

Dynamics of externally forced two-mode semiconductor lasers

Semiconductor lasers have been an important field of research for nonlinear dynamic nearly since their invention. The field of laser dynamics is concerned with any type of varying laser intensity -- from periodic intensity oscillations and laser pulses to optical chaos. Due to the fast timescales of laser dynamics below a nanosecond, laser dynamics poses an attractive field of study for many modern high-speed applications in data communications, cryptography, and optical computing.

In this project, the dynamics of a semiconductor laser with two closely spaced laser modes will be investigated. When driven by an external optical signal or by a harmonic modulation of the pump current, many interesting types of dynamics can be expected, which -- depending on the desired application -- can be reached by proper choice of the operating parameters. The aim of this project is to investigate numerically the types of dynamics and their dependence on the operating conditions. Experimental measurements of semiconductor lasers with small mode spacing can be performed as comparison and experimental verification of the predicted behaviour.