

Preface

The year 2011 was full of success for the Institute of Optoelectronics. Research concentrated on vertical-cavity surface-emitting lasers (VCSELs), optical interconnect systems, GaN-based electronic and optoelectronic devices, and semiconductor disk lasers.

The VCSELs and Optical Interconnects Group has continued its work on vertical-cavity laser-based systems for optical data communications, optical sensing, as well as biophotonics. For the first time, true bidirectional data transmission over multimode fiber at 10 Gbit/s could be demonstrated with monolithically integrated VCSEL–PIN photodiode chips.

During 2011, the GaN Group could slightly increase its activities towards semipolar GaN heterostructures as a part of our transregional research group *PolarCoN*. In particular, work on sub-micrometer laser interference lithography opened new possibilities, which may be also of great interest for highly efficient green LEDs, which are addressed in another research project. Also on the other side of the spectral range, we achieved quite remarkable results by demonstrating excellent structures for UV-LEDs. 4-point probe measurements performed on graphene sheets in-situ in a transmission electron microscope demonstrated the great advantages of combining optical lithography engineering with electron microscopy studies.

In the High-Power Semiconductor Laser Group, a frequency-doubled optically-pumped semiconductor disk laser system has been realized which emits up to 7.2 W of green light at a wavelength of 520 nm and shows an overall power conversion efficiency of 20 %. The laser system has a folded resonator setup including a nonlinear lithium triborate (LBO) crystal for second-harmonic generation of the fundamental emission at 1040 nm and a birefringent filter for polarization and frequency stabilization.

In July 2011, Andreas Strodl's Diploma Thesis on quantum dot-based laser structures was awarded by the VDI. In March 2012, Rainer Michalzik was appointed apl. Prof. at the Institute. He has served as the editor of a new VCSEL book by Springer-Verlag which is introduced in one of the articles of this Annual Report.

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