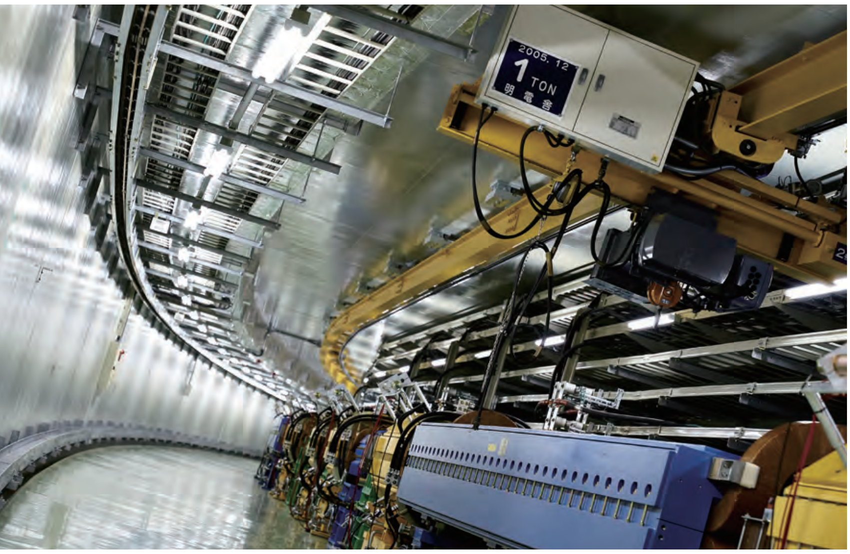
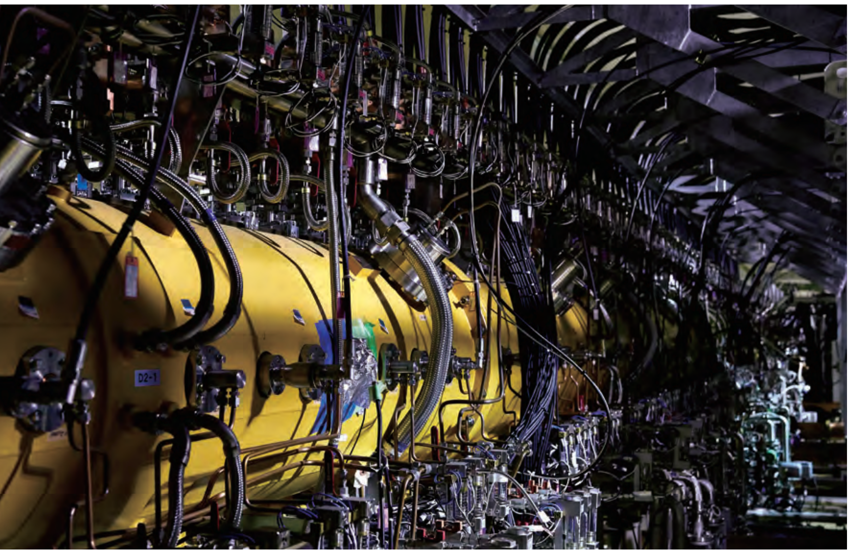




J-PARC

ANNUAL REPORT 2015

Vol.1: Highlight

Editorial Board (April 2016 – March 2017)

Hideaki HOTCHI *(Accelerator Division)*

Seiko KAWAMURA *(Materials and Life Science Division)*

Hajime NISHIGUCHI *(Particle and Nuclear Physics Division)*

Makoto YOSHIDA *(Cryogenics Section)*

Shigeru SAITO *(Transmutation Division)*

Hirohito YAMAZAKI *(Safety Division)*

Shinji NAMIKI *(Users Office Team)*

Hiroshi FUKUDA *(Public Relations Section)*

Cover photographs: Accelerators of J-PARC

Image credit: Yuki Hayashi

J-PARC Annual Report 2015

Contents

Preface

This volume describes the activities of J-PARC from April, 2015, through March, 2016.

J-PARC (Japan Proton Accelerator Research Complex) is a multi-purpose research facility based on world-class high-intensity proton accelerators built through joint efforts between the High Energy Accelerator Research Organization (KEK) and the Japan Atomic Energy Agency (JAEA). In a wide range of research fields, including materials and life sciences, elementary-particle and nuclear physics and research and developments for nuclear transmutation, we aim to contribute broadly to the advancement of humankind by promoting diverse research and development projects that cover varied areas, from basic science to industrial applications.

Since J-PARC began its operations in 2008, we have steadily increased beam intensities, worked hard to enhance the capability of our facilities, and achieved a variety of results appropriately reflecting the nature of a multi-purpose research facility. However, the radioactive material leak incident at the Hadron Experimental Facility (HEF) that occurred in 2013, caused a tremendous amount of worries and troubles to many people. After deep reflection on this incident, we are convinced more strongly than ever that our research can only be conducted with the support of the public. To ensure that the same mistakes are not repeated, we worked hard to rebuild and strengthen our safety management system and reformed our organization to ensure even greater safety at J-PARC. We will continue to make unflagging efforts to maintain our reputation of a research facility with a total commitment to safety.

Now we are happy to report that we have restarted the HEF after almost two years of shutdown. As you will find out, we, together with the users, have already started to produce significant results from the facility.

The neutrino oscillation experiment, T2K (Tokai-to-Kamioka) continues to be the flagship experiment at J-PARC. The proof of electron-neutrino appearance in a muon-neutrino beam has been already established in previous years. In this report, our first results on the anti-neutrino beam will be described.

The Materials and Life Science Facility (MLF) had to stop its operations for both the neutron and muon beamlines due to a problem with the neutron target. In order to solve the issues and develop an even stronger team to explore the frontier of targetry technologies, we have formed a new J-PARC-wide task force. While working on the target recovery process at the MLF, we have been able to produce many additional scientific achievements in energy materials and other fields, including industrial applications.

We would like to share widely all these achievements with the society, both in Japan and overseas. Furthermore, we would like to increase our social contributions by enhancing the collaboration with universities, research institutions, and industries not only by producing and sharing results, but also by fostering the next generation of researchers with a solid experience in cutting-edge facility operations, who can, in turn, create a new generation of researchers to uniteruppedly improve the facility for the benefit of the future society.

"Hi-power beams for the next stage of our life!"

Naohito SAITO
Director of the J-PARC Center

Accelerators

Overview of the Accelerator

In fiscal year 2015, one of the highlights was the resumption of the user operation at the Hadron Experimental Facility (HD) in April, two years after the HD incident in May, 2013. The proton beam power for users had been successfully ramped up to 500 kW, 390 kW, and 42 kW at 3 GeV for the MLF, 30 GeV fast extraction (FX) for the neutrino experiments and 30 GeV slow extraction (SX) for the hadron experiments, respectively. However, we had two target failures at the MLF resulting in long downtime for replacements.

The operation in FY2015 is illustrated in Fig. 1. The topics related to the beam operation are as follows:

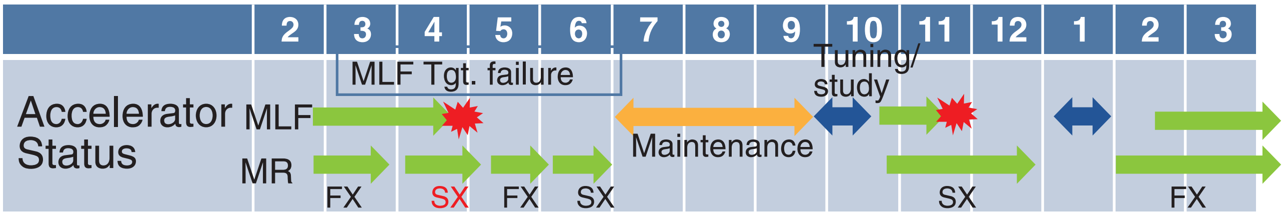


Fig. 1. Accelerator operation in FY2015.

(1) Operation for the MLF

After the accelerator study operation in the beginning of April, the beam delivery to MLF users was resumed at 400 kW, the same level as in FY2014. We increased the beam power to 500 kW, which was a new power record for the MLF user operation. Unfortunately, about two weeks later, the operation was suspended due to a defect of the neutron production target.

In October, the beam delivery to the MLF was resumed at beam power of 500 kW. However, the operation for the MLF was suspended again in November. After the replacement of the target, the beam operation was restarted in February, this time with conservative beam power of 200 kW to protect the target. To improve the quality of the experiments, even at the lower beam power, the accelerator provides a one-bunch beam instead of the regular two bunches, which creates a shorter pulse and is preferred by some MLF users.

(2) Operation for the Neutrino Experiments

The user run of MR-FX was started at 290 kW in April, but the power was increased to 330 – 345 kW thanks to parameter tuning.

The linac current for the user operation was increased from 30 mA to 40 mA in January. Fine tuning study, aiming at user operation parameter setting, was done in the linac, the RCS and the MR. As a result of the study, the beam power was successfully increased to 330 – 394 kW in February.

(3) Operation for the Hadron Experiments

In April, after the performance confirmation and the inspection by the nuclear authority, the user operation was started at beam power of 24 kW, the level at the time of the HD incident in May, 2013. We increased the beam power to 33 kW by the end of June.

We have accomplished a shorter acceleration time of 1.4 seconds, the same as that in the FX mode, compared to the previous 1.9 seconds. The MR-SX cycle time was shortened from 6.0 to 5.52 seconds. The shorter cycle time and the machine study had increased the beam power to 42 kW by December.

Table 1. Operation statistics in hours in FY2015.

Facility	User Time (hours)	Trouble, Acc.only (hours)	Trouble, Fac.only (hours)	Net Time (hours)	Availability, toral (%)
MLF	3,579	145	1,957	1,477	41.3
NU	1,671	446	55	1,169	70.0
HD	1,752	220	15	1,517	86.6

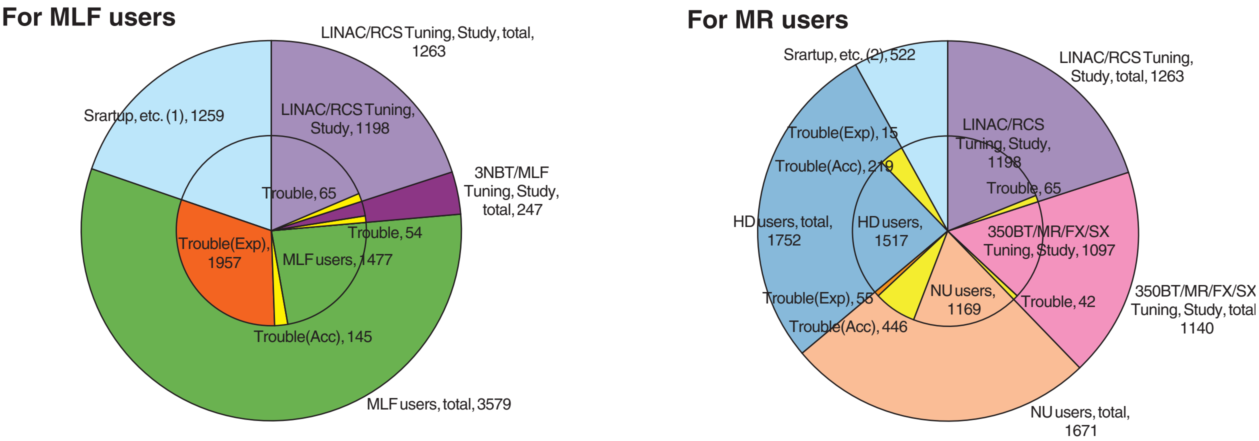


Fig. 2. Operation statistics in FY2015. The total operation time was 6,350 hours.

The operation statistics in FY2015 is shown in Table 1 and Fig. 2. The downtime by sub-system is shown in Fig. 3. The total operation time, defined by the shift leader assigned time, including startup and RF conditioning, is 6,350 hours.

We had two target failures at the MLF and a long downtime of 1,957 hours (over scaled in Fig. 3) for the replacement. That was the main cause of the lower availability. During the interruption at the MLF, the accelerator delivered beam to the NU or HD users by way of the MR.

At the MR, we had big troubles at the end of the fiscal year. One was a vacuum leak in February and the other was a coil trouble in the bending magnet at the end of March. In these cases, we provided beams to the MLF.

At the front end, the linac contributed most of the downtime, while the RCS was rather stable. A dominant characteristic this year was the occurrence of numerous troubles grouped in "Others", which may not always happen so often. Most of the events were utility or building related and included a cooling tower failure (19 hours), a cooling water valve failure (11 hours), ventilation system stops (three times, 32 hours in total) and so on. The next most frequent cause was an HVDC (High Voltage DC power supply) for klystrons. This was not limited to the power supply but also covered the high-power RF components. Several defects in this group comprised of a klystron failure, insulation breakdown of an HV cable, and several switching devices and module failures.

Some other linac downtimes were grouped in "DTL" and "SDTL". The condition of the cavities was not poor, except for some SDTL cavities with multipacting due to the aftereffects of the earthquake. The cooling water flow decrease contributed most of the downtime in these groups. We adjusted the cooling water flow rates at the weekly scheduled maintenance, but some flow rates still dropped unexpectedly.

Most of the improvement and upgrade work, such as installation of new beam diagnostics, reinforcement of the power supply, preparation for higher repetition at the MR, etc. was carried out mainly during the summer shutdown. These are described in further chapters.

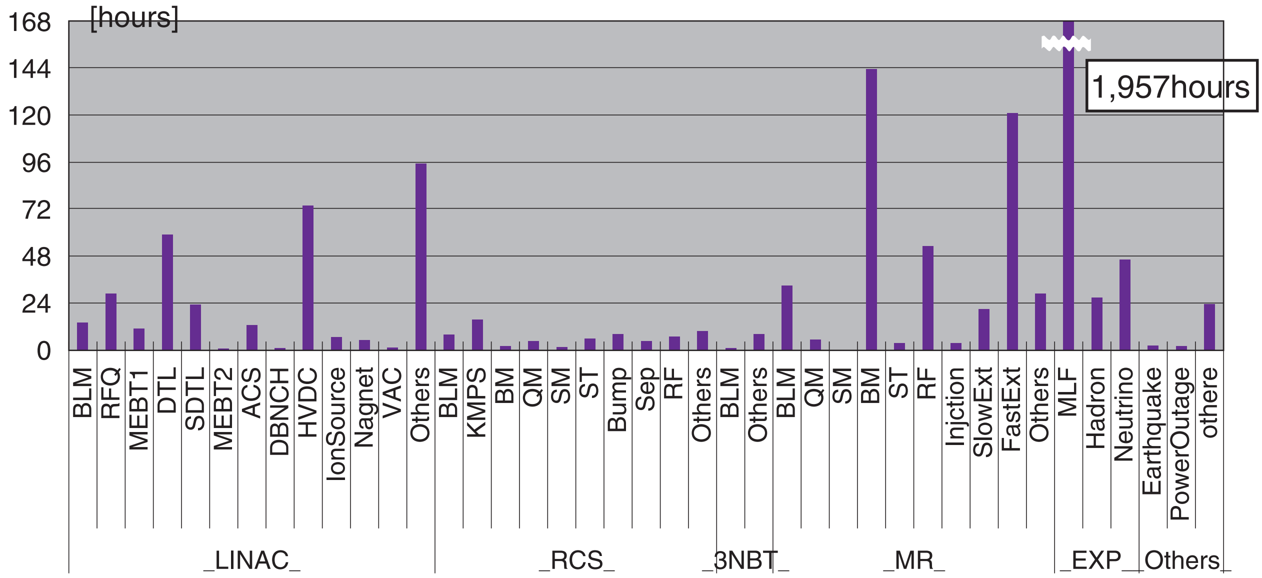


Fig. 3. Downtime by components in FY2015.

Linac

The J-PARC linac has been successfully providing the required beam after the energy and intensity upgrades. The operation history of the ion source in FY2015 is shown in Fig. 4. The ion source has demonstrated up to 60 mA beam current. Continuous operations of 1,100 hours at 33 mA and 1,004 hours at 45 mA, respectively, were achieved,. For the purpose of operating the ion source with short start-up time, pre-conditioning at an ion source test-stand has been conducted. In the pre-conditioning, the antenna failure rate was drastically decreased from 74% to 25% by the new pre-conditioning procedure that repeated 15-min low RF-power operation and impurity gas evacuation a few times before the full-power operation.

The RFQ was still the component with the highest RF-trip rate. We observed a trip rate of approximately 15 times per day, which did not change significantly from the last year. The beam operation resumed within one minute after each trip. The number of trips in the DTL1 and the SDTL5 increased just after the 2015 summer maintenance. We assume that the situation was caused by an insufficient conditioning operation because these cavities were exposed to the atmosphere during the maintenance period. The trip frequency decreased in the process of the operation, and reached an acceptable level. The ACS was running stably in comparison with the other cavities. Currently, the total trip rate of all ACS cavities is about 0.5 times per day, a third of the level at the beginning of the operation.

After the 2015 summer maintenance, the cooling water flow rate at DTL decreased significantly, especially DTQ. Once the flow rate monitor registers the problem, it takes at least 3 to 4 hours to enter the tunnel that we maintain. It's time consuming, even if it doesn't take long time to complete the flow adjustment work. A regulation method that we tried in order to fix the problem, was changing the water flow rate. This countermeasure achieved a certain result, however, we still don't understand the specific reason for the defect. We will continue our efforts to find a suitable solution.

We replaced one 324-MHz klystron and two 972-MHz ones due to their performance degradation in FY2015. Both klystron operation times, as of March, 2016, are shown in Fig. 5. We have replaced five 324-MHz klystrons in total from the beginning of the linac operation. Fifteen of the klystrons have reached roughly 45,000 hours of operation. We are apprehensive that those klystrons may come to the end of their life in the near future. It is important to prepare spare klystrons to keep the operation running smoothly.

A multipactor region, with significantly increased VSWR (Voltage Standing Wave Ratio), was observed at some SDTL cavities after the earthquake in 2011. The region of the SDTL5B spread further with the operation. In the 2015 summer maintenance, the SDTL5B cavity was removed from the beam line and opened. The internal surface of the cavity was dirty, probably due to cracked hydrocarbons from an oil-filled vacuum pump. There were also many foreign objects and other debris inside the cavity. After removing the objects and cleaning the surface with acetone, the multipactor region almost completely disappeared, as shown in Fig. 6. After the countermeasure, this problem has not occurred again at the SDTL5B. We will give the same treatment to the other SDTL cavities during the next summer maintenance.

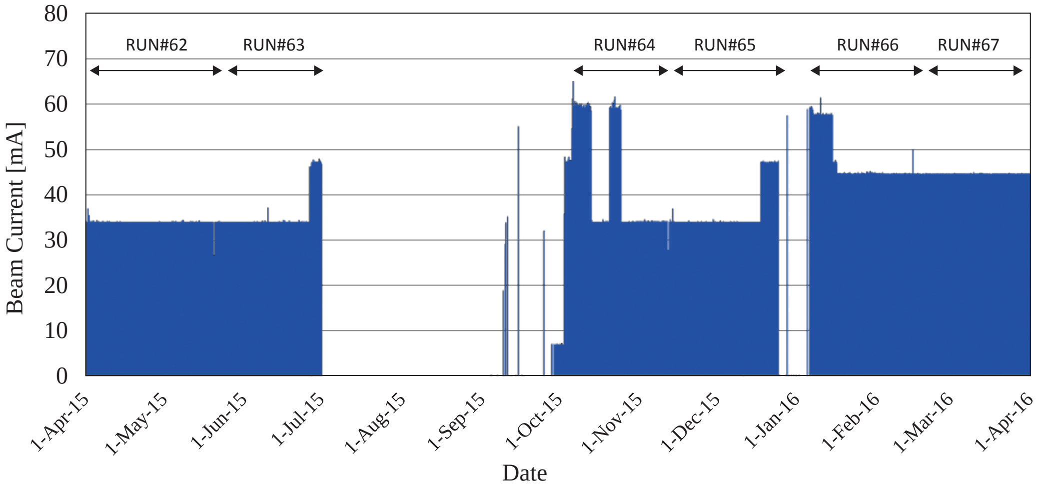


Fig. 4. Operation history of the ion source in FY2015.

Linac beam studies have been continued to mitigate the beam loss. A continuous beam loss along the ACS section was found to exceed the linear scaling of the peak current. Intra-beam striping (IBSt) effects of the H- beam were identified as the dominant beam loss in that section. The IBSt rate is positively correlated to the H- density and divergency and can be affected only by lattice setting. A beam loss reduction by 40% was shown by the beam loss monitor in the beam study, where the transverse focusing varied systematically from the original design. Further studies are necessary for the beam loss mitigation to achieve a 50-mA user operation.

For the 50-mA user operation, we are modifying the beam chopper system. During the 2015 summer maintenance, we installed a new type of scraper, increasing the beam incident angle of from 45° to 67° to reduce the beam power deposition density on the surface. The scraper temperature in the new conFiguration was measured, and its decrease by approximately 500° was observed with short beam pulses. However, there was not enough testing time to measure with long pulses, due to the MLF target trouble. We are planning to perform the test using the off-line test stand.

Two bunch shape monitors with modified design using outgas-conditioned materials are under testing at an off-line test stand. The vacuum pressure of both BSMs achieved 10^{-7} Pa which is comparable to the present BSM with additional TMPs. One BSM will be tested at the 3-MeV linac test-stand and will be installed in the MEBT1, which is the front-end part for the bunch shape measurement. The other one will be installed next year in the MEBT2, the matching section between the SDTL and ACS sections, to ensure the precise RF settings of the buncher cavity.

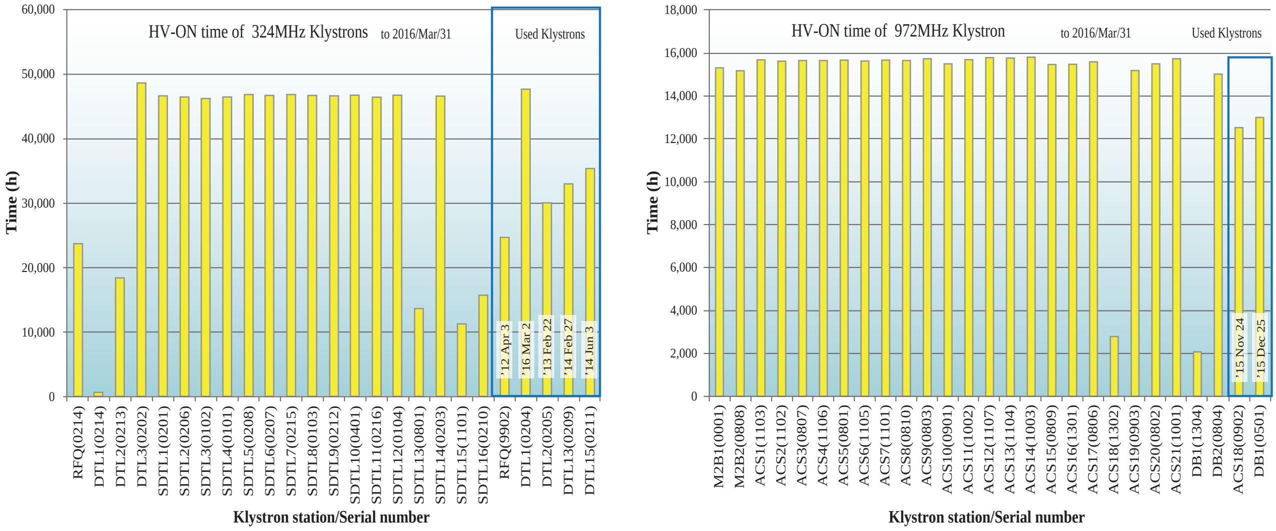


Fig. 5. Operating time of 324 MHz (left) and 972 MHz klystron (right).

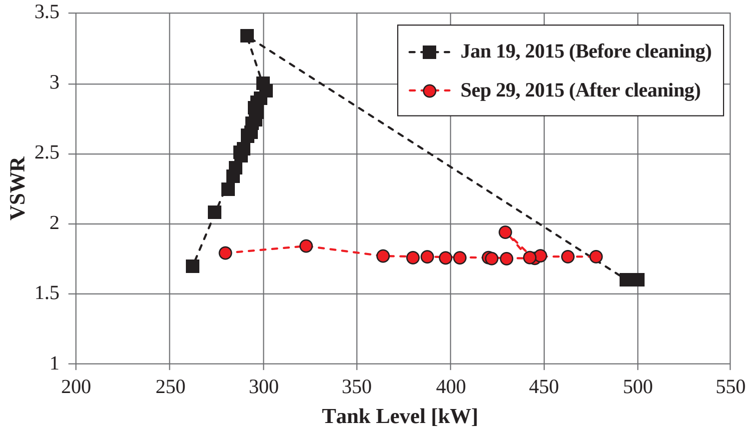


Fig. 6. VSWR as a function of the tank level at SDTL05B before and after cleaning.

RCS

Operational Status

The output power derived from RCS in the beginning of fiscal year 2015 was 400 kW, which was increased to 500 kW on April 14. However, a cooling water leak occurred in the neutron target at the end of April and the supply to MLF was stopped. Operations were conducted only for MR until July 1. The operations for the MLF were resumed on October 27, but less than a month after their resumption, a water leak occurred again on November 20. A spare neutron target was installed, and the user program was restarted on February 20. Due to the lack of a spare neutron target following the incident, the output power for the target was reduced to 200 kW to protect the existing target. Fig. 7 shows a history of the output power from the RCS.

This year, there were no serious problems in RCS, therefore the availability of RCS itself is quite good. Its operation time over the year has been approximately 3,828 h, excluding the commissioning time, with a down time of approximately 36 h; therefore, its overall availability was better than 99%. About half of the down time was caused by a problem in the pulse magnet systems (injection bump magnets and extraction kicker magnets).

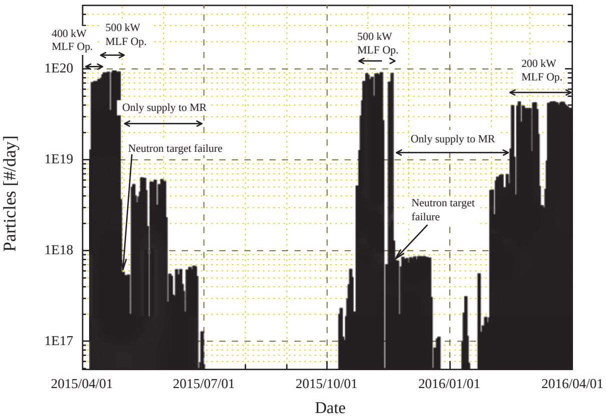


Fig. 7. History of the output power from RCS.

Maintenance and Improvements

Different types of maintenance and improvement works to reduce beam loss and ensure stable operation were carried out during the summer shutdown period. The two major improvements were as follows:

1) Improvement of the L3BT line

Previous beam commissioning results indicated that the injection beam parameters should be flexibly adjusted to reduce the amount of RCS beam loss. Two improvements were required to allow for this flexibility. The first one was the installation of additional wire scan monitors. 3 additional monitors were installed in the L3BT line with the aim of improving the matching condition between the injection and the circulating beams. The second one was the physical aperture extension of the vacuum ducts in magnets. The vertical apertures of the ceramic ducts used for vertical bump magnets were sufficient for the original beam condition, but recent study results indicated that wider beam optics would be more appropriate for achieving finer, low-loss matching conditions. Therefore, the old ceramic ducts were replaced with wider ones (see Fig. 8).

2) Anode power supply upgrade of the RF system

A 1-MW beam trial indicated that the anode power supply to the RF system did not have enough margin to complete sufficient beam loading compensation for such a high-power beam. The original anode power supply consisted of 15 inverter units, and we modified the frames of the power supply to accommodate for 4 additional inverter units on the roof of the supply system (see Fig. 9). We have 12 anode power supplies and 3 inverter units per anode power supply unit were prepared during the 2015 summer shutdown period. A total of 36 additional inverter units was installed, and the maximum anode current was increased from 124 A to 148 A.

Residual Dose Distributions and Exposure Dose during Maintenance

Before the 500-kW operation, we rectified the modulation of the beta function with a new quadrupole magnet system, and expanded the painting injection area (see the “Beam commissioning” section). As a result, the dose rate of the foil chamber, which was above 10 mSv/h after a 400-kW operation, decreased to less than this value even after a 500-kW operation. Based on these results, we intended to increase the output power to 600 kW for MLF in mid-May, but the supply to the MLF was stopped after the first cooling water leak and operations were conducted only for the MR until the summer shutdown period. The duty required for operating the MR is less than 10% of that required for operating the MLF, and the number of acceleration particles required is also less than 10%. Therefore, all residual doses in the RCS were reduced. The residual dose in the foil chamber decreased to 3 mSv/h because the radioactive nuclides with short half-lives disappeared during this period. This value did not decrease over the maintenance period because of the presence of nuclides with longer lifetimes.

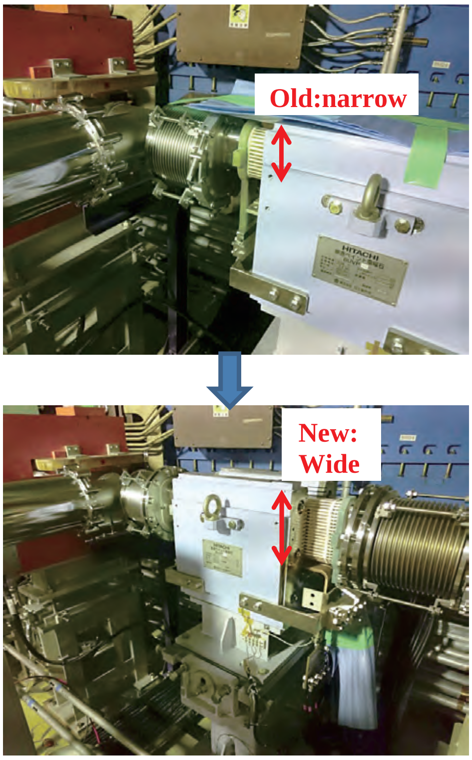


Fig. 8. Extension of the duct aperture.

Fig. 9. Reinforcement of the anode power supply system.

33 workers were exposed to a residual dose of more than 0.01 mSv during the summer shutdown period, and the corrective dose of these workers was 4.45 mSv. Table 2 shows a summary of workers' personal doses while performing maintenance work during the summer shutdown period. The number of workers who were exposed to more than 0.1 mSv residual dose was 15, and the maximum quantity of dose received by any worker was 0.42 mSv. Our objective is a residual dose of less than 1 mSv for any worker, therefore this result is acceptable.

A large amount of residual dose was not observed even after 500-kW operations. The residual dose distribution was similar to the result observed the previous year for the 300-kW operations, wherein higher radiation doses were concentrated in the injection area. Thus, the significant dose exposure was caused by the works in that area.

Table 2. Summary of workers' personal doses during maintenance work conducted during the 2015 summer shutdown period.

Exposure dose [mSv]	Number of workers [#]
0.01-0.05	11
0.06-0.1	7
0.11-0.2	7
0.21-	8

Beam Commissioning

1) Confirmation of the effectivity of the RF upgrade

A test with a 1-MW beam was conducted after the RF anode power supply was upgraded. Fig. 10 shows a comparison of beam loss signals before and after the upgrade. Before the upgrade, a resonance frequency of an *rf* cavity was temporarily set to 2.1 MHz to reduce the required anode current below the output limit of the power supply. In that case, the beam behavior was

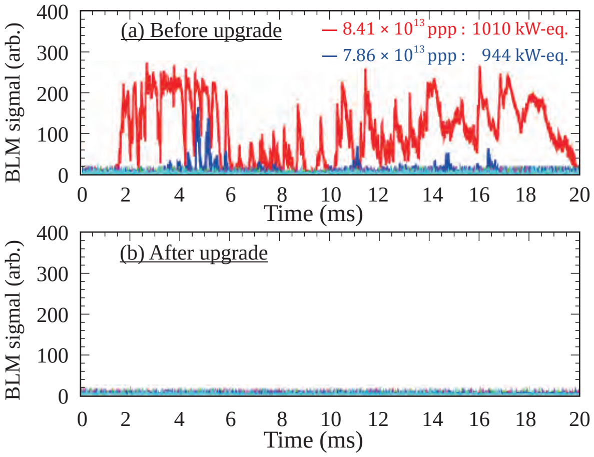


Fig. 10. Beam loss monitor signals in a high dispersion area (a) before and (b) after the RF power supply upgrade needed for a high-power beam operation. The red line shows the loss signal for 8.41×10^{13} particles per pulse, while the blue line indicates 7.86×10^{13} particles per pulse.

very unstable and we observed some beam loss. After the upgrade, the resonance frequency came back to the original value of 1.7 MHz, because we were able to feed enough current from the anode power supply, and then the beam stability was restored. The beam loss signals demonstrated that the longitudinal beam loss was removed by a sufficient feedforward tuning of the RF system.

2) Beam tuning conducted to expand the transverse painting area and mitigate further the RCS beam loss

The next area to focus on, after the major beam loss had been minimized, was the reduction in the losses caused by the foil interaction. Fig. 11 shows the average number of foil hits per particle during a beam injection under different types of operational conditions. As it can be seen, a large painting area results in a lower number of foil hits. However, that has never been realized because such a large painting area (>100 πmm-mrad.) increased the additional beam loss other than the loss caused by foil scattering. Numerical simulations and experiments revealed that this increase in beam loss was the result of modulation of the beta function caused by the edge effect of the injection bump magnets. Thus, we compensated for this modulation by using additional quadrupole magnets. We also adopted an anti-correlated painting pattern and optimal tune variation during the acceleration process. These efforts helped us to extend successfully the painting area to 200 πmm-mrad. and this resulted in further beam loss mitigation.

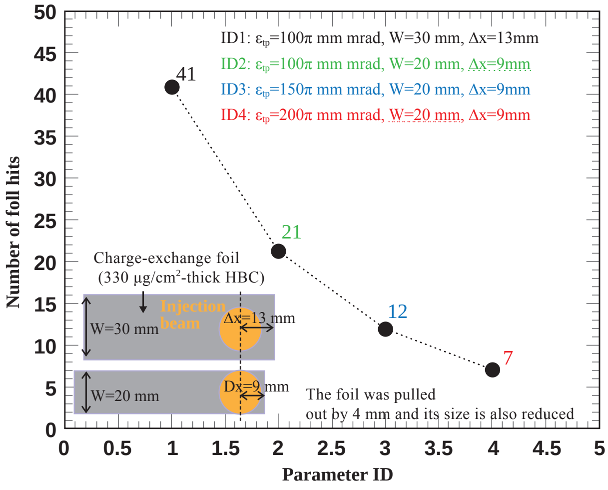


Fig. 11. Average number of foil hits per particle during beam injection under different beam injection conditions in the RCS.

3) Beam tuning for beam loss mitigation in the MR

The MLF needs a wide beam, generated by a larger transverse painting, to mitigate the shock wave on the neutron target. In contrast, the MR requires a low emittance beam, generated by a smaller transverse painting, to avoid beam loss. To satisfy the MR requirement, we investigated different ways to improve the transverse painting area and tune variation.

The results of our study indicated that a 50 πmm-mrad. correlated painting provided the smallest RMS beam width. This empirical observation agreed well with the simulated results.

The tune variation during the acceleration process was also investigated, and a better condition for making a smaller beam emittance was obtained; however, this condition caused more beam instability after the middle phase of the acceleration period. One possible solution to avoid this instability is to increase the negative chromaticity in the middle and later phase of the acceleration period. To realize such a chromaticity control, bipolar excitations are required for the sextupole magnets. But only the positive or negative chromaticity can be generated by the present power supply system of the sextupole magnets. We will therefore modify the power supply system to meet the requirement.

Summary

The output power of the MLF was initially kept at 400 kW in the current year and was increased to 500 kW in mid-April. However, a cooling water leak occurred twice in the neutron target, thus forcing the output power to be reduced to less than 200 kW. The beam power for the MR, however, was satisfactorily increased to a 600-kW equivalent. Some improvements were accomplished during the summer shutdown period. The anode power supply for the RF acceleration system was reinforced to reduce beam loss at the arc section.

To obtain better conditions resulting in less beam loss, we carried out beam commissioning. This resulted in the extension of the painting area and optimization of the operating conditions. A low emittance beam condition for the MR was also investigated, and the results of this study indicated that a modification of the existing sextupole magnet power supply system is required.

MR

Overview

The J-PARC Main Ring synchrotron (MR) of J-PARC has two user facilities. One is the Neutrino Experimental Facility and another is the Hadron Experimental Facility. The former uses the fast-beam extraction (FX) mode with a repetition period of 2.48 s. The latter uses the slow-beam extraction (SX) mode. Its repetition period is 5.52 s.

The beam power history of MR in FY2015 is shown in Fig. 12. As shown in the Figure, beam power of 394 kW was achieved for the FX mode, while that of 42 kW was also achieved for the SX mode.

The details of the MR operation in JFY2015 are reported in the following section.

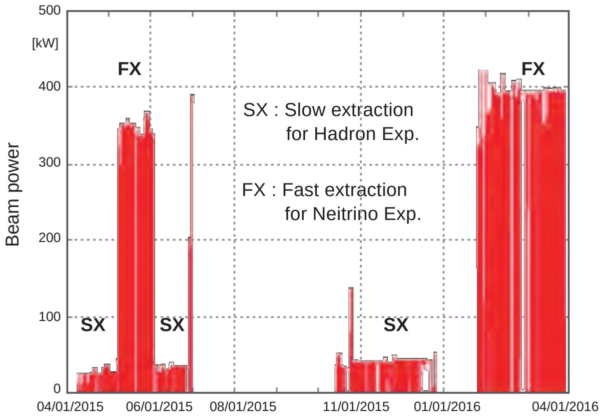


Fig. 12. Beam power history of MR.

Replaced Equipment of MR

The designated beam intensity of the FX mode is 750 kW. We are going to achieve that intensity by reducing the repetition period from 2.48 s to 1.3 s. To reduce the repetition period, we have to upgrade the magnet power supplies and the RF cavities. Furthermore, we installed the compensation kicker at the beam injection area.

MR has 9 RF cavities. One of them had been replaced in 2014 with a high-gradient cavity and 4 more cavities have also been replaced with high-gradient ones during the summer shutdown period in 2015. The remaining 4 cavities will be replaced in the summer of 2016.

However, the production of the new magnet power supply has not started due to the lack of budget. Fortunately, the budget was approved at last in JFY2016 for the magnet power supply and the new building for the power supply. Thus, the design of the building has already started.

Although the injection kicker magnet is fast enough for a 1.3 s repetition rate, the pulse of the electric current has small bumps just after the main pulse, as shown in Fig. 13. The bump kicks the previously injected beam, so that the kicked beam orbit is distorted and lost soon. Thus, a compensation kicker, which corrects the distorted orbit of the beam kicked by additional bump, was installed in the summer of JFY2015. It has been confirmed that the kicker magnet compensated the distorted orbit successfully.

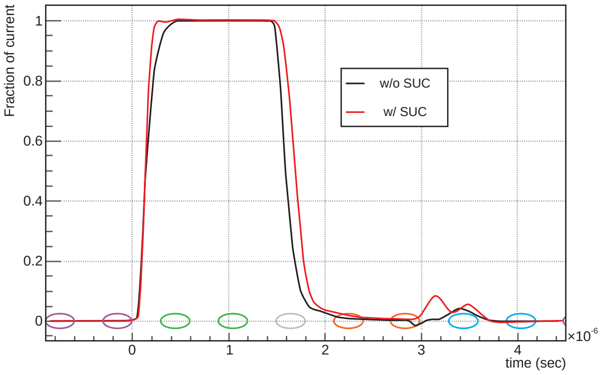


Fig. 13. Pulse pattern of the injection kicker magnet. Black line: Slow rise time without the speed up circuit (SUC). Red line: Fast rise time with SUC. This pattern is used with the compensation kicker magnet.

FX Mode Operation

We increased the beam intensity from 300 kW to 394 kW for the FX mode by the end of JFY2015. It means that a beam with 2 × 10E14 protons per pulse was accelerated. This beam intensity is equivalent to 750 kW, if the cycle time were 1.3 s, instead of 2.48 s. During FX mode operation, the beam loss in MR was approximately 1 kW. The loss was distributed in several locations and was well below the collimator limit of 2 kW.

A study with a higher intensity beam with 8 bunches showed a promise of beam power acceleration above 500 kW, even before the upgrade of the power supply. Furthermore, the projection extrapolated from the two-bunch beam study shows the possibility for beam power acceleration of more than 1 MW. Of course, that would require some loss reduction.

SX Mode Operation

The SX mode was suspended until April, 2015, because of the radiation leakage incident that happened at the Hadron Experimental Facility in 2013. A lot of official procedures and improvement of the radiation protection system of the facility were required to restart the hadron experiment. Finally, the requirements were met completely by the beginning of 2015. As a result, the SX mode resumed on April 9, 2015. The beam study was started with very low beam intensity (3 kW) because it was necessary to check the SX mode system carefully. Then the beam power was gradually increased. Beam of up to 33 kW was delivered to the Hadron Facility before the summer of 2015.

During the summer maintenance period, the repetition period of the SX mode was reduced from 6.00 s to 5.52 s by reduction of the acceleration period from 1.9 s to 1.4 s, which is the same as that of the FX mode. It increases the beam power by approximately 9%. As a result, the beam power of the SX mode was increased to 42 kW from the operation in October, 2015, with excellent efficiency (99.5%) and good beam quality (duty factor 42%).

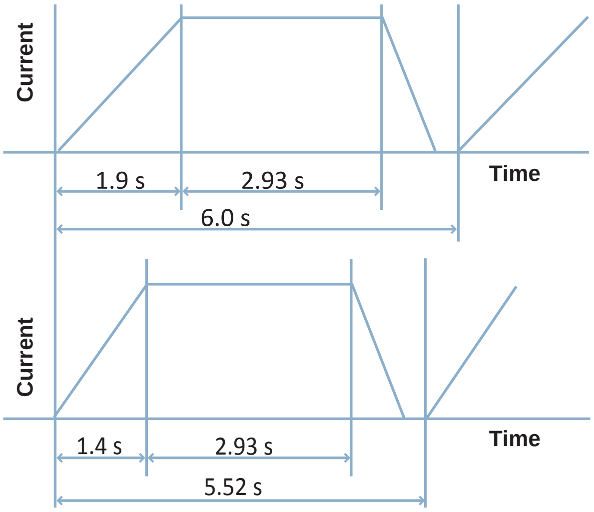


Fig. 14. Magnet current patterns of the SX mode.
Top: Previous pattern.
Bottom: New pattern.

The SX mode at 24-25 GeV was investigated to reduce the power consumption during slow extraction. (since the SX mode has a long flat top period (about 2 s, as shown in Fig. 14), the electric power consumption is much higher than that of the FX mode. The power consumption of the SX mode at around 24 GeV is almost consistent with that of the FX mode.) However, at that energy, the magnet power supplies were found to be insufficiently stable, which prevented efficient slow extraction.

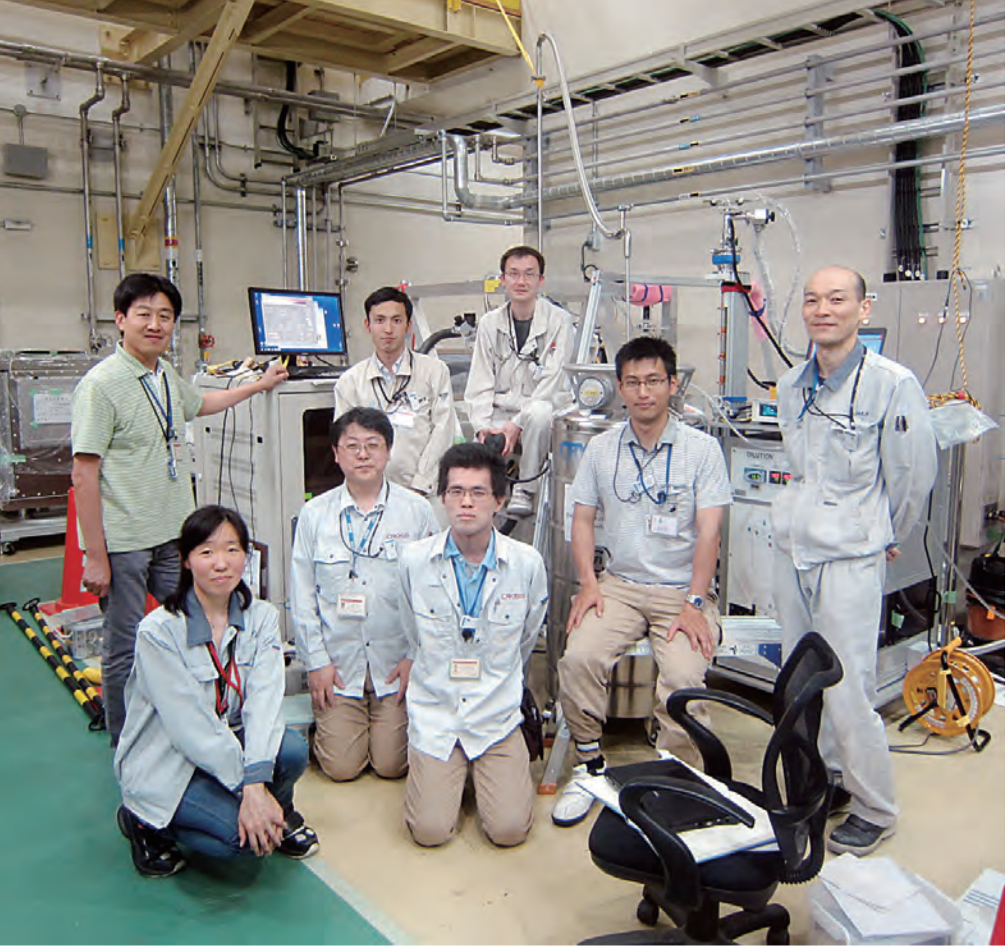
Slow extraction studies will continue to push the intensity higher. The present target power is 50 kW, which is limited by the hadron target performance. An upgraded target capable of 70-75 kW is expected to be installed in 2017.

Troubles

Two troubles, which stopped the beam operation for almost a week, happened at MR at the end of JFY2015.

The first one was a vacuum leak of the beam duct. It happened at the flange connection part of the duct of the abort dump beam line on February 25, 2016. It was caused by a beam kicked accidentally by the abort kicker. The beam struck the metallic vacuum seal between the flanges. As it was provably induced by a noise signal, we adopted several counter noise procedures. The leakage was fixed soon and the neutrino experiment was resumed on March 3, 2016.

The second trouble was the short-circuit of the coil of the 67th bending magnet (BM067). It happened on March 29, 2016. The cause of the short-circuit was the very slow leak of the cooling water from the brazing point of the hollow coil of BM067. As it was hard to fix the coil, BM067 was replaced with a spare bending magnet. The excitation of the new BM067 started on April 8, 2016.



Materials and Life Science Experimental Facility

Overview

In this report we overview the activities in J-PARC MLF in 2015. The user operation in 2015A started on April 19, 2015 with a beam power of 500 kW. However, problems with the target vessel that happened on April 30 and November 20, forced us to stop the user program. To accommodate the unperformed experiments, delayed due to the trouble, we decided to cancel the call for proposals for the 2015B period.

After the incident in November, we received urgent requests from users to resume the MLF operation, and we decided to use an alternative spare target, which had mechanically robust structure but lacked the helium gas bubbling system, necessary for a stable operation with a power higher than 300 kW. After the replacement of the spare target, we resumed the user operation with a beam power of 200 kW on February 20.

In 2015, the operations ran with an efficiency of 45%. The number of unique users was 628 (559 for neutron, 69 for muon), and the number of proposals for general use was 305 (268 for neutron, 37 for muon), which was about half of the numbers for a normal year because of the cancellation of the call for proposals in 2015B. The fraction of industrial use was 16.4% of the approved proposals.

As for the Muon Science Facility (MUSE) in MLF, the superconducting solenoid coils (SSC) and their cooling system were partially damaged in the Great East Japan Earthquake in 2011 and temporarily fixed for quick restoration. In the 2015 summer shutdown period, the replacement of the superconducting solenoid coils (SSC) on the D-line was carried out. A good news for MUSE was that the first surface muon beam was successfully delivered to the S1 area at the end of new S-line in November, 2015, and the first ultra-slow muon was generated in the U-line.

We will do our best to ensure a stable operation in J-PARC MLF and produce fruitful results in science and industry.

Neutron Source

Twice in 2015, we had problems at the neutron source, when the water-cooled shroud of the neutron production mercury target leaked during the operating periods with proton beam power of 500 kW. Furthermore, significant performance degradation appeared in the helium refrigerator of the cryogenic hydrogen circulation system for the moderators. Those troubles interrupted the MLF user program for a long time.

The first target trouble occurred on April 30, after the beam power was ramped up from 400 to 500 kW on April 14. In this case, the leak was to the outside of the shroud and the location was specified on a seal weld around a bolt in the shroud. We concluded through a detailed analysis that the diffusion bonding interface between the water shrouds was detached by welding thermal deformation in the fabrication process, followed by seal welding failure by the crack propagation induced by repeated thermal stress due to beam trips.

The shortcoming was eliminated during the fabrication process of the next target vessel and so the seal welding around the bolts was changed to full-penetration welding. However, a second trouble occurred after a 159-MWh operation at 500 kW on November 20, in which the leak was to the inside of the shroud. Since it was difficult to inspect the inside of the target vessel at MLF, the leak location was not identified. Along with the analysis, a mockup weld test piece demonstrated that this location was susceptible to weld cracking that could propagate by thermal fatigue to a leak.

Since the facility's goal is a 1-MW operation, the target vessel must be redesigned to achieve a reliable operation. We employed a monolithic design feature for the forward part of the new target vessel to eliminate weld and bolts in the high-stress region of the design. The redesigned target vessel will be fabricated in the next fiscal year, 2016.

Until then, we decided to use the spare target vessel, whose water shroud structure was mechanically more robust, although it did not equip the gas micro-bubbles injection system, necessary for a stable operation with intensity higher than 300 kW. Therefore, we restarted the MLF user operation with a 200-kW beam on February 20, 2016. The changes of the target structure design so far are shown in Fig. 1.

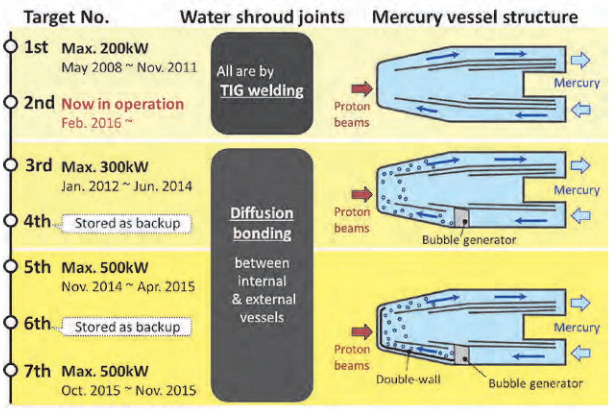


Fig. 1. Changes of target vessel structure so far.

As for the performance degradation of the helium refrigerator, it became significant during the operating period in November, 2015, when the pressure difference at the heat exchangers and the internal adsorber (ADS) rose during the three-week operation, leading to a temperature increase at the heat exchangers, influencing the temperature control at 20 K in the hydrogen system.

We regenerated the charcoal of the oil-separator of the compressor, which could be the source of water contamination at the heat exchangers and ADS. Once the operation was restarted, however, the pressure difference began to increase at almost the same rate as with the previous operation, although it went down to the initial value at the beginning, suggesting another cause, such as oil contamination.

We took measures to reduce the helium flow to suppress a source of oil contamination at the compressor of the helium refrigerator and then chose operational mode of 3-week operating period, followed by a 6-day short maintenance (purification). For the operating periods from February 20 to the end of March, 2016, the performance degradation was acceptable enough to fulfil the 3-week operation. We will take every measure to solve this problem in the summer shut-down period of 2016.

Neutron Science

1. User Program

The user program of the 2015A period started on April 19 with 18 neutron instruments and commissioning activities for 2 beam lines with 500 kW and was interrupted on April 30 due to the target problem. On October 27, we resumed the user program, which was again interrupted on November 20, due to another target problem. On February 20, we resumed again the user program with 200 kW.

For the 2015A period, 168 general use neutron proposals were approved by the MLF Advisory Board after a review at the Neutron Science Proposal Review Committee. We cancelled the call for proposals for 2015B to accommodate the 2015A experiments. We had to carry over a total of 70 experiment days from 2015 to the 2016A period.

2. Instruments Development and Construction

The commissioning of the neutron spin echo (NSE) spectrometers VIN ROSE at BL06 was progressed by Kyoto University and KEK. By refining the NSE signal, an effective 200-kHz TOF-MIEZE signal was observed successfully in October, 2015. The construction of POLANO at BL23 by Tohoku University and KEK advanced and it is expected to accept the first neutron beam in FY2016. The energy-resolved neutron imaging system, RADEN, at BL22 was completed and opened to the user program as a public beamline instrument from the 2015A period.

3. International Activities

In 2015, we hosted the following meetings:

- Workshop on Neutron Wavelength-dependent imaging-7 (May 31 - June 3, 2015, in Mito)
- The 2nd International Advisory Committee Meeting on RADEN (June 4, 2015, in Tokai)
- The 1st Japan-Korea Joint Workshop on Polarized Neutron Reflectometry (July 30, 2015, in Tokai)

From December 2 to 5, the joint school of the 7th AONSA Neutron School and the 3rd MLF School was held (Fig. 2). Although J-PARC had no neutron or muon beams at the school unfortunately, 41 participants from the Asia-Oceania region studied experimental setup and data analysis, followed by comprehensive lectures.

Fig. 2. Photo at the farewell party of the joint school of the 7th AONSA Neutron School and the 3rd MLF School.

4. Resultant Outcomes

The research activities in neutron science at MLF resulted in more than 110 papers. The number includes articles in influential journals such as Nature Physics and Nature Communications.

The PLANET beamline group won the Technology Prize of the Japanese Society for Neutron Science for the development of PLANET, the powder diffractometer, which specializes in high-pressure experiments. Susumu Ikeda, emeritus professor at KEK, received the Achievement Prize from the Japanese Society for Neutron Science for his contributions to the pulsed neutron scattering facility and observation of hydrogen in materials.

We distributed 6 press releases on scientific outcomes and technical development from our beamlines:

- Just a touch of skyrmions: Skyrmions for new high-density memory devices. (October 13, 2015)
- Comprehensive use of neutron, X-ray and super-computer for the development of tire rubber: Development of high-performance tire technology by Sumitomo Rubber Industries, Ltd. (ADVANCED 4D NANO DESIGN). (November 12, 2015)
- Diffusion process analysis of super ionic conductor towards all solid-state ion battery. (January 20, 2016)
- Hydride-ion conduction makes its first appearance. (March 18, 2016)
- Solid electrolytes open doors to solid-state batteries. (March 22, 2016)

Neutron Devices

Neutron devices can also contribute to the production of the most outstanding science in the world. The Neutron Instrumentation Section in the MLF has been developing advanced neutron devices, such as neutron detectors and optical devices.

As for neutron detectors, we conducted successfully the high-pressure operation of a two-dimensional gaseous neutron detector. In such neutron detectors, it is necessary to increase the gas pressure of the detector to achieve high detection efficiency. However, the increase of gas pressure results in decrease of the magnitude of the output signal. Thus, the supply voltage must be increased enough to boost the gas gain of the detector element. Consequently, we have developed a pressure vessel that can withstand pressures of up to 0.8 MPa, and a dedicated two-dimensional multiwire-type detector element for individual signal line readout to ensure that the detector system can be operated satisfactorily, even at high gas pressure. Demonstration experiments were performed using a gaseous mixture of He and carbon tetrafluoride (CF_4) at a total pressure of 0.8 MPa ($He/CF_4 = 0.71/0.09$). Figure 3 shows the pulse-height distributions under neutron irradiation by changing the supplied voltage to anode wires. A signal-pulse peak of neutrons can be observed clearly. This indicates that only neutron events can be easily detected by suppressing the spurious events observed in the lower channels due to electronic noise and gamma events with a conventional pulse height discrimination method.

As for optical devices, accessible length scale of the in-plane structure in polarized neutron off-specular scattering (OSS) measurement has been studied to develop high-performance polarizing supermirrors. The OSS measurement using polarized neutrons is one of the powerful techniques to observe correlations of small magnetic objects in layered systems. However, the OSS has its own accessible range and resolution of the lateral component of the momentum transfer $\boldsymbol{q}$. Thus, it is important to verify, if the length scale of the in-plane structure of the sample matches the in-plane $\boldsymbol{q}$-range and resolution, which corresponds to the in-plane component of the coherence volume, or the length scale of the measurement. Assuming a scattering geometry, where the sample surface is parallel to the (x, y) plane and neutrons incident on the sample are scattered within the (x, z) plane, it is difficult to obtain enough scattering intensity over full q_x-range for $q_z > 0.5\ \mathrm{nm}^{-1}$ in the OSS measurement, which results in accessible q_x-range limited to $|q_x| < 0.01\ \mathrm{nm}^{-1}$. On the other hand, the coupled areas with uniform orientation of the spins are modeled as rectangular boxes with lengths of 2ξ within the plane, where ξ is the lateral correlation length for the magnetic scattering, in other words, the size of an area, in which the spins are aligned to the same direction. In this case, the structure factor is expressed to be proportional to the Lorentzian function, $1/\{1+(q_x \cdot \xi)^2\}$. Figure 4 shows the Lorentzian profiles for different values of ξ. The full width at half maximum of the Lorentzian function becomes comparable to the accessible q_x-range with decreasing ξ. This means that only a small part of the full peak profile is measured, making the determination of ξ more ambiguous. To determine ξ with accuracy, the condition of $q_{x,\max} \cdot \xi \gg 1$ has to be satisfied, which follows $\xi > 100$ nm, where $q_{x,\max}$ is the maximum value of $|q_x|$ in the measurement.

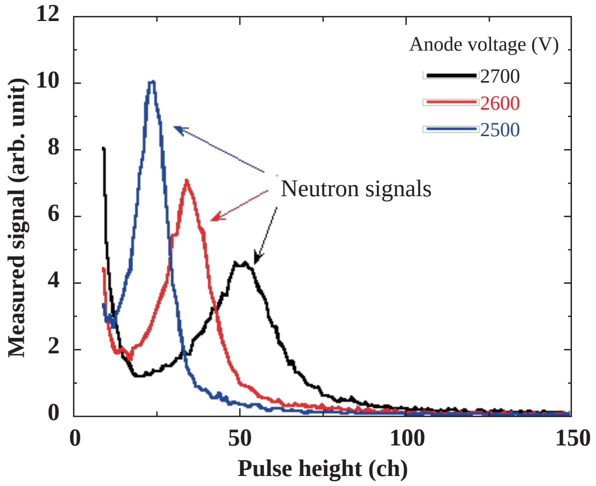


Fig. 3. Pulse height distribution from anode lines.

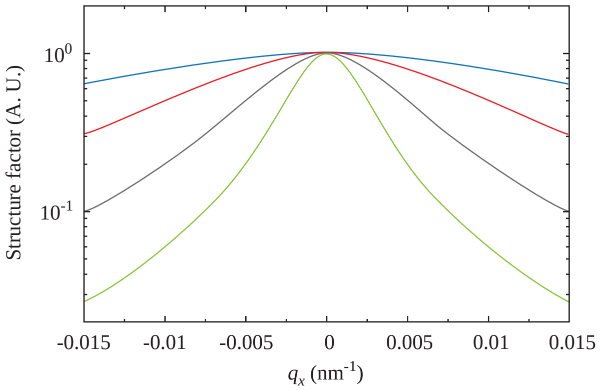


Fig. 4. Structure factors proportional to the Lorentzian function, $1/\{1+(q_x \cdot \xi)^2\}$. Green, black, red, and blue lines is the profile with $\xi = 400$, 200, 100, and 50 nm, respectively.

Muon Source and Science

1. Safety Reinforcement for Muon Beamlines/ Instruments

While the MLF operation was resumed for neutron beam delivery in February, 2015, after the fire incident in January, 2015, the Muon Section staff had concentrated on the reinvestigation of the beamline components and instruments to confirm that it was safe to restart the operation of the D-, U-, and S-lines after the fire incident at the MUSE. Following the tightened safety measures implemented by the J-PARC Center, instruments and devices dealing with high power electricity (such as magnet power supply) were checked with utmost care. The results of the reinvestigation were reviewed by the MLF Safety Panel for each beamline successively, and they were endorsed for operations by the end of May, 2015. Since the operation of MLF had to be stopped again due to the neutron target vessel trouble, the muon beam delivery did not resume until the next autumn.

2. Renewal of the Superconducting Solenoid on the D-Line

One of the major tasks for the muon staff in the 2015 summer shutdown period was the replacement of the superconducting solenoid coils (SSC) on the D-line (Fig. 5). The SSC and its cooling system were partially damaged in the Great East Japan Earthquake in 2011 and were temporarily fixed for quick restoration. Since then, the muon staff have been working in a stepwise fashion with the aim of the complete recovery of the whole system. Following the replacement of the helium compressor system last summer, they proceeded to the final step of replacing SSC. Last July, the cannon-shaped gigantic cryostat, containing the old SSC (~6 m long), was pulled out from the channel on the wall separating the experimental hall from the M2 tunnel, and the brand-new SSC in an orange-colored cryostat was finally set up in a fixed position and connected to the cooling system. The soundness of the entire system was proven by the subsequent test operation for cooling and magnet excitation, conducted in collaboration with the J-PARC Cryogenics Section, and put into service for beam operation from October, 2015.

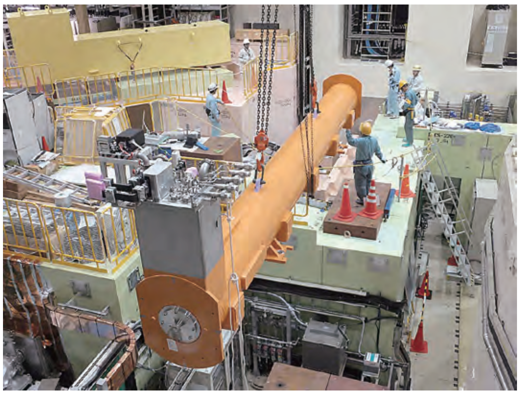


Fig. 5. New Superconducting Solenoid being craned to the position of installation.

3. Replacement of the Proton Beam Scraper

Another major task in the summer of 2015 was the replacement of the beam scraper system on the primary proton beamline (Fig. 6). The scraper, consisting of a set of water-cooled massive copper collimators, is placed just behind the muon production target to clean up the beam halo induced by scattering in the muon target.

It turned out that one of the thermometers monitoring the local temperature was not operating properly, which led to the decision to replace the entire system considering the scheduled beam power increment towards the end of FY2015. In early September, the replacement work was successfully conducted with special precautions to prevent radiation hazard. The used scraper is now safely stored in one of the storage pits for highly radioactive instruments.

Fig. 6. Proton beam scraper unit fabricated with improved design.

4. Beam Commissioning of the S-Line to the S1 Area

In Experimental Hall No.1, the first surface muon beam was successfully delivered to the S1 Area at the end of the new S-line in November, 2015 (Fig. 7). The beamline had been completed a year ago, however, the original plan of commission had to be postponed due to a series of incidents at the MLF, the fire incident at the MUSE and the trouble with the neutron target vessel, which led to the unscheduled shutdown of the MUSE until the resumption of the MLF operation in late October, 2015.

The first beam at the S1 area still brings great excitement to the muon community. Even though the S-line has been delayed and there are ever-increasing demands, the supply of beam time will catch up.

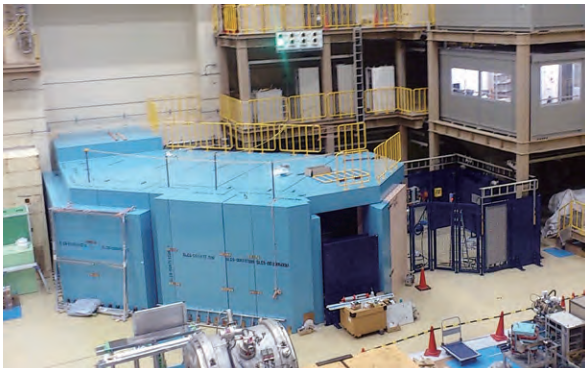


Fig. 7. Part of the S-Line completed to the S1 Area (the first of four planed branches).

Technology Development

The technology development section is responsible for developments of sample environment equipment, such as cryostats, furnaces, neutron-devices, such as 3He spin filters, pulsed magnet, and resolving the safety issues in the experimental halls.

This year, we report achievements in the safety issues at the experimental halls.

1. Radiation Safety

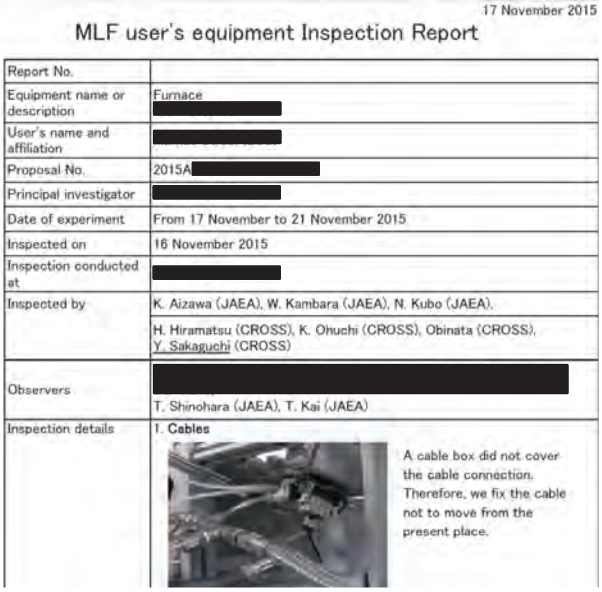
Regarding the upcoming 1-MW operation, permitted in the radiological license last year, we plan to measure the dose rates at all estimation points in MLF after the increase of the proton beam power, in order to confirm the shielding performance. In 2015, we performed a measure of the dose rates at the 450-kW operation in March and at the 560-kW operation in April. As a result, it was confirmed that the dose rates measured at all estimation points in the operation were lower than the values entered in the application, even if the measured values were scaled to the 1-MW operation.

2. Chemical Safety

Chemical safety checks of user-brought chemical materials, such as specimens and reagents, to evaluate toxicity and confirm the chemical stability of the actual physical form, such as powder, solid, liquid and gas, were performed successfully by the chemical safety team, along with confirmations of actual materials by individual beam line staffs. A total of approximately 3800 materials was checked in 2015. As a result, there were no serious problems with the performed experiments.

3. User-Brought Equipment Safety

There are many pieces of user-brought equipment in MLF, for example cryostats, magnets, furnaces, gas chamber systems, etc. So, the equipment safety team, which is consists of electrical safety staff, mechanical safety staff and general technical staff, checked various items of user-brought equipment. The total number of safety checks in 2015 was 49. As a result, there were no serious problems with user-brought equipment. Firstly, a safety check is performed about the specifications of the interlock system, electric circuit, cable specifications and terminal treatments, monitor system, etc. Next, it is confirmed whether the interlock system operates correctly. Figure 8 shows part of a permission slip as an example of check report.



17 November 2015

MLF user's equipment Inspection Report

Report No.	
Equipment name or description	Furnace [redacted]
User's name and affiliation	[redacted]
Proposal No.	2015A[redacted]
Principal investigator	[redacted]
Date of experiment	From 17 November to 21 November 2015
Inspected on	16 November 2015
Inspection conducted at	[redacted]
Inspected by	K. Aizawa (JAEA), W. Kambara (JAEA), N. Kubo (JAEA), H. Hiramatsu (CROSS), K. Ohuchi (CROSS), Obinata (CROSS), Y. Sakaguchi (CROSS)
Observers	[redacted] T. Shinohara (JAEA), T. Kai (JAEA)
Inspection details	1. Cables A cable box did not cover the cable connection. Therefore, we fix the cable not to move from the present place.

Fig. 8. Permission sheet for user-brought equipment.

4. Crane Safety

There are two cranes in each experimental hall (Experimental Hall No.1 and Experimental Hall No.2). These cranes are used by technical staffs or constructors to change an experimental setup in the beamtime and perform summer maintenance.

The safety and the effective schedules of crane usage are planned by the crane safety team. Also, that team checks the mechanical sling, lifting sling, etc. every month and replaces the old ones with new ones, if necessary. Furthermore, a crane operator, who wants to use the cranes in the experimental halls, needs to attend hands-on training by the crane safety team staff before the actual operation. For those works, it is necessary to form a work team, which includes a crane operator, slinging operator and observer, according to the rules. As a result, there were no serious troubles with the crane operations.

Particle and Nuclear Physics

Neutrino Experimental Facility

The Neutrino Experimental Facility hosts the T2K experiment: an international collaboration that includes 456 researchers from 11 nations.

In 2015, T2K accumulated data mostly in the antineutrino mode. The first antineutrino measurement results have been published [1]. As of March 31, 2016, T2K accumulated 6.07×10^{20} protons on target (POT) in the antineutrion ode in addition to 7.12×10^{20} POT in the neutrino mode since the beginning of the experiment. Later on the results are described in detail in the "Highlights-1" section of this chapter.

During the maintenance period, the helium cooling pipe of the target, which showed a small gas leak at the end of the previous run, was successfully replaced using the full remote operation system with manipulators in the hot cell.

Reference

[1] Phys. Rev. Lett. **115**, 121604 (2015).

Hadron Experimental Facility

The Hadron Experimental Facility (HEF) of J-PARC serves fixed target particle and nuclear physics experiments with hadron beams produced by the slowly-extracted (SX) 30 GeV proton beam from the Main Ring accelerator. The renovation of the facility was completed in FY2014, and the user operation resumed on April 24, 2015. In FY2015, for four months, stable user operation of HEF was achieved. The SX beam power was gradually increased; it started from 24 kW, with 6.0 second repetition cycle, and ended in December at 41.6 kW with 5.52 second repetition cycle. Four beam lines;, K1.8, K1.8BR, KL and K1.1BR for high-intensity K-mesons (kaons), were operated during that period.

Strangeness Nuclear Experiments

The E13 experiment performed γ-ray spectroscopy of light hypernuclei ${}^{4}_{\Lambda}$He and ${}^{19}_{\Lambda}$F produced by charged kaons. The hyper-nuclei were identified by measuring the outgoing charged π-mesons, and the γ-rays were measured by the Ge detector array named Hyperball-J. Several new peaks have been observed in the spectra of ${}^{19}_{\Lambda}$F, which are shown in Fig. 1. The spin-spin effective interactions between Λ in the *s*-state and the nucleon in the *sd*-orbit are expected to be understood from these peaks.

The E15 experiment, designed to search for the K^-pp bound state, accumulated 10% of the requested data. In addition to the search in the missing mass spectra, direct detection will be attempted by reconstructing the decay products in $K^-pp \to \pi^-pp$ in the cylindrical detector system. A pilot run of the E05 experiment, designed to observe Ξ hypernuclear bound states for studies of the Ξ nucleus potential, was also carried out.

The SKS superconducting spectrometer, used in E13 and E05, was moved out of the K1.8 experimental area. A new KURAMA spectrometer was installed for the upcoming experiments.

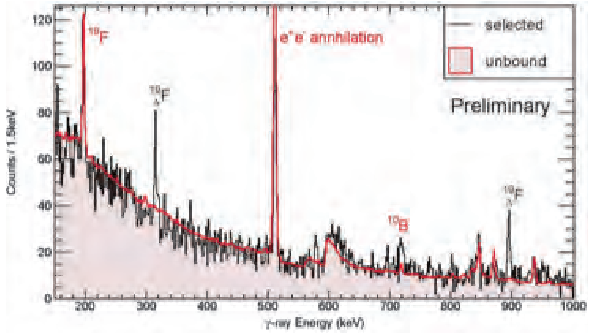


Fig. 1. γ-ray spectrum of the ${}^{19}_{\Lambda}$F run. The black histogram shows the spectrum gated in ${}^{19}_{\Lambda}$F bound state, while the red hatched one shows the spectrum gated in the highly-unbound region. Peaks were observed at 315 and 895 keV.

Kaon Decay Experiments

The E14 KOTO experiment is designed to study the rare decay of the long-lived neutral kaon into a neutral π meson and a pair of neutrinos. Detecting this decay is a challenge because only two photons from π^0 are observable, and the decay has not been observed yet. The correct value of the branching fraction has been theoretically predicted in the Standard Model as $(3.0 \pm 0.3) \times 10^{-11}$.

In 2015, KOTO resumed the physics run and a data set equal to twenty times that of the 2013 measurements was recorded. After the beam time, new large shower counters, named "Inner Barrel (IB)" (Fig. 1), and built at the KEK Tsukuba campus, were successfully

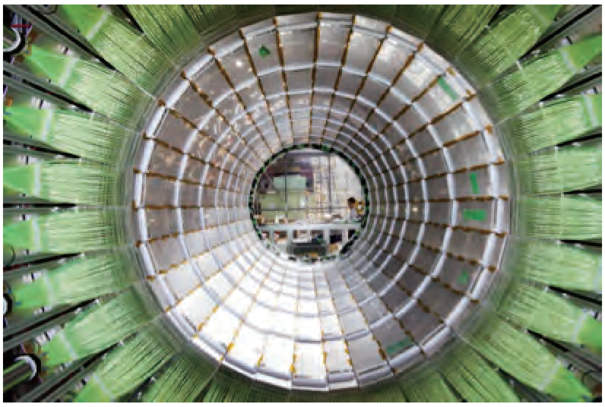


Fig. 1. Cross-sectional view of the new Inner Barrel shower counters shortly after its fabrication at KEK Tsukuba.

installed in the KOTO detector at the end of March. The new IB counters will improve the photon detection capability of the KOTO detector and further reduce the backgrounds to the rare decay.

The E36 experiment is designed to measure the decay of a charged kaon into a positron and a neutrino. This decay occurs with the branching ratio at 10^{-5}. Measurement of the ratio of the decay widths of $K^+ \to e^+ \nu$ and $K^+ \to \mu^+ \nu$ at the precision level of 0.2% would be a stringent test of the lepton universality. The experiment E36 collected data in 2015 and accumulated data corresponding to 40 k $K^+ \to e^+ \nu$ events. A search for "Dark photon (A')" with $K^+ \to \mu^+ \nu A'$ and $A' \to e^+e^-$ will also be conducted using that data. After the experiment was completed, the K1.1BR beam line and area were dismantled for the construction of the COMET and the High-p beam lines.

Muon Experiments

The goal of COMET collaboration is to search for the muon-to-electron conversion at a sensitivity of better than 10^{-14} in the first phase of its experiment. Many aspects of the R&D, such as the construction and testing in vacuum of a real-size prototype of the Straw Tube tracker, were carried out in 2015. Its performance test was conducted using an electron beam above 100 MeV together with a prototype of the LYSO crystal calorimeter to demonstrate their combined performance (Fig. 1).

The new experiment for measurement of the muon anomalous magnetic moment (g-2) and electric-dipole moment (EDM) has made advances in all of its areas. A low-energy muon source and a muon beam profile monitor were successfully tested at the muon beamline in the Materials and Life Science Experimental Facility (MLF) of J-PARC. A low-energy electron beam and a mini solenoid magnet were prepared to demonstrate the spiral injection of the beam to the magnetic field.

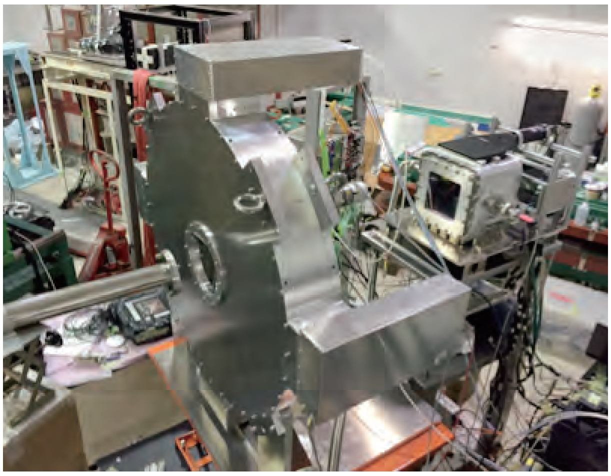


Fig. 1. Electron beam test of the Straw-Tube tracker and the LYSO calorimeter prototypes.

JSNS^2 (J-PARC E56) Experiment

JSNS^2 (**J**-PARC **S**terile **N**eutrino **S**earch at **J**-PARC **S**pallation **N**eutron **S**ource) is a new stage-1-approved experiment, which aims to confirm or refute the existence of the sterile neutrino [1]. After the approval of the stage-1 status,significant efforts were applied to start the experiment [2-4]. Here we briefly explain the specifics of those efforts.

Figure 1 shows a bird's-eye view of the MLF building and proposed JSNS^2 detector location, which is the third floor of the MLF. We have extensively discussed the potential problems with the detector location with regards to the safety, the withstand-load and sinkage of the building, the Fire Code, and the interference between maintenance works and JSNS^2 measurement [3]. There are no show stoppers so far.

The R&D for the detector, especially for the liquid scintillator, are in good shape. The liquid scintillator used in the JSNS^2 should distinguish efficiently the positron signal from the fast neutron background events (e.g., 90% detection efficiency of the signal with 1% efficiency of the background). We plan to use "Pulse Shape Discrimination (PSD)", which uses the difference of the tails fraction of the scintillation light yield between signal and background, "and/or" cherenkov light, which is emitted by the signal but not by the background [2-4].

We successfully measured the PSD capability using a small setup and Cf source at Tohoku University [2,3] and the capability of the real JSNS^2 detector was estimated by the MC simulation using the extrapolation from that small setup. We also measured the Cherenkov capability using another small setup at KEK [2-4], and found that the concrete scintillator cocktail recipe (LAB + 0.5 g/L PPO) can include both PSD and Cherenkov methods at the same time. These significant findings will be used in the JSNS^2 detector.

We intend to start the JSNS^2 experiment at the beginning of JFY2019 because the grant-in-aid (kiban(S)) was approved by JSPS for JFY2016. To start the experiment, not only R&D works but also other detector design works will be described in the Technical Design Report, which will be submitted at the beginning of 2017.

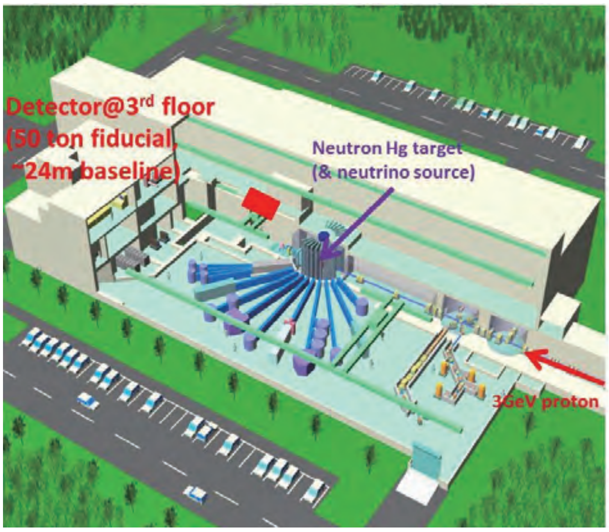


Fig. 1. A bird's-eye view of the MLF building and the proposed detector location (red box).

References

[1] M. Harada *et al,* arXiv:1310.1437.

[2] M. Harada *et al,* arXiv:1507.07076.

[3] M. Harada *et al,* arXiv:1601.01046.

[4] M. Harada *et al,* arXiv:1610.0818.

Highlights-1: First Antineutrino Oscillation Results from T2K

The neutrino mass is zero in the standard model of particle physics. However, in 1998, the Super-Kamiokande (SK) experiment revealed that neutrinos indeed have a finite mass [1]. In the experiment, it was observed that the phenomenon of "neutrino oscillation", in which muon neutrinos from the atmosphere are reduced as a function of L/E, where L is the neutrino travel length and E is the neutrino energy. It indicates that muon neutrinos can transform into other types of neutrinos. According to the theoretical model, the dependence of L/E is a clear feature of neutrino oscillation. In 2015, Prof. Takaaki Kajita won the Nobel prize "for the discovery of neutrino oscillations, which shows that neutrinos have mass", sharing the award with Prof. Arthur McDonald. Prof. Kajita's work was performed on the SK experiment.

Today, neutrino oscillation is a unique tool to assess the nature of the neutrino mass. After the discovery, physicists throughout the world have performed intensive studies of neutrino oscillation, in order to understand the origin of the neutrino mass. In other words, within the last 20 years, neutrino oscillation has become a standard tool to expand physics beyond the standard model.

In 2014, T2K, the Tokai-to-Kamioka long baseline neutrino oscillation experiment, started a new measurement of antineutrino oscillation to search for a CP violation in the neutrino oscillation. CP stands for a combination symmetry transformation with C, which transforms a particle into an antiparticle, and P, which flips the sign of the spatial coordinate. CP violation has been discovered in the quark sector (*K* and *B* meson experiments). CP violation is one of the three Sakharov conditions of our matter-dominant universe. However, the size of the CP violation in the quark sector is not enough to explain the matter-dominant universe. If CP is not conserved in neutrino oscillations, it may indicate a significant hint for the origin of our matter-dominant universe.

In 2013, T2K discovered a new type of neutrino oscillation: muon neutrinos transforming into electron neutrinos (the electron neutrino appearance) [2,3]. The discovery of electron neutrino appearance opens new possibilities to study the CP violation in neutrino oscillation.

T2K ran with a neutrino beam from 2010 to 2014.

Using all neutrino data, T2K established the electron neutrino appearance and precisely measured neutrino oscillation parameters with muon neutrino disappearance [4,5]. For this discovery and their study of neutrino oscillation, Prof. Koichiro Nishikawa and the T2K collaboration were awarded the Breakthrough Prize in 2015.

T2K is an accelerator-based neutrino oscillation experiment. A high-intensity beam is produced at the Japan Proton Accelerator Research Complex (J-PARC) at Tokai village, Ibaraki, Japan. The neutrino beam is directed to the SK located 295 km away from J-PARC. High-intensity protons from the J-PARC accelerator strike a graphite target and produce charged pions and kaons. Neutrinos (antineutrinos) can be produced from decays of positive (negative) charged pions. Horn magnets [6] can select pions of either sign by flipping the current direction.

T2K released its first antineutrino oscillation results in the summer of 2015, using data collected from May, 2014, to June, 2015. The beam power was 350 kW at that time, while the latest power level is 420 kW (as of May, 2016).

In T2K's far detector SK, 34 muon antineutrino candidate events were observed, while 103.6 ± 12.0 events are expected, if there are no antineutrino oscillations. This result is consistent with the expected disappearance due to the muon antineutrino oscillation. Figure 1 shows the reconstructed energy distribution of those candidate events. Two parameters, describing the disappearance oscillation phenomenon, can be extracted from the analysis. Figure 2 shows the best-fit values and the 68% and 90% C.L. intervals of those oscillation parameters. T2K also compared these results with the T2K muon neutrino disappearance results, and no difference between neutrinos and antineutrinos was found [7].

Using data from the same period, T2K also found three electron antineutrino candidates at the far detector, while the expected number of background events (anything other than electron antineutrino appearance) is 1.6 ~ 1.7 events, which depends on other oscillation parameters. Taking those statistical fluctuations into account, it is difficult to make any definitive statement about the electron antineutrino appearance. T2K expects more significant results in the near future, after collecting more antineutrino data. Actually, T2K has already doubled its antineutrino data statistics at the time of this writing.

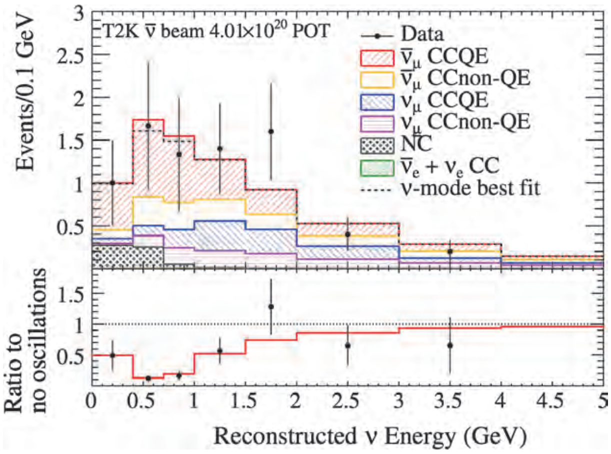


Fig. 1. Reconstructed energy distribution of muon antineutrino candidate events..

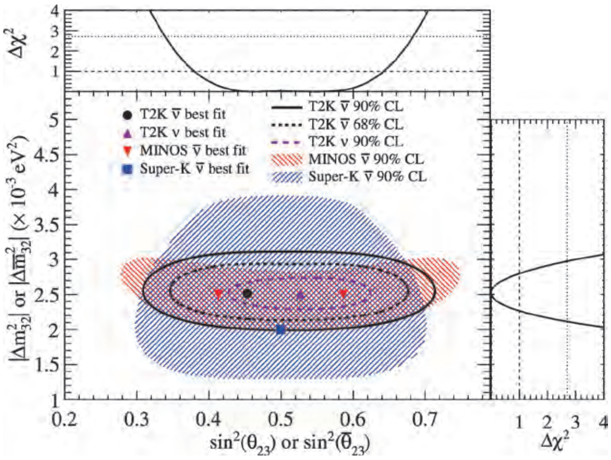


Fig. 2. T2K best-fit values and 68% and 90% C.L. intervals of two oscillation parameters. A comparison with the neutrino results is also shown.

T2K plans to continue to take both neutrino and antineutrino data. T2K has already collected a total of 1.5 × 10^{21} protons on target. The T2K goal is 7.8 × 10^{21} protons on target but it is now being proposed to extend the T2K running up to 20 × 10^{21} protons on target. Using all the proposed data, T2K has the sensitivity to possibly discover CP violation in neutrino oscillations [8].

References

[1] Super-Kamiokande Collaboration, *Phys. Rev. Lett.* **81**, 1562 (1998).
[2] T2K collaboration, Phys. Rev. Lett. **107**, 041801 (2011).
[3] T2K collaboration, Phys. Rev. Lett. **112**, 061802 (2014).
[4] T2K collaboration, Phys. Rev. Lett. **112**, 181801 (2014).
[5] T2K Collaboration, Phys. Rev. **D91**, 072010 (2015).
[6] T2K Collaboration, Nucl. Instrum. Meth. **A789**, 57 (2015).
[7] T2K collaboration, Phys. Rev. Lett. **116**, 181801 (2016).
[8] T2K collaboration, Prog. Theor. Exp. Phys. 043C**01** (2015).

Highlights-2: Charge Symmetry Breaking in Hypernuclei: Result from the Renovated Hadron Experimental Facility

Charge symmetry or charge independence is one of the basic concepts in nuclear physics. In ordinary nuclei composed of protons and neutrons, this symmetry holds well. However, a larger charge symmetry breaking (CSB) was observed in hypernuclei by the experiment carried out just after the restart of the beam operation at the J-PARC Hadron Experimental Facility (HEF) on April 24.

HEF was shut down for about 2 years after the radiation incident that occurred on May 23, 2013, in order to renovate the facility and make it safe from such incidents or similar unexpected problems. A production target (T1) was installed in a sealed chamber with circulating gas monitor system to check the radiation. Air-tight shielding structure of the primary beamline and controlled ventilation system were newly constructed in the Hadron Experimental Hall. Radiation level displays and evacuation announcement system (siren and flash lamps) were equipped at each secondary beamline area. The diagnostic and interlock system of the beam operation was also reinforced. In addition to the hardware renovation, the operation procedures and rules were strictly defined in the manuals.

After the new operation scheme was completed, a test operation started on April 9 in order to check the whole system, including the newly installed equipment. Proton beam with 3 kW power was extracted from the Main Ring (MR) to the Hadron Hall with defocus and bump orbit mode not to hit T1 in the night of April 9. On the next day, the beam was injected into T1 with focus and straight orbit mode for the first time. In each step of the beam power increase, the target system, monitor and interlock system were confirmed to work properly. The facility was inspected for granting a license on April 17, while a 12-kW beam was being used. The certificate was issued on April 20. Finally, the user operation restarted with a 24-kW beam on April 24.

Nuclear force based on strong interaction and nuclear system are invariant under exchange of protons and neutrons (charge symmetry) or more generally under any rotation in isospin space (charge independence). This approximate but basic symmetry holds almost exactly in nucleon - nucleon (N-N) interaction and ordinary nuclei. For example, binding energy difference of 70 keV in charge symmetric nuclei (called mirror nuclei), ^{3}H and ^{3}He, and scattering length difference of proton-proton (pp) and neutron-neutron (nn) of $a_{pp} - a_{nn} = -1.5 \pm 0.5$ fm (both corrected for large electro-magnetic effects) are very small and are theoretically explained by ρ^0 - ω mixing in meson-exchange models [1].

On the other hand, in the hypernuclei by adding a Λ hyperon to the ordinary nuclei, there has been a long-standing puzzle in CSB for the Λ-N Reported CSB effects are relatively large and are not yet theoretically explained. Λ binding energies of mirror hypernuclei, ${}^{4}_{\Lambda}$H and ${}^{4}_{\Lambda}$He obtained by emulsion experiments, are 2.04 ± 0.04 MeV and 2.39 ± 0.03 MeV, respectively [2], giving a large difference of 0.35 ± 0.05 MeV, as shown in Fig. 2. The excitation energy of 1^+ state or $1^+ – 0^+$ level spacing of ${}^{4}_{\Lambda}$H and ${}^{4}_{\Lambda}$He measured by the transition γ-ray provides more information about the CSB effects. The ${}^{4}_{\Lambda}$H γ-ray was measured three times [3-5], and its average weight was 1.09 ± 0.02 MeV as shown in Fig. 2 (on the left). On the other hand, ${}^{4}_{\Lambda}$He γ-ray was reported

Fig. 1. Photograph to commemorate the restart of the user operation at J-PARC HEF.

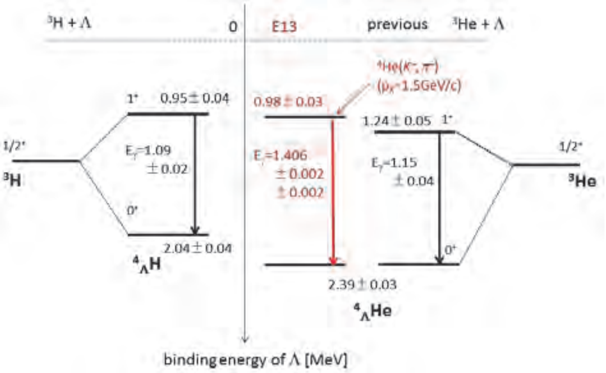


Fig. 2. Level schemes of mirror hypernuclei, ${}^{4}_{\Lambda}$H and ${}^{4}_{\Lambda}$H, constructed by past emulsion experiments and γ-ray measurements. J-PARC E13 updated the level of ${}^{4}_{\Lambda}$H, as indicated in red.

only once to be 1.15 ± 0.15 MeV [4] (Fig. 2 right side in black arrow). This result also indicates a large CSB effect. However, the ${}^{4}_{\Lambda}$He γ-ray spectra were statistically insufficient and the identification of the ${}^{4}_{\Lambda}$He seems to be ambiguous.

In order to resolve the puzzle and to confirm and improve the data on the $1^+ - 0^+$ level spacing of ${}^{4}_{\Lambda}$He, J-PARC E13 was carried out at the K1.8 beamline of HEF (Fig. 3) in April, 2015, just after the restart of the user operation of the HEF. The 1^+ states of ${}^{4}_{\Lambda}$He were produced using the (K^-,π^-) reaction on a liquid ^{4}He target by measuring beam K^- and outgoing π^- with beam and SKS spectrometers, respectively. The beam momentum of 1.5 GeV/*c* was chosen so as to maximize the yields of the 1^+ state of ${}^{4}_{\Lambda}$He in the available beam condition. γ-rays were measured in coincidence by a newly developed Hyperball-J, which consisted of 27 Ge-detectors in total, equipped with PWO counters.

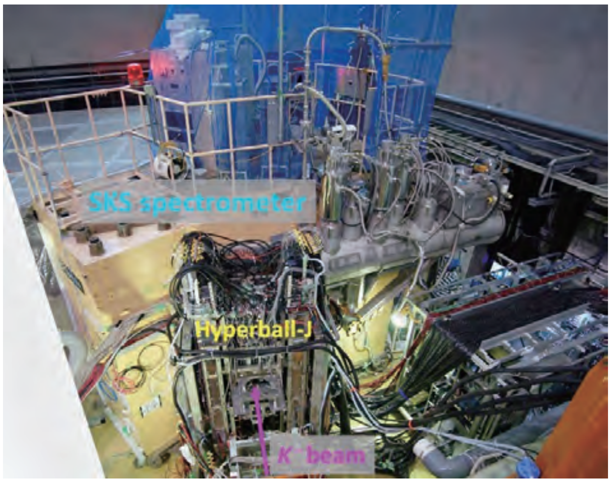


Fig. 3. Photograph of the experimental setup. Outgoing π^- were measured by SKS spectrometer and the production of ${}^{4}_{\Lambda}$He was tagged. γ-ray from ${}^{4}_{\Lambda}$He was measured by Hyperball-J in coincidence.

A peak, contributed from both 0^+ and 1^+ states of ${}^{4}_{\Lambda}$He, is seen in the missing-mass spectrum as shown in Fig. 4 on the left. In the γ-ray spectrum obtained by selecting events in the Λ bound-region, a peak was clearly observed, as shown in the Figure on the right. By taking the recoil effect into consideration, the $1^+ - 0^+$ level spacing was unambiguously determined to be $1.406 \pm 0.002^{\text{stat.}} \pm 0.002^{\text{syst.}}$ MeV in the present measurement.

This value of ${}^{4}_{\Lambda}$He is obviously larger than that of ${}^{4}_{\Lambda}$H. The present result clearly indicates the existence of CSB in the ΛN interaction. Combined with the past emulsion data, the Λ binding energy of the 1^+ state of ${}^{4}_{\Lambda}$He is 0.98 ± 0.03 MeV. Comparing the present updated energy and the reported one for the $1^+/0^+$ states of the mirror hypernuclei, the difference of the 1^+ states of 0.03 ± 0.05 MeV is much smaller than that of the 0^+ states of 0.35 ± 0.05 MeV. Therefore, the CSB effect is strongly spin-dependent. This fact may provide a key to solving the puzzle of the large CSB in hypernuclei and the underlying ΛN interaction.

The present result was published in Physical Review Letters, being selected as Editor's Suggestion [6]. The result was also covered in a press release of Tohoku University, KEK, JAEA and J-PARC Center on November 25 [7]. Further confirmation and improvement of the experimental data were carried out or planned in order to clarify the CSB effects in hypneruclei. The π^- momentum in the ${}^{4}_{\Lambda}\text{H} \rightarrow {}^{4}\text{He} + \pi^-$ weak decay was precisely measured at MANI-C [8]. The obtained Λ binding energy of the ${}^{4}_{\Lambda}$He 0^+ state was $2.12 \pm 0.01^{\text{stat.}} \pm 0.09^{\text{syst.}}$ MeV, consistent with the emulsion data. A new proposal has been submitted to J-PARC to measure γ-ray of the ${}^{4}_{\Lambda}$H $1^+ \rightarrow 0^+$ transition by Hyperball-J in coincidence with ${}^{4}_{\Lambda}$H being produced as a fragment of the ${}^{7}\text{Li}(K^-,\pi^-)$ reaction [9].

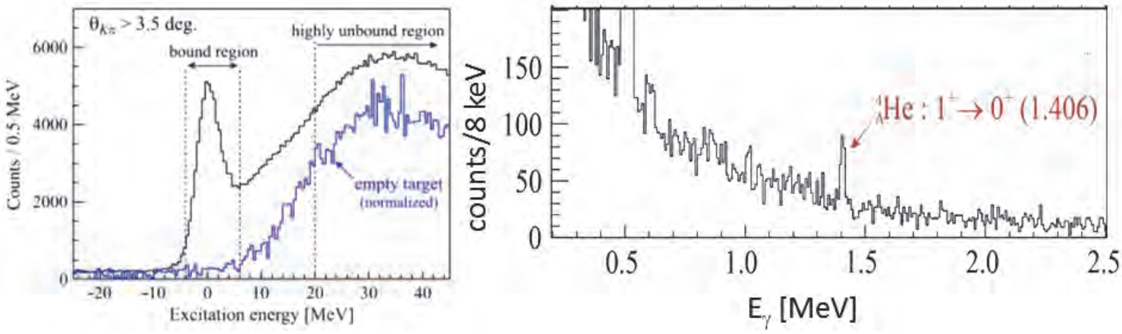
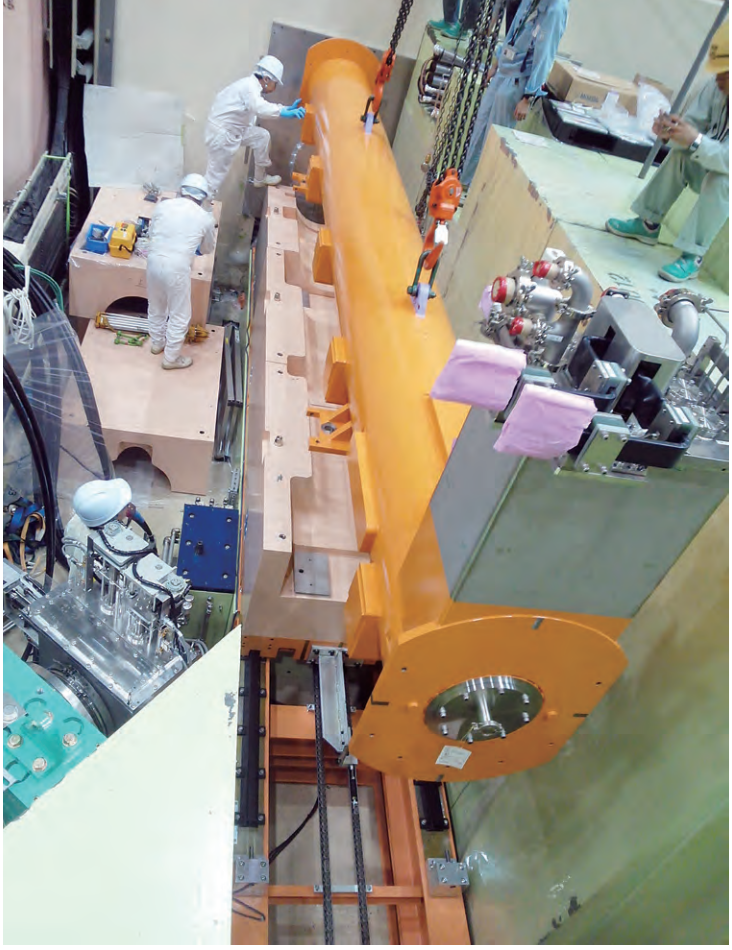


Fig. 4. (Left) Missing mass spectrum of the ${}^{4}\text{He}(K^-\pi^-)$ reaction. The peak shows the production of bound states of ${}^{4}_{\Lambda}$He (black), while no peak exists in the empty target run (blue). (Right) γ-ray energy spectrum obtained by selecting events in the bound region of the left spectrum.

References

[1] G. Miller, A. Opper, E. Stephenson, Ann. Rev. Nucl. Part. Sci. 56, 253-292 (2006).
[2] M. Juric et al., Nucl. Phys. **B52**, 1 (1973).
[3] M. Bedjidian et al., Phys. Lett. **62B**, 467 (1976).
[4] M.Bedjidian et al., Phys. Lett. **83B**, 252 (1979).
[5] A. Kawachi, Ph.D thesis, University of Tokyo, 1997.
[6] T. O. Yamamoto et al., Phys. Rev. Lett. **115**, 222501 (2015).
[7] KEK Press release on November 25,2015 (in Japanese) http://www.kek.jp/ja/NewsRoom/Release/20151125150000/
[8] A. Esser et al. Phys. Rev. Lett. **114**, 232501 (2015).
[9] Proposal for J-PARC 30 GeV Proton Synchrotron P63, http://www.j-parc.jp/researcher/Hadron/en/pac_1601/pdf/P63_2016-2.pdf



Cryogenics Section

Overview

The Cryogenics Section supports scientific activities in applied superconductivity and cryogenic engineering, carried out at J-PARC. It also supplies cryogen of liquid helium and liquid nitrogen. The support work includes the operation of the superconducting magnet system for the neutrino beamline, and support for the construction and operation of superconducting magnet systems for the muon beamline at the Materials and Life Science Experimental Facility (MLF) and the magnet systems at the Hadron Experimental Facility (HEF). It also actively conducts R&D works for future projects at J-PARC.

Cryogen Supply and Technical Support

The Cryogenics Section provides liquid helium cryogen for physics experiments at J-PARC. The used helium is recycled by the helium gas recovery facility, which is provided and operated by the Cryogenics Section. Fig. 1 summarizes the liquid helium supply in FY 2015.

Liquid nitrogen was also supplied to the users for their convenience. Its amount in FY2015 is summarized in Fig. 2. Liquid nitrogen has been regularly provided to the Radiation Safety Section for operation of a gas chromatograph. Liquid nitrogen was also supplied to the users in MLF and HEF.

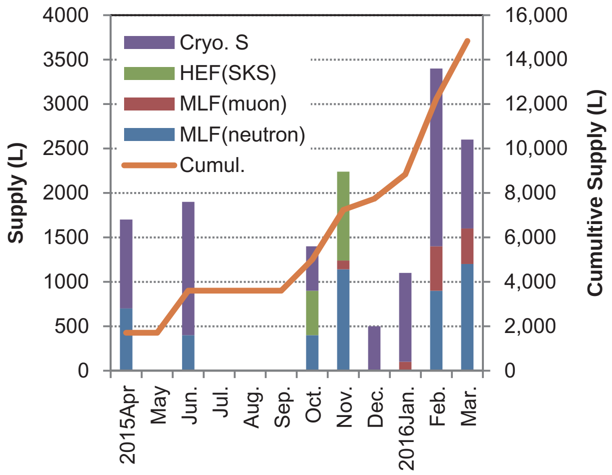


Fig. 1. Liquid helium supply at J-PARC from April, 2015, to March, 2016.

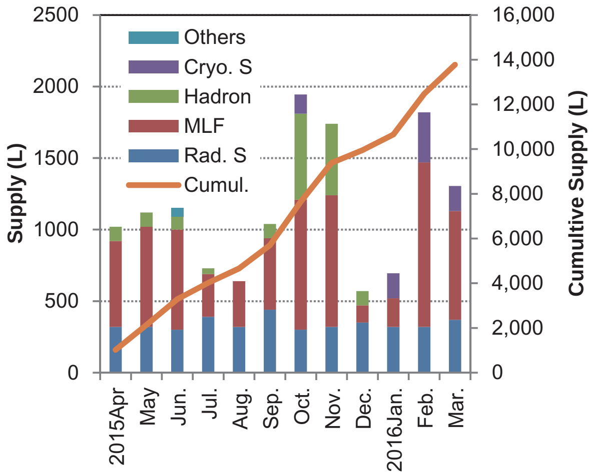


Fig. 2. Liquid nitrogen supply at J-PARC from April, 2015, to March, 2016.

Superconducting Magnet System for T2K

The superconducting magnet system operated during periods shown in Table 1. In June, 2015 the cryogenic system operation stopped as the T2K beam time was over, and the whole magnets were warmed up to room temperature in July to exchange three beam monitors, which were installed at interconnections between the magnets. Then, in November, the system briefly operated to confirm the beam monitor performance at low temperature of 4.5 K. From January, the system operated for physics data taking. During the operation, two control valves were found to have problems, as their positioners didn't work properly. The positioners were replaced with spare ones, and the valves successfully recovered their functions without losing T2K beam time. These troubles indicate aging degradation in the devices after an eight-year operation. The cryogenic system was operated for 3818 hours in FY2015, as summarized in Fig. 3.

Table 1. Operation history of the T2K superconducting magnet system.

	2015 Apr.	May	June	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	2016 Jan.	Feb.	Mar.
Operation	1/5 - 4/14	5/1 - 6/4	6/22-7/2 (Warm up)				10/21-11/18 (Beam monitor check)				1/18-5/28	
Maintenance				←		→						

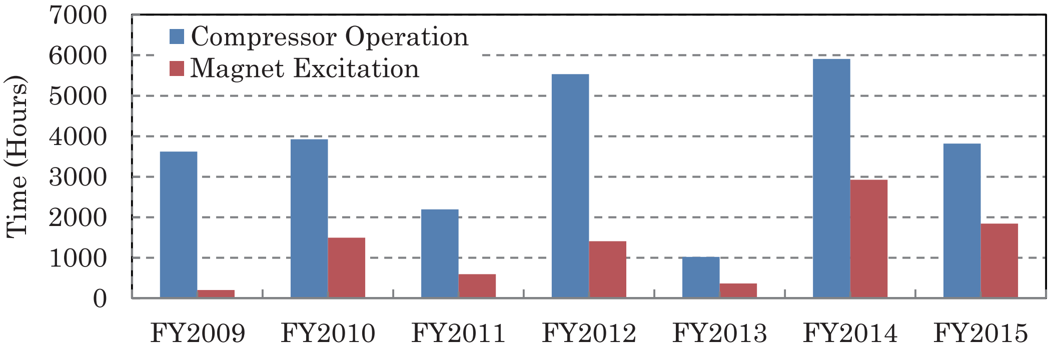


Fig. 3. Annual operation time of the cryogenic system for the J-PARC neutrino beamline.

Superconducting Magnet Systems at MLF

The Cryogenic Section contributes to the superconducting magnet systems at the Muon Science Facility (MUSE) in MLF. The 6-m long superconducting solenoid in the Decay Muon Line (D-line) was replaced with a new one, as shown in Fig. 4. It has a 20-cm warm bore and there is no thermal shield at both ends to transport a larger number of muons. After the installation work finished, the solenoid was cooled down by a D-line refrigerator and successfully charged up to a nominal field of 3.5 T. The Cryogenics Section also helps with the operation of a set of superconducting magnets in the Ultra-slow Muon Line (U-line). The magnets worked well in FY2015 and contributed to developing an ultra-slow muon production.

Fig. 4. A new superconducting solenoid with a warm bore for the MUSE D-line.

Superconducting Magnet Systems at HEF

Superconducting Kaon Spectrometer

The Cryogenics Section supports the Superconducting Kaon Spectrometer (SKS) operation at the Hadron Experimental Hall. The SKS was operated until mid-November, 2015, for physics data taking. After warming up, the SKS was transferred to the other beam line, K1.1, to prepare for the next experiment.

Superconducting Magnet System for E36

The TREK/E36 experiment for the measurement of lepton flavor universality violation was performed at the K1.1-BR beamline in the Hadron Experimental Hall. The superconducting toroidal magnet and a helium cold box (Linde TCF50), that were operated in the KEK-E246 experiment in 1990, were reused in this project. The cryogenic system had several serious problems, such as leakage of the 4 K helium pipe and control system. The Cryogenics Section conducted repair works, and completed the system construction in the Hadron Experimental Hall at the beginning of FY2015. Then, cool down, excitation and quench test were performed to evaluate the system reliability. The precooling time was approximately 2 days, which was consistent with the trend obtained in the KEK-E246 experiment. The cryogenic system was steadily operated without any troubles even in the full current quench test. After the prefectural government completed its inspection, the system was operated for a long time and steadily controlled until the E36 experiment finished, except for the maintenance working period.

COMET Superconducting Magnet System

The COMET Phase-I experiment is under construction in the Hadron South Experimental Hall (HDS). The Cryogenics Section was involved in the construction of cryogenic system and superconducting magnets. The cold box and the helium screw compressor used in the E36 experiment will be used again for the COMET experiment. After finishing the E36 experiment, the cold box and its control system were transferred from K1.1BR into HDS. Figure 5 shows the removal work of the cold box from the K1.1-BR area. High-pressure gas lines for the cryogenic system were partially constructed connecting the compressor hat to HDS at the end of FY2016.

The power supply and the current leads for the Muon Transport Solenoid were delivered to the experimental hall in FY2015. The design work for the helium transfer lines to the magnets and also details in the Pion Capture Solenoid have been improved by the Cryogenics Section.

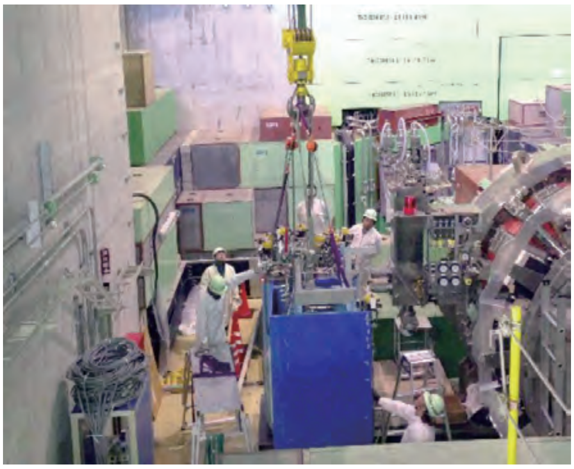


Fig. 5. Removal work of the cold box used for E36 at K1.1BR in HEF.

R&D for the Future Projects at J-PARC

The g-2/EDM project aims for the precise measurement of the anomalous magnetic moment and the electric dipole moment of muons. This experiment was proposed at the MUSE H-Line. A superconducting solenoid with high field homogeneity, better than 1 ppm locally, plays a very important role as a muon storage ring. The design study of the magnet is proceeding in collaboration with IPNS and the Cryogenics Science Center. A technical design report was submitted in May, 2015.

A muonium hyperfine structure measurement, called MuSEUM experiment, is proposed at the same beam line as the g-2/EDM project. In the experiment, the energy state transition in muonium will be observed under a static magnetic field with local homogeneity of 1 ppm. A standard NMR probe to determine the absolute magnetic field is being developed to calibrate other probes. The probe has been designed carefully, so that the material effect that causes the error field would be minimized. It was cross-calibrated using the MRI magnet at the Argonne National Laboratory (ANL) with a standard probe of pulse NMR probe, which was developed by the University of Massachusetts group, as shown in Fig. 6. The difference between the probes was measured to be about 44.16 ppb. The cause of the difference is being investigated, and the next test is planned for the beginning of 2017.

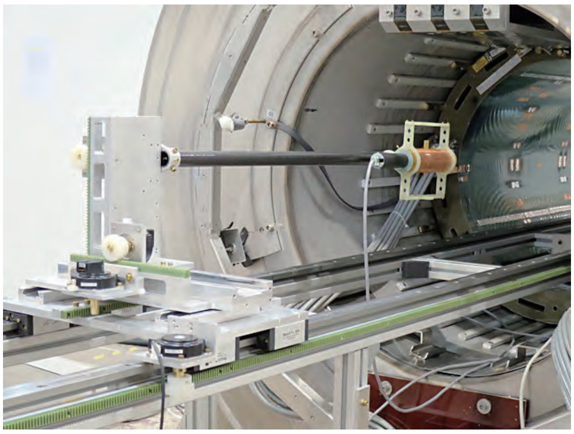
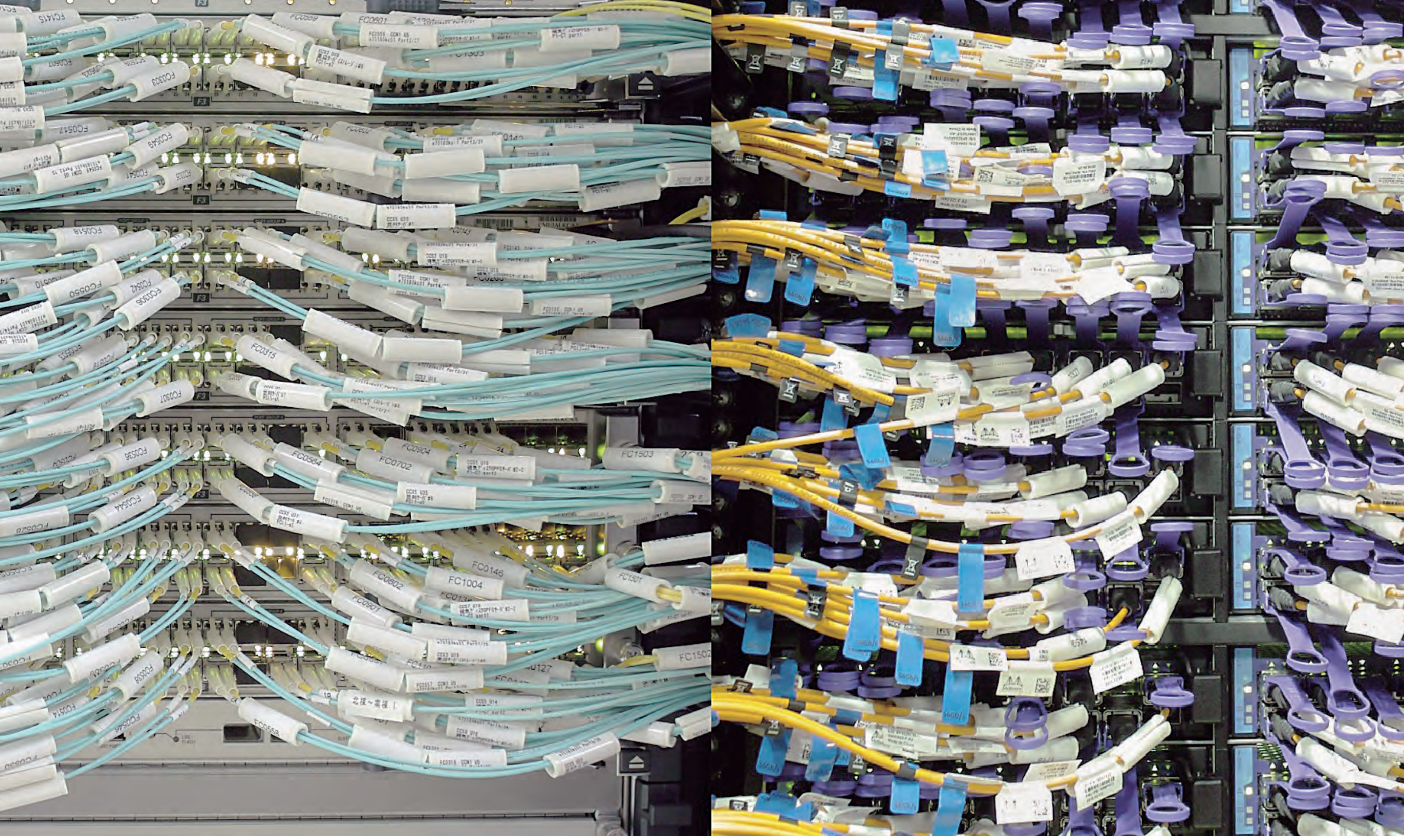


Fig. 6. The standard probe developed in KEK, tested with the MRI magnet at ANL.



Information System

Network and Computing

Statistics of Network Utilization

Since 2002, the J-PARC network infrastructure, called JLAN, has been operated independently from KEK LAN and JAEA LAN in terms of logical structure and operational policy. In 2015, the total number of hosts on JLAN exceeded 4,504, which was a 110% increase, compared to the last year. The growth curve of edge switches, wireless LAN access points and hosts (servers and PCs) connected to JLAN is shown in Fig. 1.

Figures 2 and 3 show the network utilization of the internet from/to JLAN. The bandwidth capacity for the internet through the Japan Science Information Network (SINET) is 10 Gbit/sec, which allows enough extra activity. JLAN has not only been used for internal communication in the J-PARC and external networking

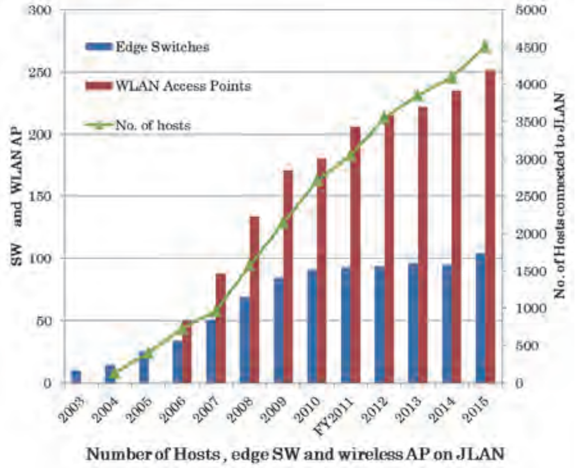


Fig. 1. Number of hosts, edge SW and wireless AP on JLAN.

through the internet, but it has also played an important role in the transfer of experiment data from the Tokai area, where the main J-PARC facilities were built, to the Tsukuba area, where the major computer resources for data analysis are located. Figures 4 and 5 show the statistics of data transfer between the two sites. The bandwidth capacity for the connection is currently 1 Gbit/s × 8 = 8 Gbit/s and this year, the usage level has been approaching half of it in 5 minutes average rate. The data traffic dropped after the J-PARC temporary shut-down, following the incident at the Hadron Experimental Facility on May 23 and has recovered after the Facility's operation restarted (Fig. 6).

GWLAN and User LAN for J-PARC Visitors

J-PARC offers two types of internet connection service for visitors, GWLAN and User LAN. The GWLAN is a wireless LAN internet connection service for short-term visitors available in almost all J-PARC buildings. Before using the GWLAN, users are required to receive a password at the J-PARC Users Office. On the other hand, the User LAN is dedicated to the J-PARC facility's public users. Since in the User LAN service users are authenticated by the same ID and password of the User Support System, which is also used for dormitory reservation or so on, they can easily start and use the internet service. Figure 7 shows the usage statistics of GWLAN and User LAN.

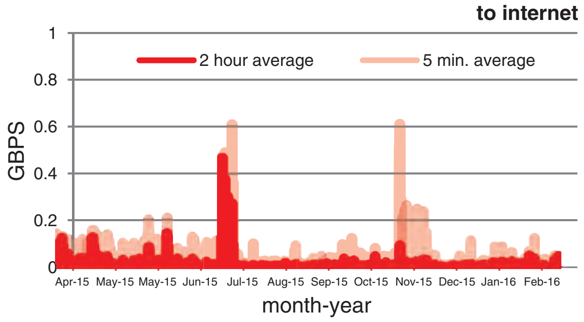


Fig. 2. Network traffic from JLAN to the internet.

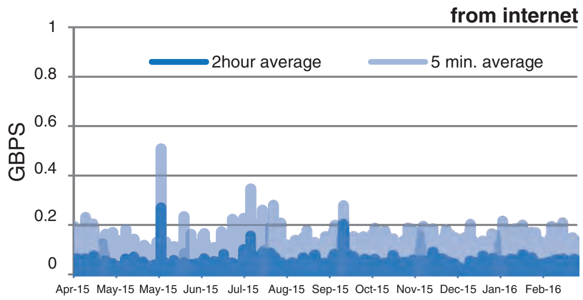


Fig. 3. Network traffic from the internet to JLAN.

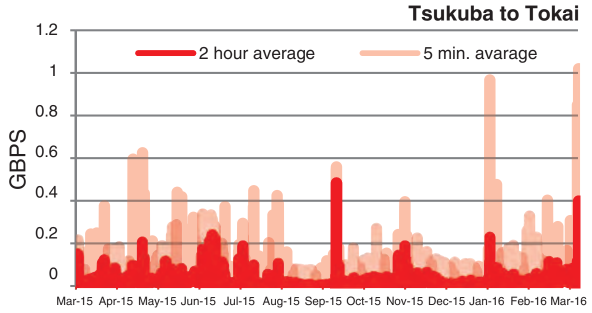


Fig. 4. Network traffic from Tsukuba to Tokai.

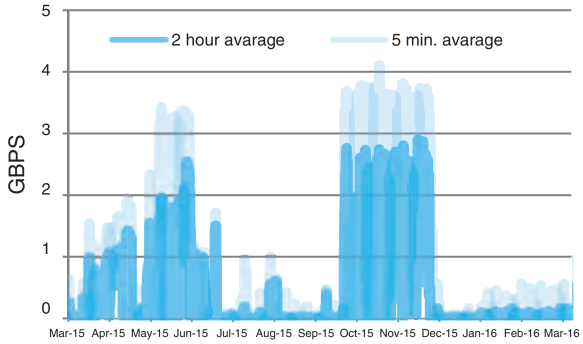


Fig. 5. Network traffic from Tokai to Tsukuba.

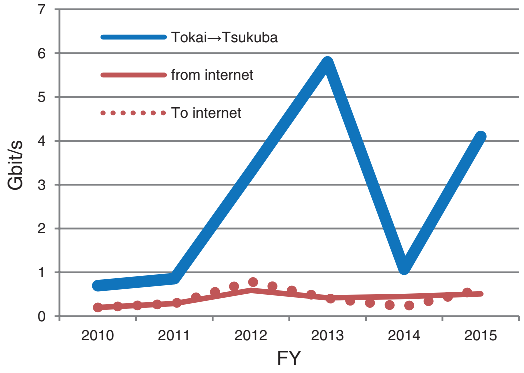


Fig. 6. Transitive graph of network traffics.

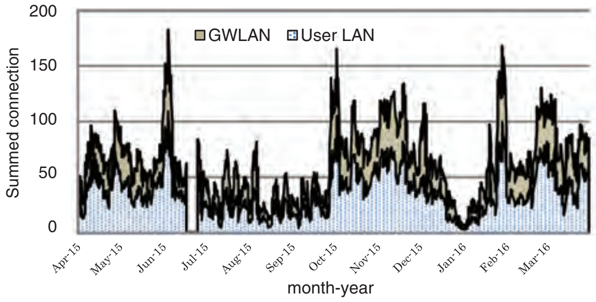


Fig. 7. GWLAN and User LAN utilization.

Statistics of Computing

Though J-PARC does not have its own central computing system for physics analysis, since 2009, the KEK central computer system at the KEK Tsukuba site has been mainly used for that purpose. Currently computer resources of 25,000 SPECint06 computing power, 1.2 PBytes disks and 5 PBytes tapes have been assigned to J-PARC (Table 1).

In the Neutrino (T2K experiment) and Hadron experiments, the data taken in the J-PARC experimental hall will be temporarily saved at the Tokai site and then promptly transferred to, stored and analyzed at the system in Tsukuba. The storage of the system will also be utilized as a permanent data archive for the Neutrino, Hadron and MLF experiments. Figures 8, 9 and 11 show the utilization statistics of the computer resources in 2015. The main users, who used the CPU and the storage constantly, were a Koto experiment group at the Hadron Facility and this year, they increased intensively the amount of their data . In contrast, the neutrino and MLF group have been accumulating data steadily (Fig. 10 and 11).

Table 1. Assigned computing resources to the J-PARC activities in the KEK central computing facility.

CPU	25,000 SPECint06
RAID Disk	1,200 TB
Tape	5.0 PB

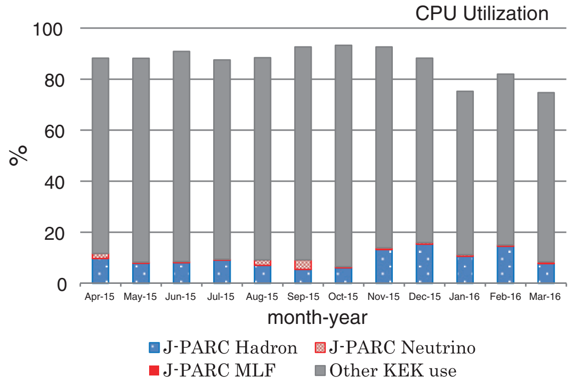


Fig. 8. CPU utilization by J-PARC groups.

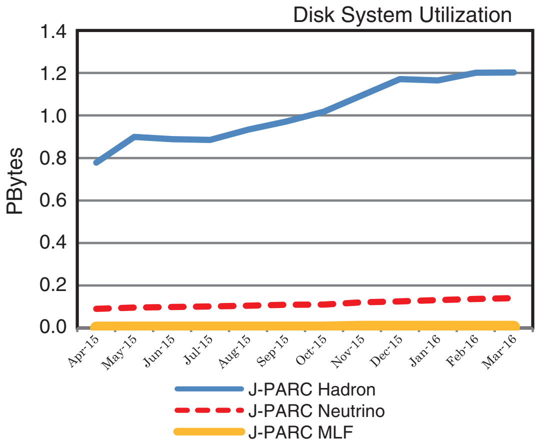


Fig. 9. Disk utilization.

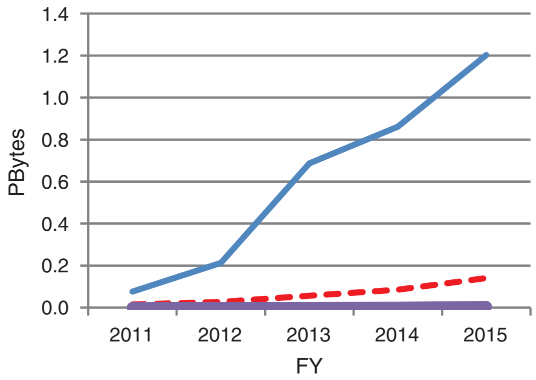


Fig. 10. Annual transition of disk utilization.

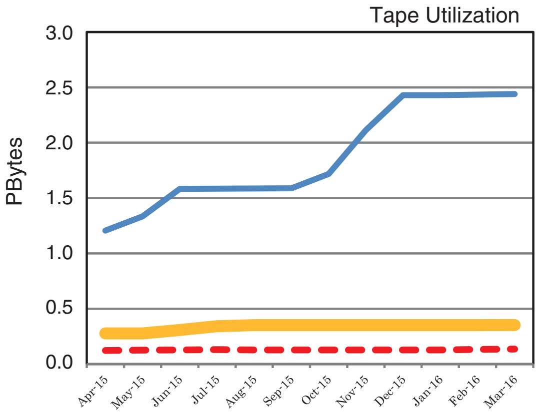


Fig. 11. Tape utilization.

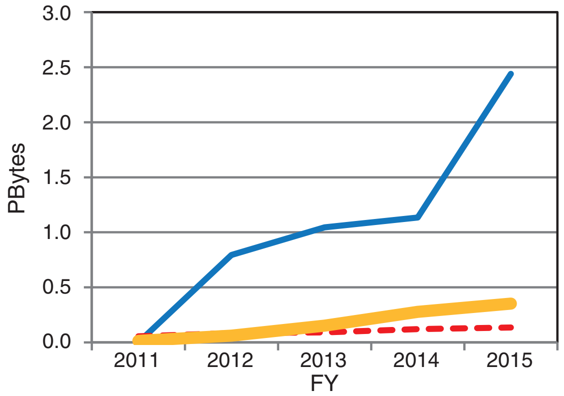


Fig. 12. Annual transition of tape utilization.

Transmutation Studies

Overview

We have been working on developing the Transmutation Experimental Facility (TEF) in J-PARC for R&D on volume reduction and mitigation of harmfulness of high-level radioactive waste by using accelerator-driven systems (ADS). To reinforce the organizational structure for accelerating the facility design and related R&D activities, the *Nuclear Transmutation Section* was moved up to the *Nuclear Transmutation Division* on April 1, 2015. In addition, two new sections, the *Target Technology Development Section* and the *Facility and Application Development Section* were created under the *Division* on October 1, 2015. About ten new members joined the staff in JFY 2015, although most of them also had another job.

This year, the design of the ADS Target Test Facility (TEF-T) made significant progress. The primary loop for the lead-bismuth eutectic (LBE) target system was designed in detail. The facility building was also

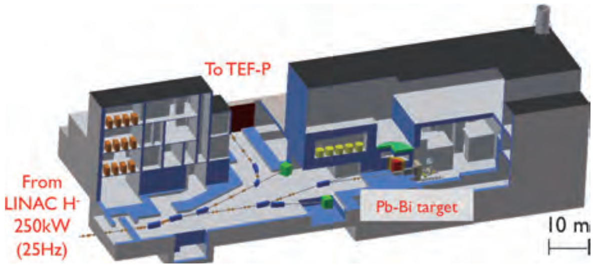


Fig. 1. Bird's-eye view of TEF-T.

detailed with planning the layout of the target and the associated systems, as well as every ancillary facility, to create 3-D bird's-eye views of the whole TEF-T (Fig. 1). To evaluate whether the TEF construction site was suitable for construction of a nuclear reactor facility, the Transmutation Physics Experimental Facility (TEF-P), a ground survey of the site was conducted.

The following R&D activities to support the TEF program also advanced. Their details will be described in the sections that follow.

- Oxygen sensor fabrication and testing
- Success in the long-term operation test of an ultrasonic LBE flow meter
- Remote-handling test for the LBE target replacement
- Testing of a freeze-seal valve
- Cladding tube burst experiment for TEF-P
- Testing of laser charge exchange technique

In August, 2015, the 8th and 9th meetings of the National Review Working Party (WP) for Partitioning and Transmutation Technologies using ADS were held. The WP discussed the progress in solving the technical issues in the TEF construction, international cooperation, human resource development, and so on. The WP evaluation statement was: "The R&D activity is going well and further development in elemental technologies and improvement in experimental devices are needed."

On October 28-29, 2015, the second TEF Technical Advisory Committee (T-TAC), which was one of the technical advisory committees under the J-PARC International Advisory Committee, was held (Fig. 2). The director of J-PARC Center defined the goal of this T-TAC as *"to evaluate technical readiness for starting detailed design and construction of TEF-T in JFY2017"*. In response, the T-TAC gave us the following encouraging evaluation: *"both systems (TEF-T & TEF-P) are outstanding and unique in the world for the development of physical, materials and engineering data for the design of large-scale ADS,"* and *"given that the appropriate resources are available, the T-TAC members acknowledge the schedules for the launch of the detailed design and construction of TEF-T in FY2017."*

By devoting our best efforts to the further advancement of the TEF program, we hope to contribute to the development of the nuclear transmutation technology with using ADS.

Fig. 2. T-TAC 2015 members and attendees.

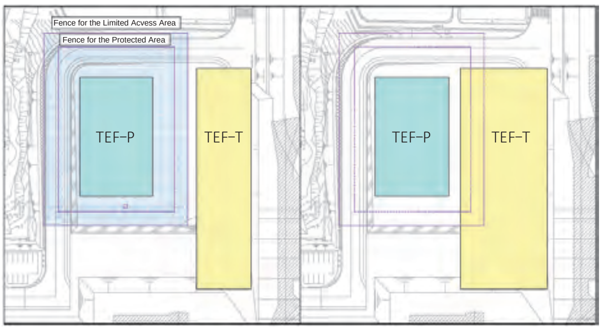
---

[1] TP: Tokyo Peil

Design of the Transmutation Experimental Facility (TEF)

Precise Arrangement of the TEF Facility Layout

Based on the last year's TEF layout study, the layout of the TEF-T and the TEF-P was arranged precisely without interfering with each other. Above TP(1) 15 m, the TEF-P should be surrounded by a multi-layered barrier. However, under TP 15 m, the multi-layered barrier is not necessary. Therefore, the TEF-T were built along the TEF-P's fence as shown in Fig. 3(a), and under TP 15m, the TEF-T can be built under the TEF-P's fence, as shown in Fig. 3(b).



(a) above TP 15m (b) under TP 15m

Fig. 3. The TEF layout for (a) above TP 15 m and (b) under TP 15 m.

Design of the TEF-T Floor Layout

In the TEF-T facility, a material irradiation test has been planned, using the liquid lead-bismuth spallation target. In an effort to ensure effective utilization of the TEF-T, some parts of the facility will be provided to users for multiple purposes. The TEF-T floor layout is designed in accordance with the study of the experimental operation and the radiation control. The TEF-T floor layout is shown in Fig. 4.

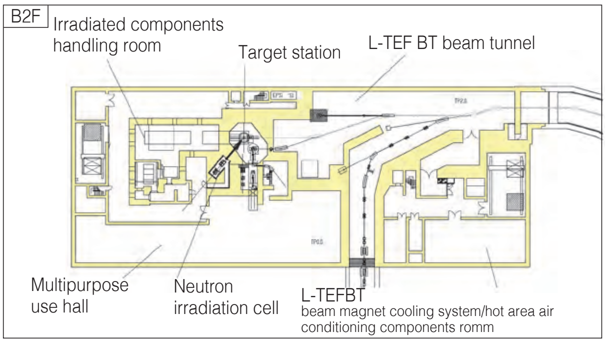


Fig. 4. The TEF-T floor layout of B2F.

Design of the TEF-T Facility

The target components and the other devices are heated by the proton beam. Also, the air in the target station and the cover gas of the circulation systems are irradiated and include activated materials as a result of the proton beam injection test. All these problems make it necessary to use the component cooling system and the off-gas processing system. The electrical receiving and transforming equipment is necessary to supply electricity to the subsystems in the TEF-T. And the proton beam tunnel, called L-TEF BT, is located in the B2F of the TEF-T.

Study of the Radiation Control

The wall thickness and the structure of the TEF-T building were designed to comply with the radiation analysis to prevent radiation exposure. Also, the pressure of the radiation controlled area is maintained lower than the atmospheric pressure to prevent leakage of radioactive materials.

Beamline to the TEF-P

In the TEF-P, 10-W proton beams extracted from the main beams will be used to perform various reactor physics experiments towards the R&D of the ADS. In order to control the beam profile in conducting the experiments, and to shut down the reactor core power safely in case of unexpected accidents, it is necessary to develop dedicated equipment, such as a beam dump, a collimator, and a beam shutter, paying attention to radiation damage and shielding. To achieve these aims, the concepts of the equipment and shielding structure have been studied. Figure 5 shows a schematic view of the beam line from the TEF-T to the TEF-P. The future work will focus on the installation and maintenance of the equipment.

R&D of a Proton Beam Monitor for the TEF Facilities

In order to irradiate the beam safely to the target placed at the TEF-T facility, observation of the beam at the target by a monitor designed specifically for that profile is essential. Since the TEF-T is designed to irradiate with a high peak current density, such as 20 $\mu A/cm^2$, which is the equivalent value of the ADS system planned in JAEA and is about 6 times higher than the present spallation neutron source in the J-PARC, a new technology for building the profile monitor is needed to ensure that the sensor of the monitor has a high

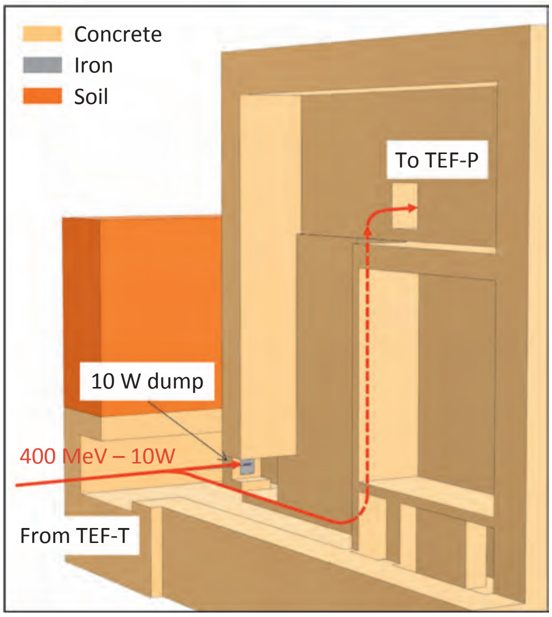


Fig. 5. Beamline from the TEF-T to TEF-P.

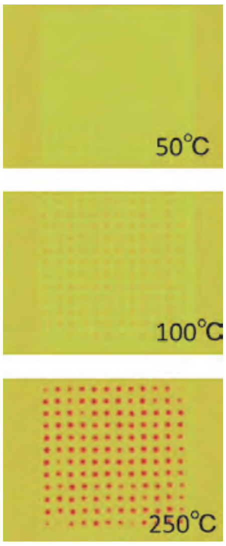


Fig. 6. Thermal image obtained with infrared bundled hollow-core fibers with 12 by 12 channels for profile monitor at the TEF-T.

radiation resistance. New monitors have been developed to observe the beam profile. The beam profile can be obtained by observing the thermal distribution image at the target or window. Since the radiation dose is extremely high around the target, a monitor with high radiation resistance is required and a camera for thermal image cannot be placed near the target, which makes it necessary to use an image transport system. To satisfy this requirement, an infrared image transfer system was developed with bundled hollow-core fibers with a length of 1 m. As an examination of the system, the thermal distribution of the ceramic heater was observed by the infrared system. The result of the thermal image is shown in Fig. 6. A clear image of the ceramic heater was obtained.

Ground Survey for the TEF-P Planning-Construction Site

The TEF-P is a part of the TEF, which is located at an experimental zero-power nuclear reactor. After the Fukushima Accident, the safety regulations for experimental reactors have been greatly strengthened, to the level of those for nuclear power reactors. Therefore, an adequacy assessment for construction of a nuclear reactor in a planned-construction site of the TEF was conducted to determine the compliance with the new regulatory standards. Because the TEF-P uses very low-power proton beam for neutronic experiments, it is necessary to locate an adjacent ADS Target Test Facility (TEF-T), which accepts almost all beams from the J-PARC Linac. An in-depth investigation of the whole planned-construction site including the TEF-T was required, ground survey of the reactor location point and the reactor building was performed, as a first step.

Four points, including the reactor location, were selected for this survey. The point of the reactor location was surveyed at about 400 m underground and the others were done at around 40 m underground to compare the data taken for other existing nuclear reactor facilities in JAEA. The ground characteristics were measured by borehole logging and ground properties were acquired in all borehole points.

As a result of this survey, it is estimated that a planned-construction site has a free bedrock surface at 344 m underground, and the surface has no significant height differences and weathering. This result confirmed that the distribution of tuff repository around the planned-construction site is matched with the data of existing reactor facilities in JAEA. Thus, it was concluded that there were no active fault lines under the TEF-P site and this site complied with the new safety standards for building experimental reactor facilities.

As a next step, further in-depth ground survey will be performed including confirmation of the case that the TEF-T does not influence negatively the safety of the experimental reactor.

R&D for the TEF-T

Studies to Construct the TEF-T

The experimental studies for LBE handling to construct TEF-T have been progressing. For the study of target materials, modification of the OLLOCHI (Oxygen-controlled LBE LOop Corrosion tests in HIgh-temperature) was finished by the end of March, 2016, and a conditioning operation without LBE has been started.

For the study of the components and their functions, operation of the IMMORTAL (Integrated Multi-functional MOckup for TEF-T Real-scale TArget Loop) has been started in 2015. For the study of instruments, the developments of oxygen sensors and an ultrasonic flow meter have been started as key instrumentation technologies for the LBE loop system. For the study of remote handling techniques, remote cutting/welding techniques to connect the TEF-T target have been advancing. For the study of the components, functional tests of the freeze-seal valve have been performed by using a test-stand for fundamental LBE technology. The results of these tests will be described in detail below.

Development of an Oxygen Sensor for LBE

In 2014, J-PARC tried to fabricate an oxygen sensor, which was a Pt/air type sensor. As a result, it was confirmed that the output voltage of the sensor was adequate within a wide temperature range. On the other hand, it is known that there is a possibility of LBE leakage, if the sensor fails. To prevent the LBE leakage, a freeze-seal design was employed in the housing of the oxygen sensor. To confirm the feasibility of the freeze-seal concept, an experiment was performed under real conditions. In this experiment, housing was prepared, LBE was put under certain pressure and the LBE leakage was checked. The LBE temperature was 450°C in all cases. Table 1 summarizes the experimental results. The TEF-T loop was designed so that the maximum pressure was 0.3 MPa and the pressure during the operation was 0.1 MPa. Through the experiments, it was confirmed that there was no LBE leakage, even under pressure of 0.5 MPa. The result meant that the freeze-seal design could be used in the TEF-T loop.

Table 1. Experimental results for freeze-seal design.

Case	A	B	C
Pressure to LBE [kPa]	206.0	306.8	520.0
Pressurization time [min]	8	13	10
LBE leakage	No	No	No
Weight (before break) [g]	239	240	239
Weight (after break) [g]	243	273	268

R&D of Flow Monitoring System for the TEF-T Target

Flow monitoring system of the coolant is one of the essential components of the safety measures for the LBE spallation target in the TEF-T. The electromagnetic flowmeter (EMF) is usually used as a liquid metal flowmeter in a high-temperature condition. LBE has the corrosiveness for materials. Therefore, the degradation of electrode was frequently observed in long-term experiments up to 3,000 hrs, resulting in signal instability of EMF, which was caused by the adhesion of impurities/deposits. The objective of this issue is to develop a long and a reliable flowmeter for the LBE target system. We focused on the ultrasonic technique and developed a flowmeter to achieve both long-term and high-reliability flow monitoring for the LBE target system in the TEF-T.

Figure 7 shows the results of the durability test of the developed flowmeter under flowing LBE condition. The LBE temperature was set to 350°C. During the experiment, the developed system provided enough signal amplitude to measure the flowrate, and the measured velocity data showed sufficiently sTable output. We proved successfully that the developed flowmeter was performing effectively over a long period of time. We performed the application test in loop restart condition with two interruption followed by two restarts. The signal decrease was 7% in after the first restart an 13% after the second restart. We concluded that the cause for the signal decrease could be the degradation of the solid-liquid boundary condition due to adhesion of impurity materials. However, the decreased signal almost recovered to the maximum value of 1,700 hrs. later under flowing LBE condition. Furthermore, the required signal amplitude of developed flowmeter is too small, hence there is no problem with such kind of decreased signal condition.

Remote Handling Techniques for the LBE System

The LBE target system is installed under high radioactive environment, hence all components should be maintained by remote handling. Specifically, the LBE target vessel requires scheduled exchange because of its limited lifetime and to get a sufficient dose of irradiation samples. We planned to replace the target vessel by using the same type of remote handling flange that was installed at MLF. However, burnup/fixing of bolts was

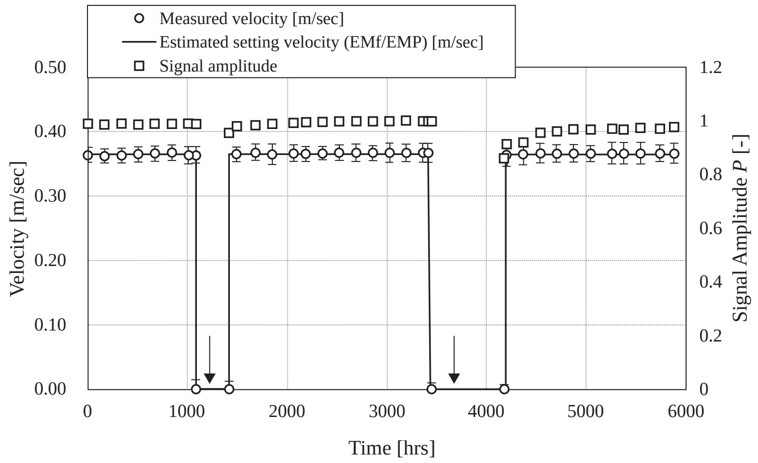


Fig. 7. Experimental results of the durability test.

frequently observed when the temperature increased up to 500°C, so we decided to apply the remote cutting/welding technique. The automatic welding machine is a commercial product manufactured by Swagelok. At first, we tried to perform the pipe cutting test and to set up the welding machine by using a single MSM.

Figure 8 shows the pipe cutting operation and the exterior of the cut surface. A modified pipe cutter was applied to decrease the machining dust under radioactive environment as much as possible. The cut surface was sufficiently smooth for welding, and little of machining dust was observed. On the other hand, the orthogonal setup of the pipe cutter was too difficult, that is why now we are developing setup jigs.

Figure 9 shows the photo of the setup procedure of an automatic welding machine. Its welding head was put and fixed on a jack to adjust the height. As a result, it was confirmed that the setup of the welding machine was possible by using a single MSM. An outstanding issue is how to position accurately both welding pipes. To overcome this problem, we will perform R&Ds in the future.

Development of the Freeze-Seal Valve

When the LBE loop operates for a long time, it produces Pb-oxides that get wedged to the seal of the mechanical valve. That causes a slow leakage of LBE, followed by decrease of the primary coolant, and finally, the loss of coolant results in aborting the circuit. In the case of Station Black Out, an automatic drain mechanism is desirable (it is not a legal recommendation), for the sake of the safety not only for the public but also for the workers. So, a freeze-seal valve (FV) has been considered as a drain valve. To confirm the performance of

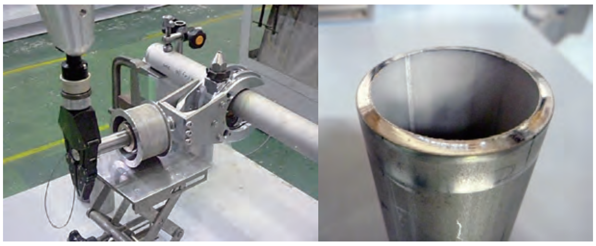


Fig. 8. Pipe cutting operation by MSM and the exterior of the cut surface.

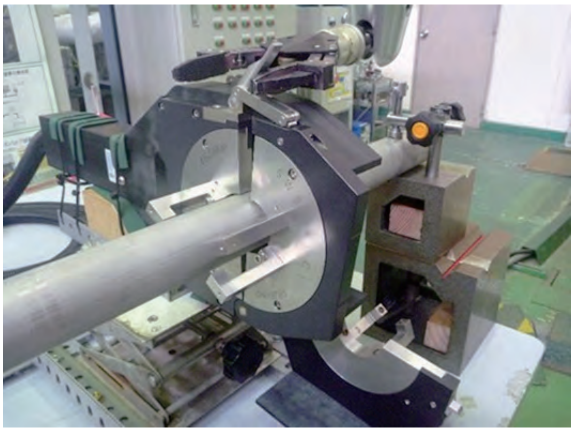


Fig. 9. Photo of the setup of the welding machine.

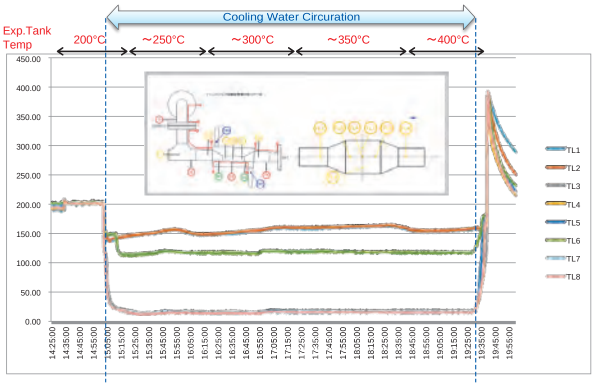


Fig. 10. Temperature response of the water-cooled FV.

FV, two types of FV with different coolants (water, air) were tested.

The results show that the freezing times of the air-cooled and water-cooled FV were 30 min and 2 – 3 min, respectively. For the water-cooled FV, the melting time with and without a heater were 10 min and 20 min, respectively. Considering the time response for freezing, we selected the water-cooled type. As of the remaining issues, it will be necessary to conduct stress tests for thermal shock.

R&D for the TEF-P

The TEP-P Related Experiment

The TEF-P is a critical assembly and it will treat minor actinide (MA) fuel in the reactor physics experiment. The temperature level, at which the air cooling of the TEF-P core would stop, was estimated but there were no data to evaluate the soundness of the MA fuel pin. To set a tentative limit temperature for the TEF-P core, a cladding tube burst experiment was performed.

PNC316 steel was employed in the experiment and two inner pressure conditions, which were based on the inner pressures of the MA fuel pin within 30 and 50 years of fabrication, were adopted. As a result, the cladding tube burst occurred at 680°C as the most severe case (Fig. 11). An estimate of the creep rupture time was also performed. It was concluded that if the cladding tube temperature would be less than 600°C, that will provide a buffer of about 100 days until the creep rupture of the MA fuel pin when the air cooling of the TEF-P stops. Through these results, the tentative limit temperature for the TEF-P core was set to 600°C.

Laser Charge Exchange Technique

For neutronics experiments using TEF-P, a low reactor power of less than 1 kW is feasible to ensure convenient experimental settings. To perform the experiments at the TEF-P under such reactor power, with an effective neutron multiplication factor (k_{eff}) around 0.97, the incident proton beam power must be in the order of 10 W. It is also important to keep and reproduce the experimental condition, especially for the injected proton beam. Because the J-PARC accelerators focus on much higher beam power, a highly reliable low-power proton beam extraction device is indispensable. The development of a laser charge exchange technique for extraction of a low-power proton beam is now underway. The laser charge exchange method (LCE) was developed originally to measure the proton beam profile and can be applied to the beam separation device for the TEF-P. Figure 12 illustrates the concept of the LCE device for the TEF-P.

The LCE device consists of a bright YAG-laser and laser transport system with beam position controllers. The negative proton (H^-) beam from the J-PARC linac is exposed by the YAG-laser beam, which can strip one of the two electrons, so as to change H^- to neutral ones (H^0). The other electron of the H^0 is finally stripped by a carbon foil, so that positive protons (H^+) are introduced into the TEF-P. We performed stability tests for laser power and position under no H^- beam collision and concluded that the LCE can be applicable at the

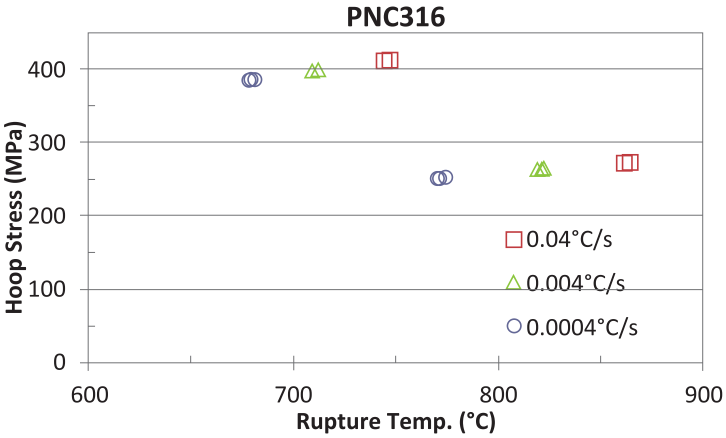


Fig. 11. Relation between hoop stress and rupture temperature.

TEF-P beam source. From this fiscal year, we will conduct further tests with the H^- beam in cooperation with the J-PARC accelerator division. As shown in Fig. 13, the LCE system is installed at the end of the 3-MeV linac in J-PARC and is certified by the Nuclear Regulation Authority of Japan. In future tests, data on the stability of the H^+ beam intensity will be obtained.

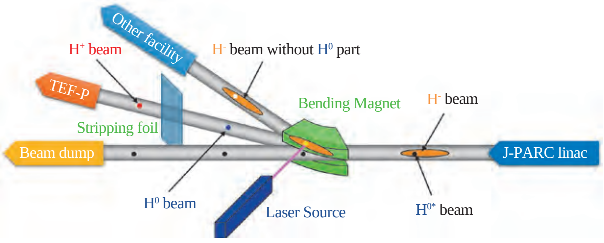


Fig. 12. Conceptual diagram of the LCE device for the TEF-P.

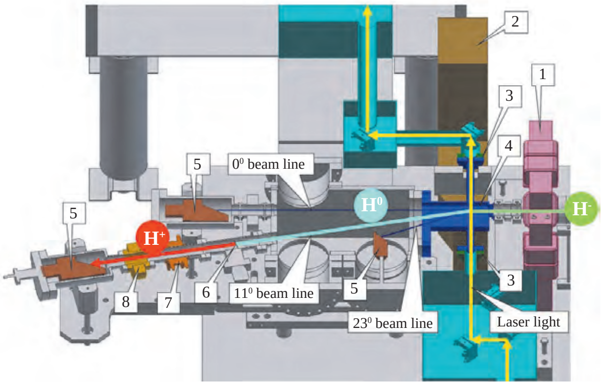


Fig. 13. Schematic View of the LCE devices (1- quad-rupole magnet, 2- bending magnet, 3- quartz viewing port, 4- vacuum chamber, 5- beam dump, 6- stripping foil, 7- beam position monitor, 8- slow current transformer).

Other activities and international collaboration

PIE Technology Developments

A series of post-irradiation examination (PIE) works of the MEGAwatt Pilot Experiment (MEGAPIE) samples has been progressing at JAEA's hot-lab. The samples were cut from the beam window (BW, material: T91) and the flow guide tube (FGT, material: SS316L). The total number of JAEA samples was 67 and all of them were prepared without LBE.

To evaluate the fracture toughness of F/M steel T91, testing techniques on SP (Small Punch) test and three-point bending test have been developed. For the SP test with φ2.4 mm steel ball, specimen preparation techniques and test methods have been confirmed. For the three-point bending test, test method without notching specimen has been confirmed. These tests on the irradiated specimens will be started in the next fiscal year at the WAste Safety Technology Engineering Facility (WASTEF).

Meeting and Workshops

The first Asia ADS Topical Meeting was held at J-PARC on October 26 and 27, focusing on the topic of "lead-bismuth handling technology". There were four participants from Korea and one from China, and as the invited speaker, Professor Juergen Konys of the Karlsruhe Institute of Technology (Germany) spoke on the steel corrosion behavior of liquid lead-bismuth and R&D on methods to suppress that behavior, developed in Germany. Later, there were presentations on the R&D situations in Japan, China and Korea, and an exchange of views on future R&D issues and cooperation to resolve them. After the meeting, the participants toured test instruments, such as the liquid lead-bismuth loop in the High Temperature Engineering Test Building of the Nuclear Science Research Institute. They asked questions and exchanged views regarding the equipment and its operation.

Safety

1. Major Events on Safety Culture and Safety Activities in the J-PARC Center

The major events on safety culture and safety activities in J-PARC center are listed in Table 1. The FY2015 workshops for fostering safety culture at J-PARC and the 3rd symposium on safety in accelerator facilities are described in the chapter "Events".

The Liaison Committee on Safety and Health for Contractors Working at J-PARC was established to share a common safety mindset and information concerning safe work at J-PARC. The first meeting of the committee was held on July 24, with 80 participants from 75 companies. At the meeting, there were reports on recent accidents and troubles in the J-PARC, lessons learned from those incidents, and precautions that must be taken.

Table 1. List of major events on safety in FY2015.

Year	Date	Events
2015	May 23	Workshop for fostering safety culture
	July 24	Meeting of the liaison committee on safety and health for contractors working at J-PARC
	Sep. 29	Refresher course on radiation safety
	Nov. 6	Safety audit
	Nov. 13	Emergency drill assuming radiation exposure accident
2016	Jan. 27-28	Symposium on safety in accelerator facilities
	Mar. 30	Meeting for exchange information on safety efforts

The J-PARC Safety Audit 2015 was conducted by outside auditors (Prof. Takano of Keio University and Prof. Ishibashi of Kyushu University) on November 6. They heard information about the current status of safety management in J-PARC Center and various efforts by the facilities, and interviewed the director, the deputy directors, the managers of facilities and other staff members. They gave us valuable suggestions for the future safety efforts, such as effective information exchange about the safety activities among the divisions.

In order to exchange and share information on safety efforts proceeding in each facility, a J-PARC Center meeting was held on March 30. A variety of activities for safety was reported by the accelerator facilities and the three experimental facilities (the Hadron Experimental Facility, the Neutrino Experimental Facility, and the Materials and Life Science Experimental Facility). These unique approaches, shared in the meeting, would be effective in reconsidering safety activities at each facility, division, section, and group in J-PARC.

2. Emergency Drill

An emergency drill was held on November 13, in cooperation with the Nuclear Science Research Institute of the Japan Atomic Energy Agency. It was assumed that the beam operation was started without evacuating a worker in the accelerator tunnel of the Main Ring and he suffered a neutron exposure of approximately 1 Gy. The drill included initial measures taken by the staff in response to a variety of situations at the accident, such as an estimating the exposure dose, transporting to a medical facility by ambulance (simulated), and press releases.

3. Radiological License Update

Application for an update of the radiological license was submitted to the Nuclear Regulation Authority on January 29[1]. The following major application items were included:

- Usage of a laser charge-conversion method on the accelerator test stand in the Linac Facility
- Addition to the license (handling and storage) of sealed radioactive isotopes in the Materials & Life Science Experimental Facility
- Upgrade of the primary proton beam intensity of the Neutrino Facility from 450 kW to 600 kW
- Addition of storage facilities for induced radioactive materials and a waste storage facility in the Hadron Experimental Facility.

In addition, we applied for installation of a new interlock system related to the personnel access to the beam tunnels after beam operation.


2015 11 13

Emergency drill (the simulated ambulance)

---

[1] We got an approval for the update application on April 18, 2016.

4. Meeting and Committee on Radiation Matter

The basic radiation safety policy in J-PARC has been discussed by the J-PARC Radiation Safety Committee (RSC), and we have discussed the specific contents of the radiation safety in the J-PARC Radiation Safety Review Committee (RSRC) on the basis of this policy.

The RSC was held twice and the RSRC was held three times during the fiscal year. In the committees, issues on radiological license upgrade were mainly discussed.

5. Radiation Exposure of Radiation Workers

Figure 1 shows the variation of the number of radiation workers in J-PARC since 2005. In JFY 2015, 3026 individuals were registered as radiation workers in J-PARC. Table 5 summarizes the distribution of annual doses for each category of workers. The radiation exposure of the workers has been monitored individually with glass dosimeters for photons and solid-state nuclear track detectors for neutrons. Almost all the records for individual exposure were undetectable, while the doses for 105 persons (3.6% of the workers) were detectable but less than 5.0 mSv.

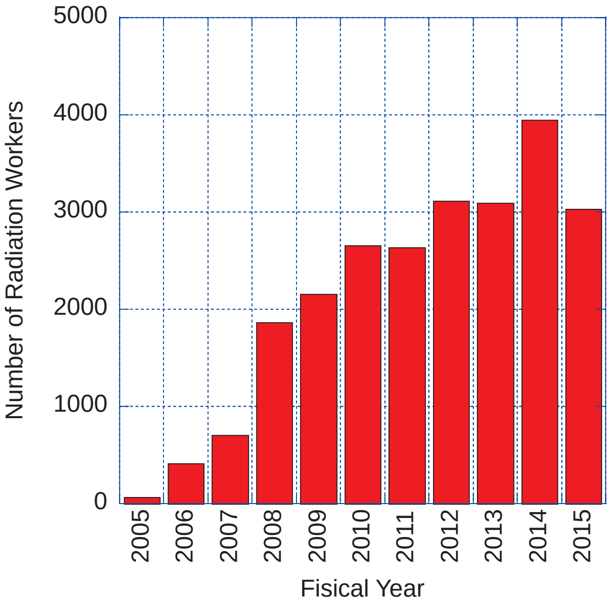


Fig. 1. Changes in the number of the radiation workers in J-PARC.

Table 2. License at the end of fiscal year 2014 and application items for license in fiscal year 2015.

	License at the end of fiscal year 2014	Application items for license in fiscal year 2015
Materials and Life Science Experimental Facility	Power : 3 GeV/1 MW Secondary beam lines (neutron) : 20 Secondary beam lines (muon) : 3	Power : 3 GeV/1 MW Secondary beam lines (neutron) : 1
Hadron Experimental Facility	Power : 30 GeV/50 kW Secondary beam lines (meson) : 4	
Neutrino facilities	Power : 30 GeV/450 kW	Power : 30 GeV/600 kW

Table 3. Radiation safety committee (RSC) in FY2015.

No.	Year	Date	Major Discussion items
23th	2015	May 26	New interlock system New category of controlled areas
24th		Dec. 24	New interlock system

Table 4. Radiation safety review committee (RSRC) in FY2015.

No.	Year	Date	Major Discussion items
9th	2015	Apr.28	New interlock system New category of controlled areas Other matters on license update
10th		Oct.6	Revision of the operation manual on the conditions of "Alert Status" transfer Revision of the safety rule of the X-ray instruments
11th		Dec.18	New interlock system New category of controlled areas Other matters on license update Revision of the local radiation protection rule on the definition of J-PARC staff

Table 5. Annual doses in fiscal year 2015.

	Dose range X (mSv)					Collective dose (person-mSv)	Maximum dose (μSv)
	UD	0.1 ≦ X ≦ 1.0	1.0 ＜ X ≦ 5.0	X >5.0	Total Workers		
In-house staff	560	41	1	0	602	16.2	1.9
User	845	0	0	0	845	0.0	0.0
Contractor	1524	62	1	0	1587	19.2	1.1
Total	2921	103	2	0	3026	35.4	1.9

User Service

Users Office (UO)

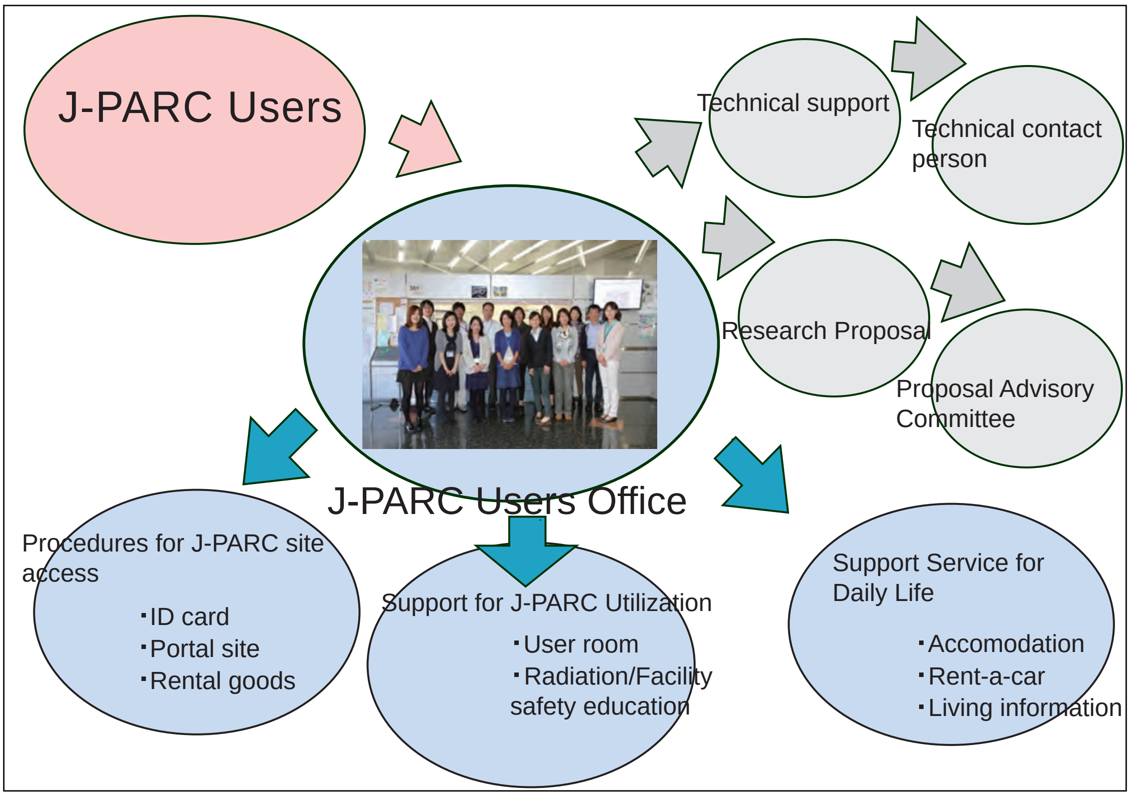
Outline

J-PARC Users Office (UO) was established in 2007. Since December, 2008, it has been located on the 1st floor of the IBARAKI Quantum Beam Research Center in Tokai-mura. The UO maintains the Tokai Dormitory and provides on-site and web support with one-stop service for the J-PARC Users. As of March 31, 2016, the UO employed 14 staffs and 4 Web Support SE staffs.

After the approval of their experiment, the J-PARC Users follow the administrative procedures, outlined on the Users Office (UO) web portal site, related to registration as a J-PARC User, radiation worker registration, safety education, accommodation, invitation letter for visa and other requirements. After that, the UO staffs continue to provide support for them by e-mail. When Users arrive at J-PARC, the UO assists them on-site with receiving the J-PARC ID, personal dosimeter, and safety education. In 2015, the UO took part in improving the J-PARC on-line experiment system to make it more user-friendly. On-line safety education system was introduced in January 2016.

2nd, left to right; SANAO Ai, ENOKI Kaori, NAMIKI Shinji, KATOGI Aki, ISOZAKI Mari, HANAWA Msahiro.
1st row, left to right KAWAKAMI Megumi, KIMURA Rie, SAKAGAMI Keiichi, ENDO Maya, HIGUCHI Yuko, ARIGA Asuko. KOBAYASHI Sayuri.

Activities of UO



J-PARC Users

J-PARC Users Office

Technical support

Technical contact person

Research Proposal

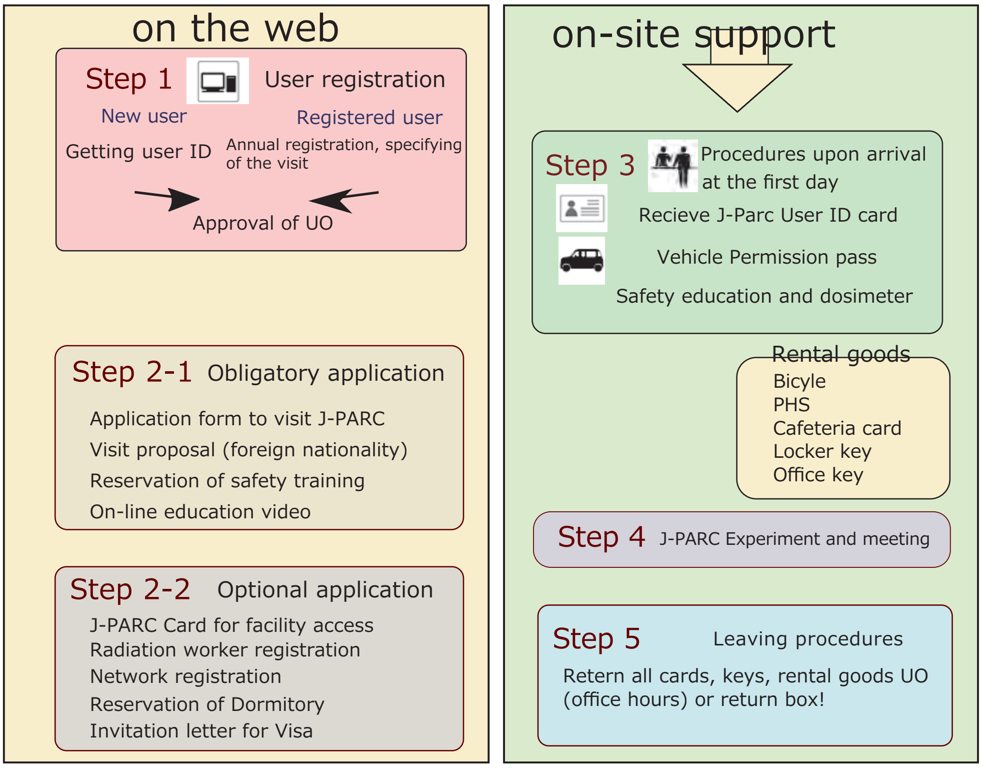
Proposal Advisory Committee

Procedures for J-PARC site access
- ID card
- Portal site
- Rental goods

Support for J-PARC Utilization
- User room
- Radiation/Facility safety education

Support Service for Daily Life
- Accomodation
- Rent-a-car
- Living information

One-stop service for J-PARC users



on the web

Step 1 User registration

New user — Getting user ID

Registered user — Annual registration, specifying of the visit

Approval of UO

Step 2-1 Obligatory application
- Application form to visit J-PARC
- Visit proposal (foreign nationality)
- Reservation of safety training
- On-line education video

Step 2-2 Optional application
- J-PARC Card for facility access
- Radiation worker registration
- Network registration
- Reservation of Dormitory
- Invitation letter for Visa

on-site support

Step 3 Procedures upon arrival at the first day
- Recieve J-Parc User ID card
- Vehicle Permission pass
- Safety education and dosimeter

Rental goods
- Bicyle
- PHS
- Cafeteria card
- Locker key
- Office key

Step 4 J-PARC Experiment and meeting

Step 5 Leaving procedures

Retern all cards, keys, rental goods UO (office hours) or return box!

Users Office at IQBRC

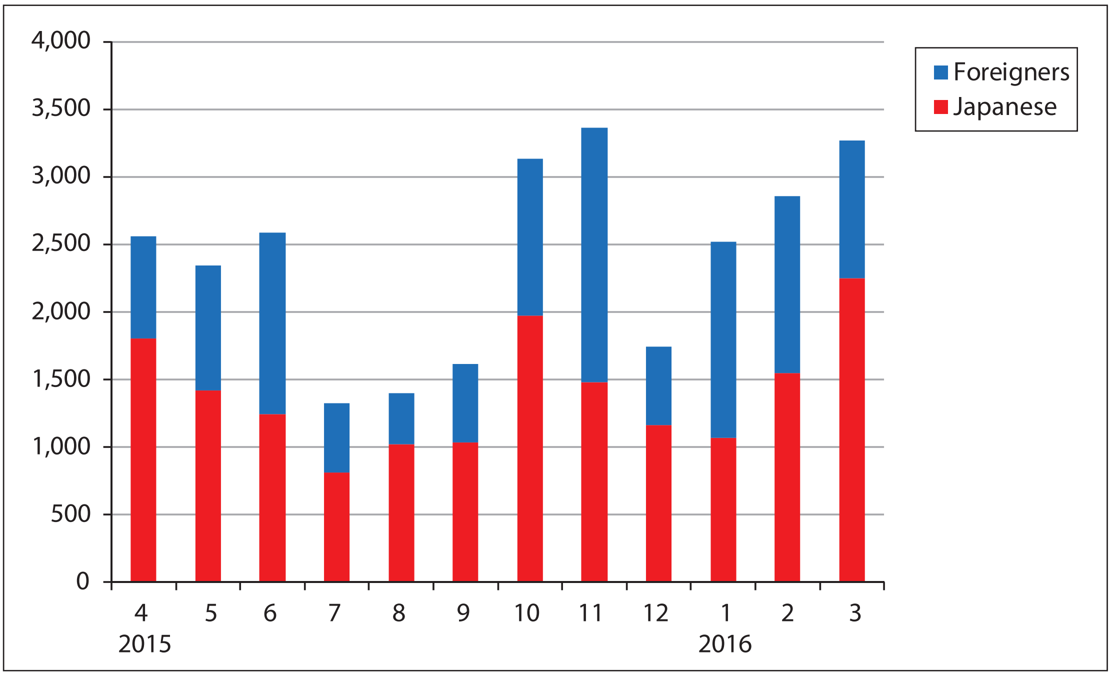
Office hours(9:00-17:00, Mon.-Fri.)

Rental bicycle

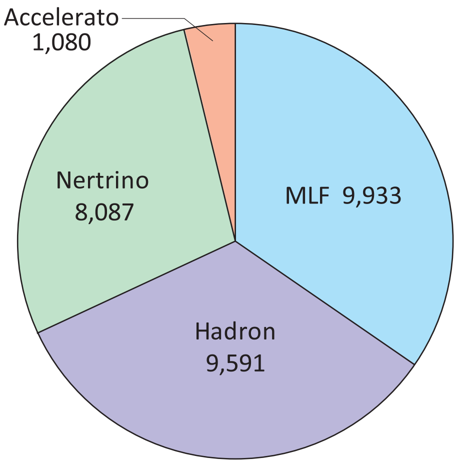
Return box at IQBRC

User Statistics

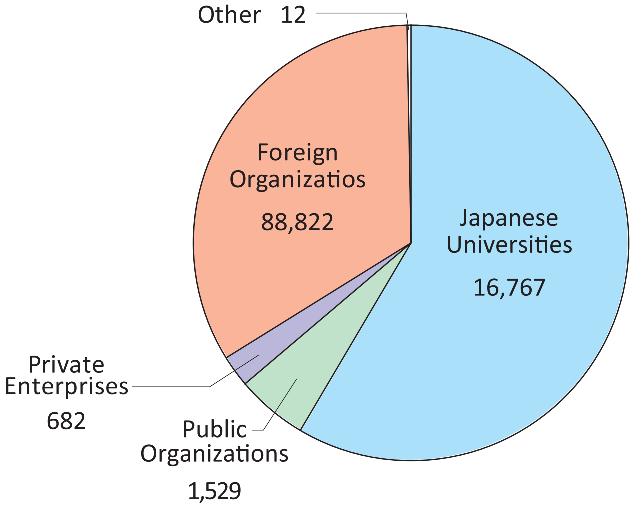
Users in 2015 (Japanese/Foreigners, person-days)

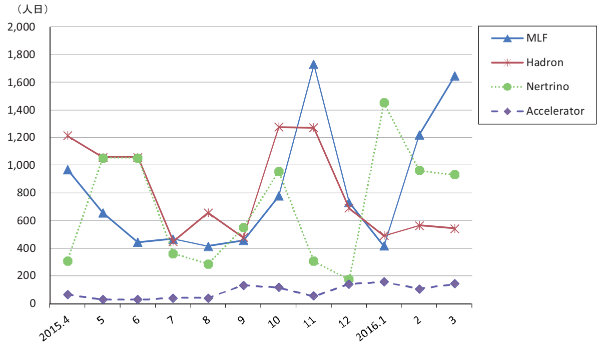


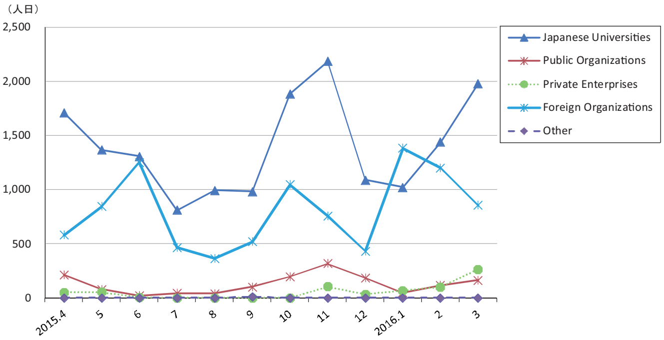
Users in 2015 (according to facilities, person-days)



Users in 2015 (according to organizations, person-days)







MLF Proposals Summary - FY2015

The call for J-PARC MLF 2015B General Use Proposals were canceled. Because of the long downtime for maintenance of the neutron target, machine time allocated to 2014B and 2015A was shifted to 2015B.

Table 1. Breakdown of Proposals Numbers for the 2015A Rounds.

Beam-line	Instrument		2015A		Full Year					
			Submitted	Approved	Submitted			Approved		
			GU	GU	PU/S	IU	ES	PU/S	IU	ES
BL01	4D-Space Access Neutron Spectrometer - ***4SEASONS***		18(2)	13(1)	3	1	2	3	1	2
BL02	Biomolecular Dynamics Spectrometer - ***DNA***		20(1)	17(1)	2	1	0	2	1	0
BL03	Ibaraki Biological Crystal Diffractometer - ***iBIX***	(100-β)‡	6	3	0	0	0	0	0	0
		(β)†	3	3	16	0	0	15	0	0
BL04	Accurate Neutron-Nucleus Reaction Measurement Instrument - ***ANNRI***		12	7	2	1	0	2	1	0
BL05	Neutron Optics and Physics - ***NOP***		5	3	1	0	0	1	0	0
BL08	Super High Resolution Power Diffractometer - ***S-HRPD***		11	7	2	0	0	2	0	0
BL09	Special Environment Neutron Powder Diffractometer - ***SPICA***		0	0	1	0	0	1	0	0
BL10	Neutron Beamline for Observation and Research Use - ***NOBORU***		8	7	3	1	0	3	1	0
BL11	High-Pressure Neutron Diffractometer - ***PLANET***		9	8	0	1	0	0	1	0
BL12	High Resolution Chopper Spectrometer - ***HRC***		13	8	4	0	0	4	0	0
BL14	Cold-neutron Disk-chopper Spectrometer - ***AMATERAS***		25	10	4	1	1	4	1	1
BL15	Small and Wide Angle Neutron Scattering Instrument - ***TAIKAN***		29(2)	15(2)	4	2	2	4	2	2
BL16	High-Performance Neutron Reflectometer with a horizontal Sample Geometry - ***SOFIA***		14	13	1	0	0	1	0	0
BL17	Polarized Neutron Reflectometer - ***SHARAKU***		13	9	1	1	1	1	1	1
BL18	Extreme Environment Single Crystal Neutron Diffractometer - ***SENJU***		24	12	2	2	1	2	2	0
BL19	Engineering Diffractometer - ***TAKUMI***		28	13	3	1	1	3	1	1
BL20	Ibaraki Materials Design Diffractometer - ***iMATERIA***	(100-β)‡	15	6	0	0	0	0	0	0
		(β)†	23	23	14	0	0	14	0	0
BL21	High Intensity Total Diffractometer - ***NOVA***		22	12	4	0	0	4	0	0
BL22	Energy Resolved Netron Imagung System - ***RADEN***		10	7	2	1	0	2	1	0
D1	Muon Spectrometer for Materials and Life Science Experiments - ***D1***		29(1)	20(1)	3	1	0	3	1	0
D2	Muon Spectrometer for Basic Science Experiments - ***D2***		12(2)	9(1)	2	1	0	2	1	0
U	Muon U		0	0	1	0	0	1	0	0
Total			**349**	**225**	**75**	**15**	**8**	**74**	**15**	**7**

GU : General Use **PU** : Project Use or Ibaraki Pref. Project Use **S** : S-type Proposals
IU : Instrument Group Use **ES** : Element Strategy
† : Ibaraki Pref. Exclusive Use Beamtime (β = 80% in FY2014)
‡ : J-PARC Center General Use Beamtime ((100-β = 20% in FY2014)
( ) : Proposal Numbers under Trial Use Access System or P-type proposals (D1, D2) in GU

J-PARC PAC Approval Summary after the 21st Meeting

	(Co-) Spokespersons	Affiliation	Title of the experiment	Approval status (PAC recommendation)	Beamline	Status
E03	K. Tanida	SNU	Measurement of X rays from Ξ^- Atom	Stage 2	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	Primary	
E05	T. Nagae	Kyoto U	Spectroscopic Study of Ξ-Hypernucleus, ${}^{12}{}_{\Xi}$Be, via the ^{12}C(K^-, K^+) Reaction	Stage 2	K1.8	
E06	J. Imazato	KEK	Measurement of T-violating Transverse Muon Polarization in $K^+ \rightarrow \pi^0 \mu^+ \nu$ Decays	Stage 1	K1.1BR	
E07	K. Imai, K. Nakazawa, H. Tamura	JAEA, Gifu U, Tohoku U	Systematic Study of Double Strangeness System with an Emulsion-counter Hybrid Method	Stage 2 high priority in the SX mode to run before summer 2016	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, Osaka EC U	Production of Neutron-Rich Lambda-Hypernuclei with the Double Charge-Exchange Reaction (Revised from Initial P10)	Stage 2	K1.8	Data taking
E11	T. Kobayashi	KEK	Tokai-to-Kamioka (T2K) Long Baseline Neutrino Oscillation Experimental Proposal	Stage 2	neutrino	Data taking
E13	H. Tamura	Tohoku U	Gamma-ray spectroscopy of light hypernuclei	Stage 2	K1.8	Finished
E14	T. Yamanaka	Osaka U	Proposal for $K_L \rightarrow \pi^0 \nu$ ν-bar Experiment at J-PARC	Stage 2	KL	Data taking
E15	M. Iwasaki, T. Nagae	RIKEN, Kyoto U	A Search for deeply-bound kaonic nuclear states by in-flight 3He(K-, n) reaction	Stage 2	K1.8BR	Data taking
E16	S. Yokkaichi	RIKEN	Measurements of spectral change of vector mesons in nuclei (previously "Electron pair spectrometer at the J-PARC 50-GeV PS to explore the chiral symmetry in QCD")	Stage 1	High p	
E17	R. Hayano, H. Outa	U Tokyo, RIKEN	Precision spectroscopy of Kaonic ^{3}He $3d \rightarrow 2p$ X-rays	Registered as E62 with an updated proposal	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 2	K1.8	
E19	M. Naruki	KEK	High-resolution Search for Θ^+ Pentaquark in $\pi^- p \rightarrow K^- X$ Reactions	Stage 2	K1.8	Finished
E21	Y. Kuno	Osaka U	An Experimental Search for $\mu - e$ Conversion at a Sensitivity of 10^{-16} with a Slow-Extracted Bunched Beam	Stage 1 TDR should be posted by April 2nd for Stage 2	COMET	
E22	S. 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 (coord'ed by JPNC)	K1.8BR	Data taking
E26	K. Ozawa	KEK	Search for ω-meson nuclear bound states in the $\pi^- + {}^{A}Z \rightarrow n + {}^{(A\text{-}1)}{}_{\omega}(Z\text{-}1)$ reaction, and for ω mass modification in the in-medium $\omega \rightarrow \pi^0 \gamma$ decay	Stage 1	K1.8	
E27	T. Nagae	Kyoto U	Search for a nuclear Kbar bound state $K^- pp$ in the d(π^+, K^+) reaction	Stage 2	K1.8	Data taking
E29	H. Ohnishi	RIKEN	Search for ϕ-meson nuclear bound states in the pbar + ${}^{A}Z \rightarrow \phi + {}^{(A\text{-}1)}{}_{\phi}(Z\text{-}1)$ reaction	Stage 1	K1.1	
E31	H. Noumi	Osaka U	Spectroscopic study of hyperon resonances below KN threshold via the (K^-, n) reaction on Deuteron	Stage 2	K1.8BR	Data taking
T32	A. Rubbia	ETH, Zurich	Towards a Long Baseline Neutrino and Nucleon Decay Experiment with a next-generation 100 kton Liquid Argon TPC detector at Okinoshima and an intensity upgraded J-PARC Neutrino beam	Test Experiment	K1.1BR	Finished
P33	H. M. Shimizu	Nagoya U	Measurement of Neutron Electric Dipole Moment	Deferred	Linac	
E34	N. Saito, M. Iwasaki	KEK, RIKEN	An Experimental Proposal on a New Measurement of the Muon Anomalous Magnetic Moment g-2 and Electric Dipole Moment at J-PARC	Stage 1 Carry out a focused review of the TDR	MLF	

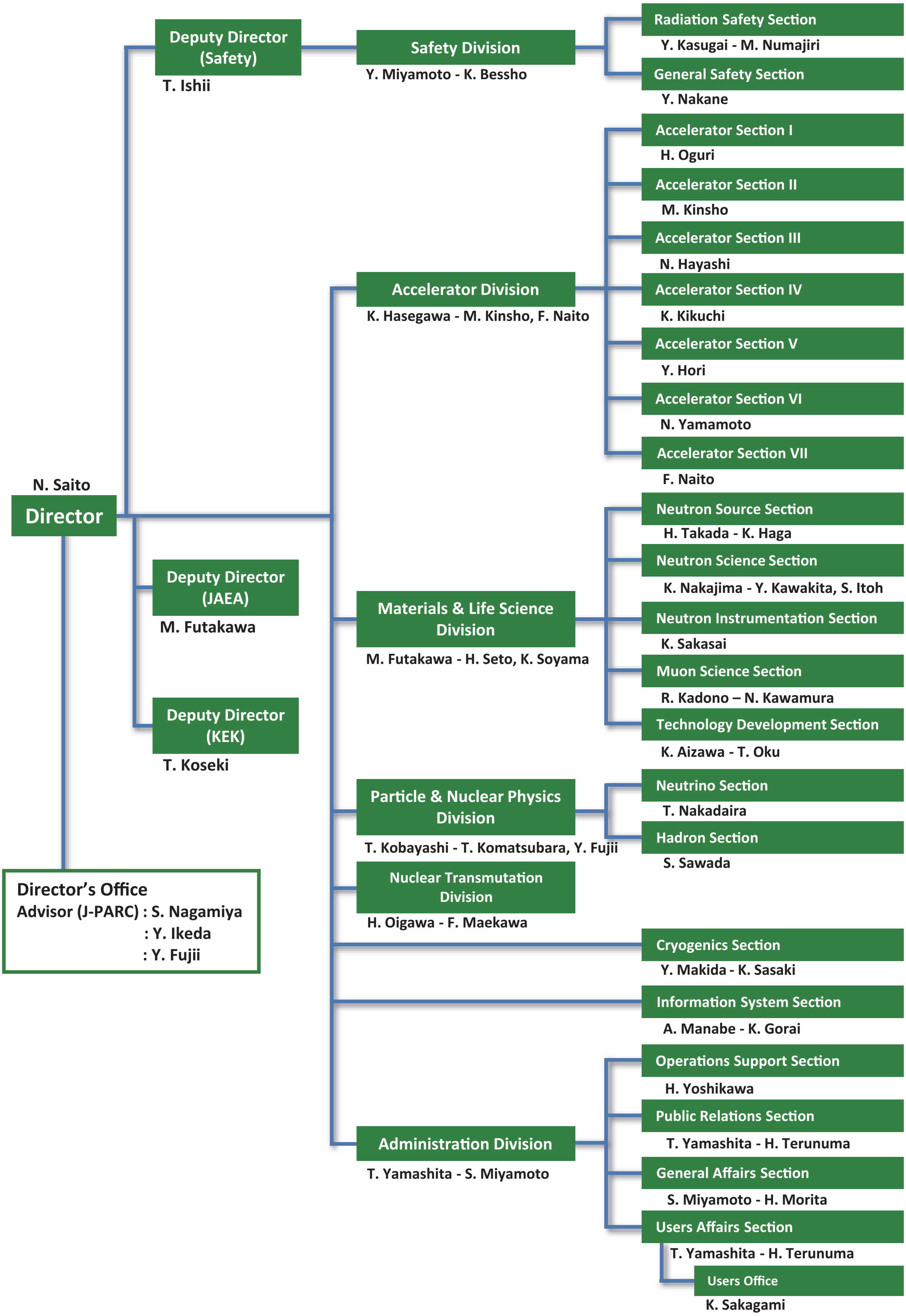
	(Co-) Spokespersons	Affiliation	Title of the experiment	Approval status (PAC recommendation)	Beamline	Status
E36	M. Kohl, S. Shimizu	Hampton U, Osaka U	Measurement of $\Gamma(K^+ \rightarrow e+ \nu)/\Gamma(K^+ \rightarrow \mu+ \nu)$ and Search for heavy sterile neutrinos using the TREK detector system	Stage 2	K1.1BR	Finished
E40	K. Miwa	Tohoku U	Measurement of the cross sections of Σp scatterings	Stage 2	K1.8	
P41	M. Aoki	Osaka U	An Experimental Search for $\mu - e$ Conversion in Nuclear Field at a Sensitivity of 10^{-14} with Pulsed Proton Beam from RCS	Deferred	MLF	
E42	J. K. Ahn	Pusan National U	Search for H-Dibaryon with a Large Acceptance Hyperon Spectrometer	Stage 1 TDR should be updated for Stage 2	K1.8	
E45	K. H. Hicks, H. Sako	Ohio U, JAEA	3-Body Hadronic Reactions for New Aspects of Baryon Spectroscopy	Stage 1	K1.8	
T46	K. Ozawa	KEK	EDIT2013 beam test program	Test Experiment	K1.1BR	Abandonded
T49	T. Maruyama	KEK	Test for 250L Liquid Argon TPC	Test Experiment	K1.1BR	Withdrawn
E50	H. Noumi	Osaka U	Charmed Baryon Spectroscopy via the (π,D^{*-}) reaction	Stage 1 IPNS should investigate the safety aspect of the beam-line	High p	
T51	S. Mihara	KEK	Research Proposal for COMET(E21) Calorimeter Prototype Beam Test	Test Experiment	K1.1BR	had to be stopped
T52	Y. Sugimoto	KEK	Test of fine pixel CCDs for ILC vertex detector	Test Experiment	K1.1BR	not performed yet
T53	D. Kawama	RIKEN	Test of GEM Tracker, Hadron Blind Detector and Lead-glass EMC for the J-PARC E16 experiment	Test Experiment	K1.1BR	not performed yet
T54	K. Miwa	Tohoku U	Test experiment for a performance evaluation of a scattered proton detector system for the Σp scattering experiment E40	Test Experiment	K1.1BR	not performed yet
T55	A. Toyoda	KEK	Second Test of Aerogel Cherenkov counter for the J-PARC E36 experiment	Test Experiment	K1.1BR	had to be stopped
E56	T. Maruyama	KEK	A Search for Sterile Neutrino at J-PARC Materials and Life Science Experimental Facility	Stage 1 status	MLF	
E57	J. Zmeskal	Stefan Meyer Institute for Subatomic Physics	Measurement of the strong interaction induced shift and width of the 1s state of kaonic deuterium at J-PARC	Stage 1 status Commissioning run with E62 before summer 2016	K1.8BR	
P58	M. Yokoyama	U. Tokyo	A Long Baseline Neutrino Oscillation Experiment Using J-PARC Neutrino Beam and Hyper-Kamiokande	Deferred	neutrino	
T59	A. Minamino	Kyoto U	A test experiment to measure neutrino cross sections using a 3D grid-like neutrino detector with a water target at the near detector hall of J-PARC neutrino beam-line	To be arranged by IPNS and KEK-T2K	neutrino monitor bld	Finished
T60	T. Fukuda	Toho U	Proposal of an emulsion-based test experiment at J-PARC	Arranged by IPNS and KEK-T2K	neutrino monitor bld	Finished
P61	M. Wilking	Stony Brook U	nuPRISM	Deferred	neutrino	
E62	R. Hayano, S. Okada, H. Outa	U. Tokyo, RIKEN	Precision Spectroscopy of kaonic atom X-rays with TES	Stage 2 Commissioning run with E57 before summer 2016	K1.8BR	
E63	H. Tamura	Tohoku U	Gamma-ray spectroscopy of light hypernuclei II	Stage 1	K1.1	

Organization and Committees

Organization Structure

J-PARC Center Organization Chart

as of April 1, 2015



Members of the Committees Organized for J-PARC

(as of March, 2016)

1) Steering Committee

Yuji Fujita	Japan Atomic Energy Agency, Japan
Hisayoshi Ito	Japan Atomic Energy Agency, Japan
Yukihide Kamiya	High Energy Accelerator Research Organization, Japan
Kazuo Minato	Japan Atomic Energy Agency, Japan
Yukitoshi Miura	Japan Atomic Energy Agency, Japan
Naohito Saito	J-PARC Center, Japan
Yasuhide Tajima	Japan Atomic Energy Agency, Japan
Daiji Takeuchi	High Energy Accelerator Research Organization, Japan
Katsuo Tokushuku	High Energy Accelerator Research Organization, Japan
Kazuyoshi Yamada	High Energy Accelerator Research Organization, Japan
Seiya Yamaguchi	High Energy Accelerator Research Organization, Japan

2) International Advisory Committee

Jean-Michel Poutissou	TRIUMF, Canada
Hiroshi Amitsuka	Hokkaido University, Japan
Sergio Bertolucci	European Organization for Nuclear Research (CERN), Switzerland
Robert Tschirhart	Fermi National Accelerator Laboratory (FNAL), USA
Thomas Roser	Brookhaven National Laboratory (BNL), USA
Shinian Fu	Institute of High Energy Physics (IHEP), China
Robert Robinson	Australian Nuclear Science and Technology Organization (ANSTO), Australia
Robert Tribble	Brookhaven National Laboratory (BNL), USA
Donald F. Geesaman	Argonne National Laboratory, USA
Horst Stoecker	GSI Helmholzzentrum für Schwerionenforschung, Germany
Hamid Aït Abderrahim	SCK·CEN, Belgium
Paul Langan	Oak Ridge National Laboratory (ORNL), USA
Hidetoshi Fukuyama	Tokyo University of Science, Japan
Andrew Dawson Taylor	Science and Technology Facilities Council (STFC), UK

3) User Consultative Committee for J-PARC

Tsuyoshi Nakaya	Kyoto University, Japan
Taku Yamanaka	Osaka University, Japan
Hiroaki Aihara	University of Tokyo, Japan
Takashi Kobayashi	High Energy Accelerator Research Organization (KEK), Japan
Hirokazu Tamura	Tohoku University, Japan
Tomofumi Nagae	Kyoto University, Japan
Takashi Nakano	Osaka University, Japan
Kazuhiro Tanaka	High Energy Accelerator Research Organization (KEK), Japan
Hajime Nanjo	Kyoto University, Japan

Masaki Fujita	Tohoku University, Japan
Mitsuhiro Shibayama	University of Tokyo, Japan
Hideaki Kitazawa	National Institute for Materials Science(NIMS), Japan
Yoshiaki Kiyanagi	Nagoya University, Japan
Masaaki Sugiyama	Kyoto University, Japan
Tosiji Kanaya	High Energy Accelerator Research Organization (KEK), Japan
Jun Akimitsu	Hiroshimao University, Japan
Kenya Kubo	International Christian University, Japan
Yasuhiro Miyake	High Energy Accelerator Research Organization (KEK), Japan
Jun Sugiyama	Toyota Central R&D Labs., Inc., Japan
Hiroyuki Kishimoto	Sumitomo Rubber Industries, Ltd., Japan
Takashi Noma	Canon Inc., Japan
Eiko Torikai	Yamanashi University, Japan
Makoto Hayashi	Ibaraki Prefecture, Japan
Satoru Yamashita	University of Tokyo, Japan
Cheol-Ho Pyeon	Kyoto University, Japan
Yoshiyuki Kaji	Japan Atomic Energy Agency, Japan

4) Accelerator Technical Advisory Committee

Thomas Roser	Brookhaven National Laboratory (BNL), USA
Roland Garoby	European Spallation Source, Sweden
Alberto Facco	Laboratori Nazionali di Legnaro (INFN), Italy
Alan Letchford	Science and Technology Facilities Council (STFC), UK
Subrata Nath	Los Alamos National Laboratory (LANL), USA
Akira Noda	National Institute of Radiological Sciences
Michael Plum	Oak Ridge National Laboratory (ORNL), USA
Jie Wei	Michigan State University, USA
Robert Zwaska	Fermi National Accelerator Laboratory (FNAL), USA
Simone Gilardoni	European Organization for Nuclear Research (CERN), Switzerland

5) Neutron Advisory Committee

Robert McGreevy	Science and Technology Facilities Council (STFC), UK
Bertrand Blau	Paul Scherrer Institut (PSI), Switzerland
John D. Galambos	Oak Ridge National Laboratory (ORNL), USA
Yoshiaki Kiyanagi	Nagoya University, Japan
Dan Alan Neumann	National Institute of Standards and Technology (NIST), USA
Jamie Schulz	Australian Nuclear Science and Technology Organization(ANSTO), Australia
Dimitri Argyriou	European Spallation Source, Sweden
Chang Hee Lee	Korea Atomic Energy Research Institute (KAERI), Korea
Mitsuhiro Shibayama	University of Tokyo, Japan
Masaaki Sugiyama	Kyoto University, Japan

6) Muon Advisory Committee

Francis Pratt	Science and Technology Facilities Council (STFC), UK
Thomas Prokscha	Paul Scherrer Institut (PSI), Switzerland
Andrew MacFarlane	University of British Columbia, Canada
Klaus Jungmann	University of Groningen, Netherland
Kenya Kubo	International Chiristian University, Japan
Toshiyuki Azuma	RIKEN, Japan
Yasuo Nozue	Osaka University, Japan
Jun Sugiyama	Toyota Central R & D Labs., Inc., Japan

7) Radiation Safety Committee

Seiichi Shibata	RIKEN, Japan
Yoshimoto Uwamino	RIKEN, Japan
Yoshihiro Asano	RIKEN, Japan
Tetsuo Noro	Kyushu University, Japan
Takeshi Murakami	Natinonal Insitute of Radiological Science, Japan
Yoshimoto Namito	High Energy Accelerator Research Organization (KEK), Japan
Shinichi Sasaki	High Energy Accelerator Research Organization (KEK), Japan
Hitoshi Kobayashi	High Energy Accelerator Research Organization (KEK), Japan
Kazuo Minato	Japan Atomic Energy Agency, Japan
Takeshi Maruo	Japan Atomic Energy Agency, Japan
Michio Yoshizawa	Japan Atomic Energy Agency, Japan

8) MLF Advisory Board

Jun Akimitsu	Okayama University/Hiroshima University, Japan
Yuji Kawabata	Kyoto University, Japan
Yoshiaki Kiyanagi	Nagoya University, Japan
Mitsuhiro Shibayama	University of Tokyo, Japan
Jun Sugiyama	Toyota Central R&D Labs., Inc., Japan
Atsushi Nakagawa	Osaka University, Japan
Masaki Fujita	Tohoku University, Japan
Michihiro Furusaka	Hokkaido University, Japan
Tetsurou Minemura	Ibaraki Prefectural Government, Japan
Toshio Yamaguchi	Fukuoka University, Japan
Hiroshi Amitsuka	Hokkaido University, Japan
Kenya Kubo	International Christian University, Japan
Toshiji Kanaya	High Energy Accelerator Research Organization (KEK), Japan
Hideki Seto	High Energy Accelerator Research Organization (KEK), Japan
Takashi Kamiyama	High Energy Accelerator Research Organization (KEK), Japan
Toshiya Otomo	High Energy Accelerator Research Organization (KEK), Japan
Yasuhiro Miyake	High Energy Accelerator Research Organization (KEK), Japan
Ryosuke Kadono	High Energy Accelerator Research Organization (KEK), Japan
Masatoshi Futakawa	Japan Atomic Energy Agency (JAEA), Japan

Kazuya Aizawa	Japan Atomic Energy Agency (JAEA), Japan
Masayasu Takeda	Japan Atomic Energy Agency (JAEA), Japan
Kazuhiko Soyama	Japan Atomic Energy Agency (JAEA), Japan
Kenji Nakajima	Japan Atomic Energy Agency (JAEA), Japan
Yukinobu Kawakita	Japan Atomic Energy Agency (JAEA), Japan
Jun-ichi Suzuki	Comprehensive Research Organization for Science and Society (CROSS), Japan

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

Kenichi Imai	Japan Atomic Energy Agency (JAEA), Japan
Akinobu Dote	High Energy Accelerator Research Organization (KEK), Japan
Kunio Inoue	Tohoku University, Japan
Hajime Shimizu	Tohoku University, Japan
Hiroyoshi Sakurai	University of Tokyo, Japan
Kazunori Hanagaki	High Energy Accelerator Research Organization (KEK), Japan
Tetsuo Hatsuda	RIKEN Nishina Center for Accelerator-Based Science, Japan
Junji Haba	High Energy Accelerator Research Organization (KEK), Japan
Thomas E. Browder	University of Hawaii, USA
Simon I. Eidelman	Budker Institute of Nuclear Physics (BINP), Russia
Gino Isidori	University of Zurich, Switzerland
Edward C. Blucher	Fermi National Accelerator Laboratory (FNAL), USA
William C. Louis III	Los Alamos National Laboratory (LANL), USA
Wolfram Weise	Technical University of Munich, Germany
William A. Zajc	Columbia University, USA

10) TEF Technical Advisory Committee

Marc Schyns	SCK·CEN, Belgium
Eric Pitcher	European Spallation Source, Sweden
Yacine Kadi	European Organization for Nuclear Research (CERN), Switzerland
Yoshiaki Kiyanagi	Nagoya University, Japan
Toshikazu Takeda	Univesity of Fukui, Japan
Juergen Konys	Karlsruhe Institute of Technology, Germany
Minoru Takahashi	Tokyo Institute of Technology, Japan

Main Parameters

Present main parameters of Accelerator

Linac	
Acclerated Particles	Negative hydrogen
Energy	400 MeV
Peak Current	40 mA
Pulse Width	0.3 ms for MLF 0.5 ms for MR
Repetition Rate	25 Hz
Freq. of RFQ, DTL, and SDTL	324 MHz
Freq. of ACS	972 MHz
RCS	
Circumference	348.333 m
Injection Energy	400 MeV
Extraction Energy	3 GeV
Repetition Rate	25 Hz
RF Frequency	0.938 MHz → 1.67 MHz
Harmonic Number	2
Number of RF cavities	12
Number of Bending Magnet	24
Main Ring	
Circumference	1567.5 m
Injection Energy	3 GeV
Extraction Energy	30 GeV
Repetition Rate	~0.4 Hz
RF Frequency	1.67 MHz → 1.72 MHz
Harmonic Number	9
Number of RF cavities	9
Number of Bending Magnet	96

Key parameters of Materials and Life Science Experimental Facility

Injection Energy	3 GeV
Repetition Rate	25 Hz
Neutron Source	
Target Material	Mercury
Number of Moderators	3
Moderator Material	Supercritical hydrogen
Moderator Temperature/Pressure	20 K / 1.5 MPa
Number of Neutron Beam Ports	23
Muon Production Target	
Target Material	Graphite
Number of Muon Beam Extraction Ports	4
Neutron Instruments*	
Open for User Program (General Use)	18
Under Commissioning/Construction	2/1
Muon Instruments*	
Open for User Program (General Use)	2
Under commissioning/construction	2/0

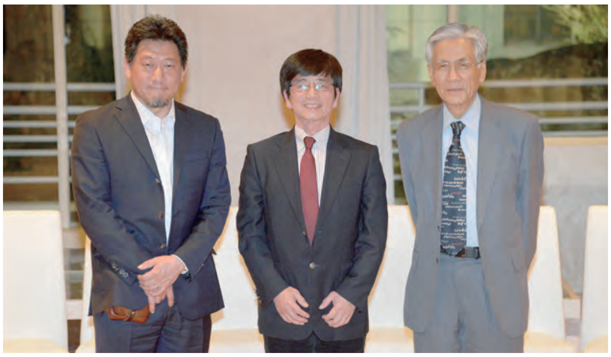
(* As of March, 2016)

Events

Events

New Director of the J-PARC Center (April 1)

Naohito Saito, one of the Deputy Directors of the J-PARC Center until March, 2015, took over the job of the Director from Yujiro Ikeda, the former Director.



N. Saito, the new Director (left) with the former Directors, Y. Ikeda (center) and S. Nagamiya (right)

Explanatory Meeting Held for Residents (April 3-5)

The J-PARC Center has completed renovation works at the Hadron Experimental Facility, and held three explanatory meetings at the Tokai Village for local residents. A total of 67 people participated in these meetings. The J-PARC Center apologized, once again, for the incident and provided an overview of the incident and related problems, reported on implementation of the facility and equipment measures to prevent recurrence, as well as the efforts to strengthen the safety management system and improve the safety awareness. At each venue, we heard valuable opinions from the participants, answered questions, and then closed the meeting.

Visit by Princess Sirindhorn of the Kingdom of Thailand (April 23)

Her Royal Highness Princess Sirindhorn of the Kingdom of Thailand visited J-PARC, and toured the Materials and Life Science Experimental Facility (MLF) and Neutrino Experimental Facility. After J-PARC, the princess visited the Ibaraki Neutron Medical Research Center and observed a next-generation cancer therapy, Boron Neutron Capture Therapy (BNCT). The Princess expressed her high expectations for stronger research ties with the Kingdom of Thailand in the future.

Resumption of the Operation at Hadron Experimental Facility (April 24)

After the radioactive material leak incident, which occurred on May 23, 2013, the J-PARC Center suspended the operation of the Hadron Experimental Facility. The repairs of the facility to prevent incident recurrence have been finished, and were reported to the local governments. We also held explanatory meetings for local residents. On April 9, we opened the renovated facility to the media and explained to them that we would start to check the facility performance, with the proton beam from the accelerator. On April 17, the facilities were inspected by the Nuclear Safety Technology Center. The inspectors confirmed that there were no problems, and we received the certificate on the April 21. Then, we resumed the operation on the April 24.

Ceremony to Commemorate the Completion of the J-PARC Research Building (May11)

A ceremony commemorating the completion of the J-PARC Research Building was held on May 11, to which we invited guests from the national and local governments and companies involved in building's construction.

The unveiling ceremony of memorial signboard

FY2015 Workshops for Fostering Safety Culture at J-PARC (May 22)

The Workshop for Fostering Safety Culture at J-PARC is held every year around May 23, the date when the radioactive material leak incident occurred at the Hadron Experimental Facility in 2013. This year, the workshop was held on May 22 in order to improve the safety awareness of the J-PARC staff members and not to forget the lessons learned from the incident. In the workshop, Professor Shoji Tsuchida of Kansai University who specialized in risk communication theory and social psychology, gave an invited talk entitled "Psychology of risk communication and crisis communication".

The workshop for fostering safety culture at J-PARC

Defects in the Neutron Target Vessel

At the MLF, defects in the neutron target vessel were confirmed at the end of April, and it was decided to carry out the replacement work about two months ahead from the original schedule, which canceled the user operation for the period. We apologized to all our users for this inconvenience.

Concluded Agreement on Mutual Cooperation with the Australian Nuclear Science and Technology Organization (ANSTO) in the Field of Neutron Science (July 20)

On July 20, in Australia, an agreement for mutual cooperation in the field of neutron science with ANSTO was concluded. Based on this agreement, the parties would deepen research exchanges, and mutually promote creation of new results. The signing ceremony for this five-year agreement was held at the opening of an international conference (AOCNS 2015) attended by many researchers using neutrons from Asia and Oceania.

Dr Adi Paterson, the Chief Executive of ANSTO (right) and Dr Naohito Saito, the Director of J-PARC Center (left)

2nd Asia-Oceania Conference on Neutron Scattering (AOCNS 2015) (July 19-23)

AOCNS 2015 was held in Sydney, Australia, attended by about 280 participants. There were about 60 scientists from Japan including J-PARC users and staff. There were talks and discussions packed with information, on topics ranging from science to technology development, and trends at the world's neutron beam facilities.

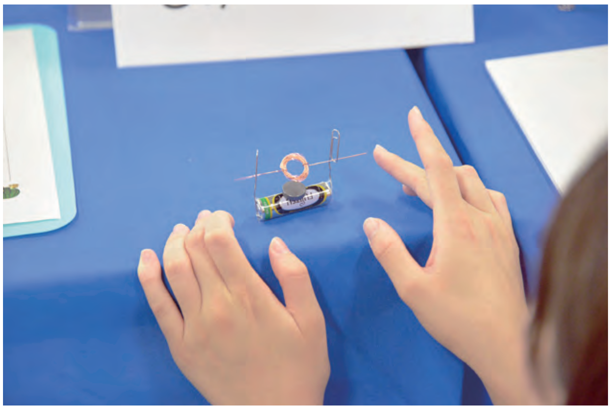
J-PARC Hello Science -"Make a Clock with Cardboard and Chopsticks!" Summer Workshop for Children- (July31, August 5, 20)

Just like last year, the J-PARC Center held a science project workshop for fifth and sixth grade students from the village's elementary schools. This year's theme was making clocks using cardboard and chopsticks. Everyone labored hard, and completed the clock one way or another.

The workshop at the Tokai Village Library

Youngster's Science Festival, 2015 National Conference / Exhibition Theme: Learning about Magnetic Force with Paper Clip Motors (July 25-26)

Together with the Japan Atomic Energy Agency (JAEA), the J-PARC Center presented an experiment and demonstration booth at the 2015 National Conference of the Youngster's Science Festival. At the booth, there was a class on how to make "clip motors" from a magnet, battery, paper clip and enamel wire, and demonstrations of a "superconducting roller coaster" and a "traveling battery". The booth was a great success, attracting many participants.



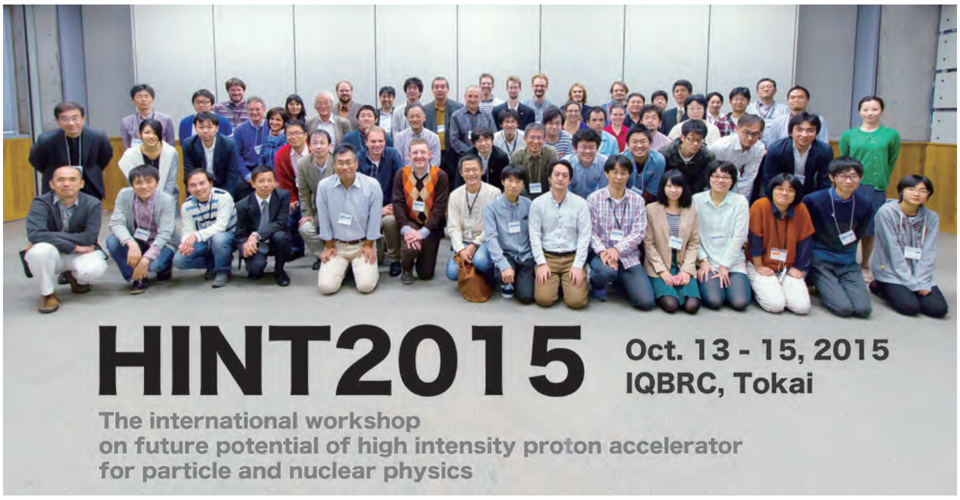
The clip motor

J-PARC Hello Science "Run! Spin! The Power of Magnets" (August 29)

J-PARC Hello Science was exhibited at a library festival as part of a program commemorating the 30th anniversary of the opening of the Tokai Village Library. The exhibit featured demonstrations of various experiments using magnetic force, and a mini-workshop on paper clip motors. About 50 children participated in making the "world's simplest clip motor". Watching the coils rotate in the motors they made, the children were surprised that a motor could be made so easily.

International Workshop on Future Potential of High-Intensity Proton Accelerators for Particle and Nuclear Physics (HINT2015) (October 13-15)

An international workshop was held to discuss the current status of elementary particle and nuclear physics using high-intensity proton accelerators, such as J-PARC, plans for high-intensity beams in the megawatt class, and prospects for new domains opened up by such facilities. The workshop was held at the Ibaraki Quantum Beam Research Center, and was attended by more than 130 researchers from 12 countries.



Participants of HINT 2015

Ozora Marche at Daijingu and Muramatsu-san Kokuzodo Temple (October 11)

The Ozora Marche is held every year by the Tokai Sightseeing Guide as an event for communicating the culture and history of Tokai Village to younger generations. The J-PARC Center participates by holding a “Science Experiment Corner”-“Superconducting Rollercoaster”, “Frigid World” using liquid nitrogen at –196°C, and “Running Battery”- for promoting interaction with the local community, and boosting interest in science.

J-PARC Hello Science Event Held at 2015 Tokai Village Elementary School Festival (November 7)

As part of the J-PARC Center’s efforts to stimulate the interest of children in science, a J-PARC Hello Science event on the power of electricity and magnetism was held at the 2015 Tokai Elementary School Festival (33rd Annual).

KEK Professor Emeritus Koichiro Nishikawa and K2K/T2K Collaboration Receive Breakthrough Prize (November 8)

Professor Emeritus Koichiro Nishikawa (former Deputy Director, J-PARC) and the K2K/T2K Collaboration received the 2016 Breakthrough Prize in Fundamental Physics for their achievements in the discovery of and research on neutrino oscillation. The Breakthrough Prize was established in 2012, and is a set of international academic awards in the field of fundamental physics, life science, and mathematics. Prof. Nishikawa and the K2K/T2K collaboration were awarded jointly with other four experiments, including the SuperKamiokande Experiment and KamLAND.

Stopped MLF Operation

The MLF had been operating since October 27, but operation was stopped on November 20 due to detection of moisture in the helium layer by a sensor installed in the neutron target vessel. Going through investigation/identification of the exact cause, it was deemed necessary to replace the neutron target vessel, and for this reason it was decided to shut down operation of the MLF for the time being. We apologized to all of our MLF users for causing so much trouble.

The 7th AONSA Neutron School and the 3rd MLF School (December 1-5)

The 7th AONSA Neutron School and the 3rd MLF School were held concurrently at MLF. These schools are for young researchers and graduate students from the Asia/Oceania region, and this year, a total of 41 participants took part. In terms of content, there were lectures on topics, such as neutron and muon science, followed by training relating to beams, in which the participants were divided into 12 small groups that worked to solve experimental problems on various themes using experimental data to report on it on the final day.

J-PARC Science Gallery –Understanding This Year's Nobel Prize in Physics in Just 30 Minutes-

The J-PARC Center held a Science Gallery in the village library, and Shinichi Sakamoto of the Public Relations Section provided an easy-to-understand explanation, starting from the question "What is an elementary particle?" and covering the research results which won the Nobel Prize in Physics 2015, "the discovery of neutrino oscillation".

Held J-PARC "Hello Science" Event at the Christmas Festival of the Ibaraki Science Museum of Atomic Energy –"Let's Make a Kaleidoscope of Light and Paper Clip Motors!"- (December 23)

A J-PARC "Hello Science" event was held at the annual Christmas Festival in the Ibaraki Science Museum of Atomic Energy. Participants heard a talk about the wonders of light, and then made a kaleidoscope, a picture pattern made with pin holes appeared to sparkle with rainbow colors. They also had the time to make the world's simplest paper clip motor. Events were held four times gathering 100 participants.

Participants listened closely wonders of light

Held J-PARC "Hello Science" Event at the Science Club of Muramatsu Elementary School, Tokai Village (January 20)

The J-PARC Center presented the amazing world of batteries and magnets at the science club of the Tokai Village Muramatsu Elementary School. We showed the club members the amazing movement of a battery through a coil of copper wire. When the secrets of the various magnet movements were explained, everyone's curiosity seemed to be stimulated.

3rd Symposium on Safety in Accelerator Facilities (January 27-28)

The J-PARC Center holds a safety symposium every year to exchange information and discuss efforts for ensuring facility safety and related matters. The participants were about 150 concerned people from various facilities, universities and companies in Japan, who shared information on various safety issues. In this year, two kinds of topics, "Management of radioactivity induced in accelerator facilities" and "Safety measures for low-temperature equipment and high-pressure gas equipment at accelerator facilities" were featured in the present symposium in addition to the existing topics such as "Lessons learned from incidents" and "Radiation safety at accelerator facilities".

SAT Technology Showcase 2016 Exhibited by J-PARC (February 4)

The J-PARC Center presented a booth featuring our projects at the SAT Technology Showcase 2016 held by the Science Academy of Tsukuba (SAT). The aim of this event was to announce research results and product technologies, and promote interaction between researchers and engineers. Many visitors stopped by J-PARC booth and gave us many questions about accelerators and the experiments.

At the J-PARC booth

Restarting of the MLF Operation (February 20)

Due to the problem with the neutron target vessel, we stopped the beam operation from November 24. After the investigation of the cause and the replacement of the target vessel with the same type that had provided the most reliable performance in the past, which was designed for lower output, we restarted the MLF operation with proton beam of 200 kW power.

1st ANSTO-J-PARC International Research Collaboration Workshop (March 2-3)

Over the two days, the 1st ANSTO-J-PARC International Research Collaboration Workshop was held at the J-PARC. This workshop was based on the memorandum of understanding on collaboration in the field of neutron science concluded in July, 2015. The approach to substantial research collaboration was discussed there.

FY2015 Quantum Beam Science Festa (7th MLF Symposium) (March 15-16)

The joint science festa of the KEK Institute of Materials Structure Science and the MLF was renamed this year as the “Quantum Beam Science Festa”, and it was held at the Tsukuba International Congress Center, with about 570 participants, including those attending the MLF Symposium and the PF Symposium on the second day. In the MLF Symposium, Toshiji Kanaya, Division Head of the Materials and Life Science Division, reported on topics such as future plans, user programs, the development situation of instruments and other equipment, problem with the target vessel, and how those problems are being handled.

Participants of the Quantum Beam Science Festa

MOU Signing Ceremony on Establishing a J-PARC Branch Office (March 18)

Osaka University and High Energy Accelerator Research Organization (KEK) have an agreement to promote collaboration and cooperation between the two organizations. Osaka University has participated in many research projects using the Hadron Experimental Facility and other systems. Based on the cooperative agreement, it was decided to establish the Osaka University J-PARC Center Branch Office at KEK Tokai Building No.1. The signing ceremony for the Memorandum of Understanding was held at the J-PARC Center.

Participants of MOU signing ceremony

Science Café: "Does Ibaraki Prefecture Really Rank Lowest in Attractiveness!" – The Appeal of Ibaraki, using Neutrons to Examine Everything from the Riddle of Life to Food Culture" (March 19)

At a Science Café organized by the JAEA, Hiroshi Nakagawa, Assistant Principal Researcher of the Quantum Beam Science Center, spoke on the theme mentioned in the title with J-PARC public relations advisor Shinichi Sakamoto acting as facilitator. Dr. Nakagawa is a researcher conducting experiments with neutrons at MLF, and he talked about the neutrons used in life science research and experiments. His talk covered the research of the storage characteristics of foods using neutrons with introducing an example "dried sweet potatoes", a noted product of Ibaraki Prefecture. There were many questions from the 20 participants regarding this topic from daily life.

The Science Café at Tokai industry and information Plaza

Visitors

Akimasa Ishikawa, member of the House of Representatives (April 20)

Masayoshi Yoshino, member of the House of Representatives (May 1)

Koji Omi, Founder and Chairman, Science and Technology in Society Forum (STS Forum) (June 22)

Adi Paterson, CEO, Australian Nuclear Science and Technology Organization (ANSTO) (August 18)

Richard Garrett, Senior Advisor, ANSTO (September 9)

Sukiman bin Sarmani, Chairman, Atomic Energy Licensing Board (AELB) and others (September 10)

Jonathan Joo-Thomson, Head of Climate Change and Energy Section, British Embassy, Tokyo (October 19)

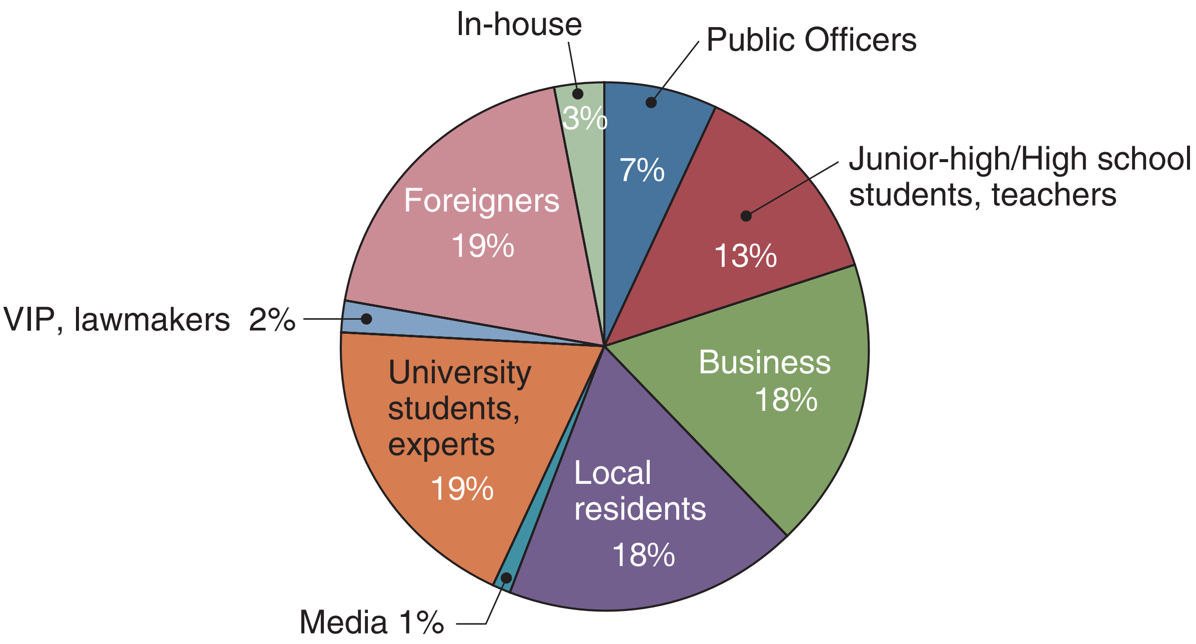
Lee, Gaonyup, Principal Researcher/Manager, Nuclear Emergency Preparedness, KAERI and others (November 5)

Logachev, Pavel Vladimirovich, Director, Budker Institute of Nuclear Physics (BINP) (December 2)

Nisamaneephong Pornthep, Executive Director, Thailand Institute of Nuclear Techmology (TINT) (March 11)

Shojiro Nishio, President, Osaka University (March 18)

There were 3,023 visitors to J-PARC for the period from April, 2015, to the end of March, 2016.



Publications

(A) Publications in Periodical Journals

A-001
Ohisa, S. *et al*.
Molecular Interdiffusion between Stacked Layers by Solution- and Thermal Annealing-Process in Organic Light Emitting Devices
ACS Appl. Mater. Interfaces, Vol 7, 20779 (2015)

A-002
Komatsu, K. *et al*.
Crystal structure of magnesium dichloride decahydrate determined by X-ray and neutron diffraction under high pressure
Acta Crystallographica, Vol B 71, 74-80 (2015)

A-003
Gong, W. *et al*.
Effect of prior martensite on bainite transformation in nanobainite steel
Acta Materialia, Vol 85, 243-249 (2015)

A-004
Zmeskal, J. *et al*.
MEASUREMENT OF THE STRONG INTERACTION INDUCED SHIFT AND WIDTH OF THE 1s STATE OF KAONIC DEUTERIUM AT J-PARC
Acta Phys. Pol. B Vol. 46, p. 101

A-005
Okuchi, T. *et al*.
Synthesis of large and homogeneous single crystals of water-bearing minerals by slow cooling at deep-mantle pressures
American Mineralogist (2015)

A-006
Ninomiya, K. *et al*.
Nondestructive Elemental Depth-Profiling Analysis by Muonic X-ray Measurement
Analytical Chemistry, Vol 87, 4597-4600 (2015)

A-007
Mizoguchi, H. *et al*.
An anti CuO2-type metal hydride square net structure in Ln2M2As2H(x) (Ln=La or Sm, M=Ti, V, Cr, or Mn)
Angew. Chem. Int. Edit., Vol 54, 2932-2935 (2015)

A-008
Takagi, S. *et al*.
True Boundary for the Formation of Homoleptic Transition-Metal Hydride Complexes
Angew. Chem. Int. Edit., Vol 54, 5650-5653 (2015)

A-009
Sato, T. *et al*.
Overview of particle and heavy ion transport code system PHITS
Annals Nucl. Energy Vol. 82, p. 110

A-010
Iio, M. *et al*.
Test Results of a Nb3Al/Nb3Sn Subscale Magnet for Accelerator Application IEEE Trans.
Appl. Supercond. Vol. 25, 4003405

A-011
Shishido, H. *et al*.
Neutron detection using a current biased kinetic inductance detector
Applied Physics Letters, Vol 107, 23601 (2015)

A-012
Matsuo, T. *et al*.
Internal dynamics of F-actin and myosin subfragment-1 studied by quasielastic neutron scattering
Biochemical and Biophysical Research Communications, Vol 459, 493-497 (2015)

A-013
Sugiyama, M. *et al*.
Solution structure of variant H2A.Z.1 nucleosome investigated by small-angle X-ray and neutron scatterings
Biochemistry and Biophysics Reports, Vol 4, 28-32 (2015)

A-014
Taminato, S. *et al*.
Highly reversible capacity at the surface of a lithium-rich manganese oxide: a model study using an epitaxial film system
Chemical Communications, Vol 51, 1673 (2015)

A-015
Mitsumi, M. *et al*.
Proton Order-Disorder Phenomena in a Hydrogen-Bonded Rhodium-η5-Semiquinone Complex: A Possible Dielectric Response Mechanism
Chemistry-Eur. J., Vol 21, 9682-9696 (2015)

A-016
Matsukawa, T. *et al*.
Neutron crystal structure analysis of stilbazolium derivatives for terahertz-wave generation
CrystEngComm, Vol 17, 2616-2619 (2015)

A-017
Makowska, M. G. *et al*.
Phase Transition Mapping by Means of Neutron Imaging in SOFC Anode Supports during Reduction under Applied Stress
ECS Transactions, Vol 68, 1103 (2015)

A-018
Mizuno, Y. *et al*.
Synthesis, crystal structure, and electrochemical properties of Li1.2+xMn0.3Co0.2Ni0.3O2 (x > 0) for lithium-ion battery cathodes
Electrochemistry, Vol 83, 820-823 (2015)

A-019
Idemoto, Y. *et al*.
Average and Local Crystal Structure and Electronic Structure of 0.4Li$_2$MnO$_3$-0.6LiMn$_{1/3}$Ni$_{1/3}$Co$_{1/3}$O$_2$ Using First-principles Calculations and Neutron Beam and Synchrotron X-Ray Sources
Electrochemistry, Vol 83, 879-884 (2015)

A-020
Iwamoto, H. *et al*.
Sensitivity and uncertainty analysis of the VENUS-F critical core
Energy Procedia, Vol 71, 33 (2015)

A-021
Kimura, A. *et al*.
Current activities and future plans for nuclear data measurements at J-PARC
Eur. Phys. J. A, Vol 51, 180 (2015)

A-022
Komatsu, K. *et al*.
Zr-based bulk metallic glass as a cylinder material for high pressure apparatuses
High Pressure Research, Vol 35, 254-262 (2015)

A-023
Shimomura, K.
Muonium in J-PARC; from fundamental to application
Hyperfine Interact. Vol. 233, p. 89

A-024
Yoshida, M. *et al*.
Status of Superconducting Solenoid System for COMET Phase-I Experiment at J-PARC
IEEE Trans. Appl. Supercond. Vol. 25, 4500904

A-025
Nomura, S. *et al*.
Design Study on Pulsed Power Supplies for the J-PARC Main Ring Magnets Using SMES
IEEE Trans. Appl. Supercond. Vol. 25, 5700805

A-026
Suzuki, S. Y. *et al*.
The Beamline DAQ System for the T2K Experiment
IEEE Trans. Nucl. Sci. Vol. 62, p. 1169

A-027
Kawamura, K. *et al*.
Structural Origin of the Anisotropic and Isotropic Thermal Expansion of K2NiF4-Type LaSrAlO4 and Sr2TiO4
Inorganic Chemistry, Vol 54, 3896–3904 (2015)

A-028
Baker, M. L. *et al*.
Relationship between Torsion and Anisotropic Exchange Coupling in a TbIII-Radical-Based Single-Molecule Magnet
Inorganic Chemistry, Vol 54, 5732-5738 (2015)

A-029
Iwase, K. *et al*.
Crystal Structure Analysis of La2Ni6CoDx During Deuterium Absorption Process
Inorganic Chemistry, Vol 54, 8650-8655 (2015)

A-030
Li, K. *et al*.
Synthesis, Structure, and Pressure-Induced Polymerization of Li3Fe(CN)6 Accompanied with Enhanced Conductivity
Inorganic Chemistry, Vol 54, 11276-11282 (2015)

A-031
He, S. *et al*.
Unusal Tempering Behavior of Fe-Cr-C Martensite
ISIJ International, Vol 55, 686-690 (2015)

A-032
Oba, Y. *et al*.
Simultaneous characterization of precipitates and matrix in a steel using small-angle neutron scattering and Bragg-edge transmission analysis
ISIJ International, Vol 55, 2618 (2015)

A-033
Zhang, Q. H. *et al*.
An in situ neutron diffraction study of anomalous superelasticity in a strain glass Ni43Fe18Ga27Co12 alloy
J. Appl. Crystallogr., Vol 48, 1183-1191 (2015)

A-034
Miura, A. *et al*.
Design and delivery of beam monitors for the energy-upgraded linac in J-PARC
J. Korean Phys. Soc. Vol. 66, p. 364

A-035
Kwon, O. *et al*.
Synthesis, structure, and conduction mechanism of the lithium superionic conductor Li10+δGe1+δP2−δS12
J. Mater. Chem. A, Vol 3, 438-446 (2015)

A-036
Fujii, K. *et al*.
Improved oxide-ion conductivity of NdBaInO4 by Sr doping
J. Mater. Chem. A, Vol 3, 11985-11990 (2015)

A-037
Ikeda, Y. *et al*.
Transport and Thermodynamic Studies of Stripe and Checkerboard Ordering in Layered Nickel Oxides $R_{2-x}Sr_xNiO_4$ (R = La and Nd)
J. Phys. Soc. Jpn., Vol 84, 023706 (2015)

A-038
Kobayashi, Y. *et al*.
Identification of Various Coexisting Phases in Superconducting and Non-superconducting Samples of RbxFe2−ySe2
J. Phys. Soc. Jpn., Vol 84, 44710 (2015)

A-039
Kajimoto, R. *et al*.
Development of Spin Correlations in the Geometrically Frustrated Triangular-Lattice Heisenberg Antiferromagnet CuCrO2
J. Phys. Soc. Jpn., Vol 84, 074708 (2015)

A-040
Kamazawa, K. *et al*.
Spin Fluctuation in YBaFe4O7+δ with Geometrically Frustrated Pyrochlore Lattice of Fe Spins
J. Phys. Soc. Jpn., Vol 84, 104711 (2015)

A-041
Ikeda, Y. *et al*.
Single-Crystal Neutron Diffraction Study of the Heavy-Electron Superconductor CeNiGe3
J. Phys. Soc. Jpn., Vol 84, 123701 (2015)

A-042
Nakadaira, T.
The graphite target for J-PARC neutrino beam-line
J. Radioanal. Nucl. Chem. Vol. 305, p. 777

A-043
Takahashi, H. *et al*.
Indirectly water-cooled production target at J-PARC hadron facility
J. Radioanal. Nucl. Chem. Vol. 305, p. 803

A-044
Makimura, S. *et al*.
Development of muon rotating target at J-PARC/MUSE
J. Radioanal. Nucl. Chem. Vol. 305, p. 811

A-045
Saha, P. K. *et al*.
Measurement of continuous degradation of a stripper foil during ths operation with 300 kW beam power in the 3-GeV RCS of J-PARC
J. Radioanal. Nucl. Chem. Vol. 305, p. 851

A-046
Yamazaki, Y. *et al*.
Analyses and the effect of impurities contained in charge stripper foils for the 3-GeV RCS of J-PARC
J. Radioanal. Nucl. Chem. Vol. 305, p. 859

A-047
Yoshimoto, M. *et al*.
Maintenance of radio-activated stripper foils in the 3 GeV RCS of J-PARC
J. Radioanal. Nucl. Chem. Vol. 305, p. 865

A-048
Sato, M. *et al*.
Liquid ^{3}He target for an experimental search for nuclear anti-kaon bound states in J-PARC
J. Radioanal. Nucl. Chem. Vol. 305, p. 883

A-049
Yokoyama, T. *et al*.
Protonation State and Hydration of Bisphosphonate Bound to Farnesyl Pyrophosphate Synthase
Journal of Medicinal Chemistry, Vol 58, 7549-7556 (2015)

A-050
Wan, T. *et al*.
In-situ structural integrity evaluation for high-power pulsed spallation neutron source – Effects of cavitation damage on structural vibration
Journal of Nuclear Materials, Vol 468, 321-330 (2015)

A-051
Negm, H. *et al*.
Reaction-yield dependence of the (γ, γ') reaction of ^238U on the target thickness
Journal of Nuclear Science and Technology, p.811 - 820 (2015)

A-052
Kogawa, H. *et al*.
Development of microbubble generator for suppression of pressure waves in mercury target of spallation source
Journal of Nuclear Science and Technology, Vol 52, 1461-1469 (2015)

A-053
Idemoto, Y. *et al*.
Characterization, average and electronic structures during charge–discharge cycle in $0.6Li_2MnO_3–0.4Li(Co_{1/3}Ni_{1/3}Mn_{1/3})O_2$ solid solution of a cathode active material for Li-ion battery
Journal of Power Sources, Vol 273, 1023-1029 (2015)

A-054
Yoshida, G. *et al*.
Muon capture probability of carbon and oxygen for CO, CO_2, and COS under low-pressure gas conditions
Journal of Radioanalytical and Nuclear Chemistry, Vol 303, 1277-1281 (2015)

A-055
Saha, P. K. *et al*.
Measurement of continuous degradation of a stripper foil during six months operation with 300 kW beam power in the 3-GeV RCS of J-PARC
Journal of Radioanalytical and Nuclear Chemistry, Vol 305, 851 (2015)

A-056
Unno, M. *et al*.
Insights into the Proton Transfer Mechanism of a Bilin Reductase PcyA Following Neutron Crystallography
Journal of the American Chemical Society, Vol 137, 5452-5460 (2015)

A-057
Tamura, J. *et al*.
High-power Test of Annular-ring Coupled

Structures for the J-PARC Linac Energy Upgrade
Journal of the Korean Physical Society, Vol 66, 399 (2015)

A-058
神谷 潤一郎 他
J-PARC RCS キッカー電磁石の In Situ での脱ガス
Journal of the vacuum society of Japan, Vol 58, 134 (2015)

A-059
荻原 徳男
回転円板から放出される気体分子の指向性に関するシミュレーション
Journal of the vacuum society of Japan, Vol 58, 168 (2015)

A-060
Kamiya, J. *et al*.
Titanium Alloy as a Potential Low Radioactivation Vacuum Material
Journal of Vacuum Science and Technology A, Vol 33, 031606-1 (2015)

A-061
岩元 大樹、西原 健司、他
パルス中性子源法を用いた未臨界度のオンライン測定
KURRI KR (CD) (CD-ROM),50, ROMBUNNNO.5 (2015)

A-062
Hirata, T. *et al*.
Effect of Local Chain Dynamics on a Bioinert Interface
Langmuir, Vol 31, 3661 (2015)

A-063
Chen, F. *et al*.
Confinement Effect on the Effective Viscosity of Plasticized Polymer Films
Macromolecules, Vol 48, 7719 (2015)

A-064
Cheon, C. I. *et al*.
Monoclinic ferroelectric NaNbO3 at room temperature: Crystal structure solved by using super high resolution neutron powder diffraction
Mater. Lett. Vol. 156, p. 214

A-065
Shi, Z. M. *et al*.
Study of tempering behavior of lath martensite using in situ neutron diffraction
Materials Characterization, Vol 107, 29-32 (2015)

A-066
Shi, Z. *et al*.
Effect of non-isothermal deformation of austenite on ferrite transformation behavior studied by in-situ neutron diffraction
Materials Science and Engineering: A, Vol 631, 153-159 (2015)

A-067
Sato, H. *et al*.
Relation between Vickers Hardness and Bragg-Edge Broadening in Quenched Steel Rods Observed by Pulsed Neutron Transmission Imaging
Materials Transactions, Vol 56, 1147 (2015)

A-068
Nii, Y. *et al*.
Uniaxial stress control of skyrmion phase
Nature Commun, Vol 6, 8539 (2015)

A-069
Saito, N. *et al*.
2nd International Symposium on Science at J-PARC: Unlocking the Mysteries of Life, Matter, and the Universe
Neutron News Vol. 26, No. 1, p. 10

A-070
Segawa, M. *et al*.
Development of a pulsed neutron three-dimensional imaging system using a highly sensitive image-intensifier at J-PARC
NUCL INSTRUM METH A, Vol 769, 97 (2015)

A-071
Hasemi, H. *et al*.
Evaluation of nuclide density by neutron resonance transmission at the NOBORU instrument in J-PARC/MLF
NUCL INSTRUM METH A, Vol 773, 137 (2015)

A-072
Hino, M. *et al*.
The ion beam sputtering facility at KURRI: Coatings for advanced neutron optical devices
Nucl. Instr. and Meth. A, Vol 797, 265 (2015)

A-073
Koike, T. *et al*.
Development of a low-temperature germanium detector via mechanical cooling with a compact pulse-tube refrigerator
Nucl. Instrum. Methods Phys. Res. A Vol. 770, p. 1

A-074
Saha, P. K. *et al*.
Measurement of 181 MeV H– ions stripping cross-sections by carbon stripper foil
Nucl. Instrum. Methods Phys. Res. A Vol. 776, p. 87

A-075
Miyazaki, Y. *et al*.
Performance test of a lead-glass counter for the J-PARC E36 experiment
Nucl. Instrum. Methods Phys. Res. A Vol. 779, p. 13

A-076
Hattori, T. *et al*.
Design and performance of high-pressure PLANET beamline at pulsed neutron source at J-PARC
Nucl. Instrum. Methods Phys. Res. A Vol. 780, p. 55

A-077
Sekiguchi, T. *et al*.
Development and operational experience of magnetic horn system for T2K experiment
Nucl. Instrum. Methods Phys. Res. A Vol. 789, p. 57

A-078
Matsumura, T. *et al*.
Photon-veto counters at the outer edge of the endcap calorimeter for the KOTO experiment
Nucl. Instrum. Methods Phys. Res. A Vol. 795, p. 19

A-079
Kim, S. H. *et al*.
Cosmic-ray test of a time-of-flight detector for double-strangeness experiments at J-PARC
Nucl. Instrum. Methods Phys. Res. A Vol. 795, p. 39

A-080
Tabata, M. *et al*.
Fabrication of silica aerogel with n=1.08 for e^+/μ^+ separation in a threshold Cherenkov counter of the J-PARC TREK/E36 experiment
Nucl. Instrum. Methods Phys. Res. A Vol. 795, p. 206

A-081
Nomura, M. *et al*.
Mechanisms of increasing of the magnetic alloy core shunt impedance by applying a transverse magnetic field during annealing
Nucl. Instrum. Methods Phys. Res. A Vol. 797, p. 196

A-082
Arimoto, Y. *et al*
Development of time projection chamber for precise neutron lifetime measurement using pulsed cold neutron beams
Nucl. Instrum. Methods Phys. Res. A Vol. 799, p. 187

A-083
Saha, P. K. *et al*.
Measurement of 181MeV H^- ions stripping cross-sections by carbon stripper foil
Nuclear Instrumentation and Method in Physics Research: Section A, Vol 776, 87 (2015)

A-084
Hotchi, H, *et al*.
Numerical study for beam loss occurring for wide-ranging transverse injection painting and its mitigation scenario in the J-PARC 3-GeV RCS
Nuclear Instruments and Methods in Physics Research A 778 102–114 (2015)

A-085
Hattori, T. *et al*.
Design and performance of high-pressure PLANET beamline at pulsed neutron source at J-PARC
Nuclear Instruments and Methods in Physics Research Section A, Vol 780, 55-67 (2015)

A-086
Aoki, K. *et al*.
Operation of the SKS magnet at the K1.8 beam line in the J-PARC hadron hall
Phys. Procedia Vol. 67, p. 809

A-087
Kino, K. *et al*.
First Imaging Experiment of a Lithium Ion Battery by a Pulsed Neutron Beam at J-PARC/MLF/BL09
Phys. Procedia Vol. 69, p. 612

A-088
Katabuchi, T. *et al*.
Misassigned neutron resonances of Nd-142 and stellar neutron capture cross sections
Phys. Rev. C, Vol 91, 37603 (2015)

A-089
Abe, K. *et al*.
Search for short baseline ve disappearance with the T2K near detector
Phys. Rev. D Vol. 91, 051102

A-090
Abe, K. *et al*.
Measurements of neutrino oscillation in appearance and disappearance channels by the T2K experiment with 6.6 ×10^{20} protons on target
Phys. Rev. D Vol. 91, 072010

A-091
Abe, K. *et al*.
Measurement of the νμ charged current quasielastic cross section on carbon with the T2K on-axis neutrino beam
Phys. Rev. D Vol. 91, 112002

A-092
Abe, K. *et al*.
Measurement of the electron neutrino charged-current interaction rate on water with the T2K ND280 π^0 detector
Phys. Rev. D Vol. 91, 112010

A-093
Abe, K. *et al*.
Measurement of the νμ charged-current quasielastic cross section on carbon with the ND280 detector at T2K
Phys. Rev. D Vol. 92, 112003

A-094
Tamura, F. *et al.*
High intensity single bunch operation with heavy periodic transient beam loading in wide band rf cavities
Phys. Rev. ST Accel. Beams, Vol 18, 91004 (2015)

A-095
Hirata, T. *et al*.
Effect of interfacial structure on bioinert properties of poly(2-methoxyethyl acrylate)/poly(methyl methacrylate) blend films in water
Physical Chemistry Chemical Physics , Vol 17, 17399 (2015)

A-096
菖蒲田 義博　他
Triangle and concave pentagon electrodes for an improved broadband frequency response of stripline beam position monitors
Physical review accelerator and beams, Vol 19, 21003-1 (2016)

A-097
Mori, K. *et al*.
Direct Observation of Fast Lithium-Ion Diffusion in a Superionic Conductor: Li7P3S11 Metastable Crystal
Physical Review Applied, Vol 4, 054008 (2015)

A-098
Hayashida, S. *et al*.
Magnetic model in multiferroic $\mathrm{NdFe_3(BO_3)_4}$ investigated by Inelastic Neutron Scattering
Physical Review B, Vol 92, 054402 (2015)

A-099
Yamauchi, I. *et al*.
Structural anomalies and short-range magnetic correlations in the orbitally degenerate system $\mathrm{Sr_2\,VO_4}$
Physical Review B, Vol 92, 064408 (2015)

A-100
Shimomura, K. *et al*.
Electronic structure of Mu-complex donor state in rutile $\mathrm{TiO_2}$
Physical Review B, Vol 92, 075203 (2015)

A-101
Ito, T. U. *et al*.
Perturbation on hyperfine-enhanced ^{141}Pr nuclear spin dynamics associated with antiferroquadrupolar order in $\mathrm{PrV_2Al_{20}}$
Physical Review B, Vol 92, 125151 (2015)

A-102
Umegaki, I. *et al*.
Spinon, soliton, and breather in the spin-1/2 antiferromagnetic chain compound KCuGaF6
Physical Review B, Vol 92, 174412 (2015)

A-103
Hase, M. *et al*.
Magnetic excitations in the spin-1/2 tetramer substance Cu2 114Cd11B2O6 obtained by inelastic neutron scattering experiments
Physical Review B, Vol 92, 184412 (2015)

A-104
Lee, H. *et al*.
Interpenetration of Chemically Identical Polymer onto Grafted Substrates
Polymer, Vol 74, 70 (2015)

A-105
Hirata, T. *et al*.
Construction of a blood-compatible interface based on surface segregation in a polymer blend
Polymer, Vol 78, 219 (2015)

A-106
Suzuki, K. *et al*.
Measurement of the muon beam direction and muon flux for the T2K neutrino experiment
Prog. Theor. Exp. Phys. 2015, 053C01

A-107
Abe, K. *et al*.
Physics potential of a long-baseline neutrino oscillation experiment using a J-PARC neutrino beam and Hyper-Kamiokande
Prog. Theor. Exp. Phys. 2015, 053C02

A-108
Hashimoto, T. *et al*.
Search for the deeply bound K^-pp state from the semi-inclusive forward-neutron spectrum in the in-flight K^-reaction on helium-3
Prog. Theor. Exp. Phys. 2015, 061D01

A-109
Ajimura, S. *et al*.
On-site background measurements for the J-PARC E56 experiment: A search for the sterile neutrino at J-PARC MLF
Prog. Theor. Exp. Phys. 2015, 063C01

A-110
Maeda, Y. *et al*.
An aerogel Cherenkov detector for multi-GeV photon detection with low sensitivity to neutrons
Prog. Theor. Exp. Phys. 2015, 063H01

A-111
Payra, D. *et al*.
Bioinspired adhesive polymer coatings for efficient and versatile corrosion resistance
RSC Advances, Vol 5, 15977 (2015)

A-112
Nakamura, A. *et al*.
"Newton's cradle" proton relay with amide–imidic acid tautomerization in inverting cellulase visualized by neutron crystallography
Science Advances, Vol 1, e1500263 (2015)

A-113
Funamori, N. *et al*.
Muonium in Stishovite: Implications for the Possible Existence of Neutral Atomic Hydrogen in the Earth's Deep Mantle
Scientific Reports, Vol 5, 8437 (2015)

A-114
Mori, K. *et al*.
Three-dimensional structures and lithium-ion conduction pathways of (Li2S) x(GeS2)100–x superionic glasses
Solid State Ionics, Vol 280, 44-50 (2015)

A-115
Osamura, K. *et al*.
Local strain exerted on Nb 3 Sn filaments in an ITER strand
Superconductor Science and Technology, Vol 28, 45016 (2015)

A-116
明午 伸一郎
J-PARC MLF の大強度ビームコミッショニングの現状
波紋, Vol 25, 271 (2015)

(C) Conference Reports and Books

C-001
Saha, P. K. *et al*.
First Simulation Results of Heavy-ion Acceleration in the RCS of J-PARC
13th International Conf. on Heavy Ion Accelerator Technology (HIAT 2015), 127 (2015)

C-002
Ueno, A. *et al*.
Emittance measurements for optimum operation of the J-PARC RF-driven H- ion source
AIP Conf. Proc., Vol 1655, 030009 (2015)

C-003
Ueno, A. *et al*.
Rod-filter-field optimization of the J-PARC RF-driven H- ion source
AIP Conf. Proc., Vol 1655, 030010 (2015)

C-004
Nakajima, K. *et al*.
Beam-transport optimization for cold-neutron spectrometer
EPJ Web of Conf., Vol 83, 03011 (2015)

C-005
Yokoo, T. *et al*.
Polarized neutron spectrometer for inelastic experiments at J-PARC : Status of POLANO Project
EPJ Web of Conferences, Vol 83, 03018 (2015)

C-006
Hori, J. *et al*.
Neutron Capture Cross Section Measurement on 91Zr at J-PARC/MLF/ANNRI
EPJ Web of Conf. (Internet), Vol 93, 2004 (2015)

C-007
Harada, H. *et al*.
Accuracy Improvement of Neutron Nuclear Data on Minor Actinides
EPJ Web of Conf. (Internet), Vol 93, 6001 (2015)

C-008
Shimomura, K.
Muonium in J-PARC; from fundamental toapplication
Hyperfine Interactions, Vol 235, 89-95 (2015)

C-009
Futakawa, M.
Material issues relating to high power spallation neutron sources
IOP Conf. Series: Materials Science and Engineering, Vol 74, 12001 (2015)

C-010
Ikeda, Y. *et al*.
Caracterization of Ferromagnetic Order in $CePd_2P_2$
J. Phys.: Conf. Series, Vol 592, 012013 (2015)

C-011
Konno, S. *et al*.
Intermultiplet transitions in filled skutterudite $SmFe_4P_{12}$
J. Phys.: Conf. Series , Vol 592, 012029 (2015)

C-012
Yoshida, G. *et al*.
Muonic atom formation processes for carbon containing molecules
J. Phys. Conf. Ser. Vol. 635, 052047

C-013
Hamada, E. *et al*.
The Application of DAQ-Middleware to the J-PARC E16 Experiment
J. Phys. Conf. Ser. Vol. 664, 082016

C-014
Obara, Y. *et al*.
Development of GEM trigger electronics for the J-PARC E16 experiment
J. Phys. Conf. Ser. Vol. 664, 082043

C-015
Takahashi, T. N. *et al*.
The electronics, online trigger system and data acquisition system of the J-PARC E16 experiment
J. Phys. Conf. Ser. Vol. 664, 082053

C-016
Kajimoto, R. *et al*.
Recent progress in the chopper spectrometer 4SEASONS at J-PARC
JAEA-Conf, Vol 2015-002, 319-329 (2015)

C-017
Nakamura, M. *et al*.
MAGIC chopper: basic concept and experimental evaluation
JAEA-Conf, Vol 2015-002, 339-348 (2015)

C-018
Saha, P. K. for the RCS beam commissioning team
Beam Commissioning Results of the J-PARC 3-GeV RCS Injection System with Upgraded 400 MeV Beam
Japan Physical Society Conf. Proc., Vol 8, 12014 (2015)

C-019
Ikeuchi, K. *et al*.
Detailed Study of the Phase Diagram of Fe-based Superconductor Ba(Fe1-xCox)2As2 by Super High-Resolution Neutron Diffraction Measurements
Journal of Physics, Vol 592, 12071 (2015)

C-020
Sakaguchi, Y. *et al*.
Dynamics of silver photo-diffusion into Ge-chalcogenide films: time-resolved neutron reflectometry
Journal of Physics; Conference Series, Vol 619, 012046 (2015)

C-021
Tomoyori, K. *et al*.
Background elimination using the SNIP method for Bragg reflections from a protein crystal measured by a time-of-flight single-crystal neutron diffractometer
Journal of Physics: Conf. Series, Vol 664, 072049-042055 (2015)

C-022
Tatsumoto, H. *et al*.
Heat Transfer Characteristics of a Horizontal Wire in Pools of Liquid and Supercritical Hydrogen
Journal of Superconductivity and Novel Magnetism, Vol 28, 1185-1188 (2015)

C-023
Futakawa, M.
Targetry overview — Various target concepts and expectable next generation targets in power frontier applications —
JPS Conf. Proc., Vol 8, 001002 (2015)

C-024
Miura, A. *et al*.
Beam monitors for the commissioning of energy upgraded linac
JPS Conf. Proc., p.011002_1 - 011002_6 (2015)

C-025
Miura, A. *et al*.
Bunch shape measurement of 181 MeV beam in J-PARC linac
JPS Conf. Proc., 8, p.011003_1 - 011003_6 (2015)

C-026
Oguri, H. *et al*.
Operation status of the J-PARC ion source
JPS Conf. Proc., p.011009_1 - 011009_6 (2015)

C-027
菖蒲田 義博　他
Analytical Estimation of the Field modulation during the injection period for the 3GeV RCS in J-PARC
JPS conf. proc., Vol 8, 012003-1 (2015)

C-028
Hotchi, H. *et al*.
Introducing an 8-GeV Booster Synchrotron between RCS and MR at J-PARC — One Possible Option toward a Multi-MW Output Beam Power from MR
JPS Conf. Proc. Vol 8, 012008 (2015)

C-029
Harada, H. *et al*.
Optics Tuning for Beam Collimation in the J-PARC 3-50 Beam Transport Line
JPS Conf. Proc., Vol 8, 012010-1 (2015)

C-030
Harada, H. *et al*
The Residual Gas Ionization Profile Monitor in the J-PARC 3-GeV Rapid Cycling Synchrotron
JPS Conf. Proc., Vol 8, 012011-1 (2015)

C-031
Harada, H. *et al*.
Design of Injection and Extraction at an 8-GeV Booster Ring and the J-PARC Main Ring for Multi-MW Output Beam Power
JPS Conf. Proc., Vol 8, 012012-1 (2015)

C-032
Hotchi, H.
1-MW Beam Operation Scenario of the J-PARC 3-GeV Rapid Cycling Synchrotron
JPS Conf. Proc. Vol 8, 012013 (2015)

C-033
Tani, N. *et al*.
The Realignment of the Beamline for J-PARC 3GeV RCS
JPS Conf. Proc., Vol 8, 012016-1 (2015)

C-034
Ohmori, C. *et al*.
High Temperature μSR Experiments for Accelerator Developments
JPS Conf. Proc., Vol 8, 012025 (2015)

C-035
Osawa, T. *et al*.
Elemental Analysis System with Negative-Muon Beam
JPS Conf. Proc., Vol 8, 025003 (2015)

C-036
Kanda, S. *et al*.
Precision Measurement of Muonium Hyperfine Splitting at J-PARC and Integrated Detector System for High-Intensity Pulsed Muon Beam Experiment
JPS Conf. Proc., Vol 8, 025006 (2015)

C-037
Nakatsugawa, Y. *et al*.
Silicon Carbide Target for a Muon-Electron Conversion Search at J-PARC MLF
JPS Conf. Proc., Vol 8, 025013 (2015)

C-038
Kitamura, R. *et al*.
Studies on Muonium Production from Silica Aerogel with Substructure for the Muon g-2/EDM Experiment
JPS Conf. Proc., Vol 8, 025016 (2015)

C-039
Torii, H. A. *et al*.
Precise Measurement of Muonium HFS at J-PARC MUSE
JPS Conf. Proc., Vol 8, 025018 (2015)

C-040
Harjo, S. *et al*.
Thermal Strain in Superconducting Nb3Sn Strand at Cryogenic Temperature
JPS Conf. Proc., Vol 8, 031001 (2015)

C-041
Hosokawa, S. *et al*.
A Combination of Anomalous X-ray Scattering and Neutron Diffraction for Structural Characterizations of Zr45Cu45Ag10Metallic Glass
JPS Conf. Proc., Vol 8, 31002 (2015)

C-042
Furuta, K. *et al*.
Local Structure of Lithium Ion Conducting Germanium Sulfide Glass: (Li2S)40(GeS2)60
JPS Conf. Proc., Vol 8, 31004 (2015)

C-043
Harjo, S. *et al*.
Metastable Austenitic Steel Deformation at Low Temperature
JPS Conf. Proc., Vol 8, 031005 (2015)

C-044
Suzuki, H. *et al*.
Application of Neutron Stress Measurement to Reinforced Concrete Structure
JPS Conf. Proc., Vol 8, 031006 (2015)

C-045
Maruyama, K. *et al*.
Neutron Diffraction Study of Isotope Enriched Glassy Sm4Ti9O24
JPS Conf. Proc., Vol 8, 31007 (2015)

C-046
Tahara, S. *et al*.
Two Low-Energy Excitations in Superionic Conductors of RbAg4I5 and KAg4I5
JPS Conf. Proc., Vol 8, 031008 (2015)

C-047
Kawasaki, T. *et al*.
Dislocation Characteristics of Martensitic Steel Studied by In-Situ Neutron Diffraction Experiment
JPS Conf. Proc., Vol 8, 031009 (2015)

C-048
Kiyanagi, R. *et al*.
Phase Transition and Internal Crystal Structure of Superprotonic Conductor, Rb3-xKxH(SeO4)2
JPS Conf. Proc., Vol 8, 31012 (2015)

C-049
Onodera, Y. *et al*.
Structure and conductivity of Na-P-S superionic conducting glasses studied by neutron and X-ray diffraction
JPS Conf. Proc., Vol 8, 31013 (2015)

C-050
Su, Y. *et al*.
Microstructure and Residual Strain Distribution in Cast Duplex Stainless Steel Studied by Neutron Imaging
JPS Conf. Proc., Vol 8, 31015 (2015)

C-051
Adipranoto, D. S. *et al*.
Crystal-Local Structure Analyses for Cathode LIBs LiNi1−xCoxO2(0 ≤x≤ 1) by Neutron Diffraction
JPS Conf. Proc., Vol 8, 031017 (2015)

C-052
Arima, H. *et al*.
Structural Study of Fe80B20 Amorphous Alloy by Anomalous X-ray Scattering Coupled with Neutron Diffraction
JPS Conf. Proc., Vol 8, 31019 (2015)

C-053
Kino, K. *et al*.
Application of the J-PARC Neutron Beam to the Transmission Measurement for a Li Ion Battery during Charge and Discharge
JPS Conf. Proc., Vol 8, 031021 (2015)

C-054
Xu, P. *et al*.
Progress in Bulk Texture Measurement

Using Neutron Diffraction
JPS Conf. Proc., Vol 8, 031022 (2015)

C-055
Sakaguchi, Y. *et al*.
Measurement of Transient Photo-Induced Changes in Thin Films at J-PARC — Time-Resolved Neutron Reflectivity Measurements of Silver Photo-Diffusion into Ge-Chalcogenide Films
JPS Conf. Proc., Vol 8, 031023 (2015)

C-056
Hoshikawa, A. *et al*.
Structure Analysis of Propane Hydrates
JPS Conf. Proc., Vol 8, 32001 (2015)

C-057
Abe, H. *et al*.
Size-tunable confined water in a room temperature ionic liquid
JPS Conf. Proc, Vol 8, 033001 (2015)

C-058
Inagaki, M. *et al*.
Muonic Atom Formation by Muon Transfer Process in C_6H_6 or C_6H_{12} and CCl_4 Mixtures
JPS Conf. Proc., Vol 8, 033004 (2015)

C-059
Ninomiya, K. *et al*.
Elemental Analysis of Bronze Artifacts by Muonic X-ray Spectroscopy
JPS Conf. Proc., Vol 8, 033005 (2015)

C-060
Pant, A. D. *et al*.
Hydration Effect on Electron Transfer in Cytochrome c Monitored by μSR
JPS Conf. Proc., Vol 8, 033007 (2015)

C-061
Sekine, Y. *et al*.
Neutron Diffraction of Ice and Water in Hydrogels
JPS Conf. Proc., Vol 8, 33009 (2015)

C-062
Fukazawa, H. *et al*.
Properties of Ferroelectric Ice
JPS Conf. Proc., Vol 8, 033010 (2015)

C-063
Akutsu, K. *et al*.
Structural study of gold nanoparticle/surfactant complex by SANS, SAXS, TEM, and EXAFS Techniques
JPS Conf. Proc, Vol 8, 033011 (2015)

C-064
Iwase, H. *et al*.
SANS and SAXS studies on the aggregates properties of a Gemini-type amphiphilic dendrimer in solution
JPS Conf. Proc, Vol 8, 33012 (2015)

C-065
Azuma, K. *et al*.
Depth Distribution of Component for the Thin Films of Binary Polystyrene Blends with Different Molecular Weights
JPS Conf. Proc., Vol 8, 033013 (2015)

C-066
Itoh, S. *et al*.
Science from the initial operation of HRC
JPS Conf. Proc., Vol 8, 034001 (2015)

C-067
Kodama, K. *et al*.
Local Lattice Distortion Caused by Short-Range Charge Ordering in Transition Metal Oxides
JPS Conf. Proc., Vol 8, 034002 (2015)

C-068
Amemiya, K. *et al*.
Magnetic Field Dependence of the Canted Spin Moment around the Interface between Ferromagnetic Ni and Antiferromagnetic FeMn Revealed by the Polarized Neutron Reflectivity
JPS Conf. Proc., Vol 8, 34004 (2015)

C-069
Ohishi, K. *et al*.
Relation between Crystallographic and Magnetic Chiralities in a Chiral Helimagnet $CsCuCl_3$
JPS Conf. Proc., Vol 8, 034006 (2015)

C-070
Lee, S. *et al*.
Time of Flight Neutron Diffraction on NiO
JPS Conf. Proc., Vol 8, 034007 (2015)

C-071
Ueno, T. *et al*.
Structural and Magnetic Depth Profile Analysis of L10 FeNi Film by Polarized Neutron Reflectometry
JPS Conf. Proc., Vol 8, 034008 (2015)

C-072
Mochiku, T. *et al*.
Crystal Structure of the Fe1−xSr2YCu2+xO6+δ Magnetic Superconductor
JPS Conf. Proc., Vol 8, 34009 (2015)

C-073
Nakao, A. *et al*.
Magnetic and Crystal Structures of the Room Temperature Ferrimagnet Sr3YCo4O10.5
JPS Conf. Proc., Vol 8, 034010 (2015)

C-074
Wakimoto, S. *et al*.
Neutron Scattering Study of Spin Fluctuations in La2−xSrxCuO4 by Four-Dimensional Mapping of Neutron Cross-Sections Using the 4SEASONS Chopper Spectrometer
JPS Conf. Proc., Vol 8, 034013 (2015)

C-075
Hiroi, K. *et al*.
Development of AC Magnetic Field Imaging Technique Using Polarized Pulsed Neutrons at J-PARC
JPS Conf. Proc., Vol 8, 35001 (2015)

C-076
Harada, M. *et al*.
Inner Observation of Canning Cadmium by Energy-Selective Neutron Imaging at NOBORU
JPS Conf. Proc., Vol 8, 35002 (2015)

C-077
Kajimoto, R. *et al*.
Background Caused by Continuously Emitted High-Energy Neutrons at the Chopper Spectrometer 4SEASONS
JPS Conf. Proc., Vol 8, 036001 (2015)

C-078
Oikawa, K. *et al*.
Custom-Made Shutter Block for Imaging Instrument "RADEN" at J-PARC
JPS Conf. Proc., Vol 8, 036002 (2015)

C-079
Yamada, N. L. *et al*.
Development of Sample Environments for the SOFIA Reflectometer for Seconds-Order Time-Slicing Measurements
JPS Conf. Proc., Vol 8, 036003 (2015)

C-080
Tomoyori, K. *et al*.
Evaluation of the Resolvable Capacity of Bragg Reflections for a New Diffractometer at J-PARC/MLF Designed for Protein Crystals with Large Unit Cells
JPS Conf. Proc., Vol 8, 036004 (2015)

C-081
Segawa, M. *et al*.
Development of a Three-Dimensional Computed Tomography System using High-Speed Camera at a Pulsed Neutron Source
JPS Conf. Proc., Vol 8, 36006 (2015)

C-082
Ooi, M. *et al*.
Upgrade of Monitoring and Operation Systems for the MLF-GCS Base on EPICS and CSS
JPS Conf. Proc., Vol 8, 036007 (2015)

C-083
Kira, H. *et al*.
Demonstration study of small-angle polarized neutron scattering using polarized 3He neutron spin filter
JPS Conf. Proc, Vol 8, 036008 (2015)

C-084
Oku, T. *et al.*
Development of Compact Laser Optics for an In-Situ Spin-Exchange Optical Pumping 3He Neutron Spin Filter
JPS Conf. Proc., Vol 8, 036009 (2015)

C-085
Suzuki, N. *et al.*
Optimization of Radial Collimators for a Powder Diffractometer SPICA
JPS Conf. Proc., Vol 8, 036010 (2015)

C-086
Nakamura, M. *et al.*
Oscillating Radial Collimators for the Chopper Spectrometers at MLF in J-PARC
JPS Conf. Proc., Vol 8, 036011 (2015)

C-087
Ishizuka, K. *et al.*
Super-Resolution Processing for Pulsed Neutron Imaging System Using a High-Speed Camera
JPS Conf. Proc., Vol 8, 36012 (2015)

C-088
Nakatani, T. *et al.*
The Control Software Framework of the Web Base
JPS Conf. Proc., Vol 8, 036013 (2015)

C-089
Ito, T. U. *et al.*
Online Monitoring of Negative Muon Beam Profiles at J-PARC MUSE using a Gated Image Intensifier
JPS Conf. Proc., Vol 8, 036014 (2015)

C-090
Sakai, K. *et al.*
Development Status of the NMR System for the Polarized 3He Neutron Spin Filter (NSF) in the MLF at J-PARC
JPS Conf. Proc., Vol 8, 36015 (2015)

C-091
Tampo, M. *et al.*
The Development of a Non-Destructive Analysis System with Negative Muon Beam for Industrial Devices at J-PARC MUSE
JPS Conf. Proc., Vol 8, 036016 (2015)

C-092
Adachi, T. *et al.*
Tuning of Ultra-Slow Muon Transport System
JPS Conf. Proc., Vol 8, 036017 (2015)

C-093
Ohhara, T. *et al.*
Current Status of an Extreme Environment Single Crystal Neutron Diffractometer SENJU at J-PARC
JPS Conf. Proc., Vol 8, 36018 (2015)

C-094
Ohshita, H. *et al.*
New Neutron Beam Monitor Based on GEM
JPS Conf. Proc., Vol 8, 36019 (2015)

C-095
Takata, S. *et al.*
The design and q resolution of the small and wide angle neutron scattering instrument (TAIKAN) in J-PARC
JPS Conf. Proc, Vol 8, 36020 (2015)

C-096
Arai, M. *et al.*
Present Status of the Materials and Life Science Experimental Facility of J-PARC
JPS Conf. Proc., Vol 8, 036021 (2015)

C-097
Shibata, K. *et al.*
The Performance of TOF near Backscattering Spectrometer DNA in MLF, J-PARC
JPS Conf. Proc., Vol 8, 36022 (2015)

C-098
Satoh. S
Development of a New Exclusive Function for a 2012 Model 6Li Time Analyzer Neutron Detector System
JPS Conf. Proc., Vol 8, 51001 (2015)

C-099
Makimura, S. *et al.*
Present Status of Muon Production Target at J-PARC/MUSE
JPS Conf. Proc., Vol 8, 051002 (2015)

C-100
Narukami, Y. *et al.*
Signal from a Single Neutron by using Current-Biased Kinetic Inductance Detector made of Superconducting Nb Nanowire
JPS Conf. Proc., Vol 8, 051003 (2015)

C-101
Miyajima, S. *et al.*
Time-Dependent Flux from Pulsed Neutrons Revealed by Superconducting Nb Current-Biased Kinetic Inductance Detector with ^{10}B Converter Operated at 4 K
JPS Conf. Proc., Vol 8, 051004 (2015)

C-102
Haga, K. *et al.*
Thermal Hydraulic Design of a Double-walled Mercury Target Vessel
JPS Conf. Proc., Vol 8, 051008 (2015)

C-103
Yamazaki, D. *et al.*
Neutron Focusing by a Kirkpatrick–Baez Type Super-Mirror
JPS Conf. Proc., Vol 8, 051009 (2015)

C-104
Sawabe, Y. *et al.*
BEAM LOSS MITIGATION BY THE MODIFICATION OF THE BEAM PULSE DEFINITION IN THE J-PARC
LINAC Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 1202

C-105
Oda, Y. *et al.*
Density Profiles of Well-Defined Poly(methyl 2-propenyl ether) (PMPE) Near Water Interface
Macromol. Symp., Vol 350, 99 (2015)

C-106
Nakamura, T. *et al.*
A two-dimensional scintillation-based neutron detector with wavelength-shifting fibers and incorporating an interpolation method
NUCL INSTRUM METH A, Vol 784, 202 (2015)

C-107
Sasa, Toshinobu
Design of J-PARC Transmutation Experimental Facility
Nuclear Back-end and Transmutation Technology for Waste Disposal, p.73 - 79 (2015)

C-108
外山 毅 他
STATUS OF THE INTRABUNCH-FEEDBACK FEEDBACK AT J-PARC MAIN RING
PASJ2015 proc., 722 (2015)

C-109
Kino, K. *et al.*
First Imaging Experiment of a Lithium Ion Battery by a Pulsed Neutron Beam at J-PARC/MLF/BL09
Physics Procedia, Vol 69, 612-618 (2015)

C-110
Hayashida, S. *et al.*
Inelastic neutron scattering on multiferroics NdFe$_3$(BO$_3$)$_4$
Physics Procedia, Vol 75, 127-133 (2015)

C-111
Iwasa, K. *et al.*
Nd-ion substitution effect on f-electron multipole order of PrRu$_4$P$_{12}$
Physics Procedia, Vol 75, 179-186 (2015)

C-112
Fang, Z. *et al.*
Improvements of Low Level RF Control Systems for J-PARC LINAC 400-MeV Upgrade
Proc. 2nd Int. Symp. Science at J-PARC, Vol 8, 011001-1 (2015)

C-113
Miura, A. *et al.*
Beam Monitors for the Commissioning of Energy Upgraded Linac
Proc. 2nd Int. Symp. Science at J-PARC, Vol 8,

011002-1 (2015)

C-114
Miura, A. *et al*.
Bunch Shape Measurement of 181 MeV Beam in J-PARC Linac
Proc. 2nd Int. Symp. Science at J-PARC, Vol 8, 011003-1 (2015)

C-115
Ao, H. *et al*.
Improvement of Vacuum Pressure in the Annular-ring Coupled Structures for the J-PARC Linac
Proc. 2nd Int. Symp. Science at J-PARC, Vol 8, 011004-1 (2015)

C-116
Morishita, T. *et al*.
Properties of the Vertical Deformation of the J-PARC Linac Tunnel
Proc. 2nd Int. Symp. Science at J-PARC, Vol 8, 011006-1 (2015)

C-117
Oguri, H. *et al*.
Operation Status of the J-PARC Ion Source
Proc. 2nd Int. Symp. Science at J-PARC, Vol 8, 011009-1 (2015)

C-118
Hori, T. *et al*.
Investigation of the Long-Term Performance of the 324 MHz Klystrons for Achieving the Efficient Operation of the Linac at J-PARC
Proc. 2nd Int. Symp. Science at J-PARC, Vol 8, 011010-1 (2015)

C-119
Tamura, J. *et al*.
ACS Installation for Beam Energy Upgrade in J-PARC Linac
Proc. 2nd Int. Symp. Science at J-PARC, Vol 8, 011011-1 (2015)

C-120
Hasegawa, K. *et al*.
Upgrade and Operation of J-PARC Linac
Proc. 2nd Int. Symp. Science at J-PARC, Vol 8, 011012-1 (2015)

C-121
Yamazaki, S. *et al*.
Development Status of Ion Source at J-PARC Linac Test Stand
Proc. 2nd Int. Symp. Science at J-PARC, Vol 8, 011014-1 (2015)

C-122
Kikuzawa, N. *et al*.
Status of operation data archiving system using Hadoop/HBase for J-PARC
Proc. of 10th International Workshop on Personal Computers and Particle *Accelerator Controls (PCaPAC 2014), p.193 - 195 (2015)*

C-123
Sugawara, T. *et al*.
Current activities for research and development on accelerator-driven system in JAEA
Proc. of 21st International Conference & Exhibition, p.648 - 656 (2015)

C-124
Miura, A. *et al*.
Vacuum improvement of bunch shape monitor for J-PARC linac
Proc. of 3rd International Beam *Instrumentation Conf. (IBIC 2014), p.430 - 434 (2015)*

C-125
Yamamoto, K. *et al*.
Beam instrumentation at the 1 MW Proton beam of J-PARC RCS
Proc. of 54th ICFA Advanced Beam Dynamics Workshop on High-Intensity, High Brightness and High Power Hadron Beams (HB 2014), p.278 - 282 (2015)

C-126
Tamura, J. *et al*.
Charge State Selective Ion Beam Acceleration with RF Linac
Proc. of HIAT2015, 216 (2015)

C-127
Tejima, M.
BEAM BASED CALIBRATION FOR BEAM POSITION MONITORS
Proc. of IBIC2015, Melbourne, Australia p. 266

C-128
Miura, A. *et al*.
BUNCH LENGTH ANALYSIS OF NEGATIVE HYDROGEN ION BEAM IN J-PARC LINAC
Proc. of IBIC2015, Melbourne, Australia p. 386

C-129
Morino, Y. *et al*.
UPGRADE OF THE BEAM MONITOR SYSTEM FOR HADRON EXPERIMENTAL FACILITY AT J-PARC
Proc. of ICALEPCS2015, Melbourne, Australia p. 86

C-130
Nakayoshi, K. *et al*.
UPGRADE OF THE CONTROL AND INTERLOCK SYSTEMS FOR THE MAGNET POWER SUPPLIES IN THE T2K PRIMARY BEAMLINE
Proc. of ICALEPCS2015, Melbourne, Australia p. 160

C-131
Sato, K. C. *et al*.
THE CONTROL SYSTEM FOR TRIM-COIL RELAY-SELECTORS IN J-PARC MR
Proc. of ICALEPCS2015, Melbourne, Australia p. 353

C-132
Agari, K. *et al*.
UPGRADES OF TEMPERATURE MEASUREMENTS AND INTERLOCK SYSTEM FOR THE PRODUCTION TARGET AT J-PARC HADRON EXPERIMENTAL FACILITY
Proc. of ICALEPCS2015, Melbourne, Australia p. 371

C-133
Miura, A. *et al*.
INTERLOCK OF BEAM LOSS AT LOW-ENERGY PART OF J-PARC LINAC
Proc. of ICALEPCS2015, Melbourne, Australia p. 405

C-134
Ohmi, K.
THEORY AND SIMULATION OF EMITTANCE GROWTH CAUSED BY SPACE CHARGE AND LATTICE INDUCED RESONANCES
Proc. of ICAP2015, Shanghai, China p. 151

C-135
Ohmori, C. *et al*.
DEVELOPMENT OF HIGH GRADIENT RF SYSTEM FOR J-PARC UPGRADE
Proc. of IPAC2015, Richmond, VA, USA p. 50

C-136
Ohmi, K.
STUDY OF EMITTANCE GROWTH CAUSED BY SPACE CHARGE AND LATTICE INDUCED RESONANCES
Proc. of IPAC2015, Richmond, VA, USA p. 245

C-137
Artikova, S. *et al*.
SPACE CHARGE SIMULATION AND MATCHING AT LOW ENERGY SECTION OF J-PARC LINAC
Proc. of IPAC2015, 251 (2015)

C-138
菖蒲田 義博 他
MEASUREMENT RESULTS OF THE IMPEDANCE OF THE RF-CAVITY AT THE RCS IN J-PARC
proc. of IPAC 2015, 255 (2015)

C-139
Kuboki, H. *et al*.
BEAM BASED GAIN CALIBRATION FOR BEAM POSITION MONITOR AT J-PARC MAIN RING
Proc. of IPAC2015, Richmond, VA, USA p. 927

C-140
Nakamura, K. G. *et al*.
DEVELOPMENT OF WIDEBAND BPM FOR PRECISE MEASUREMENT OF INTERNAL BUNCH MOTION
Proc. of IPAC2015, Richmond, VA, USA p. 937

C-141
Hotchi, H.
Recent progress of J-PARC RCS beam

commissining - Toward realizing the 1-MW output beam power
Proc. of IPAC2015, 1346 (2015)

C-142
Yoshida, M. *et al*.
RE-ACCELERATION OF ULTRA COLD MUON IN J-PARC MLF
Proc. of IPAC2015, Richmond, VA, USA p. 2532

C-143
Otani, M. *et al*.
DEVELOPMENT OF MUON LINAC FOR THE MUON G-2/EDM EXPERIMENT AT J-PARC
Proc. of IPAC2015, Richmond, VA, USA p. 2541

C-144
Fang, Z. *et al*.
LOW LEVEL RF SYSTEMS FOR J-PARC LINAC 50-mA OPERATION
Proc. of IPAC2015, Richmond, VA, USA p. 2889

C-145
Takayanagi, T. *et al*.
NEW INJECTION BUMP POWER SUPPLY OF THE J-PARC RCS
Proc. of IPAC2015, Richmond, VA, USA p. 2908

C-146
Kamiya, J. *et al*.
DEGASSING OF KICKER MAGNET BY IN-SITU BAKE-OUT METHOD
Proc. of IPAC2015, 2911 (2015)

C-147
Liu, Y. *et al*.
STABILITY STUDIES FOR J-PARC LINAC UPGRADE TO 50mA/400MeV
Proc. of IPAC2015, Richmond, VA, USA p. 3785

C-148
Maruta, T. *et al*.
RECENT PROGRESS OF THE BEAM COMMISSIONING IN J-PARC LINAC
Proc. of IPAC2015, Richmond, VA, USA p. 3789

C-149
Saha, P. K. *et al*.
PRELIMINARY STUDIES OF LASER-ASSISTED H^- STRIPPING AT 400 MeV
Proc. of IPAC2015, Richmond, VA, USA p. 3795

C-150
Kondo, Y. *et al*.
SIMULATION STUDY OF MUON ACCELERATION USING RFQ FOR A NEW MUON G-2 EXPERIMENT AT J-PARC
Proc. of IPAC2015, Richmond, VA, USA p. 3801

C-151
Tanaka, K.
Present Status and Future Plans of J-PARC Hadron Experimental Facility
Proc. of NRM2015, Villa Monastero, Varenna, Italy p. 331

C-152
Konstantinova, O. *et al*.
Scintillating fiber detector for the beam loss proton measurements at J-PARC linac
Proc. of Science (2015)

C-153
Nakatsugawa, Y.
Search for muon to electron conversion at J-PARC MLF : Recent status on DeeMe
PROC. of SCIENCE(NUFACT2014), 93 (2015)

C-154
Zambelli, L.
Flux and neutrino interaction model constraints using the T2K near detectors
Proc. of Science, EPS-HEP 2015, 058

C-155
Blondel, A. *et al*.
The WAGASCI experiment at J-PARC to measure neutrino cross-sections on water
Proc. of Science, EPS-HEP 2015, 292

C-156
Nishiguchi, H.
COMET experiment: –A search for muon-to-electron conversion at J-PARC–
Proc. of Science, EPS-HEP 2015, 585

C-157
Teshima, N. *et al*.
Development of a high-rate tolerant HV-switching multi-wire proportional chamber and its readout electronics for DeeMe experiment
Proc. of Science, FPCP 2015, 061

C-158
Nagao, D. *et al*.
After-Proton background estimation for DeeMe experiment
Proc. of Science, FPCP 2015, 062

C-159
Mineev, O. *et al*.
A Spiral Fiber Tracker for the J-PARC E36 experiment
Proc. of Science, PhotoDet 2015, 069

C-160
Kuboki, H. *et al*.
BEAM BASED GAIN CALIBRATION FOR BEAM POSITION MONITOR AT J-PARC MAIN RING
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 25

C-161
Chin, Y. H. *et al*
A TWO PARTICLE MODEL FOR STUDY OF EFFECTS OF SPACE-CHARGE FORCE ON BEAM INSTABILITIES
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 43

C-162
Otani, M. *et al*.
DEMONSTRATION OF MUON ACCELERATION AND CAVITY DESIGN OF THE MUON LINAC FOR J-PARC E34
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 56

C-163
Akutsu, K. *et al*.
Study of a Corrosion Resistant Coating Layer for Metal Magnetic Cores Using Neutron Reflectometry
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, 72-76 (2015)

C-164
發知 英明
J-PARC RCSのビームコミッショニングの近況報告 - 1-MW設計出力の実現に向けて -
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, 103 (2015)

C-165
Shibata, T. *et al*.
THE DEVELOPMENT OF NEW INJECTION SEPTUM MAGNET FOR UPGRATE OF J-PARC MR
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 115

C-166
Shirakabe, Y. *et al*.
STUDY OF THE 'INTRINSIC RIPPLES' IN SYNCHROTRON
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 120

C-167
Kawabata, Y. *et al*.
RADIATION DAMAGE STUDY OF THE POSITIONING SENSOR NETWORK SYSTEM IN HIGH RADIATION ENVIRONMENT
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 125

C-168
Okumura, Y. *et al*.
Progress of the high current Prototype Accelerator for IFMIF/EVEDA
Proc. of 12th Annual Meeting of Particle Accelerator Society of Japan, p.203 - 205 (2015)

C-169
Nakagawa, H. *et al*.
THE INTRODUCTION OF THE J-PARC MR MPS EQUIPMENT, AND THE DISCUSSION OF THE INTEREST CONCERNING THE EQUIPMENT
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 215

C-170
Makimura, S. *et al.*
PRESENT STATUS OF MUON ROTATING TARGET AT J-PARC/MUSE
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 261

C-171
Maruta, T. *et al.*
RECENT PROGRESS OF BEAM STUDY IN THE J-PARC LINAC
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 432

C-172
Igarashi, S. *et al.*
THIRD ORDER RESONANCE CORRECTION IN J-PARC MR
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 437

C-173
Shirakata, M. *et al.*
RESPONSE AND BEAM LOSS DISTRIBUTION DUE TO THE J-PARC MR COLLIMATORS
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 441

C-174
Sato, Y. *et al.*
RECENT COMMISSIONING AND PROSPECT OF HIGH POWER BEAM OPERATION OF THE J-PARC MAIN RING
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 488

C-175
Shinto, K. *et al.*
Present status of the injector for IFMIF Linear Prototype Accelerator (LIPAc)
Proc. of 12th Annual Meeting of Particle Accelerator Society of Japan, p.493 - 495 (2015)

C-176
Tamura, F. *et al.*
DEVELOPMENT OF HIGH POWER BALUNS USING MA CORES (2)
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 639

C-177
Hori, T. *et al.*
REDUCTION IN THE FAULT RATE OF HIGH VOLTAGE POWER SUPPLY FOR KLYSTRONS BY USING VETO CIRCUIT IN THE J-PARC LINAC
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 643

C-178
Sawamura, Y. *et al.*
A DEVELOPMENT OF BIPOLAR INDUCTION VOLTAGE ADDERS DRIVEN BY MOS-FETS BASED MARX GENERATORS FOR J-PARC MUON BEAM KICKER
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 694

C-179
Toyama, T. *et al.*
RESIDUAL RADIATION MEASUREMENT WITH THE BLMS IN J-PARC MR
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 719

C-180
Toyama, T. *et al.*
STATUS OF THE INTRABUNCH-FEEDBACK FEEDBACK AT J-PARC MR
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 722

C-181
Toyama, T. *et al.*
LARGE RESIDUAL RADIATION BUT SMALL BEAM LOSS SIGNAL AT J-PARC MR
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 725

C-182
Hatakeyama, S. *et al.*
MEASUREMENT OF RESPONSE MATRIX FOR INJECTION ERROR CORRECTION OF J-PARC MR
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 742

C-183
Usami, H. *et al.*
Development status of data acquisition system for IFMIF/EVEDA accelerator
Proc. of 12th Annual Meeting of Particle Accelerator Society of Japan, p.760 - 763 (2015)

C-184
Kawase, M. *et al.*
Development of accelerator device control system using the machine model
Proc. of 12th Annual Meeting of Particle Accelerator Society of Japan, p.764 - 766 (2015)

C-185
Yamada, S. *et al.*
DEPLOYMENT OF CONTROL SYSTEM STUDIO AT J-PARC MAIN RING
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 767

C-186
Kimura, T. *et al.*
THE ABNORMALITY OCCURRENCE OF MR-MPS DEVICE AND COUNTERMEASURE IN J-PARC
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 770

C-187
Kamikubota, N. *et al.*
EXPERIENCES OF COMMERCIAL AMPLIFIERS FOR J-PARC MR MAGNET POWER-SUPPLIES
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 774

C-188
Sato, K. *et al.*
EPICS CONTROL SYSTEM FOR TRIM-COIL RELAY-SELECTORS IN J-PARC MR
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 777

C-189
Aoyama, T. *et al.*
SUMMARY ALARM GUI "RADACCSAFETY" FOR J-PARC RADIATION-MONITOR SURVEILLANCE
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 787

C-190
Okabe, K. *et al.*
TWISS PARAMETER MATCHING OF THE INJECTION BEAM FOR THE J-PARC RCS
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 933

C-191
Hirano, K. *et al.*
DEVELOPMENT OF RF CHOPPER SYSTEM AT J-PARC LINAC(2)
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 944

C-192
Hasegawa, K. *et al.*
DEVELOPMENT OF THE RF CAVITY WITH FT3L MA CORES (2015)
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 951

C-193
Sugimura, T. *et al.*
THE HEAT TRANSFER ANALYSIS FOR A NEW LARGE ENTRY ANGLED SCRAPER FOR J-PARC LINAC
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 954

C-194
Nakamura, K. *et al*.
MEASUREMENT BETATRON AMPLITUDE FUNCTION DURING ACCELERATION IN J-PARC MAIN RING
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 958

C-195
Yamamoto, M. *et al*.
BEAM LOSS CAUSED BY ODD HARMONICS OF BEAM LOADING IN J-PARC RCS
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 1008

C-196
Ohkoshi, K. *et al*.
STATUS OF THE J-PARC RF ION SOURCE
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 1040

C-197
Takahashi, H. *et al*.
DEVELOPMENT OF INDIRECTLY WATER-COOLED PRODUCTION TARGET AT J-PARC HADRON EXPERIMENTAL FACILITY
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 1045

C-198
Nomura, M. *et al*.
STUDY OF SHUNT IMPEDANCE OF THE FT3L MAGNETIC ALLOY CORE
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 1096

C-199
Nemoto, Y. *et al*.
OPERATING STATUS OF THE ACS IN THE J-PARC LINAC
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 1101

C-200
Miura, K. *et al*.
DEVELOPMENT OF THERMOSTATIC UNIT FOR NEW MAGNET POWER SUPPLY AT J-PARC MR
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 1149

C-201
Shimogawa, T. *et al*.
DEMONSTRATION OF PROTOTYPE POWER SUPPLY OF J-PARC MAIN RING MAIN MAGNETS FOR HIGH REPETITION RATE OPERATION
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 1152

C-202
Morita, Y. *et al*.
DEVELOPMENT OF NPC CHOPPER FOR QUADRUPOLE MAGNETS AT STRAIGHT SECTION IN J-PARC MR
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 1156

C-203
Takayanagi, T. *et al*.
NEW INJECTION BUMP POWER SUPPLY OF THE J-PARC RCS
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 1169

C-204
Sawabe, Y. *et al*.
Beam loss mitigation by the modification of the beam pulse definition in the J-PARC LINAC
Proc. of 12th Annual Meeting of Particle Accelerator Society of Japan, p.1202 - 1205 (2015)

C-205
Hayashi, N. *et al*.
Optics model determination for Beam-Based Alignment of the J-PARC RCS
Proc. of 12th Annual Meeting of Particle Accelerator Society of Japan, p.1206 - 1209 (2015)

C-206
Agari, K. *et al*.
UPGRADE OF TEMPERATURE MEASUREMENT SYSTEM FOR BEAM DUMP AT J-PARC HADRON EXPERIMENTAL HALL
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 1243

C-207
Futatsukawa, K. *et al*.
DEVELOPMENT OF BUNCH SHAPE MONITOR AT J-PARC LINAC
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 1246

C-208
Ikeda, H. *et al*.
Improvement of the J-PARC operation data archiver using HBase/Hadoop
Proc. of 12th Annual Meeting of Particle Accelerator Society of Japan, p.1312 - 1316 (2015)

C-209
Futatsukawa, K. *et al*.
DEVELOPMENT OF PHASE ROTATION SYSTEM FOR RF-CHOPPER J-PARC LINAC
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 1317

C-210
Miyao, T. *et al*.
IMPROVEMENT OF THE VACUUM PRESSURE OF THE BUNCH SHAPE MONITOR AT J-PARC LINAC
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 1338

C-211
Uota, M. *et al*.
VACUUM DUCTS MODIFICATION TO SHAPE AND MATERIAL IN J-PARC MR
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 1342

C-212
Okada, M. *et al*.
ABOUT INFLUENCE OF A BEAM TO A DLC COATING
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 1347

C-213
Hirose, E. *et al*.
DEVELOPMENT OF A SHIELD PENETRATION SIGNAL CABLE DUCTS FOR J-PARC HADRON EXPERIMENTAL HALL
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 1393

C-214
Iwasaki, R. *et al*.
AIRTIGHT REINFORCEMENT OF SECONDARY BEAMLINE OPENINGS AT J-PARC HADRON EXPERIMENTAL FACILITY
Proc. of the 12th Annual Meeting of Particle Accelerator Society of Japan, Tsuruga, Japan p. 1398

C-215
Kasugai, Y.
Safety Measures for the Operation of the Materials and Life Science Experimental Facility (MLF) of J-PARC - Restart of MLF Operation from the Radioactive Material Leak Incident at the Hadron Experimental Facility -
Proc. of the 21st Meeting of the International Collaboration on Advanced Neutron Sources, 567 (2016)

C-216
Meigo, S. *et al*.
Beam profile monitor at the 1 MW spallation neutron source
Proc. of the International Beam Instrumentation Conf. IBIC2015, 617 (2015)

C-217
Xiong, Z. *et al*.
Mechanical Property Change in the Region of Very High-cycle Fatigue
Procedia Engineering, Vol 101, 552-560 (2015)

C-218
Ajimura, S. *et al.*
On-site background measurements for the J-PARC E56 experiment: A search for the sterile neutrino at J-PARC MLF
Prog. Theor. Exp. Phys., Vol 6, 063C01 (2015)

C-219
Terada, K. *et al.*
Measurement of neutron capture cross sections of Pd-107 at J-PARC/MLF/ANNRI
Progress in Nuclear Energy, Vol 82, 118-121 (2015)

C-220
Hasegawa, K.
PROGRESS OF BEAM INTENSITY IN THE J-PARC ACCELERATORS
第12回日本加速器学会年会プロシーディングス, 5 (2015)

C-221
Otani, M. *et al.*
DEMONSTRATION OF MUON ACCELERATION AND CAVITY DESIGN OF THE MUON LINAC FOR J-PARC E34
第12回日本加速器学会年会プロシーディングス, 56 (2015)

C-222
Hirano, K. *et al.*
DEVELOPMENT OF RF CHOPPER SYSTEM AT J-PARC LINAC（2）
第12回日本加速器学会年会プロシーディングス, 944 (2015)

C-223
Kondo, Y. *et al.*
DEVELOPMENT OF A PROTON ACCELERATOR FOR OIST BNCT
第12回日本加速器学会年会プロシーディングス, 948 (2015)

C-224
Miura, A. *et al.*
Report on IBIC2014; The 3rd International Beam Instrumentation Conference
加速器, p.234 - 238 (2015)

C-225
Omori, T. *et al.*
Radiation Tolerance Test of the Rotation Vacuum Seal for the J-Parc Beam Scraper and the ILC Positron Source
高崎量子応用研究所 研究年報 2015 (2015)

(E) KEK Reports

D-001
Safety Division J-PARC Center Annual Report on the Activities of Safety in J-PARC, FY2014
KEK Internal 2015-5

D-002
Asai, T. *et al.*
J-PARC Annual Report 2014
KEK Progress Report 2015-5

D-003
Abramishvili, R. *et al.*
COMET Phase-1 Technical Report
KEK Report 2015-1

(F) Others

F-001
Nakamura, K.
Nishina Memorial Prize: Takashi Kobayashi, Tsuyoshi Nakaya
Butsuri Vol. 70, No. 3, p. 220

F-002
Road to J-PARC from JRR2(50 years' history for neutron scattering research activity in Japan)
Butsuri Vol. 70, No. 9, p. 694

F-003
Mihara, S.
Trends : Search for New Physics Using Charged-Lepton Rare Decays
Butsuri Vol. 70, No. 10, p. 740

F-004
Morishita, T. *et al.*
Upgrade of the J-PARC Linac
Kasokuki Vol. 12, No. 1, p. 22

F-005
Yamane, I.
Conversion of J-PARC RCS to 3-GeV Compressor with Laser Stripping Injection
Kasokuki Vol. 12, No. 1, p. 31

(J) JAEA Reports

J-001
岩元 大樹　他
核変換物理実験施設を用いた炉物理実験による加速器駆動核変換システム炉物理パラメータの不確かさ低減効果
JAEA-Research 2014-033, Vol 54 (2015)

J-002
Sugawara, T. *et al.*
Conceptual study of transmutation experimental facility, 5; Investigation of MA fuel handling
JAEA-Technology 2014-044 (2015)

J-003
Kasugai, Y. *et al.*
Measurement of High-energy Neutron Fluxes and Spectra aroud the J-PARC Mercury Spallation Neutron Target using Multi-foil Activation Method
JAEA-Data/Code 2015-033, 1 (2016)

J-PARC Annual Report 2015
Vol.1: Highlight
(C) J-PARC Center
March 2017

J-PARC

Japan Proton Accelerator Research Complex

High Energy Accelerator Research Organization (KEK)
Japan Atomic Energy Agency (JAEA)

2-4 Shirakata, Tokai-mura, Naka-gun, Ibaraki 319-1195, Japan

http://j-parc.jp/

J-PARC 17-02