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Phase dependent excitation of Rydberg states in static fields. ERIC MAGNUSON, University of Virginia, VINCENT CARRAT, Northwestern University, GALLAGHER TOM, University of Virginia — Atomic electrons excited to energies near the ionization limit in the presence of a strong microwave (MW) field can end up in high lying Rydberg states. Analogous to attosecond and IR ionization experiments, the probability of producing these Rydberg states depends on the phase of the MW field at the time of excitation. In the presence of a MW field, we use an infrared (IR) laser to excite Lithium atoms to states near the ionization limit. Amplitude modulating the laser at the MW frequency gives us control of the phase of the MW field at which the excitation occurs. A prior experiment shows that, in an isotropic system, the phase dependent Rydberg production occurs at twice the MW frequency. Current work shows that applying a static field to break the symmetry along the IR and MW polarization produces phase dependence at the same frequency as the MW field. We experimentally explore how this effect changes with excitation energy, MW intensity and static field strength, and compare to results from a classical simulation. Future work will determine the absolute phase offset between the laser modulation and the MW field, and explore regimes with stronger fields and more deeply bound states, where the classical model breaks down.

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