Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Stable states in a strong IR field CHANGCHUN ZHONG, FRANCIS ROBICHEAUX, Purdue Univ — It is found that 10% of atoms stay in the quasi-stable states after being exposed to intense laser or microwave (MW) pulses, even though the pulses' intensity is much stronger than that needed for static fields ionization. The reason why atoms survive those strong pulses has attracted growing attentions. A. Arakelyan et al. [1] have observed the optical spectra of the surviving Lithium atoms after interaction with intense 38-GHz MW fields for more than 1000 cycles, and the spectra exhibit a periodic train of peaks 38GHz apart. It suggests that those weakly bound Rydberg electrons seldom go back to the ionic core, where the cycle average energy exchange happens. In this study, we are interested in the electron behavior in the presence of intense infrared fields with a much shorter wavelength (1000nm). By solving the full 3D time dependent Schrodinger equation, we calculate the spectra of the surviving atoms under intense IR fields. Our numerical calculations show atoms survive the intense field in quasi-stable states for a long time, and the optical spectra are obviously modulated by the IR frequency. Through tuning the ponderomotive energy, we see how field parameters affect the behavior of electrons. Different atoms, such as Hydrogen, Helium, Lithium, and Sodium, are tested to see how atom's energy structures influence the results.

[1] A. Arakelyan et al. Physical Review A 90, 013413 (2014)

Changchun Zhong
Purdue Univ

Date submitted: 30 Jan 2015 Electronic form version 1.4