Report of the KEK/J-PARC Muon Advisory Committee (MAC)

MAC-2023

April 2024

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Appendix

MAC2023 agenda

The Muon Advisory Committee (MAC) met on February 20th and February 21st, 2024, in the KEK Tokai Building, Room No. 116, and per zoom to review the progress and prospects since the last MAC zoom meeting in February 2023. All presentations were provided prior to the meeting, which proved very useful for MAC's efficient discussions in the Executive Sessions. The MAC thanks the MUSE staff for their considerable efforts put into the preparation of the material and the efficient running of the meeting.

I. Facility Overview

J-PARC Overview

Director Professor T. Kobayashi gave an overview of J-PARC. Two fire incidents caused by power supplies in MR and HD on April 25 and June 22 caused a stop of J-PARC operation. MLF lost 15 days of beam time, while the HD & NU program lost 44 days. The causes were identified and countermeasures taken. The hadron hall will not be in operation until April 2024. MR operation was resumed on Nov 21, as scheduled, while MLF restart was delayed to Dec 3 due to target problems. After resume of MR/NU operation, **the MR reached a record high 760 kW beam power. MAC congratulates the J-PARC team for this important achievement.** MLF resumed operation at a bit lower beam power of 800 kW, compared to 830 kW in 2022/2023. Updates on several experiments were presented: KOTO, COMET, Hyper-Kamiokande and the trans-mutation program at J-PARC. For the planned hadron hall extension (HEF-ex), an international workshop is currently being held at J-PARC. For the muon g-2 experiment, the construction of the extension building of the H-line begins in FY2024, and data taking is planned to begin in 2028. **MAC is pleased that the operating budgets from JAEA and KEK remain constant and that 7.2 beam cycles are planned,** without requesting additional funding for electricity due to the decreasing electricity costs. The long-awaited J-PARC assembly building (experimental equipment and development building) is finally funded and construction started in 2023. **MAC welcomes the progress in the realization of the dedicated J-PARC road access**, which is scheduled for construction in FY2025/2026. The next J-PARC symposium will take place in Mito, Oct 14-17, 2024.

MLF Overview/Charge to MAC

Professor T. Otomo reported the status of the MLF facility. MAC highly evaluated the stable operation of the proton beam at 800+ kW with continuous effort in increasing the beam power.

The number of general proposals over 300 demonstrates the importance and necessity of MLF for development in a wide research area. **MAC is concerned about the decreasing trend in the number of domestic proposals with. MAC recommends a more detailed analysis of the situation.**

The steady increase in the publication rate and the number of top 10% papers is highly rated.

At the end of the presentation the charges were given to the committee.

Charges to MAC2023

Charges given to MAC by J-PARC MLF Division Head Professor T. Otomo:

- Evaluate the progress made in FY2023 in terms of (1) sciences promoted by MUSE; S1 type programs, the integration of arts and science, etc.; (2) instruments such as the target system, the beamlines, the experimental apparatus, and the sample environments.

- Evaluate the scenario to proceed with the prospects in the short/middle-term (target station

1 upgrade) and long-term (target station 2) in the current situation of planned to upgrade the other facilities in the world.

- Provide recommendations on the collaborative research system with other universities and research institutes.

- Evaluate the various attempts that have been initiated to nurture/promote the next generation of both in-house staff and science society. Also, make recommendations on other methods.

Present Status of Muon Science Laboratory

Professor Shimomura provided an update on the current status of personnel, facilities, and activities at MSL. In the past year, the muon division was able to increase its regular staff by one through a cross-appointment with RCNP. Additionally, there was a changeover of one concurrent staff member and two researchers employed with external funding, bringing the total staff count to 48, one more than last year. To address the retirements of experienced staff that have occurred over the past few years, a staffing plan was devised last fiscal year to effectively divide the workload between facility operations and experimental support for seven instruments on four beamlines. **MAC appreciates that stable operations have been maintained for the time being.** However, with Professor Shimomura, the MSL Head, set to retire next fiscal year, there is a need to consider further effective reallocation of personnel**. MAC recommends that MSL establish a system to strategically develop personnel with the appropriate skill sets and leadership, taking a medium- to long-term perspective.**

The number of inter-university research proposals has been fluctuating but remains roughly at the same level over the past decade. **MAC appreciates that the stable operation of the D and S lines has led to publications with active press distribution of a wide range of advanced and impactful research results utilizing positive and negative muons**. **MAC also recognizes that such research achievements contribute significantly to the acquisition of further research funds such as KAKENHI (Grants-in-Aid for Scientific Research).**

The staff of the Muon Science Division also actively promotes outreach to the public through symposia in the arts and sciences and activities to stimulate interest in muon science among people of all ages, from primary school onwards.

Facility (MUSE) Overview

The present status of the MUSE facility was presented by Prof. Kawamura. Inter-University Research Programs (IURP) and S1 programs are steadily conducted. The third rotating target will be completed in the next fiscal year as a spare.

In the D-line, the last triplet magnet at the D1 branch has been replaced enabling to accept muon beams with the originally designed momentum. The experimental program of the elemental analysis studies by μ- for archeological artifacts has been increasing in the D2 area. In the U-line, the phase-1 campaign with some external users is ongoing using the low-energy muon beam with energy between 0.1 keV and 30 keV. In the S-line, the Kapton debris from the accident of

SGV1 in April 2022 was removed. It was confirmed that no more debris is in the upstream part of the beamline. As a measure against the increasing failure rate of FETs of the power supply of the kicker magnet, the replacement of the present FETs with SiC MOS-FETs is being considered. In the H-line, the DC separator (HSEP) was installed during the summer shutdown. The H2 area was completed in April and the construction of the platform for the RF power supplies and the laser room has started in November and will end in March 2024.

II. MUSE Facility Activity / Science Projects (S-type proposals)

Muon Source (Target and M1/M2)

MAC is very pleased to see that the spare target has been fabricated and is now being commissioned. **MAC recommends considering to have a spare target available at all times.** This is a key part of sustainable operations into the future and is essential to protect the scientific programme for any unanticipated target failure.

Plans are being developed for the storage of spent muon targets which remain highly radioactive for several years after decommissioning. Dealing with this is potentially quite expensive, but the details are highly dependent on the actual target lifetime, which is still quite uncertain. MAC is pleased to see that preparations and plans are being formulated.

MAC is also pleased to see the ongoing efforts in developing appropriate target monitoring strategies, so that failure can be anticipated well before it happens.

MAC is also pleased to see the continuing benefits of the collaborations engaged for target-related developments.

D-line

Some unfortunate failures in the past year highlight the need for monitoring aging infrastructure, and having backup plans in place to deal expeditiously with failures. MAC is pleased that the D1-team has identified problems with the TCF50 cryocooler for the beamline solenoid, so that a plan can be formulated to replace this aging fridge.

The Hadron facility magnet power supply (PS) fire incident in July necessitated implementation of PS performance-based interlocks to prevent similar events in the future. MAC notes that such failures must be quite rare. MAC is pleased that this can be done relatively simply via the EPICS control system. Clearly, there is also a role for annual physical inspections particularly on aging supplies and MAC is pleased to see this is part of the overall safety strategy.

MAC applauds the tuning efforts that have been successful in decreasing the beam divergence and decreasing beamspill-related radiation for high momentum muons. The simplicity of turning off the DQ2 quad appears to be a good solution. The effort to make a smaller beam size and divergence for negative muons was successful. MAC would like to evaluate the intensity sacrifice after the parallel beam tuning. Also, MAC suggests to perform the same efforts for positive surface muons. The usefulness of a parametrization of beam quality is useful provided values of the same quantity are available for the other beam lines at MUSE.

D2 Instruments (X-ray etc.)

The performance of the hemispherical chamber with nine germanium detectors for efficient muonic X-ray detection is remarkable.

Synergistic work with archaeologists and cultural heritage researchers is expanding the use of muons and attracting diverse interests from non-scientific disciplines.

2D and 3D elemental mapping of lithium in Li-batteries with double sided Si strip electrode detectors are in progress.

MAC is pleased that the Japanese muon group has initiated an international cooperation network for elemental analysis with muon X-rays.

Research on the integration of arts and sciences

MAC recognizes the importance of broadening the application of muon beams to the cultural heritage domain, where science, in the form of non-destructive muonic X-ray elemental analysis, is used to answer questions in the fields of archeology and history.

MAC noted that the S1 proposal related to cultural heritage research using muonic X-ray elemental analysis is evolving into a facility phase. **The institution of a specialist experimental proposal evaluation committee will help ensure that this beamtime is used for the highest impact projects, and MAC is pleased to see this is starting**.

To foster the development of this fledgling field, it is essential to have a reliable quantity of beamtime available for researchers and their students. MAC is pleased to hear that this has been considered, since results of this kind (such as the Roman coins and the Nagoya castle Shachihoko) are potentially quite high profile among the general public (i.e. the taxpayers).

Encounter and synergy of state-of-the-art astronomical detectors and exotic quantum beams

The use of TES to muonic X-ray measurements enabled to obtain very precise spectra over a wide energy range.

Testing of the QED theory at the strong electric field close to an atomic nucleus affecting the muonic X-ray energy has been conducted with a TES detector.

Introduction of a new TES detector for a higher energy photon region allowed starting to measure muonic argon X-rays, entering an electric field regime at the Schwinger-limit.

MAC congratulates the collaboration for establishing a new powerful detection tool for improved muonic X-ray spectroscopy.

X-ray Imaging

It was highlighted for the first time in MAC that imaging using muon characteristic X-rays can be used to obtain images of metallic lithium in a Li-ion battery. This knowledge is important for keeping the battery safe and expanding its use.

The results of lithium test pattern measurements using a 2D sensitive silicon double-sided sensor were shown. **MAC congratulates the team on the clear, high-resolution image obtained.**

Initially, this project was proposed as a P-type proposal but was later adopted as an S-type proposal in FY2022. It is a joint research project with several universities, and it has shown significant progress from an educational perspective.

MAC appreciates the project for its steady progress and strongly recommends continuing these efforts.

S-line

One of the long-term concerns at this beamline has been the crucial kicker and its power supplies that generated down-time due to multiple failures. **The stable operation of the kicker is clearly essential for the operation of both S1 and S2 instruments.** Through a series of wise choices, the team has finally identified the ageing of the FETs of the MARX boards. They are now planning to conduct a step-by-step replacement of all 2'304 standard FETs with new more resilient SiC FETs. **MAC supports and congratulates the team for their efforts to resolve this important issue**.

We also support the idea to keep some of the old units as backup in case of future failures. However, if SiC replacement truly resolve the issue, we encourage the team to procure some spare SiC units as future backup.

The second severe problem with the gate valve (SGV1) due to the shredding of a downstream Kapton foil has now also been resolved. It was found that ageing of the Kapton foil was not the reason, but rather a sudden pressure increase. However, no clues in the pressure-logs could be found to explain why this happened. For now a wifi camera is installed to monitor the Kapton foil. **MAC encourages the team to continue the detective work to find the reason for this incident.**

D1/S1 Instrument (μSR)

D1: The sample environment suite available for the instrument is very impressive, including the full temperature range from dilution all the way up to the furnace. In addition, both positive and negative muons are available, which makes the range of science at D1 extremely comprehensive. Given such diverse capabilities (and taking into account that beamtime is shared with D2), **MAC continues to be concerned with the rather low scientific output (publications) during the last years**.

Following the encouragements of MAC, the beamline staff (Higemoto-san) has made their own efforts to make full use of the tunable momenta of D1 by acquiring pressure cells via a

usercollaboration. Such cells are now available and have started to generate scientific output, however, there is no official D1 project for a high-pressure program. **MAC once again recommends the management to consider funding hardware as well as a dedicated high-pressure staff member and to harvest the new and important capabilities available with higher momenta at D1**.

S1:

MAC is very pleased to see that the S1 instruments is generating a steadilyincreasing publication rate within a very wide range of research fields.

MAC is also pleased to see that the promotion and reorganisation of both senior and junior staff has been conducted very smoothly and without any negative impact on the S1 operations.

Several actions (including a new cryostat lifter & optimization of schedule) have been taken to run the S1 user program more efficiently. There are still some concerns regarding possible understaffing of S1. **MAC suggests that the level of staffing contra workload should be analyzed,** but only after current optimization strategies are fully implemented and been given time to settle as well as properly evaluated.

S1 (continued):

The high-field magnet (CYCLOPS) has been repaired and successfully cooled to 5 K and ramped up to 5 T. LCR experiments were also successfully conducted (6 February 2024). Some minor problems related to stray fields have been identified and a mitigation plan is currently being put into action.

MAC congratulates the team for achieving this important milestone.

S2 Instrument

Dr. Strasser presented the current status of the development of the Muonium Laser Physics Apparatus as an S2 Instrument. The S2 area has been developed primarily for muonium 1s-2s transition experiments. While concerns remain about the kicker troubles affecting both S1 and S2 areas, the stable operation of the S2 area's equipment is commendable. Resonance signals for the muonium 1s-2s transition experiment were successfully observed in early 2022, and subsequent efforts have resulted in a steady reduction of systematic errors, which is noteworthy and anticipates further progress. **MAC congratulates to this achievement**. Additionally, the consideration of a general-use program for the S2 area is a positive step towards alleviating heavy demands on the D2 and S1 areas. Furthermore, MAC appreciates the new mission of conducting a test experiment for muon re-acceleration using an RFQ Linac, planned for 2024A, as it contributes to the advancement of the field.

MDX

Akihiro Koda presented MDX (Material Digital Transformation), a new initiative lead by MEXT to promote effective usage of the large-scale facilities in Japan through collaborations with the data science technologies. Muon science is definitely one of the research fields where data scientific approaches are relevant. The muon is also an important analysis probe method to evaluate the functions of new materials synthesized / discovered by the new data scientific approach. **MAC is pleased that the muon facility is taking part in the MDX initiative.**

One of the objectives of the initiative is building a common database among probe techniques available in KEK for the same materials measured. **MAC is looking forward to an emergence of such comprehensive databases for various beam techniques** which may be applied to data mining and feed back to the sample synthesis efforts.

U-line

MAC is pleased to see a further increase of persons involved in the U/U1A/U1B team from 12 to 14 persons. **MAC congratulates the team on its excellent progress in various directions**:

- additional beam monitors allow better control of muon beam optics in combination with simulations.

- zero field compensation at the source is essential for maintaining the muon spin polarization and for optimized muon beam extraction.

- a laser beam monitor turned out to be essential for optimizing the overlap of light beam and muonium cloud.

- a cold rare gas moderator system is in preparation for tests in D2. Ideas of optimizing the moderator geometry for beam extraction were presented.

The simulation now shows better agreement with the measurements than previously reported, and MAC recommends finding out why this is the case. The timeline of project milestones needs to be adjusted as the project is still in Phase-1.

The surface muon rate on the USM target is still an open question. Without this information, it is not possible to estimate the overall conversion efficiency of the laser ionization method - this is crucial information for further optimization. **MAC reiterates its strong recommendation to measure the surface muon rate of the U-line.**

U-line (LASER)

For high intensity production of USM, the 1s-2p/g2p-unbound scheme is more efficient than the 1s-2s (two photon) and 2s-unbound scheme. MAC recommends the continuation of the current efforts of optimizing the Lyman-alpha laser. Discontinuation of the essential commercial products (LD modules and Lyman-alpha mirrors) will be problematic; if there is a channel to ask for the continuation of the products, MAC will recommend such actions.

The laser systems for ionization of thermal muonium are the key for the success of the strategic MUSE/J-PARC projects of USM μSR, muon microscope, and muon g-2. **MAC strongly recommends to make available the additional funding needed for the new Lyman-alpha pumping scheme using a Ti:S laser to significantly increase the USM rate.**

A routine laser operation and continuous laser development is not possible with the present manpower, and MAC recommends to develop a strategy, how a laser group can be established to ensure a sustainable operation of the key projects. According to the recommendations of the Laser Review Committee from 2023, four scientists would be required for this task.

MAC appreciates the holding of the Laser Expert Review last year, and suggests installing a regularly recurring review, or even a standing committee.

U1A Instrument (USM)

The preparations towards user facility operation are continuing. Part of this is the optimization and determination of beam parameters, such as beam spot size and energy distribution. The beam size and centering could be improved, reaching a beam size with RMS width of 1-2 mm. The increase of the RMS width of the energy distribution due to the HV power supply has been estimated to 37 eV. Stable laser operation of > 1 day has been demonstrated.

While these are all very welcome achievements, the low beam rate is still a matter of concern. The USM rate at the sample position is estimated to 100/s, which appears to be too low taking into account the 300/s measured at the intermediate F3 position. Due to the small solid angle of 18% of the positron spectrometer, the USM μSR event rate is < 20/s. Therefore, the shown ZF μSR spectrum on Ca0.85Sr0.15CuO2 needed a measurement time of 1 day - which is too long for a user facility operation. **MAC recommends that the team continues its R&D efforts - including the feasibility study of the rare gas moderator technique - and provide opportunities for μSR experiments to the community as soon as possible.**

MAC acknowledges that participants of the J-PARC neutron and muon school were introduced in the USM μSR technique.

U1B Instrument (TμM)

MAC is pleased to hear that the multiple step cooler of USM will improve the beam transmission efficiency of the cyclotron, and reduces the necessary Ly-alpha laser intensity to re-ionize focused muoniums in the higher cooling steps.

MAC congratulates the TμM team for receiving the new 5-years Grant-in-Aid for Scientific Research, and recommends the continuation of the feasibility study with high priority. MAC acknowledges the new collaboration with potential users from device and life sciences, and is looking forward to the first beam of the muon cyclotron.

H-Line

The H1 area came into user operation recently. MAC congratulates the involved staff and the two experimental collaborations to their successful cooperation. Steady progress towards establishing of the H2 area is made. The final design for the extension of the H-line and the new building are well underway.

Progress with the H-line completion in 2023 encompassed the reconfiguration of the power supplies of the capture solenoid of the H-line (HS-1, 2, 3). They reached 83% for HS-1, 2 and 92% for HS-3 of their rated currents, limited by warming of the solenoid coils. This is not optimal yet but sufficient to operate at around 105 MeV/c for DeeMe.

The separator (HSEP) was installed and reported to be operating staby (at +/-233kV). Simulated e/μ suppression indicates good performance at these values, to be experimentally verified in March 2024.

The MuSEUM magnet and heavy magnetic shielding was installed in the H1 area, as well as appliances and gas safety sensors. The stray field of the magnet appeared to be under control when measured at certain locations, a larger mapping is due.

Construction of H2 continued throughout 2023, including radiation shielding and Personal Protection System (measured dose outside the shield was reported to be below 1 μSv/h), utilities, air conditioning, lights, platform for RF power supplies. The completion of platform, laser room, and two magnets (focussing solenoid HS4, quadrupole-triplet HQ456) is in progress.

DeeMe

DeeMe reported taking data in H1 with capture solenoid currents of only (0,1000,2100A) for (HS1,HS2,HS3) which is insufficient for the physics goal (however, meanwhile sufficient currents for DeeMe have been reported, see H-line). Nevertheless, the collaboration was able to operate their MWPC detector system and spectrometer magnet. DeeMe observed delayed-timing (>2.65 μs) background-hits (around 100 hits per proton pulse under their measurement conditions) in all MWPCs at similar rates where no events had been expected by the collaboration. The similarly high rates in the chambers at different distances from the beam exit appears strange. Even after track analysis a few background events remained. Present hypothesis assumes the origin to be muon beam induced background in the area around the experiment. However, this is not yet understood, requiring further investigations.

As DeeMe is scrutinized by PAC reviews, MAC can not add much more at this point. Not knowing the exact review scheme, however, **MAC recommends calling an in-depth expert-review of DeeMe** to discuss the status of their hardware, simulation, and understanding of the overall setup and measurements, as well as suitability of methods. It appears natural to allow some data taking of DeeMe with the full beam line at good settings, but **a prior review of the planned measurements including calibration and support measurements appears indicated**.

MuHFS

The science of MuSEUM is at the frontier of interest by the international particle physics community. **MAC congratulates MuSEUM on their successful performance in 2023. A particular highlight is the completion and publication of the world-leading measurement of the HFS of the muonic helium atom.** In particular, MAC also acknowledges that a blinding scheme was adopted for the analysis. Future analyses may even benefit from independent analysis groups.

Other achievements include contributions to the H-line commissioning, the achievement of very high uniformity of their magnetic field, the installation of the magnet in the H1 area, progress with the microwave cavities, and the demonstration of the SEOP re-polarization of muonic helium atoms opening the path to much improved measurements in the future.

MuSEUM is getting ready for their Mu HFS measurements in the H1 area. MAC is looking forward to their forthcoming findings and results.

g-2/EDM

MAC congratulates the g-2 collaboration on their achievements in 2023. According to the presented schedule, start of data taking in 2028 appears in reach if not too many delays will be accumulated. Also funding for the major construction works 2026+ still needs to be secured.

Presently, the availability of the unique high-intensity ultra-slow muon beam appears to be the highest risk, in particular concerning efficient muonium laser ionization. Sufficient muon statistics will be key for the measurement. Muon re-acceleration and electron injection test are slightly delayed, however, planned for 2024 and not impacting the overall schedule yet.

The main lasers have been moved in responsibility to be part of the J-PARC infrastructure. **MAC considers the availability of high-intensity re-ionized ultra-slow muon beams to be mission critical**, besides for g-2 and the muon microscope project in H2, of course also for the USM project in U1A and U1B. **The laser effort appears to be understaffed and facing supply problems. Management should consider how to improve staffing and reinforce the effort.**

The achievements of the collaboration encompass their contributions to the H-line commissioning. For the extension of the beamline, funding for the next two magnets (solenoid, quad-triplet) has been secured for FY2024.

The collaboration has made progress on many topics, among them muonium production studies, the development of magnetic field monitoring devices, the RF cavity development and testing, kicker power supply fabrication and test, kicker coil design, and injection studies. Prototypes of the tracking detectors have been produced and the production schedule is on track, while tests in the magnetic field and under kicker operation are being prepared. Also DAQ and computing resources are progressing well.

The collaboration is to be commended for the installation of a Physics Analysis Working Group to provide information for the final experimental design and to take concerted action tackle the systematic uncertainties of the experiment.

MAC is glad to see the strict reviewing process in place for g-2 by a standing expert committee of IPNS and commends the transparent communication of the collaboration, making their reporting to that committee also available to the MAC.

Human resource development

MAC is very impressed by the outreach/educational program to a broad range of people. We appreciate the dedicated presentation for this subject.

MAC recommends continuous support of these activities and keeping track of the outcomes of the communications and educational development. Additionally, MAC recommends collecting statistics for foreign Ph.D. theses related to user work performed at MLF/MUSE.

Prospects of MUSE

MAC is very impressed and strongly supports the very ambitious plan to both upgrade TS1 as well as plans for a second target station TS2.

It is clear that MLF/MUSE is the current leading pulsed muon source in the world and that it will continue to be so for the next decades. It is our belief that it is wise, with the present staff, to put the priorities on harvesting the full potential of all existing/upcoming beamlines and instruments of MUSE at TS1. The experience from such process will be the best foundation for an optimal technical and scientific strategy of the TS2 development. MAC also recommends to carefully analyze how many additional staff members are needed to conceptualize, design, develop, construct and operate TS2.

MAC recommends to further build-up MUSE, its user community, and the exploitation of the scientific possibilities. A strong user community and scientific program will be highly competitive with other international user facilities. With further growth of the program and user base, the case for TS2 will become even stronger.

III. General comments and recommendations

MAC acknowledges the outstanding work of the MUSE team in the further development of the facility, running the experimental program and the scientific results. **The human resource development programs are impressive**: from general public, high-schools, undergraduates and graduates programs. MAC recommends to continue and expand these activities, e.g. to continue working on closer collaborations with universities, to offer specialized lectures, and practicals/internships at J-PARC.

MUSE Facility personnel: it is important to hire and promote people with broad skills who are able to further develop the instrumentation and methodology of research. Only in this way the future of the facility can be guaranteed. MAC applauds the further increase of permanent and temporary staff by five. This is an important step towards a sustainable operation of MUSE user facility - although the staff situation is still a matter of concern in view of the requirements of a user facility operation. **MAC recommends that MSL establishes a system to strategically develop personnel with the appropriate skill sets and leadership, taking a medium- to long-term perspective.**

APPENDIX I

MAC2023 agenda(2024/2/21)

• 10:00 – 10:20	J-PARC overview	T. Kobayashi
• 10:25 – 10:45	MLF overview/Charge to MAC	T. Otomo
• 10:50 – 10:55	Group Photo	
• 10:55 – 11:10	Facility (MUSE) overview	N. Kawamura
• 11:15 – 11:30	Muon Source (Target+M1/M2)	S. Matoba
• 11:35 – 11:55	Executive Session	
• 11:55 – 12:55	Lunch Break	
• 12:55 – 13:10	D-line	S. Takeshita/T. Yuasa
• 13:15 – 13:30	D2 Instruments (X-ray etc)	I. Umegaki/M. Tampo
• 13:35 – 13:50	Research on the Integration of Arts and Sciences	M. Tampo
• 13:55 – 14:10	Encounter and synergy of state-of-the-art astronomical detectors and exotic quantum beams	S. Okada
• 14:15 – 14:30	X-ray Imaging	I. Umegaki
• 14:35 – 14:50	S-line	A. Koda
• 14:55 – 15:15	Coffer Break	
• 15:15 – 15:35	D1/S1 Instrument (μSR)	J. Nakamura/W. Higemoto
• 15:40 – 15:55	S2 Instrument	P. Strasser
• 16:00 – 16:15	MDX	A. Koda
• 16:20 – 16:35	U-line	S. Kanda/Y. Ikedo
• 16:40 – 17:00	Coffee Break	
• 17:00 – 17:15	U-line (LASER)	Y. Oishi
• 17:20 – 17:35	U1A Instrument (USM)	S. Kanda
• 17:40 – 17.55	U1B Instrument (TμM)	Y. Nagatani
• 18:00 – 18:15	H-line	T. Yamazaki
• 18:20 – 18:50	Executive Session	
• 19:05 – 21:05	Reception	

MAC2023 agenda(2024/2/22)

• 09:00 – 09:15	DeeMe	Y. Seiya
• 09:20 – 09:35	MuHFS	S. Nishimura
• 09:40 – 09:55	g-2/EDM	T. Mibe
• 10:00 – 10:15	Present status of MSL	K. Shimomura
• 10:20 – 10:35	Facility overview – PSI	T. Prokscha
• 10:40 – 11:10	Coffee Break	
• 11:10 – 11:25	Facility overview – TRIUMF	K. M. Kojima
• 11:30 – 11:45	Human resource development	A. Koda
• 11:50 – 12:05	Prospects of MUSE	N. Kawamura
• 12:10 – 13:10	Lunch Break	
• 13:10 – 13:25	Facility overview – RCNP	N. Aoi
• 13:30 – 13:45	Facility overview – ISIS	A. Hillier
• 13:50 – 15:50	Executive Session	
• 15:50 – 17:50	Facility Tour	
• 17:50 – 18:20	Concluding Remarks	T. Prokscha