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A NOVEL MODULATION SCHEME FOR NOISE REDUCTION IN ANALOG FIBER OPTIC LINKS

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A novel balanced modulation and detection scheme for analog fiber optic links is proposed to overcome the limitations in signal-to-noise ratio (SNR) and dynamic range (DR). In this scheme, the modulating RF signal is split into positive and negative halves and applied to a pair of laser diodes. Both arms of the link will convey a half-wave rectified version of the signal. At the receiving end the signal is restored via differential detection. Thus, in this scheme, the bias of the laser diodes can be kept very low, or virtually zero. It can be shown that in this way, the dominant noise terms at the receiver are largely suppressed as their power scales with the magnitude of the modulating RF signal. Calculation results show that significant improvements in link SNR, ranging from 3 dB for strong signals up to 40 dB for weak signals, compared to the standard intensity modulation scheme can be obtained. This feature is also accompanied by suppression of the second-order distortion up to 20 dB, hence significantly enhancing the dynamic range of the link.