Einladung zum hochschulöffentlichen Vortrag
im Rahmen des Status Assessments

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Dynamic modeling of quantum cascade and Fourier domain mode-locked lasers

Donnerstag, den 31. Januar 2019, 15.15 Uhr
Nordgelände der TUM, Theresienstr. 90, Gebäude N1, 2. OG, Raum N2128

Abstract: The invention of lasers has revolutionized many areas of science and technology. Increasingly, laser operating regimes generating special temporal or spectral waveforms are exploited for applications in metrology, imaging, sensing, materials processing, and communications. These waveforms include periodic trains of ultrashort pulses, rapidly and widely wavelength-swept optical fields, as well as generally time-periodic waveforms giving rise to broadband, comb-like spectra. Such optical fields can be realized by various types of laser sources, enabling a broad range of applications targeted at different wavelength regimes, cost and compactness requirements, etc. The further development of such laser sources and related applications largely depends on the availability of reliable and computationally efficient dynamic simulation models. In this talk, I will discuss simulation approaches for modeling the generation of ultrashort pulses and comb-like spectra in quantum cascade lasers, which are nanostructured semiconductor lasers for terahertz and mid-infrared applications. Here, the rich interplay of coherent light-matter interaction, tunneling, quantum dephasing and incoherent electron transport has to be accounted for. Furthermore, I will address the simulation of ultra-low noise operation in Fourier domain mode-locked fiber cavity lasers, which generate rapidly and widely wavelength-swept optical fields and are primarily used in high-speed medical imaging and sensing applications.

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Steuer-Nr.: 143/241/80037
USt-IdNr.: DE811193231