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Sympathetic cooling of antiprotons with laser cooling of molecular anions JULIAN FESEL, CHRISTIAN ZIMMER, CERN, European Laboratory for Particle Physics, 1211 Geneva, Switzerland, PAULINE YZOMBARD, DANIEL COMPARAT, Laboratoire Aime Cotton, CNRS, Universite Paris-Sud, 91405 Orsay, France , MICHAEL DOSER, CERN, European Laboratory for Particle Physics, 1211 Geneva, Switzerland — Molecular anions play a central role in a wide range of fields: from atmospheric and interstellar science, anionic superhalogens to the chemistry of highly correlated systems. However, up to now the synthesis of negative ions in a controlled manner at ultracold temperatures relevant for the processes in which they are involved is currently limited to a few kelvin by supersonic beam expansion followed by resistive, buffer gas or electron cooling in cryogenic environments. We present a realistic scheme for the laser cooling of C2- molecules to subkelvin temperatures, which has been so far only achieved for neutral diatomics. The generation of a pulsed source of C2- and the subsequent laser cooling techniques of C2- confined in a Penning trap are reviewed. Further, laser cooling one anions species would allow to sympathetically cool other molecular anions, electrons and antiprotons that are confined in the same trapping potential. The latter are especially relevant for the potential generation of ultracold antihydrogen atoms for precision experiments of the WEP and spectroscopy for CPT symmetry tests. In this presentation the status of the experiment and the feasibility of C2- sympathetic Doppler laser cooling, photo-detachment cooling and AC Stark Sisyphus cooling will be reviewed.

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