Modeling and 2d–Simulation of Quantum–Well Semiconductor Lasers including the Schrödinger–Poisson system

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Modeling semiconductor lasers has to face the electronic behaviour of the semiconductor, the optical field, and the interaction of both systems. That leads to the stationary Van–Roosbroeck system with selfconsistent optical modes on the device domain. The lasing region usually is a nanostructure, one or more quantum wells, quantum wires or quantum dots, and quantum effects are an important feature of the semiconductor diode laser. This requires the solution of Schrödinger’s equation in real space and its embedding into the classical transport equations. This project is concerned with mathematical and numerical methods for the solution of Schrödinger–Poisson systems with a selfconsistent effective Kohn–Sham potential, which model the electronic properties of a nanostructure. The inclusion of Schrödinger–Poisson type systems into the macroscopic semiconductor equations and their selfconsistent treatment in the Two dimensional Semi-Conductor Analysis package WIAS-TeSCA provides a tool for the development of nanoelectronic devices, which is available to the wide spread WIAS-TeSCA users community. In particular this branch of WIAS-TeSCA serves the development of quantum well diode lasers at the FBH. There simulation with WIAS-TeSCA allows a more accurate prediction of the band edges and carrier densities and thus, the intensity of the laser.
Publications within the Project

Publications in Journals and Books


Congress Communications


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