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Spin dynamics in layered honeycomb iridates: implications for Kitaev physics

SUNGKYUN CHOI, University of Oxford

We explore the spin dynamics in the frustrated honeycomb magnets Na_2IrO_3 [1] and Li_2IrO_3, candidates to display novel magnetic states stabilized by the strong spin-orbit coupling at the 5d Ir ions. Theory [2] predicts composite spin-orbital J=1/2 moments at the Ir ions coupled by strongly-anisotropic and bond-directional exchanges, the so-called Kitaev honeycomb model, which has in its phase diagram novel magnetically-ordered ordered phases and a quantum spin liquid with exotic excitations. To search for such physics the experimental technique of choice is inelastic neutron scattering to probe the spin dynamics, however this is technically very challenging due to the large absorption cross-section of neutrons by the Ir nuclei. Using an optimised setup to minimise neutron absorption we have been successful in observing strongly dispersive spin-wave excitations of the Ir moments in both compounds and results are compared with predictions for a Kitaev-Heisenberg model as well as a Heisenberg model with further neighbour couplings.

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