J-PARC

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First Issue

Japan Proton Accelerator Research Complex

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J-PARC Annual Report 2008

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Preface

This is the first Annual Report of J-PARC.

J-PARC is a joint project between two organizations, the Japan Atomic Energy Agency (JAEA) and the High Energy Accelerator Research Organization (KEK). J-PARC stands for Japan Proton Accelerator Research Complex and it is a new and exciting accelerator research facility located in Japan. It uses MW-class high power proton beams at both 3 GeV and 50 GeV. The construction budget was allocated on April 1 of 2001. Since then, the construction has been proceeding smoothly in both the accelerators and the experimental halls. Finally, in the spring of 2009 (end of Japan fiscal year 2008) the Phase 1 project was completed after 8 years of construction.

The main purpose of J-PARC is to use various types of secondary particle beams (neutrons, muons, kaons, neutrinos, etc.) that are generated in proton-nucleus reactions. Through the use of these secondary particle beams, we will attain major scientific goals in three fields: a) nuclear-particle physics, b) materials and life sciences, and c) later, in Phase 2, research and development for nuclear transmutation. The anticipated goal of the proton current is 1 MW. From 2008 four types of beams have been obtained exactly on schedule: neutron beams (May, 2008), muon beams (September, 2008), kaon beams (February, 2009) and neutrino beams (April, 2009). Thus our facilities became fully operational and now can be used by researchers.

We expect J-PARC to become one of the most important accelerator facilities in the world for the 21^{st} century's sciences. Since three major regions in the world (North America, Europe and Asian/Oceanic Area) will have major scientific centers with high power proton accelerators, we would like to create a strong research center in the Asian/Oceanic region. Many non-Japanese scientists have already started to use this facility.

From Japan fiscal year 2009 we plan to strengthen the accelerator power to 1 MW. We already started Linac construction to achieve 400 MeV. Also, we plan to make special effort on creating mechanisms to provide access to J-PARC to international users, in addition to expanding the industrial use of J-PARC, the lodging capabilities, the Phase 2 projects, etc.

Shoji Nagamiya

Director of the J-PARC Center

Overview

Yujiro Ikeda and Hitoshi Kobayashi

The year of 2008 was the most important period in the J-PARC project from various aspects in terms of accelerator development, user facility completion, secondary particle production, their performance demonstration, etc. First of all, the primary goal of the facility construction was realized with a series of the beam production at each target in the four facilities, i.e., neutron at Materials and Life Science Experimental Facility (MLF), muon at MLF, K-meson at Hadron Experimental Hall and neutrino at Neutrino Facility. They were definitely co-memorable events. Here, we like to overview the most significant events in 2008.

The fiscal year 2008 started with the 3-GeV Rapid Cycling Synchrotron (RCS) beam commissioning. Linac provided stable proton beam to RCS and finally the 3 GeV proton was extracted to the MLF in beginning of May 2008.

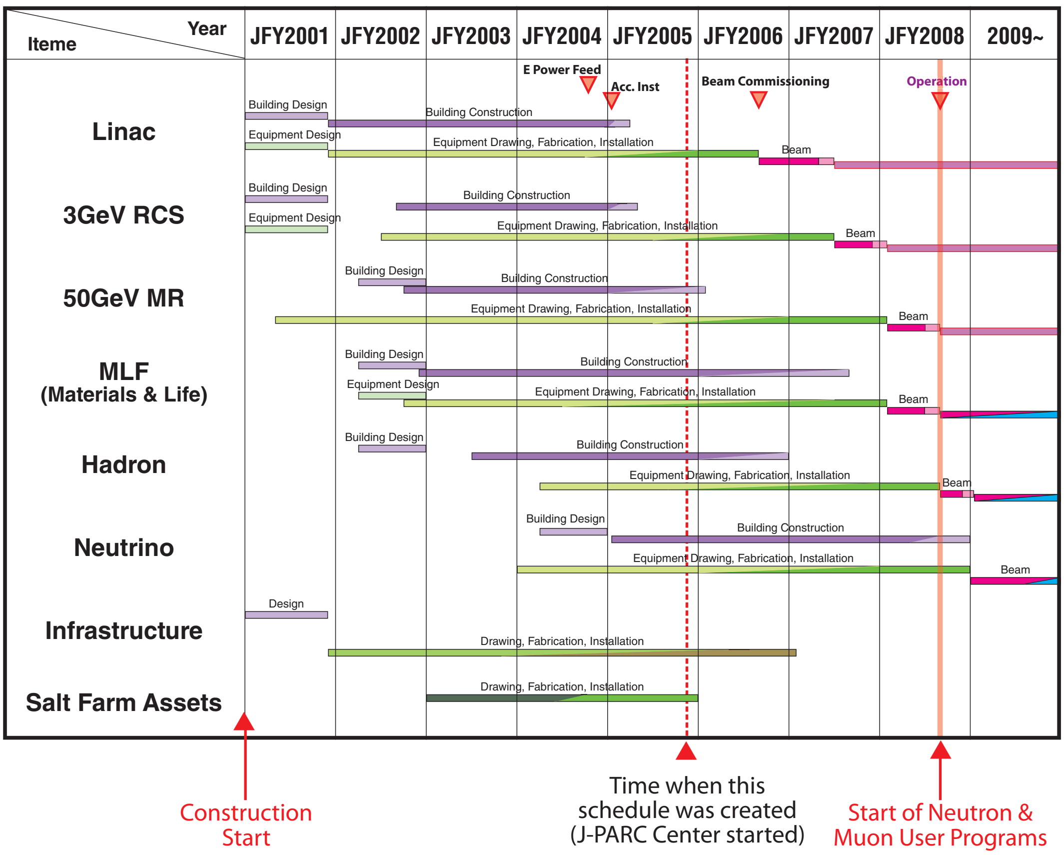
The victory in the advanced pulse neutron source facility construction was confirmed with the first neutron beam observation at the very first proton pulse injection from RCS on May 30, 2008. The instance was celebrated the neutron team for their achievement to be memorized forever in the J-PARC history. It is worth to note that right after the event, the world record in the pulse resolution was demonstrated in the super-high resolution powder diffractometer, highlighting the high-performance of the J-PARC pulse neutron source design.

In September 26, 2008, we had a pleasant moment with the first muon beam production. It was excited time when the muon beam was clearly identified. We had confirmed the facility's ability in terms of beam intensity at MW power to be the world highest muon source.

On December 23, 2008, the first proton beam was accelerated from 3 GeV to 30 GeV in Main Ring (MR), the destined energy of the first phase of the project, and it was extracted to the abort beam line by a fast extraction system.

In January 2009, Hadron experimental hall, which uses a slow extraction system, was finally ready for beam. The first beam was injected on January 27, although it was very weak signal, but the real proton was injected to the Ni target. The first clear observation of K-meson was reported on February 18, 2009.

J-PARC Construction Schedule



Ground-breaking ceremony at J-PARC site on June 6, 2002.

In April 23, 2009, the proton beam was injected on the neutrino production target through a fast extraction system in MR. The neutrino was identified by the muon monitor located downstream from the target. It was, then, the most historical day as the all of J-PARC production targets received protons, resulting in the completion of the facility construction.

Along with the facility hardware, the first user program started at the MLF on December 23, 2008. At that moment, the beam power was expected to be low as much as 20 kW at most, which was 1/50 of the goal of 1 MW. However,

First beam acceleration to 181 MeV at LINAC on January 24, 2007.

First beam acceleration to 3 GeV at RCS on October 31, 2007.

Birth of pulsed neutron beam through the spallation neutron source at MLF on May 30, 2008.

First muon beam extraction from muon production target at MLF on September 26, 2008.

we received many proposals even though the power was low, The start of first J-PARC neutron and muon user program stimulated users from academia to industrial applications.

Concerning the accelerator operation at the very beginning, we have struggled with instability of the radio frequency quadrupole (RFQ), which made limited the beam power less than 20 kW.

Nevertheless, 2008 was glorious days in J-PARC history. We could define 2008 as the commissioning year and the firm step toward the full-scale user program in 2009.

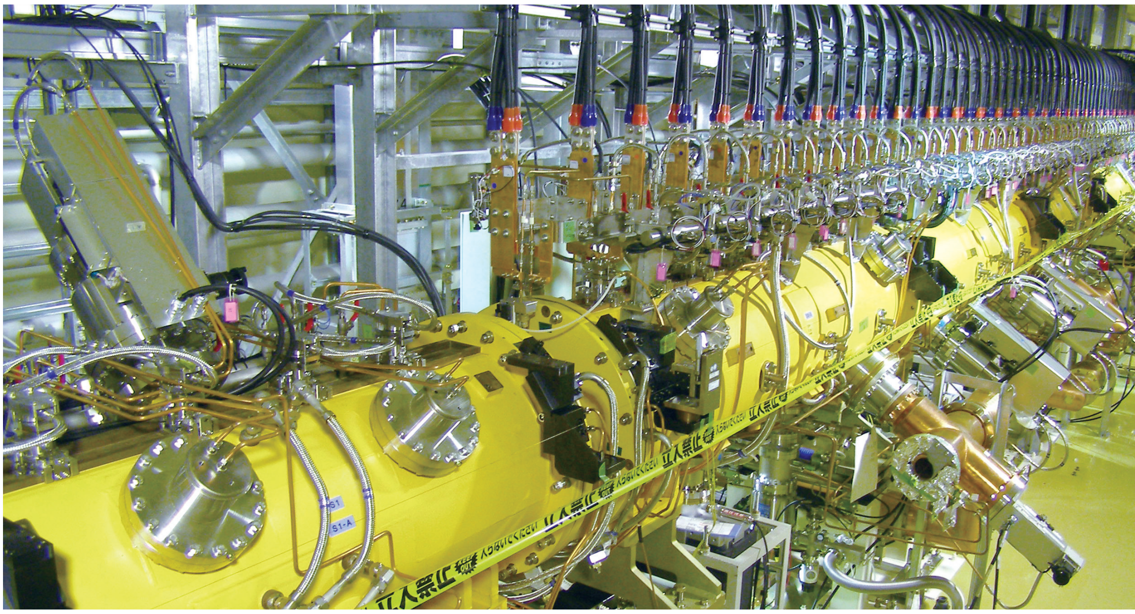
Ceremony for the start of J-PARC Center on August 8, 2006.

First beam circulation at 3 GeV in Main Ring on May 24, 2008.

First beam acceleration to 30 GeV at Main Ring on December, 2008.

First beam extraction at hadron experimental hall on January 27, 2009.

First neutrino beam production on April 23, 2009.



Accelerators

Overview

The J-PARC accelerators consist of a 181-MeV linac (LINAC) which will be upgraded to 400 MeV in 2012, a 3-GeV rapid cycling synchrotron (RCS) and a 50-GeV synchrotron (MR).

Main operational goals

	First Step			Second Step		
	Energy (GeV)	Power (kW)	Repetition Rate (Hz)	Energy (GeV)	Power (kW)	Repetition Rate (Hz)
LINAC	0.181	(30 mA)	25	0.4	(50 mA)	25 (50)
RCS	3	300 (→600)	25	3	1000	25
MR	30	300	~ 0.3	30	750	~ 0.47

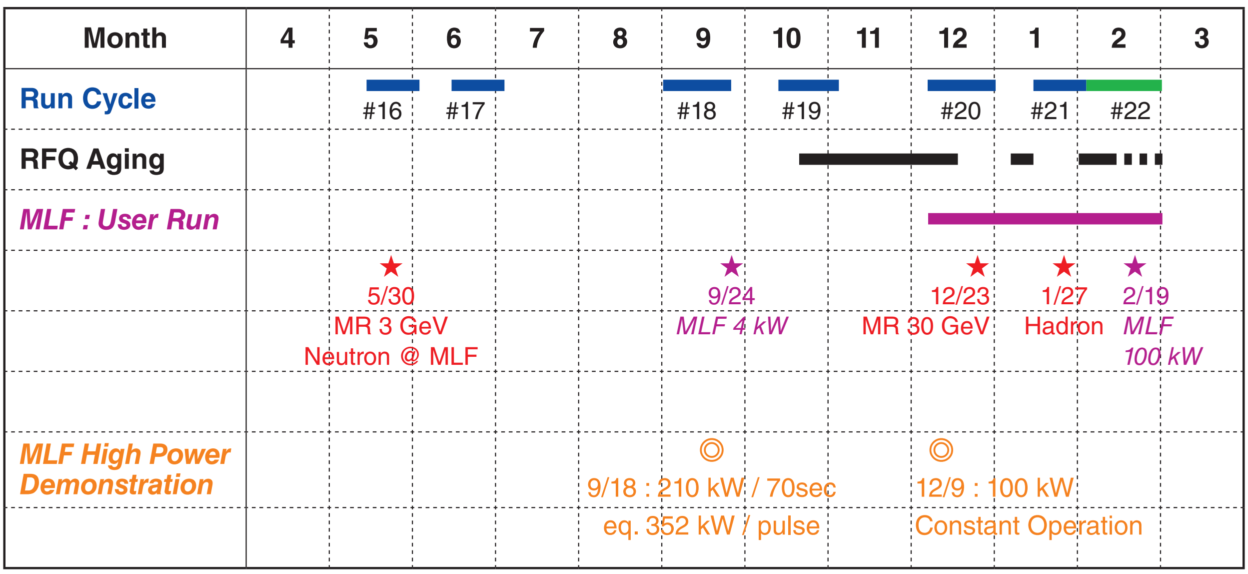
The maximum energy of MR is now set at 30 GeV to obtain maximum performance for a high intensity proton source and also to mitigate the technical issues concerning stable operation due to huge excitation currents.

Since the beam commissioning of LINAC started in November 2006, we have achieved the following main milestones:

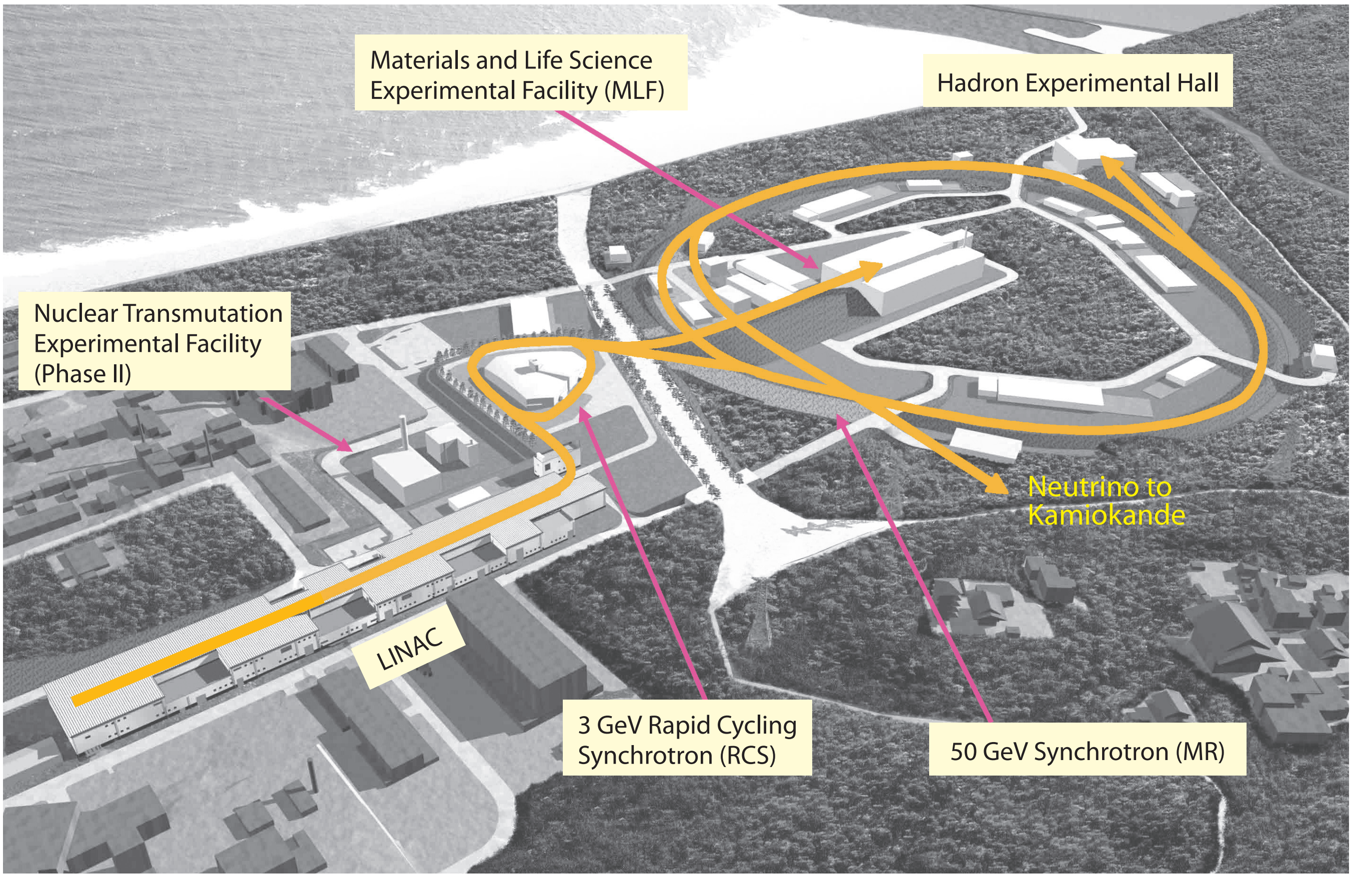
January 2007 181 MeV beam from LINAC
October 2007 3 GeV beam from RCS
May 2008 3 GeV beam stored at the injection porch in MR
December 2008 Beam acceleration to 30 GeV in MR
Started the user program of MLF
January 2009 Beam extraction to the hadron target at the 30 GeV flat top in MR

The progress in fiscal year 2008 is summarized in the following table and figure. The beam intensity and beam size of RCS is changed pulse-by-pulse according to the beam destination: MLF or MR.

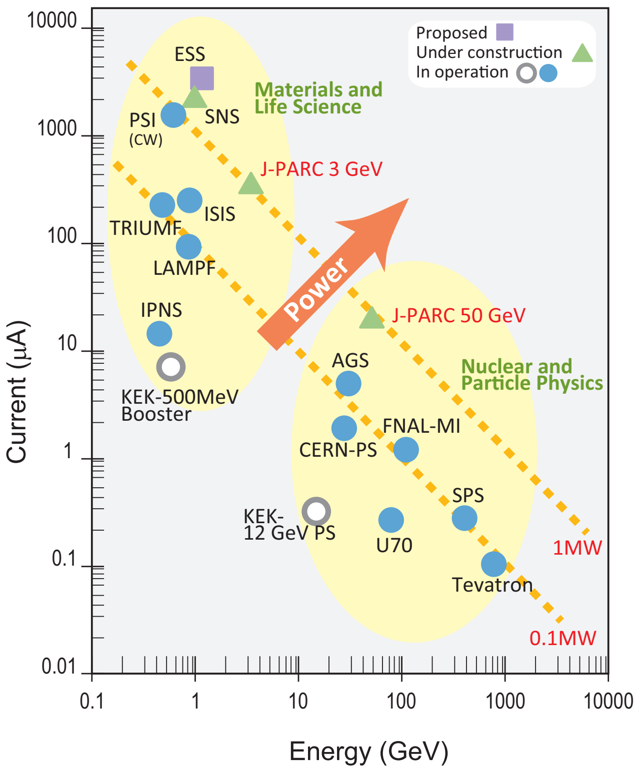
The user program of MLF started from December with 4 kW of beam power and the planned power of 100 kW was reached in February. But the discharge problem of a radio frequency quadrupole (RFQ) in LINAC described bellow suspended the stable operation for user program.



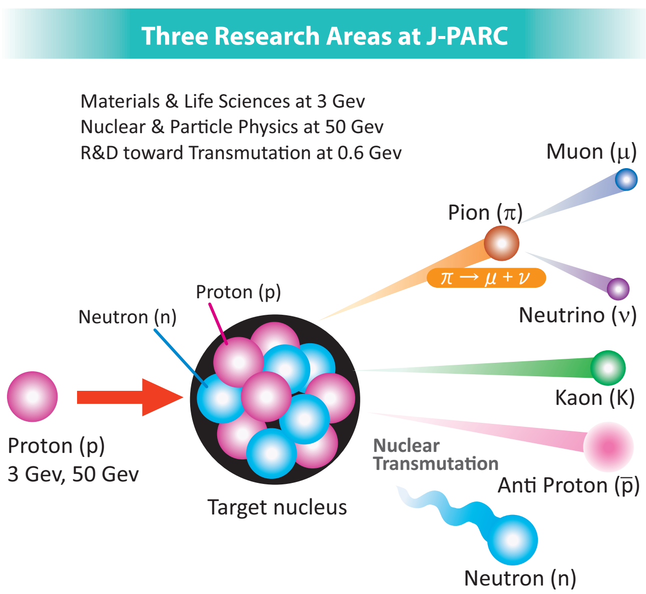
Operation schedule and typical achievements in fiscal year 2008.



Bird eye's view of the J-PARC site.

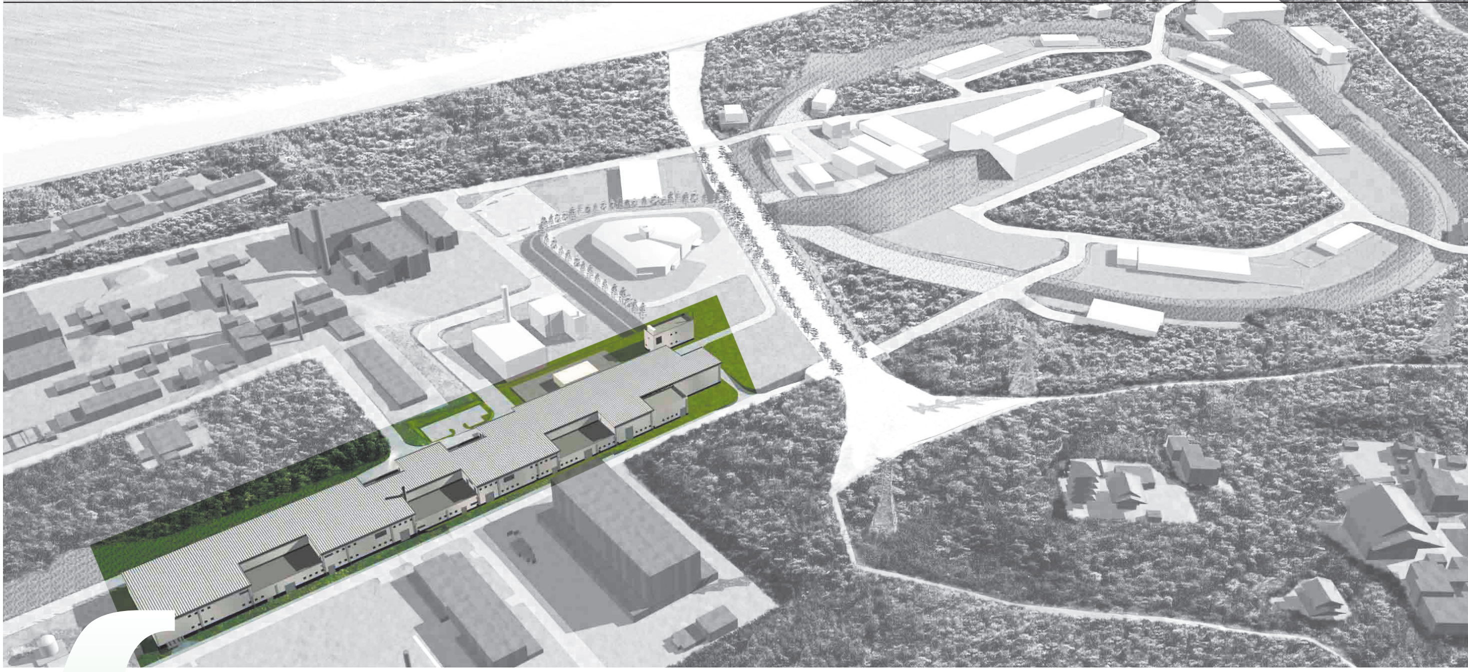


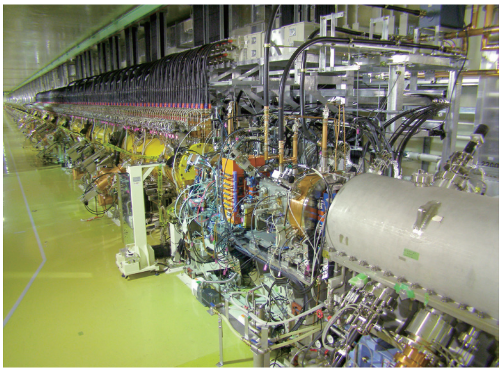
Power map of worldwide proton accelerators as of 2001.



Secondary beam produced with high-intensity proton beam.

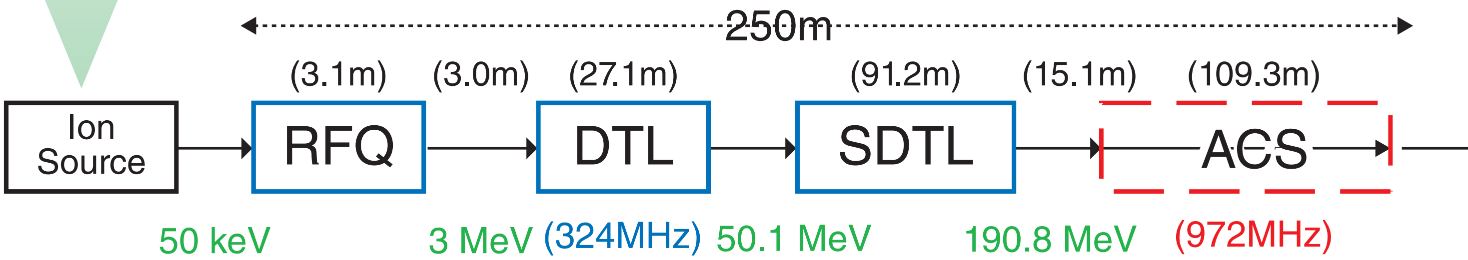
LINAC

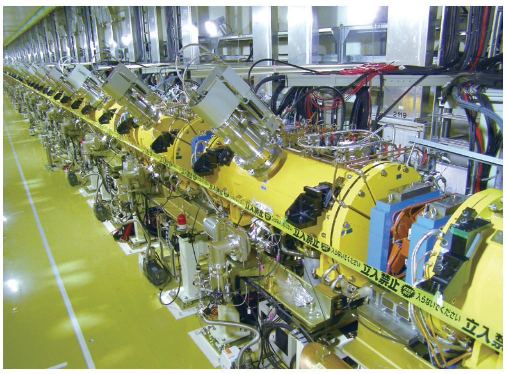




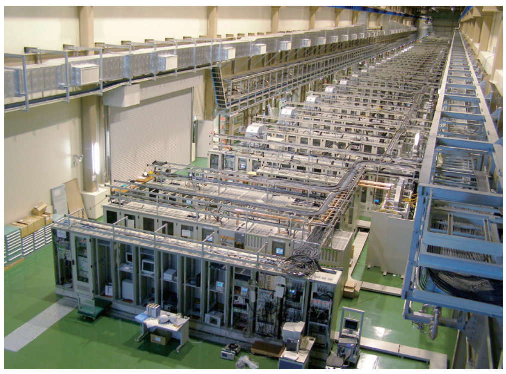
From RFQ to DTL and SDTL.

BL to RCS. One SDL unit is used as debuncher until ACS is installed.





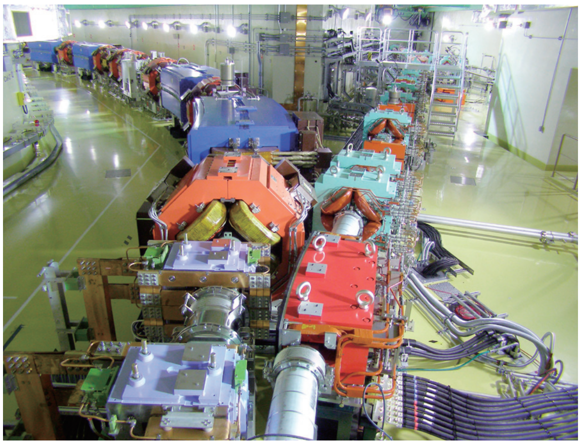
Drift tube linac.



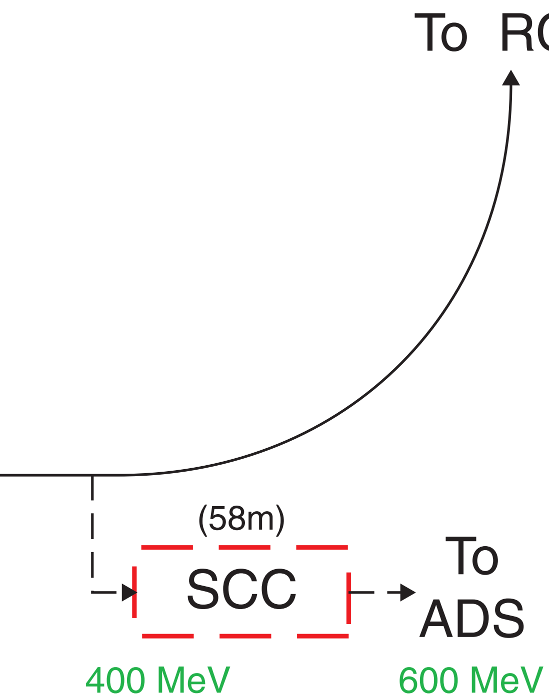
Klystron gallery.

The linac design is shown in the figure. The volume-production type of a negative hydrogen ion source is used for producing a peak current of 30 mA (which is increased to 50 mA in the second step) with a pulse length of 0.5 ms and a repetition rate of 25 Hz. The beam is extracted at 50 keV to the 324-MHz radio-frequency quadrupole (RFQ) linac and accelerated to 3 MeV. Then, the beam is accelerated through the drift tube linac (DTL) to 50 MeV, through the separated-type drift tube linac (SDTL) to 181 MeV, through the annular-ring coupled structure (ACS) linac to 400 MeV and through the super-conducting cavity (SCC) linac to 600 MeV according to the velocity increases. Here, SCC and ADS (accelerator driven transmutation system) are shifted to Phase II. RFQ, DTL and SDTL are operated with the same frequency by twenty 3-MW klystrons, which were newly developed by a klystron vendor for J-PARC in collaboration with the J-PARC accelerator team.

Currently the 181-MeV beam is injected to RCS and ACS is under construction and is expected to be in operation from 2012. The beam for RCS is chopped in order to avoid beam loss due to spilling from the RF bucket of RCS at injection.



LINAC beam merges into RCS.



LINAC building seen from the downstream.

From LINAC to RCS.

RCS

The negative hydrogen beam is injected through the charge-exchange foil and is converted to a proton beam. This injection scheme is free from the Liouville's theorem, that is, a new beam can be put in the region of phase space already occupied by the circulating beam. Therefore, in principle, the beam density can be increased to the space charge limit. To mitigate the space charge effect, the injection points in phase space are scanned to enlarge the beam emittance in both the transverse and the longitudinal phase space (this is the so-called "Painting Process").

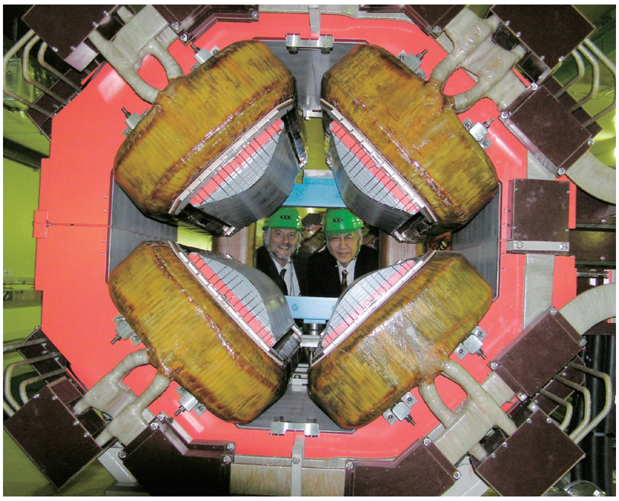
There were many issues to be resolved in the process of realizing the advantages of the RCS scheme. The most important of them were the following:

1) High accelerating voltage and wide frequency range of the RF acceleration system.
2) Ceramic vacuum chambers against large eddy current due to the fast change of the magnetic field.
3) Large aperture magnets for the beam with large emittances to mitigate the space charge effect.
4) Magnetic field tracking in rapid cycle.
5) Injection and extraction system for the high intensity beam with large emittances.

These issues have been successfully resolved to ensure the current stable operation of 100 kW.

Present main parameters of RCS

Circumference	348.333 m
Injection Energy	181 MeV
Extraction Energy	3 GeV
Emittance @ Injection	< 324 π mm-mrad.
Revolution Frequency	
at Injection	469.3 kHz
at Extraction	835.9 kHz
Repetition Rate	25 Hz
RF Frequency (MHz)	(0.938 $\rightarrow$ 1.67)
Harmonic Number	2
Number of RF Cavities	11 ($\rightarrow$ 12)
Transition Energy (γ_T)	9.14
Number of Bending Magnet	24

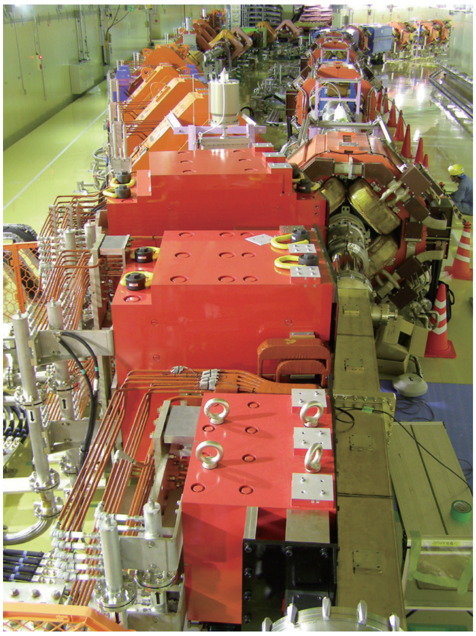


Large Aperture Quadrupole.

Dipole magnet in combination process.

Magnets in the ring.

Injection region. The beam comes from the upper-right corner. The charge exchange foil system is located in the middle. The BL to H0-dump is below to the right.



Extraction region. From left : BL to MLF, BL to MR and RCS ring.

RF acceleration stations.

Extraction kickers.

RCS building.

MR

There is transition energy in a conventional synchrotron. When the beam energy reaches this energy, the longitudinal focusing disappears in the first order and the line density of the beam blows up to infinity. That process causes instability and results in a beam loss. Therefore, the MR Lattice is designed in a way that ensures to have the imaginary transition energy in order not to arise the beam instability. The MR is the first proton synchrotron that adopted distinctive beam optics design, although there already exists as an electron storage ring for synchrotron radiation to enlarge tolerances against beam instability. The beam is accelerated to 30 GeV in 1.9 sec (2.5 sec at present) and extracted in one turn with the fast kickers to the neutrino production target, or extracted in the range of a second with the controlled resonance of betatron oscillation (the so-called Slow Extraction) to the hadron experimental facility.

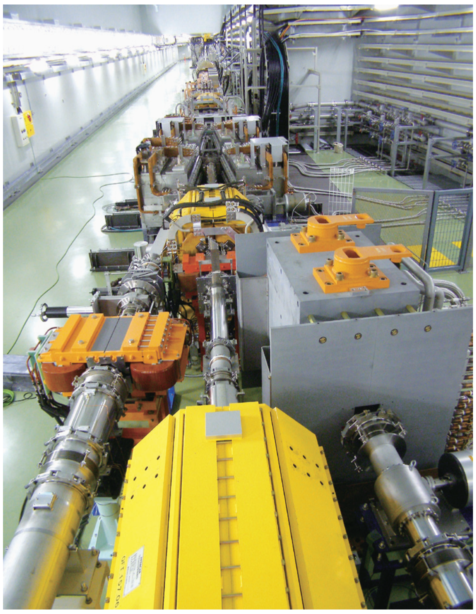
The RF acceleration system is almost the same as that of RCS except for the following point. The MA (Magnetic Alloy) cores had been radially cut with a gap of 10 mm. Thus the Q value had been optimized to about 10 in order to reduce the beam loading. The small change of frequency (1.67 ~ 1.72 MHz) permits a larger Q-value than that of RCS, still keeping the advantage of eliminating any frequency tuning system.

Present main parameters of MR

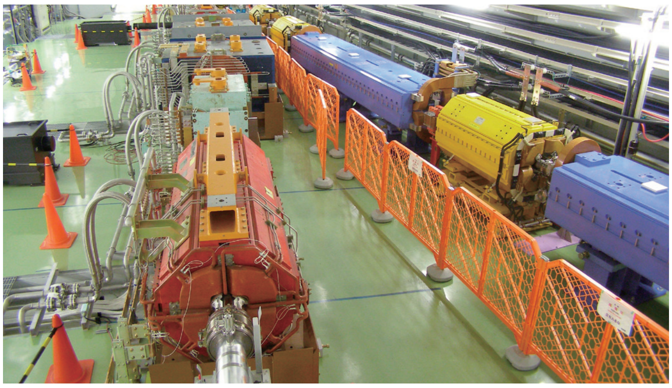
Circumference	1567.5 m
Injection Energy	3 GeV
Extraction Energy	30 GeV
Revolution Frequency	
at Injection	185.7 kHz
at Extraction	191.2 kHz
Repetition Rate	~ 0.3 Hz
RF Frequency	(1.67 → 1.72) MHz
Harmonic Number	9
Number of RF Cavities	4 (→ 6)
Transition Energy (γ_T)	*31.7 (imaginary)*
Number of BM	96

Injection region.

Magnets aligned in MR. Blue: Dipole, Yellow: Quadrupole, Green: Sextupole, Orange: Steering.



Fast extraction. Left: to abort dump, middle: to ring, right: to neutrino target.



Slow extraction region. Left : to hadron target.

Materials and Life Science Experimental Facility

In fiscal year 2008, the Materials and Life Science Division achieved two important milestones: it generated both the very first pulsed neutron beam at the spallation neutron system and the muon beam through the muon production target located at about 30 m upstream from the neutron source, and then advanced to the implementation of a user program.

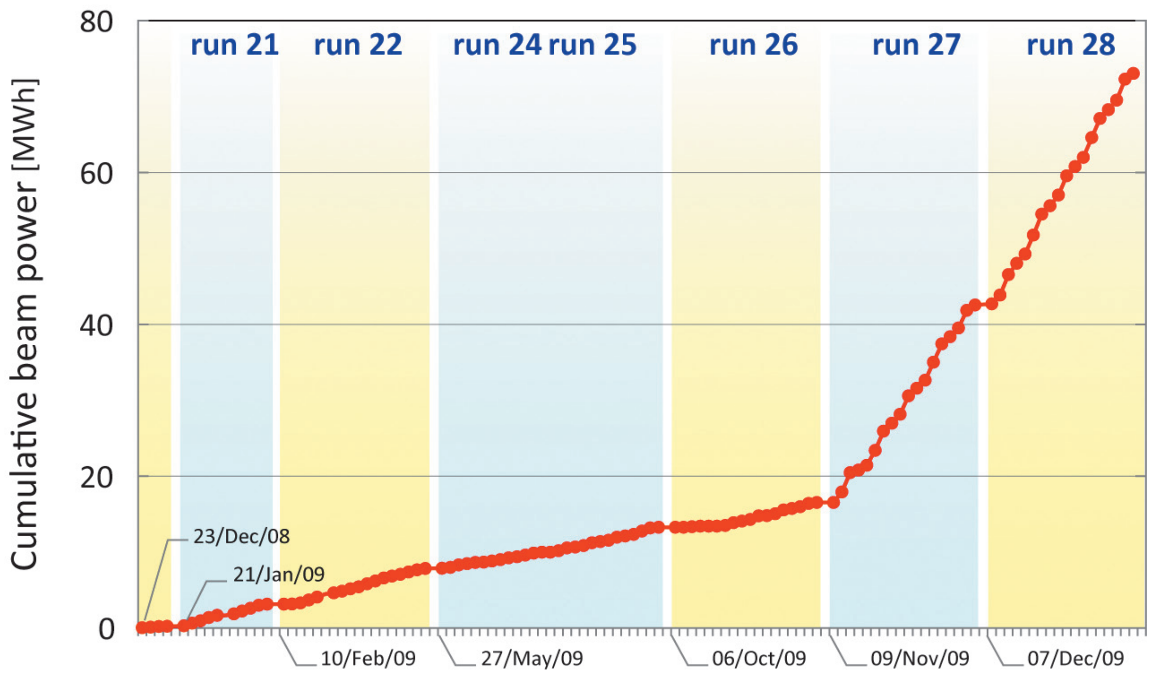
Key parameters of MLF

Injection energy	3 GeV
Repetition rate	25 Hz
Neutron source Target material Number of moderators Moderator material Moderator temperature/pressure Number of neutron beam ports Muon production target Target material Number of muon beam extraction ports	 Mercury 3 Supercritical hydrogen 20K/ 1.5 MPa 23 Graphite 4
Neutron instruments* Open for user program Under commissioning/construction	 7 4/3
Muon instruments* Open for user program Under commissioning	 1 1

(* as of the beginning of the user program in fiscal year 2008.)

Beam up rate for user program since December 2008.

No. of run cycle	Scheduled Time (h)	Up rate (%)
#20	60	85.4
#21	297	54.6
#22	366	70.0
#23	724	65.1
#24-25	394	75.1
#26	183	84.3
#27	270	86.3

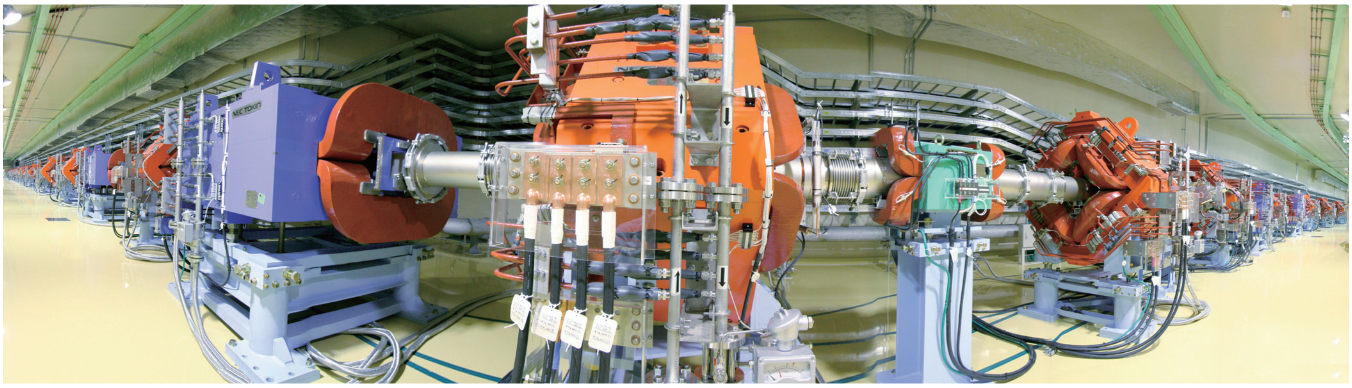


Cumulative proton beam power delivered to neutron and muon production targets at MLF since the beginning of the user program on December 2008. The operational beam power ramped to 120kW in the run cycle #27 in 2009, while it was 20 kW in fiscal year 2008.

Neutron Source

All of the 108 magnets aligned on the approximately 300 m long tunnel of the proton beam transport line (3NBT) which transports the beam extracted from 3-GeV rapid cycling synchrotron (RCS) to the neutron production target at Materials and Life Science Experimental Facility (MLF) had been switched on. As a matter of fact, the upstream section branched to the beam-dump has been operated for accelerator studies. On the first day of the proton beam delivery to the neutron production mercury target at MLF, eventually, the 3NBT successfully transported the proton beam to the mercury target with the designed tuning parameters. The beam transport was confirmed with nine current transformers (beam intensity monitors) installed in the 3NBT line. This memorable event deserves a special praise because it was achieved through the very first beam shot extracted from RCS.

During the maintenance period, the magnets and the beam monitors were re-aligned with an accuracy of ~0.1 mm through careful survey. The parameters of the beam optics were carefully tuned again throughout the on-beam commissioning. Consequently, in December 2008, successful transport of a proton beam with an intensity of 100 kW was achieved without any significant beam loss.



View of proton beam transport line (3NBT). 6 horizontal and 3 vertical bending magnets, 54 quadrupole and 45 steering magnets from the extraction point of RCS to the neutron production mercury target.

The neutron source system consists of the following core components for providing high intensity and quality pulsed neutron beams: a mercury circulation loop for target, three supercritical hydrogen moderators surrounded with an inner bellilium and outer steel reflector. It was ready to accept the first beam in May, 2008. It should be noted that the cryogenic hydrogen circulation system designed to circulate supercritical hydrogen with pressure of 1.5 MPa and temperature of around 20 K (-253°C) has been successfully operating with the largest flow rate of about 8 m^3/h for the first time in Japan.

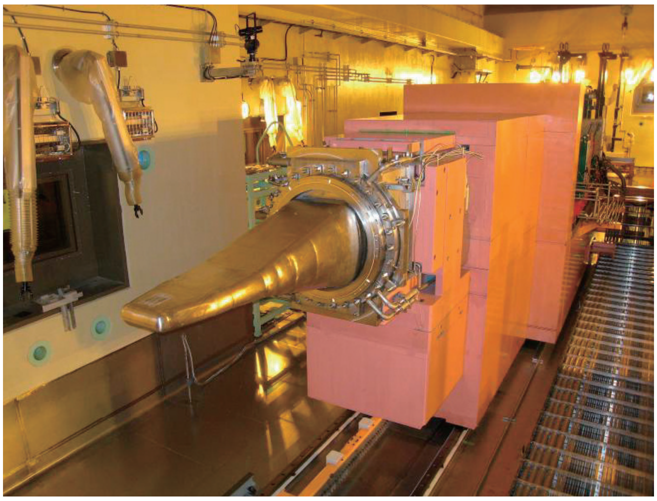
After the memorable event of producing the very first neutron beam, the neutronic performance data, i.e., spectrum, intensity and pulse shapes, have been measured for the three types of moderators as an important campaign to validate the neutronics design. The measured data agreed well with the design values, suggesting adequacy of neutronics design of JSNS.

In the 100 kW beam injection, the temperature of the flowing mercury in the target vessel was measured and almost coincided with the estimated value in the target design. The pressure waves were measured as well and were analyzed to understand the time responses of the target vessel. On the other hand, the bid for the second mercury target vessel was awarded to a vendor and the fabrication will be completed by the end of 2009. The next generation target vessel will be separated into two parts, a forward and a rear part, to reduce the waste volume at the target vessel. The research and development of a bubbling system is continuing consistently in order to mitigate the pressure wave on the mercury circulation system. The SNS team visited J-PARC and carried out the off-beam cavitation damage tests by using MIMTM (electro Magnetic IMpact Testing Machine) mercury loop.

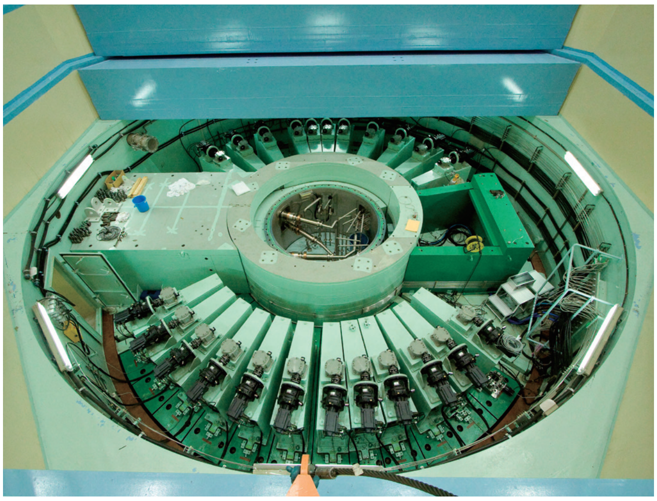
The ancillary systems were functioning in a stable way for the MLF beam operation even at 100 kW. Radiation dose levels caused by the residual radioactivity in the mercury circulation system at the hot cell were measured in November. The maintenance procedures will be reviewed and modified on the basis of the measured data. Maintenance work for the primary cooling water piping was also conducted, and many lessons have been given to reduce tritium contamination.

We encountered a couple of challenges throughout the yearly operation of the neutron source components. One was the problem with the neutron beam shutter system that occasionally was not responsive to the open signal from the shutter switch at the instrument. We finally resolved the problem by replacing the controller of the servo motor system due to malfunction caused by a bug. The other one was the failure of the rotor of a hydrogen pump. This was also repaired at the vendor's manufacturing facility.

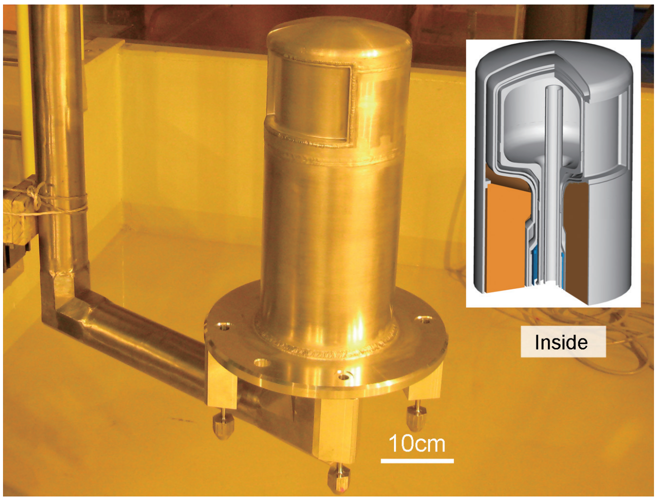
We completed a series of remote-handling tests of the mercury target, the moderators, the reflector plug and the proton beam window by using actual componets, although the actual maintenance work is going to be conducted within the next several years.



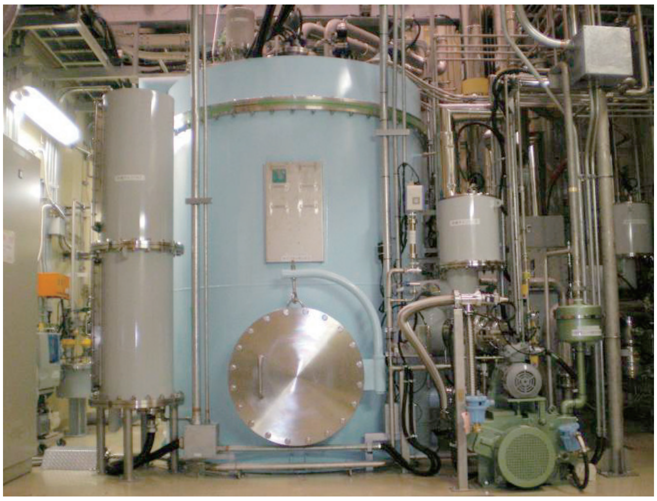
Mercury target installed on the target trolley. The target vessel has triple-walled structure and mercury flows in the target vessel with a flow rate of $41m^3/h$.



View of upper part of the neutron source station.



Coupled moderator.



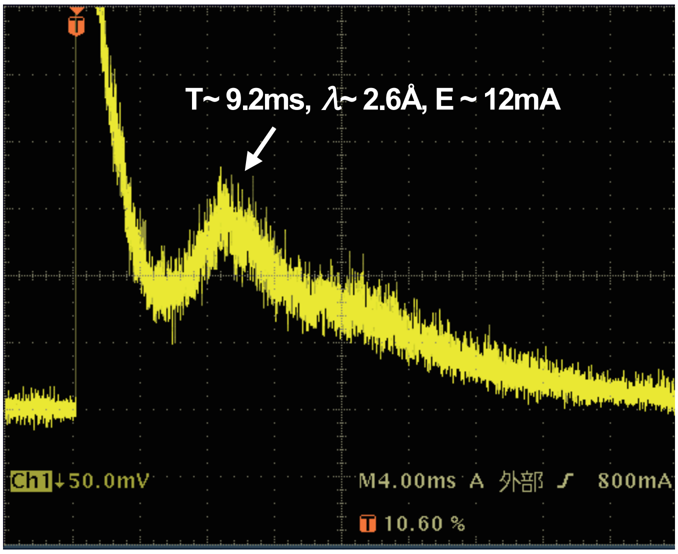
Safety box set in the cryogenic hydrogen components room in MLF, it contains a hydrogen circulation loop, hydrogen pumps, an accumulator device and other components.

Birth of pulsed neutrons in J-PARC

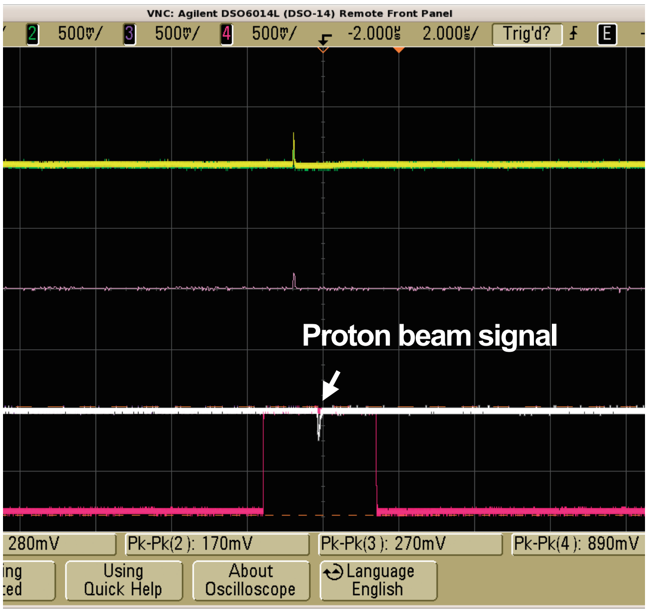
At 14:25 on May 30th, 2008, the memorable event of the first neutron being generated was recorded at MLF. A shot of 3 GeV protons from RCS was injected to the mercury target at MLF. A pulsed neutron beam extracted from the de-coupled moderator was detected by the Li-glass detectors which were incorporated in the Current type Time-Of-Flight (CTOF) technique placed in the beam line of NOBORU, NeutrOn Beam-line for Observation & Research Use (an instrument for neutron source characterization).

The first memorable neutron energy spectral intensity derived from the CTOF data is shown in the photograph. The incident proton beam profile recorded by the imaging plate is also displayed. Right after the event of the first neutron production, beams were introduced to four instruments consecutively to test the system performance.

That was a very quiet but exciting achievement of an important J-PARC landmarks. The spectrum displayed on the monitor screen confirmed our achievement as a result of a 7-years long challenge. Although the power of the accelerator was still low, equal to only 4 kW, that was a calm and convincing departure forward to the J-PARC MW pulsed neutron source. The endeavors of the MLF neutron team of JAEA and KEK, were rewarded by this historical moment.



Moderator temp. : ~18K, L=14m 12mA



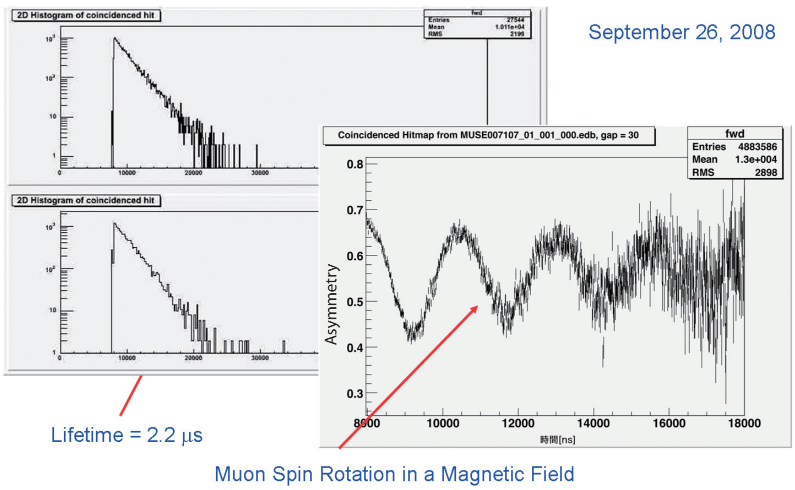
Time of flight spectrum of the first neutron beam measured at the NeutrOn Beam-line for Observation & Research Use (BL-10), (left). Proton beam signal measured by a beam intensity monitor located at the downstream end of the 3NBT line.

Successful extraction of the first muon Beam

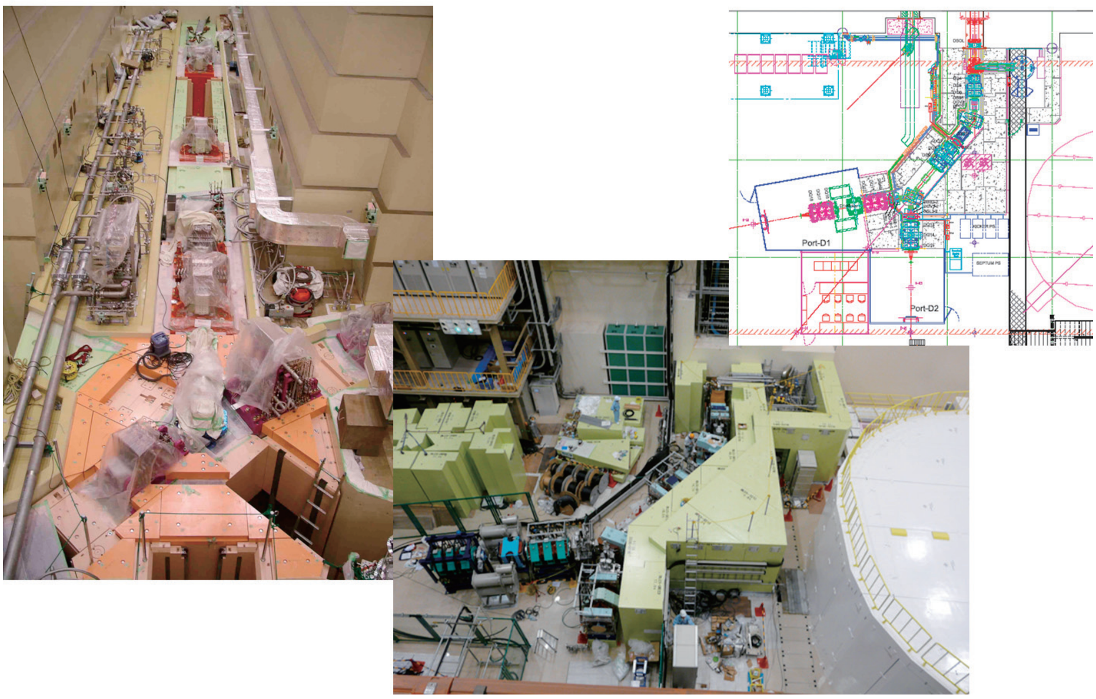
Four months after the memorable event of generating the first neutron beam, the muon experimental area at MLF opened as the most powerful muon beam utilization facility. The final commissioning procedures such as the vacuum connections and the installation of radiation shields for the decay muon beam line were finished the day before the first proton beam was delivered to MLF for the muon generation. In the afternoon of September 19, the muon production target was inserted into the target position of the proton beam transport line.

Eventually at 12:10 pm on September 26, 2008 (JST), the background-free muon beam was successfully delivered to the D1 experimental area after commissioning the secondary beam line components, which include the superconducting solenoid, the DC-separator, quadrupoles and bending magnets.

Positive muons with momenta of 29 MeV/c brought from Muon Science Laboratory (MSL) at KEK after refurbishment of emitted positrons were stopped in an aluminum plate placed at the heart of the μSR spectrometer and the positron events were recorded by a brand new data acquisition system designed to monitor the asymmetry. The build-up of the events and the associated sharpening of the precession signal under a weak transverse field were witnessed by an audience of about one hundred, who gathered at the experimental area, and celebrated the re-birth of the pulsed muon beam and the achievements of the J-PARC Muon Science Section.



Lifetime of μ^- and spin rotation in a magnetic field measured in the D1 experimental area.



Muon target area in the proton beam transport line (left), secondary muon beam line at experimental hall (right).

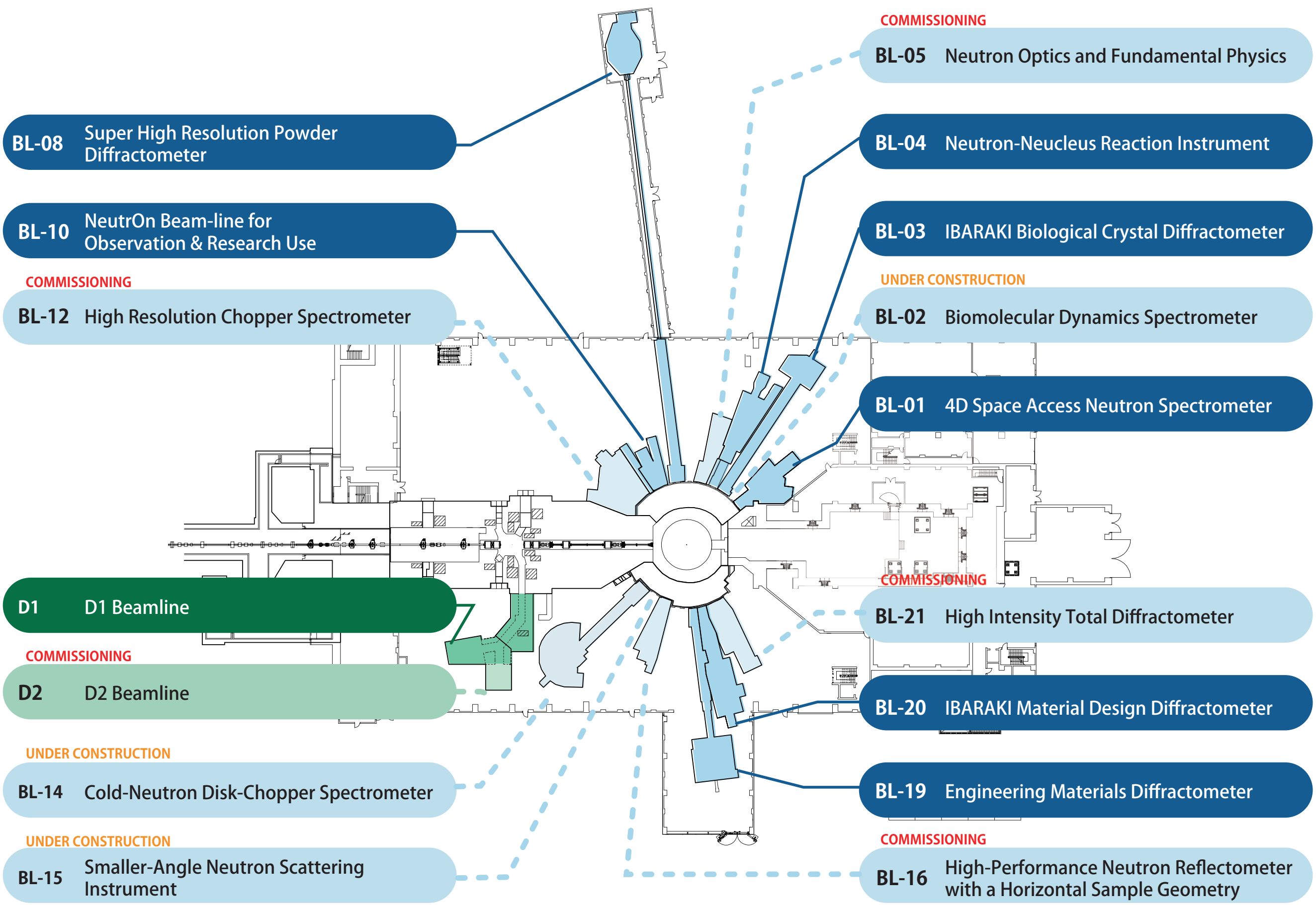
Neutron instruments

Since January, 2008, the construction of an instrument suite has been carried out intensively by many companies at the experimental halls in MLF. At the busiest period, over 10 installations were carried out simultaneously under a tight schedule to make possible the first beam operation scheduled for the end of May. The MLF staff patrolled the construction site regularly to reduce the risks of accidents. Thanks to those endeavors, the following five instruments were ready to accept the first beam on Day-1:

- IBARAKI Biological Crystal Diffractometer iBIX (BL-03),
- Neutron-Nucleus Reaction Instrument NNRI (BL-04),
- Super High Resolution Powder Diffractometer S-HRPD (BL-08),
- NeutrOn Beam-line for Observation & Research Use NOBORU (BL-10),
- IBARAKI Materials Design Diffractometer i-MATERIA (BL-20).

In September, a 4D Space Access Neutron Spectrometer 4SEASONS (BL-01), and an Engineering Materials Diffractometer TAKUMI (BL-19) joined to the commissioning stage as scheduled, and those seven instruments became available for the first user program.

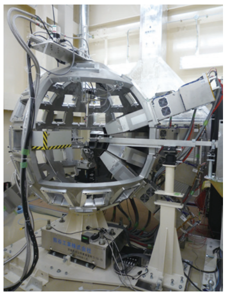
The construction of the following four additional instruments was finished in December, 2008, and they advanced to the commissioning process: Neutron Optics and Fundamental Physics Beam Line NOP (BL-05), High Resolution Chopper Spectrometer HRC (BL-12), High-Performance Neutron Reflectometer with a Horizontal Sample Geometry H-REF (BL-16) and High Intensity Total Diffractometer NOVA (BL-21).



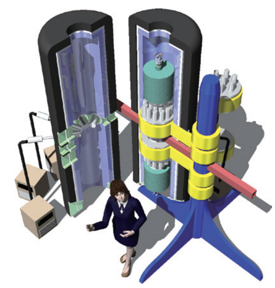
Status of neutron and muon instruments at the MLF as of December 2008.

List of neutron instruments available for user program or under commissioning in 2008.

BL-01 4D Space Access Neutron Spectrometer (4 SEASONS)



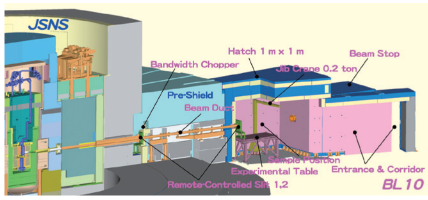
BL-03 IBARAKI Biological Crystal Diffractometer (i-BIX)



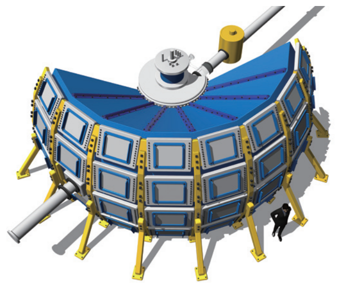
BL-04 Neutron-Neucleus Reaction Instrument (NNRI)

BL-05 Neutron Optics and Fundamental Physics (NOP)

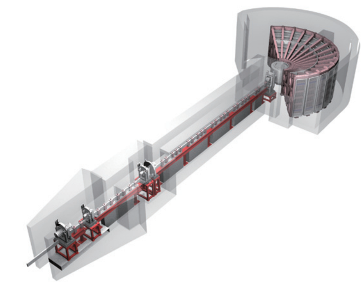
BL-08 Super High Resolution Powder Diffractometer (S-HRPD)



BL-10 NeutrOn Beam-line for Observation & Research Use (NOBORU)

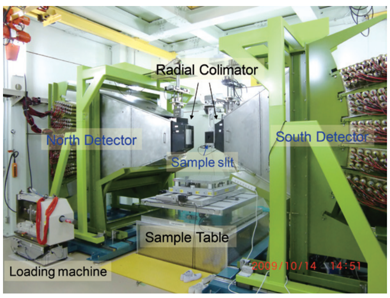


BL-12 High Resolution Chopper Spectrometer (HRC)



BL-14 Cold-Neutron Disk-Chopper Spectrometer (AMATERAS)

BL-16 High-Performance Neutron Reflectometer with a Horizontal Sample Geometry (H-REF)



BL-19 Engineering Materials Diffractometer (TAKUMI)

BL-20 IBARAKI Material Design Diffractometer (i-MATERIA)

BL-21 High Intensity Total Diffractometer (NOVA)

Machine studies and trial measurements to determine the actual usage on user programs have been carried out on each instrument. As a result of that, on i-BIX (BL-03), in a diffraction from a protein crystal (volume: 13 mm^3) was observed for the first time. Commissioning on HRC (BL-12) and H-REF (BL-16) started with existing instruments transferred from the KENS facility, KEK, and the trial measurements were successfully carried out. Especially, on H-REF, reflection from a standard sample of Ni layer was clearly observed in the range of the reflectivity of three orders of magnitude, which is expected to be improved soon after taking countermeasures for background in the further commission work. In the case of NOVA (BL-21), we conducted performance test of a new GEM beam monitor to be used for this instrument although most of the components of the spectrometer were not yet completed.

On S-HRPD, a highest resolution of 0.037% in d-spacing was proven via the instrument-group measurement with standard sample. Moreover, the temperature dependence of the crystal structure of the multiferroic materials was measured by a group of KEK and SungKyunKwan University (Korea). On NOBORU, the Hokkaido University group carried out imaging measurements on alloys and welded materials. The user program was conducted under the beam power of about 20 kW in which frequent beam-off happened due to a problem with the accelerator. However, we are expecting a full-fledged user program activity.

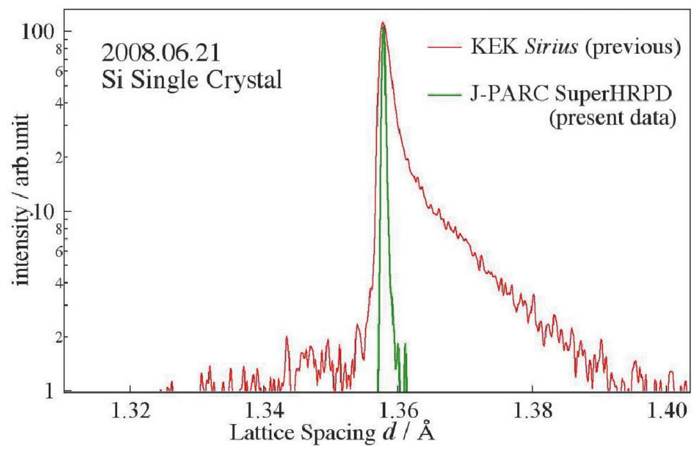
The full-scale construction of the Biomolecular Dynamics Spectrometer, DNA (BL-02) and the Smaller-Angle Scattering Instrument, TAIKAN (BL-15), previously called HI-SANS, was approved. The neutron guide tubes due to be installed in the biological shields of both instruments had already been fabricated. The high-pressure neutron diffractometer was decided to be constructed at the BL-11 to use sharp pulsed neutrons provided from the decoupled moderator.

For the development and building of neutron devices, the scintillation detector development has been successfully conducted in collaboration with the ISIS detector group. The first one dimensional scintillation detector with fiber coded method for TAKUMI (BL-19) was built and tested. A prototype of a two dimensional compact detector with wavelength shifting fiber read out for iBIX (BL-03) was tested and its production already started. The fabrication of super-mirror guide tubes with μ=4 for the beam lines of chopper spectrometers started through the use of a large scale ion beam sputtering instrument at J-PARC.

Commissioning test on two dimensional compact scintillation detectors with wavelength shifting fiber read out (first and second one) for "iBIX" and one dimensional scintillation detectors with "ISIS-type" fiber coded method for "TAKUMI" (first and second one) was performed successfully.

Related workshops and meetings.

- November 11-12, 2008
  The 2nd International Advisory Committee for the project of DNA, Biomolecular Dynamics Spectrometer.
- December 8-9, 2008.
  The 3rd International Workshop on Chopper Software
- January 27 2009
  The International Workshop on Nano-Structural Analysis with Wide-q.
- January 28-29, 2009
  The International Advisory Committee for the Smaller-Angle Neutron Scattering Instrument of J-PARC for reviewing the project of TAIKAN.
- January 28-29, 2009
  The 7th Neutron Technical Advisory Committee (N-TAC-7); The current status of the development of neutron instruments and devices, the management of the experimental halls, the system for user support, the international activities and collaborations, and the future plans were presented by members of MLF and then reviewed by the committee. The committee reported some valuable recommendations such as an increase of staff to be consistent with the best international practices.



Measured *d*-spacing of Si single crystal with the world's highest resolution of 0.037% at Super-HRPD.

Muon science

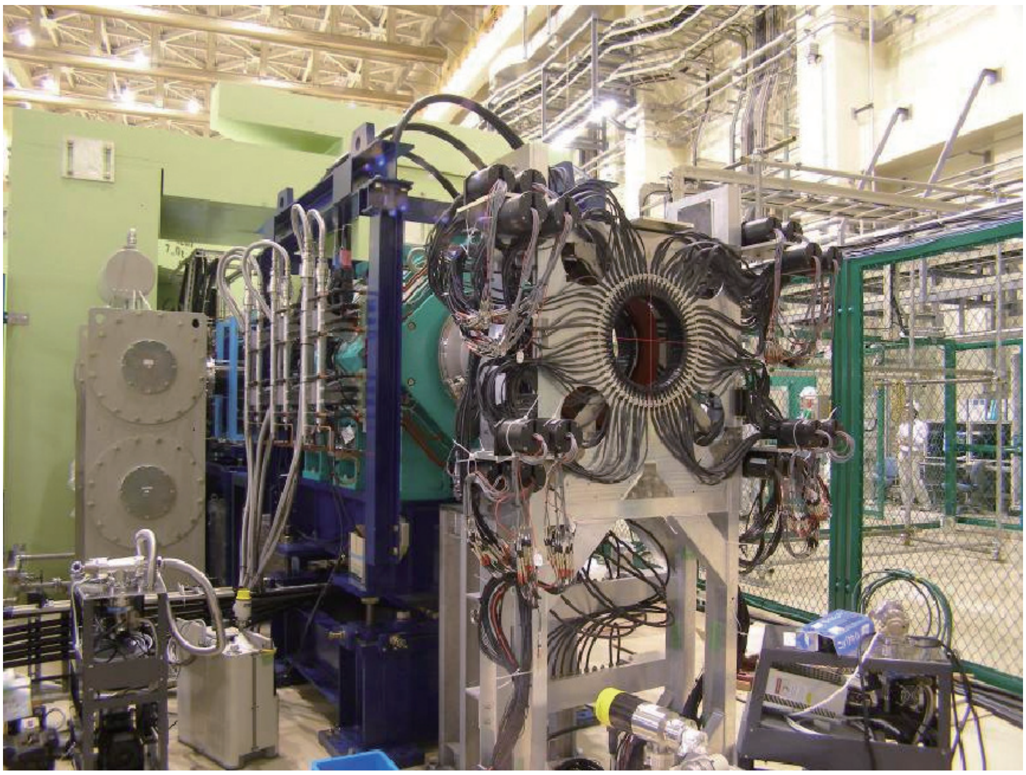
The superconducting solenoid and the cryogenic system were transferred from the muon facility at KEK and installed in the secondary muon beam line at the 2nd experimental hall of MLF. The commissioning of the superconducting solenoid was started and successfully ramped to a current of 600 A and pions from the muon production target were injected into the solenoid. The pions decayed into muons in-flight, and those muons were extracted and transported into the D2 experimental area. Positive or negative muons can be obtained by reversing the polarity of the bending and focusing magnets. We were able to observe the muonic X-rays from an aluminum target. The successful application of using negative muons for nondestructive element analysis was shown by observing the Au and Ag muonic X-rays from a koban (old Japanese gold coin).

In the D1 area, a μSR experiment with a 128-segmented spectrometer was installed and tested by obtaining the spin rotation spectra of muons under a 2 mT field and muonium under a 0.5 mT field. The experimental apparatus is currently ready to run an experiment using surface muons (4 MeV positive muons).

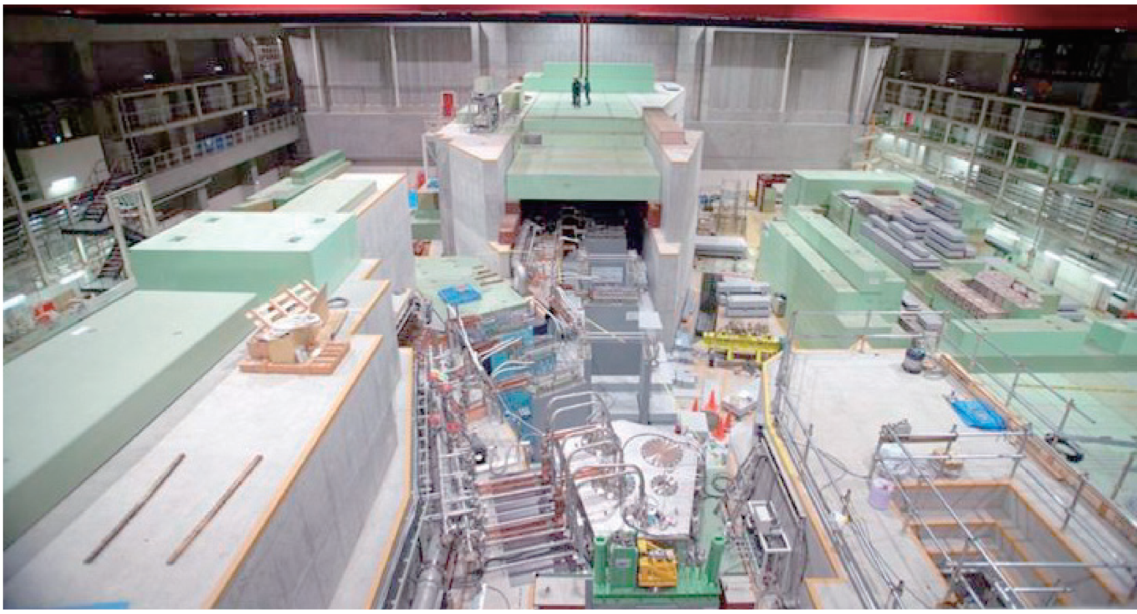
In January, 2009, a new cabin equipped with two sets of data acquisition (DAQ) electronics systems and users' desks was constructed for running the users' programs. We also started several user's programs in the end of January. The Saitama-University /JAEA group identified an antiferromagnetic state below 20 K in the $(BEDT\text{-}TTF)_2$-IBrCl compound, an organic magnet which shows superconductivity under high pressure. The KEK group obtained results on Iron-Oxypnictide Superconductors and the Toyota group obtained new results on lithium diffusion.

A meeting of the Muon Science Advisory Committee (MUSAC VII) was held at TOKAI on March 6 and 7th 2009 just as the first muon beam user period was ending successfully. The main overall recommendation was that the Ultra Slow Muon beams are the future of this facility and the group should position itself to take advantage of new funding opportunities being pursued by users while maintaining a strong scientific vision.

We started the commissioning work to establish the remote handling maintenance operation in the remote handling room and in the hot cell. The procedure to exchange monitor assembly such as CT (current transformer) and PM (profile monitor) now has been successfully established, and the study of the exchange process for the muon target is underway.



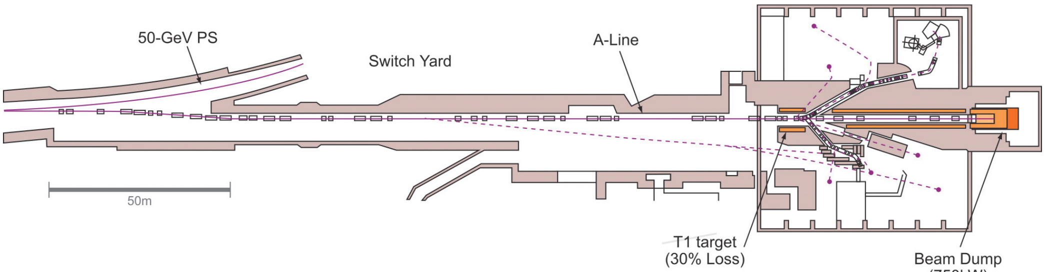
D1 instrument; surface muons, positive and negative muons with a momenta less than 50MeV/c are available.



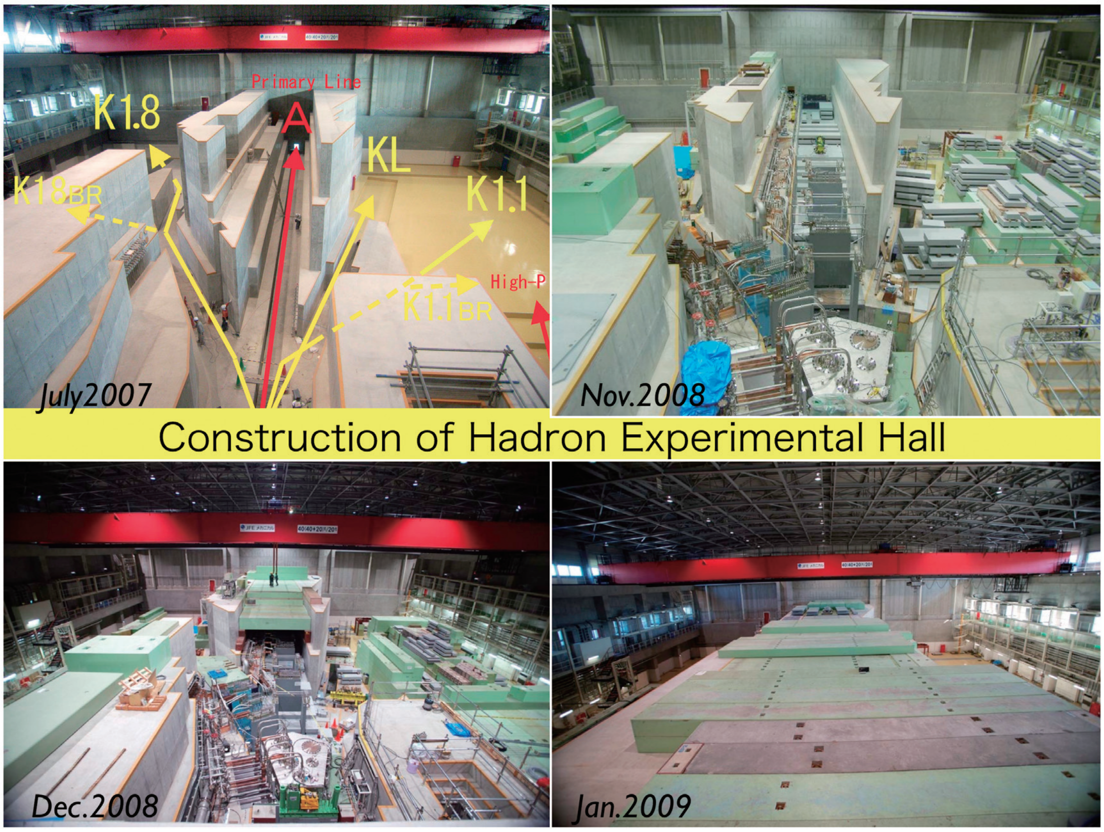
Nuclear and Particle Physics Division

Hadron Experimental Hall

The Hadron Experimental Hall is one of the two facilities at the Main Ring and utilizes the various kinds of secondary particles generated by protons. "We will have the most powerful secondary particle beams of this energy," says Professor Kazuhiro Tanaka, who led the construction of the Hall. "We will explore the new frontier in nuclear and particle physics with high intensity hadron beams. Precise measurements of CP violation in K mesons, collective motions of strange quark in hypernuclei, and many other new-generation fixed target experiments are being planned."

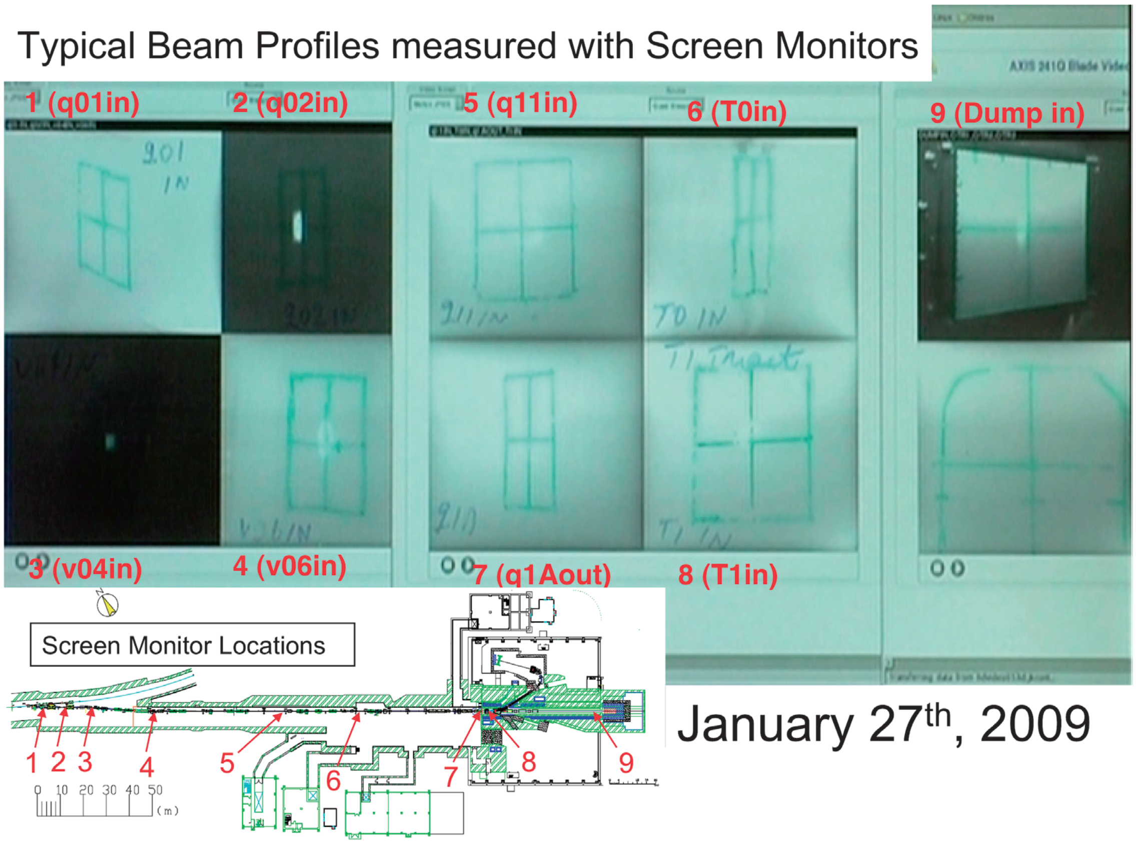


Slow Extraction Hadron Facility (Phase 1)



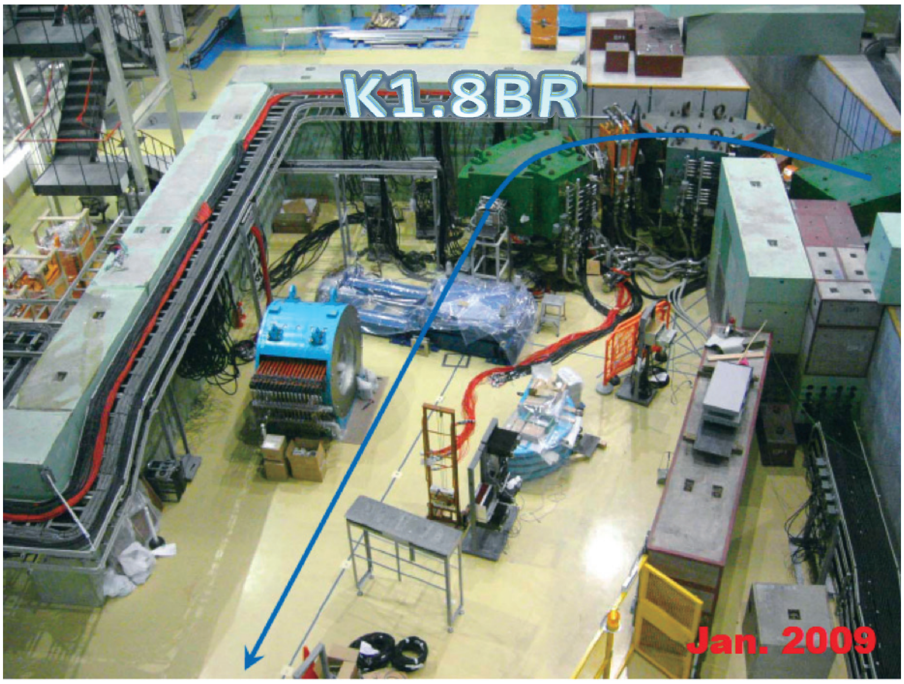
To make plenty of secondary particles by the high intensity proton beam available for experiments, many methods of handling the high intensity beam have been developed for this facility. In particular, firm radiation shield was constructed and the magnets that were hard to be broken and easy to be replaced, in case in trouble in the high radiation area, were produced. For example, the primary proton beam line was installed with chimney magnets down to the beam dump. All the magnets were successfully tested with full excitation before their installation. The vacuum system with the beam pipes, the T1-downstream pentagon vessel and pillow-seal flanges etc. have also been commissioned successfully.

On January 27, 2009, the first beam was successfully introduced to the hall down to the beam dump after a minor adjustment of the beam line elements. On that day, both the accelerator and the hadron teams started an attempt to slow-extract a proton beam for the first time, and only after a few hours of the effort, a proton beam was successfully observed at the beam dump with a monitor at 19:35. The beam was monitored with the luminescence screens located in several places in the beam line as displayed below.

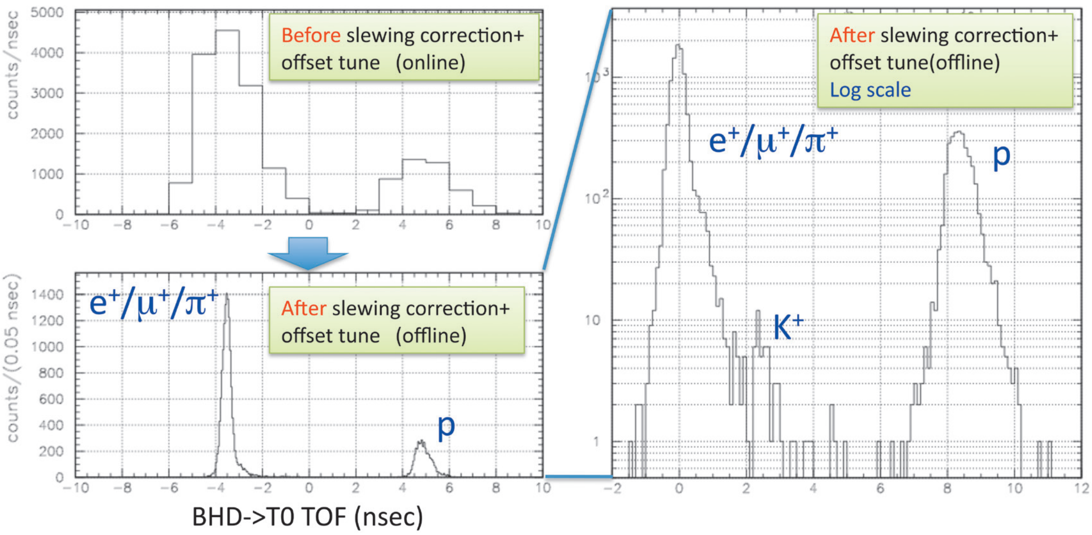


Typical profile of the beam slowly extracted down to the hadron hall for the first time on January 27, 2009. The profile was monitored with the luminescence screen located at 9 locations in the primary beam line.

After a scheduled maintenance of the accelerator, on February 10th, the production target, T1, was inserted into the proton beam to produce secondary beams. The first secondary beam was observed by the E15/E17 experiment team, headed by Prof. Ryugo S. HAYANO (Tokyo) and Dr. Masahiko IWASAKI (RIKEN), at the K1.8BR beam line. While the beam intensity of the first beam was just 10nA and the beam power of 300W corresponding to 0.1% of the design, we were able to confirm the first production of Kaon beam at the facility. The observed ratio of particle species are consistent with our expectation and further beam tuning with the electric-separator is forthcoming.



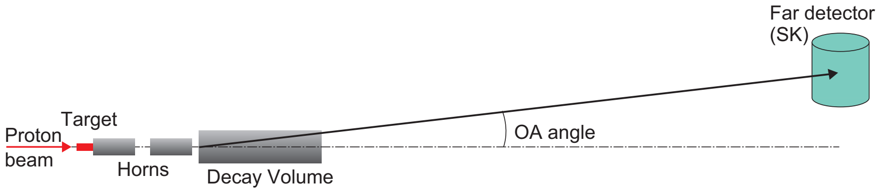
View of K.1.8BR area. E15 "kaonic nuclear spectroscopy" is now setting up the detector in the K1.8BR area together with the data taking system in the counting house outside the hall aiming for the first Hadron Hall experiment in spring, 2010.



Kaon identification by Time of Flight method in K1.8BR beam line. (courtesy of E15/E17 group)

Following the success of the first beam, the "Workshop Celebrating the First Beam at Hadron Hall" was held at the Ibaraki Quantum Beam Research Center, located just next to the J-PARC site, on March 25th and 26th. About 100 researchers attended the meeting. They discussed reports on the first beam from the accelerator team, the hadron beam line team, and the E15/E17 team, as well as the reports by the experimental groups who expect to use the beams in this fall at the K1.8 beam line and the KL beam line. In addition, they were encouraged by the talks from noted theorists, Prof. Tetsuo HATSUDA and Prof. Yasuhiro OKADA, hearing physics opportunities in the Hadron Hall. In the afternoon of March 26th, a tour to the Hadron Hall and a general assembly of the Hadron Hall Users Association (HUA) also took place.

T2K experiment



The off-axis configuration of the neutrino beam line.

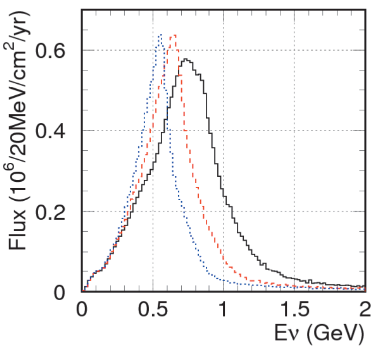
The Tokai-to Kamioka (T2K) experiment is a second-generation accelerator-based long baseline neutrino oscillation experiment. Muon neutrinos are generated at a newly built high-intensity proton synchrotron at Japan Proton Accelerator Research Complex (J-PARC), propagate 295 km across the earth, and are detected by the world's largest neutrino detector, Super-Kamiokande. Owing to the unprecedented intensity of the neutrino beam, which is two orders of magnitude higher than that in the first-generation K2K experiment (1999–2004, KEK-to-Kamioka), groundbreaking progress in understanding the unknown properties of neutrinos is expected. The construction of the neutrino facility at J-PARC started in FY2004 and was completed in FY2008, followed by the start of the experiment as scheduled in April 2009.

The evidence of neutrino oscillation has shown that neutrinos have masses and that a lepton-flavor- violating process(es) exists (exist). The physics of neutrino oscillations is yet to be revealed; two mixing parameters (the mixing angle of the first and the third generations, θ_{13} and the CP phase δ respectively) and the ordering of three mass eigenvalues are unknown. The primary goal of the T2K experiment is to determine the last unknown mixing angle θ_{13} by investigating muon neutrino to electron neutrino oscillation. If θ_{13} is sufficiently large to be measured in the early phase of the experiment, the possibility of discovering CP violation in the future will be enhanced.

The muon neutrinos are generated as decay products of pions that are produced from a target hit by a proton beam. One of the distinctive features of the neutrino beamline is so-called "off-axis" configuration. As shown in the layout drawing, the axes of the proton beam, and hence the neutrino beam, are inclined at an angle of a few degrees to the direction of the Super-Kamiokande. As shown in the resulting neutrino spectrum for given off-axis angles, the off-axis beam gives us the highest possible intensity of low-energy neutrinos with a small high-energy tail, which enables precise measurements with minimum background events.

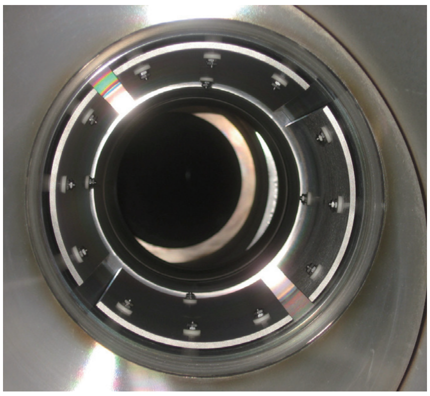
The neutrino facility at J-PARC consists of the primary proton beam line, neutrino beam line, and the near neutrino detector.

The purpose of the primary beam line is to transport proton beam extracted from the main ring onto the neutrino production target with designed beam direction and size. The primary beam line consists of the preparation section, arc section, and final focusing section. In the preparation section, property of the proton beam from the main ring is tuned to match the downstream arc section using 11 normal conducting magnets.



The expected spectrum of the off-axis beam for 3°(blue), 2.5°(red), and 2°(black), respectively. The νe- to- νμ flux ratio is as small as 0.4% at the peak of the νμ spectrum.

Superconducting combined function magnets in the tunnel.

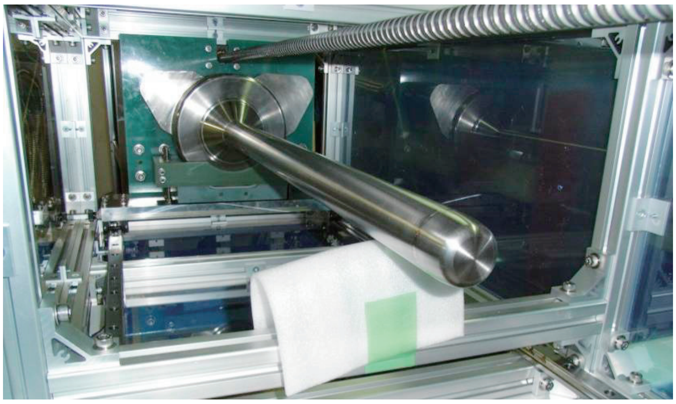


Inside electrode of the electro-static beam position monitor.

Equipments in the preparation section are designed to handle possible high radiation exposure. In the arc section, the beam is bent by ~80° to the Kamioka direction using 28 superconducting magnets, which are the world-first combined-function superconducting magnets generating both dipole and quadrupole field with single layer coil. Ten normal conducting magnets in the final focusing section are used to focus the beam onto the center of the target with designed beam size and off-axis angle. Five intensity monitors, 21 position monitors, 19 profile monitors, and 50 beam loss monitors are distributed along the beam line to guide the beam precisely. Just in front of the target, an optical transition radiation detector is placed to measure the profile of the beam.

The secondary beam line consists of three regions: the target station, which contains the target and magnetic horns, the decay volume and the beam dump. The target is a 90-cm-long graphite rod with a diameter of 26 mm. The pions generated forward from the target are focused to the Kamioka direction by a series of three electromagnets called horns. The pions are then travel in the decay volume, which is ~110-m long, ~3-m wide, 3–5 m high tunnel filled with helium gas, and decay into muons and muon neutrinos in flight. The decay volume is designed to accommodate the beam at a 2–2.5o off-axis angle. A beam dump, which consists of ~3m-thick graphite blocks followed by ~2.5m-thick iron plates, is placed at the downstream end of the decay volume to stop almost all particles other than neutrinos. High-energy muons with energies of more than 5 GeV can penetrate the beam dump. A muon monitor is placed immediately after the beam dump to monitor the intensity and the profile of such muons for each beam shot. The profile of the muons is a good indicator of the beam direction and stability.

At 280 m downstream from the target, neutrino detectors are placed to measure the neutrino beam properties. Two independent detector systems — one located on the proton beam axis and the other located off-axis (pointing toward Super-Kamiokande)— are being constructed. The main purpose of the on-axis detector is to monitor the neutrino beam direction and intensity, while the off-axis detector aims to measure energy spectrum, contamination of electron neutrinos and neutrino interaction cross sections with a similar energy spectrum at Super-Kamiokande. FY2008 was the last year of the five-years construction of the facility. Following the off-site fabrication and test, installation of the superconducting and normal-conducting magnets were carried out in 2007 and 2008. Installation and alignment of the beam monitors took place in 2008, immediately after the installation of the magnets in the relevant section. The vacuum pipes were then totally connected and evacuated to get ready for the MR operation in December 2008. Test energization of all the magnets was also successfully completed by then. The software for online data acquisition and online monitoring also got ready.



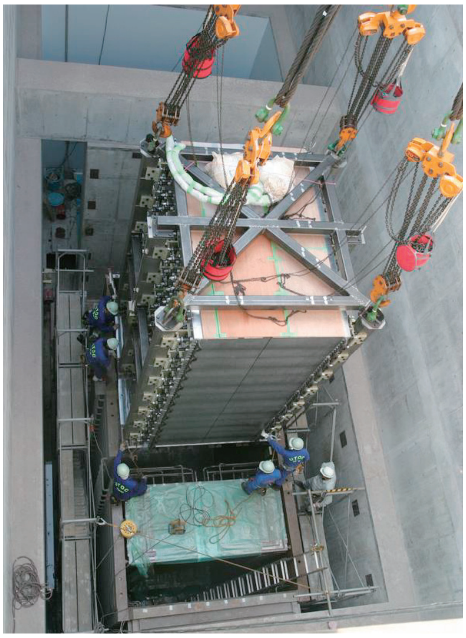
Graphite target in Ti capsule.

First magnetic horn.

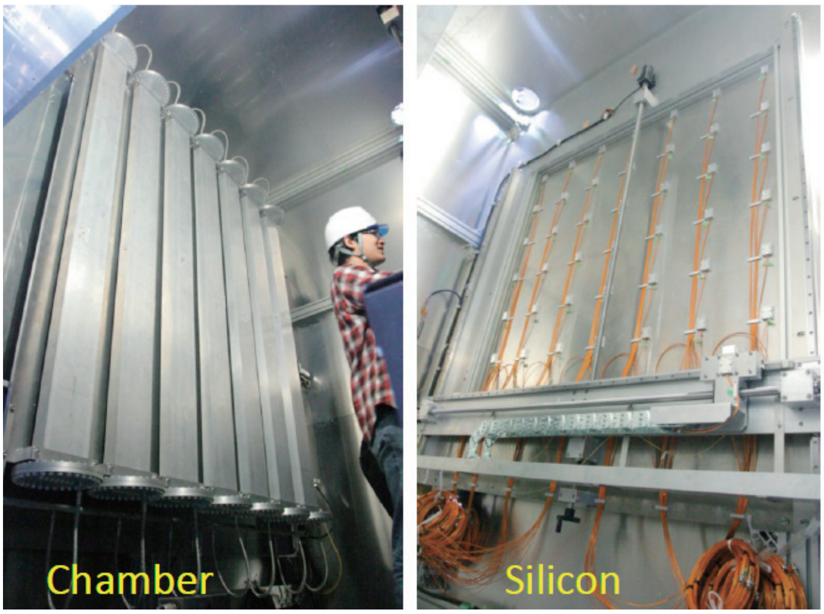
The target station building was completed and most of the beam line components inside were installed also in FY2008. The installed components are the graphite target embedded in the first magnetic horn, a baffle to protect the target, and the OTR. The second and the third magnetic horns are to be installed in summer 2009. The beam dump was successfully installed in October 2008. Two different types of muon monitors, namely, ionization chambers and silicon pad arrays, were installed and operated. They played an important role in the verification of the generation of the first neutrino beam, as described below.

After the completion of the neutrino detector hall located 280 m downstream from the target, a large magnet previously used for the UA1 experiment at CERN was successfully installed. Various detector components to measure neutrino-induced reaction are currently being installed inside of the magnet to get ready for the beam by December 2009. At the end of FY2008, the central module out of seven of the on-axis detector (INGRID) was ready for detection of the neutrino beam.

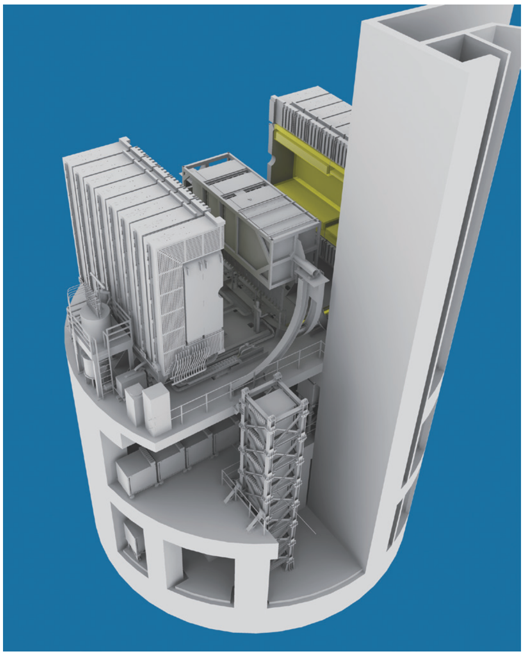
The beam operation started in April 2009 with a low-energy (30 GeV) and low-intensity (4×10^{11} protons/pulse) proton beam. The first neutrino beam was generated on April 23. The screen shot of the oscilloscope shows the signals from muon monitors that indicates the generation of the neutrino beam. The neutrino beamline officially passed government inspection on May 28. After the installation of the second and third horns and the completion of the INGRID detector, the beam commissioning will be resumed from October 2009. We plan to start the physics data taking with the completed off-axis detector in December 2009. Our first target is to accumulate 100kW $\times$ 10^7 s equivalent data and publish physics results by the end of 2010.



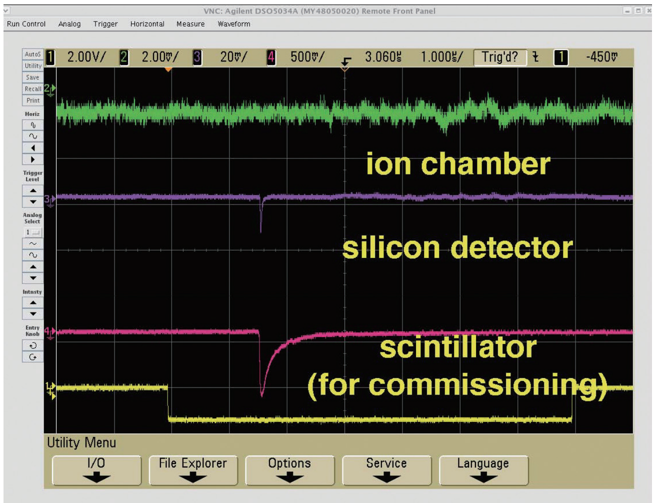
Installation of the beam- dump core.



Muon monitors monitor.



Schematic view of the front near detector at located 280 m from the target.

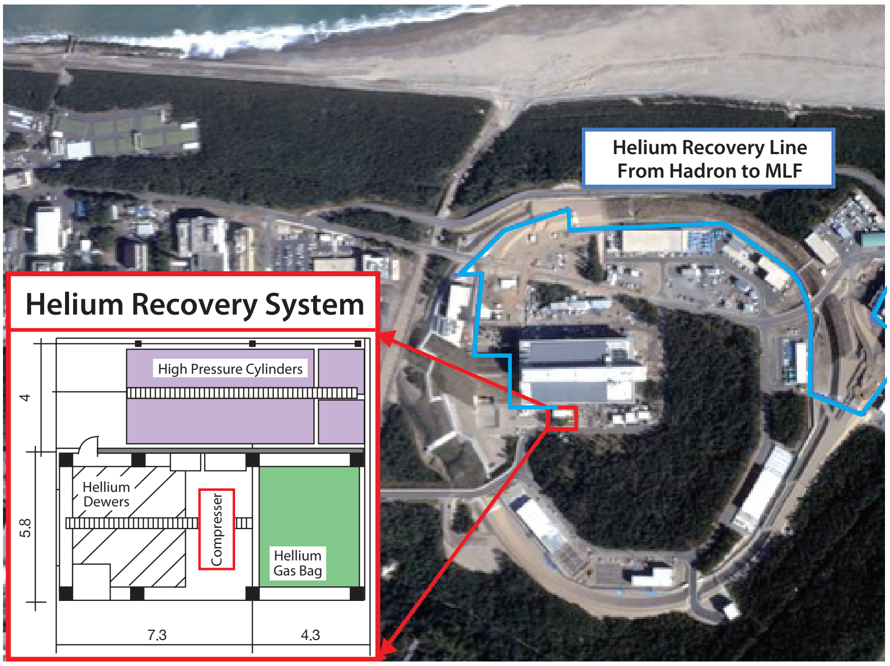


Signals from muon monitors that verify the generation of the first neutrino beam.

Cryogenic Section

One of the major tasks of the J-PARC Cryogenics Section is to provide liquid helium for physics experiments and various development activities in J-PARC. It will be provided in collaboration between the Cryogenics Section and the Accelerator Division. A helium liquefaction facility, with a capacity of 100 l/h, already exists at the JAEA LINAC building and is operated by the Accelerator Division for superconducting radio frequency (RF) development. The evaporated helium gas will be recovered from remote experimental areas by a recovery station presently being built by KEK at the west area of the Materials and Life Science Experimental Facility (MLF) as shown in the figure. The helium recovery system will be operated and maintained by the J-PARC Cryogenics Section. It is important to make efforts to recover as large amount of the gas as possible in order to conserve the helium gas resources. We plan to start that service in September 2009.

The other tasks such as construction of the superconducting magnet system for the neutrino beam line and the research and development work for the superconducting solenoids for high intensity muon beam lines are reported in the activities section.



Helium recovery system.

Activities

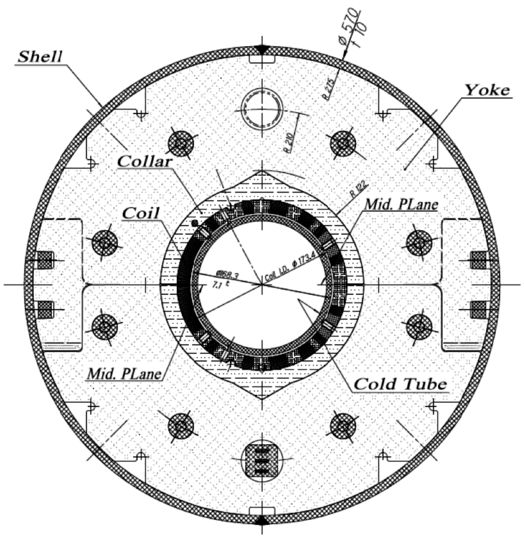
1. *Construction of Neutrino Beam Line Superconducting Magnet System*

The J-PARC neutrino beam line includes a superconducting beam line that bends a proton beam from the main ring by 80° with a bending radius of 100 m. The beam line uses 28 Superconducting Combined Function Magnets (SCFM). The figure to the right shows a cross section of an SCFM. The magnet uses a pair of single layer left/right asymmetric coils, which generate a dipole field of 2.6 T and a quadrupole field of 19 T/m accommodating 50 GeV beam. A helium refrigerator cools the system to 4.5 K, and its overall electricity consumption is about 500 kW, which is dramatically less than in systems made from normal conducting magnets.

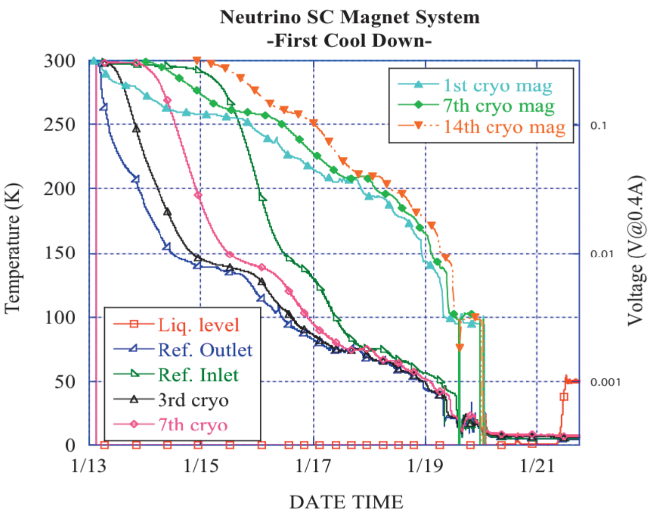
The system's installation was completed in December 2008. Its commissioning started in December 2008 with a refrigerator performance test. In January 2009, the magnet system was cooled down to the operational temperature of 4.5 K within about 10 days as shown in the figure below to the left. The excitation tests of the magnet including the magnet quench were performed successfully, and the quench recovery time was confirmed to be about two hours for the nominal quench as shown in the figure below to the right.

2. *Development of Superconducting Solenoid for Muon Beam Lines*

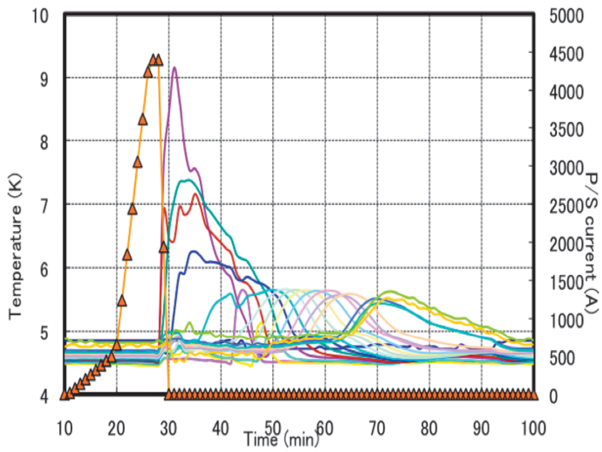
We are in the process of developing a superconducting magnet system for high intensity muon beam lines (such as the Super Omega), super slow muon beam line, or the COMET; and muon to electron conversion experiment facility, in collaboration with Muon Science Division in Institute of Materials Structure Science and Osaka University. One of our major achievements in japan fiscal year 2008 was the fabrication of the model coils, which simulate part of the curved section of the Super Omega solenoid system. The figure below shows the completed model coils designed and fabricated by KEK in house. Although the coil fabrication and testing were successful, we found a problem in the mechanical design that cause excessive cost. As a result of reaserch and development, we corrected the design and changed the bending radius of the curved section from 0.75 m to 1 m to simplify the mechanical design. Based on the new bending radius, new model coils were also made by a private company at the end of japan fiscal year 2008. The use of a new type of superconductor, MgB_2, is also considered and an R&D coil using MgB_2 was also made. Those coils will be tested in japan fiscal year 2009.



Cross section of SCFM.

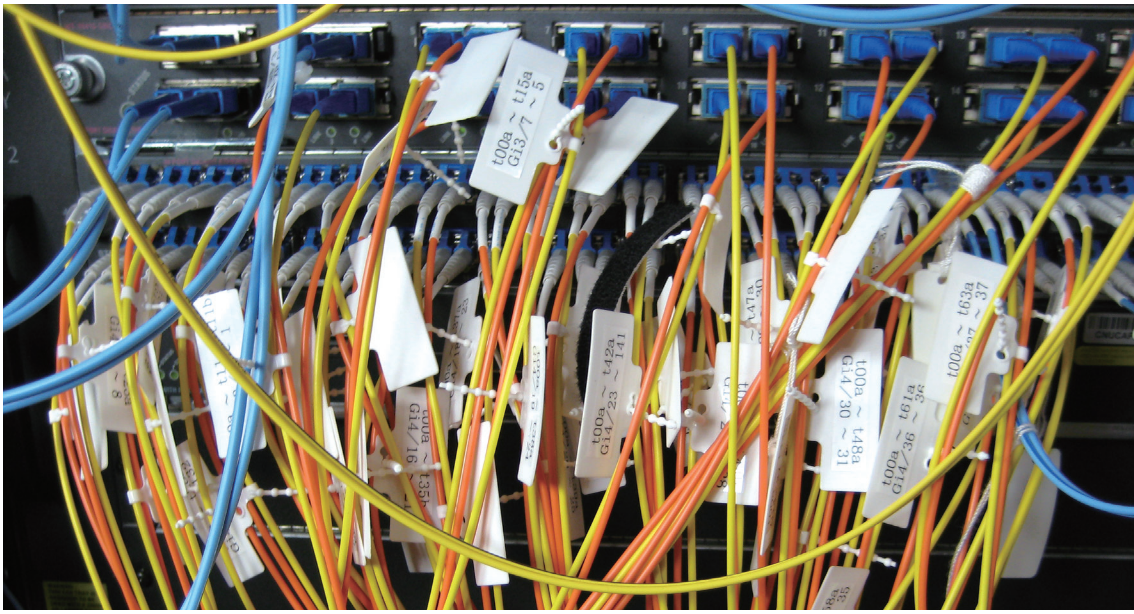


Cool down curve of the magnet system.



Re-cool down after quench.

Model coils of the curved solenoid for a muon trasport line.

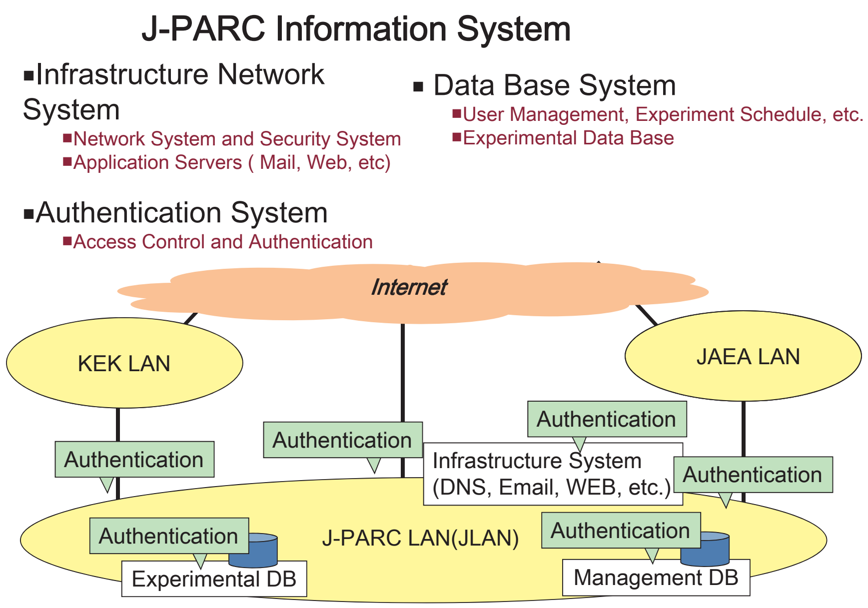


Information System Section

Overview

The J-PARC Information System is a system of computers and networks used for researches in J-PARC. The Information System Section designs, manages and operates the system. The section provides services for the Infrastructure Network System, the Authentication System and the Data Base System. Our goal is to make each system a secure and easy-to-use Information and Communication Technology (ICT) infrastructure for the J-PARC users.

In terms of computing resources, for the moment from 2009 J-PARC will rely on the KEK central computer system for analyzing and storing data from neutrinos, nuclear physics and Materials and Life Science Experimental Facility.



Outline of the J-PARC Information system.

History

When the construction of the new J-PARC facility began in 2001, the Center for Promotion of Computational Science and Engineering (CCSE) in JAERI (Japan Atomic Energy Research Institute, former organization of JAEA) and the Computing Research Center in KEK started to work in collaboration to design and build the J-PARC ICT infrastructure. The J-PARC network was planned and structured to provide an environment necessary for smooth collaborations between JAEA, KEK and J-PARC. While its full-scale implementation is planned to proceed gradually, an interim environment has been already introduced by JAERI (JAEA) and KEK since October 2002. In 2008, the JAEA/KEK computer center collaboration was dissolved and the KEK Information System Section was transferred to the J-PARC center. All the projects previously done through that collaboration have been taken over by the section.

J-PARC Network (JLAN: J-PARC Local Area Network)

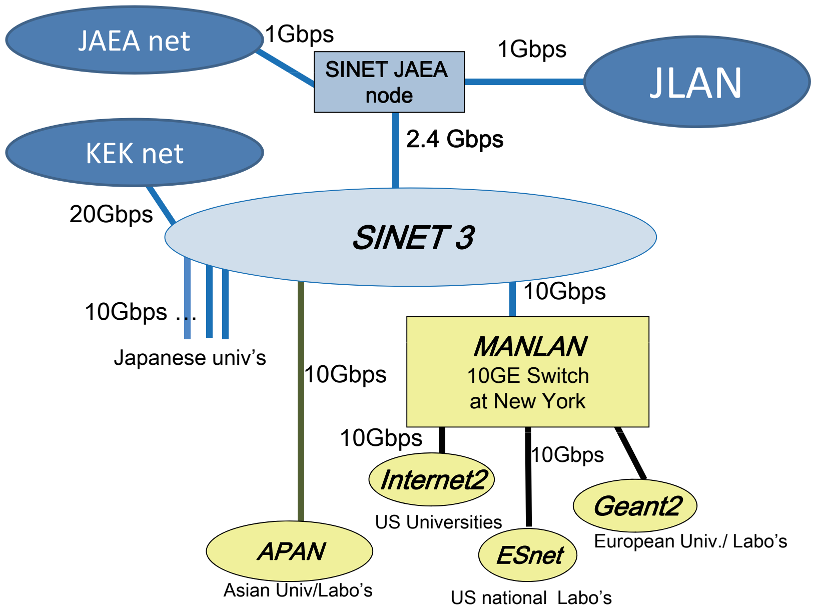
The J-PARC network called JLAN transparently covers two sites in J-PARC, the Tokai site and Tsukuba site which are about 60 km apart. JLAN provides an environment necessary for the smooth collaboration between JAEA, KEK and J-PARC. In this way, the two sites are seamlessly connected at network Layer 2. Initially, the physical connection between the two sites and the Internet connection used by the KEK network started with a 10 Mbps wide-area Ethernet. In 2004 it was replaced with a 100 Mbps Ethernet established over the Ibaraki Broad Band Network (IBBN) operated by the local government of Ibaraki Prefecture. In 2005 JAERI and KEK successfully invited Super-SINET node to Tokai campus (Super-SINET is an ultrahigh-speed network for Japanese academic researches and is provided by National Institute of Informatics (NII). For details please refer to http://www.sinet.ad.jp.)

In 2006, JLAN was connected to the Super-SINET backbone network with a 1Gbps bandwidth. After that, JLAN had its own unique doorway to the Internet. In the same time, J-PARC established a J-PARC information security policy independent both from of JAEA and KEK.

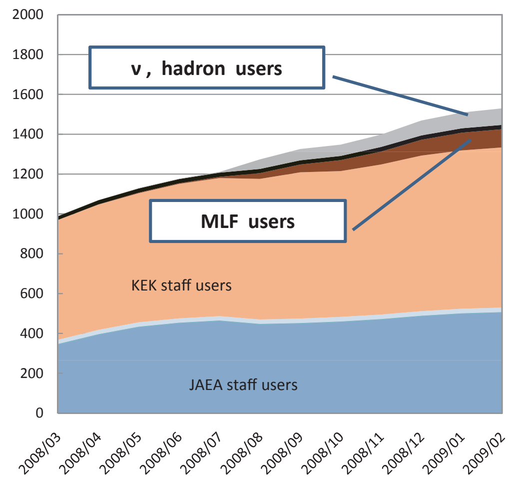
In 2007 the SINET3 succeeded the Super-SINET. Since the Super-SINET era, NII has been greatly and continuously supporting J-PARC experiments.

In 2008, the total number of hosts on JLAN exceeded 1600 and was still increasing at a rate of 150% per year.

An increasing number of public J-PARC users are expected to connect to JLAN from 2009 when J-PARC starts its operation. For the users' convenience, a Guest Network service, which is a wireless LAN service for short-term visitors, will be available in almost all J-PARC buildings. Soon after their arrival at J-PARC, the visitors will be able to connect to the Internet without any prior registration.



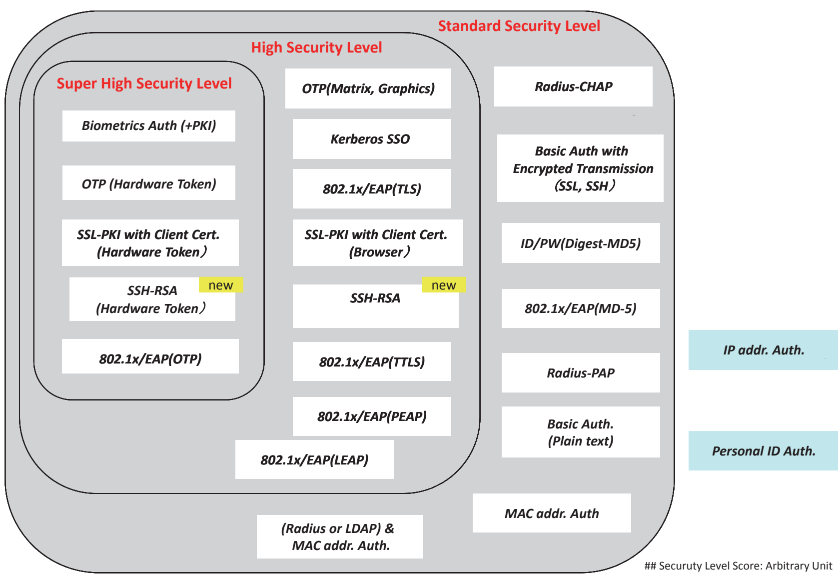
Domestic and international network connection.



Number of hosts on J-PARC (as of February, 2009).

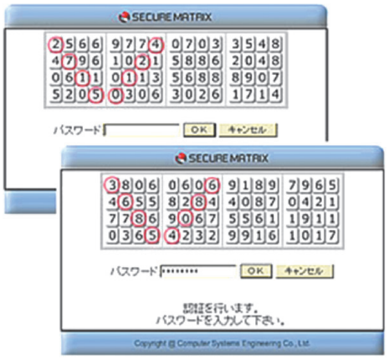
Authentication system

Since J-PARC is located at the site of an atomic energy research laboratory, it requires a more secure authentication system for using online services, which at the same time is convenient for its users. The authentication System Group researched to resolve those issues. The group listed up possible use cases of personal authentication over online services in J-PARC and mapped their required security strength to available authentication technologies. They tested the feasibility of some of them for practical use.



Personal authentication security level map (rev. 20071219).

Secure IC dongle.



One Time Password authentication using Web browser. Authentication key is image pattem.

Authentication system R&D.

Database system

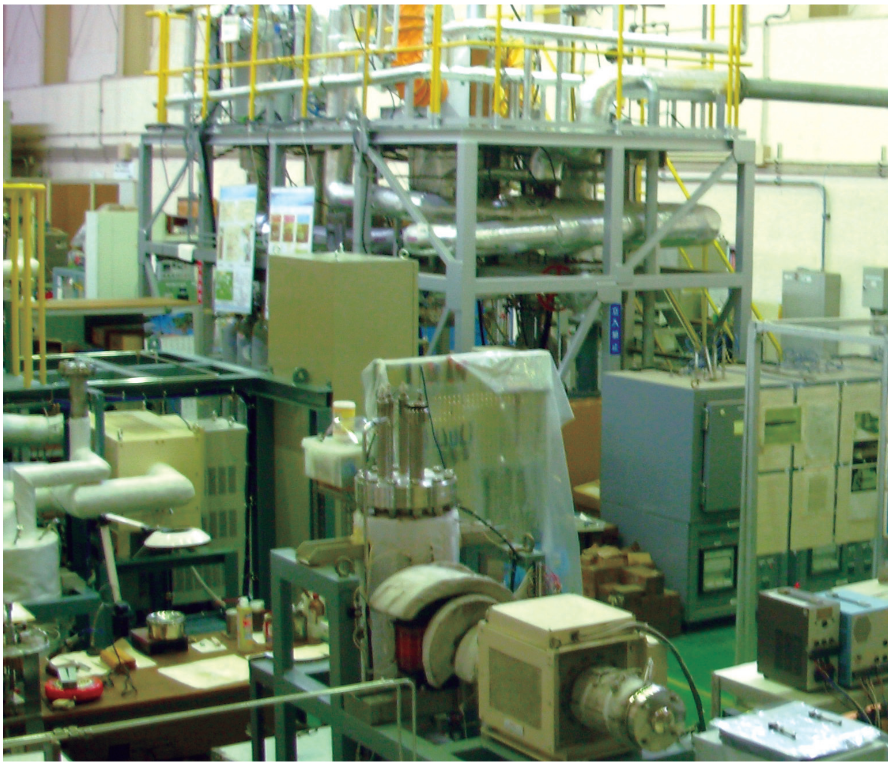
As an international public science facility J-PARC should be as easily accessible as possible. For that purpose, we planned a portal Web service to be used for almost all applications and registrations for J-PARC. It should be an integrated, 24h/7days non-stop, quick response remote service. To provide such services several databases and subsystems were developed. As a first step, a "Proposal Submission System" (https://gamusha1.j-parc.jp/) and a "User Support System" (https://mercury.j-parc.jp/usjparc/) were developed by the Users Office and have been in operation since May and December 2008, respectively. The proposal submission system displays public announcements about the J-PARC experiments and accepts corresponding proposal submissions. In the User Support System, users can complete registrations, applications, and reservations required to stay and conduct experiments at J-PARC. As a next step, a Proposal Review System to review submitted proposals is under development. The following table shows the schedule for development of the databases and systems.

	Name	FY '08	FY '09	FY '10
	One Stop Portal site	partially start	Modify	Operate
	Personnel DB	for public users	for Staffs	Operate
	Public user support system	started in Dec.	Modify	Operate
Experiment	proposal submission sys.	started in June	Operate	
	review sys.	Develop	Start	Operate
	result report sys.		Develop	Operate
	IT system ID DB		Develop	Operate
	Equipment Maintenance DB	Modify	Operate	

Administration Div. Users affairs sec.

Info. sys. sec.

Database systems and user portal system schedule.



Transmutation Section

Check and Review for Partitioning and Transmutation Technology by JAEC

The Japan Atomic Energy Commission (JAEC) reviewed the Partitioning and Transmutation (P&T) technologies including the accelerator driven system (ADS). The JAEC issued a report entitled "Current Status and a Way Forward to Promote the Research and Development of Partitioning and Transmutation Technologies".

The report summarized that P&T technologies will contribute to rational design of nuclear waste disposal system, and the research and development should be undertaken steadily to build up basic data for the discussion of its feasibility. As the basic policy for research and development (R&D)R&D of P&T technologies, the report presented that the R&D of double-strata concept with ADS should be undertaken as a part of the R&D for future nuclear power generation systems considering the transitional phase from light-water reactor (LWR) cycle to FBR cycle as well as the equilibrium phase of FBR cycle. The report indicated that further R&D and the collaborations with foreign R&D activities are required for the ADS to proceed to next R&D phase where the feasibility study is to be performed from the engineering and economical viewpoints. The report also pointed out importance of the integral experiments of the transmutation systems, especially requirement of the critical experiments using minor actinides (MA), and importance to prepare the facility to perform these experiments. Moreover, the report recommended that TEF-P (Transmutation Physics Experimental Facility) planned in the second phase of J-PARC project should be investigated as a part of the preparation of facility.

Following the decision of the JAEC, JAEA has started the discussion for rational R&D strategies including utilization plans for domestic and overseas R&D facilities.

Activities

Post Irradiation Test

To evaluate mechanical properties of irradiated materials, post irradiation examination (PIE) of the STIP (SINQ target irradiation program, SINQ; Swiss spallation neutron source) specimens was carried out at Waste Safety Testing Facility (WASTEF) in Tokai Research and Development Center, JAEA. Results of the tensile tests on austenitic steel JPCA indicated that irradiation hardening occurred with increasing displacement damage level up to 10 dpa. At higher doses, irradiation hardening seemed to tend to saturate. Degradation of ductility was bottomed around 10 dpa and specimens kept its ductility until 19.5 dpa. In the present study, all the specimens fractured in ductile manner.

As for the development of the LBE spallation target, corrosion tests of 316SS-GBEM (grain boundary engineering materials) under flowing Pb-Bi condition were conducted. Results showed that corrosion rate of GBEM was smaller than that of 316SS-BM (base materials).

Development of Flow Measurement Techniques

A new technique* to measure the velocity vector in multi-dimensions on a line in the flow field has been investigated. A system to achieve this goal was developed based on ultrasonic velocity profiling by using multiple transducers. A three-dimensional system was constructed and successfully applied to an actual flow field for three-dimensional velocity vector measurements. In future, this system will be applied to measure three-directional velocity components in the liquid metal flow.

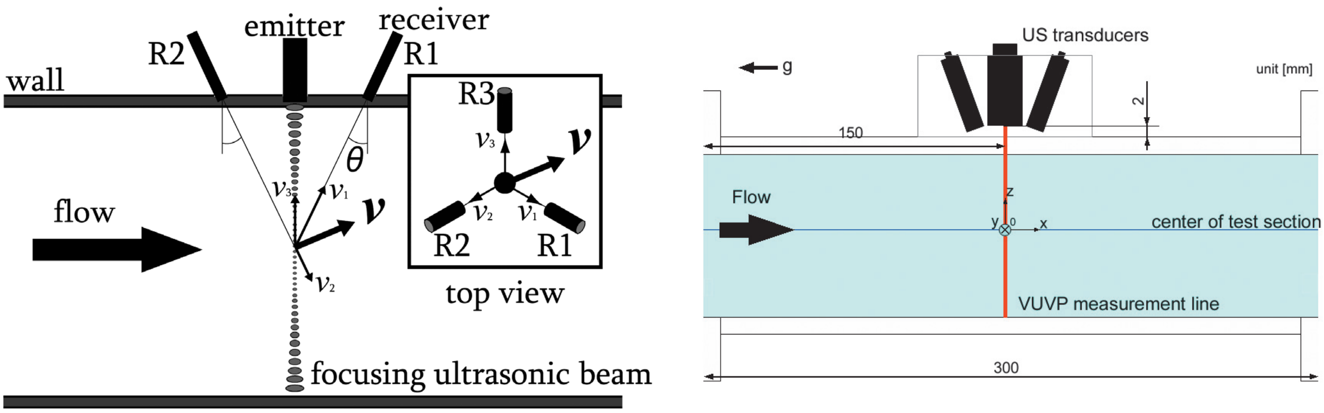
Estimation of Acceptable Beam Trip Frequencies

Frequent beam trips as experienced in existing high power proton accelerators may cause thermal fatigue problems in ADS components which may lead to degradation of their structural integrity and reduction of their lifetime. Thermal transient analyses were performed to investigate the effects of beam trips on the reactor components, with the objective of formulating ADS design that had higher engineering feasibilities and determining the requirements for accelerator reliability. These analyses were made on the thermal responses of four parts of the reactor components; the beam window, the cladding tube, the inner barrel and the reactor vessel. Our re-

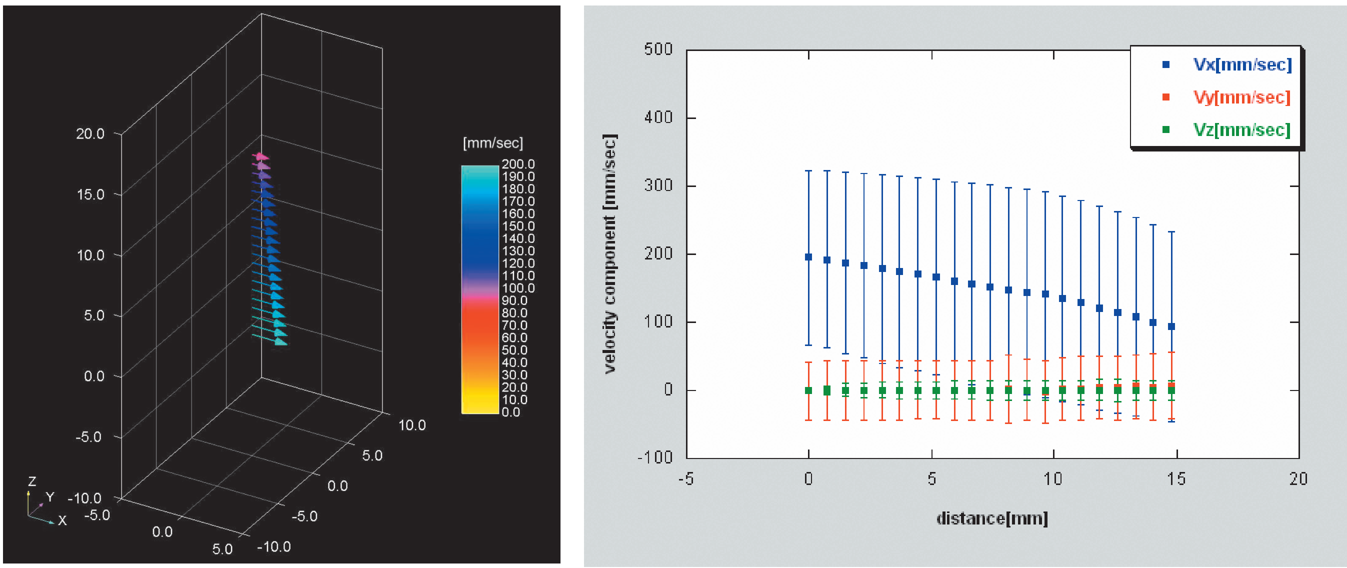
* This study was supported by innovative nuclear research and development program by Japan Science and Technology agency (JST).

sults indicated that the acceptable frequency of beam trips ranged from 50 to 2 × 10^4 times per year depending on the beam trip duration. The former was corresponding to the beam trip duration exceeding five minutes. On the other hand, the latter was corresponding to the beam trip duration 10 seconds or less. And the plant availability was estimated to be 70 % or greater in cases where the beam trip frequency decreased to the acceptable frequency of beam trips.

In order to consider measures to reduce the frequency of beam trips on the high power accelerator for ADS, we compared the acceptable frequency of beam trips with the operation data of existing accelerators. The result of this comparison showed that for typical conditions the beam trip frequency for durations of 10 seconds or less was within the acceptable level, while that exceeding five minutes should be reduced to about 1/30 to satisfy the thermal stress conditions.



Schematic illustration and measurement configuration.



An averaged three-dimensional velocity vector profile and velocity components in a rectangular water channel measured by the developed system.

Safety Division

J-PARC is a proton accelerator complex with various experimental facilities, and is managed under the Law Concerning Prevention from Radiation Hazards Due to Radio-Isotopes, etc. in the Japanese legal system. A license for its use must be issued by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), and the related safety inspection must be conducted by the Nuclear Safety Technology Center (NUSTEC), before the accelerator and the experimental facilities begin their operations. The application process for the license started in 2007 from the first phase of construction of the accelerator LINAC. By the end of fiscal year 2007, we have already submitted three applications to MEXT and received a permission to deliver the 4-kW proton beams to Materials and Life Science Experimental Facility (MLF).

In fiscal year 2008, we were able to operate proton beams with an intensity of 100 kW, for the next year our target is to ramp the beam up to 250 kW. In order to guarantee the 100 kW beam operation, we submitted an application to MEXT on July 25, 2008 and all applied items were approved on November 4, 2008. Thanks to the licensing efforts, the preparation of the neutron and muon instruments, which will be supplied for the first user program at MLF was completed in terms of radiation safety. An application for increasing the beam power up to 250 kW was also submitted in January 2009.

The on-site inspection of the secondary beam lines in the experimental area of MLF was successfully conducted by NUSTEC on September 4 and 24, 2008, before and during the operation, respectively, after which the beam lines area was officially pened for users to conduct beam experiments. The photograph shows the safety inspection conducted by NUSTEC.

Safety inspection by NUSTEC.

Application items for license in fiscal year 2008.

Accelerator /Facility	item	Application (1)* Jul. 25 2008	Application (2) Jan. 7 2009
Linac	max. accelerating particles	-	$1.8\text{x}10^{18}$ /h to $2.6\text{x}10^{18}$ /h
RCS	max. accelerating particles	from $3.1\text{x}10^{16}$ /h (@4.1 kW) to $7.5\text{x}10^{17}$ /h (@100kW)	from $7.5\text{x}10^{17}$ /h (@100kW) to $1.9\text{x}10^{18}$ /h (@250 kW)
MR	max. acceleration energy	from 3-GeV to 30-GeV	
MLF	max. accelerating particles Neutron instruments Muon instrument	from $3.0\text{x}10^{16}$ /h (@4 kW) to $7.5\text{x}10^{17}$ /h (@100kW) Add 5 instruments (total 12) 1 insturment	from $7.5\text{x}10^{17}$ /h (@100kW) to $1.9\text{x}10^{18}$ /h (@250 kW)
Hadron Hall	max. accelerating particles max. acceleration energy Exparimantal beam line	$9\text{x}10^{14}$ /h 30 GeV Kaon experimantal beam line (K1.8BR)	
Neutrino	max. accelerating particles max. acceleration energy		$9\text{x}10^{14}$ /h 30 GeV

(*) All Items applied for on July 25, 2008, were approved on November 4, 2008.

Users Office

The J-PARC Users Office (UO) started its operation in fiscal year 2007. Since December 16 2008, the UO moved to a new office space located on the first floor of the "Ibaraki Quantum Beam Research Center" building. The building is located 300m to the north of the main gate of the J-PARC and has been previously used by the NTT (Nippon Telegraph and Telephone Corporation) Research Center.

The J-PARC Users Office had the following achievements in fiscal year 2008:

April 1, 2008; UO started issuing the J-PARC User ID card to users. The users are requested to take their photo at UO or to send a jpeg-file of the photo in advance.

May 19, 2008; training for general safety and radiation workers at J-PARC with video was started targeting the users at UO.

July 8, 2008; the proposal submission system for J-PARC started and first were called proposals for the MLF (Materials and Life Science Experimental Facility) user program for the second half of fiscal year 2008 (2008B) term.

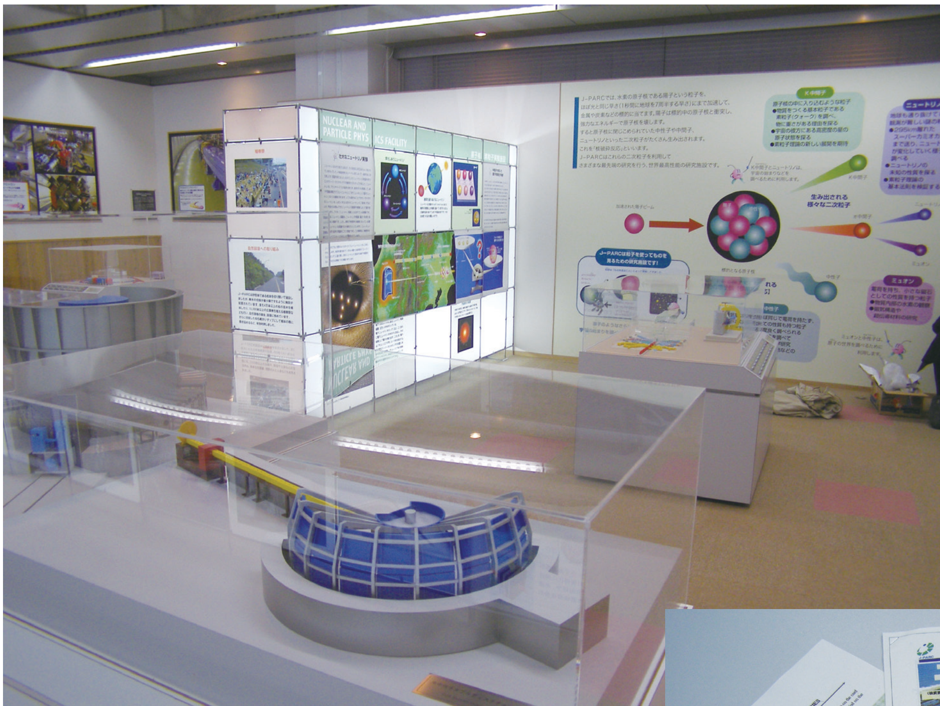
March 25-26, 2009; UO provided assistance for the "First-Beam Workshop at the J-PARC Hadron Experimental Hall" held at the Ibaraki Quantum Beam Research Center.

Entrance of the "Ibaraki Quantum Beam Research Center" building where the J-PARC Users Office is located.

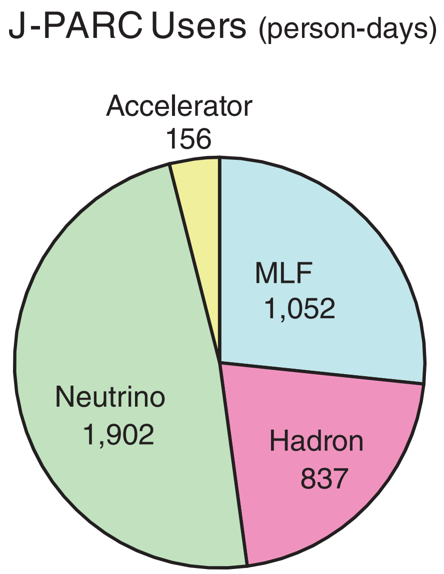
Staff of the J-PARC Users office. (as of April 2009)

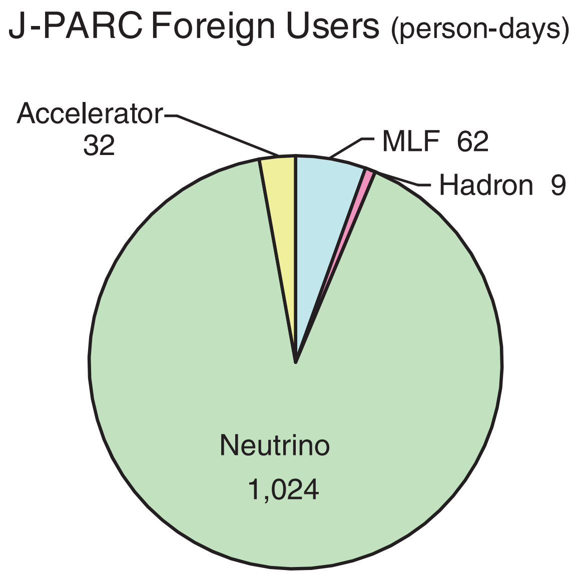
Items handled by the Users Office

- **Procedures to use J-PARC**
  User registration
  Procedures to work at J-PARC
  Accommodation booking
  Procedures to work at radiation controlled area
  Other applications
  Safety Instructions
- **Procedures to enter/leave J-PARC**
  Procedures to enter/leave J-PARC
- **How to get to J-PARC**
  Public Transportation
  Rental car Information
  KEK bus
  JAEA bus
  (circulating inside of JAEA/commuter)
- **On site Information**
  On site Facilities
  AED (Automated External Defibrillator), First Aid Kit, Stretchers
- **Borrow Items**
  Procedures to borrow items
  Cafeteria card
  Other services
- **Application for network use**
  Network (JLAN) use in Tokai area
  Network use at Tsukuba campus
- **Accommodations**
  Accommodations at KEK (Tsukuba Campus)
  Akogigaura Club
  Masago International Lodging
  Tokai bunshitsu
- **Daily Life Information**
  Visa



Users

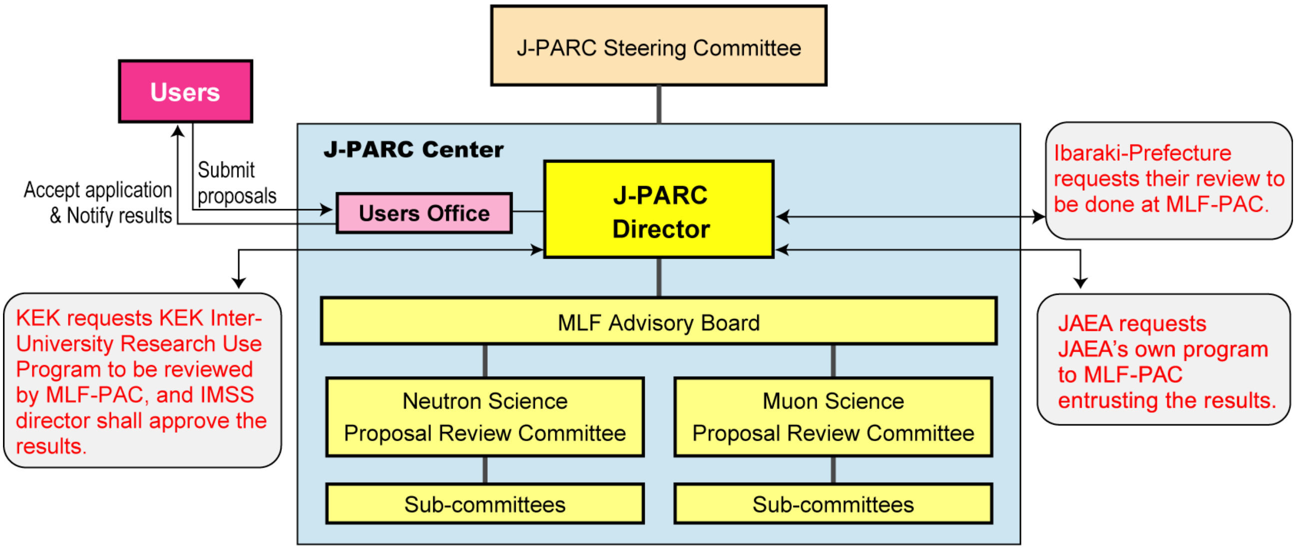




Number of users, who stayed at J-PARC in JFY2008 since the beginning of the user program at MLF in December, 2008. Total number of users at each facility (left). Total number of foreign users at each facility (right).

User Progrom

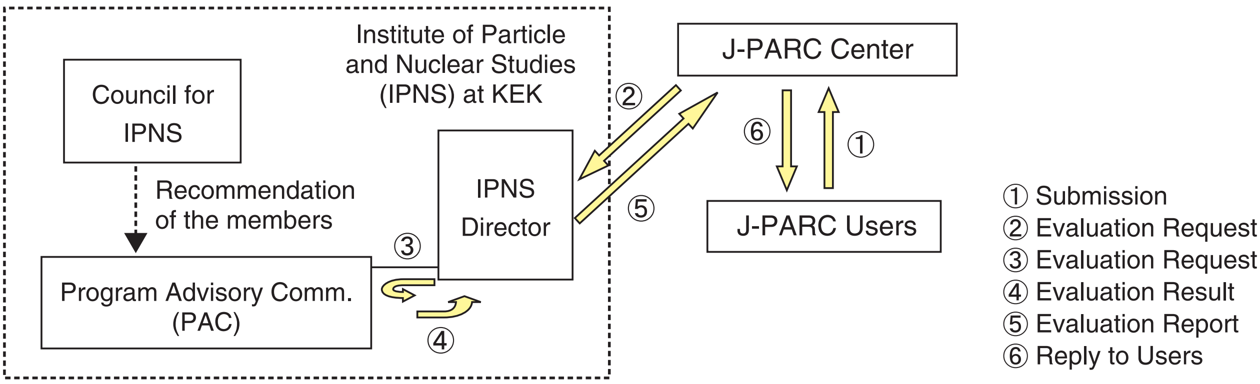
1. Proposal reviewing system for the J-PARC/MLF User program



Approval process for experimental programs in Materials and Life Science Experimental Facility (MLF).

The Neutron Science Proposal Review Committee and the Muon Science Proposal Review Committee were organized in 2008. The first proposals for the MLF user program for the second half of fiscal year 2008 (2008B) term were called from July 7 to the end of August, 2008. The call for the first half of fiscal year 2009 (2009A) term opened on December 1, 2008 and closed in February, 2009.

2. Program Advisory Committee (PAC) for Nuclear and Particle Physics Experiments at the J-PARC 50GeV Proton Synchrotron



Approval process for experimental programs in particle and nuclear sciences.

The PAC was organized in 2006 to be in charge of

(1) evaluation of the scientific merits, technical feasibility and recommendations about the neutrino program at J-PARC,

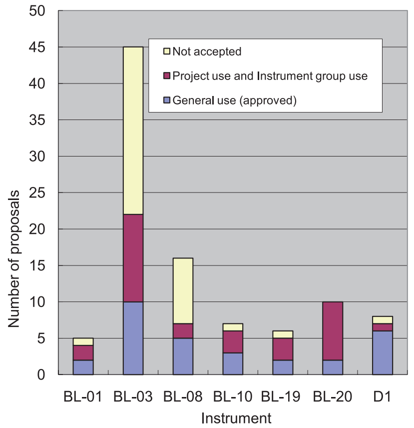
(2) evaluation of the scientific merits and technical feasibility of proposals at the hadron hall and the prioritization of the secondary beam line (K1.8 /K1.8BR /K1.1/ K1.1BR/ K0/ Others),

(3) prioritizing proposals as to which are to be Day-1 experiments.

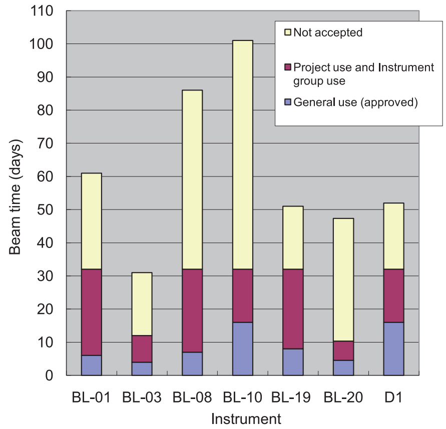
The first PAC meeting was held on June 30- July 2, 2006. The seventh PAC meeting, which was the last for fiscal year 2008, was held on March 6 and 7, 2009.

Approval summary of the J-PARC/MLF User program.

(1) Approved summary of the 2008B user program

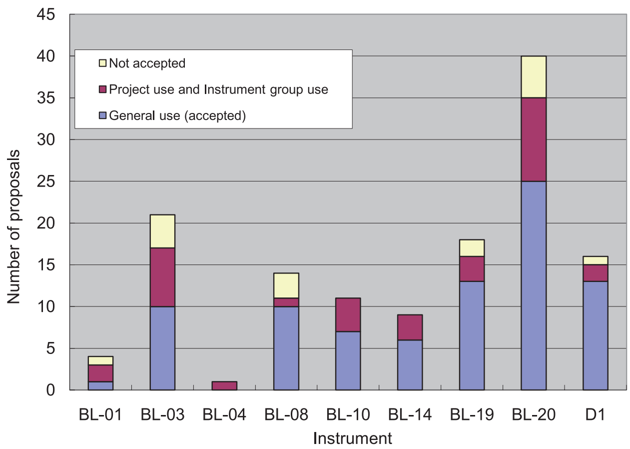


Number of the proposals submitted and/or approved for the 2008B user program for each instrument in MLF.

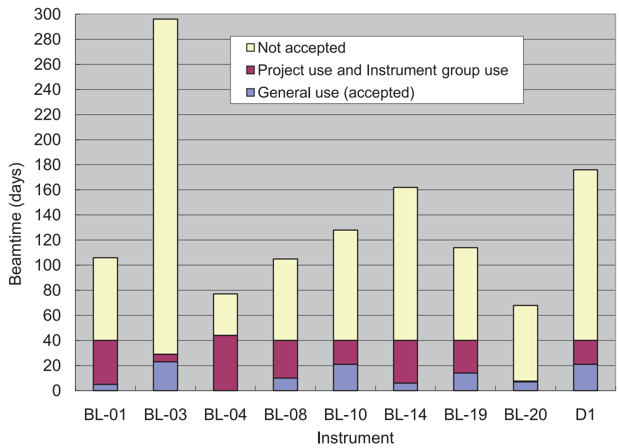


Requested and allocated beam time to each instrument for the 2008B user program.

(2) Approval summary of 2009A User program.



Number of the proposals submitted and approved for the 2009A user program for each instrument in MLF.



Requested and allocated beam time to each instrument.

Access mode for MLF use

(a) General user program

The general use provides both national and international users with an opportunity to conduct experiments with the instruments of MLF. A variety of experiments are accepted, both for academic research and for industrial applications.

(b) Project use

The project use is the access mode in which JAEA and KEK conduct their main tasks oriented programs such as inclusive scientific research projects, research programs proposed to fulfill the plans for midterm goal of JAEA, joint research programs and contract research programs with other institutes or organizations. The principal investigator of the project use may request the beamtime longer than one year in his/her proposal.

(c) Instrument group use

The instrument group use is dedicated to instrument scientists responsible for the beam-line instruments.

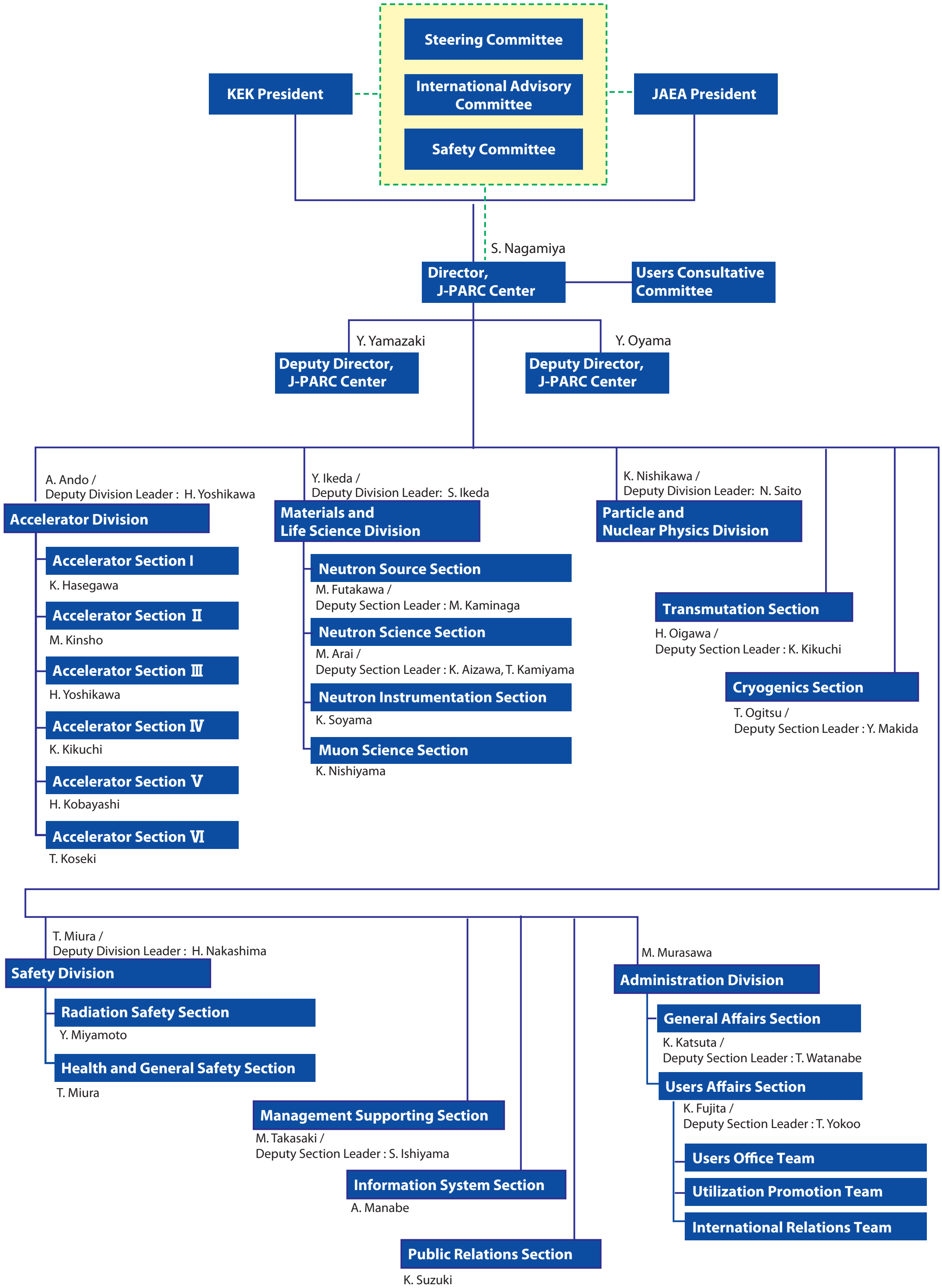
The instrument group shall maintain and/or improve the performance of their instrument, and conduct the leading-edge research and development which will output maximal performance of the instrument so that MLF always can provide users with the most superior experimental environments.

Approval summary of the 50 GeV- PAC after the 7-th meeting (March 7, 2009)

	(Co-) Sporkspersons	Affiliation (*)	Title of the experiment	Approval status (PAC recommendation)	Slow line priority		Beanline
					Day1?	Day1 Priority	
E03	K. Tanida	Kyoto U	Measurement of X rays from X^- Atom	Stage2			K1.8
P04	J. C. Peng, S. Sawada	U. of Illinois at Urbana-Champaign, KEK	Measurement of High-Mass Dimuon Production at the 50-GeV Proton Synchrotron	Deferred			Primaly
E05	T. Nagae	KEK	Spectroscopic Study of Ξ-Hypernucleus, $^{12}{}_{\Xi}$Be, via the ^{12}C(K^-, K^+) Reaction	Stage 2	Day1	1	K1.8
E06	J. Imazato	KEK	Measurement of T-violating Transverse Muon Polarization in $K^+ \to \pi^0 \mu^+ \nu$ Decays	Stage 1			K1.1BR
E07	K. Imai, K. Nakazawa, H. Tamura	Kyoto U., Gifu U., Tohoku U.	Systematic Study of Double Strangeness System with an Emulsion-counter Hybrid Method	Stage 2			K1.8
E08	A. Krutenkova	ITEP	Pion double charge exchange on oxygen at J-PARC	Stage 1			K1.8
E10	A. Sakaguchi, T. Fukuda	Osaka U	Production of Neutron-Rich Lambda-Hypernuclei with the Double Charge-Exchange Reeaction (Revised from Initial P10)	Stage 2			K1.8
E11	K. Nishikawa	KEK	Tokai-to-Kamioka (T2K) Long Baseline Neutrino Oscillation Experimental Proposal	Stage 2			neutrino
E13	H. Tamura	Tohoku U.	Gamma-ray spectroscopy of light hypernuclei	Stage 2	Day1	2	K1.8
E14	T. Yamanaka	Osaka University	Proposal for $K_L \to \pi^0 \nu$ ν-bar Experiment at J-PARC	Stage 2			K0
E15	M. Iwasaki, T. Nagae	RIKEN, KEK	A search for deeply-bound kaonic nuclear states by in-flight ^{3}He(K^-, n) reaction	Stage 2	Day1		K1.8BR
E16	S. Yokkaichi	RIKEN	Electron pair spectrometer at the J-PARC 50-GeV PS to explore the chiral symmetry in QCD	Stage 1			High pt
E17	R. Hayano, H. Outa	U. Tokyo, RIKEN	Precision spectroscopy of Kaonic ^{3}He 3d$\to$2p X-rays	Stage 2	Day1		K1.8BR
E18	H. Bhang, H. Outa, H. Park	SNU, RIKEN, KRISS	Coincidence Measurement of the Weak Decay of $^{12}{}_{\Lambda}$C and the three-body weak interaction process	Stage 1			K1.8
E19	M. Naruki	RIKEN	High-resolution Search for Θ^+Pentaquark in $\pi^- p \to K^- X$ reactions	Stage 2	Day1		K1.8
P21	Y. Kuno	Osaka U	An Experimental Search for μ - e Conversion at a Sensitivity of 10^{-16} with a Slow-Extracted Bunched Beam	Deferred			New beamline
E22	A. Ajimura, A. Sakaguchi	Osaka U	Exclusive Study on the Lambda-N Weak Interaction in A=4 Lambda-Hypernuclei (Revised from Initial P10)	Stage 1			K1.8
T25	S. Mihara	KEK	Extinction Measurement of J-PARC Proton Beam at K1.8BR	test experiment			-
P26	K.Ozawa	U. Tokyo	Direct measurements of omega mass modification in A(pi-, n) omega reaction and omega $\to$ pi0 gamma decay.	Deferred			

J-PARC organization and committees

Organization structure



Member lists of the Advisory Committees organized for J-PARC (as of March, 2009)

International Advisory Committee

Eugene W. Beier	University of Pennsylvania, USA
Jia'er Chen	Peking University, China
Bernard Frois	CEA-Saclay, France
Hidetoshi Fukuyama	Tokyo University of Science, Japan
Stuart D. Henderson	Oak Ridge National Laboratory, USA
Stephen D. Holmes	Fermi National Accelerator Laboratory, USA
Claude Petitjean	Paul Scherrer Institute, Switzerland
Jean-Michel Poutissou	TRIUMF, Canada
Yoichiro Suzuki	University of Tokyo, Japan
Satoru Tanaka	University of Tokyo, Japan
Andrew Taylor	Rutherford Appleton Laboratory and ISIS, UK
Steve Vigdor	Brookhaven National Laboratory, USA
John W. White	Australian National University, Australia (chair)

Accelerator Technical Advisory Committee

Roland Garoby	CERN
Ian Gardner	Rutherford Appleton Laboratory, UK
David Gurd	Oak Ridge National Laboratory (retired), USA
Stuart D. Henderson	Oak Ridge National Laboratory, USA
Ingo Hofmann	GSI, Germany
Stephen D. Holmes	Fermi National Laboratory, USA (chair)
Akira Noda	Kyoto University, Japan
Thomas Roser	Brookhaven National Laboratory, USA
Lloyd M. Young	Los Alamos National Laboratory (retired), USA
Jie Wei	Brookhaven National Laboratory & Tsinghua University, China

Linac Upgrade Subpanel participants

Roland Garoby	CERN
Lloyd M. Young	Los Alamos National Laboratory (retired), USA
Leonid Kravchuk	Institute for Nuclear Research, Russia
Peter Ostroumov	Argonne National Laboratory, USA
Tsumoru Shintake	Riken, Japan

Neutron Science Technical Advisory Committee

Günter Bauer	Forschungs Zentrum Jülich (retired), ESS, Germany
Stephen Bennington	Rutherford Appleton Laboratory, UK
Kurt Clausen	Paul Scherrer Institut, Switzerland
John Haines	Oak Ridge National Laboratory, USA
Toshiji Kanaya	Kyoto University, Japan
Yoshiaki Kiyamagi	Hokkaido University, Japan
Dan Neumann	National Institute of Standards and Technology, USA (chair)
Robert Robinson	Australian National Science and Technology Organization, Australia
Kazuyoshi Yamada	Tohoku University

Muon Science Advisory Committee

Jun Akimitsu	Aoyama Gakuin University, Japan
Yoshihiko Hatano	Japan Atomic Energy Agency, Japan
Robert H. Heffner	Los Alamos National Laboratory, USA
Susumu Ikeda	High Energy Accelerator Research Organization, Japan
Yujiro Ikeda	Japan Atomic Energy Agency, Japan
Masahiko Iwasaki	Riken, Japan
Yasuhiro Miyake	High Energy Accelerator Research Organization, Japan
Nobuhiko Nishida	Tokyo Institute of Technology, Japan
Kusuo Nishiyama	High Energy Accelerator Research Organization, Japan
Jean-Michel Poutissou	TRIUMF, Canada (chair)
Claude Petitjean	Paul Scherrer Institute, Switzerland
Leonid I. Ponomarev	Kurchatov Institute, Russia
Yoshinari Yamazaki	High Energy Accelerator Research Organization, Japan

Radiation Safety Committee

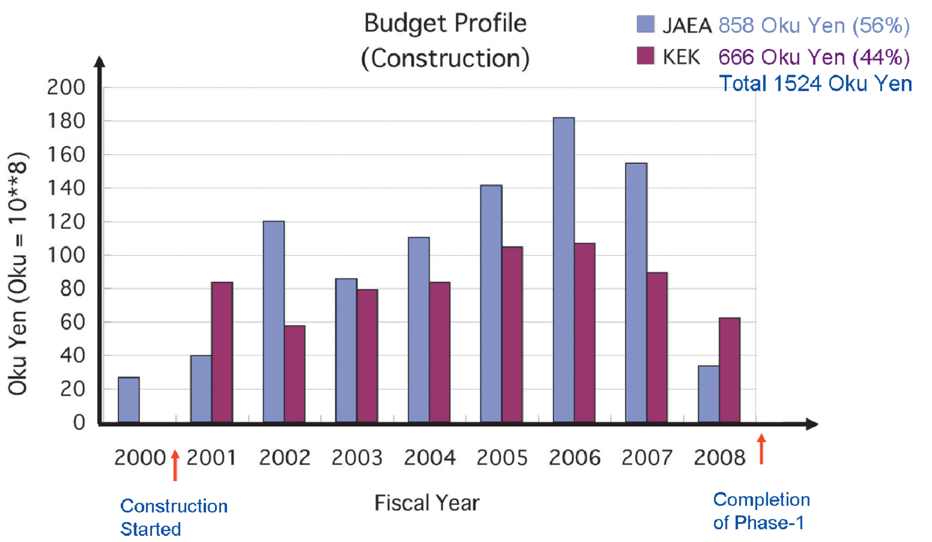
Shuichi Ban	High Energy Accelerator Research Organization, Japan
Tatsuji Hamada	Japan Radioisotope Association, Japan (chair)
Hideo Hirayama	High Energy Accelerator Research Organization, Japan
Makoto Inoue	Kyoto University, Japan
Kazuaki Kato	High Energy Accelerator Research Organization, Japan
Kenjiro Kondo	High Energy Accelerator Research Organization, Japan
Takeshi Murakami	National Institute of Radiological Science, Japan
Takashi Nakamura	Tohoku University, Japan
Hiroshi Noguchi	Japan Atomic Energy Agency, Japan
Osamu Oyamada	Japan Atomic Energy Agency, Japan
Kotaro Satoh	High Energy Accelerator Research Organization, Japan
Yoshitomo Uwamino	RIKEN, Japan
Makoto Yoshida	Japan Atomic Energy Agency, Japan

Users Consultative Committee for J-PARC

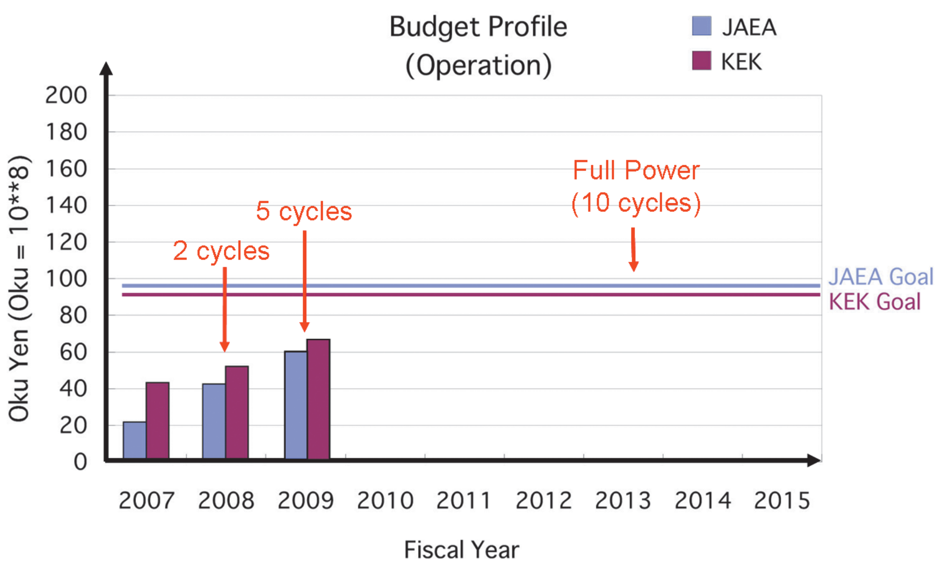
Yasuhiko Fujii	Japan Atomic Energy Agency, Japan
Toshiharu Fukunaga	Kyoto University, Japan
Yoshiaki Fukushima	Toyota Central R&D Labs., Inc., Japan
Makoto Hayashi	Ibaraki Prefecture, Japan
Tomohiko Iwasaki	Tohoku University, Japan
Shinichi Kamei	Mitsubishi Research Institute, Inc., Japan
Toshiji Kanaya	Kyoto University, Japan
Yoshiaki Kiyanagi	Hokkaido university, Japan
Sachio Komamiya	University of Tokyo, Japan
Tomofumi Nagae	Kyoto University, Japan
Tsuyoshi Nakaya	Kyoto University, Japan
Kazuma Nakazawa	Gifu University, Japan
Nobuhiko Nishida	Tokyo Institute of Technology, Japan
Kazumi Nishijima	Mochida Pharmaceutical Co., Ltd., Japan
Koichiro Nishikawa	High Energy Accelerator Research Organization, Japan
Kusuo Nishiyama	High Energy Accelerator Research Organization, Japan
Mamoru Sato	Yokohama City University, Japan

Naohito Saito	High Energy Accelerator Research Organization, Japan
Hideyuki Sakai	University of Tokyo, Japan
Hirokazu Tamura	Tohoku University, Japan
Eiko Torikai	Yamanashi University, Japan
Kazuyoshi Yamada	Kyoto University, Japan
Taku Yamanaka	Osaka University, Japan (chair)
Hideki Yoshizawa	University of Tokyo, Japan

Budget



Construction budget profile.



Operation budget profile.

Events

Events

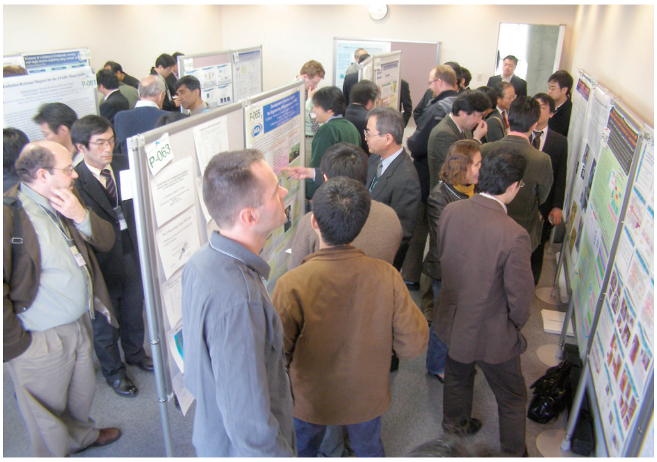
March 5 – 7, 2008

The First J-PARC International Symposium, Mito, Ibaraki, Japan.

Two major symposium a)materials and life science (IPS08) and b)particle and nuclear physics (NP08 workshop), respectively, were held separately, whereas the joint session was held in the afternoon of March 5. About 250 members participated in the former symposium and 200 in the latter, with the total number within JFY2008, many plans, dreams, and future expansions were discussed at these two symposia.

The proceedings of IPS08 was issued as the journal Nuclear Instruments and Methods in Physics Research A, Vol. 600 (2009).

Group photo.



Poster session.

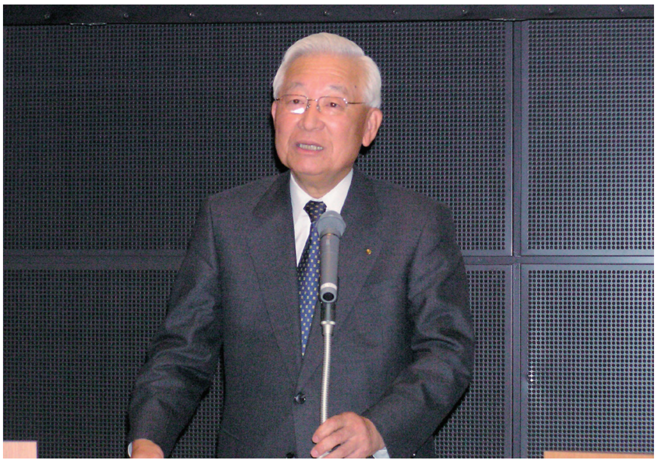
May 15, 2008

Ceremony for establishment of the Industrial Users Society for Neutron Application and the symposium of science and technology for industry, Tokyo

On May 15th, a ceremony for establishment of the Industrial Users Society for Neutron Application and a symposium of science and technology for industry were held in Tokyo.

Many companies (49 companies, 83 people) in area of industry, electric, steel, automobile, chemical, medicine etc., participated for the ceremony for establishment. Mr. Takashi Imai, the honorary of Nippon Steel Co., was appointed the chairman of this society. This society established committees on Industry-Academia collaboration, and provided much technical information, organized workshops, summarized the needs of industry within 2008.

A scene of the Ceremony.



Mr. Shoyama, the executive vice chairman, gave an inaugural speech on behalf of the Chairman Imai.

After the ceremony, the symposium of science and technology for industry was attended by about 350 participants of academies, organizations of research, industry. Before the start of the symposium, guests speeches made by Mr. Matsunami, Vice Minister of Education, Culture, Sports, Science and Technology, Mr. Okumura, the member of Council for Science and Technology Policy and Mr. Shoyama, chairman of Hitachi Ltd.. In the first part, Director Akimitsu of Aoyama Gakuin University and the others gave a lecture. In the second part, representatives of Industry, Academy and Government gave speeches about needs and expectations to J-PARC, after that, a panel discussion on needs and expectations of neutron in J-PARC was moderated by Mr. Ikawa of Yomiuri Shimbun editorial writer.

A scene of the symposium.

Panel discussion.

August 10, 2008

J-PARC Open House

On August 10th, the entire J-PARC facilities were opened to the public. Many people came from various regions and enjoyed a tour of five facilities, LINAC, 50 GeV synchrotron, Materials and Life Science Facilities, Hadron Experimental Holl, and Neutrino Experimental Facilities. The number of visitors is about 2,600 people and was more than expected.

Many people lined to wait the tour bus.

Visitors to MLF.

October 19 -25, 2008

The Asian Science Seminar on High Intensity Proton Accelerator, Beijing, China.

The seminar was planned primary for Asian young scientists who had strong interest in scientific research to be carried out at high-intensity proton accelerators such as J-PARC and at other accelerator facilities in Asia. In the seminar, lectures were given by Asian leading scientists on science frontier related to J-PARC in nuclear/particle physics and material/life science, as well as on the accelerator and experimental facilities. The number of participants by countries is China 102, Japan 86, Korea 13, Taiwan 3, and USA 3. Many young people (about 70) attended this conference.

November 18, 2008

Signing of a cooperation agreement among JAEA, KEK and Ibaraki Prefecture

JAEA, KEK and Ibaraki Prefectural Government signed a cooperation agreement to promote the application of neutron in J-PARC. The three parties cooperate and support with each other in user support, Users Office operations, technical development and operation and maintenance of beam line use, and dissemination of neutron. On November 18th, agreement signing ceremony was held in Ibaraki prefectural building, and the agreement was signed by the President of JAEA, the Director General of KEK, and the Governor Ibaraki.

From left;
President Okazaki of JAEA,
Governor Ibaraki Mr. Hashimoto,
Director Nagamiya of J-PARC center
Director General Suzuki of KEK.

December 16, 2008

Ceremony for MLF and New Building for Users, "IQBRC"

On December 16th, a ceremony was held in Tokai to celebrate the opening of the Materials and Life Science Experimental Facility (MLF) facilities to public users, a new building named as Ibaraki Quantum Beam Research Center (IQBRC), that is owned by Ibaraki Prefectural Government, and a new facility named as Tokai-mura study exchange plaza in IQBRC, that is owned by Tokai Village. IQBRC is located near the outside of Nuclear Science Research Institute, which J-PARC is located in. It is now accommodate Ibaraki Prefecture, Tokai Village, University of Tokyo, Ibaraki University, and the Users Office of J-PARC Center. And it is available to use by J-PARC users as a work apace.

A scene of the ceremony.

Ibaraki Quantum Beam Research Center (IQBRC).

March 25 -26, 2008

The First-Beam Workshop at the J-PARC Hadron Experimental Hall, IQBRC, Tokai-mura.

About 100 researchers attended the meeting and discussed reports on the first beam from the accelerator team, the hadron beamline team, and the E15/E17 team, as well as the reports by the experimental group who expect to use the beams in this fall at the K1.8 beamline and the KL beamline. In addition, they were encouraged by the talks from noted theorists, Prof. Tetsuo HATSUDA and Prof. Yasuhiro OKADA, hearing physics opportunities in the Hadron Hall. In the afternoon of March 26th, a tour to the Hadron Hall and a general assembly of the Hadron Hall Users Association (HUA) also took place.

Other Activities in 2008

Activities of the Industrial Users Society for Neutron Application in 2008

The Industrial Users Society for Neutron Application was established to promote industrial application of neutron on May 15, 2008. Membership was 49 companies at the end of March, 2009.

In 2008, the Steering Committee and Research & Development Committee were organized to operate and discuss research activities of the Society. The Society provided much information about industrial use, the operation status of J-PARC and JRR-3, the call for proposals of J-PARC and some meetings and so on. Various research meetings were planned and held in cooperation with Ibaraki Prefectural Research Society for Industrial Application of neutron Science. Further, the Society called for participations in some training courses of neutron experiments in cooperation with Nuclear Technology and Education Center and Quantum Beam Science Directorate of JAEA. Also the Seminars on Industrial Application of Neutron were held in Osaka city (December 19, 2008), Saitama city (February 3, 2009) and Hamamatsu city (February 5, 2009) for dissemination of industrial neutron use in cooperation with Ibaraki Prefecture and J-PARC Center.

Activities of J-PARC/MLF Users Society in 2008

The J-PARC/MLF Users Society was established to promote application of J-PARC through mutual exchange of users on September 7th in 2007. Membership was 259 people, and Sponsor membership was 12 parties at the end of March, 2009.

In 2008, the Secretary Committee and 9 Studying Subcommittees were organized to promote the research activities among researchers and engineers by application of neutron and muon in J-PARC/MLF. Subcommittees established the action plan in this year, and decided to hold some workshops in cooperation with the Industrial Users Society for Neutron Application and the Ibaraki committee of neutron application. This Society provided much information about the operation status and construction status of J-PARC/MLF, the call for proposals, the results of neutron and muon research and some events and so on.

Activities of the Hadron Hall Users' Association (HUA) in 2008

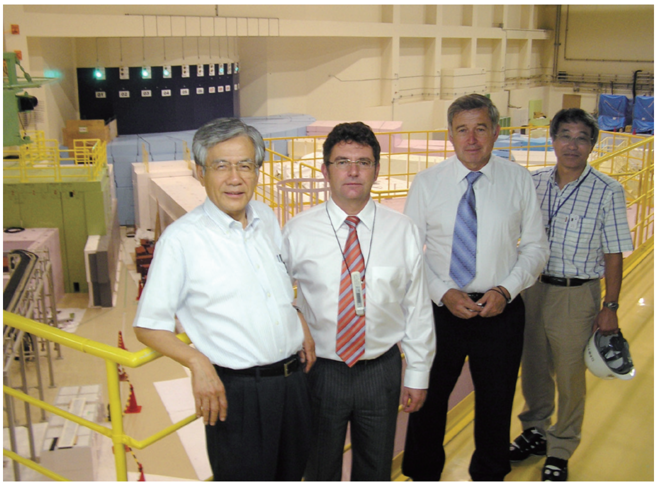
The Hadron Hall Users' Association, HUA, was founded on March 25, 2007. The purpose of HUA is, according to the Charter, to provide an organized channel for the interchange of information among those who use the Hadron Hall of the J-PARC, to make up a collective opinion among researchers from different fields with a bottom up basis, to promote better research activities, and to use the results of the research to promote the science of the Hadron Hall to a wide audience. The activities include

- Interchanging information between the members,
- Collecting opinions from the users about the current activities and the future plans of the facility, and reporting these opinions to the J-PARC Center and other related organization,
- Presenting information for the users, and promoting interchange among various researchers and organization,
- Recommending the representatives of the Hadron Hall that sit on the Users' Committee of J-PARC,
- Hosting scientific meetings, such as a Hadron Hall symposium, and promoting interchange and cooperation with other scientific organization, and
- Other necessary activities to achieve the purpose of HUA.

The membership was 154 at the end of the Japanese Fiscal Year (JFY) 2008, including 30 from foreign institutions. Two meetings were held by HUA during JFY2008. An information meeting of HUA was held at Yamagata University during the autumn meeting of the Physical Society of Japan (JPS) on September 20. Status of the construction of the slow extraction system was reported as well as the general status of the Hadron Hall construction. The general assembly of the year, which must be held at least once a year, was held at the Ibaraki Quantum Beam Research Center on March 26, 2009, just after the "First-Beam Workshop at the J-PARC Hadron Experimental Hall" at the same place. The success of the 1st beam to the Hadron Hall was reported, and the result of the election of the members of the Executive Committee for JFY2009 was introduced, as well as general discussions including ones with the user coordinator of J-PARC.

The Hadron Hall just entered its operational era. Bottom-up activities by the researchers themselves who use the Hadron Hall are of the most importance to achieve scientific goals in this era. HUA will strengthen its activities.

Major Visitors to J-PARC in 2008



Dr. Ferenc Mezei, the Hungarian Academy of Sciences and **His Excellency Mr. Ernő Bohár,** the Hungarian Ambassador to Japan (September 2, 2008).

Prof. Jiang Mianheng, vice president of the Chinese Academy of Sciences (CAS) and 6 other members of CAS, (January 16, 2009).

Dr. R. Chidambaram, Principal Scientific Advisor to the Government of India and Chairman, Scientific Advisory Committee to the Cabinet, (January 20, 2009).

Akiko Santo (wear in light blue), the Vice President of the House of Councillors. (June 27, 2008)

Koji Omi, the member of the House of Representatives. (July 3, 2008)

From left; **Akira Gunji**, the member of the House of Councillors; **Masamitsu Naito**, the member of the House of Councillors; **Yukihisa Fujita**, the member of the House of Councillors. (July 9, 2008)

Keichi Ishii, the member of the House of Representatives. (July 15, 2008)

Kisaburo Tokai, the Minister of Education, Culture, Sports, Science and Technology. (July 18, 2008)

Toshio Yamauchi, the Senior Vice Minister of Education, Culture, Sports, Science and Technology. (September 2, 2008)

Publications

Publications in Periodical Journals

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Appl. Phys. Lett. Vol. 89, p. 201910 (2006)

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Proton collaboration is under way in Japan
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Transmutation of long-lived radioactive wastes
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Hamon Vol. 14, p. 130 (2004)

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Overview of 1MW pulse neutron source at J-PARC
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Current status and future in development of JSNS
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Aiming at Establishment of a Good System for J-PARC Users.
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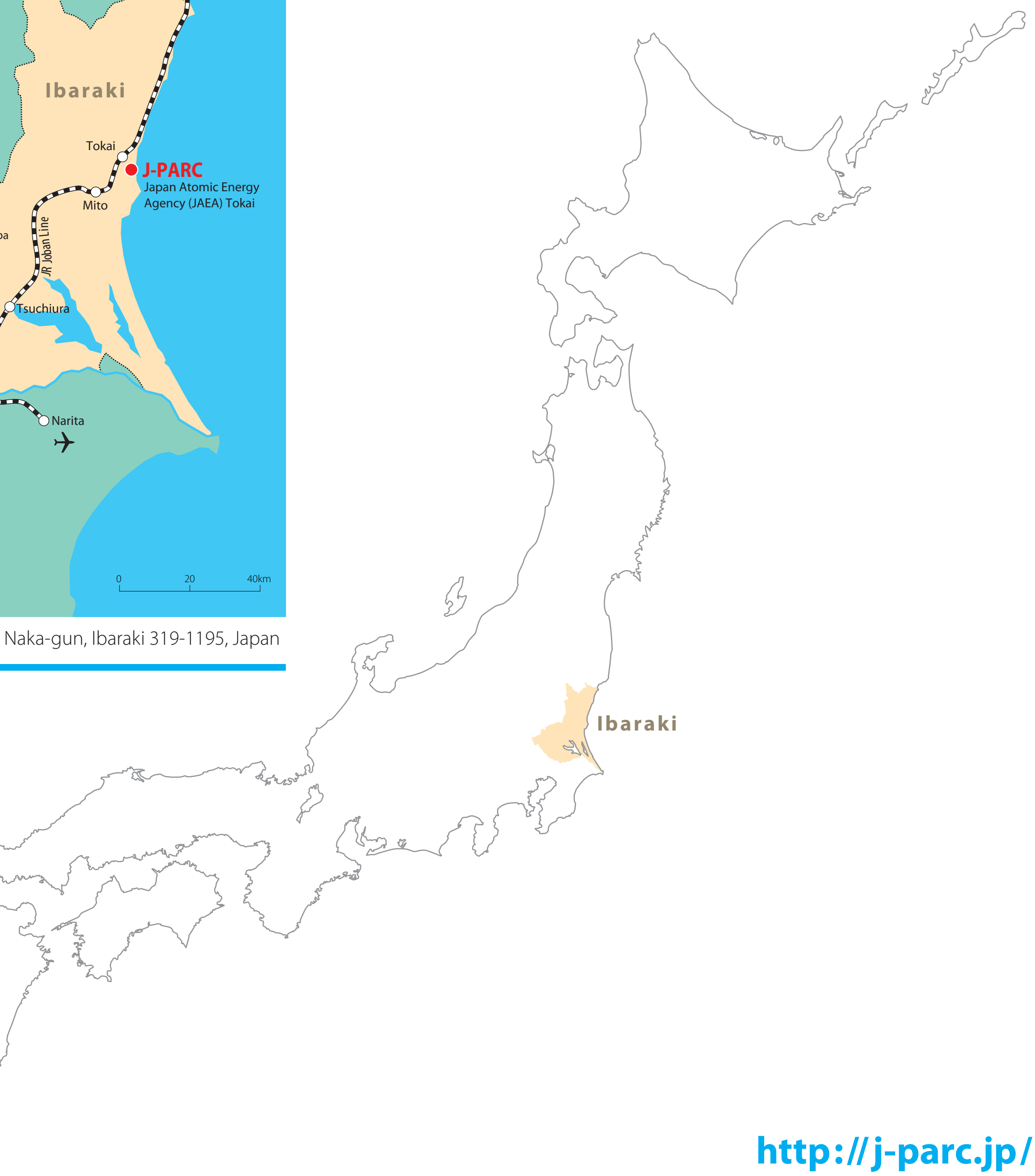

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