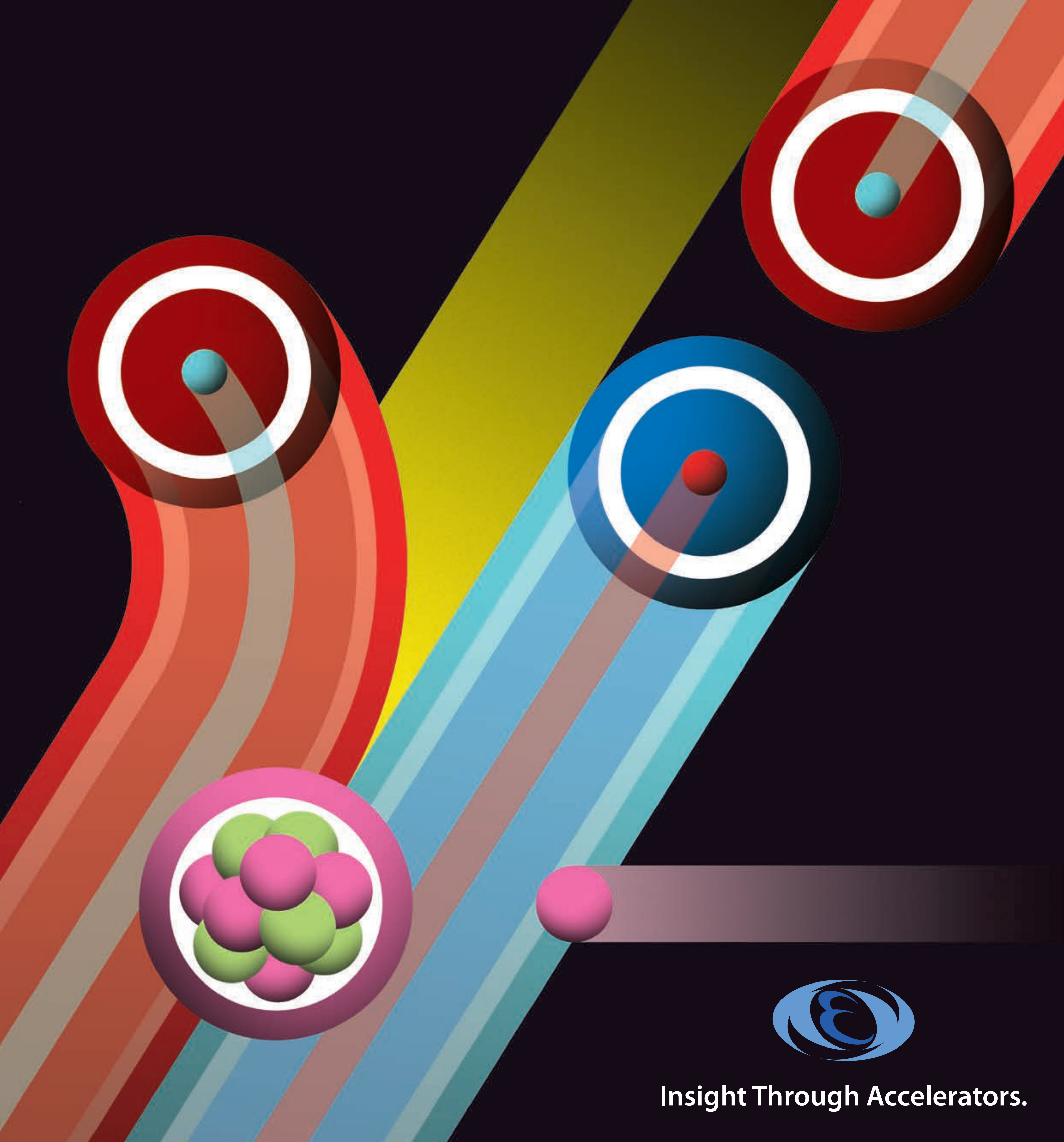
KEK

Inter-University Research Institute Corporation
High Energy Accelerator Research Organization



Insight Through Accelerators.

KEK *is a research institute that uses a variety of accelerators to unravel the mysteries of the universe, matter, and life.*

Director General
Masanori Yamauchi

Particle accelerators that accelerate electrons, protons, and others have contributed substantially to the remarkable development of science and technology in recent years by providing essential tools for studying nuclei and elementary particles, as well as means of understanding materials and biological phenomena, since it was invented in 1930's.

Important results that deepen understanding of elementary particles have been produced in Japan, such as confirmation of the Kobayashi-Maskawa theory and clarification of neutrino oscillations. Cutting-edge results have also been achieved in materials and life sciences, such as use of synchrotron radiation for structural analyses of novel superconductors and drug-related proteins, and studies of novel properties induced by hydrogen in matter using high-intensity neutron and muon beams.

Accelerators continue to achieve dramatic progress in many important ways, and play a role as a powerful driving force that supports the frontiers of new science and applied research.

In scientific research, being the first to develop new ideas and discover novel phenomena is considered to hold the highest value. Discovering and broadly sharing what no one else knew prompt subsequent discoveries, progressively expanding the limits of our knowledge. This value placed on new knowledge is the most fundamental driving force that has spurred the development of science. It has shed light on the structures of various substances and the mechanisms driving chemical reactions, and led to the development of materials with new functions, etc. So, how does one become "the first to discover?" Accelerators play an indispensable role in research fields in which KEK participates. KEK's contribution to science lies in the construction of accelerators with world-leading performance, delivering higher levels of energy or intensity than ever before to discover as-yet-unknown universal truths.

I would like to express my gratitude for your support for KEK's science efforts. We will continue to maintain a strong awareness of our responsibilities as members of society and devote ourselves to the further development of science and applied technology.

What is KEK?

All matter comprises atoms and molecules formed by the bonding of atoms. An atom is made of a nucleus and electrons, a nucleus is made of protons and neutrons, and protons and neutrons are made of quarks, a type of elementary particle.

Research into these types of elementary particles and nuclei is an important area of fundamental science, and research into elementary particles illuminates the mysteries of the universe right after its beginning. Clarification of structures and functions of matter at the molecular level is an important area of material science and is essential for the development of practical materials such as battery-related compounds and for drug discovery and other applications.

Accelerators make these types of studies possible. An accelerator is an apparatus that speeds up tiny particles such as electrons and protons nearly to the speed of light, to create high-energy conditions. This leads to the discovery of elementary particles that can be produced only under such extreme conditions. Synchrotron radiation and the beams of neutrons, muons (μ particles), and positrons obtained using accelerators are important also for studying the properties of matter.

KEK has been on the cutting edge of developing high-performance accelerators and detectors with the highest resolutions in space and time. We are also collaborating with industry to develop in the fields of electricity, radiation, machinery, measuring instruments, computers and materials.

Features of KEK

1. Contributing to the expansion of the intellectual assets of humanity

KEK explores the laws of nature and the basic structure of materials, and contributes to the expansion of the intellectual assets of humanity. We promote experimental and theoretical research into the structure and function of elementary particles, nuclei, materials, and life using high-energy accelerators.

2. An Inter-University Research Institute Corporation

KEK conducts collaborative studies with researchers both in Japan and abroad. We also provide a venue for collaboration, support advanced education and research at universities, and help develop cutting-edge research in accelerator science and research in related fields.

panoramic view of KEK Tsukuba Campas

3. An international research agency open to the world

KEK actively promotes international collaborative research. We emphasize coordination and cooperation with overseas research institutes, and serve as a hub for accelerator science in the Asia-Oceania region as one of the world's three major bases.

4. Promoting educational cooperation and human resource development

As a founding organization of the Graduate University for Advanced Studies (SOKENDAI), KEK trains human resources who will promote accelerator science and develop related cutting-edge research fields. We also provide education cooperation to graduate schools and other institutes to cultivate human resources in the accelerator science field.

Organization

1. Institute of Particle and Nuclear Studies

KEK conducts a wide range of particle physics and nuclear physics research from both experimental and theoretical approaches to explore the behavior of elementary particles and nuclei, which are the fundamental building blocks of matter. In addition to clarifying the mysteries of the microscopic world, such as elementary particles, we use high-energy accelerators to challenge the fundamental question of how the universe was born.

2. Institute of Materials Structure Science

KEK elucidates the structure and function of materials on a wide scale from the atomic level to the polymer and biomolecule level, by using synchrotron radiation, neutrons, muons, and slow positrons generated from accelerators, and conducts research in materials and life science from fundamentals to applications. Through collaboration between various quantum beam facilities, we promote multi-probe research that enables the observation of the same substance from multiple perspectives, and contribute to the advance of materials science through development and research of beam generation and application technologies.

3. Applied Research Laboratory

KEK researches and develops various technologies required for research using accelerators. We are engaged in protection from radiation, environmental management, precision measurement, computer and software development, big data analysis, network management, developmental research of superconducting electromagnets and precision instruments, liquid helium supply, etc.

4. Accelerator Laboratory

The Accelerator Laboratory provides researchers in Japan and abroad with a venue for collaborative experiments in fields such as elementary particles, nuclei, materials, and life science, through design, construction, operating maintenance, and performance improvement of the accelerators in KEK. The Accelerator Laboratory also conducts international research and development of cutting-edge accelerators for next-generation research, and promotes a wide range of activities, such as industrial and medical application of accelerators, and provision of superconducting technologies and other advanced accelerator technologies to general industry.

5. J-PARC Center

J-PARC (Japan Proton Accelerator Research Complex) is a research facility operated jointly by KEK and the Japan Atomic Energy Agency (JAEA). This multipurpose facility is open to the world, and conducts research in a wide range of fields, including particle physics, nuclear physics, materials science, and life science, using a variety of secondary particle beams such as neutrons, muons, K mesons (kaons), and neutrinos generated by the world's top-class proton beam.

B-Factory

KEK B-factory is an experimental apparatus that accumulates beams of electrons and their antiparticles, in independent rings, and then collides them at a single intersection to observe the elementary particle reactions. To produce a large number of elementary particle reactions, it is necessary to increase the intensity of the beams and to achieve a very small beam cross-section at the collision point. B-factory currently holds the world record among electron and positron colliders for highest luminosity (rate of collisions), which is a measure of performance.

SuperKEKB accelerator

The KEKB accelerator was a ring accelerator with a circumference of 3 km that creates head-on collisions of electrons and positrons. Together with the Belle detector, it was used to discover violations of the symmetry between B mesons and anti B mesons in 2001, and contributed to the 2008 Nobel Prize in Physics for Dr. Kobayashi and Dr. Maskawa. SuperKEKB is a major modification of KEKB, and reached a generation capacity (luminosity) of B mesons and other particles tens of times higher than the value achieved by KEKB. Following commissioning in 2016, a positron damping ring was constructed and the Belle II detector and superconducting beam final focus magnets were installed on the main ring. Collision and other adjustments were then performed in March through July 2018, and full-fledged physics experiments commenced in March 2019.

Electron-positron linear accelerator

The KEK electron-positron linear accelerator has a total length of 600 m and supplies high-energy electron and positron beams to SuperKEKB and the KEK synchrotron radiation accelerators (PF, PF-AR). The electron beam uses electrons emitted when a powerful pulsed laser is irradiated on a rare earth alloy. The positron beam uses positrons generated when the electron beam is collided with tungsten. Electrons and positrons with the required energy are supplied almost simultaneously to the respective rings by adjusting the acceleration tube parameters and the electromagnetic field strength at about 20-millisecond intervals.

Belle II experiment

The Belle II experiment aims to discover new laws of physics by upgrading the Belle experiment that contributed to the 2008 Nobel Prize in Physics. B mesons generated by the SuperKEKB accelerator are particles that contain heavy quarks called bottom quarks, and decay into various lighter particles. By examining this decay pattern in detail with the Belle II detector, the experiment attempts to discover events that cannot be explained by current theory of physics. This experiment has over 1,000 researchers participating from 26 countries and regions around the world. It aims to collect 50 times more data, such as on B meson decays, than the Belle experiment. Through analysis of this data, the experiment aims to further illuminate the mysteries of the beginning of the universe, such as the reason why antimatter that should have existed then disappeared, and physics beyond the standard model of particle physics.

Belle II detector

The Belle II detector is a particle detector around 8 meters high, wide and deep and weighs about 1,400 tons. It is installed to surround the area around the collision point of electron and positron beams generated by the SuperKEKB accelerator and collects various information such as energy, momentum, and type of particles generated at the collision point. This detector was made by significant improvements of Belle detector components. It combines sensors with differing characteristics, such as a decay vertex detector that makes use of semiconductor microfabrication technology and a drift chamber made by manually stringing tens of thousands of metal wires.

Belle II detector

Photon Factory

The Photon Factory (PF) is an experimental facility to observe materials and life on an atomic scale using short-wavelength "synchrotron radiation" generated from an accelerator. Here, various research is conducted to understand mechanisms of nature and to enrich our lives by nanoscale analysis of functional materials, macromolecules such as proteins that make up life, extraterrestrial materials, materials from deep inside the earth, and all other materials.

Accelerator for synchrotron radiation

When the path of electrons traveling at close to the speed of light is bent by a magnetic field, part of the energy is emitted as bright "synchrotron radiation." A synchrotron radiation ring is an accelerators that uses synchrotron radiation for research in materials and life science. KEK has two synchrotron radiation accelerators: the Photon Factory (PF), which is a storage ring with a circumference of 187 meters with an energy of 2.5 GeV, and the Photon Factory Advanced Ring (PF-AR), which has a circumference of 377 meters with an energy of 6.5 GeV. Together, PF and PF-AR supply synchrotron radiation to nearly 50 experimental stations.

Synchrotron radiation

Synchrotron radiation is light generated from an accelerator in a wide wavelength range, from infrared to X-rays. Short wavelength light, such as vacuum ultraviolet, soft X-rays, and X-rays, enable us to observe the nanoscale world, i.e., the arrangement of atoms and the motion of electrons in molecules and crystals. Synchrotron radiation is bright light with small divergence, enabling analysis of tiny samples and accurate structural analysis. It also has properties such as polarization and short pulse, and is effective to investigate the orientation of molecules and the changing state of materials such as chemical reaction.

Photon Factory

Slow Positron Facility

The positron is the antiparticle of the electron. The Slow Positron Facility carries out materials science studies using a slow positron beam. The positron beam is produced from a high-energy electron beam made by an electron linear accelerator. The generated high-energy positrons are moderated by making use of negative positron work function of metallic tungsten and then re-accelerated into a monoenergetic slow-positron beam with tunable energy. We use positron diffraction to study the atomic arrangement of material surfaces. Positron diffraction has high surface sensitivity and can reveal the atomic arrangements of the topmost surface and a few layers below it with high accuracy. We are also investigating the atomic physics of positronium and its negative ion. Positronium is a very light *atom* composed of a positron and an electron. In addition, we are investigating the electronic state of surfaces by using the positronium time-of-flight method.

Slow Positron Facility

J-PARC

At the Tokai campus, where the high-intensity proton accelerator J-PARC is operated jointly with JAEA, research is conducted to accelerate proton beams with the world's highest intensity, and various particles generated from the accelerated beams are used to research the origin of matter and life and the beginning of the universe. Protons are accelerated by three stages of accelerators up to an ultimate speed of 99.95% of the speed of light. The accelerated protons are sent to experimental facilities and used for experiments and the creation of various particles by striking targets.

Linac

Proton acceleration starts from the Linac. Negative hydrogen ions formed by the plasma of hydrogen gas reach up to 400 MeV in a linear accelerator with a total length of 250 meters. The negative hydrogen ions then pass through a thin film of carbon to strip the electrons, and are injected to the Rapid Cycle Synchrotron (RCS) as protons.

Rapid Cycle Synchrotron

The RCS is a ring accelerator synchrotron with a circumference of about 350 meters that accelerates the proton beam up to 3 GeV. Most of the extracted proton beams are led to the Materials and Life Science Experimental Facility (MLF) and used to generate neutron and muon beams, and some are sent to the Main Ring synchrotron (MR) and accelerated to even higher energy.

Main Ring synchrotron

The MR is a synchrotron with a circumference of about 1,600 meters that accelerates the 3 GeV proton beam up to 30 GeV. This beam is used for generation of secondary particles such as kaons and π-mesons in the Hadron Experimental Facility. It is also used for neutrino beam generation in the Neutrino Experimental Facility.

Materials and Life Science Experimental Facility

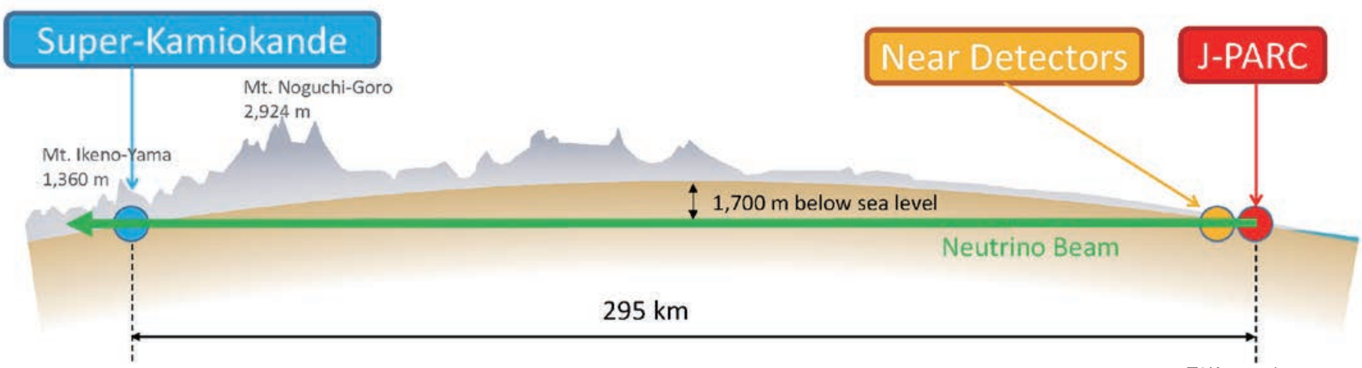
Materials and Life Science Experimental Facility (MLF) is a user facility which provides intense pulsed neutron and muon beams for scientific and industrial researches. MLF produces neutrons and muons with an accelerator-based system that delivers proton pulses to a target/moderator system. State-of-the-art experiment stations with the more intense and brighter source provide a variety of capabilities for researchers across a broad range of disciplines, such as physics, chemistry, materials science, and biology. MLF allows for measurements of greater sensitivity, higher speed, higher resolution, and in more complex sample environments than have been possible at existing neutron and muon facilities. MLF stands as a leading facility in Asia-Oceania region and is available to researchers from all over the world with varying degrees of experience.

Hadron Experimental Facility

At the Hadron Experimental Facility, the origin and evolution of matter in the Universe are explored to answer questions such as why matter is dominant over anti-matter and how states of matter are produced and were evolved from quarks to neutron stars. Various particle and nuclear physics experiments are being conducted using secondary particle (hadrons, muon) beams produced by a high-intensity proton beam from MR as well as the primary proton beam. In particle physics, we explore physics beyond "Standard Model" by search for CP violating kaon rare decay phenomena (KOTO experiment) , and the search for muon-to-electron conversion events (COMET experiment). In nuclear physics, we investigate the "strong interaction" among hadrons, especially those with strange quark(s), through spectroscopy of hypernuclei with hyperon(s) and kaonic nuclei and by hyperon scattering experiments. We also study the origin of hadron mass by examining changes of the properties of hadrons within nuclei. Experiments using primary protons commenced in 2020.

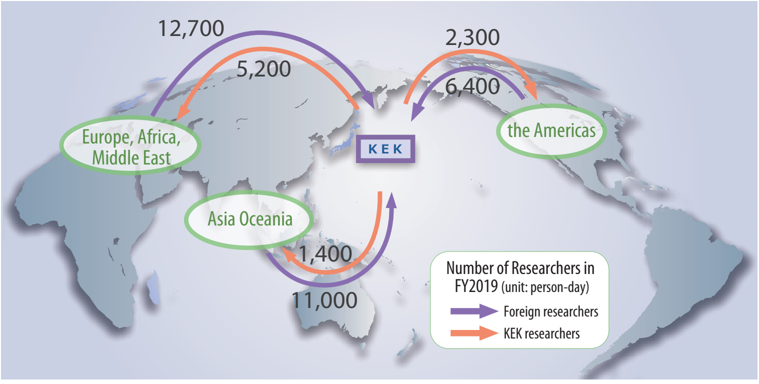
Neutrino Experimental Facility

The Neutrino Experimental Facility conducts the T2K experiment to examine the nature of "neutrino oscillations" in detail by the observation of neutrinos generated by J-PARC with the Super-Kamiokande detector 295 km away. Neutrino oscillation was discovered by Professor Takaaki Kajita and colleagues, who were awarded the Nobel Prize in Physics in 2015. The T2K experiment was the first in the world to successfully obtain definitive evidence of muon neutrino to electron neutrino transformation in 2013. The experiment has been examining the difference in the probability of oscillations for neutrinos and anti-neutrinos since 2014, and the results so far suggest that CP symmetry violation occurs with a confidence level of 95%. Work has commenced to upgrade the accelerator, the neutrino generator, and the near-detector for measurement with even higher accuracy, and in the future, the next-generation "Hyper-Kamiokande" detector will be used to challenge the properties of elementary particles and the mystery of the disappearance of anti-matter from the universe.



T2K experiment

International Collaboration



Two thousand foreign researchers visit KEK

Around 2,000 researchers from some 45 countries and regions around the world have visited KEK for such purposes as joint research and international conference attendance. In the Belle II and T2K experiments, many researchers from research institutes worldwide are participating. In the Photon Factory, the Indian Beamline (BL-18B) has been set up based on a memorandum of understanding signed with the Indian Department of Science and Technology (DST).

International Cooperation Projects

The US-Japan Science and Technology Cooperation Program, which began in 1979, has contributed greatly to the development of accelerator science and the development of young researchers in both countries. In addition to cooperating with the upgrade of the Large Hadron Collider (LHC) at the European Organization for Nuclear Research (CERN), KEK also participates in international collaborative research such as the ATLAS experiment together with Japanese universities and research institutes. In the Asian Forum for Accelerators and Detectors (AFAD), KEK cooperates in the R&D and application of accelerator and measuring instrument technology, which is particularly demanded in the Asia region.

International Cooperation Experiments

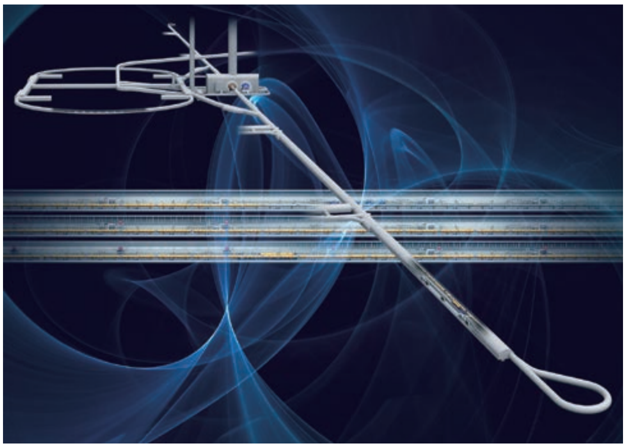
KEK is participating in the MEG experiment conducted at the Paul Scherrer Institute (PSI) in Switzerland, the POLARBEAR experiment to observe the cosmic microwave background (CMB) in the Atacama Highlands in Chile, and the TUCAN experiment to search for the neutron electric dipole moment using ultra-cold neutrons (UCN), which is being conducted at TRIUMF in Canada.

Academic Exchange Agreements

KEK has concluded academic exchange agreements with many universities and research institutes, and actively conducts joint research and exchange of researchers. These include in the Asia region the Institute of High Energy Physics (IHEP, China), the Institute for Basic Science (IBS, Republic of Korea), the Synchrotron Light Research Institute (SLRI, Thailand), and research institutes under the India Department of Atomic Energy, in North America the Fermi National Accelerator Laboratory (FNAL, the USA) and TRIUMF (Canada), and in Europe CERN, the French National Centre for Scientific Research (CNRS, France), the German Electron Synchrotron (DESY, Germany), the National Institute for Nuclear Physics (INFN, Italy), the University of Ljubljana (Slovenia), and the Budker Institute of Nuclear Physics (BINP, Russia). In particular, KEK established the Toshiko Yuasa Laboratory (TYL) jointly with France in 2006 as a virtual collaboration laboratory and has actively and systematically promoted joint research and exchanges of young researchers.

International Linear Collider (ILC)

The International Linear Collider (ILC) will be a necessary tool for unlocking some of the deepest mysteries about the universe. By colliding electrons and positrons at nearly the speed of light, the ILC will allow physicists to precisely explore extremely high-energy regions. Some 50 countries and regions worldwide are collaborating to develop accelerator technology and promote physics study. Japan is the leading candidate to host the machine, and KEK is working with scientists around the world for its timely realization. At its cutting-edge facilities: the Superconducting RF Test Facility (STF), the Accelerator Test Facility (ATF) and the Cavity Fabrication Facility (CFF), KEK is conducting various research and developments essential to realize the ILC, such as the superconducting accelerating systems, ultra-high quality beam generation and control, having achieved numerous results already.



ILC conceptual drawing ©Rey Hori

International Center for Quantum-field Measurement Systems for Studies of the Universe and Particles (QUP)

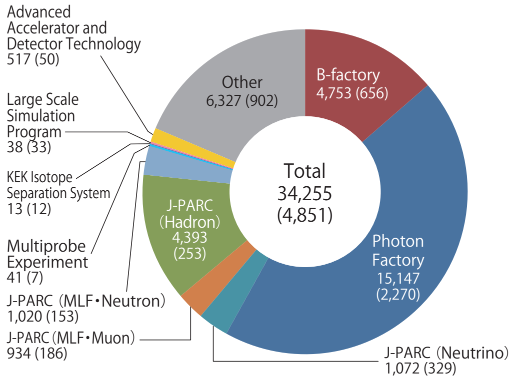
KEK has launched a new world premier international research center “International Center for Quantum-field Measurement Systems for Studies of the Universe and Particles (QUP)”. QUP will integrate particle physics, astrophysics, condensed matter physics, measurement science, and systems science in the works of invention and development of new systems for measuring quantum field. QUP has a characteristic of the global and diverse nature of quantum-field measurement. In addition to basic science, it will promote interdisciplinary research that transcends the boundaries of industry and academia.

Statistics

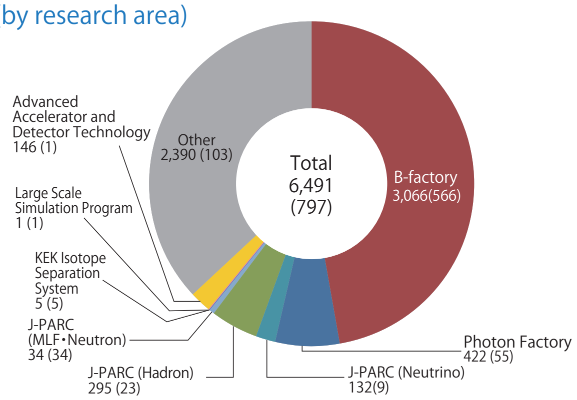
User Experimental Activities

Item / Experiment	FY2019			FY2020		
	Applications	Approved	Conducted	Applications	Approved	Conducted
B-factory	-	-	1	-	-	1
Photon Factory	378	376	754(923)	323	312	590(863)
J-PARC (MLF・Neutron)	148	139	126	97	90	71
J-PARC (MLF・Muon)	114	110	80	79	73	51
J-PARC (Hadron)	1	1	16	3	3	16
J-PARC (Neutrino)	0	0	3	2	2	5
Multiprobe Experiment	0	0	1	0	0	1
Large Scale Simulation Program	17	17	17	9	9	9
KEK Isotope Separation System	0	0	4	2	2	2
Total	658	643	1,002	515	491	746

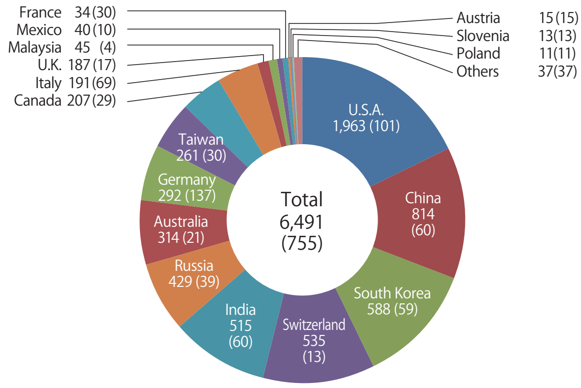
Number of Users (FY2020) [Person-days (Persons)]



Number of Users from Overseas Institutes (by research area)



Number of Users from Overseas Institutes(by country/region)



Number of Special Inter-University Researchers

Affiliation	Number
National University	17
Public University	0
Private University	1
Total	18

Institute/Laboratory	Number
Institute of Particle and Nuclear Studies	12
Institutes of Materials Structure Science	4
Accelerator Laboratory	2
Applied Research Laboratory	0

Number of International Agreement

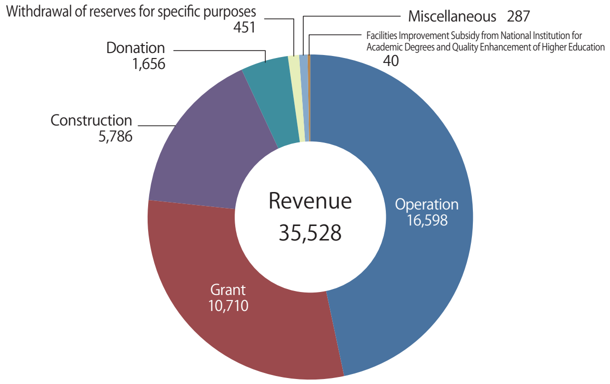
Country/Region	Number
South Korea	9
India	10
Taiwan	3
China	10
Thailand	3
Vietnam	0

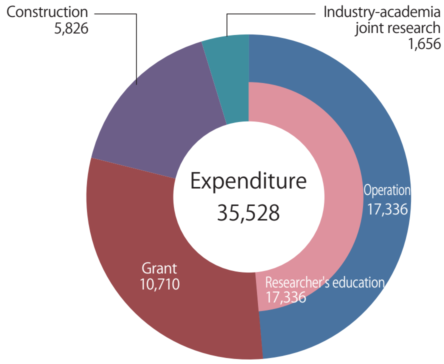
Country/Region	Number
Australia	1
U.S.A.	10
Canada	4
Chile	1
Russia	8
France	7

Country/Region	Number
Germany	4
Italy	4
Slovenia	2
Georgia	2
U.K.	2
Switzerland	2
Israel	0

Country/Region	Number
Austria	0
Sweden	3
Belarus	1
Poland	1
CERN	27
Multinational	11
Total	125

Budget (FY2021) [Million JPY]





Number of staff (April, 2021)

	Director General	Executive Director	Auditor	Research & Academic Staff	Adjunct Faculty Members	Researcher	Engineer & Technician	Officer	Total
Executive and Permanent Employee	1	5	2	337	-	-	155	157	657
Fixed Term Employee	-	-	-	22	19	148	71	170	430

The Graduate University for Advanced Studies (April, 2021)

School/Department	Quota		Newly enrolled	Registered	Total enrolled
School of High Energy Accelerator Science	5-year doctoral course 3rd year transfer admission	2 A few	1 1	17	152
Department of Materials Structure Science	5-year doctoral course 3rd year transfer admission	3 A few	1 1	12	107
Department of Particle and Nuclear Physics	5-year doctoral course 3rd year transfer admission	4 A few	11 2	43	179

Joint research with private sector [10,000JPY]

FY	Number	Amount of money
2020	81	15,827

Grants to scientifi c research [10,000JPY]

FY	Number	Amount of money
2020	193	136,844

Academic consultation[10,000JPY]

FY	Number	Amount of money
2020	6	1,274

Grants to agencies [10,000JPY]

FY	Number	Amount of money
2020	11	104,367

Donations [10,000JPY]

Types of Donations	Number	Amount of money
Specified Offering Donation	396	2,877
General Donation	84	237
International Privately Financed Students Scholarship	25	147
Request for support to gaining further understanding of the ILC Project	61	60
Promotion of KEK 50th Anniversary Commemorative Projects	177	1,960
Contribution to KEK for the future of Photon Factory	49	472
Others	7	

Trust researchers [10,000JPY]

FY	Number	Amount of money
2020	36	74,967

Facility usage fees [10,000JPY]

FY	Number		Amount of money
2020	PF	48	10,080
	Cryo-EM	21	632

Collection of books (April,2021)

Books			Journal			Total	Preprint/ Report
Japanese books	Non-Japanese books	Total	Japanese books	Non-Japanese books	Total		
14,083	26,479	40,562	5,427	44,796	50,223	90,785	131,765

※ 10,253 copies of e-books are available.

Facility (April, 2021) [m^2]

Area	Site	Building
Oho	1,531,286	196,966
Tokai	106,809	44,546
Takezono	8,350	3,412
Azuma	31,226	26,948
Total	1,677,671	271,872

※ Site of Tokai includes lease.

Number of Visitors (FY2020)

Purpose/destination of visit	Total
Guided tour	434
Exhibition hall	420
J-PARC	362
Total	1,216

Tsukuba Campus

1-1 Oho, Tsukuba, Ibaraki 305-0801 Japan
029(864)1171(dial-in number service)/
029(879)6047 (Public Relations Office)

Superconducting RF Test Facility (STF)

Belle II Detector

KEKB Accelerator

Accelerator Test Facility (ATF)

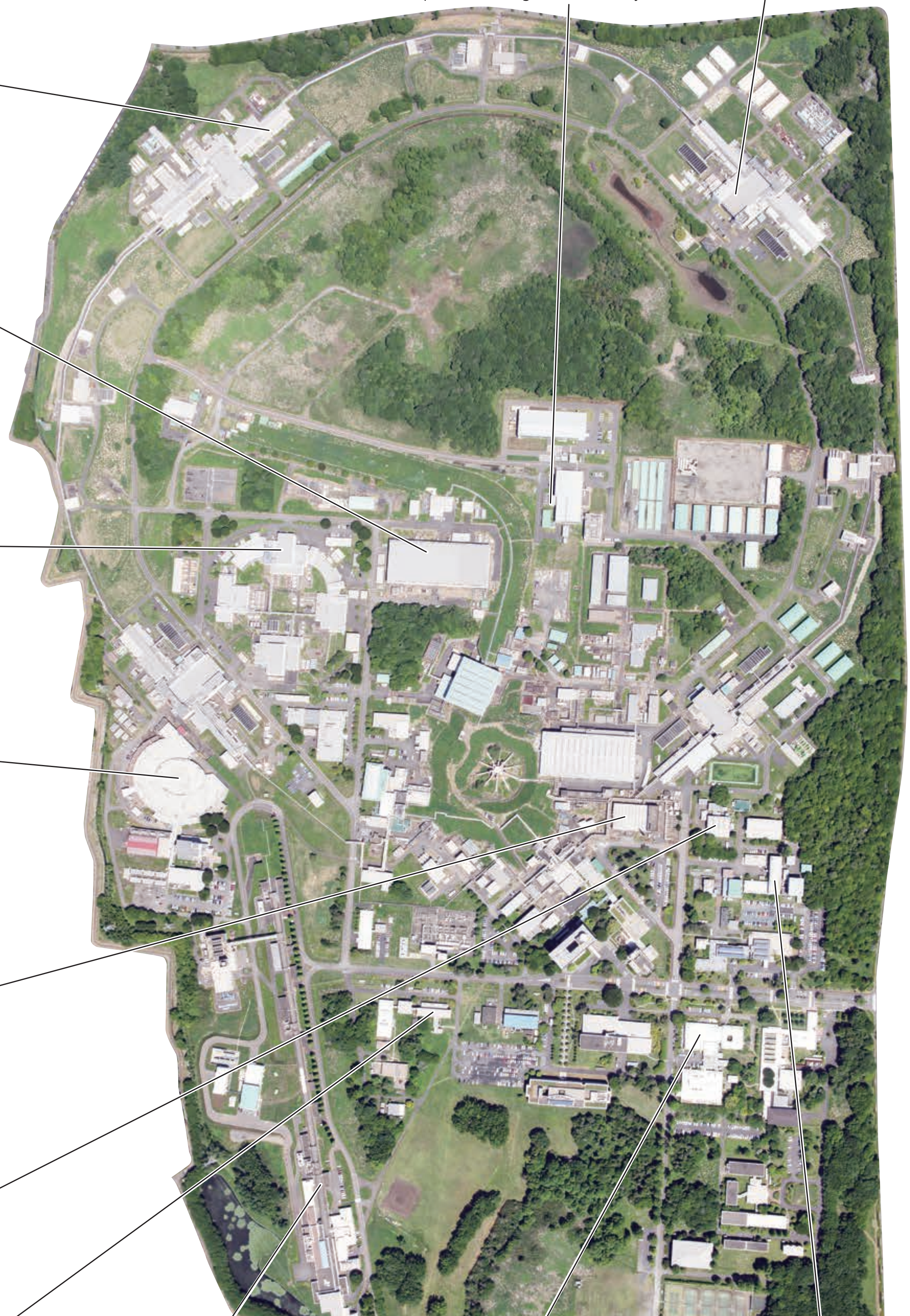
PF-AR

Photon Factory (PF)

Cavity Fabrication Facility (CFF)

Mechanical Engineering Center

Radiation Science Center



Electron-Positron Linear Accelerator

Compuring Research Center

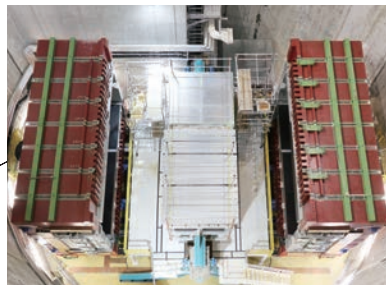
Cryogenics Science Center

Tokai Campus

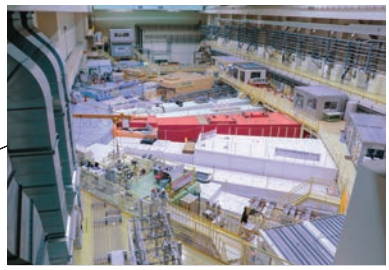
203-1 Shirakata, Tokai-mura, Naka-gun, Ibaraki 319-1106, Japan
029(284)4890

Linac

RCS



Neutrino Experimental Facility



Materials and Life Science Experimental Facility

MR

Hadron Experimental Facility

The Inter-University Research Institute Corporation

The inter-university research institute system was born in Japan to promote collaborative research beyond the university framework more than fifty years ago. The Inter-University Research Institutes are now providing researchers across the country with most advanced large-scale research facilities available and also serve as a core function for network-type worldwide collaboration research programs for different fields. One of the four independent Inter-University Research Institute Corporations is KEK, which has two inter-university research institutes and two laboratories: the Institute of Particle and Nuclear Studies (IPNS), the Institute of Materials Structure Science (IMSS), the Applied Research Laboratory, and the Accelerator Laboratory.

KEK AND NOBEL PRIZES

Kobayashi–Maskawa theory

KEK is a research institute with deep relations to the Nobel Prize. A number of KEK studies have been directly and indirectly connected to past Nobel Prizes. Many cutting-edge studies are also currently underway that are may lead to future such awards. The Belle experiment at the KEK B-factory experimentally proved the Kobayashi–Maskawa theory, for which the 2008 Nobel Prize in Physics was awarded to Dr. Makoto Kobayashi and Dr. Toshihide Maskawa. In 2001, the Belle experiment demonstrated the slight difference in the decay of B mesons and anti B mesons generated by colliding electrons and positrons. The experiment verified the correctness of the Kobayashi–Maskawa theory.

Structure and Function of Ribosome

In 2009, Dr. Ada Yonath, an Israeli scientist, was awarded the Nobel Prize in Chemistry for her accomplishment in clarifying the crystal structure of ribosomes, which can be considered protein factories. In the mid-1980s, a Weissenberg camera had been completed at the KEK Photon Factory for examining protein structures by synchrotron radiation. Dr. Yonath quickly applied for use to KEK, when she knew it. It was the beginning of joint research with the facility.

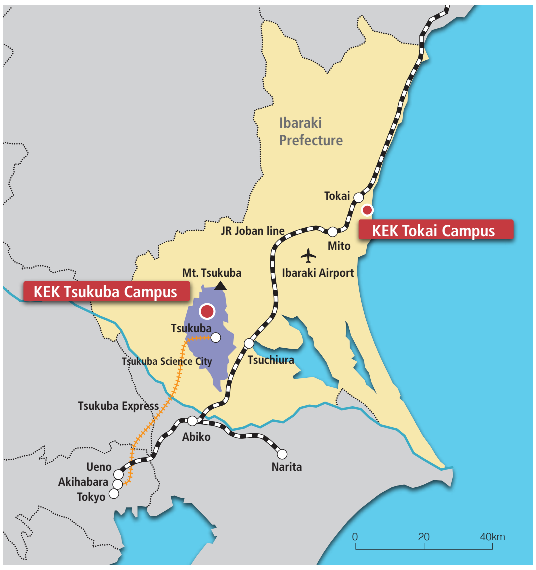
Discovery of Neutrino Oscillation

In 2015, Dr. Takaaki Kajita was awarded the Nobel Prize in Physics for his discovery of neutrino oscillation.
KEK succeeded for the first time in the world in verifying long-baseline neutrino oscillations using artificial neutrinos in the K2K experiment that detects neutrinos generated by the KEK Proton Synchrotron with the Super-Kamiokande detector located in the town of Kamioka in Hida City, Gifu Prefecture.

Dr. Makoto Kobayashi

Dr. Ada Yonath
(Photo by Dan Proges)

Dr. Kobayashi and Dr. Yonath were awarded the title of KEK Special Honorary Professor for their accomplishments.



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