

# THE BEEET



## Bulletin of the IEEE Tucson Section

November 2015  
Volume 15, Issue 2

Tucson Section Meeting Sponsored by the Tucson Joint Chapter of MTT, AP, EMC, and COM:

### 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

#### INSIDE THIS ISSUE

General Meeting Announcement .....	1
Message from the Section Chair .....	2
Chapter News .....	3
We Need to Hear from You! .....	4

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, Italy. 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.

## Help your section, help your career, help yourself!

The Tucson section has several open volunteer opportunities for the right volunteer. There are lots of benefits to volunteering:

- You get to help decide on the activities and programs that will make a difference in our community over the next year
- You get to work with other smart, dedicated engineers
- You get to learn new skills
- You get to show off your skills to others who are working right here in Tucson

So what jobs are open?

**Recording Secretary** is responsible for documenting the activities of our administrative council. This typically includes keeping minutes of committee

meetings, submitting reports as required, and participating in any votes that come up.

**Membership Development Chair** uses the IEEE membership database to keep track of the current members in our section, identify members eligible for advancement, monitor trends, and obtain and distribute recruiting materials as needed.

**PACE Chair (Professional Activities Committee for Engineers)** helps arrange professional development activities, usually supported by the larger IEEE PACE foundation. This could include career-related seminars, job fairs, project management training, and more.

Want to help in some other way? Just ask - we welcome your assistance in any capacity!

## Become an IEEE Senior Member!

Do you want to become a senior member of the IEEE? The IEEE wants to promote qualified candidates to senior membership! If you have 10 years of professional experience of which five years of significant professional performance, you are qualified for a senior member upgrade. Educational experience such as a bachelor's degree in an IEEE-designated field counts 4 years to that number, a master's degree counts 5 years and a doctorate counts 6 years. In order to find out more, point your web browser to [www.ieee.org](http://www.ieee.org) and search for senior membership!

### *Senior Membership:*

<http://www.ieee.org/web/membership/senior-members/>

Applications can be found online. You will need the references of three current senior members or fellows. If you need assistance, contact Joseph Wu at [joewu@ieee.org](mailto:joewu@ieee.org).

## Save the date....

The next meeting will come sometime in the new year!

We currently don't have anything planned. But we'll be active again in the new year.

Look for another meeting in January or February. Check the IEEE website for updates!

## U of A Student Branches

In the Tucson Section, there are active student branches. The Student Branch Chapter of the MTT frequently brings in speakers from the distinguished lecturer series.

The U of A main student branch is also active. They have been running an open lab space in the ECE department. They have been running their own meetings and occasionally have game nights.

If you're interested in finding out what they do, or want to help out with a donation go to:

<http://uaieee.com>

<http://www2.engr.arizona.edu/~mtt/>

## Keep Up with the Tucson Section: Join our email list!

The Tucson Section email list delivers the latest IEEE Tucson news right to your email box. To join, simply send an email to

*[listserv@listserv.ieee.org](mailto:listserv@listserv.ieee.org)*

Put the following in the body of the message:

*[subscribe TUCSON-SECTION-ALL yourfirstname yourlastname](#)*

You'll receive an email with instructions for confirming your new subscription.

## Other News

### Upcoming Conferences

2015 IEEE Workshop on Automatic Speech Recognition and Understanding (ASRU)

13 Dec - 17 Dec 2015

Firesky Resort and Spa

Scottsdale, AZ

[www.asru2015.org](http://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>

IEEE Tucson Section  
2626 E Malvern St.  
Tucson, AZ 85716

PRESORTED  
STANDARD  
US POSTAGE PAID  
TUCSON AZ  
PERMIT NO 140

Tucson Section, Institute of  
Electrical and Electronics Engineers  
2626 E Malvern St.  
Tucson, AZ 85716

Section Chair:

Joseph Wu (joewu@ieee.org)

Joint AP/MTT/Com/EMC Chapter Chair:

Hao Xin (hxin@ece.arizona.edu)

Newsletter Editor:

Joseph Wu (joewu@ieee.org)

Section Website:

<http://ewh.ieee.org/r6/tucson/>

Student Chapter Information:

uaieee.com

[www2.engr.arizona.edu/~mtt/](http://www2.engr.arizona.edu/~mtt/)

To report address changes:

[address-changes@ieee.org](mailto:address-changes@ieee.org)

Other record changes (typographical errors)

[record-changes@ieee.org](mailto:record-changes@ieee.org)

Other membership issues including subscriptions

[member-services@ieee.org](mailto:member-services@ieee.org)

General IEEE Information

1-800-678-IEEE(4333)

## We need to hear from you!

How can we make IEEE a better organization? We can only do it with your help. As a volunteer organization, IEEE depends on your participation to accomplish all of our goals.

As you can see from this newsletter, there are lots of activities where you can actively contribute. Are you good at organization? Volunteer to head one of our Chapters or to help organize our general meetings. Want to show off or improve your internet skills? Volunteer to help with our Web site. Interested in promoting our field to the next generation of engineers? Help with Engineers Week, or as a judge for any of our student competitions.

Even if you only have a little bit of time, there's sure to be an IEEE opportunity that will interest you. Even if you have no free time at all, but have ideas for meetings or activities that promote engineering and the IEEE, let us know! We'd like to hear from you. Please contact Joseph Wu at [joewu@ieee.org](mailto:joewu@ieee.org).

*We're on the Web!*

*Visit us at:*

<http://ewh.ieee.org/r6/tucson>