独立行政法人
情報通信研究機構
NICT NEWS
National Institute of Information and Communications Technology

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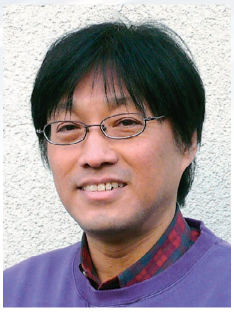
APR 2010
4

NiCT

Dependable, Secure Body Area Network

Low-power and secure, short-range wireless network supporting a super-aged society



Masahiro Kuroda

Manager, Standardization Promotion Group,
Research Promotion Department

After receiving an M.E. degree in systems science from the Tokyo Institute of Technology in 1980, joined Mitsubishi Electric Corp. before joining the Communications Research Laboratories (currently NICT) in 2002. Engaged in R&D on Unix OS development, Java standardization activities for mobile phones, Next Generation mobile networks, and R&D for low-energy and secure Body-Area Networks (BAN) focusing on health and medical fields. Currently working on standardization activities. Doctor of Engineering.

Wireless networking technology placing no burden on patients

Promoting the fields of medical care, nursing and health services has been made one of the growth strategies for Japan. Healthy and longevity are key words in these fields, and it is important for individuals to manage their own health, using preventative measurements with ease to avoid illness.

There is a need for healthcare and medical services that anyone can use easily and with confidence, enabling individuals to monitor their own health and providing appropriate data response in emergency services. To achieve this, compact and light-weight bio and vital sensors that are easy for users to manage as well as portable devices to gather data transmitted wirelessly and securely from these sensors are needed. We have developed a secure, power-efficient, short-range wireless network as well as sensors that are easy to operate and ensure the user's privacy.

The Ubiquitous Medical (UMe) Project

The Ubiquitous healthcare and Medical System (UMe, "Yu-me" means Dream in English) Project is attempting to bring together and develop practically, technical skills and know-how from various companies that have collaborative relationships with the Kanagawaken Yobouigakukyoukai (Kanagawa Preventative Medicine Association), the School of Medicine at Yokohama City University, and NICT.

In various projects, researchers are reporting results on health monitors, sets of sensors, and the systems that they comprise. However, these projects focus on research-oriented measurement instruments, and in many cases there are no plans to develop really usable equipments after the projects have completed. In basic objective of this project is to provide (1) sensors that impose as little burden on the users as possible and, (2) a power-efficient short-range wireless network composed of these sensors and able to provide security from the user's perspective, achieving health management in a variety of scenarios including medical examination centers, hospitals, homes and outdoors (Figure 1).

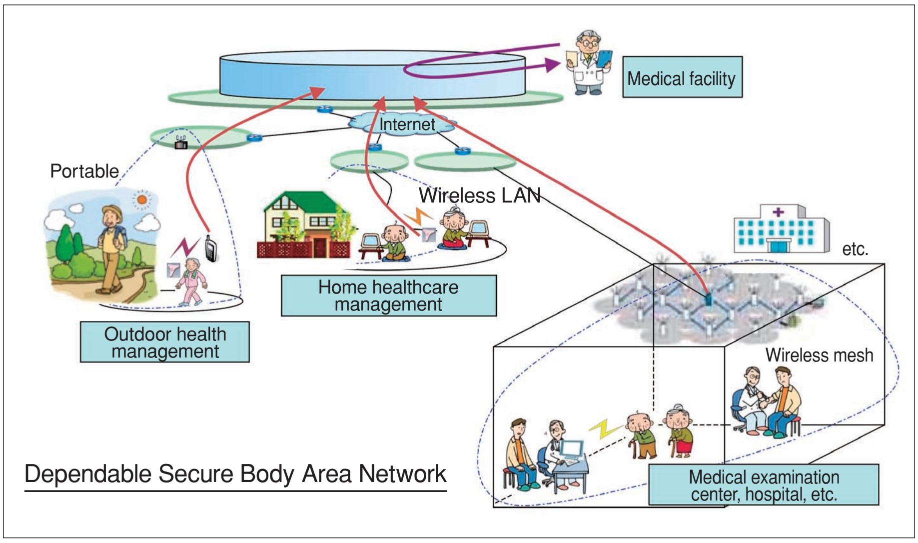


Figure 1 ● Image of the Ubiquitous Healthcare and Medical System

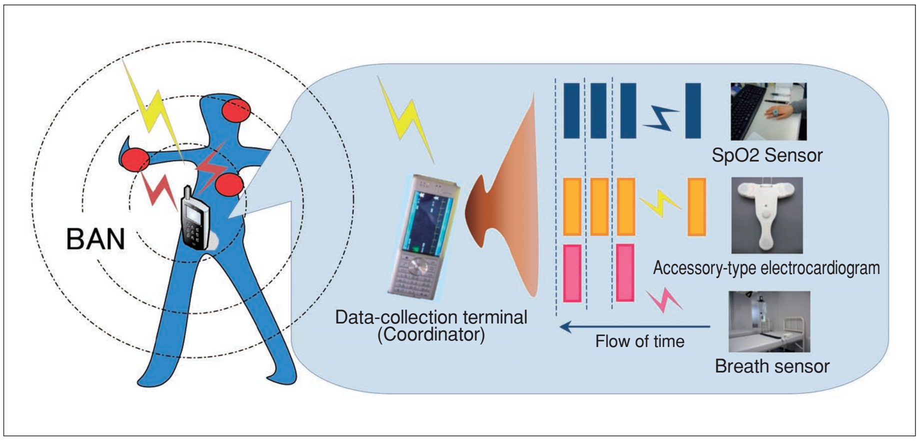


Figure 2 ● Image of Sensors Sending Data to a Data-collection Terminal

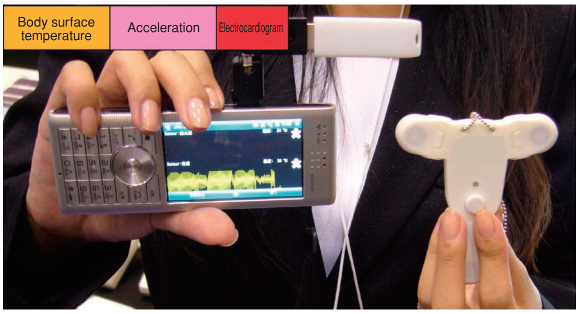


Figure 3 ● Second Generation Accessory-type Bipolar-lead Electrocardiogram Sensor which is attached to the body (right)

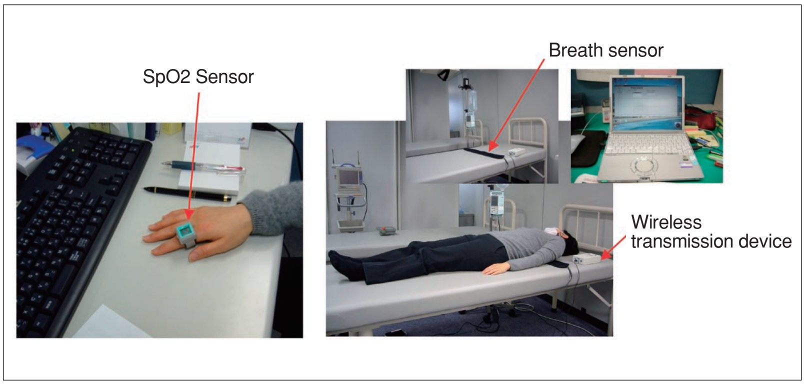


Figure 4 ● SpO2 and Breath Sensors

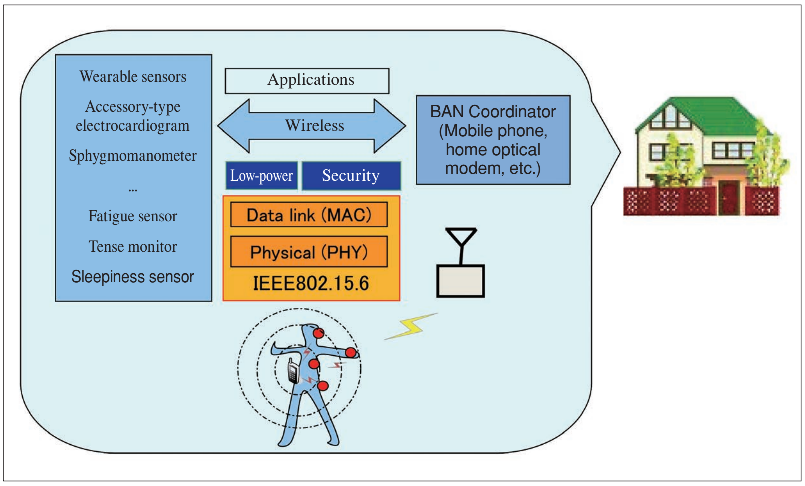


Figure 5 ● Relation between IEEE 802.15.6 and Power-efficient Network and Security Functions

Body Area Networks

Body Area Network (BAN) refers to a power-efficient short-range wireless network that connects a set of sensors to a portable terminal which collects data from the sensors. Such a network would be formed surrounding the body, eventually connecting up to 100 or more sensors attached to the body surface or embedded within it in the future. An example of a BAN is shown in Figure 2, with a portable terminal (coordinator) gathering data wirelessly from small bio-sensors on the body. Sensors spend almost no time standing-by for wireless data reception, saving a significant amount of power. The data collection terminal maintains the biological data received from the sensors in flow of time, achieving low power even while preserving privacy and without the need for special encryption configuration, through use of an automatic key-generation method. In these ways, the BAN developed in this project achieves a practical network that places little burden on the user.

Compact bio-sensors

One example of a compact bio-sensor is the accessory-type bipolar-lead electrocardiogram (accessory cardiogram) shown in Figure 3, which detects arrhythmia (an irregular pulse) and sends an emergency alert. This accessory electrocardiogram is able to measure the cardiogram, physical posture, and body surface temperature at the same time, and can be worn around the neck like a pendant. It was developed in collaboration with the School of Medicine at Yokohama City University. It uses dry rather than gel-type terminals, so they do not cause a skin rash when in contact with the skin.

The user can operate it as necessary by pressing a button on the outside through their clothing, when they feel ill for example. With this operation the electrocardiogram data, physical posture, and surface temperature are measured, encrypted, and sent to the data collection terminal. The electrocardiogram uses a compact rechargeable battery, weighs 19 g, and can take continuous measurements for over 24 hours. When electrocardiogram data is only gathered occasionally when necessary by pressing the button, it should operate for more than a year.

Other sensors

Besides the accessory electrocardiogram, we have other sensors, including a pulse-oximeter ring and a breath sensor.

The pulse-oximeter ring monitors pulse and the percutaneous oxygen saturation, so it is also called an SpO2 sensor. Like the electrocardiogram described above, this sensor operates on an internal rechargeable battery and is able to send encrypted data continuously for 24 hours to the data collection terminal.

The breath sensor is a piezoelectric element* sensor that is able to continuously gather various types of data related to breathing during sleep, monitoring aspects like depth of sleep. It is spread out under the sheet, so it is able to gather data continuously during sleep (Figure 4).

Standardization

The IEEE 802.15.6 working group is working on standardization of the Media Access Control (MAC) layer, which is a lower sub-layer for the physical and data-link layers for short-range wireless communications networks and applies to BAN. We expect to convert the BAN discussed here to IEEE 802.15.6, optimize the data transfer and synchronization mechanisms between sensors and the data collection terminal, and implement the automatic encryption-key generating network over existing wireless modules.

Currently, the Medical ICT Group in the New Generation Wireless Communications Research Center at NICT is taking a central role in defining IEEE 802.15.6 standardization. This BAN will ultimately satisfy IEEE 802.15.6.

Future Prospects

Here, we have introduced some R&D results on wearable power-efficient sensors and a secure short-range wireless network that are practical for users. To finally achieve ubiquitous healthcare and medical services, it will be necessary to confirm its worth in preventative health and medical examination. Also, bio and vital sensors that are generally safe and easy to use must be readily available around the world. We intend to continue to work toward these goals.

This research and development was conducted while the author was part of the Medical ICT Group in the New Generation Wireless Communications Research Center.

* Piezoelectric element: The word piezo means "to apply pressure" in Greek. These materials change shape when electricity is applied to them, and they are used for on/off switches and other applications.

NerveNet: A Regional Information Sharing and Communication Network, Enriching Local Lifestyle and Society

Sensor actuator networks[*1] as infrastructure

Masugi Inoue

Research Manager, Network Architecture Group,
New Generation Network Research Center
After completing a doctoral degree, joined the Communications Research Laboratory (currently NICT) in 1997. Engaged in research including ultra-high-speed wireless LAN in the millimeter-wave bands, 4th-generation mobile communications, and New Generation Networks. Doctor of Engineering.

NerveNet - Acting as a regional nervous system

In future society, overflowing with huge amounts of information, it would be helpful to create an environment that automatically delivers appropriate information to each individual at appropriate times, reducing time and costs in search for information. Also, the "Haraguchi Vision" from the Ministry of Information and Communications (MIC), set out policies for regional revitalization through ICT.

For New Generation Networks beyond 2015, networks would equip information and services to local residents, society, and to people visiting a region at appropriate times, and those could be relied upon even in times of disaster or emergency. These features would be provided by the "NerveNet" regional information sharing and communication network. Sensors connected to the network would perceive the weather, traffic, disasters, crime, regional events, family and individual movements. Based on this information, they would provide the information and services needed for localities or individuals. In the future, they could even send commands to robots connected to the network. NerveNet would provide this sort of regional nerve network, which is why it was so named.

Three functions required for a regional platform in the future

Providing a "platform" function is one of the important functions of the "NerveNet". A child-minding system that reports to families when their children pass certain locations on the way home and from school has been demonstrated in several areas, but the cost of building and running such a system would be high, making it difficult to implement in the current conditions. To reduce the relative cost of the implementation, a key is to build the network as a platform able to provide a variety of applications, rather than building a network and system providing only a single application.

The second required function is "Self-organized, Automatic Network Building". In order to build a suitable network to meet the local needs of companies, NPOs and government agencies providing regional information services, an arrangement that is easy to install and establish connections automatically, whether wired or wireless, is very important. To have continuous networking functions, even in times of natural disaster, the network must be able to change its structure autonomously to maintain function, even when part of the network goes down.

The third required function is "Safe and reliable transmission" of sensor data. Currently, the general approach is to have users login to a web site or corporate network remotely by entering a user ID and password from their mobile phone or PC. Also, the storage location of a user's mail and files and the communications path used to reach them are unknown, which presents both the advantages and disadvantages of the cloud. In the future, public information such as the weather, together with important personal or corporate information, will be transmitted by sensors with no human intervention. A mechanism to deliver such sensor information safely and reliably to the prescribed destination is needed.

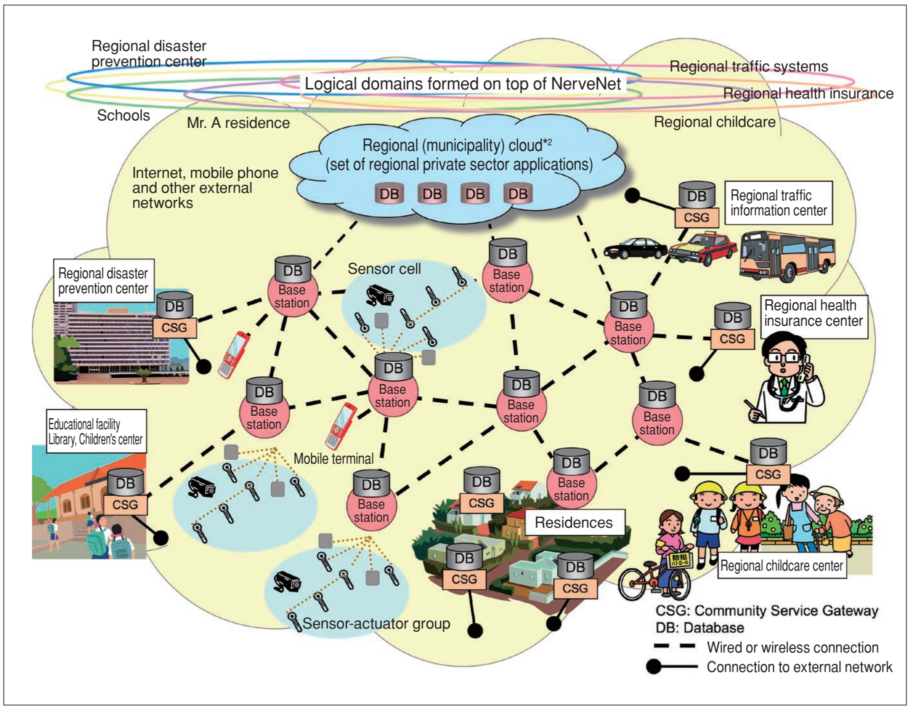


Figure 1 ● Basic structure of the NerveNet Regional Information Sharing and Communication Network

*1 Sensor-actuator network: A communications network, including routing and addressing for constituent nodes, able to sense (sensing) and analyze (data processing) a variety of environmental or biological data. It can also physically manipulate (actuation) the environment or organism based on sensing and processing results by performing this basic operating cycle periodically or on-demand. This term may also indicate a cooperative system including such a network and a series of data processing systems.

NerveNet: Integrating decentralized communication control and decentralized information processing

End terminals, such as mobile terminals, sensors and actuators, are accommodated by densely deploying base stations able to connect with each other through wired or wireless connections (Figure 1). Community Service Gateways (CSG) are placed in various regional centers, educational facilities, companies providing services, and private homes. Each CSG forms various logical domains on the network and manages the end terminals attached to it. It also operates various types of applications using the sensor data stored in its database, providing information and services to end terminals. For example, the CSG in Mr. A's house manages the registration, connection and location information for mobile terminals owned by his family. His family's location information is not provided to any third parties, and can be used such as monitoring children or measuring walking distances for health management. NerveNet can accommodate CSG in various types of organization, including households, and can function as a platform to provide all types of services for disaster prevention, health and medical care, social services, transportation, education and other government, civil or private services.

Base stations search for other neighboring base stations and establish a wireless connection with them. Then, by searching for communication paths reaching the remote station, multiple alternative paths can be discovered. Then, even if communication is interrupted, it will be able to switch to another communications path. Network configuration and maintenance is self-organized and automatic in this way.

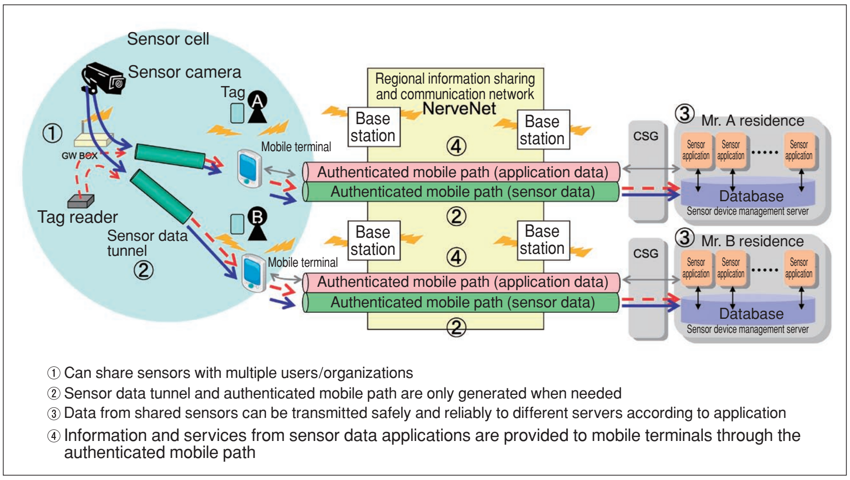


Figure 2 ● Safe and reliable transmission of data by authenticated mobile path

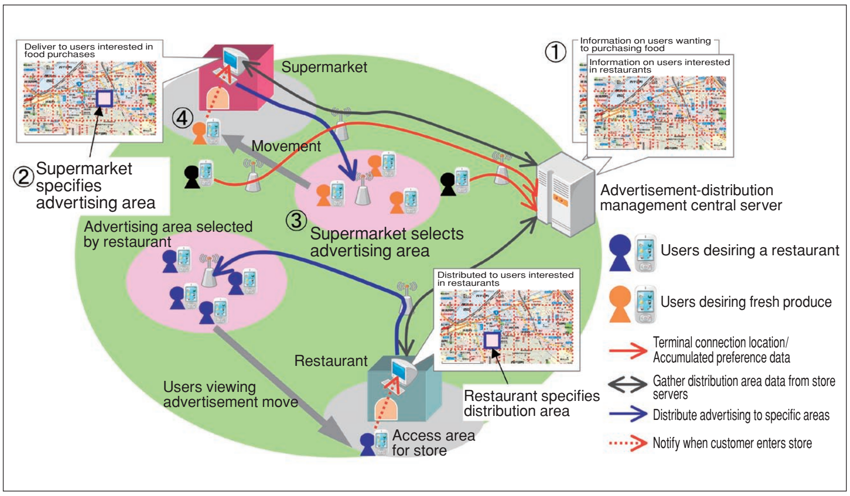


Figure 3 ● Electronic advertising delivery system, delivering to interested users without using personal information and with confirmation of its effectiveness

The mechanism for transmitting sensor data safely and reliably, shown in Figure 2, is described below. (1) The sensor signal is transported to a mobile terminal by (2) generating a sensor data tunnel, and then an authenticated mobile path is generated to transport the data to the CSG where it is stored in the DB. This is only done when it is required, and then only when certification between the mobile terminal and the CSG has been confirmed. (3) This achieves safe and reliable transport of the sensor data. Another feature of this mechanism is that multiple people or organizations can share use of the same sensors. (4) Information and services based on the sensor data can be provided through mobile terminals using the same authenticated mobile path as used in (2).

Another feature of NerveNet is that base stations are equipped with a DB and can perform decentralized information processing. Information that many users need is constantly registered with NerveNet and stored in the database. For example, users interested in information about time-limited sales at any nearby stores, without selecting specific stores, could be notified by nearby stores based on the current time and their location. The DB in the base station is also able to store important data in distributed storage, such as what users are connected, or locations of nearby Automatic External Defibrillators (AED), so that during disaster users can check the state of the area before the disaster by connecting to operating base stations and retrieving the information.

Sample NerveNet Application: Interactive electronic advertising distribution

For FY2009, there was a proposal for "R&D on a real-time advertising system for regional businesses based on user context" in the Strategic Information and Communications R&D Promotion Programme (SCOPE) from the Ministry of Internal Affairs and Communications (MIC). By inserting advertising into newspapers, the distribution can be controlled to some extent, but it is not possible to know precisely who has received it or to determine quantitatively how effective the advertising is. This research used attributes configured on a mobile terminal such as interests, as well as current location, but did not make use of personal information such as users' names or addresses. New advertisements are delivered to locations the store believes will have many people desiring their services, and the system allows the store to determine the effectiveness of advertisements quantitatively (Figure 3). The system automatically detects whether users actually enter the store after viewing advertising, and this information can be provided to indicate effectiveness quantitatively. Delivery can be optimized by adjusting the users targeted, area and timing. This is an example of an application made possible by NerveNet.

Future Developments

We plan to prepare a test bed within the NICT Headquarters facility (Koganei) and test performance in a large-scale environment. As part of this, we will build a subset of NerveNet with the cooperation of regional governments, and we plan to conduct demonstration tests with user participation. We will then improve the technology, have the users try the new applications, and show them the effectiveness of this new type of ICT. We plan to make use of results from this research in the design of New Generation Networks.

*2 Regional cloud: Using cloud computing technology spreads the cloud concept to the general population to increase efficiency, and reduce cost of regional government administrative systems. The authors define regional cloud to include systems of regional private businesses and systems providing regional services. The regional cloud aims to promote growth of services being offered by local governments, to attract business to the region and help create jobs.

Visualizing Electromagnetic Fields Emitting from Electronic Devices

Research and Development on Electromagnetic Field Distribution Measurement using Optical Crystals

Hiroyasu Ota

Senior Specialist Researcher*, Industry Collaboration Group, Collaborative Research Department, Sendai Research Center

After receiving an M. E. degree, joined Sony Corporation in 1977. Senior researcher at Electromagnetic Compatibility Research Laboratories Co., Ltd. since 1996. Transferred to the Sendai Research Center (NICT) in 2005 and currently engaged in research on high-frequency electromagnetic field measurement technology using optical crystals.

* Affiliation at the time of writing. The Sendai Research center has been closed as of the end of March, 2010. Current affiliation is in the Research Dept., Sendai R&D Center of Oi Electric Co. Ltd.

Increasing problems due to interference from electromagnetic radiation

Recently, electronic devices making use of weak radio waves in the GHz band and low amplitude electrical signals have become widespread, leading to increasing problems with degraded communications, due to electromagnetic interference between devices and interference within devices themselves. In order to resolve these types of difficulty, we need to be able to accurately measure the electromagnetic wave distributions surrounding electronic devices, to investigate the causes, and to measure the efficacy of any corrective measures taken.

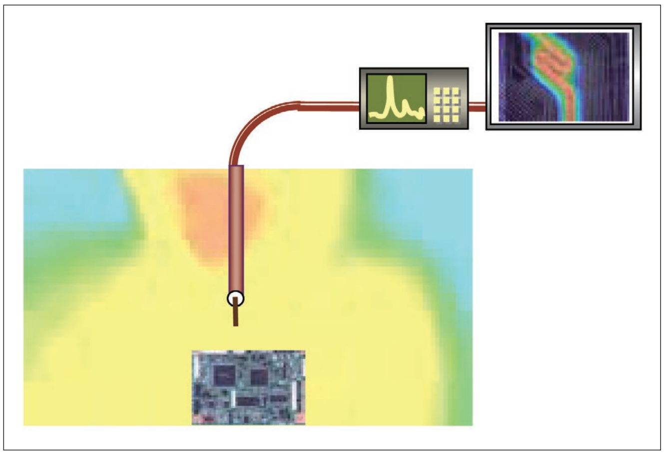


Figure 1 ● Measurements Taken with a Conventional Probe

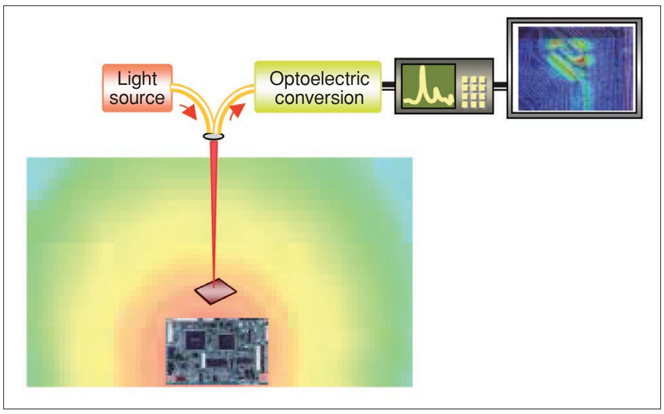


Figure 2 ● Measurements Taken with the Optical Electromagnetic Probe

Measuring electrical and magnetic fields using light

In order to measure the electrical and magnetic fields near an electronic device, generally a probe with a small linear or loop antenna attached to the end of a metal coaxial cable is used. In case the frequencies are high, the probe and metal cable changes the original electromagnetic field distribution as shown in Figure 1, therefore, it is difficult to obtain accurate measurements.

On the other hand, it is well known that electromagnetic field distributions can be measured with minimal disturbance to the field by placing an electrooptic or magnetooptic crystal, with optical properties such as refractive index that changes according to the strength of the surrounding electrical or magnetic field, near the object being measured. Then the field can be read by exposing the crystal to laser light and measuring the rotation of the polarization plane*1 as shown in Figure 2.

However, these methods, which make use of optical crystals and light beams (of diameter 0.1 mm or less), suffer from a loss of sensitivity compared to regular measuring methods because of significant losses that accompany the increased amount of processing to convert electrical to optical signals. There are also other difficulties such as the fact that magneto-optical crystals, which respond to magnetic fields, have poor characteristics at high frequencies.

At the Sendai Research Center, we have been conducting R&D to improve the sensitivity of an electromagnetic field distribution measuring system which uses these electrooptic and magnetooptic crystals, and also to enable use at high frequencies up to 60 GHz.

A loop-coil optical electromagnetic field probe, achieving high sensitivity

In order to increase measurement sensitivity, we developed an electrooptic crystal probe combining a small loop-coil and an organic crystal of DAST (4-N, N-dimethylamino-4' -N' -methyl-stilbazoliumtosylate), which is a material whose reflectivity changes significantly with electric field (electrooptic effect). The current flowing in the crystal and coil has a characteristic resonance frequency, and by using this, we are able to measure electromagnetic waves with extremely high sensitivity. We are also able to measure high-frequency electromagnetic fields up to 60 GHz using a very

*1 Rotation of the polarization plane of light: Light is a type of electromagnetic radiation, in which an electrical field oscillates perpendicular to the direction of propagation. This quantity refers to the change in direction of this oscillation before and after passing through the optical crystal.

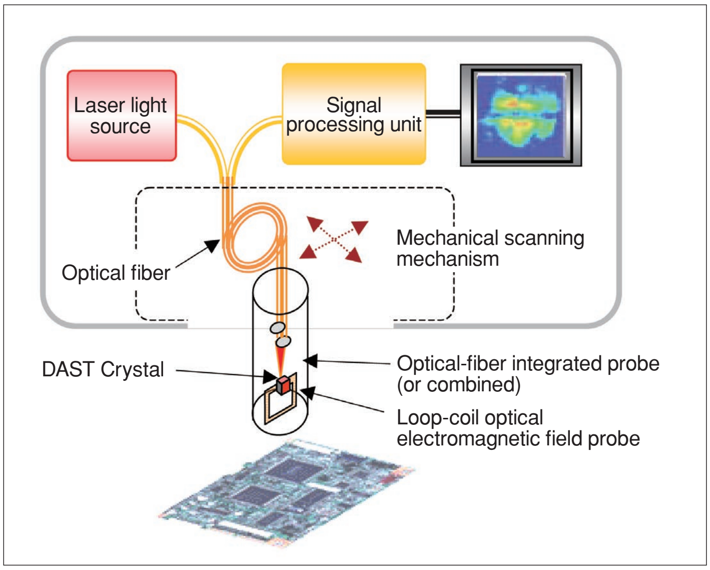


Figure 3 ● Probe-scanning Measurement System

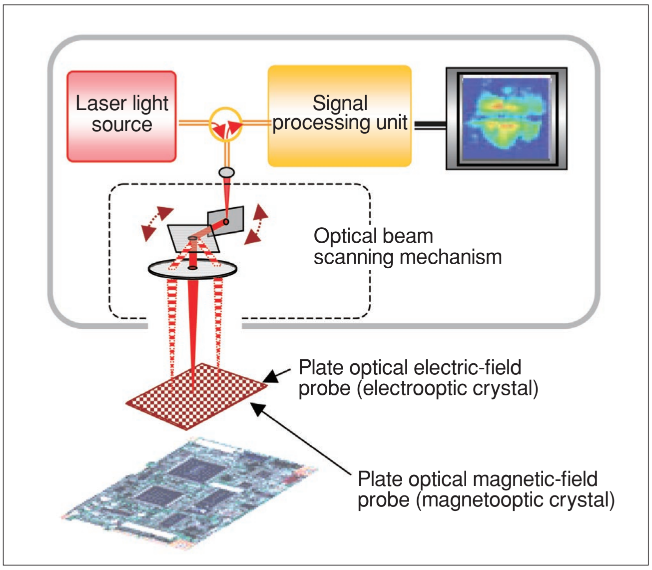


Figure 4 ● Optical Scanning System

small, 0.3 mm square loop-coil and DAST crystal probe.

We integrated this loop-coil optical electromagnetic field probe with optical fiber, and installed it in equipment able to mechanically scan the inside of a space, completing a system able to measure the electromagnetic field distribution surrounding an electronic device, as shown in Figure 3.

Measurements by optical beam scanning

The measuring system in Figure 4 is able to measure the electrical or magnetic field distribution over a fixed area at high speed and produce a visualization by placing a plate electrooptic or magnetooptic crystal near the item being measured and scanning it using a fine light beam of diameter 0.1 mm or less. For the magnetooptic crystal, we conducted a study starting with the composition of the material, and using the ferromagnetic resonance phenomenon, we were able to develop a magnetic garnet single-crystal film*2 able to measure frequencies over 30 GHz.

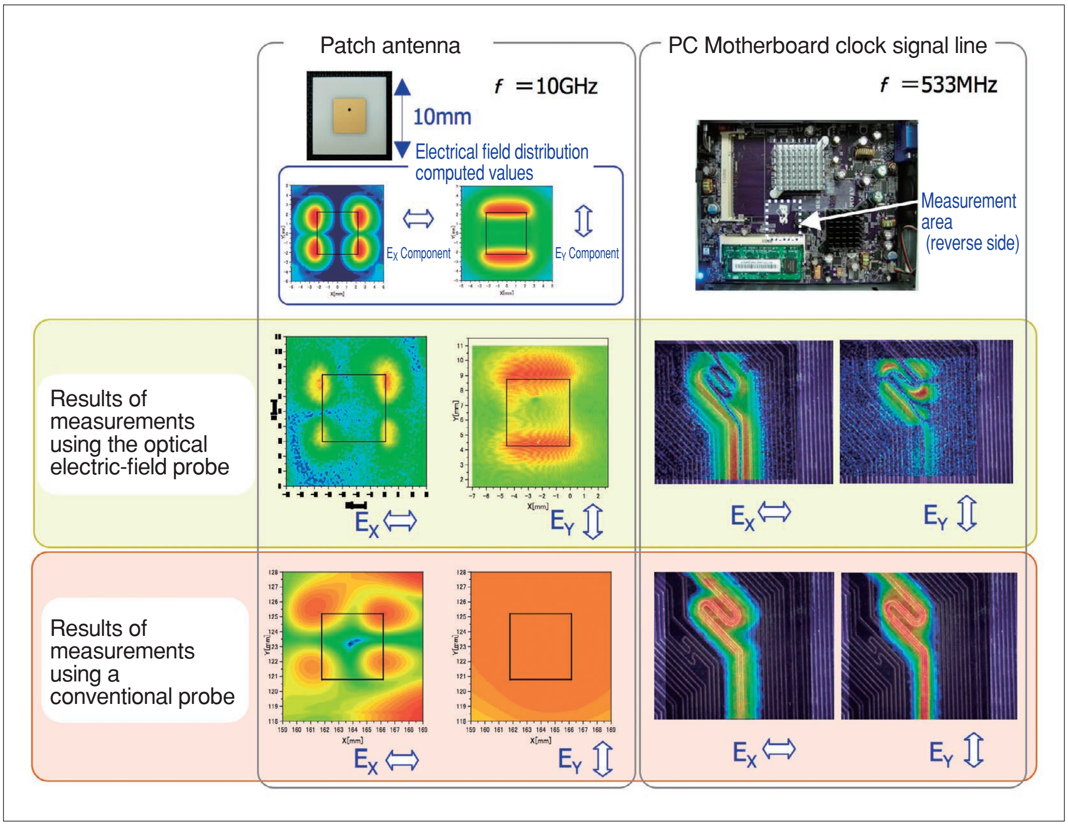


Figure 5 ● Patch antenna and electrical field distribution over a PC motherboard

Further, by forming these electrooptic and magnetooptic crystals into fine arrays of 0.2 mm squares, the probe also has only minor effect on high-frequency waves, allowing accurate measurements. With the measuring system prototyped in this project, electrical and magnetic field distributions over a 50 mm square area can be measured and a visualization created at high speed, scanning a single point in 2 ms.

The left of Figure 5 shows an example measuring 10 GHz electromagnetic waves emitted from a patch antenna approximately 4 mm square. With the conventional metal probe, coupling was too strong and it was difficult to get accurate measurements. On the right in Figure 5, measurements of the electrical field distribution above a clock signal line on a PC mother board are shown. With a conventional coaxial probe, it was not possible to determine the direction of the electrical field, but with the electrooptic probe, the direction is clearly represented.

Future Prospects

Electronic devices will continue to be miniaturized and to increase in density, and use of wireless communications with weak electromagnetic signals will continue to increase, so technology for analysis and design to help avoid the effects of electromagnetic interference is getting increasingly important.

In this project, we have developed equipment that uses light to create visualizations of electromagnetic field distributions, and we plan to make this equipment more compact and easier to use. This should allow the electromagnetic signals radiating from devices to be analyzed more efficiently, and should be useful in improving the performance of devices and preventing leakage of information.

*2 Magnetic garnet single-crystal film: A crystal formed as a transparent thin film that shows magnetism even at high frequencies. In this project we developed a Yttrium Iron Garnet (YIG) material in which some sites are replaced with bismuth (Bi) or gadolinium (Gd).

Disaster and Crisis Management ICT Symposium 2010 held at the 14th Earthquake Technology Expo/Natural Disaster Recovery Technology Expo

Mamoru Ishii, Director, Project Promotion Office, Applied Electromagnetic Research Center

Disaster and Crisis Management ICT Symposium 2010
—Using Aircraft and Satellites for Disaster Relief—

The 3rd Disaster and Crisis Management ICT Symposium was held at the Earthquake Technology Expo (in conjunction with the ICT Forum for Security and Safety) with the purpose of minimizing loss of human life and property in disaster. We showed various examples of effective countermeasures to natural disasters such as earthquakes or heavy storms with remote sensing technologies such as radar mounted on aircrafts, satellites, and other flying vehicles and wireless communications technology that is robust when a disaster strikes.

We had a fruitful discussion on "Building Systems That Can Actually be Used When a Disaster Occurs", with topics like “Matching Needs with Seeds”. There was also a demonstration of a disaster communications using the Kizuna Wideband InterNetworking engineering and test Demonstration Satellite (WINDS) at the entrance to the venue.

We will continue to advance R&D on technology useful for safety and security in society by strengthening ties between industry and government.

Program Date: February 5 (Fri) 10:00-16:30
Location: Pacifico Yokohama

Opening Speech: Dr. Hiroshi Kumagai, NICT Vice President, Member of the Board of Directors

Guest Speech: Dr. Naoki Okumura, Executive Member of the Council for Science and Technology Policy

Lectures

"Estimating Rainfall Damage through Satellite Observations"
Kazuhiko Fukami (Executive Researcher, International Centre for Water Hazard and Risk Management (ICHARM), Public Works Research Institute)

"Damage Observations using High-resolution SAR"
Masanobu Shimada (Earth Observation Research Center, Japan Aerospace Exploration Agency)

"Earthquake Damage Estimation using DEM from NASA-SRTM3"
Shinsaku Zama (Executive Researcher, Community-based Cooperation Chief, National Research Institute of Fire and Disaster)

"Possibilities for Satellite Communications in the Disaster Prevention Field"
Hiromitsu Wakana (Distinguished Researcher, NICT)

"Initiatives for Disaster Prevention using Helicopter Transmission"
Yutaka Ozaki (Communications Systems Dept., Communications Device Manufacturing Plant, Mitsubishi Electric Corporation)

Panel Discussions
Coordinator: Toshio Iguchi (NICT)
Panelists: Kazuhiko Fukami (Public Works Research Institute)
Masanobu Shimada (JAXA)
Shinsaku Zama (NRIFD)
Hiromitsu Wakana (NICT)
Yutaka Ozaki (Mitsubishi Electric Corporation)
Wataru Kobayashi (Disaster Prevention Staff, Cabinet Office)

Guest Speech: Masataka Kawauchi, Director-General for International and Technology Policy Coordination, Minister's Secretariat, Ministry of Internal Affairs and Communications

Closing address: Toshitaka Tsuda (Kyoto University), Sensing Department Chair, ICT Forum for Security and Safety

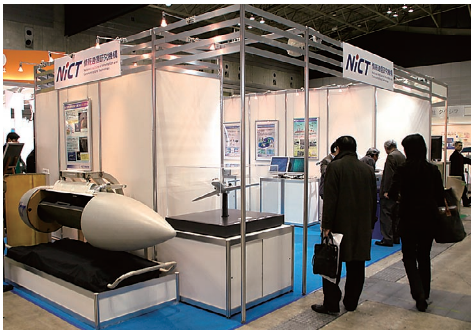
NICT Exhibit at the 14th Earthquake Technology Expo

NICT presented an exhibit at the 14th Earthquake Technology Expo, which was held on February 4 and 5 at Pacifico Yokohama in conjunction with the ICT Forum for Security and Safety. Attendance at this year's event was 9,220 visitors, exceeding last year's of 8,115. There was a continuous guests' presence at the NICT booth .

Technologies were introduced on a large-screen, "tiled display", such as synthetic aperture radar covering wide areas at high resolution regardless of weather or time-of-day. This technology was also used in the Pi-Sar aircraft-mounted system and as part of the TRMM precipitation radar unit. Other technologies, such as "Survivability" mobile phones able to transmit and receive information when a disaster strikes, transmission experiments using helicopters and satellite communications (Heli-Sat system) were also introduced.

Research on assessments of earthquake damage using a Digital Elevation Model (DEM), which has elevation values pre-measured using satellites for the entire earth, also drawing much attention.

Exhibits on the Tiled Display



The "Pi-SAR" Synthetic Aperture Radar System

Introduction to Helicopter-Satellite Communications Transmission tests (the Heli-Sat system)

Topics

Agreement Concluded with Waseda University for Cooperation and Collaboration in Creating More-Sophisticated Optical Communications

Outcome Promotion Group, Research Promotion Department

NICT and Waseda University, who have conducted collaborative research and researcher exchange in individual field, signed a collaboration agreement towards cooperation in wide range of areas including R&D, education, and human resource development, in the information and communications field on February 22, Monday at Ookuma Kaikan of Waseda University,

Based on this agreement, these individual collaborations will be systematically developed, providing much more active support for joint research, sharing equipment and facilities, and exchange among researchers, and further contributing to research progress in the information and communications field in Japan.

Dr. Katsuhiko Shirai and Dr. Hideo Miyahara.

Both of the institutions plan to focus on three issues below.

●Advanced Research on New Generation Communications Networks

Accelerating advanced and fundamental research related to more sophisticated fiber-optic communications technology including optical packet switching and optical code communication.

●Basic Research on Human Interfaces

Advancing basic technologies that will allow high technologies such as NICT's speech recognition and automated translation, and Waseda University's robotics to be integrated and used in applications such as nursing robots that are able to understand speech and provide appropriate care and lifestyle support.

●Initiatives toward International Standardization of Technology Developed in Japan

Promoting broad exchange of research out through the overseas affiliations of both institutions, particularly in Asia, and high-level human resources focusing on international standardization.

International Symposium on the "Kizuna" Wideband InterNetworking engineering and test Demonstration Satellite (WINDS)

Date: February 4, 2010 (Thu)
Location: Science Museum

Maki Akioka, Kaori Sawada, Project Promotion Office, New Generation Wireless Communications Research Center

Vice-ministers Naito(Ministry of Internal Affairs and Communications) and Nakayama(Ministry of Education, Culture, Sports, Science and Technology)

Lively Panel Discussions

Questions Posed by Audiences

"Kizuna" (WINDS) is a wideband Internet satellite developed through collaboration between NICT and JAXA and launched in February 2008 for technical demonstration. It has been producing remarkable experimental results which propose figures of next-generation satellite communications and broadcasting applications, including experiments relaying full Hi-Definition(HD) image of the total solar eclipse from Iwo Jima in 2009, Super-Hi-Vision(SHV) transmissions by NHK, and experiments transmitting real-time HD 3D image of surgery. These works have been introduced widely to the public through various media.

This symposium, jointly held with the Japan Aerospace Exploration Agency (JAXA), had over 300 participants, and featured 13 addresses, including the keynote addresses, and panel discussions. Each of the presenters introduced application experiments such as HD movie transmission from remote islands, systems to support an international fire and rescue team, or initiatives such as using Kizuna for experimental remote medical care.

At the symposium this year, the deputy director of the Thai Geo-Informatics and Space Technology Development Agency participated remotely by HDTV teleconference link via the Kizuna satellite. Also, there were other demonstrations using Kizuna. In collaboration with the Disaster Prevention Research Center of the Fire and Disaster Management Agency and the ATR, NICT conducted an experiment rapidly establishing a provisional communications network between relief teams in a disaster area and disaster response headquarters using wireless mesh networking technology* and Kizuna, calling it a "Survivability Application". In a series of experiments, it was demonstrated that an IP-telephony system and full HD video distribution system covering a fixed area could be set up in approximately three hours, including assembling the earth station. This verified the utility of the system in times of emergency.

In the final panel discussion, seven panelists, including Hiroshi Fujiwara from Internet Research Institute Inc., discussed their hopes for the future with Kizuna. In particular, the importance of space communications technology for a country leading in science and technology, and the role of Kizuna in contributing to science and technology in the Asia-Pacific region were emphasized.

* Wireless mesh networking technology: A technology that enables to establish a network in the form of a mesh, having nodes transmits data to each other by making full use of technologies such as wireless LAN.

Prize Winners

PRIZE WINNER ● **Ved Prasad Kafle** Researcher, Network Architecture Group, New Generation Network Research Center

◎DATE: 5.15.2009

◎NAME OF THE PRIZE:
The ITU Association of Japan Award for International Activities Promotion

◎DETAILS OF THE PRIZE:
For active contribution to the international standardization of next generation network architecture.

◎NAME OF THE AWARDING ORGANIZATION:
The ITU Association of Japan, Inc.

◎Comments by the winner:
Receiving this prize gives me more energy to actively pursue standardization activities based on the results of research on new generation networks. Standardization is important for realizing the new generation network to serve the future society. I wish to continue my activities on standardization while pursuing close cooperation with both Japanese and international organizations.

PRIZE WINNERS ● **Ved Prasad Kafle** Researcher, Network Architecture Group, New Generation Network Research Center
Hideki Otsuki Senior Researcher, Network Architecture Group, New Generation Network Research Center
Masugi Inoue Research Manager, Network Architecture Group, New Generation Network Research Center

◎DATE: 9.1.2009

◎NAME OF THE PRIZE:
Best Paper Award (Second Prize)

◎DETAILS OF THE PRIZE:
For the paper titled "An ID/Locator Split Architecture of Future Networks"

◎NAME OF THE AWARDING ORGANIZATION:
International Telecommunication Union, Telecommunication Standardization Sector (ITU-T) Kaleidoscope Event on Innovations for Digital Inclusion

◎Comments by the winners:
We received this prize for our paper proposing an ID/locator split architecture for use in the new generation network of the future. We have been engaged in standardization activities with ITU-T for the past three years towards introducing the ID/locator-split architecture. This prize even more motivates us This prize even more motivates us to continuously contribute to new generation network standardization in the future.


From the left: Hideki Otsuki, Ved Prasad Kafle, Masugi Inoue

PRIZE WINNER ● **Yukiyoshi Kamio** Senior Researcher, Photonic Network Group, New Generation Network Research Center

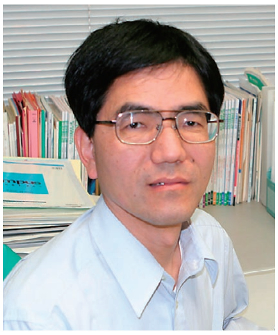
◎DATE: 9.16.2009

◎NAME OF THE PRIZE:
Communications Society: Distinguished Contributions Award

◎DETAILS OF THE PRIZE:
Contribution related to editing of IEICE Communications Society Magazine

◎NAME OF THE AWARDING ORGANIZATION:
Communications Society, the Institute of Electronics, Information and Communication Engineers (IEICE)

◎Comments by the winner:
The third journal of the IEICE was published as a magazine with the goal of providing comprehensive articles. As one of the editors , I was involved in discussions leading to the first issue, including article content, layout style, and editorial guidelines. The editor-in-chief, other editors and associate editors all dedicated themselves to publishing Communications Society Magazine (Japanese edition). I had an invaluable experience. It is a great honor to receive this prize as well. I hope that readers will enjoy Communications Society Magazine, "B-Plus".



PRIZE WINNERS ● **Yasushi Matsumoto** Research Manager, EMC Group, Applied Electromagnetic Research Center
Kaoru Gotoh Senior Researcher, EMC Group, Applied Electromagnetic Research Center

Joint Prize Winners: Takashi Shinozuka
(Telecom Engineering Center, when awarded)

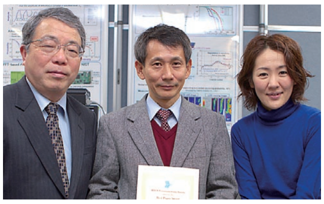
◎DATE: 9.16.2009

◎NAME OF THE PRIZE:
2009 Best Paper Award, IEICE Transactions on Communications

◎DETAILS OF THE PRIZE:
A Method for Converting Amplitude Probability Distribution of Disturbance from One Measurement Frequency to Another

◎NAME OF THE AWARDING ORGANIZATION:
Communications Society, the Institute of Electronics, Information and Communication Engineers (IEICE)

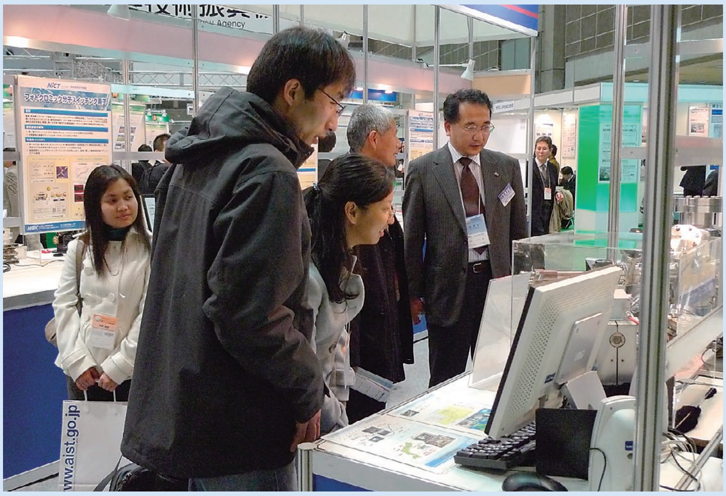
◎Comments by the winners:
With the integration of electronic and wireless communications devices and increasing device speeds, interference to wireless communications due to the wide-band electromagnetic noise emitted from electronic circuits is becoming a problem. In this research, we developed a new method of estimating the frequency dependence of the amplitude statistics of the noise by making some simple assumptions. As a result, we were able to evaluate the effect of the noise on wireless communications, and we were recognized for this achievement. We feel extremely honored to receive this prize, and feel deep gratitude to all who provided day-to-day guidance in achieving it. In the future we hope to work on practical implementations of these results.


From the left: Takashi Shinozuka, Yasushi Matsumoto, Kaoru Gotoh

International Nanotechnology Exhibition & Conference

Report on nano tech 2010 Exhibition and NICT Exhibits

Dates: February 17-19, 2010 (Wed-Fri)
Location: Tokyo Big Sight
Attendees: 42,381



The Kobe Advanced ICT Research Center (KARC) of NICT's Kobe Research Laboratories exhibited at nano tech 2010, one of the largest leading-technology exhibitions in the world. The exhibit centered on the Molecular Photonic Project in the Nano ICT Group, and the Nano ICT and Biological ICT research groups at KARC, together with the Advanced Device Research Group from the New Generation Network Research Center, who introduced their nano-tech-related projects research and technology.

The exhibition booth introduced research demonstrating manufacture of organic electro-optic devices used in optical communications, and announced research results related to molecular array manufacturing technology including low-environmental-impact organic device manufacturing through nano-electrolysis and easy ways for making vacuum environments indispensable for nanotech. The exhibit of a 3D Positioner for Scanning-Probe Microscopes (SPM) showed visualizations of arbitrary locations on actual materials at the nano level, and this attracted much interest from visitors.

Almost 10% of the exhibitors were from outside of Japan, with most of these from Korea and others from Switzerland, France, Russia, Iran, exhibiting the latest R&D and technology from governments and private industries in various countries in the EU and Asia.

On the final day, a "Nano-ICT Symposium" was held, sponsored by the Kobe Advanced ICT Research Center and co-sponsored by the Support Center for Advanced Telecommunications Technology Research Foundation. It outlined the latest research and technology trends in interdisciplinary areas uniting nanotechnology and biotechnology. NICT Senior Researcher Shukichi Tanaka, coordinated the nine lectures.

All together, four researchers from the Kobe Advanced ICT Research Center working on the latest research in these areas gave lectures, including Research Manager Akira Otomo, Researcher Shohei Kobayashi, Specialist Researcher Kenya Furuta, and Senior Researcher Ferdinand Peper. In total, 125 people participated, creating a symposium showing the high level of interest and future developments in this interdisciplinary research area.

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