Contribution ID: **1166** Type: **Oral (Non-Student) / orale (non-étudiant)**

Improved limit on the charge of antihydrogen

Thursday, 16 June 2016 13:30 (15 minutes)

Cold atoms of antihydrogen present a unique opportunity to study the properties of atomic antimatter, and via comparisons with its well-studied matter counterpart, the possibility to test fundamental symmetries such as CPT invariance. In order to probe matter-antimatter symmetry at the highest possible precision, it is essential that the anti-atoms be suspended in vacuum to allow for detailed interrogation via laser light or microwaves.

The ALPHA experiment, performed at the CERN AD, has trapped upward of 1000 antihydrogen atoms since 2010. This presentation will describe the physics measurement that we have performed with some of these atoms to study their charge neutrality. By applying stochastic acceleration to trapped antihydrogen atoms, we determine an experimental bound on the antihydrogen charge, Qe, of $|Q| < 0.71$ parts per billion (one standard deviation), in which e is the elementary charge. This bound is a factor of 20 lower than was determined from the best previous measurement. I will also offer an outlook towards the spectroscopic studies being attempted using the new ALPHA2 trap that we have commissioned.

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Session Classification: R2-3 Testing Fundamental Symmetries II (PPD-DNP-DTP) / Tests de symétries fondamentales II (PPD-DPN-DPT)

Track Classification: Nuclear Physics / Physique nucléaire (DNP-DPN)