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Rydberg atoms excited to entangled superpositions states in a chain of atoms ELLIOT PACHNIAK, Stevens Inst of Tech — Proposed is a quantum control methodology to create entangled states of two typical classes, the W and the Greenberg-Horne-Zeilinger (GHZ) for an arbitrary chain of atoms. Excitation to the Rydberg state is obtained through two-photon adiabatic passage using overlapping chirped pulses and co-action of the Rabi frequency, one-photon detuning, and the strength of the Rydberg-Rydberg interactions. Generation of the W and GHZ in a triatomic chain is performed via a control scheme derived from analysis of the field interaction Hamiltonian in order to find resonance times between the energy states and the pulse. By engineering desirable avoided crossings of energy bare states by manipulating chirp conditions we arrive at predetermined superposition states at the end of the pulse duration. Control conditions differ for creation of the GHZ and W state and are addressed as obstacles to scalability of the system.

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