Extend the limits of your exploration

ZEISS Xradia 610 and 620 Versa

ZEISS

Seeing beyond

Non-destructive 3D X-ray Imaging: Extending the Limits of Your Exploration

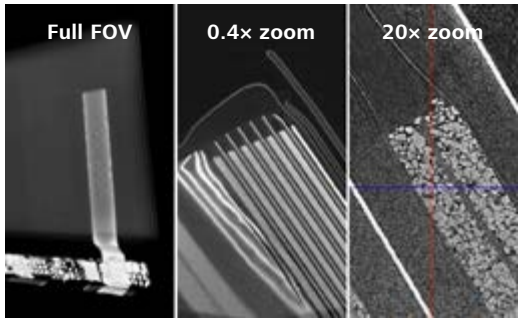
Unlock new degrees of versatility for your scientific discovery and industrial research with the ZEISS Xradia 600-series Versa 3D X-ray microscopes (XRM): the most advanced models in the ZEISS Xradia Versa family. Building on industry-leading resolution and contrast, ZEISS Xradia 600-series Versa extends the boundaries of non-destructive imaging for maximum flexibility to accelerate your research.

Breakthrough innovations in source and optics technology provide higher X-ray flux to deliver faster tomography scans without sacrificing industry-leading resolution and contrast. Innovative acquisition workflows allow you to seek—and find—regions of interest at highest resolution without cutting the sample. Move from exploration to discovery in a seamless workflow.

Simpler. More Intelligent. More Integrated.

A Class Above Traditional MicroCT

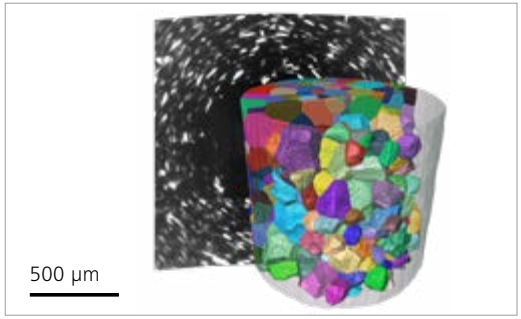
ZEISS Xradia 600-series Versa goes beyond the limits of projection-based micro-and nano-computed tomography (CT) systems. Whereas traditional CT systems rely on single-stage geometric magnification, Xradia Versa features a combination of unique two-stage magnification optics and a high flux X-ray source to produce faster sub-micron scale resolution images across the widest range of intact sample sizes and types. The Resolution at a Distance (RaaD) architecture enables high resolution 3D imaging of larger, denser objects including intact components and devices. The optional flat panel extension (FPX) enables rapid scans of very large samples (up to 25 kg), providing navigation to interior regions of interest. ZEISS Xradia Versa obtains true spatial resolution of 500 nm with a minimum achievable voxel size of 40 nm.



Smart watch battery: ZEISS Xradia 620 Versa scans the intact battery to identify areas of interest and zoom-in for high resolution imaging.

Achieve New Degrees of Freedom

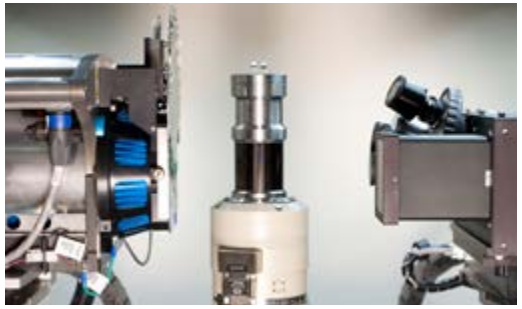
Boost the performance of your Xradia Versa by exploring advanced capabilities. Discern your materials with Xradia synchrotron-caliber optics to maximize absorption and phase contrast. Enhance absorption contrast for low-Z or similar-Z materials with the Dual Scan Contrast Visualizer (DSCoVer). Unlock 3D crystallographic information with laboratory-based Diffraction Contrast Tomography (LabDCT). Improve scan speed and accuracy of large or irregular samples with advanced acquisition techniques such as High Aspect Ratio Tomography (HART). Accelerate post-processing and image segmentation tasks using advanced machine learning with ZEISS ZEN Intellesis. Boost throughput and image quality with ZEISS DeepRecon Pro and OptiRecon, that leverage artificial intelligence and iterative reconstruction algorithms.



LabDCT option, available on Xradia 620 Versa, provides non-destructive 3D grain imaging. Sample: Armco Fe, reconstructed grain structure (color), diffraction pattern (black and white). Courtesy of University of Florida, USA; Professor Burton R Patterson

Premier 4D / *In Situ* Solution

X-ray microscopes can be used to non-destructively characterize the 3D microstructure of materials in controlled environments (*in situ*) as well as to observe the evolution of structures over time (4D). By leveraging RaaD capability, Xradia Versa maintains the highest resolution across large working distances, accommodating samples contained within environmental chambers and high-precision *in situ* load rigs. Xradia Versa seamlessly integrates with other ZEISS microscopes to solve your multi-scale correlative challenges. Unlike traditional microCT systems, Xradia Versa family is built on an established ZEISS 3D X-ray microscope platform that is upgradeable, expandable and reliable, paving the way for future enhancements and protecting your investment.



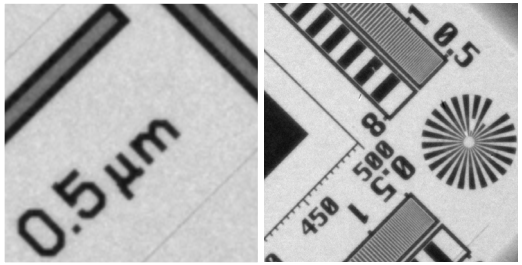
X-ray source (left), sample stage with tension/compression stage (center), and detector (right). Even with source to sample distances of several centimeters to accommodate in situ *sample holders, voxel sizes below one micron can be achieved.*

Your Insight into the Technology Behind It

Highest Resolution Without Compromise

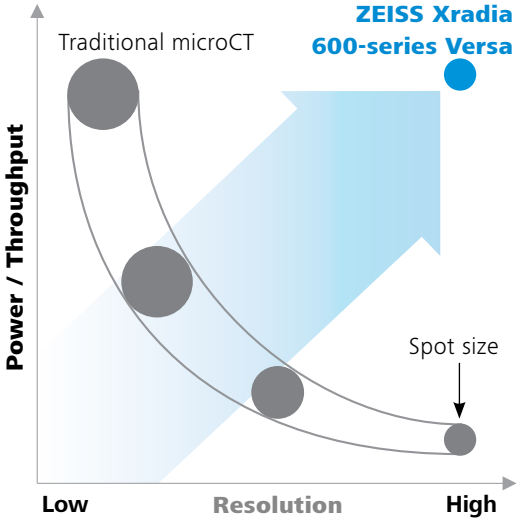
The two major challenges in X-ray computed tomography are maintaining resolution on larger sample sizes and longer working distances while simultaneously maximizing resolution and X-ray flux for greater throughput. Addressing these challenges requires breakthrough innovations, optimized design and system integration. ZEISS Xradia 600-series Versa are uniquely positioned to meet these challenges by integrating dual-stage magnification architecture with high flux X-ray source technology.

ZEISS specifies XRM on true spatial resolution, which is the most meaningful measurement of a microscope's performance. Spatial resolution refers to the minimum separation at which a feature pair can be resolved by an imaging system. It is typically measured by imaging a standardized resolution target with progressively smaller line-space pairs. ZEISS Xradia 600-series Versa obtains true spatial resolution of 500 nm with a minimum achievable voxel size of 40 nm.



Left: True spatial resolution of 0.5 µm demonstrated on JIMA resolution target
Right: True spatial resolution of 0.5 µm demonstrated on ZEISS Xradia resolution target

	Resolution on Traditional microCT Systems	Higher Resolution on ZEISS 3D X-ray Microscope (XRM)
Spot size	Suffer from spot-size dependent blur.	Unique dual-stage magnification enables performance not limited by spot size
Sample size	Only able to achieve high resolution on smallest sample sizes.	ZEISS XRM Resolution at a Distance (RaaD) technology enables the highest resolution across diverse set of sample sizes and working distances
Sample type	Limited to small, low-Z samples using low kV X-ray beam.	Energy-tuned detectors enable highest resolution across a broad range of sample types and densities
Throughput/flux	Higher throughput/flux requires larger spot size limiting resolution.	Higher flux and faster scans can be achieved without compromising resolution. In addition, optional modules such as DeepRecon Pro and OptiRecon can provide up to 10× throughput improvement.
Instrument setup	Require installation of different source targets/ filaments for different operating needs.	Source is designed to operate across entire application space with a wide range of detectors, eliminating the need for manual hardware reconfigurations



Your Insight into the Technology Behind It

Higher X-ray Flux Source – Numerous Advantages

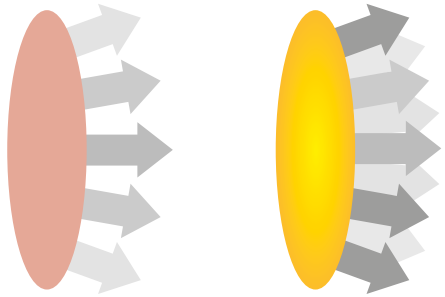
ZEISS Xradia 600-series Versa has breakthrough high power (25 W) X-ray source technology that can provide significantly higher X-ray flux compared to its predecessors. The new source pushes the boundaries with improved thermal management, increasing the flux capacity and throughput while maintaining the same stringent spot size performance as that of the already world-class Xradia 500-series Versa. A new source control system improves source responsiveness enabling faster scan setup leading to a more satisfying and engaging user experience.

Xradia 500- and 600-series Versa utilize highly optimized sealed transmission X-ray source technology. Sealed sources mean higher vacuum and longer filament life—eliminating costly, time-consuming, and error-prone frequent filament changes that are required in lower vacuum open source systems. The technological advancements in 600-series Versa enable higher X-ray flux while enhancing the source stability and lifetime.

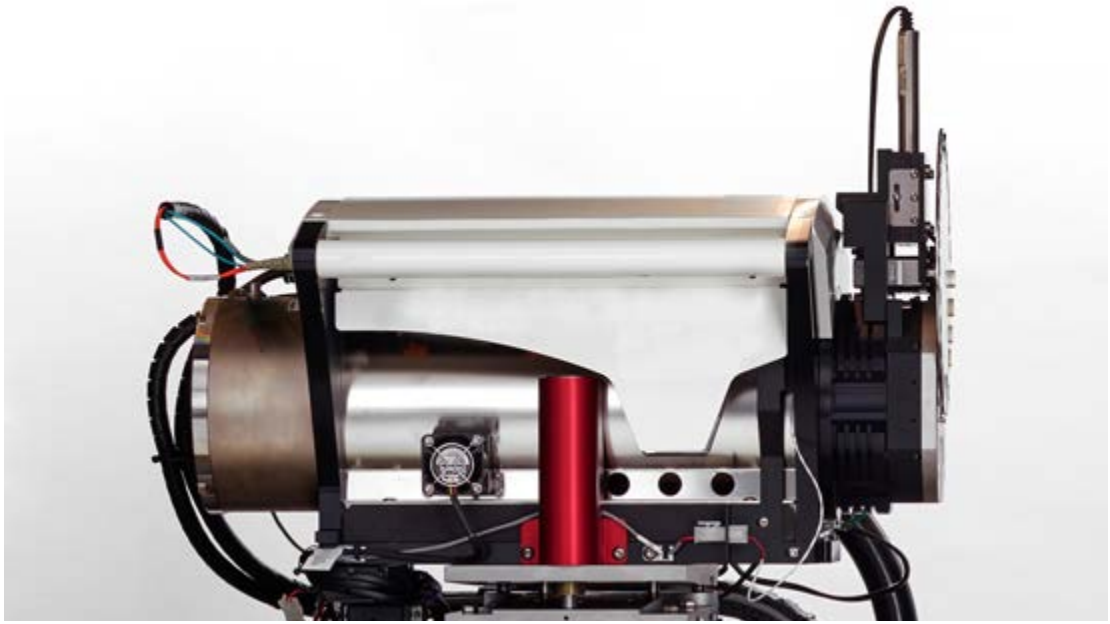
The technological advancements in 600-series Versa enable higher X-ray flux while enhancing the source stability and reliability.

What Higher X-ray Flux Offers

- Faster tomography scans
- More sample runs
- More regions of interest
- Higher contrast-to-noise ratio
- Stronger diffraction patterns
- Enabling long/multi-scan workflows (*in situ,* DSCoVer, stitching, DCT)



10 W source **25 W source**



ZEISS Xradia 620 Versa X-ray source

Your Insight into the Technology Behind It

Higher X-ray Flux –
Up to 2× Higher Throughput

3D X-ray images are constructed from a series of 2D projection radiographs, each of which requires exposing the sample with X-ray photons for a certain exposure time. Higher X-ray flux enables shorter exposure times per projection, collectively resulting in faster tomography scans. ZEISS Xradia 600-series Versa with 25 W high power source is able to achieve faster scans without compromising renowned Versa sub-micron resolution performance. Throughput improvement depends on the sample type. Denser, larger samples require higher X-ray energy to penetrate and image. The higher power (25 W) source gives exceptional performance at high energy (kV), without compromising resolution.

	Natural Resources	Materials Science	Electronics	Life Sciences
30 – 60 kV	Small Rock (1 mm)	Polymers, Wood	Camera-lens Assembly	Small bone (<5 mm), Insects
60 – 90 kV	Medium Rock (5-10 mm),	Fiber Composite, Electrodes	De-packaged Components, Battery Electrode	Medium bone (5 mm-10 mm), Tooth
90 – 120 kV	Large Rock (25 mm)	Concrete, Ceramics	Multi-layer Printed Circuit Board	Large bones (>10 mm), Jaw
120 – 160 kV	Whole Core (100 mm)	Full Battery, Metals	Intact Device, Package, Battery	Fossils

Typical X-ray microscopy imaging applications

	Power Increase Compared to Xradia 500-series Versa	Estimated Throughput Improvement Compared to Xradia 500-series Versa Baseline Tomography Scan	
		<2 hours	>2 hours
30 – 60 kV	1× – 1.3×	1× – 1.2×	1× – 1.3×
60 – 90 kV	1.3× – 1.5×	1.2× – 1.3×	1.3× – 1.4×
90 – 120 kV	1.5× – 1.8×	1.3× – 1.4×	1.3× – 1.5×
120 – 160 kV	1.8× – 2.5×	1.4× – 1.7×	1.5× – 2×

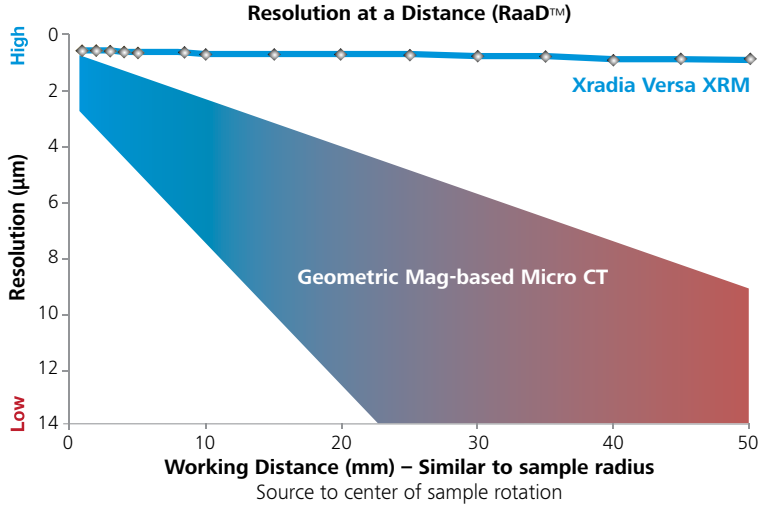
Throughput improvement shown is a representative on Xradia 600-series Versa that is sample/application dependent and based on typical tomography acquisition settings.

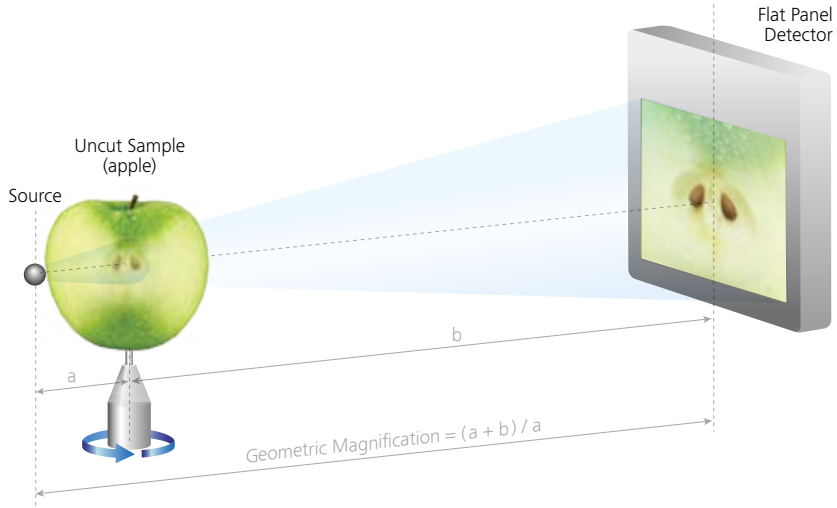
Your Insight into the Technology Behind It

ZEISS X-ray Microscopes – Designed for Your Advantage

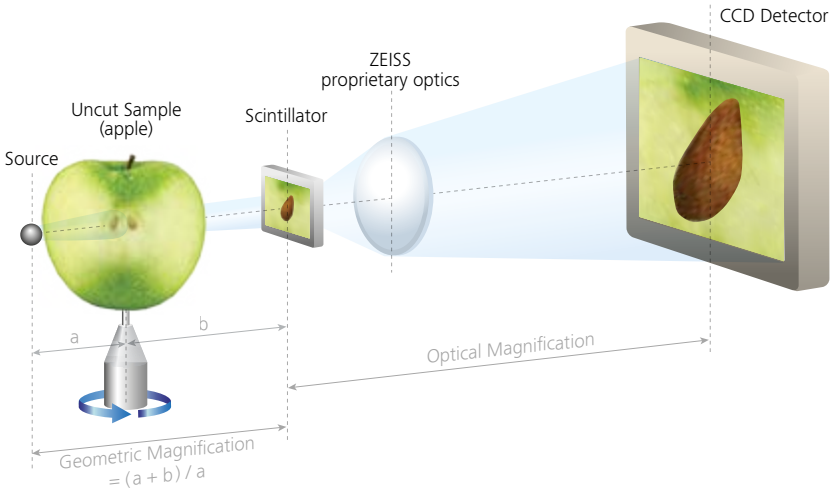
ZEISS Xradia Versa architecture uses a two-stage magnification technique that produces sub-micron resolution imaging at large working distances (RaaD) for a diverse set of sample sizes and types. Images are initially enlarged through geometric magnification as they are with conventional microCT, but then the projected image impinges on a scintillator, converting X-rays to visible light that is subsequently magnified by an optical objective before reaching the CCD detector.

Add the optional flat panel extension (FPX) to your X-ray microscope to further increase its versatility. This combination of detector designs allows for the widest range of sample sizes and types to be studied efficiently and accurately. With more X-ray photons available on ZEISS Xradia 600-series Versa, you can now achieve even faster time to results for varied sample sizes without compromising resolution.





Conventional microCT architecture. Sample must be close to the source to achieve resolution.



ZEISS XRM two-stage magnification architecture. Sample imaged independent of distance to source, enabling interiors of larger samples to be imaged non-destructively at higher resolution.

Your Insight into the Technology Behind It

Gain An Edge In Contrast

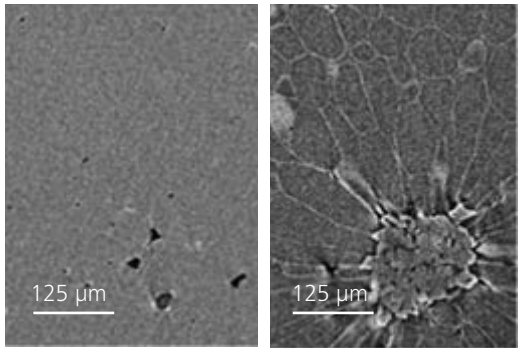
Your imaging requires superior contrast capabilities to reveal details necessary to accurately visualize and quantify features. ZEISS Xradia Versa delivers flexible, high contrast imaging for even your most challenging materials – low atomic number (low Z) materials, soft tissue, polymers, fossilized organisms encased in amber, and other materials of low contrast.

Xradia Versa family of 3D X-ray microscopes (XRM) are designed to increase material imaging flexibility by employing several contrast enhancing features. These unique system features enable ZEISS X-ray microscopes to provide superior contrast for a range of difficult-to image materials.

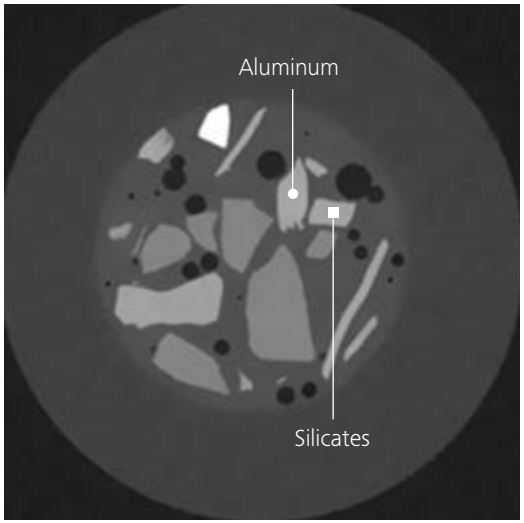
1. Enhanced absorption contrast: ZEISS' detector system consists of multiple highly specialized proprietary detectors that are each optimized to maximize collection of contrast-forming low energy X-ray photons.

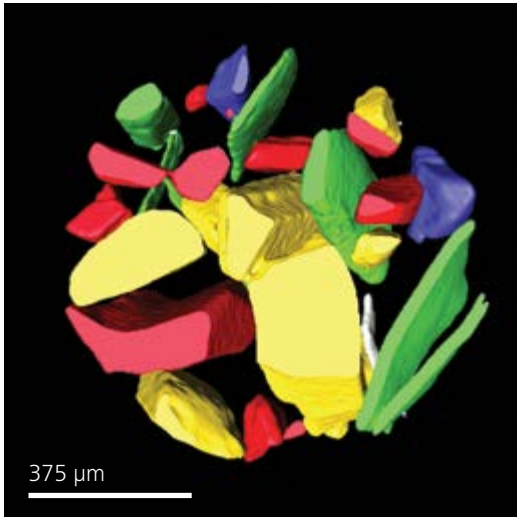
2. Tunable Propagation Phase Contrast: The unique phase contrast modality measures the refraction of X-rays and is different to standard absorption contrast, which measures the absorption of X-rays. Phase contrast enables visualization of materials with poor absorption contrast.

3. Dual Scan Contrast Visualizer (DSCoVer), exclusive to Xradia 620 Versa, extends the detail captured in a single energy absorption image by combining information from tomographies taken at two different X-ray energies. DSCoVer takes advantage of how X-rays interact with matter based on effective atomic number and density. This provides you with a unique capability for distinguishing, for example, mineralogical differences within rocks as well as among difficult-to-discern materials such as silicon and aluminum.



Pear imaged with absorption contrast – no visibility of cell walls (left), and pear imaged with phase contrast, showing details of cell walls in normal cells and stone cells (right).





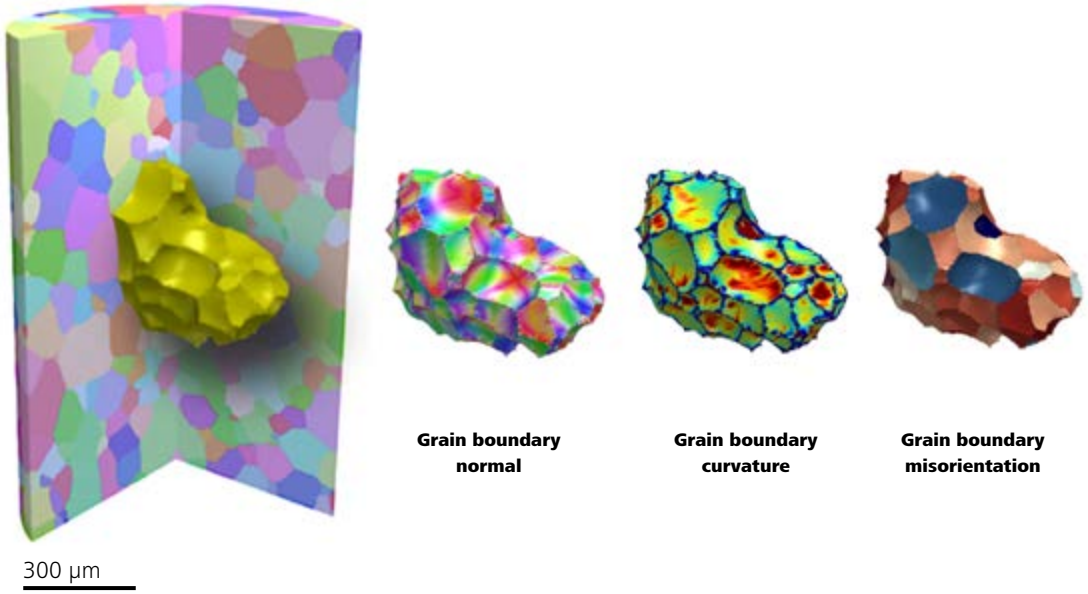
A single energy scan shows that aluminum and silicon are virtually identical (left), with very similar grayscale contrast. DSCoVer exclusively available on ZEISS Xradia 620 Versa enables separation of the particles. 3D rendering shows Aluminum/green; Silicates/red (right).

Your Insight into the Technology Behind It

LabDCT – Unlocking Crystallographic Information in Your Lab

With LabDCT option exclusively available on Xradia 620 Versa, ZEISS brings you the first ever laboratory-based diffraction contrast tomography imaging module. This unique grain imaging analytical technology enables non-destructive mapping of orientation and microstructure in 3D. No longer confined to conventional 2D metallographic investigations, direct visualization of 3D crystallographic grain orientation opens up a new dimension in the characterization of polycrystalline materials like metal alloys, geomaterials, ceramics, or pharmaceuticals.

- LabDCT enables comprehensive 3D microstructure analysis from large volume, large grain statistics down to local individual grain boundary analysis including parameters like misorientation and curvature. Investigate microstructural evolution with 4D imaging experiments, tracking grain boundary mobility and grain growth processes. Bring the capabilities of synchrotron experiments to your lab, with routine access enabling prolonged time-dependent studies across days, weeks or even months—well suited to corrosion, creep, or fatigue studies.
- Routinely and non-destructively acquire data (including grain size, morphology, orientation) on large volumes at fast acquisition times. Stitch multiple LabDCT scans to generate very large grain statistics essential for validating and improving numerical grain models.
- Combine 3D crystallographic information with 3D microstructural features such as defects or precipitates you have observed in absorption or phase tomography. Combine modalities to understand structure-property relationships between grains, voids, inclusions, and other morphological details.
- LabDCT now supports specimens with crystal structures from high cubic symmetry to systems with lower symmetry such as monoclinic materials.



Armco iron sample with abnormal grain growth. Sample courtesy of Prof. Burton R. Patterson, University of Florida

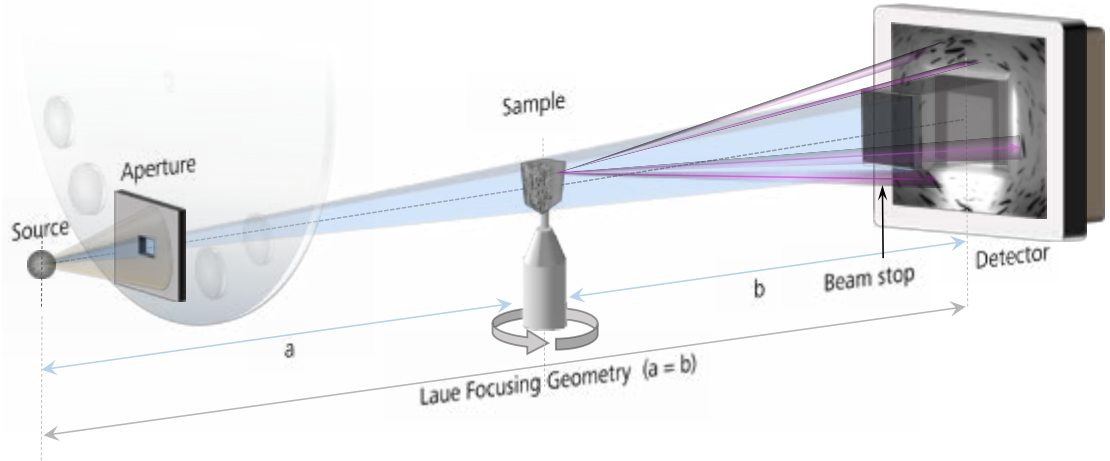
Your Insight into the Technology Behind It

LabDCT – How it Works

LabDCT option on Xradia 620 Versa is a fully integrated analytical module. The sample is illuminated through an aperture in front of the X-ray source. Both the sample absorption and diffraction information are recorded with a high resolution detection system. A beamstop is added to the set-up to block out the direct beam and to enhance the contrast of the diffraction signal. 3D crystallographic information (e.g., grain size, morphology, position and orientation) is reconstructed using GrainMapper3D software.

LabDCT Advanced Imaging Module

- Dedicated hardware: apertures, beamstop
- Integrated acquisition with Scout-and-Scan
- GrainMapper3D advanced and interactive crystallographic reconstruction software
- Dedicated high performance workstation



Schematic of the LabDCT setup

Al_4Cu alloy showing absorption and grain information. Courtesy of Prof. Masakazu Kobayashi, Toyohashi University of Technology, Japan

Your Insight into the Technology Behind It

Advanced Reconstruction Toolbox

The Advanced Reconstruction Toolbox is an innovative platform on which you can continuously access state-of-the-art reconstruction technologies from ZEISS to enrich your research and increase the return on investment of your ZEISS Xradia 3D XRM.

These unique offerings from ZEISS leverage deep understanding of both X-ray physics and customer applications to solve some of the hardest imaging challenges in new and innovative ways. These optional modules are workstation-based solutions that provide easy access and usability.

	FDK Standard Analytical Reconstruction	**OptiRecon** Iterative Reconstruction	**DeepRecon Pro** AI (Deep-Learning) based Reconstruction
Throughput	1×	up to 4×	up to 10×
Image Quality*	Standard	Better	Best
Ease-of-Use	Minimal	Requires parameter optimization	One-click setup
Applicability	Repetitive and non-repetitive workflows		

* Image quality refers to the contrast-to-noise ratio and the relative performance of reconstruction technologies is shown.

ZEISS DeepRecon

The first commercially available deep learning reconstruction technology enables you to increase throughput by up to 10× without sacrificing novel XRM RaaD. Alternatively, keep the same number of projections and enhance the image quality further. DeepRecon uniquely harvests the hidden opportunities in big data generated by your XRM and provides significant AI-driven speed or image quality improvement.

ZEISS offers DeepRecon technology in 2 forms – 1) DeepRecon Pro, and 2) DeepRecon Custom – both leveraging AI to provide unprecedented image quality with unparalleled speed.

ZEISS DeepRecon Pro is an innovative AI-based technology bringing superior throughput and image quality benefits across a wide range of applications. DeepRecon Pro is applicable to both unique samples as well as semi-repetitive and repetitive workflows. Customers can now self-train new machine learning network models on-site with an extremely easy-to-use interface. The one-click workflow of DeepRecon Pro eliminates the need for a machine learning expert and can be seamlessly operated by even a novice user. ZEISS DeepRecon Custom is targeted specifically for repetitive workflow applications to further boost XRM performance beyond DeepRecon Pro. Customers can closely collaborate with ZEISS to develop custom-created network models that precisely fits their repetitive application needs.

ZEISS OptiRecon

A fast and efficient algorithm-based technology that delivers iterative reconstruction from your desktop, allowing you to achieve up to 4× faster scan times or enhanced image quality with equivalent throughput.

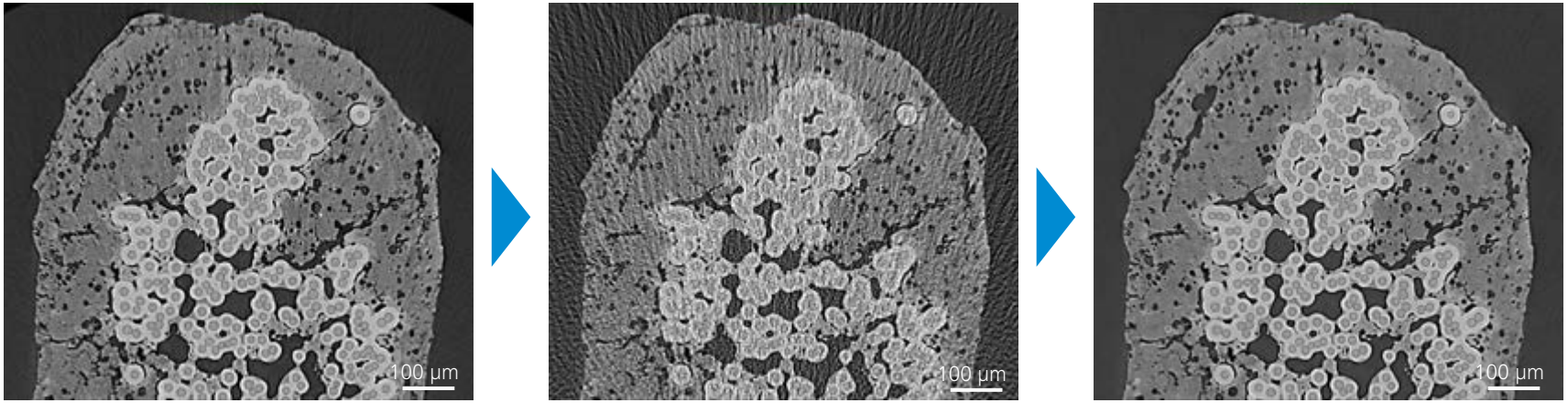
OptiRecon is an economical solution offering superior interior tomography or throughput on a broad class of samples.

ZEISS PhaseEvolve

ZEISS PhaseEvolve is a post-processing reconstruction algorithm that enhances the image contrast by revealing material contrast uniquely inherent to X-ray microscopy, which can often be obscured by phase effects in low-medium density samples or high resolution datasets. Perform more accurate quantitative analysis with improved contrast and segmentation of your results.

Your Insight into the Technology Behind It

ZEISS DeepRecon Pro – How It Works in Materials Science



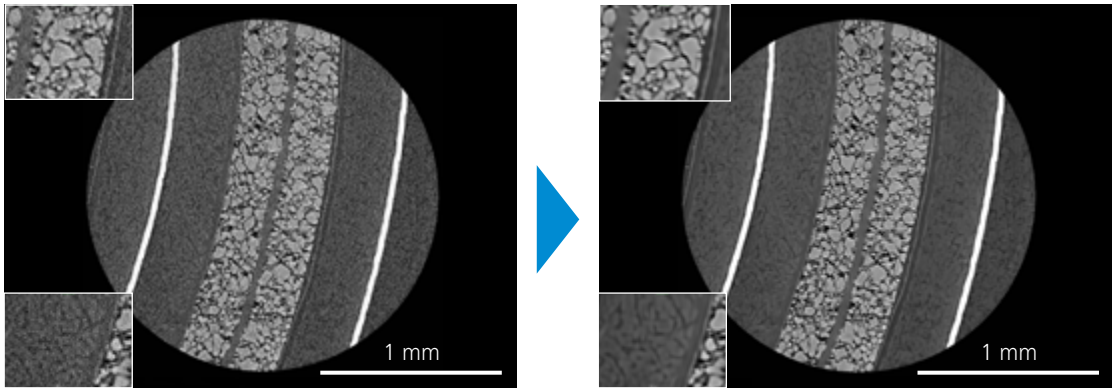
Standard reconstruction (FDK): Scan time 9 hrs (3001 projections)

Standard reconstruction (FDK): Scan time 53 mins (301 projections)

DeepRecon Pro: Scan time 53 mins (301 projections)

DeepRecon Pro used for throughput improvement for Ceramic Matrix Composite (CMC) sample, achieving 10× throughput improvement without sacrificing image quality. This would allow for much higher temporal resolution for in situ *studies.*

ZEISS DeepRecon Pro – How It Works in Electronics



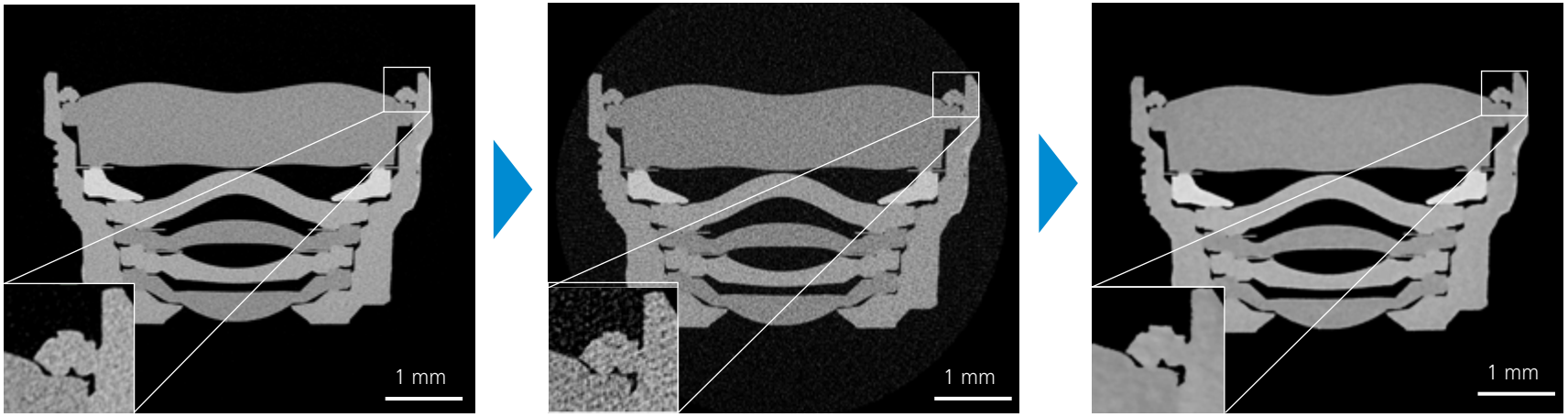
Standard Reconstruction (FDK)

DeepRecon Pro

DeepRecon Pro used for image quality improvement for a smartwatch battery. DeepRecon Pro both improves the clarity of cathode grains and polymer separator. It also allows for the recovery of features otherwise obscured by image noise, such as the electrolyte saturated anode.

Your Insight into the Technology Behind It

ZEISS OptiRecon – How It Works in Electronics



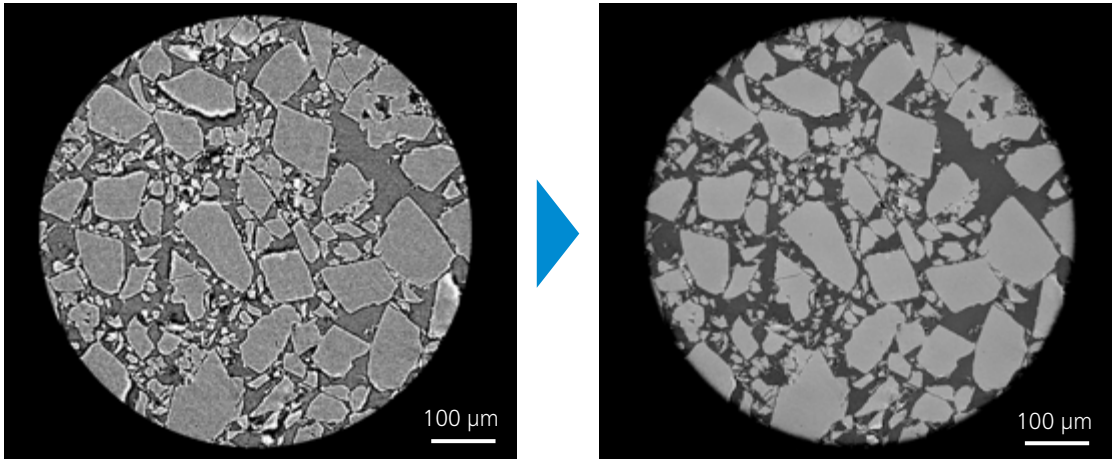
Standard reconstruction: Scan time 90 minutes (1200 projections)

Standard reconstruction: Scan time 22 minutes (300 projections)

OptiRecon: Scan time 22 minutes (300 projections)

Observe the performance of OptiRecon in a workflow performed on an electronics sample. Analyze integration issues in a smart phone camera lens, now 4× faster using OptiRecon.

ZEISS PhaseEvolve – How It Works in Materials Science



Standard reconstruction

PhaseEvolve applied reconstruction

Application of PhaseEvolve to a pharmaceutical powder sample. High resolution or low kV imaging can result in inherent material contrast being obscured by phase contrast artifacts. PhaseEvolve effectively removes phase fringes to enhance image contrast and improve segmentation results.

Your Insight into the Technology Behind It

Achieve Higher Throughput – Obtain Faster Time to Results

In addition to faster tomography scans due to higher X-ray flux and advanced reconstruction technologies, the innovative High Aspect Ratio Tomography (HART) mode, exclusive to the ZEISS Xradia 620 Versa, provides you with further throughput advantages for your flat samples such as semiconductor packages and boards. HART enables you to space projections variably so that you collect fewer projections along the broad side of a flat sample and more along the thin side. A wealth of 3D data is provided by these closely-spaced long views versus less densely-spaced short views, maximizing information density during acquisition.

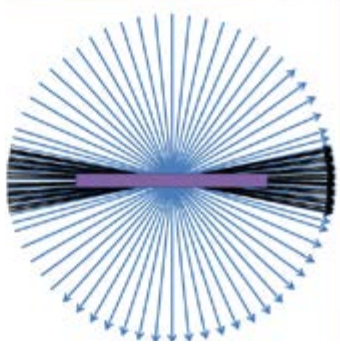
You can also tune HART to emphasize higher throughput or better image quality, thereby potentially accelerating image acquisition speed by 2×. This faster acquisition mode is in addition to a powerful dual GPU workstation that accelerates image reconstruction time by up to 40%. Add the optional flat panel extension (FPX) to achieve higher throughput (2-5×) on very large samples (up to 10×).

Challenging Sample Imaging Made Easier

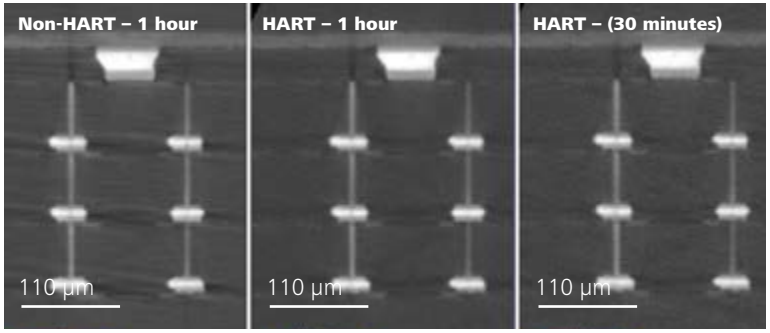
Researchers commonly use source filters to tune the X-ray energy spectrum and every ZEISS Xradia Versa comes with a standard set of 12 filters. ZEISS Xradia 610 Versa is equipped with a single filter slot allowing for manual filter change.

ZEISS Xradia 620 Versa system features Automated Filter Changer (AFC), which improves ease of use for seamlessly changing filters without manual intervention. In addition to the standard range of filters, you will find 12 additional filter slots on the AFC to allow you to use custom source filters, such as filters composed of different materials or thicknesses.

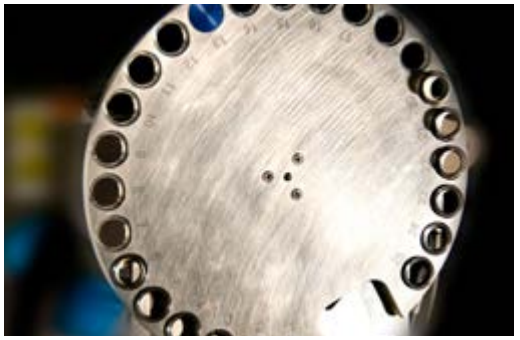
The AFC houses these filters and allows your selection to be programmed and recorded for each recipe with the Scout-and-Scan Control System. When you don't need a source filter at all, there is a convenient cut-out on the AFC to allow your samples to move even closer to the source for higher throughput.



HART projection spacing and density optimized for feature-rich short side.



DRAM chip: Non-HART (left) vs. HART (middle) shows better image quality at the same imaging time. Non-HART (left) vs. HART (right) shows same image quality in half the scan time. HART available uniquely on ZEISS Xradia 620 Versa can be tuned to emphasize either better image quality or higher throughput.



The Automated Filter Changer (AFC) exclusive to the ZEISS Xradia 620 Versa offers 12 standard filters with room for 12 custom filters.

Your Insight into the Technology Behind It

Flexibly Image Larger Samples

Wide Field Mode (WFM) is used to stitch projections horizontally to form an extended lateral field of view. This technique can provide you with either higher voxel density (nearly 2×) for a given field of view or a wide lateral field of view to provide 3× larger 3D volume for large samples.

All ZEISS Xradia Versa systems are capable of WFM with 0.4× objective. In addition, ZEISS Xradia 620 Versa system features WFM with 4× objective.

Combining WFM with the existing Vertical Stitching feature, which joins separate tomographies vertically into a taller single tomography, enables you to image large samples that are both wider and taller than the standard field of view.

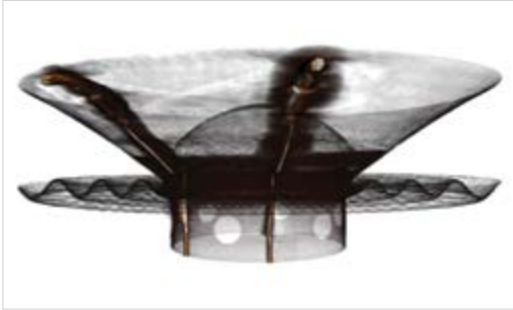
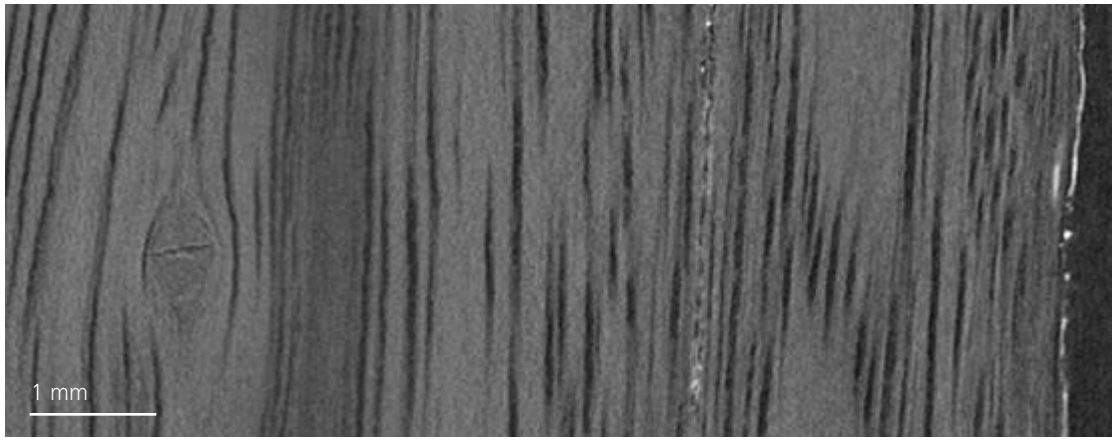


Image large samples with Wide Field Mode such as this 6" stereo speaker.



Achieve higher resolution (2× voxel) in standard field of view mode.

Your Insight into the Technology Behind It

Use Our Super Simple Control System to Create Efficient Workflows

All of the features introduced by ZEISS Xradia Versa instruments are seamlessly integrated within the Scout-and-Scan Control System, an efficient workflow environment that allows you to easily scout a region of interest and specify scanning parameters. The interface maintains the flexibility for which ZEISS Xradia Versa systems are known, enabling you to set-up scans even more easily. Scout-and-Scan software also offers recipe-based repeatability, which is especially useful for your *in situ* and 4D research, and enables you to have greater control and efficiency for future work. The easy-to-use system is ideal for a central lab-type setting where your users may have a wide variety of experience levels.

The ZEISS XRM Python API provides additional capability to interact with the Versa X-ray microscopes. There are three different APIs that can be used in Python scripts to interact with the microscope for different use cases.

The Basic API module provides methods to interact with the microscope, such as moving motors and changing objectives. The Recipe API module contains functions that can modify and run recipes to acquire data. The Basic Data Set API module can be used to read the data generated by an acquisition or reconstruction. With the seamless integration of Python API into the control system, you can expand instrument control capabilities and enhance the productivity and quality of your research.

Set, Load, Scout, Scan, Run. It's that simple.

Scout-and-Scan Advantages

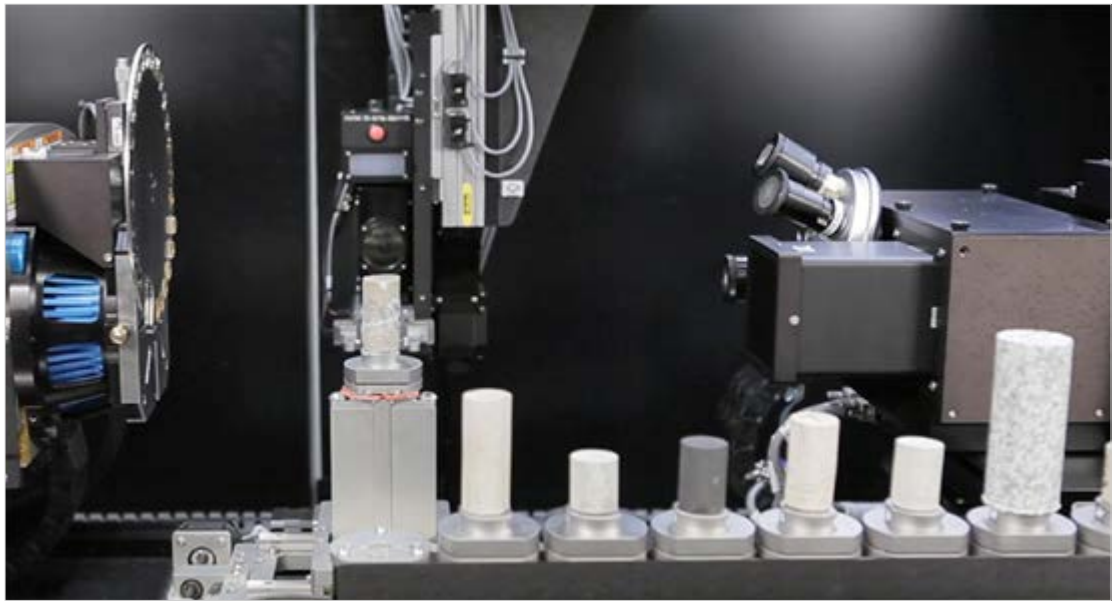
- Internal camera for sample viewing
- Recipe control (set, save, recall)
- Multiple energies
- Multiple samples with Autoloader option
- Micropositioning capability with a simple mouse click
- XRM Python API for custom workflows

Your Insight into the Technology Behind It

Increase Your Sample Handling Efficiency

Maximize your instrument's utilization by minimizing user intervention with the optional Autoloader available for all instruments in the ZEISS Xradia Versa series of sub-micron 3D X-ray microscopes. Reduce the frequency of user interaction and increase productivity by enabling multiple jobs to run. Load up to 14 sample stations which can support up to 70 samples, queue, and allow to run all day, or off-shift.

The software provides you with the flexibility to re-order, cancel and stop the queue to insert a high priority sample at any time. An e-mail/text notification feature in the Scout-and-Scan user interface provides timely updates on queue progress. Autoloader also enables a workflow solution for high volume repetitive scanning of like samples.



Autoloader option enables you to program up to 70 samples at a time to run sequentially.

Your Insight into the Technology Behind It

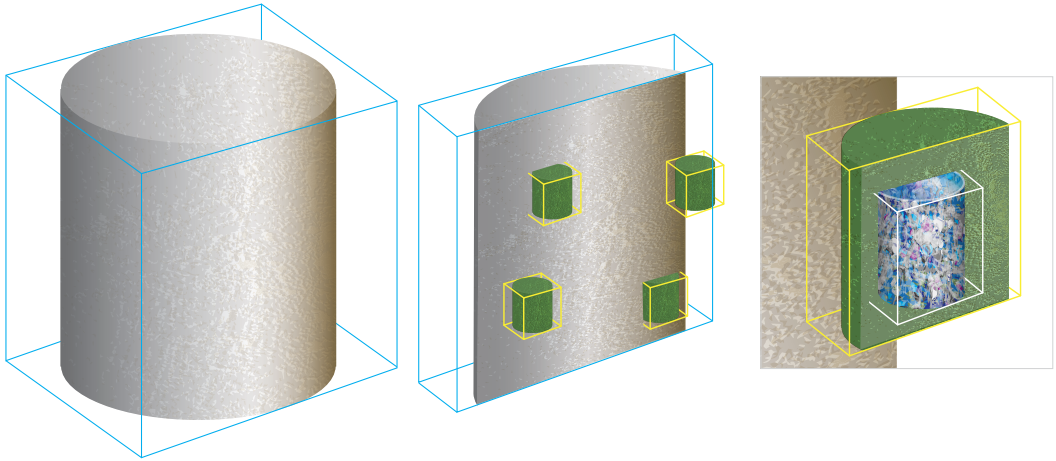
Image Even Larger Samples with High Throughput

Optional Flat Panel Extension (FPX) delivers large- sample, high throughput scanning with ZEISS best-in-class image quality. ZEISS Xradia Versa FPX enhances imaging flexibility and creates workflow efficiencies with an all-in-one system for industrial and academic research.

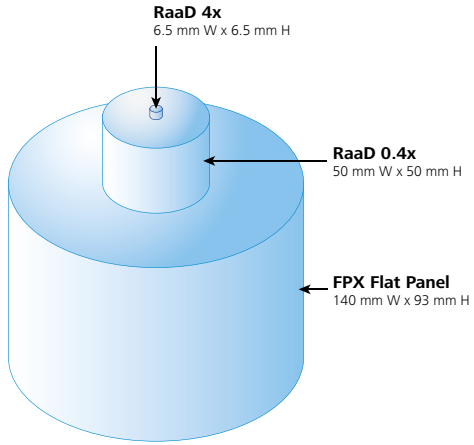
Scout-and-Zoom is a unique capability of ZEISS X-ray microscopes that leverages FPX to perform a low resolution, large field of view, "Scout" scan and identify interior regions for higher resolution "Zoom" scans on a variety of different sample types.

This powerful technique is achieved only by the Versa dual magnification microscope objectives that enable Resolution at a Distance (RaaD) and can be used to accurately identify regions of interest in several applications such as imaging a specific region of trabecular bone inside an intact bone, a particular solder bump in the interior of large semiconductor package, or a specific area of cracks or voids in a composite sample.

Now, advanced reconstruction technologies, such as OptiRecon and DeepRecon Pro, can improve the image quality of challenging "Zoom" scans without increasing image acquisition time.



Scout-and-Zoom large sample at high throughput with high resolution sub-sampling



Single FOV reconstruction volume comparison

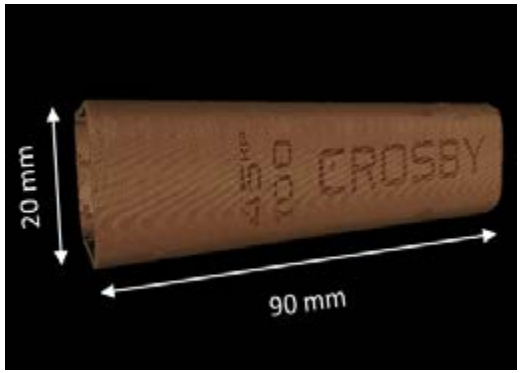
FPX Specifications	
Flat Panel Detector Array	3072 px × 1944 px
Single FOV	140 mm diameter
	93 mm height
Maximum field of view with automated stitching	140 mm diameter
	165 mm height

Your Insight into the Technology Behind It

Large Object Scout-and-Zoom Workflows with FPX

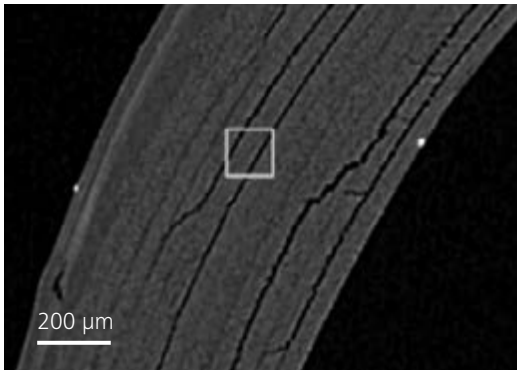
Three-stage Scout-and-Zoom workflow. Rapidly scan large field of view with FPX and then zoom to regions of interest with RaaD objectives.

FPX

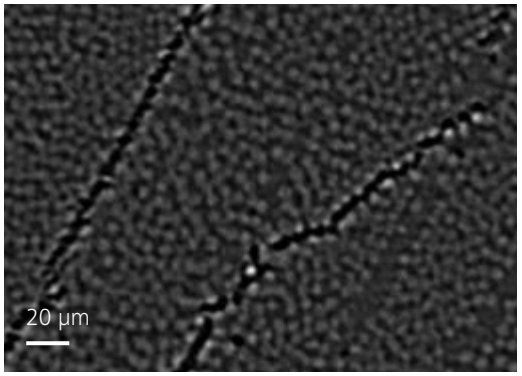


Sample set: Hockey stick fiber reinforced composite

0.4×



4×

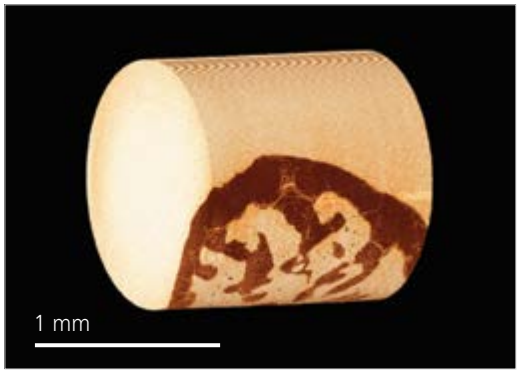


FPX

Sample set: Bear jaw, 15 cm long

0.4×

4×

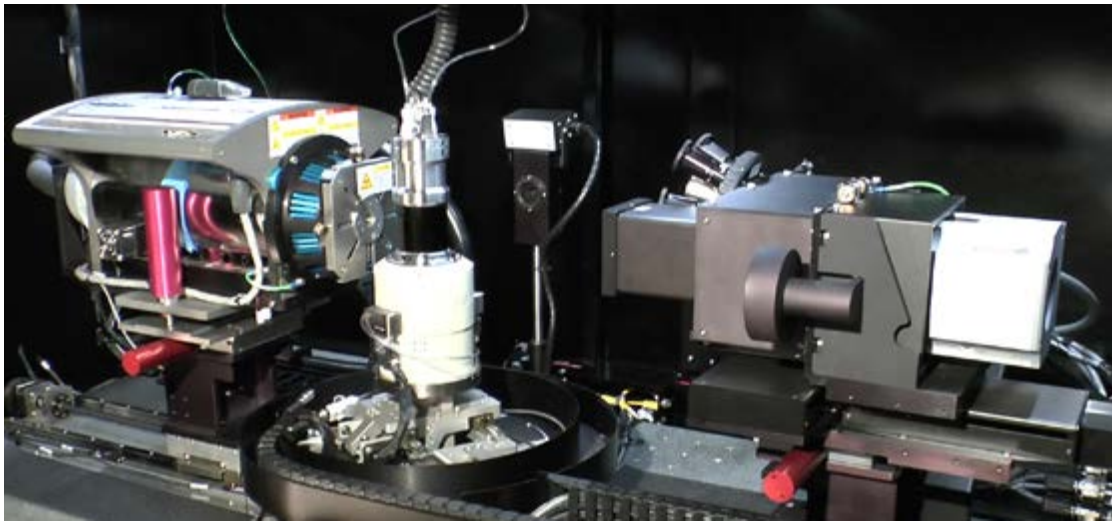


Your Insight into the Technology Behind It

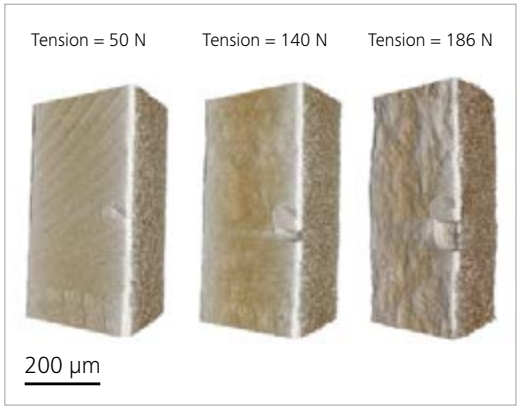
Enhance Your Experimental Possibilities by Adding the *In Situ* Interface Kit to Your XRM

Continuing to push the limits for scientific advancement, ZEISS Xradia Versa solutions have evolved to provide you with the industry's premier 3D imaging solution for the widest variety of *in situ* rigs, from high pressure flow cells to tension, compression and thermal stages.

ZEISS X-ray microscopes uniquely enable the most advanced *in situ* experiments. These studies require samples to be further away from the X-ray source to accommodate various types of *in situ* rigs. On traditional microCT systems, this significantly limits the resolution achievable for your samples. ZEISS XRM are uniquely equipped with dual-stage magnification architecture with Resolution at a Distance (RaaD) technology that enables the highest resolution for *in situ* imaging. You can add the optional *In Situ* Interface Kit to all Xradia Versa instruments. Contents include a mechanical integration kit, a robust cabling guide and other facilities (feed-throughs) along with recipe-based software that simplifies your operation from within the Scout-and-Scan user interface. Experience the highest level of stability, flexibility and controlled integration of such *in situ* devices on the Xradia Versa, which benefit from an optical architecture that doesn't compromise resolution in variable environmental conditions.



Making the industry's best in situ *solution even better:* in situ *kit tracking with Deben thermomechanical stage*



Tensile testing of a steel laser weld under increasing load. The data reveal a crack initiating and propagating from a rough surface imperfection, as well as the elongation of internal voids. Sample courtesy of Sandia National Laboratories

Your Insight into the Technology Behind It

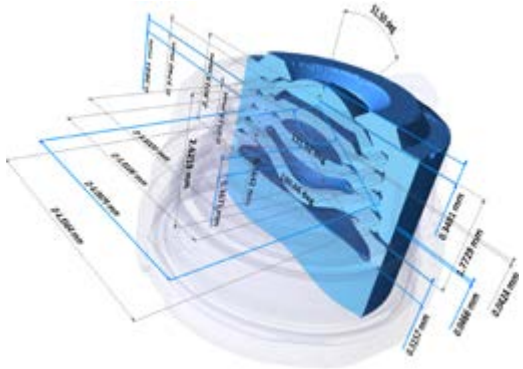
Metrology Extension – Adding Measurement Accuracy to X-ray Microscopy

With the Metrology Extension (MTX) option you turn your Xradia Versa into a verified measurement accuracy system. This is essential for academic and industrial labs where miniaturization and integration of components drive a growing demand for high-resolution metrology. Extend the capabilities of Versa by adding measurement with an accuracy far beyond the limits of conventional CT technology. Benefit from high resolution X-ray imaging combined with high-precision metrology.

XRM Check: ZEISS has developed a (multi-sphere) length standard for verifying the accuracy of the CT measurements of small-scale dimensions. It is used for determining deviation SD as per VDI/VDE 2630-1.3 guideline.

Reveal Smallest Dimensions. Measure them Most Accurately

- Leading CT metrology accuracy: Calibrated with MTX, ZEISS Xradia Versa provides a market-leading maximum permissible error value of MPE_{SD} = (1.9 + L/100) µm for measurements in small-scale volumes, where L is the measured length in mm.
- Small volumes at high resolution: MTX enables measurements with high dimensional accuracy within small reconstructed volumes of (5 mm)^3.
- Simple calibration workflow: The MTX package provides an integrated user-guided calibration workflow. Once the calibration routine has been executed, you perform precise measurements and make the data available to standard metrology software for further processing.



Smartphone Camera lens module: In the assembled state, the assessment of geometrical properties requires a non-contact and non destructive measurement method to quantify relational parameters. MTX allows the accuracy-verified measurement of properties like thickness of annular wedges, centration interlock diameters, gaps between wedges, lens-to-lens tilt, or apex heights and centration. These parameters are important for functional inspection and the enhancement of manufacturing designs and processes, to enable production of (versatile) cell phone cameras with improved image quality.

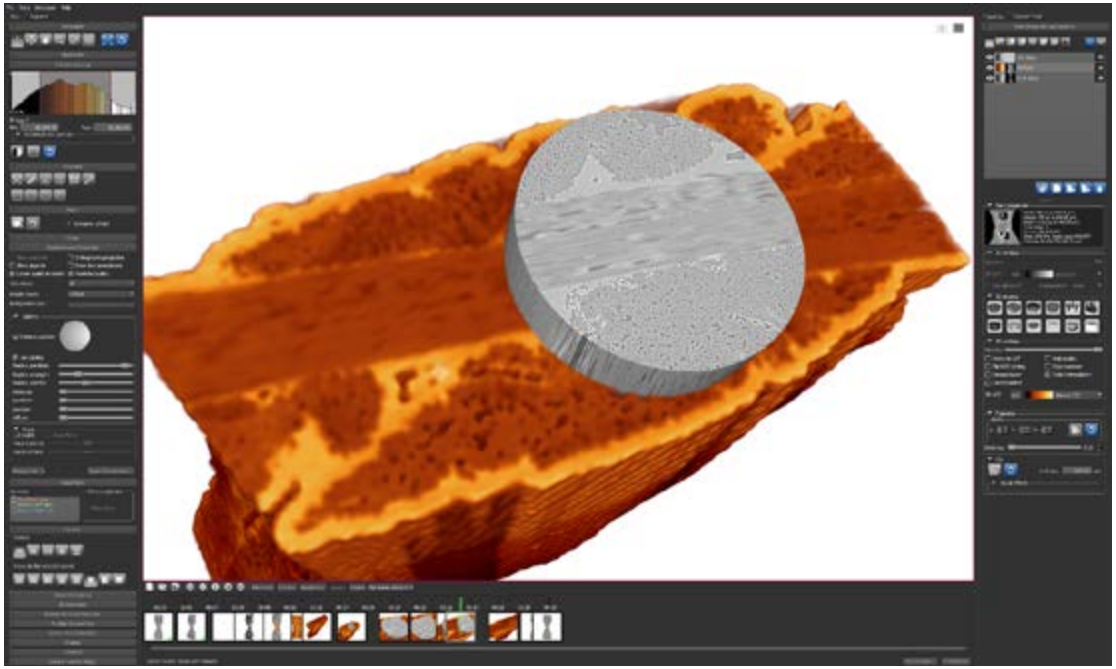
Accuracy (MPE complies with VDI/VDE part 1.3)	
SD (TS) in µm	1.9 + L/100[1, 2]
Measuring Range	Max measuring length: 4.8 mm[3]

[1] L is the measured length in mm
[2] Accuracy specifications valid for measurement in a single field of view on the 4× optical magnification
[3] Samples could be longer than 4.8 mm as long as region of interest for CT reconstruction fits inside the field of view

Your Insight into the Technology Behind It

Dragonfly Pro – Your Visual Pathway to Quantitative Answers

Dragonfly Pro is advanced 3D visualization and analysis software from Object Research Systems (ORS). It is offered exclusively by ZEISS for processing XRM, SEM, FIB-SEM and Helium ion data. Combining advanced image processing algorithms and state-of-the-art volume rendering, Dragonfly Pro enables high definition exploration and powerful quantitative analysis of your data.
Dragonfly Pro is distinguished by its ease of use, best-in-class image segmentation toolkit, and endless extensibility. Import your multi-scale, multi-microscope image studies, and you'll discover that Dragonfly Pro is the most advanced correlative imaging platform available. Integrated with a suite of image processing tools for 2D and 3D image registration, resampling, and more, Dragonfly Pro's cutting-edge image filters will make imaging artifacts disappear.
Your visual results will let your images speak for themselves. Capture and share insightful screenshots—as still images or 2D animations—or turn to Dragonfly Pro's 3D Movie Maker for effortless high-impact 3D animations.
Dragonfly Pro's intuitive user interface and simple features that map directly onto users' needs make even first-time users highly productive.
The integrated machine learning engine solves segmentation of even the most challenging samples, while interactive painting and contouring tools make curation and fine edits a breeze.
Record your workflows and replay them as needed or in batch. Even write custom Python code to drive the software to highly-customized and robust solutions.
Simple to use, but delivering the quantitative answers and visual impressions you demand, Dragonfly Pro will accelerate your 2D/3D data productivity.



Tailor the tools that are optimal to your workflow: choose plug-ins that allow you to control registration, map differences, and customize appearance. Ceramic matrix composite, imaged on a ZEISS Xradia Versa microscope. Sample courtesy of Dr. David Marshall, University of Colorado

Key User Benefits:

- Ease of use
- Image segmentation
- Multi-modal (XRM, SEM, FIB-SEM, Helium ion)
- Scripting robust and batching workflows
- Multi-scale
- Quantitative Analysis
- Movies

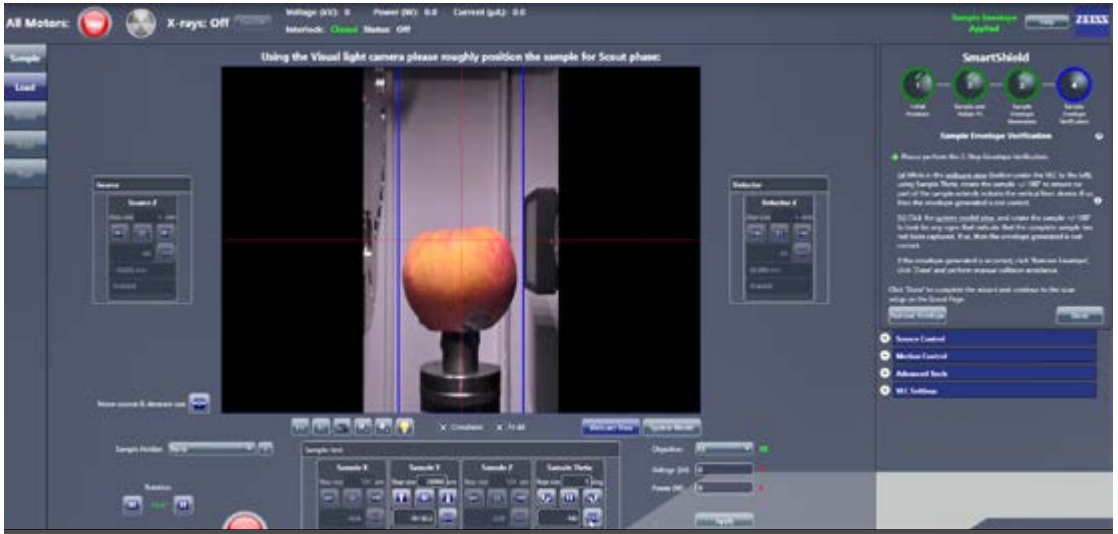
Your Insight into the Technology Behind It

SmartShield – Protect Your Sample and Optimize Experiment Setup

SmartShield protects your sample and your microscope, working within Scout-and-Scan™ control system. SmartShield wraps a digital envelope around your sample with an easy click of a button. This automated solution allows you to confidently bring your sample even closer to the source and detector. With SmartShield, new and advanced users alike can experience an elegant sample setup workflow and efficient navigation of the Versa system.

What SmartShield Offers:

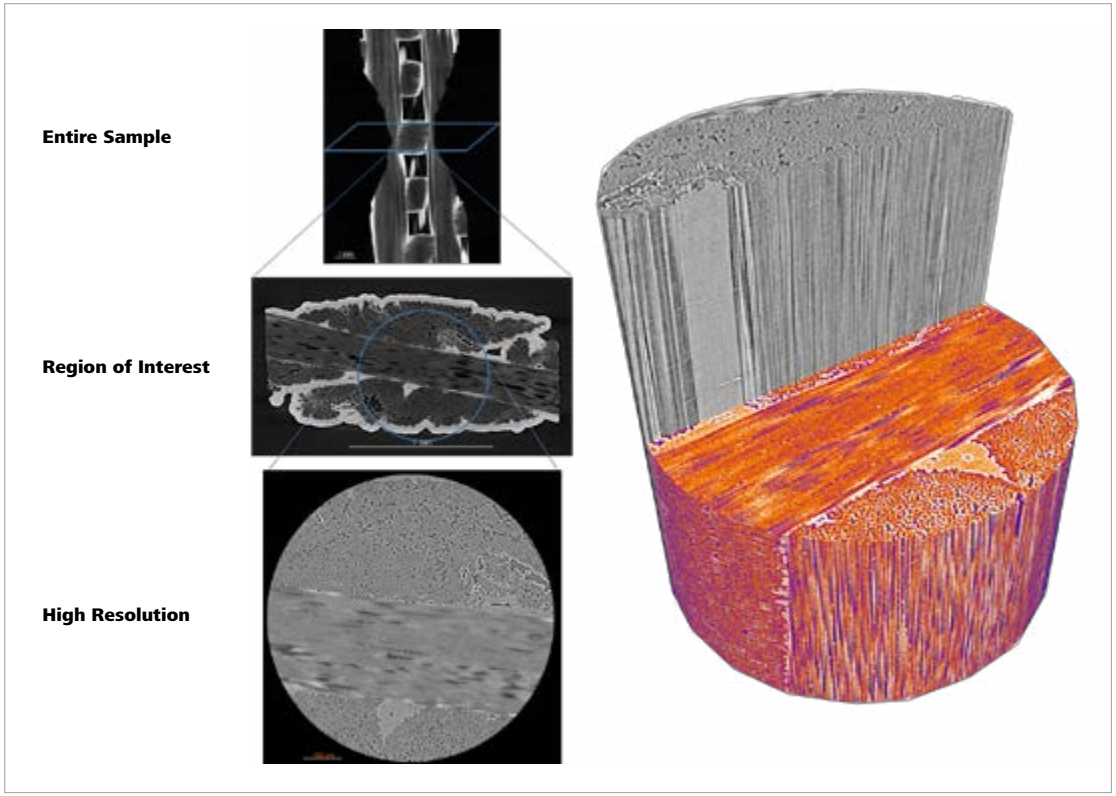
- Fully integrated rapid envelope creation within Scout-and-Scan
- 3D awareness for sample and instrument safety
- Enhanced operator efficiency during setup



Click here to view this video

Watch this video and gain insights into the workflow guided by SmartShield.

ZEISS X-ray Microscopy at Work: Materials Research



A dogbone-shaped ceramic matrix composite (CMC) sample, used for in situ *mechanical testing. Using the Scout-and-Zoom workflow, the sample can be imaged non-destructively at multiple levels of magnification to identify, target, and study changes in local structure at high resolution. Sample courtesy of Dr. David Marshall, University of Colorado*

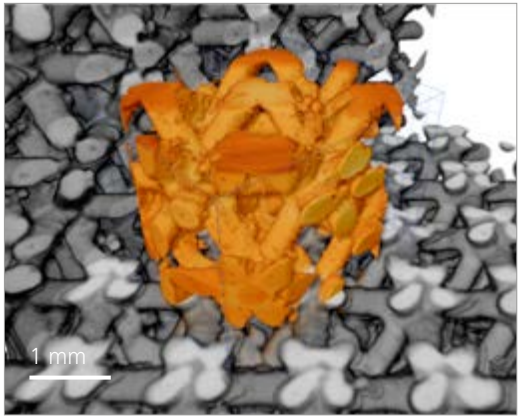
Typical Tasks and Applications

- Characterize three-dimensional structure
- Observe failure mechanisms, degradation phenomena, and internal defects
- Investigate properties at multiple length scales
- Quantify microstructural evolution
- Perform *in situ* and 4D (time dependent studies) to understand the impact of heating, cooling, desiccation, wetting, tension, compression, imbibition, drainage and other simulated environmental studies

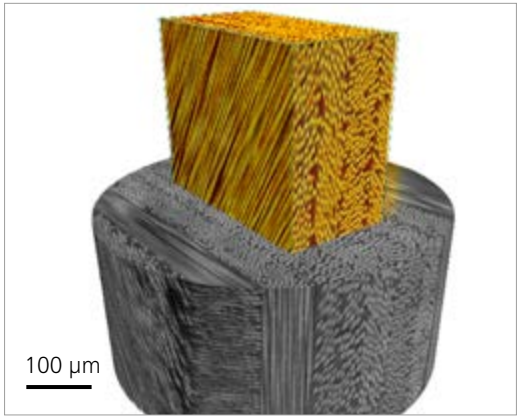
ZEISS Xradia 600-series Versa Benefits

- Non-destructive views into deeply buried microstructures that may be unobservable with 2D surface imaging; compositional contrast for studying low Z or "near Z" elements and other difficult-to-discern materials
- Ability to maintain resolution at a distance for non-destructive *in situ* imaging experiments
- Fast, efficient Scout-and-Zoom technology further enhanced with Versa FPX to look at very large samples on a macro scale to determine regions of interest for high resolution imaging
- Faster throughput provides more sample runs for better data and increased sample statistics
- For academic shared-use facilities, faster scans enable more users and improved instrument utilization

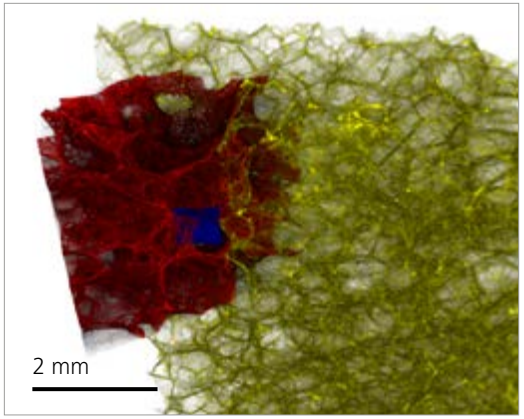
ZEISS X-ray Microscopy at Work: Materials Research



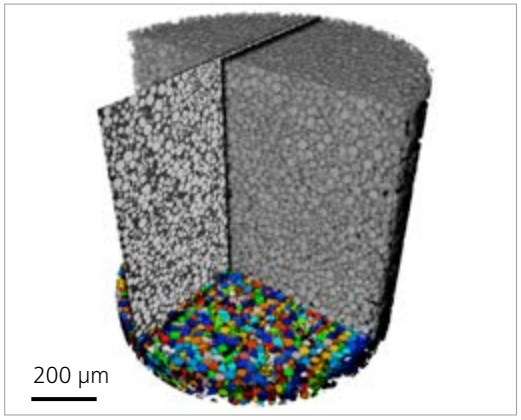
Additive manufactured lattice structure. Sample courtesy of Kavan Hazeli, Mechanical and Aerospace Engineering, The University of Alabama, Huntsville



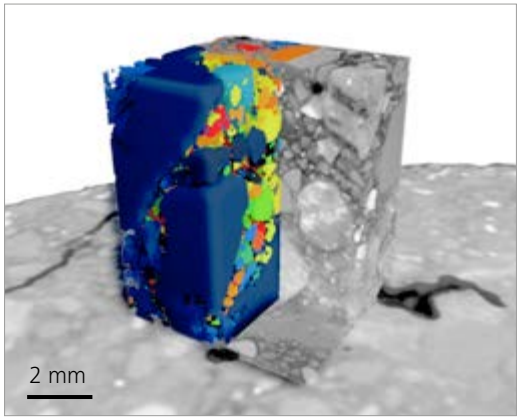
Carbon fiber reinforced polymer composite



Porous glass foam insulation imaged at multiple length scales. Sample courtesy of M.B. Østergaard, Dr. R.R. Petersen and Prof. Y. Yue (Aalborg University), and Dr. J. König (Jozef Stefan Institute)

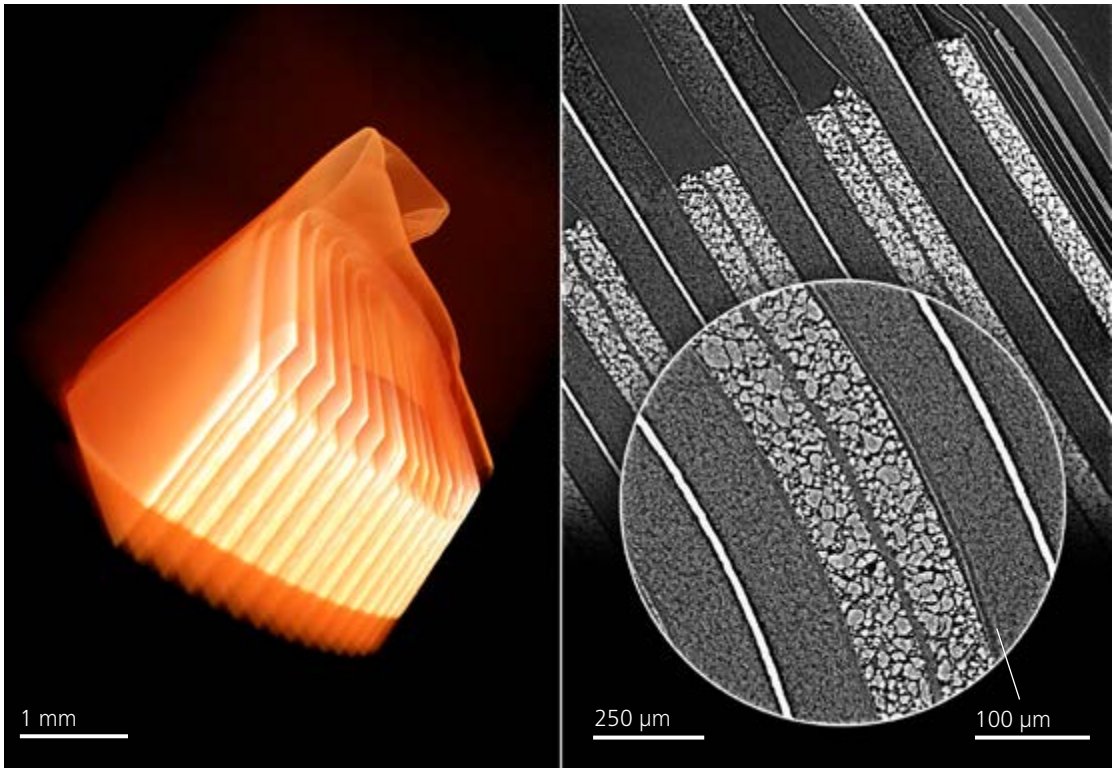


Ti-6Al-4V feedstock powder for additive manufacturing



Localized high resolution tomography and segmentation of multiple phases in concrete

ZEISS X-ray Microscopy at Work: Lithium Ion Batteries



Small pouch cell: 0.4× overview scan; 4× Resolution at a Distance; 20× Resolution at a Distance

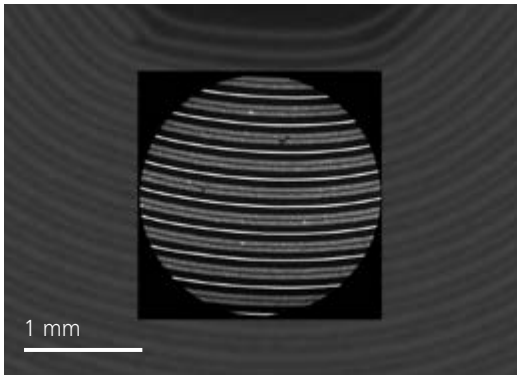
Typical Tasks and Applications

- Recipe development and supply chain control: Inspection of intact samples for effective supplier control, revealing changes in recipe or cost savings that may affect performance or longevity
- Safety and quality inspection: Identification of debris, particle formation, burrs at the electrical contact or damage to the polymer separator
- Lifetime and aging effect: Longitudinal studies of aging effects

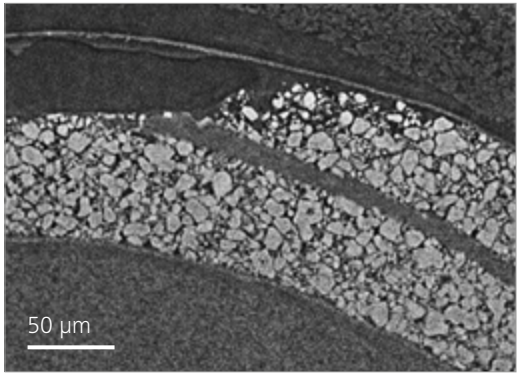
ZEISS Xradia 600-series Versa Benefits

- Resolution at a Distance allows intact pouch and cylindrical cells to be imaged at high resolution—enabling longitudinal studies of aging effects, across hundreds of charge cycles.
- No other tool can look into an intact battery with such fidelity.
- Scout-and-Zoom enables a region of interest to be identified for a high resolution investigation.
- High resolution scan times are dramatically reduced with the 600-series.

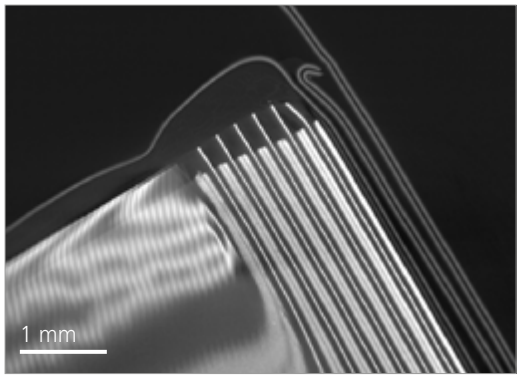
ZEISS X-ray Microscopy at Work: Lithium Ion Batteries



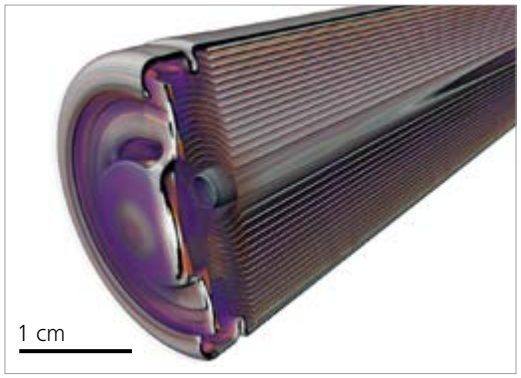
Aging effects within an intact 18650 lithium ion battery



Small pouch cell (80 kV) – in situ *microstructure, aging effect at cathode grain level, separator layer*

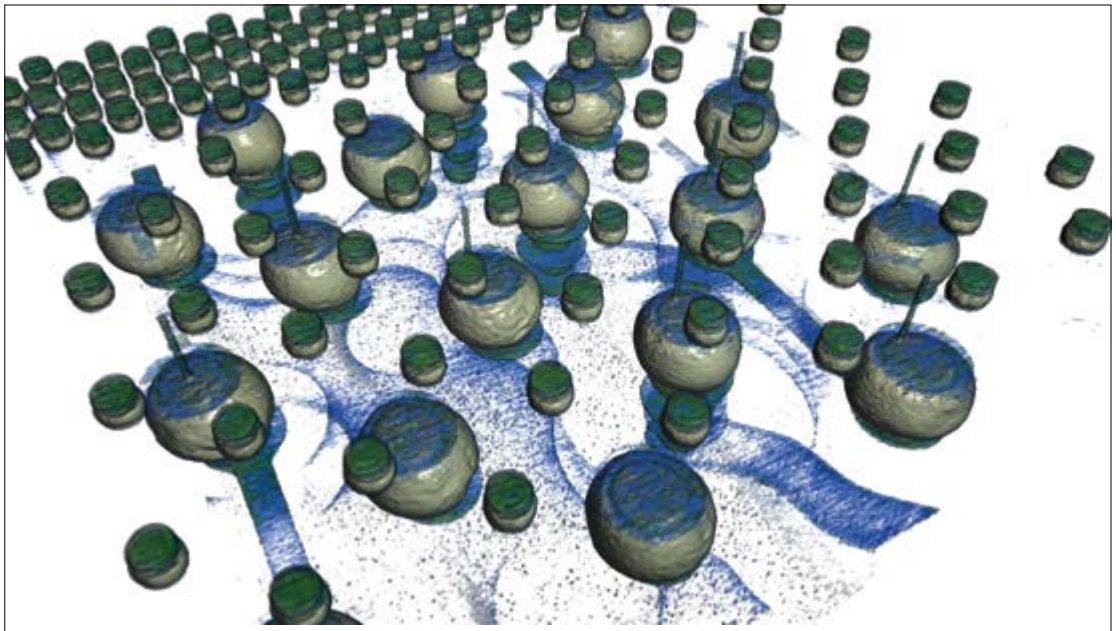


Large pouch cell (120 kV)
Failure analysis, swelling, wetting, electrolyte gas evolution



Intact cylinder cell (160 kV) – welding burrs, metallic inclusions, folds and kinks in conductive layers

ZEISS X-ray Microscopy at Work: Electronics and Semiconductor Packaging



Click here to view this video

Visualization of C4 bumps, TSVs, and Cu-pillar microbumps in a 2.5D package, enabling high-resolution views from within the intact package, 1 µm/voxel

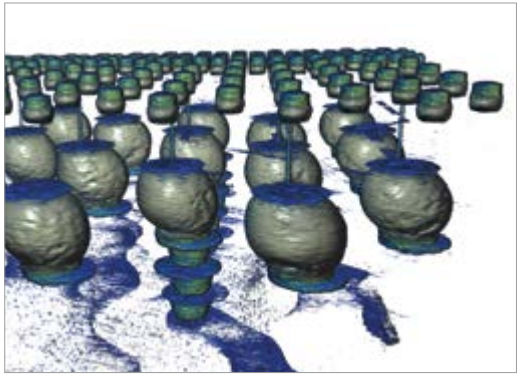
Typical Tasks and Applications

- Perform structural and failure analysis for process development, yield improvement and construction analysis of advanced semiconductor packages, including 2.5/3D and fan-out packages
- Analyze printed circuit boards for reverse engineering and hardware security

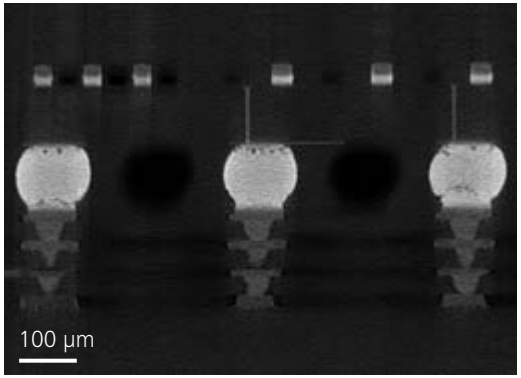
ZEISS Xradia 600-series Versa Benefits

- Non-destructively image across length scales from module to package to interconnect for submicron-resolution characterization of defects at speeds that can complement physical cross-sectioning
- Enable better understanding of defect locations and distributions by viewing unlimited virtual cross-section and plan-view images from all desired angles
- Faster throughput enables faster time-to-results for identifying failures and their root causes, as well as more sample runs for better data aiding process development and yield improvements

ZEISS X-ray Microscopy at Work: Electronics and Semiconductor Packaging

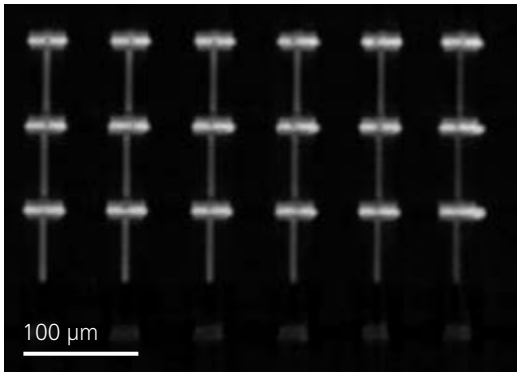


Package interconnect visualized within a 50 mm × 75 mm × 1 mm 2.5D package. Cu-pillar microbump.



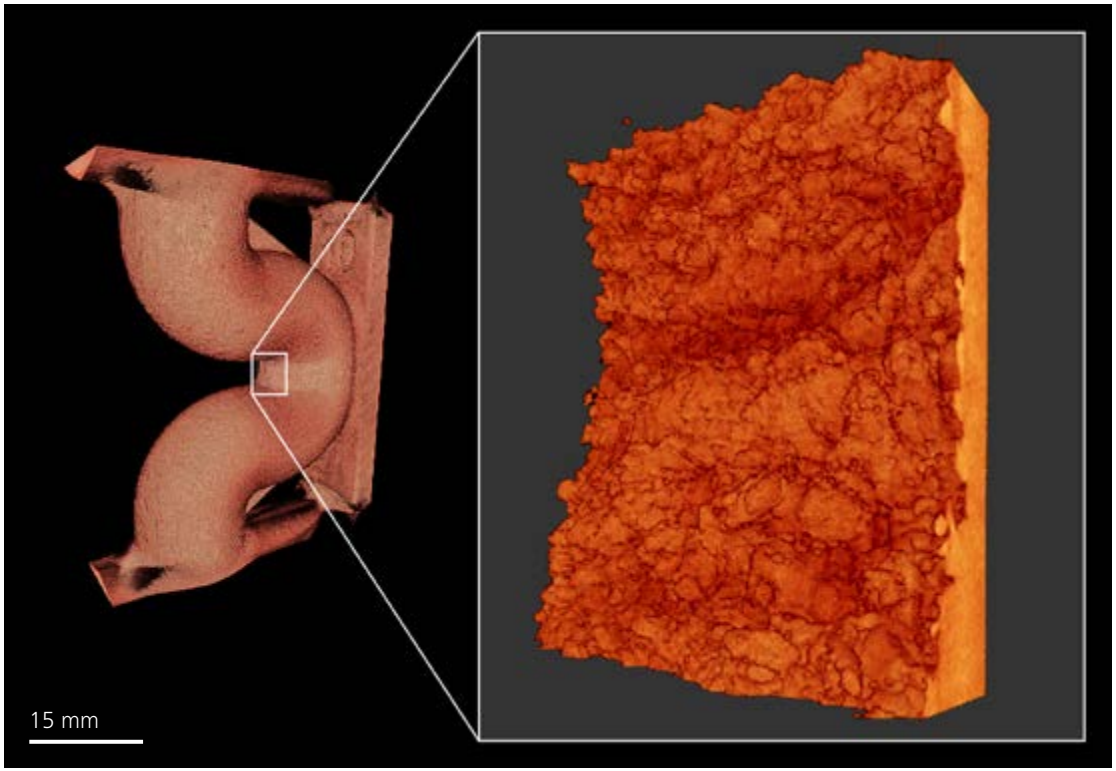
Virtual cross section from the 2.5D package reveals solder cracks and voids in C4 bumps.

DRAM package interconnect within a 10 mm × 7 mm × 1 mm package containing a 4-die stack. Solder extrusion is easily visualized in 3 dimensions, 0.8 µm/voxel.



Virtual cross section of microbumps in a DRAM package. TSVs are 6 µm in diameter and microbumps average 35 µm in diameter. Small solder voids of 2 µm are visible.

ZEISS X-ray Microscopy at Work: Additive Manufacturing



Surface roughness evaluation of an AM printed duct (Ti-6Al-4V); high resolution scan acquired at ~1.7 µm voxel over a ~3.4 mm area
Test part supplied by LZN and Liebherr

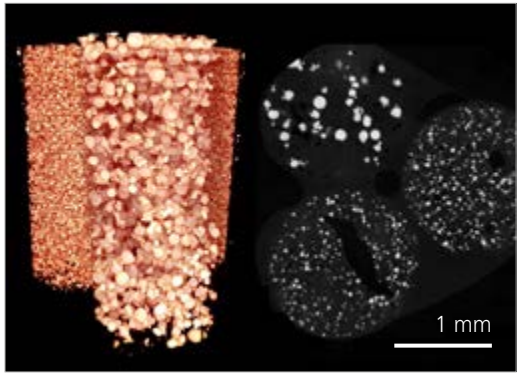
Typical Tasks and Applications

- Detailed shape, size, and volume distribution analysis of particles in Additive Manufacturing (AM) powder bed to determine proper process parameters
- High-resolution, non-destructive imaging for microstructural analysis of AM parts
- 3D imaging for comparison with the nominal CAD representation
- Detection of unmelted particles, high-Z inclusions, and voids
- Surface roughness analysis of inner structures that cannot be accessed by other methods

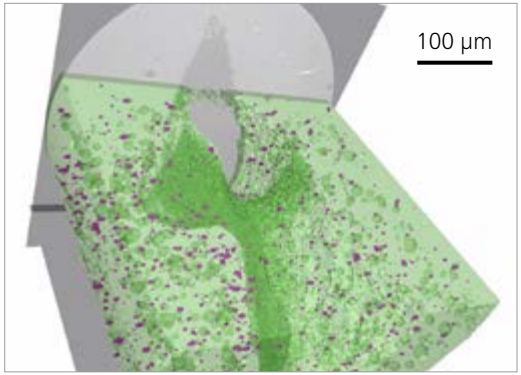
ZEISS Xradia 600-series Versa Benefits

- Scout-&-Zoom technology enables fast access to inner structures without the need for any sample manipulation.
- Faster throughput allows quality inspection along the AM process chain.
- Class-leading sub-micron resolution enables detailed analysis of both process parameters and material characteristics.

ZEISS X-ray Microscopy at Work: Additive Manufacturing

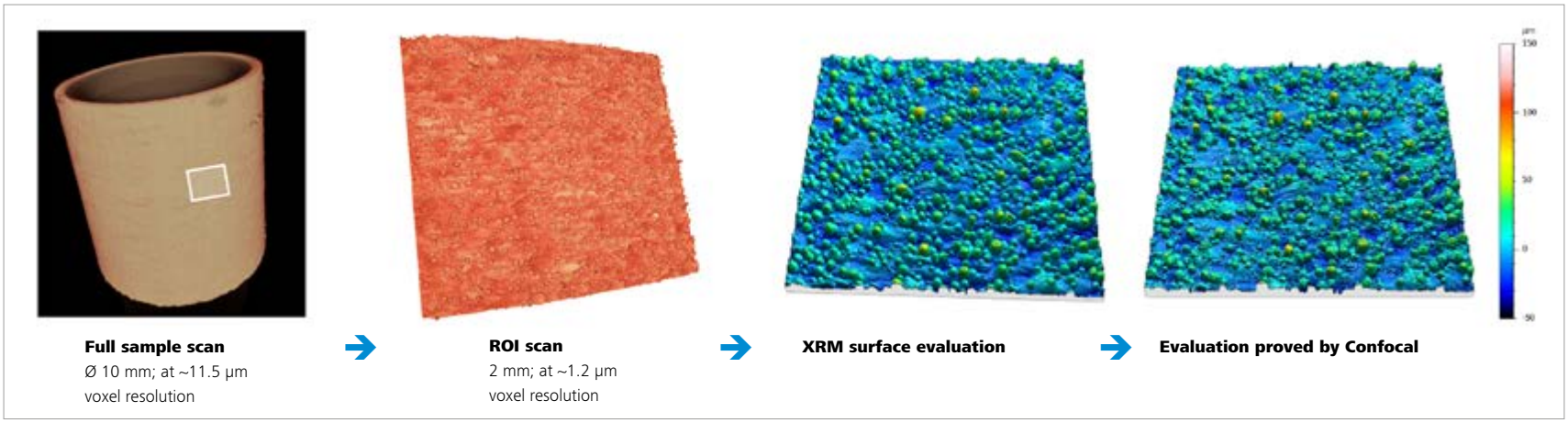


Imaging of different A205 AM powder qualities at 3.9 µm voxel resolution



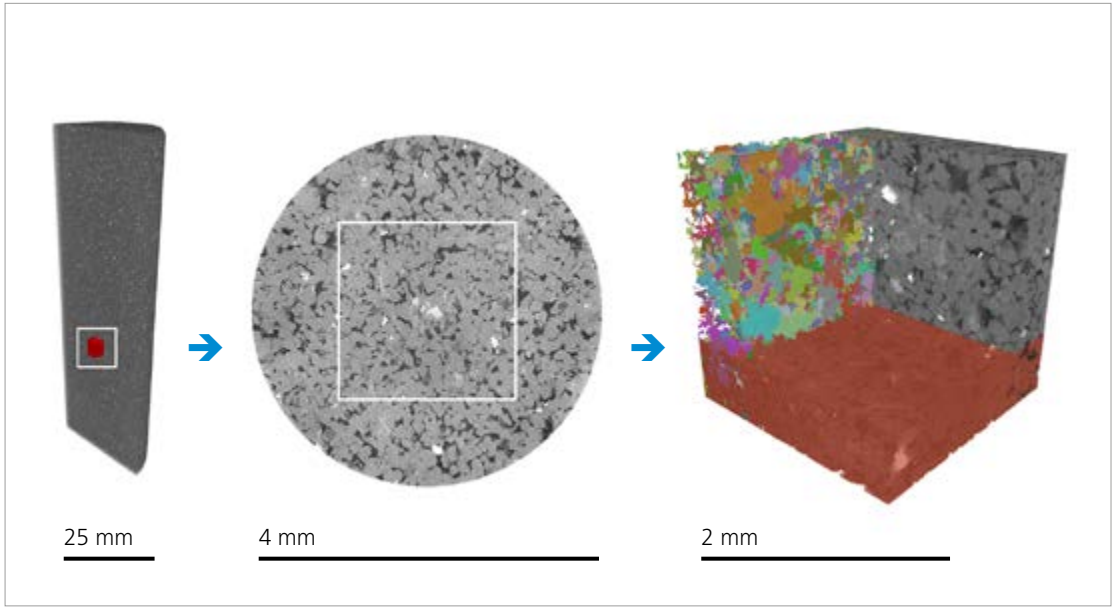
Inner structure of an AM manufactured aluminum gear wheel; 3 µm voxel resolution imaging is used to see unmelted particles, high-Z inclusions, and small voids.Sample courtesy of Timo Bernthaler, University of Aalen

Comprehensive characterization of an AM manufactured aluminum gear wheel reveals inclusions, pores, and deviation of dimensions relative to the CAD model. Sample courtesy of Timo Bernthaler, University of Aalen



ISO 25178 surface roughness evaluation of a Ti-6Al-4V test sample. Results are very similar between XRM and ZEISS Smartproof 5 confocal microscope. Test part supplied by LZN and Liebherr

ZEISS X-ray Microscopy at Work: Raw Materials



Multiscale non-invasive characterization of sandstone core, showing macroscopic imaging, high quality non-invasive interior tomography, and integrated pore scale analytical investigation (showing pore separation).

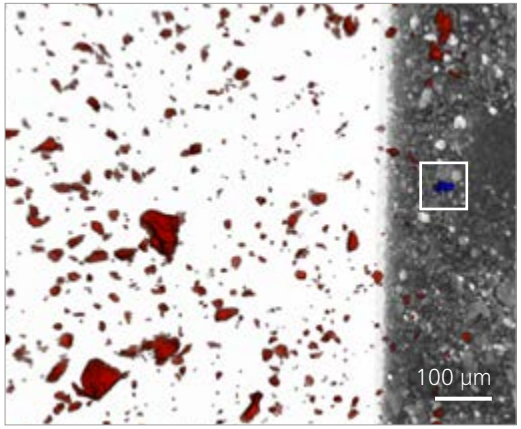
Typical Tasks and Applications

- Perform multiscale pore structural and fluid flow analysis
- Directly measure fluid flow at the pore scale using *in situ* flow equipment
- Analyze crystal structures using LabDCT
- Particle analysis with full 3D reconstruction
- Advance mining processes: analyze tailings to maximize mining efforts, conduct thermodynamic leaching studies, perform QA/QC analysis of mining products such as iron ore pellets
- Understand grain orientations in steel and other metals

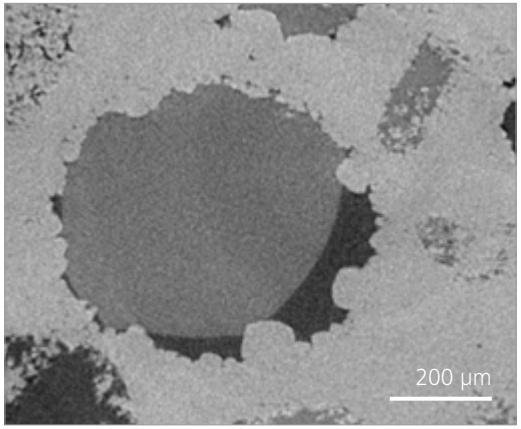
ZEISS Xradia 600-series Versa Benefits

- The most accurate 3D nanoscale support for digital rock simulations, *in situ* multiphase fluid flow studies, 3D mineralogy, and laboratory-based diffraction contrast tomography
- Multiscale imaging, characterization and modeling of large (4" core) samples at high throughput
- Higher throughput equals faster run times, reducing bottleneck for pre- and post-studies
- Higher quality data for better simulations
- Higher power allows for high signal/noise diffraction patterns to be produced even from imperfect or low symmetry crystals.

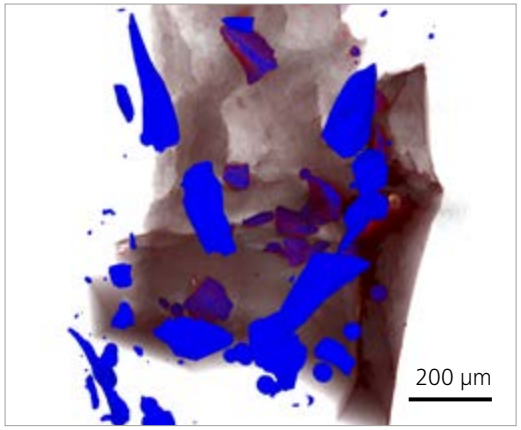
ZEISS X-ray Microscopy at Work: Raw Materials



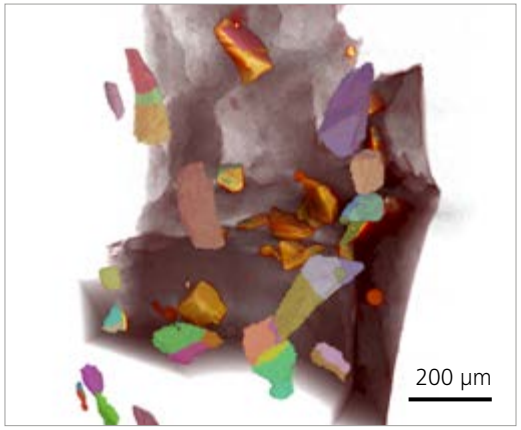
Individual gold grain identified from population of ~26,000 pyrite grains



In situ *contact angle measurement of the oil (darkest phase) – brine (intermediate phase) – calcite (lightest phase) system*

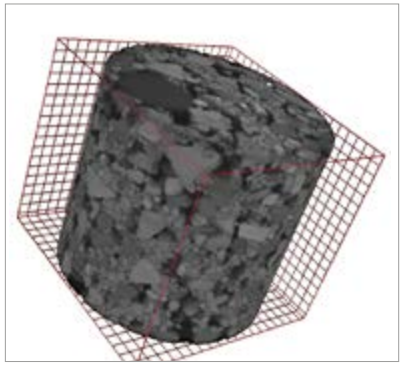


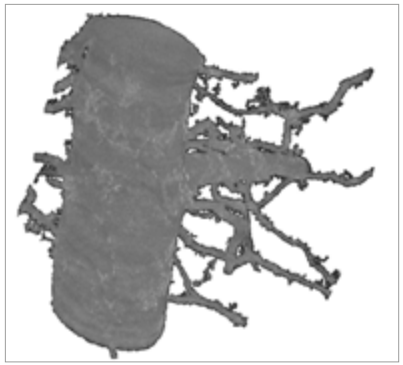
Traditional absorption contrast image of disaggregated olivine

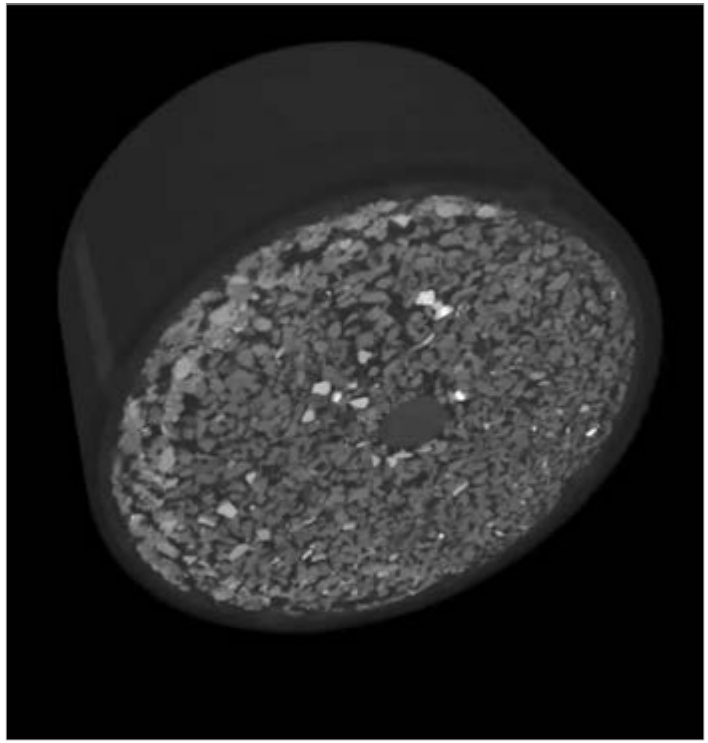


Individual sub-crystals identified using LabDCT on disaggregated olivine

ZEISS X-ray Microscopy at Work: Life Sciences







During the complete imaging process, the plant was embedded in soil. With RaaD, even large samples can be imaged with high resolution. The datasets clearly show the embedded plant root in soil: the root can be recognized as a dominant structure within the soil which consists of grains of different sizes and shapes. Voxel size: 5.5 µm. The plant root was segmented with Dragonfly Pro. Even fine structures of the root such as root branches could be identified by the software and afterwards visualized. Animation of the segmented plant root in context with the surrounding soil. Sample courtesy of Keith Duncan, Research Scientist, Donald Danforth Plant Science Center, St. Louis, MO

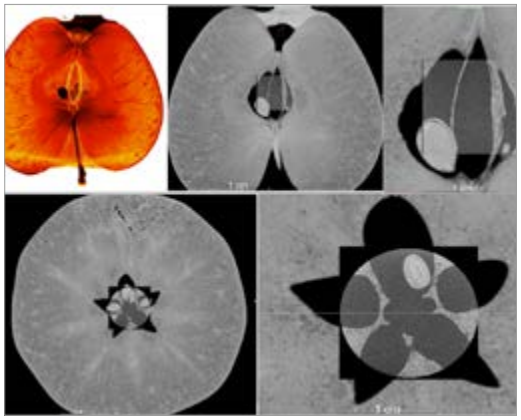
Typical Tasks and Applications

It is always a challenge to study biological samples in their natural surroundings. X-ray microscopy allows to image plant roots still embedded in their original soil without any special sample preparation. Xradia 620 Versa is particulary suitable for imaging plant roots in context with the environmental medium.

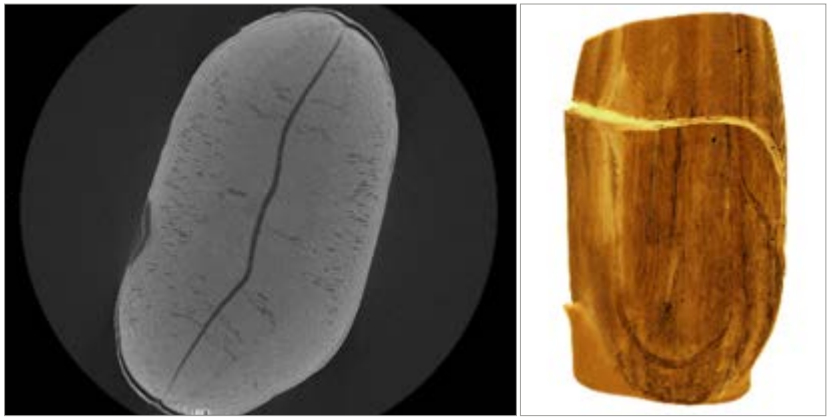
ZEISS Xradia 600-series Versa Benefits

- The sample can be imaged with high resolution at a Distance (RaaD). Large samples can be studied without any compromises in resolution.
- Large sample volumes can be imaged in a suitable time – faster than ever before.
- High-contrast images acquired with Xradia 600-series Versa enable the identification and segmentation of structures of interest fail-proof and simple. For visualization and segmentation Dragonfly Pro can be used.

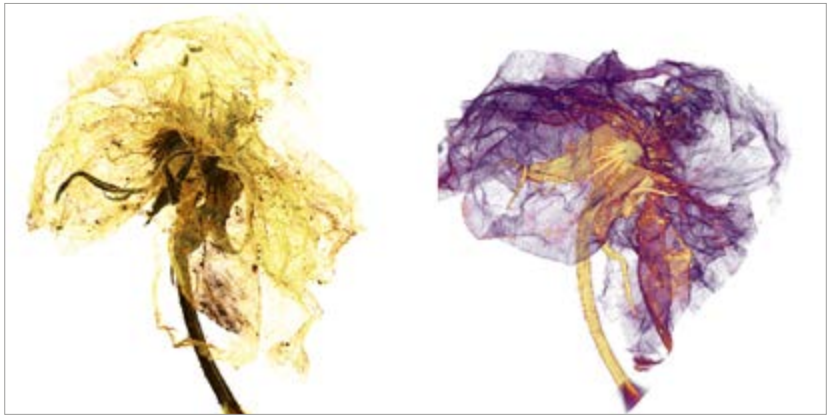
ZEISS X-ray Microscopy at Work: Life Sciences



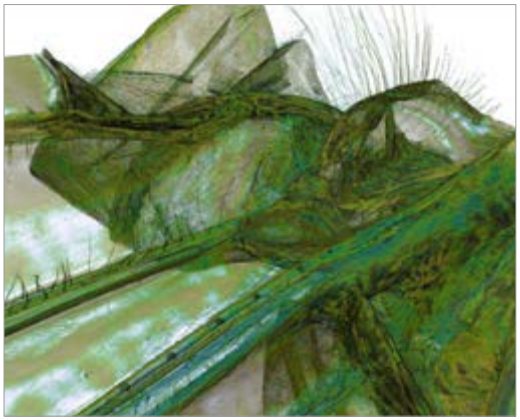
Apple or Malus is one of the most important fruit crops. The seeds and the pericarp with the endocarp and the mesocarp can be visualized without sectioning the fruit.



Seeds are very solid and compact structures and their inside is difficult to image as a whole. The image shows the pre-shaped seed leaves which will contain the energy reservoir for the further growth of the plant.



The XRM micrograph of a blossom reveals its components in a new 3D view. Dried flowers from an herabarium can be examined with the XRM. The characteristic features of the flower can lead to a unambiguous determination without destroying it. Different types of flower leaves with their specific characteristics are visible in this image. Sepals (yellow) and petals (purble) can be distinguished.



Fragile animals such as a dragonfly can be imaged without any sample preparation and sectioning. The progression of the fly muscles, allowing the individual control of the wings on this type of insect, can be visualized in its native structure.

ZEISS Xradia 620 Versa: Your Flexible Imaging Solution

1 High Throughput X-ray Microscope
- ZEISS Xradia 620 Versa with Resolution at a Distance (RaaD)
- Dual Scan Contrast Visualizer (DSCoVer) for materials discernment and dual energy analyses
- High Aspect Ratio Tomography (HART) for accelerated imaging and better image quality
- Optional Diffraction Contrast Tomography (LabDCT) for visualization of 3D crystallographic grain information

2 X-ray Source
- High power, sealed transmission source with fast activation (30 – 160 kV, Maximum, 25 W)

3 Detector System
- Innovative dual-stage detector system offers turret of multiple objectives with different magnifications and optimized scintillators for highest contrast
- 2k × 2k pixel, noise suppressed charge-coupled detector
- Optional Flat Panel Extension (FPX) for larger field of view, high throughput macroscopic imaging

4 System Stability for Highest Resolution
- Granite base vibrational isolation
- Thermal environment stabilization
- Low noise detector
- Advanced proprietary stabilization mechanisms

5 System Flexibility for a Diverse Range of Sample Sizes and Applications
- Variable scanning geometry
- Tunable voxel sizes
- Absorption contrast mode
- Phase contrast mode
- Wide Field Mode (WFM) for increased lateral tomography volume with 0.4× and 4× objectives
- Vertical stitching for joining multiple tomographies vertically

- Optional ZEISS ZEN Intellesis for image post-processing and segmentation using machine learning

6 SmartShield for Sample Protection and Setup Optimization
- Fully integrated rapid envelope creation within Scout-and-Scan control system
- Sample and instrument safety in 3D
- Enhanced operator efficiency during experiment setup

7 Advanced Reconstruction Toolbox with Options for Enhanced Performance
- ZEISS DeepRecon Pro with AI-based reconstruction technology for up to 10× throughput or superior image quality on Unique, Semi-repetitive, and Repetitive sample workflows
- ZEISS OptiRecon with iterative reconstruction for up to 4× throughput or enhanced image quality
- ZEISS PhaseEvolve for enhanced contrast and segmentation in low-medium density sample or high resolution imaging applications

8 Autoloader Option
- Maximize productivity by reducing user intervention
- Programmable handling of up to 14 sample stations
- Automated workflows for high volume, repetitive scanning

9 Sample Stage
- Ultra-high precision 4-degrees of freedom sample stage
- 25 kg sample mass capacity

10 X-ray Filters
- Automated Filter Changer (AFC) with 24 filter capacity and cutout for highest throughput 'no filter' imaging
- Set of 12 filters included
- Custom filters available by special order

11 *In Situ* and 4D Solutions
- Resolution at a Distance (RaaD) enables superior *in situ* imaging
- Integrated *in situ* recipe control for Deben stages
- *In situ* interface kit option
- Custom *in situ* flow interface kit by special order

12 Metrology Extension Option
- Add high accuracy with MPE_{SD} of 1.9+L/100 µm
- Two XRM Check Phantoms
- Calypso Software License
- Integrated user guided workflow

13 Instrument Workstation
- Power workstation with fast reconstruction
- Dual CUDA-based GPU
- Multi-core CPU
- 24" display monitor

14 Software
- Acquisition: Scout-and-Scan Control System
- Reconstruction: XMReconstructor
- Viewer: XM3DViewer
- XRM Python API to expand instrument capabilities
- Compatible with wide breadth of 3D viewers and analysis software programs
- Optional ORS Dragonfly Pro for 3D visualization and analysis

ZEISS Xradia 610 Versa: Your Flexible Imaging Solution

1 High Throughput X-ray Microscope
- ZEISS Xradia 610 Versa with Resolution at a Distance (RaaD)

2 X-ray Source
- High power, sealed transmission source with fast activation (30 – 160 kV, Maximum 25 W)

3 Contrast-optimized Detectors
- Innovative dual-stage detector system offers turret of multiple objectives with different magnifications and optimized scintillators for highest contrast
- 2k × 2k pixel, noise suppressed charge-coupled detector
- Optional Flat Panel Extension (FPX) for larger field of view, high throughput macroscopic imaging

4 System Stability for Highest Resolution
- Granite base vibrational isolation
- Thermal environment stabilization
- Low noise detector
- Proprietary stabilization mechanisms

5 System Flexibility for Diverse Range of Sample Sizes and Applications
- Variable Scanning Geometry
- Tunable voxel sizes
- Absorption contrast mode
- Phase contrast mode
- Wide Field Mode (WFM) for increased lateral tomography volume with 0.4× objective
- Vertical stitching for joining multiple tomographies vertically
- Optional ZEISS ZEN Intellesis for image post-processing and segmentation using machine learning

6 ZEISS SmartShield for Sample Protection and Setup Optimization
- Fully integrated rapid envelope creation within Scout-and-Scan control system
- Sample and instrument safety in 3D
- Enhanced operator efficiency during experiment setup

7 Advanced Reconstruction Toolbox with Options for Enhanced Performance
- ZEISS DeepRecon Pro with AI-based reconstruction technology for up to 10× throughput or superior image quality on Unique, Semi-repetitive, and Repetitive sample workflows
- ZEISS OptiRecon with iterative reconstruction for up to 4× throughput or enhanced image quality
- ZEISS PhaseEvolve for enhanced contrast and segmentation in low-medium density sample or high resolution imaging applications

8 Autoloader Option
- Maximize productivity by reducing user intervention
- Programmable handling of up to 14 sample stations
- Automated workflows for high volume, repetitive scanning

9 Sample Stage
- Ultra-high precision 4-degrees of freedom sample stage
- 25 kg sample mass capacity

10 X-ray Filters
- Single filter holder
- Set of 12 filters included
- Custom filters available by special order

11 *In Situ* and 4D Solutions
- Resolution at a Distance (RaaD) enables superior *in situ* imaging
- Integrated *in situ* recipe control for Deben stages
- *In situ* interface kit option
- Custom *in situ* flow interface kit by special order

12 Instrument Workstation
- Power workstation with fast reconstruction
- Dual CUDA-based GPU
- Multi-core CPU
- 24" display monitor

13 Software
- Acquisition: Scout-and-Scan Control System
- Reconstruction: XMReconstructor
- Viewer: XM3DViewer
- XRM Python API to expand instrument capabilities
- Compatible with wide breadth of 3D viewers and analysis software programs
- Optional ORS Dragonfly Pro for 3D visualization and analysis

Technical Specifications

Imaging	ZEISS Xradia 410 Versa	ZEISS Xradia 510 Versa	ZEISS Xradia 610 Versa	ZEISS Xradia 620 Versa
Spatial Resolution[a]	0.9 µm	0.7 µm	0.5 µm	0.5 µm
Resolution at a Distance (RaaD™)[a,b] (at 50 mm working distance)	1.5 µm	1.0 µm	1.0 µm	1.0 µm
Minimum Achievable Voxel[c] (Voxel size at sample at maximum magnification)	100 nm	70 nm	40 nm	40 nm
X-ray Source				
Architecture	Sealed Reflection	Sealed Transmission	Sealed Transmission, Fast Activation	Sealed Transmission, Fast Activation
Voltage Range	20- 90 kV, 40-150 kV (Optional)	30 – 160 kV	30 – 160 kV	30 – 160 kV
Maximum Output	8 W, 10 W/30 W (Optional)	10 W	25 W	25 W
Detector System				
ZEISS X-ray microscopes feature an innovative detector turret with multiple objectives at different magnifications. Each objective features optimized scintillators that deliver the highest absorption contrast details.				
Standard Objectives	0.4×, 4×, 10×, 20×	0.4×, 4×, 20×	0.4×, 4×, 20×	0.4×, 4×, 20×
Optional Objectives	40×	40×, Flat Panel Extension (FPX)	40×, Flat Panel Extension (FPX)	40×, Flat Panel Extension (FPX)
Stages				
Sample Stage (load capacity)	25 kg	25 kg	25 kg	25 kg
Sample Stage Travel (x, y, z)	50, 100, 50 mm	50, 100, 50 mm	50, 100, 50 mm	50, 100, 50 mm

[a] Spatial resolution measured with ZEISS Xradia 2D resolution target, normal field mode, optional 40× objective.
[b] RaaD working distance defined as clearance around axis of rotation.
[c] Voxel is a geometric term that contributes to but does not determine resolution, and is provided here only for comparison. ZEISS specifies resolution via spatial resolution, the true overall measurement of instrument resolution.

Technical Specifications

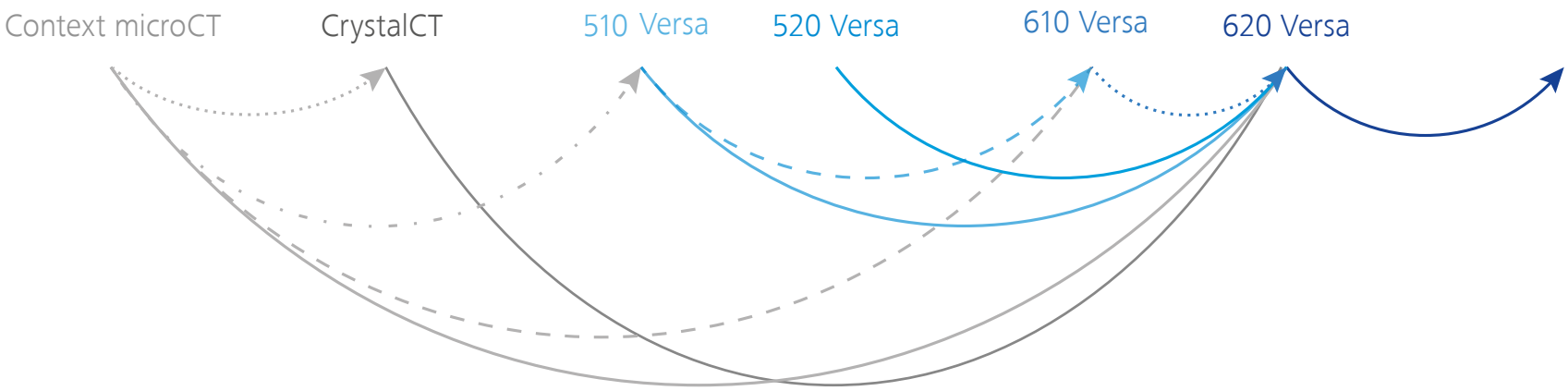
Features	ZEISS Xradia 410 Versa	ZEISS Xradia 510 Versa	ZEISS Xradia 610 Versa	ZEISS Xradia 620 Versa
Scout-and-Scan™ Control System	■	■	■	■
Scout-and-Zoom	■	■	■	■
Vertical Stitch	■	■	■	■
XRM Python API	■	■	■	■
Automated Filter Changer (AFC)				■
High Aspect Ratio Tomography (HART)				■
Dual Scan Contrast Visualizer (DSCoVer)				■
ZEISS LabDCT for Diffraction Contrast Tomography				Optional
Wide Field Mode	0.4×	0.4×	0.4×	0.4× and 4×
GPU CUDA-based Reconstruction	Single	Single	Dual	Dual
ZEISS SmartShield		■	■	■
ZEISS Autoloader	Optional	Optional	Optional	Optional
In Situ Interface Kit	Optional	Optional	Optional	Optional
ZEISS OptiRecon	Optional	Optional	Optional	Optional
ZEISS DeepRecon Pro	Optional	Optional	Optional	Optional
ZEISS PhaseEvolve	Optional	Optional	Optional	Optional
ZEISS ZEN Intellesis	Optional	Optional	Optional	Optional
ORS Dragonfly Pro	Optional	Optional	Optional	Optional
ZEISS Metrology Extension (MTX)				Optional

ZEISS Customer Focus: Continuous Improvement and Upgradeability

Protect Your Investment extends to Xradia 600-series Versa – delivering unprecedented extendibility and unrelenting support to ensure you are not left behind.

Most ZEISS X-ray microscopes are designed to be upgradeable and extendible with future innovations and developments so that your initial investment is protected. This ensures your microscope capabilities evolve with the advancements in leading technology. This is one of the key differentiators in the 3D X-ray imaging industry.

From Xradia Context microCT, to Xradia 510/520 Versa, and now with the addition of Xradia 610/620 Versa, you can field-convert your system to the latest X-ray microscope products. In addition to instrument conversions at your facility, new modules are being continuously developed that will enhance your instrument to provide advanced capabilities such as *in situ* sample environments, unique imaging modalities, and productivity-enhancing modules. Also, periodic major software releases include important new features which are made available to existing instruments, thereby enhancing and extending the capabilities of your research.



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