

Abstract Submitted
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Quantum Tests of the Universality of Free Fall DENNIS SCHLIPPERT, HENNING ALBERS, CHRISTIAN MEINERS, LOGAN L. RICHARDSON, ETIENNE WODEY, HENDRIK HEINE, DIPANKAR NATH, CHRISTIAN SCHUBERT, WOLFGANG ERTMER, ERNST M. RASEL, Institut fuer Quantenoptik, Leibniz Universitaet Hannover — Searches for violations of the Universality of Free Fall (UFF) mark an important approach in reconciling quantum mechanics and general relativity. In this respect, matter wave interferometers resemble a novel test method that differs fundamentally from experiments employing macroscopic test masses. We report on a quantum test of the UFF at the 100 ppb level using two different chemical elements, ^{39}K and ^{87}Rb [1]. We show recent improvements of the experiment aiming towards a ppb test, focusing on both, the stability, and the systematic uncertainty aided by the use of a common optical dipole trap. We furthermore present future strategies for tests of the UFF aiming for accuracies of 10^{-13} and beyond in large scale apparatuses on ground and in space.

[1] D. Schlippert *et al.*, *Phys. Rev. Lett.* **112**, 203002 (2014)

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