Vision Exhibits

Future Services of Digital Broadcasting
- Digital broadcasting for anyone, anytime, anywhere

Digital terrestrial television broadcasting has begun in the three major metropolitan areas of Tokyo, Osaka, and Nagoya and the service areas will be expanded in stages across the country. TV broadcasting in Japan is in the midst of being transformed, through digital technology, into a medium with high-quality picture and sound, multiple functions, and interactivity. The digitalization of broadcasting will also be accompanied by enhancements made to the broadcasting environment, by which anybody can obtain the information they seek on demand. This exhibition introduced the challenges of expanding digital broadcasting, and provided a booth to answer questions regarding digital broadcasting reception related issues.

Network-linked Broadcasting Services - The possibilities of digital TV connected to communications networks

Digital TV has the potential to grow into "integrated services television," which will integrate new services and various applications beyond the boundaries of broadcasting and communications. In doing so, the TV will become an indispensable tool in future homes and societies. This exhibition presented new services that link broadcasting and communications.

Digital Terrestrial Broadcasting for Mobile and Portable Receivers
- Linkage with communications expands broadcasting services

Advances in reception technology and data services are making available network-linked broadcasting services that incorporate the Internet, even for mobile and portable receiver reception. This exhibition introduced a service that combines digital terrestrial broadcasting services and wireless Internet to deliver information to portable terminals in vehicles. It also presented the mobile terminals to receive such network-linked services.

Human-friendly Digital TV
- Digital TV for everybody

Along with audio and video, digital broadcasting can deliver data in a variety of forms. We are making use of this feature to provide human-friendly broadcasting services through which everyone, including the elderly and people with physical impairments, can enjoy broadcasting services.

Integrated Services Television
- Broadcasting based on home servers expands the possibilities of TV

A broadcasting system based on home servers is a new type of broadcasting service that utilizes a receiver equipped with a large-capacity storage function and a communication function. It will permit diverse TV viewing styles, such as viewing programs at a preferred time or retrieving information, by using metadata (program related information) provided by the broadcaster. This will turn digital TV into integrated services television, with which a user can enjoy new services that link broadcasting, communications, and server functions.

Metadata Production and Applications
- Aiming at efficient program-related information generation

Along with regular programming, a future broadcasting system based on home servers will broadcast a wide variety of program-related information, called metadata, such as program titles, scene names, and the names of performers. This exhibition introduced research to efficiently generate metadata using video and speech recognition technology and language processing technology. It also included a technology to utilize existing closed-captioned data as metadata.

Advanced Conditional Access System
- For a safe, reliable usage environment

The construction of an environment in which digital broadcasting can be viewed with trust established between the viewer and the provider will require technologies to prevent the unauthorized use of and tampering with program content and metadata. While a broadcasting system based on home servers processing metadata will offer a wide range of viewing styles, it also necessitates a mechanism for content usage control as designated by the broadcaster. This exhibition presented content protection and viewing control technologies that can realize various content applications while preventing the unauthorized use of and tampering with broadcast contents, contents obtained via communications, and contents stored on the home server.

Content Rights Management and Protection
- To promote enriched information distribution

It is expected that digital TVs will be connected to high-speed broadband networks, to provide high-quality digital video. Programs tailored to the needs of individual viewers can also be provided through services such as a program request service using a network. This exhibition presented content rights management and protection, which is necessary to protect broadcasting content from unauthorized use and illegal copying over the Internet.

Ultrahigh-definition 4000-scanning-line Video System
- Pioneering future video culture

The advanced audio-visual systems of the future will present large wide-view images conveying a strong sensation of reality to the viewer, i.e., the feeling as if you were at the site of the broadcast, and play video whose is clarity equivalent to that of gravure printing. Research towards establishing such a system is centered on an ultrahigh-definition video system with 4000 scanning lines (Super Hi-Vision). This year's open house presented a screening of a program on a 450-inch screen with 22.2 channel surround sound 3D audio. Super Hi-Vision programs will also be screened at the 2005 World Exposition in Aichi, Japan, starting in March 2005.

Advanced Program Production and Control System Using High-speed Network
- Efficient program production using a network

The rapid advances in low-cost broadband IP network connections has extended the reach of information technology (IT). Research is progressing on an advanced broadcasting station system that exploits the advantages of IT in order to produce and transmit broadcast programs more promptly and efficiently. We constructed a program production and control system using high-speed networks, which performs program production using materials and equipment located on a network and uses a video edit description prepared in advance on a PC.

Television over IP Network
### - The potential of broadcasting technology with the use of networks

While broadband communications networks are gradually making feasible broadcast-quality video distribution services, the use of such networks for broadcasting will require the resolution of a number of issues, such as copyright. Research is progressing on broadcasting technologies that exploit the features of communication networks, together with network technologies that will ensure both the reliability and efficiency of large-scale simultaneous distribution of contents. One such technology under development was introduced at this exhibition.

Field Emitter Array Image Sensor with HARP Target
- Ultrahigh-sensitivity compact imaging device

There is a demand for a compact camera device with enhanced sensitivity to meet the needs of a variety of HDTV program productions, such as reporting breaking news at night or shooting images of nocturnal animals for science programming. To construct such an ultrahigh-sensitivity compact camera, an advanced imaging device, called a "field emitter array image sensor with HARP target," was fabricated.
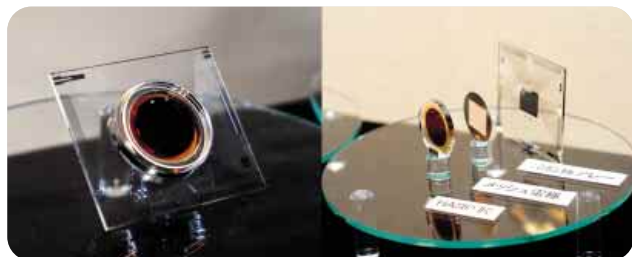
Small Perpendicular Magnetic Recording Disk
- Large-capacity storage device for portable terminal installation

Digital terrestrial broadcasting will provide new services for portable terminals. A small perpendicular magnetic recording disk would be a compact large-capacity storage device that is small enough for portable terminal application. This exhibition presented a perpendicular magnetic recording disk with a 1-inch diameter, capable of recording and reproducing HDTV programs.
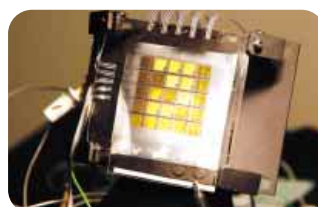

Flexible Ultra-thin Displays
- For an ultra-thin display that can be rolled up for transport

Thanks to digital broadcasting there will be more opportunities to watch television outdoors by using services such as those for mobile terminals. A durable display device suitable for such viewing styles would have to be lightweight and thin and ideally able to be rolled up. To this end, research continues on a flexible organic electro-luminescent display and a flexible liquid crystal display, together with research on driving technologies using organic thin-film transistors (TFTs) for both displays.

Flexible organic EL display *Flexible LC display* *LC device driven by organic TFT*

Fun Exhibits

Mixed Reality Audio-visual Reproduction System
- Let's go to a concert in a virtual space

One future broadcasting service will be an interactive service in which viewers can select their audio visual presentation preferences by specifying a viewpoint location. The exhibit presented a prototype system (MRAV*) that can automatically reproduce virtual 3-D sound linked to the viewpoint of 3-D CGs.

* Mixed Reality Audio-Visual Reproduction System (MRAV)

High-quality Speech Synthesis
- Reading out news and information in a natural-sounding computer-generated voice

We introduced a high-quality speech synthesis method for creating natural-sounding computer-generated speech that is easy to listen to. Its application possibilities range from automatic sound broadcasting, which automatically converts news and notification scripts into speech for radio, automatic TV program generation combining CGs and synthesized speech, and a textual information read-out service for the visually impaired and drivers of moving vehicles.

TV Agent System Using Gaze Information
- Recognition of people's intentions from their eyes

Although digital broadcasting offers many channels and new functions, the TV operations required to select them tend to become more and more complex. With the purpose of providing an easy-to-use TV for everybody, we exhibited a TV agent system that supports receiver operation by interpreting a viewer's gaze in addition to verbal commands.

TV4U (TV for You)
- Automatic program generation technology

Work is advancing on a customizable personal TV system that can automatically produce TV programs tailored to a viewer's personal preferences based on information obtained via multiple sources, such as digital broadcasting and the Internet. The TV4U system lets anyone produce, distribute*, and view TV programs with a series of simple operations.

* This applies only to programs with no copyrights related issues involved.

Multi-viewpoint Camera System
- Capturing the moment more dramatically

A multi-view shooting system was developed to capture a moment in a drama from many viewing points. This new system is capable of split-second precision shooting, with the use of sequential images taken with a number of digital cameras.

This system was employed to capture very dramatic images of Musashi and Kojiro's fight scene in the "Duel on Ganryu-jima" episode of NHK's historical drama series Musashi.

Free Viewpoint Video Representation Technology
- Viewing video from arbitrary viewing points

We would like to fulfill viewer requests such as: "I want to watch the soccer game from my favorite viewing position." We have constructed an arbitrary view image generation system that generates 3D models of a subject based on images taken with multiple cameras surrounding the subject. This system can convert an entire video scene with dynamic motion into three-dimensional data.

Integral 3-D Television
### - Instant acquisition of 3D information

We envision a future television that can present three-dimensional images that give the same depth perception that viewing an actual object gives a viewer, to enhance the perceived sensation of reality and the perceived existence of a reproduced image. This exhibition introduced a two-dimensional video expression method to allow arbitrary viewing points, and showed stereoscopic images created by an integral 3-D television that can display autostereoscopic images in real-time.

Vintage Broadcasting Equipment
- Restored camera and microphone systems/digital systems

The NHK Broadcast Museum emphasizes "operability conservation," i.e., to repair and restore old equipment to its original operational state. This exhibition reproduced an early TV studio with a TV camera and microphones from the time when TV broadcasting first started. It also reviewed the history of digital recording systems, featuring early digital sound and video recording systems.
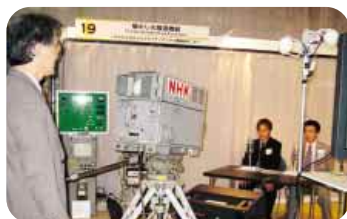
Latest HDTV Broadcasting Equipment
- Compact, energy-saving, environmentally friendly broadcasting systems

HDTV systems drive HDTV programming, which offers breathtakingly clear, high-picture-quality services. We are working to enhance the functions and reduce the size of various HDTV systems, cameras, and VCR devices. This year's open house presented systems that are convenient, highly functional, power efficient, and environmentally friendly.

Technical Exhibits

Millimeter-wave Mobile Camera
- For stable, high-picture-quality wireless transmission

The use of wireless transmission within a studio would free program production from the knots of cables crisscrossing the studio floor. This exhibit introduced a millimeter-wave mobile camera capable of transmitting high-quality picture Hi-Vision (HDTV) video signals over the millimeter-wave band (55 GHz) and element technologies that are needed for stable wireless transmission.

Mobile Robot Camera
- A more functional robot camera system

Our research on intelligent robot cameras continues with the aim of automatically shooting video footage that closely follows a program producer's intention. We exhibited a robot camera incorporating camera control based on the shooting technique of a professional cameraman. The robot's camerawork is both accurate and fast, and its programmed expertise means that it can perform colorful shoots while in motion.

Re-Transmission Technology Using 60-GHz Radio Waves
- Easy reception at apartment buildings

It is difficult to receive digital BS broadcasting in certain housing complexes. In particular, some complexes lack a suitable place to put a receiving antenna, and some community reception facilities are incapable of receiving these signals. The exhibit featured technologies to re-transmit the satellite-broadcasting signals received by community-receiving antennas to individual housing units by using 60-GHz radio waves.

ISDB-T Broadcast-wave Relay Technology
- To construct an economical broadcast-wave network

The exhibit presented a canceller with a function that eliminates co-channel interference from broadcast-wave relays. The canceller is capable of SFN* re-transmission. Also on display was a superconducting filter for relay stations that enables high-power re-transmission while suppressing interference from adjacent channels.
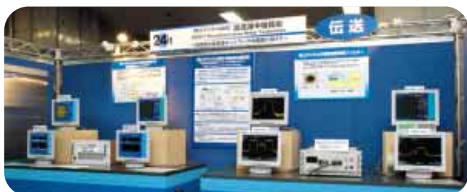
* Single Frequency Network

Image Compositing System Using Omni-directional Illumination
### - Enabling the creation of a natural lighting environment

Progress is being made on a virtual studio technology that composes natural looking video by matching the lighting conditions for a video clip generated with computer graphics (CGs) with those of an actual camera's video image. Our new video composition system is capable of lighting condition control. It matches the lighting environment of the actual video with that of the CG background video, for seamless video composition.

Advanced Satellite Broadcasting Technology
- Satellite broadcasting using the 21-GHz band

The signals for 21-GHz-band satellite broadcasting services will be prone to severe rain attenuation. There are a number of compensatory technologies currently under development to overcome this problem. The exhibit presented research on a 21-GHz-band mesh reflector for a broadcasting satellite and an algorithm that determines the required radiation pattern to compensate for rain attenuation based on actual rainfall conditions.
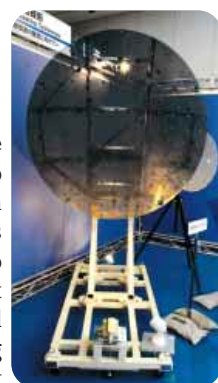
Cable TV Transmission Technology
- Digital broadcasting via cable TV network

Cable television has evolved into an information infrastructure through the introduction of Internet access. This exhibition introduced broadcasting transmission technologies for cable to supplement radio-broadcasting services, including optical wavelength-division multiplexing and 1024 QAM transmission technologies.

ISDB-T Gap Filler System
- Delivering broadcasting services to areas where no broadcast waves directly reach

To deliver digital terrestrial broadcasting services to locations that radio broadcast-waves cannot reach directly, such as in underground shopping arcades, in tunnels, indoors, and behind buildings, we constructed a gap filler that re-transmits, at micro-power levels, digital terrestrial broadcast-waves received at a nearby location. We also constructed a leaky coaxial cable re-transmission system.

Improvement of Reception Performance
### - For secure broadcasting reception

For digital terrestrial broadcasting to be delivered to mountainous areas and remote islands, will require us to increase the reliability of digital transmission. This exhibition introduced technology to enhance transmission characteristics and a technique to determine the causes of reception difficulties.

Spin-electronics for Advanced Recording Technology
- Future recording technology that manipulates electron spin

Research proceeds on an advanced recording technology, spin-electronics, which manipulates the spin of electrons. This line of research is expected to lead to very compact, large-capacity recording devices. We exhibited spin filter technologies, as well as technologies dealing with magnetic dot structures, which control the magnetism in areas of magnetic material several nanometers across.
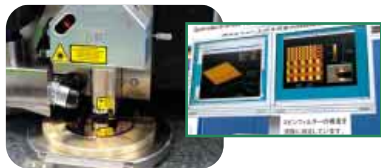
Field Emission Display for Future Ultrahigh-definition TV
- To construct a future large-screen, ultrahigh-definition display device

Field-emission displays (FEDs) are based on the operating principle that electrons emitted from a cold cathode by the application of an electrical field excite a phosphor screen to generate light. This exhibit presented the element technologies utilized in FEDs to achieve high efficiency and high-picture quality in a large-screen display.

Patents and Technical Know-How of NHK
- NHK R&D results benefiting society

This exhibition introduced examples of NHK's patents and technical know-how and had a special "technical cooperation consultation" booth for people seeking such expertise. It also exhibited recent development results from NHK Engineering Services, Inc., which included a 3D HDTV video microscopic operation system and a photoconversion cable for HDTV signals.

Software Radio Modulation/Demodulation System
- Single terminal for digital broadcasting, ITS, and cellular phone

Advances in mobile reception technology have ushered in an era where digital terrestrial broadcasting reception and various mobile communication services, such as ITS* information, can be used in moving vehicles. We presented a software-defined radio technology that describes radio terminal, functions such as broadcasting receiver or cellular phone functions, in software, to allow a single device to receive a variety of services.

* Intelligent Transport Systems

Autonomous Storage System
### - Reliable server for broadcasting stations

Broadcasters expect cost reductions and stable system operations in all of their activities, from program production and transmission to archiving. This exhibition presented an autonomous storage system that will be part of a highly reliable and scalable content server through which multiple users can input and output program contents over a network.

PDP Discharge Simulation Technology
- Reducing system power consumption

Plasma display panels (PDPs) are displays wherein phosphors emit light after being excited by the ultraviolet rays generated during gas discharge. For the development of future large displays, including an ultrahigh-definition model with 4000 scanning lines, we developed a computer simulation of PDP discharge that would permit us to develop large, highly efficient panels with lower power consumption.
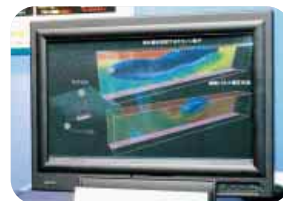
Ubiquitous Web Page Navigation for Broadcasting
- Network service that links to TV from anywhere

Research is progressing toward the realization of a ubiquitous information environment where TV connects to the Internet. We presented an exhibition of a system that allows a PC's browser to automatically access a TV channel using a nearby TV.

Multilingual Machine-aided Translation Technology for Worldwide Broadcasting Services
- Enhancing international broadcasting services

NHK's international broadcasting service, "NHK WORLD," reports the latest news, as well as the latest cultural and social trends in Japan and Asia, via its TV, radio, and Internet services, to a worldwide audience. To enhance these international broadcasting services, we have developed a "translation example browser" that supports efficient translation into 21 languages, by retrieving proper nouns and expressions.

AVC/H.264
- Advanced video coding scheme for digital broadcasting

The AVC/H.264 video-coding scheme is scheduled to be adopted for the digital terrestrial broadcasting service for mobile terminals. This exhibition introduced technologies related to this coding scheme, which suppresses the picture quality degradation suffered at extremely low bit rates.

JPEG2000 HDTV Program Production System
- For efficient single-source and multi-use production

The potential of digital broadcasting service expansion covers a wide range of media, from Hi-Vision (HDTV) to SDTV, the Internet, and low-definition TV services for mobile terminals. This exhibit presented a program production system model using the JPEG2000 video coding standard, by which HDTV video materials can be applied to various types of program production.

Organic EL Luminaire
- An ultra-thin, lightweight, energy-efficient lighting system

We are continuing to improve the efficiency and lifetime of white-light-emitting organic electroluminescent (EL) devices so that they can be incorporated in a lighting system with a diverse range of program production applications. This exhibition presented an organic EL newscaster light with a high luminous efficiency, for which the quantum efficiency was enhanced by the use of phosphorescent material.

Ultrahigh-sensitivity HDTV Handheld Color Camera
- Capturing vivid images of a dark world

Accurate reporting of incidents and emergencies happening at night requires a highly sensitive camera. The ultrahigh-sensitivity HDTV handheld color camera of this exhibit had a HARP image pickup tube with enhanced sensitivity and reliability.

Ultra-small Silicon Microphone
- To construct a microphone with a button-sized battery

With the aim of constructing an ultra-small, durable, microphone system with superior acoustic characteristics, research is advancing on a capacitive microphone made of single-crystal silicon. To expand its range of applications to the consumer market, we succeeded in reducing its drive voltage to half that of the previous model.

HDTV Optical Disk Camera for Broadcast Use
- For a tapeless newsgathering system

Besides easy handling and stable long-term storage capabilities, removable optical disks feature high-speed random access and prompt video editing, two capabilities magnetic tape does not possess. We constructed an HDTV optical disk camera that is capable of quick and efficient processing of all tasks spanning newsgathering and transmission.

Image Pickup Device Using Organic Films
- For an ultra-small color camera with no prism

The current TV broadcasting cameras use a prism to separate light into the three primary colors and three imaging devices to convert the separated colors into electrical signals (photoconversion). Our goal is to create a palm-size broadcasting camera, and our research is advancing on an imaging device using organic film that is capable of separation and photoconversion of incident light.

Ultrahigh-speed High-sensitivity CCD
- Higher pixel number gives more vivid images

Research progresses on an ultrahigh-speed, high-sensitivity CCD imaging device that can be used to capture images of split-second phenomena too fast to be perceived by the human eye. We want to upgrade the device to be useful with an HDTV system, and we created a CCD with an increased number of pixels and higher performance. This exhibit presented a prototype 150-thousand-pixel CCD.

Image Extraction Technology for Sports TV Programs
- Virtual display of pitch and offside lines

Visual effects that link actual video images and CGs are being employed to create easy-to-understand sports program broadcasts. We want visual effects technology to be able to synchronize CGs with the movement of a subject, and we created a system that can automatically extract a baseball or soccer player from video data and display the composed CG and player in a real-time manner.