

Photon Factory SAC Meeting

February 7-8, 2013

Executive Summary and Closing Remarks

Ingolf Lindau, Committee Chairperson

February 8, 2013

SAC Committee Members

7th SAC Meeting – February 7-8, 2013

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Yasuhiro Iwasawa (The University of Electro-Communications)

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Discussion Point 1: How does the PF-SAC evaluate the PF future plan in the next decade?

- The SAC considers the continuous upgrades of beamlines and instrumentation as one of the cornerstones in the roadmap for the next decade. This is a necessity to keep the PF in the frontier of international research. In this context the SAC commends the PF management for its initiative in using recovery funding to upgrade beamlines 2, 13, 28 and 15. The research on these beamlines falls within the areas of excellence and thus is of the highest strategic importance for the PF. Future refurbishing of beamlines should follow the same criteria.
- The funding of the separate injection line for the PF-AR is great news and the SAC congratulates the PF management for receiving the supplementary funding to make this possible. This will minimize the interference with the SuperKEKB project and enhance the research portfolio of the PF-AR. The PF-AR has unique time-resolved capabilities worldwide in the hard x-ray region, and it is important that the PF keeps its international status during the coming years.

Discussion Point 1: How does the PF-SAC evaluate the PF future plan in the next decade? (continued)

- The SAC welcomes very much the hybrid mode of the PF operation. It will provide great opportunities for time-resolved science and at the same time be an incubator for novel research that the 3-GeV ERL will offer the research community.
- An exceedingly important component of the roadmap is the successful construction and operation of the compact ERL. The success of this project is of paramount importance for the next step to secure the 3-GeV ERL. The SAC fully supports the high priority the PF/KEK gives this project and stresses the importance of full attention to this endeavor.
- The SAC commends the 3-GeV ERL leadership for its efforts in promoting the project with workshops on the scientific case and the completion of the conceptual design report in October 2012. Strong ongoing efforts are required to keep the proposed time schedule for the construction and commissioning of the 3-GeV ERL. The SAC applauds the plans to phase out PF and PF-AR in such a manner that the majority of the user community will not suffer from a black period before the 3-GeV ERL becomes operational.

Discussion Point 1: How does the PF-SAC evaluate the PF future plan in the next decade? (continued)

- The SAC considers the highly successful Structural Biology and Condensed Matter Research Centers as important parts of the roadmap for the next decade, offering novel opportunities for groundbreaking research and attracting funding sources.

Discussion Point 2: Is the construction of the direct injection path for PF-AR reasonable in the relation with the PF future plan?

- The SAC strongly endorses the decision to create direct injection in the PF-AR at the full operational energy. The successful implementation of such a project will represent a very significant step in the future improvement of the PF-AR's performance. This improvement will make the PF-AR not only a more reliable accelerator but will also make it much more attractive as a radiation source.
- Direct injection in the PF-AR fits very well in the overall development plans of the PF and KEK accelerator complex. It is a “win-win” situation: SuperKEKB will get the required frequent injection and PF-AR will acquire one of the qualities of the best third-generation SR sources – top-up operational capability.
- In order to capitalize on the future improvements of the PF-AR as an x-ray source, the SAC recommends replacing the existing aged undulators with new IDs optimized for future PF-AR beamlines.

Discussion Point 3: Is the BL refurbishment program for the new BL-2 and BL-15 effective for the best use of the PF facility?

- The major refurbishment of BL-2 consists of the addition of a new undulator and widening of the photon energy range covering 30eV to 4keV (VUV to SX). This enables one to conduct ARPES, XPS and XAS on a wide range of materials including transition metal oxides and nitrides, and makes BL-2 particularly suitable to studies of strongly correlated systems and functional materials. It is expected that the upgraded BL-2 will be a workhorse of the PF facility.
- BL-15 is based on the last short straight section and refurbishing this beamline is the most effective solution to support a broad range of science (e.g. catalysis, photosynthesis, solar/fuel cells) using the SAXS, XAFS and XRD techniques. In the layout of the beamline there are some challenges, e.g. sample-to-detector distance and the low-q limit for the SAXS experiments.
- The SAC fully endorses the steps the PF management has taken in the refurbishing of BL-2 and BL-15. These upgrades are in line with the research areas of excellence defined by the PF management and strongly supported by the SAC.

Discussion Point 4: How does PF-SAC evaluate the suggestion of the time-resolved science subcommittee and the response from PF?

- The PF SAC strongly endorses the conclusions and recommendations of the Time-Resolved Subcommittee and the thoughtful response by Dr. Adachi. The Subcommittee has learned that various techniques for time-resolved science, like diffraction/scattering, spectroscopy, and a combination of these methods are used by PF users. The quality and quantity of these results are quite good. The Subcommittee suggested an upgrade of NW14 in order to streamline the switching between operation modes. The PF-new group structure seems to work well for carrying out tasks related to time-resolved science.
- Regarding cERL, the PF SAC strongly encourages to use the light from cERL for time-resolved science.
- High speed detectors are in general needed for time-resolved experiments at high repetition rate light sources, like an ERL with MHz repetition rate. Considering this, the SAC recommends continuing efforts in the development of the required detectors and providing them to PF users.

Discussion Point 4: How does PF-SAC evaluate the suggestion of the time-resolved science subcommittee and the response from PF? (continued)

- The PF has chosen some specific areas of time-resolved science: photo-induced phase transition, spin-crossover, metal complexes, photochemistry, photo-catalyst, excited-state structure, photo-induced ligand dissociation and binding, and detection of dynamics of a single molecule. However, XFEL facilities (LCLS and SACLA) are also targeting these science areas and, thus, PF may still need to find ways to deliver high-impact science outputs. At the LCLS and SACLA the beamtime is very limited to internal and outside users, so the PF has a good opportunity to attract users from this pool of researchers.
- It is very attractive to users that the PF-AR provides photon sources of 5-25 keV, and the PF in hybrid mode operation provides soft X-ray sources. The upgrade of the PF-AR for top-up mode and higher repetition rates will allow the PF to provide better tools in the area of time-resolved science.

Discussion Point 5: Is the new PF users' association well organized to promote the activity of the PF users' and PF?

- The SAC is pleased with the establishment of a new PF users' community (PF-UA) on April 2012 by following the advice of the previous PF-SAC. All PF users (around 3,400) now join the new association with no membership fee.
- The SAC appreciates the fact that an appeal by this new community to the KEK president and the MEXT was effective in preventing a drastic reduction of the operation time of the PF and the PF-AR caused by the increased electricity charges resulting from the Great East Japan Disaster.
- The SAC hopes that the several subcommittees of the PF-UA will work well by performing their own tasks, to promote the PF users' activities and strengthen the cooperative relationship between the users and the PF staff members.
- The SAC encourages maintaining continuously high activity in the user community by securing many "active" members.

Discussion Point 6: How does the PF-SAC evaluate the progress in the preparation for the ERL project including the construction of the cERL?

- The SAC continues to be very impressed with the noticeable progress in both developments: preparation of the 3GeV project and impressive accomplishments in the construction of the cERL.
- The SAC strongly endorses conclusions of the 3-GeV ERL IAC that took place in July 2012. In particular, the SAC fully agrees that the well-established collaboration between KEK and JAEA, with their advanced capabilities in accelerator physics and superconducting RF technology, is uniquely positioned worldwide for the successful construction of an ERL. Also, the XFEL-O as a part of the 3-GeV ERL is an extremely exciting and un-paralleled game-changing instrument for nearly all areas investigating dynamics - electronic, atomic and perhaps even magnetic - on time scales of ps or faster.
- In recent months a significant number of cERL components have been installed inside the radiation enclosure. The cERL team has to be commended for remarkable efforts in the construction of the machine. The team is on its way to meet the critical milestone of getting first beam from the gun by the end of FY2012.

Discussion Point 6: How does the PF-SAC evaluate the progress in the preparation for the ERL project including the construction of the cERL? (continued)

- The SAC encourages the cERL team to further develop in-depth the first scientific experiment based on the Compton backscattering technique and present the case to the Committee. It is also quite desirable to continue engaging the potential cERL user community and to solicit new ideas for experiments using cERL radiation.
- For overall success it would also be important to allocate enough attention and resources to identify sources of the observed high-field emission.

SAC Other Remarks and Comments

- The SAC very much appreciated the presentation by Y. Okada on the KEK roadmap. In the roadmap for 2008-2013 PF/PF-AR Operations and Upgrade appears as item 3. During this period the operation budget for PF has decreased steadily. Thanks to recovery and supplementary funding, some very important upgrades have been made possible. The SAC welcomes and endorses the placement of photon science as one of the key activities in the new roadmap for 2014-18 so that KEK can play an important role in the development of synchrotron radiation research science in Japan.
- The SAC heard three excellent presentations by M. Kimura on “Utilization of in situ observation techniques to design materials and processes for the best-usage of limited natural resources”, T. Senda on “Structural study of Helicobacter pylori oncoprotein CagA” and Y. Wakabayashi on “Surface structure analysis of organic semiconductors”. These talks represent impressive examples of world-class research being done at the PF by both external and internal users spanning topics from industrial problems to bioscience to advanced materials.

SAC Other Remarks and Comments

- The PF and PF-AR continue to have an outstanding publication record with many papers in high-profile journals. The SAC commends the management for focusing its limited resources on areas of excellence and being successful in recruiting excellent scientists to its staff. International collaborations, as well as collaborations with domestic universities and industry, remain strong. The SAC may sound like a broken record but again points out that the shortage of scientific manpower for support of users on beamlines is a serious problem both in terms of the time the beamline scientists can spend on their own research and the help that can be provided to inexperienced user groups.
- The PF can play a crucial part in exposing university students and young scientists to the frontiers of scientific research. This is important for the future health of Japanese science in general.
- The SAC commends the PF management for its efficient use of the recovery funding and the remarkable fast return to normal operation after the earthquake disaster in March 2011. The PF/PF-AR operates with high reliability for the users and the mean time between failures is excellent.

SAC Other Remarks and Comments(continued)

- The SAC found the individual meetings with young scientists extremely valuable; they provided important insights into the operation and organization of the laboratory. The SAC looks forward to having these discussions also on the agenda for its future meetings.
- The SAC was very impressed by the well-prepared presentations and appreciated the frank and open discussions on the most crucial issues. Last, but not least, the SAC thanks the PF management and staff for their excellent logistical arrangements and support in preparation of the meeting. The great hospitality throughout the meeting was very much appreciated.