TOWARD QUANTUM STATE RESOLVED INFRARED FREQUENCY COMB SPECTROSCOPY OF THE C_{60} FULLERENE

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In this talk, we report on progress toward high resolution infrared frequency comb spectroscopy of buckminsterfullerene, C_{60}. A rotationally resolved spectrum of C_{60} has to date remained elusive, despite the very intense research into this molecule's chemical and physical properties since its discovery in 1985. Our approach utilizes cyrogenic buffer gas cooling of the output of a 1000 K effusive oven to prepare cold gas phase C_{60} molecules. We subsequently probe these with a difference frequency generation-based frequency comb tuned to the 8.5 μm IR active fundamental. The combination of a high finesse absorption enhancement cavity and Fourier transform interferometry read-out provide sensitive, broadband detection, while retaining the high spectral resolution of the frequency comb light. We will discuss our preliminary results, which tentatively suggest successful ground state vibrational cooling and observation of resolved rotational fine structure, as well as experimental modifications that we expect to improve the C_{60} number density and internal state cooling efficiency.