Abstract Submitted for the DAMOP15 Meeting of The American Physical Society

Laser assisted charge transfer in the realm of cold collisions
ALEXANDER PETROV, CONSTANTINOS MAKRIDES, SVETLANA KOTOCHIGOVA, Temple University — We study two colliding particles, Ca and Yb\(^+\), which can undergo non-radiative charge-exchange transitions from the scattering continuum in the excited \(A^2Σ^+\) state to the continuum of the ground \(X^2Σ^+\) state. This reaction can be controlled by linearly-polarized laser radiation of frequency \(\omega\), which is in the range of quasi-molecular electronic energy separation. Using the dressed-state picture or the Floquet Ansatz we construct coupled time-independent Schrödinger equations for the interatomic separation \(R\). The mechanism of electromagnetic field control is based on an interplay between intra-molecular couplings and molecule-field interactions. We show that laser field affects the chemical reaction through reversible modification of an effective Hamiltonian via either non-resonant temporal Stark shifts or resonant “dipolar” interactions, leading to both transient- and cw-light-induced non-adiabatic charge transfer. We investigate these processes for various collision energies as well as over a wide range of laser intensities and frequencies.

\(^1\)Research at Temple University is supported by MURI-ARO (W911NF-14-1-0378) and NSF (No. PHY-1308573) grants

Svetlana Kotochigova
Temple University

Date submitted: 28 Jan 2015
Electronic form version 1.4