

放射光シングルバンチ利用研究：イントロダクション

Introduction to research with single-bunch synchrotron radiation.

東 善郎
Yoshio Azuma

*Faculty of Science and Engineering, Sophia University, Kioi-cho, Chiyoda-ku, Tokyo 102-8554, Japan.
e-mail: y-azuma@sophia.ac.jp*

The organization of this workshop was motivated by a particular statement on the “Report from the 2nd Meeting of the Photon Factory International Science Advisory Committee (ISAC)” held in March 4-5, 2008.

Quote from Section 7, ISAC 2008:

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.

I am confident that the number and performance of experiments presented here in this workshop would allow us to be optimistic about the scientific excellence of the single-bunch community at the Photon Factory, and we will pass any examination and benchmarking as suggested in the ISAC report with flying colors.

The strongest asset of the single-bunch community at the Photon Factory is the fact that the 2.5 GeV ring is one of the best facilities in the world in terms of single-bunch light source performance (lifetime, current, timing characteristics, temporal and spatial stability, bunch purity etc.). This is due to the technical refinement achieved over many years of operation experience, and in particular, due to the recent implementation of top-up injection. Also, new chopper technology under development further amplifies the SB capabilities. In the world today where third generation sources have already been around for more than a decade, it should be most advantageous to further develop and exploit such very unique characteristics.

Another aspect evident from the program is that research with single bunch as of now tends to be carried out by relatively small groups. This reminds us of the earlier years of synchrotron radiation research. When I started working with synchrotron radiation as a postdoc, a major charm that I perceived of this area was the fact that this was *small science attached to big science* and we could enjoy the best of both worlds. At most third generation facilities today, with the development of sophisticated experimental stations, the situation has been changing to *medium-big science attached to big science*.

One should not overlook the fact that many major developments in basic research methodology came from small science, as one can easily see by checking the areas in which the Nobel Prize has been awarded. With small science, the important part of the work tends to be in the flexible devising of experimental methods on a daily basis. Therefore it is an area suitable for pursuit by in-house staff members and outside collaborators working closely together.

Single bunch operation requires no major funding to implement. Only beamtime allocation and peripheral instrumentation funding would be necessary. Thus it is perhaps the most cost efficient way of enhancing the performance of the Photon Factory. Also, in light of the official plan to build the ERL, it is of utmost importance to promote research with time resolved methodologies.