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Casting Light on Antimatter: Fundamental Physics with the ALPHA Antihydrogen Project at CERN¹
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ALPHA is an international project at CERN, whose ultimate goal is to test symmetry between matter and antimatter 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 a spectroscopic measurement on antihydrogen atoms by driving its hyperfine transitions with microwaves [3]. 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 [4]. This talk will discuss the recent achievements and the future prospects of fundamental physics studies with ALPHA.

[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 483, 439 (2012).

[4] C. Amole et al. Nature Comm. 4, 1785 (2013).

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