Widely Tuneable Fibre Bragg Grating Filters

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Summary

To enhance the flexibility of deployed metro-networks, dynamically re-configurable systems might become necessary. A device that can meet the tough demands to one aspect in these, that is dynamic optical add-drop filtering, is the fibre Bragg grating (FBG). This is because it can be designed to provide sharp spectral band-edge roll-off and controlled phase performance, such that channels can be filtered with far better cross-talk suppression compared to any other current competing technology.

To increase the transmission capacity in the current systems, the operation of dense wavelength division multiplexed (DWDM) networks may very well expand from the C-band into both the S- and L-bands. This creates a need for components that can cover multiple bands to reduce total component inventory. For the reasons described above including the high spectral definition and full controllable phase, ideally, such devices could be widely wavelength tuneable FBG filters. However, the maximum achievable tuning-range of a FBG very much depends on the choice of tuning-scheme. There have been a number of reports on extended-range tuneable FBG filters, but still none of them have shown the potential to be a truly practical and reliable solution [1,2]. Moreover, the actual tuning-apparatus applied in these devices is complex and often require significant electrical powers to operate hence increases the overall component cost. Furthermore, the previous demonstrations have only just exceeded 40 nm.

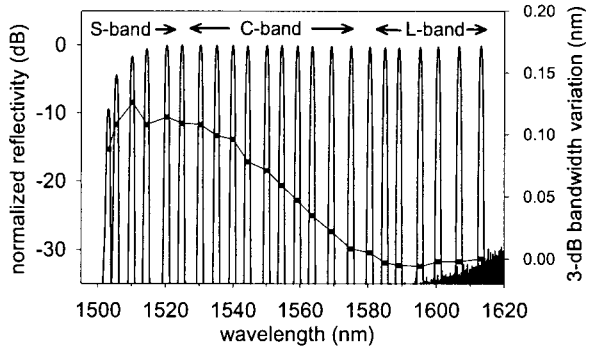

Figure 1: Measured reflection and 3-dB bandwidth variation of the tuneable filter.

In this presentation we show a simple new method to achieve extreme wavelength-coverage with Bragg gratings using axial-compression and demonstrate a record-breaking tuning-range of 110nm of a FBG filter. The key to this achievement is based on a pure-arc beam-bending technique [3,4], in conjunction with a straightforward tuning-mount [5]. No electrical power is required to the mount after a desired wavelength has been achieved and hence it can be operated in true *set-and-forget* configurations. To characterise the Bragg grating-filter during the tuning-procedures, the polarisation-mode dispersion (PMD), the polarisation dependent loss (PDL) and the uniformity of the grating is measured. These parameters remain constant even under the most extreme axial-strain. Therefore, this method exhibits the robustness for reliable wideband wavelength tuning of FBGs in next generation high data-rate WDM-systems.

References

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