PHYSIKKOLLOQUIUM
Fachbereich für Physik

Im Rahmen des Physikkolloquiums spricht

Herr Prof. Dr. Achim Kittel

über

Heat Transfer and Conduction at the Angstrom Scale

Abstract:
The coupling between nanosized subsystems is of great importance from the viewpoint of basic research and, not less important, in developing conceptually new devices. Even in low energy devices which are usually operated close to thermal equilibrium a coupling between two subsystems is caused by small differences in temperature leading to relatively large temperature gradients due to the small dimensions. For local temperature management, it might be desirable to avoid these gradients for draining waste heat or on the contrary to have as large as possible gradients during cooling of a local detector. These gradients cause a heat flow mediated by electrons and phonons which can be strongly influenced by interfaces reducing the coupling of the subsystems. Beside the heat conduction heat transport between subsystems can be mediated by photons or coupling through forces like the Casimir force. Experimental results of the investigation of different heat transfer phenomena will be presented exhibiting the applicability and the breakdown of well-established theoretical models, which were originally developed for mesoscopic or macroscopic systems. The discussed phenomena are heat transfer across a nanometer-sized vacuum gap – near-field and extreme near-field heat transfer, heat conduction through atom point contacts and the Wiedemann-Franz law, and heat conduction through single molecules.

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