

Optical mode switch group

Zhang Jin

Recently, the data center IP traffic is getting higher and higher. In order to cope with the growing communication traffic to or from data center, we have proposed mode-division-multiplexing system using single dimensional mode-set to realize low power consumption and flexible reconfigurable network [1]-[3]. In this system, optical mode switch is one of the key-device. We have already proposed the 2×2 optical mode switch and demonstrated the fundamental element of it [4]-[7]. To realize much higher mode switch, we have proposed 1×N switch based on single dimensional mode-set as shown in figure 1 [8].

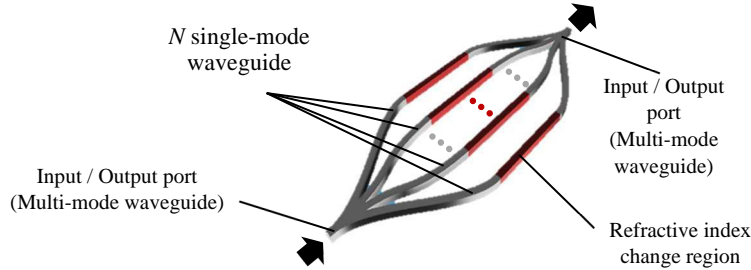


Fig.1 Proposed 1×N switch

But the feasibility of 1×4 mode optical switch was not yet reported. And it is necessary to confirm the performance of 1×4 mode optical switch in order to realize the higher mode evolution.

Calculation results of the internal loss[dB] of 1×4 optical mode switch is shown in table 1. The vertical axis shows the input mode, and the horizontal axis shows the output mode. The internal loss is expressed by the formula:

$$L_m = 10 \log \frac{P_o}{P_i} \quad [\text{dB}] \quad (1)$$

Table 1 Calculation results of the internal loss[dB] of 1×4 optical mode switch. The vertical axis shows the input mode, and the horizontal axis shows the output mode.

	0 th	1 st	2 nd	3 rd
0 th	-0.057	-0.062	-1.008	-0.947
1 st	-0.062	-0.824	-0.057	-1.14
2 nd	-1.008	-0.057	-1.0	-0.057
3 rd	-0.947	-1.14	-0.057	-0.905

According to the results, it was confirmed that the internal loss was about -1 dB. And the transmittance for 1×4 optical mode switch is shown in figure 4.

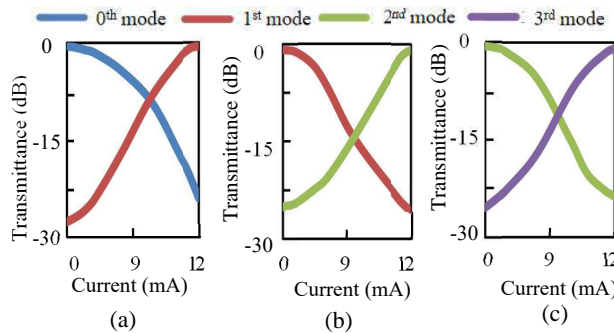


Fig.4 Transmittance for 1×4 optical mode switch

(a) 0th mode is switched to 1st mode (b) 1st mode is switched to 2nd mode (c) 2nd mode is switched to 3rd mode

【References】

- [1] K.I.Sato et. al., IEEE/OSA, A81-A93, (2009).
- [2] Y. Xiong et. al, optica, 1098-1102, (2017).
- [3] S. Ogawa et. al., (OECC)/PS2019, ThE105-106, (2019).