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## The GBAR experiment: Gravitational behaviour of antihydrogen at rest and a measurement of the antihydrogen Lamb shift

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Antihydrogen is a blossoming field of research which studies aim to shed light on the observed baryon/antibaryon asymmetry in the Universe. The GBAR project (Gravitational Behaviour of Antihydrogen at Rest) at CERN aims to measure the free fall acceleration of ultracold neutral antihydrogen atoms in the terrestrial gravitational field. The experiment consists of preparing antihydrogen ions in a two-step charge exchange reaction and sympathetically cooling them with Be<sup>+</sup> ions to less than 10  $\mu$ K. The ultracold ions will then be photo-ionized just above threshold and the free fall time over a known distance, in a first phase at a level of 1%, measured. The antihydrogen atoms produced as a byproduct of the charge exchange reaction will be parasitically used to measure the Lamb shift of antihydrogen at a precision of 100 ppm and determining for a first time the antiproton charge radius at a level of 10%. The experimental setups and the current status will be presented.

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