

# Report of the SAKURA workshop in June, 2024

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Venue: J-PARC/MLF, Tokai, Japan

## *Participants from ESS;*

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## *1. Introduction*

SAKURA program was launched in 2019 to facilitate mutual exchange between ESS and J-PARC with a fund from the Swedish Research Council (VR). There were more than 30 applications, and more than 20 proposals were awarded then. However, because of the pandemic circumstance through 2020 to 2022, the actual exchange was made only for 13 applications after ceasing the disease. It was supposed to finalize the program in spring 2024, the workshop was planned to be held at J-PARC to see the achievement of SAKURA program and discuss the collaboration between ESS and J-PARC and further continuation of the program. However, very fortunately, VR offered additional financing of 30000 EUR to cover new activities between July – December 2024. Therefore, we had arranged the workshop to include an evaluation committee to review applications from the 3<sup>rd</sup> Call for Proposals which launched in May 2024.

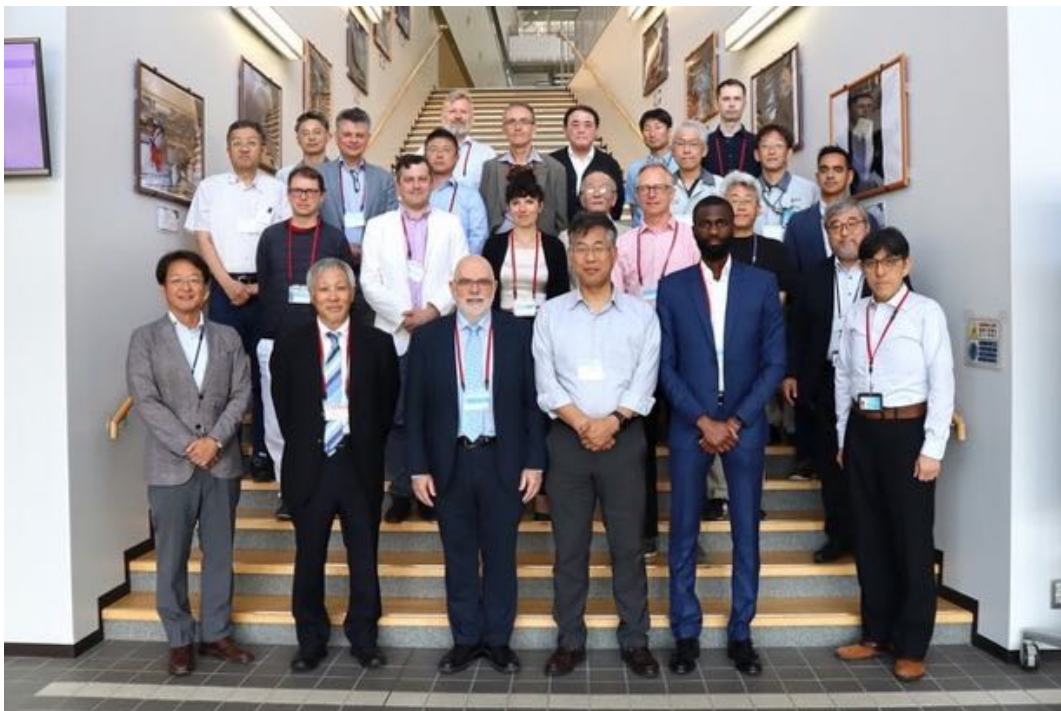


Fig. 1 At the Research Building of J-PARC

## 2. Program

The workshop program is attached as Appendix. However, here briefly describe what was presented and discussed in the workshop.

The presentation was started by the DG of J-PARC, T. Kobayashi, and the Delegation leader K. Jones. J-PARC is an interdisciplinary organization including neutron, muon, hadron and neutrino facilities, which are open for international users and industries. On the other hand, ESS is currently a dedicated organization for neutron scattering science for multi-national partners in Europe with an unprecedented long pulse source, equipped with sustainable energy recovery system, and planning the first neutron beam in 2025. Those are obviously different each other, however, there are a lot of common interests and issues to be tackled, therefore exchange and collaboration between the two world leading organizations can give mutual benefits.

## 3. Collaboration so far and from now on

The presentation was followed by a general view of the collaboration in the present and future.

### 3.1 Achievement or On-going collaborations;

- Experimental verification of the thin moderator performance done at J-PARC in 2015. This is a key element to realize the high performance of ESS with an enhancement factor 3.0 at low energy.
- Proton beam monitor development at J-PARC since 2018. This is an on-going collaboration by SAKURA
- Exchanging experience of commissioning at J-PARC in 2008 by holding a workshop at ESS in 2022
- Development of an on-line Raman monitoring system of Para-Hydrogen content in the moderator since 2018 and it is on-going with SAKURA.
- Providing an opportunity for ESS instrument scientist to experience J-PARC instruments through the regular call-for proposal scheme.

### 3.2 Possible future collaborations

- Participating in the commissioning at ESS after 2025 in various sectors (Accelerator, Target, Moderator, Instruments), which does not only help ESS staffs but also gives a training ground for young J-PARC staffs.
- There are a medium term and a long-term future project at J-PARC (MLF –Double, MLF-TS2, ADS). The experience at ESS with superconducting linac, long pulse and rotating target can give a great knowledge to J-PARC.
- On the other hand, ESS is planning 2nd phase of neutron instruments (16-22 instruments), application of fundamental physics and neutrino production, the experience on those at J-PARC can give a good suggestion to ESS.
- ESS will have a large dedicated software group (DMSC), an exchange can accelerate the software development at DMSC with experiences in actual user program at J-PARC. J-PARC can also have benefit in software development by learning the more systematically developed ones at DMSC.
- Exchange in the technology of sample environment equipment such a high-pressure press, pulsed high field magnet and deuteration technology, even in scientific research will give a mutual benefit for both organizations.

After the holistic and general remark, selected presenters gave a presentation.

### 3.3 Accelerator

- Experience on DTL RF windows at J-PARC could help to solve a arcing problem of it at ESS.
- Collaboration on the future developments of J-PARC could help staff's retention at ESS after completion of ESS accelerator.
- Upgrading J-PARC accelerators to 1.5MW (RCS) for MLF-TS2 and 1.3 MW (MR) for T2K. Retention of J-PARC staffs is necessary.
- The technology of superconducting accelerator at ESS helps the development of the ADS project at J-PARC, including 50Hz operation of the present linac as a preparatory work.

### 3.4 Target

There have been a lot of interactions between the two organization since even before the site selection at Lund and construction. Visit to J-PARC/MLF gave an opportunity for ESS staffs to build an image of high power spallation source, and to exchange moderator technology, shielding solution, neutronics and neutron beam transport, manipulation of highly radioactive components, maintenance and handling.

In the coming future we anticipate continuing collaborations on the following items.

- Optimisation of cryogenic moderator system
- Moderator development
- Remote handling system operation
- Radwaste management
- Facility reliability and availability
- Safety aspects for the public and the workers
- Emissions surveillance and control
- Code and methodology development radiation shielding calculation
- Materials radiation resistance testing, data collection

### 3.5 Data handling software

There has been interaction between the two organizations especially after SAKURA program was launched in 2019. Those are front end data reduction, instrument control and data analysis software. ESS has an unprecedentedly large software group as neutron facility, DMSC, collaboration between the two organization gives a great opportunity to J-PARC/MLF to enhance the software capability, on the other hand, DMSC can learn an actual experiment of user program at J-PARC/MLF, which will improve the usability of software at DMSC. The following items are proposed from DMSC.

- Collaboration on solutions for scientific computing (software, data science, data curation, modelling, etc):
  1. Knowledge sharing
  2. Adaptation of software developed by the other facility
  3. Joint development of software
  4. Joint research projects between staff
- Are there other ways of collaborating than visiting each other? E.g. workshops for specific domains, code camps / hackathons? (SasView code camp?)
- Hot topics in the domain: cyber security, artificial intelligence, FAIR data.

### 3.6 Instrumentation

MLF started operation in 2008 and user program started in 2009. Therefore, there are a lot of beneficial exchange on instrumentation of ESS. The followings are proposed from ESS, but J-PARC/MLF can also has benefit from the exchange.

- Cross-training of the instrument scientists at both facilities (ESS scientists act like local contacts at J-PARC)
- Take advantage of lessons learned from J-PARC instruments commissioning. (Participation at ESS commission can also give lessons for young J-PARC staffs.)
- One example of "Cultural transition from Construction project to Science facility" can be seen.
- The common solution for the sample environment (fresh ideas vs. battle-tested ones)
- Software solutions for the data reduction can be exchanged as stated in 3.5.
- New technologies co-development (TimePix3 detectors etc.)
- Scientific collaborations in common interest (SANS, NPD, Spectroscopy, Imaging)

### 3.7 Particle Physics at MLF

There are several ongoing programs at J-PARC and MLF. Those are T2K experiment, hadron physics, measurement of Sterile Neutrino, g-2 /EDM muon project, and neutron life-time measurement. The experience of them gives a good suggestion to ESS. On the other hand, the n-nbar and neutrino proposal at ESS will give collaborative opportunities to J-PARC and Japanese universities.

### 4. Presentation of status and future proposals

There were presentations of status. Those are found in the web page [1]

- MLF status Toshiya Otomo
- DMSC – Thomas Holm Rod
- ESS Instruments - Mikhail Feygenson
- NNBAR & HIBEAM - Valentina Santoro
- J-PARC future plan ("MLF double")

### 5. Site Visit

In the afternoon, there was a site visit to Materials & Life Science facility (MLF), Liniac klystron gallery, Neutrino facility and Hadron facility.



Fig. 2 Klystron Gallery of the Linac



Fig. 3 At the hot-cell manipulator stand and at the high bay corridor.

## 6. Dedicated day for the SAURA program

### 6.1. Presentation from beneficiaries of SAKURA

Program was planned to make a brief explanation of the SAKURA program followed by presentations from beneficiaries of SAKURA achieved in 2023 (Sept.) - 2024 (March). The actual exchanges were confined in a short period of time, a half year, because of the pandemic circumstance and expiration of the MOU between VR and J-PARC during the compelled period. The program could only restart after September in 2023 after revision of

the MOU. In this period, 13 applicants have been exchanged out of 20 applications originally accepted. Table 1 lists the 13 applicants and the purpose of each exchange.

Table 1 Beneficiaries of SAKURA in 2023 (Sep.) - 2024 (Feb.)

SAKURA Exchanges in 2023 - 2024							
	Applicant	Organization	Division	Exchange Purpose	Destination	Duration	Visit date
1	Piotr Rozyczko	ESS	DMSC	Obseving data pipline at MLF	J-PARC	2.5 weeks	Nov-23
2	Zoe Fisher	ESS	SCI	Deuteration technology developent	CROSS	2 weeks	Nov-23
3	Hideki Tatsumoto	ESS	Cryogenic	Development of Raman spectroscopy on para hydrogen of moderator	J-PARC	4 weeks	Nov-23
4	Laurence Page	ESS	Vacuum	Observation of vacuum equipment maintenance	J-PARC	2 weeks	Oct-23
5	Hilko Spoelstra	ESS	Vacuum	Observation of vacuum equipment maintenance	J-PARC	2 weeks	Oct-23
6	Matt Clarke	ESS	DMSC	Collabora(on to enhance scien(fic produc(vity by improving user software at the ESS and MLF	J-PARC	10 weeks	Nov-23
7	Vitcheslav Grishin	ESS	ACC	Development on beam loss monitor of linac	J-PARC	2 weeks	Oct-23
8	Maercelo Juni Fereita	ESS	Vacuum	Observation of vacuum equipment maintenance	J-PARC	2 weeks	Oct-23
9	Alexander Holmes	ESS	SE, Sci	Sample environment	J-PARC	2 weeks	03-Mar
10	Ryoji Kiyonagi	J-PARC	MLF	Development of diffraction analysis method on multi grain crystal sample	ESS	17 days	Sep-23
11	Bruce Yee Rendon	J-PARC	Accelerato	Exchange Superconducting linac technology for JAEA-ADS	ESS	5 days	Nov-23
12	Kazuyoshi Tatsumi	J-PARC	MLF	Investigation of software development at DMSC	ESS	3 weeks	Oct-23
13	Kenichirou Satou	JAEA	ACC	Development on beam loss monitor of linac	ESS	8 days	Sep-23
	4,5,8 are the same team		7 and 13 are the same team				

After the seven presentations above, there was a discussion how we can proceed the SAKURA program in the future, which is originally aiming at an exchange of researchers and/or technical personnel between ESS and J-PARC. However, we have found that even administrative staffs are quite interested in the exchange, and we can see the benefit for two organization. Therefore, we should not discriminate the interest from those bottom-up demands and we should broaden the scope, so that exchange can have a wide range of practical benefits not only for the technical sector but the operation, maintenance, science and user program, which stimulates people to use two different characteristic user facilities for his/her own research.

## 6.2 Evaluation Committee for proposals in 2024 (June - December)

An evaluation committee (closed) was held to review 26 proposed application though June to December 2024. The results will be announced soon later.

## 7. The third day

The third day was planned for individual meetings as par demand of the participants. They could have a detailed discussion with counter partners and visited the relevant sites. The interested teams are as followings,

- Target Group (Rikard, Piotr, Tatsumoto, Kevin, Harada, Teshigawara)
- Data science group (Thomas, Matt, Inamura)
- Sample Environment Group (Alex, Sakaguchi)
- Particle & Nuclear physics group (Valentina, Komatsubara)
- Science group (Mikhail, Nakamura)

- Accelerator group (Kevin, Håkan, Yamamoto)
- Instrument group (Mikhail, MA, Nakamura)

We have heard that they had a fruitful exchange in the meetings.

### 8. Conclusion

The workshop was quite successful and fruitful to exchange technical knowledge and experiences. Participants could make a very good friendship to keep the collaborative relation between ESS and J-PARC, which gives mutual benefits to proceed the construction and commissioning at ESS, and also develop a further technical improvement at J-PARC. Negotiations between ESS and VR are ongoing to further continue the programme beyond 2024, and to further expand the scope of the exchange. It is expected that VR will communicate the funding decision during Q4 of 2024. We expect extended exchanges will make a stronger tie between the two world leading neutron facilities, and make a success of them.

### References

- [1] <https://project.esss.dk/nextcloud/index.php/s/S83T9JSi96bwmt9>
- [1] <https://conference-indico.kek.jp/event/283/timetable/#20240610.detailed>



Fig. 4 After 5:00 pm on the 2nd day.