National Institutes for
Quantum and Radiological Science and Technology

Our ultimate goal is to build a platform for the conduct of world class quantum science and technology research towards the improvement of human health and the overall well being of mankind through the creation of a harmonious diversity.

The National Institutes of Quantum and Radiological Science and Technology (QST) was newly-launched as a National Research and Development Agency on 1, April 2016. QST was created as a merger of the National Institute of Radiological Sciences, the Quantum Beam Directorate and the Nuclear Fusion Directorate of the Japan Atomic Energy Agency.

QST is bestowed with the mission of conducting high quality research and development in the following areas;

- cancer therapy with charged particles
- radiation effects on human bodies
- medical applications of radiation
- radiation protection and radiation emergency medicine
- material science with quantum beams
- development of life science with quantum beams
- quantum science with high power lasers
- nuclear fusion as the ultimate energy source for mankind

QST will play a leadership role in molding the future direction of Japan's radiological science field. It will also be Japan's representative for international collaborations such as the ITER Project and the Broader Approach (BA) Activities.

QST will combine the research and development abilities of five Japanese national institutes in the fields of radiology, quantum beams and nuclear fusion to form a world class institution in quantum science and technology research.QST will promote exploratory studies and translational research that integrate quantum science and technology with medicine and life sciences.

QST will also serve as a platform to foster collaboration between industry, government, and academia, through activities such as personnel exchanges and joint research. Such efforts will benefit Society in multiple ways including increased economic output, technological advancement, as well as education and training opportunities for the next generation of engineers and scientists. Finally, QST will actively promote the creation of a harmonious diversity for Society by fostering collaborations that spark intellectual creativity, understanding and respect for other cultures around the world. This kind of activity will contribute to the progress of a peaceful and spiritually rich human society.

We hope to benefit from your support.

President Toshio Hirano

Organizations

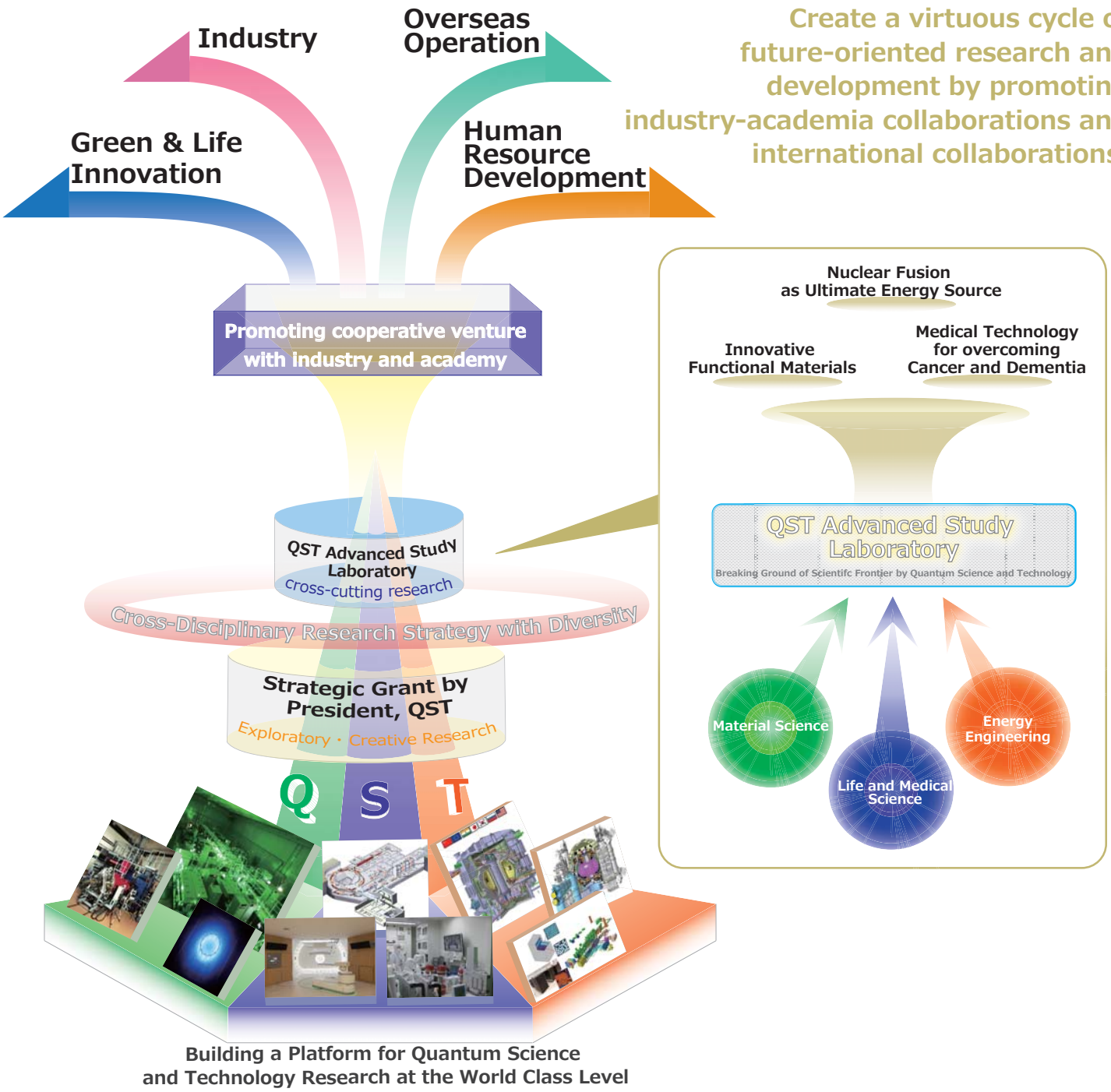
President
Auditor — Auditor's Office
Executive Director

- [Headquaters]
  - Auditing and Compliance Office
  - Dept. of Management and Planning
  - Dept. of General Affairs
  - Personnel Department
  - Dept. of Safety Administration
  - Dept. of Information Technology
  - Innovation Center
  - QST Advanced Study Laboratory

- National Institute of Radiological Sciences (Radiological Science Research and Development Directorate)
  - Research Planning and Promotion Office
  - Dept. of Administrative Services
  - Dept. of Engineering and Safety
  - Quality Assurance and Audit Office
  - Clinical Research Cluster
    - Hospital
    - Dept. of Charged Particle Therapy Research
    - Dept. of Molecular Imaging and Theranostics
    - Dept. of Functional Brain Imaging Research
  - Dept. of Accelerator and Medical Physics
  - Dept. of Radiopharmaceuticals Development
  - Dept. of Radiation Measurement and Dose Assessment
  - Dept. of Radiation Effects Research
  - Dept. of Basic Medical Sciences for Radiation Damages
  - Fukushima Project Headquarters
  - Human Resources Development Center
    - Radiation Emergency Medicine Center
    - Center for Radiation Protection Knowledge

- Quantum Beam Science Research Directorate
  - Research Planning and Promotion Office
  - Takasaki Advanced Radiation Research Institute
    - Dept. of Administrative Services
    - Dept. of Advanced Radiation Technology
    - Dept. of Advanced Functional Materials Research
    - Dept. of Radiation-Applied Biology Research
    - Tokai Quantum Beam Science Center
  - Kansai Photon Science Institute
    - Dept. of Administrative Services
    - Dept. of Advanced Photon Research
    - Dept. of Quantum Beam Life Science
    - Synchrotron Radiation Research Center

- Fusion Energy Research and Development Directorate
  - Research Planning and Promogion Office
  - Naka Fusion Institute
    - Dept. of Administrative Services
    - Dept. of ITER Project
    - Dept. of Tokamak System Technology
    - Dept. of Advanced Plasma Research
  - Rokkasho Fusion Institute
    - Dept. of Administrative Services
    - Dept. of Fusion Reactor Systems Research
    - Dept. of Fusion Reactor Materials Research
    - Dept. of Blanket Systems Research



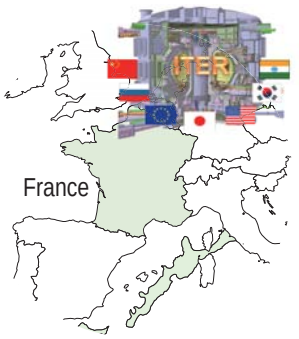
Create a virtuous cycle of future-oriented research and development by promoting industry-academia collaborations and international collaborations.

Building a Platform for Quantum Science and Technology Research at the World Class Level

Purpose	To promote quantum science and technology in a comprehensive and integrated manner
Establishment	On April 1, 2016, National Institutes of Quantum and Radiological Science and Technology was established by merging NIRS and some institutes of JAEA.
Missions	・Work to raise the level of science and technology related to medicine that involves quantum science and technologies and radiation. ・Promote quantum science and technologies that have been gaining in importance in recent years. ・Always raise the latest research fields that are suitable to call quantum science and technologies, not just existing set research fields. ・Always identify new research and technology seeds with social needs in mind, advance the transition to practical development, and build a recycling R&D environment. ・Work to have the Institutes' quantum science and technologies recognized in Japan and overseas as key fields that support Japan's progress. ・Continue to bear the social roles that NIRS has conventionally carried, including response in the event of a nuclear disaster.

Research Base

ITER-JADA On-site Support Team



Fusion Energy Research and Development Directorate

- Promotion of the ITER Project
- Research and development of advanced plasma and fusion science and technology, through Broader Approach (BA) Activities

[Base] Naka Fusion Institute
801-1 Mukoyama, Naka-shi, Ibaraki 311-0193 Japan
TEL. +81-(0)29-270-7213

[Base] Rokkasho Fusion Institute
2-166 Oaza-Obuchi-Aza-Omotedate,Rokkasho-mura,Kamikita-gun, Aomori 039-3212, Japan
TEL. +81-(0)175-71-6500

National Institute for Radiological Sciences
(Radiological Science Research and Development Directorate)

- Research and development into innovative medical uses of radiation
- Research into the impacts of radiation and radiation medicine

[Base] National Institute of Radiological Sciences
4-9-1, Anagawa, Inage-ku, Chiba 263-8555, Japan
TEL. +81-(0)43-206-3025

QST (Headquarters)

Quantum Beam Science Research Directorate

- R&D of advanced technologies for the generation, control, and use (processing and observation) of quantum beams
- Leading research into materials science, life science, and other fields, using quantum beams

[Base] Takasaki Advanced Radiation Research Institute
1233 Watanukimachi, Takasaki-shi, Gunma 370-1292, Japan
TEL. +81-(0)27-346-9232
2-4 Shirane,Shirakata,Tokai-mura,Naka-gun,Ibaraki 319-1195, Japan
TEL.+81-(0)70-3943-3400

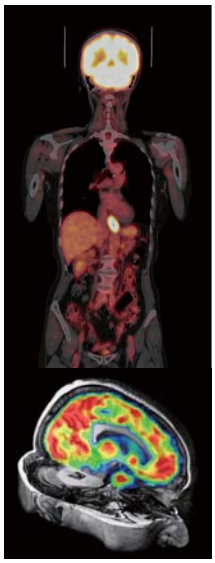
[Base] Kansai Photon Science Institute
8-1-7 Umemidai, Kizugawa-shi, Kyoto, 619-0215, Japan
TEL. +81-(0)774-71-3000
1-1-1 Kouto, Sayo-cho, Sayo-gun, Hyogo, 679-5148, Japan
TEL. +81-(0)791-58-0922

National Institute of Radiological Sciences
(Radiological Science Research and Development Directorate)

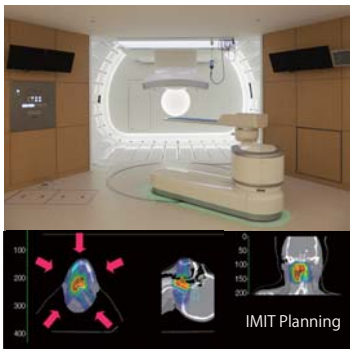
The two core elements of our ongoing research are “Research and development into innovative medical uses of radiation” and “Research into the effects of radiation and radiation medicine”. We use the research center hospital to advance these areas of research. In particular, we contribute to efforts to spread and instill heavy ion cancer therapy in national medical care, and to the development of treatment systems to apply in a nuclear disaster by developing functions as an Advanced Radiation Emergency Medical Care Support Center (tentative). Drawing on the experience gained in responding to the accident at the Fukushima Daiichi Nuclear Power Station, we are working to contribute to restoration and renewal through investigative research into the effects of radiation on people and the environment, as well as planning and implementing various types of training for human development. This human development will nurture the people needed to carry on in the fields of quantum science and technologies and radiology, to work on radiological protection and safe radiation handling, and to communicate wide-ranging knowledge of radiation.

Research and development into innovative medical uses of radiation

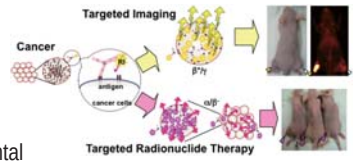
We are combining the molecular imaging technology we have been working on to date with a diverse range of imaging methods to advance R&D into diagnostics and treatment, etc., from fundamental research through practical development. Against mental and neurological diseases, we are researching the clarification of patients’ clinical conditions and diagnosis of their diseases, and developing therapy assessment methods. Against cancer, we are researching next-generation cancer treatment, aiming for a new targeted isotope therapy as a new radiotherapy effective against multiple lesions and micrometastasis. In the field of heavy ion radiotherapy research, we are working on joint research with the participation of domestic heavy ion radiotherapy facilities. This is research and development towards advancing the standardization of therapies, as well as improving, spreading and instilling irradiation methods. We are also pursuing research and development into the accelerators and irradiation technologies that are necessary to promote research in those fields, and to contribute to the advancement of RI manufacturing systems.



Diagnosis of cancer and mental and neurological diseases using radiation



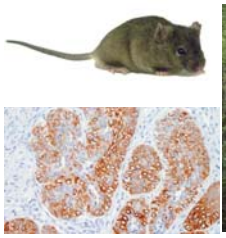
Simulation of intensity modulated heavy ion therapy and treatment rooms



Targeted isotope therapy research

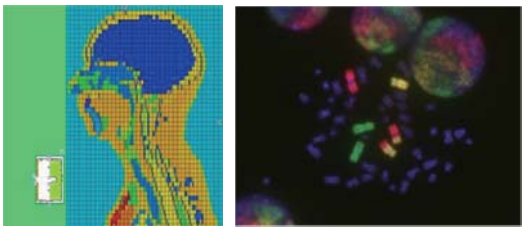
Research into the effects of radiation and radiation medicine

In the field of radiation effects, we are extending from the results of animal testing and other work to clarify the mechanisms of radiation’s impacts on humans, to build a risk model based on the results and the knowledge gained from epidemiological study. We also perform investigative research on environmental effects, pursue comprehensive research on radiation effects, and disseminate clear information, particularly about issues such as the effects of low-dose radiation. In the field of radiation medicine research, we are raising the levels of the external measurement methods necessary for internal contamination evaluation, of the imaging of radiation fields, and of dose evaluation methods using chromosomes and other biological indicators. We will also pursue cutting edge research and development into effective treatments suitable for treatment and regenerative therapy on normal tissue damage associated with radiation accidents.



Effects studies using animals

Environmental effects studies



Dose estimation research about radiation emergency medicine

Quantum Beam Science Research Directorate

We are advancing the R&D of the most advanced technologies for the generation and control of various quantum beams, and high-precision processing and observation using those beams. The beams are charged particles, gamma-rays, neutrons, high intensity laser, and synchrotron radiation, etc. The Takasaki Advanced Radiation Research Institute and the Kansai Photon Science Institute are the centers for this work. We are also pursuing world-leading R&D in the broad fields of materials science and life sciences, etc., by comprehensive use of the superior functions of quantum beams. Through the production of innovative results and the expanded diffusion of advanced quantum beam applications, we are aiming to contribute to the advance in science and technology, and the promotion of industry in Japan.

R&D using charged particles and neutrons, etc. (Takasaki Advanced Radiation Research Institute)

In radiation applications, which is one of the pillars of the peaceful use of nuclear energy, the Takasaki Advanced Radiation Research Institute particularly promotes R&D in industrial and agricultural fields, and has made great contributions to improving people's life through the diffusion of its work to society. To further advance these activities, we employ QST's Takasaki Ion Accelerators for Advanced Radiation Application (TIARA), gamma-ray and electron beam facilities in the Takasaki district, and neutron-using research facilities in the Tokai district. These facilities are used for developing and advancing the latest technologies in the generation, control, measurement, and other aspects of quantum beams, as well as making comprehensive use of functions for processing and observing quantum beams. We are advancing leading-edge R&D with high social and economic impact in fields such as materials sciences and life sciences.

TIARA Cychrotron

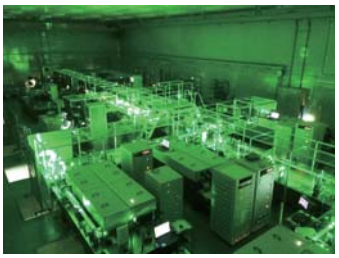
Cobalt 60 radiation source

Discovery of microscopic 3D machining technology using ion beams

Creation of fertile flower varieties using ion beam breeding

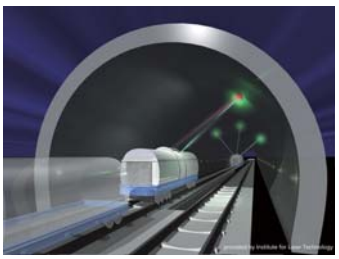
R&D based on lasers and synchrotron radiation

The Kansai Photon Science Institute has centers of activity in Kizu and Harima districts working on advanced photon research with J-KAREN laser, X-ray laser and other high power lasers and also synchrotron radiation research with contract beamlines at the SPring-8. In the Kizu district, based on the world's top class high peak power laser technology, most advanced academic researches such as laser acceleration of electrons and ions have been conducted as well as industrial and medical applications of lasers for innovation. The Harima district, using synchrotron radiation and computational science, conducts research and development on analysis and evaluation of structures, qualities and function formation mechanisms of environmental and energy materials such as hydrogen storage materials.

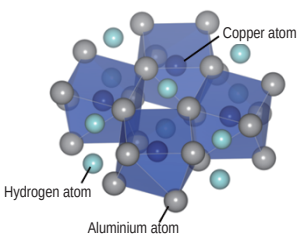


J-KAREN laser

Synchrotron radiation beam line



Development of method to detect tunnel defect using highly intense lasers



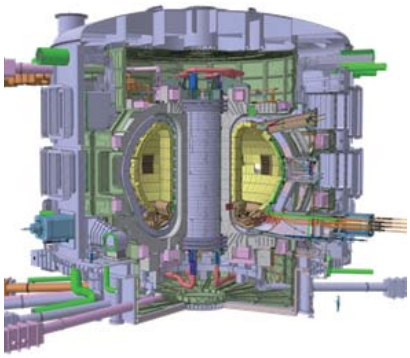
Development of hydrogen storage materials using synchrotron radiation

Fusion Energy Research and Development Directorate

We are advancing global-scale research and development of fusion energy, working towards the realization of a “Sun on Earth” that will be favorable for environment and safety. Fusion energy is generated during the fusion reactions of light nuclei that collide together to form heavier nuclei. The light from the stars and sun is produced by this fusion energy. The activities of the Fusion Energy Research and Development Directorate is composed of three main elements: “ITER Research and Development”, to demonstrate the scientific and technical feasibility of fusion energy by international cooperation; “Fusion Plasma Research and Development”, to produce and sustain controlled burning of fusion fuels; and “Fusion Science and Technology Research and Development”, to support the realization of fusion plasmas. This Directorate advances comprehensive R&D in these areas towards the early realization of fusion energy.

ITER Research and Development

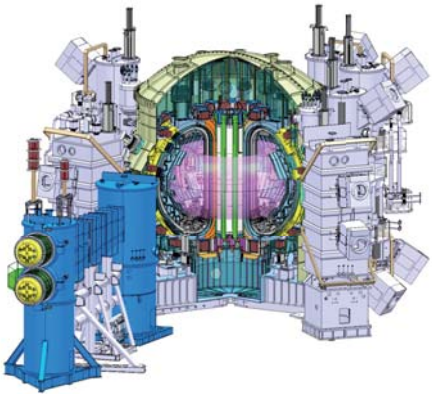
The ITER Project is a joint international project implemented by seven participating parties: Japan, the EU, Russia, the U.S., China, Korea and India. ITER is being constructed in southern France, and will demonstrate the scientific and technical feasibility of fusion energy by achieving a fusion output of 500MW for a period of 300 to 500 seconds. QST collaborates with the ITER Organization, which oversees the entire project, as well as with the other participating parties as the Japan Domestic Agency (JADA). QST is also responsible for the development and production of cutting-edge devices and equipment, such as the world’s largest superconducting coil and neutral beam injector heating equipment that handle super-high voltages, some as high as 1MV DC (Direct Corrent). QST additionally serves as the point-of-contact for Japan’s contribution of human resources to the ITER Project.



ITER

Fusion Plasma Research and Development

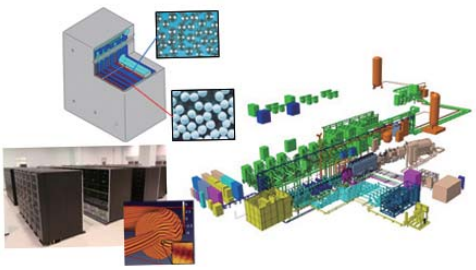
In parallel with the ITER Project, QST pursues R&D in areas such as improvement of the tokamak device, which uses a magnetic field to confine plasma into a torus, through Broader Approach (BA) Activities under collaboration between Japan and the EU. Focusing on JT-60SA, this improvement will stably and efficiently sustain the high-temperature plasma used to produce fusion energy. In JT-60SA, we take advantage of high mobility to perform research that supports the ITER Project, as well as research to complement ITER towards a DEMO reactor. We also develop human resources capable of leading international research and development.



JT-60SA

Fusion Science and Technology Research and Development

Through BA Activities, we are establishing the technology basis necessary for developing a DEMO reactor. In the International Fusion Energy Research Center (IFERC) project, we are studying on the pre-conceptual design of a DEMO reactor, and pursuing research and development of manufacturing and handling technologies for the blanket, which extracts heat for power generation and produces fusion fuel tritium. We are also developing facilities for remote participation in ITER experiments, running plasma simulations, etc. using specialized supercomputer. In the International Fusion Materials Irradiation Facility Engineering Validation and Engineering Design Activity (IFMIF/EVEDA) project, we are developing engineering basis for construction of a neutron source with energy equal to that of fusion neutrons, to investigate the impact of irradiated materials by fusion neutrons.



Blanket (upper left)
Computer simulation (lower left)
IFMIF prototype accelerator (right)

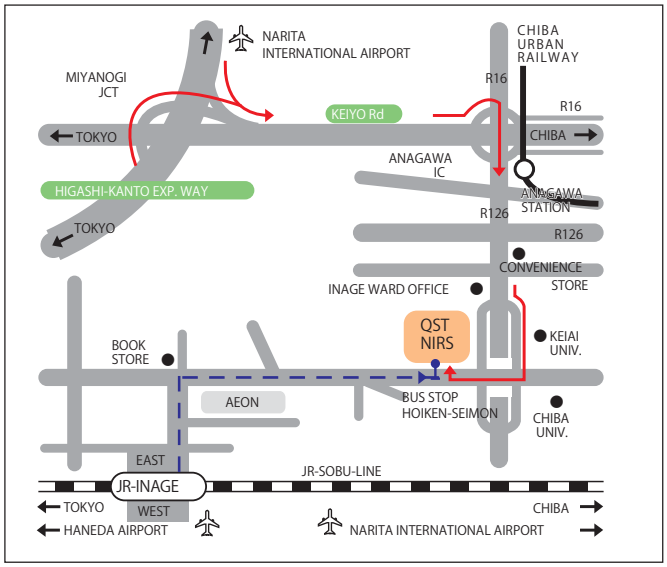
Outline

Location	4-9-1, Anagawa, Inage-ku, Chiba-shi, Chiba 263-8555, Japan TEL: +81-(0)43-206-3025
Budget	53.9 billion yen (FY2016) (including subsidies for facility improvement and fusion R&D)
Employees (approximate)	1,190 full-time staff (including 840 subject to mandatory retirement) (April 1, 2016)

Access

QST/NIRS

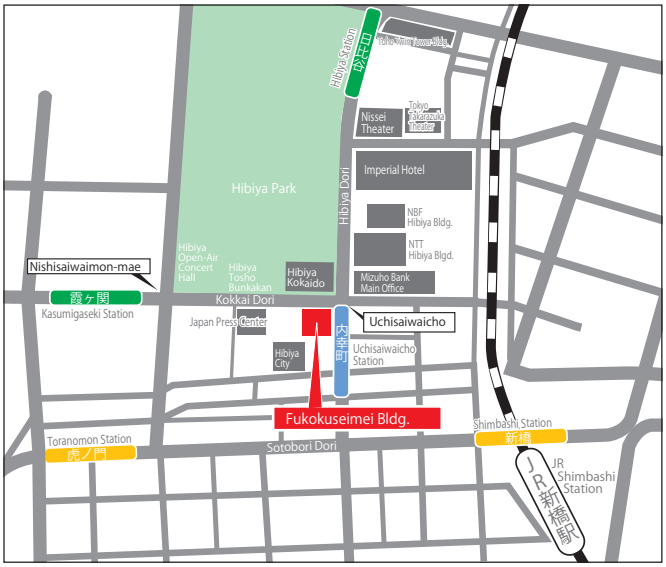
491 Anagawa, Inage-ku, Chiba-shi, Chiba 263-8555, Japan
Phone : +81-(0)43-206-3025 / Fax : +81-(0)43-206-4061
e-mail : info@qst.go.jp



By train
Take the JR Sobu line, either rapid or local, to Inage station.
Go out through the east exit (on your left as you come out of the main ticket gate), walk straight ahead and turn right at the second traffic light. Follow that road all the way to the QST / NIRS main gate at the top of the hill on the left (10 minutes), or take the Keisei bus for Sanno-cho from stop No.2 at the rotary outside the east exit of JR Inage station and get off atHoiken seimon/NIRS main gate, the first stop (fare: 100yen).

QST Tokyo Office

Fukokuseimei Building 17F
2-2, 2-Chome, Uchisaiwai-Cho, Chiyoda-ku, Tokyo 100-0011, Japan
Phone : +81-(0)70-3943-3364



- Take the Tokyo Metro Mita-Line, and get off at “Uchisaiwaicho” (Exit : A6) .....Straight to “Fukokuseimei Building”
- Take the JR Yamanote-Line / Keihin Tohoku-Line / Tokaido-Honsen, and get off at “JR Shimbashi” (Exit : Hibiyaguchi).....3 minutes’ walk
- Take the Tokyo Metro Chiyoda-Line / Hibiya-Line, and get off at “Kasumigaseki” (Exit : C4)....3 minutes’ walk
- Take the Tokyo Metro Marunouchi-Line, and get off at “Kasumigaseki” (Exit : B2)....5 minutes’ walk

National Institutes for Quantum and Radiological Science and Technology
4-9-1 Anagawa, Inage-ku, Chiba-shi, Chiba 265-8555, Japan
TEL : +81-(0)43-206-3025 / FAX : +81-(0)43-206-4061 / e-mail : info@qst.go.jp

2016.09.01