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Stability of a frequency-comb-based transfer-lock using a passive Fabry-Perot resonator and its application to spectroscopy of ultracold molecules SAMBIT BIKAS PAL, MARK LAM, KAI DIECKMANN, Centre for Quantum Technologies and Dept. of Phys., Natl Univ of Singapore — In this poster, we demonstrate a transfer-lock laser frequency stabilization[1] that utilizes a frequency comb (FC) and a radio frequency counter referenced to a GPS frequency standard to compensate for the frequency drifts of two lasers, which are locked to a single passive FabryPerot resonator (FPR). The method requires only one optical phase lock with the FC and allows transfer locking of lasers at wavelengths beyond the usable range of the FC. To attain a large frequency tuning range for the lasers, we implement optical serrodyning. We further demonstrate an efficient scheme to suppress residual amplitude modulation, thereby improving the stability of the Pound-Drever-Hall lock used in this case. The absolute frequency stability was found to be better than 2×10^{-13} on timescales up to 300 s. Hence, together with the frequency stability on short timescales provided by the FPR, this scheme facilitates coherent Raman spectroscopy as needed for an example for the production of ultracold dipolar heteronuclear molecules.

[1]S. B. Pal, M. M. Lam, and K. Dieckmann, Optics Letters, **41**, 23, 5527-5530 (2016)

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