

Optical Mode Switch

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Switching technologies in data centers are getting much attention because the conventional electrical switches lead to high power consumption in order to support the growth of network data traffic. Thus, optical router by using optical switch has been studied intensively to eliminate electrical-to-optical (OEO) signal exchange [1]. We proposed optical mode switch that switches the

“optical mode” that is orthogonal in principle [2,3]. Optical modes propagate in the same waveguide, thus, it only needs single input and output ports, as it is shown in Fig. 1 (b).

In order to evaluate the optical mode switching, MMI mode filter was used, so that the power of each mode and the crosstalk between them could be evaluated. The top view of the MMI mode filter is shown in Fig. 1 (c). MMI mode filter was used only for the purpose to distinguish the fundamental and first-order mode.

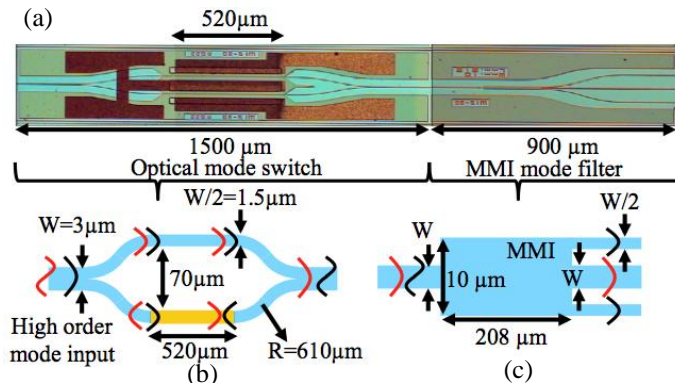


Fig. 1. Device configuration. (a) Top view of implemented device, (b) configuration detail of optical mode switch and (c) MMI mode filter.

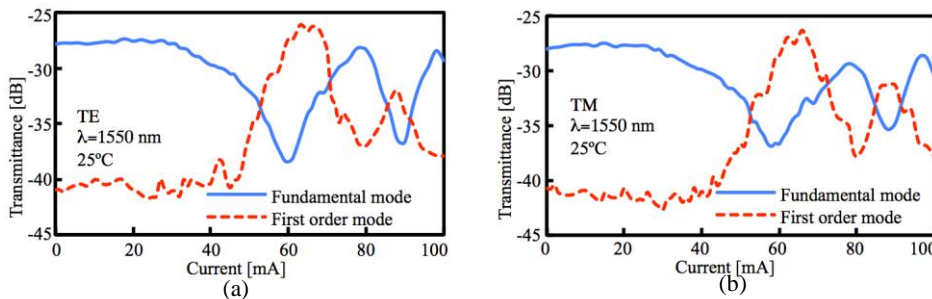


Fig. 2. Electrically controlled mode switch. (a) TE mode and (b) TM mode.

Figure 2 shows the electrically controlled mode switching results by using this configuration and MMI mode filter. Blue (solid) and red (dash) lines show the transmittance of the fundamental mode and first order mode, respectively. When the current was not injected into the device, fundamental mode power was higher than the first order mode with the crosstalk of -13 dB for TE-mode and TM-mode. When the current is increased gradually, fundamental mode power decreases slightly while first order mode power increases up to 42 mA. From 42 mA current injection, both of the power changed dramatically with the dip of fundamental mode was at 58 mA while the peak of the first-order mode was at 62 mA, showing that the switching state occurred at approximately 60 mA (5.7V).

Reference

- [1] D. J. Blumenthal et al., IEEE Opt. Comm. (2003)
- [2] R. Imansyah et al., IBP2014, 82. (2015).
- [3] R. Imansyah et al., MOC2015, 50. (2014).