Abstract Submitted
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**Observation of spin-dependent relativistic effects in ultra-long-range $Cs_2$ Rydberg molecules***[1] JIN YANG, University of Oklahoma, SAMUEL MARKSON, ITAMP, Harvard-Smithsonian Center for Astrophysics, SETH RITTENHOUSE, The United States Naval Academy, RICHARD SCHMIDT, HOSSEIN SADEGHPOUR, ITAMP, Harvard-Smithsonian Center for Astrophysics, JAMES SHAFFER, University of Oklahoma — Recent research reveals spin-dependent relativistic effects play a significant role in the structure of ultra-long-range Rydberg molecules formed by the scattering of an electron from a ground state atom. Spin-dependent relativistic effects lead to striking features in the spectra of these molecules, like mixing between singlet and triplet states. To give a more precise prediction of the spectra, spin-orbit coupling and hyperfine interactions have to be considered. These effects are particularly important for Cs because several prominent, low energy p-wave resonances exist in the electron-ground state atom scattering and cause avoided crossings to occur. We use a Hamiltonian that includes spin-dependent interactions between the Rydberg electron and ground state atoms, to reproduce experimentally measured Cs ultra-long-range Rydberg molecule spectra correlating to the 31D+6S, 32D+6S, 38D+6S and 39D+6S asymptotes. Good agreement is found between theory and experiment. New, interesting features in the spectra can be related to the corresponding spin-dependent relativistic effects.

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