Sub-Terahertz Communications for Beyond-6G Networks: From Far Field to Near Field

Abstract: For decades, the (sub-)terahertz (THz) frequency band (often defined as 300 GHz to 3 THz or broader, 100 GHz – 10 THz) had been primarily explored in the context of radar, imaging, and spectroscopy, where multi-gigahertz (GHz) and even THz-wide channels and the properties of terahertz photons offered attractive target accuracy, resolution, and classification capabilities. Meanwhile, the exploitation of the terahertz band for wireless communication had originally been limited due to several reasons, including (i) no immediate need for such high data rates available via terahertz bands and (ii) challenges in designing sufficiently high power terahertz systems at reasonable cost and efficiency, leading to what was often referred to as "the terahertz gap." In theory, the use of multi-GHz wide bands available in the THz spectrum also offers unprecedented opportunities for wireless links: up to Terabit-per-second data rate, sub-millisecond latency, and extreme secrecy of transmissions, among others. Over the recent decade, advances on many fronts have drastically changed the terahertz landscape. Some research contributions even claim that THz communications are an "essential enabler of 6G-grade connectivity". However, today, there are many misconceptions related to THz communications and their possible role in 6G and beyond-6G networks. This short talk aims to: (i) present the outline of the R&D activities in the area; (ii) clarify some of those misconceptions, simultaneously (iii) highlighting real pressing R&D challenges to be addressed toward practical and cost-efficient near-field sub-THz communication systems of tomorrow.