Report from the 11th Meeting of the Accelerator Technical Advisory Committee for the Japan Proton Accelerator Research Complex (J-PARC)

February 23 - 25, 2012
J-PARC Center
Tokai, Japan

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Introduction

The Accelerator Technical Advisory Committee (ATAC) for the J-PARC Project held its tenth meeting February 23 - 25, 2012, at the J-PARC Center in Tokai, Japan. This report of ATAC was presented to the Meeting of the International Advisory Committee (IAC) on February 27, 2012.

ATAC members in attendance at this meeting included: D. Findlay (RAL), R. Garoby (CERN), S. Holmes (FNAL), A. Noda (Kyoto U.), P. Ostroumov (ANL), U. Ratzinger (U. Frankfurt), and T. Roser (BNL, chair). J. Galambos (SNS, ORNL), J. Wei (MSU) could not attend.

The ATAC thanks the J-PARC management and staff for their hospitality during this meeting, and all the presenters for their excellent and comprehensive talks. The Committee also greatly appreciates that the J-PARC team has carefully addressed all recommendations from the last review.

Overview of J-PARC accelerator operations and power projections

A major earthquake and tsunami struck northeastern Japan, including the J-PARC complex, on March 11, 2011 – three weeks after the last ATAC meeting. The J-PARC complex suffered significant damage, as did the surrounding countryside. Planning and executing the recovery plan constituted the major activity since that time. Operations of J-PARC was reestablished in late December 2011. This is a remarkable achievement and reflects both the dedication and skill of the J-PARC staff, and the effectiveness of measures implemented into the facility design to enhance resistance to earthquakes and tsunamis. Great credit is due to the J-PARC leadership and staff for these achievements.

By the time of the 2012 ATAC meeting the complex was capable of performance levels close to pre-earthquake levels. The staff also took advantage of the extended facility shutdown to implement a number of improvements to the complex, which should have immediate payoffs in terms of performance. Nonetheless, recovery from the earthquake has essentially delayed plans for major improvements, including the upgrade of the linac energy to 400 MeV, by a year. Planning is well advanced for the next several years, including concepts for the ultimate achievement of J-PARC initial goals of 1 MW from the RCS and 750 kW from the Main Ring.

Primary Achievements

- The earthquake recovery plan was well developed and executed
    - Operations recovered in ~9 months
    - Measures implemented into the facility design to mitigate the impact of earthquake & tsunami were important

- The J-PARC staff took full advantage of downtime to implement a number of improvements to the complex
    - Collimator upgrades
    - New MR injection kicker
    - Additional rf stations

- Current operation of accelerators are approximately at pre-earthquake levels
  - 200 kW RCS, 145 kW MRFX, 3.3 kW MRSX before earthquake
    - Sufficient to allow observation of six ν_e appearance events at T2K prior to earthquake
  - RCS operating at 100 kW – limited by the neutron target; capability is 300 kW
  - MR fast extraction operated up to 125 kW – not operating in this mode due to horn problem
  - MR slow extraction operating at 3.3 kW since early January.
  - 93% availability – currently dominated by RFQ and SDTL trips

- Near term operations plan established covering JFY12-14
  - Nearly full utilization (8 cycles, 200 days) in JFY12
  - Linac upgrade delayed by one year, to summer 2013

- Concepts for achieving full J-PARC performance goals and beyond were further developed over the last year.

Comments and Recommendations

- The impacts of the earthquake remain to be addressed in a number of areas. In several instances these impacts are impairing the ability of the staff to optimize the performance of the J-PARC complex.
  - A number of building/infrastructure restorations remain to be completed, for example the klystron gallery crane and the ring rf test stand
  - The linac and RCS have not been realigned and are relying on correction magnets to compensate for misalignments caused by the earthquake. The plan is to delay realignment of the RCS until the summer 2013 shutdown.

  R1: Restore the ring rf test stand and klystron gallery crane as soon as feasible.

- A near-term operations plan exists through JFY14. As part of the plan the shutdown for installation and commissioning of the 400 MeV linac upgrade has been delayed to JFY13. The power projections have been delayed by a corresponding amount through this period.
  - The Committee endorses the decision to delay the linac upgrade by a year
  - This plan now includes the installation of the upgraded ion source and RFQ along with the new linac. As a result there will be a very significant work load on the linac group during this shutdown and may add to the complexity of the recommissioning effort.

  R2: Establish a plan for the summer 2013 shutdown that integrates all activities across the complex and connects them through a common set of schedule milestones.

Beam power projections:

RCS for MLF:

- 250 kW before JFY13 shutdown, 800 kW by JFY14, 1000 kW by middle of JFY15
- Latter goals are dependent upon the successful installation of the 50 mA ion source, RFQ upgrade, and the 400 MeV linac upgrade
- Simulations show that the 1MW goal can be reached
- Significant commissioning and operations time will be required to achieve these beam power levels on this ambitious schedule.

MR with fast extraction:

- 200 kW before JFY13 shutdown, 300 kW by JFY14, 700 kW by middle of JFY15
- Latter goals dependent upon the successful installation of the 50 mA ion source, RFQ upgrade, and the 400 MeV linac upgrade.
- JFY13 and 14 goals are achievable
- Simulations show that 700 kW cannot be reached without additional upgrades to RCS and/or MR
- ***Improvements at RCS (more 2nd harmonic rf, variable tune along ramp, etc.) could improve the 3 GeV high intensity beam quality enough to move significantly towards the design 750 kW from MR.***

  R3: A plan should be developed to maximize MR performance utilizing the full capabilities of the 1 MW RCS and possibly using alternative MR filling schemes.

- A MR beam power upgrade based on a reduction of the MR cycle time to 1.28 seconds was presented. It requires a significant upgrade/reconfiguration of the MR power supply systems and a voltage/gradient upgrade to the rf systems. These upgrades could be completed by JFY17. Beam simulations and R&D on hardware developments in support of this upgrade are well developed.
- The Committee agrees that there are significant long-term advantages to this approach.
- This major facility upgrade will be part of a government review during the spring. The budget for the upgrade will be set following this review.

  Reducing the MR cycle time from 2.56 to 1.28 seconds with a new MR power supply and high gradient rf cavities would ensure that the design beam power of 750 kW can be reached and also has the potential for a MR performance much beyond 750 kW.

MR with slow extraction:

- 10 kW before JFY13 shutdown, 50 kW by end of JFY14, 100 kW by middle of JFY15
- The Committee expects that the slow extraction goals will be very challenging to achieve
- The Committee was not presented with a self-consistent plan, supported by simulations and beam experiments, for slow extraction of 100 kW beams.

R4: Develop a strategy for achieving slow extracted beam powers approaching 100 kW that is supported by simulations. The strategy should take into account all known intensity dependent effects, incorporate comparison with beam experiments, as possible, and accommodate losses up to a few kW in the extraction region.

Linac status

Primary achievements

- The linac team has to be commended with remarkably quick recovery of the linac from consequences of the earthquake. The linac performance has been fully restored and routine beam production for 120 kW RCS operation has been resumed.

- A smart decision has been made on linac re-alignment after the earthquake. Following the significant deformations of the linac building, a new target line has been introduced with 1 mrad and 0.3 mrad kink in vertical and horizontal directions respectively. Appropriate beam steering downstream of the DTL is applied to follow the new accelerator axis. Both beam dynamics simulations and recent linac runs confirm that the new alignment strategy does not impact the linac beam quality.

Comments and recommendations

- All recommendations from ATAC-11 have been given full attention. Several of them were postponed due to the earthquake but are being considered for implementation.
- The RFQ trip rate is still high. The RFQ behavior is similar to what it was 3 years ago. However, based on previous experience, it is likely to improve.
- Appreciably higher downtime due to the failure of power supplies for klystrons and drift tube magnets were observed after the earthquake. Further investigation is required to establish the cause of these failures and to apply appropriate cure.
- Restoration work on the linac building is not yet complete; overhead crane in the klystron gallery is not functional. Contract for restoration work is expected in the beginning of FY2012.
- Overall, the beam loss level was reduced to what it was before the earthquake. However the losses are unusually sensitive to the operation parameters. Beam development work is required to determine more stable setting of the linac. There are several hot spots downstream of the SDTL where the residual activation is higher by factor of 10 or more compared to the situation before the earthquake.
- After minimization of beam losses, a significant distortion of beam orbit, up to ±6 mm, is observed downstream of the MEBT-2.
- The summer shutdown in 2012 can be efficiently used to improve linac performance and to reduce beam losses:
    - While alignment of focusing magnets and accelerating cavities has been restored nearly to original specs, misalignment of beam pipes between accelerator components can contribute to scraping the beam halo. An additional alignment work downstream of the SDTL is required.

- The source of unstable operation of the SDTL5 should be identified and fixed. Restoration of the SDTL5 performance is crucial for reduction of beam losses as was demonstrated in recent runs.

- Increased beam losses in the beginning of the beam pulse have been observed for the first time in the linac. It was demonstrated that these losses can be removed by chopping away the first microsecond of the pulse. While these losses are not a showstopper for the linac operation, there is an indication of some unusual phenomenon upstream of the MEBT chopper.

  Schedule about 2 weeks for linac beam development after the 2012 summer shutdown with the main goal of beam loss reduction and commissioning of three new Bunch Length Detectors.

3 GeV RCS, including operations after Linac upgrade

Primary achievements

- Successfully carrying out an enviably large amount of remedial and improvement work on the 3 GeV rapidly cycling synchrotron (RCS) following the earthquake in March 2011 — a comment applicable, in fact, across all parts of the accelerator system.
- Resuming operations of the RCS with little or no degradation in performance in spite of the relatively long time (six months) between the occurrence of the earthquake and the start of remedial operations.
- Using the built-in corrector magnets to compensate for displacements of the RCS lattice magnets by up to 4 mm caused by the earthquake — a very notable achievement.
- Greatly reducing radiation dose rates around the injection region by installing a new collimator at the H^0 branch take-off point.
- Demonstrating that failure of any one out of the eight fast extraction kicker magnet systems can be accommodated operationally with little or no loss of performance.
- Through the fact that there were essentially no operational issues worthy of mention, implicitly demonstrating once again the very acceptable standard of performance of the RCS RF systems.

Comments and recommendations

- It is good that it is recognized that it will be important to establish a solid basis for continuously running the RCS to the MLF neutron target at 300 kW. While the RCS has recently run at 300 kW for ~ 2 hours, which should have revealed latent problems near the surface, a run of weeks or months at 300 kW would establish another important step along the road towards higher powers.

  If it is possible to arrange an extended period of routine operation at steady beam powers sufficient to satisfy the users would afford a good opportunity for optimizing

tune manipulations throughout the acceleration cycle in order to minimise beam losses and to build up a reliable set of standard machine settings.

- The fact that the RCS ceramic vacuum chambers were not damaged in any way during the earthquake is a notable testament to the good quality of the engineering involved — both at the design stage and during manufacture.
- The RF Laboratory used for synchrotron RF systems development was badly damaged during the earthquake. In view of the importance of the RCS RF systems in ensuring the success of J-PARC, increased priority should be given to re-commissioning the laboratory.
- According to present plans, at the end of the 2013 shutdown it is clear that the RCS will incorporate several items of new hardware (*e.g.* the shift bump PSUs and the quadrupole correction magnets), that much of the equipment in the RCS associated with injection will be running under new conditions (including re-aligned lattice magnets), that because the RCS will be running with 400 MeV injection for the first time there will necessarily be changes in the beam dynamics to be accommodated, and that the 400 MeV beam will be presented to the RCS by a new accelerator system (ACS cavities installed during the shutdown and a new front end). Therefore it is possible that one month of commissioning with beam (currently foreseen as January 2014) will be insufficient time to result in a fully optimised performance.
- Looking towards eventual operation of the RCS at 1 MW, it is likely to be important to provide generous flexibility in manipulating conditions at injection and tune shifts during acceleration in order to reduce beam losses in the RCS, and to present the best beam possible to the main ring (MR). Therefore it is good to note that detailed beam simulations are being carried out towards these ends, although in practice details of beam haloes are often difficult to predict accurately.
- ***One recommendation from last year (R10) remains regarding the linac beam halo contributing to beam losses at RCS injection. The Committee recommends that this study be carried out before the energy upgrade.***

Main Ring, including operations after Linac upgrade, and PS upgrade

Findings

Before earthquake steady operations of 145 kW fast extracted beam was achieved. After the earthquake fast extracted beam to the neutrino beam line reached a high power demonstration of 124 kW and 60-87 kW during user operation. Slow extracted beam still remains at the level of 3.3 kW for user operations. A beam power level of 10 kW was reached for demonstration. User operation started last December and provides beam for 44 days until the end of March 2012. The MR experimental program has delivered already several notable results:

- Up to now 1.43 x 10^{20} protons has been provided for T2K neutrino experiment, which exceeds the 4 years amount of K2K 1 x 10^{20} protons.
- 6 ν_e candidates events are already shown ν_u disappearance has also been shown

- Preliminary results of penta-quark search in the hadron experimental hall show no peaks of penta-quark production.

The earthquake caused magnet movements of up to ~15 mm and +/- 5 mm in horizontal and vertical directions, respectively. The magnets were realigned using a laser tracker to within 0.4 mm. The infrastructure such as electricity and cooling water has been repaired and starting December 2011 beam was delivered to the experimental users.176 days of operations for users are planned during JFY12 assuming 8 operation cycles.

Substantial improvements were implemented during the extended earthquake recovery period:

- Traveling wave type injection kickers, which induced discharges in the vacuum chamber and caused beam loss by an extra kick, were replaced with lumped impedance kickers. The lower beam coupling impedance reduced the head tail motion of the beam. The waveform of the kicker was also improved but there is still a long trailing tail of the pulse, which needs to be modified.

- All MA cores with reduced impedance have been replaced with a new type with PHPS coating and RTV rubber shielding. The 7th and 8th cavities were installed in December 2011 using this new type of cores.

- The collimator system in the MR was substantially upgraded to accept significantly larger beam loss. Installation of iron shields, two absorbers and modification of cooling water channels for easy maintenance were applied in 2011 accepting 450 W. Further installation of additional sets of collimators for 2 kW and 3.5 kW are scheduled in 2012 and 2013, respectively.

- Skew quadrupole and octupoles magnets were installed in order to correct linear coupling resonance and suppress transverse beam instabilities, respectively. A beam test is scheduled in the coming spring.

Slow Beam Extraction

Extracted beam duty factor has been modified step by step from 3.6 %, 17 % to 41 % by adding spill feedback, coil shorts and 20 MHz transverse kick together with installed solenoid to reduce the multi-pactoring. Extraction efficiency was up to 99.6 % for the beam intensity of 3.3 kW, which, however, reduced to 95.9 % for higher intensity of 10.3 kW.

Chromaticity at flattop with smaller average tune spread resulted in a good extraction efficiency.

The extraction efficiency was calibrated by comparison of the beam losses of slow extraction and intentional beam loss with the use of bumped orbit combined with the linear extrapolation of the beam loss monitor with a proportional counter. Special care is required to assure the beam losses due to both process generate the same loss pattern.

A momentum shift of the beam was observed after the RF voltage was turned off. Shorting of the RF gaps should alleviate this problem.

Simulations of the slow extraction process were started but no results were presented yet. The present performance of the slow extraction from the MR is still far from the design requirements of 100 kW extracted beam power with a minimum spill duty factor of 50%. The Committee reiterates last year's recommendation:

R4: Develop a strategy for achieving slow extracted beam powers approaching 100 kW that is supported by simulations. The strategy should take into account all known intensity dependent effects, incorporate comparison with beam experiments, as possible, and accommodate losses up to a few kW in the extraction region.

Higher beam power for fast extraction is also pursued by reducing the cycle time from 3.2 s to 2.56 s during the coming summer.

The choice for future increase of MR beam power is to use an even shorter cycle time (1.28 s) rather than to increase the top energy to beyond 30 GeV.

The Committee supports the planed application of "feed forward" technique in order to improve the tracking error of the main magnet power supplies.

Linac energy and front end upgrade

Primary achievements

- The series production of the 21 ACS modules is on schedule. The earthquake did not affect the cavity production. 17 modules have been finished, two are brazed, and fabrication will be completed in August 2012. Completed modules are stored in the linac building and the factory.
- Two ACS debuncher cavities are needed for the beam transport to the RCS. One of them is brazed; the other will be delivered in November 2012.
- The klystron production is going well. The two last klystrons will be delivered early in 2012. RF power from installed klystrons is already available
- The cabling in the ACS section has well progressed, including quadrupole supplies and waveguides.
- New master oscillator and 972 MHz LLRF system have been developed and successfully tested.
- Beam diagnostics and its electronics system have been purchased or fabricated.
- One of the ACS modules was successfully power tested before March 11. It was demonstrated, that the higher mode spectrum is independent from the rf power level.
- For the intensity upgrade a SNS type rf driven prototype source involving cesium was built at JPARC and in a cooperation with SNS. The JPARC source provides a separated adjustment of plasma electrode and Cs dispenser temperatures and shows modified geometrical parameters. 74 mA of H- have been extracted successfully, while about 60 mA fit into effective transverse normalized emittance of 1.5 π mm mrad. This emittance should be well accepted by the new RFQ III, which has a design input beam rms emittance of 0.2

π mm mrad. 50 Hz, 600 μs, 60 mA beam pulses are requested and have been demonstrated at the test stand.

- RFQ III is under fabrication. This is the RFQ that matches the parameters of the intensity upgrade as described above. When compared to RFQ I it is longer (3.6m instead of 3.2m) and the surface fields are reduced by 2% while the design current increased from 30 mA to 50 mA.

Comments and recommendations

- The time schedule for performing both upgrades in parallel during the second half of 2013 is quite ambitious. A realistic schedule should be worked out.

- The linac energy upgrade is progressing very well. No showstoppers seen so far.

- The functionality of the floor integrated base plates to support the ACS cavities should be checked with respect to a long-term stability of the precisely aligned cavities.

- The remaining time is too short for rf power testing all ACS cavities on the test stand. However, reasonable checks like water flow rates on all cooling circuits and low level rf measurements should be performed on all ACS cavities prior to installation in the tunnel.

- The high current prototype source results are quite promising. A further optimization of beam emittance values is recommended.

- Cesium is used now and vacuum conditions down along the LEBT have to be checked to get no cesium contamination of the RFQ. A diaphragm for protection of the RFQ III vacuum against source contaminations should be foreseen. It should be located at a pronounced beam waist along the LEBT, to minimize the aperture.

- The presented RFQ III design looks quite reasonable. Tuning strategies to achieve voltage flatness and mode separation should be further studied by simulations. In parallel, a high power test of RFQ II, which has a similar cavity design like RFQ III would also help to make the RFQ III production a full success.

Continue the vigorous R&D to improve the high-intensity ion source performance with a particular focus on beam emittance reduction and on beam transport optimization along the LEBT, including an orifice to prevent cesium contamination of the RFQ.

R5: Obtain the safety permission for the source/RFQ beam test area and fully characterize RFQ II as soon as possible. This is of significant importance towards increased reliability and the intensity upgrade of the linac.

R6: Develop an installation and commissioning plan of the linac upgrade supporting the 6-month goal including beam commissioning of the new front end and the ACS sections.

Ring RF, including high gradient cavity

Findings

General

RF systems did not contribute significantly to the downtime during the last 12 months, and no new issue has been found.

The RF team has profited from the long shutdown resulting from the earthquake to improve the RF systems in both RCS and MR.

No more RF test place is available outside of the accelerators, now that the JAEA set-up in Hendel building has been rendered inaccessible after the earthquake.

Development of alternative options has made encouraging progress, both on the front of multi-ring cores and FT-3L based high gradient devices.

RCS cavities

Cavities #1 and #3, which had shown signs of impedance decrease, have been equipped with new cores using type-C coating. In total, 5 cavities are now equipped with this most reliable (still fully satisfying after ~7 years of experience) type of protection against corrosion. At the foreseen rate of two cavities per year during the summer, the remaining 6 cavities will all be upgraded in 2014. A 12th cavity will be ready for installation in second half of 2013.

At a later stage, simulations show that more voltage will be necessary on the 2nd harmonic of the RF to minimize halo formation at 1 MW of beam power. For that purpose, high gradient cavities using FT3L cores are proposed for replacing the initial set of cavities.

MR cavities

Two additional RF stations (#7 and 8) have been installed in the MR. The installation of a 9th one is foreseen during the summer shutdown of 2012.

The cut-core corrosion problem that started being observed in 2009 led to the development of cures. The first step is based on fine (diamond) polishing and Silica coating. Cavities equipped with such cores do not show any sign of degradation after 2 years. However, as an additional measure, "RTV rubber shielding" has been developed to block the passage of water in the cut.

Seven of the 8 cavities are already upgraded with both Silica coating and RTV rubber shielding. Cavity #1 is the only one left with only has Silica coating. It will be fully upgraded during the summer shutdown in 2012, as well as the 9th cavity, which will be installed at the same time.

As announced, the cooling circuit of the cavities has been made independent and dedicated to the RF.

In conjunction with the new MR power supply, all cavities will have to be replaced with high gradient cavities using FT3L cores to get the acceleration voltage required for cycling the MR in one second.

R&D on alternative solutions and for higher gradient
The R&D on multi-ring cores structures has significantly progressed:

- The prototype core module made up of one core with three concentric rings (to remove thermal stress and eliminate buckling) immersed in Fluorinert as cooling fluid has operated during more than 500 h at 10 kW RF power without any measurable sign of degradation.
- Because of limited resources, the next step will be a “Half-gap” cavity using 3 cores (instead of 6). Its engineering design is well advanced and construction has started. High power tests are planned during JFY2012.
- Questions related to the design of a full size cavity, impact on infrastructure, cost and safety have started to be addressed.

The performance of a new fabrication technique for the MA core (“FT3L”) has been confirmed after the realization of 12 full size cores with an ad-hoc set-up in the J-PARC Hadron Hall.

High power test on a one-gap cavity will take place before the end of 2012.

Using this technology, the construction of 5 gaps cavities is proposed which would achieve, with the same RF amplifier, twice the gradient of the present 3 gaps cavities. The same number of cavities would therefore provide enough voltage for cycling the MR in one second to 30 GeV.
Some additional R&D on ribbon fabrication is felt necessary to continue improving performance.

The proposal is made to assemble the necessary tooling for producing the cores in a J-PARC hall and to initiate fabrication before the end of 2012. Series construction could afterwards be transferred to industry, using the J-PARC tooling and know-how with the goal of having all cores available at the end of JFY2014 (March 2015).

Comments & recommendations

Present RF systems
The situation in the MR is now reasonably safe, with 8 cavities (9 after this summer shutdown) using a core treatment which has not failed until now (after ~ 2 years) and a dedicated water-cooling circuit. The situation of the RCS is also improving significantly with 5 cavities upgraded to “type-C” cores and the upgrade of the remaining 6 planned during the summer of the next 3 years.

The Committee acknowledges this accomplishment and endorses the plan for ultimately upgrading all RCS and MR cavities.

However, the Committee recommends the continuing systematic monitoring of the Finemet cavities characteristics.

An RF test place is essential for maintenance and continuation of development.

R1: Restore the ring rf test stand and klystron gallery crane as soon as feasible.

Implementation of feed forward in the MR is encouraged to help reduce disturbance to the beam during debunching before slow ejection.

R&D for future cavities

FT3L based cavities are a potential solution for getting, within the available straight sections, the RF voltage required for a shorter MR cycle time.

The Committee is impressed by the progress of this development and fully supports its continuation.

R&D on new and better performing ribbon is worth pursuing until series production of FT3L cores starts. Production for the MR should logically proceed only afterwards, synchronized with the realization of the MR power supply upgrade.

R7: The Committee recommends synchronizing series production of FT3L-based cores and cavities for the MR with the preparation of the new MR power supply.

The Committee acknowledges the high quality of the work accomplished developing multi-ring core cavities using Fluorinert cooling and supports the construction of the half-gap prototype cavity.

However, considering that the implementation of cavities based on multi-ring cores would require rebuilding all cavities and adapting the infrastructure and that there is presently no sign that type-C coating is not sufficient, such a drastic solution is not presently justified.

R8: Consider concluding the development of the multi-ring core approach after the full characterization of the “half-gap” cavity. The work accomplished in that direction should be fully documented in view of its possible future use to solve yet-undetected difficulties or for the need of other projects.

Appendix: Meeting Agenda

Thursday 23 February 2012

09:00	Project Status	S. Nagamiya
09:40	Accelerator Overview	K. Hasegawa

Status & Commissioning (Linac)

10:50	Linac Status	H. Oguri
11:30	Beam Study Results of Linac	M. Ikegami

Status & Commissioning (RCS)

13:00	RCS Status	M. Kinsho
13:40	Beam Study Report of RCS	H. Harada

Status & Commissioning (MR)

14:10	MR Status and Beam Study Results	T. Koseki
15:00	MR Slow Extraction	M. Tomizawa
15:20	Instabilities	Y. Chin

Ring RF

16:10	Ring RF Status	M. Yoshii
16:40	Alternative Cooling of MA	Y. Morita

Friday 24 February 2012

Towards 1MW RCS and 0.75MW MR-FX with Linac Energy Upgrade

09:10	Linac Energy Upgrade	H. Ao
09:40	Front End Upgrade	Y. Kondo
10:30	RCS Upgrade	N. Hayashi
11:00	1 MW Beam Simulations of the RCS	H. Hotchi
11:30	MR Upgrade	S. Igarashi
13:00	MR Power Supplies 1	S. Nakamura
13:20	MR Power Supplies 2	F. Naito
13:40	High Gradient RF Cavity	C. Ohmori

Saturday 25 February 2012

11:00	Report to project team	T. Roser