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Engineering long-range interactions between high-n, $n \geq 300$, strontium Rydberg atoms in a beam[1] ROBERT FIELDS, ROBERT BRIENZA, F.B. DUNNING, Rice University, SHUHEI YOSHIDA, J. BURGDORFER, TU Wien — In the present work the control of long-range interactions between strontium atoms in very high-n, n $\geq$ 300, Rydberg states is being examined using an atomic beam. Pairs of Rydberg atoms are initially created, under blockade conditions with well-defined initial separations in localized volumes defined by focused laser beams. Their subsequent interactions are manipulated by using a carefully-tailored series of pulsed electric fields to excite the atoms to selected (more-strongly-interacting) higher-n states, the degree of interaction being controlled through the choice of final state and the initial atom pair separation. Long-range interactions lead both to collisional destruction and to state changing, which are monitored by selective field ionization and by application of further pulsed fields. The results are analyzed using classical trajectory Monte Carlo simulations and demonstrate not only the control of Rydberg-Rydberg interactions but also their long-range.

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