ASACUSA: Atomic Spectroscopy And Collisions Using Slow Antiprotons

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on behalf of the ASACUSA Collaboration

The Low Energy Antiproton Ring (LEAR) at CERN was closed in 1996. In order to supply 100 MeV/c antiproton pulses for trapping experiments a new facility is being built this year at CERN, the Antiproton Decelerator (AD). CERN has approved three AD experiments so far: ATHENA and ATRAP for antihydrogen production and spectroscopy and ASACUSA (Atomic Spectroscopy And Collisions Using Slow Antiprotons).

ASACUSA is proposed by a collaboration of 50 scientists of CERN and Denmark, Germany, Hungary, Ireland, Japan, Switzerland and the UK. It is mainly based on the results on two previous LEAR experiments: PS194 studied the complex collisional processes leading to the atomic capture of antiprotons in matter and PS205 measured antiprotonic transitions in the antiproton-helium-electron three-body exotic system using resonant laser spectroscopy. The ASACUSA program is composed of these two interconnected lines of research.

In the first year using the 5.8 MeV beam of the AD we shall extend the laser spectroscopy of PS205 to higher resolution studies with special attention to the influence of surrounding atoms and molecules and to measuring the hyperfine splitting in $\bar{p}\text{He}^+$ via laser + microwave resonances. In 2000 using the 100 keV antiprotons of our RFQ post-decelerator we shall start studying the energy loss and channelling of slow antiprotons in low density matter and also measure the *primordial* (n, ℓ) distribution of $\bar{p}\text{He}^+$ immediately after formation. Finally, we shall install a Penning trap after the RFQ in order to study single collisions and to obtain an extracted ultra-slow beam for measuring Langevin and ionization cross sections, exotic atom formation and for $p\bar{p}$ spectroscopy.

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