**“Design, Analysis, and Applications of Waveguide-Fed Slot Arrays”**

## IEEE MTT/AP Orlando Chapter Meeting

**DATE/TIME: Friday, Oct 4th, 2013, 5:00-6:00 PM**

**SPEAKER:** Prof. Sembiam Rengarajan, California State University, Northridge

**ABSTRACT:**

Waveguide-fed slot arrays find applications in numerous radar, remote sensing, and communication systems because of desirable features such as low loss integrated feed, and low volume. Accurate electromagnetic analysis and design tools have made it possible to produce such antennas in ‘one pass’ without any hardware iterations and still meet the stringent specifications commonly encountered. Because of the all metal construction, slot arrays are ideally suited to withstand severe radiation environment encountered in spacecraft applications.

This presentation will start with Elliott’s procedure for designing waveguide fed linear and planar slot arrays. The required input data such as the scattering characteristics of isolated radiating and coupling elements may be obtained, based on techniques such as the method-of-moments solution of the pertinent integral equations (M0M), or finite element techniques, e.g., using the commercial code HFSS, while the excitation coefficients are determined from a pattern synthesis technique. Stegen-type normalization or an interpolation technique will be used with the computed slot data. External mutual coupling computation in the form of ‘element by element’ model is ideal for small to medium arrays while Floquet series of the infinite array model is suited for large arrays. Different types of feeds and sub-array architectures will be reviewed. Efficient implementation of Elliott’s algorithm with choices for the values of radiating slot admittances and coupling slot impedances will be presented. Analysis techniques such as MoM and HFSS are employed to validate and assess the performance of the arrays. Enhancements to Elliott’s technique that account for higher order mode coupling will be discussed. The use of full wave method-of-moments technique in improving the design procedure will be illustrated. Some recent examples of practical slot arrays antennas for different applications will be presented.



**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), CA, presently serving as a Professor. His experience includes periods at Bharat Electronics Ltd., India, Jet Propulsion Laboratory (JPL), Chalmers University of Technology, Sweden, US Air Force Research Laboratory, and Naval Research Lab., Washington, D.C. He has held visiting professorships at UCLA, Universidade de Santiago de Compostela, Spain, the University of Pretoria, South Africa, and the Technical University of Denmark. He has served as a consultant to Hughes Aircraft Company, Rantec, Saab Ericsson Space, Sweden, Lockheed Martin, United Nations Development Program in India, and URS Alaska. His research interests include analytical and numerical techniques in electromagnetics with applications to antennas, scattering, and passive microwave components.

Dr. Rengarajan has authored/co-authored more than 200 journal articles and conference papers. He is a Fellow of IEEE (1994), and a Fellow of the Electromagnetics Academy. He served as the Chair of the LA Chapter of IEEE Antennas and Propagation Society (1983-84), Chair of the San Fernando Valley Section of IEEE (1995), and as an Associate Editor of the IEEE Transactions on Antennas and Propagation (2000-2003). He was the Chair of the Education Committee of the IEEE Antennas and Propagation Society and was an Associate Editor of the IEEE Antennas and Propagation Magazine. He received the Preeminent Scholarly Publication Award from CSUN in 2005, CSUN Research Fellow Award in 2010, and a Distinguished Engineering Educator of the Year Award from the Engineers' Council of California in 1995. Dr. Rengarajan received more than a dozen awards from the National Aeronautics and Space Administration (NASA) for his innovative research and technical contributions to the Deep Space Network Ground Systems Antennas and to the Spacecraft Antenna Research Group of JPL. In 2005 he was appointed as an Adjunct Professor at the Electromagnetics Academy of Zhejiang University in China. He was the guest editor of a special issue of Electromagnetics on slot arrays. He has served in the technical program committee of several symposia and serves as a reviewer to many periodicals. Dr. Rengarajan is presently the Vice Chair and Chair-Elect of the Commission on Waves and Fields of the United States National Committee of the International Union of Radio Science (USNC/URSI) during the 2009-2011 triennium.

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