IEEE International Microwave Biomedical Conference IEEE-IMBioC

2018

JUNE 14-15, 2018
PENNSYLVANIA CONVENTION CENTER
PHILADELPHIA, USA
www.imbioc-ieee.org

IEEE MTT-S EMB APS

IMBioC 2018 Chairs' Welcome Messages

Welcome to Philadelphia, famous as the birthplace of life, liberty and the pursuit of happiness!

It is my great pleasure to invite you to the 2018 International Microwave Biomedical Conference (IMBioC). IMBioC will be held on June 14 – 15, 2018 at the Pennsylvania Convention Center, Philadelphia. This event is an international forum for the exchange of ideas and information on state-of-the-art research in microwave and RF theory and techniques applied to biological systems and medical applications. This conference is an ideal forum for sharing new ideas on emerging techniques and applications that will enhance the understanding of life science and benefit human wellbeing.

This year, IMBioC is part of the Microwave Week 2018, in parallel and collocated with the International Microwave Symposium (IMS), Radio Frequency Integrated Circuits (RFIC) Symposium and Automatic Radio Frequency Techniques Group (ARFTG) Conference. With the IMS2018 theme of "Microwaves, Medicine, Mobility", researchers, engineers, technologists, practitioners and clinicians from academia and industry have opportunities to create cross-discipline ideas and innovation.

IMBioC 2018 features two keynote speakers. Dr. Nicholas J. Ruggiero II, MD, who serves as the Director of Structural Heart Disease and Non-coronary Interventions at the Thomas Jefferson University, will present a speech titled "Renal Denervation for Uncontrolled Hypertension: Complexity After Symplicity" on June 14. Professor Chung-Kang Peng, who is the Director of the Center for Dynamical Biomarkers at Beth Israel Deaconess Medical Center and Harvard Medical School (BIDMC/HMS) and leads a team called Dynamical Biomarkers Group (DBG) of physicians, scientists and engineers for the Qualcomm Tricorder XPRIZE project, will discuss the topic "Is There a Fundamental Law of Health and Disease?" in his speech on June 15.

2018 IMBioC also features ten invited international speakers including Drs. Dietmar Kissinger, Greg Bridges, Gianluca Lazzi, John Volakis, Katia Grenier, Micaela Liberti, Robert Caverly, Yongxin Guo, Tzyy-Sheng Jason Horng and Christian Damm who will present their state-of-the-art research works. 44 and 24 original research papers will be presented in the 12 oral sessions and the interactive forum. The papers in IMBioC are rigorously peer-reviewed and archived in the IEEE Xplore digital library. Twelve outstanding students will participate in the Student Paper Competition in which they will be judged not only by their manuscripts but also their oral presentation during the interactive forum and a formal 2-minute elevator speech session.

IMBioC welcomes all attendees to join us at the Opening Session, held jointly with the Closing Session of IMS 2018, in the Grand Ballroom, Pennsylvania Convention Center on June 14 at 3:30-5:30 PM. A welcome reception follows the opening session. IMBioC and IMS also jointly organize the Women In Microwaves Panel Session and Network Event at Philadelphia Academy of the Fine Arts, from 7 to 9 PM on June 14. The event features Dr. Caterina Merla's speech "Working at the frontier of engineer and biology: focus on linear and non-linear optical microspectroscopy to understand electropulsation mechanisms on cells."

IMBioC is financially sponsored by IEEE MTT-S (Microwave Theory and Techniques Society) and technically sponsored by IEEE MTT-S, AP-S (Antenna and Propagation Society) and EMBS (Engineering in Medicine and Biology Society). Many committee members and reviewers are from different societies of IEEE. We also appreciate the financial support by sponsors and exhibitors including Statek Corp., Creo Medical, Cicor Group, Keysight Technologies, Kyocera, CST, Simulia, LitePoint, National Instruments, ZMT Zurich MedTech AG, SONNETS Software, Vishay Intertechnology, Huber+Suhner and Springer.

IMBioC welcomes you to participate in the multidisciplinary conversation in order to accelerate technologies advancing healthcare and benefiting humanity. We sincerely thank all the committee members for volunteering and working hard to organize the conference and for the strong support from IMS.

We look forward to seeing you in Philadelphia.

Sincerely
J.-C. Chiao and Arye Rosen

IMBioC Steering Committee:

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Technical Program Committee Co- Chairs	John Volakis
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	Steven Wright
Finance Chair	Xun Gong
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	Jenshan Lin
	James Hwang
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	Jessi Johnson
	Eric Zhao
	Xu Meng
Local Arrangement Co-Chairs	Robert Caverly
	Mohammad Tofighi
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	Kateryna Arkhypova
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	Oren Eliezer
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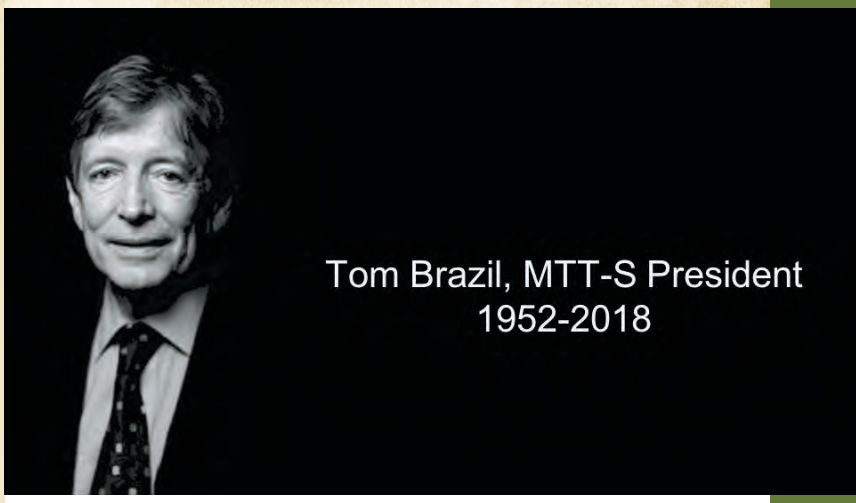
	Amin Abbosh



Tribute to Professor Thomas J. Brazil, one of the main founders of the IMBioC conference

Professor Thomas J. Brazil is one of the founders of the IEEE International Microwave Bio Conference (IMBioC) and was a member of its Executive Committee.

He received the PhD degree in 1977 from the National University of Ireland. Since 1980, he served as Professor and Head of Electronic Engineering at University College Dublin. His research interests included non-linear modelling and characterization techniques at the device, circuit and system level within high frequency electronics.

Professor Brazil was a remarkable researcher, who brought and shared science at the highest. He was appointed as Microwave Distinguished Lecturer in Microwave CAD for the term 1999-2003. He was elected a Fellow of the IEEE in 2003 and served as Secretary of the Royal Irish Academy (RIA) from 2009 to 2013. In 2010, he became a member of the IEEE Microwave Theory and Techniques Society (MTT-S) Administrative Committee. He was elected President of the IEEE MTT-S in 2016 and took the office from January 2018.

As the Chair of the MTT-S Meetings and Symposia Committee, Professor Brazil actively promoted the foundation of a new, annual and international conference gathering wireless and microwave engineering developments for biological and medical applications. He therefore sustained the merging of the two former IEEE Topical Conference on Biomedical Wireless Technologies, Networks, and Sensing Systems (BioWireleSS) and the International Microwave Workshop Series on RF and Wireless Technologies for Biomedical and Healthcare Applications (IMWS-Bio), leading to the International Microwave Biomedical Conference with alternating worldwide venues. The first IMBioC edition was held in 2017 in Göteborg, Sweden, followed in 2018 by the exciting event in Philadelphia, USA, as part of the International Microwave Week; and in May 2019 at Nanjing, China.

On behalf of the IMBioC executive committee and IMBIoC community, we would like to particularly acknowledge Professor Thomas J. Brazil for his dedication and his remarkable support to the IMBioC. He relentlessly participated to strengthen the opening of the MTT-S community to biology and medicine, making IMBioC a reality of an international and lively forum to researchers in engineering and medicine. We will keep a particular place in our heart for our nicest friend Tom, this brilliant scientist and open-minded leader.

Katia Grenier and J.-C. Chiao,
members of the Executive Committee of IMBioC

IMBioC Opening Session

15:30 – 17:30 | **Thursday, 14 June 2018** | Pennsylvania Convention Center, Grand Ballroom

"Renal Denervation for Uncontrolled Hypertension: Complexity After Symplicity"

Dr. Nicholas J. Ruggiero II, MD, Thomas Jefferson University

ABSTRACT:

Renal denervation for uncontrolled hypertension demonstrated in many early trials to be extremely successful. These trials accounted for widespread implementation of the procedure in Europe and a change in the ESC management guidelines. The large, randomized, pivotal US trial, Symplicity HTN 3, unfortunately showed no benefit in comparison to optimal medical therapy. These results bridaled enthusiasm for this technology and accounted for many companies to desert the premise altogether. Fortunately, those who believe in the procedure are pressing forward and multiple new trials which are currently enrolling will ultimately determine the future of renal denervation. In the lecture, he will discuss the mechanism of action of renal denervation and early trial data for the Symplicity HTN 3. He will also give insight for new studies and data as well as alternative options besides RF ablation.

IMBioC Opening Reception

17:30–18:30 | Pennsylvania Convention Center, Grand Hall

A one-hour opening reception will be held in the Grand Hall of the Pennsylvania Convention Center, in parallel to the IMS Closing Reception. Attendees will have an opportunity to network.

IMBioC Plenary Session

10:00 – 10:40 | **Friday, 15 June 2018** | 201A

"Is There a Fundamental Law of Health and Disease?"

Dr. Chung-Kang Peng, *Beth Israel Deaconess Medical Center/ Harvard Medical School (BIDMC/HMS)*

ABSTRACT:

In recent years, technologies enable us to collect overwhelming amount of signals about our patients. As a result, it becomes possible to quantify health and disease of human body from an integrative system viewpoint. However, conventional biomedical research tools that have been developed with reductionist theory may not be appropriate, mainly because these tools typically focus on individual components of the whole system, while ignoring important nonlinear interactions among different components of the system. In this talk, I will discuss a general framework to study physiologic dynamics. With this framework, we can derive useful measures that best reflect the emergent properties of the integrative systems, and to identify system-level properties that are critical to our understanding of a healthy system and its pathological perturbations. This new approach has a wide range of biomedical applications that will also be discussed in this talk.

IMBioC Technical Sessions

08:00 – 09:30 | **Friday, 15 June 2018** | Pennsylvania Convention Center

201A

FR1A: Transistor-Level Biosensor Techniques

Chair: Christian Damm, *Universität Ulm*
Co-Chair: Simon Hemour, *IMS (UMR 5218)*

FR1A-1: (Invited) Integrated Millimeter-Wave and THz Analyzer Platforms for Miniature Biosensors

Dietmar Kissinger, *IHP, Germany*

FR1A-2: A Compact Energy Efficient CMOS Permittivity Sensor Based on Multiharmonic Downconversion and Tunable Impedance Bridge

G. Vlachogiannakis, Z. Hu, H. Thippur Shivamurthy, A. Neto, M.A.P. Pertijs, L.C.N. de Vreede, M. Spirito, *Technische Universiteit Delft, The Netherlands*

FR1A-3: Homodyne and Heterodyne Terahertz Dielectric Sensors: Prototyping and Comparison in BiCMOS Technology for Lab-on-Chip Applications

Defu Wang, *IHP, Germany*; Klaus Schmalz, *IHP, Germany*; Mohamed Hussein Eissa, *IHP, Germany*; Johannes Borngräber, *IHP, Germany*; Maciej Kucharski, *IHP, Germany*; Mohamed Elkhouly, *Robert Bosch, Germany;* Minsu Ko, *IHP, Germany*; Yong Wang, *IHP, Germany*; H.J. Ng, *IHP, Germany*; Jongwon Yun, *IHP, Germany*; Bernd Tillack, *IHP, Germany*; Dietmar Kissinger, *IHP, Germany*

FR1A-4: Towards High-Transconductance Graphene High-Speed Biosensors

W. Wei, *IEMN (UMR 8520), France;* S. Mhedbhi, *IEMN (UMR 8520), France;* P. Tilmant, *IEMN (UMR 8520), France;* H. Happy, *IEMN (UMR 8520), France;* E. Pallecchi, *IEMN (UMR 8520), France*

201B

FR1B: Neuroimplants and Miniaturized Devices

Chair: Ifana Mahbub, *University of North Texas*
Co-Chair: Yong Xin Guo, *National University of Singapore*

FR1B-1: (Invited) Multiscale Modeling and Electroneural Interfaces for Neuroimplants: from a Retinal Prosthesis to Restore Vision to the Blind to a Hippocampus Implant for Memory Restoration

Gianluca Lazzi, *University of Southern California, USA*

FR1B-2: A Ka-Band Beamformer for Wireless Power Transfer to Body Area Networks

Nicholas D. Saiz, *Stanford University, USA;* Gabriel Buckmaster, *Stanford University, USA;* Thomas H. Lee, Stanford University, *USA*

FR1B-3: NEMS Magnetoelectric Antennas for Biomedical Application

Hwaider Lin, *Northeastern University, USA;* Mohsen Zaeimbashi, *Northeastern University, USA;* Neville Sun, *Northeastern University, USA;* Xianfeng Liang, *Northeastern University, USA;* Huaihao Chen, *Northeastern University, USA;* Cunzheng Dong, *Northeastern University, USA;* Alexei Matyushov, *Northeastern University, USA;* Xinjun Wang, *Northeastern University, USA;* Yingxue Guo, *Northeastern University, USA;* Yuan Gao, *Northeastern University, USA;* Nian X. Sun, *Northeastern University, USA*

FR1B-4: UHF RFID Sensor Tag Antenna Concept for Stable and Distance Independent Remote Monitoring

Lukas Görtschacher, *Technische Universität Graz, Austria*; Wolfgang Bösch, *Technische Universität Graz, Austria*; Jasmin Grosinger, *Technische Universität Graz, Austria*

201C

FR1C: Bio-Tissue and Cell Modelling

Chair: James Hwang, *Lehigh University*
Co-Chair: Pai-Yen Chen, *Wayne State University*

FR1C-1: (Invited) Shared Knowledge, Gaps and Challenges of Microdosimetry: Realistic Models of Cells and Endoplasmic Reticulum

A. Denzi, *Università di Roma La Sapienza, Italy;* C. Merla, *ENEA, Italy*; F.M. Andre, *VAT (UMR 8203), France;* T. Garcia-Sanchez, *VAT (UMR 8203), France;* L.M. Mir, *VAT (UMR 8203), France;* F. Apollonio, *Università di Roma La Sapienza, Italy;* M. Liberti, *Università di Roma La Sapienza, Italy*

FR1C-2: Development of a Tissue Dielectric Properties Model Based on Maxwell-Fricke Mixture Theory

Sevde Etoz, *University of Wisconsin-Madison, USA;* William Greisch, *University of Wisconsin-Madison, USA;* Christopher L. Brace, *University of Wisconsin-Madison, USA*

FR1C-3: Reproducibility Evaluation of Composite Dielectric Materials Based on an Error Propagation Model

Birk Hattenhorst, *Ruhr-Universität Bochum, Germany*; Christoph Baer, *Ruhr-Universität Bochum, Germany*; Thomas Musch, *Ruhr-Universität Bochum, Germany*

FR1C-4: Molecular Dynamics Simulations in Service of Microwave Dielectric Analysis of Biomolecules

M. Cifra, *Czech Academy of Sciences, Czech Republic*; J. Pr__a, *Czech Academy of Sciences, Czech Republic*; D. Havelka, *Czech Academy of Sciences, Czech Republic*; O. Krivosudsk_, *Czech Academy of Sciences, Czech Republic*

08:00 – 08:30

08:30 – 08:50

08:50 – 09:10

09:10 – 09:30

IMBioC Interactive Forum

09:30 – 10:00 & 15:10 – 15:40 | **Friday, 15 June 2018** | Pennsylvania Convention Center, Room 204B

FRIF1: Interactive Forum

Chair: Hung Cao, University of Washington

FRIF1-1: Accuracy Enhancement of Doppler Radar-Based Heartbeat Rate Detection Using Chest-Wall Acceleration

Mehrdad Nosrati, *Stevens Institute of Technology, USA;* Negar Tavassolian, *Stevens Institute of Technology, USA*

FRIF1-2: A Novel Millimeter Wave Radar Sensor for Medical Signal Detection

Salam Benchikh, *INRS-EMT, Canada*; Homa Arab, *INRS-EMT, Canada*; Serioja Ovidiu Tatu, *INRS-EMT, Canada*

FRIF1-3: Robust Radar-Based Human Motion Recognition with L1-Norm Linear Discriminant Analysis

Panos P. Markopoulos, *Rochester Institute of Technology, USA;* Fauzia Ahmad, *Temple University, USA*

FRIF1-4: A Novel Miniature Tissue Resection Device with Moveable Jaws that Combines 400KHz and 5.8GHz Energy for Cutting and Coagulation

Louis A. Turner, *Bangor University, UK*; Patrick Burn, *Bangor University, UK*; James E. Coad, *West Virginia University School of Medicine, USA;* Chris Hancock, *Bangor University, UK*

FRIF1-5: Feasibility Study of Applying Ferromagnetic Contrast Agents in Thermoacoustic Imaging

Dajun Zhang, *ShanghaiTech University, China*; Xiong Wang, *ShanghaiTech University, China*

FRIF1-6: Total Variation Constrained Sparse Image Reconstruction of Multiple Stationary Human Targets Behind Walls

Qiang An, *Fourth Military Medical University, China*; Jianqi Wang, *Fourth Military Medical University, China*; *Ahmad Hoorfar, Villanova University, USA*

FRIF1-7: Acoustic Transmission of Biomedical Data via the Intercommunication System of an MRI

Viktoria Kalpen, *Universität Innsbruck, Austria;* Fabian Eichin, *Universität Innsbruck, Austria;* Thomas Ussmueller, *Universität Innsbruck, Austria*

FRIF1-8: Real-Time Evaluation of Heart Rate and Heart Rate Variability Using Microwave Reflectometry

Atsushi Mase, *Kyushu University, Japan;* Yuichiro Kogi, *Fukuoka Institute of Technology, Japan*; Toru Maruyama, *Kyushu University, Japan*

FRIF1-9: Miniaturized Wireless Power Transfer Module Design for Brain Optoelectronic Implant

D.K. Biswas, *University of North Texas, USA;* N.T. Tasneem, *University of North Texas, USA;* J. Hyde, *University of North Texas, USA;* M. Sinclair, *University of North Texas, USA;* I. Mahbub, *University of North Texas, USA*

FRIF1-10: Improving the Efficiency of Magnetic Induction-Based Wireless Body Area Network (WBAN)

Negar Golestani, *University of Southern California, USA;* Mahta Moghaddam, *University of Southern California, USA*

FRIF1-11: Numerical Evaluation of Sensitivity of Microwave Metamaterial and Microstrip TL Sensors to Blood Glucose Concentration

Jan Vrba, *ELEDIA@CTU, Czech Republic*; David Vrba, *ELEDIA@CTU, Czech Republic*; Luis Díaz, *ELEDIA@CTU, Czech Republic*; Ondrej Fiser, ELEDIA@CTU, Czech Republic

RIF1-12: Inductive Ear-to-Ear Communication Systems: Coupling Enhancement by Means of Constructional Coil Features

Jan-Christoph Edelmann, *Universität Innsbruck, Austria;* S. Bergmueller, *Universität Innsbruck, Austria;* D. Mair, *Universität Innsbruck, Austria;* Gilbert Prokop, *Universität Innsbruck, Austria;* Thomas Ussmueller, *Universität Innsbruck, Austria*

FFRIF1-13: X-Band Microwave Radiation Induced Biological Effects in Rats Skin: Plausible Role of Heat Shock Proteins

Saurabh Verma, *DRDO, India*; Gaurav K. Keshri, *DRDO, India*; Manish Sharma, *DRDO, India*; Kumar V. Mani, *DRDO, India*; Santanu Karmakar, *DRDO, India*; Satish Chauhan, *DRDO, India*; Asheesh Gupta, *DRDO, India*

FRIF1-14: Characterization of Microwave Dicke Radiometer for Non-Invasive Tissue Thermometry

Sathya Priya Sugumar, *IIT Madras, India*; C.V. Krishnamurthy, *IIT Madras, India*; Kavitha Arunachalam, *IIT Madras, India*

FRIF1-15: A Highly Sensitive RF Biosensor Based on Splitter/Combiner Configuration for Single-Cell Characterization

Abdulrahman Alghamdi, *Purdue University, USA;* Saeed Mohammadi, *Purdue University, USA*

FRIF1-16: Predicting Nonthermal Electroporation of Intervertebral Disc Tissue

Steven Schwartz, *Rowan University, USA;* Gary L. Thompson, *Rowan University, USA*

FRIF1-17: Simulation of Electroporation in Cell Using Bipolar AC Pulse

Hao Qiu, *Fort Valley State University, USA;* Xianping Wang, *Southeast Missouri State University, USA;* Wenbing Zhao, *Cleveland State University, USA*

FRIF1-18: Correlation Between Dielectric Properties and Women Age for Breast Cancer Detection at 30GHz

S. Di Meo, G. Matrone, P.F. Espin-Lopez, A. Martellosio, M. Pasian, M. Bozzi, L. Perregrini, A. Mazzanti, *Italy*; F. Svelto, *Università di Pavia, Italy*; P.E. Summers, *Istituto Europeo di Oncologia, Italy*; G. Renne, *Istituto Europeo di Oncologia, Italy*; L. Preda, *Università di Pavia, Italy* M. Bellomi, *Istituto Europeo di Oncologia, Italy*

FRIF1-19: Preliminary Measurements of Magnetic Nanoparticles as Potential Biomarkers for Impedance Flow Cytometry

Pawe_ Barmuta, *Katholieke Universiteit Leuven, Belgium*; Izabela Kami_ska, *Polish Academy of Sciences, Poland*; Juncheng Bao, *Katholieke Universiteit Leuven, Belgium*; Tomislav Markovi_, *Katholieke Universiteit Leuven, Belgium*; Bo_ena Sikora, *Polish Academy of Sciences, Poland*; Krzysztof Fronc, *Polish Academy of Sciences, Poland*; Dominique Schreurs, *Katholieke Universiteit Leuven, Belgium*; Ilja Ocket, *Katholieke Universiteit Leuven, Belgium*

FRIF1-20: Spurious Material Detection on Functionalized Thin-Film Sensors Using Multiresonant Split-Rings

Mario Mueh, *Technische Universität Darmstadt, Germany*; Christian Damm, *Universität Ulm, Germany*

FRIF1-21: Real-Time Microscopic Observation of Biological Interactions with Microwave Fields

C.F. Williams, *Cardiff University, UK*; J. Lees, *Cardiff University, UK*; D. Lloyd, *Cardiff University, UK*; G.M. Geroni, *Cardiff University, UK*; S. Jones, *Cardiff University, UK*; S. Ambala, *Cardiff University, UK*; W. Baradat, *Cardiff University, UK*; G. Comat, *Cardiff University, UK*; A. Aboubakary, *Cardiff University, UK*; S. Voisin, *Cardiff University, UK*; Adrian Porch, *Cardiff University, UK*

FRIF1-22: Numerical Study of Pore Density Distribution and Pore Formation Energy

Hao Qiu, *Fort Valley State University, USA;* Xianping Wang, *Southeast Missouri State University, USA;* Ravindra Joshi, *Texas Tech University, USA;* Wenbing Zhao, *Cleveland State University, USA*

FRIF1-23: NanoNeuroRFID: A Low Loss Brain Implantable Device Based on Magnetoelectric Antenna

Mohsen Zaeimbashi, *Northeastern University, USA;* Hwaider Lin, *Northeastern University, USA;* Zhiguang Wang, *Northeastern University, USA;* Huaihao Chen, *Northeastern University, USA;* Shadi Emam, *Northeastern University, USA;* Yuan Gao, *Northeastern University, USA;* Nian X. Sun, *Northeastern University, USA*

FRIF1-24: Power Budget and Reconstruction Algorithms for Through the Wall Radar Imaging System

S. Pisa, *Università di Roma La Sapienza, Italy;* E. Piuzzi, *Università di Roma La Sapienza*, Italy; E. Pittella, *Università di Roma La Sapienza, Italy;* P. D'Atanasio, *Università di Roma La Sapienza, Italy;* A. Zambotti, *Università di Roma La Sapienza, Italy;* G. Sacco, *Università di Roma La Sapienza, Italy*

IMBioC Technical Sessions

10:50 – 12:20 | **Friday, 15 June 2018** | Pennsylvania Convention Center

201A

FR2A: Microwave Imaging and MRI

Chair: Abbas Omar, *Universität Magdeburg*
Co-Chair: Xudong Chen, *National University of Singapore*

FR2A-1: (Invited) Recent Advances in RF Aspects of Magnetic Resonance Imaging

Robert Caverly, *Villanova University, USA*

FR2A-2: Real-Time Microwave Imaging of Breast Phantoms with Constrained Deconvolution of Planar Data

D. Tajik, *McMaster University, Canada;* F. Foroutan, *McMaster University, Canada;* D.S. Shumakov, *Health Canada, Canada*; A.D. Pitcher, *McMaster University, Canada;* E.A. Eveleigh, *McMaster University, Canada;* N.K. Nikolova, *McMaster University, Canada*

FR2A-3: A Fast Algorithm for Microwave Biomedical Imaging with Inhomogeneous Background

Kuiwen Xu, *Hangzhou Dianzi University, China;* Yu Zhong, *A*STAR, Singapore*; Xudong Chen, *National University of Singapore, Singapore*

FR2A-4: Realization of Breast Tissue-Mimicking Phantom Materials: Dielectric Characterization in the 0.5–50GHz Frequency Range

S. Di Meo, *Università di Pavia, Italy*; L. Pasotti, *Università di Pavia, Italy*; M. Pasian, *Università di Pavia, Italy*; G. Matrone, *Università di Pavia, Italy*

201B

FR2B: Microwave and Antennas for Wireless Power and Wearables

Chair: Aydin Farajidavar, *New York Institute of Technology*
Co-Chair: Simon Hemour, *IMS (UMR 5218)*

FR2B-1: (Invited) RF in Medicine: Current Status and Future Directions of Antennas and Wireless Power

Yongxin Guo, *National University of Singapore, Singapore*

FR2B-2: Evaluating the Microwave Performance of Epidermal Electronics with Equivalent Transmission Line Modeling

Tammy Chang, *Stanford University, USA;* Jonathan A. Fan, *Stanford University, USA;* Thomas H. Lee, *Stanford University, USA*

FR2B-3: High Efficiency Wireless Power Transfer System Using Spiral DGS Resonators Through Biological Tissues

Sumin Chalise, *Kyushu University, Japan;* F. Tahar, *Kyushu University, Japan;* M.R. Saad, *Kyushu University, Japan;* A. Baraket, *Kyushu University, Japan;* Kuniaki Yoshitomi, *Kyushu University, Japan;* R.K. Pokharel, *Kyushu University, Japan*

FR2B-4: High-Q Implantable Resonator for Wireless Power Delivery

L. Di Trocchio, *IMS (UMR 5218), France;* J.-L. Lachaud, *IMS (UMR 5218), France;* C. Dejous, *IMS (UMR 5218), France;* A. Kuhn, *ISM (UMR 5255), France;* S. Hemour, *IMS (UMR 5218), France*

201C

FR2C: Biosensors

Chair: Arnaud Pothier, *XLIM (UMR 7252)*
Co-Chair: Pingshan Wang, *Clemson University*

FR2C-1: (Invited) Biosensors for Measuring the Dielectric Response of Single Cells to Applied Stress

Gregory Bridges, *University of Manitoba, Canada*

FR2C-2: A Four-Layer Phantom for Testing in-vitro Microwave-Based Sensing Approach in Intra-Cranial Pressure Monitoring

Jacob Velander, *Uppsala University, Sweden*; Syaiful Redzwan, *Uppsala University, Sweden*; Mauricio D. Perez, *Uppsala University, Sweden*; Noor Badariah Asan, *Uppsala University, Sweden*; Daniel Nowinski, *Uppsala University Hospital, Sweden*; Anders Lewén, *Uppsala University Hospital, Sweden*; Per Enblad, *Uppsala University Hospital, Sweden*; Robin Augustine, *Uppsala University, Sweden*

FR2C-3: Microwave Noninvasive Blood Glucose Monitoring Sensor: Penetration Depth and Sensitivity Analysis

Heungjae Choi, *Cardiff University, UK*; Steve Luzio, *Swansea University, UK*; Jan Beutler, *Université du Luxembourg, Luxembourg*; Adrian Porch, *Cardiff University, UK*

FR2C-4: Microwave Sensing Based on Peelable Microfluidic Thin Film Resonator

Rong Wang, *University of Hong Kong, China*; Li Jun Jiang, *University of Hong Kong, China*

10:50 – 11:20

11:20 – 11:40

11:40 – 12:00

12:00 – 12:20

12:20 – 13:20

200-level Meeting Room Foyer

Lunch. Lunch boxes are for paid attendees at the Foyer.

12:40 – 13:10

201A

Student Paper Competition 2-Minute elevator pitch session.

IMBioC Technical Sessions

13:20 – 15:10 | **Friday, 15 June 2018** | Pennsylvania Convention Center

201A

FR3A: Biomedical Radar

Chair: José-María Muñoz-Ferreras, *Universidad de Alcalá*
Co-Chair: Negar Tavassolian, *Stevens Institute of Technology*

13:20 – 13:50

FR3A-1: (Invited) Biomedical Radars Using Self-Injection-Locking Technology

T.-S. Jason Horng, *National Sun Yat-Sen University, Taiwan*

13:50 – 14:10

FR3A-2: Multi-Target Vital-Signs Monitoring Using a Dual-Beam Hybrid Doppler Radar

Mehrdad Nosrati, *Stevens Institute of Technology, USA;* Shahram Shahsavari, *New York University, USA;* Negar Tavassolian, *Stevens Institute of Technology, USA*

14:10 – 14:30

FR3A-3: Noise Tolerable Vital Sign Detection Using Phase Accumulated Demodulation for FMCW Radar System

Wei-Fang Chang, *National Cheng Kung University, Taiwan;* Kuan-Wei Chen, *National Cheng Kung University, Taiwan;* Chin-Lung Yang, *National Cheng Kung University, Taiwan*

14:30 – 14:50

FR3A-4: Monitoring of Healing Progression of Cranial Vault Using One-Dimensional Pulsed Radar Technique

Doojin Lee, *University of Waterloo, Canada*; George Shaker, *University of Waterloo, Canada*; Daniel Nowinski, *Uppsala University Hospital, Sweden*; Robin Augustine, *Uppsala University, Sweden*

14:50 – 15:10

FR3A-5: A Supervised Learning Approach for Real Time Vital Sign Radar Harmonics Cancellation

Justin J. Saluja, *University of Florida, USA;* Jenshan Lin, *University of Florida, USA;* Joaquin Casanova, *University of Florida, USA*

201B

FR3B: Wireless Implantable Monitoring Systems

Chair: Roberto Gómez-García, *Universidad de Alcalá*
Co-Chair: Hong Hong, *Nanjing University of Science and Technology*

FR3B-1: (Invited) Multi-Channel Wireless and Battery-Less Brain Signal Monitoring System

John Volakis, *Florida International University, USA*

FR3B-2: Ultrasonic Energy Harvesting Scheme for Implantable Active Stent

Sayemul Islam, *Temple University, USA;* Albert Kim, *Temple University, USA*

FR3B-3: Initial in-vitro Trial for Intra-Cranial Pressure Monitoring Using Subdermal Proximity-Coupled Split-Ring Resonator

Syaiful Redzwan, Jacob Velander, Mauricio D. Perez, Noor Badariah Asan, Robin Augustine, *Uppsala University, Sweden*; Mina Rajabi, Frank Niklaus, *KTH, Sweden*; Daniel Nowinski, Anders Lewén, Per Enblad, *Uppsala University Hospital, Sweden*

FR3B-4: Low-Impedance Probes for Wireless Monitoring of Neural Activation

Carolina Moncion, *Florida International University, USA;* Satheesh Bojja-Venkatakrishnan, *Florida International University, USA;* Jorge Riera Diaz, *Florida International University, USA;* John Volakis, Florida International University, *USA*

FR3B-5: Towards a Distributed Multi-Channel System for Studying Gastrointestinal Tract

Rui Bao, *New York Institute of Technology, USA;* Amir Javan-Khoshkholgh, *New York Institute of Technology, USA;* Wahib Alrofati, *New York Institute of Technology, USA;* Aydin Farajidavar, New York Institute of Technology, *USA*

201C

FR3C: Bio-Tissue Characterization I

Chair: Katia Grenier, LAAS
Co-Chair: Natalia Nikolova, *McMaster University*

FR3C-1: (Invited) Low Volume and Label-Free Molecules Characterization and Cell Monitoring with Microwave Dielectric Spectroscopy

K. Grenier, *LAAS, France;* A. Tamra, *LAAS, France;* A. Zedek, *LAAS, France;* G. Poiroux, *LAAS, France;* F. Artis, *LAAS, France;* T. Chen, *LAAS, France;* W. Chen, *LAAS, France;* M. Poupot, *CRCT (UMR 1037), France;* J.-J. Fournié, *CRCT (UMR 1037), France;* D. Dubuc, *LAAS, France*

FR3C-2: A Noninvasive Blood Glucose Measurement by Microwave Dielectric Spectroscopy: Drift Correction Technique

Masahito Nakamura, *NTT, Japan;* Takuro Tajima, *NTT, Japan;* Michiko Seyama, *NTT, Japan;* Kayo Waki, *University of Tokyo, Japan*

FR3C-3: A 60GHz Mixer-Based Reflectometer in 130nm SiGe BiCMOS Technology Toward Dielectric Spectroscopy in Medical Applications

Rahul Kumar Yadav, *IHP, Germany*; Mohamed Hussein Eissa, *IHP, Germany*; Jan Wessel, *IHP, Germany*; Dietmar Kissinger, *IHP, Germany*

FR3C-4: Measurement of Broadband Temperature-Dependent Dielectric Properties of Liver Tissue

Hojjatollah Fallahi, *Kansas State University, USA;* Punit Prakash, *Kansas State University, USA*

FR3C-5: Validation of Clausius-Mossotti Function in Single-Cell Dielectrophoresis

Xiaotian Du, *Lehigh University, USA;* Xiao Ma, *Lehigh University, USA;* Hang Li, *Lehigh University, USA;* Yaqing Ning, *Lehigh University, USA;* Xuanhong Cheng, *Lehigh University, USA;* James C.M. Hwang, *Lehigh University, USA*

IMBioC Technical Sessions

15:40 – 17:30 | **Friday, 15 June 2018** | Pennsylvania Convention Center

201A

FR4A: Pulsed Fields for Biomedical Applications

Chair: Roberto Gómez-García, *Universidad de Alcalá*
Co-Chair: Xiaoguang Liu, *University of California, Davis*

FR4A-1: Miniature Flexible Planar Microwave and RF Energy Delivery Structure for New Endoscopic Procedures — Design and Initial Pre-Clinical Data

Chris Hancock, *Bangor University, UK*; Steve Morris, *Creo Medical, UK*; Zacharias Tsiamoulos, *St. Mark's Hospital, UK;* Brian Saunders, *St. Mark's Hospital, UK*

FR4A-2: Non-Contact Picosecond Pulsed Electric Fields Up Regulate SOX2 Gene Expression in Mesenchymal Stem Cells

Ross A. Petrella, *Old Dominion University, USA;* Peter A. Mollica, *Old Dominion University, USA;* Martina Zamponi, *Old Dominion University, USA;* Shu Xiao, *Old Dominion University, USA;* Robert D. Bruno, *Old Dominion University, USA;* Patrick C. Sachs, *Old Dominion University, USA*

FR4A-3: A Microwave Ablation System for the Visualisation and Treatment of Pulmonary Nodules and Tumours

Shaun C. Preston, *Bangor University, UK*; William Taplin, *Bangor University, UK*; Aeron W. Jones, *Bangor University, UK*; Chris Hancock, *Bangor University, UK*

FR4A-4: Electropermeabilization of Isolated Cancer Stem Cells with a Novel and Versatile Nanosecond Pulse Generator

I.W. Davies, *Bangor University, UK*; C. Merla, *ENEA, Italy*; A. Casciati, *ENEA, Italy*; A. Zambotti, *ENEA, Italy*; J. Bishop, *Creo Medical, UK*; G. Hodgkins, *Creo Medical, UK*; C. Palego, *Bangor University, UK*; Chris Hancock, *Bangor University, UK*

FR4A-5: Flexible Ablation Device with Single Applicator Structure that Supports both Radiofrequency and Microwave Energy Delivery

Patrick Burn, *Bangor University, UK*; Pallav Shah, *Imperial College London, UK*; Chris Hancock, *Bangor University, UK*

201B

FR4B: Biomedical Signal Monitoring and Communication

Chair: Chung-Tse (Michael) Wu, *Rutgers University*
Co-Chair: Hung Cao, *University of Washington*

FR4B-1: Soft Wearable Sensors for Precise Physiological Signals Measurements Based on the Fabric-Substrate Complementary Split-Ring Resonator

Po-Kai Chan, *National Cheng Kung University, Taiwan;* Ta-Chung Chang, *National Cheng Kung University, Taiwan;* Kuan-Wei Chen, *National Cheng Kung University, Taiwan;* Chin-Lung Yang, *National Cheng Kung University, Taiwan*

FR4B-2: Characterization of Passive Wireless Electrocardiogram Acquisition in Adult Zebrafish

Silviu Gruber, *University of Washington, USA;* Tai Le, *University of Washington, USA;* Miguel Huerta, *University of Washington, USA;* Konnor Wilson, *University of Washington, USA;* Jingchun Yang, *Mayo Clinic, USA;* Xiaolei Xu, *Mayo Clinic, USA;* Hung Cao, *University of Washington, USA*

FR4B-3: A Miniature Wireless 64-Channel System for Monitoring Gastrointestinal Activity

Amir Javan-Khoshkholgh, *New York Institute of Technology, USA;* Wahib Alrofati, *New York Institute of Technology, USA;* Zaid Abukhalaf, *New York Institute of Technology, USA;* Ahmed Ibrahim, *Pennsylvania State University, USA;* Mehdi Kiani, *Pennsylvania State University, USA;* Aydin Farajidavar, *New York Institute of Technology, USA*

FR4B-4: Wireless Passive Monitoring of Electrocardiogram in Firefighters

Tai Le, *University of Washington, USA;* Miguel Huerta, *University of Washington, USA;* Alexander Moravec, *University of Washington, USA;* Hung Cao, *University of Washington, USA*

FR4B-5: Bone Conduction: A Feasible Concept for Ear-to-Ear Communication?

Jan-Christoph Edelmann, *Universität Innsbruck, Austria;* Gilbert Prokop, *Universität Innsbruck, Austria;* Thomas Ussmueller, *Universität Innsbruck, Austria*

201C

FR4C: Bio-Tissue Characterization II

Chair: Abbas Omar, *Universität Magdeburg*
Co-Chair: Perry Li, *Abbott Laboratories*

FR4C-1: (Invited) Material Characterization for the Detection of African Trypanosomes Using RNA-Derivatized Surface Layers with mm-Wave and THz Sensors

Mario Mueh, *Technische Universität Darmstadt, Germany*; Robert Knieß, *Technische Universität Darmstadt, Germany*; H. Ulrich Göringer, *Technische Universität Darmstadt, Germany*; Christian Damm, *Universität Ulm, Germany*

FR4C-2: Measuring Ion-Pairing in Buffer Solutions with Microwave Microfluidics

Angela C. Stelson, *NIST, USA;* Charles E. Little, *NIST, USA;* Nathan D. Orloff, *NIST, USA;* Christian J. Long, *NIST, USA;* James C. Booth, *NIST, USA*

FR4C-3: Discrimination of Glioblastoma Cancer Stem Cells by Measuring Their UHF-Dielectrophoresis Crossover Frequency

R. Manczak, C. Dalmay, P. Blondy, A. Pothier, *XLIM (UMR 7252), France;* S. Saada, B. Bessette, G. Begaud, S. Battu, M.O. Jauberteau, F. Lalloue, *HCP (EA 3842), France;* M. Inac, C. Baristiran Kaynak, M. Kaynak, *IHP, Germany*; C. Palego, *Bangor University, UK*;

FR4C-4: Ferromagnetic Resonance Characterization of Magnetic Nanowires for Biolabel Applications

Wen Zhou, *University of Minnesota, USA;* Joseph Um, *University of Minnesota, USA;* Yali Zhang, *University of Minnesota, USA;* Alexander Nelson, *University of Minnesota, USA;* Bethanie Stadler, *University of Minnesota, USA;* Rhonda Franklin, University of Minnesota, *USA*

FR4C-5: Effect of Thickness Inhomogeneity in Fat Tissue on In-Body Microwave Propagation

Noor Badariah Asan, Jacob Velander, Syaiful Redzwan, Mauricio D. Perez, Thiemo Voigt, Robin Augustine, *Uppsala University, Sweden*; Emadeldeen Hassan, *Umeå University, Sweden*; Taco J. Blokhuis, *Maastricht UMC+, The Netherlands*

15:40 - 16:00 | 16:00 - 16:20 | 16:20 - 16:40 | 16:40 - 17:00 | 17:00 - 17:20 | 17:30

Women in Microwaves Networking Event

Women in Engineering: Academia, Defense, Industry and BioTech

19:00 – 21:00 | **Thursday, 14 June 2018** | Philadelphia Academy of the Fine Arts

ORGANIZERS AND EVENT HOSTS:

Charlotte Blair, *ANSYS*
Sherry Hess, *National Instruments*
Katia Grenier, *LAAS-CNRS*

The main emphasis of this event is building a network of women who work in microwaves and RF, as well as creation of an informal mentoring network that enables women to connect with other women of all ages and across industry, academia and biotechnology. Don't miss this chance to unwind over some food and beverages while soaking in the art that the PAFA exhibits. Men, if you would like to attend, please don't forget to bring friends to this event.

GUEST SPEAKER ABSTRACT:

Our guest speaker will share her experiences on "working at the frontier of engineering and biology: focus on linear and non-linear optical micro spectroscopy to understand electropulsation mechanisms on cells." This talk will be followed by further conversation and networking amongst attendees.

ABOUT DR. CATERINA MERLA:

Guest Speaker:
Prof. Caterina Merla

Dr. Caterina Merla received the Laurea and the Ph.D. degrees in electronic engineering from the University of Rome "La Sapienza," Italy, in 2004 and 2008, respectively. From 2008 to 2010, she was a Postdoctoral Fellow with the XLIM Research Institute, CNRS- University of Limoges, Limoges, France. From 2010 to 2012, she has been a Postdoctoral Fellow with the Italian Inter-University Center of Electromagnetic Fields and Biosystems (ICEmB). She is currently with the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA), Research Centre in Rome and a Visiting Research Scientist at Lehigh University, Bethlehem, PA. Her research interests are mainly focused on the microdosimetric evaluation of the electromagnetic (EM) field at single cell level, biological sample dielectric measurements, and design and dosimetry of exposure systems oriented to EM protection studies and medical applications. Dr. Merla was the recipient of the 2008 International Union of Radio Science (URSI) Young Scientist Awards presented at the XXIX URSI General Assembly, Chicago, IL.

IEEE Journal of Electromagnetics, RF and Microwaves in Medicine and Biology (J-ERM)

Call for Papers for the IEEE IMBioC 2018 Special Issue

The IEEE Journal of Electromagnetics, RF and Microwaves in Medicine and Biology (J-ERM), sponsored by IEEE MTT-S, APS, and EMBS societies, will publish a special Issue devoted to the 2018 IEEE MTT-S International Microwave Biomedical Conference (IMBioC 2018). Authors of all papers presented at the IMBioC Conference are invited to submit an expanded version of their papers to the special Issue. The expanded version requires that the new technical content reports results beyond the IMBioC paper. Every paper will be reviewed in the same manner as all other regular submissions to this journal. Information on the journal can be found at **http://ieee-jerm.org**.

The due date for the paper submission is July 30, 2018. The expected publication date of the special issue is **October 1, 2018**. The journal is in electronic format so the accepted paper will appear in *IEEE Xplore* within a few days after acceptance.

If you have any question, please contact us at **jermimbioc@gmail.com**

Guest Editors: Dr. Roberto Gómez García and Dr. Changzhi Li

IMBioC Sponsors and Exhibition:

Dedicated exhibit time 09:30 –10:00 & 15:10 – 15:40

09:00 – 17:00 | **Friday, 15 June 2018** | Pennsylvania Convention Center, Room 204B

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IMBioC Award and Closing Reception

17:30-19:00 | 201C/202A

A half-hour award ceremony for student paper competition will be held in 201C, followed by a one-hour reception in 202A.

Coffee/Tea Break

204B
09:30-10:00 | 15:10 - 15:40

IMBioC Student Paper Competition Finalists:

A Ka-band Beamformer for Wireless Power Transfer to Body Area Networks
Student: Nicholas Saiz, *Stanford University*

Development of a Tissue Dielectric Properties Model Based on Maxwell- Fricke Mixture Theory
Student: Sevde Etoz, *University of Wisconsin–Madison*

Multi-Target Vital-Signs Monitoring Using a Dual-Beam Hybrid Doppler Radar
Student: Mehrdad Nosrati, *Stevens Institute of Technology*

A 60 GHz Mixer-based Reflectometer in 130nm SiGe BiCMOS Technology toward Dielectric Spectroscopy in Medical Applications
Student: Rahul Kumar Yadav, *IHP Gmbh*

Ferromagnetic Resonance Characterization of Magnetic Nanowires for Biolabel applications
Student: Wen Zhou, *University of Minnesota, Twin Cities*

NEMS Magnetoelectric Antennas for Biomedical Application
Student: Hwaider Lin, *Northeastern University*

Reproducibility Evaluation of Composite Dielectric Materials Based on an Error Propagation Model
Student: Birk Hattenhorst, *Ruhr University Bochum*

Evaluating the Microwave Performance of Epidermal Electronics with Equivalent Transmission Line Modeling
Student: Tammy Chang, *Stanford University*

Homodyne and Heterodyne Terahertz Dielectric Sensors: Prototyping and Comparison in BiCMOS Technology for Lab-on-Chip Applications
Student: Defu Wang, *IHP Microelectronics*

Feasibility Study of Applying Ferromagnetic Contrast Agents in Thermoacoustic Imaging
Student: Dajun Zhang, *ShanghaiTech University*

A Compact Energy Efficient CMOS Permittivity Sensor Based on Multi-Harmonic Downconversion and Tunable Impedance Bridge
Student: Gerasimos Vlachogiannakis, *Delft University of Technology*

Measurement of Broadband Temperature-Dependent Dielectric Properties of Liver Tissue
Student: Hojjatollah Fallahi, *Kansas State University*

The 2019 International Microwave Biomedical Conference (IMBioC 2019)

May 06 – 08, 2019 | Nanjing University of Science & Technology (NJUST), Nanjing, China

General Chair
Xiaohua Zhu, *NJUST*

General Co-Chairs
Ke Wu, *Univ. of Montreal*
James Hwang, *Lehigh University*

Technical Program Chair
Wenquan Che, *NJUST*

Technical Program Co-Chairs
Changzhi Li, Texas Tech University
Wei Hong, *Southeast University*

The 2019 International Microwave Biomedical Conference (IMBioC 2019) will be held on May 06-08, 2019 in Nanjing University of Science & Technology (NJUST), Nanjing, China. IMBioC is an international forum to exchange ideas and information on state-of-the-art research in microwave and RF theory and techniques that bridge the science and engineering gap as applied to biomedical systems. During the conference, some special sessions including Young Professionals (YP) and Women in Microwave (WIM) panel sessions will be organized, while one exhibition will be held simultaneously.

Paper submission

Authors are invited to submit 3-page manuscripts in PDF format. All papers must be written in English and clearly describe the concept and results. The template is available on the IMBioC website. Papers submitted will be peer reviewed. All presented papers at the conference will be included in *IEEE Xplore*, pending quality review.

Conference scopes, topics of interest, Call for Paper and details can be found at **https://imbioc-ieee.org**

Important dates

Paper submission: **Oct. 6, 2018** | Paper notification: **Dec. 6, 2018** | Final manuscript due: **Jan. 31, 2019**

IMBioC2018 session room map in the Philadelphia Convention Center