Omar M. Ramahi
IEEE EMC Society Distinguished Lecturer
Electrical and Computer Engineering Department
University of Waterloo, Waterloo
Ontario, Canada
www.ece.uwaterloo.ca/~oramahi

Seminar 1: *The Exotic World of Metamaterials and its Relevance to EMI/EMC Engineers*

Abstract: Metamaterials refers to engineered material with properties that do not exist in naturally available media. Exotic properties of metamaterials includes negative permittivity, negative permeability or even negative permittivity and negative permeability simultaneously resulting in negative index of refraction. Such metamaterial created much excitement over the past few years. But can metamaterial offer any practical implication or even application for EMI/EMC engineers? Can metamaterial provide cost-effective solutions to some of the severe challenges in the areas of shielding and filtering? In this talk, the topic of metamaterials will be demystified. Once the fundamental properties of the different types of metamaterials are presented, the effectiveness of such material in different EMI/EMC and other engineering applications will become clear. We will explore some important applications of metamaterials in EMI/EMC applications. While this presentation covers the fundamental principles behind metamaterials, emphasis will be placed on practical real-world engineering applications.

Seminar 2: *What Causes Radiation?*

Abstract: The field of EMI/EMC shares its heritage with antenna and propagation engineers, on the one hand, and physicists on the other. For the former group, much of the 20th century was spent on developing ways to predict the radiation due to some source through complex analytical and numerical schemes. Physicists, on the other hand, are interested in making the connection between the movement of the elementary charged particle, the electron, and the radiated field. Since the field of EMI/EMC engineering is related to a large degree to radiation, EMI/EMC engineers would naturally be interested in the work of these two groups. However, EMI/EMC engineers have keen interest in understanding which sources/currents are the ones that cause radiation; a question that is typically ignored by the two groups of physicists and propagation engineers. After all, if the source of radiation is found, containing it becomes easier than not knowing it in the first place. In this talk we explore the fundamental question of "what causes radiation" from a purely practical and engineering-relevant perspective. We show that powerful numerical schemes, circuit models, and analytical techniques, while potentially providing elegant and full solution to the radiating problem, fail to highlight the physical phenomenon of interest to EMI/EMC engineers in the first place unless careful attention is paid to… the fundamental sources of radiation!

Biography: Omar M. Ramahi received the BS degrees in Mathematics and Electrical and Computer Engineering (summa cum laude) from Oregon State University, Corvallis, OR. He received his M.S. and Ph.D. in Electrical and Computer Engineering from the University of Illinois at Urbana-Champaign. From 1990-1993, Dr. Ramahi held a visiting fellowship position at the University of Illinois at Urbana-Champaign. From 1993 to 2000, he worked at Digital Equipment Corporation (presently, HP), where he was a member of the alpha server product development group. In 2000, he joined the faculty of the James Clark School of Engineering at the University of Maryland at College Park as an Assistant Professor and later as a tenured Associate Professor. At Maryland he was also a faculty member of the CALCE Electronic Products and Systems Center. Presently, he is a Professor in the Electrical and Computer Engineering Department and holds the NSERC/RIM Industrial Research Associate Chair, University of Waterloo, Ontario, Canada. He holds cross appointments with the Department of Mechanical and Mechatronics Engineering and the Department of Physics and Astronomy. He has authored and co-authored over 200 journal and conference papers. He is a co-author of the book *EMI/EMC Computational Modeling Handbook, 2nd Ed.* (Springer-Verlag, 2001). Presently, he serves as an Associate Editor for the IEEE Transactions on Advanced Packaging. Professor Ramahi is an elected IEEE Fellow and is presently serving as an IEEE Electromagnetic Compatibility Society Distinguished Lecturer.