Linewidth characteristics of un-cooled fiber grating Fabry-Perot laser controlled by the external optical feedback.

ABSTRACT

The effect of external optical feedback (OFB) on the linewidth characteristics of un-cooled laser module is theoretically investigated. This laser that consists of a Fabry–Perot (FP) laser diode and fiber Bragg grating (FBG) realizes stable operation and relatively low-cost solution. The effects of external OFB and temperature on linewidth are calculated according to their effect on threshold carrier density (Nth). The temperature dependence (TD) of linewidth characteristics is calculated according to TD of laser parameters instead of well-known Parkovin relationship. Results show that, linewidth decreases as the external OFB reflectivity (Rext) increases. A narrow linewidth which is less than 3 kHz is obtained for Rext $\geq$ 0.5. In addition, the linewidth is not largely affected by temperature as compared to the DFB lasers. Also, we found that the linewidth temperature coefficient is 0.04 kHz/°C, which is small enough in comparison to 18.5 kHz/°C for the DFB laser.

Keyword: External optical feedback; Fabry-Perot laser diode; Fiber Bragg grating; Linewidth