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Reconfigurable Wavelength Selective Switching for 10 Gbps Optical Fibre Ring Networks

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Abstract content
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Wavelength division multiplexing (WDM) is used for multi-wavelength optical fibre transmission. Multiplexing increases the spectral efficiency in high capacity systems by application of flexible spectrum. Flexible spectrum is an elastic grid whose wavelength tunability is not constrained by the static wavelength grid and fixed channel spacing. Flexible spectrum allows elastic scaling of the spectrum at different modulation formats and bitrates. As such, multi-wavelengths and dynamic bandwidth allocation can be realized to satisfy the ever increasing demand for bandwidth. The reconfigurable optical add/drop multiplexers (ROADMs) provide remote channel assignment and bandwidth allocation. This paper presents simulated wavelength selective channel add/drop at a node in a 10 Gb/s ring network topology of a metro-access network. Bit error rate (BER) analysis are used to determine the quality of signal transmission by quantifying the BER of a selected wavelength at the acceptable 10-9 level. A transmission penalty is presented for different fibre lengths and channel spacing. It is found that longer lengths and smaller channel spacing introduces crosstalk interference between the wavelengths leading to bit errors. Consequently, a wavelength with higher BER is transmitted over a shorter fibre length (dropped) and another wavelength selectively added to the empty channel in the network by using the ROADM. This work is vital for network link management, efficient spectrum usage and remote configuration of the network such as fibre-to-the-home/building (FTTH/B).

Key words: WDM, flexible spectrum, ROADM, Transmission Penalty, FTTH/B

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