Overview of Laboratories

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 a new broadcasting culture. 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. One focus of our ISDB research is seamless services (seamless programs use several transmission media and can be accessed anywhere and anytime) 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 the 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 burden 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 broadcasting organ to supply precise information to viewers to help protect lives and property in the event of 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-sensitivity image pickup devices, foldable displays, and very small super-dense recorders that can record HDTV pictures for hours.
Seamless service
Terrestrial digital 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.

Barrier-free information technology
Captioned broadcasting service for the hearing-impaired
For the hearing-impaired and the elderly, we have developed speech recognition technology that can efficiently generate real-time closed captions of live broadcasts. This system has been used in broadcasts of programs such as "News 7", the Salt Lake City Olympic Games, the FIFA World Cup 2002, and the Grand Sumo Tournament.

Intelligent, efficient production system
Face Recognition technology
We have recently constructed a prototype video editing support system that uses face recognition technology to detect individuals. When a facial image is entered into this system, it retrieves video scenes containing the specified subject. To do so, indexing data is attached to each video scene.

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.

'Flexible' production system
Advanced virtual studio
An 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).

Development of 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 used in emergency broadcasting and other applications. A new prototype imaging device, a field emitter array image sensor with HARP target, has been developed by STRL with the aim of achieving 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 2.6 Gigabits per square centimeter recording density at a 200 Megabits per second data speed.