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Antihydrogen and fundamental physics

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Detailed comparisons of anti-hydrogen with hydrogen promise to be a fruitful test bed of fundamental symmetries such as the CPT Theorem for quantum field theory or studies of gravitational influence on antimatter. With a string of recent successes, starting with the first trapped anti-hydrogen and recently resulting in the first measurement of a quantum transition in anti-hydrogen, the ALPHA collaboration is well on its way to perform such precision comparisons.

We will discuss the key innovative steps that has made these feats possible and in particular focus on the detailed work on positron and antiproton preparation to achieve anti-hydrogen cold enough to trap as well as the unique features of the ALPHA apparatus that has allowed the first quantum transitions in anti-hydrogen to be measured with only a single trapped anti-hydrogen atom per experiment. We will also look at how ALPHA plans to step from here towards more precise comparisons of matter and antimatter and what we could possibly learn from such comparisons.

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