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Observation of an angular class of triatomic Cs Rydberg molecules CHRISTIAN FEY, PETER SCHMELCHER, Centre for Optical Quantum Technologies, University of Hamburg, Germany, HOSSEIN R. SADEGHPOUR, ITAMP, Harvard-Smithsonian Center for Astrophysics, Cambridge, SETH T. RITTENHOUSE, Department of Physics, The United States Naval Academy, Annapolis, JIN YANG, FABIAN MUNKES, MARGARITA BALUKTSIAN, JAMES P. SHAFFER, Homer L. Dodge Department of Physics and Astronomy, The University of Oklahoma — Ultralong-range Rydberg molecules are bound states between a Rydberg atom and one or more ground state atoms. Effectively, the Rydberg electron cloud can be viewed as an oscillatory trapping potential for the ground state atoms [1,2,3]. In our talk we focus on Cs trimers asymptotically correlating to a nd Rydberg atom and two $6s$ ground state atoms. In this case, the intrinsic anisotropy of the Rydberg wave function allows for the formation of angular potential energy curves which support bound molecular states in linear configurations but also “right triangle”-configurations. By performing electronic structure calculations including spin degrees of freedom we compute characteristic line shapes of those trimers and compare them to experimental spectra. In contrast to previously observed polyatomic Rydberg molecules we find binding energies that are not integer multiples of the dimer energies [4]. [1] Greene, Dickinson, Sadeghpour, PRL 85, 2458 (2000). [2] Bendkowsky, Butscher, Nipper, Shaffer, Löw, Pfau, Nature 458, 1005 (2009). [3] Fey, Kurz, Schmelcher, PRA 94, 012516 (2016). [4] Gaj, Krupp, Balewski, Löw, Hofferberth, Pfau, Nat. Commun. 5, 4546 (2014).

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