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46th Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics Volume 60, Number 7

Monday–Friday, June 8–12, 2015; Columbus, Ohio**Session D1: Poster Session I (4:00 pm - 6:00 pm)**

4:00 PM–4:00 PM, Tuesday, June 9, 2015

Convention Center Room: Battelle South

Sponsoring Unit: APS

Abstract ID: BAPS.2015.DAMOP.D1.59

Abstract: D1.00059 : Controlling higher-order Stark effects in an Yb optical lattice clock[Preview Abstract](#)[MathJax On](#) | [Off](#) | [← Abstract →](#)**Authors:**W.F. McGrew
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Recently, optical lattice clocks have demonstrated fractional frequency stability at the 10^{-18} level. Agreement between two Sr clocks has been observed at $-1.1 \pm 1.6 \times 10^{-18}$ [I. Ushijima *et al.*, arXiv:1405.4071 (2014)], with estimates of total uncertainty at similar levels. For the NIST Yb optical lattice clock, we have begun an experimental evaluation of all systematic uncertainties. The blackbody Stark shift - until recently the leading source of uncertainty - is controlled with a room-temperature radiative thermal shield to a fractional clock uncertainty of 1×10^{-18} . The next most significant effect is due to the optical lattice itself. We used a power-enhancement cavity to study the shift for both deep and shallow lattices with diverse thermal occupations. Hyperpolarizability effects can be significant at this level, and are precisely measured. Scalar Stark and hyperpolarizability lattice effects can be canceled to maintain total lattice shifts at $< 10^{-17}$. We also report experimental measurements of the Stark shifts due to the probe laser field and stray static electric fields.

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