

TOSHIBA REVIEW

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Special Reports

Wireless LAN Technologies

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Special Reports

Wireless LAN Technologies

*Continuous Development of Wireless LAN Technologies for Customer Satisfaction

SUGAWARA Tsutomu

*Technological Trends in Wireless LAN Systems

TAKAGI Eiji

Wireless LAN has become pervasive in people's lives. This technology cannot be categorized merely as wireless Ethernet. Rather, it is a phenomenon that should be considered to be the advent of a new wireless "killer platform" rather than a "killer application."

This paper first provides an overview of wireless technologies in the IEEE 802 Committee, then reviews the IEEE802.11 standardization and 5 GHz-band frequency regulations in the world. Device and antenna technologies for realizing wireless LAN are described next. Finally, the article discusses future trends in wireless LAN technologies.

*Toshiba SurfHere™ High-Speed Wireless Internet Access Service

TAKATO Hiromasa OGASAWARA Takashi

SurfHere™ is a public high-speed wireless network supplied by Toshiba, a leading provider of mobile computing solutions. SurfHere™ offers extremely fast and convenient Internet access at a rapidly growing number of public locations throughout United States. Users can check their e-mail, send documents, download the latest sales figures, listen to music, or simply surf the Web at their nearest SurfHere™ location. This ensures that users will never have to miss accessing important information when away from the office or home, with the convenience of using their own computer.

*Integration of Secure and User-Friendly Wireless LAN Systems

ONODA Minoru KAWAI Nobuyuki

In recent years there have been increasing opportunities to integrate network systems with wireless LAN. On the other hand, there are some issues involved including interception, unauthenticated access to the system, rogue access points, and interference with other wireless LANs or wireless systems.

Toshiba is providing wireless solutions incorporating various services to meet customers' needs.

*Enhanced-Security Wireless LAN Access Points

SUZUKI Koichi WATANABE Hiroyuki OCHIAI Tamiya

Wireless LANs have rapidly progressed in recent years as higher communication speeds have become available in addition to the advantage of portability. However, because they use radio frequency technology, wireless networks are more at risk from tapping and hacking compared to a hard-wired network. Secure wireless LANs are therefore desired.

To meet these requirements, Toshiba has developed enhanced-security wireless LAN access points for users requiring high security including corporations, public offices, and communication common carriers. We will continue to improve this technology to satisfy users' needs in the future.

*Wireless LAN Antenna Location in Notebook PCs

MASAKI Toshiyuki TESHIMA Masao MIYASAKA Toshiki

In recent years, notebook PCs integrating wireless technologies such as IEEE802.11a/b/g have been commercialized by many companies. In general, it is desirable to mount the antenna inside the body of a notebook PC in terms of portability and prevention of breakage if the PC is dropped. However, antenna performance is sensitive to the environment such as the mounting location in the notebook PC, surrounding materials, and the place where the PC itself is set.

Toshiba has measured and analyzed antenna characteristics at various locations in notebook PCs, and conducted a study on the positioning of wireless LAN antennas in notebook PCs.

*IEEE802.11a-Compliant Baseband LSI for 5 GHz-Band Wireless LAN

UNEKAWA Yasuo

Toshiba has developed an IEEE802.11a-compliant baseband LSI for 5 GHz-band wireless LAN applications using 0.18 μm CMOS technology. The functionalities of the media access control (MAC) and physical (PHY) layers are implemented on about 30M transistors employing high-precision analog-digital converter/digital-analog converter (ADC/DAC), a dedicated-hardware engine, a 32-bit RISC CPU, and large-capacity SRAMs on chip. The maximum data rate supported is 54 Mbps. Most of the MAC protocol processing is carried out by the embedded RISC CPU, thus reducing host CPU overhead.

*RF/IF Chip Set for Wireless LAN Application

ITOH Nobuyuki ISHIZUKA Shin-ichiro OTAKA Shoji

Toshiba has developed a radio frequency/intermediate frequency (RF/IF) chip set for 5 GHz-band wireless LAN application. The functionality of the RF chip consists of down- and up-conversion between an RF signal and IF signal, while that of the IF chip is demodulation and modulation between an IF signal and baseband I/Q signal. Excellent high-frequency performance was achieved by using $f_T = 45$ GHz SiGe-BiCMOS technology for the RF chip and Si-bipolar technology for the IF chip. An error vector magnitude (EVM) of -32.4 dB was obtained with 41 mA and 60 mA current consumption for receiving (RX) and transmitting (TX), respectively. This result is excellent for a 5 GHz wireless LAN chip set.

*TG2016FC Power Amplifier for IEEE802.11a-Compliant Wireless LAN

ISEKI Hirotaka SENJU Tomohiro ODAKI Yoshikatsu

Toshiba has developed the TG2016FC power amplifier employing an InGaP/GaAs heterojunction bipolar transistor (HBT) process. This power amplifier has very high linearity and high reliability. The target applications are audiovisual (AV) equipment requiring high transmission performance and long range, and embedded applications in other equipment such as PCs, access points, printers, etc.

The main target application is wireless TV sets, which require a very high-quality power amplifier with a superior error vector magnitude (EVM). For this high-level requirement we have aimed at specified EVM characteristics of 3% (typ.). In addition to good EVM, the transmission distance of a power amplifier is very important. The output power of the TG2016FC is to be specified as 18 dBm (min.).

*Wireless LAN Security Support Technologies

OSHITA Toshiaki TAKAGI Masahiro OKUDA Kenichi

Wireless LAN systems featuring improved transmission speeds and low-cost equipment have appeared on the market. Unlike wired LAN systems, however, additional security measures must be taken into consideration because unauthorized access by attackers may occur if a wireless LAN system is not properly managed. On the other hand, the adoption of encryption technology and user authentication technology may make the system less user-friendly.

In response to this situation, Toshiba Solutions Corp. and Toshiba have developed WirelessServ™ MobileGate and the Toshiba wireless LAN security tool as wireless LAN security support technologies for the convenience of users.

*Wireless LAN System Using Leaky Coaxial Cable

MATSUSHITA Naohiro SUGIYAMA Tomonori YAGINUMA Jun

Toshiba TEC is developing a new wireless LAN system using leaky coaxial cable (LCX) as an antenna for the wireless access points. Our target products are broadband wireless LANs specified by IEEE802.11a and 11g. The LCX wireless LAN can maintain high quality of communications in an indoor environment where many obstacles exist. It can also limit the propagation range of radio waves transmitted by access points. These features are realized through the combination of the LCX's unique propagation characteristics and the anti-multipass characteristics of orthogonal frequency division multiplexing (OFDM). The LCX wireless LAN is expected to be a system suitable for future wireless LANs that ensures both mobility and security.

*Application of Embedded System of Wireless LAN -- Wireless LAN Access Points

HIRAOKA Satoshi NAKA Shunsuke

With the increasing dissemination of wireless communication, wireless LAN is being applied to home electrical appliances and embedded applications such as wireless TV, in addition to PCs and their peripherals.

Toshiba Information Systems (Japan) Corp. has utilized its long accumulation of experience and achievements in embedded system development to develop a trial wireless LAN access point using an LSI chipset for IEEE802.11a-compliant 5 GHz-band wireless LAN. The baseband chip performs most of the processes related to wireless communication inside the LSI. This enables embedded systems with lower CPU power to be used for high-speed wireless communication.

*Technological Trends in Multimode Mobile Communication Terminals

-- Concept and Key Technologies of Software-Defined Radio

TSURUMI Hiroshi SERIZAWA Mutsumu

A number of wireless communication standards have been determined for various types of mobile communication services. Since some of these important services need to be implemented on the same terminal, transceivers that can cope with multiple wireless standards possess strategic importance in the next-generation wireless terminal technology.

Software-defined radio technology can be the ultimate technology to realize the flexibility that is indispensable for such multistandard connections. Multiband RF processing and flexible digital signal processing are two key stages in the processing for software-defined radio. The parameterized analog stage, with variable analog circuits controlled according to system requirements, will be one of the solutions for the multiband RF stage. Multiprocessor architecture, with a layered microprocessor and hardware engine controlled by a CPU, will be suitable for the flexible digital signal processing stage.

Feature Articles

*Global Facer-Canceller and Mail Handling System

OKABE Yoshie RYU Mitsuo NARUOKA Yoshihiko

Toshiba has developed the TC-1000 automatic mail facer-canceller for the global market. This machine directly receives mail pieces collected from mailboxes, detects and cancels the stamps attached to them (cancelling function), then orients their direction before stacking them by category (facing function).

To meet the needs of the global market, the TC-1000 has a modular architecture. This allows the modules that comprise the TC-1000 to be used in other types of mail processing machines. The TC-1000 also has greater layout flexibility than previous models. Due to its high performance, high throughput, low noise level, machine safety complying with European standards, and other features, the TC-1000 can truly compete with the leading facer-cancellers in the world today.

*Luminaries for Building Lighting with Free Voltage Range

OOTAKE Hirokazu OOISHI Takafumi

Lighting manufacturers must prepare luminaires of various designs, functions, and power supply voltage differentials in order to meet the requirements of customers. Particularly with regard to power supply voltage, Toshiba Lighting & Technology Corp. has many types of luminaires. Our new "Free series" products are able to operate in the regulated voltage range of 100 to 242 V. We have improved productivity by minimizing the luminaire types. Moreover, the "Free series" are environmentally conscious products that offer high efficiency, contribute to energy saving, are manufactured with non-chromate steel plate and lead-free solder, and have a decreased amount of packaging materials.

*Advanced Calculation System Using Monte Carlo Method for Analyses of Isotopic Composition of Spent Fuel and Radiation Flux Distribution in BWR RPVs

SAKURAI Shungo KUROSAWA Masahiko HAMADA Jun

Toshiba is currently developing an advanced calculation system using the Monte Carlo transport method for analyses of the actinides and fission product nuclides of spent fuel and the radiation flux in the reactor pressure vessel (RPV) of a boiling water reactor (BWR). Detailed determination of actinides and fission product nuclides is important in criticality evaluation for the transportation and storage of spent fuels. We have therefore developed the MCNP-BURN2 parallelization Monte Carlo burnup calculation system for this purpose. Using the design code and post-irradiation examination (PIE) analysis, we confirmed the accuracy of MCNP-BURN2. The radiation flux in the BWR RPV is calculated by the TORT (S_N method)/MCNP (Monte Carlo method) coupling method. In this method, the radiation angular flux distribution on the core surface is obtained by TORT, so the calculation for the outside of the core using MCNP is carried out with sufficient sampling at the source and the exact model for the outside structure of the core.

Frontiers of Research & Development

*Epitaxial Gate Dielectrics Directly Grown on Si for Future Highly Miniaturized LSIs

*Development of Reduced-Cost, Low-Moderation-Spectrum BWR