Preface

The Regular 13th Russian Conference on Synchrotron Radiation was held at the G.I. Budker Institute of Nuclear Physics, Novosibirsk in the period from 17 to 21 July, 2000. The Conference was opened by the Director of INP, academician A.N. Skrinsky who in his welcome speech reminded that this Meeting was to some extent the jubilee Conference: 25 years passed from the time of the First All-Union Conference of the use of Synchrotron Radiation held in Novosibirsk. For the years passed since that time the SR world community extended substantially and the most important that the range of SR using expanded significantly both in research and applications.

Russian National Conferences of SR Usage are stemmed from the first Novosibirsk Meeting on Using of Electron Storage Rings–SR Sources (1975). The experiments using SR beams at the Novosibirsk Institute of Nuclear Physics were started on July, 1973, when the X-ray SR beam was first extracted from the storage ring VEPP-3. Soon after that, the team of Prof. M. Mokulsky from the Moscow Institute of Molecular Biology obtained first SR-diffractograms for determining the deoxyribonuclease. The number of research teams at VEPP-3 grew fast and already in 1975, by the initiative of the founder and Director of INP, Novosibirsk, academician G.I. Budker the first Meeting was held with title included the field of SR application at that time: the First Meeting on Using Electron Storage Rings–SR Sources for Experiments in Biology, Solid State Chemistry and Physics (SR-75). At SR-75, only four reports were presented on experimental results with SR beams from the INP storage rings VEPP-2 and VEPP-3: by M. Mokulsky on X-ray structural studies of deoxyribonuclease, by A. Vazina on a study of structure of biopolymers with large periods, in particular, muscle structure in vivo, by I. Ovsyannikova on X-ray spectral study of catalists, by E. Glusking on a study of X-ray absorption spectra of chemical compounds in an ultra-soft X-ray region and by I. Koop on the conceptual project of the future Storage Ring–SR source for the Moscow region (presently the Kurchatov Synchrotron Radiation Center).

Next Meetings were held thereabouts biannually from 1977 and since 1982 they have got the status of National Conferences (Table 1). The basic place for holding these Conferences remains the Budker Institute of Nuclear Physics, Novosibirsk, which is for about 27 years the basic place in Russia for carrying out studies with synchrotron radiation (SR) and free electron lasers (FEL).

Proceedings of the first Russian Conferences were published in Russian and beginning from 1986, both Russian and English became official working languages at Conferences and Proceedings were published in English in special issues of Nuclear Instruments and Methods in Physics Research.

13th Russian Conference (SR-2000) attracted the attention of many Russian and foreign scientists. 222 official participants of the Conference represented 33 Institutes of the Russian Academy of Sciences and foreign research centers from Czechia, Germany, India, Japan Kazakhstan, Republic Korea, Switzerland, Ukrain and USA. During the Conference there were 63 oral and 105 poster presentations and about 100 of them were selected in the Conference Proceedings.

The scientific program of the Conference covered the following themes:

- Status reviews and scientific programs of various centers;
- SR sources and free electron lasers;
- Wigglers and undulators;
- Application of SR in physics, chemistry, catalysis, ecology, biology medicine, geology, metrology and other research fields;

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Table 1
Russian synchrotron radiation conferences

1.	I Meeting on Using of Electron Storage Rings—SR Sources for Experiments in Biology, Solid State Chemistry and Physics (SR-75)	December 16–18, 1975	Novosibirsk
2.	II Users Meeting on Synchrotron Radiation Research (SR-77)	February 8–10, 1977	Novosibirsk
3.	III Conference on Using of Synchrotron Radiation (SR-78)	March 28–30, 1978	Novosibirsk
4.	All-Union Seminar on Synchrotron Radiation Utilization (SR-79) Satellite meeting: II Russian–Britain Seminar on Synchrotron Radiation	September 24–26, 1979	Moscow
5.	IV Conference on Synchrotron Radiation Utilization (SR-80).	October 8–10, 1980	Novosibirsk
6.	V All-Union Conference on Synchrotron Radiation Utilization (SR-82)	July 27–29, 1982	Novosibirsk
7.	VI All-Union Conference on Synchrotron Radiation Utilization (SR-84) Satellite meeting: Soviet–American Seminar on Synchrotron Radiation Utilization	July 4–7, 1984	Novosibirsk
8.	VII All-Union Conference on Synchrotron Radiation Utilization (SR-86) Satellite meetings: Seminar "EXAFS Spectroscopy" Seminar "Microtrons"	June 3–5, 1986	Novosibirsk
9.	VIII USSR National Conference on Synchrotron Radiation Utilization SR-88	August 18–22, 1988	Novosibirsk
10.	IX USSR National Conference on Synchrotron Radiation Utilization SR-90	June 26–29, 1990	Moscow
11.	X National Synchrotron Radiation Conference SR-94	July 11–15, 1994	Novosibirsk
	Satellite meeting: Workshop on Russian–American Project JEDIALT (Joint Economic Development Initiative–Advanced Light Technologies)	July 8–9, 1994	
12.	XI Russian Synchrotron Radiation Conference SR-96	July 9–12, 1996	Novosibirsk
	Satellite meeting: IV Russian-French Seminar on Use of Neutrons and Synchrotron Radiation in Condensed Matter Studies	June 25–July 2, 1996	Novosibirsk–Irkutsk
13.	XII Russian Synchrotron Radiation Conference SR-98 Satellite meetings: "Generation of intense beams of slow positrons with the help of SR" "High-power free electron lasers and their application"	July 13–18, 1998	Novosibirsk
14.	XIII Russian Synchrotron Radiation Conference SR-2000 Satellite meeting: "Powerful FELs and their applications"	July 17–21, 2000	Novosibirsk

- SR experimental technique;
- Synchrotron radiation instrumentation, X-ray optics and X-ray detectors;
- Usage of SR for X-ray lithography and micromechanics;
- Generation and application of slow positrons using hard SR beams.

The first session was devoted to plenary talks on the status of SR sources and centers. Status reports of three Russian SR centers (two operational and one under development) were presented in reports by G.N. Kulipanov (Novosibirsk), V.G. Stankevich[1] (Moscow), and I.N. Meshkov (Dubna).

The Siberian Synchrotron Radiation Center (SSRC) based on laboratories of the Budker INP remains the basic site of synchrotron radiation research in Russia. Presently, SSRC has three storage rings–synchrotron radiation sources and 23 experimental stations operational and under development. In addition to experiments with SR beams, a great amount of work at SSRC is devoted to the development of components for new SR sources as bending and multipole magnets, strong field superconducting wigglers, undulators, and supplementary experimental equipment, as X-ray optics and detectors. SSRC is open for Russian and foreign researchers.

An important stage in the development of the second Russian SR center—the Kurchatov SR Source (KSRS, Moscow) is completed. The official procedure of commissioning KSRS was held

[1] Not submitted by authors for publishing in this Proceedings.

at the end of 1999. Electron storage rings for KSRS were developed, manufactured and installed by the staff of the Budker INP. The complex comprises two operational dedicated electron storage rings—SR sources: Siberia-I (450 MeV) and Siberia-II (2.5 GeV).

The Project DELSY (the Dubna Electron Synchrotron) is aimed at the development of the SR source of "nearly third generation" at the Joint Institute of Nuclear Research (JINR, Dubna). DELSY is based on the equipment of the accelerator complex transferred to Dubna from NIKHEF, Amsterdam, the Netherlands. Superconducting wigglers with a field up to 10 T developed and manufactured at Budker INP, Novosibirsk will enable the generation of quite hard X-ray radiation on DELSY at comparatively low electron energy of 2.5 GeV.

At the free electron lasers session proceeded in the form of Seminar, the most attention of the audience were attracted three reports: by S. Miginsky (Budker INP) on the status of the high-power (100 kW) FEL for IR-range being under development in Novosibirsk for the Siberian Centre for Photochemical Research incorporating an eight-turn 100-MeV accelerator–recuperator, by A. Chernyshev (Institute of Chemical Kinetics and Combustion, Novosibirsk, Russia and IR FEL Research Center, Science University of Tokyo, Japan) on the status of the experimental installation for a multiphoton dissociation and separation of isotopes in a gas medium (FEL-SUT) and by V. Litvinenko (FEL Lab, Duke University, USA) on performance of the record short wavelength ultraviolet FEL based on the OK-4 undulator system produced at Budker INP and installed at the Duke storage ring.

In Section "Instrumentation and methods", it is worth mentioning first of all a very interesting series of works performed in the latest years by colleagues from Novosibirsk Institutes of Hydrodynamics, Solid State Chemistry Budker INP on the development of the method of a super high rate diffractometry by the impact deviation of an electron beam in the storage ring and application of this technique for studies of explosion processes. Time resolution attained at VEPP-3 is 250 ns. However, with the further development of this method at SR-sources of the third generation it is quite realistic to obtain diffractograms in time of the order of 1 ns. The results and prospects of these studies were presented in the talk by B. Tolochko (Institute of Solid State Chemistry and Mechanochemistry, Novosibirsk) on the instrumentation for "in situ" investigation of the rapid structure changes during phase transformations with nanosecond time resolution and in a poster by K. Ten (Lavrentiev Institute of Hydrodynamics, Novosibirsk), et al., on methods of research of detonation and shock-wave processes with the help of SR.

One of the achievements in the last few years in the field of X-ray optics is the development of the planar X-ray waveguides with a lateral pumping, which enable more than 100 times increase in the radiation intensity, for using this beam in various schemes of X-ray microscopy, holography and diffractometry with submicron space resolution. In analogy with standing wave excitation in resonator, the SR beam at the exit of this waveguide is a coherent X-ray source of 30–40 nm width. Experimental results of this work were presented in the report by V. Chernov (Institute of Catalysis, Novosibirsk). Another type of X-ray optical elements of high resolution parabolic refractive lenses was presented in the talk by V. Aristov[1] (IMT RAS, Chernogolovka, Russia). In practice, both the planar waveguides and parabolic refractive lenses were experimentally tested with SR beams of ESRF. Unprecedented approximately 300-fold amplification (the ratio of the incident beam flux density to the excited TE_0 mode one) was observed at 8 keV using planar X-ray waveguides in experiments at VEPP-3 storage ring.

In parallel with the new techniques the traditional X-ray optics gave a demonstration of a good progress. The results of interest were reported in a poster by A.D. Akhsakhalyan (Institute for Physics of Microstructures, Nizhnii Novgorod) on X-ray focusing using bent crystals and a talk by V. Chernov[1] (Institute of Catalysis, Novosibirsk) on X-ray secondary analyser using flat-ring-shaped radial-graded multilayer.

Concerning the new types of X-ray detectors it seems to be of interest a talk by A.A. Drozdetsky (Budker INP, Novosibirsk) on a new parallax free one dimension X-ray detector without any principal limit on the angle of registration of γ-quanta and the registration rate up to 10^7 photons/s.

In the Session "SR applications in biology, medicine and environment" it is worth mentioning the studies of reconstruction of environmental conditions in the past, namely the talk given by E. Goldberg (Limnological Institute, Irkutsk) on application of SR X-ray fluorescence analysis for a study of climate change of Eurasian continent from bottom sediments of the Lake Baikal Teletskoye. The paleo-recordings were studied in cores of the Lake Baikal sediments over the time interval of Brunches Epoch (0–780 000 years). Melankovich periods from 19 to 413 000 years were separated in the obtained Fourier-spectra of geochemical paleo-indicators. All Earth's orbital periods: eccentricity—96 ky, tilt—41 and 54 ky, precession—23 and 19 ky are present in records. For the Teletsky Lake, paleo-recordings of concentrations of tracer elements containing the data on the average annual temperature and periods of solar activity cycles for the last 600 years with the 1.8 year resolution.

A talk by K. Horiuchi (University of Tokyo) on decrypting a nature of variations of cosmogenic beryllium-10 influx in sediments of Lake Baikal consider to be the important addendum to information by E. Goldberg. A possibility of use the profiles of cosmogenic Be-10 in the sediment cores for quantitative computing of sediment accumulation rate with free sampling frequency and, consequently, dating of horizons with inaccessible no other methods by accuracy is extremely powerful conclusion of the Horiuchi's model, if it is really correct.

At the session on wigglers, undulators and generation of slow positrons at the centre of attention was the talk by N. Mezentsev (Budker INP, Novosibirsk) on fabrication and application of the high-field (up to 10.3 T) superconducting wigglers in Budker INP. The work on simultaneously creation of two superconducting wigglers for acceleration centers BESSY-II (Germany) and SPring-8 (Japan) was finished in 1999. The application of high-field wigglers gives the opportunity to shift the radiation spectrum of the already built SR sources to the area of shorter wavelengths, increase significantly the SR power and to conduct new experiments. The other area of application of such wigglers is generation of the intensive beams of slow positrons by conversion of the MeV-region X-ray SR beam. The physical aspects of one of the types of slow positrons generator are analyzed in a poster by V.I. Volosov, N.A. Mezentsev and O.I. Meshkov (Budker INP, Novosibirsk) "Conceptual design of a slow positron source based on a mirror magnetic trap".

Organizers of SR-200 Conference appreciate greatly the financial support of Ministry of Industry, Science and Technology of Russian Federation, Russian Fund of Basic Research (RFBR grant 00-02-26094) and Grant Council of RF President and Governmental Support of Leading Scientific Schools (RFBR grant 00-15-96805).

G.N. Kulipanov
(Chairman of the Conference)
M.V. Kuzin
(Executive Secretary of the Conference)
D.I. Kochubej and V.B. Baryshev
Budker Institute of Nuclear Physics
Novosbirsk, Russia