Propagation Aspects in Future THz Communication Systems

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Today, commercially available systems for Wireless Local Area Networks (WLAN) or Wireless Personal Area Networks (WPAN), for example based on the IEEE standards 802.11n or 802.15.3c standard, achieve data rates of up to around 1 Gbps. However, it is foreseeable that within the next decade data rates even beyond 100 Gbps will be required [1]. Potential applications requiring such high data rates are wireless extensions of Gigabit Ethernets LANs, point-point-links connecting a hard drive or a camera to a computer, e. g., or wireless kiosk downloading applications. Recently, a lot of medium- and long-term development and standardization activities have been started. Medium-term activities are dealing with systems operating in the 60 GHz band, where 7 GHz of bandwidth have been allocated for worldwide use allowing the development of systems with data rates of several Gbps. In the long term, data rates beyond 100 Gbps require the allocation of a multitude of 10 GHz of spectrum. Such an amount of spectrum is available only at frequencies beyond 300 GHz. First trials and concepts targeting wireless communication beyond 100 GHz have been reported by various research groups [2],[3],[4],[5],[6],[7]. In 2008, a THz Interest Group was established within IEEE 802.15 to explore the possibilities to standardize a WPAN operating beyond 300 GHz [8].

In the 300 GHz frequency band, the path loss is even more significant than at 60 GHz and appropriate measures to mitigate effects in none-line-of-sight (NLOS) cases, caused e. g. by the influence of moving people, are required. Advanced antenna techniques like beam forming or beam switching are a pre-requisite to guarantee seamless service. In order to consider such techniques in the standards development, the propagation channel operating at these mm- and sub-mm wave bands in realistic environments must be well understood. For example, due to the short wavelength even the small surface roughness of typical building materials has a non-negligible impact [9]. Therefore, intensive channel modeling activities are required for frequency bands beyond 300 GHz. This invited key note talk provides an overview of the corresponding channel measurement and modeling activities. Results will be presented both for isolated propagation phenomena and for more complex scenarios close to potential future applications.

References

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