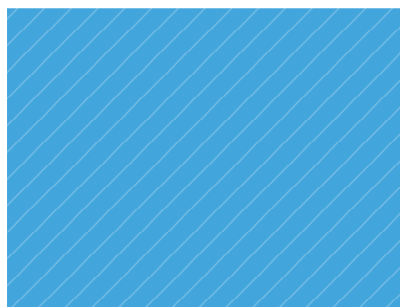


INSTITUTE CONTACT



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THEMATIC RESEARCH FOCUS

RESEARCH AREA

Lasers, laser interferometry, laser spectroscopy, optical sensing in industrial processes

EXCELLENCE

Laser interferometry, femtosecond lasers, optical sensing in industrial processes

MISSION

To stay in the wider world-top in the field of laser interferometers and optical sensing of lengths, application of the method of laser spectroscopy for contactless sensing in power engineering, medicine laser diagnostics in surgery of local necrosis of tissues.

DEVELOPED TECHNOLOGIES

CONTENT OF RESEARCH

- » Laser length standards
- » Laser interferometers and refractometers
- » Absorption gas cells for laser spectroscopy
- » Frequency optical synthesis
- » Special optical sensing in industrial processes

MAIN CAPABILITIES

We use the properties of light for precise measuring of length. We are now on the level of 1 nm (10 atoms), but we are working on an improvement in resolution of our methods up to 1 atom level. For this reason we have great potential for the future, new and modern applications.

The developed method for scale linearization of interference fringe leads to reducing the uncertainty of length measurements. Also our laser spectroscopy gives us the possibility of contactless measurement of the concentration of dangerous gasses in combustion processes. The method for surface diagnostics of smooth surfaces using femtosecond lasers allows fast recognition of the quality of produced components.

FIELDS OF RESEARCH RESULTS APPLICATION

- » Optics
- » Electric fields
- » Medical Technology
- » Automotive industry
- » Software
- » Telecommunications

ALUMNI PROFILE

Our alumni are experts in the following areas: Lasers, laser interferometry, laser spectroscopy, optical sensing in industrial processes and the construction of devices using the described technologies.

NUMBER OF RESEARCH POSITIONS

SENIOR RESEARCH STAFF

10

JUNIOR RESEARCH POSITIONS (INCL. PH.D. STUDENTS)

2



KEY RESEARCH EQUIPMENT ↘

LIST OF DEVICES

- » Laser interferometers made by the research team
- » AFM microscopes made by the research team
- » 3D positioning stage with nanometer resolution made by the research team
- » Femtosecond optical frequency synthesizers (Menlosystems)
- » Spectral analysers (Agilent)
- » Oscilloscopes (Tektronix)
- » Set of high coherence lasers working at 490 nm, 532 nm, 633 nm, 810 nm, 1064 nm (Coherent, Melles-Griot, Spectra Physics, SIOS, Continuum)

BUDGET ↘

TOTAL (MIL. CZK/ MIL. EUR)

5 / 0.2

PART OF THE TOTAL BUDGET FROM PRIVATE RESOURCES (%)

10

PART OF THE TOTAL BUDGET FROM FOREIGN RESOURCES (%)

3

MAIN PROJECTS ↘

2010–2014: Non-contact optical measuring methods and systems for precise engineering. Project FR-TI2/705 financed by the Ministry of Industry and Trade (MPO), Main contractor: Ústav přístrojové techniky AV ČR, v. v. i.

2010 –2014: Methods for generation of a length etalon by means of stabilized femtosecond mode-locked laser. Project GAP102/10/1813 financed by the Czech Science Foundation (CSF), Main contractor: Ústav přístrojové techniky AV ČR, v. v. i.

2009–2013: Components for nano-diagnostic of length fluctuations, deviation of shapes and surface faults. Project FR-TI1/241 financed by the Ministry of Industry and Trade (MPO), Main contractor: MESING, s.r.o.

2007–2009: Methods for determination of the refractive index of air with optical resonators. Project GA102/07/1179 financed by the Czech Science Foundation (CSF), Main contractor: Ústav přístrojové techniky AV ČR, v. v. i.

2006–2011: The research of methods of diagnostics of gauge blocks for precision engineering. Project 2A-ITP1/127 financed by the Ministry of Industry and Trade (MPO), Main contractor: Ústav přístrojové techniky AV ČR, v. v. i.

2006–2009: System of laser interferometers for nanometrology of lengths. Project FT-TA3/133 financed by the Ministry of Industry and Trade (MPO), Main contractor: MESING, spol. s r.o.

ACHIEVEMENTS ↘

- » The research group in cooperation with the company Mesing and the Czech Metrology Institute presented the results of the joint research – „Linear system with interferometer (Laser nano-comparator) for calibration of length sensors at the 50th International Engineering Fair in Brno (14.9. - 18.9. 2008)
- » The editors of the Technický týdeník awarded its prize, choosing along with the editors of the periodical Automatizace, the joint team of researchers that performed the Laser nano-comparator at the fair. The research group firstly presented a unique method for active stabilization of the position of laser beams which improves the reproducibility of calibration processes in the nanometer levels
- » Three scientists from the group have been awarded in the past ten years by the international community URSI (International Union of Radio Science), IMEKO (International Measurement Confederation) and SPIE (International Society for Optics and Photonics) for their innovative work in the field of lasers and optics

MAIN COLLABORATING PARTNERS ↘

COLLABORATION WITH ACADEMIC PARTNERS

- » Czech Meteorology Institute (Brno, CZ)
- » Brno University of Technology (Brno, CZ)
- » Palacky University of Olomouc (Olomouc, CZ)
- » BEV (Vienna, AT)

COLLABORATION WITH COMPANIES

- » Mesing (Brno, CZ)
- » ŽďAS (Žďár nad Sázavou, CZ)
- » I & C Energo (Třebíč, CZ)

EXPECTATIONS ↘

REQUIREMENTS

Cooperation in joint projects where an industrial partner solves technical and technological aspects of the subject of the research and our group is oriented to the development of new methods or adapting state of the art methods for solving the topic.

OFFERS

Many quality results of basic research for application
We can offer for example:

- » High-resolution laser interferometry
- » Optical detection of concentration of different gasses
- » Scientific instruments for real-time processing of signals in laser interferometers and length measurement