Workshop on Cold Rydberg Chemistry



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## Forming Rydberg Molecules in a Quantum Gas with Strong Interactions: Rotational Structure, Correlations, and Surprises

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Ultralong-range Rydberg molecules (ULRRMs), formed from the binding of one or more ground-state atoms within the electron cloud of a Rydberg atom, are of significant interest because of their novel physical properties and their potential as probes of many-body states of quantum gases. In this talk, I will report on the creation of ULRRMs through photo-association in an ultracold gas of 86-Sr atoms. Strong ground-state atomatom interactions in this system influence the molecular states that are accessible and facilitate the observation of rotational structure. The large size of ULRRMs leads to a breakdown of the Franck-Condon principle. Results are interpreted with the aid of theory that accounts for the large s-wave scattering length and recoil momentum associated with photoexcitation. Several puzzles still remain unexplained, such as the sensitivity of the photoexcitation spectrum to magnetic field.

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