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Directed Field Ionization: A Genetic Algorithm for Evolving Electric Field Pulses[1] XINYUE KANG, ZOE A. ROWLEY, THOMAS J. CARROLL, Ursinus College, MICHAEL W. NOEL, Bryn Mawr College — When an ionizing electric field pulse is applied to a Rydberg atom, the electron's amplitude traverses many avoided crossings among the Stark levels as the field increases. The resulting superposition determines the shape of the time resolved field ionization spectrum at a detector. An engineered electric field pulse that sweeps back and forth through avoided crossings can control the phase evolution so as to determine the electron's path through the Stark map. In the region of $n = 35$ in rubidium there are hundreds of potential avoided crossings; this yields a large space of possible pulses. We use a genetic algorithm to search this space and evolve electric field pulses to direct the ionization of the Rydberg electron in rubidium. We present the algorithm along with a comparison of simulated and experimental results.

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