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NICT NEWS

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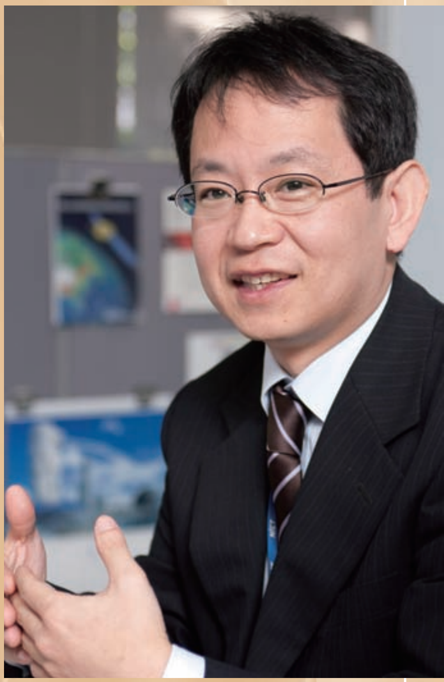
Leadoff Interview

Terahertz Technology Attracting World Attention

Expecting its broad application range from cosmic space, foods, medical care to security



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NiCT

Terahertz Technology Attracting World Attention

Expecting Its broad application range from cosmic space, foods, medical care to security

Iwao Hosako

Group Leader
Advanced Device Research Group,
New Generation Network Research Center

After completing a doctoral course of postgraduate school, worked for NKK (Nihon Kokan) Corporation, served as COE Special Researcher of Communications Research Laboratory, and joined Communications Research Laboratory (current NICT) in 1996. Has been engaged in researches including detector, semiconductor laser, and measurement system working in the terahertz frequency band.

"Terahertz frequency band" has not been so much utilized so far, but it can be applied as technology for safety and security in a broad range of application fields. Development of compact and high-performance devices for practical use is now proceeding.

What is the terahertz technology which is now expanding its application range?

Could you specifically explain what the terahertz technology is?

Hosako: Our target is to raise utilization efficiency of frequency bands by developing novel devices with various frequency bands including photonic band. As part of activities to achieve this goal, we have engaged in research and development of electromagnetic wave frequency range called terahertz frequency band, the frequency band that is positioned between the radio wave and the light wave.

According to the Radio Law, the radio wave is defined as an electromagnetic wave with its frequency smaller than 3 THz. The upper limit of frequency band currently used in the radio wave is millimeter waveband, and it is that frequency bands in millimeter waveband such as 60 GHz and 125 GHz began to be used just recently. However, frequency bands higher than 100 GHz, such as 300 GHz - 10 THz, for example, are almost not yet used. Our research on the terahertz technology aims to promote research and development in such a field that has not been so much utilized until now.

What can we do by using the terahertz technology?

Hosako: With the radio telescope ALMA (Atacama Large Millimeter / submillimeter Array) which is now under construction in Chile of South America, for example, the researchers of the ALMA will be able to observe radio wave bands from tens of GHz to about 1000 GHz by dividing them into several bands. Also in the astronomy satellite "Akari," an imager of about 3 THz is mounted to observe distant galaxies or star formations. We are currently promoting the fundamental research and development exploring for potential, more practical applications in the fields of agriculture and foods, securities, biotechnology, medicines and medical care, various industrial products, and even IT, as well as the use in astronomy like those I mentioned.

What are the specific targets of your research and development?

Hosako: Although our terahertz project started just recently in 2006, few researches previously carried out in and outside Japan were practically applied. Against this background, our target is set to creating devices which can be actually and commonly used in many applications. Specifically, we hope to develop an image camera of terahertz frequency band with real time display capability, a compact system with spectro-chemical analysis capability, devices for using the terahertz frequency band, and other practical devices. We assume to apply these technologies in the fields of safety and security which have been focused these days. For example, it may be interesting if we can develop a device to detect toxic substances contained in foods that cannot be found by X-ray or the infrared technology.

Can we check foreign objects mixed even in packaged foods?

Hosako: Electromagnetic wave of terahertz frequency band almost does not penetrate through water, but will penetrate through ice in a certain degree. While we expect frozen foods will be potentially appropriate target of inspection, those foods in packages using evaporated aluminum cannot be checked because terahertz electromagnetic wave does not penetrate through metal. If people recognize that inspection using terahertz technology ensures safety, however, these packages may be replaced by those except adding evaporated aluminum.

This technology is likely be used in the case such as the frozen jaozi problem last year, isn't it?

Hosako: Since the pesticide which was used in the case shows characteristic spectrum in the terahertz frequency band, it could be found when the sensitivity of detector will sufficiently be enhanced. If it is available, this technology will pave the way of new nondestructive and noncontact inspection methods.

How are these technologies used in the security field?

Hosako: It is said that we can inspect guns or explosives in pockets by using these technologies as counter terrorism measures. We heard the news that a company developed devices by using frequency band of several hundreds GHz, a lower terahertz band, and these devices are already practically applied.

Analyzing classic paintings through terahertz eyes

Hosako: One of the demonstrations concerning how terahertz technologies are used is analysis of classic paintings. Even though they look like the same color as white or blue from human eyes, their spectrums are different through terahertz frequency bands. Using these frequency bands, we can map where specific substances are located. The reason why we apply this technology to the analysis of paintings at first is because paint materials consist of relatively pure substances. Applying this technology in other fields will require a higher sensitivity to detect particular substances in mixed circumstances, however, which has great potentiality to be attained in years to come.

What field is promising in the future?

Hosako: The primarily important areas include security, bio-medical, and foods. The ICT related market will emerge in the next stage.

What is the goal of your future research on the horizon?

Hosako: Previously, terahertz waves were assumed not to be used for wireless transmission because of their shorter propagation distance affected by large atmosphere absorption. In addition, generation and detection of terahertz waves needed too much cost, which could be carried out only in large facilities. These are the reason why the research in this field has not been advanced until now. According to this understanding, we anticipate that it is significantly important to develop compact systems based on semiconductor lasers and semiconductor technologies, which are very much likely to be achieved in small size and with lower cost.

Thank you very much.

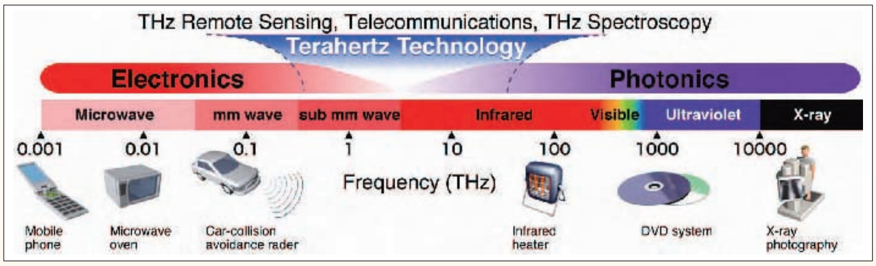
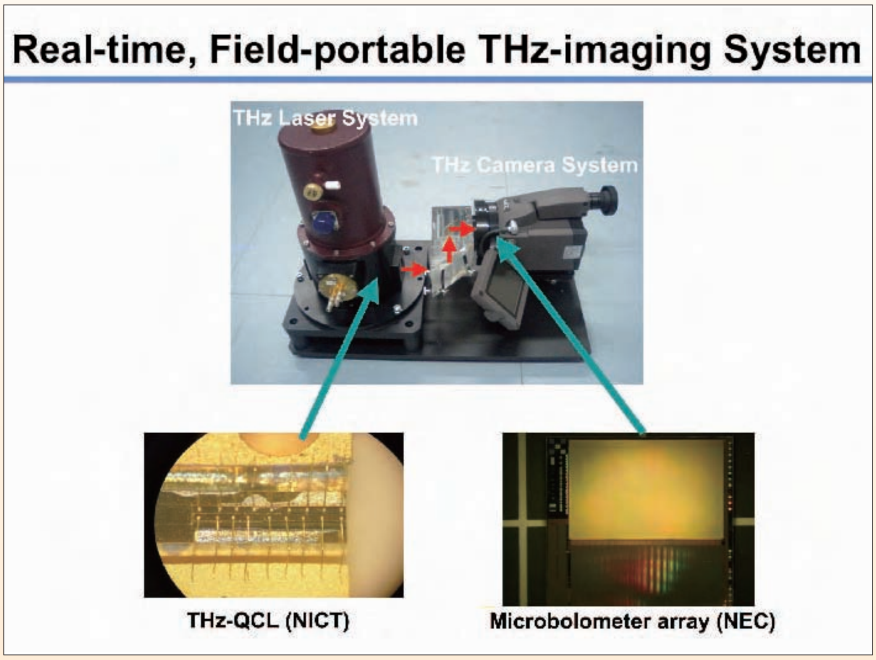
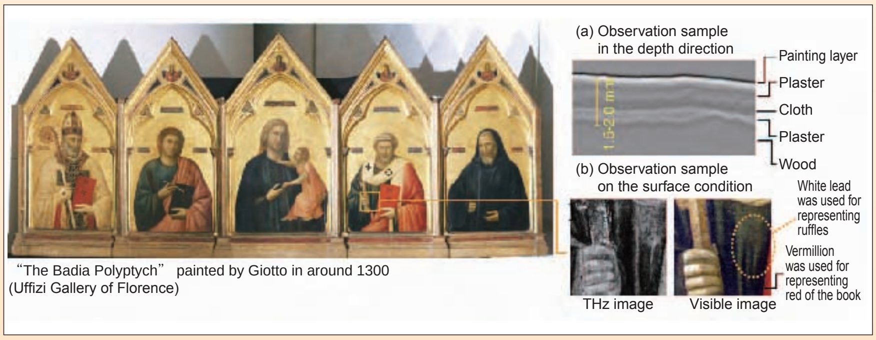


Illustration Explaining Terahertz Frequency Bands

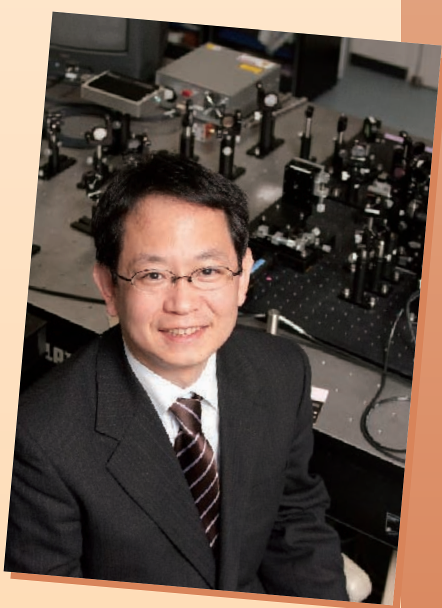


Real-time, Field-portable THz-imaging System



“The Badia Polyptych” painted by Giotto in around 1300 (Uffizi Gallery of Florence)

●In December 2008, with the cooperation of Galleria degli Uffizi which is located in Florence, Italy, we had the opportunity to analyze the famous painting of the early Renaissance (tempera) using terahertz waves. Among the figures above, reflection images produced by the terahertz imaging are shown in gray scale, with which more strongly reflected parts appear in white. Using the characteristics of terahertz waves to penetrate through optically opaque materials, we successfully observed the structure under the painting without destructing and touching it for the first time in the world as shown in picture (a). We found that on the rough surface of the base wood, plaster was pasted to cover the irregularities made by cutting out the wood, then cloth was attached on the plaster surface, another painting base plaster was added on the cloth, and the painting layer was placed on the upper plaster. We supposed that this structure followed the methods of color carvings or relieves in medieval times, because in that time of this painting, the category of “painting” was not yet established. Furthermore, with the observation (b) of surface conditions, reflection from red of the book and ruffles of the costume were stronger. Comparing with the pigment database developed by NICT, we found that the red was vermillion and ruffles were created by overpainting white lead. Furthermore, gold of the sleeve part which was invisible by human eyes was clearly recognized. (Fukunaga, Applied Electromagnetic Research Center)



Towards Brain Information and Communications Conveying Human Minds

Evaluating "Comprehension" from Brain Activities

Profile

Aya Ihara

Researcher
Biological ICT Group
Kobe Advanced ICT Research Center

After completing a doctoral course of postgraduate school, served as a research fellow in National Institute for Physiological Sciences. Joined NICT in 2005. Has been engaged in researches of brain processing of language information by noninvasive brain measurement. Doctor of Health Science.

Information and communications, and the brain research

To realize a ubiquitous society where "anyone" can access networks at "anytime" "anywhere," the development of communication technologies which allow us to send and receive a large volume of information accurately at high speed has been greatly promoted. In the future, in addition to such initiative, the technological development which supports more affluent and smoother commuications will become more important from the perspective of human side. Aiming at the realization of information and communications technologies conveying human "minds," the Brain Information Project of Biological ICT Group in Kobe Advanced ICT Research Center has been engaged in the research to objectively evaluate states or movements of "minds" ("Comprehension", "Serendipity", "Emotion", etc.) during communications by measuring brain activities and to use this brain information (information collected from brain activities) for information and communications technologies (Fig. 1). One of these researches is the brain study concerning language "Comprehension". Languages play a key role in human communications. If we can identify the mechanism of how brain comprehends language, we may open the way to new information and communications technologies which consider the understandability of information and even the speaker's comprehension level.

Extracting States and Movements of "Mind" from the Brain as Brain Information and Utilizing for Information and Communication Technologies

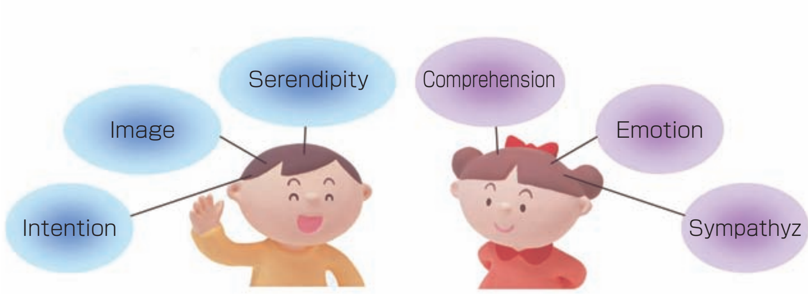


Fig.1: ICT Conveying Human Minds

Brain activity measurement extracting language processing

When human beings comprehend language, multiple processing procedures are simultaneously carried out including analysis of audio-visual inputs such as letter-strings and sounds, retrieval and identification of semantic / phonological information of words, integration of the information, and syntactic analysis. Our group uses Magnetoencephalography (MEG) to investigate "Where" and "When" these processing procedures are performed.

A lot of neurons, which convey information by exchanging current signals, are working in the human brain. Magnetoencephalogram, a weak magnetic field generated by currents passing through neurons in brain, is detected with Superconducting Quantum Interference Device (SQUID), which is a highly sensitive magnetic sensor over the whole head. Supposed currents of numerous neurons locally activated in a part of brain are a single currecnt source (dipole), we can identify spatio-temporal characteristic of brain activities with high temporal resolution in millisecond order.

However, in the case that multiple areas are activated simultaneously in brain like language processing, it was very difficult for conventional analysis methods to divide these activities. Then, we proposed original analysis methods to resolve this issue, which enabled us to analyze specific complex brain activities associated with language comprehension, including visual form processing of words, semantic / phonological processing, and even higher level of context processing, with high temporal and spatoial resolution (Fig. 2).

Exploring mechanism of how the brain comprehends language

Japanese language has a number of words which use the same orthography and pronunciation but each of their meanings are different. For example a Japanese word "くも (/kumo/)" has two meanings: "cloud" and "spider". Thus, language often contains lexical ambiguities, but we can comprehend the appropriate meaning through the context

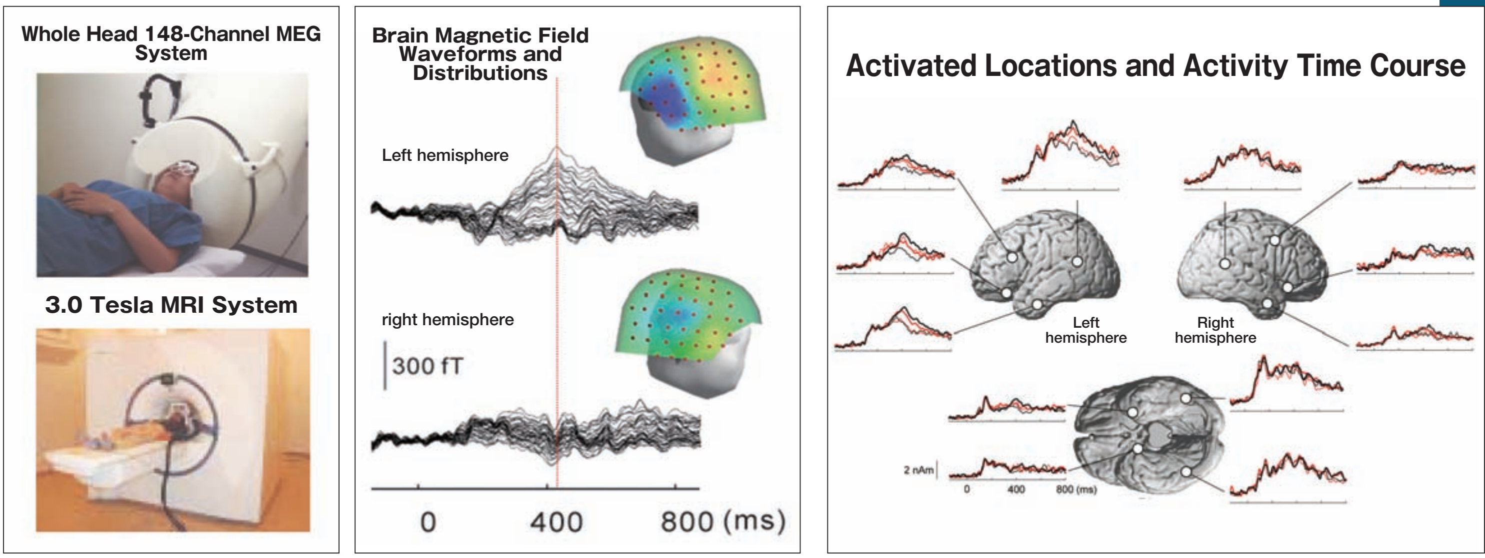


Fig.2: Analysis of Language Processing by Brain Activity Measurement Method

in our daily conversation. The ability to rapidly and flexibly process information containing ambiguity is exactly the characteristics of human beings, which is essential to successful smooth communications.

We are engaged in the research on brain processing of how multiple candidate meanings of lexically ambiguous word are represented in the brain and how the ambiguity is resolved to confirm the meaning of words. By these days, we have succeeded in clarifying the brain activities involved in the lexical ambiguity resolution using MEG (Ihara et al., NeuroImage 2007). According to its findings, we found that when a word with lexical ambiguity was provided and the meaning of it was not confirmed immediately, the left inferior frontal gyrus played an important role. It was discovered that immediately after the presentation of a ambiguous word, multiple candidate meanings were automatically activated regardless of the context (bottom-up semantic processing); about 0.2 seconds after the word presentation, semantic retrieval using the context (top-down semantic processing) started in left inferior frontal gyrus; activation of contextual inappropriate meanings was inhibited; and 0.5 seconds after a contextual appropriate meaning was selected the word presentation (Fig. 3). We supposed that parallel activation of the vocabulary in the brain is a key mechanism of flexible human semantic recognition.

ICT using brain information

On the basis of the research so far, from brain activities, we have been able to extract the change from the state when the brain feels a word meaning “not understandable” or “ambiguous” to the state of “understandable”. Using the findings of the basic research concerning “comprehension” as core technology, it may be available for us to objectively evaluate “vocabulary level” or “comprehension level” from brain activities. Furthermore, we may be able to objectively explore what information providing methods will raise the “comprehension level” of information receivers and then to propose information provision system including the evaluation of “comprehension level” (Fig. 4). We hope that if we can extract states and movements of ”minds” as brain information, such technology may prevent unnecessary misunderstandings and discrepancies in communications, which also could lead to communication interfaces to facilitate mutual understanding.

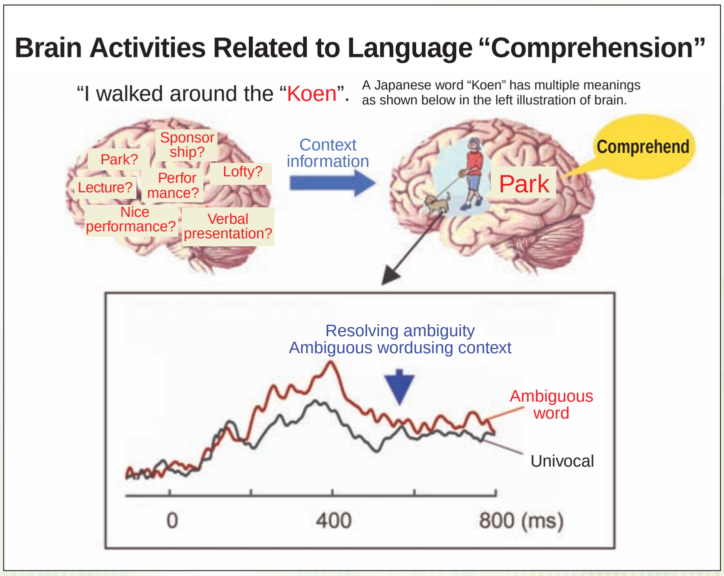


Fig.3: An Example of Research concerning Language Comprehension

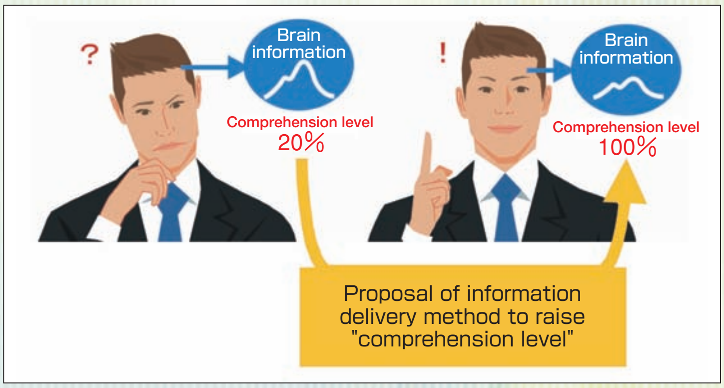


Fig.4: Toward Establishment of Objective Evaluation of “Comprehension Level”

NICT Optical Space Communications Ground Center

Ground Station for Optical Communications with Satellites

NICT Headquarters

Large telescope with 1.5 m aperture diameter

In the north premises of NICT Headquarters in Koganei-city in Tokyo, a building called “NICT Optical Space Communications Ground Center” is located with a telescope equipped. Fig.1 shows an external view of the telescope dome of this center. Inside the dome, we can find a large telescope with 1.5m aperture diameter (hereinafter referred to as “1.5m telescope”). While this telescope can be used for various purposes such as observation and ranging, we use this facility especially for research and development of laser communication technologies. Satellites are regarded as an essential factor in these days, and applications of satellites such as high resolution imaging and human activities in space has increased data volumes to be transmitted.. Since these data volumes are estimated to be increasing in the future, we aim to apply space laser communications as large volume data transmission technology which support future space utilization.

The 1.5m telescope was the second largest in Japan when it was constructed. Although several telescopes with larger aperture diameter were built to date, the feature of this 1.5m telescope is a capability to track satellites moving at high speed as an antenna for laser communications with satellites.

Fig.2 shows a picture of the telescope taken inside the dome. On each side of both shoulders of the 1.5 m telescope, a 20cm diameter telescope is mounted. We use these two types of telescopes for different purposes. For example, the 20cm telescopes are used for emission of laser beams from the ground, and the 1.5m telescope receives beams from satellites. The center has two floors, and the tube framework is placed on the second floor.

Inside of the telescope pillar is vacant with some mirrors equipped. It is designed to lead beams to the first floor along the arrow as shown in Fig.2 using

Fig.1: Telescope Dome of NICT Optical Ground Center

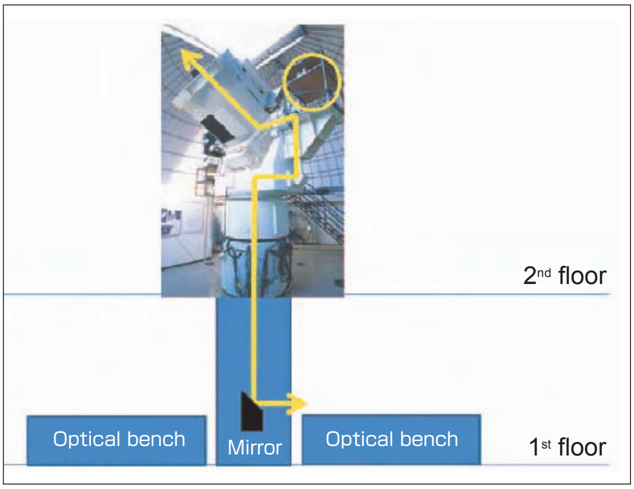


Fig.2: 1.5m Telescope

reflections of these mirrors. The mirrors are movable to change exit positions of beams collected from the telescope by operating these mirrors. For example, we can also install a camera or a measurement device on the table indicted with a circle in Fig.2. Furthermore, four large optical laboratory tables are equipped on the first floor, and we can switch the table to be used by operating the reflection direction of mirrors in the pillar. These flexibilities allow us to select and use different optical systems built on each table, with which we can effectively prepare for experiments and implement them.

Examples of optical space communications experiments

In 1994, NICT (Communications Research Laboratory at that time) succeeded in communications experiments connecting the satellite ETS-VI ("Kiku-6"), which was located about 40 thousands km from the earth, and the ground with laser beams using the 1.5m telescope for the first time in the world. Later in 2006, our institute successfully achieved laser communications with the satellite OICETS ("Kirari"). While laser communications with "Kiku-6" was carried out in a condition that the satellite looked almost stationary from the ground, in the case of "Kirari" which revolved on the lower orbit at about 600 km altitude, the satellite moved at high-speed against the ground. The laser communications driving the telescope precisely according to the movement of this satellite were also the first successful example in the world. The picture of laser beams taken at the ground station in the experiment with "Kirari" is shown in Fig.3. The circle light in the center is the laser beam from "Kirari," and the straight line extended from the center to the bottom is the laser beam emitted from the ground to the satellite.

The laser communications with satellites need to drive the telescope with high accuracy. This accuracy is maintained by Satellite Laser Ranging (SLR). In our Optical Ground Center, a dedicated optical system is built on one of the optical tables in the first floor as shown in Fig.2 to carry out SLR regularly. In addition, prior to the experiment with "Kirari" in 2006, we made an experiment to illuminate the small satellite μ-LabSAT in 2003. Since the camera mounted in the satellite detected the laser beams from the ground, we could confirm that directions of the telescopes were controlled with appropriately precise levels of definition.

Future prospects

It is known that satellite-ground laser communications are strongly influenced by weather conditions such as interruption of optical link by clouds. Raising the rate of optical link formation with satellites requires prevention of impacts from weather. Among several methods for such prevention, we are focusing on site diversity which arranges ground stations in different sites. By equipping the 1.5m telescope as the primary station and transportable telescopes which can be installed in different sites as the secondary stations, and facilitating collaboration of these telescopes via the ground networks, we are preparing for optical communications between the secondary station and the satellite, to ensure continued communications even when the weather above the primary station is cloudy. In addition, recently this 1.5m telescope is drawing attention as an optical ground station for quantum cryptography key distribution experiments, and we began the preparation for equipping such capabilities.

This article introduces NICT Optical Space Communications Ground Center as a ground station for optical communications with satellites, and the 1.5 m telescope serving as an antenna for these optical communications. Using these facilities, NICT has demonstrated successful laser communications between satellites and the ground for the first time in the world, and these activities have drawn great attentions. Currently we continue the tests for technologies supporting future space activities by installing trial devices and other equipment into the optical systems. From now on, we are going to adopt methods for the prevention of weather impacts to improve the rate of optical link formation. We also plan to simultaneously proceed with the preparation as a ground station for quantum cryptography key distribution experiments.

Fig.3: Laser Beams from the Satellite Captured at the Ground Station

Profile

Yoshihisa Takayama

Senior Researcher
Space Communications Group
New Generation Wireless Communications Research Center

Joined Communications Research Laboratory (current NICT) in 1999. Has been engaged in researches including optical phase conjugation, photonic crystals, electromagnetic analysis, and space laser communications. Doctor of Engineering.

Presidents' Bilateral Meeting towards Research Collaboration with National Institute of Advanced Industrial Science and Technology

Participants in Presidents' Bilateral Meeting

NICT and National Institute of Advanced Industrial Science and Technology (AIST) hold a meeting for presidents of both organizations to exchange their opinions to realize their research collaboration in the information and communications field on January 21, 2009.

This meeting aimed at the collaboration of both organizations to promote their research and development, and therefore, increase due synergy effects, from a broader perspective towards realizing "New-Generation Network Vision" proposed by NICT, under the leadership of presidents in each institute.

At the beginning of this meeting, Dr. Miyahara, President of NICT expressed the commitments to realize the New-Generation Network Vision in collaboration with related organizations in order to establish the industry and society which have a lot of diversion and sustainable development. Dr. Yoshikawa, President of AIST expressed the intension to realize the industry and society with sustainable development by the research and development of ultralow energy network devices. After these opening addresses, vice-presidents of each institute introduced the latest research and development topics, and participants exchanged their opinions from various points of view such as the way to promote nationwide research and development, strategies for standardization, and other up-to-date themes. At the end of the meeting, the participants from both organizations confirmed that NICT and AIST would continue to promote the research and development by utilizing their respective strengths to heighten the synergy effects generated from the collaboration between them.

It is expected that, through this meeting opportunity, the collaborative research between both organizations will be further progressed in future.

PrizeWinners

PRIZE WINNER ● **Hiroyuki Tsuji**

Senior Researcher, Space Communication Group, New Generation Wireless Communications Research Center

◎DATE : 6.19.2008

◎NAME OF THE WINNING PRIZE :
Achievement Prize of Technical Committee on Antennas and Propagation of IEICE

◎CONTENTS OF THE WINNING PRIZE :
Activity Achievement Prize of Technical Committee on Antennas and Propagation

◎NAME OF GROUP :
Technical Committee on Antennas and Propagation of IEICE

◎DATE : 9.17.2008

◎NAME OF THE WINNING PRIZE :
Activity Achievement Prize of IEICE

◎CONTENTS OF THE WINNING PRIZE :
Activity Achievement Prize of Communication Society

◎NAME OF GROUP :
IEICE Communications Society

◎Comment by the Winner:

I had an honor to be awarded for my activities for two years as sub-chief editor of Society in the Communication Society and as a member of research paper committee in the Technical Committee on Antennas and Propagation. Recently while more than half of papers coming to English research journals of Communication Society in The Institute of Electronics, Information and Communication Engineers (IEICE) are from overseas countries, these research journals play an important role in the research activities of IEICE. I'm very grateful to have valuable experiences through these activities and also receive the honorable awards.

PRIZE WINNER ● **Hidekatsu Jin**

Expert Researcher, Space Environment Group, Applied Electromagnetic Research Center

◎DATE : 8.12.2008

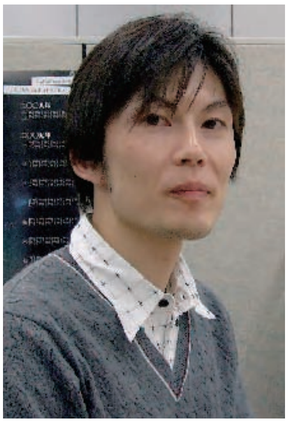
◎NAME OF THE WINNING PRIZE :
Young Scientist Award

◎CONTENTS OF THE WINNING PRIZE :
Different Behaviors of TEC and F2 Peak Electron Density at Midlatitudes During Geomagnetic Storms

◎NAME OF GROUP :
International Union of Radio Science

◎Comment by the Winner:

In this research paper, I showed that various factors are complicatedly related to ionospheric disruptions which affect radio wave propagation, by using numeric simulations. I'm very grateful that the importance of this research was greatly evaluated. Encouraged by this award winning, I will commit myself to enhance the research to ionospheric disruptions forecasting. I'm deeply thankful for appropriate advices and instructions given by Takashi Maruyama, Senior Researcher in Applied Electromagnetic Research Center, who is co-author of this paper, in various aspects in the research.



PRIZE WINNER ● **Junya Nakata**

Researcher, Hokuriku Research Center Collaborative Research Management Group, Collaborative Research Department

GROUP OF PARTICIPATOR:
Youichi Shinoda, Yashuo Tan, Kenichi Chinen, Razvan BEURAN

◎DATE : 11.12.2008

◎NAME OF THE WINNING PRIZE :
UBICOMM 2008 Best Paper Award

◎CONTENTS OF THE WINNING PRIZE :
Distributed Emulator for a Pedestrian Tracking System Using Active Tags

◎NAME OF GROUP :
The International Academy, Research and Industry Association (IARIA)

◎Comment by the Winner:

I'm very grateful that my research was greatly evaluated to receive this award concerning the development of ubiquitous network testbed which I had been engaged in at Hokuriku Research Center. I'm very thankful for the instructions given by Project Leader Shinoda and Project Sub-Leader Tan, as well as the collaboration to accomplish this research, which was given by related people in Panasonic Corporation, Internet Research Center of Japan Advanced Institute of Science and Technology, and The StarBED Team.

PRIZE WINNER ● **Teng Rui**

Expert Researcher, Universal City Group, Knowledge Creating Communication Research Center

◎DATE : 12.2.2008

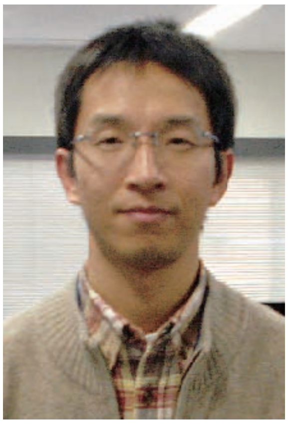
◎NAME OF THE WINNING PRIZE :
Excellent Poster Award of the 6th QoS Workshop

◎CONTENTS OF THE WINNING PRIZE :
An Efficient MAC Protocol for Relaible Networked Control in Home Netowrk Systems

◎NAME OF GROUP :
Technical Committee on Communication Quality, IEICE

◎Comment by the Winner:

This research aims at offering proposals of highly reliable Media Access Control (MAC) methods to accurately control electric apparatuses through their electric power sensing on the home network and designs of new networking methods to realize the conversion from information networks to control networks. I'm very proud of receiving this award and would like to express to the related people my deepest gratitude for their support.



NICT co-organized a symposium

Disaster and Crisis Management – ICT Symposium 2009 –

Towards observation of tornados, gusts and guerrilla rainstorms

NICT jointly organized the above symposium with ICT Forum for Security and Safety

Tetsuo Aoki, Director, Project Promotion Office, Applied Electromagnetic Research Center

Date : 10:00－16:30 February 6, 2009
Venue : Pacifico Yokohama
Number of participants : About 200
Sponsorship : Cabinet Office; Ministry of Internal Affairs and Communications; Ministry of Education, Culture, Sports, Science and Technology; Ministry of Land, Infrastructure, Transport and Tourism; Ministry of Defense

This symposium aimed at discussing the necessity to rapidly observe accidental and local natural phenomenon such as tornados, gusts and guerrilla rainstorms with high resolution, and what usage will be expected when such observation becomes available, as well as identifying ICT applications to the future disaster and crisis management. Lectures were performed by experts from operating organizations including Meteorological Agency, Ministry of Land, Infrastruct ure, Transport and Tourism, and Sewerage System Office of Tokyo Metropolitan Government, and researchers from universities and other research institutes.

During the panel discussion, specific opinions were exchanged in relation to Research and Development of Next Generation Doppler Radar Technology," one of NICT sponsored researches started in fiscal 2008 in five years framework, which offers high-speed three-dimensional observation with a high angular resolution. These opinions included the question "In which field and to what extent could the observation of specific three-dimensional structure of tornados, gusts, guerrilla rainstorms and other relevant natural disasters per ten seconds contribute to the safety and security in lives of Japanese people?" Furthermore, for the development of the laser, two issues were emphasized. One is the necessity that the laser should be developed as information system which offers information extraction from collected data, data processing, distribution and other related capabilities and the other is the importance of close communications with operating organizations using the occasions such as workshops of ICT Forum for Security and Safety to achieve the goal. With a number of questions raised from the audience and heated discussion continuing over the scheduled time, the symposium was successfully completed gaining acclaim from the participants.

NICT is committed to further promoting research and development in collaboration with various organizations in the fields of industry, government and academia to realize a society with safety and security.

A View of the Symposium

Greetings from Ishizaki, Vice Minister of Internal Affairs and Communications

Panel Discussion

NICT participated in the exhibition

nano tech 2009 International Nanotechnology Exhibition & Conference

(International Nanotechnology Exhibition & Conference)

Toru Kubota, Senior Researcher Project Promotion Office,
Kobe Advanced ICT Research Center

Date : February 18 (Wed.) - February 20 (Fri.), 2009
Venue : Tokyo Big Sight
Number of Participants : About 47,300

During the period of February 18 to 20, 2009 at the "nano tech 2009," one of the largest exhibition for advanced technologies in the world, NICT introduced the specific research activities of projects related with the nano-tech of Kobe Advanced ICT Research Center (KARC): Superconductive Electronics Project, Protein Biophysics Project, etc. and provided the information about these technologies, letting the molecular photonic project of Nano ICT Group play a key role, under the collaboration with NICT Public Relations Office. In the exhibition booth, we offered the exhibition of nano and bio research technologies of KARC, such as single photon or electron devices, and architecture technologies using organic molecules, superconducting single photon detectors, biological molecular communication technologies and so on. Besides, with regard to the frontier technology of scanning probe microscope, which we released in the press conference prior to the opening day, we displayed a real machine to appeal our achievement. Consequently, a great interest was given to it by visitors.

In this exhibition, frontier technologies and products were exhibited, not only from companies, research institutes and universities which promote the advanced science technologies in Japan, but also other countries including Germany, the United Kingdom, the Netherland and Taiwan. Furthermore, in addition to the exhibition of related nano-technologies, six other exhibitions in the fields related to KARC including nano-bio Expo 2009 and neo functional material 2009 exhibitions, were also provided simultaneously, where we were able to greatly appeal the basic and fundamental research items, and the advanced device research of NICT both at home and abroad. In addition to these exhibitions, a number of international symposiums were organized, which also provided a valuable opportunity for NICT researchers to exchange information with the participants concerned. Organizing symposiums every year, KARC has played a leading role to demonstrate its research and promote collaboration with organizations inside and outside Japan. Also in future, we will continue such activities utilizing this opportunity.

● Display concerning Scanning Probe Microscope Technology
Explaining it to Professor Tomoji Kawai (Osaka University), Chairman of nanotech Executive Committee

● NICT Exhibition Booth

NICT supports to invite foreign researchers to private companies in Japan

〈Japan Trust Program for International Research Cooperation〉

Aiming to support basic technology researches by private sector companies in the field of information and communications field, and actively facilitate international research cooperation. NICT supports these companies to invite competent foreign researchers from overseas countries by subsidizing their travel, accommodation and other related expenses.

For the subsidies of fiscal 2010, applications are scheduled to be accepted from around September, 2009.

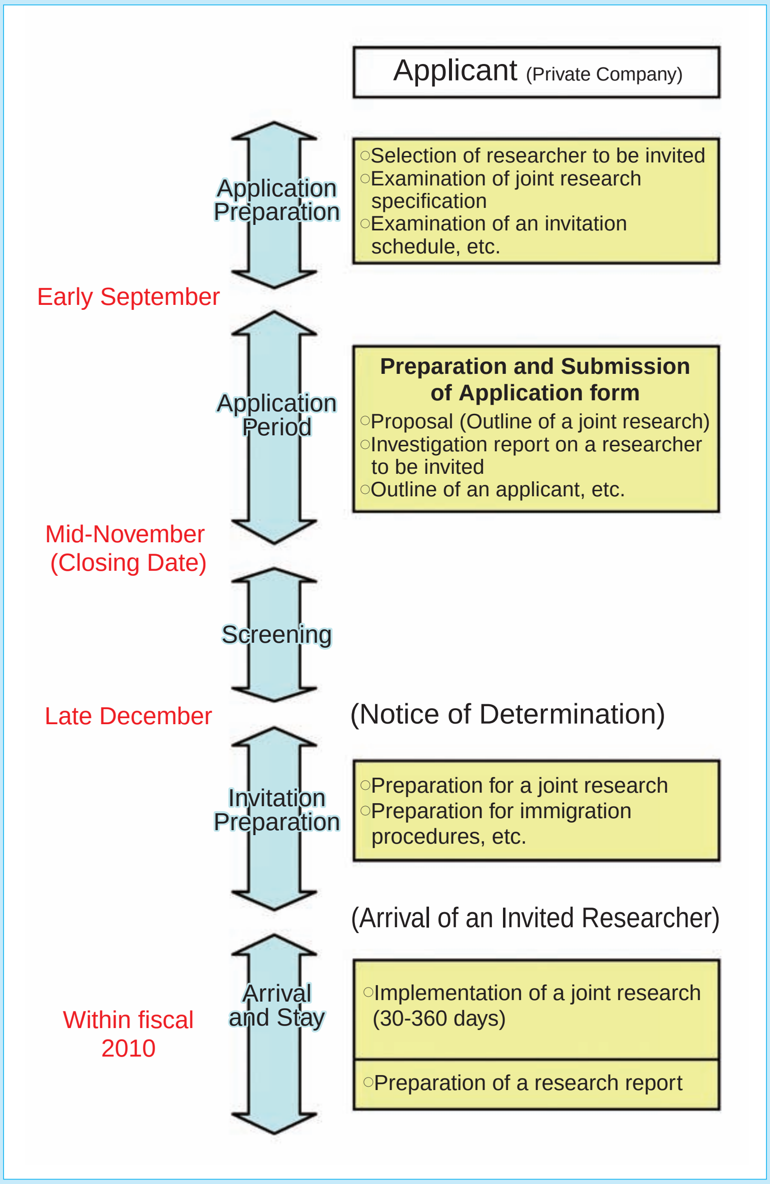
Contact the address shown below for the program outline and details of application procedures, etc.

We are looking forward to your application.

Contact persons :
Mr. Komine and Mr. Kusakai
Key Technology Research Supporting Group,
Key Technology Research Promotion Group
Tel : 042-327-6016
E-mail : kiban@ml.nict.go.jp
※**Reference URL** http://j-trust.nict.go.jp

Subsidy Specification for an Invited Researcher

Travel Expenses	Round trip airfare and domestic travel cost
Living Expenses	15,000 yen/day
Preparation Allowance	124,000 yen
Domestic Business Trip Expenses	Up to 100,000 yen in total
Other Expenses	Travel accident insurance fee



Information for Readers:

In the next issue, we will feature Information Security Research Center which leads safety and security of communications.

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4-2-1 Nukui-Kitamachi, Koganei, Tokyo 184-8795, Japan
Tel: +81-42-327-5392 Fax: +81-42-327-7587
E-mail: publicity@nict.go.jp
URL: http://www.nict.go.jp/index.html

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