INVESTIGATION OF PICOSECOND-PULSE GENERATION BY TWO-SECTION BLUE-VIOLET SEMICONDUCTOR LASERS

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During recent years, the need for picosecond laser pulses has been increasing due to applications in laser tomography, distance measurements for automotive applications, three-dimensional imaging and spectroscopy [1-3].

In this paper, we focus on the generation of ps pulses in a blue-violet InGaN laser containing an additional section (called switching section) with a saturable absorber in axial direction. The main aim of this study is to describe the pulse generation, triggered by injecting a current "Is" into the switching section, theoretically and to explore the dependence of the pulse properties on geometrical and material parameters. The laser structure considered is shown schematically in Fig. 1. The active layer is composed of three InGaN quantum wells the compositions and layer thicknesses of which are fixed. We consider lasers emitting at different wavelengths (395, 400, 405, and 410 nm) which could be achieved by implementing a Bragg grating into the cavity. The length of the active section is L=800 μm and the width of active area is W=10 μm. The length of the switching section is varied from 0 to 400 μm.

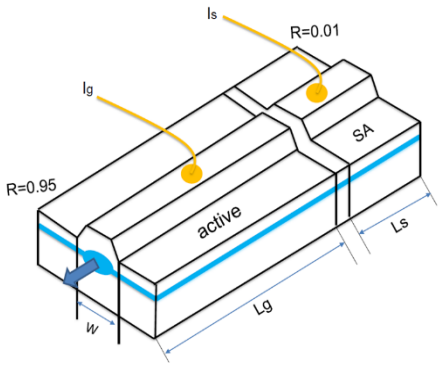

Fig.1. Setup of InGaN laser with two sections.

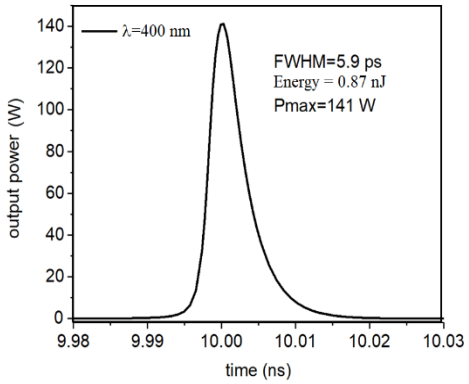

Fig. 2 Output power of a generated ps-pulse vs time.

The evolution in time of the output power is analyzed in the framework of a rate equation model. On the other hand, to get insight into the laser characteristics, we used the software package AUTO for plotting the steady-state dependence of output power on current injected into the active section. As a result of the numerical simulations, we obtained ps pulses with a width of 5.9 ps (FWHM) and energy of 0.87 nJ (see Fig. 2).

Keywords: *Picosecond optical pulses, InGaN blue-violet laser, switching*

References

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