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## NANOSCIENCE COLLOQUIUM

Thursday October 2nd 2014 at 15:15, K-space, Fysicum

### When femtosecond laser pulses meet nanoscale structures: from attosecond electron control to novel particle accelerators

**Prof. Peter Hommelhoff**

University of Erlangen-Nuremberg, Erlangen, Germany

When few-cycle laser pulses are focused on nanometer sharp structures field enhancement takes place, generating fields in excess of 1V/Angstrom right at the surface of the pointy structure. At sharp tungsten tips, we have observed many of the processes that are well known from strong-field physics with atoms in the gase phase. We have observed the rescattering process, where an electron is photo-emitted from the parent matter and returns to it within a fraction of an optical cycle; we have observed that these processes are indeed driven by the optical field, implying a strong carrier-envelope dependence.



This electron control on sub-optical cycle time scales at a solid can be used to switch currents. We will show the current status of our experiment towards light field-driven vacuum nano-electronics. In the second part of the talk we will show that electrons can also be efficiently accelerated with the help of a femtosecond laser field. This works if a dielectric transparent nano-structure is employed that periodically resets the phase of the laser. Laser-based accelerators with two orders of magnitude larger acceleration gradients than classical accelerators are now feasible, potentially leading to much more compact, laser based charged particle accelerators.

Host: Anders Mikkelsen (Synchrotron Radiation Research)

*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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