

Development of Angular Velocity Measurement Channel Based on Digital Fiber-Optic Gyroscope

A. N. Pestunov¹, E. V. Kovaleva

¹*candidate of engineering science*

Stock company "Scientific-production Association measuring equipment"

e-mail: npoit@npoit.ru

Abstract. The article is devoted to the development of channels for angular velocity measurement based on a digital fiber-optic gyroscope (FOG). The development is carried out to reduce the impact of microcircuit drift on the accuracy of angular speed measurement of open-loop FOG. The results of numerical simulation of the digital processing method of the transimpedance amplifier signal in open-loop FOG are presented. The estimation of the potential measurement quality of angular velocity by this method is performed, as well as the evaluation of the measurement quality of key parameters stabilized in open-loop FOG. The results were obtained from a numerical simulation of a 14-bit analog-to-digital converter (ADC) of successive approximation, as well as ADC signal processing with filters with finite pulse characteristic, in realistic noise conditions for a transimpedance amplifier signal. The simulation was performed using the MathCad. The simulation shows that the potentially achievable accuracy of angular velocity measurement by this method is 0,01% at a sampling rate of 50 MHz. The results demonstrate the possibility of using this method in the current development of strapdown inertial blocks (SIB) in open-loop FOG, as well as the possibility of implementing the described building principle of the angle-measuring channel using Russian electronic components.

Keywords: open-loop fiber optic gyroscope, digital signal processing, digital filter