

Title: Magnons as probes of strongly correlated matter

Abstract:

Spin waves are collective excitations of magnetic systems. An attractive setting for studying long-lived spin-wave physics is the quantum Hall (QH) ferromagnet, which forms spontaneously in clean two-dimensional electron systems at low temperature and in a perpendicular magnetic field. We used out-of-equilibrium occupation of QH edge channels in graphene to excite and detect spin waves in magnetically ordered QH states. Our experiments provide direct evidence for long-distance spin-wave propagation through different ferromagnetic phases in the $N = 0$ Landau level, as well as across the insulating canted antiferromagnetic phase. Building on these ideas I will also discuss a new scattering platform that uses spin waves to probe quantum matter.