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Precision measurement of the Stark effect on a Yb lattice clock NATHAN HINKLEY, University of Colorado, Boulder, JEFF A. SHERMAN, KYLE BELOY, NATHANIEL B. PHILLIPS, RICHARD W. FOX, CHRIS W. OATES, ANDREW D. LUDLOW, NIST, Boulder — Ultracold alkaline-earth-like atoms, confined within an optical lattice and exploiting the ultra-narrow  ${}^{1}S_{0}$  to  ${}^{3}P_{0}$ atomic transition, are utilized as high-accuracy frequency standards and precision timekeepers. The blackbody Stark effect and residual lattice ac-Stark shifts not canceled at the magic wavelength (where scalar Stark shifts between clock states  ${}^{1}S_{0}$ and  ${}^{3}P_{0}$  are balanced) both remain as the principle contributions to the frequency uncertainty. We describe precision measurements that carefully characterize these effects, paying the way towards optical lattice clock systems with  $10^{-17}$  level uncertainty. First, we determine the dynamic effect of blackbody radiation (BBR) on the atomic clock states, constraining the BBR shift uncertainty from an ideal blackbody environment to  $1.1 \times 10^{-18}$ . Next, we discuss precision measurements of the latticeinduced Stark shifts from the E1 polarizability, hyperpolarizability, and multipolar terms. Finally, we demonstrate the proficiency of lattice clock systems for precision frequency measurements by directly comparing two such Yb standards, and achieve  $10^{-17}$  frequency stability in <1000 s.

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