



Managing Board Meeting Scientific Advisory Board Meeting

Brno University of Technology
Technicka 12, Brno, Room SE6.121

The 28th of January, 2016
Time: 10:00 to 12:00

Managing Board

Prof. Jarmila **Dědková**, the dean, FEEC BUT

Prof. Lubomír **Grmela**, vice-rector, BUT

Otto **Vodvářka**, Rohde & Schwarz

Leoš **Dvořák**, Honeywell

Prof. Markus **Rupp**, Vienna Univ. Technol.

Prof. Zbyněk **Škvor**, Czech Technical Univ.

Scientific Advisory Board

Prof. Erich **Leitgeb**, Graz Univ. Technol.

Prof. Hans **Hartnagel**, Darmstadt Univ. Technol.

Prof. Juraj **Bartolić**, Univ. of Zagreb

Prof. Vladimír **Aubrecht**, CVVOZE Centre

Prof. Petr **Stehlík**, NETME Centre

Prof. Petr **Štěpánek**, ADMAS Centre

Roman **Tkadlec**, CommScope

Ladislav **Pospíchal**, MeGA

Karol **Molnár**, Honeywell



Quantitative Evaluation

Researchers: headcount + FTE

	Program	Employees	FTE
1	Microwave Technologies	32	18,5
2	Wireless Technologies	41	28,2
3	Converged Systems	40	24,8
4	Multimedia Systems	20	10,2
5	Sensor Systems	68	27,5
-	Management	8	2,8
-	Support	13	8,9
Total		222	120,9

Sampling date: 12/2015

Researchers: categories

Position	FTE
Ph.D. student	23.7
Junior scientist	51.8
Senior scientist	33.7
Total	109.2

Sampling date: 12/2015

Management

Position	Empl.	FTE
Director	1	0.50
Vice-director	2	1.00
Department head	5	1.25
Total	8	2.75

Sampling date: 12/2015

Master-degree graduates

	Program	12/2014	plan 2015	12/2015
1	Microwave Technologies	13	11	13
2	Wireless Technologies	24	7	22
3	Converged Systems	37	27	46
4	Multimedia Systems	23	3	14
5	Sensor Systems	38	22	2
Total		135	70	97

PhD-degree graduates

	Program	12/2014	plan 2015	12/2015
1	Microwave Technologies	6	2	2
2	Wireless Technologies	2	1	0
3	Converged Systems	2	5	2
4	Multimedia Systems	8	1	5
5	Sensor Systems	5	4	5
Total		16	13	14

Students involved

	Program	12/2014	plan 2015	12/2015
1	Microwave Technologies	26	30	35
2	Wireless Technologies	12	21	41
3	Converged Systems	83	77	88
4	Multimedia Systems	37	10	15
5	Sensor Systems	43	62	34
Total		201	200	213

Selected Publications

- P1** ŠTUMPF, M. Analysis of dispersive power-ground structures using the time-domain contour integral method. *IEEE Transactions on Electromagnetic Compatibility*, vol. 57, no. 2, pp. 224-231, April 2015, ISSN: 0018-9375. **IF: 1.297**
- P2** GÖTTHANS, T.; PETRŽELA, J. New class of chaotic systems with circular equilibrium. *Nonlinear Dynamics*, 2015, vol. 2015, no. 04, p. 1-7. ISSN: 0924-090X. **IF: 2.849**
- P3** MALINA, L.; HAJNÝ, J.; DZURENDA, P.; ZEMAN, V. Privacy- preserving security solution for cloud services. *Journal of Applied Research and Technology*, 2015, vol. 13, no. 1, p. 20-31. ISSN: 1665- 6423. **IF: 1.216**
- P4** DUTTA, M. K., SINGH, A., BURGET, R. Digital ownership tags based on biometric features of iris and fingerprint for content protection and ownership of digital images and audio signals. *Multimedia Tools and Applications*, 2015, p. 1-27. **IF: 1.346**
- P5** MACKŮ, R.; KOKTAVÝ, P.; SEDLÁK, P.; SMULKO, J.; TRAWKA, M. Analytical fluctuation enhanced sensing by resistive gas sensors. *Sensors and Actuators B: Chemical*, 2015, vol. 2015, no. 213, p. 390-396. ISSN: 0925- 4005. **IF: 4.097**

Publications

	Program	12/2014	plan 2015	12/2015
1	Microwave Technologies	25	20	21
2	Wireless Technologies	48	14	56
3	Converged Systems	24	51	39
4	Multimedia Systems	18	6	21
5	Sensor Systems	17	41	39
Total		132	132	176

Prototypes, software

	Program	12/2014	plan 2015	12/2015
1	Microwave Technologies	3	5	9
2	Wireless Technologies	6	4	16
3	Converged Systems	20	13	10
4	Multimedia Systems	5	2	7
5	Sensor Systems	18	10	8
Total		52	34	50

Selected prototypes, software

P1 Automatic Doppler Shift compensation in extraterrestrial microwave communication; Kasal, Zaplata

P2 Modular system for recording and evaluating characteristic of explosion-generated optical signals; patent; Marsalek et al.

P3 Smart metering data management platform; Masek, Stusek, Kovac, Hosek

P4 Dysarthric speech visualization tool (SW); Galaz, Mekyska, Mzourek, Smekal

P5 Gas sensor for selective detection of NH_3 , iC_4H_{10} and CH_4 ; Gablech, Sedivy

Research contracts

	Program	12/2014	plan 2015	12/2015
1	Microwave Technologies	3 183	1 247	2 983
2	Wireless Technologies	934	856	1 339
3	Converged Systems	1 454	3 138	1 882
4	Multimedia Systems	132	395	174
5	Sensor Systems	1 599	2 554	2 124
Total		7 302	8 190	8 502

In thousands of CZK; 1 EUR $\approx$ 28 CZK

Selected research contracts

P1 Volkswagen; In-car time-domain electromagnetic fields; Raida

P2 CISC; Design of HW and SW parts for an USRP N210 based RFID Test System; Povalac

P3 Telekom Austria; Smart Multi-Purpose Home Gateway - proof of concept demonstrator; Hosek

P4 Honeywell; Analysis of Gas Regulators; Schimmel

P5 Honeywell; Development of software for electronic equipment; R. Vrba

Grant projects (Czech)

	Program	12/2014	plan 2015	12/2015
1	Microwave Technologies	8 022	4 177	9 440
2	Wireless Technologies	11 496	2 869	14 612
3	Converged Systems	13 472	10 507	11 747
4	Multimedia Systems	3 153	1 322	4 628
5	Sensor Systems	10 608	8 551	15 316
Total		46 751	27 425	55 743

In thousands of CZK; 1 EUR $\approx$ 28 CZK

Grant projects (EU)

	Program	12/2014	plan 2015	12/2015
1	Microwave Technologies	609	702	706
2	Wireless Technologies	2 152	482	2 882
3	Converged Systems	-	1 765	193
4	Multimedia Systems	-	222	196
5	Sensor Systems	165	1 437	370
Total		2 926	4 608	4 347

In thousands of CZK; 1 EUR $\approx$ 28 CZK

Grant projects

P1 GACR; Millimeter-wave electromagnetic structures for biomedical research; Raida

P2 GACR; Research of wireless channels for communication and positioning in vehicles; Prokes

P3 TACR; Tool for collecting, analyzing and visualizing statistical data about product usage in order to increase development efficiency; Vrba

P4 TACR; Intelligent telematics information system of public transport; Smekal

P5 GACR; New nanostructured sensing system for infrared detection (NanoIR); Hubalek

Summary (2015)

	Indicator	Plan	12/2015
1	Publications	132	176
2	Prototypes, SW	34	50
3	Research contracts	8.19 MCZK	8.50 MCZK
4	Grant projects	27.43 MCZK	55.2 MCZK
5	Master-degree graduates	71	97
6	PhD-degree graduates	12	14
7	Joint projects	6	21
8	Students involved	200	213
9	Full-time equivalent	85	120

Long term summary

	Indicator	Plan (TA)	12/2015
1	Publications	294	436
2	Patents	1	3
3	Prototypes, SW	78	151
4	Research contracts	15.91 MCZK	24.27 MCZK
5	Grant projects	----- MCZK	162.7 MCZK
6	Master-degree graduates	181	278
7	PhD-degree graduates	36	50
8	Joint projects	12	21
9	Students involved	350	519
10	Full-time equivalent	61	120

Contacts

Director:

Dr. Martin Slanina; slaninam@feec.vutbr.cz

Vice-directors:

Prof. Zbynek Raida; raida@feec.vutbr.cz

Dr. Jiří Dřínovský; drino@feec.vutbr.cz



Research Targets

SIX departments (1)

Prof. Miroslav **Kasal**
Microwave Technologies

Research targets:

- Design methodology for passive and active structures operating up to 110 GHz
- Comparison of numerical and experimental studies of biological effects of EM fields

Presentation of Prof. Kasal

SIX departments (2)

Prof. Stanislav **Hanus**
Wireless Technologies

Research targets:

- Suppression of atmospheric effects in free-space optical communication
- Methods of dynamic spectrum allocation in SW and cognitive radio; multi-carrier UWB comm.

Presentation of Prof. Hanus

SIX departments (3)

Dr. Jiří **Mišurec**

Converged Systems

Research targets:

- Low-power, high-speed UWB circuits for advanced communication
- Control networks protocols for advanced communication; commercial exploitation

Presentation of Dr. Mišurec

SIX departments (4)

Prof. Zdeněk **Smékal**
Multimedia Systems

Research targets:

- Algorithms for interactive gestural interface (wo)man-to-machine
- Signal- and image-processing algorithms for advanced communication systems

Presentation of Prof. Smékal

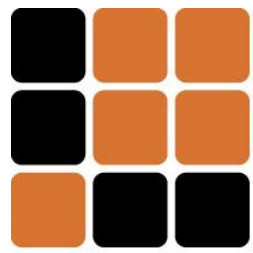
SIX departments (5)

Prof. Radimír **Vrba**
Sensor Systems

Research targets:

- Research of sensors with increased resolution for security and safety applications

Presentation of Prof. Vrba



SIX
research centre

sensor, information and communication systems

Faculty of Electrical Engineering
and Communication

Brno University of Technology
Technická 12, CZ-61600 Brno, Czechia

<http://www.six.feec.vutbr.cz>

Department of Microwave Technologies

Prof. Miroslav Kasal

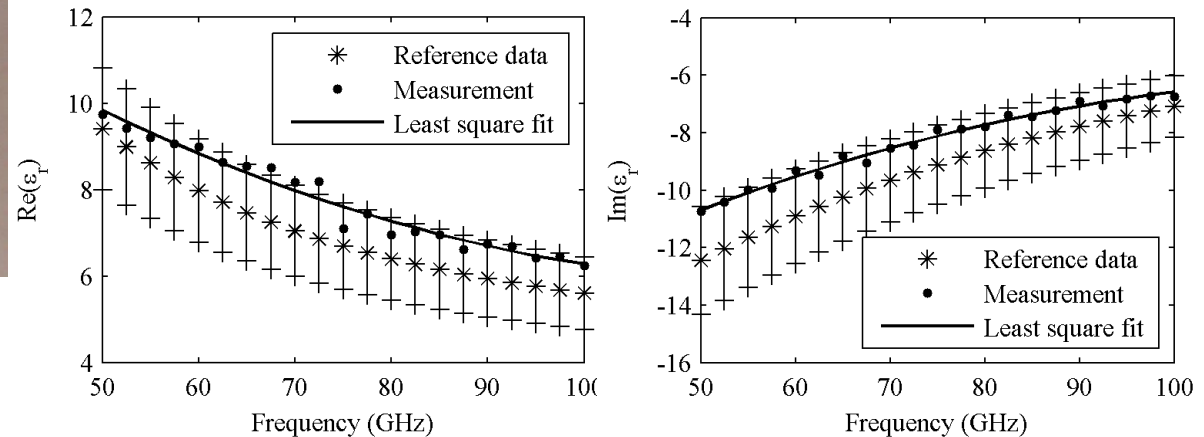
kasal@feec.vutbr.cz

Skin-equivalent phantom for V and W bands



Fabricated
sample

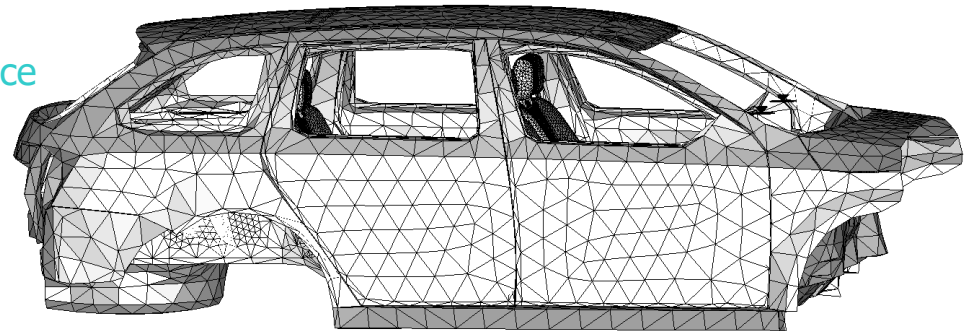
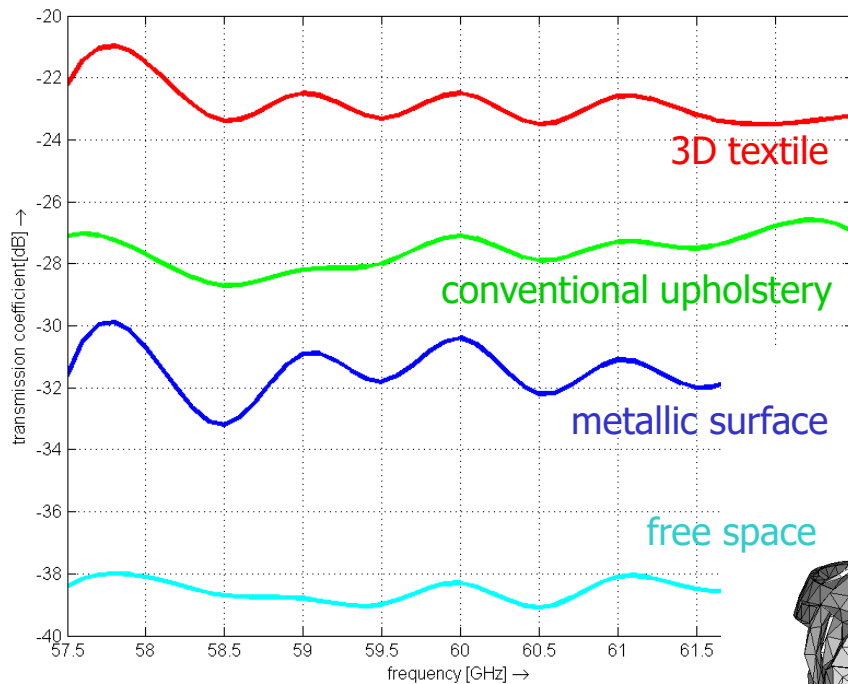
Complex relative permittivity



LACIK, J., HEBELKA, V., VELIM, J., RAIDA, Z., PUSKELY, J. Wideband skin-equivalent phantom for V and W band, *IEEE Antennas and Wireless Propagation Letters*, vol. PP, no. 99, DOI: 10.1109/LAWP.2015.2438441.

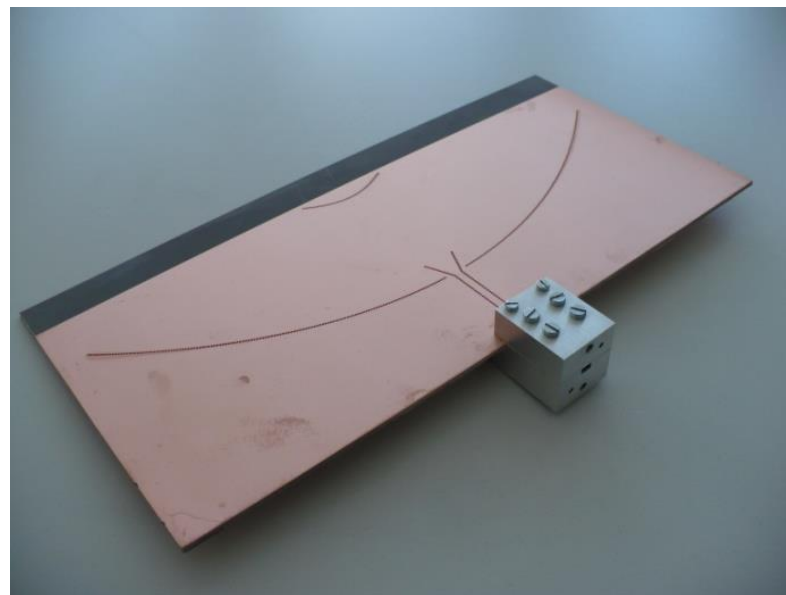
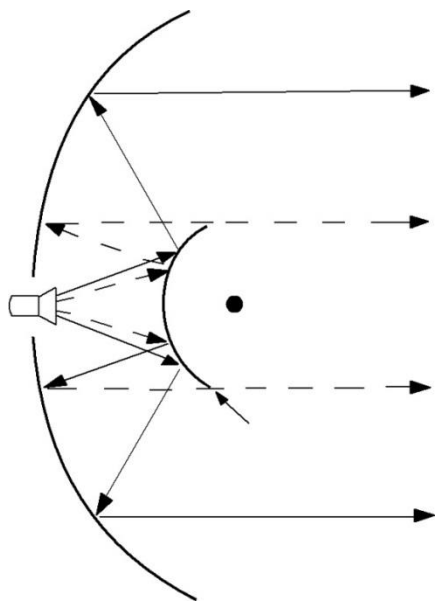
In-car wireless power transfer

Wave propagation along surface of car body → wireless transmission line



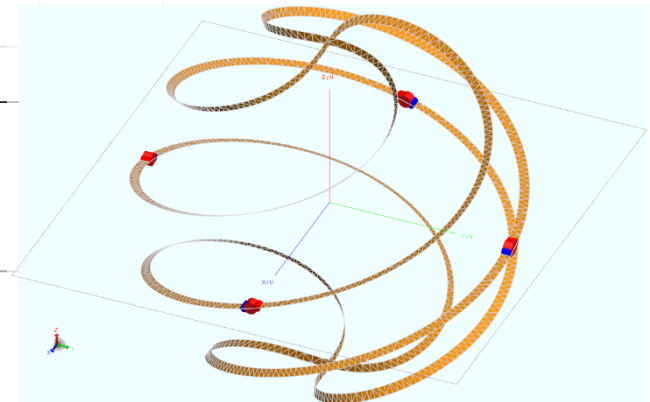
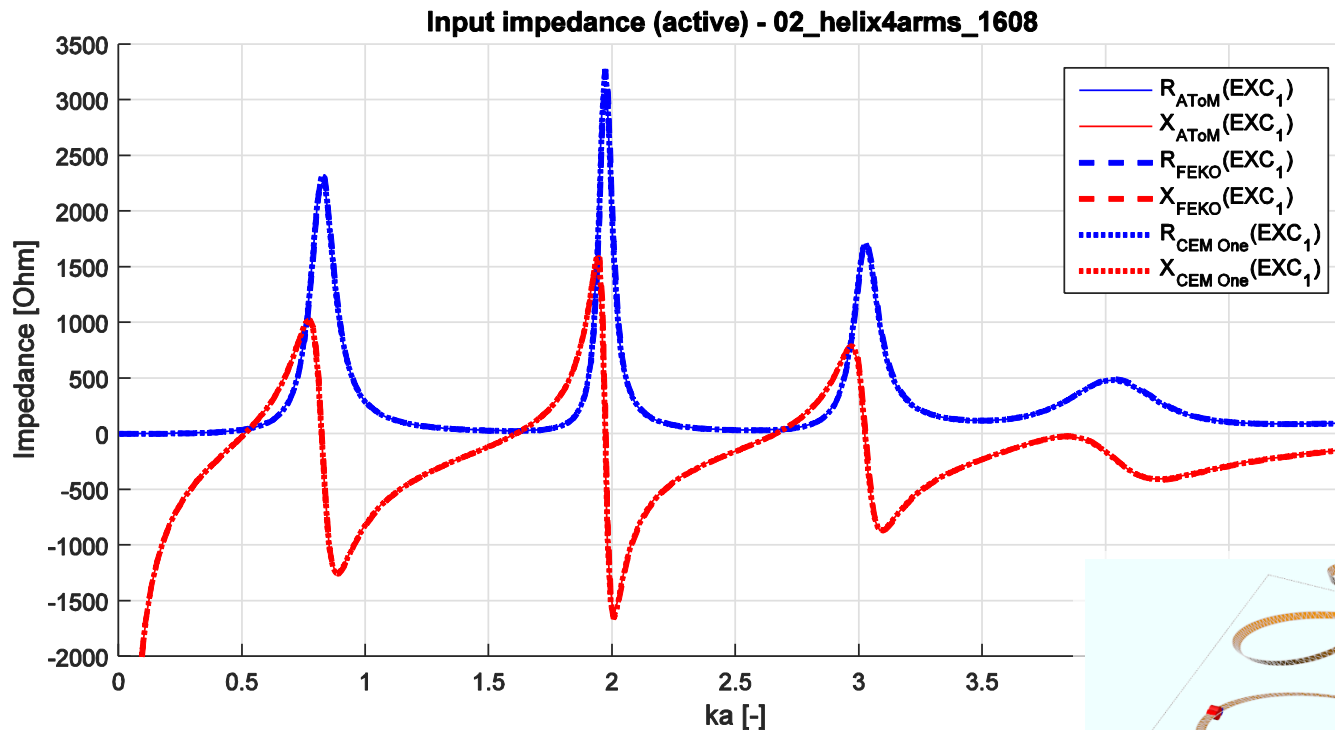
Low-profile high-gain Cassegrain antenna

- Integrated to a dielectric substrate using SIW technology.
- Suitable for a mm-wave point-to-point communication.
- Applied for Czech patent



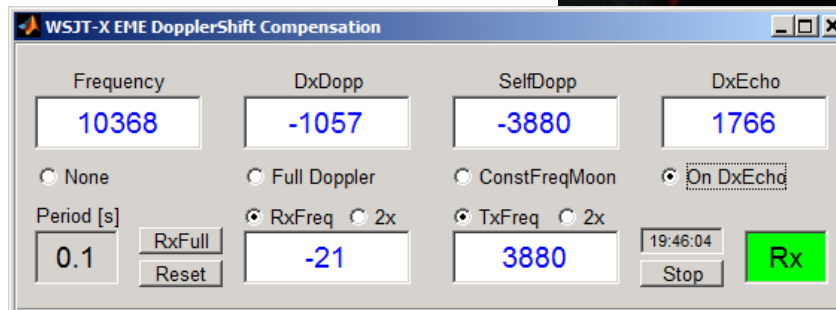
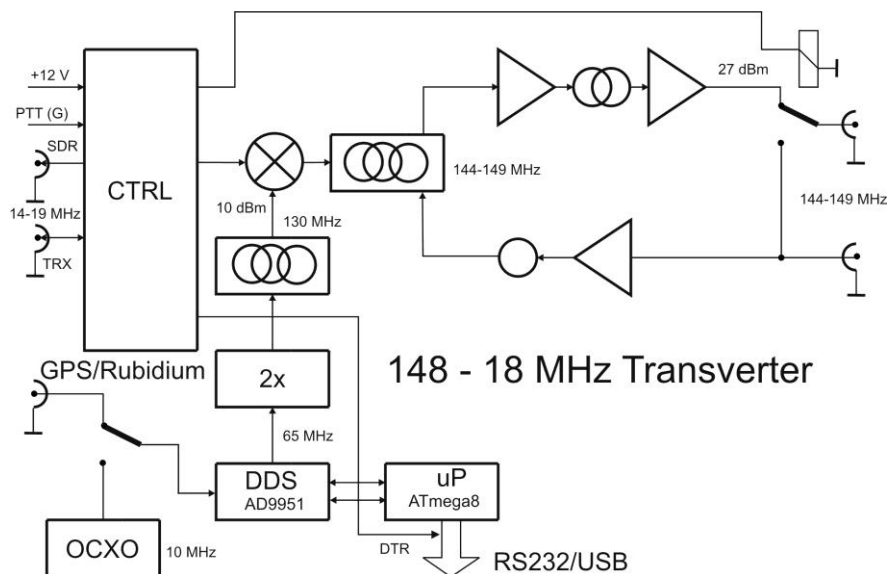
Tools for synthesis of sensors and antennas

- Project: [TACR TA04010457 \[CZK 1 587 900.-\]](#)
- Partners: [CTU in Prague](#), [MECAS ESI](#)



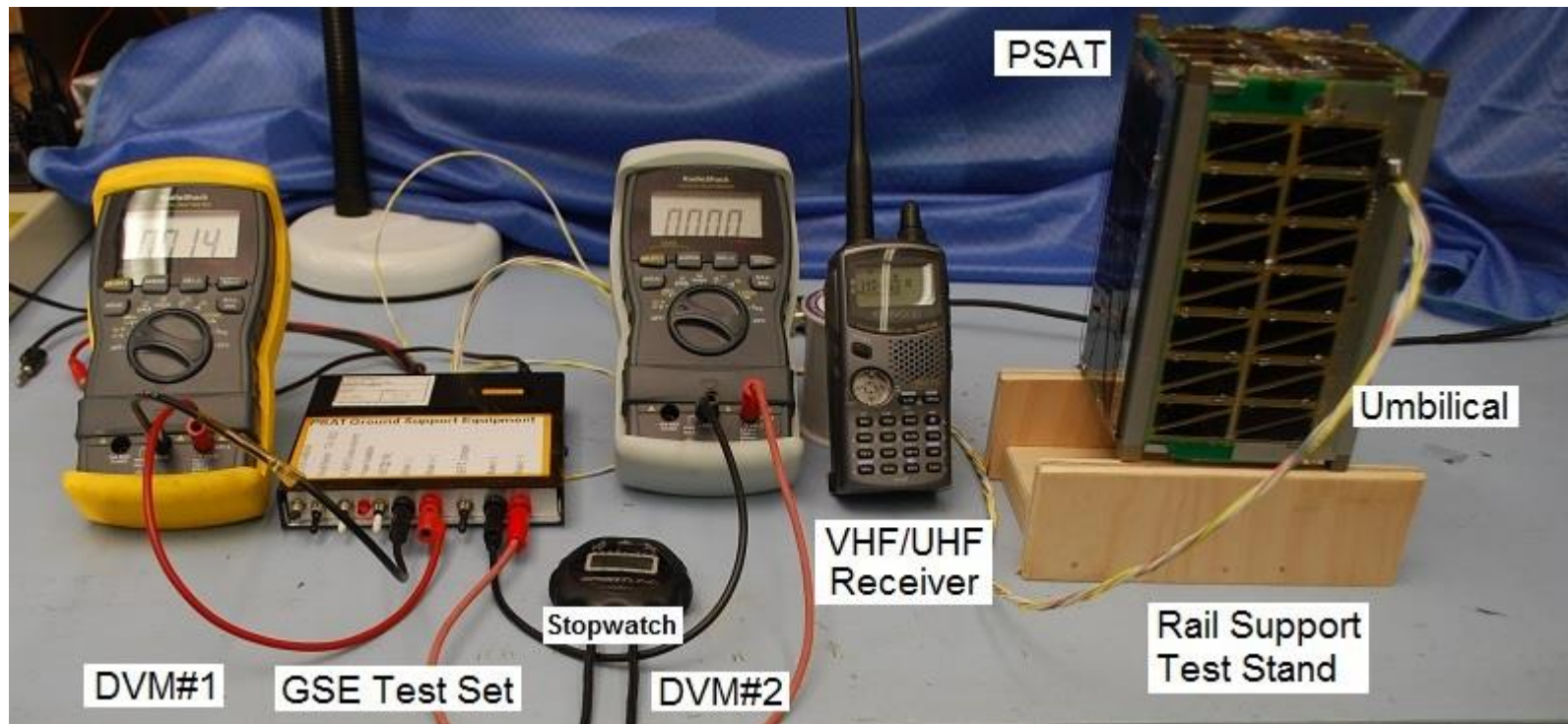
Automatic Doppler Shift Compensation ...

... in extraterrestrial communication



Narrowband transponders for PSat and BricSat

- Satellites launched in May 2015
- Health parameters of experiments monitored and evaluated

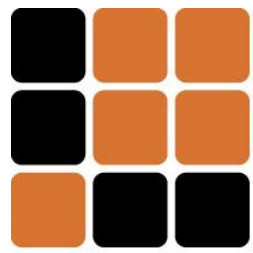


Prof. Miroslav Kasal



kasal@feec.vutbr.cz

<http://www.six.feec.vutbr.cz>



SIX
research centre

sensor, information and communication systems

Faculty of Electrical Engineering
and Communication

Brno University of Technology
Technicka 12, CZ-61600 Brno, Czechia

<http://www.six.feec.vutbr.cz>

Department of Wireless Technologies

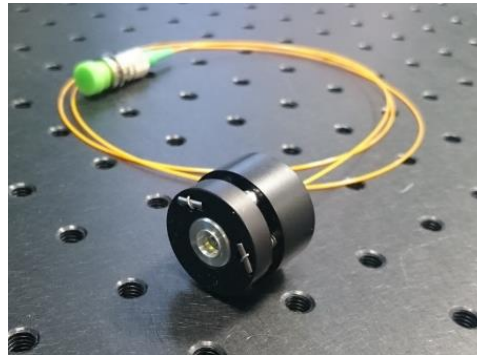
Prof. Ales Prokes
prokes@feec.vutbr.cz

28.01.2016

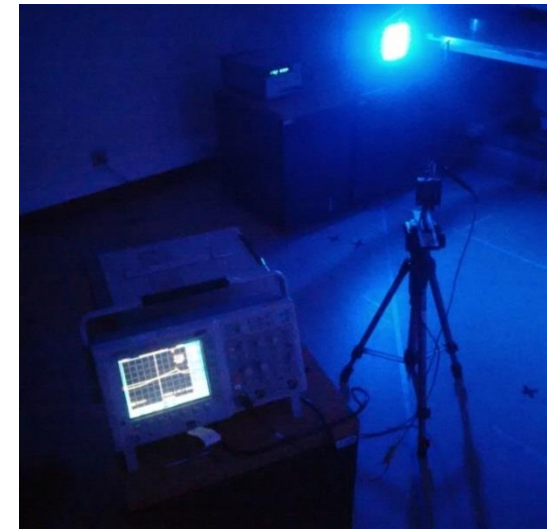
1. Optical Wireless Communications (Prof. Wilfert)

Current topics

- Free-Space Optical (FSO) Link. Project: **MPO FR-TI4/148 Hybrid Wireless Technology for Municipal Networks**



- Optical sources for FSO Links, optimal optical beam shapes, visible light communications. Project: **COST IC1101 (LD12067) Optical atmospheric propagation modelling**

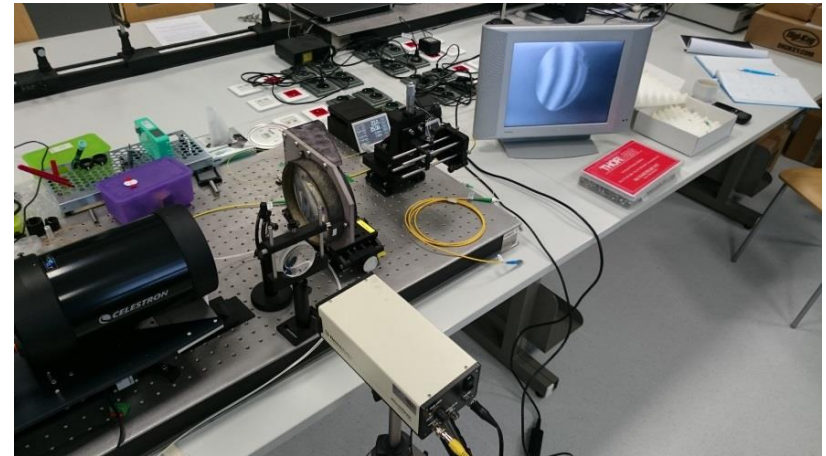


1. Optical Wireless Communications (Prof. Wilfert)

- BARCÍK, P.; WILFERT, O.; LEITGEB, E.; HUDCOVÁ, L. Optimal distribution of the optical intensity within a laser beam for optical wireless communications. ***IET Optoelectronics***, 2015, vol. 9, No. 5, p. 263-268. ISSN: 1751- 8768.
- POLIAK, J., BARCIK, P., WILFERT, O. Chapter 7. *Diffraction Effects and Optical Beam Shaping in FSO Terminals*. ***Optical Wireless Communications - An Emerging Technology*** (Book chapter)
- DOBESCH, A., Chapter 5. *Optical Digital to Analog Conversion*. ***Book on Visible Light Communications: Theory and applications*** (Book chapter)

Visions:

- Concept of fully photonic wireless link for transmission of synchronization signals – basic and applied research
- Visible light communications – applied research
- Visualization of atmospheric turbulence – basic research



2. Mobile Communications (Prof. Sigmund)

Speech processing - current topic:

- Psychological stress detection

Future work:

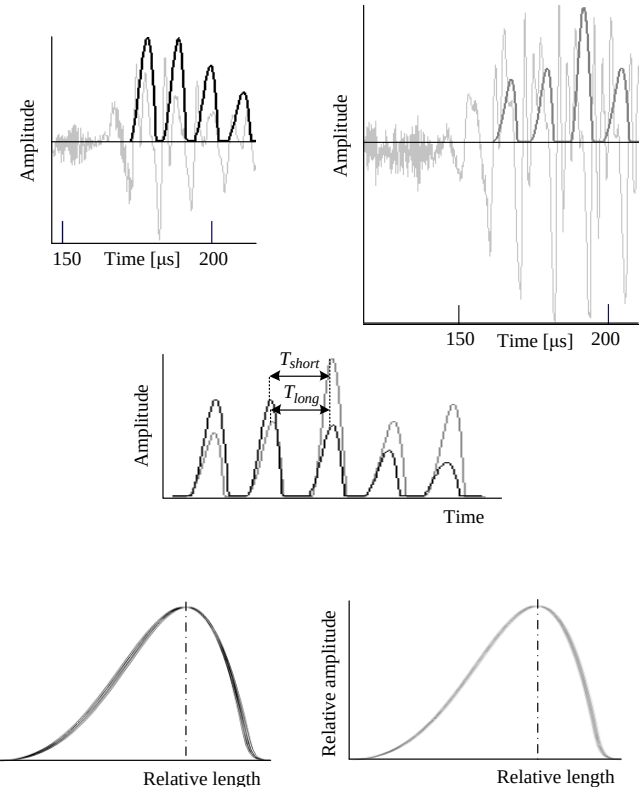
- Stress detection in time domain
- Acoustical detection of gunshots

Project Proposal H2020:

Entity for Labour and Facilities in a House IT environment

- STANEK, M., SIGMUND, M. Psychological Stress Detection in Speech Using Return-To-Opening Phase Ratios in Glottis, *Elektronika ir Elektrotechnika*, 2015, vol. 21, no. 5, p. 59-63.

- STANEK, M., SIGMUND, M., Finding the most uniform changes in vowel polygon caused by psychological stress. *Radioengineering*, 2015, vol. 24, no. 2, pp. 604-609.

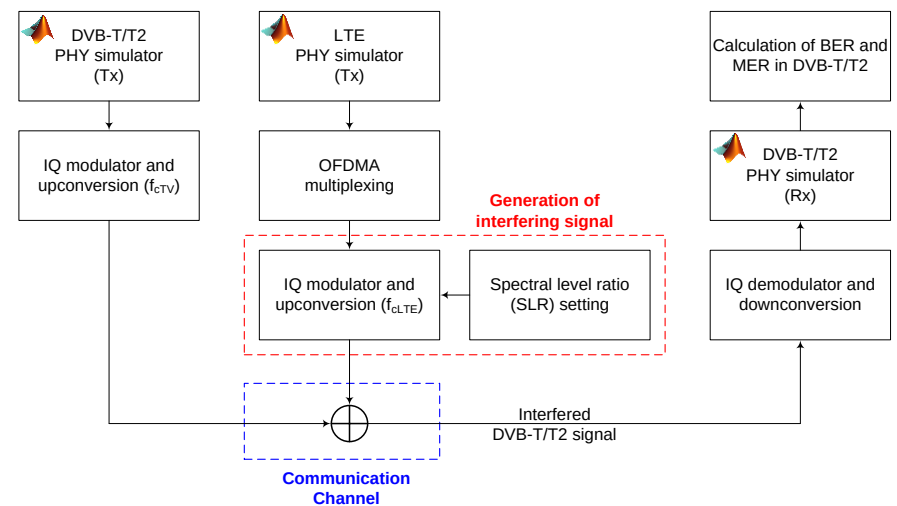
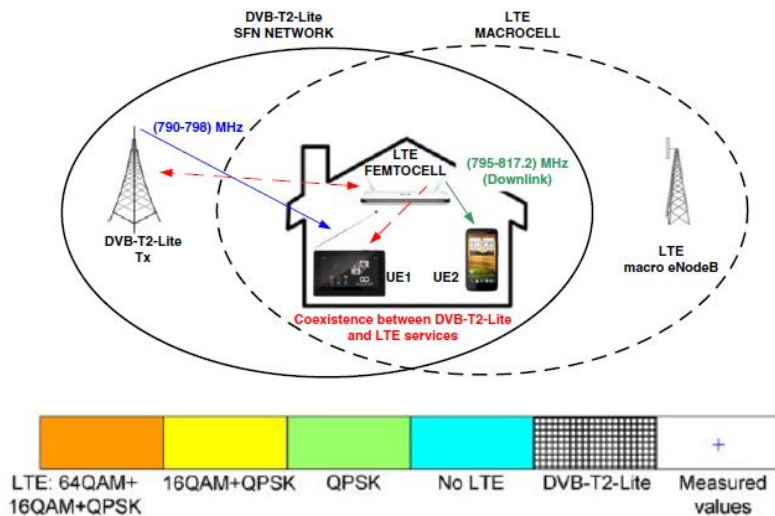


2. Mobile Communications (Dr. Polák)

3. Television Technology (Assoc. Prof. Kratochvíl)

Current topics

- Outdoor coexistence of LTE and DVB-T/T2
- Indoor coexistence of LTE and DVB-T2-Lite

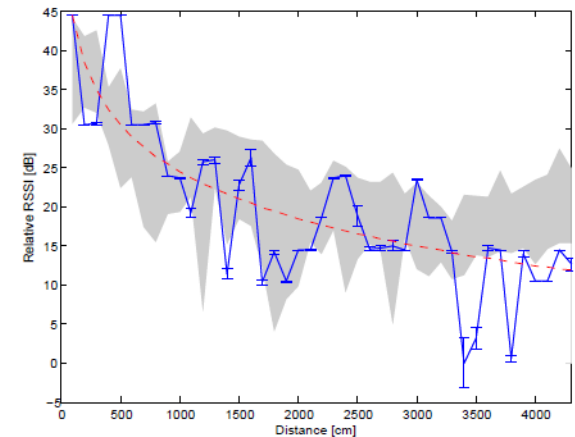
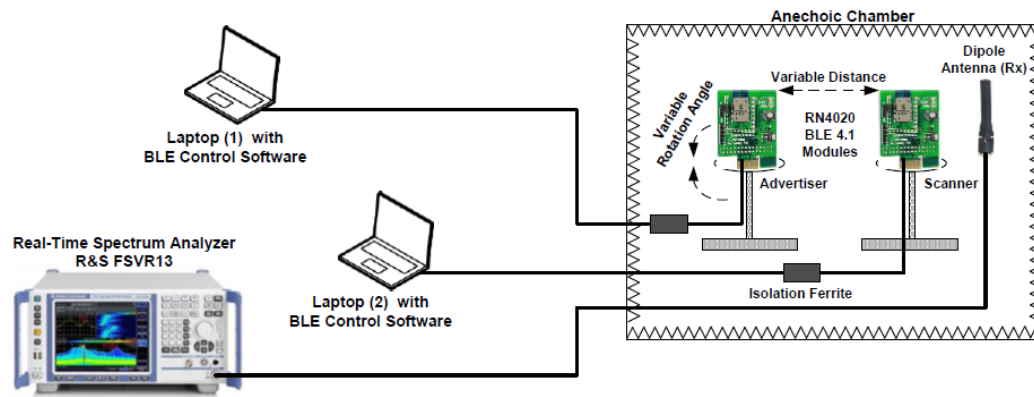


POLÁK, L.; KLOZAR, L.; KALLER, O.; ŠEBESTA, J.; SLANINA, M.; KRATOCHVÍL, T. Study of Coexistence between Indoor LTE Femtocell and Outdoor-to-Indoor DVB-T2-Lite Reception in a Shared Frequency Band. *EURASIP Journal on Wireless Communications and Networking*, 2015.

2. Mobile Communications (Dr. Polák)

3. Television Technology (Assoc. prof. Kratochvíl)

- Bluetooth and RSSI for Smart Indoor Positioning



Future work:

- Co-existence of DVB-T/T2, LTE, BLE, ZigBee, WLAN** (WP3: Advanced Co-existence algorithms, methodology, measurements)
- Study and modelling of the key components for the future personal monitoring systems

Support:

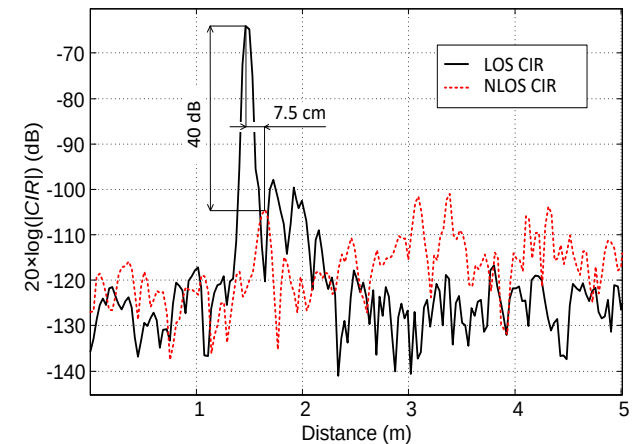
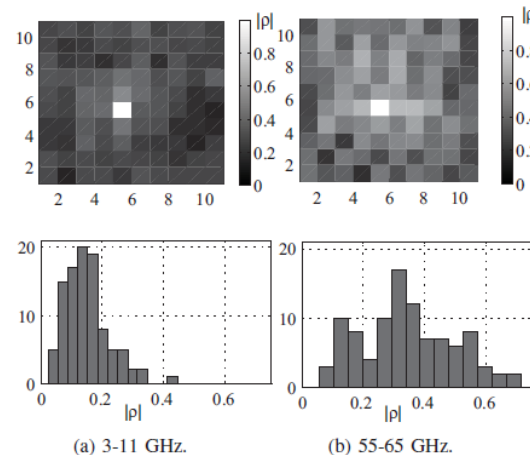
- Coexistence of RF transmissions in the future**
CORTIF CA116 - CATRENE EU project



4. Radiocommunication Systems (Prof. Prokeš)

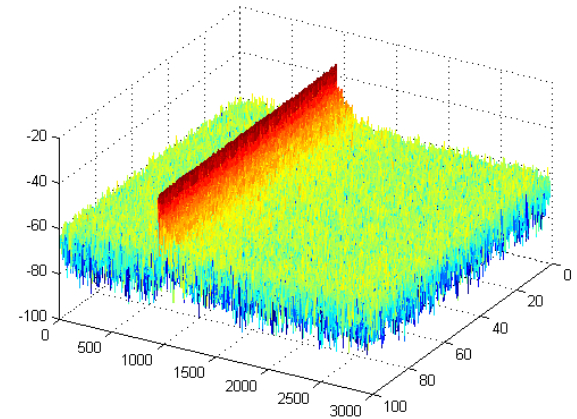
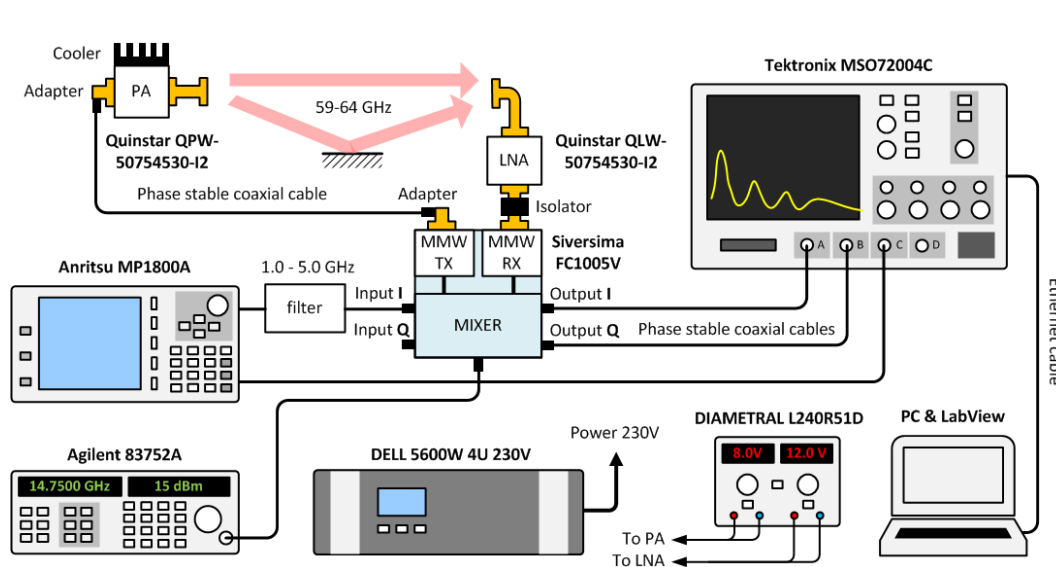
Current topics

- **Intra-vehicular radio channel modelling** of the ultra-wide frequency bands (3-11 GHz and the 55-65 GHz) in frequency and time domain
 - ✓ **Analysis of intra-vehicular channels** in terms of large- and small-scale signal fading
 - ✓ Evaluation of the intra-car **spatial stationarity** via the PDP collinearity
- Analysis and comparison of the **ranging accuracy** in the 3 to 11 GHz ultra-wide band and the 56 to 64 GHz millimeter wave (MMW) band



4. Radiocommunication Systems (Prof. Prokeš)

- Intra-vehicle **non-stationary** channel analysis and localization



- BLUMENSTEIN, J., PROKEŠ, A., MIKULÁŠEK, T., MARŠÁLEK, R., ZEMEN, T., MECKLENBRÄUKER, C. Measurements of Ultra Wide Band In-vehicle channel - statistical description and TOA positioning feasibility study. *EURASIP Journal on Wireless Communications and Networking*, 2015, roč. 2015, no. 1, p. 1-10.

4. Radiocommunication Systems (prof. Prokeš)

- KUKOLEV, P., CHANDRA, A., MIKULÁŠEK, T., PROKEŠ, A., ZEMEN, T., MECKLENBRÄUKER, C. In-vehicle channel sounding in the 5.8 - GHz band. *EURASIP Journal on Wireless Communications and Networking*, vol. 2015, no. 1, p. 1-9, 2015.
- CHANDRA, A., BLUMENSTEIN, J., MIKULÁŠEK, T., VYCHODIL, J., MARŠÁLEK, R., PROKEŠ, A., ZEMEN, T., MECKLENBRÄUKER, C. Serial subtractive deconvolution algorithms for time-domain ultra-wide band in-vehicle channel sounding. *IET Intelligent Transport Systems*. vol. 9, no. 9, p. 870 - 880, 2015.

Plan:

- **Analysis of time variant intra-vehicular channel** in time domain
- **Measurement and analysis of intra-vehicular channel in infra-red domain**

Support:

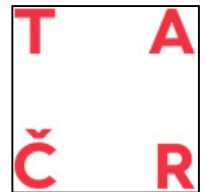
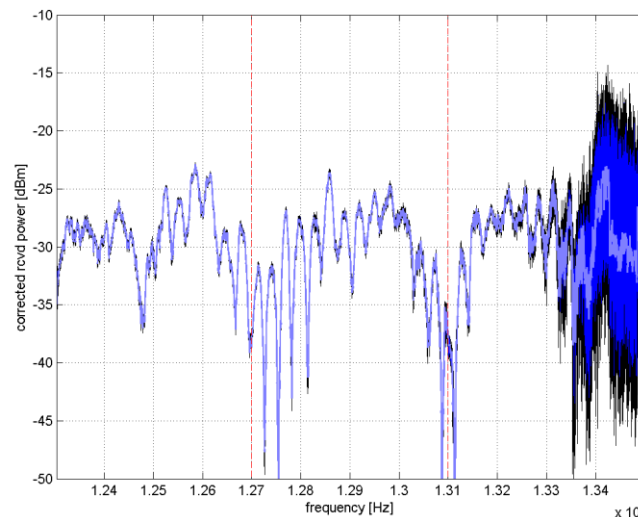
- **Research into wireless channels for intra-vehicle communication and positioning** ([GACR](#), GA 13-38735S)
- **Localization using UWB wireless systems: From algorithms to hardware implementation** ([SoMoPro-II-2012-IG](#))



4. Radiocommunication Systems (Dr. Povalač)

Current topics

- Research of smart transmission networks
- Developed channel sounders for 1.3GHz and 5GHz bands
- Channel frequency response measurement with large bandwidth chirps



Support:

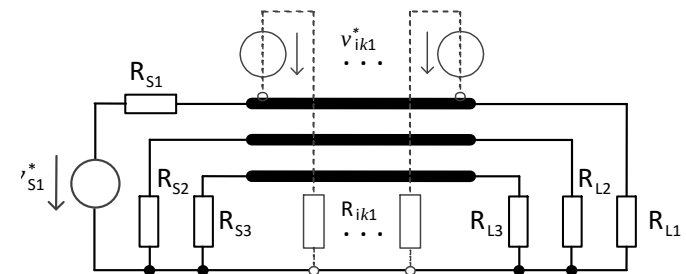
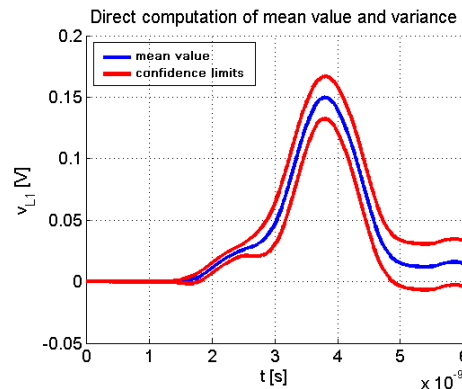
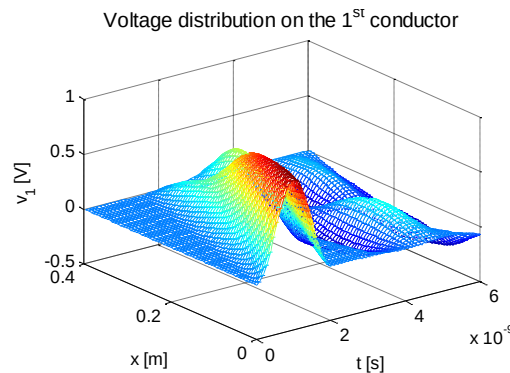
- Radio for Smart Transmission Networks (**TACR** - TA04011571)



5. Analog and Digital Systems (Prof. Brančík)

Current topic: Research of signal integrity at high-speed interconnects

Support: GACR project GA15-18288S



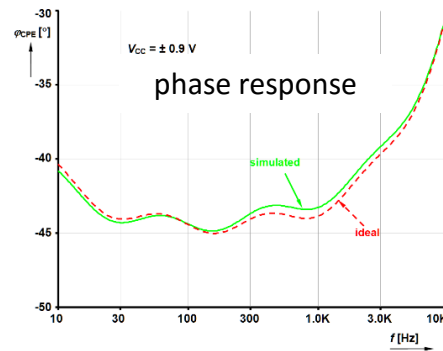
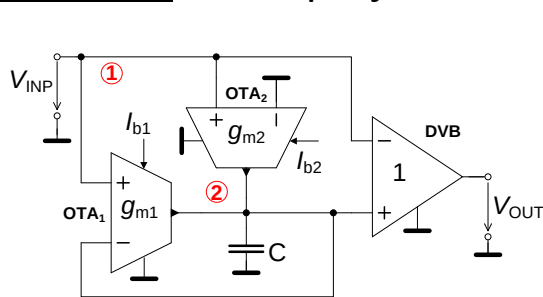
- BRANČÍK, L.; KOLÁŘOVÁ, E. Simulation of Multiconductor Transmission Lines with Random Parameters via Stochastic Differential Equations Approach. ***SIMULATION: Transactions of the Society for Modeling and Simulation International***. 12 pages, submitted: Oct. 23, 2015, first round review: Jan. 3, 2016, minor revision request (IF(2014/15)=0,818)

Future work: Utilization of partial SDEs and fractional-order DEs for the solution of signal integrity issues, nonlinear transmission lines simulation

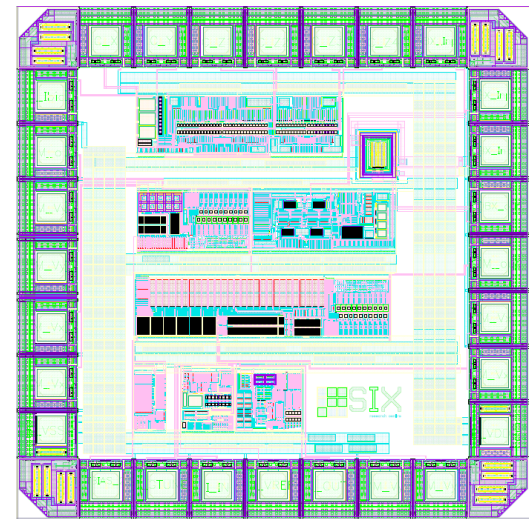
5. Analog and Digital Systems (Dr. Sotner)

Current topic: Research for electronically adjustable advanced active elements for circuit synthesis

Support: GACR project GP14-24186P



Cells prepared for fabrication in I3T25 (0.35 μ m) ONsemiconductor process (GP14-24186P)



- ŠOTNER, R.; JEŘÁBEK, J.; HERENCŠÁR, N.; PETRŽELA, J.; DOSTÁL, T.; VRBA, K. First- order adjustable transfer sections for synthesis suitable for special purposes in constant phase block approximation. *AEU - International Journal of Electronics and Communications*, 2015, vol. 69, no. 9, pp. 1334-1345.

Future plans:

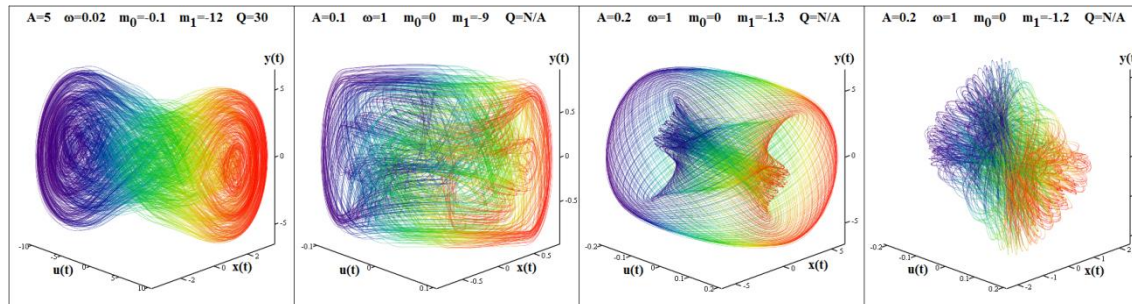
- Applications of mixed-mode active elements in CMOS technology
- Modulators based on multi-phase oscillators
- Synthesis of high-order immittance emulators (superinductors,...)

5. Analog and Digital Systems (Assoc. Prof. Petrzela)

Current work: Chaotic behavior of electronics systems (mathematical modeling of RF systems, algorithm for dynamic flow quantification).

Visions: Chaos localization in RF building blocks (mixers, amplifiers, oscillators)

Support: **GACR - GA15-22712S**, Chaotic tangles in subsystems of radiofrequency channel



- PETRZELA, J. Chaotic behavior of state variable filters with saturation-type integrators, *Electronics Letters*, 2015, vol. 51, no. 15, p. 1159-1161. DOI: 10.1049/el.2015.1563.
- PETRZELA, J. On the existence of chaos in electronically adjustable structures of the state variable filters, *International Journal of Circuit Theory and Applications*, 2016, DOI: 10.1002/cta.2193, accepted.

Summary of Wireless Technologies Group

Outputs

- 21 journal papers with IF (8 with exclusive dedication to INWITE)
- 45 conference proceedings (most of them listed in WoS or Scopus)
- 1 patent

Projects

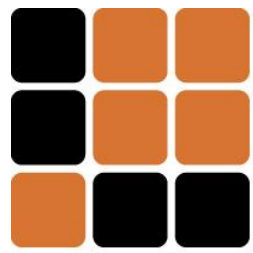
- 2 x EU project (NanoCOPS, CORTIF)
- 4 x GACR
- 4 x TACR
- 4 x COST
- 1 x MPO
- 1 x SoMoPro
- 14 x Contract with company (HS)

Prof. Ales Prokes



prokes@feec.vutbr.cz

<http://www.six.feec.vutbr.cz>



SIX
research centre

sensor, information and communication systems

Faculty of Electrical Engineering
and Communication

Brno University of Technology
Technicka 12, CZ-61600 Brno, Czechia

<http://www.six.feec.vutbr.cz>

Programme of Converged Systems

Assoc. Prof. Jiri Misurec, CSc.
misurec@feec.vutbr.cz

Vision

Devices and protocols development for fast and secure hypermedia data transmission

- data processing
- archiving methods
- novel services

[1] MALINA, L.; HAJNÝ, J.; DZURENDA, P.; ZEMAN, V. Privacy- preserving security solution for cloud services. *J APPL RES TECHNOL*, 2015, vol. 13, no. 1, p. 20-31. ISSN: 1665- 6423.

[2] ATASOYU, M.; METIN, B.; KUNTMAN, H.; HERENCŠÁR, N. New Current-Mode Class 1 Frequency- Agile Filter for Multi Protocol GPS Application. *Elektronika Ir Elektrotechnika*, 2015, vol. 21, no. 5, p. 35-39. ISSN: 1392- 1215.

[3] KOMOSNÝ, D.; VOZŇÁK, M.; KATHIRAVELU, G.; SATHU, H. Estimation of Internet Node Location by Latency Measurements - The Underestimation Problem. *Information Technology and Control*, 2015, vol. 44, no. 3, p. 279-286. ISSN: 1392- 124X.

Applications (1)

HTU-LMSB-14.1 – durable exchange

OPTOKON, a.s. [CZK 18 632 000.-]



- Prototype of VoIP exchange in durable design for army
- Running SIP and IAX2 protocols
- FSX ports added to support analogue phones
- Interconnection to the network via optical fibre

Applications (2)

Localization and classification of events using fiber optic sensor

OPTOKON, a.s. [CZK 17 109 000,-]

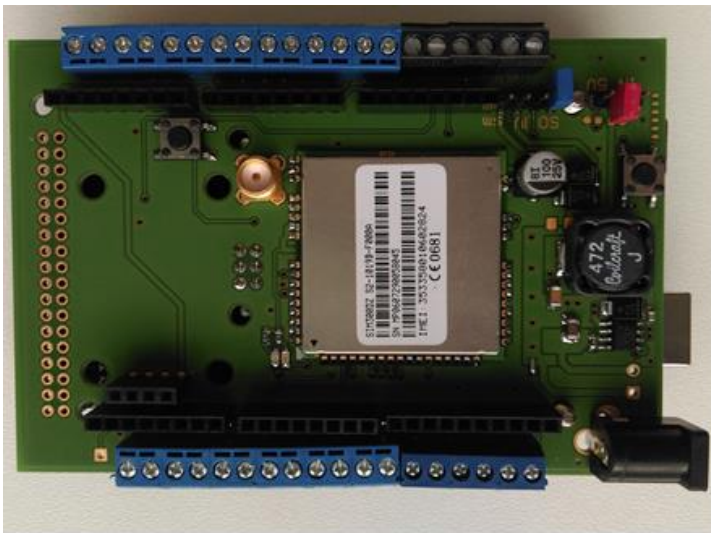


- Distributed sensor for detection, localization and classification of the mechanical vibrations
- Sensing system based on phase sensitive OTDR
- Perimeter up to 100 km
- Localization accuracy below 100 m

Applications (3)

GPS-GSM datalogger

INWITE project [CZK 271 734 000,- Kč]



- Monitoring of and data storage from external and internal sensor nodes
- GPS coordinates known
- Stored data sent to central point via GSM network for further processing

Key equipment

- Cisco Security MARS 25R
 - Monitoring, analysis of threats
- Cisco IPS-4240
 - Protection against attacks and threats
- Spirent TestCenter C1
 - Voice and video quality evaluation
- IXIA XM2-02
 - Load tester of network infrastructure
- 4G LTE-A Huawei



Interdisciplinary visions (1)

- 5G PPP
 - 5G-MTC for Consumers and Professional Communications
 - Service Level Management & Metrics for QoS & QoE
- Security and Cryptography
 - Digital identity protection and privacy protection
 - Lightweight cryptography
 - Sidechannel attacks and protection



Interdisciplinary visions (2)

- Intelligent Community Networks
 - Development of new IoT architecture the “Smart Home and Living” ecosystem
 - Protocol semantic bridging
- Life-saving Battery Management System
 - Energy management in electric vehicles
 - V2G communication systems



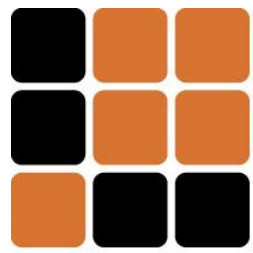
Contact

Assoc. Prof. Jiri Misurec



misurec@feec.vutbr.cz

<http://www.six.feec.vutbr.cz>



SIX
research centre

sensor, information and communication systems

Faculty of Electrical Engineering
and Communication

Brno University of Technology
Technicka 12, CZ-61600 Brno, Czechia

<http://www.six.feec.vutbr.cz>

Department of Multimedia Systems

Prof. Zdenek Smekal
smekal@feec.vutbr.cz

Vision

Signal processing, analysis and understanding of unstructured data from sensors

- In-memory learning → deep learning
- Centralised → distributed

[1] ELFMARKOVA, N.; GAJDOŠ, M.; MRAČKOVÁ, M.; MEKYSKA, J.; MIKL, M.; REKTOROVÁ, I. Impact of Parkinson' s disease and levodopa on resting state functional connectivity related to speech prosody control. PARKINSONISM & RELATED DISORDERS, 2015, roč. 2015, č. 1, s. 1-4. ISSN: 1353- 8020. IF: 3.972

[2] STUMPF, M., VANDENBOSCH, G. A. E. On the limitations of the time-domain impedance boundary condition, IEEE Trans. AP, 2013, preprint.

[3] STUMPF, M. The time-domain contour integral method - an approach to the analysis of double-plane circuits, IEEE Trans. EMC, 2013, preprint.

Applications (1)

De-identification for privacy protection in multimedia content

ICT COST CZK 1 806 000.-]



[4] PŘINOSIL, J.; KŘUPKA, A.; ŘÍHA, K.; DUTTA, M.; SINGH, A. Automatic Hair Color De-identification. In *ICGCIoT - International CConference of Green Computing and Internet of Things 2015*. 2015. ISBN: 978-1-4673-7909- 0.

[5] Dutta, Malay Kishore, Anushikha Singh, and Radim Burget. "Digital ownership tags based on biometric features of iris and fingerprint for content protection and ownership of digital images and audio signals." *Multimedia Tools and Applications* (2015): 1-27.

Applications (2)

Speech, its impairment and cognitive performance in Parkinson's disease

Ministry of Health CZK 7 349 000.-]

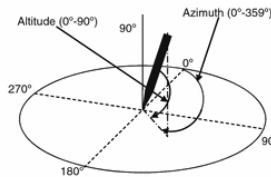


Fig. 2 Azimuth and altitude angles of the pen with respect to the plane of the writing surface



Fig. 1 Intuous WACOM A5 digitizing tablet and pen

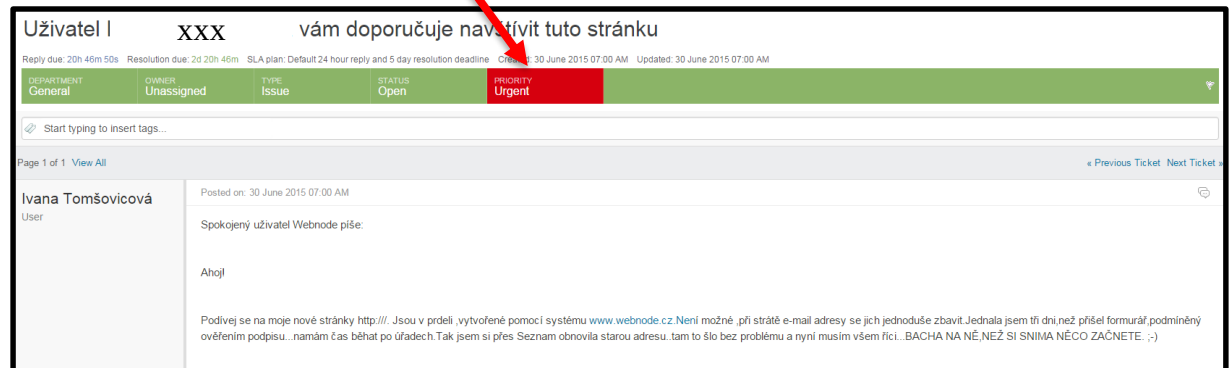
[6] ELFMARKOVA, N.; GAJDOŠ, M.; MRAČKOVÁ, M.; MEKYSKA, J.; MIKL, M.; REKTOROVÁ, I. Impact of Parkinson's disease and levodopa on resting state functional connectivity related to speech prosody control. PARKINSONISM & RELATED DISORDERS, 2015, roč. 2015, č. 1, s. 1-4. ISSN: 1353- 8020. *IF: 3.972*

[7] MEKYSKA, J.; JANOUSOVA, E.; GOMEZ-VILDA, P.; SMEKAL, Z.; REKTOROVA, I.; ELIASOVA, I.; KOSTALOVA, M.; MRACKOVA, M.; ALONSO-HERNANDEZ, J. B.; FAUNDEZ-ZANUY, M.; LOPEZ DE IPINA, K. Robust and complex approach of pathological speech signal analysis. Neurocomputing, 2015, roč. 167, s. 94-111. ISSN: 0925-2312. *IF: 2.083*

Applications (3)

Research and development of technology for
machine emotion detection in unstructured data
Ministry of Industry and Trade [CZK 15 754 000.-]

Automatic recognition and prioritization
of urgent messages in Helpdesk



Uživatel | xxx | vám doporučuje navštívit tuto stránku

Reply due: 20h 45m 50s Resolution due: 2d 20h 45m SLA plan: Default 24 hour reply and 5 day resolution deadline Created: 30 June 2015 07:00 AM Updated: 30 June 2015 07:00 AM

DEPARTMENT	OWNER	TYPE	STATUS	PRIORITY
General	Unassigned	Issue	Open	Urgent

Start typing to insert tags...

Page 1 of 1 View All

« Previous Ticket Next Ticket »

Ivana Tomšovicová
User

Posted on: 30 June 2015 07:00 AM

Spokojený uživatel Webnode píše:

Ahoj!

Podívej se na moje nové stránky <http://www.webnode.cz>. Jsou v prdeli, vytvořené pomocí systému www.webnode.cz. Není možné, při strátě e-mail adresy se jich jednoduše zbavit. Jednala jsem tři dny, než přišel formulář, podmíněný ověřením podpisu... namám čas běhat po úřadech. Tak jsem si přes Seznam obnovila starou adresu... tam to šlo bez problému a nyní musím všem říci... BACHA NA NĚ, NEŽ SI SNÍMA NĚCO ZAČNETE. :-)

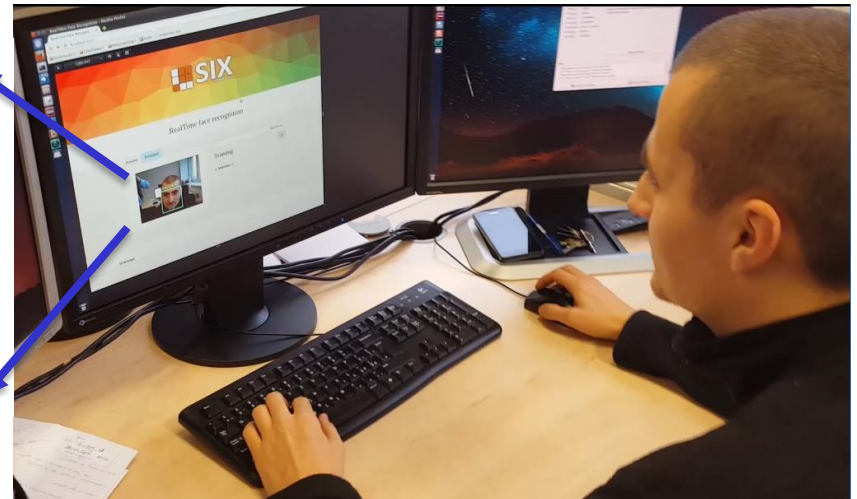


Applications (3)

Intelligent telematics information system of public transportation

TACR CZK 13 816 000.-]

Real-time Face
recognition and
tracking



Applications (4)

Optimal data communication between holographical glasses and computing unit

C[CZK 250 000.-]

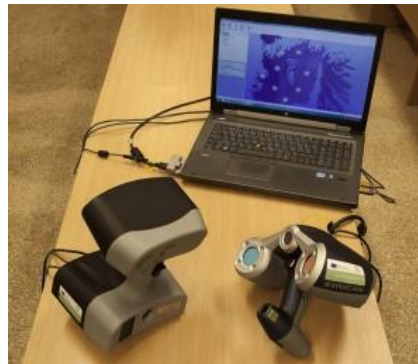


KONICA MINOLTA



Key equipment

- System for the noise sources identification
- 3D scanner set
- GPU accelerated massive parallel computing



Interdisciplinary visions

- University of Innsbruck – preparing H2020 project (population ageing)
- Started discussion with CEITEC – signal processing and cooperation



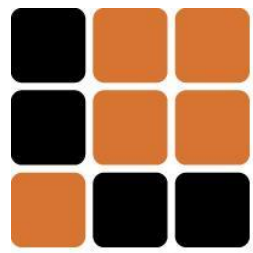
Contact

Prof. Zdenek Smekal



smekal@feec.vutbr.cz

<http://www.six.feec.vutbr.cz>



SIX
research centre

sensor, information and communication systems

Faculty of Electrical Engineering
and Communication

Brno University of Technology
Technická 12, CZ-61600 Brno, Czechia

<http://www.six.feec.vutbr.cz>

Department of Sensor Systems

Prof. Radimír Vrba
vrbar@feec.vutbr.cz

Laboratories & Teams

❑ Noise and Dielectric Spectroscopy Lab

❑ Prof. Lubomír Grmela

❑ Nanometrology Lab

❑ Dr. Vladimír Holcman

❑ Lab of Microsensors and Nanotechnologies

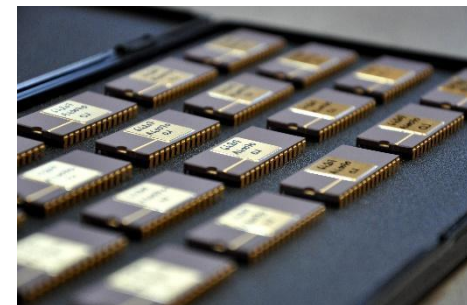
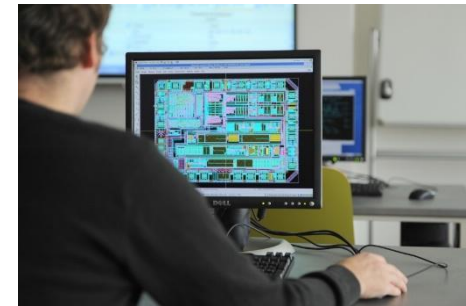
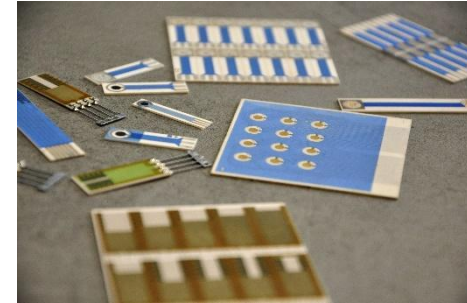
❑ Ass. prof. Jaromír Hubálek

❑ Laboratory of Full Custom Integrated Circuit Design

❑ Ass. prof. Lukáš Fojcik

❑ Sensor Systems Lab

❑ Ass. prof. Dan Komosný



Vision (1)

Autonomous and smart sensor systems based on nanotechnologies

- Zero power sensors
- Unobtrusive wearable sensors for medical purpose
- Energy harvesting and storing

- [1] Alimenti, Federico; Roselli, Luca, Theory of Zero-Power Rfid Sensors Based On Harmonic Generation and Orthogonally Polarized Antennas. Progress in Electromagnetics Research-Pier, 2013, 134 p. 337-357
- [2] Fojtik, Matthew; Kim, Daeyeon; Chen, Gregory; et al., A Millimeter-Scale Energy-Autonomous Sensor System With Stacked Battery and Solar Cells, IEEE JOURNAL OF SOLID-STATE CIRCUITS, 2013, 48 (3) p. 801-813
- [3] Prades, J. D.; Jimenez-Diaz, R.; Hernandez-Ramirez, F.; et al., Ultralow power consumption gas sensors based on self-heated individual nanowires. APPLIED PHYSICS LETTERS, 2008, 93 (12) no. 123110

Vision (2)

Supercapacitors

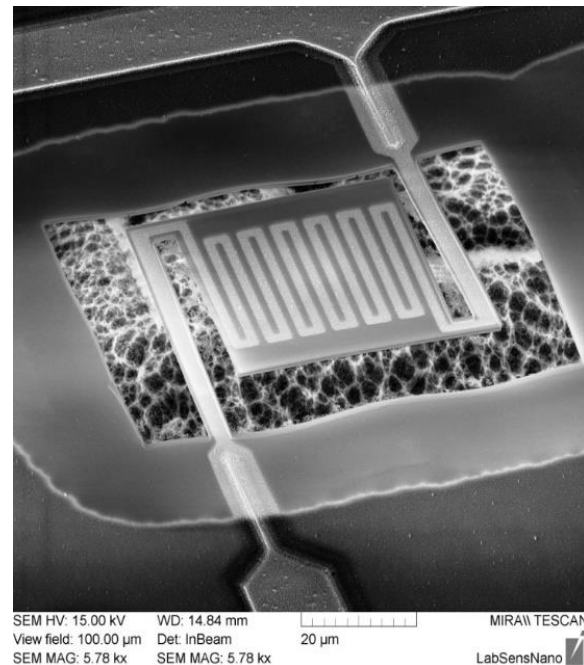
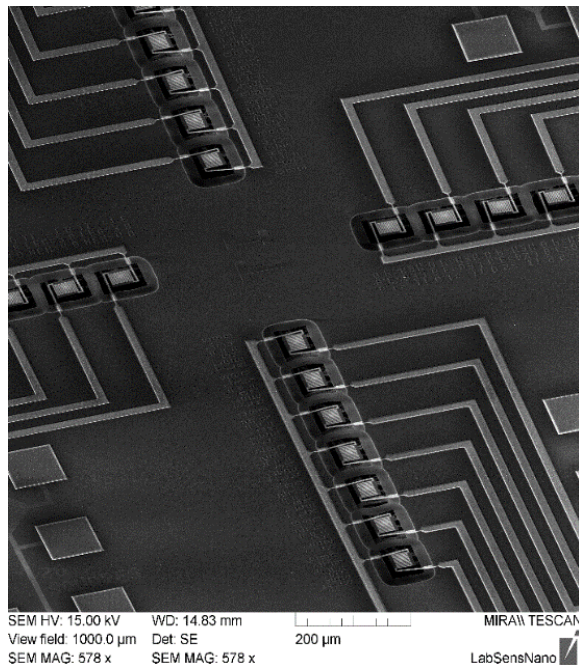
- The measuring set-up and method for the precise evaluation of the charge/discharge processes in the supercapacitor structures was designed
- Analysis of method for the precise evaluation of the charge/discharge processes in the supercapacitor structures was designed
- Measurement and analysis of dependence of the residual charge remaining in the SC's structure
- We have determined that the recovery voltage value is linearly proportional to the initial bias voltage value

Environmental monitoring and ambient assisted living systems

- Basic development of sensor structures
- CdTe detectors – investigate influence of semiconductor doping, passivation will be applied, passivation layer thickness uniformity will be evaluated by ellipsometry measurements. Surface impurity compounds and chemical elements distribution in passivation layer will be investigated by the Energy-dispersive x-ray spectroscopy and photoluminescence
- Gas sensors - investigate material conductivity by I-V measurements at temperatures 10 K – 300 K to distinguish various conductive mechanisms exhibit different character of dependence on temperature. Noise measurements will be provided for a range of polarization voltage in temperature range from 290 K to 360 K.

Applications (1)

New Nanostructured Sensing System for Infrared detection (NanoIR), GAČR [CZK 6.1 M]

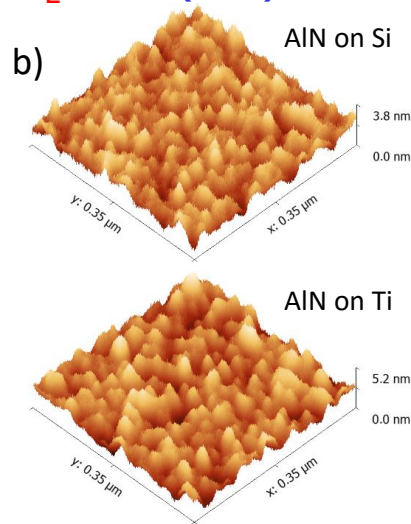
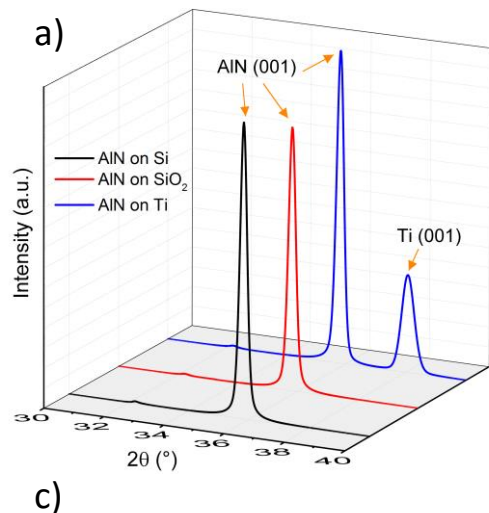


Svatoš, V.; Neužil, P.; Hrstka, M.; Hubálek, J. Effective simulation approach for study of carbon nanotube mechanical properties. In 7th NANOCON International Conference. Brno 2015

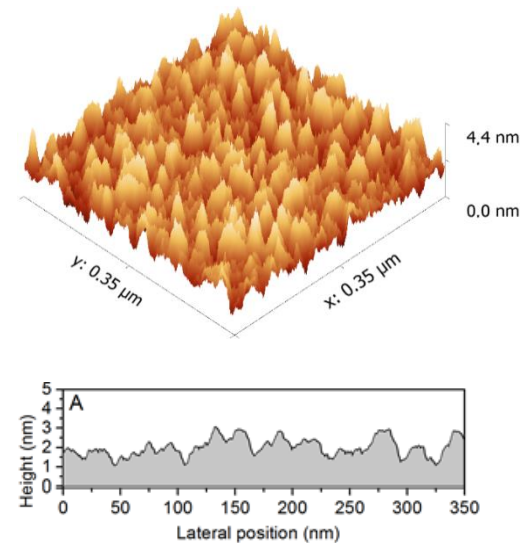
Applications (2)

- Improving materials for MEMS – cooperation with prof. Schmid group
Characterization of **aluminum nitride** thin films on Ti (001) – analysis (XRD, XPS, AFM, Ellipsometry and SEM)

Underlayers: Si (100) SiO_2 Ti (001)



Ti surface

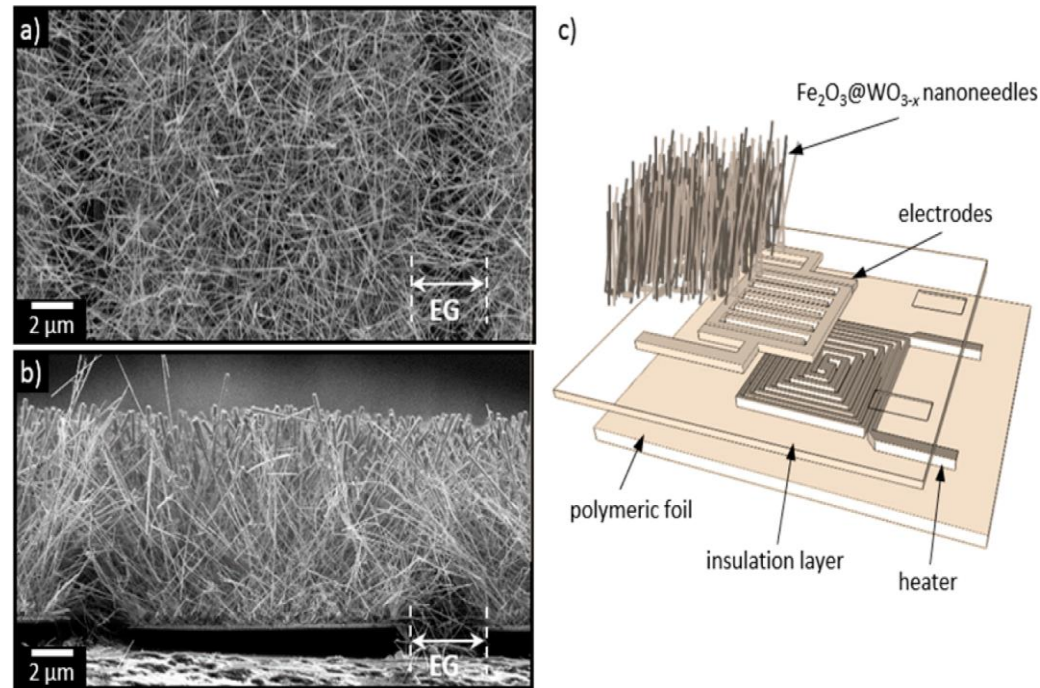


Applications (3)

- Materials and development of gas sensors (flexible substrates, MOx nanowires, APCVD technique)

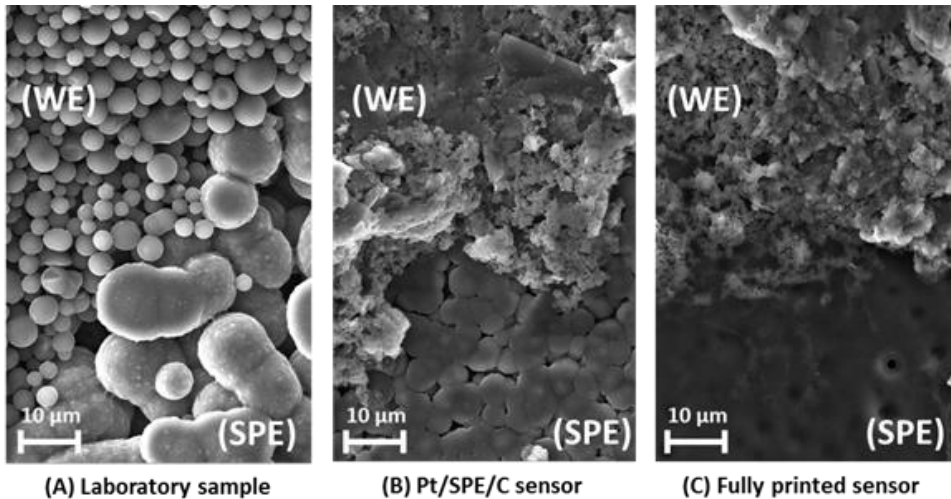
Vallejos, S.; Gracia, I.; Bravo, J.; Figueras, E.; Hubalek, J.; Cane, C., Detection of volatile organic compounds using flexible gas sensing devices based on tungsten oxide nanostructures functionalized with Au and Pt nanoparticles. *Talanta* **2015**, 139, 27-34.

Vallejos, S.; Gracia, I.; Figueras, E.; Cane, C., Nanoscale Heterostructures Based on $\text{Fe}_2\text{O}_3@\text{WO}_{3-x}$ Nanoneedles and Their Direct Integration into Flexible Transducing Platforms for Toluene Sensing. *Acs Applied Materials & Interfaces* **2015**, 7 (33), 18638-18649.

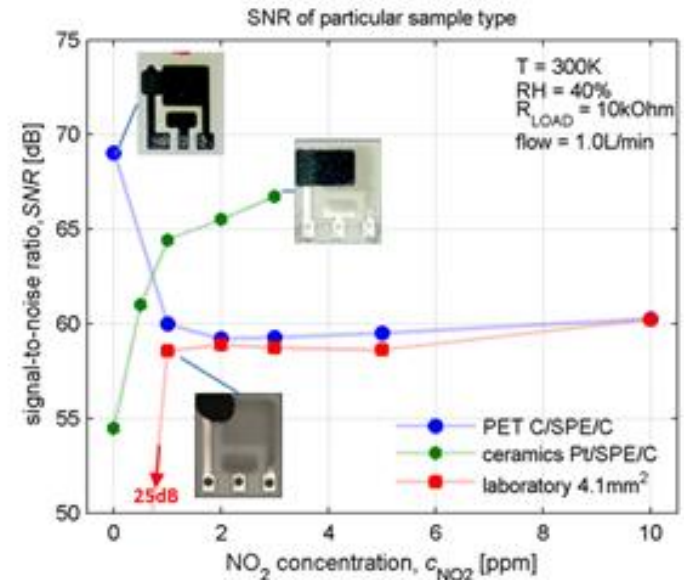


Applications (4)

➤ Sensors of in amperometric NO_2



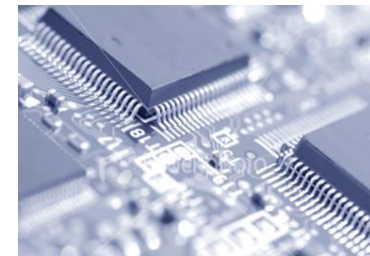
SEM pictures of planar interface working electrode / solid polymer electrolyte: (A) Laboratory sample on ceramic substrate. (B) Pt/SPE/C sensor on ceramic substrate. (C) Fully printed sensor on PET



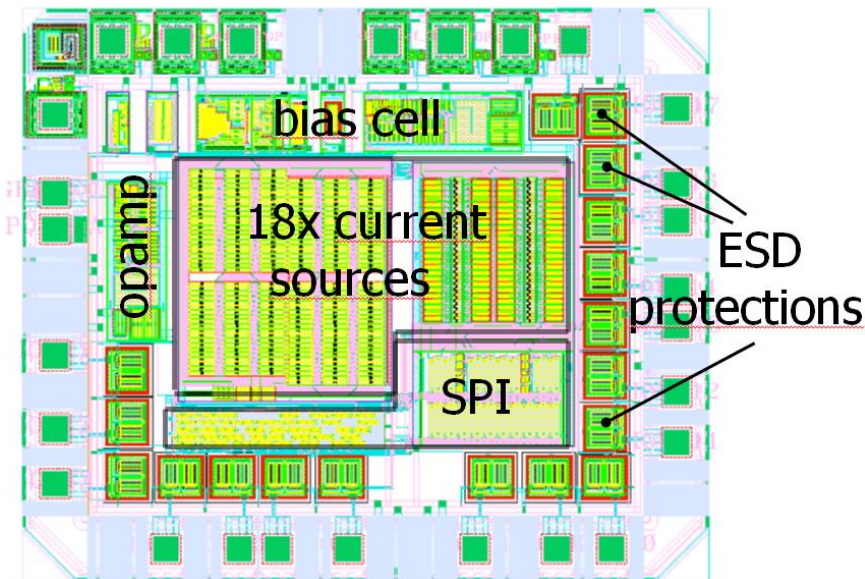
SNR of particular sample type.

Applications (5)

- Sensor signal processing and digitization
- Full custom ASIC design



Multiple current source ASIC layout



PARAMETER	CONDITION	ASIC			
		MIN	TYP	MAX	
Input Voltage		0,2		5	V
Output voltage range		-5		3,2	V
Output Current	$R_{\text{RANGE}} = 10 \text{ k}\Omega$	20		500	μA
	$R_{\text{RANGE}} = 200 \text{ k}\Omega$	1		25	μA
Current Accuracy (See next page)	$R_{\text{RANGE}} = 10 \text{ k}\Omega$	0,18		1,38	%
	$R_{\text{RANGE}} = 200 \text{ k}\Omega$	0,72		1,82	%
Current Sources Matching (See next page)	$R_{\text{RANGE}} = 10 \text{ k}\Omega$	0,2		0,86	%
	$R_{\text{RANGE}} = 200 \text{ k}\Omega$	0,8		1,58	%
Temperature Drift			37		ppm/ $^{\circ}\text{C}$
Output Impedance		20		800	$\text{M}\Omega$

Applications (6)

- GPS - GSM datalogger
 - Sensors of temperature, pressure, ...
 - Arduino-compatible shield
 - Data transfered over GPRS



Key equipment (1)

- Ion beam sputtering Bestec
- Stylus profilometry Bruker DektakXT
- Vacuum furnace
- Automatic electrochemical analyzer
- Bruker MALDI-TOF/FOF

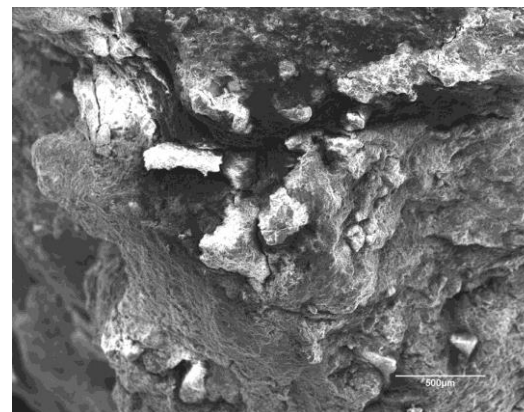
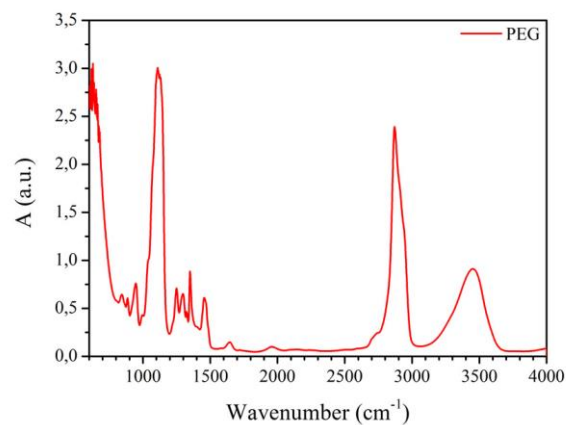


Key equipment (2)

FT-NIR spectrometer Nicolet 8700



Scanning electron beam microscope



Selected publications in IF journals

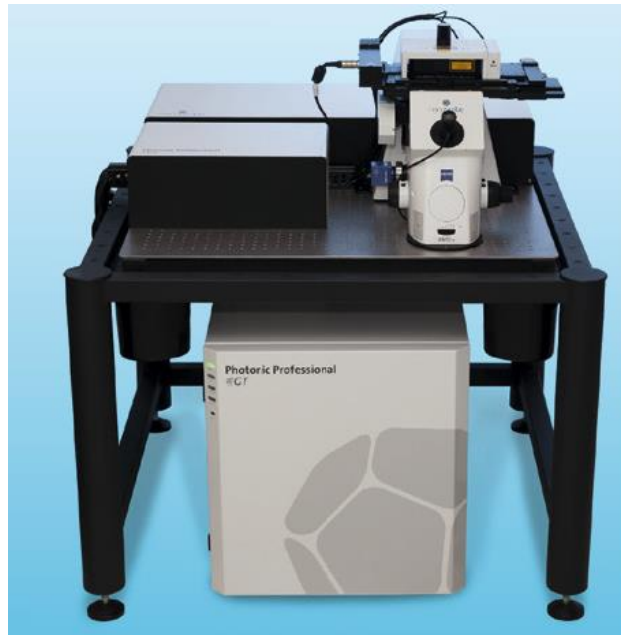
- KOMOSNY, D.; VOZNAK, M.; KATHIRAVELU, G.; SATHU, H. Estimation of Internet Node Location by Latency Measurements - The Underestimation Problem. Information Technology and Control, 2015, no. 44, vol. 3, p. 279-286. ISSN: 1392- 124X.
- BOTTA, M.; SIMEK, M.; KRAJSA, O.; CERVENKA, V.; PAL, T. On Location Estimation Technique Based of the Time of Flight in Low- power Wireless Systems. Measurement Science Review, 2015, no. 15, vol. 2, p. 58-63. ISSN: 1335- 8871.
- KHATEB, F.; VLASSIS, S.; KUMNGERN, M.; PSYCHALINOS, C.; KULEJ, T.; VRBA, R.; FUJCIK, L. 1 V Rectifier based on bulk-driven quasi-floating-gate differential difference amplifiers. CIRCUITS SYSTEMS AND SIGNAL PROCESSING. 2015. 2015 (34)(7, IF: 1.118). p. 2077 - 2089. ISSN: 0278-081X.
- KULEJ, T.; KHATEB, F. Bulk-driven adaptively-biased OTA in 0.18 um CMOS. Electronics Letters. 2015. 2015 (51)(6, IF: 0.930). p. 458 - 459. ISSN: 0013-5194. (IF(2014)=0,93).
- KUBERSKÝ, P.; SEDLÁK, P.; HAMÁČEK, A.; NEŠPŮREK, S.; KUPAROWITZ, T.; ŠIKULA, J.; MAJZNER, J.; SEDLÁKOVÁ, V.; GRMELA, L.; SYROVÝ, T. Quantitative fluctuation- enhanced sensing in amperometric NO₂ sensors. Chemical Physics, 2015, no. 456, vol. 1, p. 111-117. ISSN: 0301- 0104.
- ELHADIDY, H.; GRILL, R.; FRANC, J.; ŠIK, O.; MORAVEC, P.; SCHNEEWEISS, O. Ion electromigration in CdTe Schottky Metal-Semiconductor- Metal Structure. SOLID STATE IONICS, 2015, no. 277, vol. 27, p. 20-25. ISSN: 0167- 2738.
- ŠKARVADA, P.; MACKŮ, R.; DALLAEVA, D.; SEDLÁK, P.; GRMELA, L.; TOMÁNEK, P. SEM and AFM imaging of solar cells defects. Proceedings of SPIE, 2015, no. 9450, vol. 9450, p. 1-6. ISSN: 0277- 786X.
- KASPAR, P.; PROKOPYEVA, E.; TOMÁNEK, P.; GRMELA, L. Optical scattering in muscle tissue and its utilisation. Proceedings of SPIE, 2015, no. 9442, vol. 9442, p. 94420I1. ISSN: 0277- 786X.
- MOZALEV, A., et al, Porous-alumina-assisted formation of 3-D nanostructured niobium oxide films for advanced sensing applications, Procedia Engineering, 120 (2015) 435 – 438

Results summary

- 25 publications in IF journals
- 22 publications at conferences
- 2 granted patents (1 more pending)
- 4 utility models
- 10 functional samples

Interdisciplinary visions

- Low-power wireless sensor communication
- Sub-microne 3D printing



Nanoscribe Photonic Professional



3D printed objects

Contact

Prof. Radimír Vrba



vrbar@feec.vutbr.cz

<http://www.six.feec.vutbr.cz>