

ADVANCED PHOTON SOURCE

100-ps Time-resolved Crystallography at BioCARS

Beamline 14-ID-B at the Advanced Photon Source (APS) has been upgraded to a new role as the premier facility worldwide for 100-ps time-resolved x-ray crystallography. The upgrade is the result of a collaboration between BioCARS, one of four beamlines at the APS operated by the Center for Advanced Radiation Sources at The University of Chicago; the National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases (NIH/NIDDK); and the APS.

The upgrade, which encompasses new beamline optics and improved time resolution, features the installation of several new pieces of equipment: two undulators that operate collinearly, a new Kirkpatrick-Baez mirror system providing 90 μm (horizontal) by 35 μm (vertical) x-ray beam size at the sample, a new monochromator, an upgraded BioCARS ultra-fast x-ray chopper capable of isolating single x-ray pulses in the 24-bunch APS mode, a new heat-load chopper, and new picosecond laser system with associated laser beam-delivery optics and synchronization electronics.

The new configuration extends the time resolution available for the successful nanosecond time-resolved crystallography user program at BioCARS into the sub-ns time domain. Now, many challenging new areas of investigation become accessible, including determination of more-complex biological molecules, irreversible reactions, and important biological processes such as cooperativity, signal transduction, and catalysis.

The first experiments using the new configuration, completed in December, were collaborations between NIH/NIDDK and the University of Massachusetts Medical School. The



At the 14-ID-B dedication ceremony on April 18, 2008. Front (l. to r.): James Viccaro, director of the Center for Advanced Radiation Sources, The University of Chicago (CARS); Murray Gibson, director of the Advanced Photon Source; Keith Moffat, principal investigator for BioCARS; Philip Anfinrud, collaborator, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases (NIH/NIDDK); Timothy Graber, lead beamline designer for upgrade, CARS. Back (l. to r.): The CARS upgrade team. Zhong Ren, Shengyang Ruan, Yu-Sheng Chen, Frank Westferro, Robert Henning, Friedrich Schotte (NIH/NIDDK), Mati Meron, Vukica Šrajer, and Guy Macha. (Not pictured: Harold Brewer.)

teams successfully used crystals 10 times smaller, and x-ray exposures 10 times shorter than previously used at BioCARS, while still obtaining excellent x-ray data.

BioCARS is now welcoming new user groups interested in conducting time-resolved experiments on the upgraded beamline. Proposals can be submitted through the APS proposal system at:

http://www.aps.anl.gov/Users/apply_for_beamtime.html.

CALL FOR APS GENERAL-USER PROPOSALS

The Advanced Photon Source is open to experimenters from all scientific disciplines.

General-user proposals for beam time during Run 2009-1 are due by October 31, 2008.

Information on access to beam time at the APS is at http://www.aps.anl.gov/Users/apply_for_beamtime.html or contact Dr. Dennis Mills, DMM@aps.anl.gov, 630/252-5680.

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