

Seminar On

Multibeam Antennas Without BFN

Prof. Stefano Maci

University of Siena, Italy

Date : 3 August 2026 (Monday)

Time : 11:30 am – 12:30 pm

**Venue : Room 15-202, 15/F, State Key Laboratory of Terahertz and Millimeter Waves,
Lau Ming Wai Academic Building, City University of Hong Kong**

Abstract

Recent developments in gradient-index (GRIN) and metasurface-based antennas are enabling low-cost, compact, and highly directive multibeam solutions without the need for traditional beam forming networks (BFNs). By replacing complex RF feeding systems with passive spatial control, these approaches offer substantial reductions in hardware complexity, size, and cost. This talk highlights efficient GRIN lens synthesis techniques designed for multifocal and multibeam operation. A generalized method—beyond classical ray assumptions—enables accurate index profiles that ensure stable performance over wide frequency bands. Supported by a fast geometrical optics solver based on the Fast Sweeping Method, this approach allows direct computation of the spatial index needed to produce a desired field distribution, achieving precise beam shaping and steering passively.

We also present metasurface antennas based on both space wave control and surface-wave excitation by multiple point sources. These latter planar structures leverage engineered impedance or phase profiles to convert guided waves into multiple directive beams in free space, entirely without BFNs. Such metasurfaces are inherently thin and low-profile, and are well-suited for low-cost fabrication and integration.

Biography



Stefano MACI is a Professor at the University of Siena (UNISI). Since 2000, he has been P.I. of 10 research projects funded by the European Union (EU) and by the European Space Agency (ESA). He is a Fellow of IEEE since 2004. In 2004 he founded the European School of Antennas (ESoA), a PhD school that presently comprises 35 courses on Antennas, Propagation, and Electromagnetic Theory, and 200 teachers, among them 20 IEEE Fellow. He graduated more than 40 PhD students. He has been former member of IEEE Antennas and Propagation Society (AP-S) AdCom, the Chair of the Award Committee of the IEEE AP-S, member of the AP Executive Board of IET (UK), Distinguished Lecturer of IEEE and of EurAAP. He was recipient of several prizes and awards, among which the EurAAP Award 2014, the Chen-To Tai Distinguished Educator award 2016, of the Sheldkoff Transaction Prize in 2015, and of the URSI Dellinger Gold Medal in 2020. He is presently Director of ESoA. He has been TPC Chair of the METAMATERIAL 2020 and General Chair of EuCAP 2023. He was the president of the IEEE Antennas and Propagation Society 2023. In the last ten years he has been invited 60 times as key-note speaker in international conferences. His research activity is documented in 220 papers published in international journals, 14 book chapters, and about 600 papers in proceedings of international conferences.

***** ALL ARE WELCOME *****

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