High precision cold atom gyroscope

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Abstract

Due to its high potential, matter wave interferometry has been investigated as a tool for high precision inertial measurements for years [1]. The research topic of the CASI project (Cold Atom Sagnac Interferometer) is a gyroscope using laser cooled Rubidium atoms and aiming for a sensitivity of a few $10^{-9}\,\mathrm{rad/s/Hz^{1/2}}$ for 10^8 atoms per shot [2]. The atomic ensemble is launched in a pulsed mode onto a flat parabola with a forward drift velocity of $2,79\,\mathrm{m/s}$ [3] leading to an interrogation time of over 50 ms. Via coherent beamsplitting using Raman transitions, the atomic trajectories forming the interferometer paths can enclose an area of several $\mathrm{mm^2}$. In this talk we discuss the influence of the main noise sources which limit the sensitivity of our quantum sensor. Particularly, contributions affecting the beam splitting process as well as the detection will be considered. Furthermore, the lastest interferometry measurements will be presented. This work is supported by the DFG, QUEST, and IQS.

Keywords: ATOM INTERFEROMETRY, INERTIAL SENSOR, METROLOGY, GYROSCOPE

References

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