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Controlling the interactions of very-high-n strontium Rydberg atoms[1] R.G. FIELDS, F.B. DUNNING, Department of Physics and Astronomy and the Rice Quantum Institute, Rice University, Houston, Texas 77005-1892, USA, S. YOSHIDA, J. BURGDRFER, Institute for Theoretical Physics, Vienna University of Technology, A-1040 Vienna, Austria, European Union — Earlier studies have demonstrated that high n,n- 300, Rydberg states can be manipulated with remarkable precision using one, or more, short half-cycle pulsed electric fields (HCPs). In the present work many body dynamics of interacting Rydberg systems is exploited to create an initial train of approximately equispaced high n Rydberg atoms in an atomic beam. Their mutual interactions are then increased using HCPs to excite them to states of much higher n, the degree of coupling being tuned by varying the final target state. Interest centers on energy exchange and ionization, and their dependence on the degree of interaction. The effects of interactions are monitored through changes in the atomic field ionization spectra and through the loss of Rydberg atoms from the beam. Understanding the details of Rydberg-Rydberg interactions promises to allow creation of long-lived Rydberg atom ensembles where, due to their correlated motions, the excited electrons remain far apart .

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