Room temperature quantum effects in graphene heterostructures in high magnetic fields

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Isolation of graphene and other van der Waals materials has introduced a disruptive advancement in low-dimensional technologies and devices. Fabrication techniques, such as exfoliation and stamping, drop casting, and inkjet printing have demonstrated exciting opportunities for exploitation of 2D materials in electronic and optoelectronic devices. The flexibility in material choice, enabled fabrication of numerous new low-dimensional heterostructures with fascinating properties. In this presentation we will review the insights into fundamental properties of graphene-based heterostructures, revealed by experimental studies in static (slow) and pulsed (fast) high magnetic fields. We demonstrate quantum phenomena and interrogate charge transfer processes in graphene networks [1] and 0D/2D perovskite/graphene heterostructures [2], as well as room temperature Quantum Hall effect in 2D/2D heterostructure [3].

[1] Cottam et.al., Small 2311416 (2024).

[2] Cottam et.al., Advanced Electronic Materials 9(2), 2200995 (2023).

[3] Makarovsky et.al., in preparation (2024)