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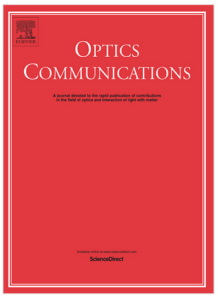

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Suppression of residual intensity modulation noise in resonator integrated optic gyro

Chengfei Zhang,[a,b] Ziwen Pan,[a,b] Yongqiu Zheng,[a,b] Panlong An,[a,b] Jun Tang,[a,b] and Jun Liu[a,b,*]

[a] *National Key Laboratory for Electronic Measurement Technology, North University of China, Taiyuan 030051, China*

[b] *Key Laboratory of Instrumentation Science and Dynamic Measurement Ministry of Education, North University of China, Taiyuan 030051, China*

**liuj@nuc.edu.cn*

Abstract: This study investigated residual intensity modulation (RIM) noise inducing offset error of the first harmonic demodulation in resonator integrated optic gyros. This offset error at the resonance point is susceptible to light intensity variation and induces frequency locking error with gyro output drift. We propose a correction for the zero error reference technique to optimize tracking resonant frequency performance, utilizing the RIM effect to correct the proportional integral servo zero error reference. Differential output from two loops is used as the rotation rate to eliminate RIM and light intensity noise, and frequency locking was compared experimentally with and without correction for the zero error reference technique. Frequency locking accuracy of 2.279°/h and long term bias stability of 27.14°/h (3600 s) were obtained, which is the current best result for the packaged resonator integrated optic gyro prototypes employing a semiconductor laser diode.

Keywords: Residual intensity modulation; Resonator integrated optic gyros; Semiconductor laser diode.

1. Introduction

Micro-electro-mechanical system based gyros [1], laser gyros [2], and fiber optic gyros [3] are widely utilized for civil and military inertial navigation. However, these traditional gyros have a number of inherent disadvantages, such as poor accuracy, large volume or high cost. Therefore, ongoing research has targeted reducing the size of the optical rotation sensors without sensitivity degradation. Resonator optical gyros and brillouin optical gyro based on the Sagnac effect, are promising alternatives to next generation inertial navigation devices, with the ultimate goal of creating a high sensitivity, low drift, and integrated optical gyroscope [4,5]. In particular, applying micro-fabrication methods