MID-INFRARED CW OPTICAL PARAMETRIC OSCILLATOR PUMPED BY AN ELECTRO-OPTIC FREQUENCY COMB

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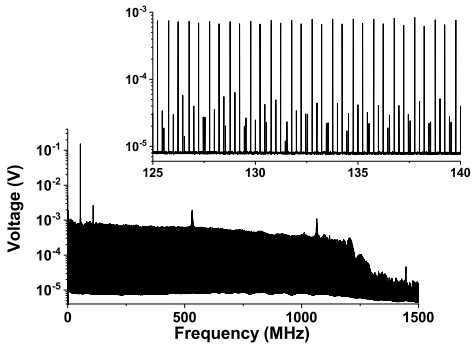

Optical frequency comb (OFC) spectroscopy in the mid-infrared (MIR) promises faster, more precise, and more sensitive molecular spectroscopy. To date, demonstrations of MIR OFCs have suffered from low power, poor wavelength coverage, or low sensitivity. Systems that do excel in these areas have high cost and complexity. The technique and measurements reported here demonstrate that singly resonant, single frequency optical parametric oscillators (OPO's) are a powerful platform for generating MIR OFC's with properties not shown by other MIR light sources.

An EOM frequency comb is first generated via phase modulation of CW light near 1064 nm. An inexpensive direct digital synthesizer (DDS)-based scheme is used to generate chirped modulation resulting in a 2 GHz-wide frequency comb with ultraflat comb teeth and frequency agile repetition rates between 1 MHz and 10 MHz. This comb pumps the OPO, resulting in an idler output that is a MIR OFC tunable between 2200 - 4000 nm with $>$1 W output power (figure). This technique is utilized to perform frequency comb spectroscopy on select rovibrational features near 3 μm in methane and acetylene.