

A compact portable laser system for mobile cold atom gravimeters

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We have designed and realized a compact portable laser system for high sensitivity mobile cold atom interferometers. The laser system is mounted in a single module with the dimension of 45 cm × 45 cm × 16 cm and emits lights directly on up to 13 fiber ports for 2-dimension magneto-optical trap, atom fountain, Raman transition and normalized detection. A double-sided optical structure and mounts without kinematic adjustment are designed to achieve high level integration and stability. The laser system is applied to a mobile atom gravimeter and achieves a sensitivity of 28 $\mu\text{Gal}/\text{Hz}^{1/2}$. To date, it has stably run with the atom gravimeter for more than half a year without internal realignment.

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Figure 1: Photograph of the laser system. To improve the degree of integration, a series of the miniaturized optical components were designed.

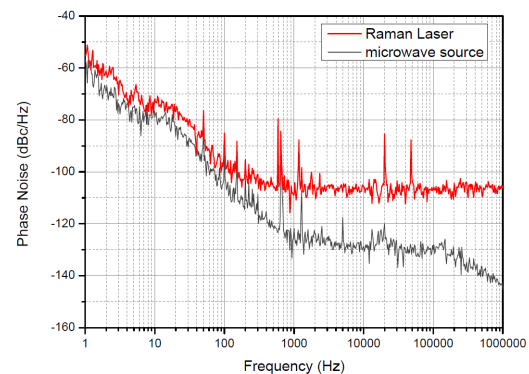


Figure 2: The phase noise of Raman lasers. The corresponding noise limitation of gravity measurement is calculated to be 9.4×10^{-10} g/shot (for $T=200$ ms).

Keywords: Atom interferometer, Laser system, Raman laser

References

- [1] Xiaowei Zhang, Jiaqi Zhong, Biao Tang, Xi Chen, Lei Zhu, Panwei Huang, Jin Wang And Mingsheng Zhan, A compact portable laser system for mobile cold atom gravimeters, submitted to Applied Optics.