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The laboratory investigation of the innovative sensor for torsional effects in engineering structures' monitoring

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Abstract:

The main objective of this work is to characterize the performance of an interferometric fibre sensor which has been designed in order to register rotational phenomena, both in seismological observatories and engineering constructions. It is based on a well-known Sagnac effect which enables to detect one-axis rotational motions in a direct way and without any reference system. The presented optical fibre sensor – FOSREM allows to measure a component of rotation in a wide range of signal amplitude from 10^{-8} rad/s to 10 rad/s, as well as frequency from 0 Hz to the upper frequency from 2.56 Hz to 328.12 Hz. The laboratory investigation of our system indicated that it keeps theoretical sensitivity equal to $2 \cdot 10^{-8}$ rad/s/Hz^{1/2} and accuracy no less than $3 \cdot 10^{-8}$ to $1.6 \cdot 10^{-6}$ rad/s in the above mentioned frequency band. Moreover, system size that equals $0.36 \times 0.36 \times 0.16$ m and opportunity to remotely control the system via Internet by special server make FOSREM a mobile and autonomous device.