IEEE Journal of Microwaves

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Introduction to the IEEE JOURNAL OF MICROWAVES

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(Editorial Paper)

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ABSTRACT The new IEEE JOURNAL OF MICROWAVES strives to be a broad-scoped publication serving the whole of the microwave community, both within and beyond the IEEE. This opening article outlines our philosophy and content, presents our editorial team, and introduces our special Inaugural Issue.

INDEX TERMS Journal of Microwaves, inaugural issue, editorial board, scope, publishing philosophy.

I. INTRODUCTION

The term **MICROWAVES**[1] first appeared in the American engineering literature in 1932 in the title of an article, "The Detection of Microwaves," published in the *Proceedings of the Institute of Radio Engineers (IRE)*. The author, Nello Carrara, of the then Royal Institute for Electrical Techniques and Communications of the Navy[2] in Leghorn, Italy, describes the use of triodes to detect "*frequencies of about 10^9 per sec*" [3]. Within a year, while still a graduate student at University of Michigan, Ann Arbor, pioneering radio astronomy engineer, John D. Kraus wrote in his IRE paper on ultra-short-wave antennas, "*The term "microwaves" has been applied to those waves less than one meter in length which may still be considered as belonging to the radio spectrum.*" [4]. With the release of this Inaugural Issue of the IEEE JOURNAL OF MICROWAVES we christen the first fully-open access technical journal focused exclusively on microwaves, but spanning the entire field – from science to invention; from theory to applications; from astronomy, chemistry, biology, and physics to engineering and technology; from nanowatt to gigawatt; and from MHz to THz. It has been a long time in coming, and we are excited and privileged to participate in its foundation and launch.

With this and future volumes, we will be bringing together high quality technical articles covering all aspects of microwave science, technology and applications in subdisciplines both within, and occasionally beyond, traditional engineering. We plan to broaden our appeal and our readership by including both overview and review articles on a wide variety of subtopics. These will both consolidate current knowledge, making it convenient for expert referrals, and serve as a learning tool for individuals just starting out. In order to help bridge our field contextually with other disciplines we will also host a special tutorial series – *Microwaves are Everywhere* – covering a variety of interesting and unusual applications from the cosmic microwave background to the microwave oven. As an introduction to our community of experts and as potential role

[1]The most widely quoted source for the term microwave as applied to the radio spectrum (actually appearing as micro-wave), is from telegrapher and long time series contributor to the British publication, *The Telegraph and Telephone Journal,* J.J. Tyrrell [1], in whose 1931 column, Telegraphic Memorabilia, wrote [2]: "*For the last year or two this vain scribbler of "Memorabilia" has been making desultory enquiries from the one or two scientific sources which have been open to him regarding the possibility of utilising wavelengths below one metre, and at more than one of such centres of research and information there was always a more or less intense belief that the ultra-short wave would ultimately come into its own. When, however, just before Easter, the successful results of trials between St. Margaret's Bay and Blanc Nez, under the joint control of the International Telephone and Telegraph Laboratories (Inc.), Hendon, and the laboratories of Le Materiel Telephonique, Paris—with wavelengths as low as 18 cm. were made known, there was undisguised surprise in more than one quarter that the problem of the micro-wave had been solved so soon. One had grown used to wavelengths a few thousand metres long, with frequencies which the normal brain could fairly well grasp, but the jump to the other extreme of anything between 10 and 100 centimetres, with their oscillations hovering in the neighbourhood of fifteen or sixteen thousand millions, was a real staggerer. To this we may add a final stroke, for The Electrical Review considers "that the range of wavelengths between 10 and 100 cm. is ripe for commercial use"! Following on these stupendous figures, we have had Marchese Marconi informing the Daily Telegraph that he had successfully experimented with wavelengths of 5 cm. and a frequency of 6,000,000,000 per second!"*

[2]R.I.E.C., Regio Istituto Elettrotecnico e delle Comunicazioni della Marina, Livorno, Tuscany, Italy, 1928–1947.

models for young professionals, we will be including a special series of biographical pieces on notable figures – *Microwave Pioneers* – in academia and industry, generated from extensive personal interviews, and similar in style and content to the *Terahertz Pioneers* series[3] that appeared in the *IEEE Transactions on Terahertz Science and Technology* from its inaugural release through 2015. Another special series – *Breakthroughs in Microwaves* – will highlight "hot new research" and the people behind the publications. Finally, we hope to add a series – *Women in Microwaves* – with the goal of motivating and recruiting young women deciding on a career path.

As we unabashedly state on our manuscript submission site[4]:

"**MICROWAVES** both documents and celebrates the Renaissance that we are now living through in microwave technology and applications. **MICROWAVES**' unique spectral region spans a wavelength range of more than five decades, from 3 meters to 30 micrometers (MHz-THz). Today, microwave devices are ubiquitous. They are literally the glue that binds our social networks. They crop up in every corner of technology. They cross disciplines as diverse as communications and cooking, and appear in devices and instruments from the millimeter-square silicon chip to the hundred-meter-square tokamak, at power levels from nanowatts to gigawatts. They have been undergoing continuous development for almost one and one-half centuries, and now they infiltrate almost every aspect of our lives – unseen, unheard, often unnoticed. No longer!

This journal is both a celebration of the successful integration of microwave technology into our world, and a call to arms. Microwave engineering needs converts. Microwave engineering is not dull. All the discoveries in microwave engineering were not made in the 1950's. On the contrary, we are on a growth trajectory that surpasses anything we could have imagined even ten years ago, and this expansion will continue well into the next decade.

Over the foreseeable future, this journal will help to highlight the science, the technology, the applications, and the accomplishments of researchers in the microwave field. **MICROWAVES** strives to be a technical journal of the highest possible caliber, showcasing contributed and rigorously peer-reviewed papers that span the wide range of disciplines and applications that the field encompasses. **MICROWAVES** is also an archival teaching platform which will carry invited review articles and selected topical reports that summarize specific experimental methods, technologies, applications, and manufacturing techniques that our renowned editors feel are essential reading for everyone in our discipline. **MICROWAVES** will add news and opinions that are helping to shape our community and its influence on society, through contributions from both editors and authors, in order to give perspective to the science and technology advances highlighted in the journal. Finally, **MICROWAVES** will anchor our field to the past and catapult us into the future, with historic perspectives and biographies, and special interviews with notable scholars in four continuously running series: *Microwave Pioneers, Microwaves are Everywhere, Breakthroughs in Microwaves' and Women in Microwaves.*

The IEEE, the Microwave Theory and Techniques Society, our contributing editors and reviewers, and especially this founding *Editor-in-Chief*, all hope that you will embrace this new model for dissemination of our collective research work and the archiving of our accomplishments.

IEEE **JOURNAL OF MICROWAVES** is a model for, rather than simply a participant in, our changing future."

II. OUR EDITORIAL TEAM

In an effort to truly span all the disciplines that make up our microwave community, our Topic Editors have been assembled from the Chairs, Vice-Chairs, or key participants of all twenty-six active technical committees[5] within the Microwave Theory and Techniques society. In addition to technical expertise, academic, governmental and industrial background, we also have significant publications experience and leadership skills on our Editorial Board, which includes two former and one current IEEE journal Editor-in-Chief, a former MTTS AdCom President, and nine current and former IEEE journal Associate Editors. Our technical efforts are aided by a senior administrative editor with experience on several IEEE journals, a veteran production editor, and a scientifically trained (PhD in bioengineering) assistant editor. Together we hope to bring an unprecedented level of technical and operational expertise, as well as a personal approach, to the journal, to our contributing authors, to our valued reviewers, and to all our readers. You will find photos and short bios of our entire team at the end of this introductory article.

III. INAUGURAL ISSUE

The goal of our Inaugural Issue is to introduce our readers, and our future contributors, to the full scope and content we intend to bring to the microwave community as we move forward. In our first year of production, Volume 1, we have planned four seasonal issues: Winter, Spring, Summer, and Fall, to be released as a series of grouped papers in early January, April, July, and November. Only the Winter (January) issue will appear in print.[6] The remaining three issues in 2021, and all subsequent issues, are planned as *on-line* only. Even though we will be bundling and paginating papers into a cohesive quarterly issue, we will publish (post) completed unpaginated articles on IEEE Xplore as soon as they have been released

[3]This series of 26 biographical articles ran from Sept. 2011 through Nov. 2015 and appear at the front of each issue of IEEE TRANSACTIONS ON TERAHERTZ SCIENCE AND TECHNOLOGY. A list of the subjects and reprints are available from this EiC.

[4][Online]. Available: https://mc.manuscriptcentral.com/ieee-jmw

[5]The current 26 MTT technical committees are listed on the IEEE JOURNAL OF MICROWAVES web page: https://mtt.org/publications/journal-of-microwaves/, under: Editorial Board (at the very bottom of the page), and they are detailed on the MTT Society web pages under Technical Coordination Committees (https://mtt.org/tcfdc).

[6]A free copy of the print issue will be mailed to anyone who fills out our survey form at: https://mtt.org/publications/journal-of-microwaves/inaugural-issue/, while supplies last.

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The papers that follow this Introduction comprise our Inaugural issue, volume 1, no. 1 of IEEE **JOURNAL OF MICROWAVES**. We have assembled 32 unique and broad-based *Special Invited* review and overview articles by noted researchers covering many of the subfields that make up the Microwave Theory and Techniques Society. Adhering to our goal of reaching out to a broad audience, anchoring our field at the center of a diverse set of applications spanning multiple disciplines, and acknowledging our history and our notable contributors, we have also included four special articles that might not traditionally appear in a technical journal. Two articles with a combined historic lean fall under the *Microwaves Pioneers* series: one on Caltech's Carver Mead, containing a personal account of the development of the first microwave transistor, and one on 2006 Nobel Laureate in Physics, John Mather. The latter bio-piece couples to our *Microwaves are Everywhere* series in this issue on the cosmic microwave background. There is also a special prologue to a new 2021 edition of *Empire of the Air: The Men Who Made Radio*, by popular author Tom Lewis, that precedes our wireless communications articles, and serves as an entertaining, but informative historical diversion.

The technical papers are loosely organized by topic, but not rigorously so. You will find a set of design and theory articles towards the end, overview articles on the importance and place of microwaves in multiple disciplines scattered throughout, and niche articles reviewing particular subtopics from chemical spectroscopy and biomedical sensing to the Internet of Things and quantum computing. There are, of course, papers on more traditional applications for microwaves, covering wireless communications, 5G, and 6G, as well as amplifiers, filters, transmission lines, detectors and microwave integrated circuits. We also include articles on high power applications (gyrotrons) and microwave power beaming. Other papers cover microwave radar in applications from automotive use to precision position sensing, and in photonics. We have a nice article on recent trends in microwave imaging for security screening, a topic on everyone's mind as they begin to travel by air again, after Covid. Branching out to more exotic topics, we include articles on metasurfaces, superconductivity, carbon nanotube devices, and microwave magnetics and nonreciprocal components. Some atypical, but very microwave appropriate, papers include articles on the Square Kilometer Array astronomical telescope, THz spectroscopy in outer space, and 100 GHz chip interconnects. Finally, design and theory articles cover periodic structures (glide symmetries), modeling, and optimization. Our last article, on power amplifiers, is our first contributed paper.

Our Spring issue is already shaping up with many additional review papers and several new and continuing feature articles, as well as several unsolicited technical submissions. Please join with our amazing group of Editors and authors and visit our homepage[7] frequently for updates and featured content. All of us on the Editorial Board, as well as on the Administrative committees of the Microwave Theory and Techniques Society, have worked very hard for the past 18 months to bring this new and exciting journal to life. We hope you will embrace it, become a reviewer or a frequent contributor, and of course, read and utilize our content to *"Expand science, technology and connectivity across the globe."*

ACKNOWLEGMENT

Starting up a new journal from scratch is a daunting task, even when existing and similar publication infrastructure is in place, and even when one already has some experience at such an endeavor. There are a thousand details to get right, a rigorous timeline to adhere to, predetermined milestones and hurdles to cross, and hundreds of people to interact with, convince of the approach, and bring on board to do real work.

The decision to develop an open access (OA) journal for the Microwave Theory and Techniques Society started long before this EiC became involved. The MTT AdCom in its entirety, its former President, Dominque Schreurs, and Publications Committee Chair, N. Scott Barker, in particular, guided this process. An OA publication designated "*IEEE Open Access Journal of the Microwave Theory and Techniques Society*" was given initial fast-track approval by the IEEE TAB (Technical Activities Board) Periodicals Committee in early 2019. Once an EiC was designated and approved, the development of the journal scope, philosophy, editorial structure, and a detailed implementation plan were begun. Simply requesting and approving the renaming of the journal to its current title entailed a delay of 12 months, to allow for a Letter of Intent, extensive Phase A and Phase B implementation plans, a financial plan, and four formal IEEE committee presentations and votes!

The approach and philosophy of introducing a stand-alone publication that would have minimal competition with existing MTT publications, rather than the originally envisioned overflow outlet for open access papers, involved an equally intensive lobbying effort, and support from many dozens of dedicated and far-sighted individuals starting with past MTT Presidents: Samir El Ghazaly, Madhu Gupta, Dick Snyder, Nick Kolias, Tim Lee, Ke Wu and Dylan Williams. Scott Barker and all the MTT Publications Committee members were also essential, and strong early supporters of the *IEEE Journal of Microwaves* concept and philosophy. A concerted team effort supported by 2020 MTT President Alaa Abunjaileh, Scott Barker, and President Elect Greg Lyons, took the journal through the nine-month approval process of the IEEE TAB Periodicals Committee. Several other MTT AdCom and committee members deserve special mention for their help along the way, including Maurizio Bozzi (MTT Treasurer), Dietmar Kissinger (MTT Technical Coordination and Future Directions Committee Chair), Anding Zhu (MTT Websites),

[7] [Online]. Available: https://mtt.org/publications/journal-of-microwaves

Ramesh Gupta (MTT Marketing and Communications), John Barr (MTT Past President), Peter Staecker (MTT and IEEE past President), and Mary Ward-Callan at IEEE Management Council.

Once the new journal had cleared most of the Periodicals Committee approval steps, for which the EiC very gratefully acknowledges the support and help of Chair Ross Stone and IEEE's Laura Creighton, Meena Shanmugavel, Dawn Melley, Joan Kenny, Peter Tuohy, Dena Hoffman, and Sandra Duran, the real work began: putting the journal's desired technical content and character together with the full paper handling process, production team, costing and financing, web content, and advertising. Here we could not have succeeded without constant help and support from IEEE's Alison Larkin, Sonal Parikh, Louis Vacca, Jeffrey Cichocki, Katie Sullivan, Kevin Lisankie, Jonathan Wiggins, Patrick Kempf, and of course our production editor, Joanna Gojlik, most of whom I am sure are very sorry they ever responded to an email from me!

No one has worked harder on the quality and content of this new journal than our incredible Topic Editors who spent all summer putting together this comprehensive inaugural issue; our superb inaugural issue authors, all of whom have taken a big chance in placing their content in a brand-new journal without a track record, an impact factor, or a reader base; and our initial cadre of reviewers, who have volunteered their time and support, without reward, to help make our content the best it can be.

Finally, no EiC could ask for more experienced, more dedicated, or more creative and helpful support than that provided by Kara McArthur and Maryam Ali.

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EDITORIAL BOARD

EDITOR-IN-CHIEF

PETER H. SIEGEL (Life Fellow, IEEE) received the B.A. degree in astronomy from Colgate University, in 1976, the M.S. degree in physics from Columbia University, in 1978, and the Ph.D. degree in electrical engineering (EE) from Columbia University in 1983. He has held appointments as a Research Fellow and Engineering Staff with the NASA Goddard Institute for Space Studies, New York City, NY, USA, from 1975 to 1983, a Staff Scientist with the National Radio Astronomy Observatory, Central Development Labs, Charlottesville, VA, USA, from 1984 to 1986, a Technical Group Supervisor and Senior Research Scientist at the Jet Propulsion Laboratory (JPL), National Aeronautics and Space Administration (NASA), Pasadena, CA, USA, from 1987 to 2014, and a Faculty Associate in electrical engineering and Senior Scientist in biology at the California Institute of Technology (Caltech), Pasadena, CA, USA, from 2002 to 2014. At JPL, he founded and led for 25 years, the Submillimeter Wave Advanced Technology (SWAT) Team, a group of over 20 scientists and engineers developing THz technology for NASA's near and long-term space missions. This included delivering key components for four major satellite missions and leading more than 75 smaller research and development programs for NASA and the U.S. Department of Defense. At Caltech, he was involved in new biological and medical applications of THz, especially low-power effects on neurons and most recently millimeter-wave monitoring of blood chemistry. He was an IEEE Distinguished Lecturer and the Vice-Chair and Chair of the IEEE MTTS THz Technology Committee. He is currently an elected member of the MTTS AdCom. He has more than 300 articles on THz components and technology and has given more than 250 invited talks on this subject throughout his career of 45 years in THz. His current appointments include the CEO of THz Global, a small research and development company specializing in RF bio-applications, a Senior Scientist Emeritus of biology and electrical engineering with Caltech, and a Senior Research Scientist Emeritus and a Principal Engineer with the NASA Jet Propulsion Laboratory. Dr. Siegel has been recognized with 75 NASA technology awards, ten NASA team awards, the NASA Space Act Award, three individual JPL awards for technical excellence, four JPL team awards, and the IEEE MTTS Applications Award in 2018. He is honored to take up the responsibility as the Founding Editor-in-Chief of IEEE JOURNAL OF MICROWAVES, which he hopes will invigorate the microwave field. Among many other functions, he served as the Founding Editor-in-Chief for IEEE TRANSACTIONS ON TERAHERTZ SCIENCE AND TECHNOLOGY, from 2010 to 2015, and the Founder, in 2009, Chair through 2011, and elected General Secretary since 2012, of the International Society of Infrared, Millimeter, and Terahertz Waves (IRMMW-THz), the world's largest society devoted exclusively to THz science and technology.

TOPIC EDITORS (ALPHABETICALLY)

TC-3 & TC-24 TOPIC EDITOR: MICROWAVE MEASUREMENTS & MICROWAVE/MM-WAVE RADAR, SENSING, AND ARRAY SYSTEMS

SHERIF S. AHMED (Senior Member, IEEE) received the M.Sc. degree in microwave engineering from The Technical University of Munich, Munich, Germany, in 2007, and the Ph.D. (Dr. Ing.) degree from The University of Erlangen Nuremberg, Erlangen, Germany, in 2013. He is currently an Adjunct Professor with Stanford University, Stanford, CA, USA, and assembles more than 15 years of professional industry experience in various R&D roles. He has coauthored 25+ research papers, 20+ patents, and a book on advanced microwave imaging methods. He was the recipient of the University Academic Award of the Technical University of Munich (TUM) in 2007, the Innovation Award of Rohde & Schwarz (R&S) in 2009 and 2018, and the IEEE MTT Microwave Prize Award of 2013. Moreover, he is a co-chair on the US ANSI standard committee for Measuring the Imaging Performance of mmWave Systems for Security Screening of Humans.

Dr. Ahmed's R&D focus extends to microwave and mmWave imaging, stand-off THz sensing, multistatic radars, advanced signal-processing techniques, terahertz technology, and last but not least, automotive radar design and characterization. Over the past decade, he pioneered the body scanner technology with the first fully-electronic multistatic mmWave imaging systems, which are being deployed worldwide today at airport checkpoints. In the recent years, he has been advancing the qualifications of automotive radars, towards autonomous driving capabilities.

TC-11 TOPIC EDITOR: MICROWAVE LOW-NOISE TECHNIQUES

JOSEPH BARDIN (Senior Member, IEEE) received the Ph.D. degree in electrical engineering from the California Institute of Technology in 2009. In 2010, he joined the department of Electrical and Computer Engineering at the University of Massachusetts, Amherst, where he is currently a Full Professor. His research group currently focuses on low temperature integrated circuits with applications in radio astronomy and the quantum information sciences. In 2017, he joined the Google Quantum AI team as a Visiting Faculty

Researcher and, in addition to his university appointment, he currently serves as a Staff Research Scientist with this team. Professor Bardin was the recipient of a 2011 DARPA Young Faculty Award, a 2014 NSF CAREER Award, a 2015 Office of Naval Research YIP Award, a 2016 UMass Amherst College of Engineering Barbara H. and Joseph I. Goldstein Outstanding Junior Faculty Award, a 2016 UMass Amherst Award for Outstanding Accomplishments in Research and Creative Activity, and a 2020 IEEE MTT-S Outstanding Young Engineer Award.

TC-20 TOPIC EDITOR: HF-VHF-UHF TECHNOLOGIES AND APPLICATIONS

ROBERT H. CAVERLY (Life Fellow, IEEE) received the Ph.D. degree in electrical engineering from The Johns Hopkins University, Baltimore, MD, USA, in 1983. He has been a Faculty Member with Villanova University in the Department of Electrical and Computer Engineering since 1997 and is currently a Full Professor. Previously, he was a Professor for more than 14 years at the University of Massachusetts Dartmouth. Dr. Caverly's research interests are focused on the characterization of semiconductor devices such as PIN diodes and FETs in the microwave and RF control environment. He has authored or coauthored more than 100 journal and conference papers and is the author of two books, *Microwave and RF Semiconductor Control Device Modeling* and *CMOS RFIC Design Principles* from Artech House. An IEEE Life Fellow, Dr. Caverly is the current Editor-in-Chief of *IEEE Microwave Magazine* and a member of the MTT-S AdCom, and was the General Chair of the 2020 IEEE Radio and Wireless Week.

TC-28 TOPIC EDITOR: BIOLOGICAL EFFECTS AND MEDICAL APPLICATIONS

J.-C. CHIAO (Fellow, IEEE) received the B.S. degree from the Electrical Engineering Department, National Taiwan University in 1988, and the M.S. and Ph.D. degrees in electrical engineering from the California Institute of Technology, in 1991 and 1995, respectively. He was a Research Scientist with the Optical Networking Systems and Testbeds Group at Bell Communications Research; Assistant Professor of Electrical Engineering at the University of Hawaii, Manoa; and Product Line Manager and Senior Technology Advisor with Chorum Technologies. Dr. Chiao was Janet and Mike Greene endowed Professor and Jenkins Garrett Professor of Electrical Engineering at the University of Texas – Arlington from 2002 to 2018. He is currently Mary and Richard Templeton Centennial Chair Professor in Electrical and Computer Engineering at Southern Methodist University (SMU).

He has authored or coauthored and edited numerous peer-reviewed technical journal and conference papers, book chapters, proceedings and books. He holds 16 patents in RF MEMS, MEMS optical, liquid crystal, nano-scale fabrication, and wireless medical sensor technologies. His research works have been covered by media extensively including *Forbes, National Geographic* magazine, National Public Radio, and CBS Henry Ford Innovation Nation.

Dr. Chiao was the recipient of the Lockheed Martin Aeronautics Company Excellence in Engineering Teaching Award; Tech Titans Technology Innovator Award; Research in Medicine award in the Heroes of Healthcare; IEEE Region 5 Outstanding Engineering Educator Award; IEEE Region 5 Excellent Performance Award; 2012-2014 IEEE MTT Distinguished Microwave Lecturer Award; 2017-2019 IEEE Sensors Council Distinguished Lecturer Award; and the 2011 Edith and Peter O'Donnell Award in Engineering by The Academy of Medicine, Engineering and Science of Texas. He has been Chair of several international conferences including 2018 IEEE International Microwave Biomedical Conference (IMBioC). He was the Chair for the IEEE MTT-S Technical Committee 10 "Biological Effect and Medical Applications of RF and Microwave," Technical Program Chair of 2019 IEEE International Wireless Symposium, and Associate Editor for IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES. He is the founding Editor-in-Chief for IEEE JOURNAL OF ELECTROMAGNETICS, RF, AND MICROWAVES IN MEDICINE AND BIOLOGY.

TC-23 & TC-25 TOPIC EDITOR: WIRELESS COMMUNICATIONS & WIRELESS POWER TRANSFER AND ENERGY CONVERSION

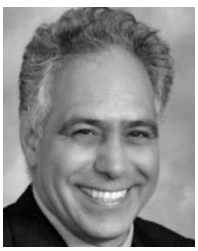
ZHIZHANG (DAVID) CHEN (Fellow, IEEE) received the B.Eng. degree in radio engineering from Fuzhou University, Fujian, China, the M.A.Sc. degree in radio engineering from Southeast University (formerly Nanjing Institute of Technology), Nanjing, China, and the Ph.D. degree in electrical engineering from the University of Ottawa, Ottawa, Ontario, Canada, respectively. He is a Professor and the former Head of the Department of Electrical ad Computer Engineering, Dalhousie University, Halifax, Nova Scotia, Canada. He is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE), a Fellow of the Canadian Academy of Engineering (CAE), and a Fellow of Engineering Institute of Canada (EIC). He is a registered Professional Engineer and has served as a consultant for local companies.

Dr. Chen has been active in teaching, research and professional services. He has been teaching various undergraduate and graduate courses in the areas of communication systems, RF/Microwave electronics/systems, antennas, and electromagnetics. He has authored or coauthored more than 450 refereed journal/conference papers and 26 industrial reports, published one book, contributed to two books, edited one research monograph and one conference proceeding, and filed eight patent applications in the areas of computational electromagnetics and RF/microwave circuit and system design (some of his publications have been cited extensively in SCI literatures). He was one of the key originators in developing new numerical algorithms and in designing a new class of compact RF circuits and systems for wireless communications. He has been a sole/principal investigator of more than twenty-eight grants from both government and industry, including a NSERC Discovery Accelerator Supplement Grant, NSERC Strategic Project Grants on Ultra-wideband Impulse Radios and novel RF-front ends; an research contract in developing structure composite microwave materials for radar applications (2011–2013); an Atlantic Innovation Fund on generic smart RF transceivers.

TC-12 TOPIC EDITOR: MICROWAVE HIGH-POWER TECHNIQUES

STEVE C. CRIPPS (Life Fellow, IEEE) received the master's and Ph.D. degrees from Cambridge University in the 1970s. After working for several years with the pioneering gallium arsenide (GaAs) group at Plessey Research, he emigrated to the U.S., where he worked for 15 years in various engineering and management positions at Watkins Johnson, Loral, and Celeritek. In 1996, Dr. Cripps returned to the U.K., working as an Independent Consultant before taking on an academic post at Cardiff University, where he is currently a Distinguished Research Professor. Dr. Cripps has authored several best-selling books on RFPA design and is a regular contributor to *IEEE Microwave Magazine* with his popular "Microwave Bytes" column. Dr. Cripps was the 2008 recipient of the IEEE Microwave Application Award.

TC-22 & TC-10 TOPIC EDITOR: MICROWAVE PHOTONICS & SIGNAL GENERATION AND FREQUENCY CONVERSION



AFSHIN S. DARYOUSH (Fellow, IEEE) is currently a Professor of electrical and computer engineering with Drexel University, Philadelphia, PA, USA, where he has developed courses in devices, circuits, and subsystems employed in microwaves, photonics, and antennas. He also conducts research in microwave photonics applied to telecommunications and biomedical engineering that resulted in more than 300 technical articles, ten patents, and eight book chapters. He became a member of the Franklin Institute's Committee on Science and the Arts in 2011. Dr. Daryoush was the recipient of Drexel University's Graduate Teaching Award in 2000, the IEEE Philadelphia Section's Franklin Key Award in 2015, and Drexel University's Alumni Award in 2018. After receiving the Microwave Prize in 1986, his 13 articles have been recognized as the best student papers in various IEEE conferences. He has also

organized various IEEE conferences since 1993, particularly serving as the TPC Chair for Radio Wireless Symposium 2008 (RWS 2008) and the Chair for the Radio and Wireless Week 2009 (RWW 2009), Microwave Photonics 2010 (MWP 2010), Benjamin Franklin Symposium on Microwave and Antenna Sub-Systems 2014 (BenMAS 2014), and International Microwave Symposium 2018 (IMS 2018).

TC-29 TOPIC EDITOR: MICROWAVE AEROSPACE SYSTEMS

NELSON J. G. FONSECA (Senior Member, IEEE) received the M.Eng. degree from Ecole Nationale Supérieure d'Electrotechnique, Electronique, Informatique, Hydraulique et Télécommunications (ENSEEIHT), Toulouse, France, in 2003, the M.Sc. degree from the Ecole Polytechnique de Montreal, Quebec, Canada, also in 2003, and the Ph.D. degree from Institut National Polytechnique de Toulouse – Université de Toulouse, France, in 2010, all in electrical engineering.

He currently worked as an Antenna Engineer successively with the Department of Antenna Studies, Alcatel Alénia Space, Toulouse, France (now Thalès Alénia Space), and with the Antennas Section, French Space Agency (CNES), Toulouse, France. In 2009, he joined the Antenna and Sub-Millimetre Wave Section, European Space Agency (ESA), Noordwijk, The Netherlands. His current research interests include multiple beam antennas for space missions, beam-former theory and design, ground terminal antennas and novel manufacturing techniques. He has authored or coauthored more than 200 papers in peer-reviewed journals and conferences. He contributed to 25 technical innovations, protected by more than 40 patents issued or pending.

Dr. Fonseca was the Chair of the 38th ESA Antenna Workshop on Innovative Antenna Systems and Technologies for Future Space Missions, October 2017, and the Co-Chair of the 2018 IET Loughborough Antennas & Propagation Conference (LAPC 2018). He is currently an Associate Editor for *IET Microwave, Antennas and Propagation* and IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES. He is also the Co-Vice Chair of the newly founded Technical Committee 29 (TC-29) of the IEEE MTT Society on Microwave Aerospace Systems. He has been a Board Member of the European School of Antennas (ESoA) since January 2019 and is also the Coordinator of the ESA/ESoA course on Antennas for Space Applications. He was the recipient of several prizes and awards, including the Best Young Engineer Paper Award at the 29th ESA Workshop on Antennas in 2007 as well as multiple ESA Technical Improvement Awards.

TC-16 TOPIC EDITOR: MICROWAVE AND MILLIMETER-WAVE PACKAGING, INTERCONNECTS AND INTEGRATION

RHONDA FRANKLIN (Senior Member, IEEE) received the M.S. and Ph.D. degrees in electrical engineering from the University of Michigan. In 1998, she joined the Department of Electrical and Computer Engineering, University of Minnesota (UMN), where she is currently a Full Professor. Her research focuses on advanced design methods for high-speed electronic circuit integration, integrated packaging, antennas, novel material and magnetic nanowire characterization for applications in communications, bio- and nano-medicine. She has coauthored over 100 technical publications, three patents, and five book chapters on integrated packaging, magnetic nanowire characterization, nanowarming, and women in microelectronics. She has been active in the IEEE MTT-S Society Education Committee, Associate Editor for IEEE MICROWAVE WIRELESS COMPONENTS LETTERS, Project Connect, Technical Coordinating Committee Chair for MTT-16 on Microwave and Millimeter-wave Packaging, Interconnect and Integration. Professor Franklin is the recipient of a 1999 NSF Presidential Career Award for Engineers and Scientist, 2014 UMN Sara Evans Scholar Leader Award, 2016 John Tate Advising Award, and IEEE 2019 MTT-S N. Walter Cox Award, and 2020 ARCS MN Chapter Scientist of the Year Award.

TC-5 TOPIC EDITOR: FILTERS

ROBERTO GÓMEZ-GARCÍA (Senior Member, IEEE) received the Dipl.-Eng. degree in telecommunication engineering and the Ph.D. degree in electrical and electronic engineering from the Polytechnic University of Madrid, Madrid, in 2001 and 2006, respectively. Since 2006, he was an Associate Professor with the Department of Signal Theory and Communications, University of Alcalá, Alcalá de Henares, Spain. He has been, for several research stays, with the C2S2 Department, XLIM Research Institute, University of Limoges, Limoges, France, the Telecommunications Institute, University of Aveiro, Aveiro, Portugal, the U.S. Naval Research Laboratory, Microwave Technology Branch, Washington, DC, USA, and Purdue University, West Lafayette, IN, USA. He is also an Adjunct Part-Time Professor with the University of Electronic Science and Technology of China, Chengdu, China, as has been an Invited Professor with Gdansk University of Technology, Poland, during 2019–2020. His current research interests include the design of fixed/tunable high-frequency filters and multiplexers in planar, hybrid, and monolithic microwave-integrated circuit technologies, multifunction circuits and systems, and software-defined radio and radar architectures for telecommunications, remote sensing, and biomedical applications, in which he has authored or coauthored more than 100 papers in international journals and more than 140 papers in international conferences.

Dr. Gómez-García was a member for the Technical Review Board for several IEEE and EuMA conferences. He is also a member of the IEEE MTT-S Filters (MTT-5), the IEEE MTT-S RF MEMS and Microwave Acoustics (MTT-6), the IEEE MTT-S Wireless Communications (MTT-23), the IEEE MTT-S Biological Effects and Medical Applications of RF and Microwave (MTT-28), and the IEEE CAS-S Analog Signal Processing Technical Committees. He was the recipient of the 2016 IEEE Microwave Theory and Techniques Society (MTT-S) Outstanding Young Engineer Award. He is an IEEE CAS-S Distinguished Lecturer (2020–2021). He was an Associate Editor for IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES from 2012 to 2016 and IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS—PART I: REGULAR PAPERS from 2012 to 2015. He was a Senior Editor of IEEE JOURNAL ON EMERGING AND SELECTED TOPICS IN CIRCUITS AND SYSTEMS from 2016 to 2017. He was a Guest Editor for several Special/Focus Issues and Sections in IEEE and IET Journals. He is currently an Associate Editor of IEEE MICROWAVE AND WIRELESS COMPONENTS LETTERS, IEEE JOURNAL OF ELECTROMAGNETICS, RF AND MICROWAVES IN MEDICINE AND BIOLOGY, IEEE ACCESS, *IET Microwaves, Antennas, and Propagation*, and the *International Journal of Microwave and Wireless Technologies*, and the MTT-S Newsletter Working Group Chair.

TC-6 TOPIC EDITOR: RF MEMS AND MICROWAVE ACOUSTICS

SONGBIN GONG (Senior Member, IEEE) received the B.S. degree in electrical engineering from the Huazhong University of Science and Technology, China, in 2004, and the Ph.D. degree in electrical engineering from the University of Virginia, Charlottesville, VA, USA, in 2010. He is currently an Associate Professor and an Intel Alumni Fellow with the Department of Electrical and Computer Engineering and Holonyak Micro and Nanotechnology Laboratory, University of Illinois at Urbana–Champaign, Urbana, IL, USA.

His research primarily focuses on the design and implementation of MEMS and acoustic devices, components, and subsystems for RF front ends. In addition, his research explores hybrid microsystems based on the integration of MEMS devices with circuits or photonics for signal processing. He was the recipient of the 2014 Defense Advanced Research Projects Agency Young Faculty Award, the 2017 NASA Early Career Faculty Award, 2019 Dean's Award for Excellence in Research at UIUC, and 2019 IEEE Ultrasonics Early Career Investigator Award. Along with his students and postdocs, he received the Best Paper Awards from the 2017 and 2019 IEEE International Frequency Control Symposium and the 2018 and 2019 IEEE International Ultrasonic Symposium and the 2nd place in the Best Paper Competition at 2018 International Microwave Symposium. He has been an Associate Editor

for IEEE T-UFFC and JMEMS, and also the Technical Committee Chair of MTT-6 RF-MEMS and Microwave Acoustics of the IEEE Microwave Theory and Techniques Society.

TC-7 TOPIC EDITOR: MICROWAVE SUPERCONDUCTIVITY AND QUANTUM TECHNOLOGIES

MICHAEL C. HAMILTON (Senior Member, IEEE) received the BSEE degree from Auburn University in 2000 and the M.S.E.E. and Ph.D. degrees in electrical engineering from The University of Michigan in 2003 and 2005, respectively. From 2006 to 2010, he was a member of Technical Staff at MIT-Lincoln Laboratory, where he worked on instrument-level and system-level projects for next generation geostationary imaging for weather satellite systems, testing and modeling of highly-scaled and environmentally-optimized CMOS devices subjected to extreme environmental conditions, and modeling, design, fabrication and test of advanced technologies for high-frequency RF sample-hold and analog-digital conversion circuits based on Fully-Depleted Silicon-On-Insulator (FD-SOI) transistors and CCD structures. His current research interests include superconducting electronics technologies, micro/nano fabrication, packaging and integration of high speed systems, signal and power integrity of densely integrated systems, application of micro and nanostructures for enhanced performance of RF and microwave systems and packaging for extreme environments (both high and low temperature). He joined the Electrical and Computer Engineering Department of Auburn University as an Assistant Professor in 2010, and was promoted to Professor in 2019. He is the Director of the Alabama Micro/Nano Science and Technology Center (AMNSTC), which is a micro/nano technology center at Auburn University funded by the State of Alabama. Dr. Hamilton is the Auburn University IEEE Student Chapter Faculty Advisor. He is on the IEEE MTT-S Education Committee, Vice-Chair of MTT-7 Technical Committee on Microwave Superconductivity and Quantum Technologies Committee, and producer/moderator of the IEEE MTT-S Webinar Series.

TC-21 TOPIC EDITOR: TERAHERTZ TECHNOLOGY AND APPLICATIONS

DMITRY KHOKHLOV received the M.S., Ph.D., and Doctor of Science (Russian analogue of the Habilitaet degree in Germany) degrees from M.V. Lomonosov Moscow State University, Moscow, Russia, in 1980, 1982, and 1992, respectively. Since 1982, he has been with the Department of Physics, M.V. Lomonosov Moscow State University, in positions from Junior Research Fellow up to Full Professor, since 1997, the Head of the Chair of General Physics, and Condensed Matter Physics, since 2006. In 2008, he was elected as Correspondent Member of the Russian Academy of Sciences. Since 2013, he is a head of the Expert Council on Condensed Matter Physics of the Russian Foundation for the Basic Research. Since 2015, he is also a head of the Expert Council on International Research Projects of the same Foundation.

He has been active in teaching, he has developed several lecture courses for undergraduate and graduate students, and supervised more than 30 M.Sc. students and about 15 Ph.D. thesis. His research interests include physics of narrow-gap semiconductors, development of sensitive detectors of terahertz radiation, photoelectric phenomena under terahertz excitation, organic semiconductors, and several other areas. He authored or coauthored more than 350 research/conference papers, edited one research monograph and filed two patents. He has been a Principal Investigator of more than 15 research grants from different Russian national agencies.

TC-1 TOPIC EDITOR: FIELD THEORY AND COMPUTATIONAL EM

FRANCISCO MESA (Fellow, IEEE) received the B.Sc and Ph.D. degrees in physics from University of Seville, Seville, Spain, in 1998 and 1991, respectively. From 1989 to 1992. He was Associate Researcher with the Department of Electronics and Electromagnetism, University of Seville. From 1992 to 1997, he was Assistant Professor with Department of Applied Physics in the University of Seville, where he was promoted to Associate Professor in 1997 and Full Professor in 2010. Between 1992 and 2004, he enjoys four stays in US universities, the first one in the Polytechnic Institute of Brooklyn (NY), and three more in the University of Houston collaborating with Prof. David R. Jackson. From July to December 2019, he was a Visiting Researcher with KTH (Royal Institute of Technology), Stockholm (Sweden) collaborating with Prof. Oscar Quevedo-Teruel.

Since 1988, he has been member of the Microwave Group of the University of Seville. During the first years of his research he worked on computational electromagnetism (integral equation method to analyze passive planar structures at microwave frequencies) as well as in diverse theoretical aspects of the wave propagation involved in these structures (mainly on the computation of Green's functions for layered bi-anisotropic structures and the dispersion relation of "exotic modes" in this structures; namely, complex modes and leaky modes). Later, he has been working in the modeling of metamaterials and periodic planar structures, contributing to the development of analytic (or quasi-analytic) equivalent circuits to characterize such structures and find physically-insightful explanations of some exotic phenomena (for instance, the extraordinary transmission/reflection, electromagnetic induced transparency, appearing of backward and forbidden bands, etc.). More recently he has worked on higher symmetries applied to electromagnetic propagation and on the design of geodesic lenses.

Since January 2014, Prof. Mesa has been IEEE Fellow proposed by the IEEE MTT Society for "contributions to the theory and computation of wave propagation in microwave planar structures." He is also member of IEEE MTT-S Technical Committee MTT-1 (Field Theory and Computational EM). His Ph.D. thesis was awarded the "Best Science Thesis in 1991" by the University of Seville.

TC-26 TOPIC EDITOR: RFID, WIRELESS SENSORS AND IOT

PAOLO MEZZANOTTE (Member, IEEE) was born in Perugia, Italy, in 1965. He received the Ph.D. degree from the University of Perugia, Perugia, in 1997. Since 2007, he has been an Associate Professor with the University of Perugia, where he has been involved in teaching the classes "Radiofrequencies Engineering" and "Systems and Circuits for IoT." Since 2014, he has the Vice Head of the Department of Engineering of the University of Perugia. He is an Associate Editor of *ACES journal*. His present h-index is 24 his research activities are testified by more than 170 publications in the most important specialized journals and at the main conferences of the microwave scientific community. His current research interests include the development of microwave circuits on bio-compatible substrates and the enabling technologies for IoT. Dr. Mezzanotte, from January 2017 to December 2019, was the Chair of the IEEE Technical Committee MTT-24- RFID Technologies.

TC-13 TOPIC EDITOR: MICROWAVE CONTROL TECHNIQUES

CHRISTOPHER D. NORDQUIST (Senior Member, IEEE) received the B.S., M.S., and Ph. D. degrees in electrical engineering from Pennsylvania State University, University Park, PA, USA, in 1997, 1998, and 2002, respectively.

At Penn State, he was an Undergraduate and Graduate Research Assistant from 1995–1998 and a National Defense Science and Engineering Graduate Fellow from 1998–2001, where he explored heterogeneous integration of compound semiconductor devices through self-assembly. In

2002, he joined Sandia National Laboratories in Albuquerque, NM, USA, where he is currently a Distinguished Member of Technical Staff in the RF/Optoelectronics Department. His current research interests and activities include the design, fabrication, integration, and application of emerging micromachined and solid-state RF and microwave devices. In this context of exploring new approaches that target key future needs, he has explored the application of a broad range of advanced technology sets including Si, GaAs, InP, GaN, MEMS, and advanced materials. He has coauthored more than 80 journal and conference publications and holds nine patents in these areas.

Dr. Nordquist is a Senior Member of the IEEE Electron Device and Microwave Theory and Techniques Societies. He is currently the Chair of the IEEE MTT-13 Technical Committee on Microwave Control Materials and serves on the editorial board of IEEE JOURNAL OF MICROWAVES. He also served as the Technical Program Co-Chair for the 2018 IEEE International Microwave Workshop in Advanced Materials, on the IEEE CSICS program committee from 2004–2006, as a Reviewer for several IEEE journals, and was a key contributor to Sandia's 2011 R&D100 award-winning Microresonator Filters and Frequency References team.

TC-8 TOPIC EDITOR: RF NANOTECHNOLOGY

LUCA ROSELLI (Fellow, IEEE) joined the University of Perugia, Perugia, Italy, in 1991. In 2000, he founded the spin-off WiS Srl, Foligno, Italy. He was involved in electronic technologies for the Internet of Things for six years. He is currently a Qualified Full Professor with the University of Perugia, where he teaches applied electronics and coordinates the High Frequency Electronics Laboratory.

He has authored more than 280 papers (H-i 28, i10 82, and over 3000 citations in Scholar) and *Green RFID Systems* (Cambridge Univ. Press, 2014). His current research interests include HF electronic systems with special attention to RFID, new materials, and wireless power transfer.

Prof. Roselli was a member of the Board of Directors of ART Srl, Urbino, Italy, from 2008 to 2012. He is also a member of the list of experts of the Italian Ministry of Research, the past Chair of the IEEE Technical Committees MTT-24-RFID, the Vice Chair of 25-RF Nanotechnologies, 26-Wireless Power Transfer, the ERC Panel PE7, and the Advisory Committee of the IEEE-WPTC, and the Chairman of the SC-32 of IMS. He is also the Co-Chair of the IEEE Wireless Sensor Network Conference. He organized the VII Computational Electromagnetic Time Domain in 2007 and the first IEEE Wireless Power Transfer Conference in 2013. He is also an Associate Editor of *IEEE Microwave Magazine*. He is involved on the boards of several international conferences. He is also a reviewer for many international journals, including PROCEEDINGS OF THE IEEE, IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES, and IEEE MICROWAVE AND WIRELESS COMPONENTS LETTERS.

TC-9 TOPIC EDITOR: MICROWAVE AND MILLIMETER-WAVE SOLID-STATE DEVICES

MICHAEL SCHRÖTER (Senior Member, IEEE) received the Dr.-Ing. degree and venia-legendi in electrical engineering from Ruhr-University Bochum, Germany, in 1988 and 1994, respectively. During eight years in industry, he held engineering and management positions at Nortel/BNR in Ottawa, Canada, as well as at Rockwell/Conexant and RFNano in Newport Beach (CA), USA. Since 1999, he has been a Full Professor with Technical University Dresden, Germany. During his 2009 to 2011 Leave of Absence from TUD he held the position of Vice President of RF Engineering at RFNano, where he was responsible for the device design of the first prototyping carbon nanotube FET process technology. He has co-authored over 260 peer-reviewed publications, four textbook chapters and two textbooks. He was a Co-Founder of XMOD Technologies in Bordeaux, France, and the Technical Project Manager for the EU project DOTFIVE and DOTSEVEN, leading to SiGe HBT technologies with world-record performance. He is the author of the industry standard compact bipolar transistor model HICUM, and his team created the ITRS (now IRDS) data for SiGe HBTs.

TC-27 TOPIC EDITOR: CONNECTED AND AUTONOMOUS SYSTEMS

HASAN SHARIFI (Senior Member, IEEE) received the bachelor's degree in 1994 and master's degree in 1997 in electrical engineering and the Ph.D. degree in the areas of microelectronics and nanotechnology from Purdue University, West Lafayette, in 2007. He is currently Manager of RF and EO/IR Subsystems Department wuth HRL Laboratories, Malibu, CA, USA. His research topics include design, fabrication and integration of RF/millimeter wave components and subsystems for next generation phased-array radar, EW and communication systems as well as low-cost, high performance EO/IR imaging sensors. Before joining HRL, he was a Research Staff Member at Birck Nanotechnology Center, Purdue University from 2005 to 2009 working on CMOS-based RF integrated circuits as well as advanced heterogeneous integration and packaging. He has authored or coauthored more than 60 journal and refereed conference papers and holds more than 35 issued patents. Dr. Sharifi was the recipient of a number of awards, including special and extraordinary merit awards from Purdue University and HRL Labs. He has served as a technical program committee and Editor for the IEEE Silicon Monolithic Integrated Circuits in RF Systems Conference. He is member of Microwave Theory and Techniques and Advanced Packaging societies.

TC-14 TOPIC EDITOR: MICROWAVE AND MM-WAVE INTEGRATED CIRCUITS

ALBERTO VALDES-GARCIA (Senior Member, IEEE) received the B.S. degree (Hons.) in electronic systems engineering from the Monterrey Institute of Technology, Toluca, Mexico, in 1999, and the Ph.D. degree in electrical engineering from Texas A&M University, College Station, TX, USA, in 2006. In 2000, he joined Motorola Broadband Communications, Nogales, Mexico, as an RF Design Engineer. In 2006, he joined IBM Research, Yorktown Heights, NY, USA, where he is currently a Principal Research Staff Member, Manager of the RF Circuits and Systems Group. In 2013, he was an Adjunct Assistant Professor with Columbia University, New York, USA. He holds more than 65 issued U.S. patents and has authored or coauthored more than 100 peer-reviewed publications. His current research work is on mm-Wave systems for communications and imaging applications. He is a Co-Editor of the book *60 GHz Technology for Gbps WLAN and WPAN: From Theory to Practice* (Wiley, 20011). Dr. Valdes-Garcia is the winner of the 2005 Best Doctoral Thesis Award presented by the IEEE Test Technology Technical Council. He was the recipient of the 2007 National Youth Award for Outstanding Academic Achievements, presented by the President of Mexico, a co-recipient of the 2010 George Smith Award presented by the IEEE Electron Devices Society, the 2017 Lewis Winner Award for Outstanding Paper presented by IEEE International Solid-State Circuits Conference, and the 2017 IEEE JOURNAL OF SOLID-STATE CIRCUITS Best Paper Award. Within IBM, he has been twice a co-recipient of the Pat Goldberg Memorial Award to the best paper in computer science, electrical engineering, and mathematics published by IBM Research (2009 and 2017). He was inducted into the IBM Academy of Technology in 2015 and was recognized as an IBM Master Inventor in 2016 and 2019. He served in the IEEE 802.15.3c 60 GHz standardization Committee, from 2006 to 2009. Since 2009, he has been serving as a Technical Advisory Board Member with the Semiconductor Research Corporation, where he was a Chair of the Integrated Circuits and Systems Sciences Coordinating Committee, in 2011 and 2012, respectively. Since 2016, he has been serving as a member for the IEEE MTT-S Microwave and Millimeter-wave Integrated Circuits Technical Committee, where he serves as Chair since 2020. In 2013, he was selected by the National Academy of Engineering for its Frontiers of Engineering Symposium.

TC-4 TOPIC EDITOR: MICROWAVE PASSIVE COMPONENTS AND TRANSMISSION LINE STRUCTURES

KE WU (Fellow, IEEE) is the Endowed Industrial Research Chair in Future Wireless Technologies and Professor of Electrical Engineering at École Polytechnique (University of Montreal). He has been Director of the Poly-Grames Research Center. He was also the Canada Research Chair in RF and millimeter-wave engineering and the Founding Director of the Center for Radiofrequency Electronics Research of Quebec. Dr. Wu held/holds visiting/honorary professorships at various universities around the world. He has graduated more than 70 Ph.D. and 94 M.Sc. Students. He has authored or coauthored more than 1300 referred papers, and a number of books and book chapters and filed more than 50 patents. Dr. Wu was the General Chair of the 2012 IEEE MTT-S International Microwave Symposium. He was the 2016 President of the IEEE Microwave Theory and Techniques Society (MTT-S). He also served as the inaugural North-American representative in the General Assembly of the European Microwave Association. He was the recipient of many awards and prizes including the inaugural IEEE MTT-S Outstanding Young Engineer Award, 2004 Fessenden Medal of the IEEE Canada, 2009 Thomas W. Eadie Medal from the Royal Society of Canada, Queen Elizabeth II Diamond Jubilee Medal, 2013 Award of Merit of Federation of Chinese Canadian Professionals, 2014 IEEE MTT-S Microwave Application Award, the 2014 Marie-Victorin Prize (Prix du Quebec), 2015 Prix d'Excellence en Recherche et Innovation of Polytechnique Montréal, 2015 IEEE Montreal Section Gold Medal of Achievement, and 2019 IEEE MTT-S Microwave Prize. He was an IEEE MTT-S Distinguished Microwave Lecturer. Dr. Ke Wu is a Fellow the Canadian Academy of Engineering and Royal Society of Canada.

TC-2 TOPIC EDITOR: DESIGN AUTOMATION

QIJUN ZHANG (Fellow, IEEE) received the Ph.D. degree in electrical engineering from McMaster University, Hamilton, Canada, in 1987. He was a Research Engineer with Optimization Systems Associates Inc., Dundas, Ontario, Canada during 1988–1990 developing advanced optimization software for microwave modeling and design. He joined the Department of Electronics, Carleton University, Ottawa, Canada in 1990, where he is presently a Chancellor's Professor. He is an author of the book *Neural Networks for RF and Microwave Design* (Boston: Artech House, 2000), a Coeditor of *Modeling and Simulation of High-Speed VLSI Interconnects* (Boston: Kluwer, 1994), and a Coeditor of *Simulation-Driven Design Optimization and Modeling for Microwave Engineering* (London, UK: Imperial College Press, 2013). His research interests include modeling, optimization, and neural networks for high-speed/high-frequency electronic design and has more than 300 publications in the area.

Dr. Zhang is a Fellow of the Canadian Academy of Engineering. He is an Associate Editor for IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES. He was an Associate Editor for *International Journal of RF and Microwave Computer-Aided Engineering* (2010–2018), and the General Chair of IEEE MTT-S International Conference on Numerical Electromagnetic and Multiphysics Modeling and Optimization in 2015. He is the Chair of the Technical Committee on Design Automation (MTT-2) of the IEEE Microwave Theory and Techniques (MTT) Society.

ASSISTANT EDITOR

MARYAM ALI received the B.S. and M.S. degrees in chemical engineering from the California Institute of Technology and Auburn University respectively, and the Ph.D. degree in biomedical engineering from The University of Texas at Austin. She was a Postdoctoral Scholar with University of California, Davis. Her research background is in cell-surface interactions and ocular diseases.

In 2020, she completed a certificate in Medical Writing at the University of California, San Diego Extension. In addition to serving as Assistant Editor of IEEE JOURNAL OF MICROWAVES, she is a Medical Writer with Medtronic.

Dr. Ali is a member of the American Medical Writers Association.

ADMINISTRATIVE EDITOR

KARA MCARTHUR received the B.A. degree in sociology and completed graduate work in healthcare ethics—both from Rice University—and currently serves on two Institutional Review Boards (IRBs), an oncology IRB and a community IRB in the Dominican Republic. She is an American Medical Writers Association certified Medical Editor and Writer. She has more than 20 years of experience in scholarly publishing, including serving as founding managing editor of the Engineering in Medicine and Biology Society's first Gold Open Access journal. Past positions include Managing Editor of Cambridge University Press's International Journal of Technology Assessment in Health Care and Director of communications for the Department of Medicine, Baylor College of Medicine. She has more than 20 peer-reviewed research publications. Her freelance work includes writing, editing, and evaluation research for national and international nonprofits.

PRODUCTION EDITOR

JOANNA GOJLIK received the B.A. degree in journalism/professional writing from The College of New Jersey, the M.A. degree in liberal studies from the University of North Carolina at Greensboro, and the Professional Certificate in Editing from New York University. She is a Journals Production Manager with IEEE. She has been with the IEEE Publications Operations Department since 2004. Over the years, she has managed a large portfolio of journals/transactions/magazines, including the flagship IEEE journal PROCEEDINGS OF THE IEEE since 2007. She has extensive experience in journals copyediting, proofreading, layout, and overall journals production.