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Photonic-assisted systems for the generation, modulation and measurement of microwave signals

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We propose and experimentally demonstrate photonic approaches to implement the transmission and processing of microwave signals for applications such as wireless access networks, radar and warfare systems. Three system architectures are exhibited for the photonic generation, modulation and measurement of microwave signals, respectively. System A is using birefringence effects in the high nonlinear fiber to simultaneously realize a frequency-multiplied and phase-shifted microwave signal. A microwave signal at doubled- or quadrupled-frequency with a full 2π phase shift is obtained over a frequency range from 10 GHz to 30 GHz. System B realizes high-performance optical single sideband modulation with a tunable optical carrier to sideband ratio. The proposed modulation improves evidently the transmission performance by suppressing the -1^{st} and$+2^{nd}$ (or the $+1^{st}$ and -2^{nd}) order sidebands. For detection, system C is an all-optical frequency measurement by using the constructive and destructive ports of a polarization-domain interferometer. The performances in terms of the frequency measurement range and measurement error are also discussed. The proposed techniques are vital to overcome the electronic bottlenecks which will satisfy the worldwide demand for higher data rate and broadband transmission.

Biography

Danqi Feng is with the Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, Wuhan, China.

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