

ENERGY EFFICIENT FUTURE WIRELESS COMMUNICATIONS

The energy needs for wireless systems is limiting the evolution of most of the IoT and 5G future solutions. In this talk an overview of the energy problem in wireless communication systems will be presented, either from a mobile network point of view, but also from a IoT point of view. The main objective is to discuss future wireless paradigms that will be changing soon with 5G and beyond, those include the spread of a distributed mobile network by using Cloud Radio Access Networks, with its associated Software Defined Radio approaches, but also the issue of battery-less wireless devices, combining wireless power transmission and backscatter communications. The talk starts first with a general overview of the energy needs for a future XG networks, and then presents in an integrated way both approaches of C-RAN and IoT wireless design. The presentation will cover topics like the hardware part of the SDR and design of battery-less wireless sensors networks. Issues like characterization of mixed-signal devices, designing of C-RAN SDR approaches, design of passive backscatter sensors will be discussed, according to the audience.



Nuno Borges Carvalho (S'97–M'00–SM'05–F'15) was born in Luanda, Angola, in 1972. He received the Diploma and Doctoral degrees in electronics and telecommunications engineering from the University of Aveiro, Aveiro, Portugal, in 1995 and 2000, respectively.

He is currently a Full Professor and a Senior Research Scientist with the Institute of Telecommunications, University of Aveiro and an IEEE Fellow. He coauthored *Intermodulation in Microwave and Wireless Circuits* (Artech House, 2003), *Microwave and Wireless Measurement Techniques* (Cambridge University Press, 2013) and *White Space Communication Technologies* (Cambridge University Press, 2014). He has been a reviewer and author of over 200 papers in magazines and conferences. He is associate editor of the *IEEE Transactions on Microwave Theory and Techniques*, *IEEE Microwave Magazine* and *Cambridge Wireless Power Transfer Journal*.

He is the co-inventor of four patents. His main research interests include software-defined radio front-ends, wireless power transmission, nonlinear distortion analysis in microwave/wireless circuits and systems, and measurement of nonlinear phenomena. He has recently been involved in the design of dedicated radios and systems for newly emerging wireless technologies.

Dr. Borges Carvalho is the co-chair of the IEEE MTT-20 Technical Committee and the past-chair of the IEEE Portuguese Section and MTT-11, he is the vice-chair of MTT-20 and also belong to the technical committees, MTT-11, MTT-24 and MTT-26. He is also the chair of the URSI-Portugal Metrology Group. He was the recipient of the 1995 University of Aveiro and the Portuguese Engineering Association Prize for the best 1995 student at the University of Aveiro, the 1998 Student Paper Competition (Third Place) of the IEEE Microwave Theory and Techniques Society (IEEE MTT-S) International Microwave Symposium (IMS), and the 2000 IEE Measurement Prize.