

Title: Energy harvesting and wireless power transfer for RFID and wireless sensors: from circuit optimization and signal design to ambient RF backscattering

Abstract:

Backscatter communication and RFID technology provides a foundation, an enabling technology towards the realization of 'zero-power' wireless sensors and implementing the Internet-of-Things (IoT) and machine-to-machine (M2M) communication. Interest in RFID technology is further enhanced by its fundamental capability for wireless powering of devices, allowing for battery-less operation. The presentation begins with an overview of ambient energy availability and energy harvesting technology challenges for low power circuits and sensors. Design challenges and novel technologies and materials, such as paper, textiles, and inkjet/3D printing are highlighted. Special focus is placed on electromagnetic energy transfer and harvesting for range maximization of passive RFID systems. Rectenna design and optimization under different operating conditions and in different operating frequencies from HF to millimeter waves is addressed. Multiple technology harvesters leading to the development of energy harvesting assisted RFIDs are discussed. Low profile and conformal solar antennas and solar-electromagnetic harvesters including examples implemented on paper and textile substrates are presented. The integration of an antenna with a thermo-electric generator is demonstrated. Waveform optimization in wireless power transfer is addressed, and the ability to improve the RF-DC power conversion efficiency of electromagnetic energy harvesting devices by tailoring the characteristics of the transmitted signals is discussed. The last part of the talk presents application examples including RFIDs and wireless sensors powered from solar and electromagnetic energy harvesting, millimeter wave back-scattering, solar energy harvesting for RFID tags and sensors based on ambient RF signal backscattering.

Speaker's short bio:

Apostolos Georgiadis was born in Thessaloniki, Greece. He received the Ph.D. degree in electrical engineering from the University of Massachusetts, Amherst, in 2002. He is Honorary Associate Professor at Heriot-Watt University, Edinburgh, UK. He has been involved for more than 20 years in the field of RF/microwave wireless systems. His research interests include energy harvesting and wireless power transmission and inkjet and 3D printed electronics. He was Associate Editor of the IET Microwaves Antennas and Propagation Journals, IEEE Microwave and Wireless Components Letters and the IEEE RFID Virtual Journal. He serves as an Associate Editor of the IEEE Journal on RFID and he is the founder and Editor in Chief of the Wireless Power Transfer journal by Cambridge University Press. He is a EU Marie Curie Global Fellow. He is Member of the IEEE MTT-S TC-24 RFID Technologies (past Chair) and Member of IEEE MTT-S TC-26 Wireless Energy Transfer and Conversion. He is Chair of URSI Commission D, Electronics and Photonics and Vice President of Conferences of the IEEE Council on RFID. He has published more than 180 papers in peer reviewed journals and international conferences. In 2016 his proposal for Inkjet/3D printed millimeter wave systems received the Bell Labs Prize, 3rd place among more than 250 proposals recognizing ideas that 'change the game' in the field of information and communications technologies.



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