

NEC Develops Compact Millimeter-Wave Transceiver for Uncompressed HDTV Signal Transmission

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Technology enables wireless, cable-connection-free high-definition TV sets

NEC Corporation today announced the successful development of a highly compact 60-GHz-band (*1) wireless transceiver that transmits uncompressed high-definition television (HDTV) signals (*2), realizing HDTV sets and displays without cable connections.

The features of the wireless video transmission equipment are as follows:

(1) The transceiver is adapted to input/output high-quality component video signals. Both uncompressed HDTV signals and stereo audio signals are transformed into a 1-Gbps ("gigabit per second") digital-data stream, and then converted to 60-GHz-band to allow wireless transmission by using ASK modulation (*3).

(2) Due to a downsized wireless module and a simplified power supply circuit, a transceiver as small in size as a business card is realized. Its dimensions are 70 mm X 50 mm X 15 mm (52 cc.) High-frequency components, such as monolithic IC's, filters and oscillators, are all built into a ceramic module using flip-chip bonding (*4), which enables easy assembling with less tuning, as well as a reduction in size.

(3) A path diversity scheme (*5) is introduced in the equipment in order to reduce the chance of link-disconnection problems associated with indoor use. A dual receiver configuration enabling two transmission paths ensures continuous transmission as automatic switching from one path to another occurs when an obstacle disturbs the link.

Along with an increase in the prevalence of HDTV broadcasting service in recent years the popularity of wide, flat panel displays, such as plasma and liquid crystals displays has also been increasing. The installation of these displays requires the use of many cables for video and audio signal connection. This has evoked a strong market demand for a wireless scheme for wall-mounted displays, as well as mobile ones, from the point of view of convenience and appearance. To date wireless HDTV signal transmission based on wireless LAN at 2.4 and 5 GHz or UWB (*6) has been developed. However, these approaches warrant special care to prevent interference from other wireless equipment using the same frequency band. They also require complicated data compression

techniques with various standards depending on the application.

On the other hand, a 60-GHz band is well suited for high-speed wireless transmission with a bit-rate of more than 1 Gbps as it has an extremely wide bandwidth of 2.5 GHz, achieves less significant interference at high frequencies, and requires no license if technical regulations are fulfilled. This enables uncompressed HDTV signal transmission, resulting in a simplified system configuration without data-compressing circuits, no degradation of video quality even for very quick motion, and real time transmission without time lag. Through its research NEC has succeeded in the development of compact 60-GHz transceivers, which realize much sought after wireless HDTV sets.

The newly developed transceivers offer increased opportunities for broadband wireless video transmission throughout the home, office, and in commercial venues etc. Furthermore, this technology does not simply allow discrete wireless equipment, but can also be extended to various high-data-rate wireless applications involved in wireless personal area networks. NEC will continue to carry out extensive research on this differential wireless technology toward its early commercialization. NEC will announce this research result at the IEEE MTT-S 2005 International Microwave Symposium that will be held in Long Beach, California, U.S.A. from June 12, 2005.

***Notes:**

(1) A 60-GHz-band is allocated as an unlicensed frequency band from 59 to 66 GHz in Japan and from 57 to 64 GHz in the U.S. for small-power applications. The radio wave in these frequency ranges is characterized by relatively high attenuation in the air due to the oxygen absorption and thus appropriate for short-range communications with less interference from other wireless systems. Its propagation is straightforward rather than diffractive and interrupted with significant

attenuation by obstacles such as a human body in the way.

(2) A high-definition television ("HDTV") features a wide aspect ratio of 16:9 on screen and a large number of horizontal lines, i.e., 1080 lines in an interlaced scan or 720 lines in a progressive scan. Consequently, excellent sharpness is obtained, as compared to a standard-definition television ("SDTV") featuring 480 horizontal lines in an interlaced scan.

(3) An amplitude shift keying ("ASK") modulation is one of the digital modulation schemes that carry data into the radio frequency signal. This modulation scheme is commonly used in the wired and fiber communication systems which handle high-speed serial data.

(4) Flip-chip bonding technique provides highly repeatable interconnections between ICs and the substrate, even in the millimeter-wave frequency range, without using wire bonding. Chips are all mounted upside down with small gold bumps through a single thermal-compression process, resulting in high yield and high productivity.

(5) Diversity in the wireless technology increases the quality of the data signals by utilizing various received signals with difference in spatial path, time, and frequency. A dual receiver configuration, ensuring two transmission paths, is one of the spatial diversity schemes.

(6) Ultra wideband ("UWB") is a short-range wireless technology for transmitting large amounts of digital data over a wide spectrum of frequency bands with very low power, enabling wireless connection of multiple devices for transmission of video, audio and other high-bandwidth data. In the U.S., the Federal Communications Commission approved the commercial use of UWB in February, 2002.

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