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Unveiling Berry curvature contributions to Hall current in C_4K materials

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We identify a new contribution to the conventional Hall effect that emerges in materials with C_4K symmetry. This contribution originates from the effect of Berry curvature on phase space density. We demonstrate this using semiclassical equations of motion and identify corrections to Hall conductivity from Berry curvature and orbital magnetic moment effects. As an illustration, we build a minimal two-band tight-binding model with altermagnetic order, breaking C_4 and K symmetries while preserving C_4K . The resulting Hall conductivity shows a kink at the altermagnetic phase transition temperature. This singular behaviour is due to the appearance of a Berry-curvature-driven contribution below the critical temperature. This effect may offer a simple transport-based signature for altermagnetic phase transitions.

Keyword-1

Hall effect

Keyword-2

Berry Curvature

Keyword-3

C_4K symmetry

Author: FARAJOLLAHPOUR, Tohid (Brock University)

Co-authors: RAMACHANDRAN, Ganesh; Prof. SAMOKHIN, Kirill (Brock University)

Presenter: FARAJOLLAHPOUR, Tohid (Brock University)

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