Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Towards Testing General Relativity with a dual species interferometer DENNIS SCHLIPPERT, JONAS HARTWIG, DANIEL TIARKS, ULRICH VELTE, SVEN GANSKE, WOLFGANG ERTMER, ERNST M. RASEL, Institut fuer Quantenoptik, Leibniz Universitaet Hannover — We report on our work directed towards a dual species matter-wave interferometer for performing a differential measurement of the acceleration of free falling ^{87}Rb and ^{39}K atoms to test Einstein's equivalence principle (universality of free fall). Based on minimal Standard Model Extension calculations this combination of test masses is more sensitive to composition based equivalence principle violating effects than, e.g. ^{85}Rb-^{87}Rb. During free fall, a Mach-Zehnder type interferometry sequence employing stimulated Raman transitions is applied synchronously for both species, achieving high common noise rejection. With an expected single shot resolution of $5 \times 10^{-8} g$ the apparatus will allow for studying systematics at the $10^{-9} g$ level after 100 s integration time. Post-correction methods for high vibrational noise environments are investigated. To assure well defined starting conditions the two species will be trapped in an optical dipole trap. The properties of this trap at 2 μm allow for fast and efficient laser cooling, use of evaporative and sympathetic cooling techniques is possible. We will show the enviromental noise limited performance of the single species Rb gravimeter and the progress of the implementation of the K gravimeter.

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Date submitted: 25 Jan 2012 Electronic form version 1.4