Halbleiter-Nanophotonik

SFB 787

Einladung

Es spricht: **Dr. Stephan Michael**

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Zeit: **Dienstag, 09. Juni 2015, 14:00 Uhr**

Ort: **Technische Universität Berlin**
Institut für Festkörperphysik
Hardenbergstraße 36, 10623 Berlin
Raum EW 731

Thema: **„Semiconductor Quantum Dots for Pulse Slow-down and Quantum Cascade Lasers"**

Abstract:

Quantum coherence effects such as electromagnetically induced transparency and group-velocity slowdown are well known in atomic few-level systems. Quantum dots (QDs) are arguably the closest realization of an atomic-like system in semiconductors, but typical room temperature dephasing times limit the achievable quantum coherence effects. I will present theoretical results of group-velocity slowdown in a V-type pump-probe scheme in InGaAs-based QDs and double QD molecules.[1] The probe pulse slowdown in a double QD molecule, which is designed to exhibit a long lived coherence, is shown to be higher than what is achievable from similar transitions in typical InGaAs-based single quantum dots. Quantum cascade lasers (QCLs) based on quantum wells (QWs) can operate up to and above room temperature and can produce a high output power. An alternative would be QCLs consisting of self-assembled QDs. I will present a theoretical investigation of the performance of electrically pumped self-organized QDs as gain material in the mid-IR range at room temperature.[2] It is found that steady-state gain requires an efficient extraction process, that prevents an accumulation of electrons in the continuum states of the QDs. However, comparing the modal gain (including a sufficient small inhomogeneous broadening) to a standard QW structure as used in QCLs, the calculations predict reduced threshold current of the QD structure for comparable modal gain.

1 S. Michael, W. W. Chow, and H. C. Schneider, Phys. Rev. B 88, 125305 (2013)
2 S. Michael, W. W. Chow, and H. C. Schneider, Phys. Rev. B 90, 165302 (2014)

Gäste sind herzlich willkommen!
Prof. Dr. A. Knorr