Sympathetic cooling of trapped ions for high resolution spectroscopy

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Abstract

The overall goal of our experiment is to yield a direct measurement of the fundamental constant the proton to electron mass ratio
μpe and to test the theory of QED. In order to determine μpe we plan to measure a ro-vibrational Doppler-free two-photon transition (v=0,L=2 to v=1,L=2)
in the the molecular hydrogen H2+.
The precision of the measurement is limited by the second order Doppler effect. In order to reduce the second order Doppler effect
the H2+ ions need to be trapped and cooled. Since molecular ions cannot be directly laser-cooled, sympathetic cooling via
laser-cooled Be+ ions was implemented.
In this talk I will first present an overview of the planned experiment and then the work that has been done in order to trap and
cool Be+. Thereafter I will present first results in the form of Coulomb crystals and I will finish by discussing the future of our
experiment.

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