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Rydberg molecules induced by high angular momentum electron-perturber interactions PANAGIOTIS GIANNAKEAS, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, MATTHEW T. EILES, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, FRANCIS ROBICHEAUX, Department of Physics and Astronomy, Purdue University, Indiana, USA, JAN-MICHAEL ROST, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany — The composite system of a Rydberg atom in the presence of a neutral one is investigated. Going beyond previous studies, we developed a theoretical framework based on the generalized local frame transformation theory which allows us to include higher partial wave interactions of the Rydberg electron with the neutral atoms, which yields additional molecular potential energy curves. These new potential curves give rise to a new family of Rydberg molecules on top of trilobite and butterfly ones. In addition, we demonstrated that these potential curves possess exotic properties, such as their support of a quasi-heavy Rydberg series which are attached to every electronic Rydberg manifold. Also, we study the influence of these new potential curves on the trilobite and butterfly curves and we observed that yield corrections of the order of a few percent for a given electronic Rydberg manifold.

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