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Ultracold collisions between Rb atoms and a Sr$^+$ ion TOMAS
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ence, Rehovot, Israel — In last decade, a novel field emerged, in which ultracold
atoms and ions in overlapping traps are brought into interaction. In contrast to the
short ranged atom-atom interaction which scales as $r^{-6}$, atom-ion potential persists
for hundreds of $\mu$m's due to its lower power-law scaling - $r^{-4}$. Inelastic collisions
between the constituents lead to spin and charge transfer and also to molecule for-
mation. Elastic collisions control the energy transfer between the ion and the atoms.
The study of collisions at the $\mu$K range has thus far been impeded by the effect of
the ion's micromotion which limited collision energy to mK scale. Unraveling this
limit will allow to investigate few partial wave and even S-wave collisions. Our sys-
tem is capable of trapping Sr$^+$ ions and Rb and Sr atoms and cooling them to their
quantum ground state. Atoms and ions are trapped and cooled in separate cham-
bers. Then, the atoms are transported using an optical conveyer belt to overlap
the ions. In contrast to other experiments in this field where the atoms are used
to sympathetic cool the ion, our system is also capable of ground state cooling the
ion before immersing it into the atom cloud. By this method, we would be able to
explore heating and cooling dynamics in the ultracold regime.

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