

INTERNATIONAL MICROWAVE SYMPOSIUM

2020

Closing Session



IMS

Connecting Minds. Exchanging Ideas.



LOS ANGELES 2020
CONNECTIVITY MATTERS



IEEE



MTT-S

IEEE MICROWAVE THEORY &
TECHNIQUES SOCIETY

RFIC



AGENDA

| | Speaker |
|---|--|
| Welcome to the IMS2020 Closing Session | Mike Delisio and Jon Hacker <i>Plenary Session Co-Chairs</i> |
| IMS2020 General Chairs Address | Tim Lee <i>General Chair</i> |
| MTT-S Awards Acknowledgement <ul style="list-style-type: none">• Microwave Magazine Best Paper• THz Science and Technology Best Paper Award• MWCL "Tatsuo Itoh" Best Paper Award• Microwave Prize | |
| In Memoriam | |
| IMS Awards Acknowledgement <ul style="list-style-type: none">• Three Minute Thesis (3MT)• Student Paper Competition (SPC)• Advanced Practice Paper Competition (APPC)• Industry Paper Competition (IPC) | |
| IMS2021 Overview | IMS2021 Team |
| Keynote Address “The Road Ahead for Quantum Computing” | Hartmut Neven <i>Engineering Director, Quantum Artificial Intelligence Lab, Google</i> |

IEEE Microwave Magazine Best Paper Award

*Recognizes, on an annual basis, the most significant contribution
in a paper published in the IEEE Microwave Magazine.*

Francisco Mesa, Raúl Rodríguez-Berral and Francisco Medina, for their paper "*Unlocking Complexity Using the ECA: The Equivalent Circuit Model as An Efficient and Physically Insightful Tool for Microwave Engineering*," IEEE Microwave Magazine, Vol. 19, No. 4, pp. 44-65, June 2018



Francisco Mesa

Francisco Mesa (Fellow, IEEE) received the Licenciado and Ph.D. degrees in Physics from the University of Sevilla, Seville, Spain, in 1989 and 1991, respectively. He is currently Professor with the Dept. de Física Aplicada 1, University of Seville. His current research interest includes electromagnetic propagation/radiation in planar structures. He has served as Associate Editor of IEEE Transactions on Microwave Theory & Techniques and is a member of the TPRC of the IMS and SC-1 of MTT-S.

IEEE Microwave Magazine Best Paper Award

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Raúl Rodríguez-Berral

Raúl Rodríguez-Berral was born in Casariche, Seville, Spain in 1978. He studied Physics at Universidad de Sevilla, Seville, Spain, where he received the Licenciado (M.Sc.) degree in 2001 and the Doctor (Ph.D.) degree in 2008. He is currently an Associate Professor with the Department of Applied Physics 1 of the same university.



Francisco Medina

No bio available at time of publication.

T-TST Best Paper Award

Recognizes the best paper published in the IEEE Transactions on Terahertz Science & Technology in the year preceding the award.

Jacob W. Kooi, Rodrigo A. Reeves, Arthur W. Lichtenberger, Theodore J. Reck, Andy K. Fung, Sander Weinreb, James W. Lamb, Rohit S. Gawande, Kieran A. Cleary, and Goutam Chattopadhyay, for their paper “A Programmable Cryogenic Waveguide Calibration Load With Exceptional Temporal Response and Linearity,” IEEE Transactions on Terahertz Science & Technology, Vol. 8, No. 4, pp. 434–445, July 2018



Jacob W. Kooi

Dr. Jacob Kooi has been interested in the technical (RF and Microwave) aspect of Radio Astronomy from a very early age. Being a HAM radio operator (KC6ECC, ‘...Emitter-Collector-Collector’) he build his own microwave radio transmitters receivers (10.290 GHz HAM band) from surplus hardware, all the while pursuing a degree in Electrical Engineering and Physics.

His research interests are in the area of Millimeter and Submillimeter wave technology, low energy physics, superconducting electronics, electrodynamics, thermodynamics, low-noise amplifiers and associated device physics, Fourier optics, instrumental stability, and their application to astronomy and aeronomy.

Dr. Kooi is currently with the Jet Propulsion Laboratory, California Institute of Technology working a various fundamental research and flight programs as a system architect and instrument scientist. Jacob is an avid mountain biker, and takes up the opportunity whenever time and weather permits. He is married and has two sons studying CS and applied physics/mathematics at UCSC.

Arthur W. Lichtenberger

Theodore J. Reck

Andy K. Fung

Sander Weinreb

Kieran A. Cleary

T-TST Best Paper Award

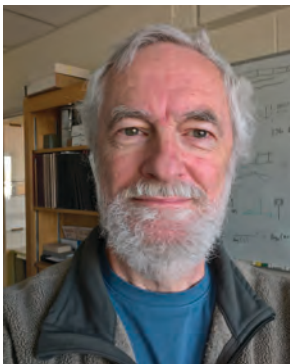
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Rodrigo A. Reeves

Rodrigo A. Reeves (M'17) received the Ph.D. degree in electrical engineering from Universidad de Concepcion (UdeC), Concepcion, Chile, in 2009.

He was a special student in astronomy with the California Institute of Technology, Pasadena, CA, USA, in 2003. He was Chief Engineer at the Chajnantor Observatory, the host of the CBI, CBI2, and QUIET, between 2005–2009. He was Postdoc in astronomical instrumentation and then from 2009 to 2014, he was a Senior Scientist with the California Institute of Technology. He is currently an Associate Professor at UdeC, the director of CePIA, the Center for Astronomical Instrumentation at UdeC, and the lead of outreach activities within the Department of Astronomy, UdeC. His research interests include cryogenic coherent receivers, the development of microwave array receivers, and sub-millimeter instrumentation with radio-astronomy applications.



James W. Lamb

James Lamb (BSc in Physics, University of Canterbury, NZ '76; PhD in Natural Philosophy, Aberdeen University, Scotland, '82) is currently Site Director at the Owens Valley Radio Astronomy Observatory. His interests are in all areas of radio astronomy instrumentation and observing techniques. He previously held positions at IRAM, Grenoble, France; NRAO, Tucson AZ; Queen Mary College, University of London, UK and; Helsinki University of Technology, Finland.

T-TST Best Paper Award

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Rohit S. Gawande

Rohit Gawande received B.E. degree from COEP, M.Sc. degree from Chalmers University, M.S. degree from Caltech, and Ph.D. degree from the University of Virginia. He worked as a research engineer at Caltech from 2011-2015 where he worked on ARGUS: a W-band spectrometer.

He is currently a member of the Radar Section at NASA's Jet Propulsion Laboratory. His research interests include RADAR and radio astronomy instrumentation. He is the PI for surface pressure sensing radar and has worked on NASA's SWOT and Europa Clipper missions. He has received multiple team awards and JPL Voyager bonus award for high profile technology contributions.



Goutam Chattopadhyay

Goutam Chattopadhyay is a Senior Research Scientist at the NASA's Jet Propulsion Laboratory, California Institute of Technology (Caltech) and a Visiting Professor at Caltech. He received the Ph.D. degree in electrical engineering from Caltech in 2000. He is a Fellow of IEEE and IETE (India) and an IEEE Distinguished Lecturer.

He is an expert in terahertz instruments and systems for space applications. He has more than 300 publications in international journals and conferences, eighteen patents, and received 35 NASA technical achievement and new technology invention awards. He received the IEEE Region 6 Engineer of the Year Award in 2018.

MCWL “Tatsuo Itoh” Award

Recognizes, on an annual basis, the most significant contribution in a paper published in the IEEE Microwave and Wireless Component. Letters.

Wei Chen, Yida Li, Rongaiang Li, Aaron Voon-Yew Thean, and Yong-Xin Guo, for their paper "*Bendable and Stretchable Microfluidic Liquid Metal-Based-Filter*," IEEE Microwave and Wireless Components Letters Tatsuo Itoh Prize, Vol. 28, Issue 3, pp. 203-205, March 2018



Wei Chen

Wei Chen received the B.Sc. degree in information engineering from South China University of Technology, Guangzhou, China, in 2009, and the Ph.D. degree in aerospace information technology from Zhejiang University, Hangzhou, China, in 2015. He joined National University of Singapore as a research fellow in 2016, focusing on flexible electronics, such as bendable and stretchable filters, flexible microwave passive components and amplifier circuits. In 2018, he joined Zhejiang University, and his current research is focused on the design and characterization of MMICs, including low noise amplifier, power amplifier and Multifunctional chips, and their applications in 5G networks.

MCWL “Tatsuo Itoh” Award

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Yida Li

Yida Li graduated from the National University of Singapore with a B. Eng (1st Hons) and Ph.D. in Integrative Science and Engineering Program. He is currently a research fellow in National University of Singapore working under Professor Aaron Thean. Before that, he was with TSMC, Hsinchu as a module R&D engineer, working on metal deposition and silicidation process at 7 nm technology node and beyond. With Professor Thean, he is now working on next generation neuromorphic computing devices using metal-oxides/novel 2D materials, as well as additive processing and heterogeneous integration of materials for new generation of hybrid flexible/wearables electronics systems.



Rongqiang Li

Rongqiang Li was born in Sichuan, China. He received M.S. and Ph.D. degrees in electromagnetic field and microwave technology from University of Electronic Science and Technology of China (UESTC), Chengdu, China, in 2007 and 2011, respectively. From 2016 to 2017, he was with the Department of Electrical and Computer Engineering, National University of Singapore, Singapore, as a visiting scholar. He is currently a Professor with College of Electronic Engineering, Chengdu University of Information Technology (CUIT), Chengdu, China. His current research interests include antennas, microwave passive circuits and flexible electronics.

MCWL “Tatsuo Itoh” Award

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Aaron Voon-Yew Thean

Aaron Thean is the Engineering Dean and a Professor of Electrical and Computer Engineering at the National University of Singapore (NUS). Prior to NUS, Aaron served as imec’s Vice President of Logic Technologies and led an International semiconductor path-finding consortium. Before imec, Aaron led technology R&D for several industry leaders; including Qualcomm, IBM, and Motorola. He led his IBM team to develop the Industry’s first foundry-compatible 32nm/28nm High-k Metal-Gate Low-Power CMOS. Aaron graduated from the University of Illinois Champaign-Urbana. He published over 300 technical papers and holds > 50 U.S. patents. He is also an IEEE Electron Device Letters editor.



Yong-Xin Guo

Yongxin Guo is a Full Professor at the Department of Electrical and Computer Engineering, National University of Singapore. He has authored over 460 international journal and conference papers and 4 book chapters. He holds over 30 granted/filed patents in USA, China and Singapore. His current research interests include antennas, wireless power, RF and millimeter-wave sensing, and MMIC modeling and design. Dr. Guo is has served as General Chair/Co-Chair for a few IEEE conferences. He has served as the IEEE Fellow Evaluation Committee for IEEE Engineering in Medicine and Biology Society (2019-2020). He is an IEEE Fellow. He is a recipient of the 2020 Microwave and Wireless Components Letters Tatsuo Itoh Prize of the IEEE Microwave Theory and Techniques Society (MTT-S).

Microwave Prize

Recognizes the most significant contribution by a published paper to the field of interest of IEEE Microwave Theory and Techniques Society.

Bhaskara Rupakula and Gabriel M. Rebeiz, for their paper "*Third-Order Intermodulation Effects and System Sensitivity Degradation in Receive-Mode 5G Phased Arrays in the Presence of Multiple Interferers*," IEEE Transactions on Microwave Theory and Techniques, Vol. 66, Issue 12, pp. 5780 – 5795, Year 2018



Bhaskara Rupakula

Bhaskara Rupakula received the B.S in Electrical Engineering (summa cum laude) from the University of California, San Diego, in 2014. He received the M.S and PhD degrees in Electrical Engineering from the same university in 2016 and 2019, respectively. He interned at Qualcomm Research in 2017 where he was involved in millimeter-wave antenna design for 5G systems. His research interests include millimeter-wave antennas and circuits for phased-arrays and wireless communication systems. He is currently at Apple Inc., Cupertino, CA.



Gabriel M. Rebeiz

No bio available at time of publication.

IMS Student Paper Competition

The Technical Paper Review Committee has identified the following students as Finalists in this year's Student Paper Competition. Finalists will be presenting their papers at the Student Paper Competition's Interactive Forum (SPC-IF) in addition to their regular presentation. All attendees are encouraged to stop by the SPC-IF and interact with these promising students, in addition to seeing them in their regular speaking sessions.

High Output Power Ultra-Wideband Distributed Amplifier using Diamond Heat Spreader in InP DHBT Technology | [Tu4F](#)

Student Finalists: Md Tanjil Shivan, Maruf Hossain, Ralf Doerner, Ksenia Nosaeva, Hady Yacoub, Ferdinand-Braun-Institut; Tom K Johansen, Technical Univ. of Denmark; Wolfgang Heinrich, Ferdinand-Braun-Institut; Viktor Krozer, Ferdinand-Braun-Institut

Advisor: Professor Viktor Krozer, Ferdinand-Braun-Institut / Johann Wolfgang Goethe-Universität Frankfurt am Main

High-Sensitivity Plasmonic Photoconductive Terahertz Detector Driven by a Femtosecond Ytterbium-Doped Fiber Laser | [Tu2E](#)

Student Finalists: Deniz Turan, Nezih Tolga Yardimci, Mona Jarrahi, Univ. of California, Los Angeles

Advisor: Mona Jarrahi, University of California, Los Angeles

Negative Group Delay Enabled Artificial Transmission Line Exhibiting Squint-Free, Dominant Mode, Backward Leaky-Wave Radiation | [Tu4A](#)

Student Finalists: Minning Zhu, Chung-Tse (Michael) Wu, Rutgers Univ.

Advisor: Chung-Tse Michael Wu, Rutgers University

A 1 mW Cryogenic LNA Exploiting Optimized SiGe HBTs to Achieve an Average Noise Temperature of 3.2 K from 4–8 GHz | [Tu3B](#)

Student Finalists: Wei-Ting Wong, Mohsen Hosseini, Univ. of Massachusetts, Amherst, Holger Rücker, IHP GmbH, Joseph Bardin, Univ. of Massachusetts, Amherst

Advisor: Joseph Bardin, Univ. of Massachusetts, Amherst

Load Modulated Balanced mm-Wave CMOS PA with Integrated Linearity Enhancement for 5G applications | [Th1G](#)

Student Finalists: Chandrakanth R. Chappidi, Princeton Univ., Tushar Sharma, NXP Semiconductors, Zheng Liu, Kaushik Sengupta, Princeton Univ.

Advisor: Kaushik Sengupta, Princeton Univ.

Miniaturized 28 GHz PCM-Based 4-bit Latching Variable Attenuator | [Tu1G](#)

Student Finalists: Tejinder Singh, Raafat Mansour, Univ. of Waterloo

Advisor: Raafat R. Mansour, Centre for Integrated RF Engineering, Univ. of Waterloo

Transmit-Receive Cross-Modulation Distortion Correction in a 5-6GHz Full Duplex Quadrature Balanced CMOS RF Front-End | [Th2F](#)

Student Finalists: Nimrod Ginzberg, Technion - Israel Institute of Technology, Tomer Gidoni, Tel-Aviv University, Dror Regev, Huawei Technologies Co., Ltd., Emauel Cohen, Technion - Israel Institute of Technology

Advisor: Professor Emanuel Cohen, Technion - Israel Institute of Technology

Gate Bias Incorporation into Cardiff Behavioural Modeling Formulation | [Tu4H](#)

Student Finalists: Ehsan M. Azad, James J. Bell, Roberto Quaglia, Jorge J. Moreno Rubio, Paul J. Tasker, Cardiff University

Advisor: Roberto Quaglia, Cardiff University

A Compact Reconfigurable N-Path Low-Pass Filter Based on Negative Trans-Resistance with <1dB Loss and >21dB Out-of-Band Rejection | [We3E](#)

Student Finalists: Mohammad Khorshidian, Columbia Univ., Negar Reiskarimian, Massachusetts Institute of Technology, Harish Krishnaswamy, Columbia Univ.

Advisor: Prof. Harish Krishnaswamy, Columbia University

A Compact Bandpass Filter with Wide Stopband and Low Radiation Loss Using Substrate Integrated Defected Ground Structure | [We2E](#)

Student Finalists: Deshan Tang, Changxuan Han, Zhixian Deng, Huizhen J. Qian, Xun Luo, Univ. of Electronic Science and Technology of China

Advisor: Xun Luo, University of Electronic Science and Technology of China

Dual-Octave-Bandwidth RF-Input Pseudo-Doherty Load Modulated Balanced Amplifier with ≥ 10 -dB Power Back-off Range | [We2G](#)

Student Finalists: Yuchen Cao, Kenle Chen, Univ. of Central Florida
Advisor: Kenle Chen, Univ. of Central Florida

An Enhanced Large-Power S-band Injection-Locked Magnetron with Anode Voltage Ripple Inhibition | [Tu1F](#)

Student Finalists: Xiaojie Chen, Xiang Zhao, Sichuan Univ., Bo Yang, Naoki Shinohara, Kyoto Univ., Changjun Liu, Sichuan Univ.
Advisor: Changjun Liu, School of Electronics and Information Engineering, Sichuan University, China

A 19 GHz Lithium Niobate Acoustic Filter with FBW of 2.4% | [Tu3E](#)

Student Finalists: Liuqing Gao, Yansong Yang, Songbin Gong, Univ. of Illinois at Urbana, Champaign
Advisor: Songbin Gong, University of Illinois at Urbana, Champaign

A High-Sensitivity Low-Power Vital Sign Radar Sensor Based on Super-Regenerative Oscillator Architecture | [We2D](#)

Student Finalists: Yichao Yuan, Rutgers Univ., Austin Ying, Kuang Chen, California State Univ., Northridge, Chung-Tse (Michael) Wu, Rutgers Univ.
Advisor: Chung-Tse (Michael) Wu, Rutgers University

Polyolithic Integration for RF/MM-Wave Chiplets using Stitch-Chips: Modeling, Fabrication, and Characterization | [Th1D](#)

Student Finalists: Ting Zheng, Paul K. Jo, Sreejith Kochupurackal Rajan, Muhannad S. Bakir, Georgia Institute of Technology
Advisor: Muhannad S. Bakir, Georgia Institute of Technology

Impact of Input Nonlinearity on Efficiency, Power, and Linearity Performance of GaN RF Power Amplifiers | [Tu3H](#)

Student Finalists: Sagar Dahr and Fadhel M. Ghannouchi, University of Calgary
Advisor: Prof. Fadhel M. Ghannouchi, University of Calgary

Noncontact High-Linear Motion Sensing Based on A Modified Differentiate and Cross-Multiply Algorithm | [We2B](#)

Student Finalists: Wei Xu, Changzhan Gu, Shanghai Jiao Tong Univ.
Advisor: Prof. Changzhan Gu, Shanghai Jiao Tong University, Shanghai

A 162 GHz Ring Resonator based High Resolution Dielectric Sensor | [Tu3D](#)

Student Finalists: Hai Yu, Bo Yu, Skyworks Solutions, Inc., Xuan Ding, Sebastian Gomez-Diaz, Jane Gu, Univ. of California, Davis
Advisor: Qun Jane Gu, University of California, Davis

A Feasibility Study on the Use of Microwave Imaging for In-Vivo Screening of Knee Prostheses | [We2D](#)

Student Finalists: Konstantin Root, Martin Vossiek, Friedrich-Alexander- Universität Erlangen-Nürnberg
Advisor: Martin Vossiek, Friedrich-Alexander-Universität Erlangen-Nürnberg,

Localization and Tracking Bees Using a Battery-less Transmitter and an Autonomous Unmanned Aerial Vehicle | [Th3C](#)

Student Finalists: Jake Shearwood, Sam Williams, Nawaf Aldabashi, Paul Cross, Bangor Univ., Breno M. Freitas, Federal University of Ceará, Chaochun Zhang, China Agricultural University, Cristiano Palego, Bangor Univ.
Advisor: Cristiano Palego, Bangor University

Closed-Loop Sign Algorithms for Low-Complexity Digital Predistortion | [We3G](#)

Student Finalists: Pablo Pascual Campo, Vesa Lampu, Tampere University, Lauri Anttila, Alberto Brihuega, Tampere Univ. of Technology, Markus Allén, Mikko Valkama, Tampere University
Advisor: Mikko Valkama, Tampere University

InP HBT Oscillators Operating up to 682 GHz with Coupled-Line Load for Improved Efficiency and Output Power | [We3C](#)

Student Finalists: Jungsoo Kim, Heekang Son, Doyoon Kim, Kiryong Song, Junghwan Yoo, Jae Sung Rieh, Korea Univ.
Advisor: Jae-Sung Rieh, Korea University, jsrieh@korea.ac.kr

A Low Power 60 GHz 6 V CMOS Peak Detector | [Th3G](#)

Student Finalists: Zoltán Tibenszky, Corrado Carta, Frank Ellinger, Technische Univ. Dresden
Advisor: Dr. Frank Ellinger, Technische Univ. Dresden

Concurrent Dual-Band Microstrip Line Hilbert Transformer for Spectrum Aggregation Real-Time Analog Signal Processing | WE1F

Student Finalists: Rakibul Islam, Md Hedayatullah Maktoomi, Washington State Univ., Yixin Gu, Univ. of Texas at Arlington, Bayaner Arigong, Washington State Univ.

Advisor: Bayaner Arigong, Washington State University

Phase Recovery in Sensor Networks based on incoherent Repeater Elements | Th2C

Student Finalists: David Werbunat, Benedikt Meinecke, Maximilian Steiner, Christian Waldschmidt, Ulm Univ.

Advisor: Christian Waldschmidt, Ulm University

In-Situ Self-Test and Self-Calibration of Dual-Polarized 5G TRX, Phased Arrays Leveraging Orthogonal-Polarization Antenna Couplings | Th1F

Student Finalists: Ahmed Nafe, Abdurrahman H. Aljuhani, Univ. of California, San Diego, Kerim Kibaroglu, Movandi, Mustafa Sayginer, Nokia Bell Labs, Gabriel Rebeiz, Univ. of California, San Diego

Advisor: Prof. Gabriel M. Rebeiz, University of California San Diego

A Scalable Switchable Dual-Polarized 256-Element Ka-Band SATCOM Transmit Phased-Array with Embedded RF Driver and $\pm 70^\circ$ Beam Scanning | We3F

Student Finalists: Kevin Kai Wei Low, Univ. of California, San Diego, Samet Zihir, Integrated Device Technology, Inc., Tumay Kanar, Integrated Device Technology, Inc., Gabriel Rebeiz, Univ. of California, San Diego

Advisor: Gabriel M. Rebeiz, University of California, San Diego

A Silicon-Based Closed-Loop 256-Pixel Near-Field Capacitive Sensing Array with 3-ppm Sensitivity and Selectable Frequency Shift Gain | We1B

Student Finalists: Jia Zhou, Univ. of California, Los Angeles, Chia-Jen Liang, National Chiao Tung Univ., Christopher E. Chen, Jieqiong Du, Rulin Huang, Univ. of California, Los Angeles, Richard Al Hadi, Alcatara LLC, James C.M. Hwang, Cornell Univ., Mau-Chung, Frank Chang, Univ. of California, Los Angeles

Advisor: Professor Frank Chang, Univ. of California, Los Angeles

Octave Frequency Range Triple-band Low Phase Noise K/Ka-Band VCO with a New Dual-path Inductor, , | Tu4C

Student Finalists: Md Aminul Hoque, Mohammad Chahardori, Washington State Univ., Pawan Agarwal, MaxLinear, Inc., Mohammed Ali Mokri, Deukhyoun Heo, Washington State Univ.

Advisor: Deukhyoun Heo, Washington State University

Liquid Crystal Based Parallel-Polarized Dielectric Image Guide Phase Shifter at W-Band | Tu4A

Student Finalists: Henning Tesmer, Roland Reese, Ersin Polat, Rolf Jakoby, Holger Maune, Technische Univ. Darmstadt

Advisor: Prof. Rolf Jakoby, Technische Universität Darmstadt

IMS Advanced Practice Paper Competition

The Advanced Practice Paper Competition (APPC) recognizes outstanding technical contributions that apply to practical applications. All finalist papers are on advanced practices and describe an innovative RF/microwave design, integration technique, process enhancement, and/or combination thereof that results in significant improvements in performance and/or in time to production for RF/microwave components, subsystems, or systems.

A CMOS Balun with Common Ground and Artificial Dielectric Compensation Achieving 79.5% Fractional Bandwidth and $<2^\circ$ Phase Imbalance

G. Yang, Tianjin Univ., R. Chen, Southeast Univ., K. Wang, Tianjin Univ.

300W Dual Path GaN Doherty Power Amplifier with 65% Efficiency for Cellular Infrastructure Applications

M. Masood, S. Embar R., P. Rashev, J. Holt, NXP Semiconductors, J.S. Kenney, Georgia Tech

RF Systems on Antenna (SoA): A Novel Integration Approach Enabled by Additive Manufacturing

X. He, Y. Fang, R.A. Bahr, M.M. Tentzeris, Georgia Tech

Load Modulated Balanced mm-Wave CMOS PA with Integrated Linearity Enhancement for 5G Applications

C.R. Chappidi, T. Sharma, Z. Liu, K. Sengupta, Princeton Univ.

Analysis and Design of a Concurrent Dual-Band Self-Oscillating Mixer

M. Pontón, A. Herrera, A. Suárez, Universidad de Cantabria

Scalable, Deployable, Flexible Phased Array Sheets

M. Gal-Katziri, A. Fikes, F. Bohn, B. Abiri, M.R. Hashemi, A. Hajimiri, Caltech

Compact Bandpass Filter with Wide Stopband and Low Radiation Loss Using Substrate Integrated Defected Ground Structure

D. Tang, C. Han, Z. Deng, H.J. Qian, X. Luo, UESTC

AFSIW-to-Microstrip Directional Coupler for High-Performance Systems on Substrate

A. Ghiotto, J.-C. Henrion, T. Martin, J.-M. Pham, IMS (UMR 5218), V. Armengaud, CNES

Quasi-Absorptive Substrate-Integrated Bandpass Filters Using Capacitively-Loaded Coaxial Resonators

D. Psychogiou, University of Colorado Boulder, R. Gómez-García, Universidad de Alcalá

High Isolation Simultaneous Wireless Power and Information Transfer System Using Coexisting DGS Resonators and Figure-8 Inductors

A. Barakat, R.K. Pokharel, S. Alshhawy, K. Yoshitomi, Kyushu Univ., S. Kawasaki, JAXA

A Synthesis-Based Design Procedure for Waveguide Duplexers Using a Stepped E-Plane Bifurcated Junction

G. Macchiarella, G.G. Gentili, Politecnico di Milano, L. Accatino, ACConsulting, V. Tornielli di Crestvolant, ESA-ESTEC

A Quadband Implantable Antenna System for Simultaneous Wireless Powering and Biotelemetry of Deep-Body Implants

A. Basir, H. Yoo, Hanyang Univ.

A 28GHz, 2-Way Hybrid Phased-Array Front-End for 5G Mobile Applications

N. Cho, H.-S. Lee, H. Lee, W.-N. Kim, Samsung

A Second Harmonic Separation Symmetric Ports 180° Coupler with Arbitrary Coupling Ratio and Transparent Terminations

P. Li, H. Ren, Washington State Univ., Y. Gu, Univ. of Texas at Arlington, B. Pejcinovic, Portland State Univ., B. Arigong, Washington State Univ.

Ultra-Wideband FMCW Radar with Over 40GHz Bandwidth Below 60GHz for High Spatial Resolution in SiGe BiCMOS

B. Welp, G. Briesse, N. Pohl, Fraunhofer FHR

A 680GHz Direct Detection Dual-Channel Polarimetric Receiver

C.M. Cooke, K. Leong, K. Nguyen, A. Escorcia, X. Mei, Northrop Grumman, J. Arroyo, Cubic Nuvotronics, T.W. Barton, University of Colorado Boulder, C. Du Toit, G. De Amici, D.L. Wu, NASA Goddard Space Flight Center, W.R. Deal, Northrop Grumman

An X-Band Lithium Niobate Acoustic RFFE Filter with FBW of 3.45% and IL of 2.7dB

Y. Yang, L. Gao, S. Gong, Univ. of Illinois at Urbana-Champaign

Automated Spiral Inductor Design by a Calibrated PI Network with Manifold Mapping Technique

X. Fa, S. Li, P.D. Laforg, Univ. of Regina, Q.S. Cheng- SUSTech

Efficient Modeling of Wave Propagation Through Rough Slabs with FDTD

S. Bakirtzis, Univ. of Toronto, X. Zhang, Univ. College Dublin, C.D. Sarris, Univ. of Toronto

High-Frequency Vector-Modulated Signal Generation Using Frequency-Multiplier-Based RF Beamforming Architecture

I. Jaffri, A. Ben Ayed, Univ. of Waterloo, A.M. Darwish, U.S. Army Research Laboratory, S. Boumaiza, Univ. of Waterloo

High-Resolution Millimeter-Wave Tomography System for Characterization of Low-Permittivity Materials

A. Och, P.A. Hölzl- Infineon Technologies, S. Schuster, voestalpine, J.O. Schratte- necker, Intel, P.F. Freidl, Infineon Technologies, S. Scheibelhofer, D. Zankl- voestal- pine, V.

Pathuri-Bhuvan, Silicon Austria Labs, R. Weigel- FAU Erlangen-Nürnberg

A Dual-Mode Frequency Reconfigurable Waveguide Filter with a Constant Frequency Spacing Between Transmission Zeros

G. B., R.R. Mansour, Univ. of Waterloo

IMS Industry Paper Competition

The Industry Paper Competition (IPC) recognizes outstanding technical contributions from industry sources. All finalist papers are from the RF/microwave industry and describe innovation of a product or system application that potentially has the highest impact on an RF/microwave product and/or system which will significantly benefit the microwave community and society at large.

A 0.011-mm² 27.5-GHz VCO with Transformer-Coupled Bandpass Filter Achieving -191dBc/Hz FoM in 16-nm FinFET CMOS

C.-H. Lin- TSMC, Y.-T. Lu- TSMC, H.-Y. Liao- TSMC, S. Chen- TSMC, A.L.S. Loke- TSMC, T.-J. Yeh- TSMC

Series-Combined Coaxial Dielectric Resonator Class-F Power Amplifier System

R.A. Beltran, F. Wang, G. Villagrana, Ophir RF

In-Band Full-Duplex Self-Interference Canceller Augmented with Band- stop-Configured Resonators

R. Sepanek, M. Hickel, M. Stuenkel, BAE Systems

A 135–183GHz Frequency Sixtupler in 250nm InP HBT

M. Bao, Ericsson, T.N.T. Do, D. Kuylenstierna, Chalmers Univ. of Technology, H. Zirath, Ericsson

AFSIW-to-Microstrip Directional Coupler for High-Performance Systems on Substrate

A. Ghiotto, J.-C. Henrion, T. Martin, J.-M. Pham, IMS (UMR 5218), V.Armengaud, CNES

Monolithic Integration of Phase-Change RF Switches in a Production SiGe BiCMOS Process with RF Circuit Demonstrations

G. Slovin, N. El-Hinnawy, C. Masse, J. Ros, D. Howard, Tower Semiconductor

A Volume Current Based Method of Moments Analysis of Shielded Planar 3-D Circuits in Layered Media

J.C. Rautio, M. Thelen, Sonnet Software

Design Considerations and FPGA Implementation of a Wideband All-Digital Transmit Beamformer with 50% Fractional Bandwidth

S. Pulipati, R. Ma, MERL

A 28GHz, 2-Way Hybrid Phased-Array Front-End for 5G Mobile Applications

N. Chog, H.-S. Lee, H. Lee, W.-N. Kim, Samsung

Digitally Assisted Load Modulated Balanced Amplifier for 200W Cellular Infrastructure Applications

S. Embar R., M. Masood, T. Sharma, J. Staudinger, NXP Semiconductors, S.K. Dhar, Univ. of Calgary, P. Rashev, G. Tucker, NXP Semiconductors, F.M. Ghannouchi, Univ. of Calgary

Suspended SiC Filter with DRIE Silicon Subcovers

E.T. Kunkee, D.-W. Duan, A. Sulian, P. Ngo, N. Lin, C. Zhang, D. Ferizovic, C.M. Jackson, R. Lai, Northrop Grumman

Three Minute Thesis

This Year's Finalists are:

Making 5G Devices Multilingual [Tu3C](#)

Eduardo Vilela Pinto dos Anjos, KU Leuven

Shaping and Steering Electromagnetic Beams for Pennies on the Dollar [Th2G](#)

Fatemeh Akbar, University of Michigan

Magical Antenna Array without the Rainbow Effect [Tu4A](#)

Minning Zhu, Rutgers University

Smart Textiles for Recycling Radio Waste [Th1E](#)

Mahmoud Wagih, University of Southampton

Improving 5G Cell Towers' Power Efficiency Using Signal Processing [We1F](#)

Ahmed Ben Ayed, University of Waterloo

Journey towards Energy-Saving Electronic Ecosystems [Th2D](#)

Aditya Dave, University of Minnesota, Twin Cities

Thriving Beyond Copper for 5G [Tu4A](#)

Renuka Bowrothu, University of Florida

Acceleration and Extension of Radial Point Interpolation Method (RPIM) to Complex Electromagnetic Structures

K. Sabet, A.I. Stefan, EMAG Technologies

Highly Linear & Efficient Power Spatium Combiner Amplifier with GaN HPA MMIC at Millimeter Wavelength Frequency

S.D. Yoon, J. Kitt, D. Murdock, E. Jackson, M. Roberg, G. Hegazi, P. Courtney, Qorvo

High-Resolution Millimeter-Wave Tomography System

Silent, But We Can Hear You! [We3D](#)

Li Wen, Shanghai Jiao Tong University

Finding the Musical Notes of Material Properties [Tu4D](#)

Nikita Mahjabeen, University of Texas at Dallas

No Ambiguity at All! [We2B](#)

Wei Xu, Shanghai Jiao Tong University

Redefining Electronics through Printing [Tu1G](#)

Shuai Yang, King Abdullah University of Science and Technology

Be Gone, Diabetes! Microwave Is In The House! [Th2E](#)

Dieff Vital, Florida International University

Improving and Enabling Future Generations of Wireless Communications: the Grandparent Factor [WE1F](#)

Abdessamad Boulmirat, Université Grenoble Alpes - CEA, LETI

A Pocket-Sized Microwave Detector [Tu3D](#)

Elif Kaya, Texas A&M University

A Truly Connected World [We1F](#)

Ifrah Jaffri, University of Waterloo

IoT: Interacting with Low-Power Devices [Tu2A](#)

Chung-Ching Lin, Washington State University

Adaptable Wireless Sensor Networks: The Backbone of Future Smart Cities [Mo2C](#)

Jay Sheth, University of Virginia

Enhancing Weather Predictions and Downloads with Microwave Electronics [Tu1A](#)

Sunil Rao, Georgia Institute of Technology

Make Low-Voltage RF Systems Possible [Tu1D](#)

Bowen Wang, Tsinghua University

Interference-Canceling 5G Devices [Mo3A](#)

Arun Paidimarri, IBM T.J. Watson Research Center

5G Signals Can See the World While Delivering Your Data [Mo3A](#)

Bodhisatwa Sadhu, IBM T. J. Watson Research Center

The Human Body: A Wire for Wireless Communications [Mo2A](#)

Baibhab Chatterjee, Purdue University

Silicon of Stars [Tu2B](#)

Yun Wang, Tokyo Institute of Technology

Empowering 5G Antenna Measurements [ARFTG](#)

Mohammadreza Ranjbar Naeini, University of Wisconsin

Keynote Address

“The Road Ahead for Quantum Computing”

Hartmut Neven

Engineering Director, Quantum Artificial Intelligence Lab, Google

ABSTRACT

The demonstration of quantum supremacy established a proof of principle that quantum computers can outperform classical ones on certain computational tasks. Since achieving this milestone the Google AI Quantum team has been pursuing two development threads, one is to increase the computational volume afforded by a quantum computer and the other is to make good use of the computational volume available. To increase the computational volume, i.e. the number of gate operations that can be performed while still maintaining high output fidelity, we will need to implement quantum error correction.

In this talk I will describe the sequence of milestones we hope to achieve en route to a fully error corrected quantum computer. Arguably the question that is the least answered for our community is whether there are commercially or scientifically interesting algorithms beyond the reach of classical machines that can be executed prior to implementing error correction. I will report on first examples.



ABOUT THE SPEAKER

Hartmut Neven is an Engineering Director at Google. He is the founder and manager of the Quantum Artificial Intelligence lab. The objective of the lab is to fabricate quantum processors and develop novel quantum algorithms to dramatically accelerate computational tasks for machine intelligence. Previously, Hartmut was head of Google's Visual Search team. His team developed the visual search service which today is used by a large number of Google products including Image Search, Google Photos, YouTube and Street View. His teams won a number of competitions designed to establish the best visual recognition software for faces (FERET 1996, FRVT 2002), objects (ImageNet 2014) and text (ICDAR 2013). Jointly with Christian Szegedy he invented the concept of adversarial images.

He was also a co-founder of Project Glass and led the team that built the first prototype. Hartmut started two computer vision companies. His second company, Neven Vision, was acquired by Google in 2006. Neven Vision pioneered visual search and launched the first face filters based on facial feature detection. Hartmut obtained his Ph.D. in 1996 with a thesis on "Dynamics for vision-guided autonomous mobile robots". Then he became a research professor at the University of Southern California.

The background of the entire image is a dark, charcoal grey. It is populated with numerous silhouettes of palm trees of varying heights and sizes. Some trees are tall and slender, reaching towards the top of the frame, while others are shorter and more rounded. The fronds of the palm trees are detailed, showing individual leaflets. The overall effect is a tropical, low-key aesthetic.

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