Abstract Submitted
for the DAMOP14 Meeting of
The American Physical Society

Survival of atoms in strong microwave fields ALEXANDR ARAKELYAN, THOMAS F. GALLAGHER, University of Virginia — Recent experimental work on the ionization of atoms by intense laser and microwave fields has shown that bound atoms in highly excited states remain after the intense radiation pulse, even though the orbital period of the detected atoms exceeds the duration of the laser or microwave pulse. In both cases the fields are orders of magnitude larger than required for static field ionization of the highly excited atoms. Here we report a large population (10-25%) left bound in the states with n >350, when atoms are exposed to strong 16.9-GHz microwave fields in the presence of a well-controlled static field of 6 mV/cm. A production of such extremely high lying states is observed for a wide range of initial Rydberg states, as low as n = 21, for Li and Na, and is, in fact, a general feature of microwave ionization. As well as the survival of the highly excited states in quasi stable orbits, threshold ionization fields also appear to depend strongly on the static field during the experiment. We observe the $1/3n^5$ dependence only if the static fields are non-zero, and larger fields are required to ionize 50% of atoms if the static field is canceled out.

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Date submitted: 28 Jan 2014

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