Unofficial English translation version 2025.3.8

Research Trend Survey Report (FY2024)
Specific Synchrotron Radiation Facility User Community

Group name: High Resolution X-ray Imaging Group

<Activities of this year>

2024.7　Survey on the future of user community

2024.9.5 (Thu) - 6 (Fri) SPring-8 Symposium 2024

9.6 13:10-15:10 Poster session, best practices showcase (Mizutani, Saiga)

2025.1-2　Research trend survey

In this year, we conducted the activities of our group focusing on the public use of NanoTerasu that started from March 2025.

In July, the SPRUC chair requested a meeting with the research group representatives to discuss the future of the user community at SPring-8 and NanoTerasu. In order to gather members' opinions of our group, we conducted a survey on the future of the user community. About 2/3 of our members expressed that it would be better to proceed jointly with both facilities, while most of the other members said they will not mind. So our group reported the opinion that the user community should be jointly organized between both facilities in the discussion with the SPRUC chair.

In the poster session of the SPring-8 Symposium 2024, we reported on best practices of SR imaging studies by Japanese and foreign members and **proposed the construction of a public imaging beamline at NanoTerasu**. Considering the current rate of proposal acceptance, **the construction of a new imaging beamline at SPring-8 is also urgently needed**.

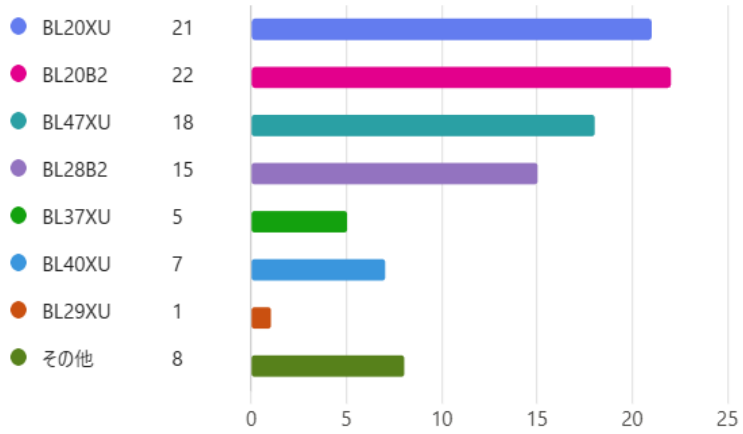
In January-February, we conducted a trend survey to solicit input from our members. We received 58 responses to the online survey by Forms (attached separately). All questions allowed for multiple responses. Our group has over 1,400 members. If we consider the number of responses as the number of member teams, the survey results can be considered as representing a substantial amount of members' opinions .

<Results of the trend survey>

1. Beamline

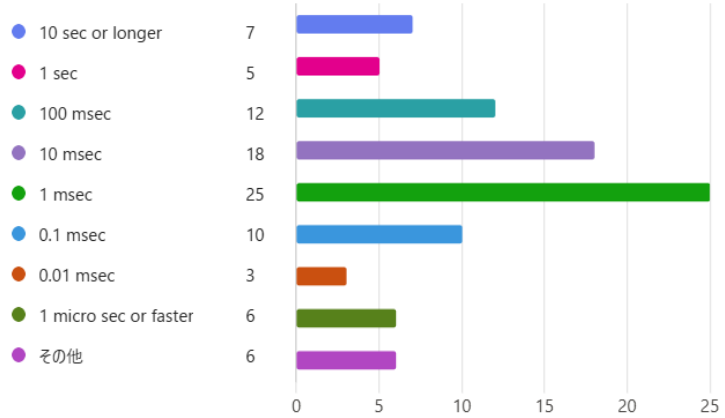
The public imaging beamlines, BL20B2, BL20XU, BL47XU, and BL28B2, are

widely used. BL40XU, BL37XU, and BL29XU were next in use. Other beamlines mentioned were BL19LXU (2 answers), 05XU, 07LSU, 16XU, 25SU, 27SU, 36XU, and SACLA (1 answer each, multiple BL listed). Thus, we can consider that the survey covered a wide range of fields without being biased toward any of the beamline.



2. Time required to measure 2D images

Last year's survey showed that there are wide needs for measurement equipment in experimental hutches. Among them, a detector capable of high-speed imaging was one of the most requested instruments. It is expected that the SPring-8-II will significantly improve the brightness, which will shorten the image acquisition time. So we asked our members for the appropriate time to take one 2D image in the coming years after the SPring-8-II upgrade. The most common answer was 1 ms, followed by 10 ms. Therefore, **demand for image detectors that can measure a single image in 1 ms to 10 ms is expected to increase**.

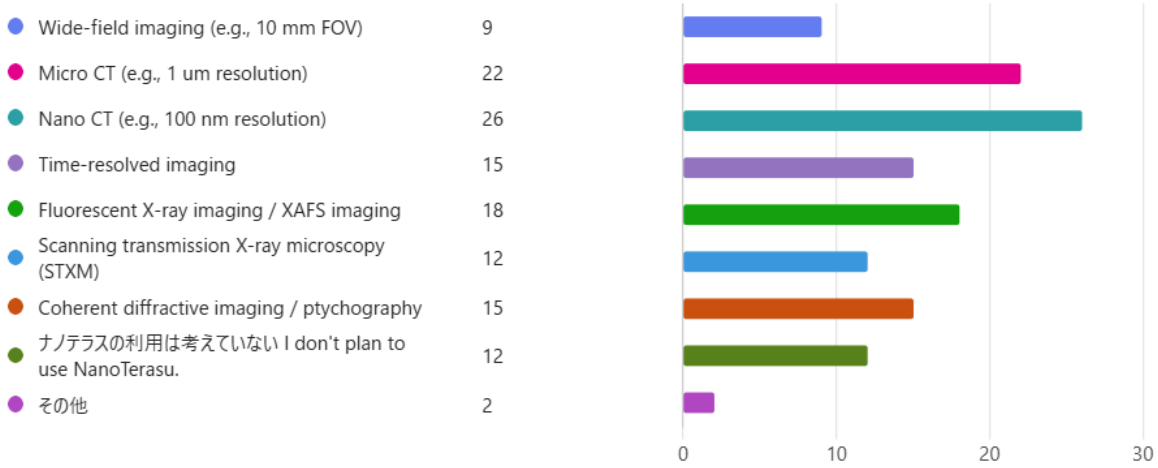


Other member comments:

(Specific information was provided in individual comments and hence is omitted here. All comments have been communicated to the facility.)

3. Measurement and experimental methods required at NanoTerasu

In last year's survey, we received many responses indicating that our members are considering using the NanoTerasu. We therefore asked what type of experiments are being considered and what measurement/experimental techniques will be used. While there were certain requests for all methods, nano-CT and micro-CT were the most common, followed by fluorescence imaging, time-resolved measurement, and coherent imaging.



At the time of the survey, NanoTerasu do not have a public imaging BL. Therefore, it is **necessary to construct a public imaging BL as soon as possible**, as mentioned in the BLs Upgrade Workshop held in this March. We inquired about the status of NanoTerasu to the relevant parties, and was informed that public use of the Coalition BL (dedicated BL) will start from 2026A. Those include micro-CT and time-resolved measurement (BL09W), coherent imaging and micro-CT (BL10U), and soft X-ray imaging (BL14U), which are consistent with the above results of this survey. Therefore, as much beamtime as possible should be made available for public use. In addition, there is no information that nano-CT and fluorescence imaging can be performed at NanoTerasu at present. Hence, **the public BL plan should include Nano-CT and fluorescence imaging in its applications**.

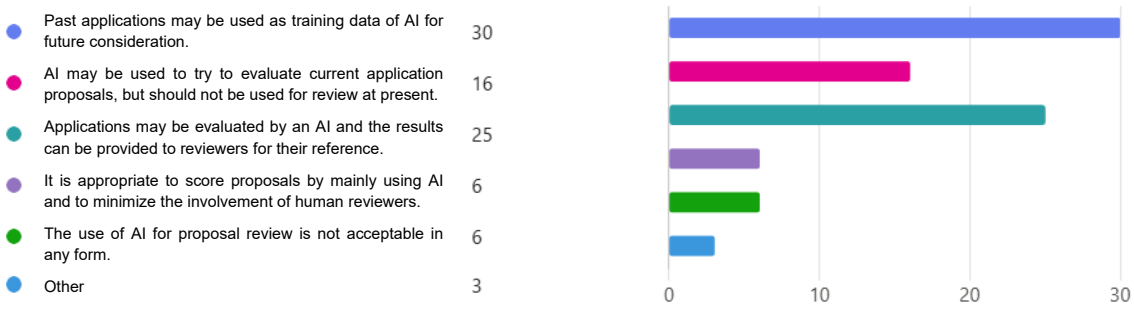
Other member comments:

(redacted)

4. Use of AI in proposal review

At this year's SPring-8 Symposium, the use of AI in proposal review was discussed. While the use of AI is expected to eliminate biases of reviewers and reduce the review workload, it remains unclear whether AI can properly evaluate applications in new fields. We conducted a survey on the use of AI in proposal review.

The majority of members are in favor of using past applications as training data for AI for future consideration. While there is much support for using AI to evaluate applications and providing its results for reviewers' reference, there is also a certain amount of the option that AI should not be used for review. Therefore, the question of **whether AI should be used for proposal review remains controversial**. Other comments pointed out (1) the need for **human supervision of AI**, (2) the need to **provide feedback to applicants on the review results** prior to the application of AI, and (3) the need for **confidentiality of application contents used as training data**. These should be prerequisites before the AI use.

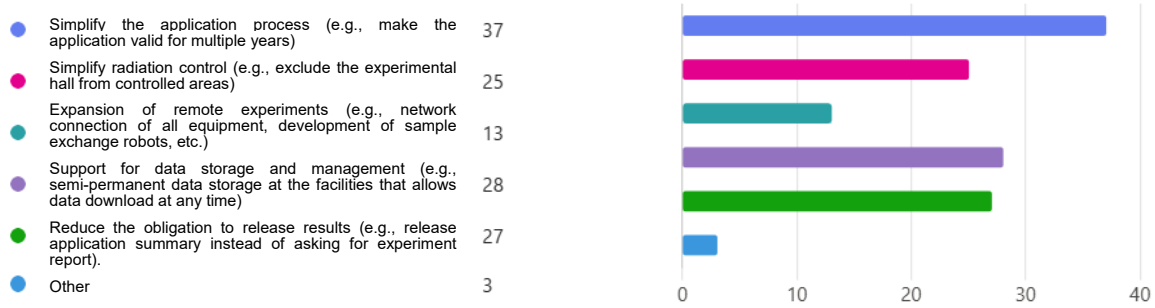


Other member comments:

(redacted)

5. Measures to reduce the workload on the user side

If AI is to reduce the workload of proposal review, measures to reduce the workload on the user side should also be considered at the same time. More than 60% of users supported simplifying the application procedure, followed by supporting data storage and management, and reducing the obligation for the beamtime report.



The **workload involved in the application and report for the SR beamtime is burdensome for researchers, and in turn, hinders the advancement of science**. It is possible to reduce the user-side workload, for example, by changing the proposal to be valid for multiple years, or by publicizing the application summary instead of asking the experiment report. These can be implemented just by revising the beamtime allocation procedure without any significant cost.

In addition, there are continuing requests for issues related to experimental data. If the data can be stored and managed at the facility, this could be a breakthrough to enable unprecedented studies that have not been done due to barriers in data handling.

Other member comments:

(redacted)

5. Response by the study group required due to the user community integration with NanoTerasu

The user community has become a new organization for all users of SPring-8, SACLA, and Nano Terrace. In response to this, we asked the group members about actions that should be taken by the user group in the open-ended question. Since we had many comments about the features and differences between NanoTerasu and SPring-8 facilities, we investigated on NanoTerasu and reported separately to the members about (1) the materials on the coalition imaging beamline, and (2) the start date of the public use of those beamlines. There were also comments regarding proposal applications, measurement techniques, data handling, and websites, etc. Since these seem to be directed more toward the facility than toward the user group, future action in the facility side is desired.

Other member comments:
(redacted)

7. Other requests

Requests were received for accommodations (NanoTerasu) and a cafeteria (supposedly SPring-8). In this year's survey, questions for those issues were intentionally omitted, as they have been surveyed repeatedly. However, this year, we finally received **a comment in English regarding improvements to the cafeteria.** This is an **embarrassing situation for Japan from an international perspective. Both facilities urgently need to improve their cafeterias and accommodations**.

It was pointed out that the study group has not collected sufficient information on NanoTerasu. We deeply regret this. The imaging BLs at NanoTerasu is operated for dedicated uses (Coalition BLs), and information on those imaging BLs cannot be found in the facility website. Its existence is not known without thorough investigation, and only limited information is available on those BLs, as pointed out. The current dedicated operation should have led to this situation. Although it is understandable that the BLs are currently dedicated from the viewpoint of construction cost, the **imaging BLs at NanoTerasu should be shared by a wide range of users** in the near future in order to operate the BLs as high-performance BLs with the cooperation of a wide range of specialists in X-ray optics, etc. **The technical information and operation status of the NanoTerasu imaging BLs should also be made publicly available**.

Other member comments:

(redacted)