

WGA3 WORKSHOP - INTEGRATION CHALLENGES FOR MM-WAVE PHASED ARRAYS

Abstract

The continuously growing need for higher data rates and, therefore, more signal bandwidth in wireless applications, drives new applications into the mm-wave frequency domain. This requires medium to large-scale array antenna systems with tens or hundreds of active antenna elements. The fact that RF power generation is distributed over a large number of active antenna elements allows to use highly-integrated and cost-effective semiconductor technologies. The aim of the workshop is to chart current challenges and discuss what innovations are needed from the point of view of the co-design methodology (e.g. design to build), materials, manufacturing processes and system requirements to make highly-integrated mm-wave phased arrays a competitive technology.

The workshop will consist of two parts: a first part with 4 keynote presentations and a panel discussion on innovation challenges, and a second part with a pitch time event for students who will have the opportunity to summarise in a few minutes, in a catchy yet clear way, the salient aspects of their research work on array antennas.

Workshop outline

Part 1: *Keynote Presentations and Panel Discussion*

- Keynote Presentations:
 - “Millimetre-wave 5G radiated by AiP”, Yue Ping Zhang (Nanyang Technological University, Singapore)
 - “Design of advanced mm-wave phased arrays with consideration to manufacturing and thermal design”, Jussi Säily (VTT, Finland)
 - “Recent Developments in Spaceborne Integrated Phased Arrays”, Giovanni Toso (ESA)
 - “Integrated Front ends for space active antennas”, Jean Philippe Fraysse (Thales Alenia Space)
- Moderators: Bart Smolders, Daniele Cavallo, Stefania Monni

Part 2: *Pitch time Event: “Pitch your Research on Array Antennas”*

- Pitching time for students to present their research on array antennas:
 - 3 min per pitch
 - free format, but if slides are used, they should be provided in advance
 - content: problem definition, pursued approach, outlook
- **The best pitch** will be selected by a jury consisting of the keynote presenters
 - **Price:** free registration to a short course of his/her choice at EuCAP2021.

Register now! Please contact Marzieh Salarrahami (University of Leuven, Belgium) is the contact person for the Pitch Event: marzieh.salarrahami@kuleuven.be..

Short CVs of the Keynote Speakers:

Giovanni Toso is with the European Space Agency. He received the Laurea degree (cum laude) and the Ph.D. degree from the University of Florence, Florence, Italy, in 1992 and 1995, respectively. In 1996, he was a Visiting Scientist with the Laboratoire d'Optique Electromagnétique, Marseille, France. In 1999, he was a Visiting Scientist with the University of California at Los Angeles (UCLA), Los Angeles, CA, USA. He received a scholarship from Alenia Spazio, Rome, Italy, and he has been appointed as a Researcher with the Radio Astronomy Observatory, Italian National Council of Researches (CNR), Rome. Since 2000, he has been with the Antenna and Submillimeter Waves Section, European Space Research and Technology Center, European Space Agency (ESA-ESTEC), Noordwijk, The Netherlands. He has been initiating and contributing to several research and development activities on satellite antennas based on arrays, reflectarrays, discrete lenses, and reflectors. In particular, in the field of onboard satellite antennas, he has been coordinating activities on multi-beam antennas (active and passive) mainly for telecom applications. In the field of terminal antennas for telecom applications, he has been initiating several research and development activities on reconfigurable antennas with electronic and mechanical scanning. He holds approximately 20 international patents where he leads innovation in RF and mmwave front-end integrated circuits (ICs). He is a part-time Professor of RF-Transceiver Integration for Satellite Communication and Wireless Infrastructure at Eindhoven University of Technology (TU/e).

Yue Ping Zhang is a full Professor with the School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore, a Distinguished Lecturer of the IEEE Antennas and Propagation Society (IEEE AP-S), a Member of the IEEE AP-S Paper Award Committee, and a Fellow of IEEE. Prof ZHANG was a Member of the IEEE AP-S Field Award Committee (2015-2017), an Associate Editor of the IEEE Transactions on Antennas and Propagation (2010-2016), and the Chair of the IEEE Singapore MTT/AP joint Chapter (2012). Prof ZHANG was conferred the esteemed title of Thousand Talents Plan Distinguished Scholar affiliated to Shanghai Jiao Tong University (2012), China. He was awarded a William Mong Visiting Fellowship (2005) and appointed as a Visiting Professor (2014) by the University of Hong Kong, China. Prof ZHANG has published numerous papers, including two invited and one regular papers in the Proceedings of the IEEE and one invited paper in the IEEE Transactions on Antennas and Propagation. He is probably the first and only Chinese radio scientist who has managed to publish a historical article in an English learned journal such as IEEE Antennas and Propagation Magazine. He received the Best Paper Award from the 2nd IEEE/IET International Symposium on Communication Systems, Networks and Digital Signal Processing, July 18–20, 2000, Bournemouth, U.K., the Best Paper Prize from the 3rd IEEE International Workshop on Antenna Technology, March 21–23, 2007, Cambridge, U.K., and the Best Paper Award from the 10th IEEE Global Symposium on Millimetre-Waves, May 24–26, 2017, Hong Kong, China. He received the prestigious IEEE AP-S Sergei A. Schelkunoff Prize Paper Award in 2012. Prof ZHANG holds 7 US patents. He has made pioneering and significant contributions to the development of AiP technology. His current research interests include the development of antenna-on-chip (AoC) technology and characterization of chip-scale propagation channels at terahertz for wireless chip area network (WCAN).

Jean-Philippe Fraysse is Microwave Research Engineer with Thales Alenia Space, France, where he works on advanced studies on space antennas. He received the Ph.D from the University of Limoges in 1999. His research interests include semiconductor device modeling, MMIC design, microwave and millimetre wave power amplifier, power combiner, RF front-end, radiating element, quasi-optical beamformer and active antenna. Dr. Fraysse holds a dozen of patents on power combining technique, quasi-optical beamformer and radiating element.

Jussi Säily, is with VTT, Finland. He received the M.Sc., Lic.Tech., and D.Sc.(Tech.) degrees in electrical engineering from Helsinki University of Technology (TKK), Espoo, Finland, in 1997, 2000, and 2003, respectively. From 1997 to 2003, he was a Research Engineer with the Radio Laboratory, TKK. Since 2004, he has been with VTT where he is a Senior Scientist in the Antennas and RF Technology research group. His research interests include beam steerable mm-wave antenna arrays for communications, mm-wave lens antennas, mm-wave radar, phased arrays, smart base-station antenna arrays, satellite antennas and electronics, RFID antennas, RF electronics, and phase-locked low-noise signal sources for instrumentation. Dr. Säily holds several patents on communications antennas and measurement techniques and has over 100 publications in journals and conference proceedings. He serves regularly as a reviewer for technical journals, including IEEE Transactions on Antennas and Propagation, IEEE Antennas and Wireless Propagation Letters, Electronics Letters, and funding agencies like the European Science Foundation. He's also a member of the COST IC0603 (ASSIST) and COST IC1102 (VISTA) management committees.

Conference Topic/Track

Applicable Tracks: T02 Millimetre wave 5G; T06 Aircraft (incl. UAV, UAS, RPAS) and automotive; T07 Defence and security

Topics: A17 Array antennas, antenna systems and architectures (incl. radomes), A14 Active and integrated antennas