Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Correlated inertial sensors using a single Bose-Einstein condensate[1] MATTHIAS GERSEMANN, Leibniz University Hannover, Institute of Quantum Optics, MARTINA GEBBE, University Bremen, ZARM, SVEN ABEND, CHRISTIAN SCHUBERT, ERNST M. RASEL, Leibniz University Hannover, Institute of Quantum Optics, QUANTUS COLLABORATION — Atom interferometers inherently feature long-term stabilities and accuracies but can face challenging environments where they are limited by e.g. vibration noise. We introduce novel schemes for such atom interferometers exploiting the narrow momentum widths of delta-kick collimated Bose-Einstein condensates (BEC). An inertial sensitive measurement setup is presented combining correlated Mach-Zehnder like atom interferometers to simultaneously measure rotations and accelerations. This geometry correlates three sets of two simultaneously operated interferometers generated from a single BEC. For each set an initial double Bragg diffraction pulse is applied to split the condensate symmetrically into two sources prior to the interferometry pulse sequence each with a non-vanishing relative motion. In this way, the interferometer is sensitive to accelerations as well as rotations. As an addition, we also present a method to increase the dynamic range by employing beam splitters with different diffraction orders in a correlated geometry. The main benefit of these dual interferometer geometries is the common rejection of vibration noise.

[1]This work is supported by the DLR with funds provided by the BMWi under Grant No. DLR 50WM1952, 50WM1641, 50WP1700, 50RK1957, the EXC 2123 Quantum Frontiers, and the VDI with funds provided by the BMBF under Grant No. VDI 13N14838.

Matthias Gersemann
Leibniz University Hannover, Institute of Quantum Optics

Date submitted: 30 Jan 2020 Electronic form version 1.4