

Round Table Discussion of Synchrotron Light Sources and their Applications

Chairman's Summary

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President SESAME Council

Abstract. The satellite meeting was dedicated to applications of synchrotron radiation in the field of natural and applied sciences, with emphasis on developing Member States activities and future directions.

Participants: E. Duke (Diamond, United Kingdom), K. Bharuth-Ram (iThemba LABS, South Africa), H Hoorani (SESAME, Jordan), G. Paolucci (Elettra, Italy), S. Kailas (BARC, India), J. Cutler (Canadian Light Source, Canada), C. Llewellyn Smith (President SESAME Council) - chair, F Mulhauser (IAEA)

This is a summary of the main points that were made, by the members of the panel and the audience, in a lively discussion that was structured under a number of headings:

1. Future directions

- Free Electron Lasers will provide a major step forward in brilliance at specific energies with a time resolution in the sub-ps range giving access to the time domain typical of chemical bond formation. However, most applications studying matter at different wavelength and not requiring extremely high time resolution will still profit from the use of conventional synchrotron light sources.
- Detector development is not following the rate of machine development. This is a serious drawback.
- In certain communities, there is a strong need of higher through-put for experiments, which will need to be solved both by adding new machines and developing techniques on existing ones.
- Compact light sources are being developed for utilization in very specific applications.

2. Applications

- Developing applications include: archaeometry, environmental science, and biology (such as imaging of cells) - although synchrotron radiation is now widely used by biologists in many countries particularly in the area of macromolecular crystallography.
- Synchrotron sources have a very broad range of applications. There is, however, a strong case for some laboratories to select one or two areas in which they can become a world leader, e.g. the Canadian Light Source is focusing on Environmental science. It can be difficult for a single laboratory working in isolation to cover all scientific fields.

3. Links between Synchrotron laboratories

- Partnerships (via Memorandums of Understanding) are necessary to allow expertise to be shared between different facilities. Builders of new sources need to visit existing ones to benefit from their experience. Synchrotron facilities have a strong track record of international co-operation which has paid dividends in the development of the scientific community.
- It is important that members of the SR community know about other techniques, such as ion beam or neutron scattering, in order to use the best tool to answer the questions they are addressing. Relationships with other institutions that house complementary devices are necessary.
- A lot of SR work is interdisciplinary and the use of several techniques is often required to provide the answers to the scientific questions.

4. SR in developing countries:

Existing facilities are in Brazil, China (including Taiwan), India, South Korea, Russian Federation and Thailand with other facilities planned or under construction elsewhere, including SESAME in Jordan.

4.1. *Status in India*

- Two machines, one at 450 MeV which has 6 beamlines and one at 2.5 GeV which will ultimately have 12 beamlines.
- Scientists are using other facilities covering a wide spectrum of applications while building the new one at home. So far, many Indian researchers are working and using facilities such as Elettra, BESSY, and SR sources in Japan.

4.2. *Status in South Africa*

- South Africa started to build a user community in 2000, and has hosted a few ‘Science at Synchrotrons’ workshops, with the last one in early 2009.
- SAF scientists and students engaged in several projects at ESRF, Elettra and the Brazilian light source.
- There is strong support from Soleil (France): an MoU has already been signed.
- A feasibility study has begun to build a machine in South Africa.

4.3. *Status of SESAME*

- There is still a lack of awareness of potential utilization of SR in the region. However those who are aware of the techniques available are enthusiastic about the facility and keenly awaiting its completion.
- Starting collaborations with developed countries seems relatively easy; starting collaboration between SESAME members is harder.