Contribution ID: **30** Type: **not specified**

Enhancing the control over the ion energy in a hybrid atom-ion experiment

We investigate the interaction of a laser-cooled trapped ion ($^{138}Ba^+$, $^{87}Rb^+$ or $^{87}Rb_2^+$) with an ultra-cold cloud of optically confined ^{87}Rb atoms. The ion is held in a linear Paul trap and is immersed in the center of the cold atomic cloud.
By controlling a set of parameters, like changing the micromotion energy, we can manipulate the atom-ion collisions and investigate elastic and inelastic collision phenomena. Using the cold atom gas we can achieve sympathetic cooling of the $^{138}Ba^+$ to sub-Doppler temperatures (sub mK).
To be able to measure the energy after collisions precisely we are setting up a resolved sideband system for the $^{138}Ba^+$ ion which I will present.
Another project is to implement a dipole trap at 493 nm for the $^{138}Ba^+$ ion and to switch off the Paul trap during the atom ion interaction in order to remove the micromotion completely.

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