moment of the antiproton [4]. Recent improvements in the stability of the apparatus demonstrate the feasibility to improve this test by at least a factor of 100. In the talk I will summarize our most recent results and give an overview on the future perspectives of BASE. [1] C. Smorra *et al.*, *Eur. Phys. Journ. Spec. Top.* 224, 16 (2015). [2] A. Mooser *et al.*, *Nature* 509, 596 (2014). [3] S. Ulmer *et al.*, *Nature* 524, 196 (2015). [4] H. Nagahama *et al.*, *Nature Comms.* 8, 14084 (2017).

¹on behalf of the BASE collaboration