Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Twin-lattice atom interferometers using thousands of photon recoils[1] SVEN ABEND, Leibniz University Hannover, Institute of Quantum Optics, MARTINA GEBBE, ZARM, University Bremen, MATTHIAS GERSEMANN, CHRISTIAN SCHUBERT, ERNST M. RASEL, Leibniz University Hannover, Institute of Quantum Optics — Atom interferometry offers an interesting perspective for the detection of gravitational waves in the frequency band between eLISA and Advanced LIGO. A key feature to reach the targeted sensitivities for these devices is large momentum transfer. Optical lattices are ideal tools to transfer large number of photon recoils onto atoms. We demonstrate twin-lattice atom interferometers with up to 1632 photon recoils at a maximum splitting of 408 photon recoils, which is to our best knowledge the largest in an interferometer reported so far. To reach these large momentum splittings while maintaining interferometric contrast, we utilize delta-kick collimated Bose-Einstein condensates. The main cause for loss of contrast in these interferometers are distortion on the lattice light field. In our setup we can verify by simulations, that these distortions are caused by aperture effects of the Gaussian beam and show an increased contrast by a factor of 3. We study the influence of these light field distortions and show the implementation of a top-hat-shaped laser beam to surpass our current limitations.

[1]This work is supported by the DLR with funds provided by the BMWi under Grant No. DLR 50WM1952 (QUANTUS-V-Fallturm), 50WM1641 (PRIMUS-III), 50WP1700 (BECCAL), 50RK1957 (QGYRO), and the VDI with funds provided by the BMBF under Grant No. VDI 13N14838 (TAIOL).

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Date submitted: 30 Jan 2020 Electronic form version 1.4