The stabilization of the laser beam in a BA laser can be achieved, for example, by injection of the optical beam at some angle to the longitudinal axis or by the external optical feedback from the corresponding off-axis mirror or grating. An introduction of 1d or 2d-periodic structures on the electrical contact can also help to improve the quality of the generated beam in BA lasers or of the amplified beam in BA amplifiers. In this talk some of these schemes allowing an improvement of the beam quality in the BA devices will be discussed. Our theoretical study is based on the simulations of the 2+1-dimensional traveling wave model which takes into account the spatio-temporal dynamics of slowly varying complex amplitudes of the counter-propagating optical fields, induced polarizations and carrier densities. A proper resolution of the fast oscillating fields, as well as the resolution of a sufficiently large optical frequency range, requires a fine space (up to 10^6 mesh points) and time (up to 10^6 points for typical 5ns transient) discretization. The resulting large numerical scheme is solved using multilevel parallel distributed computing, that allows us to run long time dynamic simulations over large parameter ranges in reasonable time. Comparable computations on a single PC system take nearly 100 times longer.

Laser array phase-locking and nonlinearity

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The talk will discuss a situation where nonlinearity plays a key role in the behavior and in the dynamics of coupled lasers. Focusing on fiber lasers, Kerr nonlinearity and resonant contribution from the gain will be compared. In the context of coherently coupled fiber laser array, specific resonator and specific filtering can be implemented to compensate for path length differences in the laser array by nonlinear contribution. Theoretical results, as well as preliminary experimental results, will be reported showing improvement in the phase-locking of fiber laser array through resonant nonlinearity.

Control of optical switchings in a bistable vertical-cavity surface-emitting laser by vibrational resonance

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We present experimental results which demonstrate that the response of a bistable laser at a selected polarization to the effect of the periodically modulated optical feedback or injection at the orthogonal polarization can be considerably enhanced by the additional periodic current modulation through the phenomenon of