Seminarankündigung

Dienstag, 26. Januar 2016
17:15 Uhr

WSI, Seminarraum S 101

“Nonlinear dynamics of quantum-dot devices: Carrier distributions and multi-mode lasing”

Regarding the growing demands for fast and efficient photonic devices within the telecommunication area, we need a theoretical understanding of complex nanostructured semiconductor devices. Here I will present results on quantum-dot (QD) laser and amplifier structures. The aim is to use semi-classical models that are sophisticated enough to yield reliable quantitative results, while they are still easy enough for analytic treatment to enable predictions of optimal conditions. Since QDs offer a variety of confined levels and a broad gain spectrum, we show the ability of QD amplifiers for dual-band operation, i.e. simultaneous amplification of counter-propagating up- and down-stream data signals. Using an optimized microscopically motivated delay-differential-equation model, we efficiently simulate the signal propagation and analyze the device performance and the interplay of noise and patterning effects due to coherent light interaction.

Further, the amplitude-phase coupling and two-mode emission of QD lasers is investigated in detail in the same framework with a focus on the internal non-equilibrium charge-carrier scattering processes. Effects like two-mode lasing will be discussed. Finally, I will shortly discuss applications of our modelling approach for passively mode-locked lasers, i.e., the suppression of unwanted fluctuations in the pulse arrival time by using additional delayed feedback section.

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