

TOSHIBA REVIEW

2004. VOL.59 NO.2

Special Reports

Digital Terrestrial Broadcasting System Equipment and Facilities

Toward the Commencement of Digital Terrestrial Television Broadcasting Service

NISHIMURA Shiro

Trends in Digital Terrestrial Television Broadcasting

MIKI Nobuyuki

Digital terrestrial television broadcasting (DTTB) services started in the Kanto, Chukyo, and Kinki areas on December, 2003. DTTB has opened up a new era in broadcasting with various services including high-quality HDTV and mobile reception. DTTB services will spread throughout the whole of Japan by 2011, whereupon all analog terrestrial television broadcasting services will be replaced.

Toshiba is contributing to the development of DTTB by participating in the construction of DTTB networks.

Master System for Digital Terrestrial Broadcasting

NAGAIISHI Atsushi / MUKOYAMA Toyohiko / KANEDA Masayuki

Terrestrial digital broadcasting will replace conventional terrestrial analog broadcasting by the year 2011, by which date all terrestrial broadcasting is scheduled to be switched over to the digital system.

Among the advantages of digital service are high quality picture and sound, multiple channels, and interactive communication via data broadcasting. In addition, the electronic program guide enables viewers to reserve items in advance and to do program content searches of the program table from their receivers.

The terrestrial digital broadcasting master system, which is at the heart of the new digital broadcasting station, accurately and automatically sends programs listed on the program table. The terrestrial digital broadcasting system has already been operating, following development of the new master system design. It has delivered programming to many broadcasting stations in the Tokyo, Nagoya and Osaka areas.

Video Server System

RANSHO Teruaki / SHIMADA Hideyuki / HONDA Makoto

Among the features of digital terrestrial broadcasting are high-definition television (HDTV), multiaudio, and multichannel services. The conventional video server for analog broadcasting has a structure for only one- or two-channel broadcasting of standard-definition television (SDTV)/stereo, and does not provide the functionality required for digital terrestrial broadcasting.

Toshiba has developed two video servers with unique features. We have received orders for these servers from numerous broadcasting stations throughout Japan, centering around the major metropolitan areas where digital terrestrial broadcasting services have already commenced.

Data Broadcasting Transmission System

SAITO Yuuichiro / MATSUO Akira / SUGITA Akihiko

One of the features of digital broadcasting is data broadcasting services. Digital terrestrial broadcasting services began in Japan in December 2003, requiring a new broadcasting method differing from that existing for broadcast satellite/communications satellite (BS/110°CS) digital services. For terrestrial broadcasting services, the TV network is formed by network stations. One station receives a program and distributes it to other stations while retransmitting it to the area of its own coverage. In the case of data broadcasting services, it is considered that the transport stream (TS) method will be used to transmit programs from the sending station to the receiving stations in the TV network.

Toshiba has developed a new data broadcasting system, the TS converter, to realize TS format distribution. The TS converter has "TS through," "elementary stream (ES) filtering," and "module exchange" functions. We expect application of the TS converter to expand for digitization of broadcast stations in the future.

Master System of Digital Terrestrial Broadcasting

SUGIYAMA Tomoaki / NUNOKAWA Satoru / KATOH Masaki

Following the introduction of broadcast satellite (BS) digital broadcasting in December 2000, digital terrestrial broadcasting services commenced in Japan in December 2003. In order to realize these new services, the various types of studio equipment used in the broadcasting system were required to provide higher compression, higher picture quality, multichannel functionality, and smaller size compared with those for BS digital broadcasting.

This paper introduces a switcher, an MPEG-2 encoder, and a multiplexer newly developed by Toshiba to meet these requirements.

Digital Terrestrial Television Transmitter

MAEDA Hirohito / FURUKAWA Yuichi / OTANI Yoshiharu

Digital terrestrial television broadcasting services began in the Kanto, Chukyo, and Kinki areas on December 2003, and are scheduled to commence in other areas in 2006.

Toshiba supplied the digital terrestrial broadcasting transmitter system to the broadcasting stations in Tokyo and Osaka, and has started operation. The feedback type predistortion system nonlinear compensator was adopted as the transmitter for digital terrestrial broadcasting, and a high-performance, high-reliability, and high-efficiency transmitter that realizes less than -50 dB intermodulation was commercialized. Twenty-four-hour broadcasting was taken into consideration in its design, and various seamless exchangers enabling maintenance work to be performed during operation were also commercialized, to realize a reliable system.

Devices for ISDB-T Transmitter

SAWADA Takeshi / SUGA Masaru / SASACHIKA Hideki

Digital terrestrial television broadcasting (DTTB) began in December 2003 in the metropolitan areas of the Kanto, Chukyo, and Kinki regions. With integrated services digital broadcasting-terrestrial (ISDB-T), which is the Japanese standard for DTTB, viewers can enjoy various types of broadcasting services.

The transmission system of ISDB-T demands new digital technologies that do not exist in the conventional analog transmission system. Toshiba has therefore developed several devices for the ISDB-T transmission system.

This paper introduces three of these devices: an orthogonal frequency division multiplex (OFDM) modulator for channel coding and OFDM modulation, an exciter for nonlinear compensation, and a power amplifier offering high performance and high efficiency. By means of these devices, the transport stream signal is converted to a high-power OFDM RF-signal in the UHF band.

Transmission Network Systems for Digital Terrestrial Broadcasting

TANAKA Hidekazu / SUGIYAMA Taiji / ISHIDA Toshihiro

A characteristic of terrestrial television broadcasting in Japan is coverage of most broadcasting areas by analog television transmitting stations in addition to the main station, due to the country's mountainous terrain. In developing digital terrestrial television broadcasting, orthogonal frequency division multiplex (OFDM) transmission system and a single-frequency network (SFN) have been adopted for effective frequency usage, requiring a large number of stations. In order to deliver satisfactory digital broadcasts, however, the methods of transmission to the main station and relay stations have been a problem to be solved.

Toshiba has been working on technical innovation of transmission network systems for digital terrestrial television broadcasting, in order to offer such systems for use in television broadcasting services. We present each client with customized guidelines and methods based upon simulations and calculations to assure that the performance of each transmission network system performs is of the necessary quality.

Feature Articles

Prospects for Service Models Using Bluetooth™

YAMATO Katsumi / SUGIKAWA Akihiko / KAWAMURA Takuya

The Bluetooth™ Special Interest Group (SIG) is developing a new Bluetooth™ specification. After the new specification is adopted, Bluetooth™ users will receive various benefits including adaptive frequency hopping and faster connections.

To popularize Bluetooth™ technology in ubiquitous services, Toshiba has developed an automatic proximity detection technique using Bluetooth™ based on the new specification. We have also contributed to the publication of the basic imaging profile (BIP) specification, which defines the requirements for exchanging imaging data between Bluetooth™ imaging devices. With the publication of BIP, the number of Bluetooth™ imaging devices will become large.

SiC Power Devices

SHINOHE Takashi

Silicon carbide (SiC) has a 10 times higher electric breakdown field than silicon, and is expected to be an excellent material for next-generation high-voltage, low-loss power devices. Already, 600 V Schottky barrier diodes (SBDs) have been used for switching mode power supplies, and switching devices are being competitively developed in many research organizations and companies.

Toshiba has performed basic research on the anisotropy of carrier mobility and breakdown voltage as well as physical models of Schottky leakage current. We have developed a new junction termination structure for the guard ring assisted-reduced surface field (GRA-RESURF) especially suitable for SiC devices, as well as a fine gate layer structure for the static induction transistor (SIT). Specific on-resistances of 1/100 and 1/10 compared with the theoretical minimum on-resistances attainable in silicon unipolar devices have been attained for the SBD and SIT, respectively. These SiC power devices will help to reduce power loss and permit downsizing of various power supply units and power conversion equipment.

Native XML Database for Contents Management Offering High Performance and Reliability

HATTORI Masakazu / NONOMURA Katsuhiko / KANAWA Takuya

Extensible Markup Language (XML) is emerging as a major new standard for representing data on the World Wide Web. Several XML database systems have been proposed for storing XML documents in different data models.

Toshiba has developed a native XML database, for which XML documents are not required to have an associated schema or document type definition. The database is not a retrieval-oriented XML engine to achieve high-speed performance; rather, it provides the optimal balance of speed, size, functionality, and reliability. It can therefore be applied to various document-centric applications from document management to network system applications.

Secondary Surveillance Radar for Air Traffic Control — SSR Mode S

HASHIDA Yoshio / OOTOMO Hisashi / KUJI Yoshinori

Secondary surveillance radar (SSR), an essential part of air traffic control, provides aircraft identification and altitude information. Recent years, however, have brought increased air traffic congestion, which has magnified the limitations inherent in the present SSR system. To resolve this problem, an improved SSR, that is, SSR Mode S, is being standardized by ICAO (International Civil Aviation Organization). Thus, Japan's Civil Aviation Bureau, which is administered by the Japan Ministry of Land, Infrastructure and Transport, is planning replacement of the conventional SSR system with SSR Mode S. Toshiba has, at the request of the Civil Aviation Bureau of Japan, developed and implemented SSR Mode S system.

World's Largest Capacity Indirectly Hydrogen-Cooled Turbine-Driven Generators

SATO Osamu / NAKAMURA Hideyuki / HATANO Hiroshi

Toshiba has developed indirectly hydrogen-cooled turbine-driven generators up to the 700 MVA class, the world's largest capacity. This achievement is the result of Toshiba's efforts to meet the needs of users for system simplification.

Weather Solutions by Local Numerical Weather Prediction Model

WADA Masakazu / SHINOHARA Tetsuya / TAKAKI Toshiaki

The weather affects people's daily lives and business activities in many ways, and various problems caused by the weather are inherent in our society. In order to explore and solve these problems, an integrated approach is necessary such as building systems that directly support daily work by fully utilizing meteorological tools; that is, observation and prediction technologies.

Toshiba has developed a weather prediction system that enables atmospheric behavior to be predicted 24 hours or more in advance, using a local numerical weather prediction model. We provide a total solution to users including observation, prediction, and operational support, combining Toshiba's accumulated technologies and knowledge with the information generated by this system.

Frontiers of Research & Development

Technology for Observation and Analysis of Mass Behavior

HD DVD Next-Generation DVD Using Blue-Violet Laser

Superconducting Magnetic Energy Storage System for High-Temperature Superconducting Applications