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Title

Frequency-Tunable Microwave Generation Based on Time-Delayed Optical Combs

Source

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Abstract

A novel approach to generating a frequency-tunable microwave signal based on time-delayed optical combs is proposed and demonstrated. The fundamental principle is to generate multiple optical combs with identical comb profile, but with each optical comb carried by an optical carrier at a different wavelength. If the optical carriers are spaced with an identical wavelength spacing, the optical combs will be time delayed with an identical time delay after passing through a dispersive fiber. By applying these optical combs to a photodetector, microwave comb lines at the fundamental-order and higher order harmonic frequencies will be generated. For a well-designed time-delay structure, however, the desired microwave harmonic will have the highest output due to constructive interference, while the other harmonics will be suppressed. An analysis is performed, which is verified by a proof-of-concept experiment. A microwave signal that is tunable from 16.8 to 27 GHz is generated. The performance of the generated signal in terms of stability and phase noise is also evaluated.