

UPGRADING THE ADVANCED PHOTON SOURCE

Built as part of the APS Upgrade project, two experiment stations in the Long Beamline Building will revolutionize materials science and energy storage research.



The newly built Long Beamline Building will house two new beamlines: the High Energy X-ray Microscope (HEXM) and the In Situ Nanoprobe (ISN).

The upgrade of the Advanced Photon Source (APS) has already delivered its most externally visible element: the Long Beamline Building. This 24,000-square-foot facility was completed in June 2022 and will house two of the project's feature beamlines: the High Energy X-ray Microscope (HEXM) and the In Situ Nanoprobe (ISN). HEXM will focus on materials science and engineering, tracing tiny defects in current and novel materials as they form. Its long focal length and large end station will provide world-leading imaging capabilities to zoom in and out of samples as large as a centimeter. ISN will be used to create longer-lasting batteries and solar cells with its ability to spot and identify nanoscale material changes under *in-situ* and *operando* conditions. Its large working distance enables the observation of complex devices as they operate.



Pre-construction drawing

HEXM Key Specifications

Photon beam energy	35-120 keV
Distance from source	70-180 m
X-ray spot size	200 nm
Working distance	1 m
Techniques	Wide-and small-angle scattering, coherent diffraction, absorption- and diffraction-based tomography

HEXM and ISN are 3 times longer than the average APS beamline, providing optical flexibility to produce both large and extremely small X-ray spot sizes while maintaining large working distances. Both beamlines are projected to finish their commissioning periods and be open for first experiments in 2024.



Pre-construction drawing

ISN Key Specifications

Photon beam energy	4.8-30 keV
Distance from source	220 m
X-ray spot size	20 nm
Working distance	55 mm
Techniques	Nano-X-ray fluorescence imaging in 2D and 3D, sub-10mm ptychography, nano diffraction, nano-XBIC and XBIC

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