

ΠΡΟΣΚΛΗΣΗ

"Embroidered Flexible Radio Frequency (RF) Electronics"

Διάλεξη του Prof. John (Yiannis) L. Volakis

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Abstract

This presentation will introduce a novel class of flexible Radio Frequency (RF) electronics composed of conductive fibers on polymer and fabric substrates. The proposed composite fiber conductors and polymer substrates provide excellent RF characteristics, including mechanical flexibility and conformality. Key to their improved conductivity is the increased stitching density of the employed conductive fibers, reaching >70 stitches per cm^2 . Prototype flexible antennas and circuits were fabricated and validated for their RF performance. These were realized by embroidering them on organza fabrics or by integrating them on thin polymer substrates. Their RF performance was found comparable to their conventional copper counterparts. Because of their excellent RF performance and high level of flexibility, these embroidered antennas should lead to a new class of electronic devices for high data rate, low profile, and reliable operation for RF applications. That is, the proposed textile composites are well suited for wearable and foldable electronics, volumetric flexible antennas and 3-D circuits. Specifically, the electronic fibers (E-fibers) can be precisely embroidered onto fabrics, and their inherent flexibility is also preferred in forming interconnects in 3D circuits. Overall, this technique is expected to lead to fully functionalized daily garments that provide superior RF properties and functionalities, including daily communications and medical monitoring. Examples will be discussed at the presentation as well as fabrication challenges for automated integration into garments.

Short CV: Prof. John (Yiannis) L. Volakis

John (Yiannis) L. Volakis was born in Chios, Greece on May 13, 1956 and immigrated to the U.S.A. in 1973. He received the Ph.D. degree from the Ohio State University in 1982. After two years at Rockwell International (now Boeing), he was appointed (1984) Assistant Professor at The University of Michigan, becoming a full Professor in 1994. Since January 2003, he has been the Chope Chair Professor at The Ohio State University, Electrical and Computer Engineering Department. He also serves as the Director of the ElectroScience Laboratory with \$7.5M in external research funding. Over the years he has carried out research on diffraction theory and scattering, antennas, computational methods, electromagnetic compatibility and interference, propagation, design optimization, RF materials, multi-physics engineering and bioelectromagnetics. His publications include seven books (among them: Approximate Boundary Conditions in Electromagnetics, 1995; Finite Element Methods for Electromagnetics, 1998; the classic 4th ed. Antenna Engineering Handbook, 2007 and Small Antennas, 2010), over 290 journal papers and over 500 conference papers. He has graduated/mentored over 65 doctoral students/post-docs with 14 of them receiving best paper awards at international conferences. Prof. Volakis is a Fellow of IEEE and a Fellow of ACES. His service to professional societies include: 2004 President of the IEEE Antennas and Propagation Society, twice the General Chair of the IEEE Antennas and Propagation Symposium, IEEE APS Fellows Committee Chair, IEEE-wide Fellows Committee member and Associate Editor of several journals. He is listed by ISI among the top 250 most referenced authors.