**“Biomimetic Electrically Small Antennas and Antenna Arrays”**

## IEEE MTT/AP Orlando Chapter Meeting

**DATE/TIME: Friday, November 30th, 2012, 4:30-5:30 PM**

 **SPEAKER:** Dr. Nader Behdad, University of Wisconsin-Madison

**ABSTRACT:**

Despite the tremendous amount of research conducted on antennas over the past decades, several fundamental problems in this area remain practically unresolved. Achieving super-resolution and super-directivity from electrically-small antenna arrays are among these challenges. While we have not yet been able to overcome these problems, nature provides us with examples of biological organisms that have addressed similar problems. In particular, the sense of directional hearing of small animals seems to be most germane to the problem of super-resolving electrically-small antenna arrays. In this talk, I will discuss our study on designing electrically small antenna systems that are based on the hearing mechanisms of small vertebrates and insects. The motivation for studying these organisms stems from the fact that some insects benefit from hyperacute directional hearing capabilities, even though their bodies and the separation between their two ears are all significantly smaller than a wavelength. In particular, in spite of its extremely small body size and the small separation between its two ears, a parasitoid fly, Ormia Ochracea, can detect the direction of arrival of an incoming sound wave with a 1°-2° angular resolution. In this presentation, I will discuss the analogies that can be drawn between the hearing mechanism of this insect and an antenna array composed of two isotropic radiators with an element spacing that is 140 times smaller than the operational wavelength. Subsequently, I will present methods for implementing such biomimetic antenna arrays along with measurement results of several prototypes. The talk will be concluded by a discussion of various applications of such antenna arrays and the potential use of this concept in developing high-gain, ultra-miniature antenna arrays.

**BIOGRAPHY:**

Nader Behdad is an Assistant Professor at the department of Electrical and Computer Engineering of the University of Wisconsin-Madison. He received the Ph.D. and the M.S. degrees in Electrical Engineering from University of Michigan - Ann Arbor in 2006 and 2003, respectively and the B.S. degree in Electrical Engineering from Sharif University of Technology in 2000. From 2006 to 2008, he was as an Assistant Professor at the Department of Electrical Engineering and Computer Science of the University of Central Florida in Orlando, FL. His research expertise is in the area of applied electromagnetics. In particular, his research interests span the fields of electrically small antennas, on-chip antennas and integrated wireless systems, frequency selective surfaces, and phased array antennas.

Dr. Behdad is the recipient of the 2011 CAREER award from the National Science Foundation, the 2011 Young Investigator Award from Air Force Office of Scientific Research, and the 2011 Young Investigator Award from Office of Naval Research. He received the 2012 Piergiorgio L. E. Uslenghi Letters Prize Paper Award of the IEEE Antennas and Propagation Society, the best paper awards in the Antenna Applications Symposium both in Sep. 2003 and in Sep. 2008, second prize in the paper competition of the USNC/ URSI National Radio Science Meeting, Boulder, CO, in January 2004, the Horace H. Rackham Predoctoral Fellowship from the University of Michigan in 2005–2006, the Young Scientist Award from the International Union of Radio Science (URSI) in 2008, and the Office of Naval Research Senior Faculty Fellowship in 2009.

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