



## Weekly Seminar

### Theory of charge-6e superconducting state in Kagome lattice superconductors

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**Time: 3:00 pm, Feb.26, 2025(Wednesday)**

**时间: 2025年2月26日 (周三) 下午3:00**

**Venue: Room w563, Physics building, Peking University**

**地点: 北京大学物理楼, 西563会议室**

#### Abstract

In this talk, I will first introduced a new type of Ginzburg-Landau theory developed for commensurate pair density wave superconducting (SC) states in a hexagonal lattice system, relevant to the Kagome superconductors  $\text{CsV}_3\text{Sb}_5$ . Compared to previous theoretical frameworks, the commensurate wave vectors permit additional symmetric terms in the free energy, altering the system's ground state and its degeneracy. Then, I will discuss topological defects in the energetically favorable (emergent) Kagome ground state and find that kinks on domain walls can carry  $1/3$  topological charges. Further it has been established a correspondence between the SC fluctuations in these states and an effective  $J_1$ - $J_2$  fully frustrated XY model on the emergent Kagome lattice. By employing a state-of-the-art numerical tensor network method, our group rigorously solve this effective model at finite temperatures and confirm the existence of a vestigial phase characterized by  $1/3$  vortex-antivortex pairs in low temperatures with the absence of phase coherence of Cooper pairs, which is dual to the charge-6e condensed phase. Our established theory provides a potential explanation for the vestigial charge-6e magnetoresistance oscillations observed in recent experiments [J. Ge, et. al., Phys. Rev. X 14, 021025 (2024)].

#### About the speaker

张广铭, 现任上海科技大学物质学院副院长, 清华大学物理系“九坤”讲座教授。1991年获上海交通大学凝聚态物理学博士学位, 先后在意大利国际理论物理中心 (ICTP) 和伦敦帝国理工大学任研究助理。1997年, 任清华大学高等研究中心研究员, 2004年至今, 任清华大学物理系教授, 历任清华大学凝聚态物理研究所所长和低维量子物理国家重点实验室副主任。长期研究凝聚态物理学中的量子多体问题, 提出严格求解二维Kitaev量子自旋模型的新方法; 建立二维量子数分数化激发的统一理论; 构建一维量子整数自旋链拓扑态的普适类; 发展关联电子多体系统中近藤共振和磁性关联的量子多体理论; 与实验组合作, 首次发现液氮温区镧镍氧 $\text{La}_3\text{Ni}_2\text{O}_7$ 压力下非常规超导电性, 入选两院院士评选出的“2023年中国科学十大进展”。1999年获香港求是科技基金会“杰出青年学者”奖, 2001年获“国家杰出青年基金”资助, 2006年被教育部聘为“长江学者特聘教授”, 2011年获中国物理学会“叶企孙物理奖”。

