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60-Channels Flexible-Grid Wavelength Selective Switch Based on a Compact Bragg Reflector Waveguides Array

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Abstract　A wavelength selective switch based on a Bragg reflector waveguides array is demonstrated with 60 channels. The passband at each channel is flexible in design by using a LCOS-based spatial light modulator. The large angular dispersion of the waveguide enables a significant reduction in the whole module size.

Introduction

A wavelength selective switch (WSS) with large number of I/O ports is important in large-scale reconfigurable optical routing systems [1, 2]. In existing approaches, it is difficult to obtain a large number of output-ports and wavelength-channels in a compact module due to a low angular dispersion in conventional gratings. Recently, our group proposed and demonstrated a novel type of WSS based a Bragg reflector waveguides array, which can provide over 100 output-ports [3]. In this report, we will show the device's capability in supporting selective switching among 60 wavelength channels, of which the passband is flexible to design.

Device Structure and Principles

The proposed WSS mainly consists of four parts as shown in Fig. 1: input and output optical fibers, Bragg reflector waveguides array, a focusing lens, and a liquid-crystal on silicon (LCOS)-type spatial light modulator. A fabricated device is also shown in Fig. 1, with an array pitch of 30 μm.

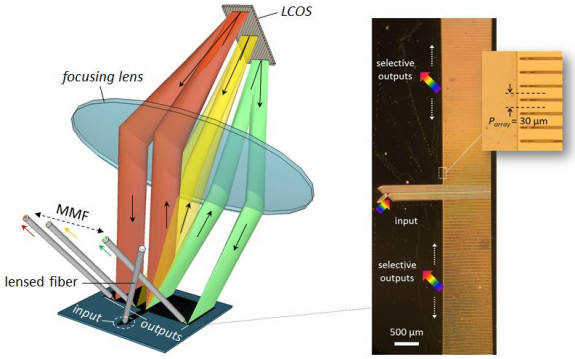

Fig. 1:　3D schematic view of the proposed WSS and a top-view photo of one fabricated device.

Experiment Results and Discussions

The input light is coupled into the waveguide, dispersed to different directions according to wavelength and modulated at different positions on the LCOS screen. The LCOS image used in the experiment is shown in Fig. 2, by controlling the periodical phase pattern on the LCOS, light can be directed back to any desirable output waveguide-ports. The LCOS display was divided into 60 regions along the dispersion direction. Output spectra at the 60 ports are illustrated in Fig. 3, with a wavelength span from 947.85 to 958.25 nm. The passband can be flexible designed according to the input wavelength channels by adjusting the region size along the dispersion direction. For example, the passband for Port 8 is wider than other ports due to a comparatively larger height of the Port 8 region in LCOS plane. The proposed setup is very compact with a size of 10 cm and can provide a large number of wavelength-channels. It is because the Bragg reflector waveguide has a large angular dispersion of 5°/THz. Thanks to the high resolution on LCOS, wavelength channel spacing is very small as 0.15-0.20 nm, which is even capable for a DWDM system.

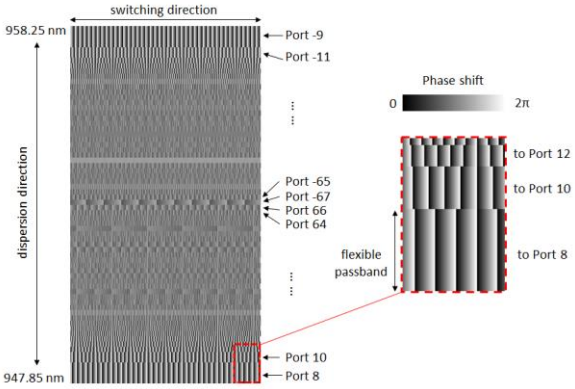

Fig. 2: LCOS image used in the measurement, which is divided to 60 regions for 60-channel selective switching.

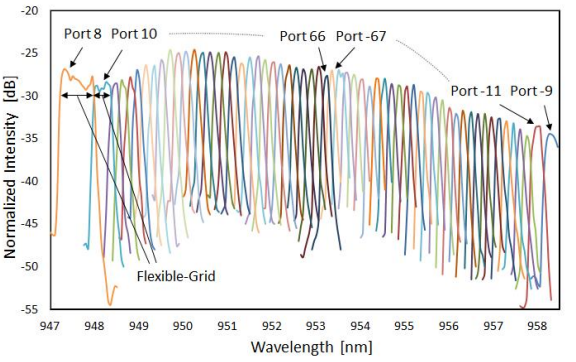

Fig. 3: Outputs spectra captured at 60 output-ports with the input wavelength range from 947.85 to 958.25 nm

Conclusions

We demonstrated a high-performance wavelength selective switch based on a Bragg reflector waveguides array with 60 selective and flexible-grid wavelengths channels. The device and whole module sizes are especially small of <1 and 10 cm.

Acknowledgements

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