Continuous Cold-atom Gyroscope with 11 cm^2 Sagnac Area at nrad/s Stability

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We report the latest results from our gyroscope based on interferometry with cold atoms. We launch laser-cooled Cesium atoms in a fountain configuration and interrogate them in a Mach-Zehnder like geometry using stimulated Raman transitions. According to the Sagnac effect, the sensitivity to rotation is proportional to the physical area enclosed by the two arms of the interferometer. We demonstrate an unprecedented interferometric area of 11 cm^2, which is 30 times larger than ever reported [1]. Using classical accelerometers, we are able to reject vibration noise by a factor 20 and obtain a state-of-the-art sensitivity of 1.2×10^{-7} rad/s/$\sqrt{\text{Hz}}$ at short term. We achieve a 2 nrad/s sensitivity after about few hours of integration [1,2]. We also demonstrate the possibility to operate our gyroscope without deadtime [3], which represents a big progress for continuous inertial sensing and more generally for applications requiring high bandwidth atom interferometry such as gravitational wave detection.

References

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