**COMPRES Beamline Scientist Annual Report 2016 to 2017**

**Dr. Haiyan Chen**

**APS 6BM-B Large Volume Press Beamline**

**Geoscience Department, Stony Brook University**

I am a Beamline Scientist fully supported by COMPRES, working for APS 6BM-B Beamline run by Stony Brook University. From October 2016 to September 2017, 6BM-B station executed ~52% of total APS beamtime, of which 91% was allocated to 36 user proposals. The setup and development time was reduced to ~ 9% to maximize time available to users. During this period, 6BM-B transferred from a dark period beamlime to a safe, stable, productive workhorse for COMPRES user community.

As the only onsite beamline scientist, I do all I can to keep the operation of the beamline safe and efficient, to comply with APS and ANL safety regulations, and to educate users on how to work safely. I took swift action during July 2017 APS administrative shutdown (APS Pause) to keep affected users informed, to keep constant communication with APS safety staff, to make sure standard operation procedures were up to date. As a result, 6BM-B was among the first few beamlines to be operational right after the Pause, and the loss of beamtime was minimized for this circumstance.

My duties as an administrator and operator of 6BM-B cover every aspect of a beamline operation and user service. One of my most important duties, however, is to make the beamline operation stable and efficient. Close interactions with user community, regular upkeep of essential equipment maintenance and service, constant development and perfection of procedures are all critical to ensure the satisfaction of 6BM-B users.

In the following sections, my activities are listed and the way I divide my time is indicated.

**User service (50%)**

Administered safety related APS required Sector Orientation to every user

Helped users with proposals and ESAFs in APS system

Worked with APS safety staff and affected users closely during APS pause

Shipped and received materials, cell parts, tools from APS to and from users

Handled all the paper work, coordination, and execution of Yale RDA (Rotational Drickamer Apparatus) equipment installation and shipment from APS to Yale University

Taught / assisted users with boron epoxy cell fabrication, cell assembly, press operation, alignment, calibration, data collection and analysis

Troubleshot hardware and software problems

Responded to users’ various needs onsite

Communicated users’ opinion of beamline to Stony Brook group

**Beamline management and operation (25%)**

Maintain press, tooling, optical system, slit, and detectors at optimum conditions

Restore systems after a blow-out, or Yale’s RDA experiment

Order supplies, such as cell parts, anvils, tools, and chemicals

Fulfill APS safety requirement of the laboratory and beamline

Review user proposals

Work with APS and Stony Brook group on beamtime allocation

Work with 6BM-A Station and users for beamtime scheduling

**Instrument development (25%)**

Made and tested 5 mm cell assembly for 3 mm anvils system

Designed cell assemblies for 3mm and 6 mm anvils for expanded pressure ranges. Cell parts productions are in progress at Kurt Leinenweber’s shop.

Acquired 3mm and 6 mm diamond anvils from commercial sources.

Put ADC slit under vacuum with the help of APS vacuum group and vendors

Machined and assembled a LED UV source to treat the radiation damage of lenses.

Tested the influence of Co57 sources on diffraction spectra background

Explored the relationships between signal to noise ratio of RDA experiment and conical slits opening

Co-designed Co57 sources manipulator with an engineer from Yale group. To be fabricated at Yale.

Explored focus of white beam in respond to request from Yale group for higher beam intensity. Not to progress further due to constrains of cost and space.

**Improvements made**

Improved radiographic image quality with UV treatment of lenses

Significantly reduced radiation damage of ADC slit in vacuum. Loss of beamtime caused by slit failure was minimized.

Energy dispersive diffraction background was reduced by reduction of Co57 source intensities.

Increased diffraction signal intensities for RDA experiments by adopting new conical slit settings

**Beamline Proposals to 6BMB**

GUP# 52848: Stress distribution during cold compression of siltstone

GUP#53215: Simultaneous determination of oxygen fugacity and phase equilibria at upper mantle temperature and pressure conditions

**Publications / Presentation**

1. T. Wu, T. A. Tyson, **H. Chen**, P. Gao, T. Yu, Z. Chen, Z. Liu, K. H. Ahn, X. Wang and S.-W. Cheong, “Pressure Dependent Structural Changes and Predicted Electrical Polarization in Perovskite RMnO3”, ***J. Phys. Condens. Matter***, 28 (**2016**) 056005
2. Cheung, S. N. C., Weidner, D. J., Li, L., Meredith, P. G., Chen, H., Whitaker, M. L., Chen X., Stress distribution during cold compression of a quartz aggregate using synchrotron X-ray diffraction: observed yielding, damage and grain crushing, ***J. Geophys. Res. Solid Earth****,* 122 (4), 2724-2735, **2017***.*
3. Chen H.Y., Whitaker L. M., Baldwin K. J., Huebsch W.B., Vaughan M. T., Weidner D. J., COMPRES Multi-Anvil Facility at Beamline 6BM-B of the Advanced Photon Source, COMPRES Meeting, New Mexico, July 2017.

**6BMB Users assisted by PI’s name and institute**

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| Name | Institution |
|  |  |
| Donald Weidner | Stony Brook University |
| Li Li | Stony Brook University |
| See Nga Cecilia Cheung | University of Wisconsin at Madison |
| Richard Triplett | Stony Brook University |
| Matthew Whitaker | Stony Brook University |
| Eric Quackenbush | Stony Brook University |
| Melinda Rucks | Stony Brook University |
| Paul Raterron | Brown University |
| Caleb Holyoke | Akron University |
| Leif Tokle | Brown University |
| Joseph Millard | University of Akron |
| Caleb McDaniel | University of Akron |
| Andreas Kronenburg | Texas A&M University |
| Cole, Blasko | University of Akron |
| Nick, Jackson | University of Akron |
| James Hirth | Brown University |
| Pamela Burnley | University of Neveda at Las Vegas |
| Shirin Kaboli | University of Neveda at Las Vegas |
| Richard Roland | University of Neveda at Las Vegas |
| Nolan Regis | University of Neveda at Las Vegas |
| Dawn Reynoso | University of Neveda at Las Vegas |
| Genevieve Kidman | University of Neveda at Las Vegas |
| Liping Wang | University of Neveda at Las Vegas |
| Pei Wang | University of Neveda at Las Vegas |
| William Duram | Masschusetts Institute of Technology |
| Lars Hansen | Oxford University |
| Kathryn Kumamoto | Standford University |
| David Goldsby | University of Pennsylvania |
| Christopher Thom | University of Pennsylvania |
| David Wallis | Oxford University |
| David Kohlstedt | University of Minnesota |
| Shun-ichiro Karato | Yale University |
| Jennifer Girard | Yale University |
| Peng Sun | Yale University |
| Noriyoshi Tsujino | Yale University |
| Moe Sakurai | Tokyo Institute of Technology |
| Awar Mohiuddin | Yale University |
| Simon Hunt | University College of London |
| Martha Pamato | University College of London |
| Andrew Thomson | University College of London |
| Isra Ezad | University College of London |