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Short-term stability improvements of an optical frequency standard based on free Ca atoms JEFF SHERMAN, NIST-Boulder, CHRIS OATES — Compared to optical frequency standards featuring trapped ions or atoms in optical lattices, the strength of a standard using freely expanding neutral calcium atoms is not ultimate accuracy but rather short-term stability and experimental simplicity. Recently, a fractional frequency instability of 4×10^{-15} at 1 second was demonstrated for the Ca standard at 657 nm [1]. The short cycle time ($\sim$2 ms) combined with only a moderate interrogation duty cycle ($\sim$15 %) is thought to introduce excess, and potentially critically limiting technical noise due to the Dick effect—high-frequency noise on the laser oscillator is not averaged away but is instead down-sampled by aliasing. We will present results of two strategies employed to minimize this effect: the reduction of clock laser noise by filtering the master clock oscillator through a high-finesse optical cavity [2], and an optimization of the interrogation cycle to match our laser's noise spectrum.

[1] Oates et al., *Optics Letters*, **25**(21), 1603–5 (2000)
[2] Nazarova et al., *J. Opt. Soc. Am. B*, **5**(10), 1632–8 (2008)

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