Seminar on RF Propagation for Next-Generation Mobile Communications

FACULTAD DE CIENCIAS UASLP

IEEE VTS IEEE Vehicular Technology Society

IEEE GUANAJUATO SECTION Vehicular Technology and Communications Joint Societies Chapter

CYTED PROGRAMA IBEROAMERICANO DE CIENCIA Y TECNOLOGÍA PARA EL DESARROLLO

Description

The Faculty of Science of the Autonomous University of San Luis Potosí, in collaboration with the IEEE Guanajuato Section Vehicular Technology and Communications Joint Societies Chapter, is organizing the seminar on Radio Frequency (RF) Propagation for Next-Generation Mobile Communications. This event brings together keynote talks and tutorials delivered by specialists in RF signal propagation, highlighting the importance of this field in the development of future mobile communication systems. The event is aimed at students and professionals interested in the application of wireless propagation concepts for the development of new technologies in communication, sensing, localization, and positioning.

The seminar is organized with support received from CYTED (Project CYTED 525RT0175), and the Chilean Research Agency ANID, through research grants ANID FONDECYT 1250951 and ANID CCTVal CIA250027.

Program

Time	Tuesday, May 5	Wednesday, May 6
9:00 - 9:30	Opening Ceremony	***RF Sounding, Modeling and Sensing: Wideband Channel Signatures from UWB Roots to THz Frontiers*** Dajana Cassioli, University of L'Aquila, Italy
9:30 – 10:00	***Joint Communications and sensing for 6G: Propagation Measurements and Models*** Reinaldo Valenzuela, Bell Labs, USA	
10:00 – 10:30		***Advanced Radiowave Propagation: Bridging Mobile Communications and Radar Systems in Complex Environments*** Rafael Caldeirinha, Instituto de Telecomunicações and Polytechnic of Leiria, Portugal
10:30 -11:00	Break	
11:00 -11:30	***Reliable Wireless Propagation Channel Modeling for Integrated Sensing and Communications up to 170 GHz*** Mauricio Rodriguez, Pontificia Universidad Católica de Valparaiso, Chile	Break
11:30 – 12:00		***Random Processes in Wireless Channel Modeling: Past, Present, and …*** David Matolak, University of South Carolina, USA
12:00 – 12:30	Alejandro Aragón-Zavala, ITESM-Qro., Mexico	
12:30 – 13:00		***Propagation-Aware Perspectives for Integrated Sensing and Communication in Vehicular and Biomedical Applications*** Carlos A. Gutierrez, Universidad Autónoma de San Luis Potosí, Mexico
13:00 – 13:30		
15:30 – 18:00	Tutorials	Tutorials

Speakers

Speaker: Reinaldo Valenzuela, Bell Labs, EE.UU.

Title: *Joint Communications and sensing for 6G: Propagation Measurements and Models*

Summary: Joint Communication and Sensing (JCAS), is a transformational and disruptive new cellular technology expected to unleash a wide range of new applications and services in 6G wireless networks by enabling them to detect, track, and identify objects using same spectrum and hardware with accurate and robust localization, and environmental mapping, alongside classical communications. A detailed knowledge of the radio propagation environment is required to determine JCAS enabled new services viability and marker potential. We have undertaken a massive measurement campaign to develop accurate and robust models for JCAS in indoor and outdoor settings. I will describe the motivation, channel sounders, measurements, and models already established in this project.

Reinaldo A. Valenzuela (Fellow, IEEE) is a Member of the National Academy of Engineering and a Bell Labs Fellow. He received the B.Sc. degree from the University of Chile and the Ph.D. degree from Imperial College London. He is currently Director of the Communication Theory Department and a Distinguished Member of Technical Staff at Bell Laboratories. His research focuses on propagation measurements and modeling, MIMO and space-time systems for high-capacity wireless communications using antenna arrays, as well as heterogeneous networks (HetNets), small cells, and next-generation air interface techniques and architectures. He has authored 247 scientific publications and holds 44 patents. He has more than 35,800 citations in Google Scholar and has been recognized as a “Highly Cited Author” by Thomson ISI. He is also a Fulbright Senior Specialist and recipient of several prestigious awards, including the IEEE Eric E. Sumner Award, the IEEE CTTC Technical Achievement Award (2014), and the IEEE VTS Avant Garde Award (2015).

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Speaker: Mauricio Rodriguez, Pontificia Universidad Catolica de Valparaiso, Chile

Title: *Reliable Wireless Propagation Channel Modeling for Integrated Sensing and Communications up to 170 GHz*

Summary: This talk will present recent research on reliable wireless propagation channel modeling for next-generation integrated sensing and communications up to 170 GHz. The presentation is framed within a research project aimed at developing statistically reliable channel models under realistic deployment conditions, where propagation must be characterized not only toward active communication users, but also toward passive targets, clutter, and surrounding environments relevant to sensing. The talk will focus on experimental and modeling challenges at mmWave and sub-THz frequencies, including coverage prediction, angular power spectra, channel dynamics, frequency dependence, and the effectiveness of highly directive antennas. Selected student-led works from our group will be used as case studies, covering indoor propagation and directional antenna gain at 28, 60, and 140 GHz, dynamic blockage produced by vehicles and people, and indoor backscattering measurements for RF sensing at 28 and 140 GHz. Through these examples, the talk will show how empirical data, physically interpretable models, simulations, and high-resolution angular measurements can be combined to assess which integrated sensing and communication services are feasible in realistic environments.

Mauricio Rodríguez (Senior Member, IEEE) is an Associate Professor with the School of Electrical Engineering at the Pontificia Universidad Católica de Valparaíso (PUCV), Chile, where he also serves as Director of the Ph.D. program in Electrical Engineering. He is also an Associate Researcher at the Centro Científico Tecnológico de Valparaíso (CCTVal). He received the Ingeniero Civil Electrónico, M.Sc., and Ph.D. degrees in electronics engineering from Universidad Técnica Federico Santa María, Chile. His research focuses on wireless propagation measurements, statistical channel modeling, millimeter-wave and sub-terahertz communications, measurement-based propagation models, and radio channel characterization for sensing applications. He has led research projects on statistically reliable wireless propagation channel models up to 170 GHz and maintains active international collaborations with Nokia Bell Labs and other research groups. He serves as an Associate Editor for the IEEE Open Journal of Antennas and Propagation.

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Speaker: Alejandro Aragón-Zavala, ITESM, Queretaro, Mexico

Title: To be defined.

Summary: To be defined.

Alejandro Aragón-Zavala (Senior Member, IEEE) received the B.Sc. degree in electronics and communications engineering from Tecnológico de Monterrey, Querétaro Campus, Mexico, in 1992, the M.Sc. degree in satellite communication engineering from the University of Surrey, U.K., in 1997, and the Ph.D. degree in antennas and propagation from the Centre for Communication System Research, University of Surrey, in 2003. He was a Senior In-Building Radio Consultant with Cellular Design Services Ltd., U.K., from 1998 to 2003, and the Program Chair and the Head of the Department of Electronics, Tecnológico de Monterrey, Querétaro Campus, from 2003 to

2011. He is currently a Titular Professor and the Head of the Regional Department of Computing, School of Engineering and Science, Tecnológico de Monterrey, and a Wireless Expert Consultant with Real Wireless Ltd., U.K. He is the author of more than 40 research articles, two e-books, and three books on wireless communications. His research interests include indoor radio propagation, high-altitude platforms (HAPS), antenna design, vehicular technologies, satellite communications, and channel modeling.

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Speaker: Dajana Cassioli, University of L'Aquila, Italia

Title: *RF Sounding, Modeling and Sensing: Wideband Channel Signatures from UWB Roots to THz Frontiers*

Summary: This seminar explores how wideband channel signatures evolve from UWB to terahertz frequencies, highlighting the role of measurement-driven research in understanding RF propagation. Starting from early UWB channel sounding and statistical modeling, the talk follows the transition to mmWave and THz bands, where bandwidth, directionality and material interactions reshape propagation behavior. Recent results show how channel variations can also enable sensing, revealing motion and environmental dynamics. The seminar concludes with emerging concepts for THz channel sounding and their potential to unify communication, modeling and sensing within next-generation RF systems.

Dajana Cassioli (Senior Member, IEEE) is an Associate Professor of Telecommunications Engineering with the University of L'Aquila, L'Aquila, Italy, where she served as the Elected Head for the Study Program in "Telecommunications Engineering: Advanced Technologies and Services" from 2021 to 2024. She co-authored more than 100 articles published in the most renowned international journals, magazines, and conference proceedings. She was a Summer Manager with the Wireless Systems Research Department, AT&T Laboratories-Research, NJ, USA, in 2000. She was a Short-Term Visiting Scholar with the University of Southern California, Los Angeles, CA, USA, hosted by Prof. Andy Molisch, in 2022. Her main research interests are in wireless communications, 5G/B5G networks and cybersecurity. Dr. Cassioli is the Chair of the SiG on Distributed and Massive MIMO of the IEEE P1944 Standard for Channel Models of Wireless Systems and the Diversity, Equity and Inclusion Activity Coordinator of the IEEE Italy Section. She is the Past Chair of the IEEE WIE AG Italy Section from 2016 to 2022 and the IEEE VT06/COM19 Italy Chapter from 2011 to 2017. She served as the Chair of the IEEE ComSoc RCC SiG on Propagation Channels for 5G&B from 2021 to 2025. Since 2015, she is the Coordinator of the University of L'Aquila Node of the CINI National Laboratory of Cybersecurity, where she led the CyberEquality WG from 2020 to 2021. She has been awarded the ERC StG VISION (Video-oriented UWB-based Intelligent Ubiquitous Sensing) in 2010 and the ERC PoC Grant iCARE (MobIle health-Care system for monitoring toxicity and symptoms in Cancer patients Receiving Disease-Oriented Therapy) in 2016. She was the CEO in 2014–2018, and 2019 of the spin-off of the University of L'Aquila "Smartly: Natives of Smart Living srl," which designs and markets advanced ICT solutions to improve the quality of life. She served as the Co-Chair for Globecom 2025 WC, ICC 2024 MWN, ICC 2023 CISS, PIMRC2018 Industry, RTSI WIE Chair in 2018, 2019, and 2020, MELECON2020 and MetroInd4.0, and the TPC member of several International Conferences, including ICC, PIMRC, VTC, and GLOBECOM. She participated in the definition of the standard channel model for the IEEE 802.15.4 standard in 2005. She is an Associate Editor of IET Electronic Letters, and an Executive Editor of WILEY INTERNET TECHNOLOGY LETTERS and Transactions on Emerging Telecommunications Technology and served as an Associate Editor for IEEE COMMUNICATIONS LETTERS from 2018 to 2022.

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Speaker: Rafael Caldeirinha, Instituto de Telecomunicações and Polytechnic of Leiria, Portugal

Title: *Advanced Radiowave Propagation: Bridging Mobile Communications and Radar Systems in Complex Environments*

Summary: This talk addresses advanced RF propagation across mobile communications and radar systems in complex environments. It covers urban and rural modelling using 3D geospatial tools, environmental effects such as vegetation and wildfires, and emerging paradigms including reconfigurable intelligent surfaces (RIS), integrated sensing and communications (ISAC) and space surveillance. Measurement-driven approaches and real 5G deployments are highlighted to bridge theory and practice.

Rafael F. S. Caldeirinha (Fellow Member of IET and Senior Member of IEEE and URSI) was born in Leiria, Portugal, in 1974. He received the B.Eng. (Hons.) in Electronic and Communication Engineering and the Ph.D. degree from the University of Glamorgan, U.K. (now University of South Wales), in 1997 and 2001, respectively, and the Habilitation (Agregação) from the University of Aveiro, Portugal, in 2020. During his doctoral studies, he was a Part-time Lecturer at the University of Glamorgan between 1997 and 2001, later appointed Senior Lecturer at the same university. In 2001, he returned to Portugal to join the Polytechnic of Leiria as Invited (Adjunct) Professor, before progressing to Coordinating Professor in 2007 and, since February 2024, Full Professor in Telecommunications. In parallel, he has been a Researcher at Instituto de Telecomunicações since 2002, where he became Senior Researcher, Head of the Antennas & Propagation Research Group in 2010, and National Coordinator of the Research Cluster on Antennas & Propagation in 2021. Since 2020, he has also served as Scientific Coordinator of PASO – Pampilhosa da Serra Space Observatory, a national scientific infrastructure of Instituto de Telecomunicações and the Ministry of National Defense, equipped with a 2.5 kW radar, a radiometer, and an optical telescope, created under the EU H2020 SST 2020 – Space Surveillance and Tracking project. Beginning in September 2025, he will assume the national role of Thematic Line Coordinator of Wireless Technologies at IT. His research focuses on radiowave propagation through vegetation and wildfire environments, radio channel sounding and modelling, radar imaging and radiometry, and reconfigurable intelligent surfaces,

with applications across micro- and millimetre-wave frequencies. He has authored or co-authored over 250 publications in international journals and conferences, holds two national patents, and contributed four studies to ITU-R Study Group activities, which formed the basis of ITU–R Recommendation P.833-5 (2005). Over the course of his career, he has participated in more than 35 national and international funded projects, including coordination of pioneering initiatives such as RESCuE-TOOL, RETIOT, and Invisible 5G, as well as earlier landmark studies on vegetation propagation for the UK Radiocommunications Agency. He has also contributed technical reports for the Portuguese Ministry of Internal Affairs following the 2017 wildfires, directly influencing national communication and safety policies. As a supervisor and mentor, Prof. Caldeirinha has guided 13 doctoral theses, 21 master's dissertations, and over 50 undergraduate final projects, and currently co-supervises 7 ongoing PhD students and 3 MSc dissertations. He has also supervised 7 post-doctoral researchers within funded research projects, many of whom have continued to establish careers in academia and industry. He has held a number of international editorial and leadership positions, including Associate Editor of the IEEE Transactions on Antennas and Propagation between 2016 and 2022, Associate Editor of the IET Microwaves, Antennas & Propagation, and Editorial Board Member of the International Journal of Communication Systems (Wiley) and of Review on Electromagnetics (EurAAP). He has served the scientific community in several capacities, including Awards & Recognition Officer of the IEEE Portugal Section, Chair of the IEEE Portugal Joint Chapter on Antennas & Propagation, Electron Devices and Microwave Theory & Techniques, Regional Delegate of EurAAP for Portugal, Spain and Andorra, and currently as a member of its Board of Directors and Secretary/Treasurer. He chairs the Scientific Committee F (Propagation and Remote Sensing) of the Portuguese URSI Committee and presides over the National Technical Commission for Electrotechnical Standardization CTE 106 on Electromagnetic Fields in the Human Environment, aligned with CENELEC.

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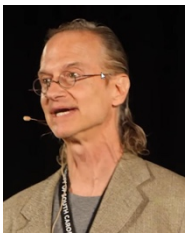
Speaker: David Matolak, University of South Carolina, EE.UU.

Title: *Random Processes in Wireless Channel Modeling: Past, Present, and …*

Summary: In this talk, we first review some of the history of wireless channel modeling, with a focus on the use of stochastic processes. We begin with some fundamentals—Maxwell's equations—then describe some examples of how random variables, then random processes, entered the realms of both wireless channel theory and practice. This lead us to the representation of path loss and small-scale fading as random, where for the latter, a wide variety of distributions has been proposed. These distributions encompass both the empirical and analytical. More recently, to model wireless channels over longer time periods and/or wider areas, statistical non-stationarity has been introduced, along with hybrid deterministic-statistical models. We provide examples of all these models, and brief comments on recent machine-learning models. Finally, we describe new models that employ the mathematics of econometrics. Some remarks for the future of random processes in wireless channel modeling conclude the presentation.



David W. Matolak (IEEE Fellow) received the B.S. degree from The Pennsylvania State University, M.S. degree from The University of Massachusetts, and Ph.D. degree from The University of Virginia, all in electrical engineering. He has over 25 years' experience in communication system research, development, and deployment, with industry, government institutions, and academia, including AT&T Bell Labs, L3 Communication Systems, MITRE, and Lockheed Martin. He has published over 280 papers, multiple book chapters, and has eight patents. Professor Matolak is a Fellow of the IEEE, and is a recipient of multiple awards, including the IEEE Vehicular Technology Society (VTS) Best Propagation Paper award (2017). He has organized many IEEE workshops and special sessions, and has been an Associate Editor for two IEEE journals. He was a professor at Ohio University (1999-2012), and since 2012 has been a professor at the University of South Carolina. His research interests are radio channel modeling, secure and covert communications, and PHY/MAC communication techniques for statistically non-stationary fading channels. Prof. Matolak is also a member of RTCA and ITU standards groups working on aviation communications, and is a member of Eta Kappa Nu, Sigma Xi, Tau Beta Pi, URSI, ASEE, and AIAA.

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Speaker: Carlos A. Gutierrez, Universidad Autónoma de San Luis Potosí, Mexico

Title: *Propagation-Aware Perspectives for Integrated Sensing and Communication in Vehicular and Biomedical Applications*

Summary: Integrated Sensing and Communication (ISAC) is an emerging paradigm that enables the use of radiocommunication signals not only for data transmission, but also for environmental sensing tasks such as target localization and activity monitoring. Unlike conventional radar and communication systems, ISAC integrates both functionalities within a unified RF framework. The design of such systems requires careful consideration of wireless channel characteristics that jointly impact sensing and communication performance. This talk presents selected case studies developed at the Faculty of Sciences of UASLP, including vehicle collision prevention using RF sensing with machine learning, contactless monitoring of respiratory activity based on wireless signals, and a proof-of-concept ISAC implementation. These examples highlight the role of propagation-aware signal processing in practical sensing applications.

Carlos A. Gutiérrez (Senior Member, IEEE) received the B.E. degree in electronics and digital communication systems from the Universidad Autonoma de Aguascalientes, Mexico, in 2002, the Advanced Studies Diploma degree in signal processing and communication theory from the Universidad Politecnica de Cataluña, Spain, in 2005, the M.S. degree in electronics and telecommunications from CICESE, Mexico, in 2006, and the Ph.D. degree in mobile communication systems from the University of Agder, Norway, in 2009. From 2009 to 2011, he was with the School of Engineering, Universidad Panamericana,

Aguascalientes, Mexico. Since January 2012, he has been with the Faculty of Science, Universidad Autonoma de San Luis Potosi, Mexico. His research interests include modeling, simulation, and measurement of wireless channels; antenna design; electromagnetic wave propagation; vehicular communications; and radio sensing for vehicular applications and human activity recognition. Dr. Gutierrez has held different positions in organizing and technical program committees of various international conferences. He has served as an Expert Evaluator for the European Commission and CONACYT (Mexico); an associate editor for the IEEE Open Journal of Vehicular Technology; an associate editor for the IEEE Vehicular Technology Magazine; and a guest editor for several international journals. His publications received three best paper awards. He is a member of the Mexican National System of Researchers (Level II).

Tutorials

Title: *Implementation of a digital communication system using software-defined radios*

Instructor: Miguel A. Díaz-Ibarra

Summary: This Software-Defined Radio (SDR) tutorial aims to introduce the fundamentals and modern applications in reconfigurable wireless communications. The concept of SDR will be addressed, highlighting how it enables the migration of functions traditionally implemented in hardware into the software domain, thereby providing greater flexibility and scalability. Additionally, the main characteristics of these systems will be analyzed, such as their ability to operate across multiple frequency bands, their adaptability to different standards, and their real-time processing capabilities. In the practical section, the transmission and reception of digital information will be implemented through several stages. At the transmitter, these stages include encryption, source coding, channel coding, and modulation. At the receiver, the corresponding stages of demodulation, channel decoding, source decoding, and decryption are performed, leading to the recovery of the original message.

Miguel A. Díaz-Ibarra received the B.S., M.S.E.E. and Ph.D. in electronics engineering from the Autonomous University of San Luis Potosí, México, in 2014, 2015, and 2020, respectively. Since 2017, he has been a Lecturer with the Polytechnic University of San Luis Potosí for the telematics engineering program. He is currently a postdoctoral researcher at the Autonomous University of San Luis Potosí, Mexico. His research interests include power control in wireless systems, wireless sensor networks, and vehicular communications.

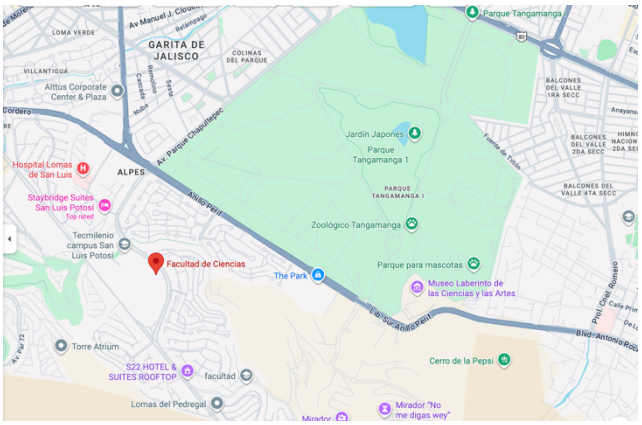
Venue

Faculty of Science, Universidad Autónoma de San Luis Potosí

Av. Chapultepec 1570, Privadas del Pedregal

San Luis Potosi 78295, Mexico

- *Talks will be held in the auditorium.*
- *Tutorials will take place in the Wireless Communications Laboratory (EIII-604)*



Format

Talks (Hybrid): Some conferences will be delivered in person by the speaker at the auditorium, while others will be given remotely via Microsoft Teams; all sessions will be streamed live through Teams.

Tutorials (In person): All tutorials will be held on site.

Cost and Registration

The event is free, but it requires completing an online registration.

If the QR code does not work, please copy and paste the following link into your browser:

https://forms.cloud.microsoft/r/K33xZfvj0G