

Characterization of Small-Signal Intensity Modulation of Single-Mode Fiber grating Fabry-Perot Laser Source.

ABSTRACT

A comprehensive study on the small-signal intensity modulation (IM) characteristics of a fiber grating Fabry-Perot (FGFP) laser is numerically investigated. The effect of external optical feedback (OFB), temperature, injection current, cavity volume, nonlinear gain compression factor, and fiber grating (FG) parameters on IM characteristics are presented. The temperature dependence (TD) of IM is calculated according to the TD of laser cavity parameters instead of using the well-known Parkove relationship. It has been shown that the optimum external fiber length (L_{ext}) is 3.1 cm. The optimum range of working temperature for FGFP laser is between 23 to 27 °C. We also show that by increasing the laser injection current from 10 to 60 mA, the IM peak amplitude decreased from 6.3 to 0.2 dB and the relaxation-oscillation frequency (ROF) is shifted from 1.2 GHz towards higher frequency of 5.48 GHz. In addition, the AR coating reflectivity and gain compression factor have no significant effect on the IM. The study indicates that a stable operation and excellent modulation characteristic can be obtained after optimization process.

Keyword: External cavity laser; Fiber Bragg grating; Modulation characteristic; Semiconductor laser diode; Wavelength division multiplexing