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(G*) (POS-40) A tunable frequency-offset-locked laser system for matter-wave interferometry

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We demonstrate a method for stabilizing a diode laser using a frequency-offset locking scheme and commercial electronics. Our 1560 nm diode laser is slaved to an ultra-stable master laser operating at 780 nm by frequency-doubling the slave laser and measuring its optical beatnote with the master on a high-speed photodiode. This RF beatnote is fed through a broadband variable divider and a frequency-to-voltage converter with a high degree of linearity. An analog proportional-integrator circuit then uses the corresponding voltage signal to control the slave laser's frequency with a tunable offset in the range of ˜100 MHz to a few GHz. The main advantage of this method is its simplicity, versatility, and scalability. For example, minor modifications of the same architecture will enable us to realize an optical phase lock between two lasers. This locking system will be deployed on a laser-cooling experiment to realize a quantum gravimeter based on matter-wave interferometry.

Keyword-1

Laser Control

Keyword-2

Matter-wave Interferometry

Keyword-3

Cold Atoms

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