PURDUE UNIVERSITY

Birck Nanotechnology Center

Dr. Dan Lawrence currently serves as the Chief Technical Officer (CTO) for Technology Service Corporation. He received the B.E.E. and M.S. degrees in electrical engineering from Auburn University, Auburn, AL, in 1996 and 1998, respectively, and the Ph.D. degree in electrical engineering from the University of Michigan, Ann Arbor, MI in 2002. In 2002, he joined the Phase IV Systems Operation of Technology Service Corporation in Huntsville, AL. In his current role, Dr. Lawrence provides technical guidance enabling the successful execution of existing TSC programs in addition to developing innovative technologies for future growth. Dr. Lawrence also provides expertise in the area of radar and communication systems for a wide range of defense programs. He also serves as a part-time instructor for the University of Alabama in Huntsville teaching both undergraduate and graduate courses in radar, antennas, and signal processing in the Department of Electrical Engineering. His technical expertise includes complete radar system design/analysis, phased arrays, novel antennas, EM scattering, RF design, and advanced waveform processing.

Substrate Integrated Waveguide Modeling: Analytical Formulation for Multiple Cylinder Scattering

Dr. Dan Lawrence

Friday, March 9, 2018
10:00am – 11:00am
WANG 3043

Substrate-integrated waveguide (SIW) is an emerging technology in the development of microwave circuits and antennas. SIW structures can be easily fabricated using existing printed circuit board techniques where rows of circular, conducting vias are embedded in a dielectric substrate between two conducting planes. The via rows provide sidewalls and the conducting planes provide the upper and lower walls of the fundamental TE_{10} waveguide mode. The technique is inexpensive to implement and has shown growing application in many microwave and RF components. Modeling of the SIW structures can present a challenge for computational electromagnetic techniques in that each via must be discretized, and the sidewalls from what is normally a simple waveguide structure can instead become a key computational limitation. Since the SIW structure reduces to a two-dimensional problem for the fundamental mode of operation when the substrate is thin, multiple scattering from infinite circular cylinders provides an accurate analytical model of the underlying phenomenology. In this presentation, an interesting analytical solution is presented that includes all the multiple interaction between conducting cylinders and can be used to accurately model the SIW via sidewalls. An X-band SIW slotted antenna array with an integrated monopulse feed network will be shown as a demonstration of the implementation and usefulness of the SIW analytical approach.

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