



### Weekly Seminar

# Prospect and Challenges of Quantum materials with Ultracold Atoms

Gyu-Boong Jo

*Hong Kong University of Science and Technology*

Time: 4:00pm, Jan. 14, 2015 (Wednesday)

时间: 2015年1月14日 (周三) 下午4:00

Venue: Conference Room 607, Science Building 5

地点: 理科五号楼607会议室



### Abstract

Quantum materials exhibiting collective and emergent phenomena are of central interest in modern quantum and material science. Ultracold atoms in optical lattices provide ideal test beds simulating ground states for many-body Hamiltonians, e. g. the Hubbard model, which capture essential features in such quantum materials. In this talk, I will first discuss the recent progress on the realization of two-dimensional optical kagome lattice containing a flat band in the non-trivial crystalline structure for ultracold atoms. A flat band provides a unique platform supporting the interaction-induced quantum phenomena such as flat-band ferromagnetism. I will briefly introduce the experimental challenges for addressing the flat band with cold atoms, and discuss our implementation.

In the second part, I will report ongoing experimental efforts at HKUST to implement an Yb Fermi gas under the high-resolution optical microscope. Fermionic Yb atoms exhibit complex internal structure with  $SU(N)$  spin symmetry offering a unique opportunity to explore new classes of the many-body problems due to the enhanced degeneracy. I will share our recent development and plans for investigating various many-body phenomena in the Yb Fermi gas system.

### About the Speaker

Prof. Gyu-Boong Jo obtained the B.S degree in physics and mathematics from the Seoul National University, and continued his Ph.D at the Massachusetts Institute of Technology. After completing Ph.D in 2010, he worked as a postdoctor at UC Berkeley before he joined the physics department at HKUST as an assistant professor in 2013. His research group mainly focuses on exploring the interface between AMO physics and condensed-matter physics aiming for the realization of synthetic quantum material. He is the recipient of the AKPA Outstanding Young Researcher Award (OYRA) in 2013 and the Early Career Award from the Research Grant Council of Hong Kong in 2014.