Van der Waals - based quantum Hall interferometers

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Abstract

The fractional quantum Hall effect has become the quintessential platform for investigating the properties of emergent anyons – quasiparticles that are neither fermions nor bosons. Here, we use hBN-encapsulated monolayer graphene with top and bottom graphite gates to electrostatically define tunable Fabry-Pérot interferometers. Screening in the van der Waals heterostructure suppresses charging effects, yielding highly visible Aharonov-Bohm interference of integer quantum Hall edges. From this interference, we extract characteristic coherence lengths and edge mode velocities of various edges, which further demonstrate the advantages that graphene offers, and we compare gate-defined and etch-defined edge mode coherence.

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