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Fundamental studies by laser spectroscopy of antiprotonic helium atoms

Thursday, 6 September 2018 14:00 (20 minutes)

The ASACUSA collaboration at CERN's Antiproton Decelerator has precisely measured the atomic transition frequencies of antiprotonic helium by laser spectroscopy. These three-body exotic atoms are each composed of a normal helium nucleus, and electron, and an antiproton. They constitute baryon-antibaryon bound states with the longest known lifetime. The experiments involved cooling 2 billion atoms to temperature 1.5-1.7 K by employing gas buffer cooling in a cryogenic helium gas target. By comparing the results with QED calculations, the antiproton-to-electron mass ratio was determined as 1836.1526734(15). This agreed with the proton-to-electron mass ratio of 8x10^-10. The spectroscopic data has also recently been used to set experimental limits on any hypothetical fifth force at the 1 Angstrom length range.

Selected session

Fundamental Symmetries and Interactions

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