RESEARCH ACTIVITIES ON MILLIMETER-WAVE WIRELESS ACCESS TECHNOLOGIES IN EUROPE

W. Keusgen, G. Grosskopf, D. Rohde, A. Norrdine, C. von Helmolt, V. Jungnickel
Fraunhofer Institute for Telecommunications, Heinrich-Hertz-Institut,
Einsteinufer 37, D-10587 Berlin, Germany
keusgen@hhi.fhg.de

ABSTRACT

Presently a number of projects is developing new technologies for mobile access and nomadic as well as local area wireless access. The envisioned data rates are up to 100 Mb/s for mobile access and up to 1 Gb/s for nomadic and local area wireless access. Driving force is the future growth of mobile and wireless communications caused by increasing data-oriented services and applications. From the physical point of view different millimeter-wave ranges are suitable for high speed data transmission, but the actual license situation in Germany and all over Europe has to be considered. There are several band segments allocated to civil mobile and fixed wireless communications. However, in most bands the available bandwidth does not exceed 200 MHz and data exchange at Gbit/s is not possible without complex signal processing. In the 60 GHz-band and at higher frequency ranges larger bandwidths are available.

Within the European FP5/FP6 funded research projects network technologies and architectures have been investigated or are under development in order to allow a generalized and affordable availability of broadband access to users, including those in less developed regions, peripheral and rural areas. Further activities are carried out in order to improve the connectivity to mobile users.

In the paper a brief review of European funded projects (e.g. BROADWAY, BROADWAN, etc.), is given with respect to radio link properties such as frequency range, data rate, modulation bandwidth, and transmission technology etc.

In Germany WIGWAM is part of the Central Innovation Program "Mobile Internet" which is funded by the German Ministry of Education and Research (BMBF). The objective of WIGWAM is the design of a complete system for wireless communication with a maximum transmission data rate of 1 Gbit/s. The targeted spectrum is the 5 GHz band and the extension bands 17, 24, and 60 GHz. Depending on the mobility of the user, the data rate should be scalable. The goal is a "1 Gbit/s component" of a heterogeneous future mobile communication system. All aspects of such a system will be investigated, from the hardware platform to the protocols, which are subject to very strong requirements given the extremely high data rate of 1 Gbit/s. Further R&D activities are carried out in the framework of BAINET which is also funded by BMBF. Experimental results are presented which have been obtained in a wireless indoor high bitrate system operating at 60 GHz. In conclusion an outlook is given concerning our research activities in the field of multi antenna systems and Gigabit-OFDM at millimeter-wave frequencies.