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Offset frequency dynamics and phase noise properties of a self-referenced 10 GHz Ti:sapphire frequency comb

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This paper shows the experimental details of the stabilization scheme that allows full control of the repetition rate and the carrier-envelope offset frequency of a 10 GHz frequency comb based on a femtosecond Ti:sapphire laser. Octave-spanning spectra are produced in nonlinear microstructured optical fiber, in spite of the reduced peak power associated with the 10 GHz repetition rate. Improved stability of the broadened spectrum is obtained by temperature-stabilization of the nonlinear optical fiber. The carrier-envelope offset frequency and the repetition rate are simultaneously frequency stabilized, and their short- and long-term stabilities are characterized. We also measure the transfer of amplitude noise of the pump source to phase noise on the offset frequency and verify an increased sensitivity of the offset frequency to pump power modulation compared to systems with lower repetition rate. Finally, we discuss merits of this 10 GHz system for the generation of low-phase-noise microwaves.

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