

时分复用光纤光栅传感阵列中DFB激光器的高精度温控设计

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摘要：

针对时分复用光纤光栅（TDM-FBG）传感阵列中使用的分布反馈（DFB）激光器高波长稳定度的要求，设计了一个高精度的DFB温控方案，包括温度测量与设定、热敏电阻线性化、PID补偿回路、H桥驱动、温度电压采集与显示等。使用DFB内置的热敏电阻和半导体制冷器（TEC）对温控电路进行了测试，其精度在200s内达到 $\pm 0.04^\circ\text{C}$ ，温控后激光器温度变化引起的应变测量误差为 $\pm 3.4\mu\epsilon$ 左右，满足TDM-FBG传感阵列的要求。

关键词：光纤光栅；传感；时分复用；分布反馈激光器；温控

Design of DFB Laser's High Performance Temperature Controller in TDM FBG Sensing Array

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Abstract:

In order to meet high wavelength stability of DFB in time division multiplexing fiber Bragg grating (TDM-FBG) sensing array, temperature control circuits of DFB are designed, including temperature measurement and set circuits, thermistor linearization, H-bridge driving circuits, PID compensation network, temperature voltage sampling circuits and display circuits. The parameters of DFB's temperature control circuits are tested by using the built-in thermistor and TEC, its accuracy can reach $\pm 0.04^\circ\text{C}$ within 200 seconds. This result shows that the strain measurement error from laser's temperature drift will be $\pm 3.4\mu\epsilon$ after temperature control.

Keywords: fiber Bragg grating; sensing; time division multiplexing; distributed feedback; temperature controller

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