

Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Dynamics of Quantum Gas in Non-Abelian Gauge Field MEHEDI HASAN, CHETAN MADASU, CHANG CHI KWONG, Nanyang Tech Univ, FR-DRIC CHEVY, Laboratoire Kastler Brossel, Ecole Normale Suprieure, DAVID WILKOWSKI, Nanyang Tech Univ — We experimentally realize SU(2)-symmetric artificial gauge field with the tripod laser scheme. First, the non-Abelian nature of the artificial gauge field is revealed by performing loop operations, at different orders, in the parameter space [1]. It was found that the dynamics of internal states leads to a new thermometric scheme that exploits the interferometric-displacement of atoms [1]. Afterwards, the coupling dynamics of internal(i.e., spin)- and external(i.e., momentum)-degrees of freedoms, in a two-dimensional non-Abelian gauge field, is shown to exhibit an asymmetric expansion of the atomic cloud [2]. This spin-orbit-coupled gas breaks the Galilean invariance and modifies the usual reflection-laws, owing to its inherent peculiar dispersion relation. The density distribution of external dynamics markedly carries the signature of the non-Abelian nature of the underlying gauge field.

F. Leroux, K. Pandey, R. Rebhi, F. Chevy, C. Miniatura, B. Gremaud, and D. Wilkowski, Non-Abelian and adiabatic geometric transformation in a cold atomic gas, *Nat. Commun.* **9**, 3580 (2018).

M. Hasan, C. S. Madasu, C. C. Kwong, F. Chevy, D. Wilkowski (under preparation).

Mehedi Hasan
Nanyang Tech Univ

Date submitted: 30 Jan 2020

Electronic form version 1.4