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Performance Comparison between the Traditional Intensity Modulation Direct Detection and Coherent Detection in a High Speed Optical Fibre Communication System

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Abstract content
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Abstract: Passive optical networks (PONs) have become a dominant approach for the fibre- to -the- home (FTTH) network deployments. Cost effective reliable technologies are a necessity for extending the unamplified transmission reach in the FTTH environment. Optical coherent detection scheme that supports even higher modulation formats and increases the receiver sensitivity is implemented. A 10 Gb/s data stream, intensity modulates a 1550 nm distributed feedback (DFB) laser with a direct detection scheme. The same modulated signal is enhanced by mixing it with a continuous wave local oscillator placed at the receiver in a homodyne coherent detection scheme. The enhanced mixed signal is then demodulated to evaluate and to compare the link performance of the direct detection and coherent cases. A back to back and a transmission through 25 km single mode fiber were simulated for the two transmission modalities. The coherently detected scheme gave better receiver sensitivity of 12 dB at an acceptable bit error rate (BER) of 10^{-9} as compared to the traditional intensity modulation direct detection (IMDD) scheme.

Key terms:

Coherent detection
Direct detection
Local oscillator
BER

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