Preface

The preface of this year's Annual Report of the Institute of Optoelectronics starts with a personal detail: In Oct. 2015, after two and a half years as the Director of Corporate Research at Infineon Technologies in Munich and two full terms or twelve years as the President of Ulm University, Karl Joachim Ebeling has resumed his previous position as the Head of the Institute. Laser-based optical sensing is his main current research interest.

The VCSELs and Optical Interconnects Group has presented novel vertical-cavity surface-emitting lasers (VCSELs) with monolithically integrated phototransistors, which could render oxide-aperture-based current confinement unnecessary in future device generations, leading to easier manufacture and higher reliability. Remarkable hysteresis and negative differential resistance properties of the new lasers are found and studied in detail. We also investigate various methods to influence the birefringence in VCSEL cavities with the ultimate goal to use novel laser devices in spin optoelectronics in the 100 GHz frequency regime. The laser modeling for improved 28 Gbit/s VCSELs has been refined. A simplified and accurate method to extract the thermal resistance from temperature-dependent continuous-wave output data of VCSELs has been devised.

After more than 7 years, our DFG transregional research group "PolarCoN" about studies on semipolar GaN structures has come to an end in 2015, leading to a bunch of final publications (many of them are printed in January 2016, hence not yet listed in this Annual Report). Although excellent results have been obtained, these studies will not be directly continued. Instead, our studies about opto-chemical sensors are carried on with even increased importance. The close cooperation with bio-chemists of our university helps us to step into life-science applications. On the other hand, we have started new activities towards AlGaN heterostructures which may find their application in deep-UV light emitting diodes.

In the High-Power Semiconductor Laser Group, a quantum-well-pumped semiconductor laser has been realized, which emits two wavelengths (957 nm and 998 nm) simultaneously and additionally allows to switch between these at continuous output powers of more than 10 W.

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