The Advanced Photon Source

A Revolver Undulator for Sector 35 of the APS

A prototype revolver undulator was installed at Sector 35 of the U.S. Department of Energy's Advanced Photon Source (APS) at Argonne National Laboratory during the January 2015 shutdown. This insertion device will provide the new Dynamic Compression Sector (DCS) with the benefits of two undulators in the space of one.

In a matter of minutes, the active undulator magnet structure can be switched between a 3.3-cm period and a 2.7-cm period. This arrangement allows higher x-ray brightness and flux over a broader energy range than could be achieved with a single conventional undulator. The installation is the culmination of a multi-year Argonne Laboratory Directed Research and Development (LDRD) program carried out by the Magnetic Devices Group in the Accelerator Systems Division to develop a robust revolver undulator platform for near-term use at the APS. The platform is also expected to be further developed in conjunction with a future upgrade of the APS.

The demands for precise, fail-safe positioning of powerful undulator magnetic arrays, in close proximity to the vacuum chambers that house the electron beam, must be met by all of the APS undulators. But the revolver undulator must also precisely index the two sets of magnetic arrays, and be safeguarded against more complex failure modes. Toward this end, the revolver undulator uses the well-proven gap separation mechanism of the most-recent 33 APS undulators, and applies the same interlock and control scheme to the revolver mechanisms. The use of this gap separation mechanism also allows future repurposing of these mechanisms as revolver undulators.

The revolver undulator that was installed at Sector 35 is the final prototype of the revolver undulator LDRD program, and benefits from post-LDRD development primarily focused on control software. The first "production" revolver undulator is undergoing assembly at the APS, with installation at Sector 35 planned for May 2015. That device uses 3.0-cm period and 2.7-cm period magnet structures.

Kevin D'Amico, DCS Project Manager, with the newly installed prototype revolver undulator at Sector 35 in the APS storage ring.

The new revolver undulator can accommodate undulator magnet structures up to 2.4-m long. Any combination of the APS-designed undulator magnet structures, from 1.72-cm to 3.6-cm periods can be used. All of the functions of the conventional undulator are retained, including gap tapering. The revolver undulator is compatible with all of the APS insertion device vacuum chambers, but requires the insertion device vacuum chamber support stands to be retrofitted to a new design.

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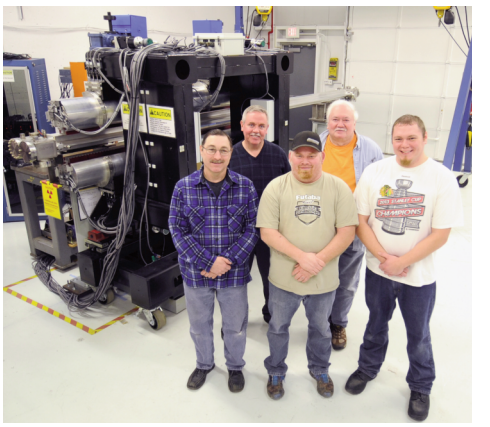
The Advanced Photon Source is supported by the U.S. Department of Energy (DOE) Office of Science under Contract No. DE-AC02-06CH11357. The DCS Project is funded by the DOE/National Nuclear Security Administration (NNSA) and is being carried out by the APS DCS project team. Washington State University, with funding by NNSA, leads the effort to develop the DCS experimental program and build the instrumentation in collaboration with the APS, DOE/NNSA national laboratories (Los Alamos, Livermore, and Sandia); Department of Defense laboratories, including the Army Research Laboratory and the Naval Research Laboratory; and academic institutions.



> The prototype revolver undulator serves as the backdrop for the members of the Accelerator Systems Division Magnetic Devices Group who assembled the new device. Left to right are: John TerHAAR, John Grimmer, Eric McCarthy, Mike Merritt, and Joe Gagliano, III. Martin Smith (not pictured) of the APS Engineering Support Division Controls Group did the controls hardware/software design and development.

Call for APS General-User Proposals

The Advanced Photon Source is open to experimenters who can benefit from the facility's high-brightness hard x-ray beams.

General-user proposals for beam time during Run 2015-3 are due by Friday, July 10, 2015.

Information on access to beam time at the APS is at https://www1.aps.anl.gov/Users-Information/About-Proposals/Apply-for-Time or contact Dr. Dennis Mills, DMM@aps.anl.gov, 630/252-5680.

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This research used resources of the Advanced Photon Source, a U.S. DOE Office of Science User Facility operated for the DOE Office of Science by Argonne National Laboratory under Contract No. DE-AC02-06CH11357.

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