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A miniature fountain in a portable atom interferometer for gravity measurement¹ FEI ZI, MIN HUANG, XIAN ZHANG, KAIKAI HUANG, XUANHUI LU, Institution of Optics, Department of Physics, Zhejiang University — By measuring the phase differences accumulated between atomic matter waves along different paths, atom interferometer is capable of many applications in fundamental physics, including measurement of gravity, Newton Constant, fine structure constant, even dark energy, gravitational wave and so on. However, making atom interferometer transportable for field work with guaranteed accuracy is still one of the main focus in this area. Here, we demonstrate a compact atom interferometer for measuring gravity by using a fountain and fiber-based optical-setup. We use two ECDLs for all trap and detection lights and produce the Raman pairs via the injection locking method utilizing a homemade ECDL with high phase coherence. In order to make the setup compact, we also modularized a part of the system, such as DAVLL locking module and beam splitting module. In the experiment, we capture 10^6 atoms at $8.5 \mu\text{K}$ from the background vapor and achieve fringes with good visibility in the Mach-Zehnder geometry. We measured the gravity with the sensitivity $\Delta g/g$ of 4.5×10^{-7} . Being simple and robust, our miniature atom interferometer aims at improved sensitivity and to be functioned outside of lab for local gravity.

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