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FACULTY OF SCIENCE AND TECHNOLOGY
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Wireless power transfer and energy harvesting for RFID and wireless sensors

by

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ABSTRACT

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 printing are presented. 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. Finally, 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.

BIOGRAPHY



Apostolos Georgiadis was born in Thessaloniki, Greece. He received the Ph.D. degree in electrical engineering from the University of Massachusetts at Amherst, in 2002. In 2007, he joined Centre Tecnologic de Telecomunicacions de Catalunya (CTTC), Barcelona, Spain, as a Senior Researcher, where he is involved in energy harvesting and radio-frequency identification (RFID) technology and active antennas and antenna arrays. Since Apr. 2013 he is Coordinating the Microwave Systems and Nanotechnology Department at CTTC. He was the Chair of the 2011 IEEE RFID Technologies and Applications (RFID-TA) Conference. He was the Chair of EU COST Action IC0803, RF/Microwave communication subsystems for emerging wireless technologies (RFCSET) and presently he is vice-Chair of EU COST Action IC1301 on Wireless Power Transfer for Sustainable Electronics. He serves as an Associate Editor of the IEEE Microwave Wireless Components Letters, IEEE RFID Virtual Journal and IET Microwaves Antennas and Propagation journals. He is past Chair of the IEEE MTT-S Technical Committee MTT-24 on RFID Technologies and member of IEEE MTT-26 on wireless energy transfer and conversion. He is Vice-Chair of URSI Commission D Electronics and Photonics and a Distinguished Lecturer of IEEE Council on RFID (CRFID).

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