THE DEVELOPMENT AND IMPLEMENTATION OF CHIRPED-PULSE FREQUENCY COMBS AT MILLIMETER WAVELENGTHS

AMANDA L. STEBER, BRENT J. HARRIS, JUSTIN L. NEILL, KEVIN K. LEHMANN, BROOKS H. PATE, *Department of Chemistry, University of Virginia, McCormick Rd., P.O. Box 400319, Charlottesville, VA 22904*.

Technological advances in such areas as active multiplier chains and high-speed digital electronics are enabling the development of sensitive high-throughput spectroscopic instruments in the millimeter and submillimeter ranges. Recently there has been an effort to develop multiplexed direct absorption spectroscopy techniques that use frequency comb sources derived from phase-locked pulse trains (often created using ultrafast lasers). We have used a high-speed arbitrary waveform generator (AWG with 12 GHz sample rate) to create frequency combs at mm-wave wavelengths using a chirped pulse as the repeating waveform. This waveform has important advantages including 100% duty cycle for the light output and compatibility with the use of frequency multiplier chains that extend the bandwidth of the comb proportional to the frequency multiplication factor. A new spectrometer operating in the 260-290 GHz range using active multiplier chains has been constructed to test the capabilities of chirped-pulse frequency comb spectroscopy for molecular rotational spectroscopy. The spectral properties of the mm-wave combs generated following x24 frequency multiplication, methods for compressed bandwidth detection using a dual-comb approach, and frequency comb analogs of FM spectroscopy will be presented.