



SSRF

Shanghai Institute of Applied Physics  
*Shanghai Synchrotron Radiation Facility*

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*2010* Annual Report

## Overview

Shanghai Synchrotron Radiation Facility (SSRF), a third generation medium-energy synchrotron light source, is a national key scientific project jointly constructed by Chinese Academy of Sciences (CAS) and Shanghai Municipal Government. The project was ranked as the major scientific project and one of the first-priority scientific and technological projects promoting the city's development in science and education.

Located at No.239, Zhangheng Road, Pudong Zhangjiang Hi-Tech Park, occupying an area of about 200,000m<sup>2</sup>, SSRF consists of a 150MeV linac, a full-energy booster, a 3.5GeV electron storage ring, 7 first-phase beamlines and experimental stations, equipments and buildings.

With the capacity to install tens of beamlines, SSRF is able to simultaneously supply the synchrotron light to about 100 experimental stations. As a world-class high-performance scientific experimental platform, SSRF will provide irreplaceable experimental methods for basic science,

applied disciplines and hi-tech development research in various fields, which includes life science, material science, earth and environmental science, nano-tech, medicine and pharmacy, chemistry and chemical engineering, and micro-fabrication. Supported by SSRF, an important scientific and technological innovation base will be established in China.



Experimental Hall

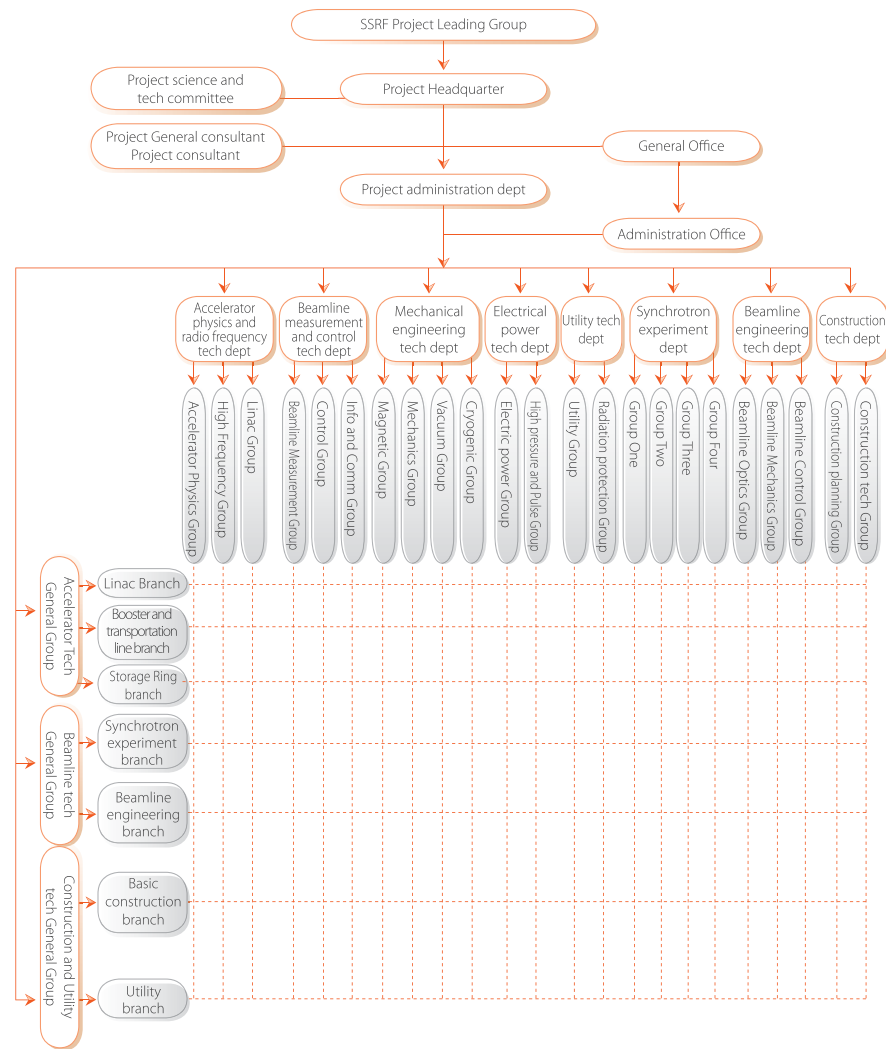


SSRF Snowscape

## Organization

The Leading Board	President: Lu Yongxiang Vice President: Han Zheng
The Science and Technology Committee	Director: Fang Shouxian Deputy Director: Xian Dingchang, Yang Fujia, Chen Senyu
The Project-Steering Board	Director: Jiang Mianheng Deputy Director: Yang Xiong General Advisor: Chen Shenyu
Managers of the Project	General Manager: Xu Hongjie Vice General Manager: Zhao Zhentang, Ding Hao

## Organizational framework



## Research progress and results

SSRF is a large integrated experimental research platform that supports the edge-cutting basic science and Hi-tech research of various disciplines. Since its operation, it has shown gradually its importance in enhancing China's innovation ability in scientific and technological fields. At present, the requested beam time from user is 3-5 times of the available beam time of the facility. (The facility plays an obvious role as a national experimental research platform. Due to its fewness in the world, the number of users in the second year exceeds 2000.) And quite a few important achievements were obtained through the researches in SSRF, some of which are issued on international top-ranking publications such as Science and Nature. Furthermore, several enterprises have utilized SSRF for the technological development in pharmacy, chemical engineering and technical appraisal. Benefits come along with their effective R & D.

List of Experimental Achievement Articles of the Users in SSRF SCI Block I (2010)

Serial. No.	Beamline	Research Group	Organization	Journal	Impact Factor
1	BL14B1	Led by Yang Ping	Singapore Synchrotron Light Source(SSLS)	Adv. Funct. Mater. 21, 133–138(2010-11-25)	6.99
2	BL14W1	Led by Bao Xinhe	Da Lian Institute of Chemical Physics, CAS	Science, 328, 1141–1144 (2010)	28.103
3	BL14W1	Led by Fu Qiang	Da Lian Institute of Chemical Physics, CAS	JACS	8.58
4	BL16B1	Led by Li Liangbin	University of Science and Technology of China(USTC)	Macromolecules, 43:602–605 (2010-1-26)	4.407
5	BL16B1	Led by Zheng Sixun	Shanghai Jiaotong University	Macromolecules, 43:2960–2969 (2010-3-23)	4.407
6	BL16B1	Led by Zheng Sixun	Shanghai Jiaotong University	Macromolecules 43 (24):10600–10611(2010)	4.407
7	BL17U1	Led by Shi Yigong	Tsinghua University	PNAS, 106:14837–14842(2009-8-17)	9.38
8	BL17U1	Led by Liu Zhijie	Institute of Biophysics, CAS	Cancer Research, 69 (18):7294-7301(2009)	7.514
9	BL17U1	Led by Yan Ning	Tsinghua University	Nature, 467, 734–738 (2010-10-7)	34.48
10	BL17U1	Led by Yan Ning, Led by Shi Yigong	Tsinghua University	Cell, 141(3): 446-457 (2010-4-30)	31.253
11	BL17U1	Led by Wang Xinquan	Tsinghua University	Nature Immunology 11:905–911 (2010-8-29)	26
12	BL17U1	Led by Xu Yanhui	Fudan University	Genes & Development, 24:235-240 (2010-9-4)	13.623
13	BL17U1	Led by Gao Fu	Institute of Microbiology, CAS	Nature Structural & Molecular Biology	12.273
14	BL17U1	Led by Xu Ruiming	Institute of Biophysics, CAS	GENES & DEVELOPMENT 24:1876–1881	12.075
15	BL17U1	Led by Zhou Congzhao	University of Science and Technology of China(USTC)	PNAS, 107 (28):12487–12492 (2010-7-13)	9.38
16	BL17U1	Rao Zihe	Nankai University	The EMBO Journal 29, 2566–2576	8.3

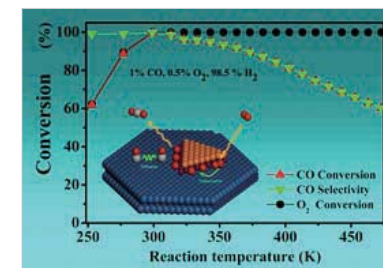
Serial. No.	Beamline	Research Group	Organization	Journal	Impact Factor
17	BL17U1	Led by Ding Jianping	Shanghai Institute of Biological Sciences, CAS	Journal of Immunology, 184: 1361 - 1368(2010)	6
18	BL17U1	Wang Jiangyun	Institute of Biophysics, CAS	J. AM. CHEM. SOC. 132(42), 14812–14818(2010-10-4)	8.58
19	BL17U1	Ye Keqiong	National Institute of Biological Sciences, Beijing	Nature	34.48
20	BL17U1	Led by Hu Yonglin	Institute of Biophysics, CAS	Plant Cell, 22: 3093–3104(2010-9)	9.293
21	BL17U1	Zhang Mingjie	The Hong Kong University of Science and Technology	Science	28.103
22	BL14B1	Led by Chen Ping	Da Lian Institute of Chemical Physics, CAS	Chemistry of Materials, 22: 3-5(2010)	5.046

### Achievements of BL14W Beamline: Research of the In-situ X-ray Absorption Spectrum of Pt-Fe Nano-catalyst

The research group led by Bao Xinhe, a CAS academician of Dalian Institute of Chemical Physics of CAS—a XAFS beamline user, and the theme group led by Prof. Huang Yuying in SSRF BL14W1 Beamline set up a close cooperative relationship and carried out the experimental research of X-ray absorption spectra of Nano-catalyst under the in-situ chemical reaction conditions. Through characterization of the in-situ X-ray absorption spectrum structure of Pt-Fe catalyst during the actual catalytic reaction process, it was found that when the catalytic reaction arrives at a steady state, the ferric species on the catalyst surface is under a low-valence ferrous state. This result validates the conclusion made through fundamental research and theoretical analysis by the theme team led by the academician Bao Xinhe. Important breakthrough was made in the construction, characterization and application research of coordinatively unsaturated ferrous (CUF) catalyst. This result was published on Science (*Science* 2010, 328, 1141) on May 28, 2010 and simultaneously reported by C&E News and Chemistry World.

The coordinative unsaturation and metal atom of nanostructure confinement is the active center of much multienzyme catalysis and homogeneous catalysis reactions. In the supported heterogeneous catalytic system, the controlled preparation of high efficient and stable active center that has the features similar to those of enzyme structure is of great importance to the development of heterogeneous catalysis and remains a huge challenge to the fundamental theory research of catalysis. With over 8

years of tough efforts, Fu Qiang, Ma Ding and Bao Xinhe from the Nano and Interface Catalysis Research Group and the researchers (such as Li Weixue) of Theoretical Catalysis Research Group of National Key Laboratory for Catalysis Foundation, Dalian Institute of Chemical Physics, CAS have innovatively and successfully created the Coordinatively Unsaturated Ferrous (CUF) theory by dint of the interface confinement effect resulting from the strong interaction between the surface of noble metals and the ferric atom in monolayer ferrous oxide membrane and in conjunction with the research result of surface scientific research and density functional theory (DFT) calculation. The selective oxidation of carbon monoxide in hydrogen-rich gas successfully eliminates the minor CO in fuel hydrogen in a high-efficiency way under the actual operation conditions of proton-exchange membrane fuel cell. This is the firstly reported actual application result of the high-efficiency elimination of the CO applied in fuel cell, and relevant catalyst preparation technology and catalytic reaction process have been submitted for the application for national invention patent.



CUF Catalyst Theory

The dynamic in-situ characterization of catalyst structure and catalysis process is crucial to clarify the catalytic mechanism. Featuring such non-replaceable advantages as high pass, high brightness, high collimation and adjustable wavelength, SSRF is a strong research tool for catalysis science field, especially for the dynamic in-situ research of high space resolution and high detection sensitivity. X-ray absorption fine structure (XAFS) is a unique effective method of synchrotron radiation for the research of local electrons around atoms and geometry. The combination of this method and corresponding technologies is very suitable for the research of the multi-composition and heterogeneous catalyst structure. SSRF BL14W XAFS beamline station is a high-performance X-ray absorption spectrum experimental facility on the basis of multi-staged Wiggler light source and at international level, which can be used for XAFS spectroscopy research of high energy resolution, high spectral purity, high signal-noise ratio and low content analysis. Through the close cooperation with the research group led by CAS academician Bao Xinhe, Dalian Institute of Chemical Physics, the technical and safety problems of on-site in-situ chemical reaction gas distribution system is solved, in-situ chemical reaction sample cell and temperature control system reconstructed, and the in-situ reaction system and experimental station data acquisition detection system integrated. Multiple sample tests and analyses as well as strict repeated experiments have been conducted to verify the reliability of results. The experimental result of in-situ XAFS of Pt-Fe catalyst during the actual catalytic reaction process reflects the existence of intermediate valence state of FeO and extraordinarily coincides with former theories and experimental analysis results. The result indicates that SSRF provides an advanced research platform for the research of China's catalytic science and makes important contribution to the development of edge-cutting sciences.

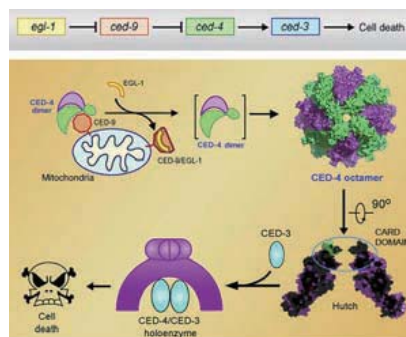
#### Results of BL17U Beamline Station: Breakthrough in the Research of CED-4 Apoptosis Structure and Functional Mechanism

The cells in human body are doomed to die: some deaths are physiologic, the others are pathological. In recent years, the research on cell death process has been a hotspot of biology and medicine research. Up to now, people have already known that there are at least two ways of cell death, i.e. cytolysis and apoptosis. Cytolysis is a way of cell death

early-recognized, while apoptosis is a way of cell death gradually recognized in recent years.

As a basic biological phenomenon of cell, apoptosis plays a decisive role in eliminating the aged and excess cells and maintaining the dynamic equilibrium of normal cells. It plays an important role in the evolution of organism, the stability of internal environment and the development of multiple systems. Apoptosis is not only a special type of cell death, but has also an important biological significance and complicated molecular biological mechanism. Apoptosis is a process of strict polygene control. With the development of molecular biological technology, we have understood multiple apoptosis processes to some extent, but as yet we are partially clear about the actual mechanism of apoptosis process. The disorder of apoptosis process may be directly or indirectly associated with many diseases. For cancer, autoimmune diseases and etc, many factors such as ray and medicine can induce apoptosis.

The reason why apoptosis becomes a research hotspot depends on the close relation between apoptosis and clinic therapy. This relation does not only clarify the mechanism of the apoptosis and the pathogenesis of immune diseases, but also results in the appearance of new disease therapy. Tumor generation and cancer are induced by multiple factors, but as a matter of fact, they are caused just because the obstruction of apoptosis makes cells increase without limitation. Neurodegenerative diseases such as Parkinson's disease, Alzheimer's disease and Huntington's disease are caused by the excess apoptosis of neuron cell. Therefore, the revealing of the molecular mechanism of apoptosis can not only make us get a better understanding of this basic life process, but can also provide clues to the development of new medication.



Schematic Diagram of Apoptosis Process

An important model organism for apoptosis research is *Caenorhabditis elegans*, because the programmed cell death gene of *Caenorhabditis elegans* is very similar to the apoptosis gene of human and mammal cells. The research group led by Professor Bob Horvitz of MIT won 2002 Nobel Prize because they, through genetics, revealed the linear regulation and control pathway of programmed cell death that consists of EGL-1, CED-9, CED-4 and CED-3.

The laboratory led by Professor Shi Yigong from the Life Science College of Tsinghua University has been always dedicated to the research of the apoptosis regulation and control mechanism. Professor Yan Ning from the Medical College of Tsinghua University won 2005 "Young Scientist Award" (North America) because her doctoral research revealed the mechanism, by which EGL-1 and CED-9 regulates and controls CED-4. Next important issue on this pathway is that it is not clear about the molecular mechanism, by which CED-4 activates CED-3 protease. The research groups led by Shi Yigong and Yan Ning have researched the structure and function of CED-4 apoptosis for about 10 years and ever gotten into bottleneck situation in midway. The research groups have successfully resolved 3.8 angstroms crystal structure of CED-4 in the laboratory of Tsinghua University until 2008, later acquired the data from 5 synchrotron radiations in U.S. Japan and China for over 10 times and finally revised the structure to 3.55 angstroms by utilizing the data from SSRF BL17U1 beamline. Through the biochemical analysis in recent two years, the research groups have finally broken through the research bottleneck and preliminarily revealed the mechanism, by which CED-4 regulates and controls CED-3. The research result was published on April 30, 2010 on CELL (2010, 141, 446-457), an international top-ranking biology journal.

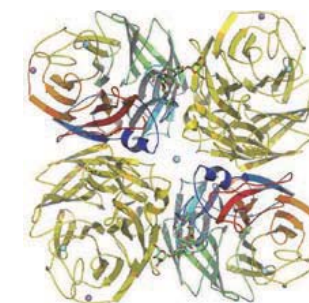
#### Achievements of BL17U Beamline Station: Firstly Resolve the Crystal Structure of Protein of The 2009 Influenza A Virus Subtype H1N1

Through about one year of hard work, the research group led by Gao Fu from the Microorganism Research Institute of CAS, a biomacromolecule crystallography beamline station user, has made great breakthrough in the research of the two important proteins—hemagglutinin (HA) and neuraminidase (NA) on the surface of the 2009 Influenza A Virus Subtype H1N1. Based on structural biology information, researchers found that the HA and NA of the 2009 H1N1 are very different from those of seasonal influenza virus. This explains spatially why the H1N1 is

epidemic to a large extent. This finding gives important guiding significance to the design and development of the medicines relating to the Influenza A Virus Subtype H1N1.

The outbreak of Influenza A Virus Subtype H1N1 in Mexico since March, 2009 has brought about huge economic and social losses. The gene fragment of the 2009 H1N1 generates from the rearrangement of the genes of fowl, human and swine-origin influenza viruses, and has very high similarity to the 1918 Pandemic Influenza Virus. Scientists from various countries have been devoted to the research of the two important proteins —hemagglutinin (HA) and neuraminidase (NA) on the surface of the influenza virus to explain the molecular mechanism for virus spreading and pathogenesis for the purpose of offering scientific basis for the prevention and control of further spreading. Chinese scientists have also actively performed relevant research in this field. Making use of the advantages of high brightness, continuously adjustable wavelength and good collimation of SSRF, the group led by Gao Fu acquired HA and NA diffraction data in SSRF BL17U1 beamline station and firstly resolved the crystal structure of the 2009 H1N1, with their research results published on *Protein & Cell* (2010, 1(5): 459-467) and the sub-journals of *Nature* such as *Nature Structural & Molecular Biology* (published online September 19, 2010).

Influenza virus evokes pathogenic factors of seasonal and epidemic influenza and adventitious Pandemic. The surface of virus has two important cyst membrane proteins: hemagglutinin (HA) and neuraminidase (NA). HA is responsible to identify the sialic acid receptor on the surface of host cell and assists the combination of virus cyst membrane and host cell, playing important role in the process of the ingression of virus into host cell. HA has



Overall Structure of the Cyst Membrane Protein (NA) of 2009 Influenza A Virus Subtype H1N1

immunogenicity and the antibody of anti-HA can neutralize the influenza virus. NA is responsible to eliminate the sialic acid from cell receptor and HA end, beneficial to the release and transfer of new virion and the prevention of virus aggregation. The research on these two proteins is of importance to the revealing of the pathogenicity, vaccine and medicine R&D of specific viral strain.

The research group selected the HA and NA of typical viral strain A/California/04/2009(H1N1) of the 2009 Influenza A Virus Subtype H1N1 as the research objects, expressed and purified these two proteins, and resolved their crystal structures with the resolution of 2.9Å and 1.9Å respectively by means of X-ray diffraction. Through 2009HA structure analysis, the researchers found that it is similar to the overall structure and the height of antigen positions (including 5 determined antibody identification epitope) of the 1918 Pandemic Influenza Virus HA, and that it is very different from seasonal influenza virus. It is supposed that 2009HA can be neutralized by the blood serum of the 1918 influenza sufferer or virus carrier. This viewpoint explained the phenomenon that the young are susceptible by the 2009 H1N1, while the older have stronger resistance, and the two articles issued on Science and Science Translational Medicine in the same period further validated this viewpoint. Furthermore, the 2009HA has some reinforced alkaline areas and can improve virus infectivity. Meanwhile, the researchers found that N279 site nearby 2009HA alkaline area has one glycosylation site more than seasonal influenza and 1918HA, and that the surplus glycosylation site obstructs the functions of alkaline area and may interfere with antibody identification to weaken virus toxicity but to

maintain the dynamic equilibrium of virus toxicity in order to ensure the virus to multiply and infect in the host body.

Neuraminidase (NA) of Influenza A Virus has 9 subtypes, which can be divided into two groups: Group 1 (N1, N4, N5 and N8) and Group 2 (N2, N3, N6, N7 and N9). The main structural feature of Group 1 of NA is that there is an extra cavern in the catalysis site, called 150-cavern. According to this special 150-cavern, some new NA inhibitors can be synthesized. Based on system generation analysis, the NA of 2009 Influenza A Virus Subtype H1N1 strain is a typical member of Group 1, but it's found that the 2009 NA has no 150-cavern in its crystal structure. It is supposed that the binding of the medicine for the 150 cavern is weak and even invalid to the 2009 H1N1. Therefore, the research findings are of important guiding significance for future drug design.

To sum up, the HA and NA of the 2009 H1N1 are very different from those of seasonal influenza, which may partially explain the reason why the 2009 H1N1 is epidemic. During the period ranging from November 2009 to May, 2010, the theme group led by Gao Fu visited SSRF BL17U1 beamline for 5 times and acquired about 40 sets of diffraction data, which provide important impetus to the completion of this project. SSRF has such advantages as high brightness, continuously adjustable wavelength and good collimation. With respect to data quality, the diffraction data acquired in SSRF is at the same level as the data acquired in Japanese Spring8. It is indicated that Chinese scientists can make full use of the advantages of SSRF and get to windward in the fierce international competition.

On January 19, 2010, SSRF project was accepted by the State. More than 200 persons including over 30 experts from National Development and Reform Commission, CAS, Shanghai Municipality, Ministry of Science and Technology, National Science Fund Committee, National Archives and Records Administration, and the honorable guests from some construction and research organizations, engineering cadres of SSRF project, attended the acceptance meeting. State Acceptance Committee was of opinion that the project contractors completed the construction on schedule, according to the indicators and at high quality. SSRF achieves outstanding performance under the least investment and at the most rapid construction speed among the similar devices in the world. It becomes one of the leading third generation synchrotron radiation light sources and sets a successful example in the construction of large scientific facilities in China. The State Acceptance Committee unanimously agreed that SSRF was accepted by the State.



State Acceptance

## Construction, operation and upgrading

### Completed on schedule and accepted by the State

After being approved by the State, SSRF began construction on Dec.25, 2004. Under the concern and support of the higher leaders and the leadership of Project Leading Board and Project Steering Board, SSRF was smoothly conducted and completed in April, 2009 on schedule.

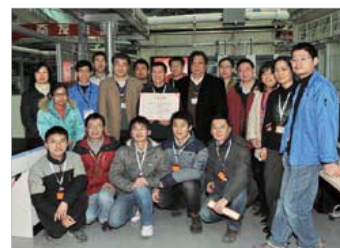
On January 6-7, 2010, the Bureau of Planning and Finance of CAS and Shanghai Municipal Development and Reform Commission organized a joint expert panel to review SSRF in terms of construction safety, finance, equipment and archiving. The review panel unanimously agreed that SSRF meets state professional acceptance conditions.

### Outstanding achievements in operation

As a national key innovation ability infrastructure, SSRF opens to the users in the field of fundamental research, application research, and hi-tech development research. Shanghai Institute of Applied Physics, CAS /SSRF National

Science Center (preparatory construction) are responsible for the operation, maintenance and upgrade of the facility. SSRF is a high-performance scientific experimental platform at international level. SSRF Users Committee assesses and reviews the experiment application twice a year. And the users can obtain SSRF experiment beam time following up the procedure: application—assessment and approval.

Users submit their applications to SSRF Users Office, within which they explain theme research background (purpose and meaning), experiment content, experiment plan (research content, research method), beam time request, etc. SSRF Users Committee is responsible to assess and review user applications; gives review advice to each application and decides whether to authorize the beam time request. SSRF National Science Center (preparatory construction) is responsible to implement the beam time

The 1000<sup>th</sup> SSRF user welcome ceremony

distribution plan made by SSRF Users Committee and provides beam time and experimental support for users to perform their research.

Since open on May 6, 2009, SSRF received its 1000th user on January 13, 2010 by holding a brief welcome ceremony in the Macromolecular Crystallography Station. Professor Teng Maikun from University of Science and Technology of China became the 1000th user of SSRF.

In 2010, SSRF received 1404 applications from users, beam time request up to 109332 hours. After SSRF Users Committee invited experts to assess the received applications in written form, 1186 of them were qualified

in expert assessment process. In accordance with expert assessment advice and SSRF operation plan, 4595 running intervals (36760 hours in total) were distributed for these themes.

In 2010, first 7 beamline stations of SSRF provided users with 28204h beam time, implemented 833 user application, covering the disciplines such as life science, condensed matter physics, chemistry, material science, geology, archeology, environment science, earth science and polymer science. The users come from 154 organizations (71 colleges and universities, 61 research institutes, 22 other organizations), and with 1662 persons/3213 person-times in total.

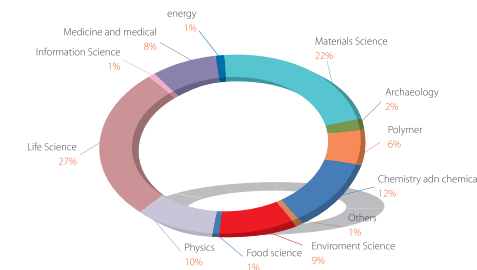


The Second SSRF Users Annual Meeting

The operation of SSRF in 2010 was as follows:

- Operation time: 7499 hours
- SR delivery time: 5459 hours
  - Beamline research time: 8760 hours (7 beamlines and stations)
  - User SR time: 28204 hours (7 beamlines and stations)
- Availability: 95.7%
- Mean time between failures (MTBF): 40.4 hours
- Accelerator research time: 1152.5 hours
- Maintenance time: 246 hours

Distribution Diagram of User Theme Research Fields (2010)



The Opening of SSRF to users in 2010 was as follows:

- Number of beamlines: 7
- Number of experimental stations: 7
- Number of user organizations: 154
- Number of experimental themes completed / planned by users: 833
- Participating users: 1662 persons / 3213 person-times

## 🔗 The projects of upgrade and open research are advancing smoothly

### 🔍 The high resolution structure determination of biological macromolecule crystal and the automatic screening system

The system can significantly improve the resolution of biological macromolecular compound structure determination and the test efficiency of the data collection on the present basis, thus establish the equipment conditions for the further realization of remote experiment in the future. Currently, the online installation and debugging of CCD detector has been completed, and is initially test-running. The automatic sample installation robot-arm has been online installed and debugged. The system joint debugging test and software system is being improved and optimized. The joint debugging test of the whole system has been completed: the repetition and reliability test is carried out; the operating regulation is

prepared; user training is conducted, and the experimental methods are optimized.

Once the system completed, an advanced platform will open to the biologists to study the structure of macromolecular compounds: the resolution limit of the detection system for structure determination of compound crystal with the unit cell dimension of 1000Å will be better than 2.5Å; the highly automatic data collecting system will greatly reduce the time that is needed to screen the samples of protein crystal, and the convenient image user interface will make it easier for the users to operate, the experiment efficiency is estimated to improve by more than 50%.

### The construction of soft X-ray interference photolithography beam line station

In this project, the existing soft X-ray spectrometry microscopy beam line is appropriately expanded and transformed, and the interferometric lithography is increased. After the project is completed, the formation of nanometer periodic pattern and the preparation of nanometer periodic structure will be realized.

Currently, all the core parts of the beam line part has been purchased, and prepared for installation and commissioning;

the experiment station part: Class 100 superclean room for the exposure of experimental station and Class 1000 superclean room for post-treatment has been completed and basically put into use; the corresponding equipment for wafer coating and developing, electron beam evaporator, ICP etching machine, UV alignment apparatus have been accepted completely; the critical parts needed for exposure have arrived.

## Scientific & technical personnel and talent training

By the end of 2010, there are 377 staffs in the Shanghai Synchrotron Radiation Facility (SSRF) project team, including 159 persons with senior professional title, 122 persons with intermediate professional title and 41 operating maintenance workers.

At the end of 2010, 17 Ph. D and 23 master students graduated from SSRF. There are now 149 under post-graduate students, including 49 Ph. D candidates and 5 post doctorates in the stations.

The total facility persons	Classified according to post			Classified according to professional title			Student			Post doctorates in the stations	Introduced talents
	Operating maintenance workers	Experimental researchers	Others	Persons with senior professional title	Persons with intermediate professional title	Others	Graduated Ph. D.	Graduated master	Under post-graduate students		
377	41	317	19	159	122	96	17	23	149	5	4

## Cooperation and exchange

### International cooperation projects

In 2010, Shanghai Institute of Applied Physics has signed a number of international cooperation agreements with foreign research institutes as follows: 1) A special cooperation agreement was signed with the calculation and simulation science platform (CSS) of the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Australia. CSIRO is one of the main foreign cooperation units in the ongoing key international cooperation project of "the international cooperation program of new X-ray



A cooperation agreement was signed between SLRI and SINAP

medical imaging method and its application based on SSRF". 2) A cooperation agreement was signed with Slovenia biological sensor, instrumentation and process research center (COBIK). The two parties will mainly implement long-term cooperation in the accelerator timing system. 3) A cooperation understanding memorandum was signed with the Synchrotron Radiation Research Institute of Thailand (SLRI). The two parties will launch a series of cooperation in the synchrotron radiation technology. And cooperation agreements were signed or updated with Paul Scherrer Institut (PSI), Stanford Linear Accelerator Center (SLAC), High Energy Accelerator Research Organization (KEK) and the Pohang Accelerator Research Organization (PAL), which has played a positive role in promoting the upgrading of

domestic synchronization radiation technology and the popularity and enhancement of the application research of synchrotron radiation.

At the same time, researchers were sent to participate in various international academic conferences, such as the Fifth Asia-Oceania Forum for Synchrotron Radiation Research, the First International Particle Accelerator Conference (IPAC' 10), the Sixth International Synchrotron Radiation Equipment Mechanical Engineering Design Conference (MEDSI2010), the Tenth International Conference on X-ray microscopy (XRM2010), the International Linear Accelerator Conference (LINAC10), etc.; staff were also sent to Deutsches Elektronen Synchrotron (DESY) for short-term work and study abroad.

### International Symposium

"Workshop on International Cooperation in Medical Application of Synchrotron Radiation at SSRF", "International Review Meeting on the Design of NFPS Beamlines", "High-Pressure Beamline Workshop for Shanghai Synchrotron Radiation Facilities", "the 156<sup>th</sup> Oriental Technology Forum - Compact X-ray Free Electron Laser", "the 160<sup>th</sup> Oriental Science and Technology Forum -Facilitating the Structural Biology Research by SSRF", "the 162<sup>nd</sup> Oriental Science and Technology Forum - Promoting the Scientific Research of Nuclear Energy Material by SSRF" were held. These International exchanges involve the main research that SSRF is working over. And some special difficulties are solved timely and effectively through the joint discussion among the domestic and foreign well-known experts in related fields.



Oriental forum series meeting

### Academic activities and science popularization

"The Sixth National Synchrotron Radiation Soft X-ray and Vacuum Ultraviolet Technology and Application Academic Conference," "SSRF Open Research Project - Self-assembly Technology and Super-high Density Nano Array Research Appraisal Meeting", "2010 Annual Operation Meeting of Large Scientific Facilities in Chinese Academy of Sciences", "the Second SSRF Beam Line Station Seminar", "the Second SSRF Annual User Academic Meeting" and "the second SSRF

Annual Operation Meeting", "the Synchrotron Radiation Application Workshop - the Application of Synchrotron Radiation X-ray Microscopy", and other meetings were organized or hosted. Special exchange Seminars were conducted with Shanghai Institute for Biological Science of CAS, National Astronomical Observatories of CAS, Ruijin Hospital, Zhejiang University, Shanghai Jiaotong University, Fudan University and other organizations.

The science demonstration project of SSRF and low-carbon economy for the Chinese Academy of Sciences in 2010 and the SSRF model in the demonstration at the 60th anniversary of Chinese Academy of Sciences were successfully completed.

In the last year, SSRF has received a total of about 150 batches of visits at home and abroad, nearly 4,000 people, including hundreds of students from high schools and universities.



The Synchrotron Radiation Application Workshop



The experts from Ruijin Hospital visited SSRF



The delegation of Fudan University HCI2010 International Meeting visited SSRF

## Chronicle of events

- Jan. 6-7* The SSRF project was successfully accepted by the review committee.
- Jan. 13* SSRF welcomed the 1000<sup>th</sup> user.
- Jan. 16* Hu Jintao, General Secretary of the CPC Central Committee, President of the PRC and Chairman of the Central Military Commission, visited SSRF.
- Jan. 19* The SSRF project successfully passed the state acceptance.
- Jan. 19* Hu Qili, President of Soong Ching Ling Foundation, Chairman of China Welfare Institute, former Vice Chairman of CPPCC, visited SSRF.
- Jan. 20* "The completion of Shanghai synchrotron radiation facility" was listed in "top 10 Chinese scientific achievements in 2009".
- Jan. 31* Wu Bangguo, member of the Standing Committee of Political Bureau, the CPC Central Committee and Chairman of the Standing Committee of the National People's Congress, visited SSRF.
- Mar. 2* Anthony J. Leggett, the Nobel Prize winner for physics in 2003, visited SSRF.
- Mar. 26* Wangang, Vice Chairman of CPPCC and minister of science and technology, visited SSRF.
- Apr. 22* Chen zhili, Vice Chairman of the NPC Standing Committee, visited SSRF.
- May 14* Li Yuanchao, member of the Political Bureau of the CPC Central Committee, Secretariat of the Central Committee of the CPC and President of the Organization Department of the CCP Central Committee, visited SSRF.
- Jun. 28-30* "The Second SSRF Beamline and Experimental Station Seminar" was successfully held in Changshu, Jiangsu Province.
- Jul. 23* Thailand's Crown Princess, Maha Chakri Sirindhorn, visited SSRF.
- Nov. 3-4* "The Second SSRF Annual User Meeting" was held in SSRF.
- Nov. 12* The Sweden royal technical delegation with the lead of Swedish King, Carl XVI Gustaf, visited SSRF.
- Dec. 28* "SSRF passed the state acceptance" was listed in the "2010 Foton Automobile Cup Top Ten Domestic Science and Technology News".



Mr. Hu Jintao visited SSRF



Mr. Hu Qili visited SSRF



Professor Anthony J. Leggett, the winner of Nobel Prize, visited SSRF



Thailand's Crown Princess, Maha Chakri Sirindhorn, visited SSRF



SSRF Aerial Photography

# GBOWS

## 2010 Annual Report

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