

# National Research Program for Genomic Medicine

## Core Facility Project : **D4**

### Operation and Upgrade of the Synchrotron Radiation Protein Crystallography Facility (SPXF)

#### **Progress Report (2006.01.01~2007.04.30)**

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Institution: National Synchrotron Radiation Research Center

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#### **Statistics of Service**

Over the reporting period (2005/09~2007/04) the number of users accommodated at the SPXF has grown significantly from 10 groups to 22 groups for BL13B1, and 10 groups to 19 groups for BL13C1. 197 PX experiments have been conducted and 1350 users have been trained. More than 79% BL13B1 beamtime is for user service which already exceeds the originally planned 65% service time and this number is expected to grow up in future. A table listed below documents this data by beamline, with the number of user groups, experiments, trained users, beamtime delivered hours, and percentage of beamtime used in user service.

Table1. Service Statistics

	# of User Groups	# of Experiments	# of Trained Users	# of Beamtime Hours Delivered	% of Beamtime Used for Service
BL13B1 MAD-PX 2005/9/20~2007/4/30	22	118	815	6456	79.2%
BL13C1 Mono-PX 2006/1/1~2007/4/30	19	79	535	4448	69.1%
Sum		197	1350	10904	

#### **Scientific Outcomes**

The publication summary for reporting period (2006/01~2007/04) shows 41 SCI papers published (including EMBO J, Nucleic Acids Res, J Biol Chem, J Mol Biol, J Med Chem, ...etc)

6 these completed and 58 conference abstract published for 105 total publications. All 105 publications represent service research where the SPXF provided facility and support only. Since SPXF is a 100% service-orientated core facility, there isn't any activity in R&D and Collaboration Research. Total 31 protein structures have been deposit to the Protein Data Bank (PDB) from SPXF beamlines. A table listed below provides a breakdown of the SCI papers in terms of total number and different Impact Factor (I.F.), conference abstracts, and PDB depositions.

Table2. Publications Statistics

	SCI Papers			Conference Abstracts	Theses	PDB Depositions
	Total	I.F. > 2	I.F. > 6			
2006	33	23	6	40	6	31
2007	8	7	4	18	NA	0
Sum	41	30	10	58	6	31

### **Performance Upgrade**

Over the pass one-and-half year, many technical problems have been pinned down and improved, these include: (1) The read-out speed of the CCD detector is improved 5 times. (2) The data processing efficiency increases 4 times. (3) Data backup speed is improved 3 times. (4) Useful exposure flux increases one order of magnitude. (5) New beamline function for automatic intensity optimization during data collection is added. (6) The signal-to-noise ratio of the fluorescence spectrum gains 3.5 times. (7) Development of X-ray sensitive beam stopper. (8) Improvement of the EMF background noise of Q210 CCD detector. (9) Install and commission the Sample Automatic Mounting (SAM) system which is scheduled to be available to users at the end of 2007. Relevant technical reports are 9 published and 8 in preparation.

### **Education and Training**

All users have to take the beamline training before they can start their experiments at SPXF. A 2~4 hours on-site training tutorials is provided for each visiting research group to help how to condition the X-ray beam, get in/out the experimental hutch, mount and center the crystal, collect diffraction data, process diffraction data, and backup data. Over the reporting period (2005/09~2007/04) 1350 users have been trained. The support staffs also provide 12 hours a day (8 hours for weekend), 6 days a week on-site user supports to help user collecting high-throughput data. A new facility web site (<http://bionsrrc.nsrcc.org.tw>) has been established on Sep. 2006. This web site is modified frequently and includes expanded user information. The user training and dissemination are also included on this web site. This web site is currently experiencing about 850 hits per month and the user guide page is especially popular. Relevant technical reports are 7 published and 6 in preparation.

### **Facility Dissemination**

The goal of facility dissemination is to disseminate experimental techniques of macromolecular crystallography to researchers or graduate student with an interest in using this specific method to further the scope of their research. Dissemination activities have included posters describing facility result and available services at conferences and workshops like the Symposium on Recent Advances in Biophysics, Annual Joint Meeting of Bio-Medical Societies, NSRRC Users Meeting, International Conference of Asian Crystallography Associations, NRPGM Retreat Meeting, and etc... In addition to posters, facility staff also manned a booth providing DM, and illustrating video film.

To promote the facility activity, a five-day Protein Crystallography Training Course is held on August 28<sup>th</sup>. The 2006 Protein Crystallography Training Course provides lecture programs and hands-on training. This course covers broad spectrum of topics on synchrotron-based protein crystallography, ranging from crystallization of proteins, data collection strategy, phasing techniques, radiation damage on protein crystals, to structure determination of proteins. More than 100 scientists and students have submitted their applications, 50 people have been selected to participate the lecture, and 15 lecture trainees are selected for hands-on practice. 2007 PX Training Course and Mini-Workshop on PX are scheduled to be held in near future. Relevant teaching materials have 12 copies in 2006 and 15 in 2007.