Addressing Surface Waves on Modulated Metasurfaces

Speaker: Dr. Enrica Martini
University of Siena, Siena, Italy
LOCATION: University of Arizona, Room ECE 530
DATE: Mon, Nov. 16 2015, 6:00 pm
Refreshments Provided

ABSTRACT
Metasurfaces (MTSs) are becoming popular due to the technological simplification they offer with respect to volumetric metamaterials. The EM properties of MTSs can be described through an equivalent homogenized isotropic or anisotropic impedance boundary condition (IBC) that in support the propagation of surface waves (SWs). At microwave frequencies, MTSs are constituted by an arrangement of electrically small elements printed over a thin slab. The MTS’s equivalent impedance can be modulated by locally changing the geometry, size or orientation of the constitutive elements.

This talk will illustrate how a proper impedance modulation allows for a deformation of the wavefront, which addresses the local wave vector and power flow along non rectilinear paths. The Transformation Optics approach, which has been proposed for volumetric metamaterials, will be generalized to define a systematic procedure for the design of modulated anisotropic MTS’s able to control the propagation path of surface waves. This approach is applicable to design a number of planar devices. Practical designs of microwave devices, including lenses, beam shifters and beam splitters, will be presented.

Another application of modulated metasurface that will be addressed in the second part of the talk, is related to leaky wave antennas. Modulated MTS antennas operate on an interaction between a cylindrical SW excited by an isotropic radiator and an MTS having a spatially modulated equivalent impedance. The periodic modulation of the IBC transforms the SW launched by the feed into a LW, thus, generating a radiating aperture. This results in a lightweight and low profile structure, characterized by low losses and simple low-cost manufacturing. Furthermore, by acting on the impedance pattern it is possible to obtain a unique control of the phase and amplitude of the aperture field, thus, molding the radiation pattern. Several examples of antennas with different polarizations and pattern shapes will be presented.

BIOGRAPHY
Dr. Martini received the Laurea degree (cum laude) in telecommunication engineering in 1998 from the University of Florence, Italy, where she worked under a one-year research grant from the Alenia Aerospazio Company, Rome, Italy, until 1999. In 2002, she received a PhD degree in informatics and telecommunications from the University of Florence and a Ph.D. degree in electronics from the University of Nice-Sophia Antipolis, under joint supervision.

In 2002, she was appointed Research Associate at the University of Siena, Italy. In 2005, she received the Hans Christian Ørsted Postdoctoral Fellowship from the Technical University of Denmark, Lyngby, Denmark, and she joined the Electromagnetic Systems Section of the Ørsted•DTU Department. Since 2007 she has been a Research Associate at the University of Siena. From 2007 to 2013 she has been adjunct professor at the University of Siena. In 2012 she co-funded the start-up Wave Up Srl, Florence.

Dr. Martini has participated to several research projects financed by industries (e.g. Thales, IDS, Selex) and by international agencies (e.g. European Space Agency, American Defense Laboratory, European Defense Agency). Since 2013 she is a Senior Member of IEEE. Her research interests include metamaterials, metasurfaces, electromagnetic scattering, antenna measurements, finite element methods and tropospheric propagation.
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13 Dec - 17 Dec 2015
Firesky Resort and Spa
Scottsdale, AZ
www.asru2015.org

2016 Wearable Robotics Association Conference (wearRAcon)
10 Feb - 12 Feb 2016
Arizona Grand Resort
Phoenix, AZ, USA
http://wearablerobotics.com/wearraconfront/

2016 Annual Reliability and Maintainability Symposium (RAMS)
25 Jan - 28 Jan 2016
Lowes Ventana Canyon Resort
Tucson, AZ
http://www.rams.org
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