Thermal transport in Kitaev-Heisenberg spin systems

Wolfram Brenig,[1] Alexandros Metavitsiadis,[1] and Angelo Pidatella[2]

[1] *Institute for Theoretical Physics, Technical University Braunschweig, Braunschweig, Germany*

[2] *Institute for Theoretical Physics, Technical University Dresden, Dresden, Germany*

We present results for the dynamical thermal conductivity of the Kitaev-Heisenberg model on ladders and the Kitaev model on honeycomb lattices. In the pure Kitaev limit [1], and in contrast to other integrable spin systems [2], the ladder represents a perfect heat insulator. This is a fingerprint of fractionalization into mobile Majorana matter and a static Z2 gauge field. We find a full suppression of the Drude weight and a pseudogap in the conductivity. With Heisenberg exchange, we find a crossover from a heat insulator to conductor, due to recombination of fractionalized spins into triplons [3]. For the honeycomb lattice, we show, that our findings persist in 2D. Our results rest on several approaches comprising a mean-field theory, complete summation over all gauge sectors, exact diagonalization, and quantum typicality [2] calculations.

References:

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