

Seminar on

New Technologies and Materials for Reconfigurable THz beam shaping and control

by

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Venue : Room 15-202, 15/F, meeting room of State Key Laboratory of Millimeter Waves, 15/F, Academic 3, City University of Hong Kong

Abstract

In recent years there has been a noticeable increase in the interest of the research community in THz technologies and science. This growing interest in the THz gap is somehow driven by the potential applications in a wide range of fields such as security, counterfeit detection, imaging, spectroscopy, etc. However, there is still the need of devices, technologies, or materials that provide the same flexibility that we have nowadays at lower (microwave) frequencies. Such flexibility would enable, for instance, to electronically beam-steer or modulate the THz radiation, or even to reconfigure the behavior of our THz devices so that they can change their behavior according to specific needs. One of the materials that have shown an enormous potential to this end is graphene, the well-known bidimensional material, discovered in 2004. Since 2014, LEMA-EPFL is a member of the European Graphene Flagship project (<http://graphene-flagship.eu/>), aiming at exploring all the electromagnetic and photonic possibilities opened by the control of this new material. This presentation will overview the recent activities in our laboratory related to the use of graphene for antenna system applications in the THz frequency range. This includes not only graphene-controlled radiating elements and reflectarrays, but also the use of graphene in related components, such as switches, isolators and modulators. Our group is also exploring the possibility of using materials having metal-insulator transitions (MIT) to electronically beam steer terahertz radiation and to control other properties of the wave such as polarization. This research is framed by the development of theoretical concepts and upper bounds allowing design & optimization of graphene devices and by the set-up of measurement systems able to characterize the electromagnetic wave properties of graphene and related materials. In addition, some innovative alternatives are being explored to develop reconfigurable and beam-steering antennas in the THz range. One of these alternatives, the use of elastomer materials will be described in detail and experimental results for THz reflectarrays will be presented.

Biography

Juan R. Mosig was born in Cadiz, Spain. He received the Electrical Engineer degree from the Universidad Politecnica de Madrid, Madrid, Spain, in 1973, and the Ph.D. degree from the Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland, in 1983. Since 1991, he has been a Professor in the Laboratory of Electromagnetics and Acoustics (LEMA) at EPFL and its Director since 1999. He has held scientific appointments with the Rochester Institute of Technology, Rochester, NY, USA; the Syracuse University, Syracuse, NY, USA; the University of Colorado at Boulder, USA; University of Rennes, Rennes, France; University of Nice, Nice, France and the Technical University of Denmark, Lyngby, Denmark.

Dr. Mosig has been a member of the Swiss Federal Commission for Space Applications, the Chairman of the EPFL Space Center, the Director of the Electrical Engineering Section at EPFL and a Vice-Dean of the Humanities and Social Sciences College at EPFL. He has authored four chapters in books on planar antennas and circuits and over 200 reviewed papers. He is the recipient of the 2015 IEEE APS Schelkunoff Award for the best Transactions AP paper of the year. His research interests include electromagnetic theory, numerical methods, and planar antennas. Dr. Mosig has been the Swiss Delegate for European COST Antenna Actions since the 1980's and the Chair for the two last completed Actions 284 and IC0603 ASSIST (2003–2011). He is now a member of the COST Senior Scientific Committee. During 2004-7 he was Vice-Coordinator of the European FP6 Network of Excellence ACE, that enabled the EuCAP Conference series. He has also served as member of the Board in the European Network "Metamorphose" and in the Coordination Actions ARTIC (FP6) and CARE (FP7). He is a founding member and Chair of the European Association on Antennas and Propagation (EurAAP) and leads the Steering Committee organizing the EuCAP Conferences series. He will be the Conference Chair for EuCAP'2016 (Davos, Switzerland, April 10-15, 2016). He has been a member of the IEEE APS AdCom, first as Transnational Delegate and currently as EurAAP representative.

*** ALL ARE WELCOME ***

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