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Title:Mid-infrared frequency comb spanning an octave based on an er fiber laser and difference-frequency generation
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Abstract:We describe a coherent mid-infrared continuum source with 700 cm <inf>-1</inf> usable bandwidth, readily tuned within 600-2500 cm<inf>-1</inf> (4-17 μm) and thus covering much of the infrared "fingerprint" molecular vibration region. It is based on nonlinear frequency conversion in GaSe using a compact commercial 100-fs-pulsed Er fiber laser system providing two amplified near-infrared beams, one of them broadened by a nonlinear optical fiber. The resulting collimated mid-infrared continuum beam of 1 mW quasi-cw power represents a coherent infrared frequency comb with zero carrier-envelope phase, containing about 500,000 modes that are exact multiples of the pulse repetition rate of 40 MHz. The beam's diffraction-limited performance enables long-distance spectroscopic probing as well as maximal focusability for classical and ultraresolving near-field microscopies. Applications are foreseen also in studies of transient chemical phenomena even at ultrafast pump-probe scale, and in high-resolution gas spectroscopy for e.g. breath analysis. © Springer Science+Business Media, LLC 2012.
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