

Little waves with big impact – 60 GHz broadband live radio for Wireless Personal Area Networks

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The Fraunhofer Heinrich Hertz Institute realizes the first MIMO broadband connection at 60 GHz – demonstration at ICC, Dresden

At the IEEE ICC 2009 scientists from the Fraunhofer Heinrich Hertz Institute in Berlin are giving the world's first public demonstration of 60 GHz wireless broadband for transmission of HD video data. Using both multi-antenna MIMO (Multiple Input Multiple Output) technology and specific Space Time Coding (STC), a wireless connection robust enough even in Non-Line-of-Sight (NLOS) propagation has been engineered. Rigorous hands-on application of theoretical concepts from communications engineering has now made the use of the 60 GHz band for wireless broadband transmission much more flexible and robust. This means that antennas now no longer need to be aligned while shadowing problems due to movement of the transceivers or people have also been eliminated. What's more, a research partnership with the Chalmers University of Technology in Göteborg has also succeeded in significantly scaling down the size of the 60 GHz RF-frontends.

60 GHz wireless technology is widely seen as one of the most promising candidates for extreme broadband wireless applications for WPAN – Wireless Personal Area Networks – and has received considerable attention over the past few years. In the near future it is expected that several GHz bandwidth in the 60 GHz band will be opened up across the world for license-free transmission of broadband data streams. The principle of high transmission capacities in the range of several GBit/s over a distance of up to 10 m enables applications like uncompressed broadcasting of live/video streams in real time and opens up a new dimension of practical uses – from home area, passenger cabins of vehicles and aircrafts through to applications for medical technology and TV studios.

Thus far all attempts for practical applications have failed due to the key problems of heavy propagation losses and multi-path interference in the radio channel. Previous solutions were based on aligned radio transmission using a direct line-of-sight connection respectively a single dominant reflected propagation path. After long years of research, scientists at the Fraunhofer Heinrich Hertz Institute have now found a way of harnessing the benefits of MIMO technology to 60 GHz wireless transmission.

By using multiple antennas on the sender side, time-shifted copies of the data can be transmitted, without increasing the utilized bandwidth. Redundant copies of the transmit signal – known as 'diversity' – are also introduced by means of the time-delayed echoes in the radio channel and the multiple receiver antennas. Correct overlay of all these copies at the receiver makes data transmission much more robust and ensures transmission even under adverse conditions. Exploiting the leverage of such diversity calls for special coding and decoding techniques which have now been developed at the Fraunhofer Heinrich Hertz Institute. Unlike previous applications of MIMO technology which aimed at higher data rates, the focus here was very much on improving transmission quality. These innovations will now serve to establish 60 GHz technology for wireless broadband transmission of up to (at the present time) 445 Mbit/s in the WPAN sector.

The new 60 GHz MIMO technology has recently been successfully implemented by scientists in Berlin and Göteborg in a radio experimental system which will be unveiled at the IEEE ICC in Dresden where visitors can see the first demonstration of secure wireless transmission of a broadband data stream. The application shows transmission of a video stream from a HD video camera to a monitor. Changing the position of the transmitter enables the testing of a variety of propagation conditions.

For more information go to: www.hhi.fraunhofer.de/icc

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First Public Demonstration
60 GHz STC-MIMO
IEEE ICC
14-18 June 2009
Dresden
Booth 30

Fraunhofer Institute for Telecommunications, Heinrich-Hertz-Institut

World leaders in the development of mobile and fixed communication networks and their key applications

Founded in 1928, over the course of its more than 80 year history the Fraunhofer Institute for Telecommunications, Heinrich-Hertz-Institut, has developed into one of the world's leading research institutes for the development of mobile and fixed communication networks and the key technologies that drive them. Today's R&D focus is on electronic imaging and interactive media, communication networks and photonic components.

In 2008 the Institute had an operating budget of approx. 25 million Euro. The ratio of third party funding lay at 76 percent of which 42 came from industry, 31 percent from contract research for the Federal Government and individual State Governments and 22 percent from funding by the European Union. At the beginning of 2009 the Institute had a staff of some 250 employees and some 80 students.

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