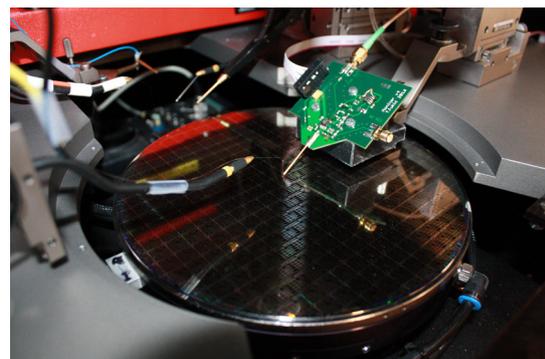
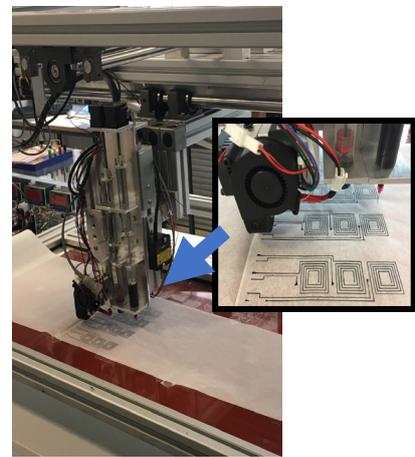
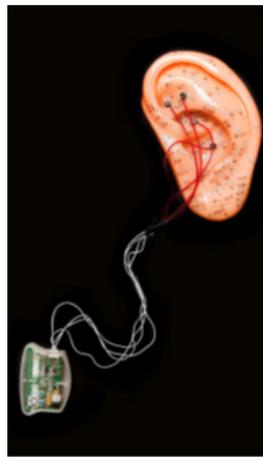
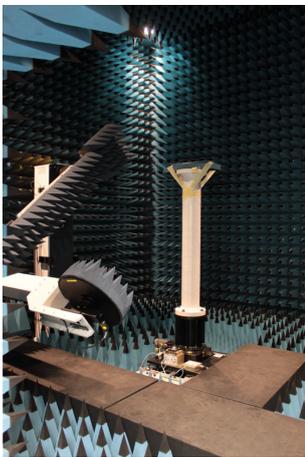


INSTITUTE OF ELECTRODYNAMICS, MICROWAVE AND CIRCUIT ENGINEERING (E354)

ANNUAL REPORT 2017



CONTENTS

Contacts	3
Staff members	4
Sponsors and Cooperation Partners	7
Current Research Areas	9
Course Program	17
Nominations and Awards	19
Events	19
Research Projects	20
Habilitation	22
Doctoral Dissertations	22
Diploma and Master Thesis	23
Publications in Scientific Journals	24
Conference Contributions	26
Scientific Reports	31

Technische Universität Wien
Institute of Electrodynamics, Microwave and Circuit Engineering
Gusshausstrasse 25/E354
1040 Wien, Austria
Tel.: +43 1 58801 – extension
Fax: +43 1 58801 – 35499
<http://www.emce.tuwien.ac.at/>

CONTACTS

	extension
Head of Institute:	
Univ.Prof. Ing. Dipl.-Ing. Dr.-Ing. Christoph Mecklenbräuer	38980
Secretariat:	
Ursula Heidlmair	35402
Margit Maritzen	35401
Andrea Mühlhauser	35112
IT-Services:	
Joseph Wageneder	35457
Fire protection/work safe:	
Heinz Klawatsch	35118
Kevin Pail	35451
Group Leader:	
○ Biomedical Sensing Ao.Univ.Prof. Dr. Eugenijus Kaniusas	35122
○ Circuit Engineering Univ.Prof. Dr.-Ing. Horst Zimmermann	354600
○ Technical Magnetism Ass.Prof. Dr. Peter Schönhuber	35111
○ Microwave Engineering Ass.Prof. Dr. Holger Arthaber	35420
○ THz Electronics Univ.Prof. Michael Feiginov	354700

STAFF MEMBERS

Status by December 31st, 2017

Professors:

Arthaber Holger Assoc.Prof. Dipl.-Ing. Dr.techn.
Feiginov Michael Univ.Prof.
Kaniusas Eugenijus Ao.Univ.Prof. Dipl.-Ing. Dr.techn.
Schönhuber Peter Ass.Prof. Dipl.-Ing. Dr.techn.
Zimmermann Horst Univ.Prof. Mag.rer.nat. Dr.techn.

Senior Scientists:

Goll Bernhard Senior Scientist Dipl.-Ing. Dr.techn
Schneider-Hornstein Kerstin Senior Scientist Dipl.-Ing. Dr.techn.

University Assistants:

Botezan Horia Univ.Ass. Dipl.-Ing. BSc
Dabiri Razlighi Babak Univ.Ass. Dipl.-Ing.
Hofbauer Michael Univ.Ass. Dipl.-Ing. Dr.techn. BSc
Pichler Bernhard Univ.Ass. Dipl.-Ing. BSc
Spudat Christian Univ.Ass. Dipl.-Phys. Dr.rer.nat.
Steindl Bernhard Univ.Ass. Dipl.-Ing.
Vaitkunas Andrius Univ.Ass. MSc

Project Assistants:

Dervic Alija Project Ass. MSc
Galler Florian Project Ass. Dipl.-Ing. BSc
Hofbauer Michael Dipl.-Ing. BSc
Huber Oliver Project Ass. Dipl.-Ing. BSc
Kampusch Stefan Project Ass. Dipl.-Ing. BSc
Mahmoudi Hiwa Project Ass.(FWF) Dr.techn. MSc
Mesgari Baset Project Ass. MSc
Pfützner Helmut Ao.Univ.Prof.i.R. Ziv.Ing. Univ.Prof. Dipl.-Ing. Dr.techn.
Shilyashki Georgi Project Ass.(FWF) Dipl.-Ing. Dr.techn.
Thürk Florian Project Ass. Dipl.-Ing.
Vokic Nemanja Project Ass. MSc
Zaisberger Michael Project Ass. Dipl.-Ing. BSc
Zecevic Nikola Project Ass. MSc

Non-scientific Employees financed by third party:

Hechenberger Stefan BSc
Neunteufel Daniel BSc
Soklic Jure
Windischhofer Andreas
Zeiner Klaus

Non-scientific staff:

Klawatsch Heinz Kontr.
Lang Reinhard
Lauinger Beatrix Fachinsp.
Pail Kevin
Sumereeder Michael Kontr.
Wageneder Josef ORev Ing.

Trainees:

Fürst Marcel
Novak Jana

Assigned to the Institute:

Griesmayer Erich Univ.Doiz. Dipl.-Ing. Dr.techn
Haas Herbert Univ.Prof.i.R. Dipl.-Ing. Dr.techn.
Jakoby Bernhard Univ.Doiz. Univ.Prof. Dipl.-Ing. Dr.techn.
Magerl Gottfried Em.O.Univ.Prof. Dipl.-Ing. Dr.techn.
Patzelt Rupert Em.O.Univ.Prof. Dr.phil.
Prechtl Adalbert Em.O.Univ.Prof. Dipl.-Ing. Dr.techn.
Russenschuck Stephan Univ.Doiz. Dr.-Ing.

Lecturers:

Bachler Martin Univ.Lektor Dr.techn. Bakk.techn.
Bauer Andreas Univ.Lektor Dipl.-Ing. BSc
Buchinger Eva Univ.Lektorin Mag.
Dietrich Horst Univ.Lektor Dipl.-Ing. Dr.techn.
Hagmair Stefan Univ.Lektor Dipl.-Ing. BSc
Hametner Bernhard Univ.Lektor Dipl.-Ing. Dr.techn.
Lorenz Anton Univ.Lektor Mag.rer.soc.oec
Mayer Christopher Univ.Lektor Dr.techn..
Pörtl Peter BSc
Wassertheurer Siegfried Univ.Lektor

Tutors:

Barghati Adam B.Eng.
Dunkl Daniel
Ertem Ilgin Dilan
Faiku Fitore
Fuchs Gerd
Geismanm Maximilian BSc
Lackner David Alexander
Mader Julia
Mamic Hanifa
Nabavi Armand BSc
Prodinger Johannes
Ryba Sophie
Zejniliovic Jasmina

Study Assistants:

Hackl Thomas BSC
Katharina Schrom

On leave:

Huber Oliver Project Ass. Dipl.-Ing. BSc
Milovancev Dinka Project Ass. MSc

Former employees:

But Dmytro Dr.techn.
Foreith Andrea
Jukic Tomislav, Dipl.-Ing. Dr.techn.
Leder Norbert, Dipl.-Ing. Dr.techn.
Mitrovic Mladen, MSc
Pojak (vormals Mitrovic) Natasa, Dr.techn. MSc

SPONSORS AND COOPERATION PARTNERS

AIT Austrian Institute of Technology GmbH
ams AG
Austrian Power Grid AG
Austria Technologie & Systemtechnik AG (AT&S)
CISC Semiconductor GmbH
Commissariat à l'énergie atomique et aux énergies alternatives, Paris
Consorzio Nazionale Interuniversitario per le telecomunicazioni, Parma
COST - Europäische Zusammenarbeit auf dem Gebiet der Wissenschaft und Technologie
Detego GmbH
Electronics and Telecommunication Research Institute, Daejeon (Korea)
Ericsson Telecomunicazioni Spa
Europäische Zusammenarbeit auf dem Gebiet der Wissenschaft und Technologie (COST)
FH OÖ Forschungs- und Entwicklungs GmbH
FWF
Frequentis AG
HSEB Dresden GmbH
Hochschuljubiläumstiftung der Stadt Wien
Infineon Technologies Austria AG
Infineon Technologies Dresden GmbH (IFD)
Infineon Technologies IT-Service GmbH
Infineon Technologies Romania & Co. Societate in Comandita Simpla
Interreg Österreich-Tschechische Republik (Europäischer Fonds für regionale Entwicklung)
Johanneum Research Forschungsgesellschaft mbH
Kathrein Solutions GmbH
LantiQ A GmbH
Materials Center Leoben Forschung GmbH
MED-EL Elektromedizinische Geräte GmbH
Medizinische Universität Wien
Nippon Steel & Sumitomo Metal Corporation
NXP Semiconductor Austria GmbH
NXP Semiconductors Netherlands BV
NXP Semiconductors N.V.
Robert Bosch GmbH
Polymer Competence Center Leoben GmbH
Mission Embedded GmbH
ÖFG – Österreichische Forschungsgemeinschaft
Österreichische Forschungsförderungs-gesellschaft mbH (FFG)
OSRAM GmbH
SES-imagotag GmbH
SGS institut Fresenius GmbH
Siemens AG
Siemens Transformers Austria GmbH & CoKG
Slovak University of Technology in Bratislava
SPTS Technologies Ltd
Stichting IMEC Nederland
STMicroelectronics srl
Swissdom AG
Systema Systementwicklung Dipl.-Inf Manfres Austen GmbH
TU Brno (Czech Republik)

TU Dresden
TU Graz
Universität Innsbruck
Universität Wien
Università degli Studi di Trento
Universitat Politècnica de València
Westfälische Hochschule Zwickau
Wirtschaftskammer Wien
WWTF – Vienna Science and Technology Fund

CURRENT RESEARCH AREAS: SYNOPSIS

THz-Electronics group

The THz-Electronics group was established at TU Wien in November 2016. In 2017, the group was working on the preparation of the THz measurement lab, starting with the fabrication processes in the Centrum for Micro and Nano Structures (ZMNS) and establishing simulation procedures of the electromagnetic properties of the THz components.

In general, the focus of the group is on the development of sources, detectors, components and complete systems for the THz frequency range. The specific research fields include physics of electronic and optoelectronic semiconductor devices, electromagnetic design of THz antennas and resonators, micro- and nano-fabrication technology, THz and microwave measurements, etc.

The primary focus of the group is on development of THz and sub-THz sources on the basis of the resonant-tunnelling diodes (RTDs). RTDs are the highest-frequency active electronic semiconductor devices, e.g, almost 2 THz RTD oscillators have been reported recently. However, much higher frequencies should be achievable with RTDs and we are aiming to demonstrate that experimentally. We are investigating different types of RTD oscillators. The most simple version of the oscillators consists of a resonant slot antenna integrated with an RTD. Such oscillators usually require a Si lens for out-coupling and collimation of the emitted radiation. A more complicated version of oscillators we are looking at, is also based on slot-antenna resonators with RTDs, but it is fabricated on thin dielectric membranes and includes an additional planar antenna integrated with the resonator. Such oscillators are much more compact and could be as small as a fraction of mm^2 . Another type of RTD oscillators we are studying is constructed in a different way. It is a microstrip travelling-wave RTD oscillator. Conceptually it is similar to a quantum cascade laser (QCL) with the difference that it has a single “cascade” (RTD layers) as its active core, instead of usually 100 cascade periods in QCLs. The microstrip RTDs should provide in principle higher output power than the lumped-element RTD oscillators. The group is working on design of different types of THz RTD oscillators, their fabrication technology and THz characterisation.

The group is also investigating photomixing THz sources, detectors and systems. Such systems are based on two (usually tuneable) lasers with a bit different frequencies. The radiation of the lasers is combined together, that leads to a beat note in the combined laser beam. By tuning the difference frequency of the lasers, one can easily tune the optical beat note frequency to be in the THz range. Further, one illuminates a photomixer with the optical beam to generate THz radiation. We are working with conductive photomixers, which are based on the fast photodiodes or they could be also based on photoconductors with very short charge-carrier lifetimes. We are working on the design of THz photomixers and on development of the photomixing systems.

Biomedical Sensing Group

Nerve stimulation

Research activities of the group in the year 2017 included investigations of physiological autonomic effects of the electrical stimulation of the auricular vagal nerve. In particular, chronic wounds in diabetes - local perfusion and their healing - were in the focus within the scope of a designed, operated and already completed clinical study (ethic-approved). Strong cooperations were established with Gerny (MRT validation of stimulation), Switzerland (validation in psychiatric diseases), Poland (non-linear processing), and Spain (validation in animals). A new

PhD student joined the group with the scientific focus on individual feedback-based adaptation of stimulation.

Electrical impedance tomography (EIT)

It is about an imaging method to observe the lung function in clinics in real time. Resulting images are not ready yet for clinical praxis, whereas reverse reconstruction algorithms are still in development. Based on a WWTF project with the Vienna Medical University, reconstruction is significantly improved with computer tomography – in terms of a novel CT-enhanced EIT – to individualize and thus improve images. Different publications were prepared.

Apnea research

Physiological phenomena within the body are analysed in detail while being recorded with non-invasive multiparametric sensors. Individual reactions of the body to voluntary apnea are focussed on. Patent application for anaesthesia fitness was filed.

Perioperative monitoring

Status of the autonomic nervous system is recorded before, during and after surgical procedures for prediction of a potentially impaired cardiovascular status. Recording were jointly performed with the Medical University of Vienna, with advanced and proprietary SW and special device settings.

Circuit Engineering Group

EASET

The work conducted by E354 in 2017 was focused for the most part on refining the data processing and calibration framework, and publishing the obtained results.

During the experimental microbeam sessions in 2016, the improved experimental setup was used that, in addition to collection of SET waveforms, also records additional calibration waveforms in each target scan to support finer calibration of multiplexer gain for each individual multiplexer input, i.e. target node. At the beginning of 2017 the data processing framework was extended to make use of the collected calibration data. The gain of each multiplexer input was extracted in an automatized fashion and verified for consistency across all target scans that probed the same multiplexer input. In this way a calibration database could be built for each used test chip, and the same approach can be used for calibrating new chips in the future, either in the laboratory or during the experiments. The collected gain values were also compared against the previous approach that extracted the gains directly from the SET waveforms, and proved to be much more reliable and accurate. Also, inconsistencies observed during the inspection of extracted gain values for the same multiplexer input across multiple scans helped in revealing invalid scans (e.g. configuration errors, induced by mistake or by radiation during the scan). Data points collected in these invalid scans were then excluded from analyses.

Furthermore, an improved version of the SET characterization procedure was developed, to improve the reliability and accuracy of extracted SET properties, such as pulse heights and pulse widths. This procedure relies heavily on the previously extracted gain calibration data. The algorithm applies a set of digital filters to original SET waveforms, to find the optimal point where reliable readings can be obtained with the least aggressive filter. This proved to be crucial in analysis of SET waveforms at reduced supply voltages, where decay of SETs has very slow slope, and increased probability of larger noise amplitudes renders the previous simple threshold-crossing-based characterization approach unreliable. Thus cleaner SET

property distributions could be obtained also for SETs with small amplitudes, which approach the noise floor level.

The improved data processing framework was applied to the results of the pulse quenching investigation in 2-input AND gates, to improve the quality of results presented in the manuscript which had been accepted for a poster presentation at the NSREC 2017 conference held from July 17th to 21st 2017, in New Orleans, Louisiana (date of acceptance: 27.03.2017). The extended paper, including also the results from OR gates and the more detailed analysis was later submitted and accepted for publication in the Transactions on Nuclear Science (TNS) journal, in the NSREC special issue [7]. In this paper, a strong charge-sharing-induced pulse quenching was observed internal to logic cells that contain inverting stage. The pulse quenching was dependent on the ion hit position and on the logic state of the cell, thus strongly suppressing SET propagation from internal to the output node in three out of four input states of an AND gate, and in one input state for OR gate. The effect is very pronounced in experiment using heavier Au ions, but it is also present in the Ca experiment.

Next, the influence of power supply on the charge sharing mechanism was investigated in inverter chain targets. Data from two experiments performed in 2016 (Ca and Au heavy ions) was analyzed, where SET responses of inverter chains with various inverter spacings were recorded at multiple supply voltages, going from sub-threshold to nominal levels. The results were accepted for a poster presentation at the RADECS 2017 conference, which was held from 2nd to 6th October 2017, in Geneva, Switzerland (date of acceptance: 26.06.2017). Subsequently, an extended paper was submitted and accepted for publication in the TNS journal (date of acceptance: 19.12.2017), special RADECS issue, which is due to appear in print mid-2018 [8]. In this paper, key factors that influence SET widths and cross sections were identified, and their changing impact across the applied supply voltage range was discussed. At higher supply voltages, the predominant factors were observed to be different LETs and inverter spacings, as in this region the SET plateau duration is the major contributor to the SET width. In the subthreshold region however, the predominant factors were process and capacitance variations, through their direct influence on the trailing “discharge” edge of SETs. Based on these observations, a simple method was devised to estimate the SET widths at reduced supply voltages, based on measurements done at nominal supply voltage supplemented by the extracted circuit parasitics, and transistor-level simulations. The proposed method matches well with the measured data.

eRAMP/Excellence in Speed and Reliability for More than Moore Technologies

In this ENIAC project actually two projects are contained:

In WP2 (Design for X in pilot line) the goal was to develop a 3-dimensionally integrated DC/DC converter. With AMS AG as project partner, DC/DC converters were designed by TU Wien, which enable a smaller volume of the converters by three-dimensionally integrating the passives on top of the CMOS chips. A 0.18 μ m high-voltage CMOS process was used to scale the efficiency advantageously. The measurements at the fabricated DC/DC converters were rather difficult. Improvement of the measurement setup was necessary. Then the measured efficiency of the DC/DC converters was lower than expected from circuit simulations. Finally, however, the difference could be explained successfully by the ESD protection circuit, which must not be used in connection with the bootstrap circuit needed for driving the high-side power NMOS switching transistor in the buck converter. The design kit for the 0.18 μ m high-voltage CMOS developed by AMS for fast ramp was verified by TU Wien and the demonstrator 4 (DC/DC converter with 3D-integrated passives) was designed successfully; both these major goals were achieved by TU Wien. The 3D-integration of the converter, unfortunately, was not finished by the project partner AMS AG before the end of the project. Nevertheless, a Ph.D. thesis (N. Pojak) was finished in 2017.

In WP3 (High performance simulation environment for 1st time right in pilot line) with Infineon in Villach and Munich as project partners, TU Wien has achieved considerable simulation methodology improvements via three possible scenarios by programming MATLAB implementations: 1) The use of an optimal design of experiments at the simulation input space instead of random selection of input parameters. 2) Developing a stimuli optimizer in a closed-loop simulation scheme based on fast learning concepts instead of the traditional open-loop input/output simulation scheme for stimuli analysis. 3) The use of effective data extraction and statistical sensitivity analysis methods for faster convergence and optimal utilization of simulation results as compared to the state-of-the-art. The achieved simulation methodology improvements have been verified and evaluated using different concepts and circuit examples. It was possible to detect the parameters, which have the largest influence on the circuits. A new solution for non-linear circuit problems, which can be implemented in Infineon's circuit simulator TITAN, was found. The project was finished successfully in May 2017.

Electronic-photonic Integration/IRIS

In the European project IRIS a photonic wafer and an electronics CMOS wafer are connected via copper pillars. The photonic layer contains ring resonators as optical switches between input and output waveguides. In total more than 800 ring resonators have to be heated individually and independently (to bring them into resonance or to far from resonance) and controlled simultaneously by an electronic IC (EIC). The circuit engineering group of EMCE is responsible for all the electronics needed for controlling the optical switches.

Three different approaches for heater control were investigated: analog, digital (pulse width modulation, PWM) and hybrid (analog input and digital PWM output). The best approach was selected and integrated in a multi-node IC in STM's BCD8sp BCD technology with more than 800 switching nodes. The electrical behavior of the fabricated IC was successfully experimentally characterized.

A offchip control loop was closed with a microcontroller. Programming of the microcontroller for the multi-node heater control was finished by EMCE. EMCE also supported the partners with PCB design for the demonstrator and the packaging partner UPVLC with floorplanning, choice of package, mounting of TEC and fiber arrays. The very high complexity of the project needed a huge amount of communication and many iterations. Testing of EICs was done and perfect functioning was verified.

In 2017 a paper for IEEE Photonics Technology Letters was submitted. The project ended on 31.12.2017.

Electronic-photonic Integration/PHELICITI

Im FFG-Projekt Phelicitati werden erstmals Ringresonatoren als Modulatoren für binäre und 4-PAM Datenübertragung verwendet. Die Arbeitsgruppe Schaltungstechnik entwickelt einen Ringmodulatortreiber und optische Empfänger, die sowohl für binäre als auch 4-PAM Modulation geeignet sind. Mit 0,35µm SiGe BiCMOS Technologie werden Datenraten von 10Gbit/s erreicht. Es wurden verbesserte elektronische Testchips im Jahr 2017 entworfen (Tapeout im März), bei AMS hergestellt und am EMCE elektrisch charakterisiert. Die Integrationsmethode des Oxidbondens in Phelicitati ermöglicht eine sehr geringe parasitäre Kapazität der elektrischen Verbindung zwischen Ringmodulator und Modulatortreiber bzw. zwischen Ge-Fotodiode und Transimpedanzverstärker. Dadurch kann die Empfängerempfindlichkeit gegenüber dem State-of-the-Art deutlich verbessert werden. Die 3-D Integration der bei CEA LETI hergestellten photonischen Komponenten verzögerte sich aufgrund technischer Probleme bei diesem Projektpartner erheblich. Leider erforderte die Komplexität der Thematik und die unprofessionelle Ausführung durch das CEA LETI eine

aufwendige und langwierige Prozessierung beim Projektpartner AMS AG, die Ende 2017 – zwei Monate nach Projektende - noch nicht abgeschlossen war.

Optische Freiraumkommunikation

In dem TU-internen innovativen Projekt „Advanced Optical Wireless Communication System“ wurden Avalanche Photodioden (APDs) in CMOS und BiCMOS OEICs untersucht sowie optische Empfänger realisiert, die im Doktoratskolleg *Cyber-Physical Production Systems* im Teilprojekt „Communication at High Data Rates in Harsh Production Environments“ in der optischen Freiraumkommunikation (Optical Wireless Communication, OWC) eingesetzt werden.

Die APDs zeichnen sich durch eine dicke Absorptionszone und damit durch eine hohe Fotoempfindlichkeit aus. Aufgrund der Verstärkung der APD konnte der Fotodiodendurchmesser auf $600\mu\text{m}$ bzw. $800\mu\text{m}$ erhöht werden, ohne die Empfängerempfindlichkeit bei 2Gbit/s entsprechend zu verschlechtern. Es wurden ein Journal Paper über einen $400\mu\text{m}$ Empfänger und zwei Konferenz-Publikationen (über einen $600\mu\text{m}$ Empfänger und ein eingeladener Beitrag auf der IEEE Int. Photonics Conf. in Orlando über OWC mit $200\mu\text{m}$ und $400\mu\text{m}$ APD-Empfängern sowie einem SPAD-Empfänger) veröffentlicht. Eine Dissertation (T. Jukic) wurde in 2017 abgeschlossen.

Optische Empfänger mit Single-Photon Avalanche Dioden (SPADs)

SPADs ermöglichen aufgrund ihrer extrem hohen Verstärkung die Digitalisierung optischer Empfänger und die Elimination des elektronischen Rauschens. Das erklärte Ziel in diesem vom FWF geförderten Projekt SPOR ist die Verkleinerung der Lücke in der Empfindlichkeit optischer Empfänger zum Quantenlimit.

SPADs, SPAD Arrays, eine aktive Quencher-Schaltung und 12 verschiedene Empfängerschaltungen in $0.35\mu\text{m}$ Hochvolt CMOS Technologie wurden im Jahr 2017 entworfen. In den Empfängerschaltungen wurden SPAD und Quencher Arrays in 4, 9 und 12 Kanälen mit unterschiedlicher SPAD-Fläche eingesetzt. Die Schaltungen wurden simuliert, layoutet, verifiziert und es wurden Postlayout Simulationen durchgeführt, um auch den Einfluss von Parasiten auf das Schaltungsverhalten zu berücksichtigen. Eine Neuheit stellen die erstmals realisierten Ladungsaddierer dar, die die Signale der einzelnen Kanäle verknüpfen. Es wurde ein Tapeout im Juli 2017 durchgeführt. Während des Herstellungsprozesses der ASICs wurde die aus CW Laser und externem Modulator bestehende Lichtquelle mit hohem Extinktionsverhältnis mit einer Wellenlänge von 635nm verbessert. Ferner wurde eine Lichtquelle mit einer roten RC-LED aufgebaut und charakterisiert. Eine weitere Dunkelkammer mit Probenhalterung und Faserjustiereinrichtung wurde konstruiert, um den Durchsatz bei den Messungen zu erhöhen. Es wurden im Dezember drei Wafer geliefert. Nach dem Sägen und Drahtbonden sowie dem Bestücken der Testplatten begannen die Messungen an den Testchips.

Die Entwicklung des Bit-Fehlermodells der SPAD-Empfänger wurde weitergeführt. Es bildet das SPAD-Empfängerverhalten teilweise schon quantitativ ab und erlaubt bereits einfache Vorhersagen zu neuen Entwürfen.

Zusammenfassend kann festgestellt werden, dass die Arbeiten in allen 5 Arbeitspaketen im Plan liegen. Eine Veröffentlichung erschien in Scientific Reports. Ferner wurde ein eingeladener Beitrag für IEEE J. Selected Topics in Quantum Electronics erstellt. Zudem wurde ein Paper von IEEE Solid-State Circuits Letters zur Veröffentlichung als erstes Paper in der ersten Ausgabe des ersten Bandes angenommen. Der Abstand zum Quantenlimit konnte auf 12.7dB reduziert werden.

Technical Magnetism

The following summarizes the main activities of the year 2017.

Study of material characteristics

A prerequisite for effective modelling is data that describes the 3D magnetic behavior of core materials in praxis-oriented ways. For alternating magnetization, in 2017, a concept was established for substantial improvements of IEC-standardized energy loss testers, a corresponding FWF project application being planned for the start of 2018; with ABB Transformers (Ludvika, Sweden) and Voestalpine (Linz, Austria) as partners.

For rotational magnetization, losses and magnetostriction were determined by means of the institute's rotational single sheet tester that represents the world-wide leading measurement system. Valuable support was provided by a guest scientist from Nippon Steel Corporation (Japan) who is performing his doctoral work at EMCE.

Development of thinnest "foil sensors"

So called nano-sensors tend to be mounted on a substrate which means that the effective final thickness is of the order of a millimeter. On the other hand, with support from FWF, a so-called 2D/3D assembler is developed that yields a variety of "foil sensors" of 100 μm sum thickness. In 2017, prototypes of strain sensors and in-plane flux density sensors were printed that can be assumed as the thinnest corresponding tools existing. They will allow for experimental verifications of numerical modelling according to III and IV.

This project work is performed in cooperation with ABB Transformers (Ludvika, Sweden).

3D Finite Element Method (FEM) for magnetic circuits

The research was aimed on specific adaptations of commercial 3D-FEM software packages like Comsol or FEMM, for modelling of magnetic circuits. A focus was put on FEMs fundamental problem to couple wide bulk-regions of magnetic material to narrow air gaps, as being typical for magnetic circuits. An effective methodology was developed that replaces air by extended, weak-magnetic medium.

For meshing and post-processing of 3D distributions of magnetic flux, a concept of "slicing" was developed. 2D results of individual slices of the circuit are vertically interconnected for a quasi-3D presentation – "real 3D-images" representing a general problem of 3D-FEM.

3D Magnetic Anisotropic Circuit Calculation (MACC)

In 2014, MACC had been developed at EMCE as a completely novel numerical method for the modelling of complexly built-up circuits like that of modern power transformer cores of extreme anisotropy. Considering the 3D character of cores, in 2017 a pre-version of 3D-MACC was established. With consideration of 3-fold non-linearity functions, it offers capacities that are unattainable even by most advanced systems of 3D-FEM. For dynamic modelling, they show calculation times up to several days, where 3D-MACC yields results of modelling in quite rapid ways. Also here, results are presented in slices, as an illustrative methodology.

In 2017, a FWF project application was prepared for a systematic comparison 3D-MACC vs 3D-FEM.

In 2017, **results of research** were published in 6 peer-reviewed journal papers (3 further already accepted).

Microwave Engineering

RFID localization and MIMO expansion

One active research topic is the localization of RFID tags. The recently developed RFID reader prototype was used in several measurement campaigns in close cooperation with project partners at TU Graz and Detego. Thereby, industrial scenarios were simulated, for example a pick and place working place. The main result was the successful validation of the anticipated performance gain, which is achieved by exploiting multiple range and angle measurements from the ranging enabled RFID reader equipped with MIMO antennas. A positioning precision in the order of 20 cm (90 % quantile) was finally obtained with a 4x4 antenna setup and a chipping frequency of 25 MHz.

Also a two frequency RFID tag was tested, which was developed in close cooperation with NXP. With this tag it is possible to separate the EPC communication in the UHF frequency band from ranging in the ISM band, where more bandwidth can be utilized which is essential for accurate localization in multipath environments.

RFID delta radar cross section (DRCS)

A Novel tag localization method which calculates the time of flight based on a broadband correlation. For this method high bandwidth is necessary to get a good spatial resolution. Thus, the DRCS is of peculiar interest to get an impression of the achievable accuracy of this ranging method.

The delta radar cross-section of RFID tags and other backscatter modulation based systems is an essential parameter, for instance in the context of the emerging topic of indoor localization. It describes the generally complex-valued difference between the two possible states of reflection which such a system can show during the tag-to-interrogator communication. For this, an extension of the scalar radar cross-section to a complex value is necessary. A comprehensive measurement system capable of determining the delta radar cross-section in different frequency bands, for different power levels, and for different incident angles of the electromagnetic waves has not been commercially available so far. Such a fully functional system was developed and assembled. This system can be used to examine entirely passive or battery assisted tags in the UHF frequency range around 900 MHz and in the ISM band around 2.45 GHz and 5.8 GHz in an anechoic environment. In addition, a supply carrier in the 900 MHz range can be provided for ISM band measurements. The conducted measurements revealed for example a highly non-linear power dependency of the delta radar cross-section of passive RFID tags.

Large signal analysis and device modelling

In many cases black box measurement based behavioral models are desired in RF simulators. These models offer high accuracy, but modeling nonlinear effects is often not possible.

For large signal excitation, traditional measurement instruments like the vector network analyzer (VNA) cannot be used due to the non-linearity of the device under test (DUT). Hence, load-pull measurements are performed to describe non-linear DUTs to finding optimum terminations for only a certain operational mode, for scalar parameters like output power, gain or efficiency. To overcome the problem a nonlinear vector network analyzer is used. This instrument allows measuring all involved signals on the harmonic grid. In combination with load-pull techniques all occurring waves can be measured also in a non-50 Ω environment.

X-parameters offer an accurate description of nonlinear devices. X-parameters work under the assumption that the DUT operates on a so-called large signal operation point (LSOP), which includes bias, fundamental frequency and one single large signal input tone. Additionally,

polyharmonic distortion model is applied. To gain higher model accuracy this model was expanded to the load dependent X-parameter model, which allows a second large signal input tone. Thus, highly accurate model prediction for non-linear DUTs can be achieved, like for harmonic controlled power amplifiers which are intended to achieve high efficiency values.

Material characterization

The characteristic and behavior of dielectric material up to 110 GHz is of great interest. Different types of substrate materials have been analyzed with simulations for special test structures. These simulations have been verified by measurements. The aim was to model the measured effects on microstrip lines for different substrate materials by a state-of-the-art 3D simulation program. Furthermore, an easily applicable formula for the attenuation constant and the dielectric permittivity for microstrip lines and conductor-backed coplanar waveguides were derived. This analytical model gives the opportunity to get the conductor properties without extensive 3D simulations.

Aeronautical communication system

One research interest is the reliable communication between aircraft and ground station in an already used frequency band. Aeronautic communication and surveillance systems are exclusively placed in the L-Band (ranging from 962 MHz to 1213 MHz). New systems must not interfere with the already deployed systems especially with the surveillance systems. The issue with older communication system is that they have a significantly higher output power and thus disturb the receiver side of new systems.

The goal is to build a receiver with high blanking immunity to co-existing systems. For this purpose several bit error rate simulation with and without interferer have been conducted. Furthermore, methods for shortening the saturation of the first LNA due to interfering blanking pulses have been developed.

Another topic of interest is the reliable synchronization between ground station and aircraft for a low SNR scenario. The communication is frame based and has a repetitive time slot (with a random access channel) to give the aircraft the opportunity to register itself to a ground station. Several methods were conducted to increase the reliability of a right signal detection to ground station receiver side for low SNR scenarios and different channel models.

Cavity filters

For low loss and steep transitions between pass-band and stop-band it is necessary to use resonant circuits with a high Q factor. Cavity based filters offer these properties but only under certain circumstances. One essential factor for a good coupling and low losses are mechanical factors starting from manufacturing accuracy to material imperfection.

Simple test structures will be produced by in-house manufacturer to test the dependency of the losses by polishing and coating the cavity surface. Also the coupling behavior between two resonators will be examined. The goal is to match the manufacturing variation with simulations in a modern 3D simulator. Furthermore, it is of interest which parts for cavity filter realizations are crucial in regard to manufacturing accuracy. Several ongoing measurements will be conducted to verify simulation results with manufactured cavity probes.

COURSE PROGRAM

Academic year 2017

COMPULSORY SUBJECTS

351.008	VO	Electrical Engineering 1	3.0	WS	SS	Schönhuber
351.009	UE	Electrical Engineering 1	3.0	WS	SS	Schönhuber
351.011	VO	Electrical Engineering 2	3.0	WS	SS	Schönhuber
351.012	UE	Electrical Engineering 2	3.0	--	SS	Fulmek
351.015	VU	Signals and Systems 1	3.0	--	SS	Prechtl
351.018	VO	Technology and Society	2.0	--	SS	Buchinger
351.019	VU	Electrodynamics	3.0	WS	SS	Goll/Prechtl
354.019	VU	Circuit Design	2.0	WS	--	Zimmermann
354.026	VU	Analog Integrated Circuits	2.0	WS	--	Zimmermann
354.040	VO	Project Management	2.0	--	SS	Lorenz
354.058	VU	RF Techniques	4.0	WS	--	Arthaber/Feiginov
354.059	LU	Lab RF Techniques	2.0	--	SS	Arthaber
354.062	UE	Analog Integrated Circuits – lab course	2.0	--	SS	Schneider-Hornstein
354.995	PR	Bachelor Thesis and Seminar	10.0	WS	SS	Kaniusas/Schönhuber/ Zimmermann/ Feiginov/Arthaber

ELECTIVE SUBJECTS

351.027	VO	Biomedical Sensors and Signals	2.0	WS	--	Kaniusas
354.028	VO	Design of integrated circuits	2.0	--	SS	Zimmermann
354.042	VU	Biomedical Instrumentation	2.0	--	SS	Kaniusas
354.060	VU	Advanced RF Techniques	4.0	WS	--	Arthaber/Pichler
354.061	SE	Seminar RF Techniques	3.0	WS	--	Arthaber/Pichler
354.064	VU	Advanced Course Circuit Design	4.0	WS	--	Schneider-Hornstein
354.065	SE	Circuit Design	2.0	WS	--	Schneider-Hornstein
362.111	VO	Introduction into Biophysics	2.0	WS	--	Kaniusas
354.073	VU	Biosignal analysis using Matlab	2.0	WS	--	Kaniusas

OPTIONAL SUBJECTS

351.029	PR	Biomedical Sensors and Signals	2.0	WS	SS	Kaniusas
354.000	KO	RF measurement instruments A	1.5	--	SS	Ehrlich-Schupita
354.001	VO	Fast Signal Processing in High-Energy Physics	1.5	WS	--	Griesmayer
354.005	PV	Special Seminar for doctoral students	2.0	WS	SS	Zimmermann
354.007	PV	Privatissimum for doctoral students	2.0	WS	SS	Magerl
354.008	SE	Diploma thesis seminar	2.0	WS	SS	Zimmermann
354.015	SE	Seminar for diploma students	2.0	WS	SS	Arthaber/Magerl
354.038	PV	Exclusive tutorial for PhD Students	2.0	WS	SS	Kaniusas
354.039	PV	Exclusive tutorial for diploma students	2.0	WS	--	Kaniusas
354.043	PA	Biomedical Instrumentation & Signals	6.0	WS	SS	Kaniusas
354.048	VU	Functional Electrostimulation (theory and praxis 1)	3.0	WS	--	Mayr
354.049	VU	Functional Electrostimulation (theory and praxis 2)	3.0	--	SS	Mayr
354.066	VO	Optoelectronic integrated circuits	2.0	--	SS	Zimmermann
354.067	SE	New trends in integrated circuit design	2.0	--	SS	Zimmermann
354.069	SE	Nanoelectronic Circuits	2.0	WS	--	Zimmermann
354.070	PV	Special Seminar for Doctoral Students	2.0	WS	--	Griesmayer
354.072	SE	Seminar Mixed-Signal ICs	2.0	--	SS	Schneider-Hornstein
354.075	VO	Field Computation and Magnetic Measurements for Superconducting Accelerator Magnets	2.0	--	SS	Russenschuck
354.076	VO	Elektronisch-photonische Integration	1.0	WS	--	Hofbauer
354.082	SE	Seminar for diploma students	2.0	WS	--	Feiginov
354.083	PV	PhD-student seminar	2.0	WS	--	Feiginov
354.996	PA	Practical Course (Transitional Rules B.-Thesis)	2.0	WS	SS	Kaniusas
354.999	VU	Selected Topics – Computer controlled measurement systems – Virtual Instrumentation	4.0	WS	--	Dietrich

NOMINATIONS AND AWARDS

- 07/2017 Award of the Vienna's chamber of commerce 2017 for the project proposal "Sensorless control of the auricular vagus nerve stimulation for pain and wound therapy", E. Kaniusas
- 01/2017 Austrian Standards: Living Standards Award 2017, Category Projects, Standardization Activities in the FFG project "REFlex", H. Arthaber, F. Galler
- 09/2017 IEEE Radio and Antenna Days of the Indian Ocean 2017, "Experimental Study on Load Dependent X-Parameter Models for PA Design", Best Student Paper 3rd price, B. Pichler
- 09/2017 5th Workshop of radio Frequency Working Group (ARGE HFT): Best Student Contribution Award, F. Galler, "Verification of Time of Flight Based Ranging for Backscatter RFID tags", F. Galler
- 06/2017 HUAWEI Seeds for the Future 2017: "Von 4G zu 5G: Das Netz der Zukunft". D. Neunteufel
- 11/2017 World Summit Award 2017: "BEEAND.ME", A. Dervic

EVENTS

- 07/2017 Organizer of CST (Computer Simulation Technology AG) Workshop on 3D Simulation Techniques with hands-on training, July 6th/7th, 2017.
- 09/2017 Organizer of the 5th Workshop of radio Frequency Working Group (ARGE HFT) at the Vienna University of Technology, September 28th/29th, 2017.
- 10/2017 Proposer and local organizer of International Workshops and WG meetings on Vagus Nerve Electrostimulation, Pain Treatment by Electrostimulation, Safety of Medical, Esthetics and Cosmetics EMF devices within EU COST Action BM1309: European network for innovative uses of EMFs in biomedical applications (EMF-MED), at the Vienna University of Technology, October 26th/27th, 2017.
- 2016-2017 Proposer and organizer of a Workshop on Vagus Nerve Stimulation within EU COST Action BM1309: European network for innovative uses of EMFs in biomedical applications (EMF-MED), Warsaw, Poland, 2017.

RESEARCH PROJECTS

Biomedical Sensing

- 2016-2021 Selective muscle and nerve stimulation (Auftragsforschung), *Contact:* Eugenijus Kaniusas, *Partner:* MED-EL Elektromedizinische Geräte GmbH
- 2016-2019 Biomedical system for personal auricular neurostimulation (Forschungsförderung), *Contact:* Eugenijus Kaniusas, *Partner:* SzeleStim GmbH
- 11.2015-11.2018 PhysDataInEITandCT - Physiologic data acquisition, analysis and interpretation based on electrical impedance tomography and computertomography, *Contact:* Eugenijus Kaniusas, *Partner:* University Clinics Hamburg-Eppendorf, Swisstom AG
- 10.2015-10.2018 PerioperativeMed - Physiologic data acquisition, analysis and interpretation in perioperative medicine, *Contact:* Eugenijus Kaniusas, *Partner:* Medical University Vienna
- 02.2017-03-2017 PersonAuriStim - Biomedical System for personalised auricular stimulation (Auftragsforschung), *Contact:* Eugenijus Kaniusas, *Partner:* SzeleSTIM G.m.b.H.
- 04.2014-04.2018 EMF-MED – European network for innovative uses of EMFs in biomedical applications (Forschungsförderung), *Contact:* Eugenijus Kaniusas, *Partner:* Europäische Zusammenarbeit auf dem Gebiet der Wissenschaft und Technologie (COST)
- 05.2015-04.2018 PersonalEIT – Novel approach to individualized mechanical ventilation of critically ill patients through Computed Tomography-enhanced bedside Electrical Impedance Tomography Imaging
- 07.2017-03.2018 VNSSens – Sensorless control of the auricular vagus nerve stimulation for pain and wound therapy (Forschungsförderung), *Contact:* Eugenijus Kaniusas, *Partner:* Wirtschaftskammer Wien

Technical Magnetism

- 08.2015-07.2019 MagFoilSensors - Magnetic Foil Sensors for Analyses in Transformer Cores (FWF) *Contact:* Helmut Pfützner, *Partner:* ABB Transformers Sweden
- 08.2017-07.2019 Magnetostriction – Magnetostriction of Transformer Core Steel under Rotational Magnetization (Forschungsförderung), *Contact:* Georgi Shilyashki, *Partner:* Nippon Steel & Sumitomo Metal Corporation

Circuit Engineering

- 04.2014-12.2017 EASET (FWF) *Contact:* Horst Zimmermann, *Partner:* E182, Prof. Steininger
- 04.2014-05.2017 eRAMP – Excellence in Speed and Reliability for More Than Moore Technologies (ENIAC) *Contact:* Horst Zimmermann, *Partner:* AMS AG, Infineon Technologies Austria AG
- 01.2014-12.2017 IRIS (EU, FP7) *Contact:* H. Zimmermann *Partner:* Ericson, ST Microelectronics, CEA-LETI, Univ. Pisa, Univ. Valencia, Univ. Trento, ETRI

- 11.2016-11.2018 Optische Empfänger – Optische Empfänger an den Grenzen des Quantenlimits (Hochschuljubiläumsstiftung), *Contact:* Bernhard Steindl
- 08.2017-07.2020 ORQL - Optical Receiver at the Quantum Limit (Stipendium ÖAW), *Contact:* Alija Dervic,
- 01.2014-12.2017 PHELICITI -Synergetic convergence of photonics and electronics by efficient 3D chip integration (FFG, Produktion der Zukunft) *Contact:* Horst Zimmermann, *Partner:* AIT, AMS AG, CEA-LETI
- 07.2017-08.2017 pureLiFi - Testing of avalanche Photo Diodes (Auftragsforschung) *Contact:* Horst Zimmermann, *Partner:* pureLiFi Ltd.
- 01.2016-12.2019 SPOR – SPAD-based fiber optical CMOS receivers (FWF) *Contact:* Horst Zimmermann
- 05.2017-04.2020 TRITON - Heterogenous Integration of Millimeter-Wave Technology (FFG), *Contact:* Horst Zimmermann

Microwave Engineering

- 02.2017-09.2017 Backscatter RFID Tags – Localization by Backscatter RFID Tags (Auftragsforschung), *Contact:* Holger Arthaber, *Partner:* imagotag GmbH
- 08.2017-10.2017 ESL RSSI – Localization of RFID tags by received signal strength (RSSI) measurements, accuracy analysis of the measured RSSI-values (Auftragsforschung), *Contact:* Holger Arthaber, *Partner:* SES-imagotag GmbH
- 10.2017-09.2020 InterOP - Interoperability of heterogeneous radio communication systems (Forschungsförderung), *Contact:* Holger Arthaber, *Partner:* Europäische Kommission – gemeinsame Unternehmen
- 10.2015-06.2018 LIMAR - L-Band Interference Mitigation for an Aeronautical Receiver (Forschungsförderung), *Contact:* Holger Arthaber, *Partner:* Frequentis AG
- 10.2014-09.2017 REFlex – RFID Real-Time Localization for Flexible Production (FFG) *Contact:* Holger Arthaber, *Partner:* NXP, CISC, Enso Detego
- 02.2016-03.2017 Reichweite Funkübertragung (Auftragsforschung), *Contact:* Holger Arthaber, *Partner:* Mission Embedded
- 05.2016-02.2017 RFID Ranging Demonstrator (Auftragsforschung), *Contact:* Holger Arthaber, *Partner:* Kathrein
- 04.2011-01.2017 TX4Green – PWM-based transmitter for green base-stations (WWTF), *Contact:* Holger Arthaber

HABILITATION

1. H. Arthaber: "*Digitally Driven Switched Mode Power Amplifiers*"; TU Wien Fakultät für Elektrotechnik und Informationstechnik, 2017.

DOCTORAL DISSERTATIONS

1. F. Fürbass: "*EEG Monitoring based on automatic detection of seizures and repetitive discharges*"; Betreuer/in(nen), Begutachter/in(nen): E. Kaniusas, F. Rattay; E354, E101, 2017; Rigorosum: 19.12.2017.
2. T. Jukic: "*Empfänger mit integrierter Lawinenfotodiode*"; Betreuer/in(nen), Begutachter/in(nen): H. Zimmermann, M. Gröschl; E354, 2017; Rigorosum: 29.06.2017.
3. A. Karabegovic: "*Development of a hydraulic circulatory loop and sensorless flow control system for testing a minimally invasive pneumatic heart pump*"; Betreuer/in(nen), Begutachter/in(nen): M. Gföhler, E. Kaniusas, C. Krenn; IKL, 2017; Rigorosum: 08.06.2017.
4. N. Leder: "*On Memory Induced, Nonlinear Behavior of All-Digital Radio Frequency Transmitters*"; Betreuer/in(nen), Begutachter/in(nen): G. Magerl, T. Brazil; E354, 2017; Rigorosum: 06.09.2017.
5. N. Pojak: "*Buck Converters in 0.18 μ m HV-CMOS Technology*"; Betreuer/in(nen), Begutachter/in(nen): H. Zimmermann, M. Gröschl; E354, 2017; Rigorosum: 08.11.2017.
6. Andrius Rapalius "*Physiological signal processing algorithms for short-term heart rate and blood pressure variability estimation*", E. Kaniusas, external expert at Kaunas University of Technology
7. Dovilė Karalienė "*Analysis of algebraic estimates of electrocardiographic and ultrasonic signals*", E. Kaniusas, external expert at Kaunas University of Technology
8. Rasa Šmidkaitė "*Structural decomposition of second order matrices in non-linear systems*", E. Kaniusas, external expert at Kaunas University of Technology

DIPLOMA AND MASTER THESES

1. D. Bugl: "*Auswerteschaltung für die Generierung von Zufallszahlen in 350nm CMOS Technologie*"; Betreuer/in(nen): H. Zimmermann, B. Goll; E354, 2017; Abschlussprüfung: 14.06.2017.
2. C. Contawe: "*Comparison of Manually and Automatically Derived ECG-based Left Ventricular Hypertrophy Parameters and their Predictive Value in Survival Analysis*"; Betreuer/in(nen): E. Kaniusas, C. Mayer; E354, 2017; Abschlussprüfung: 13.06.2017.
3. B. Dabiri Razlighi: "*Gewebevolumenreduzierung Der Oberen Atemwege Durch Rf-Therapie In Patienten Mit Schlafstörungen*"; Betreuer/in(nen): E. Kaniusas, S. Kampusch; E354, 2017; Abschlussprüfung: 06.10.2017.
4. M. Drndarevic: "*The effect of local precooling of the predominantly stressed muscles prior to high-performance exercise under normal conditions*"; Betreuer/in(nen): E. Kaniusas, S. Kampusch; E354, 2017; Abschlussprüfung: 06.10.2017.
5. M. Fasthuber: "*Testgerät zur nichtinvasiven Detektion postmortaler biologischer Gewebeeränderungen durch den dielektrischen Verlustfaktor*"; Betreuer/in(nen): H. Pfützner; E354, 2017; Abschlussprüfung: 09.03.2017.
6. M. Gattringer: "*An Improved Model for Complex Permittivity Measurements with a Split-Cylinder Resonator*"; Betreuer/in(nen): H. Arthaber, N. Leder; E354, 2017; Abschlussprüfung: 28.04.2017.
7. E. Gerstbauer: "*Entwurf und Realisierung eines GaN-MOSFET-Schaltverstärkers mit aktiv gedämpftem Ausgangsfilter höherer Ordnung*"; Betreuer/in(nen): J. Ertl, F. Maislinger; E370, 2017; Abschlussprüfung: 14.06.2017.
8. J. Kozak: "*Capacity of Low Elevation LOS MIMO Channels*"; Betreuer/in(nen): H. Arthaber, B. Pichler; E354, 2017; Abschlussprüfung: 06.10.2017.
9. S. Lintner: "*Orientation Proportional Control of a Prosthetic Wrist*"; Betreuer/in(nen): E. Kaniusas; E354, 2017; Abschlussprüfung: 19.09.2017.
10. D. Mudrak: "*Preprocessing of computed tomography images for quantification of lung specific physiology and comparison to electrical impedance tomography*"; Betreuer/in(nen): E. Kaniusas, F. Thürk; E354, 2017; Abschlussprüfung: 13.06.2017.
11. S. Riegler: "*EMG-signal processing for neuro-excitability tests using Matlab*"; Betreuer/in(nen): E. Kaniusas; E354, 2017; Abschlussprüfung: 13.06.2017.

PUBLICATIONS IN SCIENTIFIC JOURNALS

1. A. Aichholzer, Ch. Schubert, H. Mayer, H. Arthaber: "*Microwave testing of moist and oven-dry wood to evaluate grain angle, density, moisture content and the dielectric constant of spruce from 8 GHz to 12 GHz*"; European Journal of Wood and Wood Products, **May 2017** (2017), S. 1 - 15.
2. F. Furbass, S. Kampusch, E. Kaniusas, J. Koren, S. Pirker, R. Hopfengärtner, H. Stefan, T. Kluge, C. Baumgartner: "*Automatic multimodal detection for long-term seizure documentation in epilepsy*"; Clinical Neurophysiology, **128** (2017), 8; S. 1466 - 1472.
3. F. Galler, S. Grebien, T. Faseth, K. Witrisal, G. Magerl, H. Arthaber: "*Extension of an SDR UHF RFID Testbed for MIMO and Monostatic Time of Flight Based Ranging*"; IEEE Journal of Radio Frequency Identification (RFID), **Vol. 1** (2017), No. 1; S. 32 - 38.
4. S. Grebien, J. Kulmer, F. Galler, M. Goller, E. Leitinger, H. Arthaber, K. Witrisal: "*Range Estimation and Performance Limits for UHF-RFID Backscatter Channels*"; IEEE Journal of Radio Frequency Identification (RFID), **Vol. 1** (2017), No. 1; S. 39 - 50.
5. N. Leder, B. Pichler, T. Faseth, H. Ruotsalainen, H. Arthaber: "*Hierarchical-Table-Based Model for All-Digital RF Transmitters*"; IEEE Transactions on Microwave Theory and Techniques, **Vol. 65** (2017), No. 3; S. 720 - 728.
6. D. Milovancev, T. Jukic, B. Steindl, P. Brandl, H. Zimmermann: "*Optical wireless communication using a fully integrated 400 μm diameter APD receiver*"; The Journal of Engineering, **Vol. 1** (2017), 6 S.
7. M. Mitrovic, M. Hofbauer, B. Goll, K. Schneider-Hornstein, R. Swoboda, B. Steindl, K.O. Voss, H. Zimmermann: "*A DC-to-8.5 GHz 32:1 Analog Multiplexer for On-Chip Continuous-Time Probing of Single-Event Transients in a 65-nm CMOS*"; IEEE Transactions on Circuits and Systems II: Express Briefs, **Vol. 64** (2017), No. 4; S. 377 - 381.
8. M. Mitrovic, M. Hofbauer, B. Goll, K. Schneider-Hornstein, R. Swoboda, B. Steindl, K.O. Voss, H. Zimmermann: "*Experimental Investigation of Single-Event Transient Waveforms Depending on Transistor Spacing and Charge Sharing in 65-nm CMOS*"; IEEE Transactions on Nuclear Science, **Vol. 64** (2017), No. 8; S. 2136 - 2143.
9. H. Pfützner, G. Shilyashki: "*Concept for industrially relevant magnetic power loss measurements by Single Sheet Tester and Epstein Frame Testers*"; CIGRE Science&Engineering, **vol.9** (2017), S. 95 - 109.
10. H. Pfützner, G. Shilyashki, G. Trenner, E. Gerstbauer, P. Hamberger, M. Aigner: "*Transformer cores of mixed materials in limbs and yokes*"; CIGRE Science&Engineering, **vol.8** (2017), S. 108 - 115.
11. J. Puskely, T. Mikulasek, J. Lacik, R. Zbynek, H. Arthaber: "*SIW-Fed Vivaldi Antenna with Beam Steering Capabilities*"; Microwave and Optical Technology Letters, **Vol. 59** (2017), No. 5; S. 1022 - 1027.
12. A. Samoudi, S. Kampusch, E. Tanghe, J. Szeles, L. Martens, E. Kaniusas, W. Joseph: "*Numerical modelling of percutaneous auricular vagus nerve stimulation: A realistic 3D model to evaluate sensitivity of neural activation to electrode position*"; Medical & Biological Engineering & Computing, **online** (2017), S. 1 - 18.

13. C. Sánchez-Azqueta, B. Goll, S. Celma, H. Zimmermann: "*Latch-Type Optical Receiver With Integrated pin Photodiodes*"; IEEE Photonics Technology Letters, **vol. 29** (2017), 8; S. 675 - 678.
14. G. Shilyashki, H. Pfützner: "*Magnetic circuit modelling of transformer core induction - resolution and accuracy*"; IET Electric Power Applications, **vol. 11-7** (2017), 17048556; S. 1341 - 1346.
15. G. Shilyashki, H. Pfützner: "*Nanocrystalline foil sensors for local detection of in-plane magnetic flux in laminated machine cores*"; International Journal of Applied Electromagnetics and Mechanics, **vol. 55** (2017), S1; S. 61 - 68.
16. G. Shilyashki, H. Pfützner, C. Huber: "*Interlaminar magnetic flux assessment of a transformer core measured by an extra-thin printed foil detector*"; IEEE Transactions on Magnetics, **vol 53/9** (2017), 8400706; S. 1 - 6.
17. G. Shilyashki, H. Pfützner, M. Palkovits, A. Windischhofer, M. Giefing: "*3D-printed detector band for magnetic off-plane flux measurements in laminated machine cores*"; Sensors, **vol 17/12** (2017), 2953; S. 1 - 7.
18. B. Steindl, T. Jukic, H. Zimmermann: "*Optimized silicon CMOS reach-through avalanche photodiode with 2.3-GHz bandwidth*"; International Society of Optical Engineering (SPIE), **Vol. 56** (2017), No. 11; S. 110501-1 - 110501-3.
19. N. Tadic, B. Goll, H. Zimmermann: "*Laser Diode Current Driver With $(1 - t/T)^{-1}$ Time Dependence in 0.35- μ m BiCMOS Technology for Quantum Random Number Generators*"; IEEE Transactions on Circuits and Systems II: Express Briefs, **Vol. 64** (2017), No. 5; S. 510 - 514.
20. F. Thürk, S. Böhme, D. Mudrak, S. Kampusch, A. Wielander, H. Prosch, C. Braun, F. Toemboel, J. Hofmanninger, E. Kaniusas: "*Effects of individualized electrical impedance tomography and image reconstruction settings upon the assessment of regional ventilation distribution: Comparison to 4-dimensional computed tomography in a porcine model*"; PLoS ONE, **12** (2017), 8; S. 1 - 16.
21. H. Zimmermann, B. Steindl, M. Hofbauer, R. Enne: "*Integrated fiber optical receiver reducing the gap to the quantum limit*"; Scientific Reports, **Vol. 7** (2017), Article No. 2652 (2017); S. 1 - 12.

CONFERENCE CONTRIBUTIONS

TALKS AND POSTER PRESENTATIONS (WITH PROCEEDINGS-ENTRY)

1. E. Auerbach, S. Gider, G. Albuquerque, N. Leder, H. Arthaber: "*High-Frequency Modes of the Dual Free Layer Sensor*"; Vortrag: 2017 IEEE International Magnetics Conference (INTERMAG), Dublin, Ireland; 24.04.2017 - 28.04.2017; in: "*Magnetics Conference (INTERMAG), 2017 IEEE International*", (2017), 1 S.
2. E. Auerbach, N. Leder, S. Gider, D. Suess, H. Arthaber: "*Characterization of Dynamic Nonlinear Effects in MTJ-Based Magnetic Sensors*"; Vortrag: 2017 International Workshop on Integrated Nonlinear Microwave and Millimetre-Wave Circuits (INMMiC), Graz; 20.04.2017 - 21.04.2017; in: "*Integrated Nonlinear Microwave and Millimetre-wave Circuits Workshop (INMMiC), 2017*", (2017), 3 S.
3. S. Buehler, K. Wodack, S. Böhm, A. Waldmann, M. Graessler, S. Nishimoto, E. Kaniusas, F. Thürk, C. Trepte, D. Reuter: "*Localizing the aorta by electrical impedance tomography within regions of interest*"; Poster: Proceedings of the 18th International Conference on Biomedical Applications of Electrical Impedance Tomography, New Hampshire, USA; 21.06.2017 - 24.06.2017; in: "*Proceedings of the 18th International Conference on Biomedical Applications of Electrical Impedance Tomography*", (2017), S. 59.
4. S. Buehler, K. Wodack, S. Böhm, A. Waldmann, M. Graessler, S. Nishimoto, F. Thürk, E. Kaniusas, D. Reuter, C. Trepte: "*Detection of the aorta in electrical impedance tomography images without the use of contrast agent*"; Vortrag: Proceedings of the 18th International Conference on Biomedical Applications of Electrical Impedance Tomography, New Hampshire, USA; 21.06.2017 - 24.06.2017; in: "*Proceedings of the 18th International Conference on Biomedical Applications of Electrical Impedance Tomography*", (2017), S. 18.
5. M. Feiginov: "*THz Resonant-Tunneling Diodes*"; Hauptvortrag: 42nd International Conference on Infrared, Millimeter, and Terahertz Waves (IRMMW-THz), Cancun, Mexiko (eingeladen); 27.08.2017 - 01.09.2017; in: "*Infrared, Millimeter, and Terahertz Waves (IRMMW-THz), 2017*", (2017), ISBN: 978-1-5090-6050-4; 2 S.
6. M. Feiginov: "*THz resonant-tunneling diodes*"; Vortrag: IEEE Wrap 2017, Hyderabad, India (eingeladen); 18.12.2017 - 19.12.2017; in: "*3rd edition of the biennial IEEE Workshop on Recent Advances in Photonics (WRAP 2017)*", (2017), 2 S.
7. F. Galler, S. Hinteregger, T. Faseth, N. Leder, K. Witrisal, G. Magerl, H. Arthaber: "*Performance Evaluation and Verification of Spread-Spectrum Based UHF RFID Ranging*"; Vortrag: 2017 IEEE International Conference on RFID (RFID), Phoenix, Arizona, USA; 09.05.2017 - 11.05.2017; in: "*11th Annual IEEE International Conference on RFID*", (2017), ISBN: 978-1-5090-4576-1; S. 124 - 129.
8. B. Goll, H. Zimmermann: "*Receiver Chip in 0.6 μ m BiCMOS with AGC and LVDS Output Driver*"; Vortrag: 2017 Austrochip Workshop on Microelectronics, Linz; 12.10.2017; in: "*25th Austrian Workshop on Microelectronics*", (2017), ISBN: 978-1-5386-3583-4; S. 18 - 22.
9. S. Hinteregger, J. Kulmer, M. Goller, F. Galler, H. Arthaber, K. Witrisal: "*UHF-RFID Backscatter Channel Analysis for Accurate Wideband Ranging*"; Vortrag: 2017 IEEE International Conference on RFID (RFID), Phoenix, Arizona, USA; 09.05.2017 - 11.05.2017; in: "*11th Annual IEEE International Conference on RFID*", (2017), ISBN: 978-1-5090-4576-1; S. 117 - 123.

10. O. Huber, G. Magerl, H. Arthaber: "*Dispersion Behavior of the Apparent Permittivity for Quasi-TEM Transmission Lines up to 110 GHz*"; Vortrag: European Microwave Week 2017, Nürnberg, Deutschland; 08.10.2017 - 13.10.2017; in: "*Proceedings of the 47th European Microwave Conference*", (2017), ISBN: 978-2-87487-047-7; S. 839 - 842.
11. O. Huber, G. Magerl, H. Arthaber: "*Impact of Different Surface Finishes on Insertion Loss for Microstrip Resonators up to 110 GHz*"; Vortrag: IEEE Radio 2017, Cape Town, South Africa; 25.09.2017 - 28.09.2017; in: "*IEEE Radio and Antenna Days of the Indian Ocean*", (2017), 2 S.
12. S. Kampusch, E Unger, J. Bernardi, K. Whitmore, J. Szeles, E. Kaniusas: "*Design of the electrode-tissue interface in percutaneous auricular vagus nerve stimulation*"; Vortrag: International Workshop on Vagus Nerve Stimulation within EU COST Action BM1309: European network for innovative uses of EMFs in biomedical applications (EMF-MED), Warschau; 14.02.2017 - 16.02.2017; in: "*Abstract of the International Workshop on Vagus Nerve Stimulation within EU COST Action BM1309: European network for innovative uses of EMFs in biomedical applications (EMF-MED)*", (2017), S. 1 - 2.
13. E. Kaniusas, S. Kampusch, J. Szeles: "*Current directions in auricular vagus nerve stimulation*"; Hauptvortrag: International Workshop on Vagus Nerve Stimulation within EU COST Action BM1309: European network for innovative uses of EMFs in biomedical applications (EMF-MED), Warschau (eingeladen); 14.02.2017 - 16.02.2017; in: "*Abstract of the International Workshop on Vagus Nerve Stimulation within EU COST Action BM1309: European network for innovative uses of EMFs in biomedical applications (EMF-MED)*", (2017), S. 1.
14. S. Lechner, E. Kaniusas, S. Kampusch: "*Bringing auricular vagus nerve stimulation to the market: Regulatory burdens from research to business*"; Vortrag: International Workshop on Vagus Nerve Stimulation within EU COST Action BM1309: European network for innovative uses of EMFs in biomedical applications (EMF-MED), Warschau; 14.02.2017 - 16.02.2017; in: "*Abstract of the International Workshop on Vagus Nerve Stimulation within EU COST Action BM1309: European network for innovative uses of EMFs in biomedical applications (EMF-MED)*", (2017), S. 1 - 2.
15. N. Leder, B. Pichler, T. Faseth, G. Magerl, H. Arthaber: "*Compacting Look-Up-Table Models for All-Digital RF-Transmitters*"; Vortrag: IEEE Radio 2017, Cape Town, South Africa; 25.09.2017 - 28.09.2017; in: "*IEEE Radio and Antenna Days of the Indian Ocean*", (2017), 2 S
16. N. Leder, B. Pichler, G. Magerl, H. Arthaber: "*Delay Compensation and Tracking for All-Digital RF-Transmitter Models*"; Vortrag: INMMIC -International Workshop on Integrated Nonlinear Microwave and Millimeter-Wave Circuits, Graz; 20.04.2017 - 21.04.2017; in: "*The 2017 International Workshop on Integrated Nonlinear Microwave and Millimetre-wave Circuits*", (2017), ISBN: 978-1-5090-5861-7; S. 23 - 25.
17. N. Leder, B. Pichler, G. Magerl, H. Arthaber: "*Robust Verification of Look-Up-Table-Based Models for All-Digital RF-Transmitters*"; Vortrag: European Microwave Week 2017, Nürnberg, Deutschland; 08.10.2017 - 13.10.2017; in: "*Proceedings of the 12th European Microwave Integrated Circuits Conference*", (2017), ISBN 978-2-87487-048-4; S. 81 - 84.
18. H. Mahmoudi, H. Zimmermann: "*A New Sampling Technique for Monte Carlo-based Statistical Circuit Analysis*"; Vortrag: International Conference of Design, Automation and Test in Europe. (DATE17), Lausanne, Switzerland; 27.03.2017 - 31.03.2017; in:

"Proceedings of the International Conference of Design, Automation and Test in Europe. (DATE17)", (2017), ISBN: 978-3-9815370-8-6; S. 1277 - 1280.

19. D. Milovancev, T. Jukic, B. Steindl, M. Hofbauer, R. Enne, K. Schneider-Hornstein, H. Zimmermann: *"Optical wireless communication with monolithic avalanche photodiode receivers"*; Vortrag: IEEE Photonics Conference, Orlando, Florida, USA (eingeladen); 01.10.2017 - 05.10.2017; in: *"2017 IEEE Photonics Conference, 30th Annual Conference of the IEEE Photonics Society"*, (2017), ISBN: 978-1-5090-6577-6; S. 25 - 26.
20. M. Mitrovic, M. Hofbauer, B. Goll, K. Schneider-Hornstein, R. Swoboda, B. Steindl, K.O. Voss, H. Zimmermann: *"Dependence of Inverter Chain Single-Event Cross Sections on Inverter Spacing in 65 nm Bulk CMOS Technology"*; Poster: Radiation Effects on Components & Systems Conference (RADECS), Bremen; 19.09.2016 - 23.09.2016; in: *"16th European Conference Radiation and Its Effects on Components and Systems (RADECS) 2016"*, (2017), ISBN: 978-1-5090-4366-8; 4 S.
21. F. Panetsos, R. Gines, E. Kaniusas, S. Kampusch: *"Animal models of auricular vagus nerve stimulation"*; Hauptvortrag: International Workshop on Vagus Nerve Stimulation within EU COST Action BM1309: European network for innovative uses of EMFs in biomedical applications (EMF-MED), Warschau (eingeladen); 14.02.2017 - 16.02.2017; in: *"Abstract of the International Workshop on Vagus Nerve Stimulation within EU COST Action BM1309: European network for innovative uses of EMFs in biomedical applications (EMF-MED)"*, (2017), S. 1 - 2.
22. B. Pichler, N. Leder, G. Magerl, H. Arthaber: *"Experimental Study on Load Dependent X-Parameter Models for PA Design"*; Vortrag: IEEE Radio 2017, Cape Town, South Africa; 25.09.2017 - 28.09.2017; in: *"IEEE Radio and Antenna Days of the Indian Ocean"*, (2017), 2 S.
23. B. Pichler, N. Leder, G. Magerl, H. Arthaber: *"Load Error Correction for High Power Load Dependent X-Parameter Measurements"*; Vortrag: European Microwave Week 2017, Nürnberg, Deutschland; 08.10.2017 - 13.10.2017; in: *"Proceedings of the 12th European Microwave Integrated Circuits Conference"*, (2017), ISBN: 978-2-87487-048-4; S. 216 - 219.
24. B. Pichler, N. Leder, G. Magerl, H. Arthaber: *"On the Dependability of Load Dependent X-Parameter Models for Varying Loads"*; Vortrag: INMMIC -International Workshop on Integrated Nonlinear Microwave and Millimeter-Wave Circuits, Graz; 20.04.2017 - 21.04.2017; in: *"The 2017 International Workshop on Integrated Nonlinear Microwave and Millimetre-wave Circuits"*, (2017), ISBN: 978-1-5090-5861-7; S. 19 - 21.
25. A. Samoudi, E. Tanghe, S. Kampusch, L. Martens, E. Kaniusas, J. Szeles, W. Joseph: *"Numerical modelling of percutaneous auricular vagus nerve stimulation: Assessment of sensitivity of neural activation to electrode position"*; Vortrag: International Workshop on Vagus Nerve Stimulation within EU COST Action BM1309: European network for innovative uses of EMFs in biomedical applications (EMF-MED), Warschau; 14.02.2017 - 16.02.2017; in: *"Abstract of the International Workshop on Vagus Nerve Stimulation within EU COST Action BM1309: European network for innovative uses of EMFs in biomedical applications (EMF-MED)"*, (2017), S. 1 - 2.
26. A. Sandmann, A. Ahrens, S. Lochmann, W. Rosenkranz, H. Zimmermann: *"Experimental Multi-Mode MIMO System Evaluation using Semented Photo Detection"*; Vortrag: ITG Fachtagung Photonische Netze, Leipzig, Deutschland; 11.05.2017 - 12.05.2017; in: *"18. ITG-Fachtagung 272: Photonische Netze"*, (2017), ISBN: 978-3-8007-4427-5; S. 94 - 97.

27. J. Szeles, S. Kampusch, E. Kaniusas: "*Innovative clinical medicine based on auricular vagus nerve stimulation*"; Hauptvortrag: International Workshop on Vagus Nerve Stimulation within EU COST Action BM1309: European network for innovative uses of EMFs in biomedical applications (EMF-MED), Warschau (eingeladen); 14.02.2017 - 16.02.2017; in: "*Abstract of the International Workshop on Vagus Nerve Stimulation within EU COST Action BM1309: European network for innovative uses of EMFs in biomedical applications (EMF-MED)*", (2017), S. 1.
28. E. Tanghe, A. Samoudi, S. Kampusch, L. Martens, E. Kaniusas, J. Szeles, W. Joseph: "*Numerical modelling of percutaneous auricular vagus nerve stimulation: Investigation of the percentage of activated axons using different stimulation patterns*"; Vortrag: International Workshop on Vagus Nerve Stimulation within EU COST Action BM1309: European network for innovative uses of EMFs in biomedical applications (EMF-MED), Warschau; 14.02.2017 - 16.02.2017; in: "*Abstract of the International Workshop on Vagus Nerve Stimulation within EU COST Action BM1309: European network for innovative uses of EMFs in biomedical applications (EMF-MED)*", (2017), S. 1 - 2.
29. F. Thürk, D. Mudrak, S. Kampusch, S. Böhme, H. Prosch, E. Kaniusas: "*Electrical impedance tomography image explorer*"; Poster: Proceedings of the 18th International Conference on Biomedical Applications of Electrical Impedance Tomography, New Hampshire, USA; 21.06.2017 - 24.06.2017; in: "*Proceedings of the 18th International Conference on Biomedical Applications of Electrical Impedance Tomography*", (2017), S. 70.

TALKS AND POSTER PRESENTATIONS (WITHOUT PROCEEDINGS-ENTRY)

1. D. But, N. Dyakonova, D. Coquillat, A. Gutin, M. Sakhno, M. Shur, F. Sizov, W. Knap: "*THz and Sub-THz Frequency Range Detector based on Field Effect Transistors*"; Vortrag: 5th Workshop of the Radio Frequency Engineering Working Group of the Austrian Research Association (ARGE-HFT), Wien; 28.09.2017 - 29.09.2017.
2. M. Feiginov: "*THz resonant-tunneling diodes*"; Vortrag: 5th Workshop of the Radio Frequency Engineering Working Group of the Austrian Research Association (ARGE-HFT), Wien (eingeladen); 28.09.2017 - 29.09.2017
3. M. Feiginov: "*THz resonant-tunneling diodes*"; Vortrag: Russia-Japan-USA-Europe Symposium on Fundamental & Applied Problems of Terahertz Devices & Technologies (RJUSE TeraTech-2017), Troy, NY, USA (eingeladen); 01.10.2017 - 05.10.2017.
4. M. Feiginov: "*THz resonant-tunnelling diodes*"; Vortrag: 2nd ITN CELTA Summer School 2017 and 27th International Travelling Summer School on Microwaves and Lightwaves, Stockholm, Schweden (eingeladen); 08.07.2017 - 14.07.2017.
5. F. Galler, S. Hinteregger, H. Arthaber: "*Verification of Time of Flight Based Ranging for Backscatter RFID tags*"; Vortrag: 5th Workshop of the Radio Frequency Engineering Working Group of the Austrian Research Association (ARGE-HFT), Wien; 28.09.2017 - 29.09.2017.
6. R. Gomolka, S. Kampusch, E. Kaniusas, F. Thürk, J. Szeles, W. Klonowski: "*Higuchi fractal dimension of heart rate variability during percutaneous auricular VNS in healthy and diabetic subjects*"; Vortrag: COST EMF-MED European network for innovative uses of EMFs in biomedical applications, Workshop: Follow-up on developments in Vagus Nerve Electrostimulation, Wien; 26.10.2017 - 27.10.2017.
7. S. Kampusch, R. Gines, F. Panetsos, H. Le Van, F. Thürk, J. Szeles, E. Kaniusas: "*The reflex action of auricular vagus nerve stimulation on the rhythm of the heart in mice*";

- Poster: International Neuromodulation Society 13th World Congress, Edinburgh, Scotland; 27.05.2017 - 01.06.2017.
8. S. Kampusch, J. Szeles, E. Kaniusas: "*Vagusstimulation - ein neuer Ansatz in der personalisierten Medizin*"; Vortrag: Millesi Akademie, Forum Private Medizin, Wiener Privatklinik, Wien (eingeladen); 20.05.2017.
 9. S. Kampusch, J. Szeles, S. Lechner, E. Kaniusas: "*Szelestim GmbH - the innovation in pain treatment*"; Vortrag: COST EMF-MED European network for innovative uses of EMFs in biomedical applications, Workshop: Follow-up on developments in Vagus Nerve Electrostimulation, Wien; 26.10.2017 - 27.10.2017.
 10. E. Kaniusas: "*Theory and numerical experiments on nerve blockage*"; Vortrag: COST EMF-MED European network for innovative uses of EMFs in biomedical applications, Workshop: Follow-up on developments in Vagus Nerve Electrostimulation, Wien; 26.10.2017 - 27.10.2017.
 11. E. Kaniusas, S. Kampusch, J. Szeles: "*Auricular vagus nerve stimulation: from biophysics to research lines*"; Vortrag: Millesi Akademie, Forum Private Medizin, Wiener Privatklinik, Wien (eingeladen); 20.05.2017.
 12. E. Kaniusas, S. Kampusch, F. Thürk: "*Hypoxie and biosignals: from origin to theory to live-experiment*"; Vortrag: Wiener Anästhesietage 2017, Wien (eingeladen); 30.03.2017 - 01.04.2017.
 13. M. Mitrovic, M. Hofbauer, K. Schneider-Hornstein, B. Goll, K.O. Voss, H. Zimmermann: "*Evidence of Pulse Quenching in AND gates in 65 nm Bulk CMOS by Experimental Probing of Full Single-Event Transient Waveforms*"; Poster: IEEE Nuclear and Space Radiation Effects Conference, New Orleans, Louisiana; 17.07.2017 - 21.07.2017.
 14. H. Pfützner, G. Shilyashki: "*True magnetic energy losses from optimized single sheet testing*"; Vortrag: 23rd Soft Magnetic Materials Conference, Sevilla; 10.09.2017 - 13.09.2017.
 15. A. Samoudi, S. Kampusch, E. Tanghe, J. Szeles, L. Martens, E. Kaniusas, W. Joseph: "*Percutaneous Auricular Vagus Nerve Stimulation: Sensitivity Assessment of the Numerical Model*"; Vortrag: COST EMF-MED European network for innovative uses of EMFs in biomedical applications, Workshop: Follow-up on developments in Vagus Nerve Electrostimulation, Wien; 26.10.2017 - 27.10.2017.
 16. G. Shilyashki, H. Pfützner, E. Gerstbauer, G. Trenner, A. Windischhofer: "*3D Flux distribution of Epstein Frame Tester*"; Poster: 23rd Soft Magnetic Materials Conference, Sevilla; 10.09.2017 - 13.09.2017.
 17. G. Varoneckas, E. Kaniusas, J. Szeles: "*Advanced noninvasive electrical stimulation of nervus vagus for insomnia and depression treatment*"; Vortrag: COST EMF-MED European network for innovative uses of EMFs in biomedical applications, Workshop: Follow-up on developments in Vagus Nerve Electrostimulation, Wien; 26.10.2017 - 27.10.2017.
 18. K. Zimmermann, A. Fernbach, F. Galler, J. L. Du, H. Kaindl, H. Drobits, P. Kersch: "*IKT der Zukunft - eine Leistungs(vor)schau*"; Vortrag: forum IoT 2017, Wien; 28.11.2017.

SCIENTIFIC REPORTS

1. S. Kampusch, E Unger, J. Bernardi, K. Whitmore, J. Szeles, M. Pohl, G. Stehlik, A. Birsak, S. Lechner, E. Kaniusas: "*Untersuchung der Degradation von Nadelelektroden Ti/Au*"; Bericht für Technische Universität Wien, Österreich; 2017.