

## Distinguished Lecture on

# Waveguide-Fed Slot Arrays: Design, Analysis, and Applications

by

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### Abstract

Advances in electromagnetic analysis and design techniques have led to the maturity of the waveguide-fed slot array technology to the point that it is possible to design and build such arrays to meet challenging specifications, without any hardware iteration. Elliott's theory in conjunction with enhancements to the design procedure that account for higher order mode coupling between radiating and coupling elements have enabled accurate design of array antennas. Method of moments solutions of pertinent integral equations for the aperture electric field of all slots in a planar array, have helped not only in the analysis and assessment of designs but also in the improvement of designs. Commercial codes such as the HFSS have been used successfully to analyze and assess the performance of small arrays accurately.

In the talk we will review the design and analysis techniques for slot arrays. Some examples from recent applications of slot arrays in practical radar and remote sensing systems will be presented. In one example, Elliott's procedure was extended to design planar slot arrays consisting of sub-arrays as feeds to excite a dual polarized microstrip reflectarray. In another application, a large Ka band slot array was designed using an infinite array model to account for mutual coupling. Poisson sum formula was used to derive the expressions for the mutual coupling in terms of Floquet modes and the design process was found to be substantially simpler. In a recent work, the design of radiometer antennas requiring low average sidelobes over different angular regions and an average return loss of 15dB over 4% frequency band, Monte Carlo technique was used to study the effects of tolerances and modeling errors. Three antennas were designed and built in 'one pass' without any hardware iteration. The use of global optimization techniques such as the genetic algorithm in improving the return loss and pattern performance of slot arrays will also be discussed.

### Biography

**Sembiam R. Rengarajan** received the Ph.D. degree in Electrical Engineering from the University of New Brunswick, Canada in 1980. Since then he has been with the department of Electrical and Computer Engineering, California State University, Northridge (CSUN), presently serving as a Professor. He has held visiting professorships at UCLA, Chalmers University of Technology, Sweden, Universidade de Santiago de Compostela, Spain, the University of Pretoria, South Africa and the Technical University of Denmark. He also received an honorary Adjunct Professorship from Zhejiang University. He has been a consultant to government and industry in the US and abroad. He has published more than 200 journal articles and conference papers in application of electromagnetics to antennas, scattering, and microwave components. Dr. Rengarajan is a Fellow of IEEE and of the Electromagnetics Academy. He has served as an Associate Editor of the IEEE Transactions on Antennas and Propagation (APS) (2000-03) and as the Chair of the Education Committee of IEEE APS. He received the Preeminent Scholarly Publication Award from CSUN in '05, CSUN Research Fellow Award in '10, a Distinguished Engineering Educator of the Year Award from the Engineers' Council of California in '95, and 20 awards from NASA for his innovative research and technical contributions. He is the Chair of USNC-URSI Commission B (2012-14) and is a Distinguished Lecturer for IEEE APS (2011-13).

**Date** : 16 Aug., 2013 (Friday)  
**Time** : 04:00pm – 05:00pm  
**Venue** : Room G6302, 6/F, Green Zone, Academic 1,  
City University of Hong Kong (Lift 7)

\*\*\* ALL ARE WELCOME \*\*\*

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