353
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Title:Optical frequency comb generation using dual-mode injection-locking of quantum-dash mode-locked lasers: Properties and applications
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Abstract:In this paper, we describe generation and application of wide narrow linewidth optical frequency combs using dual-mode injection-locking of InP quantum-dash mode-locked lasers. First, the dependence of the RF locking-range on the device's absorber voltage is experimentally investigated. Under optimized absorber voltage, a continuous wide RF locking-range of &asyum;400 MHz is achievable for lasers with 21 GHz repetition rate. The total RF locking-range of &asyum;440 MHz is possible considering locking-range for positive and negative absorber voltages. This wide tuning > 2% of the repetition rate, a record for a monolithic mode-locked laser, is reported from a two-section device without any additional passive section or extended-cavity for repetition rate tuning. It is shown that the effective RF locking-range in dual-mode injection corresponds to the optical locking-range and repetition rate tuning under CW injection, which is wider when the free-running mode-locking operation is "less stable." The widest comb consists of 35 narrow lines within 10 dB of the peak, spanning &asyum; 0.7 THz and generating 3.7 ps pulses. Second, we show the first demonstration of multi pump phase-synchronization of two 10 Gb/s DPSK channels in a phase-sensitive amplifier using dual-mode injection-locking technique. The phase-sensitive amplifier based on the "black box" scheme shows more than 7 dB phase-sensitive gain and error free performance for both input channels with 1 dB penalty. © 1965-2012 IEEE.
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