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Bloch oscillations as a probe of the local gravitational field during optical lattice clock operation BRANDON PEDEN, DOMINIC MEISER, JILA and Department of Physics, CU Boulder, MARILU CHIOFALO, INFM and Classe di Scienze, Scuola Normale Superiore of Pisa, Pisa, Italy, MURRAY HOLLAND, JILA and Department of Physics, CU Boulder — Optical lattice clocks are approaching a level of precision where knowledge of the gravitational potential at the location of the clock is necessary in order to compare results from different labs. We propose a scheme to measure the local gravitational acceleration by detecting Bloch oscillations using the lattice beams. Under the influence of gravity, the atoms are accelerated until they reach the Brillouin zone boundary, at which time they are Bragg reflected. The Bragg reflection is accompanied by coherent scattering of photons between the two counter-propagating lattice beams in order to conserve momentum. These scattered photons can be detected without disrupting normal clock operation.

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