Antiproton-nucleus annihilation at very low energies down to capture

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ABSTRACT

The dynamics of the antiproton-nucleus interaction and the structure of the nucleus appear to affect in an unexpected way the behavior of the $\bar{p}A$ annihilation cross section (σ_{ann}) at low energies. Antiproton annihilation on light nuclei at momenta below 100 MeV/c seems to be very weakly dependent on the mass of the target nucleus against any naive expectation of a scaling law with the number of nucleons in the target. A set of measurements of antiproton-proton and antiproton-nucleus annihilation and of widths and shifts of antiprotonic atoms, together with several model analyses have demonstrated that huge saturation effects dominate the $\bar{p}$ -nucleus interaction, both in the negative energy bound state domain and in the positive energy reaction sector. Measurements of the total annihilation cross sections for antinucleons on light nuclei are also relevant for fundamental cosmology. Moreover in presence of more complete sets of data, well-tested few-body techniques exist that would permit to relate data on light nuclei to subnuclear interactions (at least in the case of D, ^{3}He and ^{4}He). The recent results on deeply bound meson-nuclear states reinforce for a better knowledge on inelastic $\bar{p}$ reactions in these elements.