Overview of NHK STRL

NHK Science & Technical Research Laboratories (NHK STRL) is the research arm of Japan's public broadcasting corporation, Nippon Hoso Kyokai (Japan Broadcasting Corporation). STRL was established in 1930, five years after NHK launched Japan's first radio broadcasting service. For over 70 years, it has specialized in research and development of broadcasting and related technologies. STRL will continue to promote broadcasting in the 21st century. Its new research facility was opened in April 2002.

Research Activities

STRL's overall goal is to facilitate the creation of new forms broadcasting. To do so, we feel it is important to study emergent technologies and to improve current broadcast technologies. Our activities range from fundamental research on human vision and audition, physics, and materials science to the development of complete broadcasting systems and services.

■ Advanced ISDB

Research on ISDB (Integrated Services Digital Broadcasting) is intended to provide broadcasting services that will enrich the viewer's cultural life. BS digital broadcasting, which was launched in 2000, is one example of ISDB. The focus of ISDB is on *seamless services* (seamless programs use several transmission media and can be accessed any time and anywhere) and home information networks (television-centered services that use a large-capacity home server to store television programs).

Another important research focus of ISDB is *barrier-free information technology* that makes this wealth of services available to everyone.

■ Contents production technology

Research into *'intelligent', efficient contents production* is meant to reduce the cost and to ease the technical burdens of television program production that often limit the choices of producers and talent in creating new audiovisual expression. Additionally, this research has yielded equipment for live broadcasting of breaking news, including super-sensitive cameras and small, lightweight devices for news gathering and transmission. This reflects NHK's responsibility as a public broadcaster to supply precise information to help protect lives and property in the event of a disaster.

■ Future broadcasting service and fundamental technology

Research on *'super-surround' audio-visual systems* includes an ultrahigh-definition system (4000 scanning lines) that outperforms HDTV in terms of picture sharpness, auto-stereoscopic television, and a 3D acoustic system.

The development of *new transmission technology and frequencies* centers on the use of the frequency band allocated to broadcasting satellites (21 GHz and above).

Materials and devices research may lead to technological breakthroughs giving rise to radically new broadcasting services. Research topics include small ultrahigh-sensitive image pickup devices, foldable displays, and very small super-dense recorders that can record HDTV pictures for hours.

ORGANIZATION

NHK Science & Technical Research Laboratories

Planning & Coordination
Planning and management of research work, international correspondence, public relations on research issues

Multimedia Services
ISDB services, next-generation program production, ...

Digital Broadcasting Networks
Terrestrial ISDB, optical fiber transmission systems, ...

Digital Satellite Broadcasting Systems
BS digital transmission systems, millimeter-wave systems, ...

Advanced Audio & Video Coding
Next-generation digital compression systems, multimedia coding, ...

Three-Dimensional Audio-Visual Systems
3-D images, 3-D sound systems, ultrahigh-definition systems, ...

Human Science
Human-friendly broadcasting, image and speech recognition technology, human interfaces, ...

Recording Technology & Mechanical Engineering
Ultrahigh-density recording, mechanical engineering, ...

Advanced Imaging Devices
Imaging devices, IC devices, ...

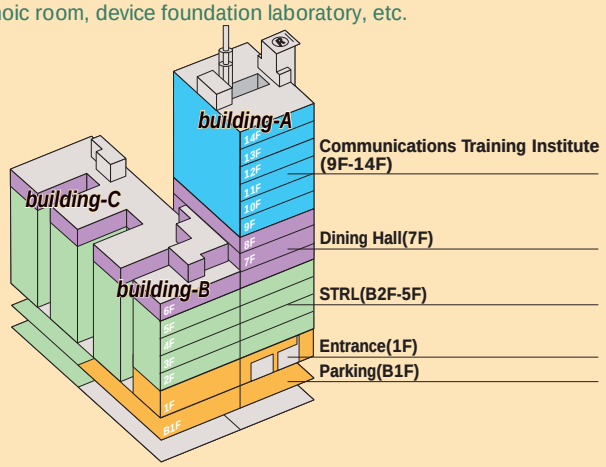
Display and Optical Devices
Display devices, optical devices, ...

General Affairs
General affairs and personnel

Personnel:287

RESEARCH FACILITY

STRL occupies the first five floors and basement of the NHK facility in Kinuta, Tokyo. The facility has a variety of special experimental laboratories, including experimental studio, ISDB laboratory, sound anechoic room, device foundation laboratory, etc.



Seamless service

Digital terrestrial broadcasting

To deliver digital terrestrial broadcasting signals nationwide, relay stations have to be established. To compensate for the distortion of terrestrial digital broadcasting signals due to transmission conditions, we are developing a high-performance diversity reception system, coupling a loop interference canceller and a long-delay multipath equalizer. We are also developing a diversity reception system that will allow a user to receive broadcasting services in a car.

Broadcasting systems based on a home server

Examinations are underway on broadcasting services based on home servers, through which a user will be able to utilize broadcasting contents stored at the receiving side or contents accessed on the broadband internet. These services are expected to transform the television into an integrated services terminal that fuses broadcasting and communications.

Barrier-free information technology

Easy-to-use TV for anyone

Receiver operations are becoming more complicated as the selection of TV broadcasting services expands with the proliferation of digital BS broadcasting and digital terrestrial broadcasting. It is also becoming more difficult to operate peripherals. We constructed a TV system in which the viewer operates the receiver and peripherals with a dialogue interface. This system can recognize the viewer from his or her facial features and voice and can give responses appropriate to him or her.

Intelligent, efficient production system

Automatic program production

A system that automatically produces television programs from scripts written in the TV-making language (TVML) is being developed. In a language education program, for instance, a human operator only needs to insert individual topics into the script template; the system will then automatically produce the rest of the program. We developed a prototype TV4U system that uses TVML to automatically create (at the receiver) sports programming that matches the individual viewer's preferences.

'Flexible' production system

Advanced virtual studio

The advanced virtual studio can freely combine images from real studio sets with CGs. This system requires no special blue background, yet can naturally combine images from virtual sets by using an Axi-Vision camera (a camera that measures the distance to a subject in addition to recording ordinary video) and an intelligent robot camera programmed with the knowledge of an experienced cameraman.

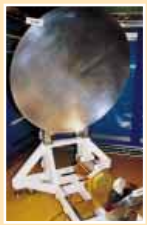
Super-surround audiovisual broadcasting system

Ultrahigh-definition, wide-screen system with 4000 scanning lines

The ultrahigh-definition image system will be part of a future medium that will convey a heightened sensation of reality to a viewer. The experimental camera and display system has four times the scanning lines of the ordinary Hi-Vision (HDTV) system (approx. 4,000 lines).

New transmission technology and frequencies

Next-generation satellite broadcasting system



The 21-GHz band, which is expected to be utilized by advanced satellite broadcasting systems in the future, shows significant rain attenuation for satellite broadcasting signals. To support a high-data-rate satellite broadcasting service in this band, STRL is studying rain attenuation compensation and fast transmission technologies.

Materials and devices

HARP image pickup technology

With 100 times the sensitivity of an ordinary camera, the HARP (High-gain Avalanche Rushing amorphous Photoconductor) pickup tube is ideal for emergency broadcasting and other applications. A new prototype imaging device, a field emitter array image sensor with HARP target, has been developed for use in an ultrahigh-sensitivity compact camera.

Flexible display

A flexible, rollable, display device can be made from a liquid crystal film or EL device. We have developed novel polymer materials whose emission mechanism is phosphorescence, in order to improve the quantum efficiency of polymer EL devices. The hope is that such displays will be foldable.

High-speed recording on a phase-change optical disk

An optical disk is a recording medium that has superior ease of handling and a random access capability. We recently fabricated a high-density optical disk with a high-speed recording capability, and conducted a high-speed reproduction experiment, attaining a recording density of 2.6 Gigabits per square centimeter and a data speed of 200 Megabits per second. With this new high-speed, high-density optical disk, we can record HDTV video signals in the HDCAM VTR compression format currently used for news gathering.