Floquet modal based Analysis of Finite and Infinite Phased Array Antennas

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Abstract
Phased array antennas are becoming increasingly popular in communication and broadcasting satellites because of their inherent advantages of beam reconfigurability. For wide angle scan application an accurate analysis of the array antenna including mutual coupling effects is very important. In this talk we present the Floquet modal analysis procedure for analyzing periodic phased array antennas. The talk begins with a discussion on the relevance of Floquet analysis with regard to a scanned beam array design. Effects of mutual coupling on the performances of an array are discussed in details. It is shown how Floquet analysis can be employed to analyze a finite array with arbitrary amplitude taper including mutual coupling effects. Design examples of patch and horn arrays are presented. Method of analysis for multilayered array structures with different periodicities is presented and applications of such structures in phased array antennas are discussed. Accuracy of Floquet model for small finite arrays is discussed. Examples of on-board array antennas in modern communication satellites are shown.

Biography
Arun K. Bhattacharyya received his B.Eng. degree in electronics and telecommunication engineering from Bengal Engineering College, University of Calcutta in 1980, and the M.Tech. and Ph.D. degrees from Indian Institute of Technology, Kharagpur, India, in 1982 and 1985, respectively.

From Nov 1985 to April 1987, he was with the University of Manitoba, Canada, as a Postdoctoral Fellow in the electrical engineering department. From May 1987 to October 1987, he worked for Til-Tek Limited, Kemptville, Ontario, Canada as a senior antenna engineer. In October 1987, he joined the University of Saskatchewan, Canada as an assistant professor of electrical engineering department and then promoted to the associate professor rank in 1990. In July 1991 he joined Boeing Satellite Systems. Dr. Bhattacharyya became a Technical Fellow of Boeing in 2002. In September 2003 he joined Northrop Grumman Space Technology group as a staff scientist, senior grade. At present he holds Distinguished Engineer and Engineering Fellow position at Northrop Grumman. He is the author of “Electromagnetic Fields in Multilayered Structures-Theory and Applications”, Artech House, 1994 and “Phased Array Antennas, Floquet Analysis, Synthesis, BFNs and Active Array Systems”, Wiley, 2006. He authored over 95 technical papers, 5 book-chapters and has 16 issued patents. His technical interests include electromagnetics, printed antennas, multilayered structures, active phased arrays and modeling of microwave components and circuits.

Dr. Bhattacharyya became a Fellow of IEEE in 2002. He is a Distinguished Lecturer of IEEE APS society. He is a recipient of numerous awards including the 1996 Hughes Technical Excellence Award, 2002 Boeing Special Invention Award for his invention of High Efficiency horns, 2003 Boeing Satellite Systems Patent Awards and 2005 Tim Hannemann Annual Quality Award, Northrop Grumman Space Technology.
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