



ELECTRONICS & INSTRUMENTATION

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AIT AUSTRIAN INSTITUTE OF TECHNOLOGY GMBH, HEALTH & ENVIRONMENT DEPARTMENT BIOMEDICAL SYSTEMS

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THEMATIC RESEARCH FOCUS

RESEARCH AREA

Medical Applications

- Prevention (Ambient Assisted Living (AAL)-Home care products, AAL-Safety&Security)
- Diagnostics (Cardiology – Pulse Wave Analysis, Cardiovascular Risk Stratification, Validation of new cardiovascular risk parameters)
- Therapeutic Systems (Biocompatible Materials and Applications, Processing Technologies)

EXCELLENCE

Prevention

- Non-invasive acquisition of Activities of Daily Living (hardware/sensors for behaviour patterns)
- Biomathematical modelling & simulation (behaviour patterns,...)
- Interpretation of the behaviour patterns and reasoning
- Regulatory process knowledge (ISO13485, MDD 2007) and standardisation (AAL)

Diagnostics

- Biomathematical Modelling and simulation
- Biosignal acquisition and analysis (pulse wave analysis)
- Regulatory process knowledge (ISO13485, MDD 2007)

Therapeutic Systems

- Development and optimization of tailored biocompatible metallic materials for biodegradable and permanent orthopaedic and cardiovascular implants
- Regulatory process knowledge (ISO13485, MDD 2007)

MISSION

We study human systems with the goal of understanding and reducing the complexity involved. This knowledge is used translational, i.e. from laboratory to human and reverse. We contribute to the enhancement of quality of life and natural sustainability.

DEVELOPED TECHNOLOGIES

CONTENT OF RESEARCH

- Development and validation of platforms for AAL solutions and services according to European Standards
- Development and validation of algorithms for behaviour pattern recognition and reasoning for AAL scenarios.
- Experimental development of intelligent user interfaces like photorealistic avatars and NFC interfaces
- Development and validation of algorithms and biomathematic models for model based pulse wave analysis for the following cardiovascular parameters like: stroke volume, peripheral resistance, central blood pressure, pulse wave velocity
- Development and validation of algorithms for wave separation and pharmacokinetics.
- Development and generation of optimal process parameters for ECAP/ICAP technologies
- Development of new Mg-alloys with outstanding parameters in UTS and YS as well as degradation rate.

MAIN CAPABILITIES

Basic research

- Study of vigilance states derived from EEG signals
- Study of pulse wave and ECG signal interaction

Application research

- Development of new Mg-alloys for biomedical applications
- Processing technologies for cardiovascular and orthopaedic implants

FIELDS OF RESEARCH RESULTS APPLICATION

Medical/health related, Biomedical technology

- Diagnostic
- Therapeutic
- Medical equipment
- Material processing technologies
- Medical treatment

NUMBER OF RESEARCH POSITIONS**SENIOR RESEARCH STAFF**

7/24

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

13/36

BUDGET**TOTAL:** 4,1 Mill. EUR**PART OF THE TOTAL BUDGET COMING FROM PRIVATE RESOURCES (%):** 35 %**PART OF THE TOTAL BUDGET COMING FROM FOREIGN RESOURCES (%):** 25 %**MAIN PROJECTS**

- **2009–2011:** ARCCore (Innovative methods for diagnosis and therapy of cardiovascular diseases); cofinanced by Lower Austria and EFRE Funds
- **2008–2012:** BioCompatible Materials & Applications (cofinanced by Lower Austria, Industry and EFRE Funds)
- **2010–2013:** UniversAAL (FP7 granted)
- **2008–2011:** CompanionAble (FP7 granted)
- **2009–2011:** Bedmond (AAL-JP granted)
- **2011–2014:** AALuis (AAL-JP granted)

ACHIEVEMENTS**Patents**

- Schmid, Bammer: Vorrichtung zur Erfassung einer Stelleinheit, Seibersdorf Labor GmbH, AIT Austrian Institute of Technology GmbH, PCT/AT2011/000154, Publication date 2011-03-28.
- Wassertheurer, Mayer: Method for Determining Cardiac Output, AIT Austrian Institute of Technology GmbH, PCT/AT 2006/000457, Publication date 2007-05-18.

- Zauner, Riemelmoser, Bammer: Lattice Part made of Metal and Method for the Production of a Lattice Part, AIT Austrian Institute of Technology GmbH, PCT/AT 2008/000048, Publication Date 2009-11-19.

Scientific results of the team members are regularly published in high profile scientific journals

- Khalavka Y., Mingler B., Friedbacher G., Okrepka G., Shcherbak L., Panchuk O.: "Influence of temperature on the synthesis of thiol-stabilized CdTe nanoparticles in aqueous solutions". *Physica status solidi*. 207 [2010], p. 370-374.
- Setman D., Mingler B., Krexner G., Zehetbauer M., Krystian M.: "Formation of Super-Abundant Vacancies in Nano Pd-H generated by High Pressure Torsion". *Scripta Materialia*, 62 [2010], p. 49-52.
- Weber T., Ammer M., Biber C., Windpessl M., Wassertheurer S., Hametner B., Mayer Ch., Kropf J.: "Arterial Wave Reflection And Arterial Stiffness Independently Predict Cardiovascular Events". *Journal of Hypertension*, 28 [2010], p. 597
- Wassertheurer S., Hametner B., Kropf J., Mayer Ch., Eber B., Weber T.: "Novel non-invasive method to assess wave reflection from the pressure waveform alone". *Artery Research*. 4 [2010], p. 145
- Lamedschwandner K., Bammer M., Oberleitner A., Schmid A., Cecil St., Preineder H., Nakovits T.: "Wirkungen elektromagnetischer Felder bei Einsatz der NFC-Technologie im Gesundheitswesen". *Elektrotechnik und Informationstechnik*, 3 [2010], p. 25-28

MAIN COLLABORATING PARTNERS**COLLABORATIONS WITH ACADEMIC PARTNERS**

- Swiss Federal Institute of Technology - ETH (Zurich, CH)

- University of Cambridge (Cambridge, GB)
- Medical University of Vienna (Vienna, AT)
- Technical University of Vienna (Vienna, AT)
- Medical University of Graz (Graz, AT)

COLLABORATIONS WITH COMPANIES

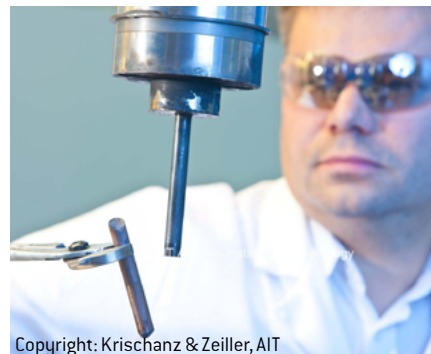
- Biotronik GmbH (Erlangen, DE)
- Synthes GmbH (Oberdorf, CH)
- O. Bock GmbH (Vienna, AT)
- Karl Leibinger Medizintechnik GmbH (Mühlheim, DE)
- Stryker GmbH (Schönkirchen, DE)
- I.E.M GmbH (Stolberg, DE)
- ELK Fertighaus AG (Schrems, AT)
- Continua Health Alliance (Beaverton, US)

EXPECTATIONS**REQUIREMENTS**

- Partners for international research projects in the field of Ambient Assisted Living, biocompatible materials and applications, processing technologies and cardiovascular risk stratification
- Collaboration with industrial partners in common projects dedicated to applied science

OFFERS

- Licensing of patents
- Partnership in international projects



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09/2011



BRNO GROUP OF THE RESEARCH CENTRE DAR (COORDINATED BY UTIA, CZ.AC.SCI. PRAGUE)

/ DEPARTMENT OF BIOMEDICAL ENGINEERING
/ FACULTY OF ELECTRICAL ENGINEERING AND COMMUNICATION TECHNOLOGIES
/ BRNO UNIVERSITY OF TECHNOLOGY

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THEMATIC RESEARCH FOCUS

RESEARCH AREA

Medical Image Reconstruction and Analysis

EXCELLENCE

- Ultrasonic computed tomography
- Retinal image analysis
- Analysis of fMRI data for neuroscientific purposes
- Fusion and analysis of multimodal medical image data

MISSION

- Internationally recognized research group in medical image vprocessing, incl. neuroscientific applications

DEVELOPED TECHNOLOGIES

CONTENT OF RESEARCH

Medical Image Reconstruction and Analysis

MAIN CAPABILITIES

- Medical image processing, analysis, reconstruction and restoration
- Authorized ophthalmological software
- Authorized software for 3D CT subtractive angiography

FIELDS OF RESEARCH RESULTS APPLICATION

- Clinical and technological research (routinely usable support of diagnostics)
- Environmental analysis (various image analyses)
- Material microscopy research

NUMBER OF RESEARCH POSITIONS

SENIOR RESEARCH STAFF

4

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

5

KEY RESEARCH EQUIPMENT

LIST OF DEVICES

- Hardware: powerful parallel computational equipment, connection to GRID resources (cooperation with Masaryk University Brno)
- Software tools for large-scale problems (up to millions of equations)

BUDGET

TOTAL (MIL. CZK/MIL. EUR)

1.8 / 0.072

PART OF THE TOTAL BUDGET FROM PRIVATE RESOURCES (%)

12

PART OF THE TOTAL BUDGET FROM FOREIGN RESOURCES (%)

12

MAIN PROJECTS

2005-2011: DAR - Data, algorithms, decision-making (project 1M0572 financed by the programme 1M - The research centres, Ministry of Education, Youth and Sports)

RELATED PROJECTS OF THE CENTRE:

- Ultrasonic computed tomography (USCT): image reconstruction from measurements, simulation, calibration (cooperation with KIT Karlsruhe)
- Retinal image analysis – evaluation of structures, namely of neural layer and vessel tree, with respect to diagnostic purposes (e.g. for glaucoma) – cooperation with Erlangen University and Hospital
- Medical 3D and 4D image data mono- and multimodal registration (applications e.g. in CT subtractive angiography, in paediatric diagnostics, etc. – cooperation with Philips Nederland)

- Analysis of functional MRI image data for neurological purposes – cooperation with the Faculty Hospital Brno

ACHIEVEMENTS

Developed specialised software packages (http://icatb.sourceforge.net/scks/scks_download_links.htm; <http://ophthalmo.ubmi.feec.vutbr.cz>)

Publications:

- Jan, J.: Medical Image Processing, Reconstruction and Restoration – Concepts and Methods. CRC Taylor and Francis Inc. (USA), 2006, ISBN 0-8247-5849-8, 760 pp.
- Jan, J.: Digital Signal Filtering, Analysis and Restoration. IEE Publishing, London (UK) 2000, ISBN 0-85296-760-8, 421 pp.
- R. Kolář, R. Laemmer, J. Jan, Ch. Y. Mardin: Segmentation of zones with increased autofluorescence in the junctional zone of parapapillary atrophy. *Physiol. Measurement*, vol. 30 (2009), pp. 1–12 H.
- HAVLÍČEK, M.; JAN, J.; BRÁZDIL, M.; CALHOUN, V. Dynamic Granger causality based on Kalman filter for evaluation of functional network connectivity in fMRI data. *NeuroImage*, 2010, vol. 53, no. 1, pp. 65-77. ISSN: 1053-8119.
- KUBEČKA, L.; JAN, J.; KOLÁŘ, R. Retrospective Illumination Correction of Retinal Images. *International Journal of Biomedical Imaging*, 2010, no. 5, pp. 201-223. ISSN: 1687-4188.
- JIŘÍK, R.; PETERLÍK, I.; JAN, J.; ZAPF, M.; RUITER, N. 3D Regularized Speed-Map Reconstruction in Ultrasound Transmission Tomography. In *Proceedings of 2009 IEEE Ultrasonics Symposium. Proc. IEEE Ultrasonics Symposium. IEEE, 2010. s. 2272-2275. ISBN: 978-1-4244-2428-3. ISSN: 1051-0117.*

MAIN COLLABORATING PARTNERS

COLLABORATION WITH ACADEMIC PARTNERS

- Friedrich Alexander University (Erlangen, DE)
- KIT (earlier Forschungszentrum), (Karlsruhe, DE)
- Masaryk University, Faculty of Medicine (Brno, CZ)
- UTIA, Academy of Sciences of the Czech Republic (Prague, CZ)

COLLABORATIONS WITH COMPANIES

- Philips Nederland (NL)
- Ophthalmological Clinic, Zlín (CZ)

EXPECTATIONS

REQUIREMENTS

- Academic partners: common scientific interests, potential for common European projects
- Industrial partners: academically formulated technological / medical problems, understanding for publication needs, material support

OFFERS

- Know-how in general and particularly medical image processing, supported by high-tech hardware and software equipment

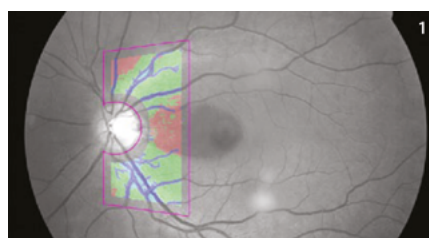


Photo 1 Human eye retina with nerve fibre layer indications for diagnosis of glaucoma, obtained by digital analysis method developed by Brno DAR group. The red colour indicates tissue damaged by the disease, the green colour indicates the existence of a healthy layer.

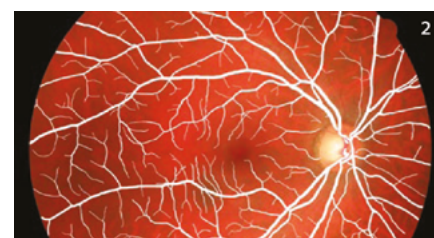


Photo 2 Human eye retina with bloodstream, automatically segmented by the method of Brno DAR group for the diagnosis of cardiovascular diseases.

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THIS SME INNOVATION GUIDE HAS BEEN DEVELOPED WITHIN THE CENTROPE TT PROJECT AND WAS FUNDED BY THE CENTRAL EUROPE PROGRAMME (EUROPEAN REGIONAL DEVELOPMENT FUND).



COHERENT LASERS AND INTERFEROMETRY

/ COHERENCE OPTICS / INSTITUTE OF SCIENTIFIC INSTRUMENTS ASCR
/ ACADEMY OF SCIENCES OF THE CZECH REPUBLIC

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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 (Menlo Systems)
- 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-1TP1/127 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)
- ŽDAS (Žďár nad Sázavou, CZ)
- I & C Energo (Třebíč, CZ)

EXPECTATIONS**REQUIREMENTS**

Cooperation in joint projects where an industrial partner solves technical and

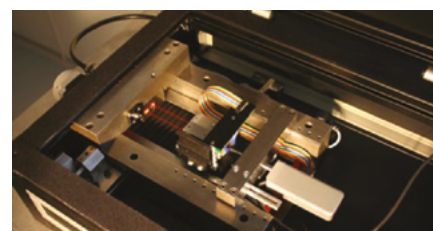
technological aspects of the subject of the research and our group is oriented to the development of new methods or adapting state of the art methods for solving the topic.

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



04/2011

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DEPARTMENT OF RADIO ELECTRONICS

/ FACULTY OF ELECTRICAL ENGINEERING AND COMMUNICATION

/ BRNO UNIVERSITY OF TECHNOLOGY

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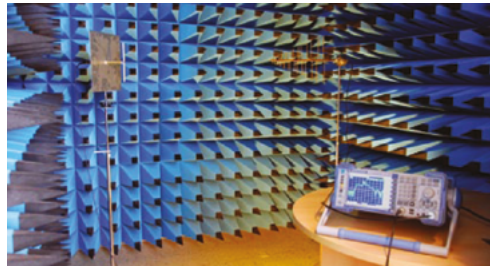
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THEMATIC RESEARCH FOCUS

RESEARCH AREA

Electronic circuits and systems, application of electronic circuits in communication systems, signal processing, electromagnetic waves

MISSION

Excellent institute, which is a part of the wider world leaders in basic and applied research.

EXCELLENCE

Applied electromagnetics, satellite and mobile communication, free space optical communication, advanced analogue electronic circuits

DEVELOPED TECHNOLOGIES

CONTENT OF RESEARCH

- Theory of electronic circuits and systems
- Application of electronic circuits in communication systems, control and industrial applications
- Signal processing and its impact on speech processing and digital wireless communication
- Electromagnetic waves, antennas, microwaves, optoelectronics and electromagnetic compatibility
- Special electronic communications (mobile, satellite, optical wireless communication)

MAIN CAPABILITIES

Basic research

Our department participates in publishing the Radioengineering Journal (included in the Thomson ISI), confirming the high international level of the institute

Application research + protection forms

National patent for multi-band antenna.

In the last few years more than 10 technical arrangements and programmes have been realized. The most considerable projects are as follows:

- Atmospheric laser optical link with self-adapting control
- Contactless optoelectronic instrument for measuring dimensions with CCD elements and microprocessor control,
- Onboard low noise receiver in L band for the experimental PHASE 3D satellite of the international organization AMSAT
- SNAP – computer programme for symbolic analysis of electronic circuits
- Digital quadrature detector for SDR (software defined radio) systems
- Frequency synthesizer and detectors with post-processing DSP for the receiver of the transponder of the Phase 3E satellite of the organization AMSAT
- Testing and measuring the EDGE system for fast data transmission in GSM networks (in cooperation with T-Mobile CZ) in the mobile communications laboratory

FIELDS OF RESEARCH RESULTS APPLICATION

- Communication, control and industrial engineering

ALUMNI PROFILE

The graduate is able to develop a completely new electronic device, improve the methods for signal processing, etc. on the basis gained by deep theoretic knowledge. Graduates find their place in experimental, research and development (R & D) centres, in academia and science institutions. Doctoral study programme graduates are also very successful abroad.

Knowledge and skills in:

Electronic analogue, pulse and digital circuits and systems, TV and video applications, HF and microwave applications, antennae and theory of electromagnetic field, signal processing, wireless communications and electromagnetic compatibility.

NUMBER OF RESEARCH POSITIONS**SENIOR RESEARCH STAFF**

10

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

30

KEY RESEARCH EQUIPMENT**LIST OF DEVICES**

- Fully equipped EMC chamber for measurements in the range of kHz to GHz
- Vector network analyzer for measurements up to 40 GHz
- Optoelectronic laboratory for characterizing free-space optical systems
- Mobile communication laboratory fully connected to T-Mobile network

BUDGET**TOTAL (MIL. CZK/MIL. EUR)**

50 / 2

PART OF THE TOTAL BUDGET FROM PRIVATE RESOURCES (%)

4

PART OF THE TOTAL BUDGET FROM FOREIGN RESOURCES (%)

20

MAIN PROJECTS

2010–2013: Agile RF transceivers and front-ends for future smart multistandard communications applications (FP7 project; ENIAC. Coordinator: Infineon)

2008–2012: High intensity radiated fields – synthetic environment (FP7 project; COOPERATION. Coordinator: Alenia Aeronautica)

2008–2010: Antennas for Car2Car communication (research contract; Contractor: Volkswagen A.G.)

ACHIEVEMENTS

- Free space optical link for gigabit wireless communication
- Transponders for AMSAT satellites
- Measurement campaign of data transfer rate in commercial mobile networks
- Antenna system for Car2Car communication

MAIN COLLABORATING PARTNERS**COLLABORATION WITH ACADEMIC PARTNERS**

- Faculty of Electrical Engineering, Czech Technical University (Prague, CZ)
- Institute of Scientific Instruments, Academy of Sciences of the Czech Republic (Brno, CZ)
- Institute of Photonics and Electronics, Academy of Sciences of the Czech Republic (Prague, CZ)
- Institute of Atmospheric Physics, Academy of Sciences of the Czech Republic (Prague, CZ)

COLLABORATION WITH COMPANIES

- Barco (Uherské Hradiště, CZ)
- Ccom (Pardubice, CZ)
- Dcom (Brno, CZ)
- ERA (Pardubice, CZ)
- Evektor (Kunovice, CZ)
- Omikron (Praha, CZ)
- První brněnská strojárna (Velká Bíteš, CZ)
- Škoda Auto (Mladá Boleslav, CZ)
- T-Mobile (Prague, CZ)
- Tesla Holding (Prague, CZ)

EXPECTATIONS**REQUIREMENTS**

- Foreign high-quality postdocs
- Demand after innovation

OFFERS

- Competitive applied research

04 / 2011

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DETECTION SYSTEMS

/ ELECTRON OPTICS / INSTITUTE OF SCIENTIFIC INSTRUMENTS
/ ACADEMY OF SCIENCES OF THE CZECH REPUBLIC

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THEMATIC RESEARCH FOCUS

RESEARCH AREA

- Scanning electron microscopy

EXCELLENCE

- BSE and SE detectors with scintillation single crystals, detection systems for VP-SEM, ESEM

MISSION

We want to maintain and further develop our position among the world's leading workplaces.

DEVELOPED TECHNOLOGIES

CONTENT OF RESEARCH

- Physical processes of interaction mechanisms at collisions of electrons with gas molecules
- Ways of electron scatter in gaseous media
- Differential pumping as well as gas flow computation in microscopes VP-SEM and ESEM
- Problems of electron scatter in the dependence on the gas medium pressure.
- Scintillation of single crystals for detection of signal electrons in SEM, ESEM and TEM

MAIN CAPABILITIES

Basic research

- Study of kinetics of single crystal scintillators
- Study of mechanisms for the creation and multiplying of signal electrons in an environment of high pressure gas and simulation of these phenomena
- Study of samples in terms of dynamic in-situ experiments

Application research + protection forms

- New types and features of the detectors for REM and EREM
- Electrochemical sensors
- Solar cells
- Stem cells and other biological samples

FIELDS OF RESEARCH RESULTS APPLICATION

Fields of research results application

- Life sciences (especially molecular biology, biochemistry)
- Material science (study of some special samples)
- Measuring instruments
- Renewable energy
- Plastics, polymers
- Glass, ceramics
- Textile industry

NUMBER OF RESEARCH POSITIONS

SENIOR RESEARCH STAFF

3

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

3

KEY RESEARCH EQUIPMENT

LIST OF DEVICES

Laboratory of environmental scanning electron microscopy:

- Observation of the process of electrically non-conducting specimens without covering them with a conducting layer on the surface

If the gas pressure in the specimen chamber of EREM is higher than 200 Pa, the primary and signal electrons collide with atoms and molecules of gases in the vicinity of the specimen and thus the originating ions compensate for charging of the specimen by incident electrons.

Through this process electrically non-conducting specimens can be observed and yet their surface need not be covered with a conducting layer. If the pressure of gas, or rather water vapour, in the specimen chamber is higher than 611 Pa (at 0°C), objects containing a certain amount of water do not dry up and collapse, and therefore are suitable for observation.

Experimental non-commercial VP-SEM

AQUASEM II equipped with a moisturizing system and cooled specimen holder. The VP-SEM can be used to study:

- Details of the surface structure of conducting and non-conducting natural animated and inanimate specimens
- Wet specimens and specimens on the boundary of states (condensation, evaporation, meeting, solidification, etc.)
- Specimens in conditions of mechanical and thermal strain in the vacuum or gas of optional humidity
- Material, topographic or voltage contrast due to which imaging of electric charge accumulation and distribution e.g. on transistor gates is possible
- Reactions of various chemical substances in the specimen chamber
- Aggressive chemical substances, e.g. battery mass
- Various types of specimens in conditions closely approximate to atmospheric pressure

Unique detection systems in the world:

- Specially designed single crystal scintillation detectors using the YAG and YAP scintillator – design, development and study of physical properties of custom-built systems.
- Unique detection systems for high pressure conditions of VP-SEM or ESEM. (detection systems are based on the gas-ionisation phenomena enabling high amplification of the detected signal) Two new detection systems have been developed and patented in the last three years.

BUDGET**TOTAL (MIL. CZK)**

3

PART OF THE TOTAL BUDGET FROM PRIVATE RESOURCES (%)

40

PART OF THE TOTAL BUDGET FROM FOREIGN RESOURCES (%)

10

MAIN PROJECTS

2010–2013: The study of the influence of magnetic and electric fields for amplification of secondary electron signals detected by a novel detector in VP-SEM (project GAP102/10/1410 financed by the Czech Science Foundation)

2009–2013: Application of Laser Technologies into the Process of Crystalline Silicon Solar Cells Production (project FR-TI1/305 financed by the Ministry of Industry and Trade)

2009–2013: New generation of electrochemical sensors and biosensors using thin modified DLC layers (project FR-TI1/118 financed by the Ministry of Industry and Trade)

ACHIEVEMENTS**European patent**

- Neděla, Vilém; Jiráček, Josef: Ionisation detector of an environmental scanning



Fig 1 Environmental scanning electron microscopy AQUASEM II

electron microscope, Institute of Scientific Instruments, Academy of Sciences of the Czech Republic, EP 2195822 (A2), Publication date 2010-06-16.

Scientific results of the team members are regularly published in high profile scientific journals

- Jiráček, J., Neděla, V., Černoch, P., Čudek, P., Runštuk, J.: Scintillation SE detector for variable pressure scanning electron microscopes. *Journal of Microscopy*. 239, 3 (2010), p. 233-238. ISSN 0022-2720
- Neděla, V., Weyda, F., Černoch, P.: Advantages of Study of Amber Fossils with Ionization Detector in Variable Pressure SEM. *Microscopy and Microanalysis*. 13, Suppl. 3 (2007), p. 250-251. ISSN 1431-9276
- Neděla, V.: Methods for Additive Hydration Allowing Observation of Fully Hydrated State of Wet Samples in Environmental SEM. *Microscopy Research Technique*. 70, 2 (2007), p. 95-100. ISSN 1059-910X
- Ježek, J., Čížmár, T., Neděla, V., Zemánek, P.: Formation of long and thin polymer fibre using nondiffracting beam. *Optics Express*. 14, 19 (2006), p. 8506-8515. ISSN 1094-4087

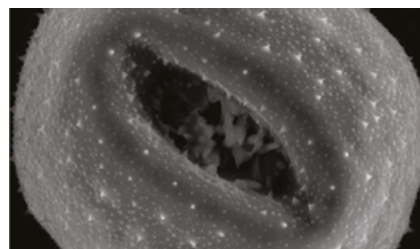


Fig 2 Detail of pollen surface structure. Ionization detector AQUASEM II microscope, a sample without any modifications

MAIN COLLABORATING PARTNERS

COLLABORATION WITH ACADEMIC PARTNERS

- University of Cambridge (Cambridge, GB)
- Westfälische Wilhelms-Universität (Münster, DE)
- University of Western Australia (Perth, AU)
- Institute of Scientific Instruments, Academy of Sciences of the Czech Republic (Prague, CZ)
- Faculty of Mechanical Engineering, Brno University of Technology (Brno, CZ)
- Faculty of Medicine, Masaryk University (Brno, CZ)

COLLABORATION WITH COMPANIES

- BVT Technologies (Brno, CZ)
- Solartec (Rožnov pod Radhoštěm, CZ)
- Tescan (Brno, CZ)
- Crytur (Turnov, CZ)
- Delong Instruments (Brno, CZ)
- Hitachi (JP)
- Jeol (JP)

EXPECTATIONS

REQUIREMENTS

- Suitable industrial partners
- Collaboration with biologists, doctors and others
- New and high-quality postgraduates
- Motivate / initiate / help companies to arrange scholarships for graduates / postgraduates

OFFERS

- Long term experience with design and production of scintillation single crystal detectors for detection of backscattered electrons and secondary electrons for SEM and ESEM
- Long term experience in the field of environmental SEM (study of nonconductive and highly wet samples)
- Cooperation with commercial partners in the field of diagnostics of materials using scanning electron microscopy

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MEASUREMENT AND DATA PROCESSING IN MEDICINE

/ MAGNETIC RESONANCE AND BIOINFORMATICS

/ INSTITUTE OF SCIENTIFIC INSTRUMENTS

/ ACADEMY OF SCIENCES OF THE CZECH REPUBLIC



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THEMATIC RESEARCH FOCUS

RESEARCH AREA

Measurement and data processing in the area of cardiology and neurology

EXCELLENCE

Analysis of repolarization dynamicity, multi-channel digital transmitter/ receiver for non-invasive monitoring of hemodynamic parameters. New methods including experimental devices, protocols and mathematical tools for effective non-invasive diagnostics in cardiology and neurology.

MISSION

We want to maintain our position among the world leaders and have research themes in which we are ranked among the top in the world.

DEVELOPED TECHNOLOGIES

CONTENT OF RESEARCH

- Cardiovascular diagnostics (the evaluation of variability of blood pressure and pulse frequency, the development of methods for noninvasive diagnostics of cardiovascular diseases with assessment of the extent of risk of acute heart incidents)
- EEG, epilepsy and Parkinson's disease (measurement and analysis of patients suffering pharmaco-resistant epilepsy and Parkinson's disease, the development of methods for analysis of event-related potentials ERP by synchronizing and de-synchronizing)
- Construction of devices and development of software for the abovementioned topics

MAIN CAPABILITIES

Basic research

- Analysis of repolarization dynamicity (submitted international patent)
- Multi-channel digital transmitter/receiver for noninvasive monitoring of the hemodynamic parameters

Application research + protection forms

- Method of prediction of sudden cardiac death (internationally patented - US, EU)
- Method of measuring the depth of anesthesia (original non-invasive methodology)
- Whole-body impedance cardiography (submitted international patent)

FIELDS OF RESEARCH RESULTS APPLICATION

- Medicine
- Biotechnology
- Scientific instruments

ALUMNI PROFILE

Our alumni are experts in measurement and data processing of biosignals, noise and artifact elimination, coupling analysis and significant parameter definition and construction of electronic devices with high dynamic range.

NUMBER OF RESEARCH POSITIONS

SENIOR RESEARCH STAFF

5

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

3

KEY RESEARCH EQUIPMENT

LIST OF DEVICES

Experimental medical instruments:

- ECG monitors
- amplifiers of biological signals with high ratio signal/noise,
- acquisition systems
- software for data recording and evaluation in neurology and cardiology
- devices for non-invasive monitoring of the hemodynamic parameters
- whole body multichannel impedance cardiography

BUDGET**TOTAL (MIL. CZK/MIL. EUR)**

20/0.8

PART OF THE TOTAL BUDGET FROM PRIVATE RESOURCES (%)

20

PART OF THE TOTAL BUDGET FROM FOREIGN RESOURCES (%)

3

MAIN PROJECTS

2008–2010: Ventricular depolarization and repolarization analysis (project GA102/08/1129 financed by the Czech Science Foundation)

2005–2007: Methods of measurement and evaluation of properties in the regulation of blood circulation (project GA102/05/0402 financed by the Czech Science Foundation)
Analysis of EEG signals scanned at high frequencies from deep brain structures

MAIN COLLABORATING PARTNERS**COLLABORATION WITH ACADEMIC PARTNERS**

- St. Anne's University Hospital Brno, ICRC Brno (CZ)
- The University Hospital Brno (CZ)
- Department of Biomedical Engineering, Brno University of Technology (CZ)

- Faculty of Veterinary Medicine, University of Veterinary and Pharmaceutical Science Brno (CZ)
- MAYO Clinic (Rochester, MN, US)
- THEW, University of Rochester (Rochester, MN, US)

COLLABORATION WITH COMPANIES

- M&I Praha (CZ)

EXPECTATIONS**REQUIREMENTS**

- Development of cooperation in the framework of established biomedical platforms (network around ICRC),
- Development of contacts with foreign firms,

OFFERS

- Experience and methodology of measurement and data analysis in cardiology and neurology
- Multichannel high dynamic range transmitter/receiver (usable for non-invasive monitoring of hemodynamic parameters)
- New, patented methodology to test the proarrhythmic influence of drugs



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PHYSICS OF NANOSTRUCTURED MATERIALS

/ UNIVERSITY OF VIENNA / FACULTY OF PHYSICS

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THEMATIC RESEARCH FOCUS

RESEARCH AREA

Micromaterials, nanomaterials, mechanical and physical materials properties, materials processing.

EXCELLENCE

Determination of physical and mechanical properties of small scaled materials and structures under mechanical and thermal loading. Processing and optimization of bulk nanostructured materials with respect to their physical properties. Structural characterization of micro- and nanomaterials down to the atomic level.

The investigated materials comprise thin films, foils, wires, solder materials, fibres, bulk and multilayered structures of various metallic, nonmetallic and polymeric micro- and nanomaterials. Giga-cycle fatigue and crack growth behavior of various structural materials.

MISSION

Our objective is to study thermal, mechanical and structural properties of small scaled structures with emphasis on the reliability and lifetime of microsystems. We develop new diagnostic tools with the aim of in situ testing of real miniaturized structures and electronic components.

Other objectives concern the optimization of mechanical and functional properties (magnetic, thermoelectric, hydrogen storage) of bulk nanostructured materials by controlling the processing and microstructural parameters. We focus on fundamental as well as applied research, also in cooperation with industry.

DEVELOPED TECHNOLOGIES

CONTENT OF RESEARCH

- Experimental determination and characterization of the thermomechanical

properties of the materials used in microelectronic and mechatronic systems as interconnects and various components.

- Development of special measurements and characterization methods required for these investigations.
- Systematic investigation of the connections between macroscopic physical properties and the microstructures of bulk nanomaterials, and establishing of reliable databases
- to design reliable simulation methods

MAIN CAPABILITIES

- Determination of stress-strain, creep, stress relaxation behaviour of materials in the micron scale using contactless strain sensors. Measurement of CTE and thermal strain by a laser speckle dilatometer.
- Special experimental setups based on ultrasonic resonance fatigue systems have been designed for investigation of fatigue and fracture properties of free standing thin foils, wires and miniaturized structures.
- A novel high frequency mechanical fatigue testing method for lifetime determination of material interconnects like various kinds of micro-joints and miniaturized interconnects.
- Performing microstructural characterization and failure analysis of materials: Application of sophisticated X-ray and electron diffraction methods (Bragg profile analysis), DSC, SEM and TEM aiming at the size (distribution) of nano-crystallites and lattice defects (with their density, arrangement), special facilities to process bulk nanostructured materials by Severe Plastic Deformation (HPT, ARB)

FIELDS OF RESEARCH RESULTS APPLICATION

Electronics and microelectronic industry, suppliers / manufacturers of materials used in electronics industry (wires, foils, solders, ceramics, substrate materials etc.) producers of metallic materials and constructions including medical applications, automotive industry

ALUMNI PROFILE

Materials science, development of tailored special testing systems for small-scaled structures and materials, contactless strain measurements, FEM simulations, structural investigation and characterization down to atomic level, optimization of properties

NUMBER OF RESEARCH POSITIONS**SENIOR RESEARCH STAFF**

12

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

18

KEY RESEARCH EQUIPMENT**LIST OF DEVICES**

- Fatigue testing resonance machines for determination of fatigue life curves in giga-cycle regime and computer controlled resonance systems for crack growth measurements.
- Special specimen set-ups for ultrasonic mechanical fatigue testing of small sized specimens and interconnects.
- Servohydraulic test machine SHIMADZU 10 kN
- Microtensile and compression testing machines, and 2 tensile machines 10N and 50 kN, environmental chamber for deformation experiments at temperatures -50°C to 300°C
- Laser speckle systems and laser interferometer system for non-contacting strain measurement, including Laser speckle based dilatometry
- Laser Doppler Vibrometer for differential vibration measurements
- Permanent magnet shaker and piezo-shaker systems for vibration analysis and reliability testing
- High intensity X-ray diffraction facility for Bragg profile analyses, access to Synchrotron facilities

- High resolution X-ray diffractometer for texture and stress analyses
- Electron microscopes (TEM, HRTEM, SEM/EBSD-BSE incl. preparation tools)
- AFM-STM
- Power-compensated DSC Calorimeters
- Torsional Rheometers
- Equipment for electrical (residual) resistivity measurement

BUDGET**TOTAL (2010):** ca. 1 Mio EUR**PART OF THE TOTAL BUDGET FROM PRIVATE RESOURCES (%):** 25 %**PART OF THE TOTAL BUDGET FROM FOREIGN RESOURCES (%):** 10 %**MAIN PROJECTS**

- FFG - Comet K- Project, "Reliability of Material Interconnects in Electronics" (2010-2014)
- FFG Bridge Project, "New qualification methods and lifetime models for micro-interconnects in electronics" in cooperation with Siemens and Infineon (2006-2009)
- FWF P 17346-N11, "Solder interconnect as a microcomposite: Size effect and thermo-mechanical stability using lead free Ag-In-Sn solders" (2006 – 2009)
- FWF Project P 17650-N02 "Lifetime controlling defects in tool steels with standard to ultrafine microstructure" (2005-2008)
- Doctorate College IK I022-N, "Experimental Materials Science- Nanostructured Materials" of University of Vienna, (2006-2009)
- FWF National Research Network S 104 "High Performance Bulk Nanocrystalline Materials: Synthesis, Microstructures and Properties" (coordinated by Group Physics of Nanostructured Materials, 5

partner institutions from all over Austria, 2008-2012]

- FWF Project P 22913-N20 "Role of Dislocations for the Plastic Deformation of Semicrystalline Polymers" (2011-2014)

ACHIEVEMENTS**PATENTS:**

- A method for cyclic shear testing of material interconnects, G. Khatibi, V. Groeger, B. Weiss, G. Lefranc, G. Mitic, Patent, 10 2005 016 038.7, 2006
- A method for fatigue testing of stents, B. Weiss, G. Khatibi, Patent, PCT/AT/2009/000472

PUBLICATIONS:

- A study of the mechanical and fatigue properties of metallic microwires, G. Khatibi, A. Betzwar-Kotas, V. Gröger and B. Weiss, Fatigue & Fracture of Engineering Materials & Structures, vol.8, Nr. 8, p 743-749, 2005
- Influence of Miniaturization on Mechanical Reliability of Lead-free Solder Interconnects, G. Khatibi, H. Ipser, M. Lederer, B. Weiss, chapter 18 in "Lead-Free solders- Materials for Reliability", Ed. K.N. Subramanian, Wiley- Blackwell
- Bulk Nanostructured Materials (Book with 30 review articles, 4 by members of Group Physics of Nanostructured Materials) Edited by Michael J. Zehetbauer and Yuntian T. Zhu 2009 WILEY-VCH Verlag GmbH & Co, Weinheim, Germany
- M. J. Zehetbauer, R. Grössinger, H. Krenn, M. Krystian, R. Pippan, P. Rogl, T. Waitz, R. Würschum Bulk Nanostructured Functional Materials by Severe Plastic Deformation, Adv.Eng.Mater., Feature Paper of Special Issue: Bulk Nanostructured Materials, 12, 692–700 (2010)

MAIN COLLABORATING PARTNERS

COLLABORATION WITH ACADEMIC PARTNERS

- Vienna University of Technology, Institute for Chemical Technologies and Analytics, Vienna Austria
- Johannes Kepler University of Linz, Institute for Measurement Technology, Linz, Austria
- KAI - Center of Expertise in Automotive and Industrial Electronics, Villach, Austria,
- Institut für Physikalische Chemie, University of Vienna, Austria
- Institut für Festkörperphysik, University of Technology, Wien, Austria
- Fraunhofer Institute for Reliability and Micro-integration, Berlin, Germany
- Montan University Leoben, Institut for Structural and Functional Ceramics (ISFK), and Department of Materials Physics (DMP), Leoben, Austria
- Materials Center Leoben Forschung GmbH (MLC), Leoben, Austria
- Erich Schmid Institute of Materials Science, Austrian Academy of Sciences, Leoben, Austria
- TGM-Inst. of Technology – Versuchsanstalt für Kunststoff- u. Umwelttechnik, Wien, Austria
- Institut für Komplexe Materialien, IFW Dresden, Germany
- Institut für Nanotechnology, Karlsruhe Institute of Technology, Germany
- Institut für Materialphysik, Universität Münster, Germany
- Department of Materials Science & Engineering, North Carolina State University, Raleigh, USA

COLLABORATION WITH COMPANIES

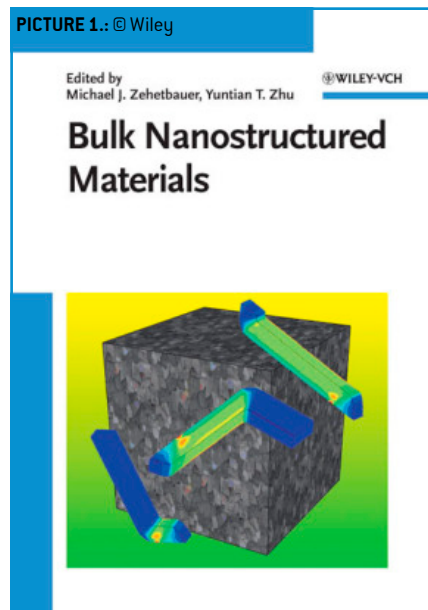
- Siemens, Vienna Austria
- Infineon Technologies, Villach Austria,
- Infineon Technologies, Warstein Germany
- Continental AG, Regensburg Germany
- Polytec, Waldbronn Germany
- Epcos-TDK, Deutschlandsberg Austria
- Biotronic, Bülach Swiss
- Abbott, Beringen Swiss

EXPECTATIONS

OFFERS

- Cooperation in development of mechanical testing techniques for small scaled structured
- Determination of static and dynamic properties of various materials and structure
- Tailored solutions for characterization of micro- and nanomaterials, and for

PICTURE 1.: © Wiley



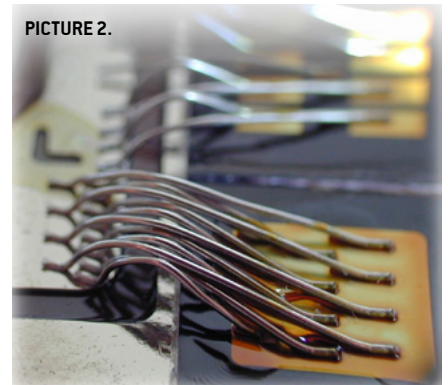
processing and property- mediated optimization of nanomaterials

- Partnership in international projects

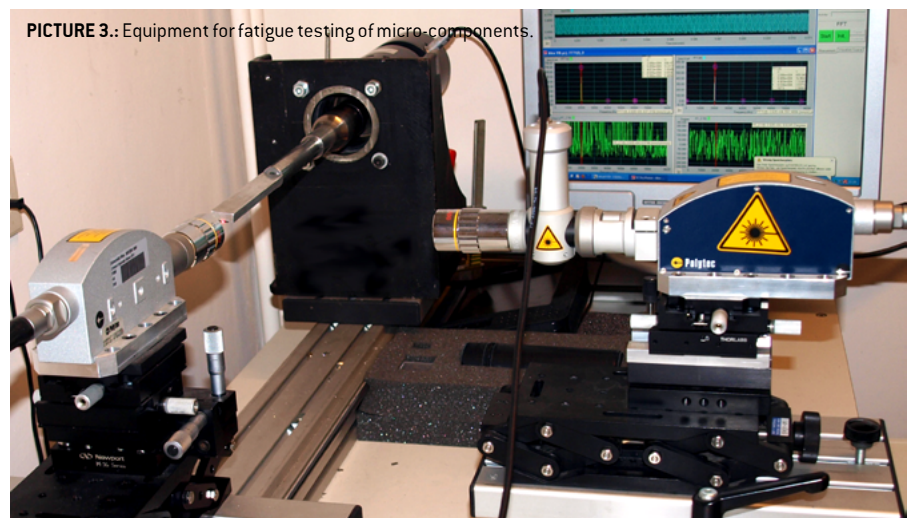
REQUIREMENTS

- Partners for research projects in the field of micro electronics
- Collaboration with industrial partners in common projects dedicated to applied science
- New complementary technologies in the field of measurement techniques and material testing
- New equipment and systems for local in situ strain measurement under dynamic loading

PICTURE 2.



PICTURE 3.: Equipment for fatigue testing of micro-components.



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DEPARTMENT OF LOGISTICS AND FORWARDING

/ FACULTY OF ENGINEERING SCIENCES

/ BAROSS GÁBOR INSTITUTE OF BUILT ENVIRONMENT AND TRANSPORT

RESEARCH GROUP CONTACT

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THEMATIC RESEARCH FOCUS

RESEARCH AREA

- Development of packaging technology and structures
- Single and transport packaging testing
- Packaging material testing
- Development of packaging standards
- Development of environmental packaging
- Testing of automotive plastic parts
- Supply Chain management related projects
- Sustainable Transport Solutions
- LEAN Management

EXCELLENCE

- In Central Europe we are able to perform environmental testing of packaging and testing of complete filled and single packaging in a very special way and wide range. Europe

MISSION

Developing new testing methods in the field of paper, plastic, steel and combined packaging. Achieve new scientific results on this field. Developing sustainable transport systems.

DEVELOPED TECHNOLOGIES

CONTENT OF RESEARCH

- Rheology testing method for cardboard, cardboard-boxes and plastics
- Testing new, biodegradable packaging materials
- Research disposable and returnable packaging systems

MAIN CAPABILITIES

The results of our R&D activities can be used immediately in practice for the packaging industries and companies who use packaging in their logistics system.

FIELDS OF RESEARCH RESULTS APPLICATION

- Industry (paper, textil, wood, electronic, electrical, automotive), Environment (recycling), Material (iron, plastics), Transportation (road, air, water, railway)

NUMBER OF RESEARCH POSITIONS

SENIOR RESEARCH STAFF

2

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

1

KEY RESEARCH EQUIPMENT

LIST OF DEVICES

- Conditioning cabinet Brabaender KKE 10.000/70 N
- Climate chamber, 150l, CLIMATS
- Combined Vibration System MTS 840
- Sunfastness examination equipment, Wheatherability Tester Xenotest 450 C804
- Wheatherability tester QUV
- Compression Tester INTSRON
- Electrostatic examination equipment, CEAST - CE-UM-351
- DSC differential scanning calorimetry, SETARAM
- Further approx. 20 pcs

MAIN PROJECTS

2005-2006: REGINS RFID

Type: Interreg IIIC

Aim: To introduce and examine the implementation possibilities of radio frequency identification methods for small and medium-sized enterprises

Tasks performed by the Department: Organizing the RFID-topic workshops for the surrounding small and medium-sized enterprises, examining the utilization and introduction opportunities in the case of national small and medium-sized enterprises

2006-2007: CORELOG (COORDINATED REGIONAL LOGISTICS)

Type: Interreg IIIB

Aim: To examine the logistics effects of governmental and regional measures in the affected member states

Tasks performed by the Department: Examining the national governmental and regional logistics

regulations, measures, organization of workshops, preparing international comparisons

2007: EVALUATION OF DISTRIBUTION PROCESSES

Type: Industrial commission

Aim: To prepare a proposal concerning the increase of efficiency and evaluation of distribution processes

Tasks performed by the Department:

Analysing, modelling of distribution processes, preparing new models, developing a proposal, having greater efficiency

ACHIEVEMENTS

- Borocz, P., Foldesi, P. [2008] – The application of the game theory onto the analysis of the decision theory of logistic packagings, Szechenyi Istvan University, Acta Technica Jaurinensis Series Logistica 2008, Vol. 1. No.2., ISSN: 1789-6932, p.: 259-269.
- Borocz, P., Mojzes, A. [2009] - Comparative analysis for principled function and expense structure of logistic packaging systems, KSI Transactions on Knowledge Society, Bulgaria September 2009, Volume 3, ISSN 1313-4787, p.:52-55.
- Mojzes, Ákos, The significance of systematic approached package design technology, KSI Transactions on Knowledge Society, number volume 4, pages 48-51, ISSN 1313-4787, 2009.
- Pánczél, Zoltán, The Significance of Logistic Package System Design, Acta Technica Jaurinensis, volume 1, number 2, pages 247-258, ISSN 1789-6932, 2008.
- Mojzes, Ákos and Pánczél, Zoltán, Importance of package planning and laboratory testing from the aspect of the logistic stresses, during transportation and warehousing, pages 64-69, Technical

University Kosice, ISBN 80-8073-623-2, 2006.

- Németh, Péter and Földesi, Péter, Performance Measurement by Characterizing Supply Chains, Proceedings of 8th Annual International Symposium on Supply Chain Management, pages 181-189, Toronto, Ontario, Canada, 2010.
- Földesi, Péter, Baricza, Miklós, Kiss, Csaba, Vas, Ottó and Bajor, Péter, The Green Truck Project, Proceedings of the 7th International Conference on Logistics and Sustainable Transport, Celje, Slovenia, 2010.
- Földesi, Péter and Botzheim, János, Modeling of loss aversion in solving fuzzy road transport traveling salesman problem using eugenic bacterial memetic algorithm, Memetic Computing, volume 2, number 4, pages 259-271, ISSN 1865-9284, 2010. [DOI]
- And further approx. 50 articles

MAIN COLLABORATING PARTNERS

COLLABORATION WITH ACADEMIC PARTNERS

- University of Maribor (Maribor, HR)
- Aristotle University of Thessaloniki (Thessaloniki, GR)
- Technical University College of the Catholic University Leuven (Leuven, BE)
- COBRO - Centralny Ośrodek Badań i Rozwojowy Opakowania (Warszawa, PL)
- IMET – Institut Mechanického Testování (Praha, CZ)
- TSU - Technický skúšobný ústav Piešťany (Piešťany, SK)
- ÖIV - Österreichische Institut für Verpackung (Wien, AT)

COLLABORATION WITH COMPANIES

- IBM Magyarorsági Kft. (Budapest, HU)
- General Motors Powertrain - Magyarország Kft. (Szentgotthard, HU),
- AUDI Hungaria Motor Kft. (Győr, HU)

- SCA Packaging Hungary Kft. (Győr, HU)
- ALCOA-Köfém Kft. (Székesfehérvár, HU)
- Delphi Hungary Kft. (Szombathely, HU)
- ELECTROLUX Lehel Kft. (Jászberény, HU)
- EPCOS Kft. (Szombathely, HU)
- FLEXTRONICS INTERNATIONAL Kft. (Sárvár, Zalaegerszeg, HU)
- General Electric Hungary Zrt.
- Nefab Packaging Hungary Kft. (Fót, HU)
- Nokia Komárom Kft. (Komárom, HU)
- NCR Magyarország Kft. (Budapest, HU)

EXPECTATIONS

REQUIREMENTS

- Standardization: new tests come to a European standard.
- Further research: cooperation for further research, e.g. funded by the EC or local authorities.
- Promotion of packaging tests in other institutes/company.

OFFERS

- Standardization: new tests come to a European standard.
- Further research: cooperation for further research, eg funded by the EC or local authorities.
- Promotion of packaging tests in other institutes/company.



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