2022 IEEE Fellows Elevation and Recognition

Chia-Chan Chang and Robert H. Caverly

Elevation to Fellow of the IEEE is an honor reserved for a select group of engineers each year. The number of Fellows elevated in any year cannot exceed one-tenth of 1% of the total voting membership. This highest grade of membership in the IEEE is conferred by the IEEE Board of Directors in recognition of an individual's outstanding record of accomplishments in any IEEE field of interest. This year, seven honorees were awarded the status of Fellow of the IEEE, with the IEEE Microwave Theory and Technology Society (MTT-S) as the evaluating Society. Another nine new Fellows are members of the MTT-S but were evaluated by other Societies or Councils. In alphabetical order, those new IEEE Fellows evaluated by the MTT-S are

- M. Jaleel Akhtar, for contributions in microwave planar sensors and nanocomposites-based microwave absorbers
- Walid Y. Ali-Ahmad, for leadership in the development of low-cost direct-conversion cellular RF systems
- Roberto Gómez-García, for contributions to planar multifunction microwave filters
- Shilong Pan, for contributions to high-performance microwave photonic imaging radar
- Smail Tedjini, for contributions to the development of harmonic backscattering RFID systems and chipless tag solutions
- Miguel Urteaga, for contributions to terahertz heterojunction bipolar transistor integrated circuit technology
- Hua Wang, for contributions to high-efficiency microwave and millimeter-wave (mm-wave) power amplifiers.

In honor of their contributions, short biographies of our Society's new IEEE Fellows are presented in the following pages. These new Fellows have worked very hard and made many sacrifices for this work. Please join us in congratulating each of them.

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M. Jaleel Akhtar
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for contributions in microwave planar sensors and nano-composites-based microwave absorbers

M. Jaleel Akhtar received the B.S. degree in electronics engineering from Aligarh Muslim University, Aligarh, India; M.S. degree in electronics and communication engineering from Birla Institute of Technology, Ranchi, India; and the Dr.-Ing. (Ph.D.) degree in electrical engineering from Otto von Guericke University of Magdeburg, Magdeburg, Germany. He was a scientist with the Central Electronics Engineering Research Institute, Pilani, India, during 1994–1997. From 2003 to 2009, he was a postdoctoral research scientist and project leader with the Karlsruhe Institute of Technology, Karlsruhe, Germany. In 2009, he joined the Department of Electrical Engineering, Indian Institute of Technology (IIT) Kanpur, where he is currently a full professor. He has supervised more than 20 Ph.D. and 75 M.Tech. students for their theses. He has authored two books, four book chapters, and over 350 papers in various peer-reviewed international journals and conferences. He recently received substantial funding to develop a world-class electromagnetic interference (EMI)/EM compatibility (EMC) test facility at IIT Kanpur. His research interests include metamaterial-inspired RF planar sensors, microwave and terahertz (THz) imaging, nanocomposites-based wideband microwave absorbers for EMI/EMC and stealth applications, and RF energy harvesting.

Dr. Akhtar is well recognized for his pioneering work in the field of metamaterial-inspired RF planar sensors and microwave imaging techniques applied to various domains. His research group has developed several innovative split-ring resonator (SRR)/complementary SRR (CSRR) planar structures for biological and humanitarian applications, such as testing blood samples for glucose estimation, and to detect contamination in common edible products, such as milk and oil, which is of much concern in many parts of the world. It was shown by his group in one of its early studies that CSRR planar RF sensors could be used for near-field microwave subsurface imaging to find defects in coatings, paint, and so on.

Dr. Akhtar has also made immense research contributions in the interdisciplinary field of nanocomposites-based wideband microwave absorbers for EMI/EMC and stealth technology applications. He has the distinction of leading one of the first research groups in the world to form effective collaborations with renowned material scientists to demonstrate the concept of hybrid absorbers, where a frequency-selective surface structure could be integrated with nanocomposites to attain effective microwave absorption over a wide frequency band without significantly increasing the overall weight, thus making these types of absorbers quite appropriate for aerospace and strategic applications.

Dr. Akhtar is currently an elected member of the MTT-S Administrative Committee. He served as the general cochair of the 2021 IEEE MTT-S International Microwave and RF Conference. He was the recipient of the 2021 Excellence in Teaching Award from IIT Kanpur and the 2009 CST University Publication Award. His research team has received several innovation and best paper awards at various forums since 2014. He is currently an associate editor of *IEEE Sensors Journal* and an editor of *IETE Technical Review*.

Relevant Publications

- G. Govind and M. J. Akhtar, "Metamaterial-inspired microwave microfluidic sensor for glucose monitoring in aqueous solutions," *IEEE Sensors J.*, vol. 19, no. 24, pp. 11,900–11,907, Dec. 2019, doi: 10.1109/JSEN.2019.2938853.
- G. Govind, N. K. Tiwari, K. K. Agrawal, and M. J. Akhtar, "Microwave subsurface imaging of composite structures using complementary split ring resonators," *IEEE Sensors J.*, vol. 18, no. 18, pp. 7442–7449, Sep. 2018, doi: 10.1109/JSEN.2018.2859228.
- M. J. Akhtar, L. E. Feher, and M. Thumm, "A waveguide-based two-step approach for measuring complex permittivity tensor of uniaxial composite materials," *IEEE Trans. Microw. Theory Techn.*, vol. 54, no. 5, pp. 2011–2022, May 2006, doi: 10.1109/TMTT.2006.873623.
- V. K. Chakradhary, H. B. Baskey, R. Roshan, A. Pathik, and M. J. Akhtar, "Design of frequency selective surface-based hybrid nanocomposite absorber for stealth applications," *IEEE Trans. Microw. Theory Techn.*, vol. 66, no. 11, pp. 4737–4744, Nov. 2018, doi: 10.1109/TMTT.2018.2864298.
- H. B. Baskey and M. J. Akhtar, "Design of flexible hybrid nanocomposite structure based on frequency selective surface for wideband radar cross section reduction," *IEEE Trans. Microw. Theory Techn.*, vol. 65, no. 6, pp. 2019–2029, Jun. 2017, doi: 10.1109/TMTT.2017.2655045.

Walid Y. Ali-Ahmad
Silicon Engineering Group, Apple
Cupertino, CA, USA

for leadership in development of low-cost direct-conversion cellular RF systems

Walid Y. Ali-Ahmad received the B.S. degree in engineering, with distinction, from the American University of Beirut, Beirut, Lebanon, and the M.S. and Ph.D. degrees in electrical engineering from the University of Michigan, Ann Arbor, MI, USA. He is currently with the Silicon Engineering Group, Apple. His technical leadership role at Apple is focused on RF system architecture and engineering for 5G-and-beyond cellular user equipment platforms.

Dr. Ali-Ahmad's core work on RF systems development for cellular RFICs started at Maxim Integrated Products (1997–2004), where he led system development of the first low-cost low-power wideband code division multiple-access direct-conversion transceiver integrated circuits (IC) in silicon-germanium bipolar CMOS (SiGe BiCMOS). This was the era of cellular handsets evolving from 2.5G to 3G and moving from the sub-1GHz cellular band to the 1,900-MHz Personal Communications Service band; the RF system work toward integration and the removal of costly off-chip components, especially the large intermediate frequency surface acoustic wave (SAW) filter, was led by Dr. Ali-Ahmad and resulted in key innovations at the chip level to combat key system issues, such as dynamic dc offsets and self-interference-related second-order intermodulation products. What followed was a race toward the development of multimode cellular transceivers, during which Dr. Ali-Ahmad worked at MediaTek, from 2007 to 2014, where he rose to the position of senior director of technology. As cellular networks evolved from 3G to 4G and more bands were added above 2 GHz, he led MediaTek's RF system architecture and the development of low-cost highly integrated multiband 2G/3G/4G CMOS direct-conversion transceivers that eliminated post low-noise amplifier RF SAW filters and reduced the receiver analog baseband circuitry area by co-optimizing the receiver analog front-end with the digital baseband design supported by innovation in the development of high-dynamic-range CMOS continuous-time delta-sigma analog-to-digital converters; the resultant competitive performance of the newly developed transceivers ultimately gave MediaTek the lead position as a mobile chipset turnkey platform vendor for the world's mass handset market. He then held the position of vice president of technology at Qualcomm (2014–2017), with a focus on advanced RF front-end system development and the top-level architecture design of LTE Advanced sub-6GHz cellular user equipment transceivers with multiple-input, multiple-output (MIMO) support. Before joining Apple, he was with Samsung Electronics America as vice president of RF systems engineering (2019–2022), where he founded a team to focus on mm-wave 5G New Radio system-on-chip architecture and antenna phased-array module RF system development.

His passion for education and training engineers led him to the position of associate professor of electrical engineering at the American University of Beirut (2004–2007), where he founded the RF and applied EM track for students, with a focus on wireless communications. He was also associated with the University of California, San Diego, San Diego, CA, USA, as an adjunct senior lecturer (2016–2018), with a teaching focus on RF systems engineering for wireless applications. He is an MTT-S Distinguished Microwave Lecturer Emeritus, and has served on the Radio Frequency Integrated Circuits Symposium Technical Program and Steering Committees from 2004 to 2018. He was the General Chair of the 2018 symposium and its Executive Committee chair in 2021.

Relevant Publications

- F. Beffa et al., "A receiver for WCDMA/EDGE mobile phones with inductorless front-end in 65nm CMOS," in *Proc. Int. Solid States Circuits Conf.*, San Francisco, CA, USA, 2011, pp. 370–372, doi: 10.1109/ISSCC.2011.5746358.
- J. Strange et al., "A HSPA+/WCDMA/EDGE 40nm modem SoC with embedded RF transceiver supporting RX diversity," in *Proc. IEEE Radio Freq. Integr. Circuits Symp.*, 2014, pp. 133–136, doi: 10.1109/RFIC.2014.6851678.
- W. Y. Ali-Ahmad et al., "Design challenges for a high performance HSDPA RF transceiver IC," in *Proc. IEEE Int. Symp. Radio-Freq. Integr. Technol. (RFIT)*, Singapore, 2009, pp. 144–149, doi: 10.1109/RFIT.2009.5383666.
- W. Y. Ali-Ahmad, "Radio transceiver architectures and design issues for wideband cellular systems," in *Proc. IEEE Int. Workshop Radio-Freq. Integr. Technol., Integr. Circuits Wideband Comm Wireless Sens. Netw.*, Singapore, 2005, pp. 21–25, doi: 10.1109/RFIT.2005.1598865.
- W. Y. Ali-Ahmad, "Effective IM2 products estimation for two-tone and WCDMA modulated type blockers in 3GPP direct-conversion receiver," *Radio Freq. Des. Mag.*, vol. 27, no. 4, pp. 32–40, Apr. 2004.

Roberto Gómez-García
University of Alcalá
Madrid, Spain

for contributions to planar multi-function microwave filters

Roberto Gómez-García 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, Spain, in 2001 and 2006, respectively. He is now a full professor with the Department of Signal Theory and Communications, University of Alcalá, Madrid. He has had several research stays with the Department of Components, Circuits, Signals, and High-Frequency Systems, XLIM Research Institute, University of Limoges, Limoges, France; Telecommunications Institute, University of Aveiro, Aveiro, Portugal; Microwave Technology Branch, U.S. Naval Research Laboratory, Washington, DC, USA; and Purdue University, West Lafayette, IN, USA. He was also an adjunct part-time professor with the University of Electronic Science and Technology of China, Chengdu, China, during 2017–2019 and an invited professor with Gdansk University of Technology, Gdansk, Poland, during 2019–2020. He has authored/coauthored about 135 papers in international journals and 165 papers in international conferences on research related to static/tunable high-frequency filters and multiplexers in planar, hybrid, 3D, and monolithic microwave IC technologies; multifunction circuits and systems; RF passive components and their application to multibranch amplifiers; RF displacement/movement sensors; software-defined radio; and radar architectures for telecommunications, remote sensing, and biomedical applications.

Dr. Gómez-García is widely recognized for significant contributions in the field of highly reconfigurable filters and multiplexers, codesigned multifunctional filtering components, and innovative RF filtering principles and associated design methods. He has pioneered a new class of microwave passive planar filters based on so-called signal-interference techniques, which have been demonstrated in ultrawideband bandpass/bandstop filters, multiband filters with an arbitrary number of passbands, ultrasharp rejection low-pass filters with extended stopbands, and switchable filters with an ultralarge bandwidth-tuning ratio with advanced performance. In addition, he was the coinventor of one of the first microwave planar bandpass filters with simultaneous continuous-type control in the center frequency and bandwidth and the main author of a frequency-agile RF multiband planar filter with one of the highest reconfiguration capabilities ever reported. Other significant achievements, along with his collaborators, include the creation of a rich variety of novel RF devices with multifunctional capabilities, such as filtering power dividers, balun filters, filtering matching networks, and reflectionless/absorptive filters and multiplexers that alleviate the need for interblock isolators in RF front-ends.

Dr. Gómez-García serves as a member of the technical review boards of several IEEE and European Microwave Association conferences. He is also a member of the MTT-S Filters (MTT-5), MTT-S RF MEMS and Microwave Acoustics (MTT-6), MTT-S Wireless Communications (MTT-23), MTT-S Biological Effects and Medical Applications of RF and Microwave (MTT-28), and IEEE Circuits and Systems Society (CASS) Analog Signal Processing Technical Committees (TCs). He was a recipient of the 2016 MTT-S Outstanding Young Engineer Award. He was a CASS Distinguished Lecturer (2020–2022). He was an associate editor of *IEEE Transactions on Microwave Theory and Techniques* from 2012 to 2016, *IEEE Transactions on Circuits and Systems I: Regular Papers* from 2012 to 2015, and *IEEE Microwave and Wireless Components Letters* from 2018 to 2020 as well as other journals, such as *IEEE Access*; *IET Microwaves, Antennas, and Propagation*; and *International Journal of Microwave and Wireless Technologies*. He was a senior editor of *IEEE Journal on Emerging and Selected Topics in Circuits and Systems* from 2016 to 2017, and he was the MTT-S Newsletter Working Group chair from 2019 to 2021. He was a guest editor for several special/focus issues and sections in IEEE and Institution of Engineering and Technology (IET) journals. Currently, he is the editor-in-chief of *IEEE Microwave and Wireless Components Letters*; associate editor of *IEEE Journal of Electromagnetics, RF, and Microwaves in Medicine and Biology*; and TC-5 topic editor of *IEEE Journal of Microwaves*.

Relevant Publications

- R. Gómez-García and J. I. Alonso, "Design of sharp-rejection and low-loss wide-band planar filters using signal-interference techniques," *IEEE Microw. Wireless Compon. Lett.*, vol. 15, no. 8, pp. 530–532, Aug. 2005, doi: 10.1109/LMWC.2005.852797.
- M. Sánchez-Renedo, R. Gómez-García, J. I. Alonso, and C. Briso-Rodríguez, "Tunable combline filter with continuous control of center frequency and bandwidth," *IEEE Trans. Microw. Theory Techn.*, vol. 53, no. 1, pp. 191–199, Jan. 2005, doi: 10.1109/TMTT.2004.839309.
- R. Gómez-García, R. Loeches-Sanchez, D. Psychogiou, and D. Peroulis, "Single/multi-band Wilkinson-type power dividers with embedded transversal filtering sections and application to channelized filters," *IEEE Trans. Circuits Syst. I, Reg. Papers*, vol. 62, no. 6, pp. 1518–1527, Jun. 2015, doi: 10.1109/TCSI.2015.2418838.
- R. Gómez-García and A. C. Guyette, "Reconfigurable multi-band microwave filters," *IEEE Trans. Microw. Theory Techn.*, vol. 63, no. 4, pp. 1294–1307, Apr. 2015, doi: 10.1109/TMTT.2015.2405066.
- D. Psychogiou and R. Gómez-García, "Reflectionless adaptive RF filters: Bandpass, bandstop, and cascade designs," *IEEE Trans. Microw. Theory Techn.*, vol. 65, no. 11, pp. 4593–4605, Nov. 2017, doi: 10.1109/TMTT.2017.2734086.

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Shilong Pan
College of Electronic and Information Engineering,
Nanjing University of Aeronautics and Astronautics
Nanjing, China

for contributions to high-performance microwave-photonic imaging radar

Shilong Pan received the B.S. and Ph.D. degrees in electronic engineering from Tsinghua University, Beijing, China, in 2004 and 2008, respectively. From 2008 to 2010, he was a "Vision 2010" Postdoctoral Research Fellow in the Microwave Photonics Research Laboratory, University of Ottawa, ON, Canada. He joined the College of Electronic and Information Engineering, Nanjing University of Aeronautics and Astronautics, Nanjing, China, in 2010, where he is currently a full professor and the director of the State Key Laboratory of Microwave Photonics. His research interest is microwave photonics, which includes the optical generation and processing of microwave signals, analog photonic links, photonic microwave measurement, and integrated microwave photonics. He has authored or coauthored more than 400 papers in peer-reviewed journals and conference proceedings.

Prof. Pan is recognized for significant contributions to microwave photonic imaging radars with ultrahigh resolution. He and his group demonstrated the first photonics-based imaging radar with a resolution of 1.3 cm and an imaging rate of 100 frames per second. Later, he improved the resolution to 0.85 cm. To generate high-quality microwave waveforms required by photonics-based imaging radar, he also pioneered photonic synthetic wideband signal generation and achieved a time-bandwidth product that is far beyond the capability of the state-of-the-art electronic waveform generator. He has made outstanding contributions to optical vector analysis, leading to the commercialization of the ultrahigh-resolution optical vector analyzer (OVA) for the characterization of microwave photonic and all-optical devices with kilohertz-level resolution. He was the first to implement asymmetric microwave-to-optical and optical-to-microwave conversions to eliminate nonlinear impairment, resulting in the birth of an OVA with a record high resolution of 334 Hz and a record high dynamic range of >90 dB.

Prof. Pan is currently a deputy editor of *Chinese Optics Letters*; an associate editor of *Journal of Lightwave Technology*, *IEEE Transactions on Microwave Theory and Techniques*, and *Electronics Letters*; and the vice-chair of the MTT-S Microwave Photonics TC (MTT-22). He has also served as a chair of several international conferences, symposia, and workshops, including the technical program committee (TPC) chair of the 2015 International Conference on Optical Communications and Networks, the TPC chair of the 2023 IEEE International Topical Meeting on Microwave Photonics (MWP), a TPC cochair of MWP 2017, and the general cochair of MWP 2021.

Prof. Pan is a fellow of the Optical Society of America, Society of Photo-Optical Instrumentation Engineers, and IET. He was selected as an IEEE Photonics Society Distinguished Lecturer in 2019 and an MTT-S Distinguished Microwave Lecturer in 2022. He was a recipient of the MTT-S Outstanding Young Engineer Award in 2021.

Relevant Publications

- S. L. Pan and Y. Zhang, "Microwave photonic radars," *J. Lightw. Technol.*, vol. 38, no. 19, pp. 5450–5484, Oct. 2020, doi: 10.1109/JLT.2020.2993166.
- S. L. Pan, X. Ye, Y. Zhang, and F. Zhang, "Microwave photonic array radars," *IEEE J. Microw.*, vol. 1, no. 1, pp. 176–190, Jan. 2021, doi: 10.1109/JMW.2020.3034583.
- S. L. Pan and J. P. Yao, "Photonics-based broadband microwave measurement," *J. Lightw. Technol.*, vol. 35, no. 16, pp. 3498–3513, Aug. 2017, doi: 10.1109/JLT.2016.2587580.
- S. L. Pan et al., "Satellite payloads pay off," *IEEE Microw. Mag.*, vol. 16, no. 8, pp. 61–73, Sep. 2015, doi: 10.1109/MMM.2015.2441619.
- T. Qing, S. P. Li, Z. Z. Tang, B. D. Gao, and S. L. Pan, "Optical vector analysis with attometer resolution, 90-dB dynamic range and THz bandwidth," *Nature Commun.*, vol. 10, no. 1, Nov. 2019, Art. no. 5135, doi: 10.1038/s41467-019-13129-x.

Smail Tedjini
Grenoble Institute of Technology, University Grenoble Alpes
Grenoble, France

for contributions to the development of harmonic backscattering RFID systems and chipless tag solutions

Smail Tedjini received the M.S. degree in 1979, Ph.D. degree in 1982, and doctorat d'etat in physics from the University of Grenoble Alpes in 1985. He was an assistant professor in the Department of Electronics, Grenoble Institute of Technology (Grenoble INP), University of Grenoble Alpes, from 1981 to 1986 and a senior researcher at the French National Center for Scientific Research from 1986 to 1993. He became a university full professor in 1993. Since 1996, he has been a professor at the National School of Advanced Systems and Networks (ESISAR), Department of Embedded Systems, Grenoble INP. His teaching areas include applied electromagnetism, RF, wireless systems, and optoelectronics. He has nearly 40 years of experience in academic education, research, and the management of university affairs.

He served as a coordinator and staff member in numerous academic programs for education and research. He was the coordinator for Ph.D., M.S., and B.S. degree programs for the University of Grenoble Alpes; some of these programs were in collaboration with international universities from Europe, Canada, Brazil, Vietnam, Egypt, and Maghreb. He served as the director of the ESISAR. His research interests include applied electromagnetism and the modeling of devices and circuits in the RF and optoelectronic domains. His current research focuses on wireless systems, with special attention to RFID technology.

He was the founder, in 1996, and a past director of the Systems Design and Integration Laboratory (LCIS), Grenoble INP. He was a project manager within the Optoelectronic and RF Systems group, LCIS, which he founded 25 years ago and led until 2014. He supervised nearly 50 Ph.D. students and has more than 350 publications. He served as an examiner/reviewer/opponent for tens of Ph.D. degrees in many countries (France, Germany, Finland, Spain, Ireland, Italy, Sweden, Vietnam, Australia, Singapore, India, Brazil, Egypt, and Maghreb).

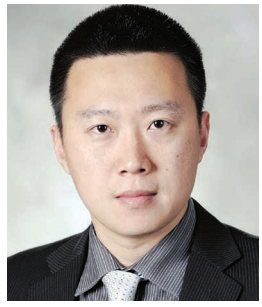
He supervised tens of research contracts with public administrations and industries. He was a member of several TPCs and serves as an expert/reviewer for national and international scientific committees and conferences as well as journals of IEEE, the IET, the Photonics and Electromagnetics Research Symposium, the Multidisciplinary Digital Publishing Institute, and the International Union of Radio Science (URSI), and he has served as an expert for numerous French and international research programs.

Prof. Tedjini has organized several conferences/workshops/summer schools and was the TPC chair/cochair at numerous conferences within several professional societies, including IEEE and URSI. He was the TPC chair of the 2010 IEEE International Conference on RFID; general chair of the 2012 IEEE International Conference on RFID Technology and Applications; past president and founder of the IEEE Components, Packaging, and Manufacturing Technology Society French Chapter; 2008–2014 vice president of the IEEE France Section; 2008 elected vice-chair of URSI Commission D: Electronics and Photonics; and 2011–2014 chair of URSI Commission D. In addition, he was the 2014–2017 president of URSI-France, 2017–2019 vice-chair of the MTT-24 TC, and 2020–2021 chair of the MTT-26 TC.

Prof. Tedjini has contributed to the simulation, design, and characterization of devices/subsystems in mm-wave and optoelectronic domains in three areas: nonreciprocal mm-wave finline devices, optical microwaves, and RFID technology. He has made contributions that increase coding capacity by using the RF encoding particle that consists of a unique printed resonator that is repeated with different sizes.

Relevant Publications

- S. Tedjini and E. Pic, "New analysis of semiconductor isolators: The modified spectral domain analysis (Short Papers)," *IEEE Trans. Microw. Theory Techn.*, vol. 33, no. 1, pp. 59–64, Jan. 1985, doi: 10.1109/TMTT.1985.1132947.
- S. Tedjini, A. Ho-Quoc, and D. A. M. Khalil, "All-optical networks as microwave and millimeter-wave circuits," *IEEE Trans. Microw. Theory Techn.*, vol. 43, no. 9, pp. 2428–2434, Sep. 1995, doi: 10.1109/22.414599.
- S. Tedjini, G. Andia-Vera, M. Zurita, R. C. S. Freire, and Y. Duroc, "Augmented RFID tags," in *Proc. IEEE Topical Conf. Wireless Sens. Sens. Netw. (WiSNet)*, Austin, TX, USA, 2016, pp. 67–70, doi: 10.1109/WISNET.2016.7444324.
- S. Tedjini, Y. Duroc, G. Andia Vera, C. Loussert, and M. Recouly, "RFID communication system," U.S. Patent US9455769B2, Sep. 27, 2016.
- S. Tedjini, N. Karmakar, E. Perret, A. Vena, R. Koswatta, and R. E-Azim, "Hold the chips: Chipless technology, an alternative technique for RFID," *IEEE Microw. Mag.*, vol. 14, no. 5, pp. 56–65, Jul./Aug. 2013, doi: 10.1109/MMM.2013.2259393.



Hua Wang
Department of Information Technology and Electrical Engineering, Swiss Federal Institute of Technology Zürich
Zürich, Switzerland

for contributions to high-efficiency microwave and millimeter-wave power amplifiers

Hua Wang is a full professor and the chair of electronics in the Department of Information Technology and Electrical Engineering, Swiss Federal Institute of Technology (ETH) Zürich. He is the director of the ETH Integrated Devices, Electronics, and Systems Group. Prior to that, he was a tenured associate professor in the School of Electrical and Computer Engineering, Georgia Institute of Technology (Georgia Tech), Atlanta, GA, USA, where he held the Demetrius T. Paris professorship. He was the founding director of the Georgia Tech Center of Circuits and Systems and the Georgia Tech Electronics and Micro-System lab. He worked at Intel and Skyworks in 2010–2011. He received the Ph.D. degree in electrical engineering from the California Institute of Technology, Pasadena, Pasadena, CA, USA, in 2007.

Prof. Wang received the Qualcomm Faculty Award in 2021 and 2020, DARPA Director's Fellowship Award in 2020, DARPA Young Faculty Award in 2018, National Science Foundation CAREER Award in 2015, MTT-S Outstanding Young Engineer Award in 2017, Georgia Tech Sigma Xi Young Faculty Award in 2016, and Georgia Tech School of Electrical and Computer Engineering Outstanding Junior Faculty Award in 2015.

Prof. Wang is interested in innovating analog, RF, and mm-wave ICs and systems for wireless communication, sensing, and bioelectronics. He has authored/coauthored 200+ peer-reviewed journal/conference papers and over 30 patents.

Prof. Wang is recognized for his original and significant contributions to high-efficiency microwave and mm-wave power amplifiers (PAs). He and his team invented multiple new PA architectures, including digital Doherty PAs with digital power digital-to-analog converters as the reconfigurable main/auxiliary PA paths, hybrid digital PAs with multiple efficiency enhancement techniques and built-in analog linearization, the wideband linear Doherty PA covering 28/37/39-GHz 5G bands, the superresolution mixed-signal Doherty PA with analog main PA and digital auxiliary PA paths, the class W multidrive PA, the current-mode inverse outphasing PA, and the coupled-line balun load-modulated PA for 3:1 extremely wideband active modulation. He also explores machine learning/artificial intelligence techniques for the in-field reconfiguration of voltage standing-wave ratio-resilient front ends and direct synthesis of passive and active circuits. He and his team established and maintain the world's first public database on PAs, which is now the design/benchmark guideline in academia and industry for consumer, aerospace, and defense electronics.

Prof. Wang has made significant contributions to antenna-electronics codesigns that explore and merge multifeed antennas with distributed and reconfigurable RF circuits. His innovations include on-antenna power combining/splitting, on-antenna Doherty and outphasing active load modulation, on-antenna noise cancellation, and on-antenna full duplex communication. He also explores nonconventional phased arrays and MIMO arrays. His contributions include self-steering MIMO arrays for ultralow-latency beamforming, constellation deposition arrays for secured communication, and joint time-space-frequency modulated arrays for concurrent multibeam MIMOs, super-resolution radar, and one-shot multi-transmitter/receiver localization.

Prof. Wang has been a TPC member for the IEEE International Conference on Solid-State Circuits, IEEE Symposium on Radio Frequency Integrated Circuits, IEEE Custom Integrated Circuits Conference (CICC), and IEEE BiCMOS and Compound Semiconductor Integrated Circuits and Technology Symposium. He was the conference chair for CICC 2019, general chair for CICC 2020, and TPC cochair for the 2021 International Microwave Symposium. He is an MTT-S Distinguished Microwave Lecturer for 2022–2024, and he was an IEEE Solid-State Circuits Society (SSCS) Distinguished Lecturer for 2018–2019. He was the chair of the IEEE CASS/SSCS Atlanta Joint Chapter in 2012–2021, which won the 2014 SSCS Outstanding Chapter Award.

Relevant Publications

- S. Hu, F. Wang, and H. Wang, "A 28-/37-/39-GHz linear Doherty power amplifier in silicon for 5G applications," *IEEE J. Solid-State Circuits*, vol. 54, no. 6, pp. 1586–1599, Jun. 2019, doi: 10.1109/JSSC.2019.2902307.
- T. Chi, F. Wang, S. Li, M. Huang, J. Park, and H. Wang, "A 60GHz on-chip linear radiator with single-element 27.9dBm Psat and 33.1dBm peak EIRP using multifeed antenna for direct on-antenna power combining," in *Proc. IEEE Int. Solid-State Circuits Conf. (ISSCC)*, San Francisco, CA, USA, 2017, pp. 296–297, doi: 10.1109/ISSCC.2017.7870378.
- M. Huang, T. Chi, F. Wang, T. Li, and H. Wang, "A full-FoV autonomous hybrid beamformer array with unknown blockers rejection and signals tracking for low-latency 5G Mm-wave links," *IEEE Trans. Microw. Theory Techn.*, vol. 67, no. 7, pp. 2964–2974, Jul. 2019, doi: 10.1109/TMTT.2019.2906602.
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- T. Chi et al., "A multi-modality CMOS sensor array for cell-based assay and drug screening," *IEEE Trans. Biomed. Circuits Syst.*, vol. 9, no. 6, pp. 801–814, Dec. 2015, doi: 10.1109/TBCAS.2015.2504984.

The seventh newly elevated IEEE Fellow is Miguel Urteaga, Teledyne Scientific, Thousand Oaks, CA, USA, for contributions to terahertz heterojunction bipolar transistor integrated circuit technology. Unfortunately, Dr. Urteaga's biography was not received by the time this article went to press.

MTT-S Members Elevated to Fellow of the IEEE Evaluated by Other Societies

We would also like to recognize our members who have been elevated to Fellow by other Societies or Councils. Currently, there are 39 Societies and seven Technical Councils in IEEE. Members elevated to the level of Fellow by other Societies who are also members of the MTT-S are listed here in alphabetical order according to the evaluating Society or Council:

- Francesco Andriulli, by the IEEE Antennas and Propagation Society (AP-S), for contributions to computational electromagnetics
- Mauro Ettorre, by the AP-S, for contributions to large antenna arrays based on quasi-optical beam formers
- Wonbin Hong, by the AP-S, for contributions to millimeter-wave mobile and base station antennas
- Ahmad Hoorfar, by the AP-S, for contributions to sensing and imaging in stratified media and optimization in electromagnetics
- Oscar Quevedo-Teruel, by the AP-S, for contributions to glide symmetry based metasurfaces and lens antennas
- Jack Schuss, by the AP-S, for leadership in the development of antennas for satellite communications and radars
- Christina Lim, by the IEEE Photonics Society (PHO-S), for contributions in hybrid fiber-wireless communications technology
- Boon Ooi, by the PHO-S, for contributions to broadband light emitters and visible light communications
- Kenichi Okada, by the SSC-S, for contributions to millimeter-wave communication circuits design.