Realization of a compact laser system for atom interferometer

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A simple and compact design of the laser system is important for realization of compact atom interferometers (AIs) [1]. We design and realize a simple fiber bench-based 780-nm laser system used for ^{85}Rb AI-based gravimeters. The laser system contains only one 780 nm seed laser, and the traditional frequency-doubling-module is not used. The Raman beams are shared with one pair of the cooling beams by using a liquid crystal variable retarder based polarization control technique. This laser system is applied to a compact AI-based gravimeter, and a best gravity measurement sensitivity of 230 μGal/Hz$^{1/2}$ is achieved. The gravity measurements for more than one day are also performed, and the long-term stability of the gravimeter is 5.5 μGal [2].

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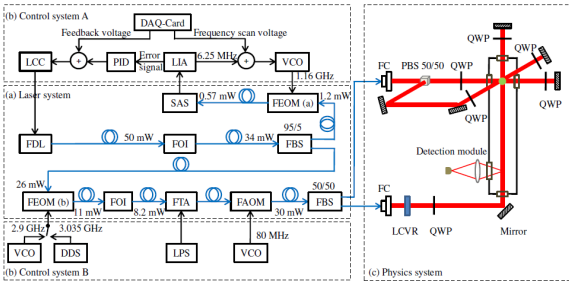

Fig. 1. The schematic of an AI-based gravimeter. (a) Laser system; (b) Control system; (c) Physics system.

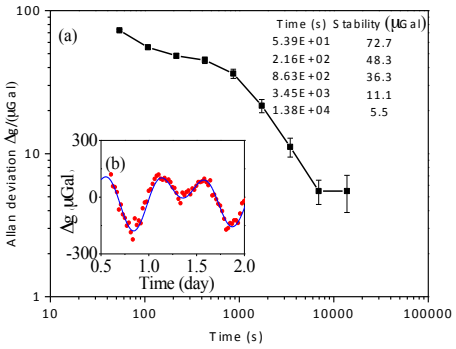

Fig. 2. (a) The Allan deviation of the gravity data after deducing theoretical tide value. The time for the total measwithurement points is about 1.4 days. (b) The long-term gravity measurement compared the theoretical tide value.

Keywords: Optical systems, Interferometry, Atom optics, Laser cooling.

References

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