

CONDENSED MATTER SCIENCES SEMINAR

Dr Yan-Qi Wang

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Host

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Title

Domain Walls of Chiral Topological Phases: From Emergent Geometry to Real-Time Dynamics and Optical Signatures

Friday, September 11th, 2026

1st Floor – B101

15:00-16:00

Abstract

Bulk–edge correspondence is a defining principle of topological matter. Chiral topological phases make this principle especially vivid: their boundaries host unidirectional modes whose structure, dynamics, and response provide direct access to the underlying topological order. In this talk, I will first consider domain walls between domains of opposite chirality in a chiral spin liquid, where topological order meets spontaneous time reversal symmetry breaking. Fluctuations in bond amplitudes act as effective vielbein fields, revealing emergent geometry beyond the Chern–Simons description. We further determine how the wall width, tension, and interface mode velocity depend on microscopic exchange couplings. I will then turn to the physical edges of fractional Chern insulators and use field theory and tensor network simulations to follow chiral edge modes in real time. Crystalline band curvature, intrinsic to the lattice nature of fractional Chern insulators, generates corrections at high energies that dominate edge dynamics over the short time windows accessible to experiments, before universal chiral Luttinger liquid behavior is restored at longer times. We further propose time-resolved optical spectroscopy to probe edge correlations and dynamics in excitonic moiré systems, where the electrical neutrality of excitons makes conventional electronic transport inapplicable.