

采用并行DD-MZM实现光学倍频毫米波40 GHz RoF系统的QPSK

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Optical QPSK Modulation Based on Parallel DD-MZM Scheme in a 40 GHz Radio over Fiber System

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摘要 提出一种采用并行双电极马赫曾德尔调制器(dual-drive Mach-Zehnder modulator, DD-MZM)实现光学倍频毫米波光载无线(radio over fiber, RoF)通信系统的正交相移键控(quadrature phase shift keying, QPSK)调制方法. 在中心站, 光波进入并行DD-MZM后分为4路, 分别由4个微波信号调相. 此光波通过光纤后被送到基站, 经光电转换后产生的高次谐波含有毫米波成分, 调整调相指数可使所需的毫米波振幅最大. 该系统在生成毫米波的同时, 实现了QPSK调制, 解决了传统毫米波RoF系统QPSK调制方式的缺陷. 通过仿真验证了毫米波的产生和信号的调制解调过程, 证明了该链路的可行性.

关键词: 毫米波 双电极马赫曾德尔调制器 光载无线 谐波生成

Abstract: A new millimeter-wave radio over fiber (RoF) system based on optical frequency multiplication (OFM) technique is proposed, in which quadrature phase shift keying (QPSK) is implemented on optical wave in a parallel structure of Mach-Zehnder modulators (MZM). In the center station, light-wave injected into parallel DD-MZM is split into four optical carries, which are phase modulated by four microwave signals respectively, and then combined together. The light-wave is photodetected to generate an electrical signal consisting of harmonics of the microwave signal. The desired millimeter-wave signal is included in the harmonics, and can be maximized just by adjusting the phase modulation index. QPSK modulation is realized while millimeter waves are generated at the base station. This system overcomes the disadvantage of the traditional optical QPSK modulation in an mmRoF system. Simulation results verify the millimeter-wave generation technique, and the signal modulation and demodulation, showing feasibility of the proposed millimeter-wave system.

Keywords: millimeter wave, dual-drive Mach-Zehnder modulator, RoF, harmonic generation

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