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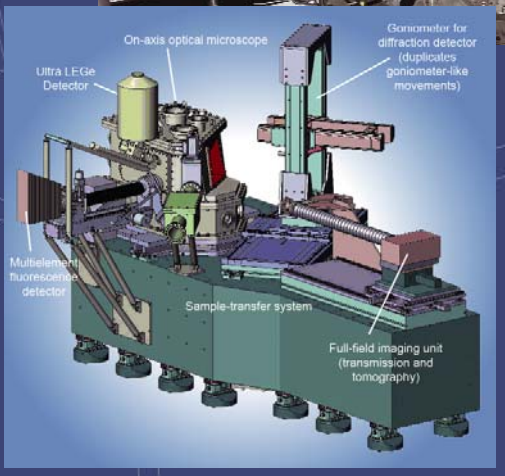
Advanced Photon Source

The Nanoprobe at APS Sector 26

The Hard X-ray Nanoprobe at APS Sector 26 was designed to study nanoscale phenomena in advanced materials and devices using x-ray diffraction, x-ray fluorescence, and x-ray imaging techniques. The system was constructed by and is operated in a partnership between the Argonne Center for Nanoscale Materials (CNM) and the X-ray Operations and Research section of the APS X-ray Science Division. The instrument uses brilliant x-rays with photon energies from 3 keV to 30 keV to probe the properties of nanoscale materials with a spatial resolution of 30 nm. The system provides a combination of scanning-probe and full-field transmission imaging. Full-field imaging allows efficient three-dimensional visualization of complex systems and devices. Scanning-probe imaging provides sensitive, quantitative analysis of elemental composition, chemical states, crystallographic phase, and strain. The facility is now operational and accepting general users.



The nanoprobe instrument in the 26-ID-C endstation is shown in the photo above and rendering at right. A vacuum chamber contains the x-ray optics and specimen. Energy-dispersive detectors for x-ray fluorescence are mounted on the inboard side of the vacuum chamber (left in the photo). Different area detectors for detecting diffracted x-rays are mounted on a goniometer on the outboard side (right side of the photo). Transmitted x-rays used for full-field imaging propagate through a flight tube on the downstream side to an area detector downstream of the instrument chamber. The technology for positioning x-ray optics and specimen is based on laser Doppler interferometers and composite flexure stages. This approach allows positioning with an accuracy approaching 1 nm over a range of more than 5 mm. The first optical enclosure of the hard x-ray nanoprobe beamline, 26-ID-A, contains the high-heat-load double-mirror system; a beam-defining aperture; and slits, masks, collimators, and beam shutters. A cryogenically cooled double-crystal monochromator with submicroradian angular stability for high-resolution imaging, and a double multilayer monochromator for high-throughput imaging, are located in the second optical enclosure, 26-ID-B. A polarizer and a beam chopper needed to characterize magnetic materials and pursue time-resolved studies will be installed in the near future.

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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 2009-3 are due by July 10, 2009.
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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