Abstract Submitted
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Theory of long range interactions for Rydberg states attached to hyperfine split cores[1] FRANCIS ROBICHEAUX, Purdue University, DONALD BOOTH, MARK SAFFMAN, University of Wisconsin — Theory for one and two atom interactions is developed for the case when the atoms have a Rydberg electron attached to a hyperfine split core state, a situation relevant for some rare earth and some alkaline earth atoms proposed for experiments on Rydberg-Rydberg interactions. For the rare earth atoms, the core electrons can have a very substantial total angular momentum, J, and a non-zero nuclear spin, I. For alkaline earth atoms there is a single, s, core electron whose spin can couple to a non-zero nuclear spin for odd isotopes. The hyperfine splitting of the core state can lead to substantial mixing between the Rydberg series attached to different thresholds. Compared to the unperturbed Rydberg series of the alkali atoms, series perturbations and near degeneracies from the different parity states could lead to qualitatively different behavior for single atom Rydberg properties (polarizability, Zeeman mixing and splitting, etc) as well as Rydberg-Rydberg interactions (C5 and C6 matrices).

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