TALK

Topic: **On System-Level Analysis & Design of Energy-Neutral Cellular Networks**

Presenter: Prof. Dr. Marco Di Renzo

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Abstract:

In the last few years, research on energy-efficient wireless networks has received an upsurge of interest: many research projects have been funded and many innovative solutions (signal processing algorithms, communication protocols, network architectures) have been proposed. With the emergence of new IoT-based application and service capabilities that 5G wireless networks need to be able to support, however, a question is worth being asked: "Is it sufficient that IoT-enhanced 5G wireless networks are energy-efficient?" The 5G Infrastructure Public Private Partnership (5G-PPP) says that this is not sufficient. Indeed, in their "5G manifesto" presented at the Mobile World Congress, 5G-PPP representatives have emphasized that "5G will bring drastic energy efficiency improvement and develop energy harvesting everywhere. This energy chase will cover terminal devices, network elements, and the network as a whole including data centers. For example, it will enable a 10 years lifetime of a battery powered sensor. It will also contribute to Europe's objectives to improve our energy sources mix with more renewables installed, e.g., on base stations". In a nutshell, in order to support the emerging IoT market, 5G wireless networks are required not to operate only in an energy-efficient manner but to be as much "energy-autonomous" as possible, by harvesting energy from renewable energy sources and radio frequency signals, which can be used for replenishing the batteries of low-energy devices and, for some IoT applications, even for allowing tiny low-energy mobile devices to operate without batteries. Even though this was considered to be pure science fiction up to just one year ago, recent technological advances have proved that this is indeed possible. In this talk, we will illustrate scenarios and applications that are currently under discussion in order to make 5G networks energy-neutral and, with the aid of tools from stochastic geometry, we will present a feasibility study about the application of RF-based energy harvesting to cellular networks.

Bio:

Marco Di Renzo (S'05–AM'07–M'09–SM'14) received the Laurea degree (cum laude) and the Ph.D. degree in electrical engineering from the University of L'Aquila, Italy, in 2003 and 2007, respectively, and the D.Sc. degree (Habilitation à diriger des recherches) from the University of Paris-Sud, France, in 2013. Since 2010, he has been a CNRS Associate Professor (Chargé de Recherche Titulaire CNRS) with the Laboratory of Signals and Systems, Paris-Saclay University-CNRS, CentraleSupélec, University of Paris-Sud, Paris, France. His research interests include

wireless communications, communication theory, and stochastic geometry. He currently serves as an Editor of the IEEE Communications Letters and the IEEE Trans. on Communications. He is a Distinguished Lecturer of the Communications Society and the IEEE Vehicular Technology Society. He is a recipient of several research distinctions, which include the 2013 Network of Excellence NEWCOM# Best Paper Award, the 2013 IEEE-COMSOC Best Young Researcher Award for Europe, Middle East and Africa (EMEA Region), the 2015 IEEE Jack Neubauer Memorial Best System Paper Award, the 2015 Distinguished Visiting Fellow of the Royal Academy of Engineering, U.K., the 2015-2018 CNRS Award for Excellence in Research and in Advising Doctoral Students, the 2016 MSCA Global Fellowship, as well as 6 Best Paper Awards at IEEE conferences. He is the project coordinator of two EU-funded multi-partner projects (ETN-5Gwireless and ETN-5Gaura).