

FEED-FORWARD COHERENT LINK FROM A COMB TO A DIODE LASER : APPLICATION TO SATURATED CAVITY RING DOWN SPECTROSCOPY

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We applied a feed-forward frequency control scheme to establish a phase-coherent link from an optical frequency comb to a distributed feedback (DFB) diode laser: This allowed us to exploit the full laser tuning range (up to 1 THz) with the linewidth and frequency accuracy of the comb modes. The approach relies on the combination of an RF single-sideband modulator (SSM) and of an electro-optical SSM, providing a correction bandwidth in excess of 10 MHz and a comb-referenced RF-driven agile tuning over several GHz. As a demonstration, we obtain a 0.3 THz cavity ring-down scan of the low-pressure methane absorption spectrum. The spectral resolution is 100 kHz, limited by the self-referenced comb, starting from a DFB diode linewidth of 3 MHz. To illustrate the spectral resolution, we obtain saturation dips for the $2\nu_3$ R(6) methane multiplet at μbar pressure. Repeated measurements of the Lamb-dip positions provide a statistical uncertainty in the kHz range.