

ENERGY sustainability for Net ZERO Radio Communications

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Lecture Abstract

Energy is central to all our activities, especially now, as electricity is needed for basic human survival. Nevertheless, the resources are limited. On certain occasions, we need to rely on the opportunity to have specific energy availability and energy on demand so that sensors, emergency communications, and ICT will continue to operate even if the energy grid is not there.

This talk will discuss the electricity generation problem and how to cope with the huge demand for ICT (Information Communication Technologies) technologies. We will address new paradigms for radio communications and alternatives to make energy available when needed and where needed. It is expected that Net Zero Radio alternatives will be available on the market in the future.

Nuno Borges Carvalho was born in Luanda, Angola, in 1972. He received his 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, the director of the Department of Electronics, Telecommunications and Informatics at UA, and an IEEE Fellow. He coauthored *Intermodulation in Microwave and Wireless Circuits* (Artech House, 2003), *Microwave and Wireless Measurement Techniques* (Cambridge University Press, 2013), *White Space Communication Technologies* (Cambridge University Press, 2014) and *Wireless Power Transmission for Sustainable Electronics* (Wiley, 2020). He has been a reviewer and author of over 400 papers in magazines and conferences. He is the Editor in Chief of the *Cambridge Wireless Power Transfer Journal*, an associate editor of the *IEEE Microwave Magazine*, and former associate editor of the *IEEE Transactions on Microwave Theory and Techniques* and *IET Microwaves Antennas and Propagation Journal*.

He is the co-inventor of six patents. His main research interests include software-defined radio front-ends, backscatter communications, wireless power transmission, nonlinear distortion analysis, and measurements in microwave/wireless circuits and systems. He has

been involved in the design of dedicated radios and systems for newly emerging wireless technologies.

Dr. Borges Carvalho is a member of the IEEE MTT ADCOM, the past chair of the IEEE Portuguese Section, TC-20 and TC-11, and also belongs to the technical committees, TC-25 and TC-26. He is also the Chair of the URSI Commission A (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.

He is a Distinguished Lecturer for the RFID Council and was a previous Distinguished Microwave Lecturer for the IEEE Microwave Theory and Techniques Society. In 2023 he is the IEEE-MTT President.