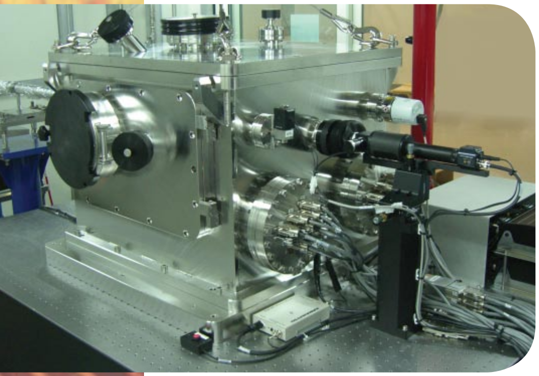
xradia™

UltraSPX-S200/S220

Scanning-Probe X-ray Microscope for Synchrotron Facilities



Ultra-high resolution analysis and characterization
with a scanning nanoprobe

The UltraSPX takes advantage of the coherent X-ray beams available at modern synchrotron light sources to bring established X-ray analytical techniques, such as X-ray fluorescence, spectroscopy, and diffraction, down to the nanometer scale. Xradia's high-performance X-ray optics produce a focused beam down to 30 nm. This X-ray probe is raster scanned across the sample to produce highest-resolution maps with elemental, chemical, or crystallographic phase information depending on the photon energy and detection modality.

Key Benefits

Structural, elemental, chemical and crystallographic information on the nanoscale

Ultra-high spatial resolution to 30 nm

Fluorescence, absorption, XANES, phase and / or crystallographic contrast

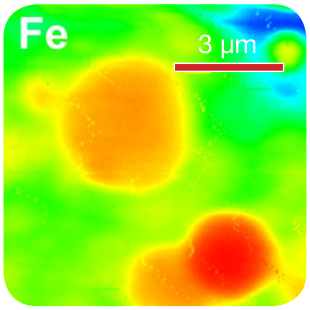
Open system architecture offers flexible configuration

Cryogenic sample handling to minimize the effects of radiation damage for organic specimens

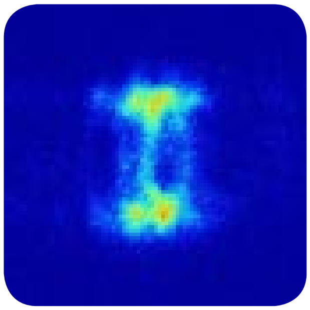
Application Examples

- **Materials Science**
  Characterization of nano-materials in areas such as alternative energy, fuel cells, micromechanics, and industrial processes
- **Life Science**
  Mapping and quantification of trace elements in cells or tissue samples with parts-per-billion sensitivity, providing insight into uptake, function and toxicity in biological systems
- **Geosciences and Environmental**
  Analysis of specimens in their natural environment, critical for areas such as heavy metal uptake, nuclear waste storage and bioremediation
- **Semiconductor**
  Probing of properties such as strain or doping concentration that affect functionality of modern ICs on the nanoscale, without destroying the component.

Laser-interferometer technology and precision piezo stages provide sub-5 nm positioning of beam and sample with excellent long-term stability. In the soft X-ray range, typically transmitted intensity is detected as a function of position and photon energy, to produce X-ray Absorption Near-Edge Structure (XANES) image stacks revealing chemical composition and the binding state of elements. At higher X-ray energies, elemental information can be acquired by detecting fluorescence photons with sensitivities as low as parts-per-billion. Additional detection modalities such as a configured transmission detector for phase contrast imaging or a diffraction detector for crystallographic phase mapping can be added easily to the system to provide additional structural information.

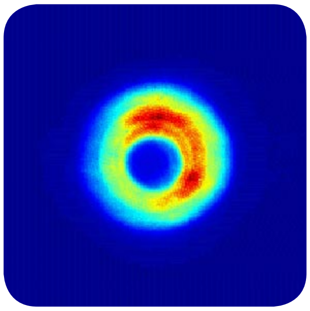


Iron Fluorescence
of a geo-polymer.
Image courtesy of J. Provis (Univ. Melbourne) and V. Rose (ANL).



Coherent Bragg Diffraction Pattern
of a functional nanodevice.
Image courtesy of M. Bedzyk (Northwestern Univ.) and M. Holt (ANL)

Automated Sample Exchange Robot
for cryogenic sample handling system.



Diffraction pattern
of a thin film sample using a zone plate.
Image courtesy of C. Thompson (NIU), G. B. Stephenson (ANL) and M. Holt (ANL)

UltraSPX-S200/S220 Scanning-Probe X-ray Microscope for Synchrotron Facilities

Features

Multiple zone plate optics possible to tune beam flux and resolution to experimental requirements

Integration of KB mirrors and other optics possible

Integrated visible light microscope for easy sample alignment

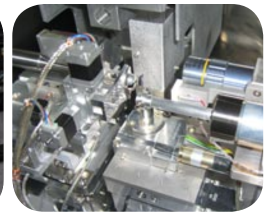
Cryogenic sample handling with automated sample exchange robot available

System flexibility and open EPICS-based control system for integration of in-situ devices, additional detector and general extensibility

Laser interferometer controlled step- and fly scanning

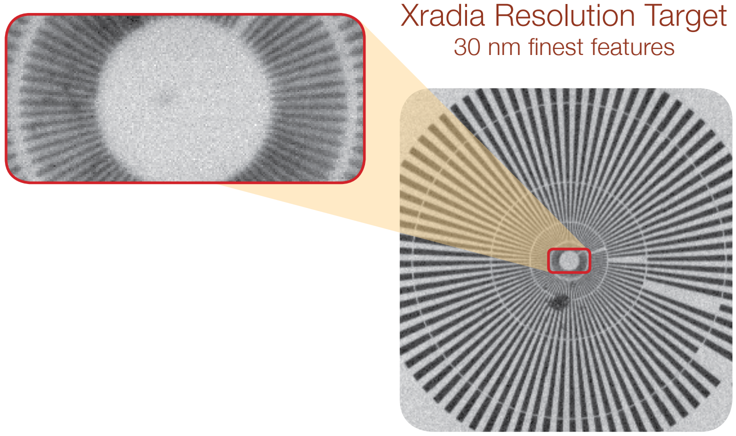
Sub-5 nm positional stability

Key Specifications



Systems	UltraSPX-S200	UltraSPX-S220
Energy range	5 to 20 keV	200 to 3000 eV
Best Spatial Resolution	30 nm	30 nm
Sample environment	Air or vacuum	Vacuum
Positional stability	< 5 nm	< 5 nm
Detector options	Fluorescence Photodiode Transmission camera Diffraction camera possible (customer integration)	Phosphor/PMT Photodiode Integration of customer-supplied detectors possible (e.g. pixel detector)
Data acquisition times	Beamline and application dependent	

* Specifications are typical. Please consult Xradia for custom requirements.



Xradia Resolution Target
30 nm finest features

The UltraSPX-S200 / S220 typically requires an undulator beamline.
Please consult Xradia for beamline recommendations.

All specifications subject to change. Please consult Xradia for current specifications.

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