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TOWARDS ESTABILISHING OF NATIONAL CENTRE OF SYNCHROTRON RADIATION IN POLAND

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Synchrotron radiation facilities (SRF) are established part of contemporary world research landscape. They facilitate fast advances of life, health, and physical sciences as well as development of new technologies. The extent of synchrotron radiation use has been growing up steadily for the last two decades all over the world and it is anticipated that the growth will continue in future. Growing community of synchrotron radiation users has generated increasing demand for the beam-time in infrared, vacuum UV and X-ray ranges. In response, many new synchrotron radiation facilities are now being constructed and planned, not only in large countries of strong economy but also in developing countries. Interesting trends concerning SRF are observed in Japan where large and medium scale installations, intended to deliver photon beams of extreme brightness and energy, are constructed side by side with small, university-based devices, that still have many orders of magnitude better characteristics than laboratory sources. It is expected that such trends will be followed in other parts of the world. No doubt, the "cutting edge" of research activity will continue to create the demand for beams of higher brightness, flux and photon energy (which can be satisfied only at large scale facilities) but it is predictable that the increasing fraction of research done presently with laboratory radiation sources will be shifting towards small-scale synchrotron radiation facilities. Several hundred Polish scientists, a meaningful fraction of all synchrotron radiation users, take part in experiments using synchrotron sources all over the world. Many of them belong to the Polish Synchrotron Radiation Society – an active body promoting the use of synchrotron radiation for better quality of scientific research and organizing seminars and conferences devoted to synchrotron radiation annually since early nineties.

If we do not invest in the future we shall fall behind[1]**.** Present European Union priorities include knowledge, research and innovation as the key priorities and a pillar of development and stable welfare of Europe. Poland as a new member of EU will have to conform to the EU policy. The government strategy published in 2004 assumes a fast increase of investments in research and development sector starting from 2005. Improving economy allows for even more expectations. No other scientific research installations has had such major impact on advances in science an technology as the synchrotron radiation laboratories. It is obvious that the time is ripe now for establishing a National Centre of Synchrotron Radiation in Poland.

Recently, several Polish educational and research institutions constituted around the idea of Polish SRF. The initial objective was to support relocation of old French synchrotron "SuperACO". The relocation project was dropped in July 2003 after a negative opinion formulated by the Polish Ministry of Scientific Research and Information Technology. However, the opinion was not concerned with the idea of SRF in Poland in principle, and the importance of synchrotron radiation for contemporary research was clearly appreciated by officials of the Ministry.

The initiative group has asked Polish users of synchrotron radiation to submit a brief description of proposed research projects to be realized at the new facility. In our presentation a review of research proposals currently proposed by Polish scientists will be presented with the aim to determine a set of technical requirements necessary for future synchrotron light source planed to be constructed in Poland. Authors of six out of 23 projects indicated interest in photon energies over 4 keV but only three of them exclusively. Although the number of projects is limited, which is quite understandable given the undefined future of the Polish SRF, such a poll indicates that there exist considerable interest in use of synchrotron radiation of energies that can be provided by a small-scale source. Also, it has to be taken into account that starting 1st July 2004 Poland will become a member of ESRF Consortium and user's demand for the beam-time in hard X-ray range will be, at list partially, satisfied on more regular basis at ESRF.

It is recognized that synchrotron radiation users are the most interested in use of radiation from insertion devices, preferably undulators, because of the beam quality, brightness and stability that enable studies of microscopic samples, high energy resolution, and fast data acquisition. There exist also considerable interest in radiation of controlled polarization (circular/eliptical/linear) provided by undulators of special construction. Similarly attractive are undulators which allow for fast tuning of photon energy while maintaining stability of the beam. Such improved radiation sources of third generation have

1) *Romano Prodi, plenary session Strasbourg, 14 January 2003.*

become available recently, thanks to development of accurate design and manufacture of complex magnet systems and due to improved control techniques. Several possibilities concerning the source for Polish SRF, are being evaluated. For obvious reasons, solutions which could be accommodated in realistic budget, of the order of 10^7 €, have been looked for. At first, solutions similar to, those adopted for Hiroshima Synchrotron Radiation Center (HSRC) at University of Hiroshima based on synchrotron Aurora-2D manufactured by Sumitomo corp., or those adapted for Singapore Synchrotron Light Source at University of Singapore based on synchrotron Helios-2 by Oxford Instruments are discussed. Both Aurora-2D and Helios-2 sources base on the concept of racetrack type electron storage ring. The advantages of such solution is the low cost of initial installation, low maintenance cost and the completeness of the system delivered ready to use with injector microtron and with control systems. The drawbacks are: i) the moderate ring performance resulting mainly from large beam emittance, ii) and small to none possibility of upgrading such device. Alternative solution taken into account is a design of dedicated compact storage ring in close cooperation with Berliner Electronenspeicherring Gesselschaft fur Synchrotronstrahlung m.b.H (BESSY) construction team. The storage ring could be in fact made similar to the recently developed Metrology Light Source being currently designed in BESSY for Physikalisch Technische Bundestanstalt. In course of consultations with BESSY specialists it has been established that a 1 GeV ring could be designed within similar conceptual framework. The ring could accommodate several insertion devices including superconducting wiggler. The insertion devices could be manufactured at moderate cost at Budker Institute of Nuclear Physics in Nowosibirsk as well as in BESSY. A preliminary time schedule and the budgetary requirements for planned Polish National Center of Synchrotron Radiation will also be presented.