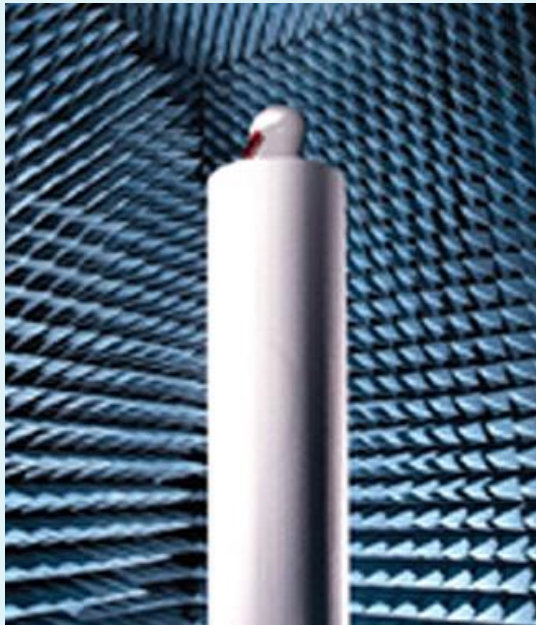


IW1 - From Materials to Orbit: Advancing Antenna Technologies for Next-Gen Connectivity



Abstract:

This workshop explores cutting-edge antenna innovations spanning terrestrial and non-terrestrial networks. Participants will examine electromagnetic transparency techniques that enable compact, multi-band base station antennas to share apertures while minimizing interference. The program also addresses the challenges of next-generation satellite terminals, highlighting methods for achieving and validating robust circular polarization performance under dynamic NTN conditions. Together the workshop presentations provide a cohesive view of the materials, architectures, and testing environments shaping future wireless connectivity.

Workshop Outline:

This workshop consists of three 30-minute talks given by speakers from industry. The presentations will be practical and application-oriented, enabling attendees to learn measurement techniques and troubleshooting methods they can apply in their work. The goal is to provide an informal and highly interactive workshop that encourages exchange between the speakers and the audience. Speakers include Andy Chung, Director of Wireless Solutions at ETS-Lindgren (Taiwan), and Juan Antonio del Real, Sales Director for EMEA at Maury Microwave (France).

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Title: Dynamic Antennas and Arrays for Enhanced Security in Wireless Networks

By: Jeffrey Nanzer, MSU Research Foundation Distinguished Professor, Electrical and Computer Engineering, Michigan State University, USA

Abstract: Future 5G wireless networks will rely on multiple levels of security to ensure reliable operations in emerging areas such as smart cities, automotive networks, and IoT. Aperture-based physical layer security represents a promising approach that can be implemented in concert with traditional cryptographic security techniques. We present the design of dynamic antenna elements and dynamic antenna arrays supporting directional modulation for physical layer security. By dynamically changing the location of the phase center of the antenna or array, complex signal modulation can be imparted on the wireless signal at a range of angles outside of an unperturbed information beam, corrupting the data and making it more challenging to demodulate. Signals within the information beam remain unmodulated and recoverable, thereby creating a spatial information filter that can be used jointly with other security approaches. We describe the theory behind dynamic antennas and present the design and experimental results of single-element antennas as well as multi-element arrays.

Title: Navigating the NTN Frontier: Robust Circular Polarization Testing and Environment Validation for Next-Gen Satellite Terminals

By Andy Chung, Director, Wireless Solutions, ETS-Lindgren, Taiwan



Abstract: Achieving seamless Non-Terrestrial Network (NTN) integration requires satellite terminals to maintain high polarization purity under dynamic and often unpredictable link conditions. For industrial manufacturers, the challenge is no longer just designing a circularly polarized (CP) antenna but accurately characterizing its performance at scale. This presentation focuses on the critical methodologies required to establish and validate a robust CP testing environment.



Title: Uncertainty Analysis in Antenna S-Parameter Measurements

By Juan Del Real, Sales Director for EMEA, Maury Microwave, France

Abstract: Accurate characterization of antenna performance relies heavily on precise S-parameter measurements; however, these measurements are inherently affected by multiple sources of uncertainty. This paper addresses the identification, quantification, and propagation of uncertainties in antenna S-parameter measurements, with particular emphasis on reflection and transmission coefficients obtained using vector network analyzers (VNAs). Key contributors to measurement uncertainty, including instrumentation accuracy, calibration procedures, connector repeatability, cable effects, environmental conditions, and antenna positioning, are systematically analyzed.