香港城市大學 City University of Hong Kong

Department of Electronic Engineering

毫米波國家重點實驗室 State Key Laboratory of Millimeter Waves

IEEE (HK) Section AP/MTT

Seminar on

HOW WELL DO YOU KNOW YOUR S-PARAMETERS?

by

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Abstract

The purpose of this talk is to demonstrate that a recently published paper dealing with *little known facts and some new results* on transmission lines is due to an incomplete interpretation of the nonphysical artifacts resulting from a particular mathematical model for the S-parameters. These artifacts are not real and do not exist when a different form of the S-parameters are used. Thus, the first objective of this talk is to introduce the two different types of S-parameters generally used to characterize microwave circuits with lossy characteristic impedance. The first one is called the pseudo-wave, an extension of the conventional travelling wave concepts, and is useful when it is necessary to discuss the properties of a microwave network junction irrespective of the impedances connected to the terminals. However, one has to be extremely careful in providing a physical interpretation of the mathematical expressions as in this case the reflection coefficient can be greater than one, even for a passive load impedance and the transmission line is conjugately matched. The second type of S-parameters is called the power wave scattering parameters. They are useful when one is interested in the power relation between microwave circuits connected through a junction. In this case, the magnitude of the reflection coefficient cannot exceed unity and the power delivered to the load is directly given by the difference between the powers associated with the incident and the reflected waves. Since this methodology deals with the reciprocal relations between powers from various devices this may be quite suitable for dealing with a pair of transmitting and receiving antennas where power reciprocity holds. The second objective is to illustrate that when the characteristic impedance of the line or the reference impedances in question is real and positive, then both of them provide the same results. Finally, a general methodology with examples is presented to illustrate how the S-parameters can be computed for an arbitrary network without any a priori knowledge of its characteristic impedance.

Biography

Tapan K. Sarkar received the B.Tech. degree from the Indian Institute of Technology, Kharagpur, in 1969, the M.Sc.E. degree from the University of New Brunswick, Fredericton, NB, Canada, in 1971, and the M.S. and Ph.D. degrees from Syracuse University, Syracuse, NY, in 1975. He is now a Professor in the Department of Electrical and Computer Engineering, Syracuse University. His current research interests deal with numerical solutions of operator equations arising in electromagnetics and signal processing with application to system design. He obtained one of the "best solution" awards in May 1977 at the Rome Air Development Center (RADC) Spectral Estimation Workshop. He received the Best Paper Award of the IEEE Transactions on Electromagnetic Compatibility in 1979 and in the 1997 National Radar Conference. He has authored or coauthored more than 300 journal articles and numerous conference papers and 32 chapters in books and 15 books.

He received Docteur Honoris Causa both from Universite Blaise Pascal, Clermont Ferrand, France in 1998 and from Politechnic University of Madrid, Madrid, Spain in 2004. He received the medal of the *friend of the city of Clermont Ferrand*, France, in 2000.

Date : 23 Feb. 2012 (Thursday)
Time : 5:00pm – 6:00pm
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City University of Hong Kong

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

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