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An optical frequency tracker for real-time monitoring and diagnostics of narrow linewidth laser systems LUIS FELIPE GONCALVES, RACHEL E. SAPIRO, GEORG RAITHEL, DAVID A. ANDERSON, Rydberg Technologies — We present an Optical Frequency Tracker (OFT) for real-time, fine-grained linearization of laser scans and diagnostics of narrow-linewidth laser systems. The device allows one to accurately detect and remove nonlinearities from the frequency axis of measured spectra, including chirps and hysteresis, as well as characterize frequency drifts and jitter. This is relevant, for example, in atomic and molecular spectroscopy where the precise determination of spectroscopic lines is critical. The OFT is a compact unit that incorporates a temperature-stabilized monolithic waveguide to generate equidistant optical frequency markers that serve as a frequency ruler. The marker spacing of an individual OFT unit is typically set to a value on the order of 10 MHz. The overall frequency-marker drift is below 10 kHz/s. In the present demonstration we have used an OFT to characterize the performance of two laser systems: a tunable, narrow-band external-cavity 1020-nm diode laser and a 780-nm DFB laser. In both cases, the OFT has been used to correct non-linearities in the frequency scans that would otherwise have led to significant errors in spectroscopic measurements of atomic line positions. Detailed OFT performance metrics and further applications will be discussed.

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