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Testing CPT using low energy antiprotons

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According to the CPT theorem, physics laws are unchanged under the simultaneous inversion of charge (C), parity (P) and time (T). Since many of candidate theories for unifying gravity and the standard model include effects that violate assumptions for the CPT theorem, such as curved spacetime, nonpointlike interactions and unitarity violation through decoherence, it is important to experimentally test CPT to the highest possible precision. Since the 1s-2s two-photon laser spectroscopy and the ground-state hyperfine splitting microwave spectroscopy of atomic hydrogen have already been carried out respectively to 10^{-14} and 10^{-12} relative precision, high-precision comparison of hydrogen and antihydrogen will be one of the most sensitive CPT tests. For the 1s-2s experiment, we need to make cold antihydrogen atoms in the ground state so that they can be trapped in a magnetic trap. For the hyperfine splitting measurement, a slow antihydrogen beam must be produced. At present, even though antihydrogen atoms can be routinely produced at CERN's antiproton decelerator (AD) at a rate of some 100 Hz, the produced anti-atoms are neither in the ground state nor cold enough to be useful for spectroscopy. Current status and future directions are discussed. I will also discuss the status of high-precision laser spectroscopy of antiprotonic helium atoms ($barp - e^-$−He), which now offers the best baryonic CPT test.