IEEE AP-S Distinguished Lecture Series in Italy

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Venue: Università degli Studi di Perugia, Sapienza Università di Roma, and Università Roma TRE

Prof. Pai-Yen Chen

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Prof. Pai-Yen Chen, IEEE Antennas and Propagation Society (AP-S) Distinguished Lecturer (DL), visited the University of Perugia (Università degli Studi di Perugia), Sapienza University of Rome (Sapienza Università di Roma), and Università Roma Tre (Roma Tre University) within the IEEE AP-S DL Workshop Series in Italy.

This February, the IEEE AP-S DL Workshop Italy Series provided a unique platform to engage the vibrant electromagnetic research community at the University of Perugia (Università degli Studi di Perugia), Sapienza University of Rome (Sapienza Università di Roma), and Roma Tre University (Università Roma Tre). Organized and coordinated by Dr. Levent Sevgi and jointly led by Prof. Cristiano Tomassoni (University of Perugia; Chair of the IEEE Italy Section Joint Chapter AP03/MTT17), Prof. Fabrizio Frezza (Sapienza University of Rome), and Prof. Alessio Monti (Roma Tre University), the DL series showcased the recent advent in antennas, propagation, and electromagnetics research. Prior to the events, announcements were widely disseminated through the official IEEE Italy Section communication channels, social media (e.g., LinkedIn), and international research networks (e.g., ELEDIA Networks), ensuring a broad reach across the Italian electromagnetics community. Given the collaborative nature of these research hubs, the lectures were organized in a hybrid format, facilitating both on-site attendance and virtual participation for regional and international IEEE members.

The series featured an elite panel of IEEE AP-S Distinguished Lecturers, including Prof. Pai-Yen Chen, Prof. Okan Yurduseven, and Prof. Özlem Özgün. A significant highlight was the participation of world-renowned luminaries, including Prof. Andrea Alù (Founding Director of CUNY Advanced Science Research Center), Prof. Stefano Maci (University of Siena; Founding Director of ESoA), and Prof. Prof. Cristiano Tomassoni. Their presence fostered a high-level scientific dialogue, as they engaged in deep technical interactions with the audience alongside the speakers. At each venue, Dr. Sevgi presented an overview of the IEEE AP-S, detailing its mission and the DL program. He further shared his expertise in computational electromagnetics, electromagnetic scattering, and visualized learning of electromagnetics. He warmly invited graduate students and aspiring engineers to participate in the global AP-S community.

Prof. Pai-Yen Chen's DL was entitled "Non-Hermitian Electromagnetics and its Applications." In the first part of his talk, he reviewed his work on non-Hermitian electromagnetics, electronics and photonics, showing how the formal similarity between the Schrödinger and Maxwell equations allows for experimental observation of parity–time (PT) symmetry in radio-frequency, terahertz, and optical systems with spatially distributed, balanced gain and loss. He described exceptional points and phase transitions in PT-symmetric systems and practical implementations using metamaterials, metasurfaces, transmission-line networks, and lumped-element circuits. He highlighted the eigenvalue bifurcation effect in the proximity of exceptional points and its great potential to develop wireless passive sensors with unprecedented sensitivity and resolvability. He also summarized his in vitro and in vivo work

on bioimplantable and wearable sensors and electronic skins (e-skins) for healthcare and telediagnosis applications. In the second part, Prof. Chen discussed the coherent perfect absorber–laser (CPAL) point, a self-dual singularity in the PT-broken phase that functions simultaneously as a perfect absorber and a laser at the same frequency. He outlined applications of CPAL-enabled devices in optical modulators and switches, and ultrasensitive monochromatic interferometric sensors. He also talked about the CPAL-based low-loss epsilon-near-zero (ENZ) metachannel that supports nearly unattenuated fast-wave propagation, yielding a superdirective leaky-wave antenna whose beam angle is steered by tuning the gain–loss parameter. Finally, he introduced the concept of "electromagnetically unclonable functions (EMUFs)" or electromagnetic fingerprints, which harness the high entropy and stochastic nature at singularities of non-Hermitian systems to generate cryptographic keys from temporal and spectral responses. He outlined EMUF applications in identification, authentication, wireless access control, anti-counterfeiting, and hardware security modulus. The lectures concluded with an active Q&A and discussion with attendees and leading experts.

In summary, Professor Chen's DL visit to Italy was highly fruitful, fostering a high-level scientific dialogue between the IEEE AP-S and the broader electromagnetic research community.

Picture : A collection of photos from IEEE AP-S DL Workshop Series in Italy.