

Colloquium
Dahlem Center for Complex Quantum Systems

Nonlinear dynamics of quantum-dot lasers: The importance of nonequilibrium carrier distributions

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Time: Tuesday, December 2nd, 2014, 16:00 c.t.

Location: Hörsaal A (1.3.14)

Abstract:

The dynamics of quantum-dot (QD) based semiconductor laser structures as well as solitary lasers under optical perturbations and dynamic modulation are highly promising for applications in telecommunication networks. For these applications the dynamics of the electric field amplitude as well as its phase is of great importance to correctly describe the laser response. As such, a detailed description of charge-carrier induced gain and refractive index changes must be formulated. While the optical transitions resonant to the lasing wavelength determine the optical gain, the off-resonant transitions lead to an index change and thus influence the electric field phase. Using a rate-equation model based on microscopically calculated scattering rates between the different charge carrier states I will report on the role of nonequilibrium carrier distributions for the laser dynamics as well as the role of scattering lifetimes for the optical response to external perturbations.