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Fundamental Physics with the ALPHA Antihydrogen Project at CERN

Monday 25 August 2014 18:00 (30 minutes)

ALPHA is an international project at CERN, whose ultimate goal is to test symmetry between matter and anti-matter at highest possible precision via comparisons of the properties of atomic hydrogen with its antimatter counter-part, antihydrogen. After several years of development, we recently achieved significant milestones, including the first stable confinement of antihydrogen [1] for as long as 1000 seconds [2]. ALPHA has also succeeded in performing the first proof-of-principle spectroscopic measurement on antihydrogen atoms by driving its hyperfine transitions with microwaves [3]. Most recently, we reported a precision measurement of charge neutrality of antihydrogen, setting a new limit of the electric charge of the positron [4]. Moreover, we have recently constructed an entirely new apparatus, ALPHA-2, which will allow laser access to the trapped anti-atoms, and provide improved magnetic field configurations for microwave spectroscopy. For the longer-term, possibilities for a measurement of antimatter-gravity interactions are being explored. This talk will discuss the recent achievements and the future prospects of fundamental physics studies with ALPHA.

References : [1] G. B. Andresen et al., Nature 468, 673 (2010). [2] G.B. Andresen et al., Nature Physics 7, 558 (2011). [3] C. Amole et al., Nature (London) 483, 439 (2012). [4] C. Amole et al. Nature Communications 5, 3955 (2014).

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