



**Sonderforschungsbereich 631**  
Festkörperbasierte Quanteninformationsverarbeitung



# SEMINARANKÜNDIGUNG

**Dienstag, 16. Februar 2010**

**17:15 Uhr**

**WSI, Seminarraum S 101**

## **“Few-cycle THz studies of quantum cascade laser active regions and resonators”**

Few-cycle THz pulses generated by ultrafast laser pulses provide a perfect tool to explore the properties of quantized transitions providing direct insight to the dynamics and coherence of nanostructures. With the combination of few-cycle THz spectroscopy and quantum cascade technology we are able to perform unique measurements of stimulated emission. Coupling few-cycle THz pulses into quantum cascade lasers allows probing of the processes within the active zone. This gives direct information regarding the energy, dynamics and coherence of transitions in the QCL structure.

In addition, I will present micro-cavity quantum-cascade lasers emitting in the THz region. Strong mode confinement in the growth and in-plane directions are provided by a double-plasmon waveguide. We observe whispering-gallery modes and very low threshold currents compared to Fabry-Perot cavities; In a detailed study of the emission we were able to observe dynamical frequency pulling effects. Photonic crystals offer another possibility to confine THz and to control the dispersion. A hexagonal lattice of quantum cascade pillars provides a large photonic band gap. We observe lasing at the flat band region at band edges. Large frequency tuning by the photonic crystal period is demonstrated.

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