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Observation of gravitational free-fall of antimatter with ALPHA-g at CERN and future development with HAICU at TRIUMF

Monday 27 May 2024 16:15 (30 minutes)

The goal of the ALPHA experiment at CERN is to perform high precision comparison between antihydrogen and hydrogen to test the fundamental symmetries that underpin the Standard Model and General Relativity. For decades, there have been many speculations about the gravitational behaviour of antimatter. The ALPHA collaboration has developed the ALPHA-g apparatus to measure the gravitational acceleration of antihydrogen. We have recently shown, directly for the first time, that the antihydrogen gravitational acceleration is compatible with the corresponding value for hydrogen [Nature 621, 716 (2023)]. To push antihydrogen research into an entirely new regime, new techniques, such as anti-atomic fountains and anti-atom interferometers, must be developed. The HAICU experiment at TRIUMF in Vancouver aims to use laser-cooled hydrogen atoms [Nature 592, 35 (2021)] to do just that. In this talk, we will report our first measurement on antihydrogen gravity with ALPHA-g and discuss the status of development towards an atomic hydrogen fountain and atomic hydrogen interferometer with HAICU.

Keyword-1

Fundamental Symmetries

Keyword-2

Gravity

Keyword-3

Antihydrogen

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