



THE CHINESE UNIVERSITY OF HONG KONG
Department of Physics
SEMINAR

Mobility Spectrum Analysis of Electronic Reconstruction in Correlated Materials

by

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Place: Rm G25, Science Centre North Block, CUHK

ALL INTERESTED ARE WELCOME

Abstract

Mobility spectrum (μ -spectrum) analysis has emerged as a powerful bulk probe for uncovering electronic reconstruction in correlated quantum materials. In this seminar, I will present two examples— CsV_3Sb_5 and URu_2Si_2 —in which μ -spectrum analysis reveals key electronic features without any assumptions about the number or types of carriers, offering a versatile way to disentangle complex multiband responses in magnetotransport data.

In the kagome metal CsV_3Sb_5 , μ -spectrum analysis identifies tiny Fermi pockets with extremely high mobility that emerge within the charge-density-wave (CDW) transition [1]. These pockets dominate the low-field non-monotonic Hall response and provide a unified explanation for the characteristic Hall anomaly. Controlled electron irradiation suppresses this response while leaving the electronic structure essentially unchanged, demonstrating that high-mobility carriers—not anomalous Hall mechanisms—govern the Hall behavior in the CDW phase.

In the heavy-fermion compound URu_2Si_2 , μ -spectrum analysis yields a detailed electronic structure in the hidden-order (HO) phase [2]. The spectrum resolves multiple electron- and hole-like components, including a heavy band consistent with cyclotron resonance and small pockets absent in Shubnikov–de Haas data. The Sommerfeld coefficient γ is quantitatively reproduced using the carrier components identified by our μ -spectrum analysis, suggesting that all Fermi-surface pockets in the HO phase are captured by this approach.

These results show that μ -spectrum analysis provides a robust, assumption-free framework for identifying Fermi-surface reconstruction in correlated quantum materials.

[1] S. Liu, KH *et al.*, PRL **135**, 056502 (2025). [2] Q. Ligeer, KH *et al.*, *in preparation*.

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