

Affordable Medium-Finesse Optical Cavity for Diode Laser Stabilization

D RODRÍGUEZ FERNÁNDEZ¹, M A LEFRÁN TORRES¹, M R CARDOSO¹, J D M KONDO², M SAFFMAN³, AND
L G MARCASSA¹

¹*Instituto de Física de São Carlos, Universidade de São Paulo, 13566-590, São Paulo, Brazil.*

Contact Phone: +5516988625833

²*Physics, Federal University of Santa Catarina, Florianópolis/SC, Brazil*

³*Department of Physics, University of Wisconsin, Madison WI, USA*

Contact Email: davidrf@ifsc.usp.br

We have constructed and characterized an affordable medium-finesse optical cavity to stabilize tunable diode lasers at two different wavelengths (780, and 960 nm, respectively). Its main element is an ultra-low expansion glass spacer, whose temperature was stabilized using thermoelectric cooler elements inside a vacuum chamber. By combining the dual sideband technique and the classical Pound–Drever–Hall technique, we could lock the lasers at any frequency within the cavity free spectral range. The cavity presents a long-term resonant frequency drift of 1.2 MHz/day, which can be compensated for by temperature variation. Finally, we demonstrate the cavity use in an electromagnetically induced transparency microwave spectrum experiment in a thermal atomic sample.