

Proposal of photon-photon resonance control scheme on active-MMI laser diode

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Optical inter-connection is highly developed due to computer technology. And the direct modulation laser diode (DML) might be one of the transmitter candidates especially for future mobile IT devices because of its merits of low energy consumption and small size. However, the modulation speed of DML has been limited by the CPR phenomenon. In order to overcome this problem, we design the 3×1 active-MMI laser diode [1, 2], as shown in Fig. 1 to utilize the Photon-Photon resonance phenomenon to extend the modulation bandwidth.

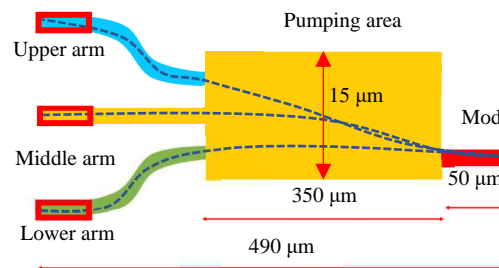


Fig. 1 Schematic example of active-MMI laser diode

Because of the structure of active-MMI laser diode which consists of multi arms, it is not only used to exploit the PPR phenomenon but also can be used to control the position of the PPR. As shown in Fig. 2, we keep the current charge in middle arm, lower arm and the pumping area as 55mA, 57mA, and 172mA and change the current injection in upper arm from 34mA-49mA in the step of 3 mA. And we can see that the PPR is shifted with the current change.

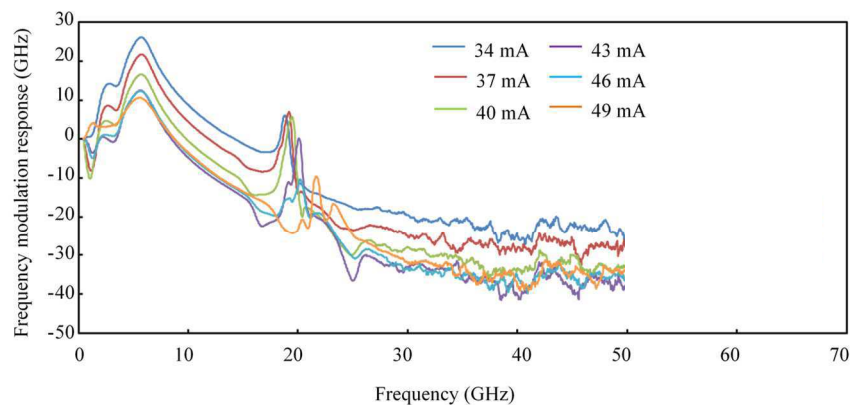


Fig. 2 Small signal response of the fabricated active-MMI LD

By changing the current injection into arms, the peak position of the PPR can be controlled, which provides a method for us to extend the modulation bandwidth by shifting it away from the CPR or close to the CPR to fill the damping between the CPR and it.

Reference

- [1] B Hong, et al, Tech. Dig. OFC., TH3B.4. (2018).
- [2] S Murakami, et al, Tech. Dig. MOC., G-4. (2019).