Measuring the period of a pendulum with a tall atom interferometer

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Atom interferometers have long been recognized as very powerful tools for precision measurements. Light-pulse atom interferometers allow atoms to freely evolve in-between laser pulses and acquire information about the surrounding potential with a phase that scales as T^2, although proposals and experiments involving higher-order scaling (T^3) have been reported [1, 2, 3]. The quantum sensors group at the Naval Postgraduate School is building a very tall atom interferometer for precision measurements of inertial forces. Our first proposed experiment involves the measurement of the period of a nearby Foucault pendulum with the atom interferometer. In this talk, I will first motivate why we would want to do such a simple experiment in such a complicated way. The phase of the atom interferometer can be calculated using the Feynman path integral technique. I will outline these calculations, highlighting the differences that arise between our system and a more traditional Kasevich-Chu-style gravimeter [4]. Next, I will briefly show the status of the construction of the apparatus. Finally, I will speculate on other fundamental measurements that could be made with our apparatus.

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