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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  $2.19 \times 10^{-2}$  deg/h and  $5.29 \times 10^{-4}$  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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