Optics Communications
Volume 285, Issue 12, 1 June 2012, Pages 2897-2904

Numerical simulation of the amplification of picosecond laser pulses in tapered semiconductor amplifiers and comparison with experimental results

V. Z. Tronciu, S. Schwertfeger, M. Radziunas, A. Klehr, U. Bandelow, H. Wenzel

https://doi.org/10.1016/j.optcom.2012.02.036

Abstract

We apply a traveling wave model to the simulation of the amplification of laser pulses generated by Q-switched or mode-locked distributed-Bragg reflector lasers. The power amplifier monolithically integrates a ridge-waveguide section acting as pre-amplifier and a flared gain-region amplifier. The diffraction limited and spectral-narrow band pulses injected in to the pre-amplifier have durations between 10ps and 100ps and a peak power of typical 1W. After the amplifier, the pulses reach a peak power of several tens of Watts preserving the spatial, spectral and temporal properties of the input pulse. We report results obtained by a numerical solution of the traveling-wave equations and compare them with experimental investigations. The peak powers obtained experimentally are in good agreement with the theoretical predictions. The performance of the power amplifier is evaluated by considering the dependence of the pulse energy as a function of different device and material parameters.