LABORATOIRE D'ELECTRONIQUE ET ELECTROMAGNÉTISME

Vous êtes cordialement invité au séminaire :

Innovative Techniques for the Design of Lens Antennas: Transformation Optics and Metasurfaces

Prof. Oscar Quevedo-Teruel

Assistant Professor
School of Electrical Engineering (EES)/ Electromagnetic Engineering (ETK)
KTH Royal Institute of Technology, Sweden

Email : oscarqt@kth.se

Abstract: Lenses were not commonly used at microwave frequencies due to their large size compared with the wavelength and their bulky shapes. However, recently, there have emerged new applications at higher frequency bands, where it is impossible the use of conventional antenna technologies such as arrays and reflectors. As arrays and reflectors, lenses can be employed to increase the directivity of antennas. Conventional lenses were already the chosen technique for THz and optical transmitters and receivers. However, when speaking about high microwave frequency bands or the low band of the THz spectrum, the conventional design techniques for lenses are insufficient. In this talk, the advances in two innovative techniques will be presented: Transformation optics and metasurfaces. Transformation optics is a tool providing the mathematical link of one coordinate system of one space to any other, while retaining the same electromagnetic propagation behavior. The outcome of such a transformation is the necessity to fill the space with a material with both magnetic and dielectric properties. There are several routes to take when employing transformation optics: non-Euclidean, analytical and quasi-conformal transformation. The quasi-conformal technique is very attractive, since allows the design of full dielectric and isotropic configurations at the price of assuming an approximation of the conformal anisotropy. In this talk, transformation optics will be used to manipulate the shape of conventional lenses and to cloak objects in surfaces, with a wide band of operation. On the other hand, metasurfaces are thin metamaterial layers that can produce unusual reflection properties of incident plane waves, or to guide surface waves. These unusual properties can be used to create innovative antennas and microwave circuits. Their main advantage with respect to other technologies is their low cost of manufacturing and flat profile. This makes them prospectively interesting for the next generation of high rate communication antennas, near field scanners, high frequency filters, and radio telescopes.

Short biography: He received his M.Sc. degree in telecommunication engineering from University Carlos III of Madrid (Spain), in 2005, and developed his Master Thesis at Chalmers University of Technology in Sweden. Later on, he obtained his PhD at Carlos III University of Madrid in 2010. He was then invited as a post-doctoral researcher at University of Delft (The Netherlands) in 2010; and post-doctoral research fellow at Department of Theoretical Physics of Condensed Matter at Universidad Autonoma de Madrid in 2010-2011. He was working at Queen Mary University of London as a post-doctoral research assistant in 2011-2013; and he has recently started to work at KTH as Assistant Professor in the School of Electrical Engineering (EES), Electromagnetic Engineering (ETK). He was awarded with the Carlos III University of Madrid Award of Excellence 2010 to the best professional career of former students who obtained the university degree from February 2004 to November 2006. He received the National Award Arquimedes for the best supervisor of M. Sc. Theses in Engineering and Architecture in Spain in 2010. Recently, in 2012, he received the prestigious Raj Mittra Junior Travel Grant. He has made a significant scientific contribution to optimization techniques applied to electromagnetism, small antennas, reconfigurable antennas, multimode antennas for MIMO systems, leaky wave antennas, metamaterials, metasurfaces, transformation optics, high impedance surfaces, textile antennas and on-body antennas. He is co-author of more than 35 papers in international journals, more than 60 in international conferences and 2 patents.

Date : Vendredi 25 Septembre à 12h45-13h45
Lieu : Salle de réunion du L2E,
Campus de Jussieu, Couloir 65-66, 1^{e} étage

Contact : H. Kokabi, Professeur (UPMC, L2E), Email : hamid.kokabi@upmc.fr, Tél : 0144275467