

## Antenna Design and Test Considerations for Future 5G/6G Wireless Communication



Janet O'Neil is a customer relations specialist with ETS-Lindgren. She has over 30 years of experience in the RF and Electromagnetic Compatibility (EMC) industries. She is a member of the Board of Directors of the IEEE EMC Society and past member of the Antenna Measurement Techniques Association (AMTA) Board of Directors. Ms. O'Neil has organized dozens of technical workshops during her career as well as served as chair or vice-chair of various IEEE International Symposia for the EMC and MTT Societies. Her education includes BA degrees in English and in Business Economics from the University of California, Santa Barbara.

### **Abstract:**

Antenna design is a distinct art, combining sound engineering principals with creative and novel approaches. Design efforts can be costly and time consuming. In this workshop, speakers will address the design of antennas and associated implications of the design on different frequency ranges. Channel modeling and the impact of the environment on the antenna will be reviewed. To validate the antenna performance, the significance of different test methods will be shown using near-field, far-field, and alternative test techniques.

### **Workshop outline:**

*We will have two speakers, from industry and academia, with the presentations as follows:*

**Title:** Modern 5G Millimeter Wave Antenna Array Evaluation in Near- and Far-Field Environments

**Abstract:** The purpose of this study is to investigate the possibility of using a smaller near-field measurement system to accurately measure the antenna pattern of a modern millimeter wave phased antenna array. The results made in near-field test system are then compared to

the far-field results performed in a typical Compact Antenna Test Range (CATR). Measurements are made using CW and modulated signals to evaluate if the complexity of the waveform effects on the results. The goal of the study is to see if correlation can be found between different methods to allow a more compact and cost-effective test solution to be used for antenna evaluation.

**Speaker:** Mr. Jari Vikstedt, Director - Wireless Solutions, ETS-Lindgren



**Biography:** Jari Vikstedt is the Director - Wireless Solutions for ETS-Lindgren in Cedar Park, Texas. He has over 25 years of experience with ETS-Lindgren in developing and testing RF test solutions for EMC and Wireless applications. Mr. Vikstedt and the other engineers at ETS-Lindgren are active technical contributors to the leading wireless industry organizations, including the CTIA, 3GPP, IEEE, and the Wi-Fi Alliance®.

Recently, Mr. Vikstedt has devoted his expertise to the development of CTIA and 3GPP Over-The-Air (OTA) testing solutions as well as developing innovative 5G OTA test solutions. His research interests include developing creative test solutions to meet unique customer requirements. He holds a patent for creating a novel design for an adaptive antenna performance validation system. Mr. Vikstedt earned a BSEE degree in RF Engineering from the Turku University of Technology, Finland.

**Title:** Phased-Array Calibration Using Built-in-Self-Test Techniques

**Abstract:** This talk shows our work in how a large phased-array can be calibrated using built-in-self-test techniques. A portion of the array can be used as a Tx and a portion as a Rx, and with multiple Tx and Rx measurements, one can measure the vector response of each element and calibrate the array. This method does not require external components or antennas, and can be used on existing transmit and receive arrays for 5G MIMO systems.



**Speaker:** Prof. Gabriel Rebeiz, University of California, San Diego

**Biography:** Prof. Gabriel M. Rebeiz is a Member of the National Academy, Distinguished Professor and the Wireless Communications Industry Endowed Chair at the University of California, San Diego. He is an IEEE Fellow, and is the recipient of the IEEE Daniel E. Nobel Medal, the IEEE MTT Microwave Prize (2000 and 2014), the IEEE MTT 2010 Distinguished Educator Award and the IEEE Antennas and Propagation 2011 John D. Kraus



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Antenna Award. His group has lead the development of complex RFICs for phased array applications from X-band to W-band, culminating recently in wafer-scale integration with high-efficiency on-chip antennas. His phased array work is now used by most companies developing complex communication and radar systems. He has graduated more than 100 PhD students and post-doctoral fellows.