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High-Precison, Accurate, and Robust Optical Frequency Source Using a Non-Narrow Linewidth Laser KRISHNA MYNENI, U.S. Army RDECOM/AMRDEC, RDMR-WDS-WO, Redstone Arsenal, AL 35898, HONGROK CHANG, Ducommun Miltec, 678 Discovery Dr., Huntsville, AL 35806, DAVID D. SMITH, NASA Marshall Space Flight Center, ES31, Huntsville, AL 35812 — We stabilize the center frequency of an off-the-shelf diode laser to the saturated-absorption resonances of the ^{87}Rb D_2 hyperfine transitions. The laser makes no use of optical feedback from an external cavity for line narrowing or frequency tuning. Using two such sources, we characterize the output frequency stability, frequency accuracy, line width, and coherence time of the source. Despite the short-term megahertz-level line width of the source, our results demonstrate that the stabilized laser provides a frequency stability of $\sim$1 kHz at an integration time of 10 s, and a frequency accuracy of $\sim$150 kHz over a tuning range of 230 MHz and at 100 ms integration time. Our laser source is relatively simple, compact, portable, and is expected to be far less susceptible to environmental influences such as vibration and temperature variation than a stabilized laser system which relies on an external cavity. Therefore, our stabilized laser source has potential applications for atom-based sensors for field use. Results will also be presented demonstrating use of the source for measurement of hyperfine frequency intervals, and measurement of frequency-accurate saturated-absorption spectra in ^{87}Rb.

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