

[Invited Talk]

The Receiving and Scattering Properties of Antenna Elements and Finite Arrays

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Abstract

An interesting and somewhat controversial topic is the receiving and scattering properties of the general antenna. In recent years, this topic has been given considerable attention in the IEEE AP-S Magazine. In this presentation, we consider the fundamental receiving and scattering properties of antenna elements and finite arrays. We examine the general validity and application of the Thevenin and Norton equivalent circuits to resonant and antiresonant antennas in terms of predicting both received and scattered powers. We consider the concept of scattered power in view of it being non-recoverable and in terms of its relation to the received power and the law of conservation of power. We consider the receiving and scattering properties of electrically small antennas as well as finite arrays and the concept of whether a finite array absorbs or receives all available power. Circuit theory and numerical simulations of the receiving and scattering properties of both single elements and finite arrays are used as examples. We demonstrate that the law of conservation of power necessitates the fact that any antenna or array that receives power must also scatter power.

About the speaker



Steven R. Best is a Principal Sensor Systems Engineer with the MITRE Corporation in Bedford, MA. He received the B.Sc.Eng and the Ph.D. degrees in Electrical Engineering in 1983 and 1988 from the University of New Brunswick in Canada. Dr. Best has over 25 years of experience in business management and antenna design engineering in both military and commercial markets. Prior to joining MITRE, Dr. Best was with the Air Force Research Laboratory (AFRL) at Hanscom AFB, where his research interests included electrically small antennas, wideband radiating elements, conformal antennas, antenna arrays and communications antennas. Prior to joining AFRL, he was President of Cushcraft Corporation in Manchester, NH from 1997 to 2002. He was Director of Engineering at Cushcraft from 1996 to 1997. Prior to joining Cushcraft, he was co-founder and Vice President and General Manager of Parisi Antenna Systems from 1993 through 1996. He was Vice President and General Manager of D&M/Chu Technology, Inc (formerly Chu Associates) from 1990 – 1993. He joined Chu Associates as a Senior Electrical Engineer in 1987.

Dr. Best is the author or co-author of 3 book chapters and over 100 papers in various journal, conference and industry publications. He frequently presents a three-day short course – Antennas and Propagation for Wireless Communication, he is the author of a CD-ROM series on antenna theory and design, and he has presented several Webinars on antenna topics. He has also authored an IEEE Expert Now module on electrically small antennas. Dr. Best is a former Distinguished Lecturer for IEEE Antennas and Propagation Society (AP-S), a former member of the AP-S AdCom, a former Associate Editor for the IEEE Transactions on Antennas and Propagation, and Senior Past Chair of the IEEE Boston Section. He is currently the AP-S Electronic Communications Editor-in-Chief. Dr Best is a Fellow of the IEEE and the current President of the IEEE Antennas and Propagation Society.