Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

From 2D semimetal to topological Fulde-Ferrell superfluid in fermionic ultracold atoms TING FUNG JEFFREY POON, XIONG-JUN LIU, International Center for Quantum Materials, School of Physics, Peking University and Collaborative Innovation Center of Quantum Matter — The intriguing topological phenomena have been observed in different condensed matter systems including topological insulators and topological superconductors. In the light of this, the ultracold spin-orbit coupled Fermi gases became a excellent platform to investigate the phenomenon difficult to observe otherwise owing to its high experimental controllability. Since recent experiments have been able to realize two-dimensional spin-orbit coupling, the studies concerning topological superfluid are promising. In this work, we propose a generic theory to determine whether a time-reversal symmetry breaking system is topological or not after considering a superconducting pairing, by knowing the properties of the Fermi surfaces and the low lying states. Then we also propose an easily acheived experimental model that contains a novel 2D spin-orbit coupling for cold atoms to demonstrate the generic theory and to provide a possible realisation of a gapped topological Flude-Ferrell superflud, characterized by Cooper's pairs with finite center-of-mass momenta, with large topological regions. The Berezinskii Kosterlitz-Thouless transition in this system is also investigated in this work.

Ting Fung Jeffrey Poon
Peking Univ., and Collaborative Innovation Ctr of Quantum Matter

Date submitted: 20 Nov 2016 Electronic form version 1.4