

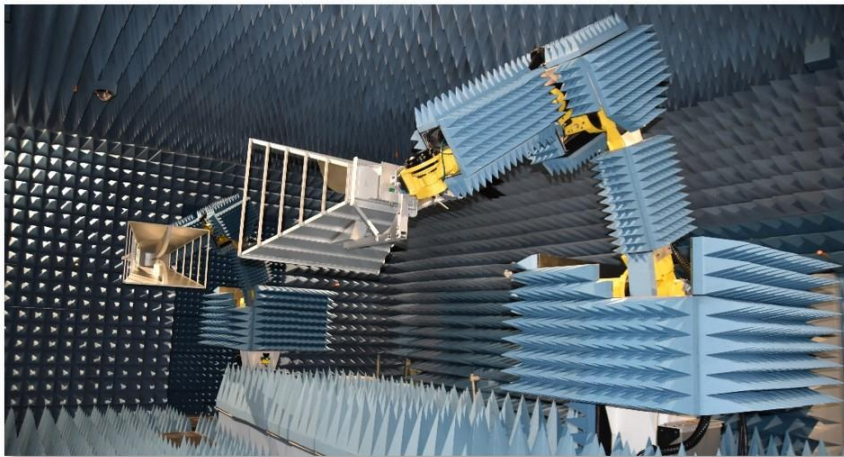
## Industrial Workshop

Organiser: Marc Dirix

Company/Organization: Antenna Systems Solutions (& Next Phase Measurements)



**Title:** Advanced solutions for modern antenna test challenges



**Abstract:** The workshop will provide an insight of current state of the art approaches to meet the challenges in modern antenna measurements, present by Antenna Systems Solutions, Next Phase Measurements and The Boeing Company. Several approaches will be discussed, including compact range reflectors, robotics and advanced post-processing techniques.

Improved surface design techniques for compact range reflectors allow improved quiet zone performance in smaller overall installed space requirements. We will focus on recent advances in the mathematical definition of the blended rolled edge reflector surface. This allows a reduction of the diffraction effects on the reflector corners, further reducing the amplitude and phase ripple in the quiet zone. We further present the automated design and optimization tools, that allow control of both quiet zone distribution as well as control on direct illumination of the chamber walls by the rolled edges.

Additionally, the demands of many sophisticated modern antennas have resulted in the need for innovative near-field antenna measurement systems with greater flexible, lower cost of ownership, massively improved reliability, and greatly improved measurement throughput. We illustrate how these demands can be addressed through the novel use of multi-axis industrial robotic systems. As illustrative examples, plane-rectilinear, plane-polar and non-canonical measurement-schemes are discussed. The use of planar near-field compressive sensing is also discussed, which shows an enormous increase in throughput that can be attained in production test environments.

Further integration of modern data postprocessing tools such as AI driven phase recovery for phaseless measurements, compressive sensing and plane-bi polar transformation augment the capabilities of antenna testing and evaluation.

### Speakers:



**Sergiy Pivnenko** was born in Kharkiv, Ukraine, in 1973. He received the M.Sc. and Ph.D. degrees in electrical engineering from Kharkiv National University, Ukraine, in 1995 and 1999, respectively. From 1998 to 2000, he was a Research Fellow at the Radiophysics Department, Kharkiv National University. From 2000 to 2015, he was an Associate Professor at the Electromagnetic Systems Group, Department of Electrical Engineering, Technical University of Denmark (DTU), where he was doing research and teaching in antenna measurement techniques and was responsible for operation of the DTU-ESA Spherical Near-Field Antenna Test Facility. While at DTU, he participated to multiple research projects related to design, development, and characterization of satellite antennas, development of new near-field probes and probe correction techniques for near-field antenna measurements. In 2015, Dr. Pivnenko joined Antenna Systems Solutions as Technical Director, where he is responsible for scientific and technical tasks related to development of antenna measurement ranges of all possible kinds. He was invited teacher in summer schools and PhD courses and is continuing teaching in several courses of the European School of Antennas on the topics of antenna measurements. He is the author or co-author of 3 book chapters, 26 journal papers, and more than 100 conference papers. Dr. Pivnenko is a member of IEEE, EurAAP, and AMTA.



**Dennis Lewis** received his BS EE degree with honors from Henry Cogswell College and his MS degree in Physics from the University of Washington. He has worked at Boeing for 35 years and is recognized as a Technical Fellow, leading the enterprise antenna measurement capability for Boeing Test and Evaluation. Dennis holds twelve patents and is the recipient of the 2013 & 2015 Boeing Special Invention Award. He is a senior member of the IEEE and several of its technical societies including the Microwave Theory and Techniques Society (MTT-S), the Antennas and Propagation Society and the Electromagnetic Compatibility (EMC) Society. He actively contributes to these societies as a member of the IEEE MTT-S subcommittee 3 on microwave measurements and as a Board Member and a past Distinguished Lecturer for the EMC Society. He is a Senior Member and served as Vice President on the Board of Directors for the Antenna Measurements Techniques Association (AMTA) and chaired its annual symposium in 2012 & 2023. As a past faculty member at North Seattle College, Dennis developed and taught a course on The Fundamentals of Measurement Science. He is also a past chair and serves on the Technical Advisory Committee. His current technical interests include aerospace applications of reverberation chamber test techniques as well as microwave and antenna measurement systems and uncertainties.



**Marc Dirix** received the Dr.-Ing. in information and communication technology by the RWTH Aachen University, Germany in 2018. Previously, he had his Master Degrees in Information and Communication Technology by the same University in 2009. During 2004 to 2015, he worked as a researcher and teacher at the Institute of High Frequency Technology of the RWTH Aachen University, Germany, where his main research topics were antenna measurements and material characterisation. In 2004, he has founded the Marc Dirix /RF company which focuses on material measurement automation for RF applications. In 2014, Marc was involved on the ESA funded EAML VIII project. In 2018, he joined Antenna Systems Solutions S.L. as application engineer and project manager where he is working on developing antenna measurement systems ranging from micro- to mm-wave for the commercial and research market with reference customers worldwide, such as Saab, Viasat Antenna Systems, Telecom Italia, Université Sophia Antipolis.



**Professor Stuart Gregson** has in excess of twenty five years of experience working in the space, aerospace and communications sectors and is currently Director of Operations and Research at Next Phase Measurements, and an honorary visiting professor in the School of Electronic Engineering and Computer Science at Queen Mary University of London. He received his BSc degree in Physics in 1994 and his MSc degree in Microwave Solid State Physics in 1995 both from the University of Portsmouth. He received his PhD degree in 2003 from Queen Mary University of London with near-field antenna measurements and statistical pattern recognition as his main subject areas. Prof. Gregson has developed special experience with near-field antenna measurements, finite array mutual coupling, computational electromagnetics, installed antenna and radome performance prediction, compact antenna test range design & simulation, electromagnetic scattering, 5G OTA measurements and has published numerous peer-reviewed research papers on these topics regularly contributing to and organizing industrial courses on these subject areas. At the end of 2007 he was the lead author of the research text Principles of Planar Near-Field Antenna Measurements, and in 2014 he co-authored a second text, Theory and Practice of Modern Antenna Range Measurements which are now both in their 2nd editions. He is a Fellow of the Antenna Measurement Techniques Association, a Fellow of the Institution of Engineering and Technology, a Fellow of the Institute of Physics and is a chartered Engineer and Physicist. In 2018, Prof. Gregson was elected to the AMTA Board of Directors where he served first as Treasurer and currently as Vice President.