

Abstract for an Invited Paper
for the GEC08 Meeting of
The American Physical Society

Ionization dynamics of atoms by strong, ultra-short laser pulses

KENNETH KULANDER, Lawrence Livermore National Laboratory

The multiphoton double ionization of He is observed to be far more efficient than would be expected based on the second electron leaving some time after the first, at a significantly higher intensity, in an uncorrelated sequence. Therefore some sort of correlated two-electron process, called non-sequential ionization (NSI), is required. NSI has been modeled theoretically using everything from ‘exact’ full spatial 3D (and model 1D) quantum calculations to completely classical trajectory representation. A commonly studied quasi-classical, rescattering scheme reproduces the general characteristics of the observations, but it fails at the threshold. Its predicted intensity for the onset of NSI is at least a factor of two too high. A new resonance process that addresses this problem has been developed and tested on a 1D model for which exact solutions are easily obtained. This model’s NSI threshold behavior leads to the prediction of a path to double ejection that involves a new laser-induced doubly excited (autoionizing) state. The analysis of the results, particularly in relation to NSI in real He measurements, will be presented.