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Pushing the Boundaries of Computational Electromagnetics – Application to Antenna Designs, Placement, Co-site Interference Simulations and Digital Twins

Simulation-driven design changed product development forever, enabling engineers to reduce design, iterations, and prototype testing. Increasing scientific computing power expanded the opportunity to apply analysis, making large design studies possible within the timing constraints of a program. This talk will focus on advanced CEM simulation tools that incorporate numerical methods, such as Method of Moments (MoM), Multilevel Fast Multipole Method (MLFMM), Finite Element Method (FEM), Finite Difference Time Domain (FDTD), Physical Optics (PO), Ray Lancing Geometrical Optics (RL-GO), and Uniform Theory of Diffraction (UTD). As the complexity of connected devices increases each day, designers are taking advantage of AI/ML to generate trained models for their physical antenna designs and perform fast and intelligent optimization on these trained models. Using the trained models, different optimization algorithms and goals can be run quickly, in seconds, that can be utilized for comparison studies, stochastic analysis for tolerance studies etc. Use of cloud computing combined with AI/ML, many design iterations can be performed in a short period and reducing the time to market. This talk will also focus on future trends in cloud computing for physics-based simulations and the emerging topics such as Digital Twins.

C.J. Reddy is Siemens Fellow at Siemens Digital Industries Software. He served as Vice President, Business Development-Electromagnetics for Americas at Altair from 2014 to 2025 and transitioned to Siemens, with the acquisition of Altair by Siemens. Dr. Reddy was awarded the Natural Sciences and Engineering Research Council (NSERC) of Canada Visiting Fellowship to work at Communications Research Center in Ottawa during 1991-1993 and was awarded the US National Research Council (NRC) Resident Research Associateship in 1993 to work at NASA Langley Research Center in Hampton, Virginia. He also worked as Research Professor at Hampton University from 1995 to 2000. Dr. Reddy was the President of Applied EM, Inc (2000-2017) where he led several Phase I and Phase II SBIR projects for the DoD and NASA. He was also the President of EM Software & Systems (USA) Inc (2002-2014) and led the marketing of the EM Simulation tool, Feko in North America. EM Software & Systems (USA) Inc was acquired by Altair in 2014.

Dr. Reddy is a Fellow of IEEE, Fellow of ACES (Applied Computational Electromagnetics Society) and a Fellow of AMTA (Antenna Measurement Techniques Association). Dr. Reddy is a co-author of the book, "Antenna Analysis and Design Using FEKO Electromagnetic Simulation Software," published in June 2014 by SciTech Publishing (now part of IET). Dr. Reddy served as an Associate Editor for IEEE Open Journal of Antennas of Propagation and IEEE Transactions on Antennas and Propagation. He served as the Chair of IEEE Antennas and Propagation Society (AP-S) Young Professionals Committee during 2021-2024 and served on the AP-S AdCom during 2023-2024. Dr. Reddy is appointed to IEEE Fellows Committee by IEEE Board of Directors for the terms 2020-2021 and 2022-2023. Currently, Dr. Reddy is serving as the 2026 IEEE AP-S President. Dr. Reddy is inducted into IEEE Heritage Circle by the IEEE Foundation for establishing the "*IEEE AP-S CJ Reddy Travel Grant for Graduate Students.*"



Mahmoud Wagih

Reader, University of
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What Makes Green RF Electronics: Advanced Materials, Packaging, and Emerging Applications

The electronics industry produces non-negligible emissions and e-waste, and is a major consumer of critical raw materials (CRMs), which could hinder its growth to deliver our digital aspirations. I will introduce a life cycle assessment (LCA)-driven approach to electronics design, showing how to quantify the true environmental footprint as well as methods to design electronics for environmental sustainability and supply chain resilience. Looking at the impact of semiconductor devices and specifically RFICs, methods for circularity through recycling and re-use will be introduced, identifying trade-offs in reliability, performance, and ease of recycling. Fully biodegradable RF package assemblies with high-performance transmission beyond 120 GHz will be showcased, along with their ability to enable a circular economy for RFICs, without the use of traditional bonding approaches. Finally, emerging applications in RF-based sensing will be introduced, showing how microwave electronics could reduce the complexity of sensing interfaces.

Mahmoud Wagih is a Reader at the University of Glasgow, UK, leading the Green RF-Enabled Electronics Lab, and co-director for the UKRI Centre for Responsible Electronics “REACT”; he is also the Founder of RX Watt Ltd., a start-up dedicated to RF-powered sensors. His research covers materials, manufacturing, and applications of sustainable microwave to THz systems including advanced packaging, RF sensing, and RFID/wireless power, with 130+ papers and 4 patents on these topics. He has been principal or co-investigator on £17M projects and has received 20+ Awards including a Royal Academy of Engineering Medal, being listed in Forbes 30Under30, and multiple Best Paper prizes. He is an IEEE Distinguished Microwave Lecturer, a Topic Editor for the IEEE Journal of Microwaves, and a member/vice-chair of several IEEE microwave committees.