EDITORIAL

The present volume of the journal is different from the others. It initiates recollections of Polish researchers using the synchrotron radiation in the difficult first years (mostly 1980's) of exploitation of the light emitted by the storage rings. The studies were difficult, but also exciting, because the users frequently had to design and build an equipment of new type, they had no computers at their disposal, and had to fight with various problems including the long unpredicted shutdowns. This issue starts with a paper by Leif Gerward on his collaboration with Professor Bronisław Buras, an eminent Polish scientist (at school, I learned physics from textbooks of his authorship shared with Jan Ehrenfeucht; by the way, Jan Ehrenfeucht and his wife were neighbours and friends of my grandmother despite she had nothing in common with physics). From the Gerward's paper we do not only learn about the collaboration and inventions: we also discover how important is, sometimes, a coffee break, permitting for scientific interactions that finally lead to great achievements. Welcome to read this and the other three interesting stories about the early days of studies at synchrotron beams, as well as the abstracts and extended abstracts of lectures and contributions of both meetings, where the coffee breaks may, again, have some influence on the paths the Science is going along.

Wojciech Paszkowicz

SYNCHROTRON LIGHT NEWS

New type of intense light source reported*. February issue of *Nature Physics* provides an article by Schlenvoigt, *et al.*[a] reporting on the first successful combination of a laser-plasma wakefield accelerator, with an undulator to generate visible synchrotron radiation. With the pulsed light focused from a 5-TW optical laser into a 2-mm-wide gas jet, a beam of electrons accelerated to a peak energy of between 55–75 MeV has been obtained. The electron beam has been subsequently directed into a 1-m-long undulator producing light at the red end of the visible spectrum (with the wavelength of about 700-950 nm). This approach, that relies on the use of electron beams produced by a laser-driven particle accelerator, could substantially reduce, after some improvements, both the size and cost of synchrotron and FEL X-ray sources, the authors claim.

[a] *H.-P. Schlenvoigt, K. Haupt, A. Debus, F. Budde, O. Jäckel, S. Pfotenhauer, H. Schwoerer, E. Rohwer, J.G. Gallacher, E. Brunetti, R.P. Shanks, S.M. Wiggins, D.A. Jaroszynski, "A compact synchrotron radiation source driven by a laser-plasma wakefield accelerator", Nature Physics 4 (2008) 130-133.*

Free electron lasers based on the effect of self-amplified spontaneous emission (SASE-FELs) can deliver tunable, highly coherent monochromatic radiation in ultra-short pulses of only 10-50 fs and of peak power exceeding 1 GW in the wavelength range of XUV to X-rays[b]. SASE-FELs have been recognized as excellent sources capable to probe the dynamics of ultrafast processes, and to determine the structure of matter with unprecedented spatial and temporal resolution, inaccessible with other known types of radiation sources. After the theoretical predictions about a possibility of intense laser like emission at wavelengths shorter than UV have been successfully confirmed with XUV-FLASH in HASYLAB (Hamburg), the prototype of SASE-FEL facility, the construction of next three devices working in the range of hard X-rays started. SASE-FEL is a large-scale facility composed of a linear electron accelerator, a long undulator and bunch compressors (‘chicanes’) as its main parts. To initiate the SASE process in the undulator, the electron beam, in a form of a train of ultra-short bunches of possibly highest electron density, should be accelerated to energy up to a

[b] *R. Bonifacio, C. Pellegrini, L.M. Narduci, Opt. Commun. 50 (1984) 373–378.*

few GeV. This is achieved with a superconducting RF linear accelerator operating at an electric field that cannot exceed, at present, the intensity of about 40 MV/m. With this E-field, the accelerator should be as long as a few hundred meters to produce electron bunches of sufficient energy, making this way the whole FEL very large and expensive.

As it has been noted by Nakajima[c] in his interesting comment to the above-cited article by Schlenvoigt *et al.*, the laser-plasma wakefield accelerator can be an alternative to the RF linacs applied currently at SASE-FELS. It uses the immense electric fields produced in the plasma at the focus of ultra-high intensity lasers to accelerate electrons over distances of just centimeters. That is thousands of times shorter than a conventional particle accelerator. In addition, the relative energy spread of accelerated electrons can be soon minimized to the order of 0.1% for a 1-GeV beam, with an emittance down to 0.1–1.0 π mm mrad. With these parameters an electron bunch of length as short as 10 fs, and an effective beam current of up to 100 kA could be produced without the need for a compression in chicanes. This would substantially reduce not only the accelerator, but also the required undulator length to just a few meters, instead of more than a hundred meters, that are necessary in X-FEL.

New infrared beamlines anounced**. New beamlines have been announced: (i) at FLASH, DESY, combining coherent IR pulses with the FEL radiation in the VUV spectral range[d], and (ii) at Ritsumeikan University for an infrared microspectroscopy.[e] A new beamline in this spectral range is also planned at the University of Wisconsin for medical applications[f] where multiple overlapping beams will be used to homogenously illuminate the sample area.

Upgrade for the European Synchrotron Radiation Facility**. After fourteen years of successful work of the facility, an upgrade is decided. The upgrade has an aim to maintain the ESRF at the status of one of leading third-generation light sources. In particular, up to 10 new beamlines are planned.[g]

Agreement on Collaboration*****:** On April 8th, 2008, an Agreement on Collaboration between the Polish Synchrotron Radiation Society, PSRS (Polskie Towarzystwo Promieniowania Synchrotronowego – PTPS) and the Centre for Synchrotron Radiation Ltd. (Centrum Promieniowania Synchrotronowego Sp. z o.o. – CPS) has been signed. The PSRSS organisation has over 16 years experience in various forms of activity in the synchrotron users community. The CPS company has been created two years ago with the initiative of the Jagiellonian University in order to carry out the preparatory actions which eventually lead to the construction of a synchrotron light source in Poland and the creation of the National Centre for Synchrotron Radiation. The Agreement will notably contribute to the effectiveness of the mandatory actions of both institutions. In particular, the parties agree on co-ordination of their educational and scientific popularisation activities in the field of applications of the synchrotron light. The important elements of the common efforts consist in promotion of the synchrotron radiation as an exceptionally effective investigation tool in *e.g.* material engineering and medical sciences, and other fields where these methods are in Poland not widely enough used.

Meetings****:**

Interaction of Free-Electron-Laser Radiation with Matter, Hamburg 2008. A workshop *Interaction of Free-Electron-Laser radiation with matter: Recent experimental achievements, challenges for theory*" is to be held on 8-10 October, 2008 at DESY, Hamburg. It is devoted to recent experimental and theoretical achievements based on studies on the interaction of intense VUV and soft X-ray FEL radiation with matter.[h]

8th National Symposium of Synchrotron Radiation Users, Cieszyn 2009. *The 8th National Symposium of Synchrotron Radiation Users* (8th KSUPS) will be organised by the Polish Synchrotron Radiation Society in co-operation with the University of Silesia in Cieszyn on 24th – 25th September 2009. Welcome!

Picked up for you by:
*J. Pełka (*), W. Paszkowicz (**,) and E.A. Görlich (***).*

---

[c] *K. Nakajima, "Compact X-Ray sources. Towards a table-top free-electron laser", Nature Physics 4 (2008) 92-93.*

[d] *M. Gensch, L. Bittner, A. Chesnov, H. Delsim-Hashemi, M. Drescher, B. Faatz, J. Feldhaus, U. Fruehling, G.A. Geloni, Ch. Gerth, O. Grimm, U. Hahn, M. Hesse, S. Kapitzki, V. Kocharyan, O. Kozlov, E. Matyushevsky, N. Morozov, D. Petrov, E. Ploenjes, M. Roehling, J. Rossbach, E.L. Saldin, B. Schmidt, P. Schmueser, E.A. Schneidmiller, E. Syresin, A. Willner, M.V. Yurkov, "New infrared undulator beamline at FLASH", Infrared Phys. Technol. 51 (2008) 423-425. (Proc. 4th International Workshop on Infrared Microscopy and Spectroscopy with Accelerator-Based Sources)*

[e] *T. Yaji, Y. Yamamoto, T. Ohta, S. Kimura, "A new beamline for infrared microscopy in the SR center of Ritsumeikan University", Infrared Phys. Technol. 51 (2008) 397-399. (Proc. 4th International Workshop on Infrared Microscopy and Spectroscopy with Accelerator-Based Sources)*

[f] *http://src.wisc.edu/meetings/UM2007/abstracts/ Hirschumgl_Abstract_SRC_UM2007.pdf.*

[g] *C. Detlefs, "Upgrade of An Upgrade for the European Synchrotron Radiation Facility", Synchrotron Radiation News 21 (1) (2008) 35-40.*

[h] *https://indico.desy.de/conferenceDisplay.py?confId=798.*