Kolloquium

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Experiments on quantized thermal conductance, the uncertainty principle and the Wiedemann-Franz law

physikalisches

Mo. 24.6.19
16:00 Uhr
Ort: H34

This talk will describe two research streams we follow on thermal transport, one related to quantized heat transported through atomic and molecular junctions, and one related to hydrodynamic transport in Weyl semimetals.

Thermal transport of phonons and electrons through small channels or constrictions exhibits quantized conductance. The effect is more elusive than the conductance quantization of charge transport due to experimental challenges. The talk will show experiments to measure thermal transport in atomic and molecular junctions, where conductance quantization at room temperature is observable. Interestingly, in an atomic-sized metal contact the Wiedemann Franz law holds, which relates charge and thermal transport in ordinary metals. The existence quantum of thermal conductance can be understood as following from the uncertainty principle.

In the electron liquid of the semimetal WP2, in contrast, the uncertainty principle only applies to momentum-conserving scattering but not to energy conserving scattering. As a consequence, one of the strongest reported breakings of the Wiedemann-Franz law is observed in micro-samples and the clearest signatures of hydrodynamic charge transport. This places this highly interesting material at an odd position among different transport concepts.