

# Integrated Transceivers for 5G and 6G Wireless Communications

**Mihai Sanduleanu**  
**Khalifa University**

## Abstract:

The talk concerns Highly Integrated Transceivers for 5G and 6G Wireless Communication standards, realized in modern CMOS Technologies. For 5G Wireless standard, the transmitter poses high demands to linearity and efficiency because of high PAPR imposed by transmitting QAM signals on OFDM carriers. To fulfill the spectral mask requirements, we are proposing a new modulation format called Digital Exponential modulation working with two Inverse Class D power amplifiers driven by constant amplitude signals. This is conducive to high efficiency but also high linearity when combining, in Far Field, the Electromagnetic Waves, from the two transmit antennas. As the Transmitter is realized with digital blocks, we are a step closer to Mitola's vision of a digital Transmitter. The 6G Wireless standard will require a paradigm shift. Sending 100Gb/s Data wirelessly will require a combination of Photonics and Electronics. We propose a hybrid Transceiver based on the integration of Nano-photonics and Electronics in the same CMOS SOI Technology. Carbon Nanotubes antennas, realized on top of the SOI, with the same orientation could provide the beamforming. Optical phase shifters could provide the Beam-steering of the Transmit Signal.

## Biography:



Received his MSc, MEE and PhD degrees from the Technical University of Iasi, Romania, Eindhoven University of Technology, The Netherlands and University of Twente, The Netherlands in 1993, 1990 and 1999, respectively. From 1999 to 2000, he was with Philips Semiconductors, Nijmegen, The Netherlands, working on fiber optic communication circuits. From 2000 to 2007 he joined Philips Research Eindhoven, The Netherlands and he was involved in Fiber Optic Interface circuits, RF IC Design, mm-Waves Transceiver design and Ultra-low-power radios. From 2008 to 2013, he conducted research at IBM T.J. Watson Research Center, Yorktown Heights, New York in mm-Waves transceivers for communication, imaging and RADAR, THz electronics. He is currently Associate Professor at Khalifa University of Science and Technology. Dr. Sanduleanu's area of expertise include Wireless transceiver design for RF/mm-Waves/THz communication, High Speed Communication Circuits for serial I/O, High speed analog-to-digital converters, Phased-Array Systems, High-speed digital circuits and systems. Dr. Sanduleanu authored/co-authored 8 books and more than 120 papers in International Conferences and Journals. He holds 54 US patents. Dr. Sanduleanu served as Associate Editor for IEEE Transactions on Circuits and Systems in 2012-2011 and he is Associate Editor for Springer Nature "Analog Integrated Circuits and Signal Processing"

# Millimeter wave and Terahertz Energy Harvesting

**Lutfi Albasha**  
**American**  
**University of Sharjah**

## Abstract:

Millimeter-wave (mmWave) energy harvesting offers a pathway to self-powered wireless sensors, IoT devices, and biomedical systems. Leveraging the high-frequency spectrum available for 5G and 6G, enables compact antennas and higher power density, but challenges remain in rectifier efficiency, matching networks, and CMOS integration. This talk highlights recent advances in mmWave design and circuit techniques for efficient conversion, with applications in next-generation communication, sensing, and healthcare platforms.

## Biography:



Lutfi Albasha received the B.Eng. and Ph.D. degrees in electronic and electrical engineering from the University of Leeds, Leeds, U.K. He joined Sony Corporation and worked on commercial radio-frequency integrated circuit (RFIC) chip products for mobile handsets. He was involved in the design of highly integrated CMOS and BiCMOS transceivers. He also joined Filtronic as a Senior Principal Engineer and created an integrated circuits design team. The team supported the company's foundry design enablement for mass production and

taped out its first commercial chips. He joined the American University of Sharjah in Sharjah, United Arab Emirates, where he advanced to the rank of Full Professor. His current research interests include energy harvesting, miniaturized radars, and wireless power transfer. He received several recognition awards from industry and academia. He created the Product Design Program at AUS and mentors students on entrepreneurship and startups.

# **Low-cost Portable Novel microwave sensors for Non-invasive Glucose detection**

**Boutheina Tlili**

**Rochester Institute of Technology Dubai**

## **Abstract:**

This research aims to explore the shortcomings of existing approaches which have been discussed in literature and propose a low cost portable, non-invasive antenna which improves the accuracy of glucose monitoring. In this project we were able to develop and propose an antenna solution which was designed, simulated with CST software, built (using LPFK machine in DT Lab and at KAUST Lab) and tested in order to accurately check the glucose level for diabetes patients. We have designed different sensor configurations operating in the ISM band 2.5-2.4 GHz. The simulated results showed an impressive detection capability and a remarkable sensitivity of blood glucose level starting as low as 50 mg/dl. The desired performance of the fabricated sensors are validated through in-vitro and in-vivo measurements.

## **Biography:**



Dr. Boutheina Tlili joined the Department of Electrical Engineering at Rochester Institute of Technology Dubai as an associate professor in 2010. Dr. Tlili received a bachelor of Sciences and a Master of Sciences in Electrical Engineering from Michigan State University in the US. She earned her PhD in Electrical Engineering from the same University. Prior to joining RIT, she was the program director of the Computer Engineering program at Michigan State University-Dubai. Dr. Tlili was an associate professor and program coordinator of Electrical and

Computer Engineering program at the American University in Dubai from 2008-2004. Her current research interests include energy harvesting, wireless power transfer and Antenna design for Biomedical Applications. She has published many articles in international journals and conferences. She received several recognition awards from industry and academia. Dr. Tlili is an IEEE senior member for the past 20 years. She is a member of IEEE Antenna and propagation society, Microwave Theory and Techniques, TEMS and Education Society. She is the chapter chair of APS society for the UAE section.

Dr. Tlili is an active volunteer. She served as the IEEE Women in Engineering chair for the UAE section from 17-2005 and on the Executive committee of IEEE region 8 UAE section. She has organized many events and partnered with many Women organizations to empower women in Engineering. She serves as WIE liaison and part of BoG or IEEE TEMS. She is nominated recently as VP for conferences.

# Mastering Antenna Measurements: Key Concepts and Lab Techniques

**Zubair Akhter**

**Technology Innovation Institute**

## Abstract:

Antenna measurement plays a pivotal role in the design and validation of wireless communication systems, directly impacting system reliability, efficiency, and regulatory compliance. This seminar is designed for early-career engineers, graduate students, and researchers seeking a solid foundation in antenna characterization techniques. The session will cover essential topics, including:

- Radiation pattern measurement and interpretation
- Gain and directivity evaluation
- Impedance matching and return loss analysis
- Polarization characterization
- Anechoic chamber testing and environmental considerations

Participants will gain exposure to key laboratory instruments such as vector network analyzers (VNAs), spectrum analyzers, and far-field measurement setup. Emphasis will be placed on real-world challenges such as calibration, error mitigation, and measurement repeatability. Through a blend of theoretical insights and examples, attendees will develop the skills necessary to confidently characterize antenna performance, preparing them for advanced research and industry roles in RF and microwave engineering.

## Biography:



Dr. Zubair Akhter is a Senior Antenna Engineer at the Technology Innovation Institute (TII), Abu Dhabi, where he leads research and development in advanced antenna systems and Radome technologies. He holds a Ph.D. in Electrical Engineering from the Indian Institute of Technology Kanpur, with a specialization in microwave imaging, ultra-wideband antennas, and non-destructive testing.

Dr. Akhter has extensive experience in antenna design, measurement, and characterization, including work on through-wall imaging systems, Chipless RFID sensors, and printed-flexible electronics. Prior to joining TII, he was a Postdoctoral Fellow at King Abdullah University of Science and Technology (KAUST), Saudi Arabia, where he contributed to cutting-edge research in on-chip antennas and microwave sensing.

He has authored over 68 peer-reviewed publications in leading journals such as IEEE Transactions on Antennas and Propagation and IEEE Transactions on Microwave Theory and Techniques and holds six U.S. patents. Dr. Akhter has delivered more than 20 invited talks at international conferences and institutions and is a founding chair of the IEEE Antennas and Propagation Student Branch Chapter at IIT Kanpur.

His current research interests include AI-assisted antenna characterization, compact measurement setups, and novel antenna materials for next-generation wireless systems. Dr. Akhter is passionate about mentoring young engineers and advancing practical antenna measurement techniques for real-world applications.

# On Selecting the Best-Suited Antenna Range for Measuring Antenna Radiated Performance

**Gwenaël Dun**  
**NSI-MI Technologies**

## Abstract:

In Engineering, there is not a one-size-fits-all solution. Different types of antennas require different antenna ranges for measuring them. Based on the Recommendations of IEEE STD 2021-149 the audience will learn which is the best approach to measure different antennas as well as understand that there are not hard boundaries and that a not-well suited range can be used with added uncertainty. A quick sample of uncertainty evaluation is also presented for a type of antenna range.

## Biography:



Dr. Gwenaël Dun is a Senior Electromagnetics Engineer with Ametek NSI-MI. He joined the company in 2021 as a chamber project manager. Since 2023, he is with the EM analysis group managed by Dr. Vince Rodriguez. His job consists of performing electromagnetic analysis of antenna measurement products and systems, including anechoic chambers/ranges, compact range reflectors, antennas, and optimizing RF absorber coverage. Besides his EM activities, he still managed chamber projects in EMEA region.

Prior to joining NSI-MI, he brings more than 15 years' experience in the design, testing and project management of anechoic chambers for antenna measurements and other microwave applications worldwide; working with SIEPEL, a French manufacturer of shielded room and EM absorbers.

Gwenaël holds a MSEE from the University of Nantes, France and a PhD from University of Western Brittany, France. He is an IEEE and AMTA member.

# Advanced Electromagnetic Techniques for Low-Observable Platforms: EM Modeling, Material Characterization, and RCS Measurement

**Papa O. Leye**

**Technology Innovation Institute**

## Abstract:

Radar Cross Section (RCS) is a fundamental parameter in radar and stealth technology that indicates how detectable an object is by radar. It varies with frequency, aspect, and polarization, and depend on the object's geometry, size, material composition, and surface features. This talk presents an end-to-end workflow for low-observable design that tightly couples EM modelling, material characterization, and RCS measurement.

On the modelling side, we review full-wave methods (MoM/FEM/FDTD) and high-frequency asymptotic techniques (PO, GO/UTD, PTD), with attention to meshing, convergence, dispersion, and model-order trade-offs. We then emphasize material characterization as a design enabler, covering broadband extraction of complex permittivity and permeability via free-space transmission/reflection and waveguide/coaxial fixtures (e.g., NRW). Practical aspects, including calibration, sample preparation, anisotropy, and uncertainty quantification, are addressed.

For RCS measurement, we outline best practices in anechoic/compact ranges, time-domain gating with VNA/pulsed systems, background subtraction, dynamic-range management, and data processing. A case study demonstrating model-measurement agreement is presented.

Attendees will gain actionable guidance and practical tools for stealth design, improving prediction fidelity, and accelerating radar signature assessment.

## Biography:



Dr. Papa Leye is a Lead Researcher in Stealth Technology at the Technology Innovation Institute in Abu Dhabi, UAE. He has over fifteen years of experience in advanced electromagnetic applications, specializing in electromagnetic simulation, radar cross-section measurement, material characterization, and the development of radar-absorbing materials for low-observable platforms. His early career in electromagnetics involves developing advanced models for electromagnetic signal propagation in space, validated through experimental measurements.

Over the years, he has led R&D initiatives focused on advancing radar cross-section (RCS) prediction methods, RCS measurement techniques, electromagnetic system hardening, and system integration into naval and airborne platforms.

# MHz to THz Technologies (MTT) and Our Place in the Universe

**Goutam Chattopadhyay**  
**NASA JPL**

## Abstract:

Space exploration has long served as a powerful catalyst for inspiring the imagination of the next generation. The sight of rovers on Mars, images from distant galaxies, and the dream of humans returning to the Moon or reaching Mars ignite curiosity and a spirit of discovery in young minds. These missions are not just feats of engineering—they are stories that capture the human desire to explore the unknown and push beyond boundaries. By engaging students, educators, and the public in the wonders of space, exploration fosters STEM education, fuels innovation, and builds a generation that dreams bigger and reaches further.

Beyond its inspirational value, space exploration offers a unique lens through which we can better understand ourselves and our place in the cosmos. As we study other planets and moons, we gain valuable insight into planetary evolution, atmospheric behavior, and the potential for life beyond Earth. Observing Earth from space also provides critical data on climate change, environmental degradation, and the fragile systems that sustain life. In this way, space science not only fuels our search for extraterrestrial life but also deepens our understanding of Earth's past, present, and future. Ultimately, exploring the universe is a journey inward as much as outward—it challenges us to think about our shared humanity, our responsibility to protect our planet, and our collective future among the stars.

In this lecture, we will explore the technological innovations driving the next generation of space instruments and highlight specific instrument developments along with the fundamental science questions they aim to address.

## Biography:



Dr. Goutam Chattopadhyay is a Senior Scientist at NASA's Jet Propulsion Laboratory (JPL) and Visiting Professor at Caltech. He earned his Ph.D. in Electrical Engineering from Caltech in 2000 and has also served in academic roles at IISc Bangalore and IIT Kharagpur. A Fellow of IEEE and IETE, he is the 2025 President of the IEEE Microwave Theory and Technology Society and an IEEE Distinguished Lecturer. His research focuses on microwave, millimeter-wave, and terahertz systems, radars, and space instrumentation for life detection beyond Earth.

Dr. Chattopadhyay has authored over 400 publications, holds more than 20 patents, and has received 35+ NASA awards, including the North Star Award (2025), NASA-JPL's highest honor. His other major recognitions include the Armstrong Medal (2024), the NASA-JPL People Leadership Award (2023), IEEE Region 6 Engineer of the Year (2018), and several best paper and memorial awards from IEEE and IETE.

# **The AFSIW Technological Platform – The High-Performance Millimeter-Wave PCB Alternative**

**Anthony Ghiotto**

**Bordeaux Institute of Technology**

## **Abstract:**

Introduced in the early 2000s, the substrate integrated waveguide (SIW) technology, has triggered a huge interest from academia to industry with the focus on the design and development of low-loss, compact, integrated, self-packaged and low-cost microwave and millimeter-wave circuits, antennas and systems. However, the classical metallic waveguide technology, which offers better performances such as lower insertion loss and higher power handling, has still been used in the design of microwave and millimeter-wave systems, despite its higher cost and bulky structure. To offer a highly integrated, further loss-reduced, low-cost alternative to the conventional waveguide and also to allow a wide-spread use of the millimeter-wave spectrum, a new SIW structure called Air-Filled SIW (AFSIW) has been introduced. This new structure has been theoretically and experimentally studied in details with a substantial amount of results. At millimeter wave frequencies, compared to the SIW topologies, the proposed AFSIW scheme exhibits a substantially lower insertion loss (three times at Ka-band, for example) and a much higher average power handling capability (four times, at Ka-band for example). Numerous AFSIW passive components have been investigated designed and demonstrated, which take advantages of the well-established multilayer printed circuit board (PCB) fabrication process. Couplers, phase shifters, power dividers, antennas and filters have been modeled, designed, prototyped and measured based on the introduced technology. Their performances have theoretically and experimentally been compared with their SIW counterparts to demonstrate and validate the benefits of the proposed technology.

## **Biography:**



Dr. Anthony Ghiotto is an Associate Professor (with Full Professor habilitation) at ENSEIRB-MATMECA, Bordeaux Institute of Technology, and a researcher at the IMS Laboratory, University of Bordeaux. He received his M.Sc. and Ph.D. in optics, optoelectronics, and microwave engineering from the Grenoble Institute of Technology and later held a postdoctoral fellowship at École Polytechnique de Montréal. He has also been a Guest Professor at the University of Pavia.

His research focuses on the analysis, design, and integration of microwave and millimeter-wave circuits, including PCB, SIW, dielectric waveguides, BiCMOS, and CMOS technologies. He is the recipient of several prestigious awards, among them the IEEE MTT-S Outstanding Young Engineer Award (2022), the IEEE/SEE Brillouin Award (2020), and the URSI Young Scientist Award (2008).

Dr. Ghiotto plays an active role in the IEEE Microwave Theory and Techniques Society (MTT-S), serving as vice-chair of MTT-4, member of multiple technical committees, and chair of the IEEE MTT French Chapter since 2017.

# Empowering Connectivity: Wearable Antennas for Wi-Fi and 5G

**Sima Noghanian**

**CommScope Ruckus Networks**

## Abstract:

Wireless connectivity plays a major part in our daily lives. Wireless Local Area Network (WLAN), mostly operating through Wi-Fi technology, is one of the major technologies to provide this connectivity. 5G is another technology that promises a significant increase in data transmission speed. The goal of this talk is to highlight some of the aspects of the wearable antennas designed for applications in Wi-Fi and 5G, emphasizing their significance in enabling continuous, reliable connectivity for various wearable devices utilized in diverse applications and industries. With the focus on wearable wireless devices, it is desired to have a direct connection to networks such as Wi-Fi or 5G networks. Therefore, there is a need for wearable antennas in the WiFi or 5G bands (especially the sub 6 GHz band) that can seamlessly be integrated into clothing. Such antennas should be small. However, the small antennas usually have omnidirectional patterns, and their input impedance may be affected significantly by the lossy human tissue in their vicinity. On the other hand, the radiation toward the body can cause a high Specific Absorption Rate (SAR), requiring a reduction in the input power to comply with the standard SAR levels. In addition, wearable antennas must be lightweight and flexible. There are multiple options for flexible materials that may be considered. Other conditions specific to wearable antennas are being low-profile, compact, and efficient. Some of the factors that need careful consideration are the performance of the antennas under bending, crumpling, and stretching. The other factors are the cost, availability, washability, and endurance under extreme and harsh conditions. Some of the wearable antennas may be integrated as parts of the clothing, such as buttons or zippers, while others may be integrated into the surface area of the clothes.

This talk is an exploration of wearable antennas for 5G and Wi-Fi, highlighting their pivotal role in enabling ubiquitous and reliable wireless connectivity.

## Biography:



Dr. Sima Noghanian is a Distinguished Hardware Engineer at CommScope Ruckus Networks and also serves as an Antenna/RF consultant with StrokeDx and Neuspera Medical. She earned her Ph.D. from the University of Manitoba and completed a Postdoctoral Fellowship at the University of Waterloo. From 2002 to 2018, she held faculty positions in electrical engineering at Sharif University of Technology, the University of Manitoba, and the University of North Dakota, where she also chaired the department from 2014 to 2016. She later worked as an Electromagnetic Application Engineer at PADT Inc. and as Principal Antenna Design Engineer at Wafer LLC.

A Fellow of the Applied Computational Electromagnetics Society (ACES) and Senior Member of IEEE and URSI, Dr. Noghanian serves on multiple editorial boards, including IEEE Transactions on Antennas and Propagation and IEEE Antennas and Propagation Magazine. She is an elected member of the IEEE AP-S Administration Committee (2025–2023), a Distinguished Lecturer of IEEE AP-S (2026–2024), Chair of the AP-S Technical Committee on Antenna Measurement, and Chair of



# Multifunctional Antennas and Arrays for Wireless Communications

**Satish K. Sharma**

**San Deigo State University**

## Abstract:

This talk will explore the state-of-the-art in multifunctional antennas and arrays, which are capable of delivering multiple functionalities, such as frequency agility, frequency and polarization reconfiguration, and radiation pattern reconfiguration, including their possible combinations. This topic is crucial for antenna engineers and researchers, particularly in the context of 5G/6G technology, where multifunctional antennas and arrays are expected to play a significant role. As the demand for high data throughput increases, the need for antennas that are multifunctional, compact, low-profile, lightweight, and cost-effective becomes more critical. However, achieving these capabilities also adds complexity to antenna design and implementation.

The talk will begin with an introduction to the different types of multifunctional antennas and the various design approaches used to create them. It will showcase representative examples, including those developed at the Antenna and Microwave Lab (AML) at San Diego State University. The discussion will also cover multiple-input-multiple-output (MIMO) and massive MIMO antennas that incorporate multiband, frequency-tunable, and reconfigurable radiating elements, designed for practical wireless communication devices such as cell phones, base stations, multimedia devices, and routers. For handheld devices like cell phones, the presentation will address specific absorption rate (SAR) and the impact of human hand and head proximity on antenna performance. Challenges in antenna design, fabrication, and measurement will be explored, along with future research directions in this field.

## Biography:



Dr. Satish Kumar Sharma is a Professor of Electrical and Computer Engineering at San Diego State University (SDSU), where he founded and directs the Antenna and Microwave Laboratory (AML). He earned his Ph.D. in Electronics Engineering from IIT-BHU, India, in 1997 and completed postdoctoral research at the University of Manitoba before working as a Senior Antenna Engineer at InfoMagnetics Technologies Corporation. He joined SDSU in 2006, was promoted to full professor in 2014, and served as Interim Department Chair (2023–2022). He has also been a Distinguished Summer Faculty Fellow at the Naval Information Warfare Center, Pacific.

Dr. Sharma's research spans antennas from VHF to millimeter-wave frequencies, with expertise in beam steering, phased arrays, reconfigurable and conformal antennas, massive MIMO, CubeSat antennas, and metasurfaces. He has published over 320 papers, holds three US and Canadian patents, and co-edited the Handbook of Reflector Antennas and Feed Systems as well as co-authored Multifunctional Antennas and Arrays for Wireless Communication Systems.

He received the NSF CAREER Award (2009), the IEEE AP-S Harold A. Wheeler Prize Paper Award (2015), and has served as Associate Editor for both IEEE Transactions on Antennas and Propagation and IEEE Antennas and Wireless Propagation Letters. His work has been supported



# From Engineering Electromagnetics to Electromagnetic Engineering: Teaching/Training Next Generations

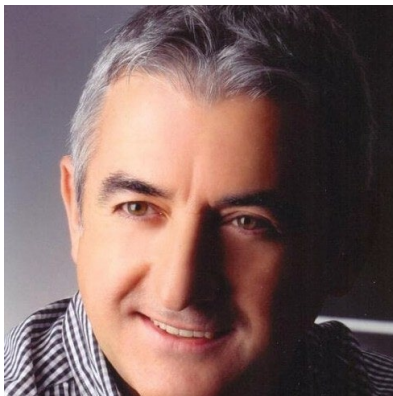
**Levent Sevgi**

**Istanbul Technical University**

## **Abstract:**

The role of Electromagnetic (EM) fields in our lives has been increasing. Communication, remote sensing, integrated command/ control/surveillance systems, intelligent transportation systems, medicine, environment, education, marketing, and defense are only a few areas where EM fields have critical importance. We have witnessed the transformation from Engineering Electromagnetics to Electromagnetic Engineering for the last few decades after being surrounded by EM waves everywhere. Among many others, EM engineering deals with broad range of problems from antenna design to EM scattering, indoor–outdoor radiowave propagation to wireless communication, radar systems to integrated surveillance, subsurface imaging to novel materials, EM compatibility to nano-systems, electroacoustic devices to electro-optical systems, etc. The range of the devices we use in our daily life has extended from DC up to Terahertz frequencies. We have had both large-scale (kilometers-wide) and small-scale (nanometers) EM systems. A large portion of these systems are broadband and digital and must operate in close proximity that results in severe EM interference problems. Engineers must take EM issues into account from the earliest possible design stages. This necessitates establishing an intelligent balance between strong mathematical background (theory), engineering experience (practice), and modeling and numerical computations (simulation).

## **Biography:**



Prof. Dr. Levent Sevgi is an IEEE Fellow and recipient of the IEEE APS Chen-To Tai Distinguished Educator Award (2021). He has held academic and research positions at institutions including Istanbul Technical University, Raytheon Systems Canada, NY Polytechnic University, and the University of Massachusetts Lowell, and most recently served at Istanbul OKAN and ATLAS Universities.

He has worked in electromagnetics for nearly four decades, with expertise in radiation, propagation, scattering, EMC/EMI, radar systems, and numerical methods. He served as an IEEE AP-S Distinguished

Lecturer (2023–2020) and currently chairs the IEEE AP-S DL Committee. He has also contributed extensively to IEEE AP-S through editorial and committee roles and is founding chair of the EMC TURKIYE International Conferences.

Prof. Sevgi has authored over 180 papers, numerous book chapters, and five books published by IEEE-Wiley and Artech House, covering electromagnetic modeling, simulation, propagation, and EMC engineering.