Abstract Submitted
for the DAMOP19 Meeting of
The American Physical Society

Multi-axis Compact Gyroscope with a Grating-chip and Point Source Atom Interferometry XIAOJIE LI, QI FU, ZHIXIN MENG, PEIQIANG YAN, YANYING FENG, Tsinghua Univ, JOINT INSTITUTE FOR MEASUREMENT SCIENCE TEAM — Developing a compact atom interferometer (AI) with the ability of multi-axis measurement is important for extending its applied scope to field environment. We propose a new design of multi-axis AI gyroscope based on a grating chip, which allows a single input laser beam for atomic trapping and coherent manipulation. Multiple AIs are formed by the input laser beam along with the other four diffractive beams generated by the grating chip. The rotation induced phase shifts from different input axes lead to different spatial interference fringes due to the modulation of the atomic velocity. With the point source interferometry (PSI) and the spatially resolved detection, multi-axis rotations may be measured by imaging the final atom cloud after the interferometer sequence and decoding the information of spatial fringes from different input axes. We use Monte-Carlo based method to simulate the grating AI signals under multi-axis rotation input and evaluate its application as a multi-axis gyroscope. The effects of image plane position, initial temperature of the atom cloud and rotation rate on fringe periods are analyzed and the scale factor fitting the phase gradient and rotation rate is estimated. Initial experimental results are also reported.

Xiaojie Li
Joint Institute for Measurement Science, Tsinghua Univ

Date submitted: 23 Jan 2019 Electronic form version 1.4