

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 (N_{th}). 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 (R_{ext}) increases. A narrow linewidth which is less than 3 kHz is obtained for $R_{ext} \geq 0.5$. 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