Spinons and Magnon Pairs in the Spin-Seebeck Effect

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Investigating exotic magnetic materials with spintronic techniques has been proving effective at advancing magnetism and spintronics [1]. Particularly, the spin-Seebeck effect (SSE), the thermal generation of spin current, is a powerful tool for detecting signatures of elusive quasiparticles in quantum spin systems. This is thanks to the fact that SSE is applicable to Mott insulators while it can result from quasiparticles mediated by antiferromagnetic interactions. Hence, the two features make SSE applicable to quantum spin systems with antiferromagnetic interactions.

In this contribution, I will present experimental results for spin-Seebeck effects of one-dimensional spin liquids, that is, a Tomonaga-Luttinger liquid (TLL) in Sr_2CuO_3 [2] and a spin-nematic TLL in $LiCuVO_4$ [3]. Sr_2CuO_3 is an established model material for spinons while $LiCuVO_4$ for magnon pairs, partly demonstrated by neutron scattering experiments [4-6]. Our experiments, combined with theoretical calculations, demonstrated that SSE can probe spinons in a TLL and magnon pairs in a spin-nematic TLL. Our study shows that SSE serves as an effective probe for spin-transport properties of quantum spin systems, rendering itself complementary to quantum beam experiments.

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