Reverberation Chambers for Antenna Measurements

Abstract

In this workshop, a combination of industrial and scientific speakers will describe the advantages and recent developments of performing antenna measurements in reverberation chambers. Over the past decades, the use of reverberation chambers has become more popular for applications such as UE connectivity testing, hardware and algorithm validation for ADAS radars, and EMC. This also means that the field of research is rapidly growing, so it is about time to have a dedicated workshop on them at the EuCAP 2025.

Workshop outline

In this workshop, 6 speakers from academia and industry will present on different usages of the reverberation chamber. The workshop will be accessible to non-experts as it will detail the basic concepts and operations of reverberation chambers, but the speakers will also present their latest innovations. Each speaker will have approximately 30min of speaking time, with room for questions afterwards. Specifically, the speakers will cover the following topics on RCs:

1. Dennis Lewis (The Boeing Company): "Overview of Reverberation Chambers and Related Research at Boeing"
2. Anouk Hubrechsen (ANTENNEX): “High-frequency Reverberation Chamber Design and Measurement Methods”
3. Guillaume Andrieu (University of Limoges): "Overview of VIRC Advantages and Their Potential for Antenna and Wireless Device Characterizations"
4. John Kvarnstrand (Bluetest): “Measuring Wireless Devices Over-The-Air in Reverberation Chamber”
5. Rob Horansky (NIST): “Metrology of OTA Wireless Testing in Reverberation Chambers”
6. Garth Dabreu (ETS-Lindgren): “Automotive EMC Immunity and Emissions 4.4.”

Speakers

Dennis Lewis, The Boeing Company, 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 in Seattle, Washington, for 34 years and is recognized as a Technical Fellow, leading the enterprise antenna measurement capability for the Boeing Test and Evaluation Electromagnetics group. Dennis holds eleven patents and received the 2013 and 2015 Boeing Special Invention Awards.

Anouk Hubrechsen received the B.Sc. and M.Sc. degrees in Electrical Engineering from the Eindhoven University of Technology, Eindhoven, The Netherlands, in 2017 and 2019, respectively, where she finished her Ph.D. in 2023 on reverberation-chamber measurements of mmWave antennas. She was a Guest Researcher with the National Institute of Standards and Technology in Boulder, CO, USA, in 2018 and 2019. There she was involved in reverberation-chamber metrology for Internet-of-Things applications. She is co-founder and CEO of ANTENNEX B.V., a company that develops equipment for measuring integrated antenna systems, based on reverberation-chamber technology.

Guillaume Andrieu received the master’s degree in radiofrequencies and optical communications from the University of Limoges, Limoges, in 2003, and the Ph.D. degree in electronics from the IEMN Laboratory, Telice Group, University of Lille, Villeneuve d’Ascq, France, in 2006. In 2003, he joined the Renault Technocentre, Guyancourt, France. In 2006, he joined the XLIM laboratory, University of Limoges, as a Post-Doctoral Fellow, where he has been an Associate Professor since 2009. His current research interests include coupling on cables and electromagnetic compatibility testing including reverberation chambers (including VIRC) and bulk current injection tests. Since January 2022, G. Andrieu is the President of the French IEEE EMC chapter.

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John Kvarnstrand was born in Vetlanda, Sweden in 1971. He received the M.Sc. degree in engineering physics from Faculty of Engineering (LTH) of Lund University, Sweden 1997. From 1997 to 2000, he was antenna engineer at TimeSpace Radio AB, Sweden working with multibeam reflector antennas. From 2000 to 2004, he was RF engineer at Paratek Microwave Inc, MD, USA working with microwave components and antennas based on ferroelectric ceramics technology. From 2004 to 2012 he was principal engineer at Orbital Sciences Corporation, VA, USA, working with antennas for communication satellites. Since 2012, he has been with Bluetest AB, Gothenburg, Sweden working with research and development of reverberation chambers and related technologies. He holds the position of method development group manager. He is author and coauthor of several papers and patents.

Robert D. Horansky received the B.A. degree in chemistry and the Ph.D. degree in physics from the University of Colorado, Boulder, CO, USA, in 1999 and 2005, respectively. His thesis work focused on low-noise dielectric measurements on novel materials in molecular electronics. Since 2005, he has been with the National Institute of Standards andTechnology (NIST), Boulder, CO, USA, where he started out developing the highest resolving power energy dispersive sensor to date. He then went on to develop metrology techniques for single photon sensors in nuclear radiation and optical power measurements. In 2015, he joined the Metrology for Wireless Systems Project in the Communications Technology Laboratory, NIST developing calibrations and traceability for millimeter-wave wireless systems and reverberation-chamber measurements for cellular applications. He is the Secretary of the IEEE P1765 Standards Working Group on Uncertainty for EVM, and the winner of two Department of Commerce Medals for research in LTE Factor Screening and Novel Single Photon Detectors.

Garth D'Abreu is the Director, Automotive Solutions at ETS-Lindgren based at the corporate headquarters office in Cedar Park, Texas. He currently has primary responsibility for the design and development functions within the Systems Engineering group, specializing in turn-key solutions for Automotive EMC, Wireless and OTA test integration. 5Some of these more complex full vehicle and ESA test chambers involve his coordination with the RF engineering team on custom components, and the certified, internal Building Information Modeling (BIM) team at ETS-Lindgren.
He is the ETS-Lindgren subject matter expert responsible for the ongoing research and development of Reverberation chambers and GTEM cells, and also supports the RF filters, EMP applications and wireless device test systems groups. Automotive EMC, Antenna measurement and Wireless system tests for modern vehicles, incorporate multiple measurement techniques and chamber design considerations, for which his experience is well suited. Mr. D'Abreu is a senior member of the IEEE EMC Society and active participant in standards development, on the US ISO and CISPR D automotive EMC standards committees, with over 35 years of experience in the RF industry. He holds a BSc degree in Electronics & Communications Engineering, from North London University (London Metropolitan University), UK.

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