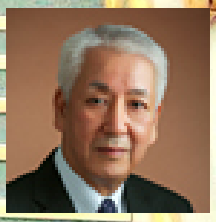
THE INTERNATIONAL ADVISORY COMMITTEE ON THE J-PARC PROJECT

REPORT

Meeting held February 29th - March 1st 2016

In the J-PARC research building, Tokai, Japan

Reaching new heights in science achievements



April 4th, 2016

Contents

EXECUTIVE SUMMARY

The International Advisory Committee of J-PARC (J-PARC-IAC) met on Feb 29th and March 1st 2016 in the new research building of J-PARC to evaluate the past performance of the laboratory and advise its director on future directions. The IAC found that considerable progress was made on implementing a new Safety program under the Safety Division leadership and that a sustain effort will continue to be required to develop a safety culture at all levels of the operation, with particular attention paid to the contractual workforce and users. The results presented by the accelerator group to both the A-TAC and the IAC demonstrate that the RCS and the MR accelerators will be able to reach design criteria performance .The IAC is pleased to hear about the new funding approved for the upgrade of the MR power supplies . However the amount of beam time delivered was considerably reduced by reliability problems most notably with the failures of two mercury targets in the MLF which points to the need to refocus the global effort on sustainable and reliable beam delivery beyond accelerator peak performance. The IAC recommends implementing a new milestone on beam delivery and reprogramming the overall effort to meet this milestone. Most of the experimental instruments are now either complete or soon to be fully operational and more than ever the focus of the science divisions should be on delivery of science and publication of scientific results. The IAC was delighted by the major awards obtained by J-PARC related users, most notably the Nobel Prize of Professor Kajita and the breakthrough prize earned by the T2K team but also the prizes awarded to young members of J-PARC's user community. New results were presented from all areas of activity, MLF, neutrino, Hypernuclear physics, Muon and MuSR experiments while the COMET experiment is making great strides. This is very promising and the IAC is encouraging J-PARC to continue to grow its portfolio of top publications by implementing an effective user support policy. This is also the view expressed by MEXT and by the parent institutions but it will require adequate and sustained funding. For the ADS program, the IAC appreciates the advances made to define the TEF-T and TEF-P components of the facility and supports giving priority to the TEF-T part in view of the more difficult regulatory requirements required to bring nuclear fuel loaded with minor actinides to the J-PARC site for TEF-P. Finally, the IAC recommends that management pays more attention to the gender imbalance at all levels of the J-PARC operation and management.

SUMMARY OF THE RECOMMENDATIONS BY SECTIONS IN THE REPORT

Management

- Develop a J-PARC science driven agenda to be expressed in a global vision statement and divisional goals based upon science achievements.
- Explore possibilities for adding key scientific personnel to drive this science agenda.
- Focus the team on beam delivery performance by establishing a milestone in terms of beam delivered to experiments and obtaining the funding and personnel necessary to meet that milestone while maintaining a safe environment.

Safety

- The continuing effort to move from a top down to bottom up approach to safety must be promoted at all levels.
- The risk register is very much concentrated on the safety aspects and lacks a substantial analysis of the high level risks, the so-called enterprise risks, owned by the top management, which might not necessarily descend from the occurrence of a serious accident, but for instance could originate from single points of catastrophic failure of the beam delivery systems , from a drastic reduction of the operation budget, or from the failure to meet scientific goals. The IAC recommends their inclusion in the risk register and risk analysis.
- A strict oversight should be implemented by defining for each task a Leader in Matter of Safety, with the authority to stop work in case of safety infringements whether committed by a contractor, a user or an employee.
- Establishing a permanent crisis team (and its alternate) available 24/7. These teams should include the needed technical/admin people as well as the communication sector. The teams should be led by a crisis manager, with the Director (or his/her alternate) having the last word in the decision process. The team should be convened with an automatic procedure in a designated crisis room, always ready.

Accelerators

- Develop a strategy to maximize facility availability and science output.

Particle and Nuclear Physics

- **Neutrino**
  J-PARC, KEK, and MEXT should continue their commitment toward maximal utilization of the T2K research program, which will most benefit from stable and reliable operation of the Main Ring and associated neutrino beamline.

- **Particle Physics**
  The IAC fully endorses the plea to have a high intensity run in 2016 for the KOTO experiment, in view of the importance of the measurement and to stay ahead of the competition.

- **Muon**

J-PARC needs to determine the funding profile for the muon experiments to determine if they can be mounted on a schedule to keep them competitive. Additional delays will make it difficult for the program to have the international impact that was envisioned with the schedule as put forward at last year's IAC meeting.

- **Nuclear physics**
  The IAC supports the move to a kaon beam based program for the next cycles.

Material and Life Science Facilities

- Management should engage the broader research community to identify the most important scientific needs. The instrument improvements required to meet these needs should be sequentially focused on a small number of instruments, with the sequence of instruments prioritized according to the most pressing scientific needs.
- Need to develop a Strategic Science Plan addressing the emerging Grand Challenges that can be tackled by the MLF
- The present heterogeneous J-PARC organizational structure and multiple funding sources is complex. It may also be confusing to potential users. Strong management will be required to coordinate these different elements in order to translate a strategic science plan for MLF into a coherent set of prioritize actions that maximize scientific productivity and impact. A consolidated or unified user community with a single voice and a single communication channel to MLF management may help to avoid confusion and to provide a coordinated response to user needs.

MUSE Facility

- With the successful commissioning of three of the four main secondary beamlines (D, S, U), the MUSE group should focus on the delivery good science from these beamlines and on the urgent construction of the H line for the fundamental g-2 experiment to remain competitive and for other potential unique applications of reaccelerated muon beams.

TEF (Transmutation Experimental Facilities)

- Continue the support R&D needed to secure the TEF construction.
- Make a full effort to get approval from the government for the construction of TEF facility within J-PARC, by concentrating on the TEF-T that is of value in the international scene of Accelerator Driven Systems (ADS) and material testing.
- Give a high priority for starting up the TEF-T which is less complex in terms of licensing than the TEF-P.
- Evaluate carefully the usefulness of TEF-P loaded with Minor Actinide (MA) based Fuel in terms of the safety assurance in particular with the vision to make the J-PARC an open campus for the public, and in terms of an international perspective by considering other facilities that could be more suitable for this work.

INTRODUCTION

The J-PARC International Advisory Committee (IAC) met at the J-PARC new research building on Feb 29th and March 1st to hear presentations from the Director and from group leaders regarding the progress accomplished in the past year and the ambitions for the future. The IAC also heard from the funding agency (MEXT) and from the two parent organization (KEK and JAEA). It also toured some of the facilities on Tuesday afternoon (MLF, COMET, and Neutrino ND280). The committee had a chance to meet the staff at a reception which was attended by the mayor of Tokaimura. The IAC was pleased to hear from the mayor that the city fully supports the laboratory and is willing to work with J-PARC to welcome its users. The agenda for the meeting is given in Appendix I and the committee membership in Appendix II. Two members (Prof. H. Stoeker and Prof. Donald Geesaman) could not join us during this meeting). In this report the IAC presents its findings and its recommendations following the order of the presentations and responding to the charge given by Director N. Saito (see Appendix III).

GENERAL STATUS OF THE PROJECT

Director N. Saito presented an overview of the J-PARC laboratory. He pointed out the recent changes that he introduced in the management team personnel to help him carry out his vision for the coming year. In his selection of the highlights of the past years, he chose to emphasize the major awards obtained by J-PARC related researchers: they include Prof. Kajita (a member of T2K) for his Nobel prize, Prof Nishikawa Founding member of T2K and the T2K collaborators for the 2016 Breakthrough Prize in Fundamental Physics, the Nishikawa prize awarded to a team of the G-2 collaboration, and the JSNS special recognition of the PLANET team. The IAC congratulates the winners and thanks them for their contributions to science and for the visibility it brings to J-PARC.

The accelerator team has demonstrated that there was no show stopper from the accelerator chain in achieving the design value for beam power directed to the MLF (1 MW) and in the near future to the neutrino target (750 kW) now that the power supply upgrade in the Main Ring (MR) has been funded. The slow extracted beam to hadron users is improving and can meet the requirements of several experiments.

The year was not without challenges. Most notably two MLF target failures contributed to a significantly reduced beam delivery to neutron and MUSE users (20%), while other problems affected the MR and Neutrino users. Clearly, as the accelerators are pushed towards their design goals, the weaker components are being tested to their limits and one needs to refocus the technical effort towards improving the reliability and stability of the overall beam delivery systems. The IAC would like to point out that this is also linked to the safety, quality control, and crisis management issues discussed in the safety section of the report.

Significant progress has been made for mounting the COMET experiment to search for physics beyond the Standard Model. The new building extension is operational and components of the beamline are being assembled. The MUSE facility has an improved D line with a new superconducting solenoid, the U beamline has been commissioned and the first Ultra Slow Muon detected, the S line is partially operational with two stations, and the H line is being finalized.

Several experiments made use an improved slow-extracted proton beam to the hadron hall and important results were published (in *Phys. Rev. Letters.*). The hypernuclear program finished a series of measurements using pion beams and is moving to a phase using kaon beams.
Overall the facility is now suffering from reliability and stability issues which must be tackled in parallel while achieving the design performance of the accelerators. This involves paying attention to the full slate of systems needed to deliver safely intense beams to experimental stations in each area.

Recommendations

- Develop a J-PARC science-driven agenda to be expressed in a global vision statement and in divisional goals based upon science achievements.
- Explore possibilities for adding key scientific personnel to drive this science agenda.
- Focus the team on beam-delivery performance by establishing a new milestone in terms of beam delivered to experiments and obtaining the funding and personnel necessary to meet that milestone while maintaining a safe environment.

SAFETY

Deputy Director for Safety, Tetsuro Ishii, gave a status report regarding the safety environment at J-PARC. The IAC acknowledges the prompt action J-PARC has taken in response to the 2015 recommendations and commends management for the achieved results.

A global approach based on the *Safety First* principle and on the ownership of the safety policies by all the employees, users, and contractors has been implemented, by the definition of a new formal risk management structure, which has generated a site-wide-risk register containing the assessment, ownership, mitigation, and update of each risk.

A new formal crisis management structure has also been created, and the various levels of crisis have been redefined.

In parallel, a strong effort has been also made in the promotion of the safety culture and of the communication to improve the relation with the external bodies, as well as to improve the internal awareness.

The IAC has been also impressed by the very good incident record in the last period.

Recommendations
Although the IAC globally endorses the adopted measures, there are a few points which should be taken in consideration.

- The continuing effort to move from a top down to bottom up approach to safety must be promoted at all levels.
- J-PARC is using a substantial number of contractors for the various activities of the laboratory, including sensitive ones, who are trained to comply to the basic safety rules of the laboratory before they carry out their activities. Considering that any incident caused by a contractor would compromise the reputation of the lab, we recommend that a strict supervision be implemented by defining for each task a Leader in Matter of Safety, with the authority to stop work for safety infringement whether committed by a contractor, a user, or an employee.

- The risk register is very much concentrated on the safety aspects and lacks a substantial analysis of the high level risks, the so-called enterprise risks, owned by the top management, which might not necessarily descend from the occurrence of a serious accident, but for instance could originate from single points of catastrophic failure of the beam delivery systems, from a drastic reduction of the operation budget, or from the failure to meet scientific goals. The IAC recommends their inclusion in the risk register and risk analysis.
- We applaud the introduction of crisis drills which have been carried out in the past months and we suggest to further improve their organization by:

  – Establishing a permanent crisis team (and its alternate) available 24/7. These teams should include the needed technical/admin people as well as the communication sector. The teams should be led by a crisis manager, with the Director (or his/her alternate) having the last word in the decision process. The team should be convened with an automatic procedure in a designated crisis room which is always ready.

  – Contracting an external company to organize drills (at least one per crisis team), where the scenario is unknown to anybody in the lab. The ensuing debriefing will be worth the money spent, by exposing possible weaknesses in the crisis management.

STATUS OF THE ACCELERATOR SYSTEMS

Based upon the presentation by Dr. K Hasegawa and the report from the A-TAC given by its chair Dr. T. Roser, it is clear that there has been excellent progress of the performance of the J-PARC accelerator complex over the last year. The J-PARC facility is now on track to soon achieve the original performance goals of the J-PARC project. The IAC is pleased to note that the Main Ring Power Supply upgrade is fully funded and underway. This will provide a 750 kW beam to the neutrino facility by FY18. Unfortunately, difficulties with the MLF target prevented the new high-intensity capabilities of the RCS of up to 1 MW of beam power to be used for the science program.

The facility needs to shift the main emphasis from achieving maximum beam power performance to reliable and stable facility operation. Based on a comprehensive reliability analysis, the necessary strategies, procedures and hardware improvements and upgrades should be implemented to maximize the facility availability. This includes the implementation of an effective machine protection system.
The IAC notes that the J-PARC accelerators are capable of causing major damages at the single-pulse level and hence machine and beamline protection are critical.

The IAC is satisfied that the spares situation for the accelerators is generally under control: This is true for the critical LINAC Klystrons which are reaching their expected lifetime of operation. A spare RFQ is available should it be needed.

However some critical issues remain with the spare MLF and neutrino targets, neutrino horns etc.

Recommendation
Develop a strategy to maximize facility availability and science output.

SCIENTIFIC PROGRAMS

PARTICLE AND NUCLEAR PHYSICS

Neutrino Physics

The 2015 Nobel Prize in Physics and the 2015 Breakthrough Prize have highlighted the achievements and promise of the J-PARC neutrino program. The program this year has focused on anti-neutrino beams, where oscillations have been observed in disappearance measurements and hints of oscillations in appearance searches. The T2K experimental program has and continues to be the particle physics flagship at J-PARC and is a solid platform from which to plan and launch next generation neutrino physics initiatives. The experiment, laboratories, and agencies are to be congratulated for an outstanding year.

Meanwhile, the NOvA experiment, at Fermilab in the USA, has achieved stable operations and is now producing scientific results. With both the T2K and NOvA programs operating well, it is timely for the two collaborations to work towards optimizing the world-wide program through coordinated choices of beam configurations (e.g. neutrino vs anti-neutrino running).

Recommendation

J-PARC, KEK, and MEXT should continue their commitment toward maximal utilization of the T2K research program, which will most benefit from stable and reliable operation of the Main Ring and associated neutrino beamline.

Particle Physics

Prof. Taku Yamanaka presented the status of the Kaon Physics at J-PARC, describing the status of the experiments E36 and E14 (KOTO).

E36 is an experiment that has completed data and that has been dismounted in early 2015. It is currently completing data analysis. Its goal was to look for lepton universality safety infringements in the Kl2 decays, by measuring the ratio of the decay amplitudes of $K^+ \rightarrow e^+ \nu(\nu)$ and $K^+ \rightarrow \mu^+ \nu(\nu)$, which is theoretically known in the Standard Model with a precision of .04%. Its goal was to measure this ratio with an error of 0.25%, in this way surpassing the best limit set by the NA62 experiment at CERN (0.4%). Unfortunately, the present best forecast for the achieved sensitivity will be 0.5%, due mainly to the poor statistics collected and to a minor extent to a poorer performance of the apparatus. It could still be improved with a more refined analysis.

E14 (KOTO) is an international collaboration poised to measure the rare (and CP violating decay) $K_L \rightarrow \nu,\nu$ bar which can be reliably calculated with an error ~2% in the Standard Model to have a Branching Ratio Br = 2.4×10^{-11}. Any deviation from this Branching Ratio would be a clear hint of new physics, whose scale could be inferred by the size of the deviation. KOTO is therefore a very important actor in the indirect search for new physics and complements the direct searches performed at the LHC. It is in competition with a similar experiment at CERN (NA62), which studies a similar rare decay for the charged Kaons and which is currently completing its commissioning and is starting its physics run.

KOTO has performed its commissioning in 2013 and then, after the long shutdown, in 2015 (20 times more data collected) and it is preparing for its physics run with a complete detector, a large

improvement in the Data Acquisition system, allowing it to sustain in excess of 270 kW beam intensity, and a refined way to get rid of the neutron background.

Recommendation
The IAC fully endorses the plea to have a high-intensity run in 2016 for the KOTO experiment, in view of the importance of the measurement and the desire to stay ahead of the competition.

Muon Physics
The J-PARC particle physics muon research program made important advances in 2015, most notably excellent progress on infrastructure and beam components for the COMET experiment and breakthrough R&D on increasing muonium production yields critical to future experiments based on high precision ultra-cold muon beams. Detector systems for COMET and the precision muon program have also advanced this year. The muonium breakthrough and progress on precision muon beam detectors are necessary steps for the J-PARC g-2 program to confirm any observation of new physics made by the Fermilab g-2 program which is rapidly advancing. The muon program as a whole however has not kept pace with earlier schedule milestones. The scientific landscape is competitive, with a long established program at the PSI facility in Switzerland continuing a series of upgrades, and new programs at Fermilab in the USA which are well supported and now in the construction phase. There is a growing possibility that the J-PARC muon program may not remain competitive on the world-wide landscape. Sustained funding will be important for the program to remain competitive.

Recommendation
J-PARC needs to determine the funding profile for the muon experiments to determine if they can be mounted on a schedule to keep them competitive. Additional delays will make it difficult for the program to have the international impact that was envisioned with the schedule as put forward at last year's IAC meeting.

Nuclear Physics
The nuclear physics program is now focusing on hypernuclear studies using K beams in the Hadron Hall. The work being carried out in this area is unique in the world and is showing good progress with the recent measurement of a large-charge-symmetry breaking effect in the A=5 hypernuclei. The team that carried out this work is to be congratulated on obtaining this result rapidly and for having published it quickly in *Physical Review Letters*. This first result bodes well for a longer term program of experiments that will help quantify the strangeness degree of freedom in the nuclear force. The performance of the slow-extraction system is now allowing this program to be started.

MATERIAL AND LIFE SCIENCES FACILITY (MLF)

There have been some excellent recent scientific achievements in the neutron scattering user program. These achievements demonstrate the importance and impact of the MLF. Scientific productivity, as measured by publications in scientific journals, is growing. Most notable is the impact of work by Sumitomo Rubber, that was announced[1] at the Tokyo Motor Show, on "Advanced 4D Nano Design". On the basic-science side, there was a *Science Advances* article in 2015 on the Newton's Cradle protein relay mechanism, from iBIX and a *Nature Communications* article on skyrmions from the TAIKAN small-angle-scattering machine.

[1] http://www.srigroup.co.jp/english/news/2015/2015_130.html

On the technical side we congratulate the J-PARC team on extending the detector coverage on both 4SEASONS and TAIKAN, and efforts to get full detector coverage on all instruments should continue.

However, the MLF scientific productivity could be much better, and it is clear that the neutron scattering instruments have not yet reached their full potential and impact. There are several factors that contribute to scientific productivity including source and instrument capability and performance, staffing levels and expertise, software for data collection, visualization and analysis, sample environment and a broad and vibrant external user community, but it is not clear which factors are limiting scientific productivity at present.

The main issue is that J-PARC only supplied neutrons for around 30 days per year in 2015. It will be very difficult to compete with other facilities that operate for users up to 250 days per year. The IAC urges the J-PARC management to increase the reliability of supply of neutrons from the source. This is far more important than increasing the power of the source from 200 kW to 1 MW.
A secondary issue is whether J-PARC has yet made the cultural change from a construction project to a fully functioning user facility with a strong focus on science. The IAC's suspicion is that it has not, and that stronger scientific leadership is needed from within the J-PARC team. Of course this must be done in coordination with the Japanese user community.

The construction of new innovative instruments at the MLF has proceeded at an impressive pace and these instruments have the potential to form a world class suite. There are numerous ongoing activities to continue to improve these instruments toward their full potential. However, it is not clear that this very broad and diffuse approach is the most efficient or effective approach. There is a lack of a coherent strategic science plan which sets out the scientific agenda of MLF and defines a set of prioritized instrument upgrades.

The IAC also suspects that the J-PARC instruments are understaffed, by international standards. It appears from the J-PARC website that there are uniformly 2 scientists per instrument, with a variety of affiliations, but more than 50% from JAEA. Some of these clearly have other responsibilities in management, data management and so on. The IAC recommends that J-PARC benchmark its front-line instrument scientist staffing against other facilities, instrument by instrument. An average of 3 scientists per instrument is probably more appropriate, with significantly more focussed on the high throughput beamlines. It was not clear whether the priority for staff is to serve and collaborate with external users, or to drive the internal research programs of KEK and JAEA. International experience is that it is very important for management to make its emphasis clear. If J-PARC wants to extend its user base beyond physics and materials science, its instrument scientists will have to be involved more strongly in all aspects of producing science from the facility, right down to data analysis and writing papers. The IAC was not convinced by the discussion of data analysis, which seemed to imply that analysis was the responsibility of the users. International experience is that this may work for expert groups in well-established areas of science, but that it does not for new users, especially in emerging areas like soft matter, cultural heritage, some engineering applications, earth science, biology and so on. A lot more "hand holding" may be required if the user base is to be extended beyond condensed-matter physics and materials science.

Recommendations
There is a need to develop a Strategic Science Plan addressing the emerging Grand Challenges that can be tackled by the MLF. To optimize this plan, MLF management should seek help from the external user community.

Determine what the potential productivity could be for each instrument if all of the above factors are optimal e.g. how many papers could each instrument produce? This could be done by bench marking current instrument productivity against the productivity of similar instruments at other leading neutron scattering facilities. Instruments should also be audited to identify areas of underperformance. These two activities will allow management to identify specific areas for instrument improvement that will most effectively and efficiently accelerate increases in scientific productivity. Care should be taken to ensure that the ratio of external to internal users is healthy.

Management should engage the broader research community to identify the most important scientific needs. The instrument improvements required to meet these needs should be sequentially focused on a small number of instruments, with the sequence of instruments prioritized according to the most pressing scientific needs.

The present heterogeneous J-PARC organizational structure and multiple funding sources is complex. It may also be confusing to potential users. Strong management will be required to coordinate these different elements in order to translate a strategic science plan for MLF into a coherent set of prioritize actions that maximize scientific productivity and impact. A consolidated or unified user community with a single voice and a single communication channel to MLF management may help to avoid confusion and to provide a coordinated response to user needs.

MUSE

In the absence of steady beam operation due the MLF target problems, the MUSE facility personnel have advanced the facility construction along the lines of the master plan. The beam quality – focusing – of the D line has been significantly improved, S1 line is now ready to deliver beams to two stations, and the first ultra-slow muon beam has been delivered from the U line. The H-line is well defined and ready to be constructed. It also is attracting the interest of users for its re-accelerated muon beams which could provide new and unique capabilities.
But the user program suffered greatly as a result of this year's operational losses.
The IAC is impressed by the way the muon group has used the time to improve the facility in many areas, which will benefit the user programme in the long term.

The shortage of manpower continues to be a concern. This matter has been highlighted for several years, but a solution is still not forthcoming. This will become critical in the near future when the U and S lines begin regular operation.

Even the limited scientific highlights demonstrate the potential of the MUSE beamlines across a wide spectrum of applications, but ***sustained and reliable operation is essential*** to engage and expand the potential user community. The reduced MLF power due to the limitation of the spare MLF neutron target is not an issue in the short to medium term.

Recommendation:

- With the successful commissioning of three of the four main secondary beamlines (D, S, U), the MUSE group should focus on the delivery good science from these beamlines and on the urgent construction of the H line for the fundamental g-2 experiment to remain competitive and for other potential unique applications of reaccelerated muon beams.

NUCLEAR TRANSMUTATION

The report of Dr. Fujio Maekawa, deputy head of the Nuclear Transmutation Division of J-PARC, described the progress accomplished on the TEF design and the associated R&D support program. The IAC acknowledges the prompt actions J-PARC has taken in response to the 2015 recommendations and commends management for the remarkable increase of manpower for this program.

The IAC acknowledges the enhanced importance of ADS activity within J-PARC through the creation of the Nuclear Transmutation Division reporting to the J-PARC director.

Recommendations

Taking into account the International review by T-TAC of the TEF-T and TEF-P designs and safety approach, the IAC recommends:

- To continue the support R&D needed to secure the TEF construction (for prioritization consider in first instance the realization of TEF-T and refer to the T-TAC report of Oct. 2015 Meeting).
- To make a full effort to get approval from the government for the construction of TEF facility within J-PARC, by concentrating on the TEF-T that is of value in the international scene of Accelerator Driven Systems and material testing.
- To give a high priority for starting up the TEF-T, which is less complex in terms of licensing than the TEF-P.
- To evaluate carefully the usefulness of TEF-P loaded with Minor Actinide-based fuel in terms of the safety assurance in particular with the vision to make the J-PARC an open campus for the public, and in terms of an international perspective by considering other facilities that could be more suitable for this work.

INSTITUTIONAL SUPPORT BY KEK AND JAEA

The IAC heard from M. Yamauchi, director of KEK, and from Y. Muira, executive director of JAEA regarding the commitment of the two parent institutions and the foreseen role of J-PARC in their respective scientific road maps.

Support for the J-PARC project is one of the major missions of KEK. That part of the KEK program is being prioritized in the context of the program implementation plan (KPIP) which is reviewing all KEK activities. KEK will work together with JAEA for the safe operation of the J-PARC and for enhancement of its science potentials. With J-PARC, KEK intends to contribute to world-wide science communities, to impact to society, and to foster the next generations of researchers and engineers. While the KEK's budget has received some 12% increase, it barely compensates for the increase in power cost and a tight situation remains regarding the number of beam cycles that can be funded for the MR operation.
Much has changed in the JAEA perspective following the Fukushima accident and the MONJU reactor failure to restart. JAEA is restructuring to meet the new national requirements in terms of nuclear power safety, fuel handling and nuclear facilities decommissioning. Some of the fusion research and more fundamental materials research using quantum beams are being transferred to a new institution. Overall the budget of JAEA is being squeezed but JAEA remains committed to supporting J-PARC and provided for 7 cycles of operation funding while increasing its commitment to the transmutation program.

MEXT view of J-PARC

S. Hagiwara outlined the expectation of his ministry regarding J-PARC and focused his presentation on the delivery milestones for J-PARC as expected by MEXT. As a user facility, J-PARC needs to attract users by providing them with unique facilities and a stable, predictable and sustainable beam delivery. This is echoing the key recommendation the IAC is making this time regarding improving the reliability of the whole beam delivery systems. But MEXT is also aware that to stay at the leading hedge of research establishments in the world, sequential upgrades will be required from time to time and that a good balance between "static" high quality operation and "dynamic" evolvement is key to the success of J-PARC.

The IAC endorses these views and appreciates that MEXT is recognizing the potential of this great facility. The IAC confirms its recommendation to give higher priority to reliability and availability of the facility as whole at this time.

Conclusions

The IAC is pleased with the demonstration that the accelerators will meet design goals soon and agrees with ATAC that the efforts should now include solving the reliability issues of the beam transport and targets. It recommends establishing beam delivery milestones to guide the effort across the full J-PARC personnel and solidify the production of excellent science across the various experimental areas.

The mission of the laboratory is to deliver science and safe and reliable beam delivery is a necessary condition for attracting users at a facility like J-PARC. The IAC is pleased that J-PARC's management has placed safety as one of the top consideration for its mode of operation and recommends further strengthening of the safety culture across the laboratory. The evaluation of the laboratory performance will be more and more judged on the scientific achievements of its user community and the relevance of its activities to society. The IAC notes the constant effort of the parent organisations to provide resources for J-PARC in a climate of tight fiscal realities and salutes the interest and support of the Tokai village as indicated by the presence of its mayor at the reception.

The IAC notes that J-PARC should pay more attention to involving women in all aspects of its operation and regrets that no presentations were given by women, no women attendees were present in the audience and there is no longer women representation on the IAC. There must be a top down effort by management to increase participation of women in science at all levels. As an aside, it would be impossible to attract IUPAP support for activities where women representation is deemed insufficient.

The IAC members thank Director N. Saito and all the presenters for providing a detailed view of the laboratory and outlining the successes and challenges they are facing. The IAC thanks the support staff for making all the very effective arrangements for the meeting.

The IAC hopes that its evaluation will be helpful in shaping an attractive science program at J-PARC.

Appendix I

Agenda for the International Advisory Committee Meeting of J-PARC in 2016

Date: February 29 (Mon) and March 1 (Tue), 2016
Place: J-PARC Research Building

Draft v4

February 29 (Mon)									
Executive Session									
8:45	–	9:00	(	10	+	5	)	Charge to the Committee	Naohito SAITO
Opening									
9:00	–	9:40	(	30	+	10	)	Report from the Director	Naohito SAITO
9:40	–	10:10	(	20	+	10	)	Safety at J-PARC	Tetsuro ISHII
10:10	–	10:25	(	15			)	Coffee	
Accelerator									
10:25	–	10:45	(	15	+	5	)	Progress and Prospects	Kazuo HASEGAWA
10:45	–	11:05	(	15	+	5	)	A-TAC View of Accelerator Activities	Thomas ROSER
Material and Life Science I									
11:05	–	11:45	(	30	+	10	)	Overview of Neutron Facility	Toshiji KANAYA
11:45	–	12:25	(	30	+	10	)	Neutron Instruments, Operations & Science at MLF	Kenji NAKAJIMA
12:25	–	13:25	(	60			)	Lunch	
Material and Life Science II									
13:25	–	14:05	(	30	+	10	)	MUSE Status and MAC Review	Yasuhiro MIYAKE
Particle and Nuclear Physics I									
14:05	–	14:20	(	10	+	5	)	Overview of Particle and Nuclear Physics	Takashi KOBAYASHI
14:20	–	14:35	(	10	+	5	)	Hadron beam resumption	Hitoshi TAKAHASHI
14:35	–	14:50	(	15			)	Coffee	
Particle and Nuclear Physics II									
14:50	–	15:15	(	20	+	5	)	Nuclear physics program	Hirokazu TAMURA
15:15	–	15:40	(	20	+	5	)	Neutrino physics	Takeshi NAKADAIRA
15:40	–	16:00	(	15	+	5	)	Kaon physics	Taku YAMANAKA
16:00	–	16:20	(	15	+	5	)	Muon program	Tsutomu MIBE
Executive Session (closed)									
16:20	–	17:45	(	85			)	Review and Discussion	IAC Members
17:45	–	17:50	(	5			)	Group Photo	
Views from Funding Agency and Host Institutes									
17:50	–	18:10	(	15	+	5	)	J-PARC: A View from MEXT	Sadahiro HAGIWARA
18:10	–	18:30	(	15	+	5	)	KEK and J-PARC	Masanori YAMAUCHI
18:30	–	18:50	(	15	+	5	)	JAEA and J-PARC	Yukitoshi MIURA
Banquet									
19:00	–	21:00	(	120			)	Banquet	
March 1 (Tue)									
Accelerator Driven Transmutation Research									
9:00	–	9:40	(	30	+	10	)	ADS Project	Fujio MAEKAWA
Executive Session (closed)									
9:40	–	11:30	(	110			)	Review and Discussion, Drafting	IAC Members
Close out									
11:30	–	12:00	(	30			)	Recommendations	Jean-Michel POUTISSOU
12:00	–	13:30						Lunch	

Appendix II

IAC Committee members for 2016

International Advisory Committee (IAC)

	Name	Affiliation	Position	Area
1	Jean-Michel Poutissou (chair)	TRIUMF	Associate Director & Nuclear Medicine Division Head emeritus	Muon
2	Hiroshi Amitsuka	Graduate School of Science, Hokkaido University	Professor	
3	Thomas Roser	Brookhaven National Laboratory	Chair of the Collider-Accelerator Department	ACC
4	Shinian Fu	Institute of High Energy Physics	Director, Accelerator Technology Division	
5	Sergio Bertolucci	the European Organization for Nuclear Research(CERN)	Director for Research and Scientific Computing	Particle
6	Robert Tschirhart	Fermi National Accelerator Laboratory	Deputy Head of the Particle Physics Division	
7	Robert Tribble	Brookhaven National Laboratory	Deputy Director for Science and Technology	Particle/ Nucl
8	Donald F. Geesaman	Argonne National Laboratory	Distinguished Argonne Fellow and Associate Director, Physics Division	Nucl
9	Horst Stoecker	GSI Helmholtzzentrum für Schwerionenforschung GmbH	Scientific Director	
10	Hamid Aït Abderrahim	SCK・CEN	Deputy Director General	ADS
11	Paul Langan	Oak Ridge National Laboratory	Associate Laboratory Director, Neutron Sciences Directorate	Neutron
12	Hidetoshi Fukuyama	Research Institute for Science & Technology, Tokyo University of Science	Director	
13	Robert Robinson	Bragg Institute, Australian Nuclear Science and Technology Organisation	Head	
14	Andrew Dawson Taylor	National Laboratories, Science and Technology Facilities Council	Executive Director	

Appendix III

Charges to IAC2016 from J-PARC by N. Saito, director

- **Evaluate overall performance of J-PARC Center**
  - **In promotion of science with safety**
  - **Any suggestions and additions to all AC's recommendations in view of total performance of J-PARC are welcome**
- **Review the safety activities**
  - **Any improvements are visible?**
  - **Safety culture is being well penetrated thru staff and users?**
- **More uniform operation combining KEK, JAEA, and CROSS efforts is a critical issue. Any suggestions for improvements are welcome**
- **Review of J-PARC organization is in preparation : any inputs are welcome**
- **Any suggestions to improve the total performance of J-PARC**