OPTICAL ADD-DROP MULTIPLEXER BASED ON FIBER BRAGG GRATINGS FOR THE ITU WDM SYSTEMS

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1. Introduction

The optical add-drop multiplexer (OADM) is one of the key components for dense wavelength division multiplexing (WDM) networks. Several wavelength OADM's have been proposed based on arrayed wave-guide gratings (AWG) [1], Fabry-Perot filters, combination of dielectric thin film MUX and DEMUX [2] and Bragg gratings written in Mach-Zhender interferometers [3]. In this work, we propose a more simple, cost effective, flexible, easily upgrade and transparent configuration, using a fibre Bragg grating (FBG), an optical circulator, a power combiner and a mechanical – optical switch. The functionality of the OADM node is demonstrated in a 3 channels 200 GHz spaced, WDM system with 75 km, operating at 2.5 Gb/s.

2. Experimental setup

The basic architecture of the OADM node is show on figure 1. It consists of a fibre Bragg gratings, an optical circulator a power combiner and an optical switch. At first, *N* multiplexed wavelengths are led to the Bragg grating through the circulator, then the filtered signal is reflected and go back to the circulator where is removed. The remaining channels are coupled with the added channel in a power combiner. The optical switch allow the selection of the add – drop operation with the remotion and addition of a channels or a pass through operation where the removed channels is added again.

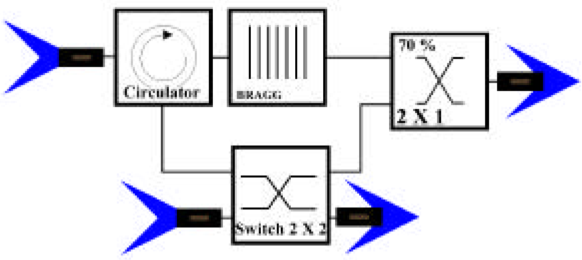

Figure 1 – Schematic of the OADM.

To investigate the operation and system performance of this OADM, three distributed feedback lasers (DFB) based at the ITU grid of 200 GHz (≈ 1.6 nm) spacing with wavelengths of 1549.32 nm, 1550.92 nm and 1552.52 nm, were externally modulated at 2.5 Gb/s with a non-return to zero (NRZ) 2^7-1 pseudo random bit sequence (PRBS). In the experimental 70 km transmission link, single mode fibre is used. Two Erbium doped fibre amplifiers (EDFA) having saturated output powers of 13 and 17 dBm and noise figures smaller than 4 dB are employed to provide the required power to compensate the link loss.

The average pass through, added and drop insertion loss is 6.5 dB, 5.0 dB, 5.1 dB respectively, the insertion loss for the remaining channels is 6.0 dB. The relatively high insertion losses are due to the optical attenuators used to equalise the power of all the channel at the OADM output. The isolation and crosstalk of the optical circulator is greater than 60 dB and the FBG have a central reflective wavelength of 1550.88 nm, with a 0.73 nm bandwidth and a reflectivity of 99.97 %.

3. Results and conclusions

The figure 2 shows the power the dropped signal at the OADM and the passed through. The two small components presents with the dropped signal (Fig 2 (a)) are due to residual reflections on the circulator and on the FBG. The small spectral component at 1550.92 nm on the pass-trough signal (Fig. 2 (b)) results from the imperfect reflection of the central wavelength by the FBG. The OADM coherent and incoherent crosstalk is –27.5 dB and –36.0 dB for the drop and pass-trough channels, respectively.

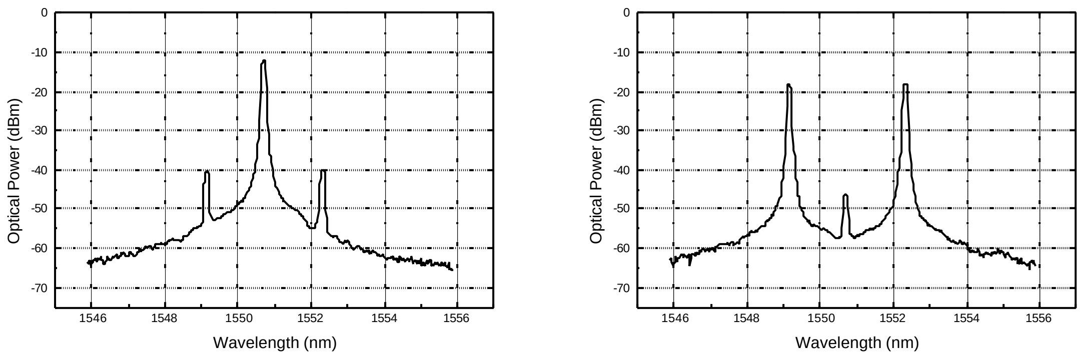

Figure 2 – The power spectra of: (a) the dropped signal, (b) the passed through signal.

References

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