

Short Course

Unconventional Antenna Arrays Synthesis – Fundamentals and Advances –

presented by:

Professor Andrea MASSA

Co-organized by:



NAGASAKI University



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Talk Abstract

Antenna arrays are a key technology enabling a huge number of applications in our everyday lives. They are used in communications, radar, navigation, remote sensing, radio-astronomy, and in many other systems. Pushed by the continuous growth of wireless services, antenna arrays have significantly evolved since their introduction.

In recent years, modern applications (e.g., 5G, satcoms, autonomous driving) are imposing more and more challenging constraints and requirements on antenna arrays. These include the need for multiple functionalities, large bandwidth, and high reconfigurability. These additional functions add significantly to the cost, complexity, and weight of the array, but they cannot be jointly accomplished without a careful consideration of the overall array architecture. Recent advances in the development of high-power amplifiers, analog-to-digital converters, and artificial materials have enabled new array architectures. Indeed, advanced array architectures, including sparsity through thinning or adding some functions at the subarray level, can help to incorporate these extra capabilities, albeit with trade-off in terms of gain or aperture efficiency and potentially increased sidelobes as compared to conventional array solutions.

This short course, after briefly reviewing the basics and fundamentals of antenna array theory, will focus on state-of-the-art and mostly recently introduced methodologies for the design and analysis of advanced unconventional arrays, discussing capabilities, limitations, and perspectives.

Applicative examples, including MATLAB exercises, will corroborate the developed concepts. The Short Course includes 9 hours of classes (6 hours of lessons and 3 hours of software exercises/demos) spanning over 3 days.

Course material provided: (a) Short Course Slides and (b) Software (MATLAB-based ELEDIA SW codes), which will be used during exercises.

Target group: BS/MS Students, PhD students, Researchers, Scientists, and Engineers who are

Background knowledge: Basics of Mathematical Analysis, Electromagnetics, and Antenna Theory.

Biography:

Andrea Massa (*IEEE Fellow, IET Fellow, Electromagnetic Academy Fellow*) he has been a Full Professor of Electromagnetic Fields @ University of Trento since 2005.

At present, Prof. Massa is the director of the network of federated laboratories "ELEDIA Research Center" located in Brunei, China, Czech, France, Greece, Italy, Japan, Perú, Tunisia with more than 150 researchers. Moreover, he is Professor @ CentraleSupélec (Paris - France), Guest Professor @ UESCT (Chengdu - China), and Visiting Professor @ Tsinghua (Beijing - China).


He has been holder of a Senior DIGITEO Chair @ L2S-CentraleSupélec and CEA LIST in Saclay (France), UC3M-Santander Chair of Excellence @ Universidad Carlos III de Madrid (Madrid - Spain), Adjunct Professor @ Penn State University (USA), Visiting Professor @ Missouri University of Science and Technology (USA), the Nagasaki University (Japan), the University of Paris Sud (France), the Kumamoto University (Japan), and the National University of Singapore (Singapore).

Prof. Massa is member of the Editorial Board of the "Journal of Electromagnetic Waves and Applications" and of the European School of Antennas (ESoA). It has been appointed IEEE AP-S Distinguished Lecturer (2016-2018) and served as Associate Editor of the "IEEE Transaction on Antennas and Propagation" (2011-2014).

His research activities are mainly concerned with inverse problems, antenna analysis/synthesis, radar systems and signal processing, cross-layer optimization and planning of wireless/RF systems, system-by-design and material-by-design (metamaterials and reconfigurable-materials), and theory/applications of optimization techniques to engineering problems (coms, medicine, and biology).

Prof. Massa published more than 350 scientific publications on international journals and more than 500 in international conferences (>200 invited). He has organized more than 100 scientific sessions in international conferences and has participated to several technological projects in the EU framework (>20 EU Projects), at the national and local level with national agencies (>300 Projects/Grants).

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Location:
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