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Many-body physics with spin states of Rydberg atoms ELLIOT PACHNIAK, SVETLANA MALINOVSKAYA, Department of Physics, Stevens Institute of Technology — Rydberg atoms with very high principal quantum numbers trapped in a optical trap are used to study the collective spin properties of ultracold atomic systems. The interaction Hamiltonian of collective spin states of ultracold Rydberg atoms were explored in diatomic and triatomic chains in pursuit of the development of a robust algorithm for many body N atomic chains. Superposition states were designed where the ground and Rydberg states became entangled in an orderly array, which will be referred to as an entangled crystalline state. The characteristics of entangled crystalline states were observed using quantum control methodology in both diatomic and triatomic chains.

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