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Absolute phase reference for phase-dependent ionization of Rydberg states in strong microwave fields[1] ERIC MAGNUSON, TOM GALLAGHER, Univ. of Virginia — The final energy of an electron excited to a continuum or high-lying Rydberg state in the presence of a strong microwave (MW) field is dependent on the phase ϕ_0 of the MW field at which excitation occurs. Analogous to experiments using attosecond pulsed lasers to probe atoms and molecules in strong infra-red (IR) fields, exciting Rydberg states with a modulated IR laser have shown that ionization probability is strongly dependent on ϕ_0. A classical model has been very useful in understanding these experiments, but the model's prediction that phase dependent ionization is greatest at an absolute phase of $\phi_0 = \pi/6$ had not yet been tested. To measure ϕ_0 between the laser modulation and MW field, we excite the —54f¿ Rydberg state of Lithium with a phase modulated IR diode laser, while applying a MW field synchronous to the IR modulation and a DC field. The MW field causes the energy of the addressed state to oscillate, and the excitation probability will be greatest when the phase modulation of the laser and the energy modulation are in phase, providing an absolute reference for ϕ_0.

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Eric Magnuson
Univ. of Virginia

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