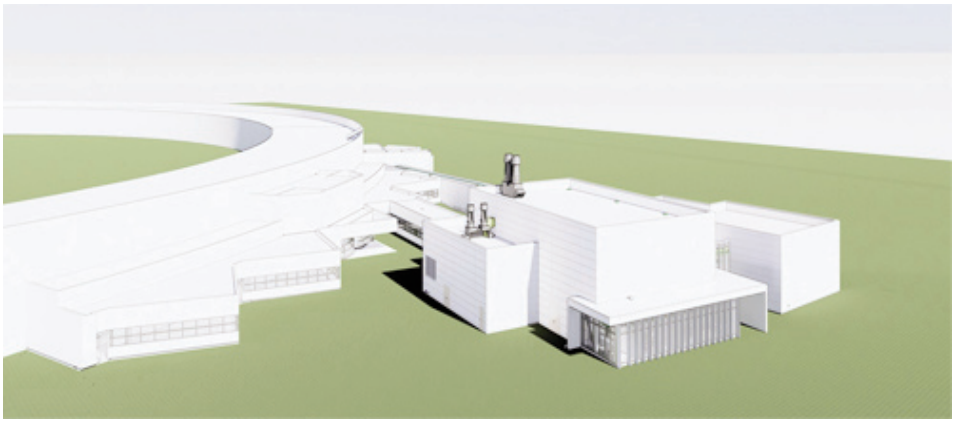
The Advanced Photon Source

New State-of-the-Art Beamlines for the Advanced Photon Source



Artist's rendition of the APS Upgrade Long Beamline Building. (Image by HDR Architects.)

In a socially distanced ceremony held on the morning of July 22, 2020, at the U.S. Department of Energy's (DOE) Argonne National Laboratory, representatives of the DOE, Argonne, the Advanced Photon Source (APS), and the University of Chicago broke ground to mark the start of construction on the Long Beamline Building, an experiment hall that will house two new beamlines that will be built as part of the $815 million upgrade of the APS.

The APS Upgrade will replace the already powerful electron storage ring at the heart of the facility with a state-of-the-art magnet lattice system that will increase the brightness of the x-rays generated by up to 500 times. As part of this project, nine new beamlines will be constructed around the existing storage ring to facilitate a variety of research aims; the Long Beamline Building will host two of them.

The beamlines in the Long Beamline Building will be about three times longer than those currently at the APS, sending photons further from the source to reach the samples being analyzed. This distance provides more focused x-ray beams, allowing scientists to look at something as small as the finest structure inside even the most compact computer chip, in real time. The new facilities will also have greater capability for in situ imaging.

These beamlines include:

- **The In Situ Nanoprobe (ISN)**: A 250-meter (820-foot) beamline specifically designed for tightly focused in situ imaging. Its beam can focus down to 20 nanometers, and it provides enough space between the optics and the sample to change the environment of the sample (through temperature, pressure and other methods) and track the effect of these changes at extremely fine resolution. One application of the ISN would be more precise understanding of electrochemical reactions inside batteries, which is anticipated to lead to breakthroughs in extending battery life.
- T**he High-Energy X-ray Microscope (HEXM)**: Designed for higher-energy X-rays that can penetrate into denser materials, this 180-meter (590-foot) beamline combines that energy with greater focusing ability. This will allow scientists to more precisely map the compositions of materials, and HEXM's potential for in situ measurements will make it a destination beamline for materials science and engineering applications. One application would be to test airplane engine blades under stress, to see where cracks form in the materials they are made of and learn how to prevent them.

Construction is scheduled to begin this fall, with a proposed completion date in mid-2022 for the Long Beamline Building. First light for the APS Upgrade is expected in late 2023.

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 2021-1 are due by Friday, October 30, 2020.

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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Advanced Photon Source
Bldg. 401/Rm A4113
Argonne National Laboratory
9700 S. Cass Ave.
Argonne, IL 60439 USA
aps.anl.gov
apsinfo@aps.anl.gov

U.S. DEPARTMENT OF ENERGY
Office of Science
science.energy.gov/

Argonne NATIONAL LABORATORY
anl.gov