INSTITUT DE PHYSIQUE ET CHIMIE DES MATERIAUX DE STRASBOURG
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Séminaire AXE 1 - Sciences et Matériaux Quantiques

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Thermodynamics of quantum Hall phases in graphene devices

Non-Abelian states of matter retain memory of the order in which their quasiparticles are exchanged, presenting an intriguing possibility in condensed matter physics. While some fractional quantum Hall states are expected to host non-Abelian quasiparticles, they have been notoriously difficult to probe due to the narrow energy range over which they are realized. In this talk, I will report on the quantitative determination of large energy gaps in the fractional quantum Hall regime of bilayer graphene, using a technique that enables a direct measurement of the chemical potential of 2D systems [1]. Additionally, I will show that chemical potential measurements can be used to quantitatively extract the entropy of quantum Hall phases in both monolayer and bilayer graphene, providing new insights into the nature of their quasiparticle excitations [2].

References

[1] A. Assouline, T. Wang, H. Zhou, L. A. Cohen, F. Yang, R. Zhang, T. Taniguchi, K. Watanabe, R. S.K. Mong, M. P. Zaletel, A. F. Young, *Energy gap of the even denominator fractional quantum Hall state in bilayer graphene*, Phys. Rev. Lett. 132, 046603 (2024)

[2] A. Assouline, T. Wang, H. M. Yoo, R. Fan, F. Yang, R. Zhang, T. Taniguchi, K. Watanabe, M. P. Zaletel, A. F. Young, *Entropy of strongly correlated electrons in partially filled Landau level,* arXiv 2503.16738 (2025)

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