Atom-chip based quantum gravimetry with Bose-Einstein condensates\textsuperscript{1} SVEN ABEND, MATTHIAS GERSEMANN, HOLGER AHLERS, ERNST M. RASEL, Institut fuer Quantenoptik, Leibniz Universitaet Hannover, MARTINA GEBBE, HAUKE MUINTINGA, CLAUS LAEMMERZAHL, ZARM, Universitaet Bremen, QUANTUS TEAM — Today’s generation of inertial sensitive atom interferometers typically operate with sources of laser cooled atoms and thus their performance is limited by velocity spread and finite-size effects that impose systematic uncertainties. Ultra-cold sources such as a BEC or even delta-kick cooled atomic ensembles with extremely narrow velocity dispersion are able to overcome these limitations and are crucial for obtaining high-fidelity beam splitters. Atom-chip technologies offer the possibility to generate a BEC and perform delta-kick cooling in a fast and reliable away. We show a combination of such an ensemble generated in a miniaturized atom-chip setup with the application of low-loss Bragg beam splitting to perform inertial sensitive measurements. A specialty of this setup is the retro-reflection of the beam splitting light field from the atom-chip itself, serving as inertial reference in vacuum. This allows for a compact realization of a quantum gravimeter determining the local gravitational acceleration to the scale of local variations limited by seismic noise.

\textsuperscript{1}This work is supported by the German Space Agency (DLR) with funds provided by the Federal Ministry for Economic Affairs and Energy (BMWi) due to an enactment of the German Bundestag under grant numbers DLR 50 1131-1137 (QUANTUS-III).

Sven Abend
Institut fuer Quantenoptik, Leibniz Universitaet Hannover

Date submitted: 30 Jan 2015   Electronic form version 1.4