Kolloquium
Theoretische Physik

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Noninteger-spin magnonic excitations and their transport via spin pumping

Recent experimental advances in generation and detection of pure spin currents have opened up new avenues for exploiting magnets for technology as well as for exciting fundamental physics. Exotic quasiparticles have been observed in complex spin systems exhibiting spin ice rules, skyrmions etc. Here, we discuss emergence of novel quasiparticles, mediated by magnetic dipolar interactions, that have been hiding in simpler spin systems with uniformly ordered ground states.
Amongst other properties, these quasiparticles exhibit spin ranging from zero to above 1. Of particular interest is our finding that the eigenmodes in an easy-axis antiferromagnet are spin-zero quasiparticles instead of the widely believed spin 1 magnons.
We also discuss spin pumping across a ferrimagnet/non-magnetic conductor interface. The obtained spin current expression includes intra- as well as cross-sublattice terms. The latter contribution has been disregarded in previous literature and results in qualitatively changes to our understanding of spin transport in the system.

References:

[1] A. Kamra and W. Belzig, Super-Poissonian shot noise of squeezed-magnon mediated spin transport, Phys. Rev. Lett. 116, 146601 (2016).
[2] A. Kamra, U. Agrawal, and W. Belzig, Noninteger-spin magnonic excitations in untextured magnets, Phys. Rev. B 96, 020411 (R) (2017).
[3] A. Kamra and W. Belzig, Spin pumping and shot noise in ferrimagnets: bridging ferro- and antiferromagnets, Phys. Rev. Lett. 119, 197201 (2017).