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Phase-locked scanning interferometer for frequency stabilization of multiple lasers ALEXEY TONYUSHKIN, MICHAEL DI ROSA, LANL — We report a simple scheme for stabilizing and tuning the length of a conventional piezo-driven optical cavity against the resonant transmission of a master laser. Different from the other schemes, we drive the piezo at its mechanical resonance of 5 kHz over an amplitude equivalent to one free spectral range and use a feedback circuit that incorporates a phase- sensitive detection of the master-laser transmission. The bandwidth of our cavity-lock circuit is 1.4 kHz, as limited by the resonance frequency of the cavity piezo. The mean cavity length is stabilized to a minimum Allan variance of ∼10 kHz (a length stability of 20 parts per trillion) equaling that of the polarization-stabilized He-Ne we use as our master laser. Here, we investigate the mechanical characteristics of the cavity, describe the lock circuit and its measured performance, and present calculations relating the phase-sensitive signal to cavity displacement. We believe our setup economizes the cost and amount of equipment necessary for stabilizing multiple cw lasers operating at different wavelengths.

Alexey Tonyushkin
LANL

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