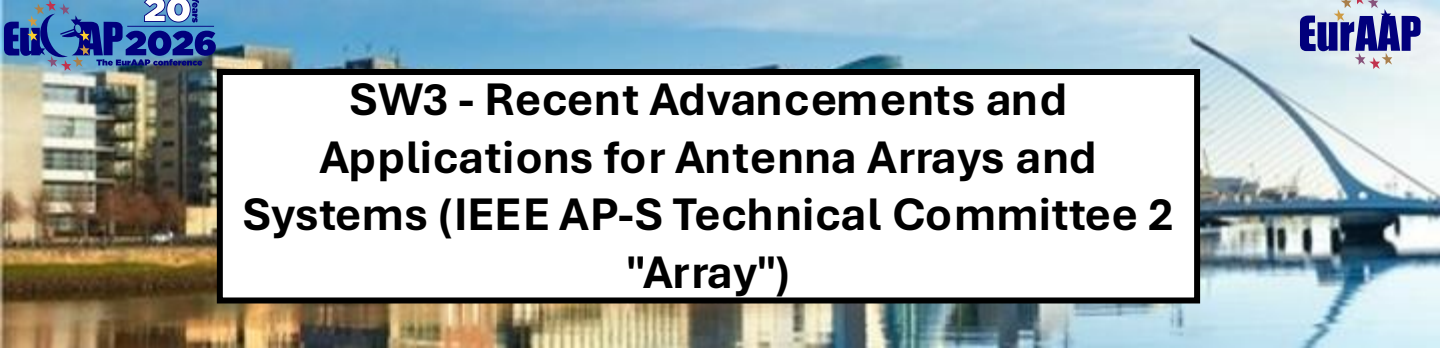


SW3 - Recent Advancements and Applications for Antenna Arrays and Systems (IEEE AP-S Technical Committee 2 "Array")

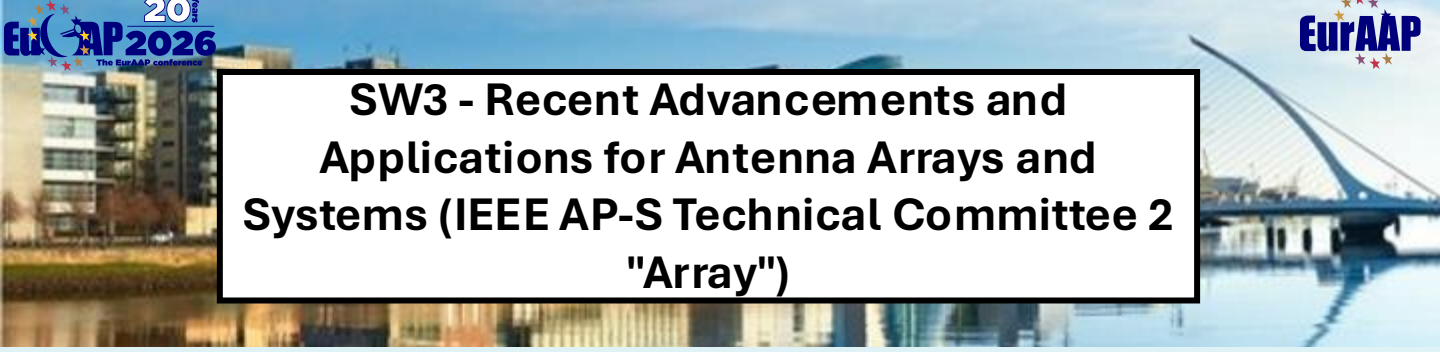
Abstract:

In the scope of the IEEE Antennas and Propagation Society (AP-S) Technical Committee 2: "Arrays" (TC-2) is responsible for monitoring and advancing the latest developments and trends in antenna array and system technologies. This scientific workshop aims at sharing and discussing the latest advancements and applications for antennas arrays and systems for enabling emerging radio technologies for 5G and beyond. The workshop will serve as a valuable platform for knowledge exchange and networking and is envisaged to gather experts and researchers in the proposed field from all around the world to present, discuss and showcase their latest innovative research in antenna arrays, and next-generation antenna systems.

Workshop outline:

In the scope of the IEEE Antennas and Propagation Society (AP-S) Technical Committee 2: "Arrays" (TC-2) is responsible for monitoring and advancing the latest developments and trends in antenna array and system technologies. This scientific workshop aims at sharing and discussing the latest advancements and applications for antennas arrays and systems for enabling emerging radio technologies for 5G and beyond. The workshop will serve as a valuable platform for knowledge exchange and networking and is envisaged to gather experts and researchers in the proposed field from all around the world to present, discuss and showcase their latest innovative research in antenna arrays, and next-generation antenna systems.

Confidential



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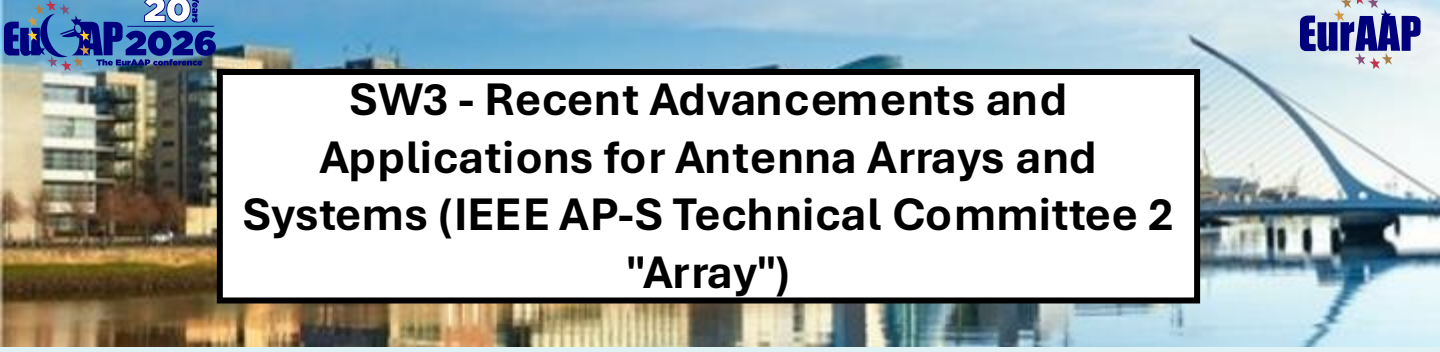
Agenda:

Time	Speaker	Title
08:00 – 08:05	Dr. Diane Titz (Université Côte d'Azur) / Prof. Tian Hong Loh (National Physical Laboratory)	Welcome and Workshop Scope
08:05 – 08:35	Prof. Yong-Mei Pan (South China University of Technology)	Design of Wide-Angle Beam-Scanning Millimeter-Wave Dielectric Resonator Antenna Arrays
08:35 – 08:55	Prof. Mauro Ettorre (Michigan State University)	Non-dispersive Radiation: Concepts and Future Directions from Communications to High-Power Applications
08:55 – 09:15	Prof. Takashi Tomura (Institute of Science Tokyo)	Origami Deployable Reflectarray Antennas for Small Satellites
09:15 – 09:35	Prof. Tian Hong Loh (UK National Physical Laboratory)	A Metrological Millimetre-Wave Over-The-Air Test Platform Incorporating a Fully-Connected Hybrid Beamformer with a Large Antenna Array
10:10 – 10:30	Dr. Martijn de Kok (Eindhoven University of Technology)	Power Amplifier (PA)-Antenna Co-Design in Active Phased Array Antennas
10:30 – 10:50	Prof. Zhi-Hao Jiang (Southeast University, China)	Development of Reconfigurable Reflect-Arrays and Their Application for Beam-Steering Cassegrain Reflector Antennas
10:50 – 11:10	Prof. Oscar Quevedo-Teruel (KTH Royal Institute of Technology)	Design Considerations for Array Radomes
11:10 – 11:30	Dr. Diane Titz (Université Côte d'Azur)	Antenna Systems for E-Band and Future Telecom Applications
11:30 – 11:50	Dr. Diane Titz / Prof. Tian Hong Loh / Prof. Yong-Mei Pan / Prof. Mauro Ettorre / Prof. Takashi Tomura / Prof. Zhi-Hao Jiang	Panel Discussion



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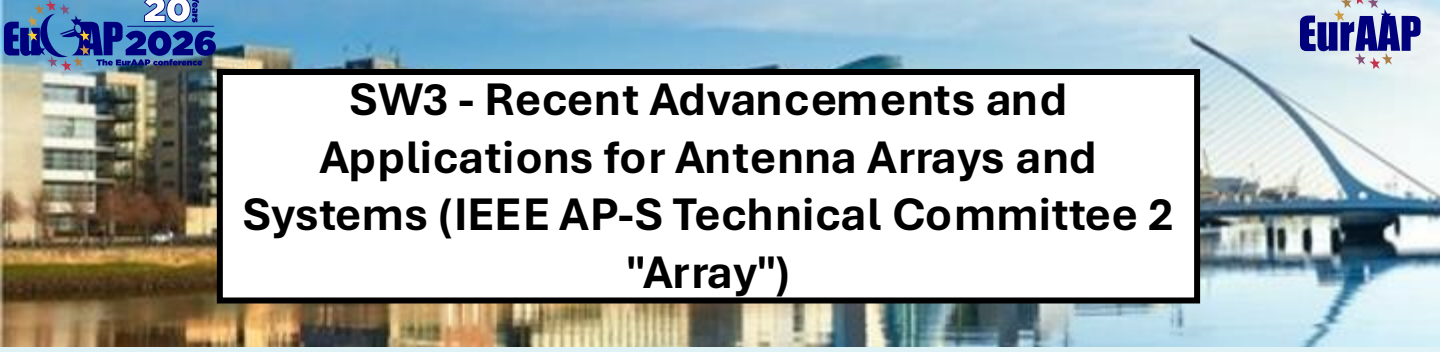
Speakers:

Yong-Mei Pan (IEEE Fellow) is a full professor at the School of Electronics and Information, South China University of Technology, China. Her research focuses on dielectric resonator antennas, filtering antennas, MIMO antennas, and antenna-in-package, with over 150 SCI-indexed papers published and 12 US patents granted. Dr. Pan was awarded the IEEE Antennas and Propagation Society's Lot Shafai Mid-Career Distinguished Achievement Award in 2022, the Guangdong Province Science and Technology Award for Technological Invention (First Class) in 2020, and the Ministry of Education's Higher Education Scientific Research Outstanding Achievement Award for Natural Science (First Class) in 2016. Dr. Pan served as an Associate Editor for the IEEE Transactions on Antennas and Propagation (TAP) from August 2016 to October 2022, and she is currently a Track Editor of TAP.

Mauro Ettorre received a Laurea degree "summa cum laude" in Electrical Engineering and a Ph.D. degree in Electromagnetics from the University of Siena, Italy, in 2004 and 2008, respectively. Part of his Ph.D. work was developed at the TNO, the Netherlands. Since 2023, he has been a Professor at Michigan State University, East Lansing, USA. Previously, he was a Research Scientist at the CNRS, IETR laboratory in France. From 2014 until 2020, he co-led the multi-beam antenna activity for satellite applications in the joint laboratory between IETR and Thales Alenia Space, France. From 2016 until 2021, he led the mm and sub-mm waves team at IETR, and co-chaired from 2021 to 2023 the department ADH (Antennas and Microwave Devices Department) at IETR.Dr. Ettorre's research interests include the analysis and design of quasi-optical systems, periodic structures, wideband arrays, millimeter-wave antennas, non-diffractive radiation, and localized waves. He has authored over 97 journal papers and 250 conference communications and holds 14 patents (2 licensed) on millimeter-wave antenna technology. Dr. Ettorre is a Fellow of IEEE. From 2017 until 2023, he served as Associate Editor for the IEEE Transactions on Antennas and Propagation. Since 2023, he has served as Track Editor for the same journal. He currently serves as the Editor-in-Chief of the IEEE Antennas and Propagation Magazine. Dr. Ettorre is the 2024 IEEE MTT-S and AP-S Inter-Society Distinguished Lecturer. The research activities of Dr. Ettorre have been recognized with several prizes, including the 2009 French Ministry of Research award for the most innovative project in all natural sciences, the Young Investigator Award from the French National Research Agency in 2014, the Innovation Award at the 2018 ESA Antenna Workshop in the Netherlands, the Best Paper Award in Electromagnetics and Antenna Theory at EuCAP 2018, UK, the Best Antennas Paper Award at EuCAP 2021, Germany and Best Paper Award at the iWAT 2023, Denmark. "



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Speakers:

Tian Hong Loh (IEEE Fellow) is a Principal Scientist at the UK National Physical Laboratory (NPL) and the Science Area Leader for NPL's Electromagnetic Technologies Group. He leads a team of scientists undertaking ground-breaking measurement science research in support of the emerging electromagnetic technologies developments. He has edited one book, holds seven patents, authored, and co-authored over 240 refereed publications. He is currently President of the URSI UK Board, Chair of the EurAAP Measurement Working Group, Visiting Professor at the University of Surrey, UK, Representative of the IEEE APS at the IEEE FNTC, member of IEEE APS Standards Committee, IEEE TCAM and the IET, and senior member of IEEE and AMTA. His research interests include 5G/6G communications, MIMO antennas, smart antennas, small antennas, metamaterials, body-centric communications, wireless sensor networks, electromagnetic compatibility, and computational electromagnetics.

Martijn de Kok obtained his Bachelor, Master and PhD degrees Electrical Engineering (all cum laude) from Eindhoven University of Technology in The Netherlands. His PhD thesis, defended in 2025, was titled 'Active Phased Array Antenna Systems for Next-Generation Radars: Co-design, Integration, and Scalability.' In 2019 he was a visiting student at the Advanced RF & Optical Technologies group of the NASA Jet Propulsion Laboratory. In 2021 he became a guest researcher at the Radar Technology department of TNO Defense, Safety and Security in The Hague. In 2025 he joined TNO as a Scientist focusing on phased-arrays and high-power antenna systems for applications including large-scale radars and space. Dr. de Kok received the Best Antenna Theory and Design Paper Award at the 2025 EuCAP conference, and the 2025 Veder-prize for his contributions to Dutch radio science in that year.

Zhi Hao Jiang received the Ph.D. degree from The Pennsylvania State University, in 2013, and is currently a Professor with the State Key Laboratory of Millimeter Waves, Southeast University. He has published 3 books and more than 150 papers in peer-reviewed journals, and holds 12 granted U.S. patents and 30 granted Chinese patents. He was a committee member of the IEEE AP-S NTDC (2022 – 2024), serves as the Associate Editor of IEEE Transactions on Antennas and Propagation and as a committee member of IEEE AP-S TC-2 and IEEE MTT-S CEC, and has served as the TPC Co-Chair for multiple international conferences. He was a recipient of the Outstanding Youth Scholar of NSFC in 2021, the IEEE Microwave Prize in 2021, the Young Scientist Award at URSI-GASS 2020 and ACES-China 2019. His current research interests include millimeter-wave antennas and circuits, impedance surfaces, and analytical methods.

SW3 - Recent Advancements and Applications for Antenna Arrays and Systems (IEEE AP-S Technical Committee 2 "Array")

Speakers:

Oscar Quevedo-Teruel received his Telecommunication Engineering and Ph.D. Degrees from Carlos III University of Madrid, Spain in 2005 and 2010. In 2014, he joined the KTH Royal Institute of Technology (Stockholm, Sweden), where he is presently a Full Professor in the Department of Communication Systems in the School of Electrical Engineering and Computer Science. He is also the responsible for the Antenna Laboratory and Director of the Master Programme in Electromagnetics Fusion and Space Engineering. He was a distinguished lecturer of the IEEE Antennas and Propagation Society for the period of 2019-2022. He is an IEEE Fellow for his contributions to glide symmetry based metasurfaces and lens antennas. He has been a member of the EurAAP Board of Directors since January 2021. Since January 2022, he is presently the EurAAP vice-chair. He was an Associate Editor of the IEEE Transactions on Antennas and Propagation since 2018-2022, and he acts as Track Editor in IEEE TAP since 2022. He is the founder and editor-in-chief of the EurAAP journal Reviews of Electromagnetics since 2020. He has made scientific contributions to periodic structures with higher symmetries, lens antennas, metasurfaces, physical optics and ray tracing. He is the co-author of more than 160 papers in international journals and more than 250 at international conferences.

Diane Titz (SMIEEE) received her Master degree from Paris-Saclay University in 2009 and her Ph.D degree from University of Côte d'Azur, France, in 2012. Since then, she is been as associate researcher with the Polytech'Lab at the University of Côte d'Azur, while teaching physics and chemistry to future engineering students. Her research interest include millimeter-wave to terahertz applications through the design of antennas, lens and their measurement. She has coauthored three book chapters and more than 80 publications. She was the recipient of the 2018 Lot Shafai mid-career distinguished achievement award. She also serves as an associate editor for the IEEE TAP and is a committee member of AP-S TC2.

Takashi Tomura received his Ph.D. degree from Tokyo Institute of Technology, Japan. His doctoral research focused on the hybrid analysis of millimeter-wave broadband waveguide slot array antennas using the Method of Moments and the Finite Element Method. He previously worked at Mitsubishi Electric Corporation, where he was engaged in the research and development of reflector antennas for satellite payloads and ground station antennas for satellite communications. Since 2017, he has been with Tokyo Institute of Technology (now Institute of Science Tokyo), where he works on deployable origami-inspired antennas for small satellites and high-gain antennas and modules in the sub-terahertz frequency bands.

SW3 - Recent Advancements and Applications for Antenna Arrays and Systems (IEEE AP-S Technical Committee 2 "Array")

ABSTRACTS:

Design of Wide-Angle Beam-Scanning Millimeter-Wave Dielectric Resonator Antenna Arrays:

Dielectric Resonator Antennas (DRAs), composed primarily of dielectric material, offer high radiation efficiency in the mm-Wave band by eliminating conductor loss, making them ideal for mm-Wave systems. Complementing this, phased array technology enables rapid electronic beam steering, flexible shaping, and precise pointing through accurate amplitude and phase control, serving as a key enabler to overcome mm-Wave propagation bottlenecks. This report highlights our group's progress in wide-angle scanning DRA phased arrays. We propose a strategy that leverages dielectric resonant modes, ground plane image effects, and inter-element near-field coupling to broaden the element active pattern. This approach significantly expands the array's scanning range without introducing additional structural complexity.

Non-dispersive Radiation: Concepts and Future Directions from Communications to High-Power Applications

The dispersive behavior of radiating systems significantly impacts the radiation of short pulses used in communication, sensing, and power transmission. This presentation will introduce fundamental concepts, outline limitations, and provide the metrics necessary for analyzing radiating systems. The aim is to clarify the scientific questions and obstacles related to the radiation of short pulses. Following this introduction, the presentation will discuss recent advancements addressing these challenges and offer innovative solutions for effectively radiating extremely short pulses with minimal dispersion.

Origami deployable reflectarray antennas for small satellites

6G requires extended coverage over the air, sea, and space, in addition to ultra-high-speed communications and low latency. This talk presents origami deployable reflectarray antennas for small satellites. The antennas can be compactly stowed by origami fold patterns when onboard a rocket and deployed large in space. To further increase the functionality of the antennas, reconfigurable reflectarrays enable non-flatness compensation and beam steering.

A Metrological Millimetre-Wave Over-The-Air Test Platform Incorporating a Fully-Connected Hybrid Beamformer with a Large Antenna Array

Current efforts to develop cost-effective, energy-efficient wireless systems operating at millimeter-wave (mm-wave) frequencies with large-scale phased array antennas—driven by the high data-rate demands of future sixth-generation (6G) networks—have highlighted the need to explore the use of hybrid beamforming technologies. This talk presents a novel metrological mm-wave 5G new-radio MIMO testbed for radiated-two-stage (RTS) over-the-air (OTA) testing. The testbed features a highly reconfigurable fully connected hybrid beamformer with a large antenna array, a base station emulator, a channel emulator, and a user-programmable software-defined radio (SDR) platform. The evaluation of the RTS method is presented.

SW3 - Recent Advancements and Applications for Antenna Arrays and Systems (IEEE AP-S Technical Committee 2 "Array")

ABSTRACTS:

Power amplifier (PA)-antenna co-design in active phased array antennas

This presentation outlines a holistic co-design workflow for active phased arrays, integrating Power Amplifier (PA) load-pull modeling with antenna design using a custom simulation framework. The approach supports early stage design decisions and enables rapid optimization of the PA-antenna interface while accounting for finite-array effects and varying active reflection coefficients. A 16-element X-band array comprising Vivaldi antennas directly matched to gallium nitride (GaN)-based PAs is developed and realized to demonstrate the methodology. The presented co-design strategy offers a practical foundation for efficiently scalable and high-performance active array systems.

Development of Reconfigurable Reflect-Arrays and Their Application for Beam-Steering Cassegrain Reflector Antennas

Reconfigurable arrays, realized by integrating RF switches into radiating or scattering elements, offer a new low-cost beamforming solution for communication and sensing applications. The first part of this report will focus on the design and experimental validation of Ka-band reconfigurable reflect-arrays and transmit-arrays, including large-scale high-bit reconfigurable reflect-arrays, wideband dual-polarization reconfigurable reflect-arrays, and wideband dual-polarization reconfigurable transmit-arrays. In addition, the report will present the use of a reconfigurable reflect-array as the sub-reflector in an electrically large Cassegrain antenna to achieve two-dimensional electronic beam steering of its high-gain beam.

Design considerations for array radomes

Most of the practical implementations of arrays make use of a radome to protect the antennas from the environment. Consequently, radomes can have a negative influence in the performance of the array. Therefore, its analysis and design are crucial for the final implementation of most of the commercial arrays. In this talk, we will explain the practical considerations to take into account when an array is integrated with a radome. In addition, we will show how to fast simulate these radomes with ray-tracing techniques and physical optics. Finally, we will discuss on how to take advantage of the radome in our own benefit.

Antenna systems for E-band and future telecom applications

5GNR (Beyond 5G) and 6G wireless network access and backhaul as well as satellite telecommunications are targeting E-band (71 to 76 GHz and 81 to 86 GHz) and D-band (150 GHz) radio systems due to the wide available bandwidth the offer. This presentation will show several antenna and antenna-array designs within these bands manufactured using Digital Additive Manufacturing (DAM) techniques as well as High Density Interconnect (HDI) Planar Circuit Board (PCB). Part of this work has been done with the support of the European SHIFT (Sustainable, Technologies Enabling Future Telecom Applications) project.