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Characterization and Compensation of Fibre Link Dispersion in a 10 Gb/s Flexible Network

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Abstract content
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Typical optical networks require deployment of optical fibres that minimise signal and data distortion over the length of transmission. Flexible networks involve dense-wavelength division multiplexed (DWDM) systems propagating within a single fibre or a concatenation of fibres at different bandwidths. For scalable and effective network resource utilisation, fibre impairments that lead to signal distortion should be considered during a network link design. Chromatic dispersion (CD) introduces signal broadening which in turn causes intersymbol interference in transmitted data in long-haul high speed transmissions. As a result, dispersion effects in a link should be measured, characterized and optimized for better quality of transmission (QoT). This work provides an experimental measurement of CD in a typical fibre link using the phase shift method. The performance of different fibre links has been evaluated using bit error rate (BER) measurement at 10⁻⁹ threshold. A 10 Gb/s signal at 1306 nm and 1550 nm has been transmitted through ITU-T G.652 and G.655 fibres. These fibres exhibit different attenuation, dispersion and polarization mode dispersion (PMD) properties and performance at different wavelengths. A G.652 fibre with 0 ps/nm.km dispersion at 1306 nm had a 1.1 dB transmission penalty for 18 km. Whereas a 1550 nm transmission on G.655 fibre with a -2 ps/nm.km dispersion had a 0.5 dB penalty for 25.49 km. Therefore, dispersion managing wavelengths and fibres should be used to minimize dispersion effects for better QoT and BER. This work is vital for network link design, topology and deployment of fibres in long-haul, metro-access and fibre to the home/building (FTTX) networks.
Key words: Flexible Networks, Dispersion, Transmission, Fibre-link Networks

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