Modelling of multisection semiconductor lasers

MINDAUGAS RADZIUNAS
Weierstrass Institute for Applied Analysis
and Stochastics (WIAS), Berlin
Mohrenstrasse 39
10117 Berlin, Germany
e-mail: radziunas@wias-berlin.de

A well known system of differential equations describing the dynamics of multi-section semiconductor laser is considered. This system consists of two PDE's of hyperbolic type describing evolution of forward and backward propagating optical fields and is coupled with ODE which express dynamics of carriers inside the laser device. Such a model is able to recover complicated dynamical behaviour of the laser such as self pulsations, bistability, hysteresis [1].

The reduced ODE model where only one or two modes of optical field are taken into account is derived. It is demonstrated numerically, that such a simplified model is able to recover the main features of the "full" PDE model, and, therefore, can be used for modeling and optimisation of semiconductor lasers. Being much simpler than PDE model, it allows to understand and investigate the origin of different dynamical effects in laser and to find the areas in parameter space where these effects are not sensitive to small perturbations.

References

[1] M. RADZIUNAS, H.-J. WÜNSCHE, B. SARTORIUS, O. BROX, D. HOFFMANN, K. SCHNEIDER, AND D. MARCENAC, Modeling Self-Pulsating DFB Lasers with an Integrated Phase Tuning Section, IEEE J. Quantum Electron., **36**, No. 9, September 2000, 1026–1034.