Mode Crosstalk Evaluation in Mode Selective Active Multimode Interferometer Laser Diode Based on Wavelength Spectrum Analysis Method Mode

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1. Introduction

The lateral mode selective light source has been demonstrated with over 40 GHz bandwidth on each single mode [1]. For practical application on transmission the evaluation of lasing mode quality must be evaluated. As the emission wavelength of 0th and 1st order mode locates at different range, accurate while simple mode crosstalk evaluation method is obtained from spectrum analysis [2]. In this work, mode crosstalk between 0th and 1st order mode was evaluated based on spectrum analysis. As a result, Mode crosstalk of -13.7 dB -12.5 dB for 0th and 1st mode have been confirmed, respectively.

2. Device Concept

Figure 1 shows the fabricated device structure. 0th mode and 1st mode have individual propagation paths [3]. Upper and down side bending waveguide are propagation path of 0th and 1st order mode, respectively. The bending waveguides left side act as the mode selector each mode. The straight access waveguide and multimode section consist the pumping section. By controlling current injection into the mode selector region, output modes are selected [4].

3. Results and discussion

Figure 2 (a) and (b) shows the measured near field pattern (NFP) of only 0th and 1st order mode operation. As can be seen from the figures, individual 0^{th} and 1^{st} order modes were confirmed experimentally. Figure 3 (a) and (b) show the emission spectrum of 0th mode and 1st order mode, respectively. As can be seen from the figures, the 0th mode component mainly locates at wavelength range shorter than 1560 nm. On the other hand, 1st order mode component locates at wavelength range longer than 1560 nm. Thus, for quick and simple evaluation method, wavelength components below 1560 nm are attributed to 0th mode. The range from 1560 nm to 1580 nm are attributed to conponent of 1^{st} order mode. By integrating the wavelength components form 1530 to 1560, power of 0^{th} order mode is evaluated. On the other hand, integration from 1560 nm to 1580 nm wavelength range brings the power of 1^{st} order mode. Consequently, in Fig. 3 (a), power of 0th mode and 1st order mode are evaluated as 0.4630 mW and 0.0200 mW, corresponding to mode corostalk of -13.7 dB. Similar procedure could be done for Fig. 3 (b). After integrating, power component of 0th and 1st order mode are 0.0331mW and 0.5379 mW, respectively, corresponding to mode croostalk of -12.5 dB.

4. Conlcusions

Mode crosstalk evaluation based on spectrum analysis on mode selective light source was demonstrated. Evaluated mode cross talks are -13.7 dB and -12.5 dB for 0th and 1st order mode, respectively.

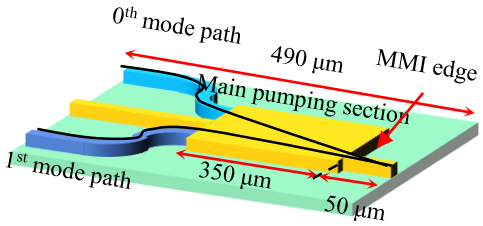

Fig. 1. Device structure of mode selective light source

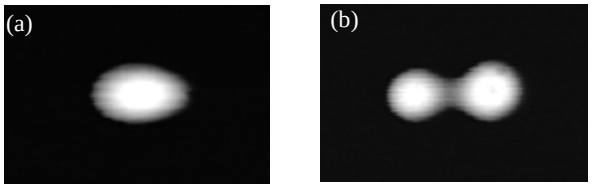

Fig. 2 NFP of (a) 0^{th} mode and (b) 1^{st} order mode

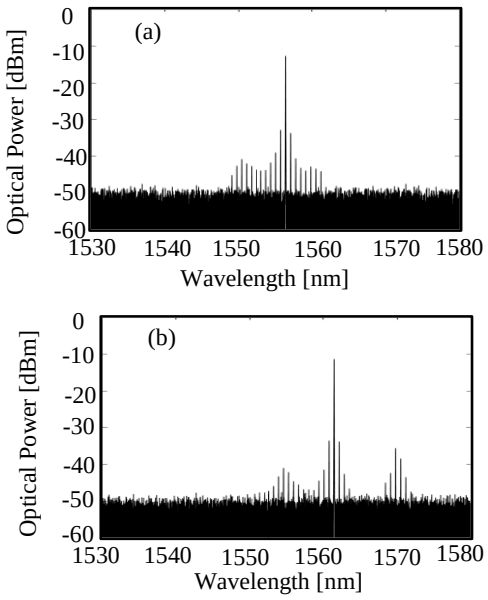

Fig. 3. Spectrum of single lateral mode lasing cases. (a)Measured 0^{th} mode spectrum, and (b) measured 1st mode spectrum.

References:

[1] B. Hong, et al., OFC, Th3B.4. 2018.
[2] B. Hong, et al., MOC 2018, F-6. 2018.
[3] J. V. Roey, et al., JOSA, vol. 71,803, 1981.
[4] B. Hong, et al., OECC/PS, TuD3, 2016.