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Chair: Dan Jiao, Purdue University, USA — Co-Chair: Werner Thiel, ANSYS, USA

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<sup>1</sup>Kyoto Institute of Technology, Japan **A** ; <sup>2</sup>University of California, Los Angeles, USA **A**
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<sup>1</sup>RFIC-Lab (EA 7520), France **A** ; <sup>2</sup>Universidade de São Paulo, Brazil **A** ; <sup>3</sup>L2E, France **A**
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<sup>1</sup>University of South Alabama, USA **A** ; <sup>2</sup>University of California, Irvine, USA **A**

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Chair: Marc Franco, Qorvo, USA — Co-Chair: Robert H. Caverly, Villanova University, USA

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<sup>1</sup>Sichuan University, China **A** ; <sup>2</sup>Kyoto University, Japan **A**

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Chair: Guoan Wang, University of South Carolina, USA — Co-Chair: John Ebel, Air Force Research Laboratory, USA

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Chair: Erin Kiley, Massachusetts College of Liberal Arts, USA — Co-Chair: Jos'e E. Rayas-S'anchez, ITESO, Mexico

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Co-Chair: Luca Pierantoni, Università Politecnica delle Marche, Italy

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Chair: Vittorio Camarchia, Politecnico di Torino, Italy — Co-Chair: Damon Holmes, NXP Semiconductors, USA

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*<sup>1</sup>CityU, China* **A** ; *<sup>2</sup>University College Dublin, Ireland* **A**

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Chair: Amelie Hagelauer, Universität Bayreuth, Germany

Co-Chair: Songbin Gong, University of Illinois at Urbana-Champaign, USA

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Chair: Zhizhang David Chen, Dalhousie University, Canada — Co-Chair: Marco Pirola, Politecnico di Torino, Italy

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Chair: Jun Brandon Choi, SUNY Buffalo, USA — Co-Chair: Maurizio Bozzi, Università di Pavia, Italy

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*<sup>1</sup>IMS (UMR 5218), France* **A** ; *<sup>2</sup>CNES, France* **A**
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Chair: Pekka Kangaslahti, Jet Propulsion Laboratory, USA — Co-Chair: George Duh, BAE Systems, USA

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*<sup>1</sup>VTT Technical Research Centre of Finland, Finland* **A** ; *<sup>2</sup>Caltech, USA* **A** ; *<sup>3</sup>IHP, Germany* **A**
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*<sup>1</sup>Jet Propulsion Laboratory, USA* **A** ; *<sup>2</sup>Özyeğin University, Turkey* **A** ; *<sup>3</sup>Northrop Grumman, USA* **A**
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*<sup>1</sup>Fraunhofer IAF, Germany* **A** ; *<sup>2</sup>MPI for Radio Astronomy, Germany* **A** ; *<sup>3</sup>INAF, Italy* **A** ; *<sup>4</sup>IRAM, France* **A**
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Chair: Christian Carlowitz, FAU Erlangen-Nürnberg, Germany — Co-Chair: Hermann Boss, Rohde & Schwarz, Germany

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<sup>1</sup>Technische Universität Dresden, Germany **A** ; <sup>2</sup>Bosch Sensortec, Germany **A**
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<sup>1</sup>University of California, Santa Barbara, USA **A** ; <sup>2</sup>University of California, San Diego,  
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Marcel Geurts<sup>2</sup>*  
<sup>1</sup>Katholieke Universiteit Leuven, Belgium **A** ; <sup>2</sup>NXP Semiconductors, The Netherlands **A**

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Chair: Malgorzata Celuch, QWED, Poland — Co-Chair: Arnaud Pothier, XLIM (UMR 7252), France

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<sup>1</sup>University of California, Davis, USA **A** ; <sup>2</sup>Skyworks Solutions, USA **A**
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<sup>1</sup>Università Politecnica delle Marche, Italy **A** ; <sup>2</sup>Lehigh University, USA **A** ; <sup>3</sup>Cornell  
University, USA **A** ; <sup>4</sup>Università “G. D’Annunzio” Chieti-Pescara, Italy **A**



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Chair: Brice Ivira, Broadcom, USA — Co-Chair: Amir Mortazawi, University of Michigan, USA

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*Ruochen Lu, Yansong Yang, Steffen Link, Songbin Gong, University of Illinois at Urbana-Champaign, USA* **A**
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*Yansong Yang, Liuqing Gao, Songbin Gong, University of Illinois at Urbana-Champaign, USA* **A**
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Tu3E-4      **C** **Surface Acoustic Wave Resonators Using Lithium Niobate on Silicon Carbide Platform**  
*Shibin Zhang<sup>1</sup>, Ruochen Lu<sup>2</sup>, Hongyan Zhou<sup>1</sup>, Steffen Link<sup>2</sup>, Yansong Yang<sup>2</sup>, Zhongxu Li<sup>1</sup>, Kai Huang<sup>1</sup>, Xin Ou<sup>1</sup>, Songbin Gong<sup>2</sup>*  
*<sup>1</sup>Chinese Academy of Sciences, China **A** ; <sup>2</sup>University of Illinois at Urbana-Champaign, USA **A***
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*Shu-Yuan Tseng<sup>1</sup>, Chin-Chung Hsiao<sup>2</sup>, Ruey-Beei Wu<sup>1</sup>*  
*<sup>1</sup>National Taiwan University, Taiwan **A** ; <sup>2</sup>Tai-Saw Technology, Taiwan **A***
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## Tu3F: Broadband, High-Performance GaN and GaAs Power Amplifiers

Chair: Charles F. Campbell, Qorvo, USA — Co-Chair: Gayle Collins, Obsidian Microwave, USA

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Tu3F-1      **C** **A Compact 10W 2-20GHz GaN MMIC Power Amplifier Using a Decade Bandwidth Output Impedance Transformer**  
*Michael Roberg, Manyam Pilla, Scott Schafer, Thi Ri Mya Kywe, Robert Flynt, Nguyenvu Chu, Qorvo, USA* **A**
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*Jun Kamioka, Masatake Hangai, Shinichi Miwa, Yoshitaka Kamo, Shintaro Shinjo, Mitsubishi Electric, Japan* **A**
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*Philip Zurek, Zoya Popović, University of Colorado Boulder, USA* **A**
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*T. Hoffmann, Florian Hühn, S. Shevchenko, Wolfgang Heinrich, Andreas Wentzel, FBH, Germany* **A**
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*Yuji Komatsuzaki<sup>1</sup>, Rui Ma<sup>2</sup>, Shuichi Sakata<sup>1</sup>, Keigo Nakatani<sup>1</sup>, Shintaro Shinjo<sup>1</sup>*  
*<sup>1</sup>Mitsubishi Electric, Japan **A** ; <sup>2</sup>MERL, USA **A***

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## Tu3H: Advances in Microwave Semiconductor Devices

Chair: Patrick Fay, University of Notre Dame, USA — Co-Chair: Tony G. Ivanov, U.S. Army Research Laboratory, USA

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- C** **Impact of Input Nonlinearity on Efficiency, Power, and Linearity Performance of GaN RF Power Amplifiers**  
*Sagar K. Dhar<sup>1</sup>, Tushar Sharma<sup>2</sup>, Ramzi Darraji<sup>3</sup>, Damon G. Holmes<sup>2</sup>, Joseph Staudinger<sup>2</sup>, Xin Yu Zhou<sup>4</sup>, Vince Mallette<sup>5</sup>, Fadhel M. Ghannouchi<sup>1</sup>*  
<sup>1</sup>University of Calgary, Canada **A** ; <sup>2</sup>NXP Semiconductors, USA **A** ; <sup>3</sup>Ericsson, Canada **A** ; <sup>4</sup>CityU, China **A** ; <sup>5</sup>Focus Microwaves, Canada **A**
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- C** **High Power AlN/GaN HEMTs with Record Power-Added-Efficiency >70% at 40GHz**  
*Kathia Harrouche, Riad Kabouche, Etienne Okada, Farid Medjdoub, IEMN (UMR 8520), France **A***
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- C** **InAlN/GaN-on-Si HEMT with 4.5W/mm in a 200-mm CMOS-Compatible MMIC Process for 3D Integration**  
*Shireen Warnock<sup>1</sup>, Chang-Lee Chen<sup>1</sup>, Jeffrey Knecht<sup>1</sup>, Richard Molnar<sup>1</sup>, Donna-Ruth Yost<sup>1</sup>, Matthew Cook<sup>1</sup>, Corey Stull<sup>1</sup>, Ryan Johnson<sup>1</sup>, Christopher Galbraith<sup>1</sup>, Jeffrey Daulton<sup>1</sup>, WeiLin Hu<sup>1</sup>, Gianni Pinelli<sup>1</sup>, Joshua Perozek<sup>2</sup>, Tomas Palacios<sup>2</sup>, Beijia Zhang<sup>1</sup>, Jeffrey Herd<sup>1</sup>, Craig Keast<sup>1</sup>*  
<sup>1</sup>MIT Lincoln Laboratory, USA **A** ; <sup>2</sup>MIT, USA **A**
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- C** **Noise Performance of Sub-100-nm Metamorphic HEMT Technologies**  
*Felix Heinz, Fabian Thome, Arnulf Leuther, Oliver Ambacher, Fraunhofer IAF, Germany **A***
- PAGE 297  
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- C** **High-Power RF Characterization of Diamond Schottky Barrier Diodes at X-Band**  
*Xenofon Konstantinou<sup>1</sup>, Cristian J. Herrera-Rodriguez<sup>1</sup>, Aaron Hardy<sup>2</sup>, John D. Albrecht<sup>1</sup>, Timothy Grotjohn<sup>1</sup>, John Papapolymerou<sup>1</sup>*  
<sup>1</sup>Michigan State University, USA **A** ; <sup>2</sup>Fraunhofer USA CCD, USA **A**
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## Tu4A: Innovative Wave Transmission, Manipulation and Generation

Chair: Christian Damm, Universität Ulm, Germany — Co-Chair: Jason Soric, Raytheon, USA

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- C** **A Fine Picosecond Pulse Generator Based on Novel SRD Topology and Tapered NLTL**  
*MuhibUr Rahman, Ke Wu, Polytechnique Montréal, Canada **A***
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- C** **Liquid Crystal Based Parallel-Polarized Dielectric Image Guide Phase Shifter at W-Band**  
*Henning Tesmer, Roland Reese, Ersin Polat, Rolf Jakoby, Holger Maune, Technische Universität Darmstadt, Germany **A***
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- C** **Negative Group Delay Enabled Artificial Transmission Line Exhibiting Squint-Free, Dominant Mode, Backward Leaky-Wave Radiation**  
*Minning Zhu, Chung-Tse Michael Wu, Rutgers University, USA **A***
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- C** **Demonstration of Low Loss RF Conductor in K<sub>a</sub> and V Bands Using Cu/Fe Multilayers for 5G and Millimeter Wave Applications**  
*Renuka Bowrothu, Yong-Kyu Yoon, University of Florida, USA **A***
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- C** **Equivalent Circuit Models for Full-Tensor Anisotropic Composite Right/Left-Handed Metamaterials**  
*Tsutomu Nagayama, Kagoshima University, Japan **A***

## Tu4B: High-Performance Low-Noise Amplifiers

Chair: Chinchun Meng, National Chiao Tung University, Taiwan

Co-Chair: Luciano Boglione, U.S. Naval Research Laboratory, USA

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- C** **A 6.5–12GHz Balanced Variable Gain Low-Noise Amplifier with Frequency-Selective Non-Foster Gain Equalization Technique**  
*Huiyan Gao<sup>1</sup>, Nayu Li<sup>1</sup>, Min Li<sup>1</sup>, Shaogang Wang<sup>1</sup>, Zijiang Zhang<sup>1</sup>, Yen-Cheng Kuan<sup>2</sup>, Xiaopeng Yu<sup>1</sup>, Qun Jane Gu<sup>3</sup>, Zhiwei Xu<sup>1</sup>*  
<sup>1</sup>Zhejiang University, China **A** ; <sup>2</sup>National Chiao Tung University, Taiwan **A** ;  
<sup>3</sup>University of California, Davis, USA **A**
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- C** **A Compact Frequency-Tunable VGA for Multi-Standard 5G Transceivers**  
*Roe Ben Yishay, Danny Elad, ON Semiconductor, Israel **A***
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- C** **A CMOS Band-Pass Low Noise Amplifier with Excellent Gain Flatness for mm-Wave 5G Communications**  
*Han-Woong Choi, Sunkyu Choi, Choul-Young Kim, Chungnam National University, Korea **A***
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- C** **A Tri (K/Ka/V)-Band Monolithic CMOS Low Noise Amplifier with Shared Signal Path and Variable Gains**  
*Chia-Jen Liang<sup>1</sup>, Ching-Wen Chiang<sup>1</sup>, Jia Zhou<sup>2</sup>, Rulin Huang<sup>2</sup>, Kuei-Ann Wen<sup>1</sup>, Mau-Chung Frank Chang<sup>1</sup>, Yen-Cheng Kuan<sup>1</sup>*  
<sup>1</sup>National Chiao Tung University, Taiwan **A** ; <sup>2</sup>University of California, Los Angeles, USA **A**
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- C** **A 64.5–88GHz Coupling-Concerned CMOS LNA with >10dB Gain and 5dB Minimum NF**  
*Kaijuan Zhang<sup>1</sup>, Chunqi Shi<sup>1</sup>, Guangsheng Chen<sup>2</sup>, Jinghong Chen<sup>3</sup>, Runxi Zhang<sup>1</sup>*  
<sup>1</sup>East China Normal University, China **A** ; <sup>2</sup>Shanghai Eastsoft Microelectronics, China **A** ; <sup>3</sup>University of Houston, USA **A**

## Tu4C: Advanced Design Techniques for Voltage Controlled Oscillators

Chair: Nils Pohl, Ruhr-Universität Bochum, Germany — Co-Chair: Hiroshi Okazaki, NTT DOCOMO, Japan

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- C** **Octave Frequency Range Triple-Band Low Phase Noise K/Ka-Band VCO with a New Dual-Path Inductor**  
*Md. Aminul Hoque<sup>1</sup>, Mohammad Chahardori<sup>1</sup>, Pawan Agarwal<sup>2</sup>, Mohammad Ali Mokri<sup>1</sup>, Deukhyoun Heo<sup>1</sup>*  
<sup>1</sup>Washington State University, USA **A** ; <sup>2</sup>MaxLinear, USA **A**
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- C** **A Superharmonic Injection Based G-Band Quadrature VCO in CMOS**  
*Xuan Ding<sup>1</sup>, Hai Yu<sup>1</sup>, Bo Yu<sup>2</sup>, Zhiwei Xu<sup>3</sup>, Qun Jane Gu<sup>1</sup>*  
<sup>1</sup>University of California, Davis, USA **A** ; <sup>2</sup>Skyworks Solutions, USA **A** ; <sup>3</sup>Zhejiang University, China **A**
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- C** **A Power Efficient 60-GHz Super-Regenerative Oscillator with 10-GHz Switching Rate in 22-nm FD-SOI CMOS**  
*Ali Ferschischi, Hatem Ghaleb, Zoltán Tibenszky, Corrado Carta, Frank Ellinger, Technische Universität Dresden, Germany **A***
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- C** **A 0.011-mm<sup>2</sup> 27.5-GHz VCO with Transformer-Coupled Bandpass Filter Achieving -191dBc/Hz FoM in 16-nm FinFET CMOS**  
*Chi-Hsien Lin, Ying-Ta Lu, Hsien-Yuan Liao, Sean Chen, Alvin L.S. Loke, Tzu-Jin Yeh, TSMC, Taiwan **A***
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- C** **An X-Band LC VCO Using a New Boosted Active Capacitor with 53% Tuning Range and -202.4dBc/Hz FoM<sub>T</sub>**  
*Pawan Agarwal, Mohammad Chahardori, Deukhyoun Heo, Washington State University, USA **A***

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## Tu4D: Microwave Systems and Methods for Permittivity Measurements

Chair: Pawel Kopyt, Warsaw University of Technology, Poland

Co-Chair: Rashaunda M. Henderson, University of Texas at Dallas, USA

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- C** **Broadband Measurement of Dielectric Properties of Substrates up to 67GHz Using a Coaxial Air Line**  
*Nikita Mahjabeen, Alan Paul Zanders, Rashaunda Henderson, University of Texas at Dallas, USA* **A**
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- C** **High-Resolution Millimeter-Wave Tomography System for Characterization of Low-Permittivity Materials**  
*Andreas Och<sup>1</sup>, Patrick A. Hölzl<sup>1</sup>, Stefan Schuster<sup>2</sup>, Jochen O. Schrattenecker<sup>3</sup>, Philipp F. Freidl<sup>1</sup>, Stefan Scheiblhofer<sup>2</sup>, Dominik Zankl<sup>2</sup>, Venkata Pathuri-Bhuvana<sup>4</sup>, Robert Weigel<sup>5</sup>*  
<sup>1</sup>Infineon Technologies, Austria **A** ; <sup>2</sup>voestalpine, Austria **A** ; <sup>3</sup>Intel, Austria **A** ; <sup>4</sup>Silicon Austria Labs, Austria **A** ; <sup>5</sup>FAU Erlangen-Nürnberg, Germany **A**
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- C** **Non-Destructive Testing of Non-Metallic Concentric Pipes Using Microwave Measurements**  
*Hailun Wu, Maryam Ravan, Raveena Sharma, Jay Patel, Reza K. Amineh, NYIT, USA* **A**
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- C** **Portable Low-Cost Measurement Setup for 2D Imaging of Organic Semiconductors**  
*Malgorzata Celuch<sup>1</sup>, Olivier Douheret<sup>2</sup>, Przemyslaw Korpas<sup>3</sup>, Ryszard Michnowski<sup>4</sup>, Marzena Olszewska-Placha<sup>1</sup>, Janusz Rudnicki<sup>1</sup>*  
<sup>1</sup>QWED, Poland **A** ; <sup>2</sup>Materia Nova, Belgium **A** ; <sup>3</sup>Warsaw University of Technology, Poland **A** ; <sup>4</sup>Vigo System, Poland **A**
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- C** **Clutter Mitigation Based on Adaptive Singular Value Decomposition in Tomographic Radar Images for Material Inspection**  
*Dominik Meier<sup>1</sup>, Bersant Gashi<sup>1</sup>, Torsten Link<sup>2</sup>, Thomas Schwarze<sup>3</sup>, Christian Zech<sup>1</sup>, Benjamin Baumann<sup>1</sup>, Michael Schlechtweg<sup>1</sup>, Jutta Kühn<sup>1</sup>, Markus Rösch<sup>1</sup>, Leonhard M. Reindl<sup>4</sup>*  
<sup>1</sup>Fraunhofer IAF, Germany **A** ; <sup>2</sup>Composite Material Supply, Germany **A** ; <sup>3</sup>GFaI, Germany **A** ; <sup>4</sup>Albert-Ludwigs-Universität Freiburg, Germany **A**

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## Tu4E: Nonlinear Circuits & Systems

Chair: Christopher Silva, Aerospace, USA — Co-Chair: Subrata Halder, Qorvo, USA

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- C** **Mutual Injection Locking of Oscillator Circuits Through Inductor Coupling**  
*A. Suárez<sup>1</sup>, Franco Ramirez<sup>1</sup>, R. Melville<sup>2</sup>*  
<sup>1</sup>Universidad de Cantabria, Spain **A** ; <sup>2</sup>Emecon, USA **A**
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- C** **Analysis of the Transient Dynamics of Coupled-Oscillator Systems**  
*Sergio Sancho, A. Suárez, Franco Ramirez, Universidad de Cantabria, Spain* **A**
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- C** **Analysis and Design of a Concurrent Dual-Band Self-Oscillating Mixer**  
*M. Pontón, A. Herrera, A. Suárez, Universidad de Cantabria, Spain* **A**
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- C** **A Coupling Factor Independent Wireless Power Transfer System Employing Two Nonlinear Circuits**  
*Ruiying Chai, Amir Mortazawi, University of Michigan, USA* **A**
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- C** **Over-The-Air Behavioral Modeling of Millimeter Wave Beamforming Transmitters with Concurrent Dynamic Configurations Utilizing Heterogenous Neural Network**  
*Hang Yin, Zhengbo Jiang, Xiao-Wei Zhu, Chao Yu, Southeast University, China* **A**

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## Tu4F: Innovations in Broadband mm-Wave Power Amplifiers

Chair: David Brown, BAE Systems, USA — Co-Chair: Mark P. van der Heijden, NXP Semiconductors, The Netherlands

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- C** **High Output Power Ultra-Wideband Distributed Amplifier in InP DHBT Technology Using Diamond Heat Spreader**  
*Tanjil Shivan<sup>1</sup>, Maruf Hossain<sup>1</sup>, Ralf Doerner<sup>1</sup>, Tom K. Johansen<sup>2</sup>, Ksenia Nosaeva<sup>1</sup>, Hady Yacoub<sup>1</sup>, Wolfgang Heinrich<sup>1</sup>, Viktor Krozer<sup>1</sup>*  
<sup>1</sup>FBH, Germany **A** ; <sup>2</sup>Technical University of Denmark, Denmark **A**
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- C** **Broadband PA Architectures with Asymmetrical Combining and Stacked PA Cells Across 50–70GHz and 64–110GHz in 250nm InP**  
*Tushar Sharma, Zheng Liu, Chandrakanth R. Chappidi, Hooman Saeidi, Suresh Venkatesh, Kaushik Sengupta, Princeton University, USA **A***
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- C** **C to V-Band Cascode Distributed Amplifier Design Leveraging a Double Gate Length Gallium Nitride on Silicon Process**  
*Patrick E. Longhi<sup>1</sup>, Sergio Colangeli<sup>1</sup>, Walter Ciccognani<sup>1</sup>, Lorenzo Pace<sup>1</sup>, Rémy Leblanc<sup>2</sup>, Ernesto Limiti<sup>1</sup>*  
<sup>1</sup>Università di Roma “Tor Vergata”, Italy **A** ; <sup>2</sup>OMMIC, France **A**
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- C** **A 20W GaN-on-Si Solid State Power Amplifier for Q-Band Space Communication Systems**  
*R. Giofrè<sup>1</sup>, F. Costanzo<sup>1</sup>, A. Massari<sup>2</sup>, A. Suriani<sup>2</sup>, F. Vitulli<sup>2</sup>, Ernesto Limiti<sup>1</sup>*  
<sup>1</sup>Università di Roma “Tor Vergata”, Italy **A** ; <sup>2</sup>Thales Alenia Space, Italy **A**
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- C** **Highly Linear & Efficient Power Spatium Combiner Amplifier with GaN HPA MMIC at Millimeter Wavelength Frequency**  
*Soack Dae Yoon, John Kitt, Dylan Murdock, Eric Jackson, Michael Roberg, Gamal Hegazi, Patrick Courtney, Qorvo, USA **A***

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## Tu4H: Advanced Transistor Modeling and Characterization

Chair: Rob Jones, Raytheon, USA — Co-Chair: Douglas Teeter, Qorvo, USA

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- C** **Gate Bias Incorporation into Cardiff Behavioural Modelling Formulation**  
*Ehsan M. Azad, James J. Bell, Roberto Quaglia, Jorge J. Moreno Rubio, Paul J. Tasker, Cardiff University, UK **A***
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- C** **GaN and GaAs HEMT Channel Charge Model for Nonlinear Microwave and RF Applications**  
*Anthony E. Parker, Macquarie University, Australia **A***
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- C** **A Transient Two-Tone RF Method for the Characterization of Electron Trapping Capture and Emission Dynamics in GaN HEMTs**  
*Pedro M. Tomé, Filipe M. Barradas, Luís C. Nunes, João L. Gomes, Telmo R. Cunha, José C. Pedro, Instituto de Telecomunicações, Portugal **A***
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- C** **Explaining the Different Time Constants Extracted from Low Frequency  $Y_{22}$  and  $I_{DS}$ -DLTS on GaN HEMTs**  
*João L. Gomes, Luís C. Nunes, José C. Pedro, Instituto de Telecomunicações, Portugal **A***



## We1A: Non-Planar Filters I

Chair: Simone Bastioli, RS Microwave, USA — Co-Chair: Miguel A.G. Laso, Universidad P'ublica de Navarra, Spain

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We1A-1 **C** **Direct Synthesis Technique of Quasi-Canonical Filters Comprising Cascaded Frequency-Variant Blocks**  
*Yuxing He<sup>1</sup>, Zhewang Ma<sup>2</sup>, Nobuyuki Yoshikawa<sup>1</sup>*  
<sup>1</sup>Yokohama National University, Japan **A** ; <sup>2</sup>Saitama University, Japan **A**
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We1A-2 **C** **Design of Extracted-Pole Filters: An Application-Oriented Synthesis Approach**  
*Giuseppe Macchiarella<sup>1</sup>, Stefano Tamiazzo<sup>2</sup>*  
<sup>1</sup>Politecnico di Milano, Italy **A** ; <sup>2</sup>CommScope, Italy **A**
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*Yan Zhang, Ke-Li Wu, CUHK, China **A***
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We1A-4 **C** **Synthesis of Extracted Pole Filters Without the Extra Spikes**  
*Y. Yang<sup>1</sup>, Yi Zeng<sup>1</sup>, M. Yu<sup>1</sup>, Q. Wu<sup>2</sup>*  
<sup>1</sup>CUHK, China **A** ; <sup>2</sup>Xidian University, China **A**
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We1A-5 **C** **A Synthesis-Based Design Procedure for Waveguide Duplexers Using a Stepped E-Plane Bifurcated Junction**  
*Giuseppe Macchiarella<sup>1</sup>, Gian Guido Gentili<sup>1</sup>, Luciano Accatino<sup>2</sup>, Vittorio Tornielli di Crestvolant<sup>3</sup>*  
<sup>1</sup>Politecnico di Milano, Italy **A** ; <sup>2</sup>ACConsulting, Italy **A** ; <sup>3</sup>ESA-ESTEC, The Netherlands **A**

## We1B: Advances in Wireless Sensors

Chair: Jasmin Grosinger, Technische Universität Graz, Austria — Co-Chair: Etienne Perret, LCIS (EA 3747), France

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*Meissa Babay<sup>1</sup>, Clement Hallepee<sup>1</sup>, Claire Dalmay<sup>1</sup>, Bruno Barelaud<sup>1</sup>, Emre Can Durmaz<sup>2</sup>, Canan Baristiran Kaynak<sup>2</sup>, Mehmet Kaynak<sup>2</sup>, David Cordeau<sup>1</sup>, Arnaud Pothier<sup>1</sup>*  
<sup>1</sup>XLIM (UMR 7252), France **A** ; <sup>2</sup>IHP, Germany **A**
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*Hamed Rahmani, Aydin Babakhani, University of California, Los Angeles, USA **A***
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*Jia Zhou<sup>1</sup>, Chia-Jen Liang<sup>1</sup>, Christopher Chen<sup>1</sup>, Jieqiong Du<sup>1</sup>, Rulin Huang<sup>1</sup>, Richard Al Hadi<sup>2</sup>, James C.M. Hwang<sup>3</sup>, Mau-Chung Frank Chang<sup>1</sup>*  
<sup>1</sup>University of California, Los Angeles, USA **A** ; <sup>2</sup>Alcatel, USA **A** ; <sup>3</sup>Lehigh University, USA **A**
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We1B-4 **C** **All-Digital Single Sideband (SSB) Bluetooth Low Energy (BLE) Backscatter with an Inductor-Free, Digitally-Tuned Capacitance Modulator**  
*James Rosenthal, Matthew S. Reynolds, University of Washington, USA **A***
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*Ferran Paredes, Cristian Herrojo, Ferran Martín, Universitat Autònoma de Barcelona, Spain **A***

## We1C: mm-Wave and Terahertz Transmitter Components

Chair: Theodore Reck, Virginia Diodes, USA — Co-Chair: Adrian Tang, Jet Propulsion Laboratory, USA

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- C** **A 99–132GHz Frequency Quadrupler with 8.5dBm Peak Output Power and 8.8% DC-to-RF Efficiency in 130nm BiCMOS**  
*Kefei Wu<sup>1</sup>, Muhammad Waleed Mansha<sup>2</sup>, Mona Hella<sup>2</sup>*  
<sup>1</sup>Analog Devices, USA **A** ; <sup>2</sup>Rensselaer Polytechnic Institute, USA **A**
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- C** **A 135–183GHz Frequency Sixtupler in 250nm InP HBT**  
*Mingquan Bao<sup>1</sup>, Thanh Ngoc Thi Do<sup>2</sup>, Dan Kuylenstierna<sup>2</sup>, Herbert Zirath<sup>1</sup>*  
<sup>1</sup>Ericsson, Sweden **A** ; <sup>2</sup>Chalmers University of Technology, Sweden **A**
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We1C-3
- C** **Broadband and High-Gain 400-GHz InGaAs mHEMT Medium-Power Amplifier S-MMIC**  
*Bersant Gashi, Laurenz John, Dominik Meier, Markus Rösch, Axel Tessmann, Arnulf Leuther, Hermann Maßler, Michael Schlechtweg, Oliver Ambacher, Fraunhofer IAF, Germany **A***
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We1C-4
- C** **A 160–183GHz 0.24-W (7.5% PAE) PA and 0.14-W (9.5% PAE) PA, High-Gain, G-Band Power Amplifier MMICs in 250-nm InP HBT**  
*Zach Griffith, Miguel Urteaga, Petra Rowell, Lan Tran, Teledyne Scientific & Imaging, USA **A***
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We1C-5
- C** **A 140GHz Power Amplifier with 20.5dBm Output Power and 20.8% PAE in 250-nm InP HBT Technology**  
*Ahmed S.H. Ahmed<sup>1</sup>, Munkyo Seo<sup>2</sup>, Ali A. Farid<sup>1</sup>, Miguel Urteaga<sup>3</sup>, James F. Buckwalter<sup>1</sup>, Mark J.W. Rodwell<sup>1</sup>*  
<sup>1</sup>University of California, Santa Barbara, USA **A** ; <sup>2</sup>Sungkyunkwan University, Korea **A** ; <sup>3</sup>Teledyne Scientific & Imaging, USA **A**

## We1D: Novel Microwave Technologies for Biomedical Sensing

Chair: Souvik Dubey, Abbott, USA — Co-Chair: Hung-Wei Wu, Kun Shan University, Taiwan

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*S. Augé<sup>1</sup>, A. Tamra<sup>1</sup>, L. Rigal<sup>2</sup>, V. Lohjois<sup>2</sup>, B. Ducommun<sup>2</sup>, D. Dubuc<sup>1</sup>, K. Grenier<sup>1</sup>*  
<sup>1</sup>LAAS, France **A** ; <sup>2</sup>ITAV (USR 3505), France **A**
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*Rezki El Arif, Wei-Chih Su, Mu-Cyun Tang, Tzyy-Sheng Horng, Fu-Kang Wang, National Sun Yat-sen University, Taiwan **A***



## We1E: High Frequency Non-Reciprocal Techniques Using Novel Material, Device and Circuit Approaches

Chair: Dimitris Pavlidis, FIU, USA — Co-Chair: Yuanxun Ethan Wang, University of California, Los Angeles, USA

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*Ting Lu<sup>1</sup>, Joseph D. Schneider<sup>1</sup>, Xiating Zou<sup>1</sup>, Sidhant Tiwari<sup>1</sup>, Zhi Yao<sup>2</sup>,  
Greg Carman<sup>1</sup>, Robert N. Candler<sup>1</sup>, Yuanxun Ethan Wang<sup>1</sup>*  
<sup>1</sup>University of California, Los Angeles, USA **A** ; <sup>2</sup>Berkeley Lab, USA **A**

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- C** **Microwave Applications of Zirconium-Doped Hafnium Oxide Ferroelectrics: From Nanoscale Calculations up to Experimental Results**  
*M. Aldrigo<sup>1</sup>, M. Dragoman<sup>1</sup>, E. Laudadio<sup>2</sup>, S. Iordanescu<sup>1</sup>, M. Modreanu<sup>3</sup>, I.M. Povey<sup>3</sup>,  
F. Nastase<sup>1</sup>, S. Vulpe<sup>1</sup>, P. Stipa<sup>2</sup>, A. Di Donato<sup>2</sup>, L. Pierantoni<sup>2</sup>, D. Mencarelli<sup>2</sup>*  
<sup>1</sup>IMT Bucharest, Romania **A** ; <sup>2</sup>Università Politecnica delle Marche, Italy **A** ;  
<sup>3</sup>University College Cork, Ireland **A**

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- C** **Novel Non-Reciprocal Microwave Spin Wave and Magneto-Elastic Wave Devices for On-Chip Signal Processing**  
*Ilya N. Krivorotov<sup>1</sup>, Eric A. Montoya<sup>1</sup>, Amanatullah Khan<sup>1</sup>, Andrei N. Slavin<sup>2</sup>,  
Mingzhong Wu<sup>3</sup>*  
<sup>1</sup>University of California, Irvine, USA **A** ; <sup>2</sup>Oakland University, USA **A** ; <sup>3</sup>Colorado State University, USA **A**

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*Na Zhu<sup>1</sup>, Andrew Franson<sup>2</sup>, Seth Kurfman<sup>2</sup>, Michael Chilcote<sup>2</sup>, Denis R. Candido<sup>3</sup>,  
Katherine E. Nygren<sup>4</sup>, Michael E. Flatté<sup>3</sup>, Kristen S. Buchanan<sup>4</sup>,  
Ezekiel Johnston-Halperin<sup>2</sup>, Hong X. Tang<sup>1</sup>*  
<sup>1</sup>Yale University, USA **A** ; <sup>2</sup>The Ohio State University, USA **A** ; <sup>3</sup>University of Iowa, USA **A** ; <sup>4</sup>Colorado State University, USA **A**

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*Hakhamanesh Mansoorzare, Reza Abdolvand, University of Central Florida, USA **A***

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*Jose Antonio Bahaonde, Ioannis Kymissis, Harish Krishnaswamy, Columbia University, USA **A***

## We1F: Advances in 5G mm-Wave Systems and Architectures

Chair: *Gent Paparisto, Cadence Design Systems, USA*

Co-Chair: *Christian Fager, Chalmers University of Technology, Sweden*

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*Cristian B. Czegledi<sup>1</sup>, Mikael Hörberg<sup>1</sup>, Martin Sjödin<sup>1</sup>, Per Ligander<sup>1</sup>, Jonas Hansryd<sup>1</sup>, Jan Sandberg<sup>1</sup>, Jonas Gustavsson<sup>1</sup>, Daniel Sjöberg<sup>1</sup>, Dimitris Polydorou<sup>2</sup>, Dimitris Siomos<sup>2</sup>*  
<sup>1</sup>Ericsson, Sweden **A** ; <sup>2</sup>OTE, Greece **A**
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*Nuutti Tervo, Bilal Khan, Olli Kursu, Janne P. Aikio, Markku Jokinen, Marko E. Leinonen, Markku Juntti, Timo Rahkonen, Aarno Pärssinen, University of Oulu, Finland **A***
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*Ahmed Ben Ayed, Giovanni Scarlato, Patrick Mitran, Slim Boumaiza, University of Waterloo, Canada **A***
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*Iffrah Jaffri<sup>1</sup>, Ahmed Ben Ayed<sup>1</sup>, Ali M. Darwish<sup>2</sup>, Slim Boumaiza<sup>1</sup>*  
<sup>1</sup>University of Waterloo, Canada **A** ; <sup>2</sup>U.S. Army Research Laboratory, USA **A**
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*Sravan Pulipati, Viduneth Ariyaratna, Md. Rayhan Khan, Shubhendu Bhardwaj, Arjuna Madanayake, Florida International University, USA **A***
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*John Kimionis, Michael J. Holyoak, Amit Singh, Shahriar Shahramian, Yves Baeyens, Nokia Bell Labs, USA **A***

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Chair: Jeong-sun Moon, HRL Laboratories, USA — Co-Chair: Kenneth Mays, Boeing, USA

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*Young-Kai Chen<sup>1</sup>, Abirami Sivananthan<sup>2</sup>, Tsu-Hsi Chang<sup>3</sup>*  
<sup>1</sup>DARPA, USA **A** ; <sup>2</sup>Booz Allen Hamilton, USA **A** ; <sup>3</sup>HetInTec, USA **A**
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*Shintaro Shinjo, Masatake Hangai, Yutaro Yamaguchi, Moriyasu Miyazaki, Mitsubishi Electric, Japan **A***
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*Y. Cao<sup>1</sup>, V. Kumar<sup>1</sup>, S. Chen<sup>1</sup>, Y. Cui<sup>1</sup>, Soack Dae Yoon<sup>1</sup>, E. Beam<sup>1</sup>, A. Xie<sup>1</sup>, J. Jimenez<sup>1</sup>, A. Ketterson<sup>1</sup>, C. Lee<sup>1</sup>, Douglas Linkhart<sup>2</sup>, Anton Geiler<sup>2</sup>*  
<sup>1</sup>Qorvo, USA **A** ; <sup>2</sup>Metamagnetics, USA **A**
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*Jeong-sun Moon<sup>1</sup>, Bob Grabar<sup>1</sup>, Mike Antcliffe<sup>1</sup>, Joel Wong<sup>1</sup>, Chuong Dao<sup>1</sup>, Peter Chen<sup>1</sup>, Erdem Arkun<sup>1</sup>, Isaac Khalaf<sup>1</sup>, Andrea Corrion<sup>1</sup>, James Chappell<sup>1</sup>, Nivedhita Venkatesan<sup>2</sup>, Patrick Fay<sup>2</sup>*  
<sup>1</sup>HRL Laboratories, USA **A** ; <sup>2</sup>University of Notre Dame, USA **A**
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*Josephine Chang, Shamima Afroz, Brian Novak, Jordan Merkel, Ken Nagamatsu, Robert Howell, Northrop Grumman, USA **A***

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Chair: Ming Yu, CUHK, China — Co-Chair: Giuseppe Macchiarella, Politecnico di Milano, Italy

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*Enrique López-Oliver<sup>1</sup>, Cristiano Tomassoni<sup>1</sup>, Lorenzo Silvestri<sup>2</sup>, Maurizio Bozzi<sup>2</sup>, Luca Perregrini<sup>2</sup>, Stefania Marconi<sup>2</sup>, Gianluca Alaimo<sup>2</sup>, Ferdinando Auricchio<sup>2</sup>*  
<sup>1</sup>Università di Perugia, Italy **A** ; <sup>2</sup>Università di Pavia, Italy **A**
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*Yuliang Chen, Ke-Li Wu, CUHK, China **A***
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*Mónica Martínez Mendoza, Margarita García Tudela, Rubén Gómez-Chacón Camuñas, Thales Alenia Space, Spain **A***
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*F. Teberio, P. Martin-Iglesias, I. Arregui, I. Arnedo, T. Lopetegi, M.A.G. Laso, Universidad Pública de Navarra, Spain **A***
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*Gaetan Prigent<sup>1</sup>, Anne-Laure Franc<sup>2</sup>, Matthias Wietstruck<sup>3</sup>, Mehmet Keynak<sup>3</sup>*  
<sup>1</sup>LAAS, France **A** ; <sup>2</sup>LAPLACE (UMR 5213), France **A** ; <sup>3</sup>IHP, Germany **A**
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*Anton Sieganschin, Thomas Jaschke, Arne F. Jacob, Technische Universität Hamburg-Harburg, Germany **A***

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Chair: Kazuya Yamamoto, Mitsubishi Electric, Japan — Co-Chair: Changzhan Gu, Shanghai Jiao Tong University, China

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*Karan Gumber<sup>1</sup>, Francesco Amato<sup>2</sup>, Corinne Dejous<sup>1</sup>, Simon Hemour<sup>1</sup>*  
<sup>1</sup>IMS (UMR 5218), France **A** ; <sup>2</sup>Università di Roma "Tor Vergata", Italy **A**
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*Aline Eid, Jimmy Hester, Manos M. Tentzeris, Georgia Tech, USA **A***
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*Steffen Hansen, Christian Bredendiek, Nils Pohl, Fraunhofer FHR, Germany **A***
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*Dominique Henry, Timothée Marchal, Julien Philippe, Hervé Aubert, Patrick Pons, LAAS, France **A***
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*Wei Xu, Changzhan Gu, Jun-Fa Mao, Shanghai Jiao Tong University, China **A***
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Chair: Samet Zahir, IDT, USA — Co-Chair: Herbert Zirath, Chalmers University of Technology, Sweden

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*Ibrahim Abdo<sup>1</sup>, Takuya Fujimura<sup>1</sup>, Tsuyoshi Miura<sup>1</sup>, Korkut K. Tokgoz<sup>1</sup>, H. Hamada<sup>2</sup>, Hideyuki Nosaka<sup>2</sup>, Atsushi Shirane<sup>1</sup>, Kenichi Okada<sup>1</sup>*  
<sup>1</sup>Tokyo Institute of Technology, Japan **A** ; <sup>2</sup>NTT, Japan **A**
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*M.H. Eissa<sup>1</sup>, N. Maletic<sup>1</sup>, E. Grass<sup>1</sup>, R. Kraemer<sup>1</sup>, Dietmar Kissinger<sup>2</sup>, Andrea Malignaggi<sup>1</sup>*  
<sup>1</sup>IHP, Germany **A** ; <sup>2</sup>Universität Ulm, Germany **A**
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*Tadao Nagatsuma<sup>1</sup>, Fumiya Ayano<sup>1</sup>, Keita Toichi<sup>1</sup>, Li Yi<sup>1</sup>, Masamichi Fujiwara<sup>2</sup>, Noriko Iiyama<sup>2</sup>, Junichi Kani<sup>2</sup>, Hiroshi Ito<sup>3</sup>*  
<sup>1</sup>Osaka University, Japan **A** ; <sup>2</sup>NTT, Japan **A** ; <sup>3</sup>Kitasato University, Japan **A**
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*Caitlyn M. Cooke<sup>1</sup>, Kevin Leong<sup>1</sup>, Khanh Nguyen<sup>1</sup>, Alfonso Escorcía<sup>1</sup>, Xiaobing Mei<sup>1</sup>, Jennifer Arroyo<sup>2</sup>, Taylor W. Barton<sup>3</sup>, Cornelis Du Toit<sup>4</sup>, Giovanni De Amici<sup>4</sup>, Dong L. Wu<sup>4</sup>, William R. Deal<sup>1</sup>*  
<sup>1</sup>Northrop Grumman, USA **A** ; <sup>2</sup>Cubic Nuvotronics, USA **A** ; <sup>3</sup>University of Colorado Boulder, USA **A** ; <sup>4</sup>NASA Goddard Space Flight Center, USA **A**
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*Martin Geiger, Simon Gut, Philipp Hügler, Christian Waldschmidt, Universität Ulm, Germany **A***

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Chair: Chia-Chan Chang, National Chung Cheng University, Taiwan — Co-Chair: Changzhi Li, Texas Tech University, USA

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*Pin-Hsun Juan, Kuan-Hung Chen, Fu-Kang Wang, National Sun Yat-sen University, Taiwan* **A**
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*Tzu-Jung Tseng, Chao-Hsiung Tseng, Taiwan Tech, Taiwan* **A**
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*Yichao Yuan<sup>1</sup>, Austin Ying-Kuang Chen<sup>2</sup>, Chung-Tse Michael Wu<sup>1</sup>*  
*<sup>1</sup>Rutgers University, USA* **A** ; *<sup>2</sup>Cal State Northridge, USA* **A**
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*Konstantin Root, Ingrid Ullmann, Frank Seehaus, Martin Vossiek, FAU Erlangen-Nürnberg, Germany* **A**
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*Wei-Chih Su, Pin-Hsun Juan, De-Ming Chian, Tzzy-Sheng Horng, Chao-Kai Wen, Fu-Kang Wang, National Sun Yat-sen University, Taiwan* **A**
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## We2E: Recent Advances in Compact and High Performance Planar Filter Design and Realization

Chair: Dimitra Psychogiou, University of Colorado Boulder, USA

Co-Chair: Christopher Galbraith, MIT Lincoln Laboratory, USA

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*Dimitra Psychogiou<sup>1</sup>, Roberto Gómez-García<sup>2</sup>*  
*<sup>1</sup>University of Colorado Boulder, USA* **A** ; *<sup>2</sup>Universidad de Alcalá, Spain* **A**
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*Yilong Zhu, Yuandan Dong, UESTC, China* **A**
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*Deshan Tang, Changxuan Han, Zhixian Deng, Huizhen Jenny Qian, Xun Luo, UESTC, China* **A**
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- C** **Step Impedance Resonator (SIR) Loaded with Complementary Split Ring Resonator (CSRR): Modeling, Analysis and Applications**  
*P. Vélez<sup>1</sup>, J. Muñoz-Enano<sup>1</sup>, A. Ebrahimi<sup>2</sup>, J. Scott<sup>2</sup>, K. Ghorbani<sup>2</sup>, Ferran Martín<sup>1</sup>*  
*<sup>1</sup>Universitat Autònoma de Barcelona, Spain* **A** ; *<sup>2</sup>RMIT University, Australia* **A**
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*Mengdan Kong<sup>1</sup>, Dimitra Psychogiou<sup>2</sup>, Yongle Wu<sup>1</sup>*  
*<sup>1</sup>BUPT, China* **A** ; *<sup>2</sup>University of Colorado Boulder, USA* **A**

## We2F: 5G Arrays and Beamformers

Chair: Kwang-Jin Koh, Lockheed Martin, USA — Co-Chair: Tumay Kanar, Renesas Electronics, USA

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*Namjun Cho, Hyo-Sung Lee, Hanyeop Lee, Woo-Nyun Kim, Samsung, Korea* **A**
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*Yusheng Yin<sup>1</sup>, Zhe Zhang<sup>1</sup>, Tumay Kanar<sup>2</sup>, Samet Zehir<sup>2</sup>, Gabriel M. Rebeiz<sup>1</sup>*  
*<sup>1</sup>University of California, San Diego, USA* **A** ; *<sup>2</sup>IDT, USA* **A**
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*Kenneth E. Kolodziej, Aidan U. Cookson, Bradley T. Perry, MIT Lincoln Laboratory, USA* **A**
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*Chun-Nien Chen<sup>1</sup>, Li-Cheng Hung<sup>1</sup>, Yi-Hsien Lin<sup>1</sup>, Tzu-Chien Tang<sup>1</sup>, Wei-Pang Chao<sup>1</sup>, Guan-Yu Lin<sup>1</sup>, Wei-Jun Liao<sup>2</sup>, Yu-Hsiang Nien<sup>2</sup>, Wei-Cheng Huang<sup>1</sup>, Tai-Yu Kuo<sup>1</sup>, Kun-You Lin<sup>1</sup>, Tian-Wei Huang<sup>1</sup>, Yi-Cheng Lin<sup>1</sup>, Hsin-Chia Lu<sup>1</sup>, Tsung-Heng Tsai<sup>2</sup>, Huei Wang<sup>1</sup>*  
*<sup>1</sup>National Taiwan University, Taiwan* **A** ; *<sup>2</sup>National Chung Cheng University, Taiwan* **A**
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*Junho Park<sup>1</sup>, Jaehyun Choi<sup>1</sup>, Dongpil Park<sup>2</sup>, Myun-soo Kim<sup>2</sup>, Chisang You<sup>3</sup>, Doochan Jung<sup>3</sup>, Insu Song<sup>3</sup>, Jaewook Lee<sup>3</sup>, Yong Nam Whang<sup>4</sup>, Yongha Lee<sup>5</sup>, Byoungwan Kang<sup>6</sup>, Wonbin Hong<sup>1</sup>*  
*<sup>1</sup>POSTECH, Korea* **A** ; *<sup>2</sup>Dongwoo Fine-Chem, Korea* **A** ; *<sup>3</sup>LG Electronics, Korea* **A** ; *<sup>4</sup>SK Telecom, Korea* **A** ; *<sup>5</sup>Y-TECH, Korea* **A** ; *<sup>6</sup>Corning Precision Materials, Korea* **A**

## We2G: Load Modulated Power Amplifiers

Chair: Leo de Vreede, Technische Universiteit Delft, The Netherlands — Co-Chair: Paul Draxler, MaXentric Technologies, USA

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*Yuchen Cao, Kenle Chen, University of Central Florida, USA* **A**
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*Jingzhou Pang<sup>1</sup>, Yue Li<sup>1</sup>, Chenhao Chu<sup>1</sup>, Jun Peng<sup>2</sup>, Xin Yu Zhou<sup>3</sup>, Anding Zhu<sup>1</sup>*  
*<sup>1</sup>University College Dublin, Ireland* **A** ; *<sup>2</sup>UESTC, China* **A** ; *<sup>3</sup>CityU, China* **A**
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*Shuichi Sakata<sup>1</sup>, Katsuya Kato<sup>1</sup>, Eri Teranishi<sup>1</sup>, Takumi Sugitani<sup>1</sup>, Rui Ma<sup>2</sup>, Kevin Chuang<sup>3</sup>, Yu-Chen Wu<sup>3</sup>, Kei Fukunaga<sup>1</sup>, Yuji Komatsuzaki<sup>1</sup>, Kenichi Horiguchi<sup>1</sup>, Koji Yamanaka<sup>1</sup>, Shintaro Shinjo<sup>1</sup>*  
*<sup>1</sup>Mitsubishi Electric, Japan* **A** ; *<sup>2</sup>MERL, USA* **A** ; *<sup>3</sup>NanoSemi, USA* **A**
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*Mir Masood<sup>1</sup>, Srinidhi Embar R.<sup>1</sup>, Peter Rashev<sup>1</sup>, John Holt<sup>1</sup>, J.S. Kenney<sup>2</sup>*  
*<sup>1</sup>NXP Semiconductors, USA* **A** ; *<sup>2</sup>Georgia Tech, USA* **A**
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*Srinidhi Embar R.<sup>1</sup>, Mir Masood<sup>1</sup>, Tushar Sharma<sup>1</sup>, Joseph Staudinger<sup>1</sup>, Sagar K. Dhar<sup>2</sup>, Peter Rashev<sup>1</sup>, G. Tucker<sup>1</sup>, Fadhel M. Ghannouchi<sup>2</sup>*  
*<sup>1</sup>NXP Semiconductors, USA* **A** ; *<sup>2</sup>University of Calgary, Canada* **A**



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## We3A: Recent Advances in Passive Components

Chair: Holger Maune, Technische Universität Darmstadt, Germany — Co-Chair: Thomas Lingel, TTM Technologies, USA

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*Haysam M. Kadry, Dimitrios L. Sounas, Wayne State University, USA* **A**
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*You-Rong Liu, Chung-Hsien Chan, Yo-Shen Lin, National Central University, Taiwan* **A**
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*Jin Li, Tao Yuan, Shenzhen University, China* **A**
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*Kyutae Park, Byung-Wook Min, Yonsei University, Korea* **A**
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*Mohamed H.A. Elsayaf, Abdelhamid M.H. Nasr, Amr M.E. Safwat, Ain Shams University, Egypt* **A**
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*Nhu-Huan Nguyen<sup>1</sup>, Anthony Ghiotto<sup>2</sup>, Tifenn Martin<sup>2</sup>, Anne Vilcot<sup>1</sup>, Tan-Phu Vuong<sup>1</sup>, Ke Wu<sup>3</sup>*  
*<sup>1</sup>IMEP-LAHC (UMR 5130), France* **A** ; *<sup>2</sup>IMS (UMR 5218), France* **A** ; *<sup>3</sup>Polytechnique Montréal, Canada* **A**
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Chair: Marcus Da Silva, National Instruments, USA — Co-Chair: Sherif Ahmed, Entrepreneur, USA

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*Alberto Maria Angelotti, Gian Piero Gibiino, Corrado Florian, Alberto Santarelli, Università di Bologna, Italy* **A**
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*Vincent Gillet<sup>1</sup>, Jean-Pierre Teyssier<sup>2</sup>, Ahmad Al Hajar<sup>3</sup>, Ahmed Gasmi<sup>3</sup>, Charles Edoua Kacou<sup>3</sup>, Michel Prigent<sup>1</sup>, Raymond Quéré<sup>1</sup>*  
*<sup>1</sup>XLIM (UMR 7252), France* **A** ; *<sup>2</sup>Keysight Technologies, USA* **A** ; *<sup>3</sup>OMMIC, France* **A**
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*Yashar Alimohammadi<sup>1</sup>, Eigo Kuwata<sup>1</sup>, Xuan Liu<sup>1</sup>, Thoalfukar Hussein<sup>2</sup>, James J. Bell<sup>1</sup>, Lei Wu<sup>3</sup>, Paul J. Tasker<sup>1</sup>, Johannes Benedikt<sup>1</sup>*  
*<sup>1</sup>Cardiff University, UK* **A** ; *<sup>2</sup>Al-Furat Al-Awsat Technical University, Iraq* **A** ; *<sup>3</sup>Huawei Technologies, China* **A**
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*Alberto Maria Angelotti<sup>1</sup>, Gian Piero Gibiino<sup>1</sup>, Troels S. Nielsen<sup>2</sup>, Dominique M. M.-P. Schreurs<sup>3</sup>, Alberto Santarelli<sup>1</sup>*  
*<sup>1</sup>Università di Bologna, Italy* **A** ; *<sup>2</sup>Keysight Technologies, USA* **A** ; *<sup>3</sup>Katholieke Universiteit Leuven, Belgium* **A**



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Chair: Dietmar Kissinger, Universität Ulm, Germany — Co-Chair: William Deal, Northrop Grumman, USA

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*Jungsoo Kim, Heekang Son, Doyoon Kim, Kiryong Song, Junghwan Yoo, Jae-Sung Rieh, Korea University, Korea* **A**
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*Teruo Jyo, Munehiko Nagatani, Minoru Ida, Miwa Mutoh, Hitoshi Wakita, Naoki Terao, Hideyuki Nosaka, NTT, Japan* **A**
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*Alper Karakuzulu<sup>1</sup>, M.H. Eissa<sup>1</sup>, Dietmar Kissinger<sup>2</sup>, Andrea Malignaggi<sup>1</sup>*  
*<sup>1</sup>IHP, Germany* **A** ; *<sup>2</sup>Universität Ulm, Germany* **A**
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Chair: Chris Robenbeck, U.S. Naval Research Laboratory, USA

Co-Chair: Chia-Chan Chang, National Chung Cheng University, Taiwan

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*Li Wen, Changzhan Gu, Jun-Fa Mao, Shanghai Jiao Tong University, China* **A**
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*Shekh M.M. Islam<sup>1</sup>, Naoyuki Motoyama<sup>2</sup>, Sergio Pacheco<sup>2</sup>, Victor M. Lubecke<sup>1</sup>*  
*<sup>1</sup>University of Hawaii at Manoa, USA* **A** ; *<sup>2</sup>ON Semiconductor, USA* **A**
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*Asaf Tzadok, Alberto Valdes-Garcia, Petar Pepeljugoski, J.-O. Plouchart, Mark Yeck, Huijuan Liu, IBM T.J. Watson Research Center, USA* **A**

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Chair: Sanghoon Shin, U.S. Naval Research Laboratory, USA — Co-Chair: Julien Lintignat, XLIM (UMR 7252), France

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*Mohammad Khorshidian, Negar Reiskarimian, Harish Krishnaswamy, Columbia University, USA* **A**
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*Huayong Jia, Raafat R. Mansour, University of Waterloo, Canada* **A**
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*Junchen Lai<sup>1</sup>, Tao Yang<sup>1</sup>, Pei-Ling Chi<sup>2</sup>, Ruimin Xu<sup>1</sup>*  
*<sup>1</sup>UESTC, China* **A** ; *<sup>2</sup>National Chiao Tung University, Taiwan* **A**

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Chair: Byung-Wook Min, Yonsei University, Korea — Co-Chair: David Ricketts, North Carolina State University, USA

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*Kevin Kai Wei Low<sup>1</sup>, Samet Zahir<sup>2</sup>, Tumay Kanar<sup>2</sup>, Gabriel M. Rebeiz<sup>1</sup>*  
*<sup>1</sup>University of California, San Diego, USA* **A** ; *<sup>2</sup>IDT, USA* **A**
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*Jonghoon Myeong<sup>1</sup>, Kyutae Park<sup>1</sup>, Ahmed Nafe<sup>2</sup>, Hyunchul Chung<sup>2</sup>, Gabriel M. Rebeiz<sup>2</sup>, Byung-Wook Min<sup>1</sup>*  
*<sup>1</sup>Yonsei University, Korea* **A** ; *<sup>2</sup>University of California, San Diego, USA* **A**
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*Julio Navarro, Boeing, USA* **A**
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*Morris Repeta<sup>1</sup>, Wenyao Zhai<sup>1</sup>, Tyler Ross<sup>1</sup>, Kimia Ansari<sup>1</sup>, Sam Tiller<sup>1</sup>, Hari Krishna Pothula<sup>1</sup>, David Wessel<sup>1</sup>, Xu Li<sup>2</sup>, Hua Cai<sup>2</sup>, Dong Liang<sup>2</sup>, Guanjiang Wang<sup>2</sup>, Wen Tong<sup>1</sup>*  
*<sup>1</sup>Huawei Technologies, Canada* **A** ; *<sup>2</sup>Huawei Technologies, China* **A**
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*Gökhan Gültepe<sup>1</sup>, Samet Zahir<sup>2</sup>, Tumay Kanar<sup>2</sup>, Gabriel M. Rebeiz<sup>1</sup>*  
*<sup>1</sup>University of California, San Diego, USA* **A** ; *<sup>2</sup>IDT, USA* **A**

## We3G: Digital Predistortion and Supply Modulation

Chair: John Wood, Wolfspeed, USA — Co-Chair: Jonmei J. Yan, MaXentric Technologies, USA

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*Pablo Pascual Campo, Vesa Lampu, Lauri Anttila, Alberto Brihuega, Markus Allén, Mikko Valkama, Tampere University, Finland* **A**
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- C** **OTA-Based Data Acquisition and Signal Separation for Digital Predistortion of Multi-User MIMO Transmitters in 5G**  
*Xiaoyu Wang<sup>1</sup>, Yue Li<sup>1</sup>, Chao Yu<sup>2</sup>, Wei Hong<sup>2</sup>, Anding Zhu<sup>1</sup>*  
*<sup>1</sup>University College Dublin, Ireland* **A** ; *<sup>2</sup>Southeast University, China* **A**
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*Sophie Paul, Wolfgang Heinrich, Olof Bengtsson, FBH, Germany* **A**
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*Florian Hühn, Felix Müller, Lars Schellhase, Wolfgang Heinrich, Andreas Wentzel, FBH, Germany* **A**
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*Peco Gjurovski, Lukas Huessen, Renato Negra, RWTH Aachen University, Germany* **A**

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Chair: Zaher Bardai, Consultant, USA — Co-Chair: Jeffrey A. Nanzer, Michigan State University, USA

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*Pengfei Qin, Tianwu Li, Er-Ping Li, Zhejiang University, China* **A**
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- C** **Efficient Modeling of Wave Propagation Through Rough Slabs with FDTD**  
*Stefanos Bakirtzis<sup>1</sup>, Xingqi Zhang<sup>2</sup>, Costas D. Sarris<sup>1</sup>*  
*<sup>1</sup>University of Toronto, Canada* **A** ; *<sup>2</sup>University College Dublin, Ireland* **A**
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*Anna Pietrenko-Dabrowska<sup>1</sup>, Slawomir Koziel<sup>2</sup>, John W. Bandler<sup>3</sup>*  
*<sup>1</sup>Gdansk University of Technology, Poland* **A** ; *<sup>2</sup>Reykjavik University, Iceland* **A** ; *<sup>3</sup>McMaster University, Canada* **A**
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*Kazem Sabet, Anca I. Stefan, EMAG Technologies, USA* **A**
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*J. Gouloumet, B. Leuenberger, C. Schori, S. Grop, P. Rochat, Orolia, Switzerland* **A**
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*Yuto Kato, Masahiro Horibe, AIST, Japan* **A**
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- C** **Millimeter-Wave Resonator Based on High Quality Factor Inductor and Capacitor Based on Slow-Wave CPS**  
*Abdelhalim A. Saadi, Marc Margalef-Rovira, Youcef Amara, Philippe Ferrari, RFIC-Lab (EA 7520), France* **A**

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*Zhongxia Simon He<sup>1</sup>, Ahmed Hassona<sup>1</sup>, Álvaro Pérez-Ortega<sup>2</sup>, Herbert Zirath<sup>1</sup>*  
<sup>1</sup>Chalmers University of Technology, Sweden **A** ; <sup>2</sup>Gotmic, Sweden **A**
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*J.M. Lopez-Villegas, A. Salas, N. Vidal, Universitat de Barcelona, Spain **A***
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*Ahmed Moulay, Tarek Djerafi, INRS-EMT, Canada **A***
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*Rakibul Islam<sup>1</sup>, Md. Hedayatullah Maktoomi<sup>1</sup>, Yixin Gu<sup>2</sup>, Bayaner Arigong<sup>1</sup>*  
<sup>1</sup>Washington State University, USA **A** ; <sup>2</sup>University of Texas at Arlington, USA **A**
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*G. Ceccato<sup>1</sup>, J.L. Cano<sup>2</sup>, A. Mediavilla<sup>2</sup>, Luca Perregrini<sup>1</sup>*  
<sup>1</sup>Università di Pavia, Italy **A** ; <sup>2</sup>Universidad de Cantabria, Spain **A**
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*Peizhao Li<sup>1</sup>, Han Ren<sup>1</sup>, Yixin Gu<sup>2</sup>, Branimir Pejcinovic<sup>3</sup>, Bayaner Arigong<sup>1</sup>*  
<sup>1</sup>Washington State University, USA **A** ; <sup>2</sup>University of Texas at Arlington, USA **A** ; <sup>3</sup>Portland State University, USA **A**
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*Jongheun Lee, Seunggoo Nam, Juseop Lee, Korea University, Korea **A***
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*Kang Zhou, Ke Wu, Polytechnique Montréal, Canada **A***
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*Eloi Guerrero, Patricia Silveira, Angel Triano, Jordi Verdú, Pedro de Paco, Universitat Autònoma de Barcelona, Spain **A***
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*Yilong Zhu, Yuandan Dong, UESTC, China **A***
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*Vishvajitsinh Kosamiya, Jing Wang, University of South Florida, USA **A***
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*B. Aja<sup>1</sup>, L. de la Fuente<sup>1</sup>, A. Fernandez<sup>1</sup>, Juan P. Pascual<sup>1</sup>, E. Artal<sup>1</sup>, M.C. de Ory<sup>2</sup>, M.T. Magaz<sup>3</sup>, D. Granados<sup>2</sup>, J. Martin-Pintado<sup>3</sup>, A. Gomez<sup>3</sup>*  
<sup>1</sup>Universidad de Cantabria, Spain **A** ; <sup>2</sup>IMDEA Nanociencia, Spain **A** ; <sup>3</sup>Centro de Astrobiología, Spain **A**
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*Akim A. Babenko<sup>1</sup>, Alírio S. Boaventura<sup>1</sup>, Nathan E. Flowers-Jacobs<sup>1</sup>, Justus A. Brevik<sup>1</sup>, Anna E. Fox<sup>1</sup>, Dylan F. Williams<sup>1</sup>, Zoya Popović<sup>2</sup>, Paul D. Dresselhaus<sup>1</sup>, Samuel P. Benz<sup>1</sup>*  
<sup>1</sup>NIST, USA **A** ; <sup>2</sup>University of Colorado Boulder, USA **A**

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*Dennis C. Feng, Mehrnoosh Vahidpour, Yuvraj Mohan, Nicholas Sharac, Tyler Whyland, Sam Stanwyck, Ganesh Ramachandran, Michael Selvanayagam, Rigetti Computing, USA* **A**
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*Abdessamad Boulmirat, Alexandre Siligaris, Clément Jany, José Luis Gonzalez Jimenez, CEA-Leti, France* **A**
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*Xiaohu Wu, Mahmoud Nafe, Xiaoguang Liu, University of California, Davis, USA* **A**
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*Markus Weiß, Christian Friesicke, Rüdiger Quay, Oliver Ambacher, Fraunhofer IAF, Germany* **A**
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*Jincheng Zhang, Tianxiang Wu, Lihe Nie, Dong Wei, Shunli Ma, Junyan Ren, Fudan University, China* **A**
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*Siqi Wang, Wenhui Cao, Thomas Eriksson, Chalmers University of Technology, Sweden* **A**
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*Martin Geiger, Martin Hitzler, Christian Waldschmidt, Universität Ulm, Germany* **A**
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*Yali Zhang, Brandon Garcia, Joseph Um, Bethanie Stadler, Rhonda Franklin, University of Minnesota, USA* **A**
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*Junho Park, Dongkwon Choi, Wonbin Hong, POSTECH, Korea* **A**
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*Han Ren<sup>1</sup>, Peizhao Li<sup>1</sup>, Yixin Gu<sup>2</sup>, Bayaner Arigong<sup>1</sup>*  
<sup>1</sup>Washington State University, USA **A** ; <sup>2</sup>University of Texas at Arlington, USA **A**
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*Fabian Michler<sup>1</sup>, Stefan Schoenhaerl<sup>1</sup>, Sven Schellenberger<sup>2</sup>, Kilin Shi<sup>1</sup>, Benedict Scheiner<sup>1</sup>, Fabian Lurz<sup>1</sup>, Robert Weigel<sup>1</sup>, Alexander Koelpin<sup>2</sup>*  
<sup>1</sup>FAU Erlangen-Nürnberg, Germany **A** ; <sup>2</sup>Brandenburgische Technische Universität, Germany **A**
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*Adrian Eng-Choon Tan<sup>1</sup>, Josh McCulloch<sup>2</sup>, Wolfgang Rack<sup>2</sup>, Ian Platt<sup>1</sup>, Ian Woodhead<sup>1</sup>*  
<sup>1</sup>Lincoln Agritech, New Zealand **A** ; <sup>2</sup>University of Canterbury, New Zealand **A**

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*Alassane Sidibe, Alexandru Takacs, Gaël Loubet, Daniela Dragomirescu, LAAS, France*  
**A**
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- C** **Power-Combined Rectenna Array for X-Band Wireless Power Transfer**  
*Eric Kwiatkowski<sup>1</sup>, Christopher T. Rodenbeck<sup>2</sup>, Taylor W. Barton<sup>1</sup>, Zoya Popović<sup>1</sup>*  
<sup>1</sup>University of Colorado Boulder, USA **A** ; <sup>2</sup>U.S. Naval Research Laboratory, USA **A**
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- C** **Conductivity Measurement in mm-Wave Band with a Fabry-Perot Open Resonator**  
*J. Cuper, B. Salski, T. Karpisz, A. Pacewicz, P. Kopyt, Warsaw University of Technology, Poland* **A**
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## Th1B: Late-Breaking News in Silicon Technologies and Circuits

*Chair: Deuk Heo, Washington State University, USA*

*Co-Chair: James F. Buckwalter, University of California, Santa Barbara, USA*

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*Qiang Yu, Yi-Shin Yeh, Jeffrey Garret, Jabeom Koo, Saurabh Morarka, Said Rami, Guannan Liu, Hyung-Jin Lee, Intel, USA* **A**
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*Shafiullah Syed<sup>1</sup>, Sameer Jain<sup>1</sup>, Dimitri Lederer<sup>2</sup>, Wen Liu<sup>1</sup>, Elanchezhian Veeramani<sup>1</sup>, Baljit Chandhoke<sup>1</sup>, Arvind Kumar<sup>1</sup>, Greg Freeman<sup>1</sup>*  
<sup>1</sup>GLOBALFOUNDRIES, USA **A** ; <sup>2</sup>GLOBALFOUNDRIES, Belgium **A**
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- C** **Efficiency Enhancement Technique Using Doherty-Like Over-The-Air Spatial Combining in a 28GHz CMOS Phased-Array Transmitter**  
*Avraham Sayag, Itamar Melamed, Emanuel Cohen, Technion, Israel* **A**
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- C** **A Multi-Standard 15–57GHz 4-Channel Receive Beamformer with 4.8dB Midband NF for 5G Applications**  
*Abdulrahman A. Alhamed, Oguz Kazan, Gabriel M. Rebeiz, University of California, San Diego, USA* **A**



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## Th1C: Advanced Radar Systems for Automotive and Vehicular Applications

Chair: Markus Gardill, Julius-Maximilians-Universität Würzburg, Germany

Co-Chair: Martin Vossiek, FAU Erlangen-Nürnberg, Germany

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*Minh Q. Nguyen<sup>1</sup>, Reinhard Feger<sup>1</sup>, Jonathan Bechter<sup>2</sup>, Markus Pichler-Scheder<sup>3</sup>, Andreas Stelzer<sup>1</sup>*  
<sup>1</sup>Johannes Kepler Universität Linz, Austria **A** ; <sup>2</sup>ZF Friedrichshafen, Germany **A** ; <sup>3</sup>LCM, Austria **A**
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- C** **A System Analysis of Noise Influences on the Imaging Performance of Millimeter Wave MIMO Radars**  
*André Dürr, Dominik Schwarz, Christian Waldschmidt, Universität Ulm, Germany **A***
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*Eric Klinefelter, Jeffrey A. Nanzer, Michigan State University, USA **A***
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- C** **Root-MUSIC Based Power Estimation Method with Super-Resolution FMCW Radar**  
*Tatsuya Iizuka, Yohei Toriumi, Fumihiko Ishiyama, Jun Kato, NTT, Japan **A***
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*Maximilian Gall<sup>1</sup>, Markus Gardill<sup>1</sup>, Jonas Fuchs<sup>2</sup>, Thomas Horn<sup>1</sup>*  
<sup>1</sup>InnoSenT, Germany **A** ; <sup>2</sup>FAU Erlangen-Nürnberg, Germany **A**
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## Th1D: Chip-Scale Interconnects and Packaging Technologies

Chair: Rhonda Franklin, University of Minnesota, USA — Co-Chair: Florian Herrault, HRL Laboratories, USA

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*Ting Zheng, Paul K. Jo, Sreejith Kochupurackal Rajan, Muhannad S. Bakir, Georgia Tech, USA **A***
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*Björn Deutschmann, Arne F. Jacob, Technische Universität Hamburg-Harburg, Germany **A***
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*Te-Yen Chiu<sup>1</sup>, Yu-Ling Lee<sup>2</sup>, Chun-Lin Ko<sup>3</sup>, Sheng-Hsiang Tseng<sup>3</sup>, Chun-Hsing Li<sup>1</sup>*  
<sup>1</sup>National Tsing Hua University, Taiwan **A** ; <sup>2</sup>Atom Element Matter, The Netherlands **A** ; <sup>3</sup>NARLabs-TSRI, Taiwan **A**
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*Philippe Roux-Lévy<sup>1</sup>, Joseph M. De Saxce<sup>1</sup>, Chun Fei Siah<sup>2</sup>, Jianxiong Wang<sup>2</sup>, Beng Kang Tay<sup>2</sup>, Philippe Coquet<sup>2</sup>, Dominique Baillargeat<sup>1</sup>*  
<sup>1</sup>XLIM (UMR 7252), France **A** ; <sup>2</sup>CINTRA (UMI 3288), Singapore **A**
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- C** **Suspended SiC Filter with DRIE Silicon Subcovers**  
*Elizabeth Twyford Kunkee, Dah-Weih Duan, Andrew Sulian, Peter Ngo, Nancy Lin, Chunbo Zhang, Dino Ferizovic, Charles M. Jackson, Richard Lai, Northrop Grumman, USA **A***



## Th1E: Advances in RF Energy Harvesting

Chair: Alessandra Costanzo, Università di Bologna, Italy — Co-Chair: Smail Tedjini, LCIS (EA 3747), France

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- C** **A W-Band Rectenna Using On-Chip CMOS Switching Rectifier and On-PCB Tapered Slot Antenna Achieving 25% Effective-Power-Conversion Efficiency for Wireless Power Transfer**  
*Pingyang He, Jie Xu, Dixian Zhao, Southeast University, China* **A**
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- C** **An Ultra-Low-Power Power Management Circuit with Output Bootstrapping and Reverse Leakage Reduction Function for RF Energy Harvesting**  
*Zizhen Zeng<sup>1</sup>, Shanpu Shen<sup>2</sup>, Bo Wang<sup>3</sup>, Johan J. Estrada-López<sup>1</sup>, Ross Murch<sup>2</sup>, Edgar Sánchez-Sinencio<sup>1</sup>*  
<sup>1</sup>Texas A&M University, USA **A** ; <sup>2</sup>HKUST, China **A** ; <sup>3</sup>Hamad Bin Khalifa University, Qatar **A**
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- C** **Compact and High Efficiency Rectifier Design Based on Microstrip Coupled Transmission Line for Energy Harvesting**  
*Fading Zhao, Daniele Inserra, Guangjun Wen, UESTC, China* **A**
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- C** **High-Efficiency Sub-1GHz Flexible Compact Rectenna Based on Parametric Antenna-Rectifier Co-Design**  
*Mahmoud Wagih, Alex S. Weddell, Steve Beeby, University of Southampton, UK* **A**
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- C** **920MHz Band High Sensitive Rectenna with the High Impedance Folded Dipole Antenna on the Artificial Magnetic Conductor Substrate**  
*Nobuhiko Yasumaru, Naoki Sakai, Kenji Itoh, Toshiki Tamura, Shigeru Makino, Kanazawa Institute of Technology, Japan* **A**

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Chair: Frank E. van Vliet, TNO, The Netherlands — Co-Chair: Christian Waldschmidt, Universität Ulm, Germany

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*Sravan Pulipati, Rui Ma, MERL, USA* **A**
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*Sravan Pulipati<sup>1</sup>, Viduneth Ariyaratna<sup>1</sup>, Ashira L. Jayaweera<sup>2</sup>, Chamira U.S. Edussooriya<sup>2</sup>, Chamith Wijenayake<sup>3</sup>, Leonid Belostotski<sup>4</sup>, Arjuna Madanayake<sup>1</sup>*  
<sup>1</sup>Florida International University, USA **A** ; <sup>2</sup>University of Moratuwa, Sri Lanka **A** ; <sup>3</sup>University of Queensland, Australia **A** ; <sup>4</sup>University of Calgary, Canada **A**
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- C** **In-situ Self-Test and Self-Calibration of Dual-Polarized 5G TRX Phased Arrays Leveraging Orthogonal-Polarization Antenna Couplings**  
*Ahmed Nafe, Abdurrahman H. Aljuhani, Kerim Kibaroglu, Mustafa Sayginer, Gabriel M. Rebeiz, University of California, San Diego, USA* **A**
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- C** **Scalable, Deployable, Flexible Phased Array Sheets**  
*Matan Gal-Katziri, Austin Fikes, Florian Bohn, Behrooz Abiri, M. Reza Hashemi, Ali Hajimiri, Caltech, USA* **A**
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- C** **28GHz Active Monopulse Networks with Amplitude and Phase Control and -30dB Null-Bandwidth of 5GHz**  
*Hyunchul Chung, Qian Ma, Gabriel M. Rebeiz, University of California, San Diego, USA* **A**

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Chair: Kaushik Sengupta, Princeton University, USA — Co-Chair: Joe Qiu, U.S. Army Research Laboratory, USA

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- C** **A 28GHz Linear and Efficient Power Amplifier Supporting Wideband OFDM for 5G in 28nm CMOS**  
*Yen-Wei Chang<sup>1</sup>, Tsung-Ching Tsai<sup>1</sup>, Jie-Ying Zhong<sup>1</sup>, Jeng-Han Tsai<sup>2</sup>, Tian-Wei Huang<sup>1</sup>*  
<sup>1</sup>National Taiwan University, Taiwan **A** ; <sup>2</sup>National Taiwan Normal University, Taiwan **A**
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- C** **A Balanced Power Amplifier with Asymmetric Coupled-Line Couplers and Wilkinson Baluns in a 90nm SiGe BiCMOS Technology**  
*Yunyi Gong, John D. Cressler, Georgia Tech, USA **A***
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- C** **Load Modulated Balanced mm-Wave CMOS PA with Integrated Linearity Enhancement for 5G Applications**  
*Chandrakanth R. Chappidi, Tushar Sharma, Zheng Liu, Kaushik Sengupta, Princeton University, USA **A***
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- C** **A 22–37GHz Broadband Compact Linear mm-Wave Power Amplifier Supporting 64-/256-/512-QAM Modulations for 5G Communications**  
*Fei Wang, Adam Wang, Hua Wang, Georgia Tech, USA **A***
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- C** **Two W-Band Wideband CMOS mmW PAs for Automotive Radar Transceivers**  
*Yuting Xue<sup>1</sup>, Chunqi Shi<sup>1</sup>, Guangsheng Chen<sup>2</sup>, Jinghong Chen<sup>3</sup>, Runxi Zhang<sup>1</sup>*  
<sup>1</sup>East China Normal University, China **A** ; <sup>2</sup>Shanghai Eastsoft Microelectronics, China **A** ; <sup>3</sup>University of Houston, USA **A**
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- C** **An 18.5W Fully-Digital Transmitter with 60.4% Peak System Efficiency**  
*R.J. Bootsman<sup>1</sup>, D.P.N. Mul<sup>1</sup>, Y. Shen<sup>1</sup>, R.M. Heeres<sup>2</sup>, F. van Rijs<sup>2</sup>, M.S. Alavi<sup>1</sup>, L.C.N. de Vreede<sup>1</sup>*  
<sup>1</sup>Technische Universiteit Delft, The Netherlands **A** ; <sup>2</sup>Ampleon, The Netherlands **A**

## Th2B: Late-Breaking News from the Terahertz Frontier

Chair: Nils Pohl, Ruhr-Universität Bochum, Germany

Co-Chair: James F. Buckwalter, University of California, Santa Barbara, USA

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- C** **First Demonstration of G-Band Broadband GaN Power Amplifier MMICs Operating Beyond 200GHz**  
*Maciej Ćwikliński, Peter Brückner, Stefano Leone, Sebastian Krause, Christian Friesicke, Hermann Maßler, Rüdiger Quay, Oliver Ambacher, Fraunhofer IAF, Germany **A***
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- C** **475-GHz 20-dB-Gain InP-HEMT Power Amplifier Using Neutralized Common-Source Architecture**  
*H. Hamada, T. Tsutsumi, H. Matsuzaki, H. Sugiyama, Hideyuki Nosaka, NTT, Japan **A***
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- C** **A High-Isolation and Highly Linear Super-Wideband SPDT Switch in InP DHBT Technology**  
*Tanjil Shivan<sup>1</sup>, Maruf Hossain<sup>1</sup>, Ralf Doerner<sup>1</sup>, Tom K. Johansen<sup>2</sup>, Ksenia Nosaeva<sup>1</sup>, Hady Yacoub<sup>1</sup>, Wolfgang Heinrich<sup>1</sup>, Viktor Krozer<sup>1</sup>*  
<sup>1</sup>FBH, Germany **A** ; <sup>2</sup>Technical University of Denmark, Denmark **A**
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- C** **240-GHz Reflectometer with Integrated Transducer for Dielectric Spectroscopy in a 130-nm SiGe BiCMOS Technology**  
*Defu Wang<sup>1</sup>, M.H. Eissa<sup>2</sup>, Klaus Schmalz<sup>2</sup>, Thomas Kämpfe<sup>1</sup>, Dietmar Kissinger<sup>3</sup>*  
<sup>1</sup>Fraunhofer IPMS, Germany **A** ; <sup>2</sup>IHP, Germany **A** ; <sup>3</sup>Universität Ulm, Germany **A**
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- C** **A 311.6GHz Phase-Locked Loop in 0.13μm SiGe BiCMOS Process with -90dBc/Hz In-Band Phase Noise**  
*Yuan Liang<sup>1</sup>, Chirn Chye Boon<sup>1</sup>, Yangtao Dong<sup>1</sup>, Qian Chen<sup>1</sup>, Zhe Liu<sup>1</sup>, Chenyang Li<sup>1</sup>, Thomas Mausolf<sup>2</sup>, Dietmar Kissinger<sup>3</sup>, Yong Wang<sup>4</sup>, Herman Jalli Ng<sup>5</sup>*  
<sup>1</sup>NTU, Singapore **A** ; <sup>2</sup>IHP, Germany **A** ; <sup>3</sup>Universität Ulm, Germany **A** ; <sup>4</sup>UESTC, China **A** ; <sup>5</sup>KIT, Germany **A**

## Th2C: Networked and Distributed Radar and Imaging Systems

Chair: Christian Waldschmidt, Universität Ulm, Germany — Co-Chair: Martin Vossiek, FAU Erlangen-Nürnberg, Germany

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*Serge Mghabghab, Jeffrey A. Nanzer, Michigan State University, USA* **A**
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*Stavros Vakalis, Jeffrey A. Nanzer, Michigan State University, USA* **A**
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*Michael Gottinger, Marcel Hoffmann, Martin Vossiek, FAU Erlangen-Nürnberg, Germany* **A**
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*David Werbunat, Benedikt Meinecke, Maximilian Steiner, Christian Waldschmidt, Universität Ulm, Germany* **A**
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*Jessica B. Sanson, Daniel Castanheira, Atilio Gameiro, Paulo P. Monteiro, Instituto de Telecomunicações, Portugal* **A**
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## Th2D: 3D Packaging and Additive Manufacturing

Chair: Kamal Samanta, Sony, UK — Co-Chair: Dominique Baillargeat, XLIM (UMR 7252), France

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*Xuanke He, Yunnan Fang, Ryan A. Bahr, Manos M. Tentzeris, Georgia Tech, USA* **A**
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*Aditya Dave, Rhonda Franklin, University of Minnesota, USA* **A**
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*Yepu Cui, Syed Abdullah Nauroze, Ryan A. Bahr, Manos M. Tentzeris, Georgia Tech, USA* **A**
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*V. Fiorese<sup>1</sup>, C. Belem Gonçalves<sup>1</sup>, C. del Rio Bocio<sup>2</sup>, D. Titz<sup>3</sup>, F. Gianesello<sup>1</sup>, C. Luxey<sup>3</sup>, G. Ducournau<sup>4</sup>, E. Dubois<sup>4</sup>, C. Gaquière<sup>4</sup>, D. Gloria<sup>1</sup>*  
*<sup>1</sup>STMicroelectronics, France* **A** ; *<sup>2</sup>Universidad Pública de Navarra, Spain* **A** ;  
*<sup>3</sup>Polytech’Lab (EA 7498), France* **A** ; *<sup>4</sup>IEMN (UMR 8520), France* **A**

## Th2E: Novel Applications of Wireless Power Transfer

Chair: Nuno Borges Carvalho, Universidade de Aveiro, Portugal — Co-Chair: Marco Dionigi, Università di Perugia, Italy

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*Adel Barakat<sup>1</sup>, Ramesh K. Pokharel<sup>1</sup>, Shima Alshhawy<sup>1</sup>, Kuniaki Yoshitomi<sup>1</sup>, Shigeo Kawasaki<sup>2</sup>*  
<sup>1</sup>Kyushu University, Japan **A** ; <sup>2</sup>JAXA, Japan **A**
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*Masaya Tamura, Kousuke Murai, Marimo Matsumoto, Toyohashi University of Technology, Japan **A***
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- C** **The K-Band Communication Transmitter/Receiver Powered by the C-Band HySIC Energy Harvester with Multi-Sensors**  
*Satoshi Yoshida<sup>1</sup>, Kentaro Matsuura<sup>2</sup>, Daisuke Kobuchi<sup>2</sup>, Naoto Yabuta<sup>3</sup>, Toshihiro Nakaoka<sup>3</sup>, Kenjiro Nishikawa<sup>1</sup>, Shigeo Kawasaki<sup>4</sup>*  
<sup>1</sup>Kagoshima University, Japan **A** ; <sup>2</sup>University of Tokyo, Japan **A** ; <sup>3</sup>Sophia University, Japan **A** ; <sup>4</sup>JAXA, Japan **A**
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- C** **A Wireless Power Transfer System (WPTS) Using Misalignment Resilient, On-Fabric Resonators for Wearable Applications**  
*Dieff Vital, John L. Volakis, Shubhendu Bhardwaj, Florida International University, USA **A***
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- C** **A 3D Rectenna with All-Polarization and Omnidirectional Capacity for IoT Applications**  
*Sheng Wang, Hong-Yeh Chang, National Central University, Taiwan **A***
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- C** **RF Energy On-Demand for Automotive Applications**  
*G. Paolini, M. Shanawani, A. Costanzo, F. Benassi, D. Masotti, Università di Bologna, Italy **A***

## Th2F: In-Band Full-Duplex Cancellers and Transceivers

Chair: Kenneth E. Kolodziej, MIT Lincoln Laboratory, USA — Co-Chair: Kate A. Remley, NIST, USA

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- C** **A BST Varactor Based Circulator Self Interference Canceller for Full Duplex Transmit Receive Systems**  
*Charles F. Campbell<sup>1</sup>, Jon A. Lovseth<sup>2</sup>, Shawn Warren<sup>1</sup>, Arthur Weeks<sup>3</sup>, Paul B. Schmid<sup>1</sup>*  
<sup>1</sup>Qorvo, USA **A** ; <sup>2</sup>Collins Aerospace, USA **A** ; <sup>3</sup>University of Central Florida, USA **A**
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- C** **In-Band Full-Duplex Self-Interference Canceller Augmented with Bandstop-Configured Resonators**  
*Robert Sepanek, Mark Hickie, Mark Stuenkel, BAE Systems, USA **A***
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- C** **An Integrated Full-Duplex/FDD Duplexer and Receiver Achieving 100MHz Bandwidth 58dB/48dB Self-Interference Suppression Using Hybrid-Analog-Digital Autonomous Adaptation Loops**  
*Yuhe Cao, Xuanzhen Cao, Hyungjoo Seo, Jin Zhou, University of Illinois at Urbana-Champaign, USA **A***
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- C** **A Full-Duplex Transceiver with CMOS RF Circulation and Code-Domain Signal Processing for 104dB Self-Interference Rejection and Watt Level TX Power Handling**  
*Ahmed Hamza<sup>1</sup>, Aravind Nagulu<sup>2</sup>, Hussam AlShammary<sup>1</sup>, Cameron Hill<sup>1</sup>, Eythan Lam<sup>1</sup>, Harish Krishnaswamy<sup>2</sup>, James F. Buckwalter<sup>1</sup>*  
<sup>1</sup>University of California, Santa Barbara, USA **A** ; <sup>2</sup>Columbia University, USA **A**
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- C** **Transmit-Receive Cross-Modulation Distortion Correction in a 5–6GHz Full Duplex Quadrature Balanced CMOS RF Front-End**  
*Nimrod Ginzberg<sup>1</sup>, Tomer Gidoni<sup>2</sup>, Dror Regev<sup>3</sup>, Emanuel Cohen<sup>1</sup>*  
<sup>1</sup>Technion, Israel **A** ; <sup>2</sup>Tel Aviv University, Israel **A** ; <sup>3</sup>Toga Networks, Israel **A**

## Th2G: Phased Array and Beamformer Integrated Circuits

Chair: *Jeremy Dunworth, Qualcomm, USA* — Co-Chair: *Donald LaFrance, Lockheed Martin, USA*

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*Erick Aguilar<sup>1</sup>, Vadim Issakov<sup>2</sup>, Robert Weigel<sup>1</sup>*  
<sup>1</sup>FAU Erlangen-Nürnberg, Germany **A** ; <sup>2</sup>OvG Universität Magdeburg, Germany **A**
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*Matthias Voelkel<sup>1</sup>, Stefan Pechmann<sup>1</sup>, Herman Jalli Ng<sup>2</sup>, Dietmar Kissinger<sup>3</sup>, Robert Weigel<sup>1</sup>, Amelie Hagelauer<sup>4</sup>*  
<sup>1</sup>FAU Erlangen-Nürnberg, Germany **A** ; <sup>2</sup>IHP, Germany **A** ; <sup>3</sup>Universität Ulm, Germany **A** ; <sup>4</sup>Universität Bayreuth, Germany **A**
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*Soroush Rasti-Boroujeni, A. Wyrzykowska, M. Mazaheri, A. Palizban, S. Ituah, A. El-Gouhary, G. Chen, H. Gharaei-Garakani, M. Nezhad-Ahmadi, S. Safavi-Naeini, University of Waterloo, Canada **A***
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*Fatemeh Akbar, Amir Mortazawi, University of Michigan, USA **A***
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*Qian Lin<sup>1</sup>, Haifeng Wu<sup>2</sup>, Yijun Chen<sup>2</sup>, Liulin Hu<sup>2</sup>, Shanji Chen<sup>1</sup>, Xiaoming Zhang<sup>1</sup>*  
<sup>1</sup>Qinghai Nationalities University, China **A** ; <sup>2</sup>Chengdu Ganide Technology, China **A**
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## Th3B: Robert J Trew: More than 50 Years of Service to the Microwave Community

Chair: *Samir El-Ghazaly, University of Arkansas, USA* — Co-Chair: *George Haddad, National Science Foundation, USA*

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*Heather M. Trew, U.S. Department of the Treasury, USA **A***
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*Madhu S. Gupta, University of California, San Diego, USA **A***
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*Mike Golio, Golio Endeavors, USA **A***
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*Alfy Riddle, Quanergy Systems, USA **A***



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## Th3C: Emerging Technologies for Radar Detection, Tracking, and Imaging

Chair: Rudy Emrick, Northrop Grumman, USA — Co-Chair: Danny Elad, ON Semiconductor, Israel

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- C** **K-Band MIMO FMCW Radar Using CDMA for TX-Separation Based on an Ultra-Wideband SiGe BiCMOS Radar Chipset**  
*Benedikt Welp<sup>1</sup>, Alex Shoykhetbrod<sup>1</sup>, Stefan Wickmann<sup>1</sup>, Gunnar Briese<sup>1</sup>, Georg Weiß<sup>2</sup>, Jennifer Wenderoth<sup>2</sup>, Reinhold Herschel<sup>1</sup>, Nils Pohl<sup>1</sup>*  
<sup>1</sup>Fraunhofer FHR, Germany **A** ; <sup>2</sup>MBDA Deutschland, Germany **A**
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- C** **Measurement-Based Performance Investigation of a Hybrid MIMO-Frequency Scanning Radar**  
*Alex Shoykhetbrod, Harun Cetinkaya, Sandra Nowok, Fraunhofer FHR, Germany **A***
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- C** **Ultra-Wideband FMCW Radar with Over 40GHz Bandwidth Below 60GHz for High Spatial Resolution in SiGe BiCMOS**  
*Benedikt Welp, Gunnar Briese, Nils Pohl, Fraunhofer FHR, Germany **A***
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- C** **Harmonic Micro-Doppler Detection Using Passive RF Tags and Pulsed Microwave Harmonic Radar**  
*Neda Nourshamsi, Cory Hilton, Stavros Vakalis, Jeffrey A. Nanzer, Michigan State University, USA **A***
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- C** **Localization and Tracking Bees Using a Battery-Less Transmitter and an Autonomous Unmanned Aerial Vehicle**  
*Jake Shearwood<sup>1</sup>, Sam Williams<sup>1</sup>, Nawaf Aldabashi<sup>1</sup>, Paul Cross<sup>1</sup>, Breno M. Freitas<sup>2</sup>, Chaochun Zhang<sup>3</sup>, Cristiano Palego<sup>1</sup>*  
<sup>1</sup>Bangor University, UK **A** ; <sup>2</sup>Universidade Federal do Ceará, Brazil **A** ; <sup>3</sup>China Agricultural University, China **A**

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## Th3D: Late-Breaking News in mm-Wave Communication and Radar Systems

Chair: Yuanxun Ethan Wang, University of California, Los Angeles, USA

Co-Chair: James F. Buckwalter, University of California, Santa Barbara, USA

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- C** **A 25–29GHz 64-Element Dual-Polarized/Dual-Beam Small-Cell with 45dBm 400MHz 5G NR Operation and High Spectral Purity**  
*Hyunchul Chung, Qian Ma, Yusheng Yin, Li Gao, Gabriel M. Rebeiz, University of California, San Diego, USA **A***
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- C** **Linearization of mm-Wave Large-Scale Phased Arrays Using Near-Field Coupling Feedback for >10Gb/s Wireless Communication**  
*Rosannah Murugesu, Michael J. Holyoak, Hungkei Chow, Shahriar Shahramian, Nokia Bell Labs, USA **A***
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- C** **Modular Scalable 80- and 160-GHz Radar Sensor Platform for Multiple Radar Techniques and Applications**  
*Wael A. Ahmad<sup>1</sup>, Maciej Kucharski<sup>1</sup>, Arzu Ergintav<sup>1</sup>, Dietmar Kissinger<sup>2</sup>, Herman Jalli Ng<sup>3</sup>*  
<sup>1</sup>IHP, Germany **A** ; <sup>2</sup>Universität Ulm, Germany **A** ; <sup>3</sup>KIT, Germany **A**
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- C** **A Radar System Concept for 2D Unambiguous Angle Estimation Using Widely Spaced MMICs with Antennas On-Chip at 150GHz**  
*Patrik Grüner, Markus Klose, Christian Waldschmidt, Universität Ulm, Germany **A***
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- C** **Wide-Band Frequency Synthesizer with Ultra-Low Phase Noise Using an Optical Clock Source**  
*Meysam Bahmanian, Saeed Fard, Bastian Koppelman, J. Christoph Scheytt, Universität Paderborn, Germany **A***

## Th3E: Late-Breaking News in III-V MMICs

Chair: Hasan Sharifi, HRL Laboratories, USA — Co-Chair: James F. Buckwalter, University of California, Santa Barbara, USA

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- C** **A 20W 2–20GHz GaN MMIC Power Amplifier Using a Decade Bandwidth Transformer-Based Power Combiner**  
*Michael Roberg, Manyam Pilla, Thi Ri Mya Kywe, Robert Flynt, Nguyenvu Chu, Qorvo, USA* **A**
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- C** **A 120-mW, Q-Band InP HBT Power Amplifier with 46% Peak PAE**  
*Andrea Arias-Purdue<sup>1</sup>, Petra Rowell<sup>1</sup>, Miguel Urteaga<sup>1</sup>, Keisuke Shinohara<sup>1</sup>, Andy Carter<sup>1</sup>, Josh Bergman<sup>1</sup>, Kang Ning<sup>2</sup>, Mark J.W. Rodwell<sup>2</sup>, James F. Buckwalter<sup>2</sup>*  
<sup>1</sup>Teledyne Scientific & Imaging, USA **A** ; <sup>2</sup>University of California, Santa Barbara, USA **A**
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- C** **Transformer-Based Broadband mm-Wave InP PA Across 42–62GHz with Enhanced Linearity and Second Harmonic Engineering**  
*Zheng Liu, Tushar Sharma, Chandrakanth R. Chappidi, Suresh Venkatesh, Kaushik Sengupta, Princeton University, USA* **A**
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- C** **A 300- $\mu$ W Cryogenic HEMT LNA for Quantum Computing**  
*Eunjung Cha<sup>1</sup>, Niklas Wadefalk<sup>2</sup>, Giuseppe Moschetti<sup>3</sup>, Arsalan Pourkabirian<sup>2</sup>, Jörgen Stenarson<sup>2</sup>, Jan Grahn<sup>1</sup>*  
<sup>1</sup>Chalmers University of Technology, Sweden **A** ; <sup>2</sup>Low Noise Factory, Sweden **A** ; <sup>3</sup>Qamcom Research & Technology, Sweden **A**

## Th3G: Phased Array Silicon Components

Chair: Sorin P. Voinigescu, University of Toronto, Canada — Co-Chair: Cynthia Hang, Raytheon, USA

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- C** **A DC-32GHz 7-Bit Passive Attenuator with Capacitive Compensation Bandwidth Extension Technique in 55nm CMOS**  
*Zijiang Zhang<sup>1</sup>, Nayu Li<sup>1</sup>, Huiyan Gao<sup>1</sup>, Min Li<sup>1</sup>, Shaogang Wang<sup>1</sup>, Yen-Cheng Kuan<sup>2</sup>, Xiaopeng Yu<sup>1</sup>, Zhiwei Xu<sup>1</sup>*  
<sup>1</sup>Zhejiang University, China **A** ; <sup>2</sup>National Chiao Tung University, Taiwan **A**
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- C** **A Low Power 60GHz 6V CMOS Peak Detector**  
*Zoltán Tibenszky, Corrado Carta, Frank Ellinger, Technische Universität Dresden, Germany* **A**
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- C** **A 35GHz Hybrid  $\pi$ -Network High-Gain Phase Shifter with 360° Continuous Phase Shift Range**  
*Dong Wei<sup>1</sup>, Xuan Ding<sup>2</sup>, Hai Yu<sup>2</sup>, Qun Jane Gu<sup>2</sup>, Zhiwei Xu<sup>3</sup>, Yen-Cheng Kuan<sup>4</sup>, Shunli Ma<sup>1</sup>, Junyan Ren<sup>1</sup>*  
<sup>1</sup>Fudan University, China **A** ; <sup>2</sup>University of California, Davis, USA **A** ; <sup>3</sup>Zhejiang University, China **A** ; <sup>4</sup>National Chiao Tung University, Taiwan **A**
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- C** **A 68-dB Isolation 1.0-dB Loss Compact CMOS SPDT RF Switch Utilizing Switched Resonance Network**  
*Xi Fu, Yun Wang, Zheng Li, Atsushi Shirane, Kenichi Okada, Tokyo Institute of Technology, Japan* **A**
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- C** **A CMOS Balun with Common Ground and Artificial Dielectric Compensation Achieving 79.5% Fractional Bandwidth and  $<2^\circ$  Phase Imbalance**  
*Geliang Yang<sup>1</sup>, Rui Chen<sup>2</sup>, Keping Wang<sup>1</sup>*  
<sup>1</sup>Tianjin University, China **A** ; <sup>2</sup>Southeast University, China **A**

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



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**C A 20.8–41.6-GHz Transformer-Based Wideband Power Amplifier with 20.4-dB Peak Gain Using 0.9-V 28-nm CMOS Process**

*Chieh-Wei Wang<sup>1</sup>, Yu-Chun Chen<sup>1</sup>, Wen-Jie Lin<sup>1</sup>, Jeng-Han Tsai<sup>2</sup>, Tian-Wei Huang<sup>1</sup>*

*<sup>1</sup>National Taiwan University, Taiwan  ; <sup>2</sup>National Taiwan Normal University, Taiwan *