Contribution ID: **51** Type: **Hot Topic**

Using sympathetically laser cooled positrons for improved antihydrogen trapping

Wednesday, 15 January 2020 12:15 (15 minutes)

The ALPHA colaboration has recently demonstrated laser and microwave spectroscopy of several different transitions in the antihydrogen atom. Since we typically trap around only twenty antihydrogen atoms per experimental cycle, in these experiments we choose to accumulate hundreds of antihydrogen atoms over time scales ranging from tens of minutes to many hours in order to have a sufficient number of antihydrogen atoms for a given measurement. These long experimental runs limit the number of experiments that can be performed, especially due to our finite allocation of the antiproton beam.
To increase the rate of data aquisition, and potentially the precision of future spectroscopic measurements, we are currently working towards increasing the antihydrogen trapping rate. The positron temperature is thought to play a vital role in both the rate of antihydrogen formation, and on the trapping rate of antihydrogen. Currently, positrons that we use for antihydrogen synthesis reach a temperature of around 30K. By lowering the positron temperature, significantly more antihydrogen atoms should be trapped.
We propose sympathetically cooling the positrons using laser cooled beryllium ions, 9Be+, a technique that has previously been demonstrated. Simulations in ALPHA have shown that the temperature of the positrons could potentially be reduced to less than 5K if cooling is maintained during antihydrogen formation. We have recently demonstrated trapping and laser cooling of beryllium ions, using an ion source which was designed to operate under the significant constraints imposed by the ALPHA apparatus. We are currently performing experiments where we mix the laser cooled ions with positrons and will present our latest results towards sympathetic cooling.

Primary authors: JONES, Jack Mccauley (Swansea University (GB)); MAXWELL, Daniel Thomas (Swansea University (GB)); MADSEN, Niels (Swansea University (GB)); PESZKA, Joanna (Swansea University (GB))

Presenter: JONES, Jack Mccauley (Swansea University (GB))

Session Classification: Antimatter 1

Track Classification: Antimatter