POLISH NATIONAL AGENCY FOR ACADEMIC EXCHANGE

STER PROGRAMME

name of the unit:

PHOTONICS GROUP

Institute of Physics, Lodz University of Technology

symbol:

I-71

http://www.fizyka.p.lodz.pl/en/

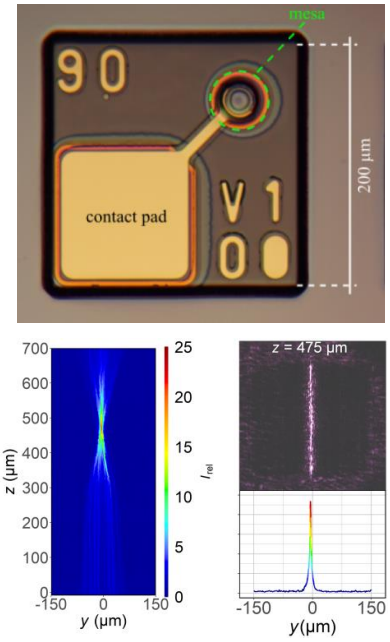
head of the unit:	potential promoters:	contact person:
Prof. Tomasz Czyszanowski, PhD, DSc	Prof. Tomasz Czyszanowski, PhD, DSc Robert Sarzała, PhD, DSc, TUL Prof. Michał Wasiak, PhD, DSc, TUL Prof. Maciej Dems, PhD, DSc, TUL Prof.	Prof. Tomasz Czyszanowski, PhD, DSc phone: 48-42-631-39-66 tomasz.czyszanowski@p.lodz.pl

scope of activities:

- development of numerical models of semiconductor lasers and optoelectronic nanostructures taking into account the mutual interactions between thermal, electrical, recombination, and optical phenomena and mechanical stress
- designing and optimization of semiconductor lasers and laser arrays
- experimental characterization of semiconductor lasers and photonic nanostructures
- study of resonance phenomena in optics

present activities:

- designing and processing of VCSELs including VCSEL arrays and lasers with photonic structures
- designing and processing of highly reflective mirrors based on photonic subwavelength structures including focusing mirrors
- experimental characterisation of semiconductor lasers and photonic structures
- designing and processing of transparent electrodes
- designing of edge-emitting laser arrays
- designing of quantum cascade VCSELs
- analysis of Fano resonances and bound states in the continuum



future activities:

- further development of existing research areas and development of new, more detailed numerical models
- designing, processing and experimental characterisation of VCSELs employing bound states in the continuum
- near and far field analysis of photonic structures and VCSELs
- development of efficient optical numerical models for higher order Bragg gratings
- analysis of new optical phenomena occurring in configurations with broken time parity

publications/patents, awards, projects:

- M. Gębski, J. A. Lott, T. Czyszanowski: Electrically injected VCSEL with a composite DBR and MHCG reflector, Opt. Express 27, 7139 (2019).
- P. Komar, M. Gębski, J. A. Lott, T. Czyszanowski, M. Wasiak: Experimental demonstration of light focusing enabled by monolithic high-contrast grating mirrors, ACS Appl. Mater. Interfaces 13, 25533 (2021).
- Brejnak, M. Gębski, A. K. Sokół, M. Marciniak, M. Wasiak, J. Muszalski, J. A. Lott, I. Fischer, T. Czyszanowski: Boosting the output power of large-aperture lasers by breaking their circular symmetry, Optica 8, 1167 (2021).
- L. Y. M. Tobing, M. Wasiak, D. H. Zhang, F. Weijun, T. Czyszanowski: Nearly total optical transmission of linearly polarised light through transparent electrode composed of GaSb monolithic high-contrast grating integrated with gold, Nanophotonics, 10, 3823 (2021).
- "The technology of the production of innovative epitaxial structures and VCSEL laser devices" – project financed by the National Centre for Research and Development

• "Subwavelength MHCG gratings as active mirrors for a new class of quantum cascade lasers with vertical resonant cavity" – project financed by the National Science Centre
keywords: semiconductor lasers, vertical-cavity surface-emitting lasers, edge-emitting lasers, laser arrays, subwavelength gratings, photonic structures, subwavelength structures, numerical analysis, computer simulations, experimental analysis
list of internship proposal in this research team: VCSEL designing. Numerical simulation of Fano resonances. Experimental characterization of VCSELs.