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IEEE AP-S Distinguished Lecture (Hong Kong Chapter)

Transformation Optics and Its Applications to Lens Antennas

Prof. Oscar Quevedo-Teruel
KTH Royal Institute of Technology, Stockholm, Sweden

Date: 13 August, 2021
Time: 04:00 pm to 05:00 pm (Hong Kong, UTC+8:00)
Venue: Online
Registration link: https://events.vtools.ieee.org/event/register/278232

Abstract

Optical transformation can be used to link one coordinate system of one space to any other, while retaining the same electromagnetic propagation behavior of the original. 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, and three of these are: non-Euclidean, analytical and quasi-conformal transformation. Non-Euclidean transformations produce full dielectric materials, and it is very promising for surface wave applications, particularly for antennas on vehicles. The analytical transformation results in the necessity of anisotropic materials in the implementation of designs. The difficulties of the latter can be solved with the quasi-conformal technique, which allows the design of full dielectric and isotropic configurations at the price of assuming an approximation of the conformal anisotropy.

In this seminar, Oscar Quevedo-Teruel will explain the fundamentals of transformation optics, the different types of transformations, emphasizing their advantages and disadvantages, and their potential use for lens antennas, such as hyperbolic lenses and Luneburg lenses that have received recent interest for Satellite and 5G communications.

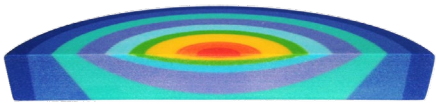

Fig. 1: Photograph of a transformed planar lens which retains the original electromagnetic properties of a curved hyperbolic lens.

Biography

Oscar Quevedo-Teruel is a Senior Member of the IEEE. He received his Telecommunication Engineering Degree from Carlos III University of Madrid, Spain in 2005, part of which was done at Chalmers University of Technology in Gothenburg, Sweden. He obtained his Ph.D. from Carlos III University of Madrid in 2010 and was then invited as a postdoctoral researcher to the University of Delft (The Netherlands). From 2010-2011, Dr. Quevedo-Teruel joined the Department of Theoretical Physics of Condensed Matter at Universidad Autonoma de Madrid as a research fellow and went on to continue his postdoctoral research at Queen Mary University of London from 2011-2013.

In 2014, he joined the Division for Electromagnetic Engineering in the School of Electrical Engineering and Computer Science at KTH Royal Institute of Technology in Stockholm, Sweden where he is a Full Professor and Director of the Master Programme in Electromagnetics Fusion and Space Engineering. He has been an Associate Editor of the IEEE Transactions on Antennas and Propagation since 2018 and is the founder and editor-in-chief of the EurAAP journal Reviews of Electromagnetics since 2020. He was the EurAAP delegate for Sweden, Norway, and Iceland from 2018-2020, and he has been a member of the EurAAP Board of Directors since January 2021. He is a distinguished lecturer of the IEEE Antennas and Propagation Society for the period of 2019-2022, and Chair of the IEEE APS Educational Initiatives Programme since 2020.

He has made scientific contributions to higher symmetries, transformation optics, lens antennas, metasurfaces, leaky wave antennas and high impedance surfaces. He is the co-author of 102 papers in international journals and 160 at international conferences.

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

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