北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Seminar

Indication of time-reversal symmetry breaking superconductivity in kagome CsV_3Sb_5

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Time: 3:00 pm, June.18, 2025 (Wednesday)

时间：2025年6月18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

The interplay among frustrated lattice geometry, non-trivial band topology and correlation yields rich quantum states of matter in kagome systems. A series of recent members in this family, AV_3Sb_5 (A = K, Rb or Cs), exhibit a cascade of symmetry-breaking transitions, involving the 3Q chiral charge ordering, electronic nematicity, roton pair density wave and superconductivity. The nature of the superconducting order is yet to be resolved. Here we report an indication of dynamic superconducting domains with boundary supercurrents in intrinsic CsV_3Sb_5 flakes. The magnetic field-free superconducting diode effect is observed with polarity modulated by thermal histories, suggesting that there are dynamic superconducting order domains in a spontaneous time-reversal symmetry-breaking background. Strikingly, the critical current exhibits double-slit superconductivity interference patterns when subjected to an external magnetic field. The characteristics of the patterns are modulated by thermal cycling. These phenomena are proposed as a consequence of periodically modulated supercurrents flowing along certain domain boundaries constrained by fluxoid quantization. Furthermore, thermally modulated intrinsic d.c and a.c. Josephson effects are observed in CsV_3Sb_5 flakes, strongly suggesting the presence of dynamic superconducting domains with weak links at domain boundaries. All these observations fall into the framework of chiral superconducting domain network, offering new insights into the superconducting nature of Kagome systems.

About the speaker

Dr. Xiao Lin received his B.S. degree from Zhejiang University (2008), and Ph.D. degree from Zhejiang University (2013). He did his postdoctoral studies at Ecole Supérieure de Physique et de Chimie Industrielles (ESPCI), Paris Tech. from 2013 to 2015. He became a Humboldt postdoctoral research fellow at Cologne University from 2016 to 2018. He joined Westlake University as an assistant professor in 2018 and was promoted to a tenured associate professor in 2025. Dr. Lin has rich experience in studying the transport properties of quantum matter, such as polar superconductors, polar metals, chiral superconductors, etc. His current research interests focus on nonlinear optical/transport phenomena, superconducting diode effect, quantum transport and quantum phase manipulation.