



IEEE Southeastern Michigan Section

Chapter IV (Trident)

Talk – 5:00 to 6:00 pm

Thursday, July 9, 2015

Room #1005, EECS Bldg,  
North Campus, University of Michigan,  
1301 Beal Ave, Ann Arbor, MI



## “Analytical and Numerical Techniques for Artificial Structures Embedded in Multilayered Media”

**Guido Valerio**

Associate Professor in the Electronics and Electromagnetism Laboratory at Sorbonne Universités, Université Pierre et Marie Curie, in Paris, France.

### Abstract:

Design techniques for artificial structures made of arrays embedded in multilayered media, such as artificial materials, metasurfaces, leaky-wave antennas, have recently enjoyed an increasing interest. Unfortunately the accurate and efficient prediction of their parameters (e.g., phase and leakage constants) is often a difficult task, as they cannot always be rigorously determined with common commercial software. *Ad-hoc* numerical approaches are needed to characterize the modal properties of all the wave species supported by these structures.

A flexible formulation can be achieved through integral equation methods. Unfortunately, the required periodic potentials are expressed through slowly converging series and integrals, thus making impractical any direct numerical solution of the problem. A review of computational methods for various kinds of periodic multilayered potentials, developed by the authors at Sapienza University and at University of Houston, will be discussed.

Furthermore, a specific method will be discussed, capable to analyze electrically large substrate integrated waveguides consisting of stacked parallel-plate waveguides hosting dielectric or metallic posts and coupling and/or radiating slots. A mode matching is enforced on posts, while slots are modeled through a method of moments. Substantial accelerations are proposed to minimize the computational effort. Simulated and measurement results will be presented covering filtering structures, antenna and near-field beam launchers.

### Speaker's Biography:

Guido Valerio received the Ph.D. degree in electromagnetics in 2009, from La Sapienza University, Rome, Italy. From February to August 2008 he was a Visiting Scholar at the University of Houston, TX, USA. From 2011 to 2014, he was a researcher at the Institute d'Electronique et de Telecommunications de Rennes (IETR), France. Since September 2014 he is an Associate Professor in the Electronics and Electromagnetism Laboratory, at Sorbonne Universités, Université Pierre et Marie Curie, in Paris, France.

His scientific interests involve the efficient computation and interpolation schemes for periodic Green's functions, the rigorous modeling of the interaction of nonperiodic sources with periodic media, modal properties of multilayered structures, full-wave methods for large SIW multilayered antennas. He has worked in the GPR characterization of Martian soil, and in the design of several typologies of antennas.

In 2008 Dr. Valerio was the recipient of the “Leopold B. Felsen Award for Excellence in Electrodynamics.” In 2009 he was a finalist for the “Young Engineering Prize” at the *European Microwave Conference*. In 2010 he was the recipient of the “Barzilai Prize” for the best paper at the *National Italian Congress of Electromagnetism (XVIII RiNEM)*. In 2014, he was the recipient of the RMTG Award for junior researchers presented at the *IEEE Antennas and Propagation Society Symposium*, Memphis, TN.

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