Bit Error Rate Monitoring for Automatic Bias Control of Quadrature Amplitude Modulators

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Abstract : The most common quadrature amplitude modulator (QAM) applies two Mach-Zehnder Modulators (MZM) and one phase shifter to generate high order modulation format. The bias of MZM changes over time due to temperature, vibration, and aging factors. The change in the biasing causes distortion to the generated QAM signal which leads to deterioration of bit error rate (BER) performance. Therefore, it is critical to be able to lock MZM's Q point to the required operating point for good performance. We propose a technique for automatic bias control (ABC) of QAM transmitter using BER measurements and gradient descent optimization algorithm. The proposed technique is attractive because it uses the pertinent metric, BER, which compensates for bias drifting independently from other system variations such as laser source output power. The proposed scheme performance and its operating principles are simulated using OptiSystem simulation software for 4-QAM and 16-QAM transmitters.

Keywords : automatic bias control, optical fiber communication, optical modulation, optical devices
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