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光通信与光信息技术

电光调制器偏置点抖动控制对射频信号的影响

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摘要: 马赫-曾德尔电光调制器的偏置点控制是光载射频传输链路中一项十分关键的技术。为了分析马赫-曾德尔电光调制器偏置点抖动控制对射频信号的影响,用贝塞尔级数展开再进行频谱分析的方法对系统输出信号成分进行了理论分析,设计了马赫-曾德尔调制器任意点控制系统并进行了实验验证。用MATLAB进行仿真后可知,在输入射频功率为18dBm时,抖动信号幅度需小于45mV,2次射频信号对抖动信号引起的频率分量抑制比才能大于20dB;而在输入射频功率为10dBm时,这个幅度要小于19mV。改变抖动信号幅度进行实验,得到2次射频信号对抖动信号引起的频率分量抑制比与仿真结果误差始终保持在3dB~3.2dB左右。结果表明,马赫-曾德尔电光调制器工作在线性偏置点时,抖动信号引起的频率分量是可以忽略的;但将调制器偏置控制在最低偏置点时,对射频信号的影响不可忽略。

关键词: 光通信 光载射频传输 偏置点抖动控制 马赫-曾德尔电光调制器

Effect of dither tone-based electro-optic modulator bias control on radio-frequency signal

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Abstract: Bias control of Mach-Zehnder electro-optic modulators(EOM) is of great importance in radio over fiber links. In order to study the impact of dither tone-based modulator bias control on

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radio frequency(RF)signal, the output signal component of the system was theoretically analyzed by means of spectrum analysis after it was turned into the Bessel series, a system for arbitrary bias point was designed to confirm the analysis experimentally. The results of MATLAB simulation show that when the input RF power is 18dBm, only when the amplitude of dither tone is smaller than 45mV, the suppression ratio of the second harmonic of RF signal to signal caused by dither tone can be greater than 20dB. When the input RF power is 10dBm, the amplitude should be smaller than 19mV accordingly. When the amplitude of dither tone changes, the error between the experimental data of the suppression ratio of the second harmonic of RF signal to signal caused by dither tone and the simulation results is maintained at about from 3dB to 3.2dB. The results demonstrate that when Mach-Zehnder EOM works at linear bias-point, frequency components caused by dither tone can be ignored, however, when Mach-Zehnder EOM works at smallest bias-point, the impact of dither tone cannot be ignored.

Keywords: optical communication radio over fiber dither tone-based bias control Mach-Zehnder electro-optic modulator

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