
Heat transport in quantum conductors

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Abstract

Quantum physics rules electrical and heat transport across low dimensional conductors. Despite thirty years of research in mesoscopic physics, the field of quantum heat transport remains mostly unexplored experimentally, essentially because heat currents are much harder to probe than electrical currents.

In this talk, I will present how heat transport measurements allow us to investigate not only fundamental quantities, such as the quantum of thermal conductance^{1,2}, but also provides a new way to explore the rich physics of the integer and fractional quantum Hall effect. We have developed a very straightforward approach to measure the heat current in quantum conductors realized in two dimensional electron gases at the interface between GaAs and AlGaAs layers. It relies on the measurement of current fluctuations using an extremely sensitive voltage amplifier operating at cryogenic temperatures, based on homegrown high-electron-mobility transistors.

These experiments pave the way to many studies in the emergent field of quantum heat transport, such as the quantum phase manipulation of heat currents.

1 Jezouin et al., Science 342, 601 (2013)

2 Anthore et al., Reverts de la physique 42, 16 (2014)

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