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Numerical and experimental investigations of micro-integrated external cavity diode lasers

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Abstract We report the results of numerical and experimental investigations of the electro-optical behaviour of an external cavity diode laser device composed of a semiconductor laser and a distant Bragg grating, which provides an optical feedback. The travelling wave model was used to simulate and analyse the nonlinear dynamics of the considered laser device. Different modelling approaches for gain and refractive index change functions have been considered. It is shown, that the simulated behaviour of the electro-optical characteristics is in good agreement with experiments.

Keywords External cavity · Diode laser · Bragg grating · Travelling wave model

1 Introduction

During recent years the control and stabilization of the emission of semiconductor lasers by an external cavity has received considerable attention. In particular, wavelength stabilized, narrow-spectral linewidth semiconductor lasers are required for different applications such as frequency conversion, quantum optical experiments, coherent optical communications, spectroscopy etc... Wavelength stabilization can be achieved by the integration of a Bragg grating into the resonator, either monolithically into the laser chip (distributed feedback laser, distributed Bragg reflector laser) or in an external cavity configuration. In the latter case

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