Title: Fundamental Limits of Simultaneous Energy and Information Transmission

Speaker: Selma Belhadj Amor

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Abstract:
A radio frequency (RF) signal carries both energy and information. From this standpoint, a variety of modern wireless systems suggest that RF signals can be simultaneously used for information and energy transmission. However, these two tasks are usually conflicting and thus, there exists a trade-off between information transmission rates and energy transmission rates in most of point-to-point channels and multi-user channels.
In this talk, we will first review existing fundamental limits of simultaneous energy and information transmission (SEIT) in point-to-point channels and introduce new fundamental limits in both centralized and decentralized multi-user scenarios. In a centralized multi-user channel, the fundamental limits on the information rates given a minimum energy rate constraint are described by the notion of information-energy capacity region introduced by the pioneering work by Fouladgar and Simeone in 2012 for discrete memoryless multi-access and multi-hop channels. Alternatively, in a decentralized multi-user channel, we have recently introduced the notion of information-energy Nash region to characterize the fundamental limits on the information-energy rate tuples that are stable in the sense of Nash. Our main focus in this talk will be on the Gaussian multi-access channel as a basic setup to capture the key aspects of the intrinsic information-energy tradeoff. However, most of our results continue to hold for more general network structures. This talk will be concluded by a discussion of the future technical challenges and research directions regarding SEIT.

This work was done in collaboration with Samir M. Perlaza (Inria, Lyon, France), Ioannis Krikidis (University of Cyprus, Nicosia, Cyprus), and H. Vincent Poor (Princeton University, Princeton NJ, USA).

Speaker's Bio:
Selma Belhadj Amor (Ph.D., Télécom ParisTech 2015) is an INRIA Postdoctoral Research Fellow at Laboratoire CITI (Joint Lab between Université de Lyon, INRIA, and INSA de Lyon), Lyon, France. Since March 2016, she is also a visiting research scholar at the School of Applied Science at Princeton University (NJ, USA). In 2011, she had held a long term research appointment at the School of Computer and Communication Sciences at Ecole Polytechnique Fédérale de Lausanne (EPFL). She received the B.Sc. and M.Eng. degrees in Electrical Engineering in 2009 and 2011, respectively, from Grenoble-INP Ensimag, Grenoble, France. She also received the M.Sc. degree in Mathematics and Computer-Science in 2011 jointly from Grenoble-INP Ensimag and Université Joseph Fourier (UJF), Grenoble, France. She received the Ph.D. degree in Electrical Engineering in 2015 from Télécom ParisTech, Paris, France.