Abstract Submitted
for the DAMOP07 Meeting of
The American Physical Society

Electric-Field-Induced Feshbach Resonances in Ultracold Alkali Metal Mixtures ZHIYING LI, ROMAN KREMS, University of British Columbia — It is shown that the scattering length of alkali metal atoms in ultracold binary mixtures can be effectively modified by dc electric fields of $\sim$ 30 - 100 kV/cm. The mechanism of electric-field-control of ultracold collisions is based on the interaction of the instantaneous dipole moment of the collision complex with external electric fields. This interaction is dramatically enhanced near p-wave scattering resonances. We present a detailed analysis of Feshbach resonances in ultracold collisions of Li and Cs atoms in the presence of superimposed electric and magnetic fields. We show that the electric-field couplings between s- and p-wave collision channels may not only induce electric-field resonances, but also shift the positions of s-wave magnetic resonances, thereby making the electric field control of ultracold atoms possible even far away from p-wave resonances. In addition, we demonstrate that electric fields may rotate and spin up the collision complex of ultracold atoms at substantial rates leading to anisotropic ultracold scattering. Finally, we explore the effect of the relative orientation of magnetic and electric fields on collision dynamics near Feshbach resonances. References: R. V. Krems, Phys. Rev. Lett. 96, 123202 (2006); Z. Li and R. V. Krems, Phys. Rev. A (2007) (in press).

Zhiying Li
University of British Columbia

Date submitted: 26 Jan 2007 Electronic form version 1.4