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Laser Frequency Stabilization Using a Calcium Ramsey-Bordé Interferometer JUDITH OLSON, Department of Physics, University of Colorado, Boulder, CO, USA, RICHARD FOX, National Institute of Standards and Technology, Boulder, CO, USA, EDUARDO DE CARLOS-LOPEZ, Time and Frequency Division Centro Nacional de Metrología, Querétaro, México, CHRIS OATES, ANDREW LUDLOW, National Institute of Standards and Technology, Boulder, CO, USA — Ramsey-Bordé (RB) interferometry is a powerful spectroscopic tool for the interrogation of narrow optical resonances. Even for atomic systems with broad velocity distributions, spectral features free from first-order Doppler and transit-time broadening can be resolved using two counterpropagating pairs of copropagating beams. In our system, a high-flux thermal calcium beam is excited from the $^1S_0$ to $^3P_1$ state using the 657 nm intercombination line. The high spectral resolution afforded by RB interferometry allows exploration of spectral features approaching the transition's natural linewidth, 400 Hz. Together with the large atom number from the continuously fed thermal beam, the optical frequency reference has considerable potential for a compact frequency standard with extremely low instability. We previously observed fractional frequency instability of 5.5×10^{-15} at 1s using this technique. With the addition of a laser to access the strong 431 nm cycling transition from the $^3P_1$ to the doubly excited $^3P_0$ state, the potential exists to achieve frequency stability below 10^{-16} at short times. We explore the implementation of this system and future enhancements to further improve the standard's short- and long-term performance.

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