The Departments of Physics and Chemistry & Biochemistry

Present a Seminar Titled:

"Rydberg States of Diatomic Molecules: Still One Atom Too Many?"

Presented by:

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We observe Rydberg-Rydberg transitions by combining two- or three-step laser-excitation with Chirped Pulse millimeter-wave (CPmmW) spectroscopy. An ~100 ns duration mmW pulse, with frequency chirped linearly-in-time, polarizes all two-level systems (typically $\Delta n=\pm 1$ Rydberg-Rydberg transitions with kilo-Debye transition moments) within the 10 GHz frequency range of the chirp. Multiplexed, phase coherent, time-domain detection of all resultant Free Induction Decay (FID) signals samples 10^5 100 kHz resolution elements of spectrum. This represents a many-orders-of-magnitude increase in "spectral velocity" over a lasers-only step-by-step frequency scan. Previously unimaginable classes of structural and dynamical information are now obtainable. Spectra of core-nonpenetrating (orbital angular momentum, l>3) Rydberg states of molecules *resemble* Rydberg spectra of atoms, because transitions between different molecular ion-core vibrational (v^+) and rotational (N^+) levels are effectively forbidden. But the vastly richer but still-simple molecular spectra sample the (v^+,N^+) multipole moments and polarizabilities of the ion-core as well as resonances between the Kepler orbit period of the Rydberg electron and the internal motions of the ion-core. Superradiance is a quantum many-body interaction. The entire phase versus time evolution of a single superradiant event is observable. The superradiance is exquisitely sensitive to external electric fields. How are the many-body interactions encoded in the superradiance?

Tuesday, April 2, 2019 @ 3:00 p.m. in OCNPS 200
Refreshments at 2:30 pm