Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Time-Dependent Electron Interactions in Double-Rydberg Wavepackets F. ROBICHEAUX, Auburn University, X. ZHANG, R.R. JONES, University of Virginia — We consider the evolution of double-Rydberg wavepackets in which the two valence electrons in Ba are radially localized via sequential short-pulse laser excitation. Following the launch of the wavepackets, the atoms are exposed to a subpicosecond, half-cycle electric field pulse (HCP). The atoms either directly ionize during the HCP or are further excited by it, autoionizing to a distribution of Ba^+ Rydberg states. These ions are then subjected to a field ramp which ionizes the most highly excited Ba^+ to Ba^{2+}. The Ba^{2+} signal is recorded as a function of the relative launch times of the two electrons and as a function of the HCP delay. The data show a dramatic reduction in the Ba^{2+} yield when the HCP arrives after the excitation of the second wavepacket, suggesting that autoionization occurs almost instantly. This conclusion is supported by both full quantum and classical Monte Carlo calculations. The quantum calculations numerically solve the time dependent Schrodinger equation using a radial grid of points for each electron and coupled spherical harmonics. These calculations do not include the HCP but clearly show that more than 80% of the atoms ionize within one Rydberg period and the character of the ionization depends on the relative launch times.

F. Robicheaux
Auburn University

Date submitted: 27 Jan 2012 Electronic form version 1.4