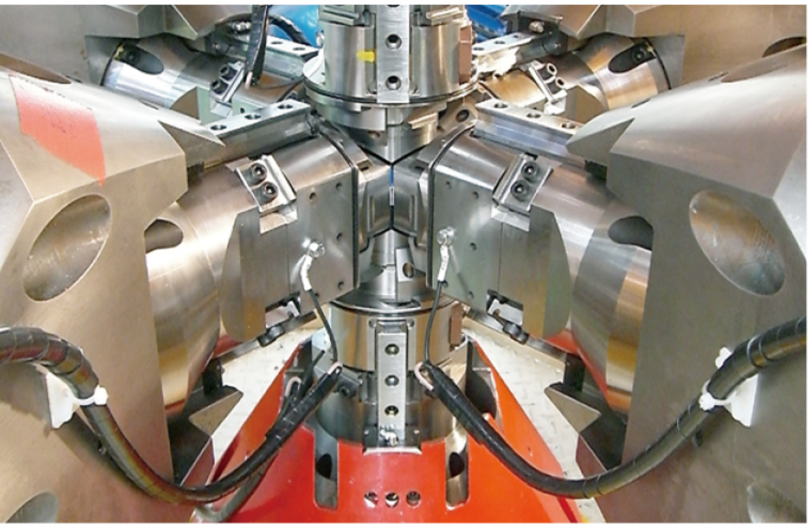
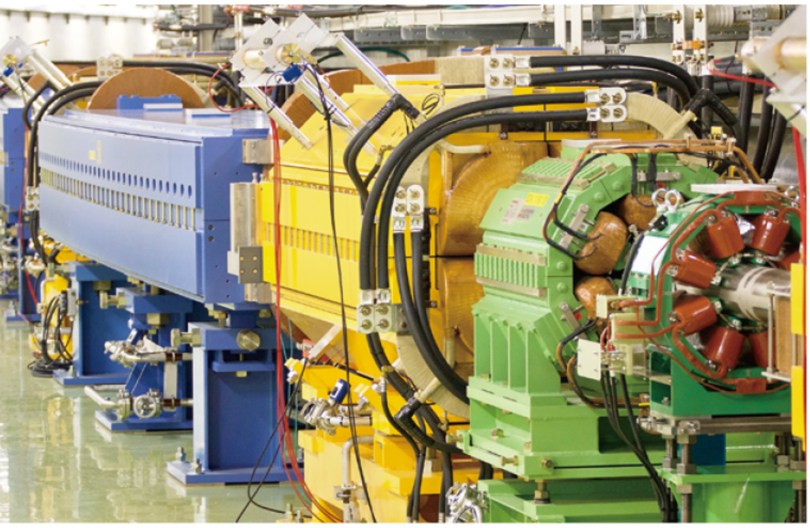
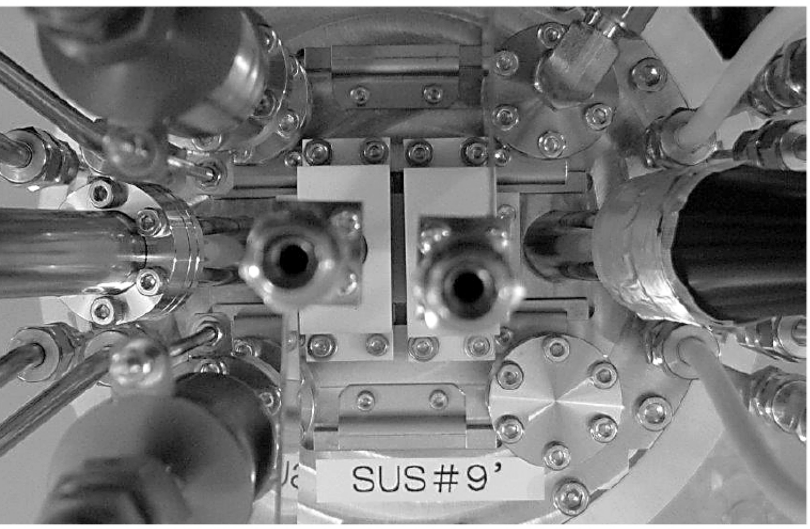






J-PARC

ANNUAL REPORT 2017

Vol.1: Highlight

Cover photographs


Photograph ① : Six-axis press "ATSUHIME" at PLANET beamline in MLF
Image credit: Takanori Hattori


Photograph ② : The moment just before compression!
Image credit: Takanori Hattori


Photograph ③ : All types (di-, quadru-, sextu-, octupole) of electromagnets in MR
Image credit: Masahiko Uota


Photograph ④ : Hydrogen negative ion source waiting in preparation for source breakdown
Image credit: Akira Takagi

J-PARC Annual Report 2017

Contents

Preface

This volume describes the progress made at J-PARC in fiscal year 2017, from April 2017 through March 2018. During that period, we focused on maintaining the stable operation of the Material and Life Sciences Experimental Facility (MLF) and gradually increasing the beam power at the Main Ring (MR) to maximize the user beam availability and the possible number of protons on target at each facility. We believe that a stable and reliable operation of the facilities is the basis of the scientific achievements and we promote it strongly in cooperation with the users from all over the world.

At the MLF, we started the operation at beam power of 150 kW, which was a continuation of the lower power operation from the previous year, in order to avoid damage to the vessel for the neutron production target. After a new target vessel was installed, we were able to increase the beam power gradually to 400 kW by the end of FY2017. As a result of the step-by-step approach to increasing the beam power while maintaining the high level of availability, which has reached 93.3%, we were able to achieve simultaneously high stability and the world’s highest number of neutrons and muons per pulse.

As of the operation of MR, the Fast eXtraction (FX) for the neutrino program has reached a beam power of 475 kW, which is 63% of the design power, to produce impactful results from the neutrino oscillation experiment, T2K. The Slow eXtraction (SX) had to stop its operation for a month due to the failure of the electro-static septum, which is the crucial device of the SX. This incident limited the beam availability to 66%, However, the beam power was kept stably at the highest power of 50 kW in the operation from January to February 2018.

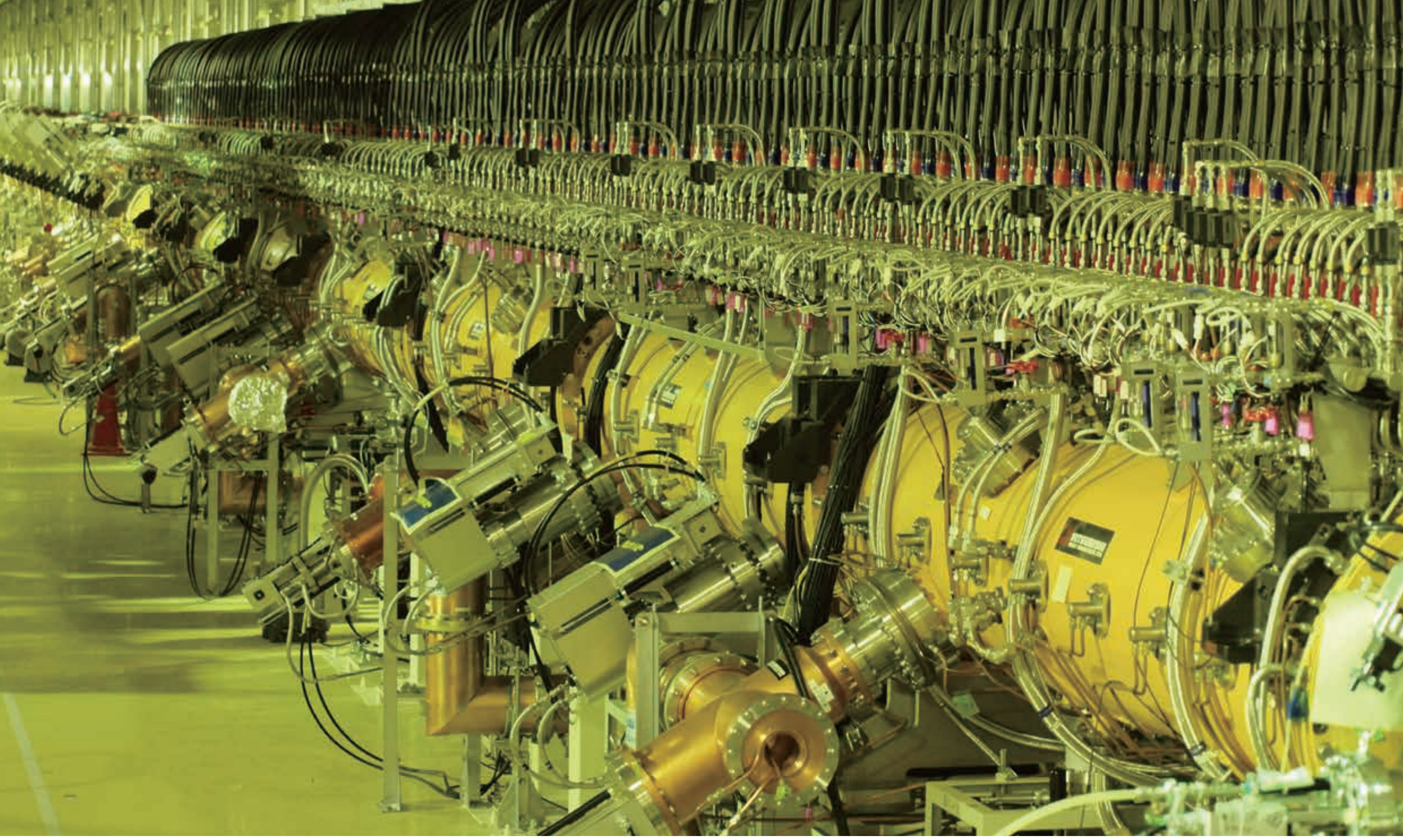
These beam operations have been realized on the basis of the safety policy adopted at J-PARC, which is being continuously improved through the annual all-hands meeting for safety, emergency drills, and safety review. The efforts to improve the safety not only for the staff members but also for users and contractors working at the facilities, especially newcomers, are continuing. One of those efforts is reflected in our slogan, "Mindful of Others".

Other supporting sections, like the Cryogenics section and the Information systems section, are also making progress to accommodate new users and new needs.

Due to the efforts to maintain the facilities with high availability and high beam power, we were able to produce significant scientific and technological output. Some of it resulted in press releases with collaborating institutions. We would like to share all these outcomes widely with the world community. Furthermore, we would like to contribute to the society by enhancing the collaboration with universities, research institutions, and industries not only by producing and sharing our results, but also by creating the next generation of researchers with an extensive experience in cutting-edge facility operation, who can, in turn, produce the next generation of research facility for the future.

"High power beams for the next stage of our life!"

Naohito SAITO
On behalf of the J-PARC staff members,
Director of J-PARC Center



Accelerators

Overview of the Accelerator

The J-PARC accelerator complex consists of a 400 MeV linac, a 3 GeV Rapid Cycling Synchrotron (RCS) and a Main Ring Synchrotron (MR, 30 GeV). A proton beam from the RCS is injected to the Materials and Life Science Experimental Facility (MLF) for neutron and muon experiments. The MR has two beam extraction modes: fast extraction (FX) for the Neutrino experimental facility (NU) and slow extraction (SX) for the Hadron experimental facility (HD).

The operation in FY2017 is illustrated in Fig. 1. The topics related to the beam operation are as follows:

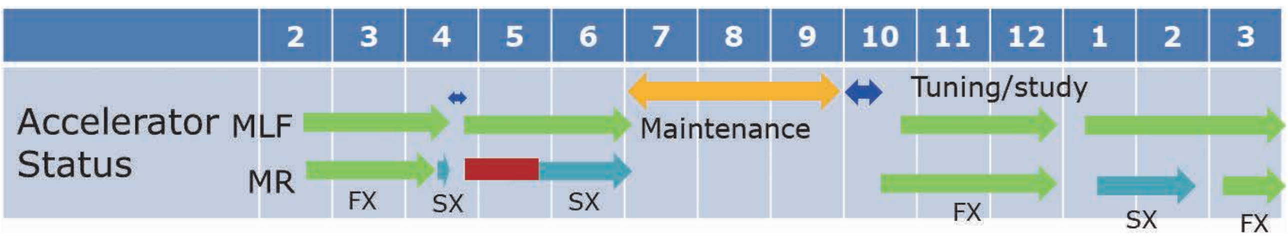


Fig. 1. Accelerator operation in FY2017.

(1) Operation for the MLF

Due to damages of the neutron production targets incurred twice in 2016, we delivered beam at the lower-risk power of 150 kW before the target replacement. The target was replaced with a newly-designed one during the summer shutdown of 2017. After a few days of pilot operation at 150 kW, we increased the power to 300 kW in October and until December, smooth delivery was ensured at that power level. The beam power was further increased to 400 kW in January 2018 and the beam delivery continued without serious troubles.

To improve the quality of the experiments even at the lower beam power, the linac and the RCS have provided a one-bunch beam instead of the regular two bunches, which created a shorter pulse, preferred by some fast-TOF and muon users.

(2) Operation for the Neutrino Experiments (FX mode)

The user run of the MR-FX was continued from February of the previous fiscal year to April 12 at beam power of 460-470 kW, which was slightly increased in the operation from January 2017.

After the summer shutdown, we resumed beam delivery in October and the beam power was increased to 450 kW as the vacuum pressure improved after the maintenance work on the MR. After the fine tuning of the MR, we delivered beam at 470 kW, which was at a similar level as before the summer shutdown.

The FX operation restarted in March at beam power of 470 kW.

(3) Operation for the Hadron Experiments (SX mode)

We switched the extraction mode from FX to SX on April 12 and smoothly ramped up the power to 44 kW, which exceeded the previous power of 42 kW in June 2016. But during the startup after the scheduled maintenance day of April 26, one of the Electro-Static Septum (ESS) failed, and the beam operation was suspended. We coped with this issue for about three weeks and delivered beam again, though the beam power was slightly down to 37 kW. The details are described in the MR chapter that follows.

The second SX operation run in the year was from January to February. Thanks to the beam tuning and the faster repletion time, the beam power was increased to 50 kW, which was a long-desired power level. The other highlight in this run was a successful slow extraction and delivery test at 8 GeV for the COMET (COherent Muon to Electron Transition) experiment.

The operation statistics for FY2017 are shown in Table 1 and Fig. 2. The total operation time, which was shift leaders' on duty time at the control room, including startup and RF conditioning, was 6,448 hours. The net user operation hours and the beam availability rate for each experimental facility were as follows: 4,249 hours (93%) for MLF; 1,757 hours (89%) for NU; and 1,055 hours (66%) for HD. These statistics show that the linac and the RCS operated properly. The cause of the low availability for the HD was the ESS trouble in April 2017.

The downtime by components is shown in Fig. 3. There were several causes of the downtimes.

Over the last few years, we have taken many countermeasures against troubles at the linac: stabilization of the cooling water flow, inside cleaning of some SDTL cavities, replacement of old bias power supplies for HVDC. The result was an improvement of the availability compared to 2016. But the category of "HVDC", which is not limited to the Power Supply breakdown, was still dominant. We had a 15-hour beam stop due to an insulation break of a high voltage cable to a klystron. The next dominant category is "Others". It includes cooling water pump failures, as well as some circuit breaks, such as a reference signal generator, timing modules and network modules.

We had a long downtime at the RCS in April 2016 due to a vacuum leak at one of the ring collimators. We took countermeasures against this problem. The RCS was rather stable in 2017.

The MR had several troubles in 2016, but thanks to our persistent efforts, the reliability improved. One exception was the ESS malfunction in the "SlowExt" category. To rectify this problem, we considered several countermeasures to avoid the instability, as well as actions to improve the hardware.

Most of the improvement and upgrade work was carried out during the summer shutdown. These improved items, major downtime causes, and beam power history are described in further chapters.

Table 1. Operation statistics in hours for FY2017. Figures in the parentheses in trouble columns show the loss time contributions as percentage.

Facility	User Time (hours)	Trouble, Acc.only (hours)	Trouble, Fac.only (hours)	Net Time (hours)	Availability, Toral (%)
MLF	4,555	270 (5.9%)	35 (0.8%)	4,249	93.3
Neutrino (FX)	1,978	185 (9.4%)	35 (1.8%)	1,757	88.8
Hadron (SX)	1,601	506 (31.6%)	39 (2.4%)	1,055	65.9

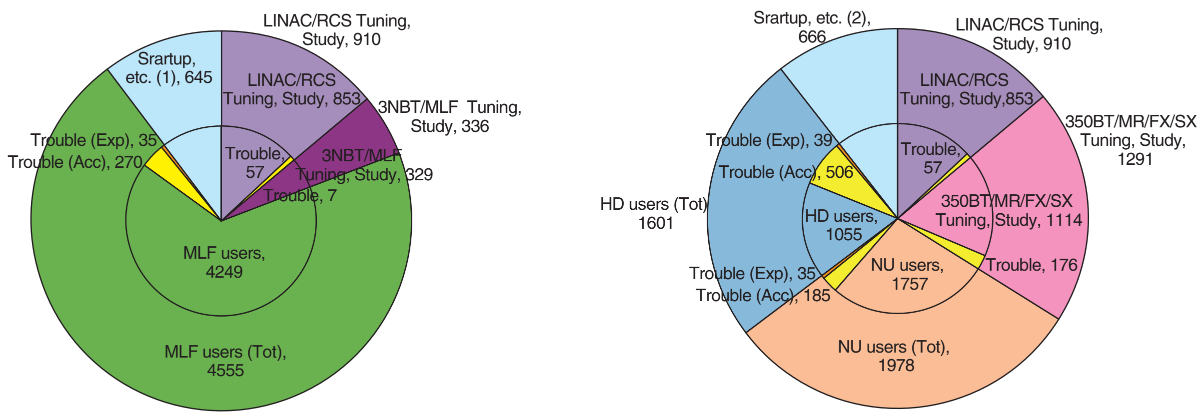


Fig. 2. Operation statistics for FY2017. The total operation time was 6,448 hours.

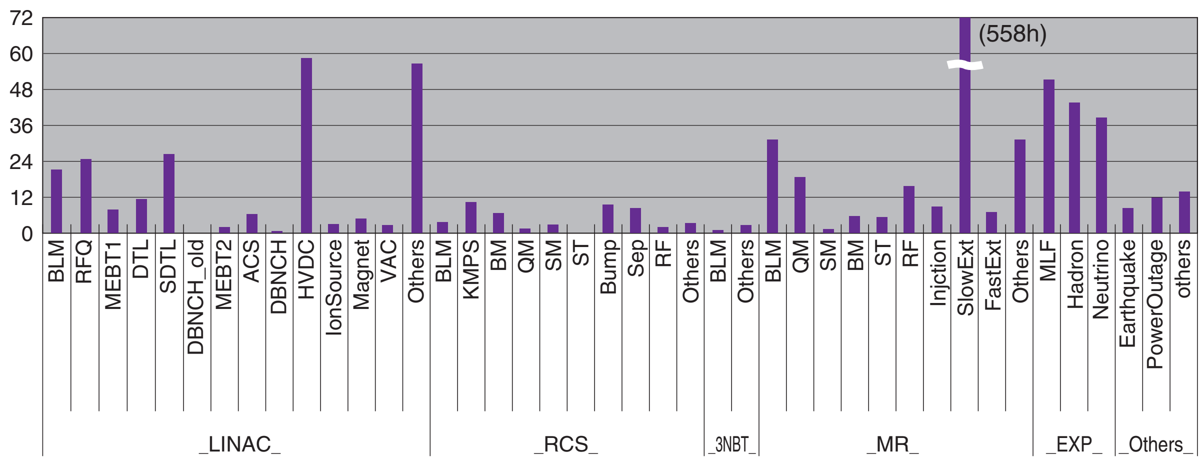


Fig. 3. Downtime by components in FY2017.

Linac

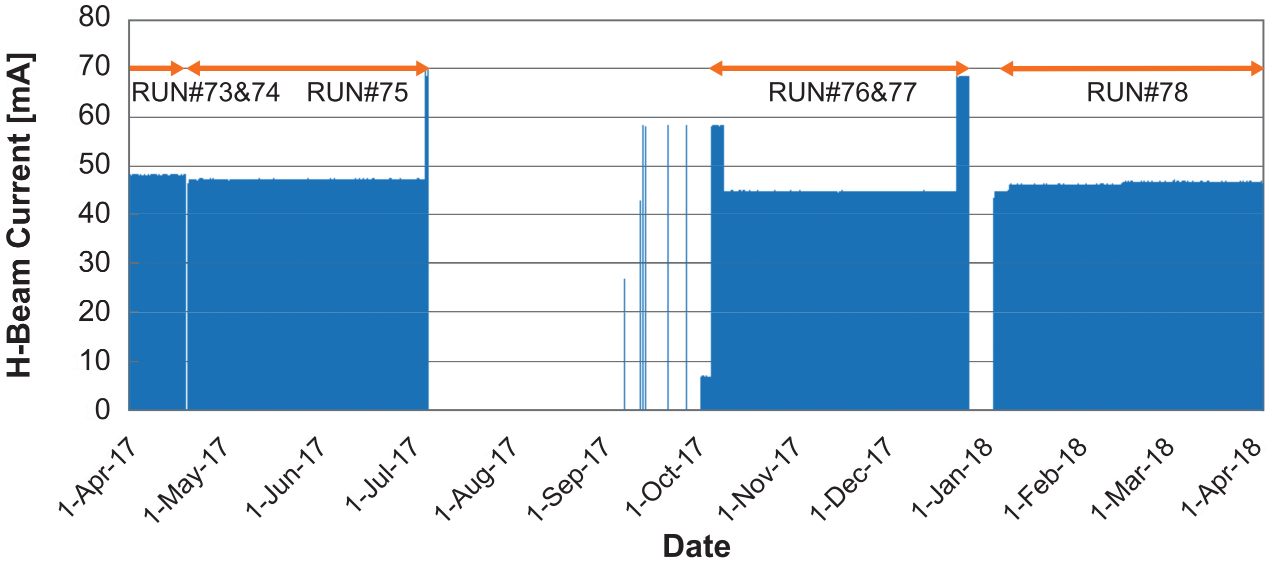


Fig. 4. Operation history of the ion source in FY2017.

Overview

During FY2017, the linac was operated with high availability of about 93%. Two 10-hour long beam stop events occurred due to the failure of a pump of a cooling water system and an anode modulator of a klystron high voltage power supply system. The number of trips due to the RFQ and the beam loss monitor was still significantly higher than that of other components.

Accelerator components status

The linac has been operated with a peak beam current of 40 mA for the user operation. A cesiated RF-driven negative hydrogen ion source has been successfully providing the required beam without any serious troubles. The operation history of the ion source in FY2017 is shown in Fig. 4. We gradually increased the continuous operation times of the ion source. In RUN#78, a continuous operation of 2,080 hours was achieved with the typical beam current, pulse length and repetition rate of 47 mA, 300 μs and 25 Hz, respectively. At the end of RUN#75 and RUN#76&77, the ion source extracted a stable 68 mA beam to perform the high intensity beam study at the linac.

As shown in Fig. 5, we observed the RFQ RF-trip approximately 15 times per day, which did not change significantly in the past several years. These trip events reduce the beam availability by approximately 1%. We suppose the origin of the trip is the sparking between vane tips, which had been contaminated by carbon-related contaminants. Improvement of the vacuum evacuation performance is planned to clean up the inner surface of the RFQ.

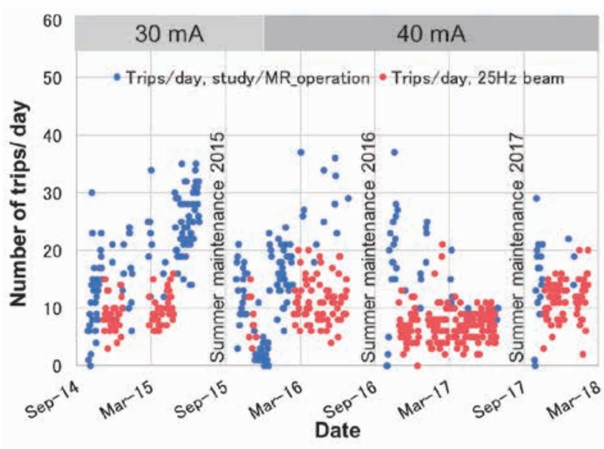


Fig. 5. Time variation of the number of RFQ RF-trips.

After the earthquake in 2011, we could not input a design rf power into some SDTL cavities due to the multipactor. To improve this situation, we polished the inside of the cavities by using acetone during the 2015 and 2016 summer maintenance. Owing to the treatment, the multipactor region disappeared perfectly except for the SDTL05A cavity. Therefore, we retried the polishing of the SDTL05A cavity in the summer of 2017. After the cleaning, the region almost disappeared so it became possible to operate all the SDTL cavities at design input rf power. However, recent observation showed that the region started to expand slightly. We need to continue to monitor it carefully.

The operation of the ACS cavities was more stable than the one of the other cavities. The number of trips of all the ACS cavities was about 0.3 times per day or less than one-third of that at the initial operation period of the ACS.

The RF chopper system, which is installed just after the RFQ, consists of two RF-deflecting cavities and a beam scraper. Recently, the 300-400 kW user operation with single-bunch was conducted at the RCS. In the 400 kW and single-bunch operation, the scraper received the heat flux approximately 1.3 times larger than that at the 1 MW double-bunch operation (this is our goal). The measured surface temperature of the scraper as the function of the operation time is shown in Fig. 6. At 400 kW and a single-bunch operation, the temperature reached and saturated at about 1800°C. The temperature is sufficiently lower than the tolerable level of 2900°C, where the gasification of carbon becomes significant. As a result, it was confirmed that the present scraper was usable in the 1-MW operation without problem.

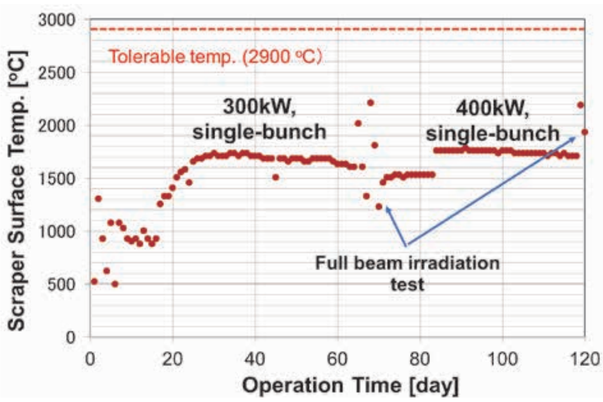


Fig. 6. Time variation of the temperature on the scraper surface.

Klystron system status

We replaced four 324-MHz klystrons and two 972-MHz ones due to their performance degradation in FY2017. Eleven 324-MHz klystrons exceeded 55,000 hours of operation as of March, 2018. These aged klystrons may come to the end of their life in the near future. A klystron test-stand was built to perform off-line conditioning before installation to save replacement time.

Beam monitor development

In order to conduct more precise beam studies by measuring a longitudinal beam profile, we planned to install three bunch shape monitors (BSMs) at the ACS section. Two BSMs were already installed at ACS#1 and #2 in 2016 and 2017. The last BSM for ACS#3 was already fabricated and is under testing at the vacuum and RF system. We will install it in 2018.

A new wire scanner monitor (WSM) based on carbon nanotube (CNT) wire was developed. The CNT device is expected to increase the wire's lifetime. The result of the off-line beam test showed the CNT-WSM has the same dynamic range as the carbon-WSM, which is presently used at the MEBT1 section (see Fig. 7). We will install the CNT-WSM at the most upstream of the MEBT1 section in 2018.

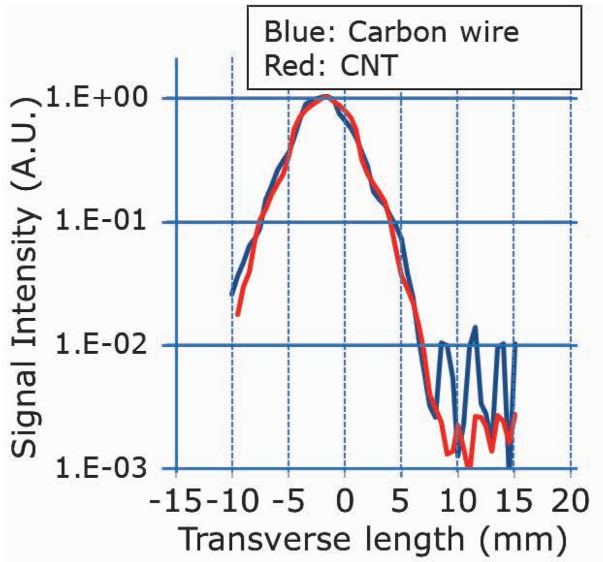


Fig. 7. Beam profile by CNT and carbon wire.

In preparation for higher intensity beam measurement we have been developing a gas-sheet beam monitor for a non-destructive beam profile measurement. After the confirmation test, the monitor was installed at the L3BT section during the 2017 summer maintenance. We could observe the beam profile clearly at the preliminary experiment. We will continue to develop the monitor for practical use.

60-mA trial beam study

We are considering further upgrade plan to increase the RCS beam power to 1.5 MW. To realize the upgrade plan, the beam current and the beam pulse length must increase to 60 mA and 600 μs respectively, which corresponds to an increase by 20% over the present design values. The trial beam study with 60 mA current was conducted in July and December 2017 to clarify the issues in realizing the upgrade plan. The first 400-MeV and 56-mA beam at the linac exit was demonstrated in December 2017, as shown in Fig. 8. We were concerned that a significant beam loss could occur at the DTL1 section, because the alignment of the drift-tubes (DTs) in DTL1 was deformed by the huge earthquake in 2011 so that the actual aperture was reduced. However, no significant beam loss was observed during the beam study. Therefore, the shift of the DT alignment is probably not fatal to the 60-mA operation.

A significant decrease of the beam transmission was observed in the RFQ and the MEBT1 scraper. The RFQ transmission was about 6% lower than that of the nominal 40 mA. In order to improve the beam transmission, we plan to increase the RFQ tank level, re-optimize the MEBT1 lattice and adjust the scraper gap at the next trial study. As a result of the beam simulation, the reduction of the beam halo from the ion source will have an effect on improving the beam transmission at the RFQ. Further trial beam studies are planned to demonstrate a 1.5 MW-equivalent beam at the RCS.

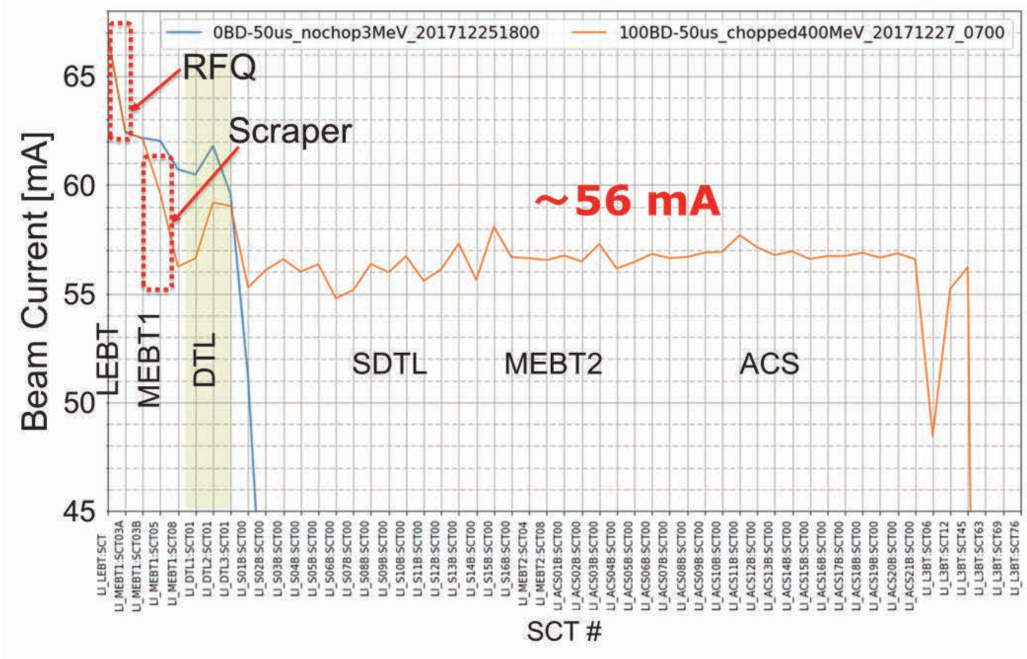


Fig. 8. Beam transmission measured 60-mA trial beam study.

RCS

Operational status

In 2015, during operation at a beam power of 500 kW, cooling water leaks occurred twice in the neutron target. After the second incident, the RCS output power to the MLF was limited to 200 kW to protect the target, due to the lack of a spare one. Since a new target was not available until the summer of 2017, the output power was further reduced to 150 kW after the summer shutdown period in 2016. Thus, the beam power at the beginning of JFY2017 was 150 kW. After replacing the neutron target with a new one in the summer shutdown of 2017, the power of the beam to the MLF was increased stepwise from 300 to 400 kW. For beam powers of less than 500 kW, the RCS was operated in one-bunch mode. In this mode, only one of the two RF buckets was filled by the injection beam from the linac. The RCS is designed to generate 1 MW beams in two-bunch mode, where 400 kW one-bunch beam corresponds to 800 kW two-bunch beams from a beam dynamics viewpoint. Therefore, this operation enabled us to confirm that the RCS had the potential to operate at an output power of 800 kW. Meanwhile, the MR output power was steadily increased as the MR commissioning progressed. Fig. 9 shows the change in the RCS output power with respect to time.

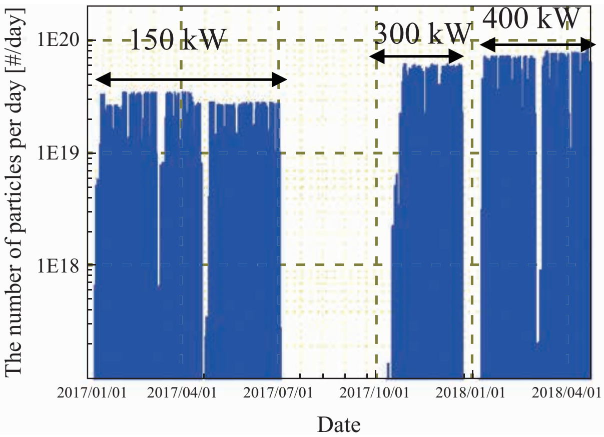


Fig. 9. Changes in the RCS output power over time.

This year, there were no serious problems in the RCS, therefore the availability of the RCS itself was quite good. Its operation time over the year was approximately 4,556 h, excluding the commissioning time, and downtime of approximately 28 h; therefore, its overall availability was better than 99%. The major incidents were a discharge of the capacitor in the RF amplifier, a puncture of the shift bump power supply unit, and a failure of the control system in the sextupole magnet power supply.

Maintenance and improvements

1) Foil production

In the J-PARC RCS, the Hybrid type thick Boron-doped Carbon (HBC) foil was used for charge exchange injection. It had been produced in the KEK laboratory since the beginning of the RCS commissioning. However, due to retirement of the expert in the HBC foil production, it became difficult to produce the HBC foil in KEK anymore. Therefore, the foil deposition system in KEK was moved to the J-PARC site to continue the HBC foil production. By using this system, we started research and development to produce more robust foil.

With some trial-and-errors, we produced new HBC foil. The performance of the new HBC foil was evaluated by using the heavy ion beam facilities in the Takasaki Advanced Radiation Research Institute of the National Institute for Quantum and Radiological Science and Technology before installing it in the RCS. The test result indicated that the new HBC foil would be almost as durable as the original KEK HBC foil. Finally, one new foil was tested during a 10-day user operation in June, and it endured during this period. Fig. 10 shows the new HBC foil after the 10-day operation.

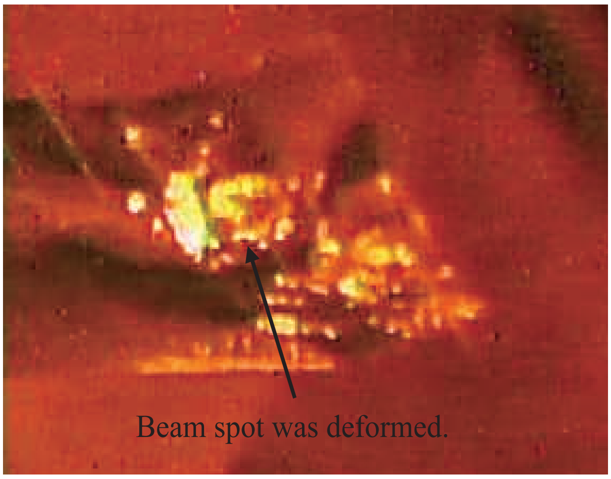


Fig. 10. The new foil after the 10-day operation.

2) Improvement of the correction QM

Numerical simulations, which included the effect of the space charge and the magnetic field errors, and the actual beam study results, indicated that it was necessary to switch the betatron tunes pulse-by-pulse between the MLF and MR operations in order to achieve a suitable beam condition for each destination, respectively. Since there was not enough space to install an additional new magnet set for this purpose, we considered using the existing correction quadrupole magnets (QDTs) also for the pulse-by-pulse tune change. The QDTs were originally prepared to compensate the edge focus effect of the injection bump magnets during the injection period. They were installed in the summer of 2014 and enabled large transverse painting for the MLF. However, not only to correct the edge focus but also to change the betatron tune, we had to extend the duration and reinforce the excitation current. In the summer shutdown of 2017, we extended the duration of the power supply of QDT from a few ms to 12 ms at the first onset. This improvement made it possible to partially change the operation tunes between the MLF and MR operations.

Residual dose distribution and exposure during maintenance

Since the output power to the MLF was initially limited, the residual doses in the RCS were relatively small in the summer of 2017, compared to the previous years.

Table 2 summarizes the radiation doses received by the workers during the summer shutdown period in 2017. A total of 41 workers were exposed to doses of more than 0.01 mSv, and their collective dose was 1.08 man-mSv. Only five workers were exposed to residual doses of more than 0.05 mSv, and the maximum dose received by any one worker was 0.07 mSv. Both the collective and maximum doses were significantly lower than those of previous years. This can be attributed to establishment of a foil maintenance procedure, low output power to the MLF, and no serious work near the injection area.

Table 2. Summary of worker radiation doses during the summer shutdown period in 2017.

Residual dose [mSv]	Number of workers
0.01–0.05	36
0.06–0.1	5

The residual doses around the RCS increased proportionally to the output power by the end of 2017, when the 300-kW operation ended. However, when the output was increased to 400 kW in January 2018, we found higher beam losses than expected and the residual dose in the RCS tunnel was higher than ever before. In particular, we found that the highest dose was 8 mSv/h, just outside the injection branch, where no significant doses had been observed before. After investigation, we found that the reference clock of the linac timing system had malfunctioned, making the energy of the injection beam unstable. Correcting this fault stabilized the beam and the residual dose fell by less than a half. Even so, the losses still appeared to be higher in comparison with the preliminary tests conducted during previous beam studies. We will continue the beam study to identify the source of these increased losses.

Beam commissioning result

A wider beam profile is required to reduce the residual doses in the RCS and the peak charge density of the injected beam for the neutron target. We achieved this beam condition by correcting the resonance of the betatron oscillation and extending the transverse injection painting region.

On the contrary, the MR requires beam with smaller emittance to obtain smaller beam halo and mitigate beam losses in the MR. However, when we use the same operation tune as in the MLF case ((ν_x, ν_y)=(6.45,6.32)), a large emittance growth occurs for the first 6 ms, especially on the vertical plane. Fig. 11 shows the time dependence of the rms emittance growth calculated from injection to extraction with smaller painting area of 50π mm-mrad. This emittance growth is caused mainly by the vertical stopband due to the resonance of ν_y=6. The small painting applied for this operation mode generates a large space-charge detuning and resonance crossing (See Fig. 12).

The solution to avoid this resonance is to choose a vertical tune higher than in the MLF case. On the other hand, a higher vertical tune causes a significant loss in the MLF operation. Therefore, we extended the duration of the QDTs power supply system to switch the tune during the injection timing between the MLF and MR operations.

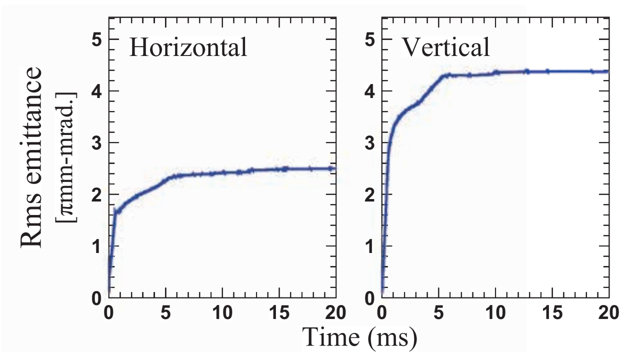


Fig. 11. Time dependence of the rms emittance growth calculated from injection to extraction.

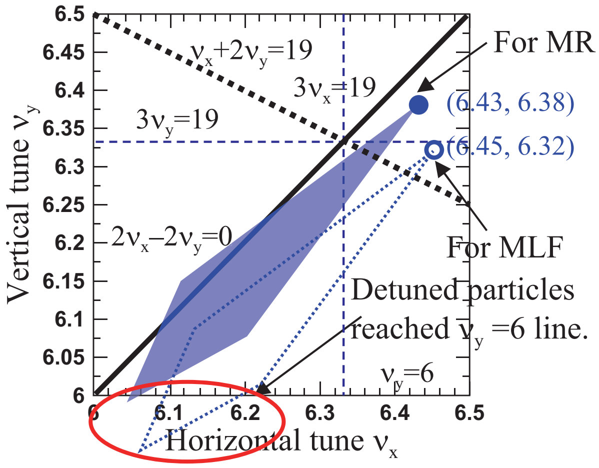


Fig. 12. Tune diagram.

By using the improved QDTs, we tried to mitigate the emittance growth by increasing the vertical operation tune away from the resonance line of ν_y=6 during injection timing for the MR operation. The results are shown in Fig. 13. The emittance growth in the vertical plane was well mitigated by the new parameter, as predicted by the numerical simulation.

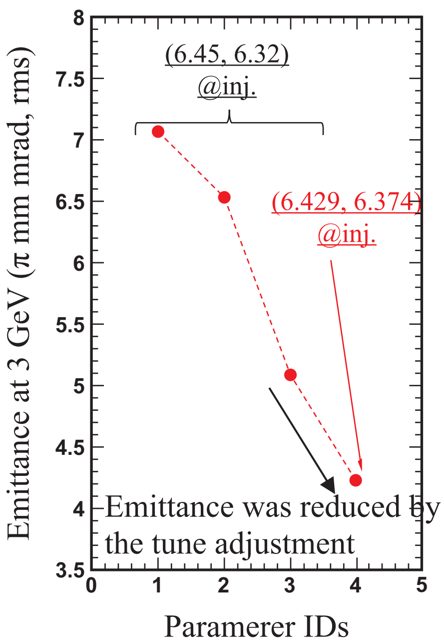


Fig. 13. Measurement results of the vertical emittance.

Summary

In the JFY2017, the RCS user operation continues to be almost stable. As of March, 3.5*10^{13} ppp beams, which were equivalent to 400 kW, were delivered to the MLF in one-bunch mode and 6.2*10^{13} ppp beams, which were equivalent to 750 kW at a 25-Hz operation in the RCS, were delivered to the MR. The output power will be gradually increased toward 1 MW by carefully monitoring the status of the neutron target and the beam loss.

As of the beam test, we improved the correction quadrupole magnet system to optimize the beam operations for both the MR and MLF. We extended its duration from a few ms to more than ten ms, enabling us to partially change the operation tunes. We were finally able to obtain emittances of about 4.5π mm-mrad. in both the horizontal and vertical phase spaces in the MR operation parameter.

We will continue the study, aiming not only to keep reducing the losses and generate smaller-emittance beam but also to increase the output power further.

MR

Overview

The Main Ring synchrotron (MR) of J-PARC supplies the 30-GeV proton beam alternatively to the neutrino experimental facility in a 2.48 s period, which is called fast-beam extraction (FX) mode, or also to the hadron experimental facility in a 5.52 s or 5.2 s period, which is called slow-beam extraction (SX) mode.

Fig.14 shows the beam power history of the MR. The beam power near the 500 kW is the beam for the FX mode. For the SX mode, the beam power is around 50 kW.

The operation periods for each of the modes in JFY2017 are summarized below:

(1) April 1, 2017 ~ April 12, 2017: FX
(2) April 13, 2017 ~ June 27, 2017: SX
(3) Oct. 18, 2017 ~ Dec. 21, 2017: FX
(4) Jan. 15, 2018 ~ Feb. 28, 2018: SX
(5) Mar. 9, 2018 ~ Mar. 31, 2018:FX

The progress and troubles for each mode of operation of the MR are described in the following sections.

SX mode operation

The first SX mode operation of JFY2017 started on April 13 with beam power of 44 kW, which is larger than the operation power of 42 kW in JFY2016. The repetition period was 5.52 s.

However, the ribbon type electrodes of the Electro-Static Septum Number 1 (ESS-1) were broken by the collision of the unstable beam bunch and unfortunately, broken wires touched the high voltage electrode, which applied 104 kV, so the electrode was short-circuited, as shown in Fig. 15. A spare ESS made of titanium was quickly transferred from the KEK Tsukuba campus to Tokai. However, it could not keep the 100 kV without a dark current in the tunnel. Thus, it was decided to replace the broken ESS-1 with the ESS-2, because MR has two ESSs (ESS-1,2).

Fig. 15. Broken wires in ESS-1

The broken ESS-1 was removed from the beam line and ESS-2 was transferred from the original position to the place, where ESS-1 was installed. (The original ESS-2 section was connected using straight vacuum duct.) The beam tuning of the SX mode resumed on May 24, 2017. The beam separation by one ESS was worse than before. Thus, the beam intensity was limited to a maximum of 37 kW in order to keep the beam loss the same as it was before the ESS-1 trouble.

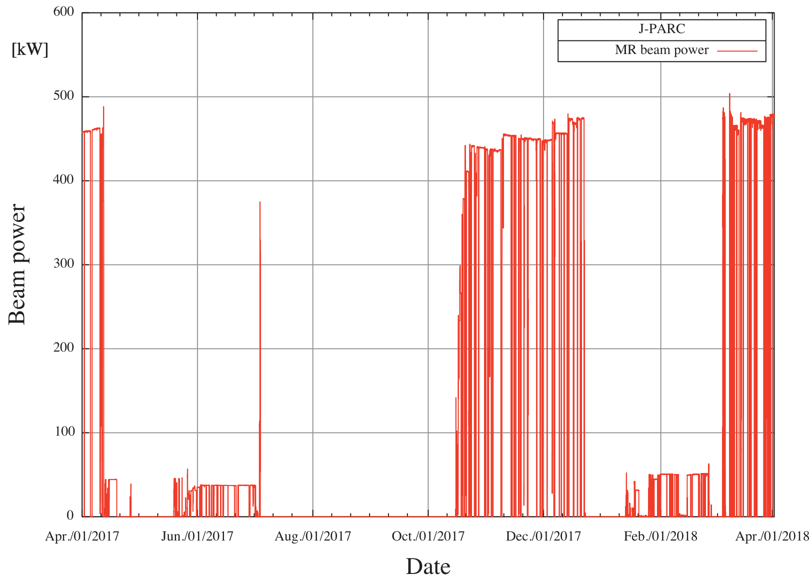


Fig. 14. MR beam power history (JFY2017).

During the summer maintenance period, the repaired and improved spare of ESS-1 was installed in the tunnel. ESS-2 was returned to the original position.

The second SX mode operation started on January 15, 2018. During that period, the repetition frequency was shortened from 5.52 s to 5.2 s by reducing the flat top length so that the SX beam power was increased by about 6%.

The maximum beam power for the SX mode operation is limited by the performance of the target in the hadron experimental facility. The beam power on the hadron target is 53.4 kW in maximum, as approved by the Nuclear Regulation Agency in Japan. Therefore, the MR limits the maximum operation beam power to 51.8 kW, which is 97% of 53.4 kW, because we have to keep the beam power lower than 53.4 kW.

The maximum operation beam power of the SX mode was 51 kW. The MR supplied the beam to the hadron experiment very stably.

During this SX mode period, two 8-GeV acceleration trial was carried out and each of them involved four days of continuous beam study. The trials were required by the COMET experiment, which aims to find the conversion of muon to electron without the emission of neutrinos. During those studies, an 8-GeV beam was successfully extracted slowly to the hadron target.

Although the beam availability for the SX mode in JFY2017 was 66% due to the ESS trouble, the operation of the SX mode stabilized after we fixed the problem.

FX mode operation

At the beginning of April 2017, beam power of 470 kW for FX mode was achieved. However, the power increased gradually from 150 kW to 450 kW after the summer maintenance period, because vacuum scrubbing by beam was required for the equipment, newly installed in the summer. After a week of scrubbing, the beam power was gradually increased more than 450 kW. Finally, the power reached 475 kW. The FX mode operation was very stable. As a result, we achieved an availability of 89% for the FX mode in JFY2017.

New magnet power supply

The design beam power of the FX mode is 750 kW. Since we are going to achieve the power by shortening the repetition period from 2.48 s to 1.32 s, it is necessary to replace and/or modify many accelerator components.

In particular, the magnet power supplies of the main magnets must be replaced with newly developed ones. The R&D of the new power supply had been completed. The first new power supply for the bending magnet, which is the biggest one, has been installed in the new building for the power supply. It is shown in Fig. 16. It accumulates the regenerative electromagnetic power returns from magnets in the capacitor bank of 2.9 F, which consists of three containers and can keep a total of approximately 4 MJ, so that the influence on the input power from the power station will be minimized. The containers of the capacitor bank were

Fig. 16. New power supply for the bending magnet
Size: W 2.5 m x H 2.5 m x L 25 m

placed at the new power supply building, as shown in Fig. 17.

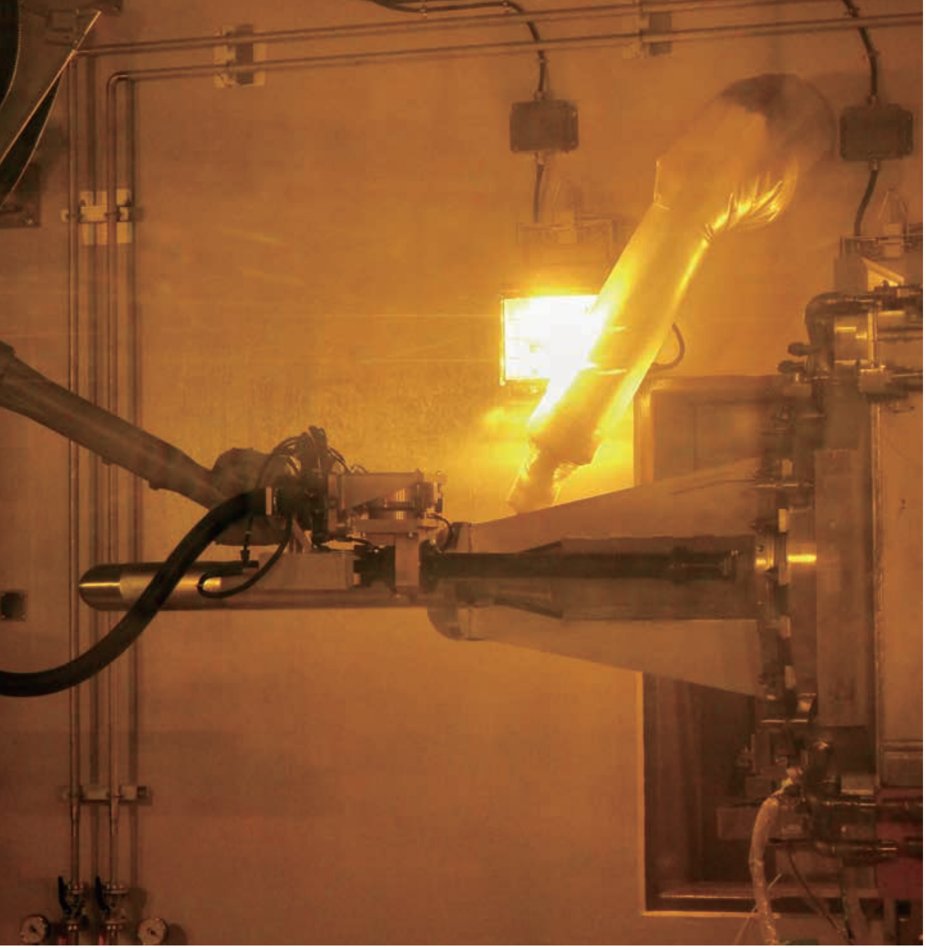
The power supply with the bank supplies power to 16 magnets, which are 1/6 of the bending magnets in the MR. The basic test of each component continues. An operation test will be performed by using the real bending magnets in the tunnel in JFY2018.

Summary

During the SX mode operation, the MR had a problem with ESS-1. We needed a month to fix it. However, that was just one significant trouble. Aside from that, the beam operation was stable. We achieved 51 kW beam power for the SX mode and 475 kW beam power for the FX mode, respectively.

For higher repetition rate operation in the near future, the biggest magnet power supply, the first one to be mass-produced, has been installed in the new magnet power supply building. The preparation for the test of the power supply is ongoing.

Fig. 17. Capacitor banks at the new building. Three containers contain the capacitors. D4 is one of the new power supply buildings.



Materials and Life Science Experimental Facility

Overview

In fiscal year 2017, the operation of Materials and Life Science Experimental Facility (MLF) started with the neutron production mercury target (#2), which had an older design without helium bubbling system. The power was limited to 150 kW although the operation was very stable. In the summer maintenance period we replaced the target with a new one (#8) with helium bubbling system. The operation started with power of 300 kW on October 24 after the summer maintenance period, then the power increased to 400 kW in the beginning of 2018 to continue the stable operation to the end of fiscal year 2017. The beam availability to the scheduled beam time in fiscal year 2017 was 92%. The operation of the muon production target, which was replaced with a one with rotating design in 2014, was performed without a major problem. The operations of the neutron and muon targets were stable thanks to the great efforts of the J-PARC MLF staff.

There were many activities at the MLF in 2017. One of the most important international meetings was the Second Collaboration Workshop between the European Spallation Source (ESS) and J-PARC, which was held at the ESS in Lund on January 18 and 19, 2018. The meeting was carried out under the Memorandum of Collaboration (MoC) in the field of spallation neutron related development between the ESS and J-PARC. The extension ceremony of the MoC was held in Stockholm on July 7, 2017, in the presence of the Swedish and Japanese Prime Ministers. Ten delegates from the J-PARC center participated in the workshop to exchange information about management of organizations, radiation and general safety issues, accelerator technology, neutron sources, neutron instruments and data management.

The 2nd Neutron and Muon School was jointly organized with the 9th AONSA Neutron School during the period from November 16 to 20. Forty-nine young researchers and graduate students from thirteen countries participated in the school. They attended neutron and muon lectures, toured the sites of J-PARC and JRR-3 and took part in experiments with neutron and muon instruments at MLF.

In this Annual Report, I would like to introduce the readers to the research highlights and the status of MLF in fiscal year 2017.

Neutron Source

In fiscal year 2017, the neutron production mercury target (target #2) was operated continuously at 150 kW from the previous fiscal year to June 2017 without any problem. It was used for a year and a half since February 2016, during which the accumulated beam power reached 1,064 MWh. In the summer outage, we inspected the pressure-wave-induced pitting damages on the beam injection portion at the target front by cutting out a specimen with a cutting device. We observed damages with a maximum depth of 300 μm on the surface of specimen, however it was sufficiently shallow compared to the critical depth of 1.3 mm.

In September 2017, a new target vessel with redesigned structure (target #8) was delivered to the MLF (see Fig. 1). It eliminated the previously designed joint structure with bolts between the inner mercury vessel and the surrounding water shroud from the forward part of 350 mm length, where high thermal stress was induced by beam trips during the operating period. Instead, it adopted a monolithic structure, which was cut out from a steel block with a wire electric discharge machining technique.

Target #8 was equipped not only with a gas-micro-bubbles generator but also with a double-walled front end to make high-speed mercury flow in a 2-mm-wide narrow channel for mitigating the pitting damage. The neutron production operation with target #8 began at 300 kW on October 24. The measured results of the temperature increase and the displacement velocity of the target vessel were consistent with the design values. The beam power was increased up to 400 kW in January 2018. The steady operation continued until March and, as a result, the annual operating days reached 187.5 with an excellent operation efficiency of 92%.

The fabrication of target #9, with the same structure as target #8, was conducted 6 months after target #8's fabrication by the same vendor. It was completed in March 2018.

During the summer outage, the proton beam window (PBW) #2, made with aluminum alloy, was replaced with a new one. The accumulated beam power on PBW #2 was 2,509 MWh, which was far less than the lifetime value of 10,000 MWh, but we replaced it because one side of the beam window was exposed to high humidity environment when small water leak occurred on the water shroud of the target in the helium vessel in April 2015. There was no damage on the surface of PBW #2.

There was also remarkable progress in the used target vessel management. The storage building, named Radio-Activated Materials (RAM) Building, was completed in the J-PARC site in December 2017. A shipping container was fabricated and delivered to the RAM building in March 2018 (see Fig. 2), while bids were called for fabrication of a shielding cask with sufficient thickness needed to guarantee the allowable dose rate (< 2 mSv/h) on the surface.

Fig. 1. Photo of target vessel #8 delivered to MLF.

Fig. 2. Photo of the shipping container for used target vessels.

Neutron Science

1. User program

For the general-proposal round for 2017A, 153 general proposals and 5 new user promotion proposals were approved from 228 submissions. For 2017B, 167 general proposals and 5 new user promotion proposals were approved from 291 submissions. Also, 8 of a new type of proposals, the General Proposals (Long Term) (three-years-valid proposals) were approved from 24 submissions.

A new proposal category started at two pilot instruments, Super HRPD at BL08 and NOVA at BL21, at the end of 2017B, which is a mail-in program called Fast Track Proposal. The users send their samples to the MLF, the MLF staff carries out the experiments on users' behalf and sends them back the data.

2. Instruments

POLANO at BL23 is in the commissioning phase. In November 2017, a MIEZE part of the neutron spin-echo suit VIN ROSE at BL06 moved into a user program phase. Other instrumental work has also been done.

A measurement of the neutron lifetime is on-going on NOP at BL05 to achieve an accuracy of 1 s. The data taking is still continuing to reduce the uncertainty. Multiple-wavelength neutron holography with the time-of-flight technique was developed on NOBORU at BL10. By using a single crystal of Eu-doped CaF_2, a clear three-dimensional atomic image around Eu^{3+} substituted for Ca^{2+} was obtained, revealing the local structure that allows it to maintain charge neutrality.

3. International activities

The 9th AONSA School / the 2nd Neutron and Muon School was held from November 16 to 20. 49 young researchers and graduate students from Korea, Australia, Indonesia, India, China, Taiwan, Thailand, Malaysia, New Zealand, Vietnam, Nepal, the United Kingdom, the Russian Federation, as well as Japan, participated in the school. The neutron science group contributed 10 neutron instruments for hands-on experiments (Fig. 3).

The J-PARC Center and CROSS hosted the J-PARC Workshop "Deuterated Materials Enhancing Neutron Science for Structure Function Applications" on October 19 and 20, 2017. 62 scientists discussed neutron studies in the field of material and life siences by utlizing deuteration technology.

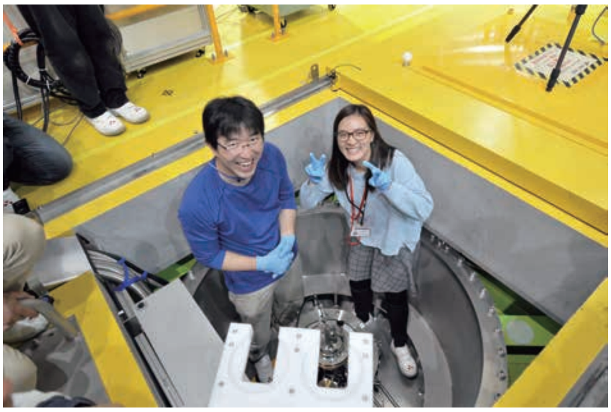


Fig. 3. Dr. Yamada and his student enjoying hands-on experiment at DNA at BL02 at the school.

4. Resultant outcomes

The research activities in neutron science at the MLF resulted in more than 160 articles, including 80 peer-reviewed papers. This number includes papers in influential journals such as Nature Materials, Nature Communications and Scientific Reports.

The HRC beam line (BL12) group won the Technology Prize of the Japanese Society for Neutron Science for the development of the construction of high-resolution chopper spectrometer and implementation of neutron Brillouin scattering measurement.

The prize for development technology of Sumitomo Rubber Industries, Ltd. (Cooperation of SPring-8 / J-PARC / K-computer and Advanced tire developments) was awarded as Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology, Japan in 2017. It should be noted that Sumitomo Rubber Industries decided to hire a fixed-term resident researcher, who works closely with the J-PARC staff; this initiative is called J-PARC / Sumitomo Fellowship program. The first fellow employed by this program was assigned in JFY2017.

Neutron Device

One of the ongoing activities at the Neutron Instrumentation Section of the MLF has been the development of a gas-based position-sensitive neutron-detection system, which adopts a two-dimensional detector element and can read out an individual signal line. In the present study, we have developed a new two-dimensional detector element using circular cathode bumps for charge collection to establish high efficiency in both the charge collection and the neutron detection.

The developed element has triangularly-arranged, small-sized circular cathode bumps, which are linked together in the x- and y-directions for the individual signal line readout. The entire and partially magnified photographs of a developed bump cathode element are shown in Fig. 4.

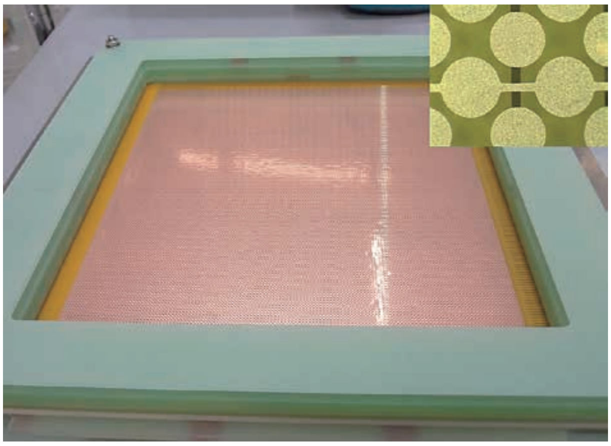


Fig. 4. Entire and partially magnified photographs of a developed bump cathode element.

The developed bump cathode element consisted of a polyimide insulator and circular cathode bumps (pads) made from Cu on the insulator. A polyimide layer with a thickness of 0.025 mm was used as the substrate and the thickness of the bumps was 0.02 mm. Two types of circular bumps, with diameters of 0.6 and 0.65 mm, were triangularly arranged on the surface of the polyimide. The 0.65- and 0.6-mm bumps were linked in lengthwise direction on the bottom of the substrate using 0.1 mm lines, and the crosswise direction on the surface of the substrate using 0.05 mm lines, respectively. Both lines were arranged orthogonally. As a result, the 0.65- and 0.6-mm bumps were used for detection of incident neutrons in the x- and y-directions, respectively.

The sensitive area was 128 mm × 128 mm with a pitch of 1 mm in both directions. For use in the detector system, the bump element was placed on the base plate made from alumina ceramic with thickness of 1.5 mm.

Irradiation experiments for the bump cathode element were performed using a neutron detection system consisting of a pressure vessel, amplifier-shaper-discriminator boards, optical signal transmission devices, position encoders with field-programmable gate arrays, and a data acquisition device. The experiments were carried out under the gas condition of He / (15%) CF_4 at 0.7 MPa. Figure 5 shows the flat-field image measured by the detector, which confirmed the good spatial homogeneity of the detector element. The analysis of the image shows that the average pixel count was 134 with a standard deviation of σ = 13.5, which corresponded to an average count fluctuation of 10.1%. The intrinsic spatial resolution can be calculated from the obtained flat-field image in our detector system [2]. The average intrinsic spatial resolution in the sensitive region was 1.89 mm FWHM calculated by taking into account the track lengths of the secondary particles with He / (15%) CF_4 at a pressure of 0.7 MPa.

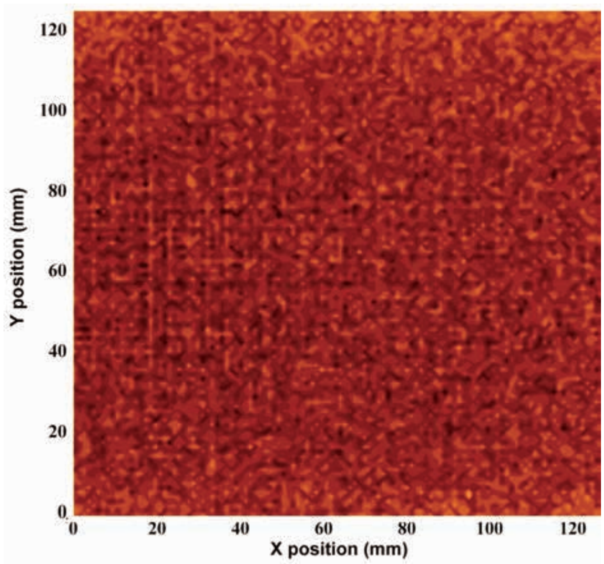


Fig. 5. Flat-field image under Cf-252 neutron irradiation.

References

[1] K. Toh et. al., Nuclear Inst. and Meth. Phys. Res., A726 169 (2013).

[2] K. Toh et. al., J. Phys. Conf. Ser. 528 (2014) 012045.

Muon Source and Science

Developments of low-emittance negative muon beams in progress

The reduction of the beam momentum spread at the D2 area was of crucial importance to ensure the control of the stopping position for negative muons in a sample that would allow depth-resolved element analysis using muonic X-ray. A major milestone towards this goal was achieved by tuning the entire beam-transport optics components including the super-conducting solenoid on the D-line. As shown in Fig. 6, a minimum momentum width of 1.7% (as a relative Gaussian width) with beam divergence of laterally 30 mm and vertically 60 mm of full (6σ) two-dimensional Gaussian widths was obtained. The tuning also yielded significantly increased muon flux at a momentum of 5 MeV/c (~120 keV in energy), more than 100 times greater than that for the previous condition.

This development made it feasible to install a new collimator with aluminum cover at the end of the beam exit (see Fig. 6). The collimator has a conically tapered shape following the beam focusing envelope with a hole with diameter of 50 mm at the end, reducing the distance of the focusing point from the beam exit by 200 mm compared to the previous setup. This also allowed more freedom for placing Ge detectors for muonic X-rays, e.g., at the upstream side of the sample.

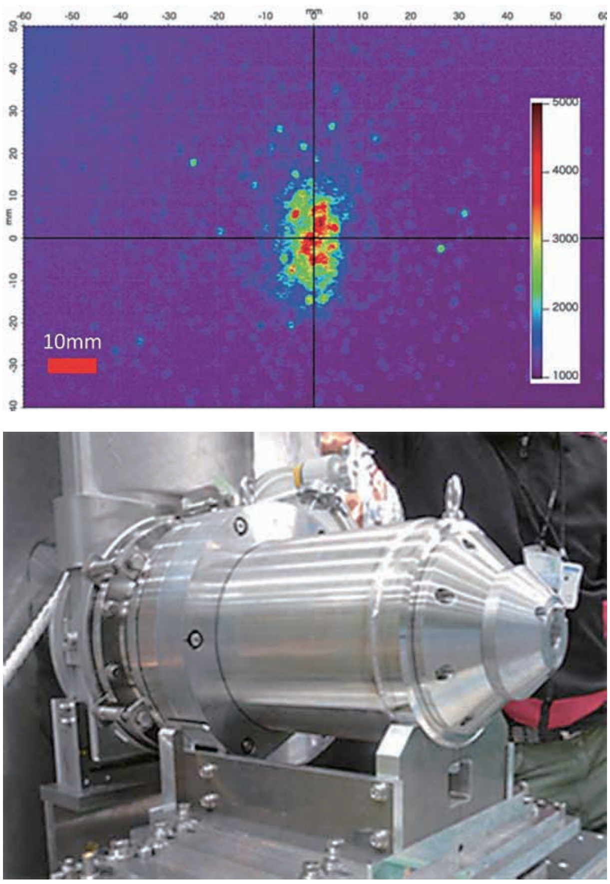


Fig. 6. (Top) Profile of the negative muon beam at the focal point in the D2 area. (Bottom) A side view of the new beam collimator installed at the beam exit of the D2 area.

Struggle for ultra-slow muons continued

Since the successful generation of ultra-slow muons (USMs) at MUSE in FY2015, experimenters had been striving to increase the yield of USMs to the level needed for practical applications. However, they were still in a long crucial stretch of their efforts throughout 2017, fiddling with numerous devices, including the muon beamline (the U-line, consisting of superconducting solenoids and axial-focusing solenoids), for optimizing the muon stopping range in the hot tungsten target, complex laser systems to maximize the ionization efficiency of the thermal muonium (Mu) atoms, the electrostatic lens, and the quadrupoles for transporting the ionized USMs to the sample position.

Among these, the bottleneck was the vacuum-ultraviolet (VUV) laser power for the Mu ionization. A crystal vendor's delay to deliver a promised high-quality yttrium-gallium-aluminum-oxide (YGAG) crystal needed for the final laser amplifier hampered the improvement of the total ionization efficiency. In addition, relatively low proton beam power (~150 kW in 2017A) placed further limit to the net USM yield by reducing the incident surface muon flux, making the entire tuning work time-consuming and inefficient (which was improved by the ramp-up of the proton power to ~300-400 kW in 2017B). We sincerely hope that the crystal vendor would be able to fabricate a good YGAG crystal to avoid further efficiency problems.

Meanwhile, a muon spin rotation spectrum was successfully measured upon transporting a beam of USM with 30 keV to a silver plate placed at the sample position. The positron event data accumulated over three days of beamtime yielded a backward-forward asymmetry corresponding to the initial muon polarization of nearly 50%, as expected for muons after being ionized from muoniums in the spin-triplet state.

ARTEMIS spectrometer at the S1 area in full service for the Inter-university research program

Since its installation at the S1 area on the S-line, the ARTEMIS spectrometer funded by the S1-type project for the Element Strategy Initiative on Electronic Materials (PI: K. M. Kojima) completed commissioning toward the end of the 2016B term and was switched for the General-Use of KEK Inter-University Research Program in FY2017. By the end of 2017, 17 such proposals were awarded beamtime, and 43 researchers from 25 research institutes around the world (including 10 students and 5 re-searchers from overseas) visited MUSE to carry out muon experiments. Owing to the high-proton beam flux of 400 kW attained toward the end of 2017, they enjoyed high throughput μSR measurements with a data rate as high as 200 million events per hour.

In the meantime, ARTEMIS continued to enhance the sample environments to meet various users' demands. For example, the commissioning of a cryo-furnace system was completed to facilitate the sample temperature control from 1.5 K to 500 K without switching the cryostat (Fig. 7). Another development was the sample holder furnished with a device for rotating sample within a plane that allowed angle-resolved μSR measurements using a single-crystalline specimen. The on-line data acquisition system including the user-interface also underwent significant improvement to incorporate parameters for newly added experimental conditions.

Fig. 7. Users from Toyota Central Res. Dev. Lab (Japan) and KTH Royal Institute of Technology (Sweden) are preparing the sample mounted in a cryo-furnace.

Construction of electric power substation for the H-line in progress

While the neutron users have access to a variety of fully-fledged beamlines and instruments in MLF, a part of the muon users, those with specific interest in fundamental physics experiments, is still waiting for the construction of the promised new beamline, the "H-line," in experimental hall No. 1. The beamline was named after the original plan, which envisioned the delivery of a "high-momentum" muon beam. Since then, the plan underwent significant revisions to meet demands from proposed experiments that required high-muon flux as well as momentum tunability. The detailed design of the beamline also made it ever clearer that the electric power needed to drive the beamline magnets would exceed the current supply capacity of MLF. The issue is now being resolved by constructing a new electric power substation near the MLF building. As the first step, installation of cable racks and pitting of the building wall have started during this summer's shutdown period. Part of the construction work involves building of outdoor structures, which will be continued until the end of this fiscal year.

Technology Development

1. Safety operation issues

The operation of the sample environment equipment and neutron instruments in the MLF with reliable safety is one of our most important issues. To achieve that task, the Technology Development Section has been reviewing the safety standards.

During high-temperature experiments, the users are obliged to monitor the status of the furnace at the beamline, which overloads them. To reduce that load, the sample environment team and the instrument safety team considered this year an unattended operation. Eventually, it was decided that the unattended use of the cryo-furnace would be the first stage in introducing the unattended operation of the high-temperature experiments, if the following conditions are met:

1) Passed safety check by the instrument safety team.
2) Maximum temperature is less than 800 K.
3) Heater output is less than 400 W.
4) Interlock system about temperature abnormality is available.
   Heater stops automatically above maximum temperature and has no automatic return.
5) No fire spreading by multiple holders where the heater is.
6) Monitoring the signal light of the alarm indication system in the monitoring room.

The cryo-furnace is very common sample environment equipment in MLF, regardless of the elastic scattering instrument and the inelastic instrument. The List of parameters for unattended cryo-furnace operation is shown in Table 1.

The next issue is the high-field magnet operation. Under the current rule, based on stringent criteria, if staffs or users want to access the area around an operating 7-T magnet, they have to stop applying the magnetic field. Now we are discussing a new rule.

2. Development of a high-durability chopper

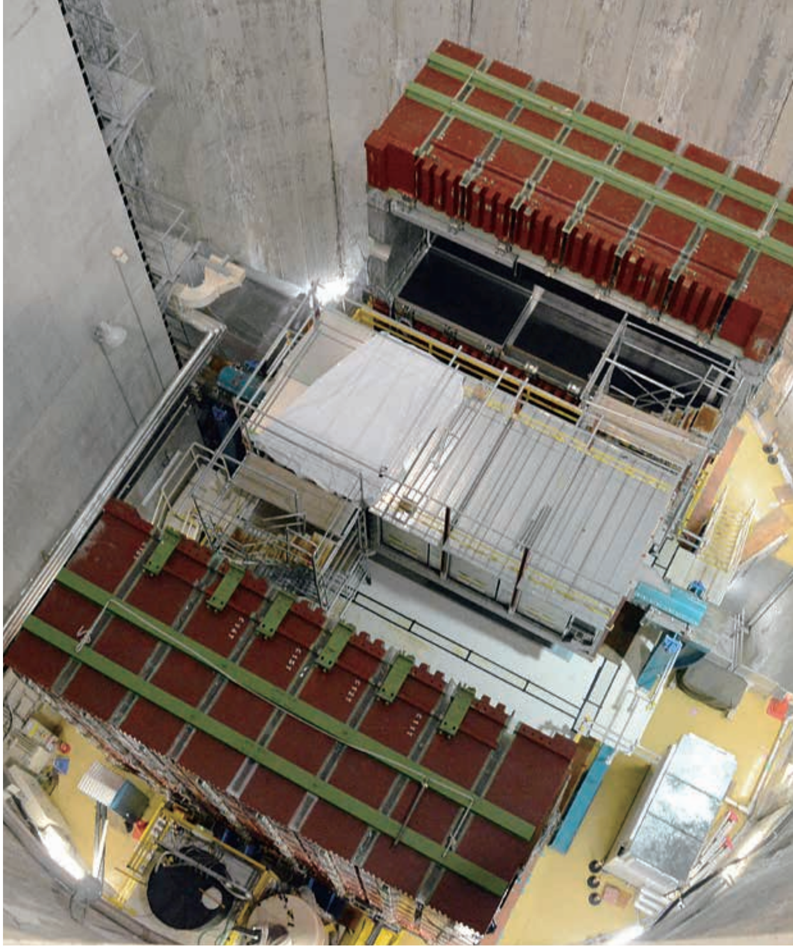
To prepare for the upcoming 1-MW operation, it is very important to develop a chopper and a high-speed disk chopper. It is because the maintenance of the choppers is a heavy work due to high activation in their operating area. We are developing a high-durability T0 chopper, designed for a ten-year maintenance period. The prototype was fabricated well, and the long-term operation test continues successfully. The actual machine will be fabricated next year and installed in the year after that. As for the high-speed disk chopper, we started the design of a disk shape with sufficiently high mechanical strength and reliability for a 350-Hz operation.

3. Preparation of advanced computational environment

Toward the 1-MW operation, we are preparing an advanced computational environment, which consists of individual beamline computational environment and a high-performance computer with high-volume storage (200 TB × 2) in the J-PARC research building, connecting high speed optical cables (40 GbE) and network switches which are currently redundant. This year, the installation of the optical cables was completed. After the remaining part of the environment is installed, the operation will start in 2019.

Table 1. List of parameters for unattended cryo-furnace operation.

BL	Type	Temperature range (K)	Heater output (W)	Sensor
BL01	Top loading	4~600	100, 150	Rhodium iron
BL02	Top loading	15~680	50	Platinum
BL09	Top loading	10~800	100	K type thermocouple
BL14	Top loading	5~550	100	Platinum
BL20	Bottom loading	4~600	70	Platinum, N type thermocouple
BL20	Auto sample changer	4~800	150	Platinum
BL21	Auto sample changer	20~500	75, 130	Platinum
BL21	Top loading	5~500	75	Platinum
SE	Top loading	5~700	240, 50	Platinum, silicon



Particle and Nuclear Physics

J-PARC Neutrino Experimental Facility

Neutrino Experimental Facility hosts the T2K experiment, an international collaboration of 481 researchers from 12 nations.

For the T2K experiment, data were collected in the neutrino mode until April 12 in 2017. After the summer shutdown, the T2K experiment was performed in the anti-neutrino mode from October 16 to December 22, and subsequently from March 9 in 2018 until May 31. The stable operation of a 480-kW beam was successfully achieved. The history of the accumulated protons on target (POT) and the beam power are plotted in Fig. 1. As of March 31, 2018, T2K accumulated 12.5×10^{20} POTs in the anti-neutrino mode, and 15.1×10^{20} POTs in the

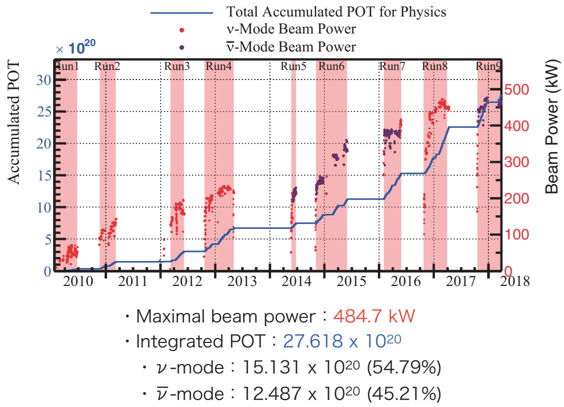


Fig. 1. History of accumulated POT and beam power since the beginning of T2K.

neutrino mode since the beginning of the experiment.

The event reconstruction algorithm of the far detector has been improved. It resulted in an increase in the electron-like event sample by approximately 30%. Better modeling of the neutrino–nucleus interactions using near detector data was achieved by T2K.

T2K reported new results in a KEK seminar in August, including an update on the constraint of the CP phase of neutrino oscillations with the benefit of analysis improvement and additional data acquired until April of 2017. The details are described in the highlight section of this annual report. T2K also updated the result of the θ_{23} analysis, which is consistent with the maximal mixing. Further studies for the reduction of systematic uncertainty continue.

During the summer maintenance period, a beam window that separates the proton beam line vacuum from one atmospheric pressure helium in the helium vessel was exchanged (Fig. 2). It had been sustaining 1-atm-pressure-difference for eight years since the beginning of the experiment, and accumulating large proton irradiations and heat impulses. As it was highly radio-active, the exchange operation was performed with fully remote handling. Following the preparation and tests in 2016, the exchange operation was successfully completed. The new window has operated stably since the run restarted in October.

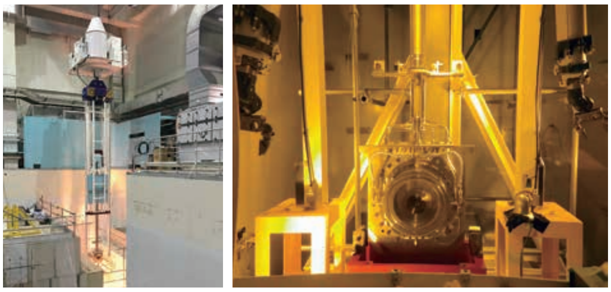


Fig. 2. An old beam window under removal from the beamline. Left: suspended from the remote-hoisting attachment, Right: old window in the manipulator room.

J-PARC Hadron Experimental Facility

Hadron Experimental Facility (HEF) of J-PARC is for fixed-target experiments of particles and nuclear physics using hadron beams produced by the slowly extracted 30-GeV protons from the Main Ring accelerator. In FY2017, the user operation of HEF was conducted from April to June 2017, and from January to February 2018. In the first period, the beam power was limited to 37 kW and the user beam time was only one month, owing to an accelerator problem. In the second period, the repetition cycle was shortened from 5.52 s to 5.20 s, and the stable user operation with 51 kW was realized. Three beam lines, K1.8, K1.8BR, and KL, for high intensity K mesons (kaons) were operated. The total beam power delivered during the FY2017 operation was 2,038 kW•days, and the data acquisition for two experiments, E07 and E31, was completed.

In the southern area of the experimental hall, the construction of the beam dump of the high-p beam line, the shielding wall of the COMET beam line, and the new stage for magnet power supplies were performed in 2017.

Strangeness/Hadron Physics Experiments

A hybrid-emulsion experiment to study double strangeness nuclei (E07) completed the beam exposure to the emulsions at the K1.8 beam line by June. The photographic development of 118 modules was completed at Gifu University in February 2018. The scanning of the emulsions is in progress at Gifu University and the Advanced Science Research Center at the Japan Atomic Energy Agency. Several candidate events for double strangeness nuclei were found, although their nuclear species were not yet uniquely identified (Fig. 3).

In the beam operation from January in 2018, the E31 experiment that studies $\Lambda(1405)$ in the $K^- d \rightarrow n\Sigma\pi$ reactions completed data acquisition at the K1.8BR beam line, collecting four times or more statistics than that obtained in the previous run, aiming for the separate analysis of each isospin channel of the final $\Sigma\pi$ states.

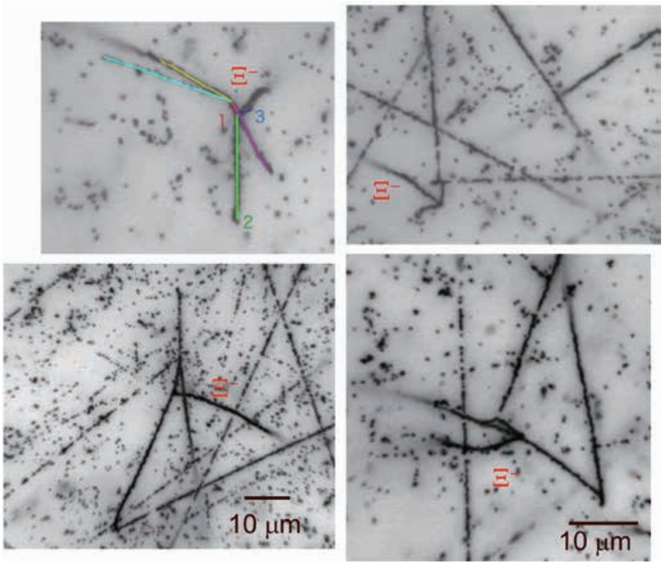


Fig. 3. Overlaid photograph of the emulsion for candidate events of double strangeness nuclei.

Kaon Decay Experiment

The KOTO experiment is designed to study the decay of a neutral kaon (K_L) into a neutral π meson and a pair of neutrinos. The detection of this decay is challenging, because only two photons from π^0 are observable; the decay has not been observed. This decay breaks the CP symmetry directly, and the branching fraction is theoretically well predicted in the SM of particle physics as $(3.0 \pm 0.3) \times 10^{-11}$. By examining this ultra-rare decay, a new source of CP symmetry breaking that can explain the matter–antimatter asymmetry in the universe may be revealed.

In FY2017, KOTO continued with data acquisition with the new "inner barrel" shower counters installed to the detector in March 2016. In parallel, the analysis of the data collected since FY2015 is ongoing intensively.

J-PARC Muon Experiments

COMET aims at searching for muon-to-electron conversion with a sensitivity of better than 10^{-14} in the first phase of the experiment. Intensive R&D has been continued in 2017 toward the start of the experiment. The performance test of the cylindrical drift chamber, the primary detector of the physics measurement, was started using cosmic-ray muons. The construction of the Straw-tube tracker and the mass production of lutetium yttrium ortho-silicate (LYSO) used for the electron calorimeter was launched.

The acceleration and bunched-extraction tests of 8-GeV proton beam were conducted in January and February of 2018. The measurement of the beam extinction factor was performed with the secondary beam at the K1.8 beam line, showing an excellent performance of the J-PARC proton beam mandatory for the COMET experiment.

An experiment for the measurement of the muon's anomalous magnetic moment (g-2) and EDM is under preparation in Materials and Life Science Experimental Facility (MLF) of J-PARC. The collaboration successfully demonstrated the acceleration of negatively charged muoinium ion to 90 keV using a radio frequency quadrupole (RFQ). In addition, the developments of a muonium production target, NMR probe, spiral injection, beam profile monitor, and positron tracking detector were performed.

Highlights-1: Enhanced early hint of CP asymmetry in the neutrino sector

Particles and antiparticles are always generated in pairs and are related like light and shadow. Even in the early universe, baryonic matter and its antimatter must have been evenly produced. However, the current natural world consists dominantly of matter, and antimatter is rarely observed. Almost all the antimatter produced in the early universe seems to have vanished. This paradox is one of the most mysterious puzzles in physics. A key to solving this problem is to determine whether or not there is a difference between particles and antiparticles. This difference is called charge-parity (CP) symmetry breaking (or CP violation).

The first observed phenomena of CP violation reported in the quark sector can be expressed by the Cabibbo–Kobayashi–Maskawa matrix. However, it is not sufficient to quantitatively explain the observed matter–antimatter asymmetry. Therefore, it is important to identify other sources of CP violation. Especially, the search for CP violation in the neutrino sector will remain one of the most interesting subjects in particle physics in coming decades. The Tokai-to-Kamioka (T2K) long-baseline neutrino-oscillation experiment uncovered the world's first indication of CP violation in the neutrino sector in 2016 through analysis of the data obtained up to that time [1], and progress with more data is anticipated.

There are three types of neutrinos: electron neutrinos (ν_e), muon neutrinos (ν_μ), and tau neutrinos (ν_τ), which are named after their charged partners. Because neutrinos have finite mass, one type of neutrino can transform to another type, a phenomenon known as neutrino oscillation. Neutrino oscillation is theoretically expressed by the Pontecorvo–Maki–Nakagawa–Sakata matrix, parametrized by three mixing angles (θ_{12}, θ_{13}, and θ_{23}) and a CP-violating phase, δ_{CP}. After the discovery of neutrino oscillation by the Super-Kamiokande (SK) experiment in 1998 [2], many experiments have been conducted, and the three mixing angles have been measured. However, no definitive measurement of a CP-violating phase has been made yet. This can be realized by the precise measurement of the $\nu_\mu \rightarrow \nu_e$ transition that was observed by T2K in 2013 [3].

The T2K setup is described in detail in [4]. T2K used a high-intensity proton beam from J-PARC to produce a muon neutrino beam and the SK detector, 295 km away from J-PARC, as its far detector. 30-GeV proton beams were exposed to a graphite target to produce charged pions and kaons, which were focused by three magnetic horns. The charged mesons decayed in flight to muon neutrinos and muons in a 94-m-long decay volume, followed by a graphite beam dump and muon monitors. By selecting the polarity of the horn current, a neutrino or antineutrino beam was selectively produced. The neutrino beam provided by off-axis methods had a narrow energy spectrum, peaking at 0.6 GeV, where the neutrino oscillation at 295 km distance is maximum.

T2K began operations in January 2010 and collected data until May 2013 with the neutrino beam. After the discovery of the $\nu_\mu \rightarrow \nu_e$ oscillation, data collection with the antineutrino beam was performed from May 2014 to May 2016. The data collection from October 2016 to April 2017 doubled the amount of neutrino beam data.

In August 2017, T2K released the new results of the search for CP violation with increased data and an improved analysis method that enables signal detection with about 30% higher efficiency [5]. The collected data corresponded to an exposure of 2.23×10^{21} protons-on-target (POT) in total, of which 14.7×10^{20} and 7.6×10^{20} POT were collected with the neutrino and antineutrino mode beams, respectively. In the far detector data, 89 ν_e and 7 anti-ν_e candidate events remained after all selection criteria were applied (Fig. 4) while approximately 67 ν_e and 9 anti-ν_e events are expected by assuming no CP violation (δ_{CP} = 0°, ±180°) (Table 1). This difference between theory and the observation excludes no CP

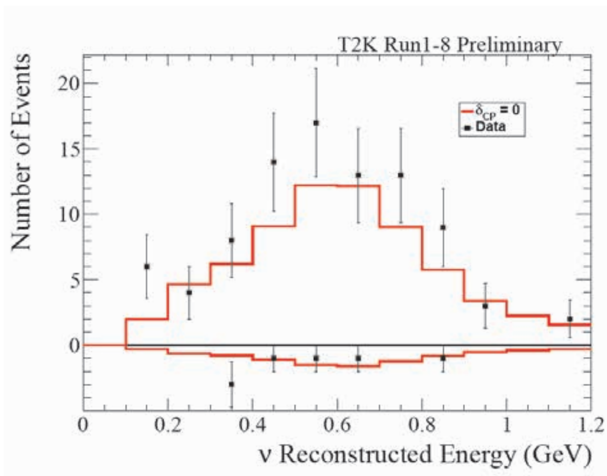


Fig. 4. Reconstructed neutrino energy of the ν_e (top) and anti-ν_e (bottom) with the expected spectrum by assuming no CP violation [5].

Table 1. Numbers of ν_e and anti-ν_e events between the expectation in case of no CP violation and the actual observation.

Beam	Expected (no CP violation)	Observation
Neutrino	67.4 (δ_{CP} = 0) 67.7 (δ_{CP} = 180°)	89
Antineutrino	9.0 (δ_{CP} = 0) 8.9 (δ_{CP} = 180°)	7

violation hypothesis with a 95% confidence level. The most probable value of δ_{CP}, which depends on the mass ordering ($\Delta m^2_{23} > 0$ or < 0), is −105° for the normal ordering ($\Delta m^2_{23} > 0$) assumption and −79° for the inverted ordering ($\Delta m^2_{23} < 0$) assumption (Fig. 5). The indication of CP violation is clearer now than it was from the first hint obtained in 2016.

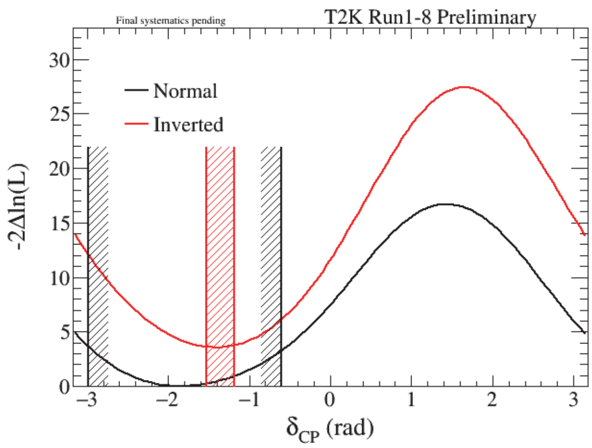


Fig. 5. Curves showing a degree of inconsistency with the observed data as a function of δ_{CP} for the normal (black) and inverted (red) mass ordering assumptions. The vertical lines show the allowed 95% confidence intervals [5].

In October 2017, T2K restarted data collection with the antineutrino beam. During this period, a maximum beam power of 490 kW was achieved for continuous beam operation. The beam intensity reaches 2.45 × 10^{14} protons per pulse, which exceeds the world's highest intensity previously recorded for a fast-extracted beam from a proton synchrotron. This data collection will double the antineutrino beam data by the summer of 2018. The accumulated POT from the beginning of T2K operation is about to reach 3 × 10^{21} POT. The T2K Collaboration aims to extend data taking up to 20 × 10^{21} POT with the J-PARC accelerator upgrade to perform an initial observation of CP violation at a >99.7% confidence level for the case of maximum CP violation [6]. T2K will continue its data collection to further achieve the goal of discovering CP violation.

References

[1] K. Abe *et al*. (T2K Collaboration), Phys. Rev. Lett. **118**, 151801 (2017).

[2] Y. Fukuda *et al*. (Super-Kamiokande Collaboration), Phys. Rev. Lett. **81**, 1562 (1998).

[3] K. Abe *et al*. (T2K Collaboration), Phys. Rev. Lett. **112**, 061802 (2014).

[4] K. Abe *et al*. (T2K Collaboration), Nucl. Instrum. Methods. A **659**, 106 (2011).

[5] M. Hartz, KEK Colloquium, August 4, 2017.

[6] K. Abe *et al*. (T2K Collaboration), arXiv: 1609.04111v1 (2016).

Highlights-2: The first determination of level structure of $^{19}_{\Lambda}$F and a radial dependence of ΛN spin-spin interaction strength

The γ-ray spectroscopy using Ge detectors is one of powerful methods to study fine structures of nuclei with a few keV or better resolution and accuracy and has revealed various many-body aspects of nuclei in its long history. This method was successfully applied for the first time in 1998 to hypernuclei at KEK 12-GeV PS. Since then, light (*s*- and *p*-shell) Λ hypernuclei have been intensively studied by this method in order to obtain the spin-dependent interaction between Λ and nucleons (N) from structural information such as level spacing. This was done with the help of theoretical frameworks to connect the bare interaction and nuclear properties of many-body systems. Recently the level structure of a heavy (*sd*-shell) Λ hypernucleus, $^{19}_{\Lambda}$F, was determined for the first time by experiment at J-PARC Hadron Experimental Facility [1]. The structure, especially the energy spacing of the ground state doublet, is well reproduced by theoretical model calculations together with the existing light Λ hypernuclear data.

The data was taken at the K1.8 beam line in 2015. The $^{19}_{\Lambda}$F hypernucleus was produced by the ^{19}F(K$^-$, π^-) reaction at 1.8 GeV/c with a 20 g/cm^2-thick liquid CF_4 target, as shown in Fig. 6. The hypernuclear states were identified by the missing mass of the reaction by analyzing the incident K$^-$ and outgoing π^- by K1.8 beam spectrometer and Superconducting Kaon Spectrometer (SKS), respectively. The missing-mass resolution was 8.7 MeV (full width at half maximum, FWHM), which was determined by energy loss in the thick target. It was sufficient to reject highly excited states of $^{19}_{\Lambda}$F and background $^{12}_{\Lambda}$C contributions. The γ-rays were measured in coincidence with the Hyperball-J detector, which consisted of 27 coaxial-type Ge detectors with a crystal size of 70 mm (ϕ) $\times$ 70 mm (length), and $PbWO_4$ counters for background suppression from Compton scattering in the Ge crystals and π^0 decay. After an in-beam energy calibration of the Ge detectors using a ^{232}Th source and known γ-rays from the target or surrounding materials, an accuracy of 0.5 keV was achieved for the range of 0.1 to 2.5 MeV, while the energy resolution was measured to be 4.5 keV (FWHM) for 1 MeV γ-rays.

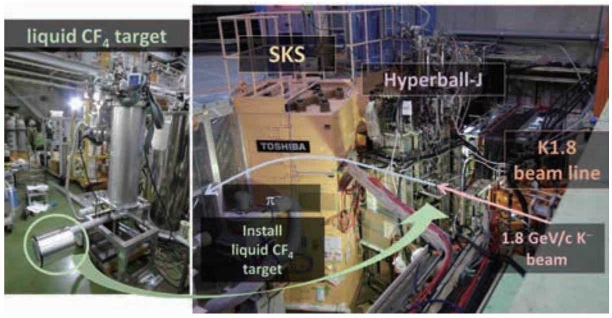


Fig. 6. Experimental setup at K1.8 beam line. The production of $^{19}_{\Lambda}$F was identified with the spectrometer system at K1.8 beam line. The γ-rays were measured in coincidence with Hyperball-J detector.

Figure 7 shows the γ-ray spectrum after selecting low-lying states region of the $^{19}_{\Lambda}$F. In addition to the known γ-rays from normal nuclei, four γ-rays from the $^{19}_{\Lambda}$F hypernucleus were identified. The obtained energies of these γ-rays are 315.5 $\pm$0.4(stat.)$^{+0.6}_{-0.5}$ (syst,), 895.2 $\pm$0.3(stat.)$\pm$0.5(syst.), 952.81 $\pm$1.2(stat.)$^{+0.5}_{-0.6}$ (syst.), and 1265.6 $\pm$1.2(stat.)$^{+0.7}_{-0.5}$ (syst.) keV.

A reconstructed level structure and assignment of γ-ray transitions are shown in Fig. 8. In the assignment,

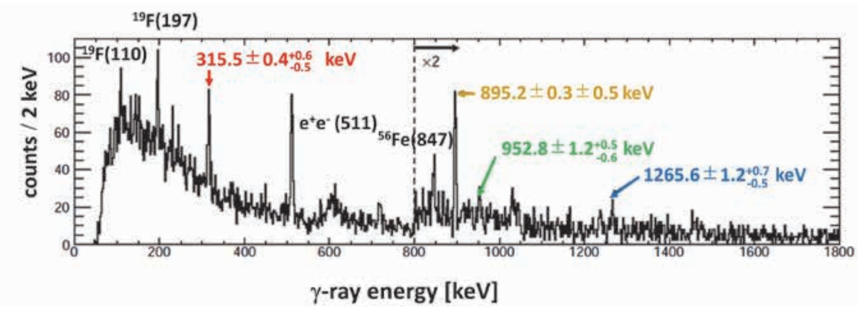


Fig. 7. The γ-ray spectrum after selecting low-lying states region of $^{19}_{\Lambda}$F. Four γ-rays from $^{19}_{\Lambda}$F as well as γ-rays from ordinary nuclei were identified.

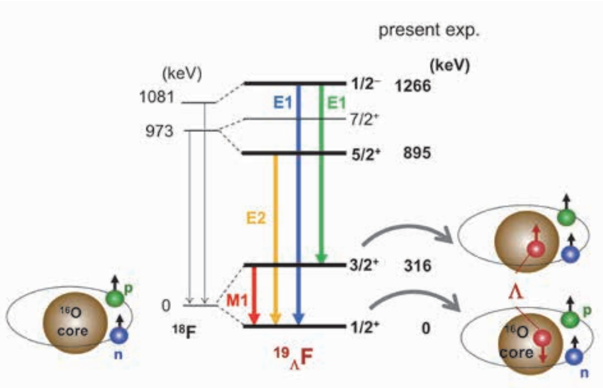


Fig. 8. A reconstructed level scheme and γ-ray transitions of ${}^{19}_{\Lambda}$F.

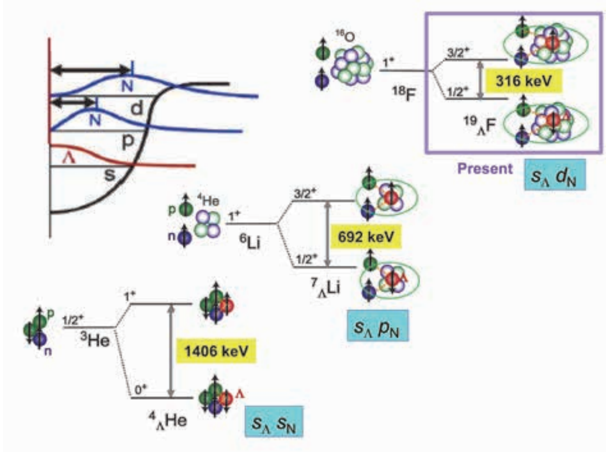


Fig. 9. An energy spacing of the ground state doublet and a radial-dependence of ΛN spin-spin interaction strength.

we assumed weak-coupling between a Λ and the core nucleus, which holds well in Λ hypernuclei because the ΛN interaction is weaker than the NN interaction. We also took into account the estimated cross sections of the excited states. The observed peak widths, which are broad for the 316 keV γ-ray by Doppler shift and narrow for the other γ-rays, are consistent with expected values for the lifetimes of the states.

The energy spacing of the ground state doublet is of great interest when considering the radial dependence of the effective strength of the ΛN spin-spin interaction. In the weak coupling picture, the ground state with spin J of the core nucleus splits into two states, each with spin $J \pm 1/2$, when a Λ is added. The energy spacing is determined mainly by the spin-spin term of the interaction between a Λ in the 0*s*-orbit and nucleons in the outermost orbit (valence nucleons). The mean distance and the wave function overlap between the Λ in the 0*s*-orbit and the valence nucleons vary with the size of the Λ hypernucleus. Thus, the comparison of the spacing among *s*-, *p*-, and *sd*-shell Λ hypernuclei provides a unique test of our understanding of the ΛN interaction and the hypernuclear structure (Fig. 9).

The spacing of 316 keV is in good agreement with two independent shell-model calculations. Millener predicts it to be 305 keV from the phenomenological spin-dependent ΛN interaction strengths determined from the *p*-shell Λ hypernuclear data [2]. On the other hand, based on the shell-model calculation by Umeya and Motoba [3] using the effective ΛN interaction made by G-matrix method from theoretical models of the bare interaction, Nijmegen SC97e and SC97f [4], the energy-spacing of the ground state doublet of *sd*-shell hypernucleus, ${}^{19}_{\Lambda}$F, is expected to be 346 keV when the spin-spin interaction strength is adjusted to reproduce the energy spacing of 692 keV for the *p*-shell hypernucleus, ${}^{7}_{\Lambda}$Li.

The present result indicates that these theoretical frameworks work quite successfully in describing the structure not only for light *s*- and *p*-shell Λ hypernuclei but also for heavier hypernuclei beyond the *p*-shell. Such precise spectroscopic studies of light to heavy Λ hypernuclei would also provide a unique means to investigate the nuclear density dependence of the baryon-baryon interactions in nuclear matter. It may provide an essential clue in solving the hyperon puzzle, the inconsistency between the observed maximum mass of neutron stars and the equation of states of nuclear matter derived from experimental data on ordinary nuclei and hypernuclei.

References

[1] S. B. Yang *et al*., Phys. Rev. Lett. **120**, 132505 (2018).
[2] D. J. Millener, Nucl. Phys. A **914**, 109 (2013).
[3] A. Umeya and T. Motoba, Nucl. Phys. A **954**, 242 (2016).
[4] Th. A. Rijken, V. G. J. Stoks, Y. Yamamoto, Phys. Rev. C **59**, 21 (1999).

Highlights-3: Beam innovation strengthens the J-PARC particle and nuclear physics program

J-PARC is a multi-purpose and multi-disciplinary research complex with a series of proton accelerators, LINAC, RCS, and MR, and experimental facilities. By applying intense primary-proton beams, secondary particles are produced and their beams are used for a variety of experiments. The power of the proton beam extracted from the accelerator is crucial, because the number of particles available for performing an experiment in a limited time is proportional to the power. With higher beam power, the purity of secondary-particle beams can also be improved by the instruments, e.g. collimators and separators in the beam lines.

At Hadron Experimental Facility (HEF) [1] of J-PARC, the 30-GeV proton beam is slowly-extracted from the MR over a period of 2 seconds. In February 2018, the beam power for the slow extraction (SX) reached 51 kW, which is half of the initial goal. HEF is currently conducting a rich and strong physics program as the unique "Kaon Factory" with two beam lines, K1.8 and K1.8BR, for charged K mesons (kaons) and a single beam line, KL, for neutral kaons (Fig. 10). During FY2017, the accumulated beam power for SX was 2,038 kW•days, corresponding to 3.7×10^{19} protons. Data was acquired for the E07 experiment at K1.8 for studying double strangeness nuclei with emulsion and the E31 experiment at K1.8BR for hyperon resonances below the $\bar{K}N$ threshold. The KOTO experiment at KL for the rare decay $K_L \rightarrow \pi^0 \nu\bar{\nu}$ was performed for better sensitivities. The following new measurements in preparation are to be performed in near future: X-rays from kaonic He atoms (E62), cross sections of the Σ-hyperon proton scatterings (E40), and X-rays from Ξ-hyperon atoms (E03). MR will further increase the SX beam power toward 100 kW over the next couple of years; the precision of the measurements and the sensitivity of the searches with kaons will be much improved, and new experiments such as an H-dibaryon search will begin.

The proton beam hits the gold target of HEF to produce secondary particles. The current target system, operating without problems since 2015, was originally designed for a beam power of 50 kW. A new system, with improvements to the target and the beam windows of the chamber so as to be durable for 90 kW and above, is being prepared. The design was reviewed by experts in December 2017. The system will be fabricated in FY2018 and the new target system will be installed at HEF in FY2019.

At the South Experimental Building of HEF, a new experiment, named COMET, will be conducted to search for the lepton-flavor violating muon-to-electron conversion. In order to suppress the background in the slow extraction from MR for COMET, 8-GeV protons

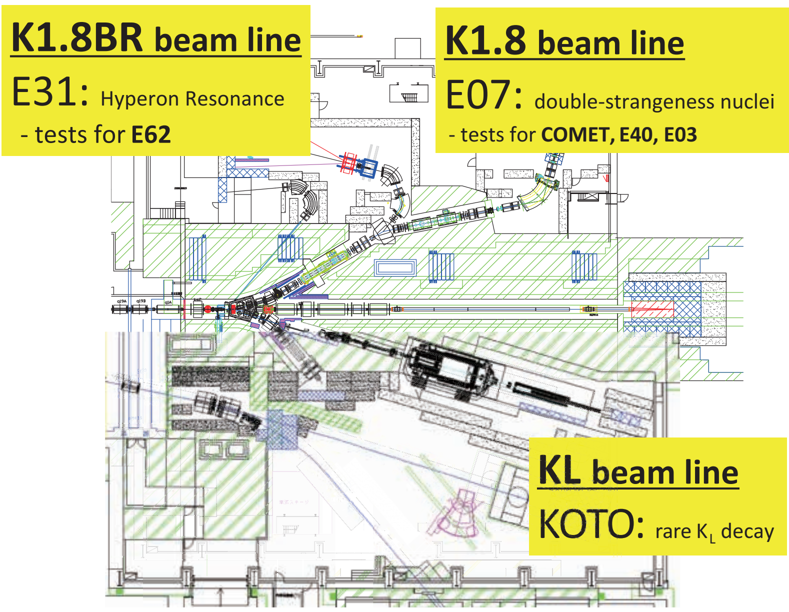


Fig. 10. Beam lines and experiments for the user operation of HEF in FY2017.

should be grouped at 1.1-microsecond interval. The fraction of the protons remaining in the interval, called the "extinction factor", should be less than 10^{-10}. MR experts and COMET collaborators have been working to realize this for many years. In February 2018, they extracted the beam to HEF for the first time and performed the extinction measurement with the timing of secondary particles from the target through the K1.8 beam line to the experimental area. As a preliminary result, a sufficient extinction factor $< 1 \times 10^{-10}$ has been obtained (Fig. 11); further improvements of the extinction factor, to $< 6 \times 10^{-11}$, are expected based on their studies. COMET continues the beam line and detector construction so as to begin the experiment in timely manner.

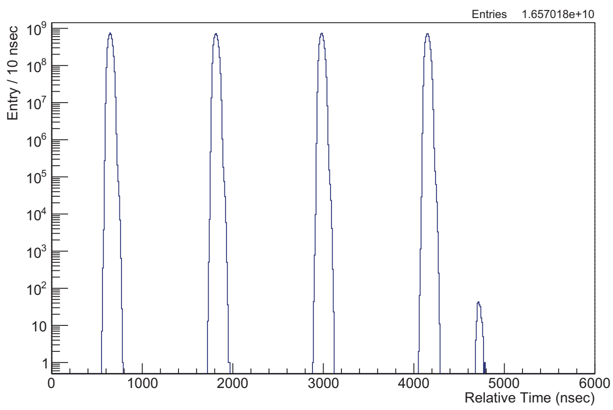


Fig. 11. Time characteristics of the secondary particles produced by the 8 GeV pulsed proton beam for the COMET experiment.

At Materials and Life Science Experimental Facility (MLF) of J-PARC, the 3-GeV proton beam with 500 kW, from the RCS accelerator, produces pulsed neutron and muon beams. Basic laws in particle and nuclear physics can be tested with them. In particular, to precisely measure muon's anomalous magnetic moment (g-2) and electric dipole moment (EDM), a new g-2/EDM experiment (E34) with an ultra-cold muon beam is being designed. To realize the beam, which is completely different from those used in previous g-2 experiments [2], novel techniques must be developed. As a milestone, the collaborators successfully conducted an experiment at the D2 line of the J-PARC muon science facility MUSE in MLF to generate negative muonium atoms, which are bound states of a positive muon and two electrons, and accelerate them in a radio frequency (RF) quadrupole linac to 89 keV (Fig. 12). In this experiment, muons have been accelerated using an RF accelerator for the first time [3].

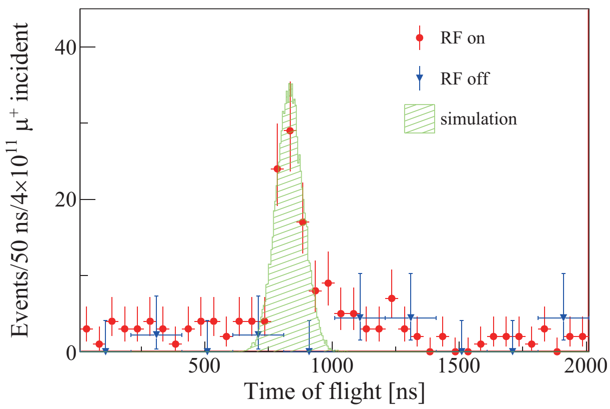


Fig. 12. Time-of-flight spectra of the negative-charged configuration with RF on and off. The peak of the RF on spectrum at 830 ns corresponds to the accelerated negative muonium atoms [3].

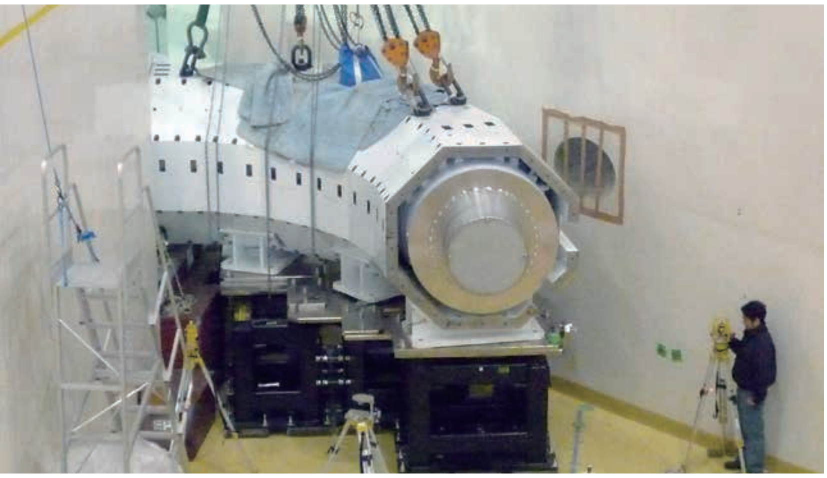
Our innovation on beams with high intensity protons strengthens the particle and nuclear physics program of J-PARC, improves the diversity of the research, and will bring about progress in the search for new physics.

References

[1] K. Agari *et al.*, Prog. Theore. Exp. Phys., **2012**, 02B008 (2012); K. Agari *et al*, *ibid*., **2012**, 02B009 (2012).

[2] G. W. Bennett *et al*. (Muon g-2 Collaboration), Phys. Rev. D, **73**, 072003 (2006).

[3] S. Bae *et al*., Phys. Rev. Accel. Beams, **21**, 050101 (2018).



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 maintainance and operation of the superconducting magnet systems for the neutrino beamline, for the muon beamline at the Materials and Life Science Experimental Facility (MLF) and construction of 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 at the Cryogenics Section. Figure 1 summarizes the liquid helium supply in FY2017.

Liquid nitrogen was also supplied to the users for their convenience. Its amount in FY2017 is summarized in Fig. 2. Liquid nitrogen has been regularly provided to the Radiation Safety Section for operation of a gas chromatograph. It was also supplied to the users in the MLF and the HEF.

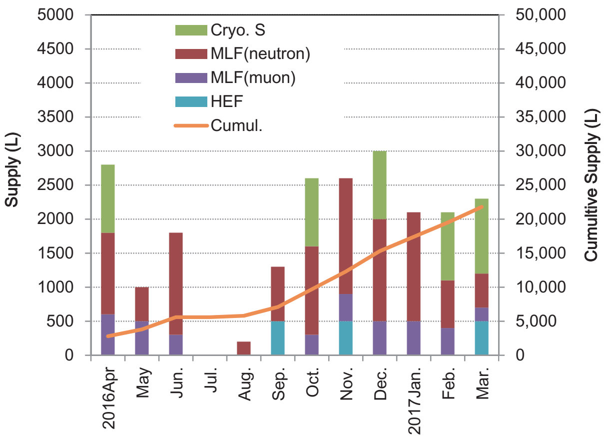


Fig. 1. Liquid helium supply at J-PARC from April 2017, to March 2018.

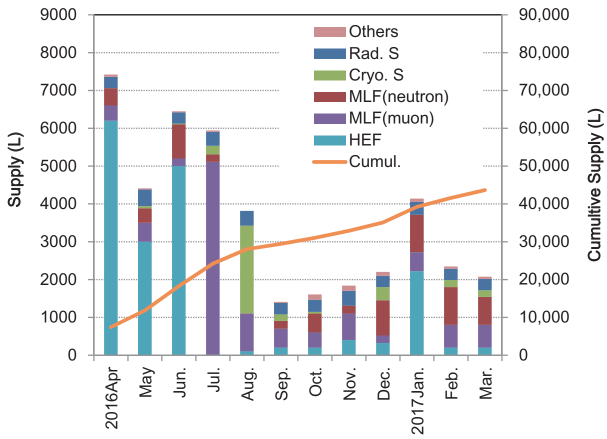


Fig. 2. Liquid nitrogen supply at J-PARC from April 2017, to March 2018.

Superconducting Magnet System for T2K

The superconducting magnet system for the T2K experiment operated during the periods shown in Table 1. The system worked well without disturbing the beam time. In addition to the regular maintenances and inspections in the summer, the filter elements in the 2nd and the 3rd oil separator at the compressor were replaced with fresh ones since their operation had reached the recommendation time. Also, welding repair was performed on some of the outdoor piping to prevent defects by corrosion-induced thinning wall phenomena. Repair work on beam monitors in the superconducting beam line was carried out in the summer shutdown. In order to replace some mechanical parts of the movable monitors, the cryostats for the monitors were opened from July 24 to 26 (Fig. 3). After the repair work, the cryostats were closed from September 6 to 8. There was no leak of vacuum, so the cooling operation was resumed on schedule.

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

	2017 Apr.	May	June	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	2018 Jan.	Feb.	Mar.
Operation	1/3-4/21							10/16-12/25				2/28-6/1
Maintenance												

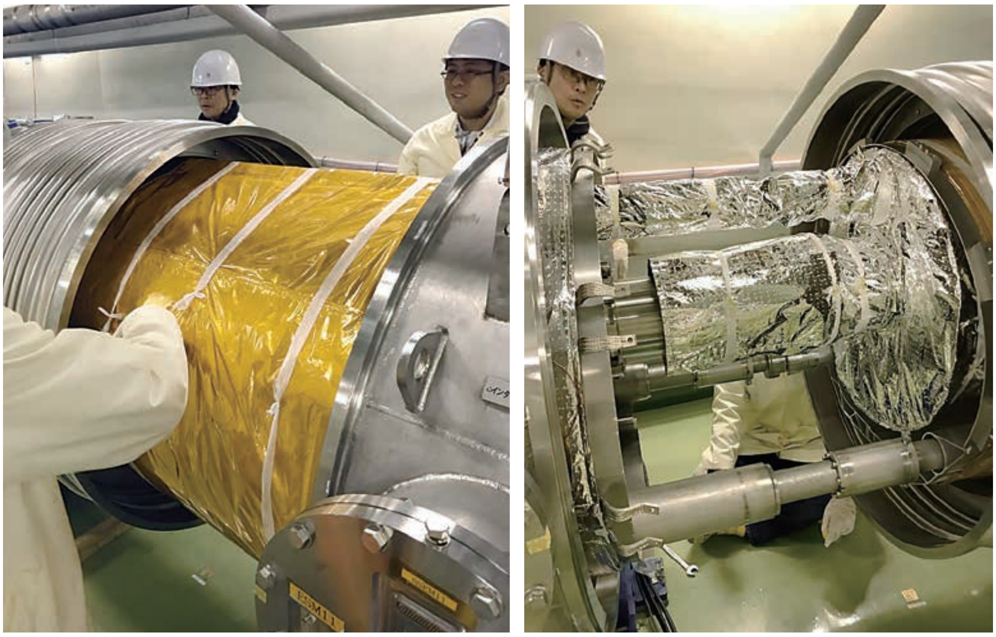


Fig. 3. Picture of the cryostat for the beam monitor before the repair works.

Superconducting Magnet Systems at the MLF

The Cryogenic Section contributes to the operation and maintenance of the superconducting magnet systems at the Muon Science Facility (MUSE) in the MLF. The superconducting solenoid in the Decay Muon Line (D-line) was operated from January to the end of June 2017. After the annual maintenance in the summer shutdown from July to September, it restarted on October 19. It was stopped on December 25 for the New Year holidays, and resumed on January 5. To investigate the trouble with the power supply (PS) observed in 2016, a logging system was installed to monitor the programmable logic controller (PLC) in the PS, and two abnormal events were found on the signal line to reset the PS in March and May 2017. Fortunately, the duration of these events was too short to activate the reset operation, but we were convinced that malfunction occurred in the PLC. So, the PLC was replaced with a new one during the summer shutdown and no problems were found in the PS after the replacement.

Superconducting Magnet Systems at the HEF

The COMET experiment is under construction in the Hadron South Experimental Hall (HDS) of the Hadron Experimental Facility (HEF). The Cryogenics Section was involved in the construction of the cryogenic system and superconducting magnets. Production of the superconducting solenoid magnet using radiation-resistant materials is in progress for the muon source. The design work for the helium transfer lines to the magnets and the detailed design of the cryostat of the Pion Capture Solenoid were improved. The integration plan of the magnet system, including the detectors, was improved, as shown in Fig. 4.

The magnets are designed to be cooled by a two-phase flow of liquid helium with temperatures of 4.5 K and around 50 K for the cryogenic helium gas for the shield. The cold box (LINDE TCF-50), used for the J-PARC E-36 experiment in FY2015, was relocated in HDS. In the operation for E36, some of the temperature sensors in the cold box had a problem functioning at cryogenic temperature, thus, they were replaced to achieve nominal cooling power and stable operation. The cool-down tests confirmed that all cryogenic temperature sensors responded accurately, which was consistent with the expectation shown in the temperature-entropy diagram of the TCF-50. In addition, the characteristics of the Joule-Thomson (JT) valve were also clarified and the optimal JT operation was achieved. Finally, it was also clarified that the cryogenic system had a cooling capacity of 130 W at 4.5 K with a heat load of 500 W on the 50 K shield. The measured cooling capacity was about 1.1 times higher than the estimated total heat load in the COMET Phase-I.

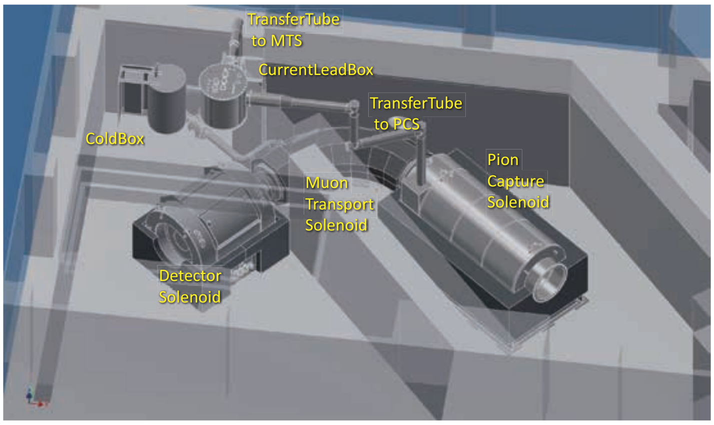


Fig. 4. Plan view of the superconducting magnet system for the COMET Phase-I.

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 a high field homogeneity, better than 1 ppm locally, plays a very important role as a muon storage ring. The review of the technical design report (TDR) was held in 2016. Based on comments from the committee, the magnet design was modified, especially in terms of the cryogenic design, so that the number of cryocoolers could be reduced from 6 to 4.

A muonium hyperfine structure measurement, called MuSEUM experiment, has been proposed for 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 newly-developed probe was tested at the Argonne National Laboratory (ANL) in March 2018, as shown in Fig. 5. It was found that the resolution could be improved from 7.6 ppb to 1.7 ppb, however the material susceptibility of the probe structure was worse, 194 ppb, than the previous value of 70.6 ppb. A further study is in progress.

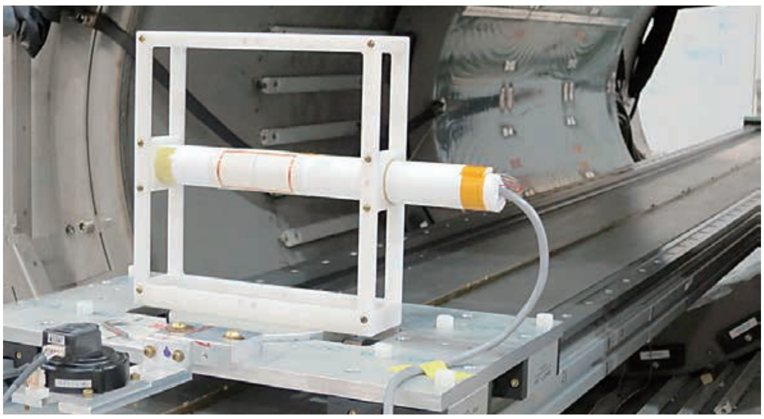
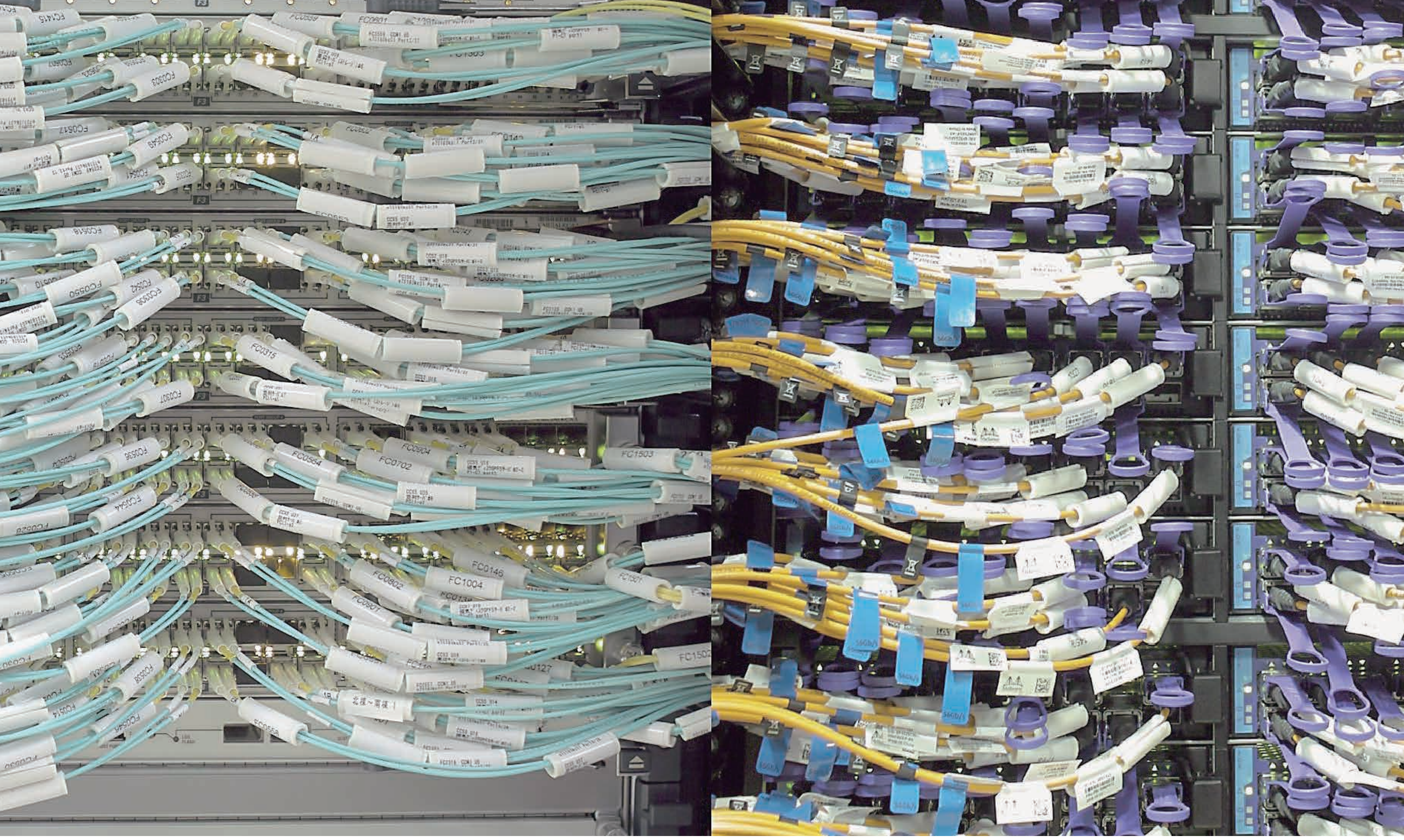


Fig. 5. Material effect measurement of a new standard probe at the ANL.



Information System

Overview

The Information System Section plans, designs, manages and operates the network infrastructure of J-PARC and also ensures its information security. In terms of computing, until now, J-PARC has owed its major computer resource for analyzing and storing data from neutrinos, nuclear physics and MLF experiments to the KEK central computer system. The section connects J-PARC network to the KEK central computing system directory and helps the users to utilize the system effectively.

Status of Networking

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 2017, the total number of hosts on JLAN exceeded 5,000 and the number has increased by 106% from the last year. The growth curve of edge switches, wireless LAN access points and hosts (servers and PCs) connected to JLAN are shown in Fig. 1.

In April 2016, the National Institute of Informatics (NII) has upgraded the SINET (Japan Science Information Network http://www.sinet.ad.jp) from version 4 to 5, in which the backbone network was increased from 40 Gbps to 100 Gbps. The SINET is not only a gateway from JLAN to the internet but also an important connection between Tokai and KEK Tsukuba sites in J-PARC. According to the SINET upgrade, the network bandwidth between Tsukuba and Tokai was increased from 1 Gbps × 8 to 10 Gbps. Beyond the current bandwidth, the upgrade offers a future option of 20 Gbps for both of the internet and Tokai-Tsukuba connections, if the J-PARC network can be adapted.

Figures 2 and 3 show the network utilization of the internet from/to JLAN. Since the bandwidth capacity for the internet through the SINET is 10 Gbps, it is clear that there is enough space for additional activity. Figures 4 and 5 show the statistics of data transfer between the Tokai site and the Tsukuba site. Figure 6 shows the usage level has been approaching half of the upper limit, especially during the period when the Hadron facility was running.

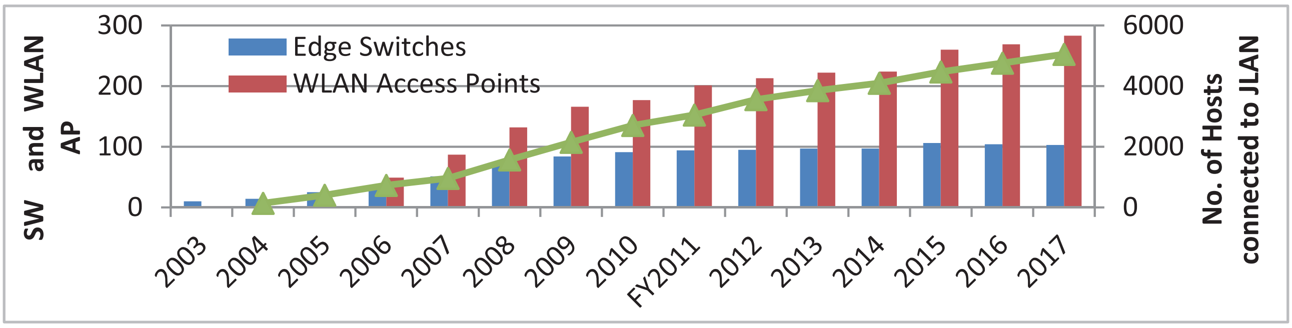


Fig. 1. Number of hosts, edge SW and wireless AP on JLAN.

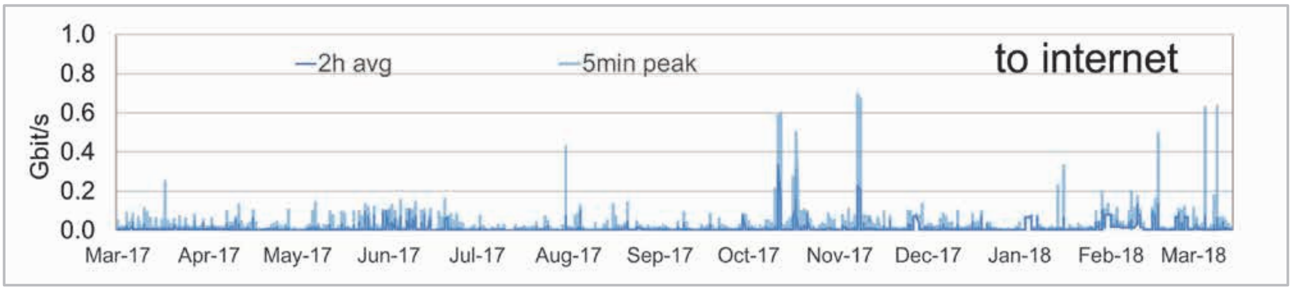


Fig. 2. Network traffic from JLAN to the internet (two hours average and five minutes peak value).

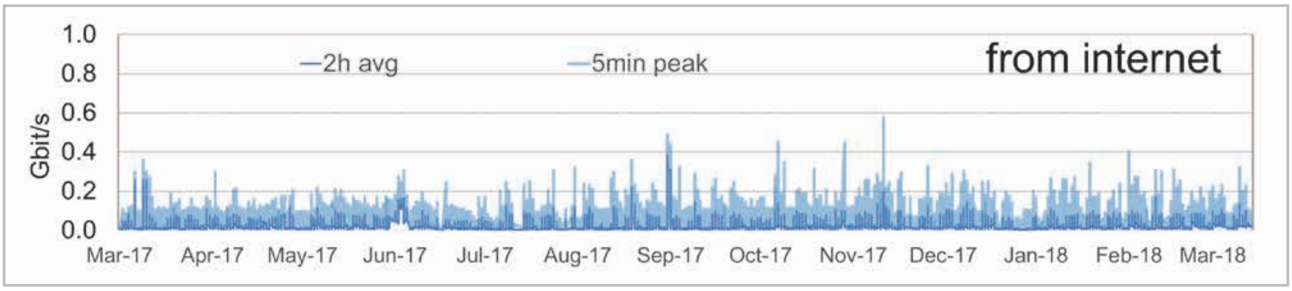


Fig. 3. Network traffic from the internet to JLAN.

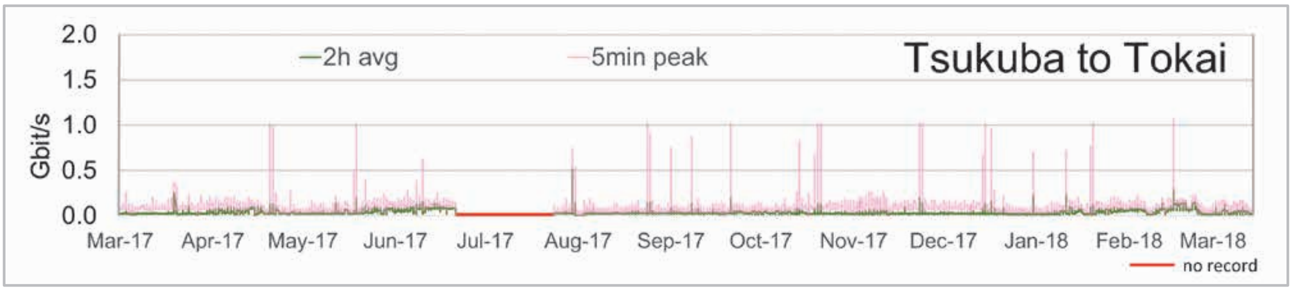


Fig. 4. Network traffic from the Tsukuba site to the Tokai site.

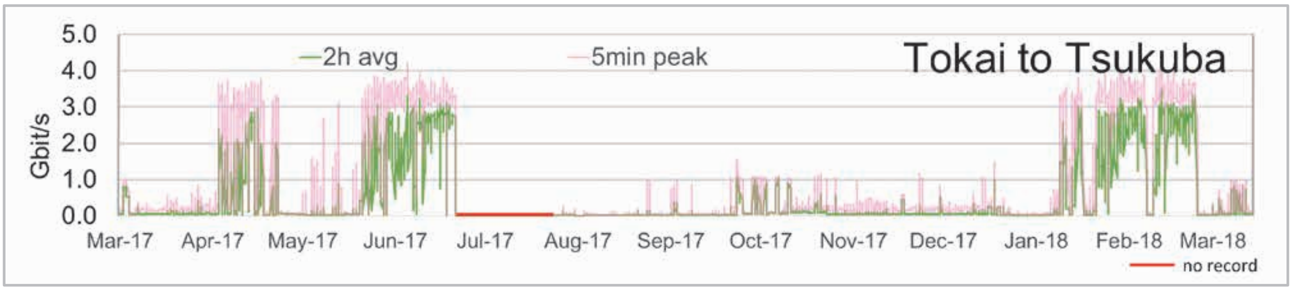


Fig. 5. Network traffic from the Tokai site to the Tsukuba site.

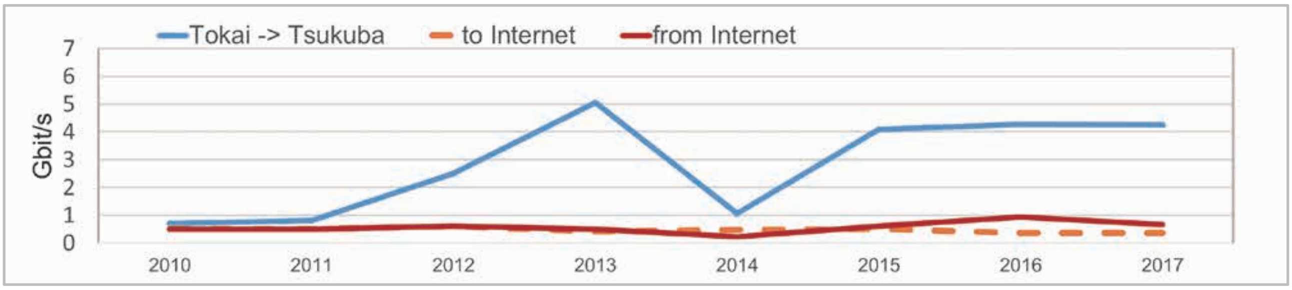


Fig. 6. Peak network traffic for the recent years.

Internet Connection Services for Visitors and Public Users of J-PARC

Since 2009, J-PARC has offered a Guest Network (GWLAN) service, which is a wireless internet connection service for short-term visitors available in almost all J-PARC buildings. In the end of 2014, an additional network service called User LAN has started. To use the GWLAN, the users are required to receive beforehand a password at the J-PARC Users Office, while in User LAN users are authenticated by the same ID and password of the User Support System, which is also used for dormitory reservation and other activities. From March 2016, a new service called "eduroam" has been started. The eduroam (https://www.eduroam.org/) is the secure roaming access service developed for the international research and education community and jointly used among a huge number of research institutes, universities and other facilities around the world. The eduroam service will be a convenient third option of internet connection service for J-PARC visitors. Figure 7 shows this FY's usage statistics for GWLAN, User LAN and the newly-started eduroam service.

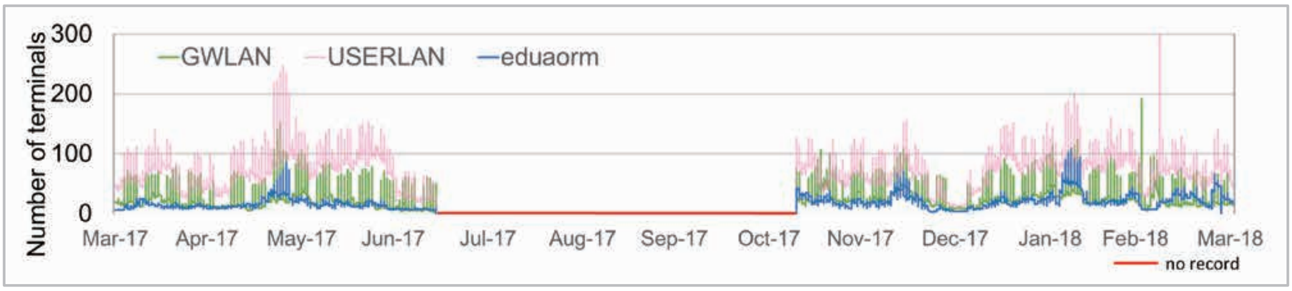


Fig. 7. Usage trends of GWLAN, User LAN and eduroam.

Status of Computing

Though J-PARC does not have computing resources for physics analysis, since 2009, the KEK central computing system (KEKCC) at the KEK Tsukuba campus has been mainly used. At the Neutrino (T2K), Hadron and Neutron (MLF) experiments, the data taken at J-PARC are temporarily saved at their facilities and then promptly transferred, stored and analyzed at the system in Tsukuba. The storage of the system is also be utilized as a permanent data archive for their data.

The second upgrade of the system was completed in 2016, and the computing resources assigned to J-PARC are shown in Table 1. Figures 8-10 show the utilization statistics of the computing resources in 2017. The main users, who used the CPU and storage constantly, were from the Hadron experiment (KOTO) and the Neutrino groups. The MLF group also started to store data to tapes on the system.

Table 1. Assigned computing resources to the J-PARC activities in the KEKCC.

CPU (Intel Xeon E5-2697v3)	4700 cores
RAID Disk (GPFS)	4.5 Peta Bytes
Tape (HSM)	27 Peta Bytes

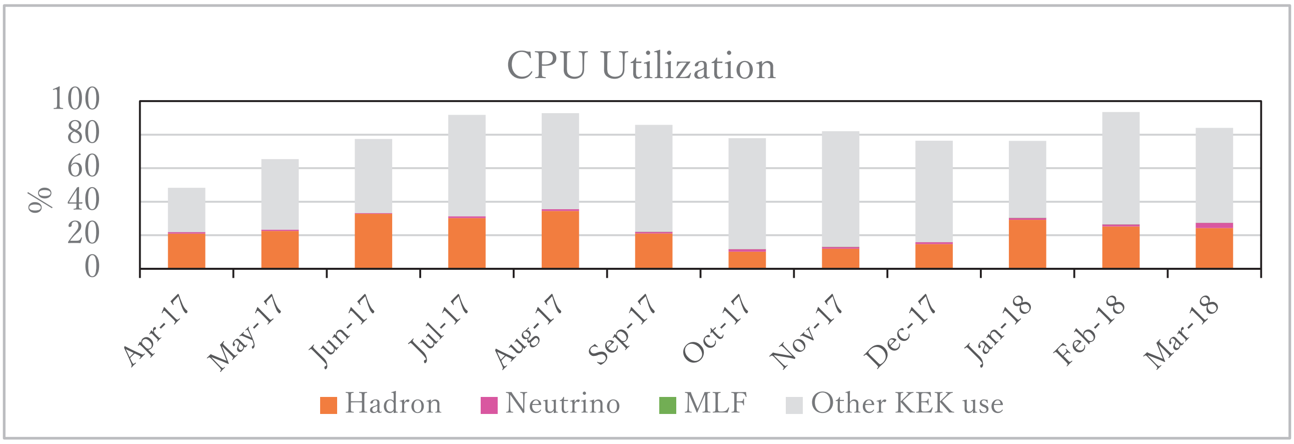


Fig. 8. CPU usage statistics (the yellow line shows the resource assignment for J-PARC).

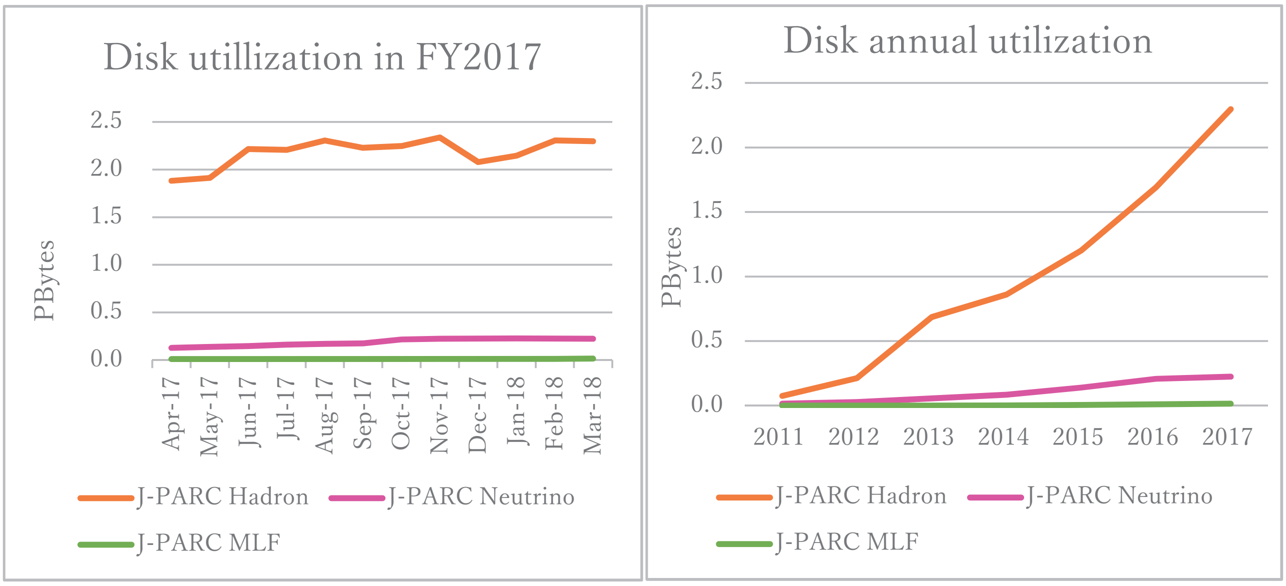


Fig. 9. Disk usage statistics (left: trend for this FY year , right: annual trend).

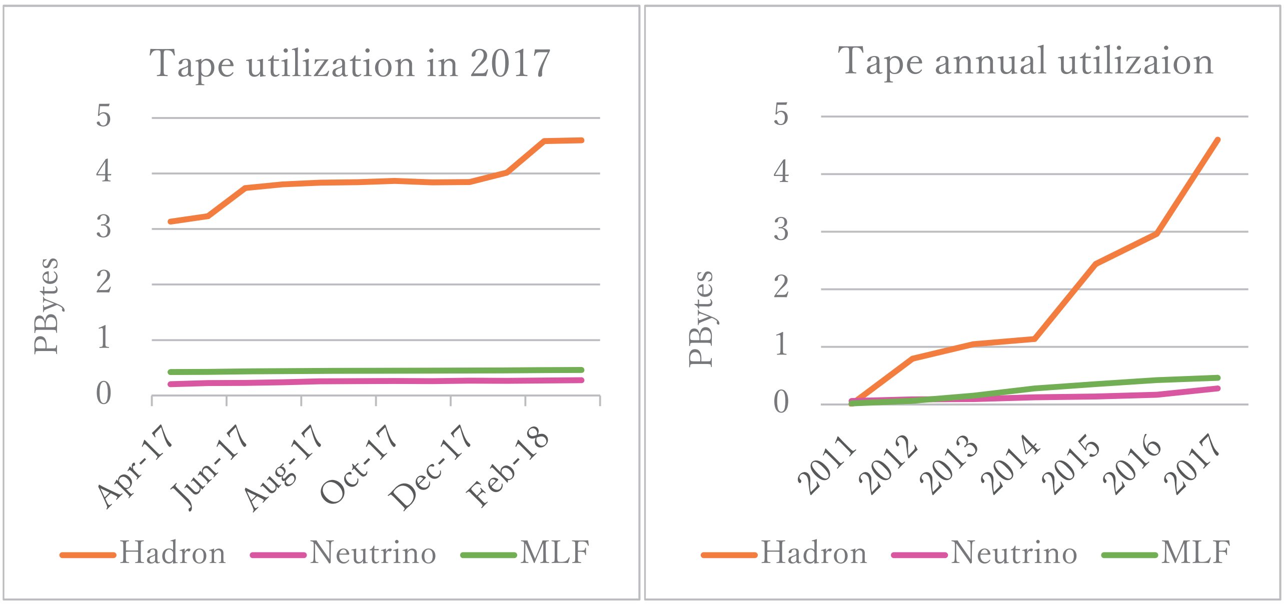


Fig. 10. Tape library usage statistics (left: trend for this FY year , right: annual trend)

Transmutation Studies

Overview

We have been working on R&D needed for developing nuclear transmutation technology with using accelerator-driven systems (ADS) for volume reduction and mitigation of harmfulness of high-level radioactive waste with utilizing J-PARC's research resources.

As for the Transmutation Experimental Facility (TEF) in J-PARC, in addition to a technical design report for the ADS Target Test Facility (TEF-T) published in March 2017 (JAEA-Technology 2017-003, 539 pages), a safety design report for the Transmutation Physics Experimental Facility (TEF-P) was published in February 2018 (JAEA-Technology 2017-033, 383 pages). This report summarizes the safety design of TEF-P and corresponds to a partial draft of documents needed to apply for the reactor installment license.

As for R&D for contributing to the ADS development, significant progress was achieved on the following two topics. The first one was the successful operation of IMMORTAL (Integrated Multifunctional MOckup for TEF-T Real-scale TArget Loop). The heat input by a proton beam to flowing liquid lead-bismuth eutectic (LBE) was simulated in the operation. The LBE temperature was elevated by 50°C by a heater, and the heat was removed by operating a heat exchanger, in which pressurized water was used as the secondary coolant. Thus, the basic function of the TEF-T LBE loop was demonstrated successfully. The second topic was a launch of displacement-per-atom (DPA) cross section measurement by using a J-PARC's proton beam. The DPA is very important because it is a measure for radiation damage evaluation on materials. However, the experimental cross section data are very scarce especially around 1 GeV, the energy region that is important for ADS.

Owing to these efforts on design and R&D for the TEF program, the technical requirements for the construction of TEF have been mostly fulfilled. On the other hand, the quick start of the construction is difficult due to JAEA's severe budgetary situation. The use of TEF to obtain the necessary experimental data had been at the heart of JAEA's roadmap to ADS development, while we have revised the JAEA's roadmap so as to proceed our R&D with considering the possible delay in the construction of J-PARC's experimental facility. In particular, included in the revised roadmap are enhancement of computational science in the fields of the materials radiation damage simulation and virtual ADS simulator, experimental data taking for validation and verification of simulated results, and re-examination of the J-PARC's irradiation facility. We believe this new approach will make the J-PARC's irradiation facility more attractive and effective by introducing leading edge knowledge to the purpose and specifications of the facility.

On February 19 and 20, 2018, the fourth TEF Technical Advisory Committee (T-TAC), which was one of the technical advisory committees under the J-PARC International Advisory Committee, was held (Fig. 1). The T-TAC encouraged our activity to re-examine the J-PARC's irradiation facility as "*The proposed approach builds on J-PARC's strong expertise in the field of accelerator and target technologies and addresses a scope that encompasses not only the ADS mission but also other high power accelerator applications.*"

Fig. 1. T-TAC members and attendees.

Research and development

Studies for proton irradiation facility

The experimental studies for proton irradiation facility for ADS have been progressing. Concerning the LBE spallation target design, the thermal-hydraulic performance of the LBE target vessel was improved. In the LBE loop experiment, the operation of IMMORTAL (Integrated Multi-functional MOckup for TEF-T Real-scale TArget loop) has continued. Regarding the target materials, the modification of OLLOCHI (Oxygen-controlled LBE LOop Corrosion tests in HIgh-temperature) was finished. In the area of instrument developments, the manufacturing of oxygen sensors has been progressing as a key instrumentation technology for LBE loop system. The results of these tests are described in detail below.

LBE spallation target design

Figure 2 compares the LBE flow patterns of the original and modified targets. Several stagnant regions exist in the original model and may cause high temperature and high thermal stress zone. Some off-balance flow also appears in the outer tube of the original model. These flows may lead to a flow-induced vibration. By adjusting the target dimensions and adding some flow-control parts, stagnant regions and off-balance flows are eliminated to make the LBE flow uniform and smooth.

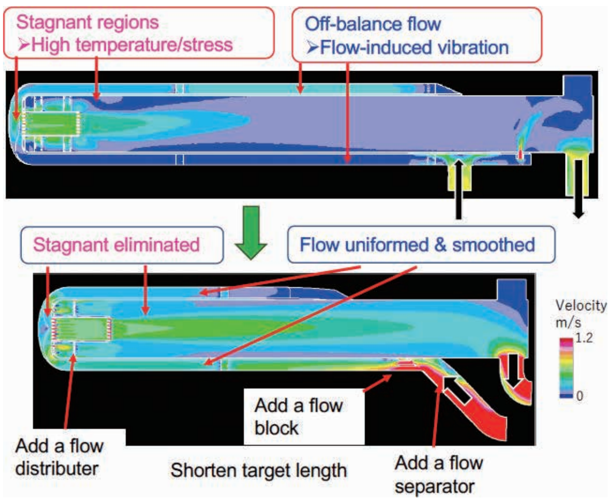


Fig. 2. LBE flow patterns of the original and modified targets.

IMMORTAL

The operation tests of the LBE target mockup loop IMMORTAL have continued. We have successfully completed an operation test of the LBE loop with simulating proton-induced heat generation and its removal. Under the heat input condition of 50 kW by an electric heater, IMMORTAL was stably operated with a temperature difference of 50°C. As a future step, experimental data to verify the safety analysis model for the LBE loop systems will be acquired by simulating transient events, such as beam over power and loss of flow accidents.

OLLOCHI

The modification to install mechanical testing machine was finished, as shown in Fig. 3. By this unique modification, mechanical tests in flowing LBE became possible. A conditioning and oxygen concentration control test will be started, followed by a corrosion test.

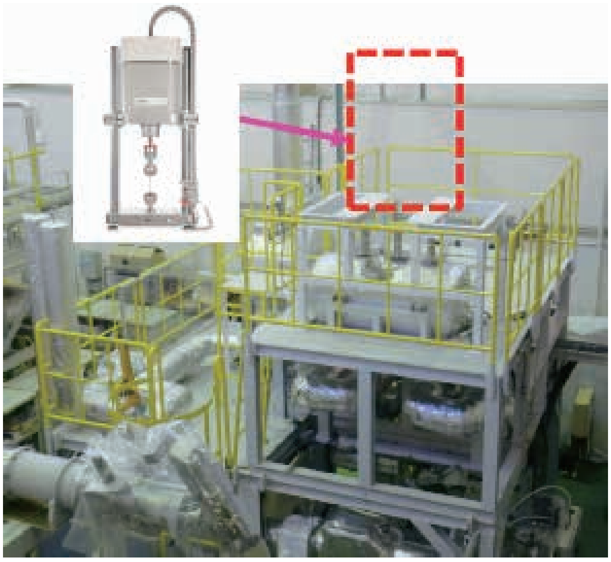


Fig. 3. Outline of the modified OLLOCHI.

Oxygen sensor development

Gamma-ray irradiation experiments with a Co-60 source were performed at the Takasaki site, QST. About 5 MGy of total dose were exposed to JAEA made sensors (Ag-air type, Fig. 4) without SS housing and plastic materials by the dose rate of 1 kGy/h. After the irradiation, the performance of the irradiated sensors was examined, and no significant irradiation effects were observed.

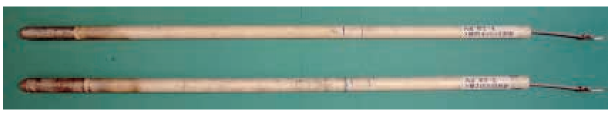


Fig. 4. JAEA made sensors (after irradiation).

Measurement of a spallation product

Accurate evaluation of spallation product yields is important for the safety of the ADS facilities. As the first step of the experiment, the cross section of the product yield from a ^{197}Au sample was measured for protons with energy range between 0.4 to 3 GeV. After the proton beam irradiation, γ-rays from residual nuclei were measured with Ge detectors. Calculated production cross sections with several reaction models were compared with the measured values. It was found that the calculation with PHITS with several reaction models shows considerable underestimation of ^{127}Xe production as shown in Fig. 5.

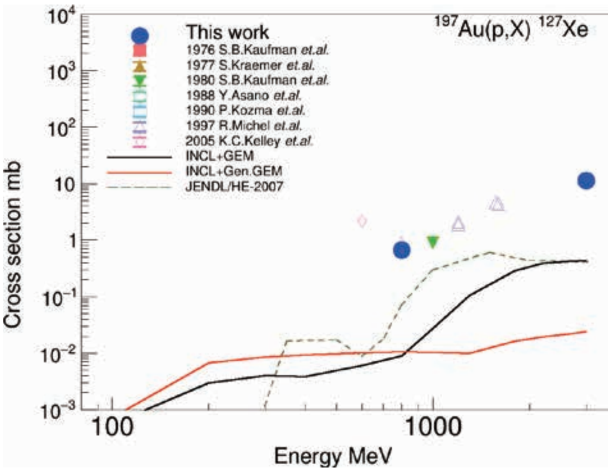


Fig. 5. Cross section of the present experiment for ^{127}Xe production on ^{197}Au compared with other experiments, evaluated data, and calculations.

Displacement cross section measurement

As an index of radiation damage of materials, displacement per atom (DPA) is widely used in many fields, such as fission and fusion reactors and accelerator facilities. The DPA can be estimated by integrating a particle flux by the displacement cross section. Since the experimental displacement cross section data were scarce for protons with energy higher than 20 MeV, we started the experiment in J-PARC with the experimental apparatus shown Fig. 6. The displacement cross section could be delivered from an electric resistivity increase of a sample by proton irradiation. To prevent the defect from recovering by thermal motion of atoms, the sample was cooled at about 4 K by using a cryocooler. The experiment started with copper because it is widely used in accelerators.

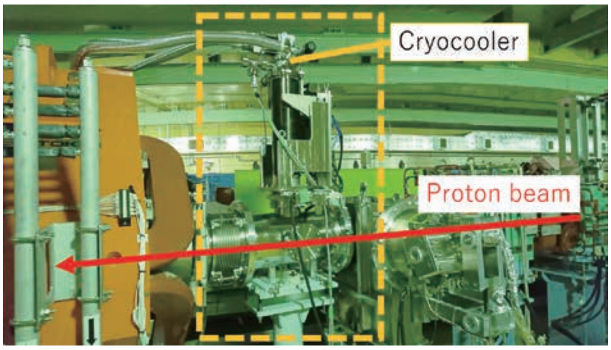


Fig. 6. Vacuum chamber for displacement cross section installed on a beam transport line.

Improvement of the spallation model

In the design of high-energy accelerator facilities, such as ADS, spallation models play an important role in estimating the radiation dose and radioactive source. For the purpose of accurate prediction of spallation product yields, an improvement of the spallation model has been conducted. So far, we have proposed a new model to predict the fission cross sections over a wide range of incident energies and target materials, and implemented it in the spallation model (Fig. 7). The present model will be further improved by the experimental result of the spallation product using protons at J-PARC.

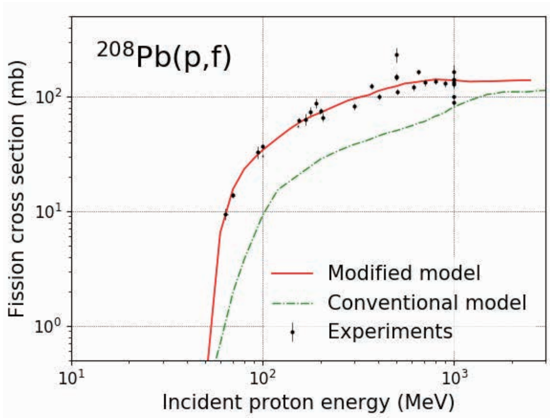


Fig. 7. Fission cross section of ^{208}Pb with the improved model.

Safety design report for TEF-P

A safety design report for TEF-P was issued in February 2018 by complying with the new regulatory standards strengthened after the accident of the TEPCO Fukushima Daiichi Nuclear Power Plant in March 2011. The TEF-P facility as a nuclear reactor facility used for testing and research is required to comply with "Ministerial ordinance for technical standards on location, structure and equipment of nuclear reactor facilities used for testing and research (Regulation No. 21, Nuclear Regulation Authority, December 6, 2013)." To indicate to the adopting of each item in Regulation No. 21, this report contains explanations on the safety design of the nuclear reactor facility and instructions on the maintenance of facilities and systems necessary for dealing with the event of an accident. From the safety analyses, anticipated operational occurrences (a reactivity insertion, a heat generation, etc.) and design basis accidents (a reactivity accident, a proton beam injection, a radioactivity release into environment, etc.) were extracted and each of them was estimated to be of no significant external influence. Consequently, the safety design of the TEF-P facility obtained a prospect of meeting the current licensing and approval.

Evaluation of heat removal during the failure of TEF-P core cooling

The evaluation of the natural cooling characteristics of TEF-P core during a failure of the core cooling system was performed to confirm whether the core would be damaged or not by the failure of the core cooling system.

Thermal evaluation was performed by ANSYS with the three-dimensional heat transfer analysis. The calculation results (Fig. 8) showed that the maximum core temperature was 294°C which was less than the designed temperature criterion of 327°C. It was proven that according to the designed condition the core temperature was lower than the assumed value during a failure of the core cooling system.

Laser charge exchange technique

In the last issue of the J-PARC Annual Report 2016, we described a laser charge exchange (LCE) technique for TEF-P. The LCE technique is a meticulous low-power beam extraction technique from the high-power proton beam stream of the J-PARC linac. The LCE device consists of a bright laser with wavelength of 1064 nm and a laser transport system with beam position controllers. The laser beam is exposed to a negative proton (H^-) beam from the J-PARC linac to strip one of the two electrons to convert H^- to neutral protons (H^0). The other electron in the H^0 is finally stripped by a carbon foil to obtain the positive protons (H^+) to be transported to TEF-P.

To demonstrate the LCE technique, we installed the LCE device at the end of a 3-MeV linac in cooperation with the J-PARC accelerator division (Fig. 9). An LCE experiment was conducted using the pulse laser beam in FY2016, and the results were summarized in ref.[1]. In FY2017, we conducted the LCE experiment using the continuous laser beam to extract the continuous H^+ beam.

As a result of the experiment, a charge-exchanged H^+ beam with a power of 5.9×10^{-4} W was obtained. If the laser light from this LCE device collided with the H- beam (400 MeV, 250 kW) delivered from the J-PARC linac, a stripped H^+ beam with a power of 0.73 W equivalent was obtained, and this value agreed well with the theoretical value. Thus, we established an elemental technology required for TEF, *i.e.*, the foundations of control technology for the extraction of the low-power H^+ beam from the high-power H^- beam at J-PARC.

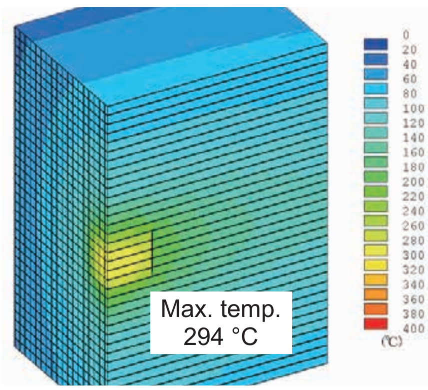


Fig. 8. Temperature distribution during failure of the TEF-P core cooling system.

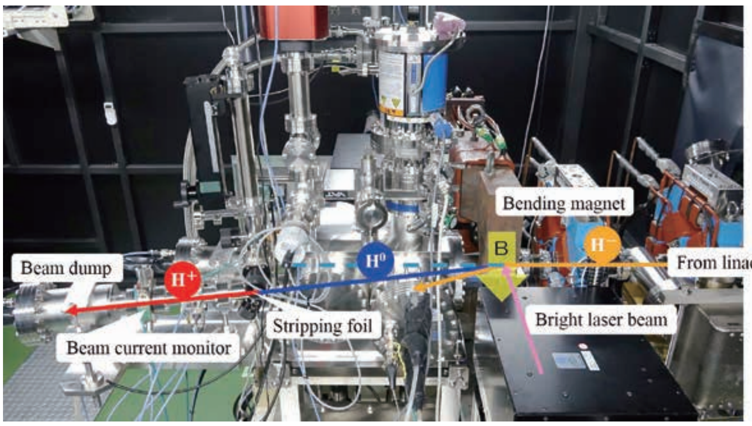


Fig. 9. Laser Charge Exchange (LCE) device. We performed laser injection (pink arrow) and beam bending (yellow arrow) in one bending magnet.

Reference

[1] H. Takei *et al.*, Plasma and Fusion Res., 13, 2406012 (2018).

International collaboration

Meeting and workshop

Information exchange meeting about the ADS accelerators between MYRRHA (Multipurpose hYbrid Research Reactor for High-tech Applications: an ADS experimental reactor construction project by the Belgian Nuclear Research Centre, SCK·CEN) and J-PARC was held in Tokai from March 6 to 7, 2018. Three scientists from SCK·CEN and many participants from J-PARC took part in the meeting (Fig. 10). Many topics, such as the current status of accelerator development at MYRRHA, accelerator-operation experiences and future development plans at J-PARC, were presented in this meeting. In particular, the participants discussed measures for achieving high reliability required for the ADS accelerators. Since the exchanging information meeting had great benefits for both sides, we decided to hold future meetings.

Fig. 10. Attendees of the meeting.

Safety

Safety

1. Major events on safety culture and safety activities at the J-PARC Center

The major events on safety culture and safety activities at the J-PARC Center are listed in Table 1.

Every year since 2014, the J-PARC Center holds workshop 5.23 for fostering safety culture to keep fresh the lessons of the radioactive material leak incident at the Hadron Experimental Facility on May 23, 2013. This year, a "Safety Day" was launched, which, in addition to workshop 5.23, also includes a discussion of the safety culture. The safety day took place on May 25. In the morning, we held a meeting to exchange information on the safety efforts between the sections. The number of participants was approximately one hundred. The director of the J-PARC Center gave the "Safety Awards for good examples" to the hadron section and the radiation safety section, because they reported more good examples of safety in their daily works than the other sections. Dr. Masayuki Hagiwara from the radiation safety section gave a scientific talk about the radiological measurement of radioactive materials at the Hadron Experimental Facility at the time of the leak incident and explained what actually happened then. Dr. Hiroaki Watanabe from the hadron section introduced the reduction trials of the radiation exposure at the replacement work of chain-clumps of the vacuum components in the primary beam line at the Hadron Experimental Facility. In the afternoon part of the Safety Day, workshop 5.23 for fostering safety culture was held at the auditorium of the Nuclear Science Research Institute with 303 attendees. Mr. Hidemi Ishizaka, the representative of "Sekkyaku-koujyou-ii'nkai & peace" (Improving Service & Peace) was invited this year; he spoke about the importance of safety at the Tokyo Disney Resort.

The emergency drill was carried out on November 16. It was assumed that a contractor, working in the second utility building of the neutrino experimental facility, suffered body contamination with tritiated water. The main purpose of the drill this year was to practice the method of transporting the victim to the distant facility equipped with decontamination instruments.

Fig. 1. Emergency drill

The J-PARC Safety Audit in JFY2017 was conducted by two external auditors (Prof. Akira Tose from Niigata University and Dr. Katsumi Hayashi from Hitachi Ltd.) on December 4. They reviewed mainly three points: the effectiveness of the safety management system, the emergency response system, and the promotion of safety culture. They suggested that the activity of "Mindful of others" should be improved further. They also pointed out that systematic prevention of incidents and troubles ensures good scientific results.

2. Standing room of the command post for crisis management

Previously, the room of the command post for crisis management was shared with the meeting room at the central control building. After an emergency situation occurred, crisis management equipment was installed in the meeting room. In order to improve the initial response in case of emergency, a standing room of the command post was urgently needed. The standing room of the command post was equipped on the first floor of the J-PARC research building and was ready to use on March 22, 2018.

Fig. 2. The standing room of the command post

3. Radiological license update and facility inspection

Applications to update the radiological license were submitted to the Nuclear Regulation Authority on

December 18. The major application items are listed in Table 2. The permits for the applications were issued on February 26.

The safety inspection of the Hadron Experimental Facility was successfully conducted on May 31, and the certificate was issued on June 2 by Radiation Management Institute, Inc. The inspection items were the shielding construction prepared for a new beam line and the radiation dose measurements around it in the Hadron Experimental Facility. The corresponding radiological application had been submitted on August 5, 2016, and the permit was issued on September 27, 2016.

4. Meetings of the committee on the radiation safety matter

The basic policies on radiation safety in the J-PARC are supposed to be discussed by the J-PARC Radiation Safety Committee (RSC). Meanwhile, the J-PARC Radiation Safety Review Committee (RSRC) is expected to discuss specific subjects of radiation safety in the J-PARC. The RSC meetings were held twice and those of the RSRC, three times. The major issues are summarized in Table 3.

5. Radiation exposure of radiation workers

In JFY2017, 3388 persons were registered as radiation workers. In these five years the numbers of workers were between 3000 and 3500, except JFY2014 when many contractors took part in the construction work of the hadron south experimental-hall, which is located in the radiation-controlled area of the Hadron Experimental Facility.

The distribution of annual exposed doses is summarized in Table 4 for each category of workers: in-house staff, users and contractors. The exposed doses of gamma-rays and of neutrons were measured with an optically stimulated luminescence (OSL) dosimeter and with a plastic solid-state track detector, respectively. All users and almost all in-house staffs and contractors were exposed to doses below the detection limit (Not Detected, expressed as "ND" in the table). The maximum exposed dose was 2.8 mSv. Though it was less than the administrative dose limit at the J-PARC (7 mSv/year), we should continue to make an effort to reduce the exposed doses of all workers.

Table 1. List of major events on safety in FY2017

Year	Date	Events
2017	May 25	Safety Day (Meeting to exchange safety information between the sections; Workshop for fostering safety culture)
	July 7	Liaison committee on safety and health for contractors
	Sep. 28, Oct. 6, 18, 27, Nov. 21	Refresher course on radiation safety for in-house staff
	Nov. 16	Emergency drill assuming body contamination with HTO
	Dec. 4	JFY2017 J-PARC Safety Audit
2018	Jan. 25 - 26	5th Symposium on Safety in Accelerator Facilities

Table 2. Major application items of the radiological license

Facility	Items of an application
Li	• Beam intensity: $8.2 \times 10^{18} \rightarrow 8.3 \times 10^{18}$ protons/hour
RCS	• Beam intensity: $8.2 \times 10^{18} \rightarrow 8.3 \times 10^{18}$ protons/hour • New purpose of accelerator usage
MR	• Beam intensity: $4.5 \times 10^{17} \rightarrow 4.9 \times 10^{17}$ protons/hour
MLF	• Construction of a new storage facility for induced radioactive material (RAM building)
NU	• Beam intensity: $4.5 \times 10^{17} \rightarrow 4.9 \times 10^{17}$ protons/hour • Relocation of an exhaust monitoring system
All	• Optimization of the application document

Table 3. Radiation Safety Committee (RSC) and Radiation Safety Review Committee (RSRC) in FY2017

No.	Date	Major Issues
The Radiation Safety Committee		
28th	Jun. 12, 2017	• Policy on the radiological license update for the RCS, the MLF and the Neutrino facilities
29th	Mar. 22, 2018	• Report on the search of a sterile neutrino at the MLF facility • Inspection of the standing command post room
The Radiation Safety Review Committee		
16th	Jun. 15, 2017	• Update of the radiological license for the RCS, the MLF and the Neutrino facilities • Revision of the operational rules
17th	Aug. 29, 2017	• Report from the ad-hoc working group about the material irradiation experiment at the 3N-BT area • Revision of the radiological license update for the RCS and the Linac facilities
18th	Mar. 7, 2018	• Relocation of the standing command post room and related revision of the operational rules • Use of the X-ray generator at the JRB and related revision of the safety rule for X-ray generators • Revision of the rule for reporting incidents, etc. and the standard of incident reports • Report on the implementation of the interlock system of the high-P experimental area at the HD facility • Report on the search of a sterile neutrino at the MLF facility

Table 4. Annual exposed doses in FY2017

	# of workers	Dose range x (mSv)				Collective dose (person mSv)	Maximum dose (mSv)
		ND	$0.1 \leq x \leq 1.0$	$1.0 < x \leq 5.0$	$5.0 < x$		
In-house staff	665	627	31	7	0	22.0	2.8
Users	1,280	1,280	0	0	0	0	0
Contractors	1,447	1,389	51	7	0	25.1	1.7
Total	3,388	3,292	82	14	0	47.1	2.8

User Service

Users Office (UO)

Outline

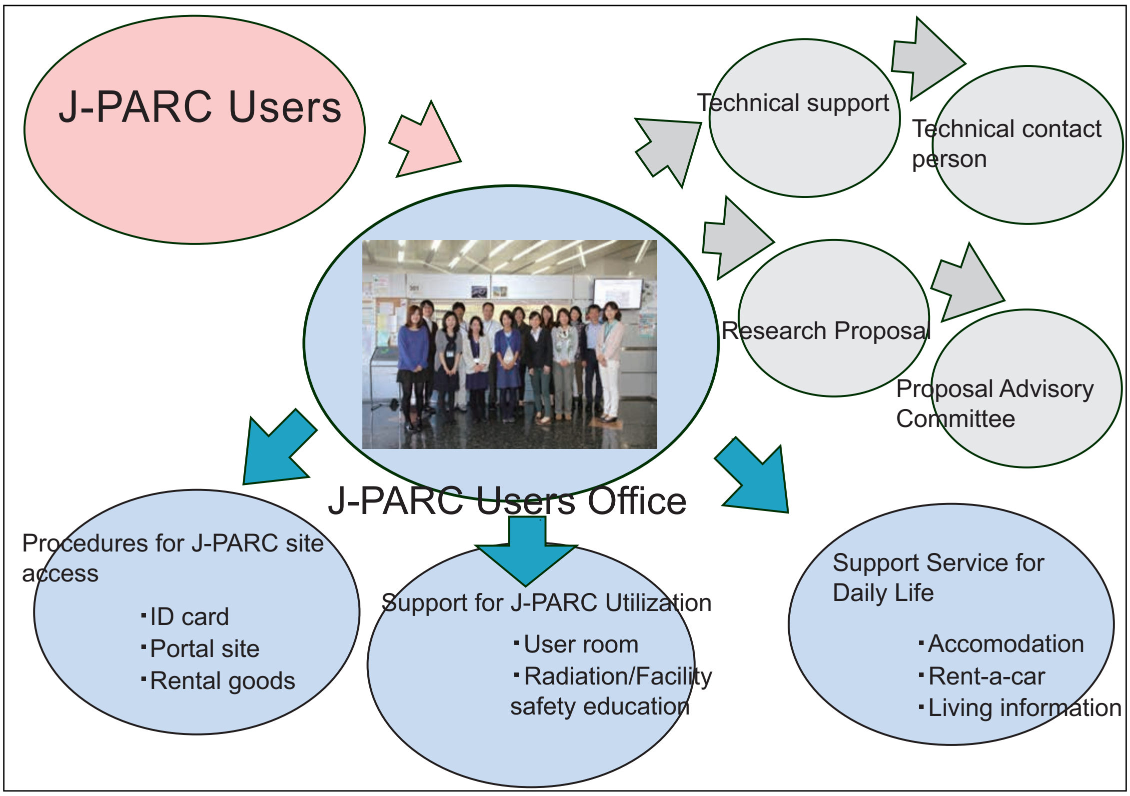
The J-PARC Users Office (UO) was established in 2007. It opened an office on the first floor of the IBARAKI Quantum Beam Research Center in Tokai-mura, in December 2008. UO maintains the Tokai Dormitory for the J-PARC users. UO provides on-site and WEB support with one-stop service for the utilization of the J-PARC. As of March 31, 2017, UO had 14 staffs and 4 WEB Support SE staffs.

The J-PARC Users, after the approval of their experiment, follow the administrative procedures outlined on the Users Office (UO) WEB Portal Site, related to the registration as a J-PARC User, radiation worker registration, safety education, accommodation, invitation letter for visa and other requirements. Then the UO staffs provide them with support by e-mail. After their arrival at the J-PARC, UO gives on-site assistance to the J-PARC Users, like receiving the J-PARC ID, glass badge, and safety education. Since 2015, UO had been doing its part to improve the J-PARC on-line experiment system and make it more user-friendly.

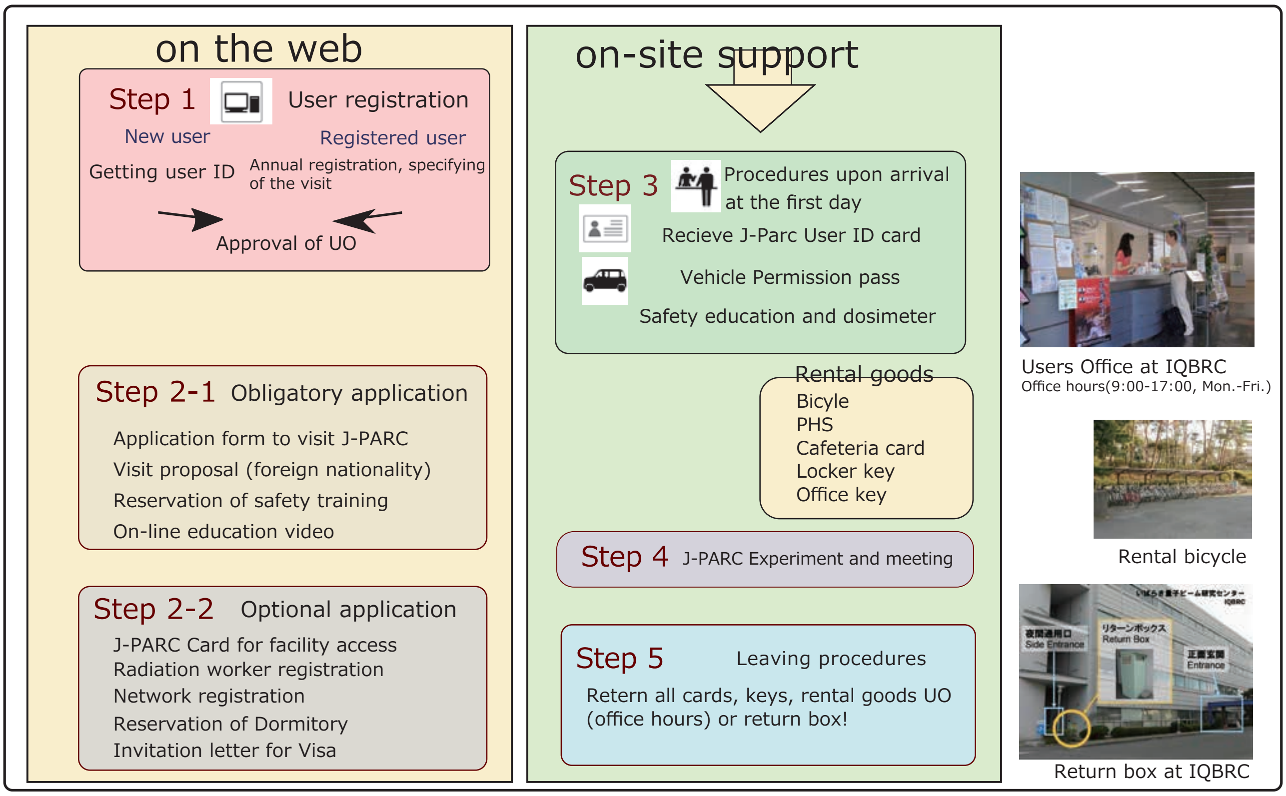
Map to J-PARC Users Office

1st row, left to right KIMURA Rie, KAWAKAMI Megumi, SAKAGAMI Keiichi, KOBAYASHI Sayuri, KATOGI Aki.
2nd, left to right ISOZAKI Mari, HANAWA Masahiro, ISHIKAWA Tomoko, ISHIKAWA Taeko,OKUKI Rika, KIKUCHI Ayako, SANAO Ai.

Activities of UO

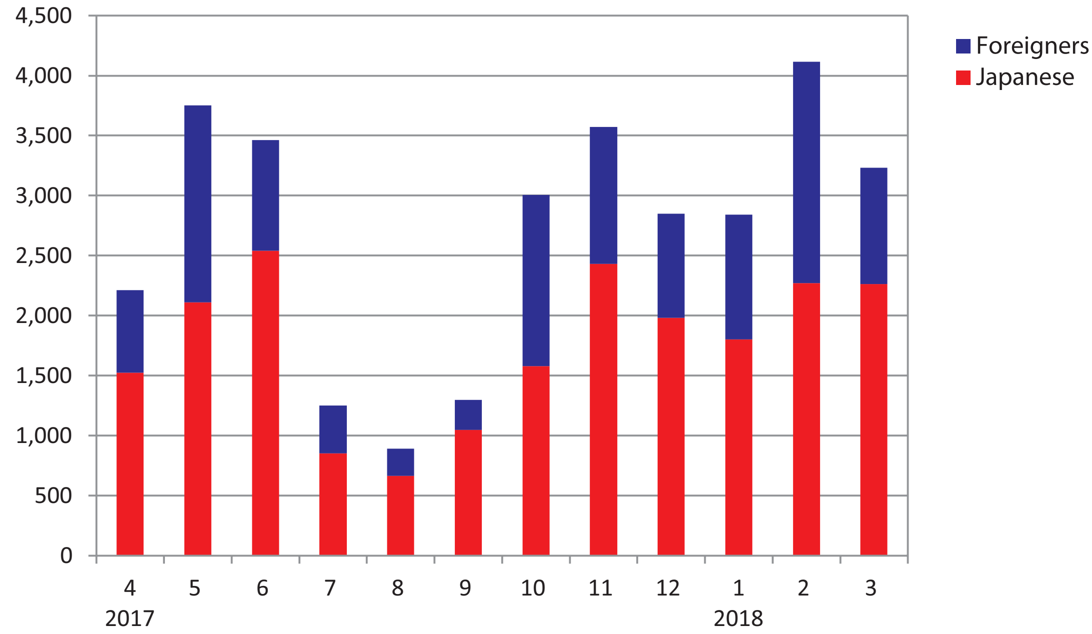


One-stop service for J-PARC users

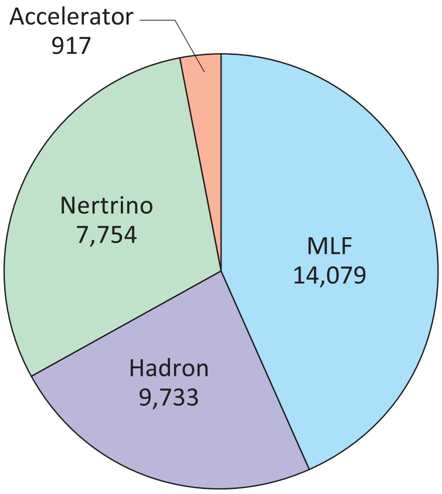


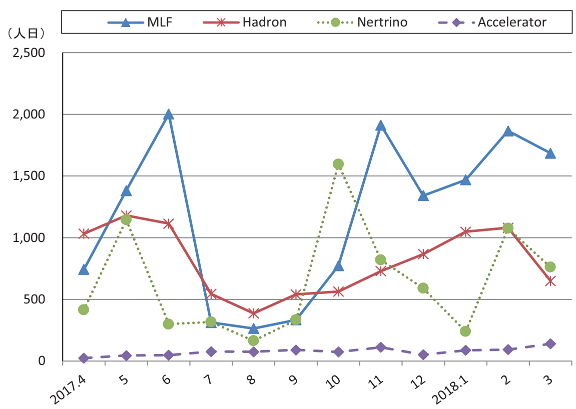
User Statistics

Users in 2017 (Japanese/Foreigners, person-days)

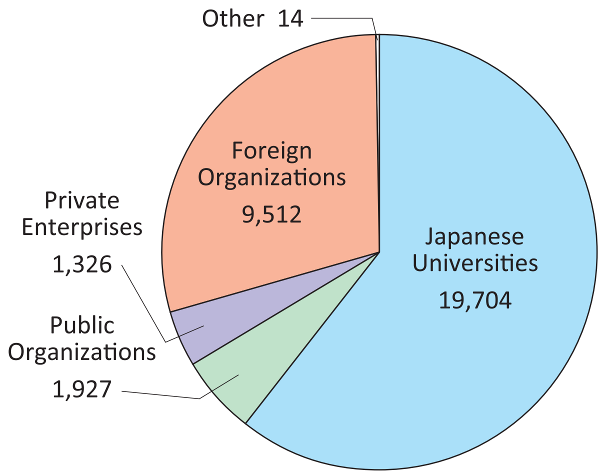


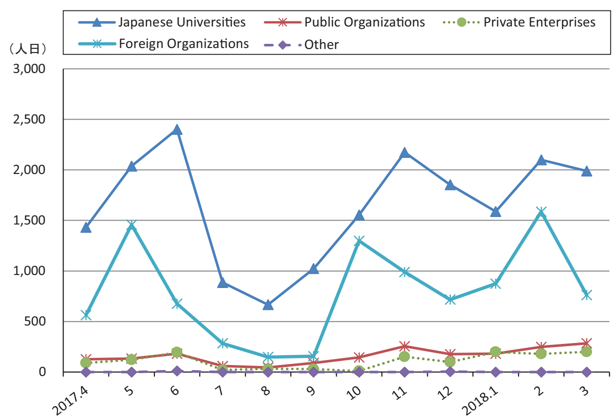
Users in 2017 (according to facilities, person-days)





Users in 2017 (according to organizations, person-days)





MLF Proposals Summary - FY2017

Table 1. Breakdown of Proposals Numbers for the 2017 Rounds

Beam-line	Instrument		2017A		2017B		Full Year					
			Submitted	Approved	Submitted	Approved	Submitted			Approved		
			GU	GU	GU	GU	PU/S	IU	ES	PU/S	IU	ES
BL01	4D-Space Access Neutron Spectrometer - ***4SEASONS***		18(0)	9(0)	19(1)	11(1)	0	1	1	0	1	1
BL02	Biomolecular Dynamics Spectrometer - ***DNA***		16(1)	13(1)	18(1)	13(1)	0	1	0	0	1	0
BL03	Ibaraki Biological Crystal Diffractometer - ***iBIX***	(100-β)‡	8	1	6	0	0	0	0	0	0	0
		(β)†	2	0	0	0	19	0	0	10	0	0
BL04	Accurate Neutron-Nucleus Reaction Measurement Instrument - ***ANNRI***		9	7	12	3	0	1	0	0	1	0
BL05	Neutron Optics and Physics - ***NOP***		6	3	2	2	0	0	0	0	0	0
BL06	Neutron Resonance Spin Echo Spectrometers - ***VIN ROSE***		0	0	0	0	0	0	0	0	0	0
BL08	Super High Resolution Powder Diffractometer - ***S-HRPD***		11	8	12	8(0)	0	0	0	0	0	0
BL09	Special Environment Neutron Power Diffractometer - ***SPICA***		0	3	0	0	0	0	0	0	0	0
BL10	Neutron Beamline for Observation and Research Use - ***NOBORU***		11	6	8	7	0	1	0	0	1	0
BL11	High-Pressure Neutron Diffractometer - ***PLANET***		8(0)	6(0)	15(0)	8	0	1	0	0	1	0
BL12	High Resolution Chopper Spectrometer - ***HRC***		12	7	9	3	1	0	0	1	0	0
BL14	Cold-neutron Disk-chopper Spectrometer - ***AMATERAS***		28	10	22	6	0	1	0	0	1	0
BL15	Small and Wide Angle Neutron Scattering Instrument - ***TAIKAN***		18(2)	17(2)	26(0)	11(0)	0	3	1	0	3	1
BL16	High-Performance Neutron Reflectometer with a horizontal Sample Geometry - ***SOFIA***		19	9	7	7	0	0	0	0	0	0
BL17	Polarized Neutron Reflectometer - ***SHARAKU***		9(1)	10(1)	20(1)	15(1)	0	1	1	0	1	1
BL18	Extreme Environment Single Crystal Neutron Diffractometer - ***SENJU***		16(0)	11(0)	22(0)	5(0)	0	2	1	0	2	1
BL19	Engineering Diffractometer - ***TAKUMI***		23	13	25	11(0)	0	1	2	0	1	2
BL20	Ibaraki Materials Design Diffractometer - ***iMATERIA***	(100-β)‡	13	6	19	4	0	0	0	0	0	0
		(β)†	44	24	20	20	18	0	0	18	0	0
BL21	High Intensity Total Diffractometer - ***NOVA***		19	17	17	7	0	0	0	0	0	0
BL22	Energy Resolved Neutron Imaging System - ***RADEN***		13(1)	11(1)	16(2)	8(2)	0	3	0	0	3	0
BL23	Polarization Analysis Neutron Spectrometer - ***POLANO***		0	0	0	0	0	0	0	0	0	0
D1	Muon Spectrometer for Materials and Life Science Experiments - ***D1***		15(1)	4(0)	15(1)	9(0)	0	1	0	0	1	0
D2	Muon Spectrometer for Basic Science Experiments - ***D2***		12(0)	7(0)	13(0)	9(0)	0	1	0	0	1	0
S1	General purpose μSR spectrometer - ***ARTEMIS***		12(1)	9(1)	14(1)	9(1)	0	1	0	0	1	0
U	Muon U		0	0	0	0	0	1	0	0	1	0
Total			**290**	**211**	**360**	**233**	**38**	**20**	**6**	**29**	**20**	**6**

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 FY2017)
‡ : J-PARC Center General Use Beamtime (100–β = 20% in FY2017)
( ) : Proposal Numbers under New User Promotion or P-type proposals (D1,D2) in GU
[NOTE] • The data of breakdown includes the number of urgent proposals.
• This breakdown was made in September 2018.

J-PARC PAC Approval Summary after the 25th Meeting

	(Co-) Spokespersons	Affiliation	Title of the experiment	Approval status (PAC recommendation)	Beamline	Status
E03	K.Tanida	JAEA	Measurement of X rays from Ξ^- Atom	Stage 2	K1.8	In preparation
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 New experiment E70 based on the S-2S spectrometer	K1.8	Finished
E06	J.Imazato	KEK	Measurement of T-violating Transverse Muon Polarization in $K^+ \to \pi^0 \mu^+ \nu$ Decays	E36 as the first step	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	K1.8	Finished Data analysis
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	Li run finished, Be target run with S-2S
E11	T. Nakaya, M. Wascho	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 $K_L \to \pi^0 \nu$ 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 2 for Run 0	High p	
E17	R.Hayano, H.Outa	U Tokyo, RIKEN	Precision spectroscopy of Kaonic ^{3}He 3d->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 $\pi^- p \to K^- X$ 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	Phase-I Stage 2 Engineering desing and operation plan to be presented.	COMET	
E22	S.Ajimura, A.Sakaguchi	Osaka U	Exclusive Study on the Lambda-N Weak Interaction in A=4 Lambda-Hypernuclei	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	Finished
E26	K.Ozawa	KEK	Search for ω-meson nuclear bound states in the π-+^{A}Z -> n+${}^{(A-1)}_{\omega}$(Z-1) reaction, and for ω mass modification in the in-medium $\omega \to \pi^0 \gamma$ 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	Fisnished
E29	H.Ohnishi	RIKEN	Search for ϕ-meson nuclear bound states in the pbar + ^{A}Z -> ϕ + ${}^{(A-1)}_{\phi}$(Z-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 PAC supports requests of a second run of 20+1.5 days in early 2018.	K1.8BR	Finished Data analysis
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	T. Mibe	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 PAC needs additional time to evaluate the FRC responses and new TDR.	MLF	
E36	M.Kohl, S.Shimizu	Hampton U, Osaka U	Measurement of $\Gamma(K+ \to e+ \nu)/\Gamma(K+ \to \mu+ \nu)$ and Search for heavy sterile neutrinos using the TREK detector system	Stage 2 PAC expects completion of the data analysis and presentation of the darkphoton search.	K1.1BR	Finished Data analysis
E40	K.Miwa	Tohoku U	Measurement of the cross sections of Σp scatterings	Stage 2 Minimal commissioning and initial DAQ to be done in June	K1.8	In preparation
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	Reviewed in MLF/ IMSS

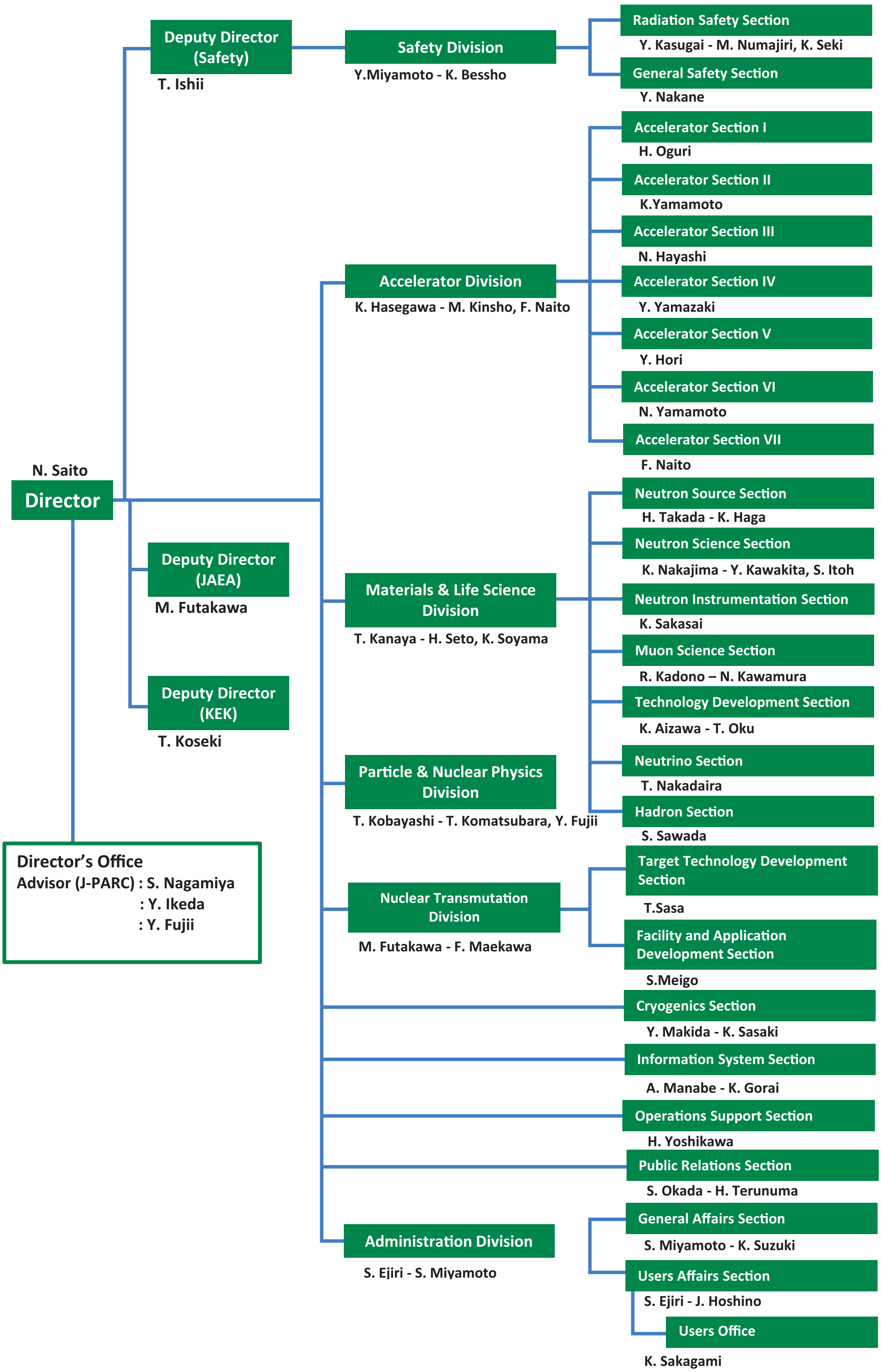
	(Co-) Spokespersons	Affiliation	Title of the experiment	Approval status (PAC recommendation)	Beamline	Status
E42	J.K.Ahn	Pusan National U	Search for H-Dibaryon with a Large Acceptance Hyperon Spectrometer	Stage 2 Commissioning and physics run plan to be submitted	K1.8	
E45	K.H.Hicks, H.Sako	Ohio U, JAEA	3-Body Hadronic Reactions for New Aspects of Baryon Spectroscopy	Stage 1 Describe the achievable data quality for each channel and clarify the physics output for stage 2	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 The FIFC, IPNS, and E50 should investigate the beam-line feasibility	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 Review of the answers to the questions is necessary for Stage 2	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 Beam time for the pilot run to be allocated.	K1.8BR	in preparation
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
E61	M. Wilking	Stony Brook U	nuPRISM	Stage 1 Develp a plan for phase-1 infrastructure construction	neutrino	
E62	R. Hayano, S. Okada, H. Outa	U. Tokyo, RIKEN	Precision Spectroscopy of kaonic atom X-rays with TES	Stage 2	K1.8BR	in preparation
E63	H. Tamura	Tohoku U	Gamma-ray spectroscopy of light hypernuclei II	Stage 2	K1.1	BL not ready yet. Exp. in
T64	Y. Koshio	Okayama U	Measurement of the gamma-ray and neutron background from the T2k neutrino/anti-neutrino at J-PARC B2 Hall	Arranged by IPNS and KEK-T2K	neutrino	
E65	T. Nakaya	Kyoto U	Proposal for T2K Extended Run	Stage 1	neutrino	
T66	T. Fukuda	Nagoya U	Proposal of an emulsion-based test experiment at J-PARC	Test Experiment	neutrino	
P67	I. Meigo	JAEA	Measurement of displacement cross section of proton in energy region between 3 and 30 GeV for highintensity proton accelerator facility	Carry out the experiment within the framework of facility development	MR	
T68	T. Fukuda	Nagoya U	Extension of T60/T66 Experiment: Proposal for the Run from 2017 Autumn	Test Experiment	neutrino	
E69	A. Minamino	Yokohama National U	Study of neutrino-nucleus ineraction at around 1GeV using cuboid lattice neutrino detector, WAGASHI, muon range detectors and magnetized spectrometer, Baby MIND, at J-PARC neutrino monitor hall	MOU with T2K before Stage 1 TDR to be submitted for stage-2 approval	neutrino	
E70	T. Nagae	Kyoto U	Proposal for the next E05 run with the S-2S spectrometer	Stage 1 Encourage to submit a TDR	K1.8	
E71	T. Fukuda	Nagoya U	Proposal for precise measurement of neutrinop-water cross-section in NINJA physics run	MOU with T2K before procceding to Stage 1	neutrino	
E72	K. Tanida	JAEA	Search for a Narrow Λ* Resonance using the p(K-, Λ)η Reaction with the hypTPC Detector	Stage 1 Encourage to submit a TDR and to analyze Belle data further	K1.8BR	

Organization and Committees

Organization Structure

J-PARC Center Organization Chart

as of April 1, 2017



Members of the Committees Organized for J-PARC

(as of March, 2018)

1) Steering Committee

Yukihide Kamiya	High Energy Accelerator Research Organization (KEK), Japan
Toshikazu Ishii	High Energy Accelerator Research Organization (KEK), Japan
Katsuo Tokushuku	High Energy Accelerator Research Organization (KEK), Japan
Kazuyoshi Yamada	High Energy Accelerator Research Organization (KEK), Japan
Seiya Yamaguchi	High Energy Accelerator Research Organization (KEK), Japan
Yukitoshi Miura	Japan Atomic Energy Agency (JAEA), Japan
Sonoko Watanabe	Japan Atomic Energy Agency (JAEA), Japan
Masayasu Takeda	Japan Atomic Energy Agency (JAEA), Japan
Hiroyuki Oigawa	Japan Atomic Energy Agency (JAEA), Japan
Kazuo Minato	Japan Atomic Energy Agency (JAEA), Japan
Naohito Saito	J-PARC Center, Japan

2) International Advisory Committee

Jean-Michel Poutissou	TRIUMF, Canada
Francis Pratt	Science and Technology Facilities Council (STFC), UK
Jun Sugiyama	Toyota Central R & D Labs., Inc., Japan
Thomas Roser	Brookhaven National Laboratory (BNL), USA
Shinian Fu	Institute of High Energy Physics (IHEP), China
Eckhard Elsen	European Organization for Nuclear Research (CERN), Switzerland
Patricia McBride	Fermi National Accelerator Laboratory (FNAL), USA
Robert Tribble	Brookhaven National Laboratory (BNL), USA
Donald F. Geesaman	Argonne National Laboratory, USA
Karlheinz Langanke	GSI Helmholzzentrum für Schwerionenforschung, Germany
Hamid Aït Abderrahim	SCK CEN, Belgium
Hirotada Ohashi	University of Tokyo, Japan
Paul Langan	Oak Ridge National Laboratory (ORNL), USA
Hidetoshi Fukuyama	Tokyo University of Science, Japan
Dan Alan Neumann	National Institute of Standards and Technology (NIST), USA
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
Hiroyuki Noumi	Osaka 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	Okayama University/Hiroshima University, Japan
Tadashi Adachi	Sophia 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
Kenya Kubo	International Christian University, Japan
Toshiro Tomida	Ibaraki Prefecture,Japan
Satoru Yamashita	University of Tokyo, Japan
Cheol-Ho Pyeon	Kyoto University, Japan
Yoshiyuki Kaji	Japan Atomic Energy Agency (JAEA), Japan

4) Accelerator Technical Advisory Committee

Thomas Roser	Brookhaven National Laboratory (BNL), USA
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
Toshiyuki Shirai	National Institutes for Quantum and Radiological Science and Technology (QST), Japan
Michael Plum	Oak Ridge National Laboratory (ORNL), USA
Jie Wei	Michigan State Univ., USA
Robert Zwaska	Fermi National Accelerator Laboratory (FNAL), USA
Simone Gilardoni	European Organization for Nuclear Research (CERN), Switzerland
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
Mark Wendel	Oak Ridge National Laboratory (ORNL), USA
Yoshiaki Kiyanagi	Nagoya University, Japan
Christiane Alba-Simionesco	The Laboratoire Leon Brilloin (LLB), France
Jamie Schulz	Australian Nuclear Science and Technology Organization(ANSTO), Australia
Dimitri Argyriou	Ames Laboratory, USA
Chang Hee Lee	Korea Atomic Energy Research Institute KAERI), Korea
Mitsuhiro Shibayama	University of Tokyo, Japan
Masaaki Sugiyama	Kyoto University, Japan

6) Muon Science 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

Yoshitomo Uwamino	RIKEN, Japan
Yoshihiro Asano	University of Hyogo, Japan
Takeshi Iimoto	University of Tokyo, Japan
Takeshi Murakami	National Institute of Radiological Science, Japan
Hiroshi Watabe	Tohoku University, Japan
Hitoshi Kobayashi	High Energy Accelerator Research Organization (KEK), Japan
Yoshihito Namito	High Energy Accelerator Research Organization (KEK), Japan
Shinichi Sasaki	High Energy Accelerator Research Organization (KEK), Japan
Kazuo Minato	Japan Atomic Energy Agency (JAEA), Japan
Hiroshi Nakashima	Japan Atomic Energy Agency (JAEA), Japan
Michio Yoshizawa	Japan Atomic Energy Agency (JAEA), Japan

8) Radiation Safety Review Committee

Tetsuro Ishii	J-PARC Center, Japan
Yukihiro Miyamoto	J-PARC Center, Japan
Masaharu Numajiri	J-PARC Center, Japan
Hidetoshi Kikunaga	Tohoku University, Japan
Hiroshi Yashima	Kyoto University, Japan
Kanenobu Tanaka	Riken,Japan
Shunsuke Yonai	National Institute of Radiological Science, Japan
Yasuhiro Yamaguchi	Comprehensive Research Organization for Science and Society (CROSS), Japan
Masami Ohkawara	Japan Atomic Energy Agency (JAEA), Japan
Akihiko Osa	Japan Atomic Energy Agency (JAEA), Japan
Makoto Kobayashi	Japan Atomic Energy Agency (JAEA), Japan
Nobukazu Toge	High Energy Accelerator Research Organization (KEK), Japan
Kazuyoshi Masumoto	High Energy Accelerator Research Organization (KEK), Japan
Hiroshi Matsumura	High Energy Accelerator Research Organization (KEK), Japan
Kazuo Hasegawa	J-PARC Center, Japan
Yoshiaki Fujii	J-PARC Center, Japan
Takeshi Komatsubara	J-PARC Center, Japan
Kazuhiko Soyama	J-PARC Center, Japan
Kotaro Bessho	J-PARC Center, Japan
Yoshimi Kasugai	J-PARC Center, Japan

9) MLF Advisory Board

Jun Akimitsu	Okayama University/Hiroshima University, Japan
Masaaki Sugiyama	Kyoto University, Japan
Yoshiaki Kiyanagi	Nagoya University, Japan
Mitsuhiro Shibayama	The University of Tokyo, Japan
Jun Sugiyama	Toyota Central R&D Labs., Inc., Japan
Jun Takahara	Kyusyu University, Japan
Takahisa Arima	The University of Tokyo, Japan
Michihiro Furusaka	Hokkaido University, Japan
Masaki Takada	Tohoku University, 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

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

Nori Aoi	Osaka University, Japan
Ryuichiro Kitano	High Energy Accelerator Research Organization (KEK), Japan
Masahiro Kuze	Tokyo Institute of Technology, Japan
Hirokazu Tamura	Tohoku University, Japan
Akira Ohnishi	Kyoto University, Japan
Kazunori Hanagaki	High Energy Accelerator Research Organization (KEK), 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
Deborah Harris	Fermi National Accelerator Laboratory (FNAL), USA
Rikutaro Yoshida	Thomas Jefferson National Accelerator Facility, USA
Steven Kettell	Brookhaven National Laboratory (BNL), USA
Josef Pochodzalla	University of Mainz, Germany
Wolfram Weise	Technical University of Munich, Germany
William A. Zajc	Columbia University, USA

11) TEF Technical Advisory Committee

Marc Schyns	SCK CEN, Belgium
Eric Pitcher	Los Alamos Neutron Science Center (LANSCE), USA
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	
Accelerated Particles	Negative hydrogen
Energy	400 MeV
Peak Current	40 mA
Pulse Width	0.5 ms
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	Liquid hydrogen
Moderator temperature/pressure	20 K / 1.5 MPa
Number of neutron beam extraction ports	23
Muon Production Target	
Target material	Graphite
Number of muon beam extraction ports	4
Neutron Instruments*	
Open for user program (general use)	20
Under commissioning/construction	1/0
Muon Instruments*	
Open for user program (general use)	3
Under commissioning/construction	1/0

(* As of March, 2018)

Events

Events

Science Café for Science and Technology Week (April 23)

At a Science Café for the 58th Science and Technology Week organized by the Ministry of Education, Culture, Sports, Science and Technology, J-PARC Center gave a lecture and scientific experiments to the public. The event was held at Science Museum in Kitanomaru Park in Tokyo. The participants were quite interested to see the experiments on waves created by sounds, which explained the Neutrino oscillations in the T2K experiments conducted by J-PARC and other groups.

At Science Café

1st J-PARC round-table conference with press (April 27)

J-PARC Center had its 1st round-table conference attended by 10 journalists from 7 media organizations from in and out of Ibaraki prefecture in order to show them the "Latest J-PARC " while giving them tours J-PARC research facilities. First in the conference, the J-PARC Director, Naohito Saito, gave his speech. Mr. Saito explained about research at J-PARC, which included material science that has contributed to developments of fuel cells and new rubber materials for tires, as well as particle/nuclear physics, such as T2K (Tokai to Kamioka) experiments for understanding neutrino oscillation. Following the speech, journalists were given a tour of the material/life science laboratory, the neutrino monitoring building, and the Hadron Experimental Facility.

Participation in the Interactions. org meeting for promoting communications between particle physics laboratories (May 11-12)

Interactions.org is a network of particle physics laboratory public relations. Its regular meeting was held at the Dutch National Institute for Subatomic Physics (Nikhef) in Holland. This year, public relations personnel from 17 laboratories from all over the world met, including representatives from CERN and Fermi National Accelerator Laboratory (FNAL) in the U.S. etc.. They gave reports on their communication efforts in each laboratory organization. J-PARC reported on the T2K experiment progress and its public relations plans.

FY2017 Workshop 5.23 for Fostering Safety Culture at J-PARC (May 25)

To remember the lessons learned in the radioactive material leak accident at the Hadron Experimental Facility on May 23, 2013, J-PARC holds a workshop to raise safety awareness of the staff members every year around the day of accident. Starting this fiscal year, "Safety Day" was added as "the day J-PARC prioritizes safety". On that morning, a meeting was held to exchange safety information, and in the afternoon, Workshop 5.23 was held. The auditorium of the Nuclear Science Research Institute was the main venue for the afternoon's workshop. A TV conference, linking KEK (High Energy Accelerator Research Organization) Tsukuba Campus and KEK Tokai Campus, was set up. Mr.Hidemi Ishizuka, president of Improving Service & Peace, was invited as a speaker, and he gave a speech "Safety Efforts is Disney Resort's Priority".

Mr.Hidemi Ishizuka, invited lecturer

Research Collaboration Meeting between SNS and J-PARC on spallation neutron source (June 6-9)

A Research Collaboration Meeting between related parties from Neutron Source Facility at MLF of J-PARC and Oak Ridge National Laboratory Spallation Neutron Source (SNS) in the U.S. was held. SNS and J-PARC have many similarities in their equipments and structures of their facilities. In this meeting, there were exchanges of information including views regarding development of high power neutron source technology in both facilities, also common issues and future cooperation between both parties were discussed on judging material fatigue caused by 10 years of operation, welding and grafting technology as well as technology for controlling damage caused by pressure wave.

Participants of the meeting

The 14th Muon g-2/EDM Collaboration Meeting (June 7-9)

The 14th Muon g-2/EDM Collaboration Meeting was held with 51 participants from Japan, Korea, Canada, and other nations. This meeting aims to offer world scientists the ability to gather and promote research on the precise measurement of g-2/EDM (anomalous magnetic moment/electric dipole moment) using the ultra-cold Muon beam, planning to be experimented on Muon H line which is under preparation at MLF. In this meeting, the current situation regarding preparation for scheduled experiments, construction status of H line, and related U line preparation and operation were reported by concerned parties.

Participants of the meeting

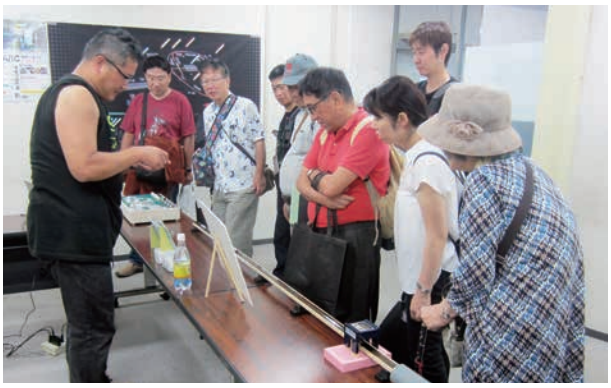
J-PARC Hello Science Experimental Session at Nakamaru Elementary School (June 21)

J-PARC's PR section had planned and held Hello Science Experimental Session at the Science club of Tokai village Nakamaru Elementary School. This experimental session has been targeted for elementary school students in Tokai village. Nakamaru Elementary School became the third school to hold this session since it was started two years ago. J-PARC's PR section made a lecture and conducted an experiment and craft with a theme "light" on that day.

Experiment of the three primary colors of light

Participation in the Geo Space Adventure (GSA) 2017 exhibit (July 15-16)

An exploration event, "GSA (Geo Space Adventure)", has been held every summer in Kamioka town of Hida city(Gifu prefecture) where Super-Kamiokande (SK) is located, and its main event is a tour of the SK experimental area inside the Kamioka mine, 1000m below ground level. For the first time, J-PARC Center joined this event. J-PARC's public relations' staff gave an overview of J-PARC and explained about artificial generation of neutrinos. In addition, a science experiment on the theme of magnets was presented for the audience to learn about the principle of an accelerator.



Gauss accelerator debuted in the event

Summer break science lab "Nothing is there, but something is there! The science of vacuum" (July 31, August 9 and 28)

This summer, J-PARC "Hello Science" Scientific Experiment Class for 5th and 6th grade students from Tokai-village was held three times at Tokai-village Industry and Information Plaza "iVil". For the first half of the class, children measured the weight of air and saw how close they were to the actual value. In the last half of the class, their experiment theme was the effects of no air. Children compared conditions with air and without air by observing : how free-falling objects (light and heavy) behave, audibility of sounds, how light travels and temperature changes and so on. All three times, there were as many as 20 participants, and every class was very lively.

Children enjoyed the experiment

FY2017 "Children's Tour Day in Kasumi-gaseki" (August 2 to 3)

This event is jointly organized by ministries and agencies such as MEXT and offers details of operations and office tours. It is a family-oriented event, and children have an opportunity to learn about and experience society in general. This year, 25 agencies, ministries, etc. offered details of their operations and office tours, etc.. J-PARC Center had an exhibition as a participating program at the former building of Ministry of Education, Culture, Sports, Science and Technology (MEXT). The exhibition booth was titled, "Zoom and Bang, Run and Hit: Experiment with a Simple Accelerator! " J-PARC Center explained the mechanism of an accelerator with an experiment using a "gauss accelerator".

J-PARC Center booth at the site

J-PARC Open House (August 20)

J-PARC Center opened its facility to the public, repeating the event from previous year. During the summer, when the facility stops its operation, J-PARC invites the public to see the Main Ring accelerator, the Material and Life Science Experimental Facility (MLF), neutrino monitoring building, and the Hadron Experimental Facility, which are all otherwise off limits to the public. Offered events were: "J-PARC lecture" , in which the audience learnt about cutting edge technologies, the "MLF Science Café and the "Particle Physics Saloon" where the audience enjoyed casual talks with the researchers.

J-PARC Research Building

Sigining ceremony of the memorandum of understanding with RaDIATE for participation in international joint research projects (September 20)

For 3 days from September 20, the 4th collaboration meeting of RaDIATE (Radiation Damage In Accelerator Target Environments) was held at Tokai-village. RaDIATE provides a system to promote international collaboration for cooperative research on radiation damage from a high-energy proton accelerator in target and window materials. During the meeting, on September 20 J-PARC Center director Naohito Saito signed a memorandum of understanding for J-PARC participation. Since 2016, J-PARC had requested to join the collaboration because it saw the advantage of gaining knowledge that would allow long-term stable operation of the facility, such as improved functionality of targets for secondary particle production and beam windows for experiments at J-PARC.

Participants of RaDIATE

9th J-PARC Hello Science " 'Seeing' the world with neutron: Let's see through materials using neutrons" (September 29)

J-PARC Center held the 9th Science Café at Tokai-village Industry and Information Plaza "iVil", and Takenao Shinohara of the Neutron Instrumentation Section gave a talk on research developing at J-PARC's neutron beam line "Raden (Energy Resolved Neutron Imaging System)". That is "visualization technique" research, seeing the inside of materials non-destructively. He explained that neutrons give a view very different compared to X-rays, which are also radiation. The audience asked many questions. The Café ended in lively mood.

Participation in the 5th Ozora Marche 2017 with "J-PARC Science Experiment Corner" (October 21)

This was the 4th consecutive participation of J-PARC in "Ozora Marche" , an open market held at the grounds of "Daijingu Shrine" and "Muramatsusan Kokuzoudou" in Tokai-village Muramatsu. J-PARC Center set up a corner to have participants experience fundamental science that supports J-PARC research. As well as the annual superconductivity roller coaster experiment, liquid nitrogen (-196°C) experiments included an experiment using liquid nitrogen to cool carbon dioxide and oxygen, which are usually in a gaseous state. Also, for a gauss accelerator experiment, J-PARC Center demonstrated magnets and metal balls lined on a rail being hit by another ball. As a result, the metal ball, which was placed at the very end of the rail, shot out faster than the metal ball that hit the first magnet on the rail. J-PARC corner attracted many visitors along with Tokai-village Mayor Osamu Yamada.

J-PARC Center booth in the event

The 9th AONSA Neutron School / 2nd Neutron and Muon School (November 16-20)

Co-hosted by the J-PARC Center, the Comprehensive Research Organization for Science and Society (CROSS) and others, the 9th AONSA Neutron School/ 2nd Neutron and Muon School was held at MLF. This school was designed for young researchers and graduate students in the Asia-Oceania region, such as Australia, China, India and South Korea. This time, 50 people from 13 countries participated. The school offered lectures by university professors and conducted lab experiments by dividing the participants into 11 neutron beam groups and a muon beam group.

Participation in the 17th Youngsters' Science Festival at Hitachi city and CROSS Public Seminar (November 26 and December 2)

On November 26, the J-PARC Center participated in the 17th Youngsters' Science Festival and presented a booth called "Accelerators!!". J-PARC Center demonstrated experiments with a gauss accelerator and opened a class to build an accelerator from paperboard and iron balls. At the Public Seminar on December 2, which CROSS conducted at Tsukuba City Hall, J-PARC Center lectured on the principle of neutrino oscillation and gravitational wave observations in relation to water waves and on what J-PARC is pursuing with their neutrino experiments.

J-PARC Center booth, "Accelerators!!" in the Science Festival on Nov. 26

KOTO experiment collaboration meeting (December 15-17)

International collaborative researchers who have been working on KOTO experiments at the Hadron Experimental Facility met to promote rare neutral kaon decay experiments. Thirty four researchers participated from Japan, the US, South Korea, Taiwan, etc.. In the meeting, participants gave reports on the analysis status of all the acquired data, a preparation status and future improvements of the data readout system for the upcoming beam time this month in addition to a preparation status for this summer's detection instrument improvement and future plans. Participants were engaged in an active discussion.

The group photo with participants

ImPACT J-PARC information sharing meeting (December 25)

The J-PARC Center has been pursuing R&D for the "nuclear transmutation" technology to transmute long-lived Minor Actinides, which are contained in high-level radioactive waste, into short-lived nuclides by using accelerators. Additionally, the Japan Science and Technology Agency (JST) has been pursuing similar R&D but for long-lived fission products as one of the themes of ImPACT (Impulsive Paradigm Change through Disruptive Technologies) Program led by Program Manager (PM) Reiko Fujita. Because high intensity accelerators for nuclear transmutation was the common interest for both organizations, an information exchange meeting was held at JST Tokyo headquarters in Ichigaya.The meeting was initiated by Fujita's greeting. J-PARC gave the status of J-PARC's accelerator, and reported on reliability required for the accelerators for nuclear transmutation and a development plan for such accelerators.

5th Symposium on Safety in Accelerator Facilities (January 25-26)

Since the radioactive material leak incident at the Hadron Experimental Facility in 2013, the J-PARC Center has held safety symposiums every year for information-sharing and discussions to improve safety with persons involved with accelerators both inside and outside Japan. The featured topics this time were "radiation safety education" and "ensuring safety in heavy object transportation". The event was held with the participation of 124 attendees, including 61 from external organizations such as accelerator facilities, universities, and corporations in Japan as well as overseas.

13th J-PARC Hello Science "J-PARC will go forward again in high intensity this year!" (Janury 26)

In the first J-PARC Hello Science of 2018 held at Tokai-village Industry and Information Plaza "iVil", J-PARC Center Director Naohito Saito gave a speech "J-PARC will go forward again with high intensity this year." His talk started with the introduction of the J-PARC facilities and research. He continued to explain that high-intensity beams are the key to high statistics and high-precision data collection and analysis, as well as the discovery of rare phenomena. This is why scientists all over the world are seeking to have more powerful beams, and J-PARC is not satisfied with world's strongest at this point. He revealed that it has a future plan to increase intensity.

A participant gave some questions to Director Saito after his talk

14th J-PARC Hello Science "Let's Talk About the 'Real Strong Force'"

For the 14th J-PARC Hello Science, Kyoichiro Ozawa from the Hadron Section talked about research at the Hadron Experimental Facility. Dr. Ozawa first explained initiatives in nuclear physics, and then pointed out that research at J-PARC is being conducted based on the core themes of "formation of hadrons from quarks" and "acquisition of mass due to the strong force". Dr. Ozawa responded conscientiously to each of the many questions asked during his talk, and deepened his interaction with participants.

Established J-PARC Center Kyushu University Branch (March 2)

For collaboration and cooperation of High Energy Accelerator Research Organization (KEK) and Kyushu University, a Memorandum of Cooperation signing ceremony was held at the J-PARC Research Building. This memorandum establishes a J-PARC branch of Kyushu University at KEK Tokai Building No.1 and allow Kyushu University researchers and students to cooperatively research in J-PARC. It is expected that closer cooperative research relationships with universities can be achieved by establishing branch offices for each domestic university using J-PARC.

Participants of memorandum signing ceremony

FY2017 Quantum Beam Science Festa /9th MLF Symposium (March 2-4, Ibaraki Prefecture Cultural Center)

FY2017 Quantum Beam Science Festa was held with organizers such as J-PARC Center, KEK Institute of Materials Structure Science, and Comprehensive Research Organization for Science and Society (CROSS). During the event, users of J-PARC MLF and PF (Photon Factory) gathered together in one venue, and engaged in lively discussions about research results achieved using quantum beams of synchrotron radiation, neutrons, and muons.The 9th MLF Symposium was held on the first day, and there were reports on new technology development at MLF and current status of beamlines undergoing commissioning. As a first-time trial, a tour of MLF was held, and about 40 participants, mainly using synchrotron radiation at PF, entered the area of the MLF beamlines. A keynote address and parallel sessions were held on the second day, and on the third day, there was a review meeting on future plans for the MLF. The event was successful with as many as 524 participants.

Visitors

Giovanni Anelli, Group Leader, Knowledge Transfer Group, the European Organization for Nuclear Research (CERN) (May 9)

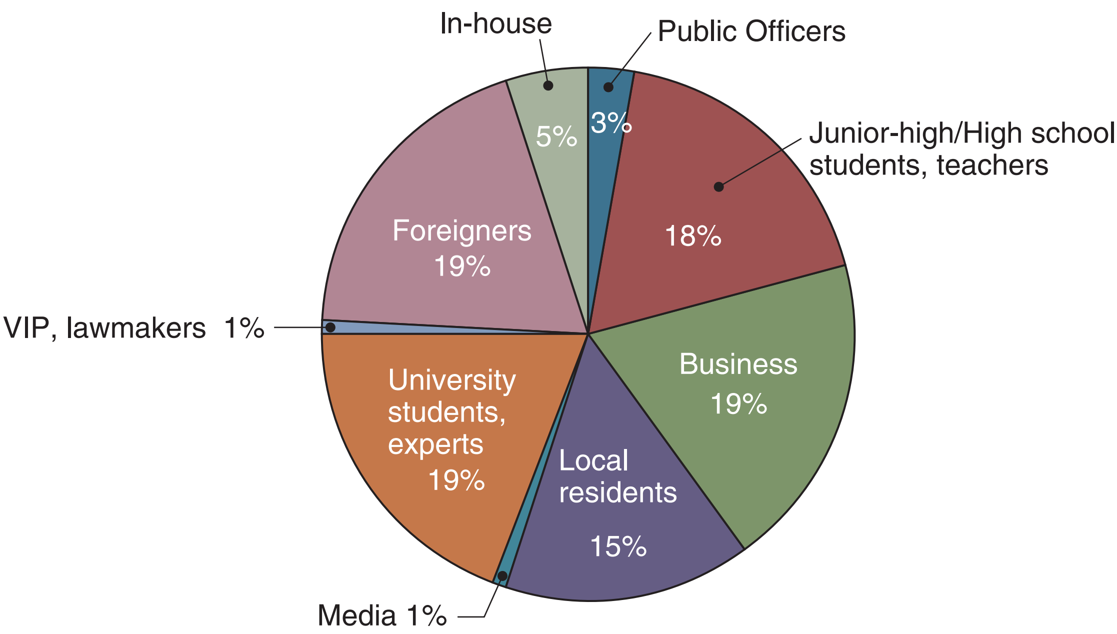
Young-Kee Kim, Louis Block Distinguished Service Professor, University of Chicago (July 12)

Paolo Giubellino, Scientific Managing Director, Facility for Antiproton and Ion Research in Europe GmbH (FAIR GmbH) (August 25)

Yifang Wang, Director, Institute of High Energy Physics, Chinese Academy of Sciences (September 8)

Kazuhiko Oigawa, Governor, Ibaraki Prefecture (November 20)

There were 2,959 visitors to J-PARC for the period from April, 2017, to the end of March, 2018.



Publications

(A) Publications in Periodical Journals

A-001
Ninomiya, H. *et al.*
Neutron diffraction study of antiferromagnetic $ErNi_3Ga_9$ in magnetic fields
(2017)

A-002
Onuki, Y. *et al.*
Rietveld Texture Analysis for Metals Having Hexagonal Close-Packed Phase by Using Time-of-Flight Neutron Diffraction at iMATERIA
Adv. Eng. Mater., 1700227 (2017)

A-003
Miao, P. *et al.*
Large Magnetovolume Effect Induced by Embedding Ferromagnetic Clusters into Antiferromagnetic Matrix of Cobaltite Perovskite
Adv. Mater., Vol.29, 1605991 (2017)

A-004
Abe, K. *et al.*
Search for an Excess of Events in the Super-Kamiokande Detector in the Directions of the Astrophysical Neutrinos Reported by the IceCube Collaboration
Astrophys. J. Vol. 850, p. 166 (2017)

A-005
Matsuo, T. *et al.*
Modulation of the picosecond dynamics of troponin by the cardiomyopathy-causing mutation K247R of troponin T observed by quasielastic neutron scattering
BBA-Proteins and Proteomics, Vol. 1865, 1781-1789 (2017)

A-006
Yoshimoto, M. *et al.*
Unusually Stable Plastic Crystal Phase of CCl4 Confined in Graphitic Slit-shaped Micropores from Neutron Diffraction
Chem. Lett., Vol.46, 923-925 (2017)

A-007
Yoshimura, T. *et al.*
Single-alkyl and multi-alkyl chain-containing amphiphilic oligomers with several sugar side chains: solution properties and nanostructural analysis of aggregates by SANS
Colloid Polym. Sci., Vol. 295, 793-802 (2017)

A-008
Adachi, T. *et al.*
Novel electronic state and superconductivity in the electron-doped high-Tc T'-superconductors
Condensed Matter, Vol. 2, 23 (2017)

A-009
WATANABE A. *et al.*
Ambient pressure synthesis and H-conductivity of LaSrLiH2O2
Electrochemistry, Vol.85, 88-92 (2017)

A-010
Maekawa, F. *et al.*
J-PARC transmutation experimental facility program and situation of the world
Energy Review, Vol.37(9), p. 15-18 (2017)

A-011
S. Meigo, *et al.*
Measurement of aluminum activation cross section and gas production cross section for 0.4 and 3-GeV protons
EPJ Web of Conferences 146, 11039 (2017)

A-012
Iwamoto, H. *et al.*
Validation of PHITS spallation models from the perspective of the shielding design of Transmutation Experimental Facility
EPJ Web of Conferences 153, 01016 (2017)

A-013
Ueno, Y. *et al.*
New precise measurement of muonium hyperfine structure interval at J-PARC
Hyperfine Interact. Vol. 238, p. 14 (2017)

A-014
Ueno, Y. *et al.*
New precise measurement of muonium hyperfine structure interval at J-PARC
Hyperfine Interactions, 238(1), p.14_1-14_6 (2017)

A-015
Hemmi, T. *et al.*
Evaluation of Bending Strain in Nb3Sn Strands of CIC Conductor Using Neutron Diffraction
IEEE Trans. Appl. Supercond. Vol.27, 1-5 (2017)

A-016
Hashimoto, T. *et al.*
Beamline Test of a Transition-Edge-Sensor Spectrometer in Preparation for Kaonic-Atom Measurements
IEEE Trans. Appl. Supercond. Vol. 27, 2100905 (2017)

A-017
Ogitsu, T. *et al.*
Design Study of Superconducting Transmission Line Magnet for J-PARC MR Upgrade
IEEE Trans. Appl. Supercond. Vol. 27, 4003705 (2017)

A-018
Iio, M. *et al.*
Mechanical Analysis of Pion Capture Superconducting Solenoid System for COMET Experiment at J-PARC
IEEE Trans. Appl. Supercond. Vol. 27, 4100205 (2017)

A-019
Iimura, S. *et al.*
Ferrimagnetic Cage Framework in $Ca_{12}Fe_{10}Si_4O_{32}Cl_6$
Inorg. Chem., Vol. 56, 566-572 (2017)

A-020
Park, S.-W. *et al.*
Transformation of the Chromium Coordination Environment in LaCrAsO Induced by Hydride Doping: Formation of La2Cr2As2OyHx
Inorg. Chem., Vol. 56, 13642-13645 (2017)

A-021
Onuki, Y. *et al.*
Improvement of magnetostrictive properties of Fe-15mol%Ga alloy by texture formation during high temperature uniaxial compression deformation
ISIJ International, Vol. 57, 755-757 (2017)

A-022
Onuki, Y. *et al.*
Quantitative phase fraction analysis of steel combined with texture analysis using time-of-flight neutron diffraction
J Mater Sci, Vol.52, 11643-11658 (2017)

A-023
Mizoguchi, H. *et al.*
Cubic Fluorite-Type CaH2 with a Small Bandgap
J. Am. Chem. Soc., Vol. 139, 11317-11320 (2017)

A-024
Oba, Y. *et al.*
Energy-resolved small-angle neutron scattering from steel
J. Appl. Cryst., Vol. 50, 334-339 (2017)

A-025
Esmaeili, A. *et al.*
New functions and graphical user interface attached to powder indexing software CONOGRAPH
J. Appl. Cryst., Vol. 50, 651 (2017)

A-026
Sato, H. *et al.*
Inverse pole figure mapping of bulk crystalline grains in a polycrystalline steel plate by pulsed neutron Bragg-dip transmission imaging
J. Appl. Cryst., Vol. 50, 1601-1610 (2017)

A-027
Huang, M. *et al*.
Development of a correction method for the time-of-flight prompt gamma-ray analysis
J. Appl. Phys., Vol. 121, 104901 (2017)

A-028
Hayashi, T. *et al*.
Interfacial interaction and glassy dynamics in stacked thin films of poly (methyl methacrylate)
J. Chem. Phys., Vol. 146, 203305 (2017)

A-029
Razuvaev, G. P. *et al*.
The low energy muon beam profile monitor for the muon g–2/EDM experiment at J-PARC
J. Instrum. Vol. 12, C09001 (2017)

A-030
Matsukawa, T.
Evaluation of Hydrogen-Bonding Distance in Organic Nonlinear Optical Crystals for High-Output Terahertz-Wave Generation
J. Mol. Struc., Vol. 1134, 835-839 (2017)

A-031
Hino, M. *et al*.
Supermirror neutron guide system for Neutron Resonance Spin Echo spectrometers at a pulsed neutron source
J. Nucl. Sci. Technol., Vol. 54, 1223-1232 (2017)

A-032
Yamaguchi, T. *et al*.
Analysis of Prepeak Structure of Concentrated Organic Lithium Electrolyte by Means of Neutron Diffraction with Isotopic Substitution and Molecular Dynamics Simulation
J. Phys. Chem. B, Vol. 121, 5355-5362 (2017)

A-033
Fujiwara, S. *et al*.
Ligation-Dependent Picosecond Dynamics in Human Hemoglobin as Revealed by Quasielastic Neutron Scattering
J. Phys. Chem. B, Vol. 121, 8069-8077 (2017)

A-034
Yamada, T. *et al*.
Dynamical Behavior of Hydration Water Molecules between Phospholipid Membranes
J. Phys. Chem. B, Vol. 121, 8322-8329 (2017)

A-035
Price, D.L. *et al*.
Relaxation in a Prototype Ionic Liquid: Influence of Water on the Dynamics
J. Phys. Chem. Lett. ,Vol. 8, 715-719 (2017)

A-036
Iida,K. *et al*.
Time-of-Flight Elastic and Inelastic Neutron Scattering Studies on the Localized 4d Electron Layered Perovskite $La_5Mo_4O_{16}$
J. Phys. Soc. Jpn., Vol. 86, 064803 (2017)

A-037
Iida,K. *et al*.
Spin Resonance in the New-Structure-Type Iron-Based Superconductor CaKFe4As4
J. Phys. Soc. Jpn., Vol. 86, 093703 (2017)

A-038
Tomiyasu, K. *et al*.
Magnetic Properties of Electron-Doped LaCoO3
J. Phys. Soc. Jpn., Vol. 86, 094706 (2017)

A-039
Doi, Y. *et al*.
Crystal structures, magnetic properties, and DFT calculation of B-site defected 12L-perovskites Ba2La2MW2O12 (M = Mn, Co, Ni, Zn)
J. Phys.: Condens. Matter, Vol. 29, 365802 (2017)

A-040
Abe, M. *et al*.
Study on the deterioration mechanism of layered rock-salt electrodes using epitaxial thin films–Li (Ni, Co, Mn) O2 and their Zr-O surface modified electrodes
J. Power Sources, Vol. 345, 108-119 (2017)

A-041
Narita, Y. *et al*.
Fast neutron tolerance of the perpendicular-anisotropy CoFeB–MgO magnetic tunnel junctions with junction diameters between 46 and 64 nm
Japanese Journal of Applied Physics, Vol56, 0802B3 (2017)

A-042
Hosokawa, S. *et al*.
Impurity effects in the microscopic elastic properties of polycrystalline Mg-Zn-Y alloys with a synchronized long-period stacking ordered phase
Journal of Alloys and Compounds, Vol. 695, 426-432 (2017)

A-043
Nyuui, T. *et al*.
Correlation between gas transport properties and the morphology/dynamics of crystalline fluorinated copolymer membranes
Journal of Applied Polymer Science, Vol. 135, 45665 (2017)

A-044
Idemoto, Y. *et al*.
Change of local structures for 0.5Li2MnO3–0.5LiMn1/3Ni1/3Co1/3O2 in first charge process of different rates
Journal of Materials Science, Vol. 52, 8630-8649 (2017)

A-045
H. Iwamoto *et al*.
On-line subcriticality measurement using a pulsed spallation neutron source
Journal of Nuclear Science and Technology, 54: 4, 432-443, (2017)

A-046
Kai, T. *et al*.
Measurements of neutronic characteristics of rectangular and cylindrical coupled hydrogen moderators
Journal of Nuclear Science and Technology, 1-7 (2017)

A-047
Fujisaki, F. *et al*.
Mechanical synthesis and structural properties of the fast fluoride-ion conductor PbSnF4
Journal of Solid State Chemistry, Vol. 253, 287-293 (2017)

A-048
Sakai, Y. *et al*.
A Site and B Site Charge Orderings in an s–d Level Controlled Perovskite Oxide PbCoO3
Journal of the American Chemical Society, Vol. 139, 4574-4581 (2017)

A-049
Seki, Y. *et al*.
Development of Multi-colored Neutron Talbot–Lau Interferometer with Absorption Grating Fabricated by Imprinting Method of Metallic Glass
Journal of the Physical Society of Japan, Vol. 86, 44001 (2017)

A-050
Ogiwara, N. *et al*.
Conductance of a long rectangular channel; Pressure dependence
Journal of the Vacuum Society of Japan, 60(12), p. 475-480 (2017)

A-051
Kamiya, J. *et al*.
Thermal desorption characteristics of several charge stripper carbon films for J-PARC RCS
Journal of the Vacuum Society of Japan, 60(12), p. 484-489 (2017)

A-052
Tanoue, H. *et al*.
Quantitative Analysis of Polymer Brush Formation Kinetics using Quartz Crystal Microbalance: Viscoelasticity of Polymer Brush
Langmuir, Vol. 33, 5166-5172 (2017)

A-053
Higaki, Y. *et al*.
Effect of Charged Group Spacer Length on Hydration State in Zwitterionic Poly (sulfobetaine) Brushes
Langmuir, Vol. 33, 8404-8412 (2017)

A-054
Hori, K. *et al*.
Structure and Mechanical Properties of Polybutadiene Thin Films Bound to Surface-Modified Carbon Interface
Langmuir, Vol. 33, 8883-8890 (2017)

A-055
Tanoue, H. *et al*.
Kinetics of Dynamic Polymer Brush Formation
Macromolecules, Vol. 50, 5549 (2017)

A-056
Xu, PG. *et al*.
Evaluation of austenite volume fraction in TRIP steel sheets using neutron diffraction
Materials Characterization, Vol. 127, 104-110 (2017)

A-057
Tsuchida, N. *et al*.
Room-temperature creep tests under constant load on a TRIP-aided multi-microstructure steel
Materials Science and Engineering: A, Vol. 700, 631-636 (2017)

A-058
Tomota, Y. *et al*.
Quantitative Evaluation of Texture and Dislocations during Annealing after Hot Deformation in Austenitic Steel Using Neutron Diffraction
Materials Science Forum, Vol. 905, 25-30 (2017)

A-059
Harjo, S. *et al*.
Unusual Plastic Deformation Behavior in Lath Martensitic Steel Containing High Dislocation Density
Materials Science Forum, Vol. 905, 46-51 (2017)

A-060
Wan, T. *et al*.
Effects of grain size on ultrasonic attenuation in type 316L stainless steel
Materials, Vol. 10(7), p. 753_1-753_17 (2017)

A-061
Ungár, T. *et al*.
Composite behavior of lath martensite steels induced by plastic strain, a new paradigm for the elastic-plastic response of martensitic steels
Metallurgical and Materials Transactions A, Vol. 48, 159-167 (2017)

A-062
Harjo, S. *et al*.
Work Hardening, Dislocation Structure, and Load Partitioning in Lath Martensite Determined by In Situ Neutron Diffraction Line Profile Analysis
Metallurgical and Materials Transactions A, Vol48, 4080-4092 (2017)

A-063
Ohisa, S. *et al*.
Influence of solution- and thermal-annealing processes on the sub-nanometer-ordered organic–organic interface structure of organic light-emitting devices
Nanoscale, Vol.9, 25-30 (2017)

A-064
Igarashi, M. *et al*.
Non-aqueous selective synthesis of orthosilicic acid and its oligomers
Nature Communications, Vol. 8, 140 (2017)

A-065
Ito, S. *et al*.
Structure of the magnetic excitations in the spin-1/2 triangular-lattice Heisenberg antiferromagnet Ba3CoSb2O9
Nature Communications, Vol. 8, 235 (2017)

A-066
Iizuka, R. *et al*.
Hydrogenation of iron in the early stage of Earth's evolution
Nature Communications, Vol. 8, 14096 (2017)

A-067
Li, B. *et al*.
Polar rotor scattering as atomic-level origin of low mobility and thermal conductivity of perovskite CH3NH3PbI3
Nature Communications, Vol. 8, 16086 (2017)

A-068
Ueno, A.
Cesiated surface H^- ion source; Optimization studies
New Journal of Physics (Internet), 19(1), p. 015004_1-015004_15(2017)

A-069
Miyajima, S. *et al*.
Neutron flux spectrum revealed by Nb-based current-biased kinetic inductance detector with a ^{10}B conversion layer
NUCL INSTRUM METH A, Vol842, 71-75 (2017)

A-070
Hirose, K. *et al*.
Simultaneous measurement of neutron-induced fission and capture cross sections for ^{241}Am at neutron energies below fission threshold
Nucl. Instr. Meth. Phys. Research A, 856 pp. 133-138 (2017)

A-071
Nishiguchi, H. *et al*.
Development of an extremely thin-wall straw tracker operational in vacuum–The COMET straw tracker system
Nucl. Instrum. Methods Phys. Res. A Vol. 845, p. 269 (2017)

A-072
Mineev, O. *et al*.
The design and basic performance of a Spiral Fiber Tracker for the J-PARC E36 experiment
Nucl. Instrum. Methods Phys. Res. A Vol. 847, p. 136 (2017)

A-073
Morita, Y. *et al*.
Stability test for power converters in high-powered operations for J-PARC MR main magnets
Nucl. Instrum. Methods Phys. Res. A Vol. 870, p. 12 (2017)

A-074
Shimada, T. *et al*.
Measurement of thermal deformation of magnetic alloy cores of radio frequency cavities in 3-GeV rapid-cycling synchrotron of Japan proton accelerator research complex
Nucl. Instrum. Methods Phys. Res. A Vol. 875, p. 92 (2017)

A-075
Ahn, J. K. *et al*.
J-PARC-HI Collaboration
Nucl. Phys. A Vol. 967, p. 985 (2017)

A-076
Tanaka, K. *et al*.
Reopening of Research Activities on Strangeness Nuclear Physics at J-PARC
Nucl. Phys. News Vol. 27, p. 21 (2017)

A-077
Shimada, T. *et al*.
Measurement of thermal deformation of magnetic alloy cores of radio frequency cavities in 3-GeV rapid-cycling synchrotron of Japan Proton Accelerator Research Complex
Nuclear Instruments and Methods in Physics Research A, 875, p. 92-103 (2017)

A-078
Hosobata, T. *et al*.
Development of precision elliptic neutron-focusing supermirror
Opt. Express, Vol. 25, 20012-20024 (2017)

A-079
Akaishi, Y. *et al*.
High-density kaonic-proton matter (KPM) composed of $\Lambda^* \equiv K^-p$ multiplets and its astrophysical connections
Phys. Lett. B Vol. 774, p. 522 (2017)

A-080
Pushin, D.A. *et al*.
Far-field interference of a neutron white beam and the applications to noninvasive phase-contrast imaging
Phys. Rev. A, Vol. 95, 043637 (2017)

A-081
Ito, T.U. *et al*.
Excited configurations of hydrogen in the

BaTiO3-xHx perovskite lattice associated with hydrogen exchange and transport
Phys. Rev. B, Vol. 95, 020301(R) (2017)

A-082
Xu, X. L. *et al*.
Critical slowing of quantum atomic deuterium/hydrogen with features of multiferroicity in the geometrically frustrated system Co2(OD)3Cl/Co2(OH)3Cl
Phys. Rev. B., Vol. 95, 024111 (2017)

A-083
Matsuura, M. *et al*.
Development of spin-wave-like dispersive excitations below the pseudogap temperature in the high-temperature superconductor $La_{2-x}Sr_xCuO_4$
Phys. Rev. B,Vol. 95, 024504 (2017)

A-084
Kamazawa, K. *et al*.
Interaction of spin-orbital-lattice degrees of freedom: Vibronic state of the corner-sharing-tetrahedral frustrated spin system HoBaFe4O7 by dynamical Jahn-Teller effect
Phys. Rev. B, Vol. 95, 104413 (2017)

A-085
Miao, P. *et al*.
Hole-doping-induced melting of spin-state ordering in PrBaCo2O5.5+x
Phys. Rev. B, Vol. 95, 125123 (2017)

A-086
Klotz, S. *et al*.
Bulk moduli and equations of state of ice VII and ice VIII
Phys. Rev. B,Vol. 95, 174111 (2017)

A-087
Iwasa, K. *et al*.
Crystalline-electric-field excitations and spin dynamics in Ce3Co4Sn13 semimetallic chiral-lattice phase
Phys. Rev. B, Vol. 95, 195156 (2017)

A-088
Babkevich, P. *et al*.
Magnetic excitations from two-dimensional interpenetrating Cu framework in Ba2Cu3O4Cl2
Phys. Rev. B, Vol. 96, 014410 (2017)

A-089
Kofu, M. *et al*.
Vibrational states of atomic hydrogen in bulk and nanocrystalline palladium studied by neutron spectroscopy
Phys. Rev. B, Vol. 96, 054304 (2017)

A-090
Wang, C. *et al*.
Observation of magnetoelastic effects in a quasi-one-dimensional spiral magnet
Phys. Rev. B, Vol. 96, 085111 (2017)

A-091
Kofu, M. *et al*.
Vibrational states of atomic hydrogen in bulk and nanocrystalline palladium studied by neutron spectroscopy
Phys. Rev. B, 96(5), p.054304_1-054304_7 (2017)

A-092
Doté, A. *et al*.
Fully coupled-channels complex scaling method for the K^-pp system
Phys. Rev. C Vol. 95, 062201 (2017)

A-093
Honda, R. *et al*.
Missing-mass spectroscopy with the $^6Li(\pi^-, K^+)X$ reaction to search for $^6_\Lambda H$
Phys. Rev. C Vol. 96, 014005(2017)

A-094
Abe, K. *et al*.
Search for proton decay via $p \to e^+\pi^0$ and $p \to \mu^+\pi^0$ in 0.31 megaton·years exposure of the Super-Kamiokande water Cherenkov detector
Phys. Rev. D Vol. 95, 012004 (2017)

A-095
Abe, K. *et al*.
First measurement of the muon neutrino charged current single pion production cross section on water with the T2K near detector
Phys. Rev. D Vol. 95, 012010 (2017)

A-096
Abe, K. *et al*.
Search for Lorentz and CPT violation using sidereal time dependence of neutrino flavor transitions over a short baseline
Phys. Rev. D Vol. 95, 111101 (2017)

A-097
Abe, K. *et al*.
Updated T2K measurements of muon neutrino and antineutrino disappearance using 1.5×10^{21} protons on target
Phys. Rev. D Vol. 96, 011102 (2017)

A-098
Abe, K. *et al*.
Search for nucleon decay into charged antilepton plus meson in 0.316 megaton · years exposure of the Super-Kamiokande water Cherenkov detector
Phys. Rev. D Vol. 96, 012003 (2017)

A-099
Abe, K. *et al*.
Measurement of $\bar{\nu}_\mu$ and ν_μ charged current inclusive cross sections and their ratio with the T2K off-axis near detector
Phys. Rev. D Vol. 96, 052001 (2017)

A-100
Abe, K. *et al*.
Measurement of neutrino and antineutrino oscillations by the T2K experiment including a new additional sample of ν_e interactions at the far detector
Phys. Rev. D Vol. 96, 092006 (2017)

A-101
Abe, K. *et al*.
Combined Analysis of Neutrino and Antineutrino Oscillations at T2K
Phys. Rev. Lett. Vol. 118, 151801 (2017)

A-102
Matsuura,K. *et al*.
Spin-Orbital Correlated Dynamics in the Spinel-Type Vanadium Oxide MnV2O4
Phys. Rev. Lett., Vol. 119, 017201 (2017)

A-103
Matsumoto, T. *et al*.
Quantum twin spectra in nanocrystalline silicon
Phys. Rev. Materials, Vol. 1, 051601 (2017)

A-104
Hotchi, H. *et al*.
Achievement of a low-loss 1-MW beam operation in the 3-GeV rapid cycling synchrotron of the Japan Proton Accelerator Research Complex
Physical Review Accelerators and Beams (Internet), 20(6), p. 060402_1-060402_25 (2017)

A-105
Shobuda, Y. *et al*.
Chromaticity effects on head-tail instabilities for broadband impedance using two particle model, Vlasov analysis, and simulations
Physical Review Accelerators and Beams (Internet), 20(7), p. 071003_1-071003_18 (2017)

A-106
Ibuka, S. *et al*.
Damped spin-wave excitations in the itinerant antiferromagnet γ -Fe0.7Mn0.3
Physical Review B, Vol. 95, 224406 (2017)

A-107
Iimura, S. *et al*.
Large-moment antiferromagnetic order in overdoped high-Tc superconductor 154SmFeAsO1-xDx
Proc Natl Acad Sci U. S. A., Vol. 114, E4354-E4359 (2017)

A-108
Shobuda, Y. *et al*.
Theoretical elucidation of space charge effects on the coupled-bunch instability at the 3 GeV rapid cycling synchrotron at the Japan Proton Accelerator Research Complex
Prog. Theor. Exp. Phys. 2017, 013G01 (2017)

A-109
Ahn, J. K. *et al*.
A new search for the $K_L \to \pi^0 \nu\bar{\nu}$ and $K_L \to \pi^0$

X^0 decays
Prog. Theor. Exp. Phys. 2017, 021C01 (2017)

A-110
Fukuda, T. *et al*.
First neutrino event detection with nuclear emulsion at J-PARC neutrino beamline
Prog. Theor. Exp. Phys. 2017, 063C02 (2017)

A-111
Yamada, K. *et al*.
First demonstration of an emulsion multi-stage shifter for accelerator neutrino experiments in J-PARC T60
Prog. Theor. Exp. Phys. 2017, 063H02 (2017)

A-112
Yamamoto, M. *et al*.
Observation of simultaneous oscillations of bunch shape and position caused by odd-harmonic beam loading in the Japan Proton Accelerator Research Complex Rapid Cycling Synchrotron
Prog. Theor. Exp. Phys. 2017, 113G01 (2017)

A-113
Natori, H. *et al*.
A fast high-voltage switching multiwire proportional chamber
Prog. Theor. Exp. Phys., Issue2, 023C01 (2017)

A-114
Shobuda, Y. *et al*.
Theoretical elucidation of space charge effects on the coupled-bunch instability at the 3 GeV Rapid Cycling Synchrotron at the Japan Proton Accelerator Research Complex
Prog. Theor. Exp. Phys. (Internet), 2017(1), p. 013G01_1-013G01_39 (2017)

A-115
Harada, H. *et al*.
Beam-based compensation of extracted-beam displacement caused by field ringing of pulsed kicker magnets in the 3 GeV rapid cycling synchrotron of the Japan Proton Accelerator Research Complex
Prog. Theor. Exp. Phys. (Internet), 2017(9), p. 093G01_1-093G01_16 (2017)

A-116
Shobuda, Y. *et al*.
Resistive-wall impedances of a thin non-evaporable getter coating on a conductive chamber
Prog. Theor. Exp. Phys. (Internet), 2017(12), p. 123G01_1-123G01_22 (2017)

A-117
Takada, H. *et al*.
Materials and Life Science Experimental Facility at the Japan Proton Accelerator Research Complex I: Pulsed Spallation Neutron Source
Quantum Beam Sci., 2017, 1, 8 pp 1-26 (2017)

A-118
Higemoto, W. *et al*.
Materials and Life Science Experimental Facility at the Japan Proton Accelerator Research Complex IV: The Muon Facility
Quantum Beam Sci., Vol. 1, 11 (1-24) (2017)

A-119
Nakamura, S. X. *et al*.
Towards a unified model of neutrino-nucleus reactions for neutrino oscillation experiments
Rep. Prog. Phys. Vol. 80, 056301 (2017)

A-120
Inutsuka, M. *et al*.
Dynamic contact angle on a reconstructive polymer surface by segregation
RSC Adv., Vol. 7, 17202-17207 (2017)

A-121
Cereser, A. *et al*.
Time-of-Flight Three Dimensional Neutron Diffraction in Transmission Mode for Mapping Crystal Grain Structures
Sci. Rep., Vol. 7, 9561 (2017)

A-122
Harjo, S. *et al*.
Martensite phase stress and the strengthening mechanism in TRIP steel by neutron diffraction
Sci. Rep., Vol. 7, 15149 (2017)

A-123
Mamiya, H. *et al*.
Magnetic Bragg dip and Bragg edge in neutron transmission spectra of typical spin superstructures
Sci. Rep., Vol. 7, 15516 (2017)

A-124
Tremsin, A.S. *et al*.
Non-Destructive Study of Bulk Crystallinity and Elemental Composition of Natural Gold Single Crystal Samples by Energy-Resolved Neutron Imaging
Sci. Rep., Vol7, 40759 (2017)

A-125
Takagi, S. *et al*.
Formation of novel transition metal hydride complexes with ninefold hydrogen coordination
Sci. Rep., Vol. 7, 44253 (2017)

A-126
Tomota, Y. *et al*.
Reverse austenite transformation behavior in a tempered martensite low-alloy steel studied using in situ neutron diffraction
Scripta Materialia, Vol. 133, 79-82 (2017)

A-127
Wang, Y. *et al*.
Multi-scaled heterogeneous deformation behavior of pearlite steel studied by in situ neutron diffraction
Scripta Materialia, Vol140, 45-49 (2017)

A-128
Mashita, R. *et al*.
Quasielastic Neutron Scattering Study of Microscopic Dynamics in Polybutadiene Reinforced with an Unsaturated Carboxylate
Soft Matter, Vol. 13, 7862-7869 (2017)

A-129
Mori, K. *et al*.
Structural origin of massive improvement in Li-ion conductivity on transition from $(Li_2S)_5(GeS_2)(P_2S_5)$ glass to $Li_{10}GeP_2S_{12}$ crystal
Solid State Ionics, Vol. 301, 163-169 (2017)

A-130
Shishido, H.
Neutron detection using the superconducting Nb-based current-biased kinetic inductance detector
SUPERCONDUCTOR SCIENCE & TECHNOLOGY, Vol. 30, 094003 (2017)

(C) Conference Reports and Books

C-001
Yamazaki, Y.*et al*.
Current status of J-PARC accelerator infrastructure
Accelerator Reliability Workshop, ARW 2017

C-002
Ueno, A. *et al*.
Emittance improvements of cesiated RF-driven H^- ion source to enable 60mA operation of high-energy and high-intensity LINACs by plasma impurity controls
AIP Conference Proceedings 1869, p.030011_1-030011_10 (2017)

C-003
Shibata, T. *et al*.
High density plasma calculation of J-PARC RF negative ion source
AIP Conference Proceedings 1869, p.030017_1-030017_11 (2017)

C-004
Ueno, A. *et al*.
Transverse RMS emittance evaluation based upon explicit and reasonable definitions of 100% and 95% beams
AIP Conference Proceedings 1869, p. 030052_1-030052_7 (2017)

C-005
Oguri, H. *et al*.
Operation Status of the J-PARC RF-Driven H- Ion Source
AIP Conference Proceedings, Vol 1869, 030053 (2017)

C-006
Seto, H. *et al*.
Inelastic and quasi-elastic neutron scattering spectrometers in J-PARC
Biochimica et Biophysica Acta-General Subjects, Vol. 1861, 3651-3660 (2017)

C-007
Kumano, S.
Hadron tomography studies by generalized parton distributions and distribution amplitudes
EPJ Web Conf. Vol. 141, 06002 (2017)

C-008
Nakao, T. *et al*.
Developments of a new data acquisition system at ANNRI
EPJ Web Conf,Vol.146,03021 (2017)

C-009
Harada, H. *et al*.
Research and development for accuracy improvement of neutron nuclear data on minor actinides
EPJ Web Conf, Vol. 146, 11001 (2017)

C-010
Kino, K. *et al*.
Measurement of the neutron capture resonances for platinum using the Ge spectrometer and pulsed neutron beam at the J-PARC/MLF/ANNRI
EPJ Web Conf, Vol. 146, 11024 (2017)

C-011
Kimura, A. *et al*.
Neutron capture cross section measurements of 120Sn, 122Sn and 124Sn with the array of Ge spectrometer at the J-PARC/MLF/ANNRI
EPJ Web Conf, Vol. 146, 11031 (2017)

C-012
Katabuchi, T. *et al*.
Measurement of the neutron capture cross section of 99Tc using ANNRI at J-PARC
EPJ Web Conf, Vol. 146, 11050 (2017)

C-013
Muto, R. *et al*.
Monitoring System for the Gold Target by Radiation Detectors in Hadron Experimental Facility at J-PARC
EPJ Web Conf. Vol. 153, 07004 (2017)

C-014
Muto, R. *et al*.
Monitoring System for the Gold Target by Radiation Detectors in Hadron Experimental Facility at J-PARC
EPJ Web Conf. Vol. 153, 07004 (2017)

C-015
Yamamoto,K.
Worker dose under high-power operation of the J-PARC 3 GeV Rapid Cycling Synchrotron
EPJ Web of Conferences (Internet), 153, p. 07022_1-07022_6 (2017)

C-016
Ueno, Y. *et al*.
New precise measurement of muonium hyperfine structure interval at J-PARC
Hyperfine Interactions, Vol. 238, 14 (2017)

C-017
Kawabata, Y. *et al*.
Effect of interlamellar interactions on shear induced multilamellar vesicle formation
J. Chem. Phys., Vol. 147, 034905 (2017)

C-018
Yamamoto, K.
Supersymmetry and Kaon physics
J. Phys. Conf. Ser. Vol. 800, 012013 (2017)

C-019
Shiomi, K.
Status of the J-PARC KOTO experiment
J. Phys. Conf. Ser. Vol. 800, 012022 (2017)

C-020
Asano, S. *et al*.
Ce-substitution effects on the spin excitation spectra in $Pr_{1.4-x}La0.6Ce_xCuO_{4+\delta}$
J. Phys.: Conf. Ser., Vol. 807, 52009 (2017)

C-021
Kamazawa, K. *et al*.
Possible low spin state of Fe ions in $HoBaFe_4O_7$
J. Phys.: Conf. Ser., Vol. 828, 012012 (2017)

C-022
Haku, T. *et al*.
Neutron Scattering Study in Breathing Pyrochlore Antiferromagnet Ba3Yb2Zn5O11
J. Phys.: Conf. Ser., Vol. 828, 012018 (5 pages) (2017)

C-023
Wan, T. *et al*.
Study on the evaluation of erosion damage by using laser ultrasonic integrated with a wavelet analysis technique
J. Phys.: Conf. Ser., 842(1), p. 012010_1-012010_10 (2017)

C-024
Hiroi, K. *et al*.
Magnetic field imaging of a model electric motor using polarized pulsed neutrons at J-PARC/MLF
J. Phys.: Conf. Ser., Vol. 862, 012008 (2017)

C-025
Maruyama, R. *et al*.
Accessible length scale of the in-plane structure in polarized neutron off-specular and grazing-incidence small-angle scattering measurements
J. Phys.: Conf. Ser., Vol. 862, 012017 (2017)

C-026
Shinohara, T. *et al*.
Polarization analysis for magnetic field imaging at RADEN in J-PARC/MLF
J. Phys.: Conf. Ser., Vol. 862, 012025 (2017)

C-027
Ibuka, S. *et al*.
Spin wave dispersion just above the magnetic order-order transition in the metallic antiferromagnet Mn3Pt
J. Phys.: Conf. Ser., Vol. 868, 012017 (2017)

C-028
Otani, M. *et al*.
Crossbar H-mode drift-tube linac design with alternative phase focusing for muon linac
J. Phys. Conf. Ser. Vol. 874, 012038 (2017)

C-029
Kondo, Y. *et al*.
Beam dynamics design of the muon linac high-beta section
J. Phys. Conf. Ser. Vol. 874, 012054 (2017)

C-030
Kitamura, R. *et al*.
First trial of the muon acceleration for J-PARC muon g-2/EDM experiment
J. Phys. Conf. Ser. Vol. 874, 012055 (2017)

C-031
Yee-Rendon, B. *et al*.
Electron cloud simulations for the main ring of J-PARC
J. Phys. Conf. Ser. Vol. 874, 012065 (2017)

C-032
Miura, A. *et al*.
Bunch shape monitor development in J-PARC linac
J. Phys. Conf. Ser. Vol. 874, 012080 (2017)

C-033
Satou, K. *et al*.
Development of wide dynamic range beam loss monitor system for J-PARC main ring
J. Phys. Conf. Ser. Vol. 874, 012087 (2017)

C-034
Friend, M.

J-PARC accelerator and neutrino beamline upgrade programme
J. Phys. Conf. Ser. Vol. 888, 012042 (2017)

C-035
Bronner, C. *et al*.
Physics sensitivity of a possible extended T2K run–T2K Phase 2
J. Phys. Conf. Ser. Vol. 888, 012215 (2017)

C-036
Ohira-Kawamura, S. *et al*.
Sample environment at the J-PARC MLF
Journal of Neutron Research, Vol. 19, 15-22 (2017)

C-037
Morishita, T. *et al*.
Vacuum properties and operation stability of the radio-frequency quadrupole accelerator in Japan Proton Accelerator Research Complex linac
Journal of Vacuum Science & Technology A 35, 041602 (2017)

C-038
Ichikawa, Y. *et al*.
Study of the $\bar{K}$-nucleus interaction by using the $^{12}C(K^-, p)$ reaction at J-PARC
JPS Conference Proceedings (Internet), 13, p.020007_1-020007_5 (2017)

C-039
Tamura,H. *et al*.
γ-ray spectroscopy of hypernuclei; Recent results and prospect at J-PARC
JPS Conference Proceedings (Internet), 17, p.011004_1-011004_11 (2017)

C-040
Yang, S.B. *et al*.
The First gamma-ray spectroscopic study of $_{sd}$-shell hypernucleus, $^{19}_{\Lambda}F$
JPS Conference Proceedings (Internet), 17, p.012004_1-012004_4 (2017)

C-041
Nakagawa, M. *et al*.
Search for excited state of Σ hypernucleus in the J-PARC E13 experiment
JPS Conference Proceedings (Internet), 17, p.012009_1-012009_4 (2017)

C-042
Miwa, K. *et al*.
High statistics Σ p scattering experiment using high intensity pion beams at J-PARC
JPS Conference Proceedings (Internet), 17, p.041002_1-041002_6 (2017)

C-043
Sako, H.
Study of baryon excited states in (π,2π) reactions at J-PARC
JPS Conference Proceedings (Internet), 17, p.063004_1-063004_2 (2017)

C-044
Gogami, T. *et al*.
Spectroscopy of nuclei with multi-strangeness by using new S-2S spectrometer at J-PARC
JPS Conference Proceedings (Internet), 18, p.011031_1-011031_6 (2017)

C-045
Sasa, T. *et al*.
Design of 250kW LBE spallation target for the Japan Proton Accelerator Research Complex (J-PARC)
NEA/CSNI/R(2017)2 (Internet), p. 111-116 (2017)

C-046
Wan, T. *et al*.
Study on optimisation of target head design for the TEF-T LBE spallation target
NEA/CSNI/R(2017)2 (Internet), p. 117-127 (2017)

C-047
Obayashi, H. *et al*.
Application of ultrasonic flowmeter for LBE flow
NEA/CSNI/R(2017)2 (Internet), p. 188-194 (2017)

C-048
Saito, S. *et al*.
Status of LBE corrosion test loop "OLLOCHI" and experiments at JAEA
NEA/CSNI/R (2017)2 (Internet), p. 195-200 (2017)

C-049
Oikawa, K. *et al*.
A comparative study of the crystallite size and the dislocation density of bent steel plates using Bragg-edge transmission imaging, TOF neutron diffraction and EBSD
Phys. Procedia, Vol. 88, 34-41 (2017)

C-050
Su, Y. H. *et al*.
Time-of-flight Neutron Transmission Imaging of Martensite Transformation in Bent Plates of a Fe-25Ni-0.4C Alloy
Phys. Procedia, Vol. 88, 42-49 (2017)

C-051
Kamiyama, T. *et al*.
Microstructural Information Mapping of a Plastic-deformed α-iron Plate during Tensile Tests using Pulsed Neutron Transmission
Phys. Procedia, Vol. 88, 50-57 (2017)

C-052
Ito, D. *et al*.
Visualization of solidification process in lead-bismuth eutectic
Phys. Procedia, Vol. 88, 58-63 (2017)

C-053
Matsumoto, Y. *et al*.
Recent progress of radiography and tomography at the energy-resolved neutron imaging system RADEN
Phys. Procedia, Vol. 88, 162-166 (2017)

C-054
Seki, Y. *et al*.
Experimental evaluation of neutron absorption grating fabricated by oblique evaporation of gadolinium for phase imaging
Phys. Procedia, Vol. 88, 217-223 (2017)

C-055
Hayashida, H. *et al*.
Development of an in-situ SEOP 3He neutron spin filter for magnetic imaging techniques
Phys. Procedia, Vol. 88, 231-236 (2017)

C-056
Kai, T. *et al*.
Reliability estimation of neutron resonance thermometry using tantalum and tungsten
Phys. Procedia, Vol. 88, 306-313 (2017)

C-057
Nakane, Y. *et al*.
Dose Measurements through the Concrete and Iron Shields under the 100 to 400 MeV Quasi-Monoenergetic Neutron Field (at RCNP, Osaka Univ.)
Proc. of 13th International Conference on Radiation Shielding & 19th Topical Meeting of the Radiation Protection and Shielding Division of the American Nuclear Society-2016, EPJ Web of Conference 153, 08022 (2017)

C-058
Hotchi, H. *et al*.
Recent progress of J-PARC RCS beam commissioning; Efforts for realizing a high-intensity low-emittance beam
Proc. of 14th Annual Meeting of Particle Accelerator Society of Japan (Internet), p. 95-99 (2017)

C-059
Tamura, F. *et al*.
Development of a vector rf voltage control system for the J-PARC RCS
Proc. of 14th Annual Meeting of Particle Accelerator Society of Japan (Internet), p. 241-245 (2017)

C-060
Yamamoto, K. *et al*.
New injection system design of the J-PARC rapid cycling synchrotron
Proc. of 14th Annual Meeting of Particle Accelerator Society of Japan (Internet), p.374-378 (2017)

C-061
Kondo, Y. *et al*.
High-beta section of a muon linac for the measurement of the muon g-2/EDM at J-PARC

Proc. of 14th Annual Meeting of Particle Accelerator Society of Japan (Internet), 398-400 (2017)

C-062
Hayashi, N. *et al*.
Interlocked events of beam loss monitors at the J-PARC linac
Proc. of 14th Annual Meeting of Particle Accelerator Society of Japan (Internet), p. 540-544 (2017)

C-063
Sako, H. *et al*.
Observation of beam loss proton tracks at 400 MeV J-PARC Linac
Proc. of 14th Annual Meeting of Particle Accelerator Society of Japan (Internet), p. 545-547 (2017)

C-064
Shinto, K. *et al*.
Effect of RF discharge for a high intnsity H- ion source on the eztracted beam
Proc. of 14th Annual Meeting of Particle Accelerator Society of Japan (internet), 648-650 (2017)

C-065
Ohkoshi, K. *et al*.
Operation Status of the J-PARC H^- Ion Source
Proc. of 14th Annual Meeting of Particle Accelerator Society of Japan (Internet), 651-654 (2017)

C-066
Harada, H. *et al*.
Laser storage ring with high power for realization of laser stripping injection
Proc. of 14th Annual Meeting of Particle Accelerator Society of Japan (Internet), p. 684-688 (2017)

C-067
Hirano, K. *et al*.
Negative hydrogen ion beam irradiation experiments of beam scrapers using the J-PARC 3MeV-linac
Proc. of 14th Annual Meeting of Particle Accelerator Society of Japan (Internet), 847-852 (2017)

C-068
Okabe, K. *et al*.
A Failure investigation of the beam collimator system in the J-PARC 3 GeV rapid cycling synchrotron
Proc. of 14th Annual Meeting of Particle Accelerator Society of Japan (Internet), p. 853-857 (2017)

C-069
Saha, P. K. *et al*.
Status of proof-of-principle experiment for 400 MeV H- stripping to protons by using only lasers in the 3-GeV RCS of J-PARC
Proc. of 14th Annual Meeting of Particle Accelerator Society of Japan (Internet), p. 866-870 (2017)

C-070
Suganuma, K. *et al*.
Present status of water cooling system at J-PARC LINAC 2017
Proc. of 14th Annual Meeting of Particle Accelerator Society of Japan (Internet), p. 871-873 (2017)

C-071
Fujirai, K. *et al*.
Vibration analysis of water cooling towers' defective fan bearing units at J-PARC RCS
Proc. of 14th Annual Meeting of Particle Accelerator Society of Japan (Internet), p. 874-876 (2017)

C-072
Sawabe, Y. *et al*.
Improvement of a timing system in J-PARC Linac/RCS
Proc. of 14th Annual Meeting of Particle Accelerator Society of Japan (Internet), p. 1133-1136 (2017)

C-073
Takahashi, H. *et al*.
Supervision and alarm system for J-PARC Linac and RCS
Proc. of 14th Annual Meeting of Particle Accelerator Society of Japan (Internet), p. 1151-1154 (2017)

C-074
Morishita, T. *et al*.
Floor deformation and vibration measurements of the J-PARC linac
Proc. of 14th Annual Meeting of Particle Accelerator Society of Japan (Internet), 1287-1290 (2017)

C-075
Hasegawa, K. *et al*.
Status of J-PARC accelerators
Proc. of 14th Annual Meeting of Particle Accelerator Society of Japan (Internet), p. 1317-1321 (2017)

C-076
Obayashi, H. *et al*.
Experimental application of ultrasonic flowmeter for TEF-T LBE spallation target system
Proc. of 17th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-17) (USB Flash Drive), 10 Pages (2017)

C-077
Wan, T. *et al*.
Study on the thermal-hydraulic of TEF-T LBE spallation target in JAEA
Proc. of 17th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-17) (USB Flash Drive),13pages (2017)

C-078
Shibata, T. *et al*.
LEBT commissioning of the J-PARC LINAC
Proc. of 28th International Linear Accelerator Conference (LINAC 2016) (Internet), p. 251-253 (2017)

C-079
Artikova, S. *et al*.
Deflector design for spin rotator in muon linear accelerator
Proc. of 28th International Linear Accelerator Conference (LINAC 2016) (Internet), p. 830-832 (2017)

C-080
Hayashi, N. *et al*.
Beam-loss monitoring signals of interlocked events at the J-PARC Linac
Proc. of 5th International Beam Instrumentation Conference (IBIC 2016) (Internet), p. 368-371 (2017)

C-081
Takei, H. *et al*.
Present status of the laser charge exchange test using the 3-MeV linac in J-PARC
Proc. of 5th International Beam Instrumentation Conference (IBIC 2016) (Internet), p. 736-739 (2017)

C-082
Hayashi, N. *et al*.
Beam position measurement during multi-turn painting injection at the J-PARC RCS
Proc. of 8th International Particle Accelerator Conference (IPAC '17) (Internet), p. 277-280 (2017)

C-083
Yamamoto,K. *et al*.
New injection scheme of J-PARC rapid cycling synchrotron
Proc. of 8th International Particle Accelerator Conference (IPAC '17) (Internet), p. 579-581 (2017)

C-084
Hasegawa, K. *et al*.
Performance and status of the J-PARC accelerators
Proc. of 8th International Particle Accelerator Conference (IPAC '17) (Internet), p. 2290-2293 (2017)

C-085
Tamura, J. *et al*.
Detection of H0 Particles in MEBT2 Chicane of J-PARC Linac
Proc. of 8th International Particle Accelerator Conference (IPAC '17) (Internet), p. 2308-2310 (2017)

C-086
Hotchi, H. *et al*.
Realizing a high-intensity low-emittance beam in the J-PARC 3-GeV RCS

Proc. of 8th International Particle Accelerator Conference (IPAC '17) (Internet), p. 2470-2473 (2017)

C-087
Saha, P. K. *et al*.
Simulation studies of transverse beam instabilities and measures beyond 1 MW beam power in the 3-GeV RCS of J-PARC
Proc. of 8th International Particle Accelerator Conference (IPAC '17) (Internet), p. 3750-3752 (2017)

C-088
Takahashi, H. *et al*.
Stabilization of timing system operation of J-PARC Linac and RCS
Proc. of 8th International Particle Accelerator Conference (IPAC '17) (Internet), p. 4000-4002 (2017)

C-089
Ito, T. *et al*.
Multipactor Problem of J-PARC SDTL
Proc. of 8th International Particle Accelerator Conference (IPAC '17) (Internet), p. 4184-4186 (2017)

C-090
Naganawa, N. *et al*.
A neutron detector with submicron spatial resolution using fine- grained nuclear emulsion
Proc. of 8th International Topical Meeting on Neutron Radiography, ITMNR-8, 4-8 September 2016, Beijing, China, Physics Procedia, Vol. 88, 224-230 (2017)

C-091
S. Meigo, H. Matsuda, H. Iwamoto
Cross section measurement in J-PARC for neutronics of the ADS
Proc. of AccApp'17 pp. 396-402 (2017)

C-092
Sugiyama, Y. *et al*.
MEASUREMENT OF THE LONGITUDINAL COUPLED BUNCH INSTABILITIES IN THE J-PARC MAIN RING
Proc. of IBIC2017, Grand Rapids, USA p. 225 (2017)

C-093
Kobayashi, A. *et al*.
UPGRADE OF THE BEAM POSITION MONITORING SYSTEM AT THE J-PARC MAIN RING FOR HIGH INTENSITY OPERATION
Proc. of IBIC2017, Grand Rapids, USA p. 229 (2017)

C-094
Toyama, T. *et al*.
NEW DESIGN OF A TAPERED-COUPLER BPM TOWARD SIMPLER GEOMETRY AND FLATTER FREQUENCY RESPONSE
Proc. of IBIC2017, Grand Rapids, USA p. 237 (2017)

C-095
Agari, K. *et al*.
DEVELOPMENT OF THE POWER SUPPLY CONTROL SYSTEM FOR J-PARC HADRON EXPERIMENTAL FACILITY
Proc. of ICALEPCS2017, Barcelona, Spain p. 697 (2017)

C-096
Kimura, T. *et al*.
OPERATION STATUS OF J-PARC MR MACHINE PROTECTION SYSTEM AND FUTURE PLAN
Proc. of ICALEPCS2017, Barcelona, Spain p. 341 (2017)

C-097
Nakayoshi, K. *et al*.
DEVELOPMENT OF AN EXPERT SYSTEM FOR THE HIGH INTENSITY NEUTRINO BEAM FACILITY AT J-PARC
Proc. of ICALEPCS2017, Barcelona, Spain p. 1229 (2017)

C-098
Moriyama, K. *et al*.
DEVELOPMENT OF STATUS ANALYSIS SYSTEM BASED ON ELK STACK AT J-PARC MLF
Proc. of ICALEPCS2017, Barcelona, Spain p. 1423 (2017)

C-099
Kamikubota, N. *et al*.
NETWORK SYSTEM OPERATION FOR J-PARC ACCELERATORS
Proc. of ICALEPCS2017, Barcelona, Spain p. 1470 (2017)

C-100
Miura, A. *et al*.
BUNCH SHAPE MONITOR DEVELOPMENT IN J-PARC LINAC
Proc. of IPAC2017, Copenhagen, Denmark p. 271 (2017)

C-101
Toyama, T. *et al*.
MEASUREMENT OF TRANSVERSE MULTIPOLE MOMENTS OF THE PROTON BEAM IN THE J-PARC MR
Proc. of IPAC2017, Copenhagen, Denmark p. 274 (2017)

C-102
Shibata, T. *et al*.
THE DEVELOPMENT OF A NEW LOW FIELD SEPTUM MAGNET SYSTEM FOR FAST EXTRACTION IN MAIN RING OF J-PARC
Proc. of IPAC2017, Copenhagen, Denmark p. 573 (2017)

C-103
Shibata, T. *et al*.
THE NEW HIGH FIELD INJECTION SEPTUM MAGNET SYSTEM FOR MAIN RING OF J-PARC
Proc. of IPAC2017, Copenhagen, Denmark p. 576 (2017)

C-104
Satou, K. *et al*.
DEVELOPMENT OF WIDE DYNAMIC RANGE BEAM LOSS MONITOR SYSTEM FOR J-PARC MAIN RING
Proc. of IPAC2017, Copenhagen, Denmark p. 1248 (2017)

C-105
Hasegawa, K. *et al*.
PERFORMANCE AND STATUS OF THE J-PARC ACCELERATORS
Proc. of IPAC2017, Copenhagen, Denmark p. 2290 (2017)

C-106
Ohmori, C. *et al*.
BATCH COMPRESSION FOR MULTI-MW J-PARC
Proc. of IPAC2017, Copenhagen, Denmark p. 2294 (2017)

C-107
Yamamoto, M. *et al*.
AN UPGRADE SCENARIO OF RF SYSTEM TO ACHIEVE 1.6 MW BEAM ACCELERATION IN J-PARC RCS
Proc. of IPAC2017, Copenhagen, Denmark p. 2297 (2017)

C-108
Kondo, Y. *et al*.
BEAM DYNAMICS DESIGN OF THE MUON LINAC HIGH-BETA SECTION
Proc. of IPAC2017, Copenhagen, Denmark p. 2304 (2017)

C-109
Tamura, J. *et al*.
DETECTION OF H^0 PARTICLES IN MEBT2 CHICANE OF J-PARC LINAC
Proc. of IPAC2017, Copenhagen, Denmark p. 2308 (2017)

C-110
Kitamura, R. *et al*.
FIRST TRIAL OF THE MUON ACCELERATION FOR J-PARC MUON g-2/EDM EXPERIMENT
Proc. of IPAC2017, Copenhagen, Denmark p. 2311 (2017)

C-111
Otani, M. *et al*.
CROSSBAR H-MODE DRIFT-TUBE LINAC DESIGN WITH ALTERNATIVE PHASE FOCUSING FOR MUON LINAC
Proc. of IPAC2017, Copenhagen, Denmark p. 2868 (2017)

C-112
Shobuda, Y. *et al*.
COUPLED BUNCH INSTABILITY AND ITS CURE AT J-PARC RCS
Proc. of IPAC2017, Copenhagen, Denmark p. 2946 (2017)

C-113
Ito, T. *et al*.
MULTIPACTOR PROBLEM OF J-PARC SDTL
Proc. of IPAC2017, Copenhagen, Denmark p. 4184 (2017)

C-114
Yee-Rendon, B. *et al*.
ELECTRON CLOUD SIMULATIONS FOR THE MAIN RING OF J-PARC
Proc. of IPAC2017, Copenhagen, Denmark p. 4436 (2017)

C-115
Artikova, S. *et al*.
BEAM DYNAMICS STUDIES ON LOW AND MEDIUM ENERGY BEAM TRANSPORT WITH INTENSE H–IONS FOR J-PARC LINAC
Proc. of IPAC2017, Copenhagen, Denmark p. 4439 (2017)

C-116
Shirakata, M.
ESTIMATION AND MEASUREMENTS OF RADIATION DOSE DISTIBUTION FOR THE RADIATION TEST AREA IN J-PARC MAIN RING
Proc. of IPAC2017, Copenhagen, Denmark p. 4689 (2017)

C-117
Grillenberger, J. K. *et al*.
THE ENERGY EFFICIENCY OF HIGH INTENSITY PROTON DRIVER CONCEPTS
Proc. of IPAC2017, Copenhagen, Denmark p. 4842 (2017)

C-118
Sako, H.
Baryon spectroscopy in (π,2π) reactions with 10^6Hz pion beams at J-PARC
Proc. of Science (Internet), 5 Pages (2017)

C-119
Nagae, T. *et al*.
Observation of Ξ bound states in the $^{12}C(K^-, K^+)X$ reaction at 1.8 GeV/$_c$ in J-PARC
Proc. of Science (Internet), 7 Pages (2017)

C-120
Tanaka, K.
Exclusive pion-induced Drell-Yan process at J-PARC for accessing the nucleon GPDs and soft nonfactorizable mechanism
Proc. of Science, DIS 2017, 249 (2017)

C-121
Park, J.
Searching for a Sterile Neutrino at J-PARC MLF: JSNS2 experiment
Proc. of Science, EPS-HEP 2017, 128 (2017)

C-122
Ueno, K. *et al*.
Development of a thin-wall straw-tube tracker for COMET experiment
Proc. of Science, EPS-HEP 2017, 524 (2017)

C-123
Nishiguchi, H.
Search for Muon-to-Electron Conversion at J-PARC: COMET Experiment
Proc. of Science, EPS-HEP 2017, 674 (2017)

C-124
Chikuma, N. *et al*.
Development of electronics and data acquisition system for the J-PARC T59 (WAGASCI) experiment
Proc. of Science, EPS-HEP 2017, 780 (2017)

C-125
Fujii, Y.
Development of the Diamond based Proton Beam Monitor for COMET Experiment
Proc. of Science, EPS-HEP 2017, 789 (2017)

C-126
Sato, Y.
Muon g–2/EDM Experiment at J-PARC
Proc. of Science, KMI 2017, 006 (2017)

C-127
Shibata, T. *et al*.
THE DEVELOPMENT OF NEW INJECTION SEPTUM MAGNET FOR UPGRATING OF J-PARC MR(3)
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 68 (2017)

C-128
Shimogawa, T. *et al*.
FIRST NEW POWER SUPPLY OF MAIN MAGNET FOR J-PARC MAIN RING UPGRADE
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 73 (2017)

C-129
Soma, T. *et al*.
PREDICTIVE DETECTION & DIAGNOSIS OF ACCELERATOR SYSTEM USING SYSTEM INVARIANT ANALYSIS TECHNOLOGY (SIAT)
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 81 (2017)

C-130
Sato, Y. *et al*.
BEAM LOSS LOCALIZATION WITH SCATTERER CATCHER SYSTEM IN J-PARC MAIN RING
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 90 (2017)

C-131
Kitamura, R. *et al*.
CURRENT PREPARATION AND PROSPECTS OF THE MUON ACCELERATION TEST WITH RFQ IN J-PARC
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 100 (2017)

C-132
Kobayashi, A. *et al*.
UPGRADE OF THE BEAM POSITION MONITOR (BPM) AT THE J-PARC MAIN RING FOR HIGH INTENSITY OPERATION
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 187 (2017)

C-133
Yee-Rendon, B. *et al*.
PYECLOUD SIMULATIONS OF THE ELECTRON CLOUD FOR THE J-PARC MR
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 197 (2017)

C-134
Tamura, F. *et al*.
DEVELOPMENT OF A VECTOR RF VOLTAGE CONTROL SYSTEM FOR THE J-PARC RCS
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 241 (2017)

C-135
Otani, M. *et al*.
DTL DESIGN FOR MUON LINAC
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 364 (2017)

C-136
Kondo, Y. *et al*.
HIGH-BETA SECTION OF A MUON LINAC FOR THE MEASUREMENT OF THE MUON G-2/EDM AT J-PARC
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 398 (2017)

C-137
Futatsukawa, K. *et al*.
STATUS OF THE J-PARC LINAC LLRF SYSTEM
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 486 (2017)

C-138
Fukuoka, S. *et al*.
DEVELOPMENT OF BUNCH SHAPE MONITOR AND STUDY OF LONGITUDINAL BEAM MATCHING AT J-PARC LINAC
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 535 (2017)

C-139
Hayashi, N. *et al*.
INTERLOCKED EVENTS OF BEAM LOSS MONITORS AT THE J-PARC LINAC
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 540 (2017)

C-140
Sako, H. *et al*.

OBSERVATION OF BEAM LOSS PROTON TRACKS AT 400 MEV J-PARC LINAC
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 545 (2017)

C-141
Miura, A. *et al*.
TENSILE FRACTURE TEST OF METRIC WIRE OF BEAM PROFILE MONITORS
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 560 (2017)

C-142
Miyao, T. *et al*.
BEAM PROFILE MEASUREMENT USING CARBON NANOTUBE WIRES
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 572 (2017)

C-143
Sato, K. *et al*.
DEVELOPMENT OF TRIGGERED SCALER TO DETECT MISSING TRIGGER
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 627 (2017)

C-144
Shinto, K. *et al*.
EFFECT DUE TO RF DISCHARGE FROM A HIGH INTENSITY H^- ION SOURCE UPON THE EXTRACTED BEAM
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 648 (2017)

C-145
Ohkoshi, K. *et al*.
OPERATION STATUS OF THE J-PARC H^- ION SOURCE
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 651 (2017)

C-146
Watanabe, H. *et al*.
DEVELOPMENT OF A RADIATION-RESISTANT ROTATION SENSOR FOR NEW PRODUCTION TARGET AT J-PARC HADRON FACILITY
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 655 (2017)

C-147
Takahashi, H. *et al*.
DEVELOPMENT OF NEW PRODUCTION TARGET AT J-PARC HADRON EXPERIMENTAL FACILITY
Proc.of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 660 (2017)

C-148
Wakai, E. *et al*.
IMPORTANCE AND INTERNATIONAL COLLABORATION OF RADIATION DAMAGE RESEARCH IN ACCELERATOR-TARGET FIELD
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 724 (2017)

C-149
Hirano, K. *et al*.
NEGATIVE HYDROGEN ION BEAM IRRADIATION EXPERIMENTS OF BEAM SCRAPERS USING THE J-PARC 3MEV-LINAC
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 847 (2017)

C-150
Ohmori, C. *et al*.
A BUNCH MANIPULATION FOR MULTI-MW J-PARC
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 858 (2017)

C-151
Saha, P. K. *et al*.
STATUS OF PROOF-OF-PRINCIPLE EXPERIMENT FOR 400 MeV H^- STRIPPING TO PROTONS BY USING ONLY LASERS IN THE 3-GeV RCS OF J-PARC
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 866 (2017)

C-152
Niki, K. *et al*.
OPERATION STATUS AND RADIATION RESISTANT PERFORMANCE OF SURVEILLANCE CAMERA IN J-PARC MR TUNNEL
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 882 (2017)

C-153
Liu, Y. *et al*.
PROGRESSES OF J-PARC LINAC COMMISSIONING
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 885 (2017)

C-154
Igarashi, S. *et al*.
TRANSVERSE RESONANCES AND CORRECTIONS IN J-PARC MR
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 889 (2017)

C-155
Muto, R. *et al*.
SIMULATION STUDY OF BEAM SCATTERER FOR BEAM LOSS MITIGATION IN SLOW EXTRACTION AT J-PARC MR
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 892 (2017)

C-156
Hasegawa, K. *et al*.
STATUS REPORT OF THE RF CAVITY WITH FT3L MA CORES AND DEVELOPMENT OF A VACUUM CAPACITOR
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 924 (2017)

C-157
Agari, K. *et al*.
DEVELOPMENT OF CURRENT MONITORING SYSTEM FOR MAGNET POWER SUPPLY AT J-PARC HADRON EXPERIMENTAL FACILITY
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1040 (2017)

C-158
Miura, K. *et al*.
DEVELOPMENT OF COMPACT POWER SUPPLY FOR CAPACITOR BANK CONTROL TEST AT J-PARC MR
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1043 (2017)

C-159
Hirose, E. *et al*.
INSTALLATION OF A GIANT SPECTROMETER MAGNET WITH A WEIGHT OF 300 TONS AT J-PARC HADRON EXPERIMENTAL FACILITY
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1046 (2017)

C-160
Hirose, E. *et al*.
INSTALLATION OF A GIANT SPECTROMETER MAGNET WITH A WEIGHT OF 300 TONS AT J-PARC HADRON EXPERIMENTAL FACILITY
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1046 (2017)

C-161
Shibata, T. *et al*.
THE DEVELOPMENT OF A NEW FAST EXTRACTION SEPTUM MAGNET FOR UPGRADING OF J-PARC MR
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1051 (2017)

C-162
Morita, Y. *et al*.
DEVELOPMENT OF CAPACITOR BANK OF J-PARC MR MAIN MAGNET POWER SUPPLY FOR HIGH REPETITION RATE OPERATION
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1056 (2017)

C-163
Sugimoto, T. *et al*.
UPGRADE OF THE COMPENSATION KICKER MAGNET FOR J-PARC MAIN RING
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1061 (2017)

C-164
Naito, D. *et al*.
EVALUATION OF MULTIPOLE MAGNETIC FIELD WITH HIGH REPETITION RATE OPERATION IN J-PARC MR
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1065 (2017)

C-165
Yee-Rendon, B. *et al*.
MEASUREMENTS OF THE ENERGY DISTRIBUTION OF THE ELECTRON CLOUD AT J-PARC MR
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1069 (2017)

C-166
Sugiyama, Y. *et al*.
ANALYSIS OF LONGITUDINAL BEAM OSCILLATION IN J-PARC MR
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1072 (2017)

C-167
Shirakata, M. *et al*.
FOUR-AXES BEAM COLLIMATOR AND BEAM LOSS RESPONSES AT THE J-PARC MR
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1077 (2017)

C-168
Moriya, K. *et al*.
DEVELOPMENT OF THE BUNCH SHAPE MONITOR IN THE J-PARC L3BT
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1081 (2017)

C-169
Futatsukawa, K. *et al*.
DEVELOPMENT OF BUNCH SHAPE MONITOR AT MEBT2 OF J-PARC LINAC
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1084 (2017)

C-170
Kurimoto, Y.
REAL-TIME OPTICS CORRECTIONS USING PRECISE MEASUREMENT OF THE CURRENT THROUGH MAIN MAGNETS
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1089 (2017)

C-171
Toyama, T. *et al*.
BEAM SIZE MEASUREMENT WITH THE BPMS IN THE J-PARC 3-50BT
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1094 (2017)

C-172
Kamikubota, N. *et al*.
MIGRATION SCENARIO OF WAVEFORM DIGITIZERS USED IN J-PARC MR
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1137 (2017)

C-173
Toyoda, A. *et al*.
DEVELOPMENT OF DATA ARCHIVE SYSTEM FOR J-PARC HADRON BEAMLINE(2)
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1140 (2017)

C-174
Yamada, S. *et al*.
DEPLOYMENT OF ARCHIVER APPLIANCE AT J-PARC MAIN RING
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1144 (2017)

C-175
Kimura, T. *et al*.
PERFORMANCE EVALUATION OF MR-MPS AND DEVELOPMENT PLAN OF NEW MR-MPS FOR J-PARC
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1148 (2017)

C-176
Doi, K. *et al*.
CURRENT STATUS AND FUTURE PROSPECT OF J-PARC MAIN RING ARCHIVE WEB VIEWER
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1155 (2017)

C-177
Yanaoka, E. *et al*.
DEVELOPMENT OF FORCED SYNCHRONOUS TRIP SYSTEM OF BUMP MAGNET POWER SUPPLIES
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1158 (2017)

C-178
Kawabata, Y. *et al*.
DURABILITY OF POSITIONING SENSOR NETWORK SYSTEM IN RADIATION ENVIRONMENT (J-PARC) AND APPLICATION PLAN OF DISASTER PREVENTION APP
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1282 (2017)

C-179
Hasegawa, K. *et al*.
STATUS OF J-PARC ACCELERATORS
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan p. 1317 (2017)

C-180
Satou, K. *et al*.
Development of wide dynamic range beam loss monitor system
for J-PARC main ring
Proc. of the 14th Annual Meeting of Particle Accelerator Society of Japan, Sapporo, Japan WEP079 (2017)

C-181
OI, N. *et al*.
Measurement of neutron scattering from noble gas to search for a short-range unknown force
Proc. of the 26th International Nuclear Physics Conference, 11-16 September, 2016, Adelaide, Australia, Proceedings of Science (2017)

(D) KEK Reports

D-001
Maruyama, T. *et al*.
11th KEK summer challenge in 2017
KEK Proceedings 2017-10 (2017)

(F) Others

F-001
Harjo, S. *et al*.
Changes of Dislocation Density and Dislocation Arrangement during Tensile Deformation in Lath Martensitic Steels
Advanced Experimental Mechanics, Vol. 2, 112-117 (2017)

F-002
Takahashi, H.
Report on Symposiums in the Autumn Meeting 2016
Butsuri Vol. 72 No. 2, p. 130 (2017)

F-003
Takahashi, H.
Report on Symposiums in the Autumn Meeting 2016
Butsuri Vol. 72 No. 3, p. 197 (2017)

F-004
Takahashi, H.
Report on Symposium in the 72nd Autumn Meeting
Butsuri Vol. 72 No. 7, p. 518 (2017)

F-005
Nakamura, T. *et al*.
Development of Scintillation Neutron Detector using Wavelength-shifting Fiber Technology
Hamon, Vol. 27(1), p. 4-7 (2017)

F-006
Iizuka, R. *et al*.
In situ neutron diffraction of iron hydride in iron-silicate-water system under high pressure and high temperature condition
Hamon, Vol. 27(3), p. 104-108 (2017)

F-007
Iinuma, H. *et al*.
SCCJ Café–Season 5–Molecular Science in Biology(4)–Novel Quantum Beam, Muon Spectroscopy and Theoretical Approach–
J. Comput. Chem. Jpn., Vol. 16, A12-A17 (2017)

F-008
Yamamoto, K. *et al*.
Water Content Near Surface of Poly(dimethyl siloxane)-<i>co</i>-poly(<i>N</i>,<i>N</ i>-dimetly acrylamide) Hydrogel Revealed by Neutron Reflectivity Measurements
Japanese journal of polymer science and technology, Vol. 74, 36-40 (2017)

F-009
Nakagawa, H. *et al*.
Basic and applied life science extended by neutron
Journal of the Particle Accelerator Society of Japan, Vol. 13(4), p. 214-219 (2017)

F-010
Nakajima, K. *et al*.
Materials and Life Science Experimental Facility (MLF) at the Japan Proton Accelerator Research Complex II: Neutron Scattering Instruments
Quantum Beam Science, Vol. 1, 9 (2017)

F-011
Akita, K. *et al*.
In-situ Residual Stress Analysis during Thermal Cycle of a Dissimilar Weld Joint Using Neutron Diffraction and IEFEM
Quarterly Journal of the Japan Welding Society, Vol. 35, 112s-116s (2017)

F-012
Nakajima, K.
A Cold-Neutron Disk-Chopper Spectrometer AMATERAS and Scientific Research Carried out on This Spectrometer
RADIOISOTOPES, Vol. 66(2), 101-115 (2017)

F-013
Tomota, Y. *et al*.
Recent Progress of Line-profile Analyses for Neutron or X-ray Diffraction
Tetsu-to-Hagané,Vol.103,73-85 (2017)

(J) JAEA Reports

J-001
Sugawara, T. *et al*.
Cladding tube burst experiment assumed MA fuel pin for transmutation physics experimental facility
JAEA-Research 2017-011, 35 Pages (2017)

J-PARC Annual Report 2017
Vol.1: Highlight

March 2019

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 18-05