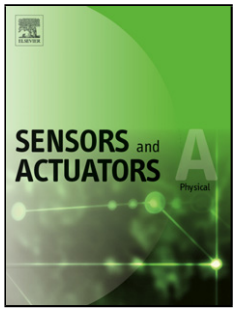

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Influence of magnetic fields on the bias stability of atomic gyroscope operated in spin-exchange relaxation-free regime

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Abstract

For the atomic gyroscope (AG) operated in spin-exchange relaxation-free (SERF) regime, the sensitivity to external magnetic fields has been suppressed while the ability to sense inertial rotations has been kept. Here, a theoretical relationship between the magnetic fields and the AG response is given, and the influence of field fluctuations on the systematic stability is also shown. The spin-exchange rate of the electron spins R_{se}^{en} and the relaxation rate of the nuclear spins R_{tot}^{n} aggravate the influence of the field component B_x. Experimental results indicate that the contributions of long-term fluctuations in the fields, approximately 2.4 pT/h for B_x and 0.9 pT/h for B_y, to the bias stability are 2.19×10^{-2} deg/h and 5.29×10^{-4} deg/h. This work is not only valuable for understanding the field-suppression effect in SERF AG, but also provides a useful tool for identifying the influence of fields on the systematic stability.

Keywords: Atomic gyroscopes, Inertial sensors, Magnetic-field suppression, Magnetic-field stability

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