

# **Second Photon Factory ISAC Meeting**

## **Executive Summary and Closing Remarks**

**K. Hodgson, Committee Chairperson**

**March 5, 2008**

# ISAC Committee Members\*

## – 2<sup>nd</sup> ISAC Meeting – March 4-5, 2008

E. Fontes – Cornell University

H. Fukuyama – Tokyo University School of Science

E. Gluskin – Advanced Photon Source

K. Hodgson – Stanford University, Chairperson

I. Lindau – Stanford University

K. Miki – Kyoto University

T. Ohta – Ritsumeikan University

M. Ree – Pohang Accelerator Laboratory

V. Saile – University of Karlsruhe

H. Suematsu – Riken Harima Institute

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\*all 10 members present for Marc 4-5, 2008 meeting

# PF, Photon Science and the KEK Roadmap



High Energy Accelerator Research Organization (KEK)  
Institute of Materials Structure Science (IMSS)

**Photon Factory**

- ISAC recognizes that PF, SBRC, and the proposed SMRC within IMSS do forefront and pioneering research across a broad range of materials and life sciences. It is essential that the impact of this research and its importance to Japan be recognized by KEK as a key part of its mission.
- In the domain of the “nanoscale”, the properties of x-rays (including their short wavelength and penetrating ability) greatly enable and drive discovery. They provides the means to understand the basic structure and functionality of materials from the viewpoint of basic science (areas include condensed matter, biological systems, environmental and chemical sciences and many others).
- KEK can be a world leader in research that will enable solving important societal challenges of our time, including:
  - Design of new drugs to cure and control human disease and improve our health and well being
  - Understanding of man-made and natural pollution and remediation processes in our environment
  - Development of improved processes and materials underlying clean, efficient, sustainable and environmentally friendly energy production, storage and conversion
  - Understanding, tailoring and controlling the properties of atomically engineered nanoscale materials for advanced technology

# KEK as a World Leading Center For Scientific Discovery using Photons, Neutrons and Muons

- ISAC, PF and IMSS have developed a vision for the future that is based on the use of two complementary x-ray sources: i) the existing electron *storage ring* PF which produces x-rays that are typically referred to as “synchrotron radiation” and ii) the planned x-ray Energy Recovery Linac (ERL).
- The PF provides a well understood, robust and mature means for obtaining detailed information on the fundamental interactions between the electrons, spins and atoms in materials. An improved understanding of these interactions forms a large part of what is envisioned as “grand scientific challenges” and is driving fundamental investigations across a range of biological and physical sciences
- The ERL is a completely new class of next generation x-ray source. PF and KEK have the remarkable opportunity to build the world’s first hard x-ray ERL. ERL x-rays will provide a clear “vision” into systems on the atomic and nanoscale through novel imaging techniques (including systems under extreme conditions of pressure/temperature). Also possible will be the study of systems undergoing real-time reaction and change.
- KEK also provides forefront sources for Neutrons and Muons and these tools can provide information that is complementary to x-rays.

# KEK as a World Leading Center For Scientific Discovery using Photons, Neutrons and Muons



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- ISAC wishes to emphasize the broad and deep impact of the research done at PF, as enabled by its accelerator-based light source and talented scientific staff.
- KEK provides a unique and world class environment for accelerator science and excellence for development of future generation of photon sources.
- The Research Centers of excellence are a key additional element in delivering world class science from the accelerator based facilities.
- ISAC urges that KEK recognize the unique role played by PF within the context of Japanese synchrotron science, especially noting that:
  - PF provides unique instruments of the highest quality for soft x ray research in Japan where there has traditionally been world leadership in this important area for condensed matter studies and AMO physics.
  - ERL promises to be a unique, x-ray source complementary to XFEL at Spring-8
  - KEK and PF have the responsibility and stewardship of a very important large National and International photon science user community. Currently PF serves about 3000 users from a broad range of scientific disciplines in academia, national laboratories and industry and this number continues to grow.

# Structure Materials Science Research Center (SMRC)

- ISAC recognizes the strategic importance of a focused center that is organized around the study of advanced materials. It is an area that is important for future growth of PF and provides strong opportunities for university/industry ties.
- ISAC believes that is important to carefully consider the organizational structure that would be most effective to achieve selected scientific goals. We encourage that the PF management broaden the discussion to the wider outside community and rapidly convene a group of experts to visit and advise on details.
- ISAC believes that the SMRC can be modeled after the very successful SBRC. Management needs to make a concerted effort to inform and engage staff and outside scientists in the concept for the proposed center. Important elements also include attracting external funding and cooperation with the user community.
- ISAC emphasizes that a critical and indeed unique opportunity exists to appoint a world-leading scientist to head the Center. This position is critical to the strategy of developing photon science as an increasingly strong component of KEK.
- The concept is very broad (photons, neutrons and muons) and this could be unique. By engaging Spring-8, it is clear that the overall strategy will be stronger.

# Areas of Excellence and Beam Line Program - I

- ISAC strongly endorses the strategy and process to identify and focus on the areas of excellence.
- Management is strongly encouraged to refine and focus within each of the areas on instruments and opportunities which can be world class and which have a strong underpinning of infrastructure at PF and in the region (including manpower).
- ISAC is pleased to see the strong progress in the prioritization and relocation/decommissioning of the bending magnet beam lines. ISAC feels that the process has been reasonably aggressive given the complexity of the task (solving the hybrid problem) and providing state of the art soft x-ray IDs. Engagement of the user community seems to have been the case up to now. It is very important that this process continues to be open and in close cooperation with the user community.
- ISAC urges that in making choices of beam line/instrument reconfiguration decisions, consideration be given to how best to support the identified areas of excellence.

## Areas of Excellence and Beam Line Program – II

- ISAC recognizes that the VUV/SX capabilities have been improved and feel that an appropriate fraction of available resources have been assigned for this important restructuring.
- International collaborations – ISAC supports a phased shutdown of BL20B assuming that the instrumentation and support can be maintained at a level where users can obtain excellent access and data. ISAC also continues to support enthusiastically the Indian BL effort. It is important to better articulate and quantify the arrangements and understand how this will be mutually beneficial to both parties.



# ERL Project

- ISAC continues to strongly support the ERL development in that it offers a route to next generation performance that compliments Spring-8, XFELs and other Japanese light sources. Further, it is clear that the important strong engagement of the KEK accelerator division is ongoing and is a key to positioning KEK to be at the forefront of future light source development.
- Developing a compelling science case for the ERL project and facility, including organizing and involving the user community, should continue to be a very high priority. We note for example the upcoming science case workshop as a positive step. PF and KEK are strongly encouraged to continue in this direction.
- Identify commonality among the future accelerator projects at KEK and better integrate and include the ERL (and PF) in this core accelerator technologies” program. Significant progress in design and critical R&D has been observed by ISAC and PF and KEK are to be strongly complimented and encouraged.
- ISAC applauds the renaming of the “test facility” to the Compact ERL and redefining of the technical objectives and science case. This project is a very important “stepping stone” to the x-ray ERL.

## Other Conclusions and Comments

- ISAC believes that theory is an increasingly important aspect of progress in many of the science focus areas, especially as the complexity of the problems being addressed grows very large. PF should strategically look to use opportunities for in house appointments and collaboration with outside theory groups to form strategic alliances that bring strong theory components to the selected areas of excellence.
- IVCAG program – ISAC does not see medical imaging as a key area of excellence. We endorse and support the subcommittee recommendations. If external funding for a microtomography end station is forthcoming, than such a development could have merit. However it should not come from the PF core budget.
- Single bunch operation – It was clear that the fraction of single bunch time should be assigned on the basis of scientific excellence. ISAC does recognize that PF offers unique scientific capabilities in this area. The performance of experiments carried out during this time should be carefully examined and benchmarked.

## Other Conclusions and Comments - II

- Educational beam line – in principal this is a good idea but it will require careful preparation and could consume significant resources. Impact on PF resources is of concern. PF is in a unique position to collaborate with outside universities and this is an appropriate direction. PF has been and remains a very important resource for graduate and postgraduate education and training – developing the next generation of scientists.
- ISAC was especially pleased with the level and quality of the science presentations. However, the talks could be more focused and shorter.
- ISAC would like to applaud the PF Director and Senior management for its strong leadership and vision during this past year.
- We thank the PF and outside Staff for their excellent science and technical presentations and openness in discussion. Also we thank the administrative staff for their outstanding organizational help and for the very fine hospitality in making our visit very comfortable and efficient.

# PF ISAC – Processes and Recommendations

- Experience of ISAC members with other advisory bodies suggests that a 3-year cycle is most effective. Membership should rotate on a staggered basis with two 3-year terms for each member being the norm. This longer period of time is especially important for continuity if the goal of 2 meetings per year is not met on average.
- ISAC strongly supports the formation of the Review Subcommittees and expresses its willingness to continue to fully engage in this important process. ISAC should see the reports, or at least a summary, before its meetings if at all possible.
- ISAC membership – we feel that the committee balance is appropriate and about the right size.
- ISAC found that the agenda for this meeting was too dense and rushed and there was insufficient time for discussion (including the need for more executive session time).
- Next meeting date – October or November ?