

Abstract Submitted
for the DAMOP09 Meeting of
The American Physical Society

Multichannel quantum-defect theory of ultracold atom-ion collisions ZBIGNIEW IDZIASZEK, University of Warsaw (Poland), TOMMASO CALARCO, University of Ulm (Germany), PAUL JULIENNE, NIST (USA), ANDREA SIMONI, Universite de Rennes 1 (France) — We study atom-ion scattering in the ultracold regime. To this aim, an analytical model based on the multichannel quantum defect formalism is developed and compared to close-coupled numerical calculations. We apply our model to the specific systems of $^{40}\text{Ca}^+ - \text{Na}$ and $^{138}\text{Ba}^+ - ^{87}\text{Rb}$, and investigate the occurrence of magnetic Feshbach resonances. The presence of several resonances at experimentally accessible magnetic fields should allow the atom-ion interaction to be precisely tuned. A fully quantum-mechanical study of charge exchange processes shows that charge-exchange rates should remain small even in the presence of resonance effects. Most of our results can be cast in a system-independent form and are important for the realization of the charge-neutral ultracold systems.

Zbigniew Idziaszek
University of Warsaw

Date submitted: 23 Jan 2009

Electronic form version 1.4