Abstract Submitted
for the DAMOP13 Meeting of
The American Physical Society

Controlling ultracold chemical reactions via Rydberg-dressed interactions[1] JIA WANG, JASON BYRD, ION SIMBOTIN, ROBIN CÔTÉ, Department of Physics, University of Connecticut, Storrs, Connecticut 06269, USA
— Chemical reactions in the cold and ultracold temperature regimes are sensitive to the long-range interaction between reactants. This is especially the case when there is a weakly bound state near the collision threshold. Altering the long-range potential provides a tool to control the chemical reaction by shifting the position of near threshold bound states. In this work, we study the effect of Rydberg-dressing a reactant, which can be accomplished experimentally by weakly coupling its ground state to a Rydberg state using a strongly detuned laser. This leads to an enhancement in the effective polarizability of the reactant and hence a modification of the long-range interaction. We theoretically investigate this effect in the benchmark system H_2+D, and carry out a full quantum mechanical scattering calculation for the reaction rates.

[1]Partially supported by the US Department of Energy Office of Basic Sciences.

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Date submitted: 30 Jan 2013 Electronic form version 1.4