

Lecturer: Andrew F. Peterson

Title: A Tutorial on the Numerical Solution of the EFIE for PEC Targets

Level: Introductory (beginning graduate students)

Abstract: In this two-part tutorial, we discuss the derivation of the Electric Field Integral Equation (EFIE) for perfect electric conductors (PEC) and consider its numerical solution using the method of moments (MoM) with Rao-Wilton-Glisson (RWG) basis and testing functions on triangular patch models. The treatment will be at an introductory level and should be suitable for beginning graduate students and others who have little background in computational EM. The treatment of the Green's function singular integrals needed for the entries of the system of equations will be considered in detail, and techniques based on both singularity subtraction and singularity cancellation will be introduced. The accuracy of the numerical solutions will be explored as a function of cell densities, and means of assessing the accuracy will be introduced. A MATLAB code demonstrating a possible implementation will be used for illustration and distributed to participants. Some extensions of the MoM approach to other integral equations, curved patch models, and higher order basis functions will also be briefly discussed.

Biography: Andrew F. Peterson received the B.S., M.S., and Ph.D. degrees in Electrical Engineering from the University of Illinois, Urbana-Champaign. Since 1989, he has been a member of the faculty of the School of Electrical and Computer Engineering at the Georgia Institute of Technology, where he is a full Professor. He teaches electromagnetic field theory and computational electromagnetics, and conducts research in the design of antenna arrays and feed structures, the development of computational techniques for electromagnetic applications, and the application of machine learning to electromagnetic analysis and design. He is a coauthor of the 1998 text *Computational Methods for Electromagnetics*, the 2016 text *Higher-order Techniques in Computational Electromagnetics*, several lectures in the Morgan/Claypool Synthesis Library, and approximately 300 journal and conference research publications. He has served as a consultant to industrial organizations in the areas of array antenna design and the development of electromagnetic modeling software.

Dr. Peterson served as the General Chair of the 1998 IEEE AP-S International Symposium and URSI/USNC Radio Science Meeting, as Chair of the IEEE Atlanta Section, as a member of IEEE AP-S AdCom, and as a member of the Board of Directors of the Applied Computational Electromagnetics Society (ACES). He was the President of the IEEE AP-S during 2006, and the President of ACES from 2011 to 2013. He also served as a Track Editor and previously an Associate Editor for the IEEE Transactions on Antennas and Propagation, and served as an Associate Editor for the IEEE Antennas and Wireless Propagation Letters. He was the Technical Program Co-Chair for the 2009 ACES Conference in Monterey and the 2019 IEEE AP/URSI Symposium in Atlanta, and was the TPC Chair for the 2022 IEEE AP/URSI Symposium in Denver. He is a Fellow of the IEEE, a Fellow of ACES, and a recipient of the IEEE Third Millennium Medal. He received the ACES Mainstay Award in 1996, the ACES Valued Service Award in 2000, 2004, and 2010, the ACES Service Award in 2016, and the ACES Technical Achievement Award in 2021.