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Ultralong-range Rydberg molecules with kilo-Debye dipole moments

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In recent years, there has been a great deal of theoretical and experimental interest in ultralong-range Rydberg molecules. First proposed over 15 years ago, these molecules form due to repeated scattering of a highly excited Rydberg electron off a ground state neutral atom. They are predicted to be ultralong-range, with inter-nuclear separations on the order of 100 nanometers. When the electron has a high angular momentum, $l > 2$, the electron wave function can be highly localized around the ground state atom. These molecules, called "trilobite" molecules, are predicted to posses extremely large electric dipole moments, on the order of kilo-Debye. In this talk I will present recent experimental and theoretical work that has resulted in the first realization of Rydberg trilobite molecules with ultra-large permanent electric dipole moments in a cold gas of Cs.

In collaboration with D. Booth, J. Yang, J.P. Shaffer, University of Oklahoma; and H.R. Sadeghpour, Harvard-Smithsonian Center for Astrophysics.