TECHNISCHE UNIVERSITÄT CHEMNITZ

PHYSIKALISCHES KOLLOQUIUM

Mittwoch, 28.05.2014, um **16:00 Uhr**

Ort: Reichenhainer Str. 90; Neues Hörsaalgebäude, Raum: 2/N013

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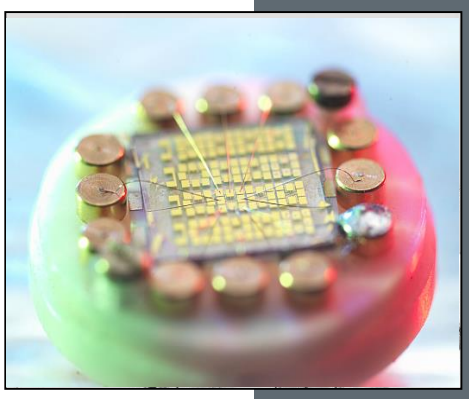
Quantum metrology in the graphene age

In this colloquium I will discuss some of the challenges facing modern metrology and how graphene helps to address them.

Metrology links physical observables to standards. The long-standing ambition of metrologists is to get away from artefact standards and to redefine the standards in terms of the fundamental constants. Precise measurements of the fundamental constants are needed to avoid a sudden change in the values of all observables as a result of such redefinition. Confidence in the universality of the experimental values of the fundamental constants is paramount. New materials are sought to verify this universality and also to make standards more convenient to use.

The discovery less than 10 years ago of the quantum Hall effect (QHE) in graphene [1,2] sparked immediate interest in the metrological community. The QHE, a fascinating macroscopic quantum effect occurring in two-dimensional conductors, relates the resistance quantum R_K only to the fundamental constants of nature, $R_K=h/e^2$. Although the QHE has been used successfully for more than two decades to realise the resistance scale [3], graphene has potential to supersede conventional semiconductors as the material of choice for quantum electrical metrology.

I shall review the progress achieved in graphene engineering, physical understanding and metrology from the first accurate QHE measurements performed on exfoliated samples (with precision of 15 parts in 10^6) [4] and on graphene on SiC (3 parts in 10^9) [5] to a direct comparison between graphene on SiC and GaAs demonstrating equivalence of the quantised values of the Hall resistance with a relative uncertainty of 8.6 parts in 10^{11} [6].



REFERENCES
1. K. S. Novoselov et al., Nature, 438, 197 (2005).
2. Y. B. Zhang et al., Nature, 438, 201 (2005).
3. B. Jeckelmann and B. Jeanneret, Reports on Progress in Physics, 64, 1603 (2001).
4. A. J. M. Giesbers et al., Applied Physics Letters, 93, 222109 (2008).
5. A. Tzalenchuk et al., Nature Nanotechnology, 5, 186 (2010).
6. T. J. B. M. Janssen et al., New Journal of Physics, 13, 093026 (2011).

Alle Zuhörer sind ab 15:45 Uhr zum Kaffee vor dem Hörsaal eingeladen.

Informationen zum Vortrag erteilt Prof. Dr. Thomas Seyller, Tel.: 0371 531 32898