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Interferometry with Bose-Einstein condensates in microgravity
ERNST MARIA RASEL, Institut für Quantenoptik, Leibniz Universität Hannover, QUANTUS COLLABORATION — A new field in matter wave optics is emerging, which is based on very long baseline atom interferometry (VLBAI). These interferometers strive to increase the sensitivity by coherently spitting and separating wave packets over macroscopic spatial and temporal scales. Bose-Einstein condensates are the ideal source for performing this kind of interferometry and were exploited for the first time in the extended free fall with a chip-based atom laser for Rubidium. Combining delta kick cooling with BEC we can produce ensembles with energies equal to temperatures falling below one nK. Employing an asymmetric Mach-Zehnder type interferometer we could study over hundreds of milliseconds the coherent evolution of a wave-packet and analyse delta kick cooling with the help of the observed interference fringes. A novel generation of atom chips allows to the fast generation of large condensates of more than 100000 atoms in a shoebox sized setup. This project is supported by DLR 50 WM 0346) and DFG-QUEST.

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