NANOSCIENCE COLLOQUIUM

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Nanowire and Graphene Terahertz nanodetectors

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Generation and detection of Terahertz radiation has become of large interest over the last few years for its potential in non-invasive imaging, spectroscopic and biological applications, process and quality control, homeland security and environmental monitoring.
In the last decade, the problem of THz generation has started to be seriously addressed with the development of quantum cascade (QC) lasers, nowadays capable to reach high output powers (>120mW) in a relatively broad operating frequency range (1.2-4.7 THz). However, despite the recent number of scientific and commercial progresses, a sensitive and fast low-cost room temperature THz detector technology is still missing.
Commercially available THz detectors are indeed based on thermal sensing elements being either very slow (10-400 Hz) (Golay cells, pyroelectric elements), or requiring deep cryogenic cooling (hot-electron bolometers), while those exploiting fast non-linear electronics (Schottky diodes) are mostly limited to the range < 1 THz.
The talk will offer an overview on our recent approaches for the development of room-temperature THz nanodetectors with a special focus on the recent demonstration of high-sensitivity terahertz detectors based on a field effect transistor configuration, employing as active elements semiconductor nanowires or graphene and properly integrated with low shunt-capacitance antennas to funnel the radiation into the strongly sub-wavelength detecting element. The potential of this technology for scalability to higher frequencies and the development of flexible geometries make the proposed approach highly competitive for a future generation of THz detection systems.

Host: Andreas Wacker (Mathematical Physics)

This is one in a regular series of Nanoscience Colloquia, aimed at all researchers and students with an interest in nanoscience. The series is arranged by the Strategic Research Environment "The Nanometer Structure Consortium at Lund University" (nmC@LU) and by the Linnaeus environment "Nanoscience and Quantum Engineering", funded by the Swedish Research Council (VR).

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