

Ultra-broadband Communication Networks in the Terahertz Band (and Beyond)

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Abstract:

Wireless data traffic has grown exponentially in recent years due to a change in the way today's society creates, shares and consumes information. This change has been accompanied by an increasing demand for higher speed wireless communications, *anywhere, anytime*. Following the current trend, wireless Terabit-per-second (Tbps) links are expected to become a reality within the next ten years. In this context, Terahertz (THz)-band (0.1-10 THz) communication is envisioned as a key wireless technology of the next decade. The THz band will help overcome the spectrum scarcity problems and capacity limitations of current wireless networks, by providing an unprecedentedly large bandwidth. In addition, THz-band communication will enable a plethora of long-awaited applications, both at the nano-scale and at the macro-scale, ranging from wireless massive-core computing architectures and instantaneous data transfer among non-invasive nano-devices, to ultra-high-definition content streaming among mobile devices and wireless high-bandwidth secure communications. In this seminar, an in-depth view of THz-band communication networks will be provided. First, the state of the art and open challenges in the design and development of THz transceivers and antennas will be presented, with special emphasis on novel hybrid graphene/semiconductor devices. Then, the current progress and future research directions in terms of channel modeling; physical layer design, including bandwidth-adaptive modulation and ultra-massive MIMO transmission schemes; and, link layer solutions, including error, flow and medium access control for THz-band communication networks, will be tackled in a bottom-up approach, defining a roadmap for the development of this next frontier in wireless communication.

Short Bio:

Josep M. Jornet is an Assistant Professor with the Department of Electrical Engineering at the University at Buffalo, The State University of New York. He received the B.S. in Telecommunication Engineering and the M.Sc. in Information and Communication Technologies from the Universitat Politècnica de Catalunya, Barcelona, Spain, in 2008. He received the Ph.D. degree in Electrical and Computer Engineering from the Georgia Institute of Technology (Georgia Tech), Atlanta, GA, in 2013. From September 2007 to December 2008, he was a visiting researcher at the Massachusetts Institute of Technology (MIT), Cambridge, under the MIT Sea Grant program. He was the recipient of the Oscar P. Cleaver Award for outstanding graduate students in the School of Electrical and Computer Engineering, at Georgia Tech in 2009. He also received the Broadband Wireless Networking Lab Researcher of the Year Award in 2010. In 2016 and 2017, he received the Distinguished TPC Member Award at the IEEE International Conference on Computer Communications (INFOCOM). In 2017, he received the IEEE Communications Society Young Professional Best Innovation Award. Since July 2016, he is the Editor-in-Chief of the Nano Communication Networks (Elsevier) Journal. He also serves in the Steering Committee of the ACM Nanoscale Computing and Communications Conference series. He is a member of the IEEE and the ACM. His current research interests are in Terahertz-band communication networks, Nano-photonics wireless communication, Intra-body Wireless Nanosensor Networks and the Internet of Nano-Things.

