



清华大学高等研究院

Institute for Advanced Study, Tsinghua University

物理学术报告

Physics Seminars (biweekly)

- Title:** Quantum Griffiths Singularity in 2D Superconductors and Log-Periodic Quantum Oscillations in Ultra-quantum Topological Materials
- Speaker:** Jian Wang (王健)
International Center for Quantum Materials, School of Physics, Peking University
- Time:** 4:00pm, Tuesday, Oct. 10, 2017
(3:30~4:00pm, Tea and Coffee)
- Venue:** Conference Hall 322, Science Building, Tsinghua University

Abstract

Quantum phase transition is one of most important topics in condensed matter physics. For the first time, we observe the divergence of dynamical critical exponent for the superconductor-metal transition in ultrathin cyrtalline Ga films grown on GaN substrate, which is a the major signature of quantum Griffiths singularity and manifests a new quantum phase transition in 2D superconductors [1,2]. This discovery is further revealed in LAO/STO(110) interface superconductors [3] and monolayer NbSe₂ films[4].

It is well known that so far there are two classes of quantum oscillations. One is B periodic oscillations, such as AB and AAS effects for mesoscopic system and Little Parks oscillations for superconducting systems. The other one, i.e. 1/B periodic SdH oscillations from quantized Landau levels, might be more universal. However, we discover a new class of quantum oscillations beyond quantum limit in high quality topological materials, showing exotic log B period. Further theoretical investigation reveals that the Efimovian bound states can explain the log-periodic quantum oscillations (i.e. discrete scale invariance) well. [5]

References

- [1] Science 350, 542 (2015); [2] Science 350, 509 (2015); [3] Phys. Rev. B 94, 144517 (2016); [4] Nano Letters (2017), DOI: 10.1021/acs.nanolett.7b03026; [5] arXiv:1704.00995