

Quantum thermal Hall effect of chiral spinons in a Kagome strip

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We develop a theory for the thermal Hall effect in a spin-1/2 system on a strip of Kagome lattice, where a chiral spin-interaction term is present. To this end, we model the Kagome strip as a three-leg XXZ spin-ladder, and use Bosonization to derive a low-energy theory for the spinons in this system. Introducing further a Dzyaloshinskii-Moriya interaction (D) and a tunable magnetic field (B), we identify three distinct B -dependent quantum phases: a valence-bond crystal (VBC), a "metallic" spin liquid (MSL) and a chiral spin liquid (CSL). In the presence of a temperature difference between the top and the bottom edges of the strip, we evaluate the net heat current generated along the strip, and consequently the thermal Hall conductivity. We find that the VBC-MSL-CSL transitions are accompanied by a pronounced change in the behavior of thermal Hall coefficient as a function of B . In particular, analogously to the quantum Hall effect, in the CSL phase the thermal Hall conductivity exhibits a quantized plateau centered around a commensurate value of the spinon 'filling factor' B/D .