Ultra-broadband Wireless Communications in the 0.1-10 Terahertz Band

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Abstract

By supporting tens or hundreds GHz bandwidths, 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 invited speech, an overview of THz-band communications will be provided. First, the current progress and open research directions in terms of THz-band channel modeling will be presented. The main phenomena affecting the propagation of THz signals will be explained and their impact on the channel capacity will be assessed. Second, novel communication mechanisms such as the modulation techniques, resource allocation, timing acquisition schemes, and Ultra-Massive Multiple-Input Multiple-Output (UM- MIMO) will be presented. Finally, the state of the art and open challenges in the network layer design and other relevant research directions will be stated. This presentation is expected to provide the audience with the necessary knowledge to work in a cutting-edge research field, at the intersection of antennas and propagation, and information and communication technologies.

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