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### **Ultralong-range polyatomic Rydberg molecules**

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Ultralong-range polyatomic Rydberg molecules are formed when a ground-state atom is bound to a Rydberg atom. The binding mechanism of these Rydberg molecules is based on the low-energy collisions between a Rydberg electron and a ground-state atom and leads to the unusual oscillatory behavior of the adiabatic potential energy curves. If the ground-state atom immersed into the Rydberg wave function is replaced by a heteronuclear diatomic molecule another type of polyatomic Rydberg molecules can form. In this case, the Rydberg electron is coupled to the internal states of the polar ground-state molecule. In this talk, we will explore the electronic structure and rovibrational properties of these ultralong-range polyatomic Rydberg molecule. For the second type of Rydberg molecules, the polar dimer is allowed to rotate in the electric fields generated by the Rydberg electron and Rydberg core as well as an additional external field. We will investigate the metamorphosis of the Born-Oppenheimer potential curves, essential for the binding mechanism, with varying electric field and analyze the resulting properties such as the vibrational structure and the alignment and orientation of the polar dimer [1]. [1] R. Gonzalez-Ferez et al, New J. Phys. 17, 013021 (2015)