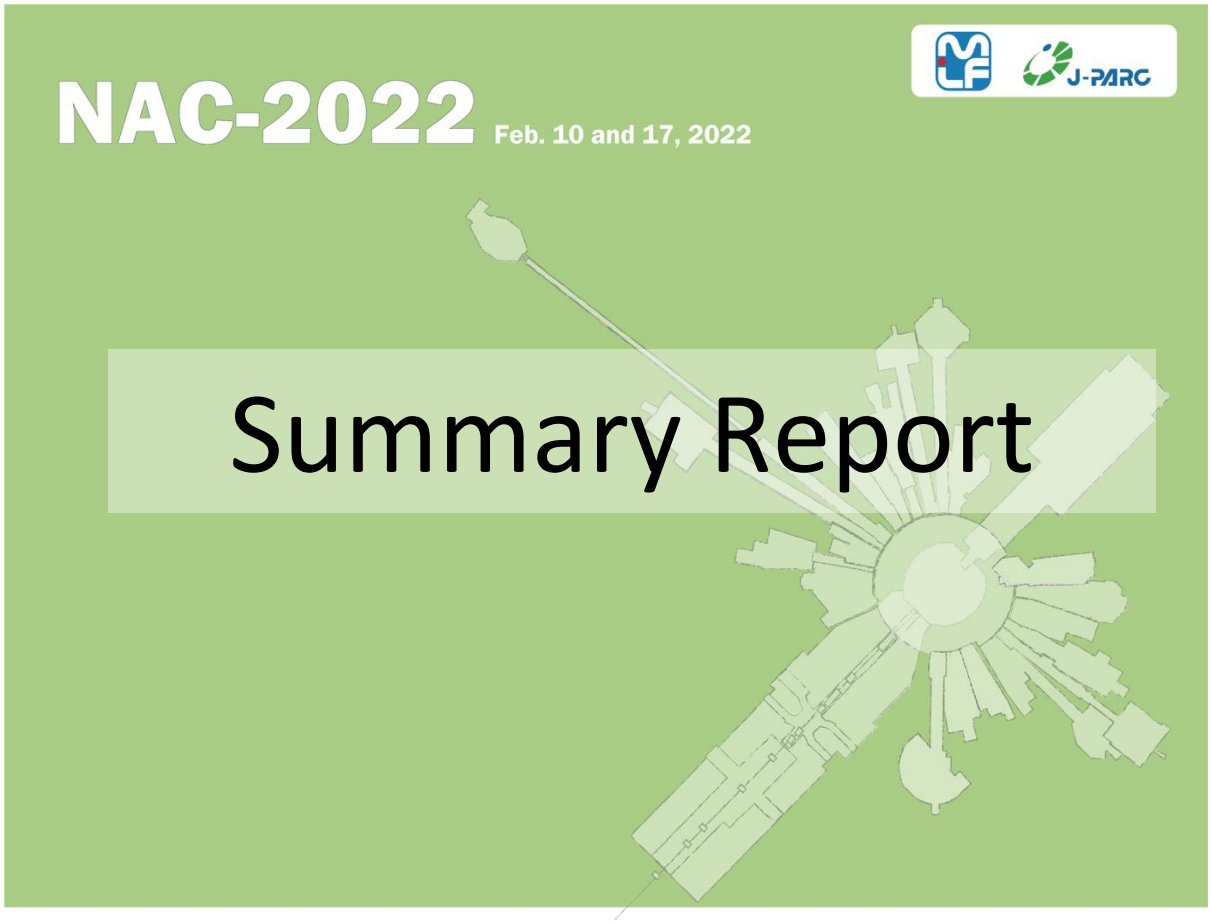

Jamie Schulz (Chair), Yoshie Otake, Philip King, Bertrand Blau, Michael Dayton, Günter Muhrer, Christiane Alba-Simionesco, Jonathan Taylor, Sungil Park, Taka-hisa Arima, Ken Andersen, Toyohiko Kinoshita

Charge to NAC 2022

- Neutron Target development & maintenance
  - Is the aging countermeasures and the upgrading plan appropriate?
  - Are efforts to extend the service life appropriate?
- Neutron Instruments & Outcomes
  - Do neutron instruments remain at the forefront of the world?
  - Are aging countermeasures and upgrading plans appropriate?
- Sample environments, detectors and optical devices
  - Does it meet the user's requirements?
  - Are upgrading plans appropriate?
- Scientific productivity / User Program
  - Analysis of publication status appropriate?
  - Is the promotion of industrial use, mainly through joint research and consortia, appropriate?
- Remote Experiment
  - Evaluate the efforts to realize remote experiment at MLF.
  - Is the promotion of industrial use, mainly through joint research and consortia, appropriate?

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Introductory Remarks

The Neutron Advisory Committee (NAC) thanks the participants for the detailed presentations and their helpful and open responses to the discussions and questions

The NAC values the provision of the charge, presentations and video recordings prior to the first meeting and request in future (if required) that this material is provided in advance of the first meeting

The format of the meeting worked well, with high-level summary presentations to supplement the detailed presentations provided before the meeting

The NAC welcomes Takashi Kobayashi as the new Director of J-PARC

The chair thanks the NAC for their enthusiastic participation

NAC-2022 Committee

Jamie Schulz - ANSTO (Chair)
Yoshie Otake - RIKEN
Philip King - ISIS
Bertrand Blau - PSI
Michael Dayton - ORNL
Günter Muhrer - ESS
Christiane Alba-Simionesco - LLB (CEA/CNRS)
Jonathan Taylor - ESS
Sungil Park - KAERI
Taka-hisa Arima - University of Tokyo
Ken Andersen - ORNL
Toyohiko Kinoshita - SPring-8

NAC-2022 Agenda

10-Feb	Zoom			
19:00		Closed Session	0:20	
19:20		Group photographing	0:05	
19:25	NAC2022-0	Overview of J-PARC	0:15	T. Kobayashi
19:40	NAC2022-1	Overview of MLF	0:10	T. Otomo
19:50	NAC2022-2	Neutron Source	0:10	K. Haga
20:00	NAC2022-3	Neutron Instruments & Outcomes	0:10	Y. Kawakita & S. Itoh
20:10	NAC2022-4	Sample Environments, Detectors and Devices	0:10	T. Oku & T. Nakamura
20:20		Break	0:15	
20:35	NAC2022-5	Analysis of Publication Status	0:10	J. Suzuki
20:45	NAC2022-6	Industrial Use	0:10	T. Miyazaki / H. Kodama
20:55	NAC2022-7	Remote Experiment	0:10	K. Soyama
21:05		Q&A	0:20	
21:25		Adjourn		

17-Feb	Zoom			
	19:00	Closed Session	0:20	
	19:20	Group photographing	0:05	
	19:25	Discussion with MLF staff	0:30	J. Schulz
	19:55	Closed Session	1:30	J. Schulz
	21:25	Summary session	0:30	
	21:55	Adjourn		M. Shibayama

General Comments

The MLF appears to be operating more as a single organisation. Staff & management are to be commended for working towards this unified MLF objective

The MLF continues to prioritise stable operations which are critical for the user program whilst increasing power in a systematic stepwise approach which has resulted in stable operations for the user community.

The recent achievement of 700kW with an availability of >90% is commended.

The NAC is pleased to note that the J-PARC budget has been sustained in JFY2022 as predictable sustained funding for international research infrastructure is critical for success

Maintaining user operations during COVID-19 must be commended and the progress that has been made on implementing remote access will benefit all users.

Neutron Target Development & Maintenance

The NAC commends J-PARC and the MLF on their recent demonstration of stable beam operation at 700kW with >90% availability.

The current activities undertaken to evaluate MLF component operational parameters against initial design requirements enables strategies and options for feasible power upgrades through establishment of existing margins and identification of potential upgrade pathways.

As an appropriate aging countermeasure, MLF has manufactured a spare Moderator-Reflector Assembly which is scheduled to be installed next year. The NAC strongly supports the efforts of the assembly testing which was carried out during the 2021 summer outage period. It revealed some unforeseen difficulties which can be settled before the actual replacement operation.

The NAC would like to emphasize the potential for undesirable interferences to nominal MLF operations as a result of the “disassemblable target” hot cell activities. Contingencies should be identified and evaluated to ensure primary hot cell operations can be maintained.

The current plan and proposed design changes to the target to improve bubble density at the target nose and planned indentation testing to assess material strength show promise to enable extension of target lifetimes from one to two years. Additionally, the operational impacts driven by limited spent target storage capacity are being actively addressed though target life extension and target volume reduction.

Besides reducing target storage volume, increasing target operation to two years has additional benefits in enabling an increase in neutron production time.

Continuous efforts should be paid to find a satisfactory explanation for the strongly varying amount of tritium release during target exchange. Understanding the mechanisms of tritium production will be critical in light of the increase in target lifetimes.

Performance of Existing Suite of Neutron Instruments

Science examples presented to the NAC demonstrate that the MLF neutron instruments are leading to high quality scientific outputs. Industry case studies presented are leading to impactful real-world outcomes.

To ensure the performance and the operation of the instruments, MLF should continue to increase the number of permanent staff (technical and scientific) on site.

Opportunity exists to clearly articulate MLF's role in supporting Japanese scientific & research priorities and grand challenges.

Benchmarking with JRR3 should be undertaken to clearly articulate which is the most appropriate instrument for particular scientific questions/problems.

Neutron Instrument Upgrade Plans

The NAC was pleased to see that the instrument upgrade plans demonstrate a healthy and varied level of activity needed to keep the instrument suite up to date.

A wide variety of instrument upgrade plans were shown, covering roughly ⅓ of the instrument suite. Efforts to remedy performance deterioration (DNA and 3He detectors) are important.

Prioritising completion of detector systems to a good level across the suite could be considered. For example two (Polano & HRC) instruments have only ~50% installed coverage.

It is very positive to hear that a 2030 roadmap for neutron developments for MLF is being drawn up. It is suggested that this is expanded to include JRR-3, to show a plan for instrument developments. The NAC feels this is a very important step, and the NAC would welcome updates at future meetings.

The roadmap would benefit from the strategic involvement of other neutron facilities in Japan and the user community.

Sample Environments

The NAC is pleased to observe that the number of sample environment staff has increased; new staff are supporting user demands (in particular in the field of soft matter and biology).

We note that experiments are needing to be limited for some scientific capabilities because of over-demand on equipment. It is very healthy to see the equipment being used to this extent - it shows it is very beneficial to user science - but plans to mitigate this situation would be good to see.

In general, SE development has become an extremely important part of a neutron facility's service provision. Experiments are becoming increasingly complex, requiring in-situ and in-operando measurements on realistic systems.

The NAC is pleased to see that a number of developments of common SE equipment have been undertaken which allow new capabilities across several beamlines, e.g. P-E pressure cell and furnaces.

The MLF should consider if there are any particular areas of sample environment capability/expertise in which J-PARC would like to excel. E.g. in high-field provision

The MLF should develop a 5-10 year roadmap for future developments. Inputs to this plan could include user requests, aging existing equipment, trends at other facilities etc. These plans may be in different areas, e.g. one for high fields, one for ULT, one for pressure, etc.

It is better to realize common sample environments (conditions and sample holders) between the user's lab and MLF. Sample transfer and exchange system should be developed.

Detectors and Optical Devices

The MLF continues to be an innovative of world-leading neutron scattering devices & components. This includes detectors, polarising supermirrors and 3He spin filters.

The recent focussing supermirror development activity has achieved a world leading m=6.2 is commendable. An increase in production capacity would help to implement this development on instruments

The work of neutron optical elements in particular should be led by developers who see the potential to go beyond the conventional boundaries, and the promotion of such efforts will enable J-PARC to take a leap forward as a facility that produces cutting-edge science.

Good progress is being made with deploying polarized 3He for in-beam polarizers.

A combined strategy for developing and implementing supermirror and 3He polarizers is recommended to be included in the MLF2030 vision.

Overall good progress is seen for the detector programme, especially development of updated read out for MWPC providing high rate capability. MLF collaborates on key technologies with other neutron facilities. The degradation that has been observed in 3He PSDs installed in high flux instruments is under investigation, similar degradation is seen at ILL, there is collaboration between the two facilities

User Program (Demand & Usage)

MLF operates 4 user access mechanisms which are consistent with other international facilities:

- General Use Proposals (Short-term and One-year)
- General Use Proposals (Long-term up to 3 years)
- Fast Track (mail-in) Proposals
- Urgent Access Proposals

Demand continues to remain healthy for MLF instruments with an average proposals success rate of 41% (2021B round) (170/410 proposals assuming success rate is similar for muons).

International demand continues to increase as J-PARC's international reputation continues to grow.

Domestic demand by Japanese organisations appears to be decreasing. This is likely due to COVID-19. However, this should be closely monitored into the future in the case there is an underlying trend.

MLF's intent to increase domestic collaboration is supported by the NAC. It is recommended that a strategy with corresponding initiatives and metrics is developed. This strategy should also be aligned with Japan's scientific & research priorities and grand challenges whilst also including the unique strengths of neutron scattering (magnetism etc).

Although the beamtime is limited the NAC recommends consideration of a MLF PhD program for the development and engagement of students (by fund or beamtime) similar to programs employed at other international neutron scattering facilities.

Scientific Productivity (Publications)

The current MLF publishing rate of approved proposals is 34% which is less than other international facilities. A target of 50% is consistent with experience at other international facilities. However this target needs to be balanced with the high industry utilisation (24%) which is likely to produce less traditional publication outputs.

The MLF must continue to seek to understand why the publishing rate is lower than expected. This includes liaising with users that have not published results from experiments, analysing the data and undertaking actions to increase the publication rate, as well as ensuring that instrument scientists have enough time to work with users on data analysis.

It would be valuable to undertake a benchmarking exercise against comparable instruments at other facilities to observe international trends and further understand the MLF publication rates at the instrument level.

Policies and systems should be considered to assist in tracking outcomes of individual experiments such as minting DOI's for experiments to be referenced in papers (as done at the ILL and ISIS). This would assist in answering the question of whether too many experiments are not being published or whether several experiments are needed for each publication.

Industrial Use

The industry program at MLF continues to be commendable in comparison to other international facilities with the average ratio of industrial use of 24%. However, there is a room for growth considering that there are not many paying industry users and that most of the industrial use is concentrated on a few beamlines.

NAC supports joint research with industry and/or forming consortia to attract more users from industry. NAC recommends training students in the process so that they can play important roles in leading future innovations using neutrons.

The significant contribution that Ibaraki Beamline has made to industrial applications and the importance of educational activities for industry are clear, and the ripple effect on other beamlines is also evident in the results.

It would be more efficient not only for industrial use but also for human resource development if MLF aim to establish a framework for information exchange and communication among beamline scientists beyond the differences in organizations and facilities (MLF, JRR3, CANS' near J-PARC), for example, such as a further expansion of J-JOIN.

It is hoped that education and lectures on the use of neutrons in industry will be further opened up to the general public of students and companies. The activities of J-JOIN can be used for this purpose.

For the industry use, a J-PARC maintenance period of a few months, which is necessary for a stable operation, may cause some disadvantage. NAC recommends cooperating/partnering with JRR-3 to ensure consistent services to industry.

Computing & Remote Experiment

The MLF has implemented a remote user programme that mirrors similar systems seen at other neutron facilities.

The NAC recommends that MLF continues to clearly define different types of 'remote' access:

- Mail-in Fast Track: users mail samples and instrument scientists undertake short well defined measurements for users, e.g. powder diffraction in standard sample environment
- Remote access: users mail samples, instrument scientists mount/load samples and users may be able to view the experiment and data
- Remote control: users mail samples, instrument scientists mount/load samples and users are able to view the experiment and data and remotely control some aspects of the experiment.

Fast track user access is in place for 3 (key) instruments in the MLF user programme.

Remote access has been is heavily used across the instrument suite during the COVID-19 pandemic with almost 50% of experiment in a recent period utilising that mode.

MLF have developed and implemented a useful remote control capability, that allows remote users to take control of the instrument including instrument systems and sample environment. A specific funding stream has been utilised to implement this capability and included in that the design and manufacture of automated sample changers.

Staffing

The current level of remote use likely increases the staff workload to that end a move to allow full (or partial) remote control of instruments is essential.

Staffing plan to support remote experiments should be developed.

The move towards remote control of instruments and more generally increased use of digital solutions places increased load on staff in the IT area care must be taken to ensure that workloads are not too high, and that there are considerations for support available if systems fail during operation. Sufficient budget should be available to maintain the systems if this mode of use becomes the new normal.

Any future plan for remote experiments should make it clear if the proposed changes are to improve the efficiency of the instrument scientists by allowing them to operate the instruments remotely (e.g. from home), or if the effort is to support services for remote users, which will not physically be on site for the experiment.

When the remote experiments are performed normally, the task of staff members become hard. MLF and users community have to think about how to share the work and to support staff.

Policy & Guidelines

The implementation is considered and addresses essential areas such as information security.

So far the system has been deployed and tested on one MLF instrument. Deployment across other candidate instruments will follow. Care should be taken to ensure that the underlying infrastructure (network) has the correct capacity to handle this deployment. MLF could also consider specific trainings to be implemented to allow remote use to be successful.

Consider including remote users in the tracked number of unique users (academic or industrial; japanese or foreigners).

Guidelines should be developed which experiments can be done remotely, which will require onsite presents, and these guidelines should be communicated to the users.

It will decrease the chance to educate and train young scientists and students. For future, the educational program system should be considered.

Training plan for remote users should be developed including virtual experiments on the instruments on site.

Computing general comments

MLF has developed a very comprehensive suite of controls and acquisition software that matches the instrument needs.

The facility users have access to remote infrastructure to perform data analysis. MLF could consider how data management plans could be used to help users identify what their data treatment needs are.