

Report of the RIKEN SPring-8 Center Advisory Council 2016

General statement

The SPring-8 campus hosts two accelerator based light sources, SPring-8 and SACLA that are world leading. SACLA is the second operating hard x-ray free electron laser (FEL) in the world and the first compact FEL that has established the paradigm for such sources. From its earliest operations it has produced important scientific results and has continued to do so. SACLA produces the shortest wavelengths worldwide and is a leader in investigations in non-linear x-ray physics.

The SPring-8 storage ring source has world leading capabilities. The 1 km beamline enables the development of unique x-ray optics as evidenced by the continued progress for hard x-ray reflection optics. The newly commissioned in-elastic scattering beamline on the 25 m straight section is the best in its class and is producing important results that should further our understanding of the physics of strongly correlated quantum materials.

The RSC is pursuing continuous growth of both facilities and is focusing on the upgrade path for the SPring-8 storage ring in step with the two other high energy 3rd generation synchrotron sources.

The RSC is also focusing on the management of the facilities on the SPring-8 campus with organizational changes as exemplified by the success of the engineering section.

Comments on the specified issues

Terms of Reference for RSAC

Comment on our recent changes and our plans for managing SPring-8/SACLA, including the relationship with JASRI and the public/contract beamlines,

Reducing or removing barriers between JASRI and the RSC will lead directly to increased efficiency that will be most evident in increased scientific impact. The RSAC takes note of the steps so far and agrees that continued progress in this direction is important. A direct consequence of ‘barriers’ is the difference in staffing between RSC beamlines and the public beamlines operated by JASRI. RSAC strongly endorses a uniform approach to staffing, beamlines operations, staff research opportunities independent of the organization be it RSC or JASRI. The RSAC is also pleased with the contract beamlines, in particular those supported by industry. To better understand these issues and provide scientific advice for developments RSAC hopes at the next review there will be the opportunity to see the overall picture of the scientific portfolio including both the RIKEN beamlines as well as the public and contract beamlines.

Provide suggestions on how to compromise the RIKEN research management organization structure based on the models of the Max Planck Institute with that of large-scale infrastructures (the RIKEN SPring-8 Center),

In the introductory presentation about RIKEN the RSAC heard of the historic connections between the creation of RIKEN and the MPG. It is important to note however that the scale of the RIKEN independent researchers is significantly smaller than that of the MPG. More recently RIKEN has taken on the additional task of operating large user facilities, a role that the MPG does not have. The operation of large facilities in other countries is in general handled by different agencies or different parts of agencies that have facility responsibility, for example the Office of Science within DoE in the US and the HGF in Germany. The RSAC sees significant merit in a management structure independent of the historic RIKEN role of chief scientist laboratories separating the large facilities under an independent management structure. The structure should combine aspects of the DoE office of science and the HGF for large facilities in Japan at a scale commensurate with the existing facilities, for example SPring-8/SACLA, PF, J-PARC, the proposed SLiT-J. There are of course differences between the DoE and the HGF: the HGF stimulates collaboration between facilities by requiring consensus on significant infrastructure funding while the DoE encourages 'healthy competition' and funds research at the individual laboratories directly connected to the facility capabilities.

Comment on the role of SPring-8 in the SR Platforms across Japan, and furthermore, its role to the extended Platforms including other large-scale user facilities (J-PARC and the K-Computer). Please take into consideration collaboration programs with industry, especially in light of the new 3 GeV facility to come.

Director Ishikawa presented a long-term vision for large facilities across Japan. The RSAC agrees with the perspective that there is a natural synergy between large accelerator based user facilities such as SPring-8/SACLA, J-PARC, PF and the proposed SLiT-J. As such these facilities would optimally be managed by a single organization. This could lead to further efficiencies with single groups for detectors, insertion device magnets, and other areas common to all facilities. This approach would also naturally lead to a standardized user access system permitting the best match of experimental needs to experimental capabilities of the facilities. Dr. Ishikawa also included high performance computing in his vision as part of the Japan wide facility system. RSAC notes that while high performance computing is critical in science and technology it plays a very different role than the user facilities and should be managed independently.

Provide comments summarizing the strength and weaknesses of SPring-8/SACLA facilities in comparison with their global counterparts for our further evolution.

- **Strengths:**

Both SPring-8 and more recently SACLA have continued to develop and provide unique and critical scientific tools for the user community in Japan as well as worldwide. SACLA and SPring-8 are among the world leading photon science facilities and in several areas have no peers. Of particular note the quality of the staff, their productivity and engagement is exceptional. As well the RSC's focus on science is unusual. RSAC notes the creative approach to proposal evaluation and experiment support at SACLA with a specific focus on non-linear optics has led to world leading breakthrough science. Their approach with priority proposals allows a focus on specific areas where SACLA has unique potential. At SPring-8 the two beamlines, inelastic scattering and the micro-focus PX beamline we visited are both at the forefront of SR facilities worldwide. The envy of the synchrotron radiation community worldwide is the development of industrial uses at SPring-8, in particular the industry-academic partnership in the general area of soft matter. Compared to prior reviews the results presented in structural biology are highly competitive on the international scale. Finally, a first step in removing barriers, the centralization of the engineering across the SPring-8 site, has had a significant impact.

- **Weaknesses**

For the RSAC the overall organization and division of responsibilities between RIKEN and JASRI remain unclear. Without a management system that has overall responsibility for the development and operation of SPring-8 in the upcoming upgrade the impact of the facility on the international stage may be jeopardized. To date the self-organized approach to specific science areas has worked but there is concern that as the development of SPring-8-II becomes a reality there needs to be a management system that addresses the prioritization within and between disciplines.

Without a single management structure the transfer of the world-class developments on the RIKEN beamlines to the public beamline portfolio is hindered. This conclusion is based on the presentations and the site visit.

Terms of Reference for Center Advisory Councils

President Dr. Hiroshi Matsumoto has asked the Center Advisory Councils to answer specific questions in his terms of reference (TOR). What follows are the RSAC comments and recommendations.

TOR 1. The strength of the RSC is its proven ability to design, construct and operate accelerator based light sources, both storage rings as well as free electron lasers (SPring-8 and SACLA respectively) that are among the world leading facilities. The weakness of the facilities on the SPring-8 site is the division of responsibility between two organizations, RSC and JASRI, which have the responsibility to deliver unique science through support of the user

community whether they are RIKEN scientists or public users. From a facility perspective we recommend, for the mid and long term, the upgrade of SPring-8 to SPring-8-II as part of the development of an overall strategy for large facilities in Japan. In addition complete the potential of SACLA to provide 5 independent FELs. The combination will keep the facilities on the SPring-8 site world leading. Regarding the management of the facilities for science delivery the maximum yield will be achieved by eliminating any barriers between various organizations on the SPring-8 campus.

TOR 3. The RSC is different from other RIKEN Centers in a fundamental way. As already said in TOR 1 the strength and mandate for the RSC is the design, construction and operation of large accelerator based x-ray sources. Strong RSC scientists are critical to this task, but the true measure of success is the scientific results from these facilities independent of the affiliation of the scientist carrying out the research. The RSAC strongly agrees that the RSC has met the goal of TOR 3 which is scientific excellence. This is highlighted by the developments for state of the art structural biology tools both on SPring-8 and SACLA where microfocus and serial crystallography capabilities on SPring-8 and SACLA respectively are world class. The inelastic scattering capabilities and scientific impact from the RIKEN beamlines on SPring-8 are truly world leading. In the area of non-linear x-ray optics the RSC team is also recognized as a world leader and the results from this team and collaborators appears regularly in the most respected journals. The staff, in particular Drs. Tamasaku for non-linear optics and Dr. Baron for inelastic x-ray scattering, for example, are sought as invited speakers at almost every conference in their respective fields. One point under TOR 3 is research management which is addressed above. Finally in terms of ‘global brain circulation’ RSC has a number of individuals that hold joint appointments with internationally connected universities.

TOR 4. The RSC has world leading RIKEN beamlines on both SPring-8 and SACLA that are in routine use by many outstanding RIKEN investigators.

Recommendations

1. All other facilities of comparable size and breadth have regular beamline reviews that evaluate technical status, scientific productivity by users and staff. These reviews guide investments to keep the beamlines competitive and productive. RSAC recommends establishing reviews at SPring-8 in preparation for SPring-8-II. These reviews will inform the prioritization of investments between now and the completion of the upgrade. These reviews should cover all the beamlines whether under the responsibility of RIKEN or JASRI.
2. The overall portfolio of beamlines at SPring-8 should be evaluated in light of the

developments at SLiT-J and the existing facilities at PF and AR at KEK to guide choices for SPring-8-II.

3. Some peer facilities have management structures where the scientific disciplines that benefit most from their beamline capabilities are highlighted in order to optimally invest resources to maximize scientific impact. This approach for the RSC in collaboration with JASRI is strongly encouraged.