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Exploring $np+np \rightarrow ns+(n+1)s$ dipole-dipole interactions with genetically optimized field ionization pulses[1] ZHIMIN CHERYL LIU, MAIA R. RABINOWITZ, MIAO WANG, Bryn Mawr College, LAUREN YOAST, THOMAS J. CARROLL, Ursinus College, MICHAEL W. NOEL, Bryn Mawr College — With strong transition dipole moments, Rydberg atoms are able to exchange energy resonantly through long-range interactions. Often, selective field ionization (SFI) is used to obtain the atoms' state distribution after the interaction. In principle, SFI can map the binding energy of an atomic state to arrival time of the electron signal as atoms are ionized with a linearly increasing electric field ramp. However, the resolution of this technique is limited by the many Stark avoided crossings that are encountered as the field increases. We have previously developed "directed field ionization", a modification of SFI, which coherently manipulates the shape of time-resolved signal and thus improves the resolution[2,3]. Here, we examine the $np + np \rightarrow ns + (n + 1)s$ dipole-dipole interactions near $n = 36$ using directed field ionization. With our technique, we quantify the state-distribution during the interaction and explore many-body effects.

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[2]V. Gregoric *et al.*, Phys. Rev. A **96**, 023403 (2017).
[3]V. Gregoric *et al.*, Phys. Rev. A **98**, 063404 (2018).

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