Abstract Submitted
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Frequency-divide-and-conquer approach to creating frequency combs in the infrared[1] K. VODOPYANOV, N. LEINDECKER, A. MARANDI, R. BYER, Stanford Univ., V. PERVAK, Ludwig-Maximilians-Universität München, Germany — The technique of optical Frequency Combs - a broadband series of some million sharp equidistant phase-locked frequency spikes from mode-locked femtosecond lasers - has revolutionized optical frequency metrology and led to creation of optical atomic clocks. Also, frequency combs opened new capabilities in molecular spectroscopy since they provide a unique combination of large wavelength coverage, high spectral resolution, and the ability of parallel spectral data acquisition. Practical comb sources based on Ti:sapphire, Yb- and Er- fiber lasers, are limited to the near-IR spectral region, $\lambda < 2$ μm, while to take the full advantage of frequency combs for molecular spectroscopy, one would need operation at longer (> 2.5 μm) wavelengths, that is in the region of fundamental rotational-vibrational absorption bands. Here we implement a new approach for creating broadband mid-infrared frequency combs based on a subharmonic optical parametric oscillator (OPO). The source conveniently down converts the frequency comb of an erbium fiber laser with a center wavelength of 1560nm and produces a 2/3-octaves-wide frequency comb centered at $\lambda = 3.1$ μm with 40% quantum efficiency. The frequency comb is phase-locked to the pump laser and has other remarkable coherence properties which we studied by interfering the outputs of two identical OPOs pumped by the same laser.

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