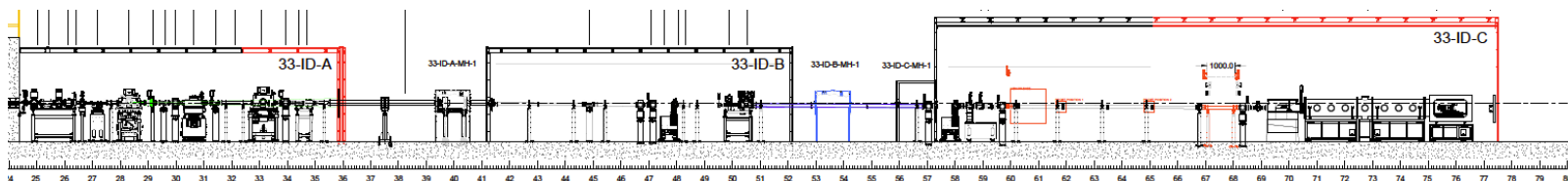


# UPGRADING THE ADVANCED PHOTON SOURCE PHOTON SOURCE

## Moving toward the ultimate X-ray microscope with the PtychoProbe feature beamline

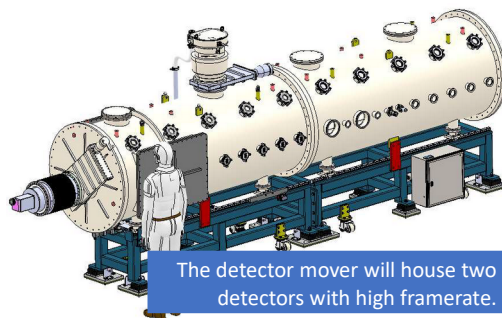


Above: A schematic of the PtychoProbe beamline layout to be constructed at beamline 33-ID of the Advanced Photon Source. Left: An X-ray ptychographic tomography of copper sulfide secondary particles. PtychoProbe will enhance our current capability in both spatial resolution and imaging speed. Image: J. Deng, et. al, *Rev. Sci. Instrum.* 90, 083701 (2019)



The upgrade of the Advanced Photon Source will enable many advanced capabilities. One of the most sought-after is the ability to capture elemental and structural information using X-rays at the nanoscale. The PtychoProbe beamline, to be built as part of the Upgrade, will make use of the new facility's ultrabright beams to realize the highest possible spatial resolution for X-ray microscopy. PtychoProbe will combine X-ray fluorescence with ptychography to achieve resolutions as low as a single nanometer.

Moving X-ray microscopy into the nanoscale is crucial for understanding hierarchical systems, from atomic to macro scales. This includes scientific questions about biology, energy conversion, the environment, materials, catalysis, nanoelectronics and more. PtychoProbe will also have high spatial resolution for chemical information using X-ray fluorescence contrast. This beamline will enable high-resolution two- and three-dimensional imaging of thick objects, bridging the resolution gap between contemporary X-ray and electron microscopy. PtychoProbe is expected to be online near the end of 2024.



The detector mover will house two area detectors with high framerate.

### PtychoProbe Key Specifications

Photon beam energy	5-30 keV
Distance from source	75 m
X-ray spot size	down to 5 nm
Techniques	X-ray fluorescence combined with ptychography

Follow the APS Upgrade Project at [aps.anl.gov/APS-Upgrade](https://aps.anl.gov/APS-Upgrade)

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