



Quantum Physics

Low phase noise diode laser oscillator for 1S-2S spectroscopy in atomic hydrogen

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We report on a low-noise diode laser oscillator at 972 nm actively stabilized to an ultra-stable vibrationally- and thermally compensated reference cavity. To increase the fraction of laser power in the carrier we designed a 20 cm long external cavity diode laser with an intra-cavity electro-optical modulator. The fractional power in the carrier reaches 99.9% which corresponds to a rms phase noise of $\phi^2_{\text{rms}} = 1 \text{ mrad}^2$ in 10 MHz bandwidth. Using this oscillator we recorded 1S-2S spectra in atomic hydrogen and have not observed any significant loss of the excitation efficiency due to phase noise multiplication in the three consecutive 2-photon processes.

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