

Abstract Submitted
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Harmonic trap resonance enhanced synthetic atomic spin-orbit coupling LING-NA WU, XINYU LUO, State Key Laboratory of Low Dimensional Quantum Physics, Department of Physics, Tsinghua University, ZHI-FANG XU, Department of Physics, University of Tokyo; School of Physics, Huazhong University of Science and Technology, MASAHITO UEDA, Department of Physics, University of Tokyo, RUQUAN WANG, Institute of Physics, Chinese Academy of Sciences, LI YOU, State Key Laboratory of Low Dimensional Quantum Physics, Department of Physics, Tsinghua University; Collaborative Innovation Center of Quantum Matter — The widely adopted scheme for synthetic atomic spin-orbit coupling (SOC) is based on the momentum sensitive Raman coupling [1], which is easily implemented in one spatial dimension. Recently, schemes based on pulsed or periodically modulating gradient magnetic field (GMF) were proposed [2,3] and the main characteristic features have subsequently been demonstrated [4,5]. The present work reports an experimental discovery and the associated theoretical understanding of tuning the SOC strength synthesized with GMF through the motional resonance of atomic center-of-mass in a harmonic trap. In some limits, we observe up to 10 times stronger SOC compared to the momentum impulse from GMF for atoms in free space.

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5. G. Jotzu, et al, *Phys. Rev. Lett.* **115**, 073002 (2015).

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