Abstract Submitted
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Angular-momentum couplings in long-range Rydberg molecules DAVID ANDERSON, STEPHANIE MILLER, GEORG RAITHEL, University of Michigan — We present results of a recent theoretical study of angular-momentum couplings in long-range diatomic Rydberg molecules formed between a rubidium Rydberg and $5S_{1/2}$ ground-state atom [1]. A Fermi model is used that takes into account all angular-momentum couplings comparable to the $e^- + 5S_{1/2}$ scattering interaction strength. The model includes S- and P-wave singlet and triplet $e^- + 5S_{1/2}$ scattering, the fine-structure of the Rydberg atom as well as the hyperfine-structure of the $5S_{1/2}$ atom. The effects of these couplings on the adiabatic molecular potentials are discussed. We calculate bound-state energies, lifetimes, and electric and magnetic dipole moments for the $^{87}\mathrm{Rb}(nD_j + 5S_{1/2})$ molecules in all potentials. The hyperfine structure gives rise to mixed singlet-triplet potentials in both low- and high-ℓ molecular classes. These spin-mixed potentials are deep enough to sustain bound states, which were recently observed in low-ℓ Cs_2 molecules [2]. We also study the effects of the hyperfine structure on the deep ^{3}S and ^{3}P adiabatic molecular potentials in both Rb_2 and Cs_2 molecules.

[1] D. A. Anderson, S. A. Miller, G. Raithel, PRA (2014).
[2] H. Saßmannshausen, F. Merkt, J. Deiglmayr, arXiv:1412.0846 (2014).

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