

Abstract Submitted  
for the DAMOP20 Meeting of  
The American Physical Society

**An Atomic Gradiometer with Two Parallel Elliptically Polarized Laser-pumped Used for Magnetocardiography<sup>1</sup>** KAIFENG YIN, ZHI LIU, JING WANG, YAN YIN, QAUNPU LIU, FENGWEN ZHAO, BINQUAN ZHOU, Beihang University, HANGZHOU INNOVATION INSTITUTE COLLABORATION<sup>2</sup> — A new type of compact atomic gradiometer was designed and integrated. The gradiometer utilizes two parallel elliptically polarized light beams to optically pump atoms. To achieve higher sensitivity, the gradiometer works in the SERF regime. The circularly polarized components of both elliptical laser beams are used to polarize atoms, while the linearly polarized components are used to detect the atoms' spin polarization state. These two parallel beams of the gradiometer do not interfere with each other and can work independently in the magnetometer mode or constitute a gradiometer. The sensitivity of the magnetometer is near  $22 \text{ fT}/\sqrt{\text{Hz}}$ , and the corresponding gradient sensitivity can reach  $14 \text{ fT}/\text{cm}/\sqrt{\text{Hz}}$  on a 1 cm baseline. Using this gradiometer, magnetocardiography measurement was successfully performed. The experimental results show that in a poor magnetic shielding environment, the magnetometer cannot clearly measure the magnetocardiography signals due to the fluctuations of the environmental magnetic field, while the gradiometer can successfully extract clear magnetocardiography signals. The common-mode rejection ratio, bandwidth and working range of the magnetic gradiometer were also measured and explained.

<sup>1</sup>National Key RD Program of China (2018YFB2002405)

<sup>2</sup>Hangzhou Innovation Institute, Beihang University

Kaifeng Yin  
Beihang University

Date submitted: 22 Jan 2020

Electronic form version 1.4