

HiLASE Centre Introduction



- Cutting-edge lasers
- Advanced laser applications technologies
- High-skilled experts
- Tracked collaboration with industry and R&D centers around the globe

www.hilase.cz
HiLASE VIRTUAL TOUR

The HiLASE R&D Centre holds **several world records** e.g. in **multi-beam laser nanostructuring** and in the **speed production of laser-induced periodic nanostructures on a stainless steel surface** and has earned the esteemed title of **Centre of Excellence**. Another **world record** was earned by the high-energy DPSSL system BIVOJ, which has reached the level of 146 J at a repetition rate of 10 Hz at a wavelength of 1030 nm.

RESEARCH PROGRAMMES

Industrial Laser Applications | Scientific Laser Applications | Advanced Laser Development

HIGH-TECH LASER TECHNOLOGIES

- High-power (up to 1 kW) lasers
- High-energy – tens of Js lasers
- Advanced laser surface functionalization (up to 40000 beams simultaneously)
- Advanced metallic components strengthening by high-energy lasers – Laser Shock Peening
- Hybrid solutions – Laser with Traditional or other Laser technologies
- LIDT – ISO certified or customized tests

KEY RESEARCH AREAS



ADVANCED LASER PROCESSING & PRODUCTION TECHNOLOGIES

Laser surface treatment, laser micro/nano machining and structuring, industrial process development etc.



SPACE-BORNE LASER TECHNOLOGIES

Lasers qualified for space applications – asteroid mining, optical communication, satellite protection, defense applications and laser propulsion.



SMART & SAFE SOLUTIONS FOR LASER SYSTEMS & APPLICATIONS

Materials and components testing on laser irradiation, laser mass spectroscopy.



LASER NANOTECHNOLOGY

Pulsed laser deposition of 2D materials, laser-annealing synthesis of 2D materials, laser direct printing of 2D materials, pulsed laser fabrication of biocompatible interfaces.



LASER TECHNOLOGIES FOR COMPACT PARTICLE & RADIATION SOURCES

High-power laser sources, adaptive optics, predictive thermo-optical modeling, laser beam engineering/shaping.

INDUSTRIES WE SERVED

- Photonics
- Semiconductor
- Aerospace
- Defense & Space
- Automotive
- Tooling
- Energy
- Biomedical
- Material processing for glass, plastic, metal, semiconductor, and other industries

HILASE CENTRE OFFERS:

- Laser-induced Forward Transfer (BB LIFT) - precise transfer of 2D materials on any substrate (silicon, glass, flexible polymers) for micro-electronics printing
- Pulsed laser deposition of 2D materials (MoS₂, graphene, WS₂, Mxenes) including multi-layers (ablation in vacuum and gas noble and reactive environment by fs, ps, ns lasers). State-of-the-art Quality control of the deposition process, including in-situ control.
- Functionalization (structuring, change of reactivity) of chemical and physical properties of 2D materials by laser processing
- Laser-induced precise and selective crystallization and ablation of semiconductors on specific locations (down to a few micrometres) of micro-electronics devices in sensing applications and microcircuit fabrication
- Laser fabrication of the components (microelectrodes, circuits, interconnections) based on 2D structures
- Predictive modelling for 2D materials (quantum models of band-gap structures, optical properties, conductivity)
- 2D materials as a matrix for Matrix-Assisted Laser Desorption Ionization (MALDI) for the characterization of biomolecules (proteins, amino acids, peptides)

PATENTS:

EP 3481583 – “METHOD AND SYSTEM OF ULTRAFAST LASER WRITING OF HIGHLY-REGULAR PERIODIC STRUCTURES”

LU102294 – “A METHOD AND DEVICE FOR NANOMATERIAL STRUCTURE”

