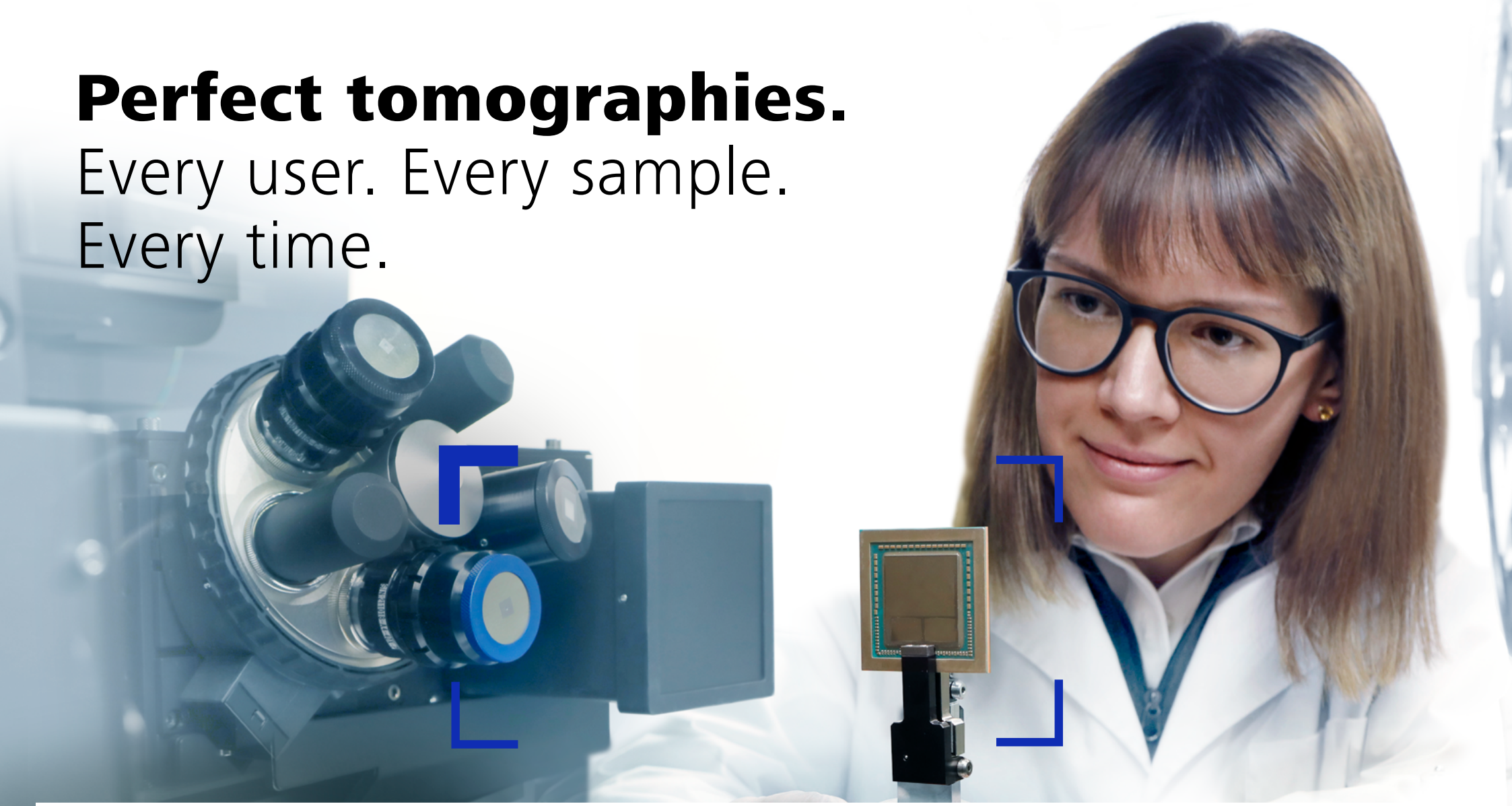
Perfect tomographies.

Every user. Every sample.
Every time.



ZEISS VersaXRM 730

End-to-End 3D X-ray Microscopy.

www.zeiss.com/VersaXRM730

ZEISS

Seeing beyond

Perfect Tomographies. Every User. Every Sample. Every Time.

ZEISS VersaXRM® 730 3D X-ray microscope (XRM) offers a wider array of choices than any advanced XRM on the market. New opportunities in a constantly shifting technology landscape require new capabilities. And dynamic workforce requirements demand greater flexibility than ever.

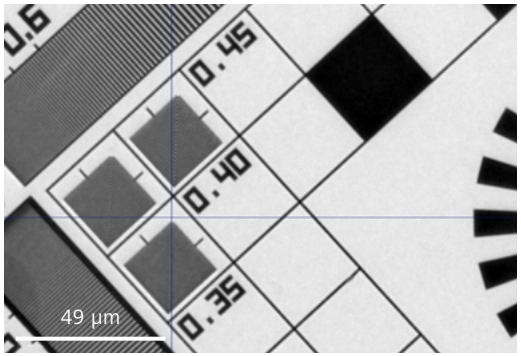
As the user base for XRM has grown around the world, Versa® instruments have left the realm of supporting a select few super users doing novel research with advanced X-ray microtomography at world-leading laboratories, to become part of the everyday characterization ecosystem with a broader set of users at a wider level of skills. A growing range of samples is being studied and analyzed at every level to develop new solutions for the increasing challenges that impact our daily lives.

VersaXRM 730 expands the horizon of what users can achieve from their research. The system delivers breakthrough resolution performance, takes accessibility to the next level with an intuitive user experience, and accelerates productivity with both faster throughput and faster time-to-results. Additionally, it leverages game-changing AI, all of which combine to enable the study of an unprecedented range of samples while accommodating user skill levels from novice to the most expert, unlocking entirely new application capabilities.

Easier. More Intelligent. Tailored to Your Requirements.

Optimize visibility with higher resolution & performance

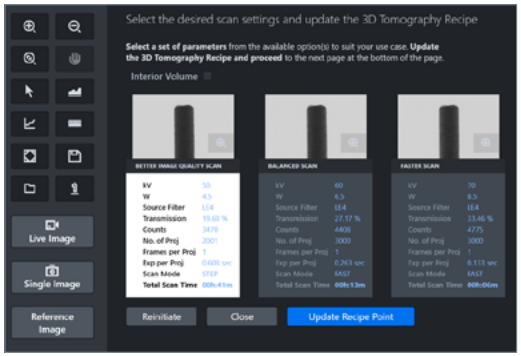
Resolution performance is about more than just highest specified resolution. With today's dynamic research demands, you want to achieve high-resolution 3D imaging across the widest range of sample types, to see more features in more of your samples, than previously possible. ZEISS VersaXRM 730, with the higher energy capabilities of the exclusive 40× Prime (40×-P) objective, enables you to push the limits of submicron imaging with unparalleled resolution performance of 450-500 nm across the full range of source voltage, from 30 kV to 160 kV. AI capabilities allow you to gain deeper insights from your measurements by improving image quality, expanding your field of view, and extending your experimental capabilities.



40×-P resolution target image clearly showing 450 nm [0.45 on target] lines and spaces. Collected at 30 kV source voltage.

Improve productivity and accessibility with human-centered design

The physics of X-ray imaging can be complex, so ZEISS XRM researchers studied user habits, dove into their challenges and employed human-centered design (HCD) principles to develop the ZEN navx™ guidance and control system for Versa XRM. ZEN navx enables even the newest user in a busy environment to be immediately productive doing advanced micro-computed tomography, greatly reducing the burden of training. It also allows your experienced users to explore the full versatility of the platform. And, ZEN navx File Transfer Utility (FTU) automatically transfers data from the microscope to other locations so that users have their information where they need it, when they need it.

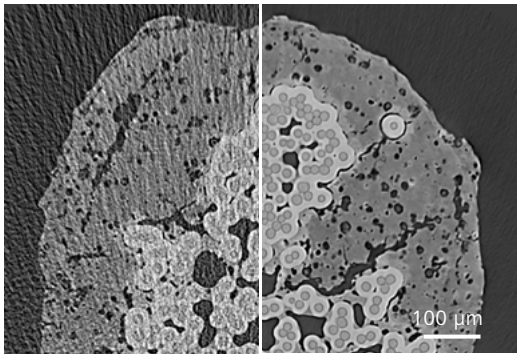


ZEN navx guides users through automated workflows with intelligent system insights to deliver results more easily and efficiently.

Achieve efficient, fast targeting with end-to-end 3D navigation

With VersaXRM 730, you can now navigate in 3D, image in 3D, and measure in 3D with an innovative and immersive end-to-end 3D experience. Innovation in throughput and image quality performance across both hardware and software help you achieve maximum impact with your research.

- Acquire more data in less system time
- Get the right data the first time with the intuitive ZEN navx interface
- Achieve rapid turnaround on imaging or sample inspection with one-minute tomographies using FAST Mode and Flat Panel Extension (FPX)
- Pinpoint your images with confidence using Volume Scout for true 3D feature targeting



Utilize included AI reconstruction to improve image quality and throughput. Ceramic matrix composite sample rapid scan with standard (FDK, left) and AI (DeepRecon Pro, right) reconstruction showing reduced noise and artifacts for maximum insight.

Your Insight into the Technology Behind It

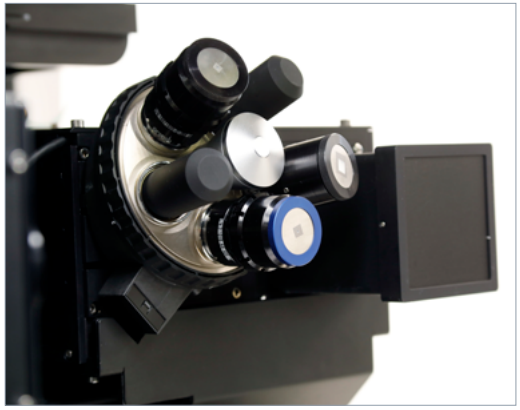
Highest Resolution Without Compromise

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 VersaXRM 730 is uniquely positioned to meet these challenges by integrating dual-stage magnification architecture with high flux X-ray source technology and resolution performance.

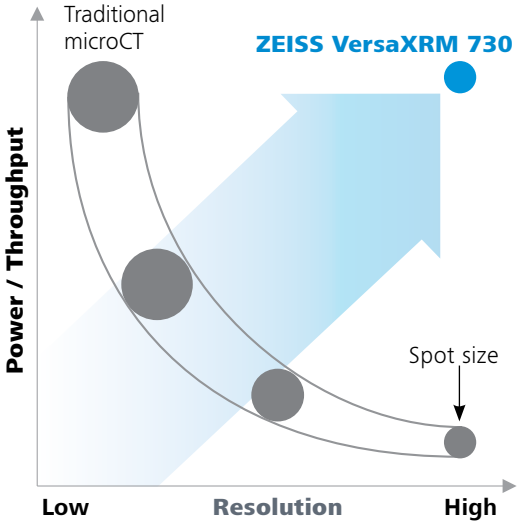
ZEISS specifies XRM on true spatial resolution, which is the most meaningful measurement of a microscope's performance. Spatial resolution refers to the minimum separation at which a feature pair can be resolved by an imaging system. It is typically measured by imaging a standardized resolution target with progressively smaller line-space pairs. With the new 40×-P objective, the system achieves un-paralleled resolution performance of 450-500 nm across the full range of source voltage, from 30 kV to 160 kV, delivering Resolution Performance at a Distance, and pushing industry standards of submicron imaging resolution for the widest range of sample types.

At 450 nm, VersaXRM 730 obtains a 10% improvement in spatial resolution over existing technologies, with a minimum achievable voxel size of 40 nm.

	Resolution on Traditional microCT Systems	Higher Resolution on ZEISS 3D X-ray Microscopes (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 Resolution at a Distance enables the highest resolution across diverse sets of sample sizes and working distances.
Sample type	Limited to small, low Z samples using low kV X-ray beam.	Energy-tuned, contrast-optimizing detectors enable the highest resolution across a broad range of sample types and densities and also interior tomographies.
Throughput/flux	Higher throughput/flux requires larger spot size limiting resolution.	Higher flux and faster scans can be achieved without compromising resolution. The included AI-based ZEISS DeepRecon Pro provides up to 10× throughput improvement, while the optional ZEISS DeepScout enables high resolution reconstruction of large samples 100× faster. Resolution performance with the 40×-P expands your possibilities.
Instrument setup	Require installation of different source targets/ filaments for different operating needs.	Source is designed to operate across the entire application space with a wide range of detectors, eliminating the need for manual hardware reconfigurations.



The ZEISS 40×-Prime objective (blue) efficiently converts X-rays into visible light at high energies, enabling the imaging of high Z materials like metals, as well as the highest resolution interior tomographies.

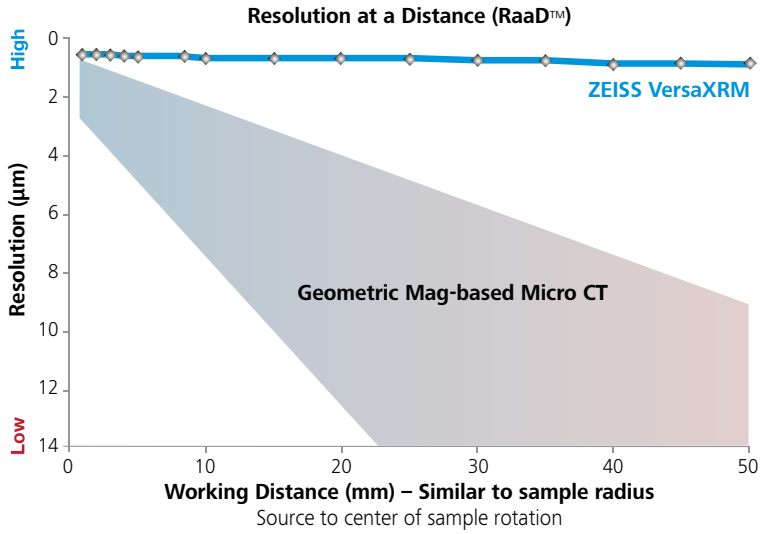


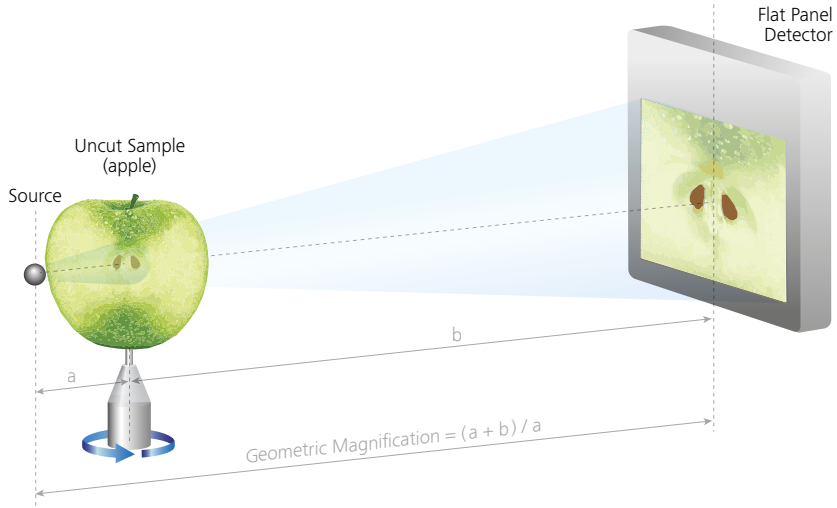
Your Insight into the Technology Behind It

ZEISS X-ray Microscopes – Designed for Your Advantage

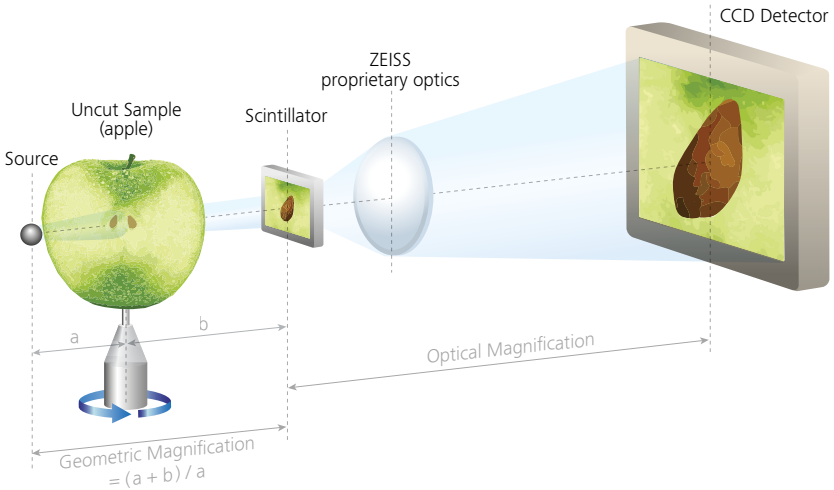
ZEISS Versa XRM architecture uses a two-stage magnification technique that produces submicron resolution imaging at large working distances (RaaD) for a diverse set of sample sizes and types. Images are initially enlarged through geometric magnification as they are with conventional microCT, and then 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.

The optional flat panel extension (FPX) on Versa XRM series microscopes further increases versatility, delivering one-minute tomographies via FAST Mode. 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 your 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 Versa 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

Higher X-ray Flux Source – Numerous Advantages

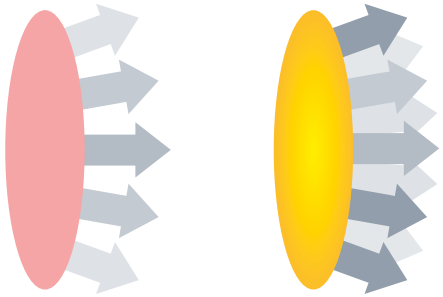
ZEISS VersaXRM 730 has breakthrough high power (25 W) X-ray source technology that can provide significantly higher X-ray flux compared to predecessors. The new source pushes the boundaries with improved thermal management, increasing the flux capacity and throughput while maintaining the same stringent spot size performance as that of the already world-class Versa 500-series. A new source control system improves source responsiveness, enabling faster scan setup leading to a more satisfying and engaging user experience.

Versa XRM series X-ray microscopes use 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.

Technological advancements of VersaXRM 730 enable higher X-ray flux while enhancing source stability and reliability.

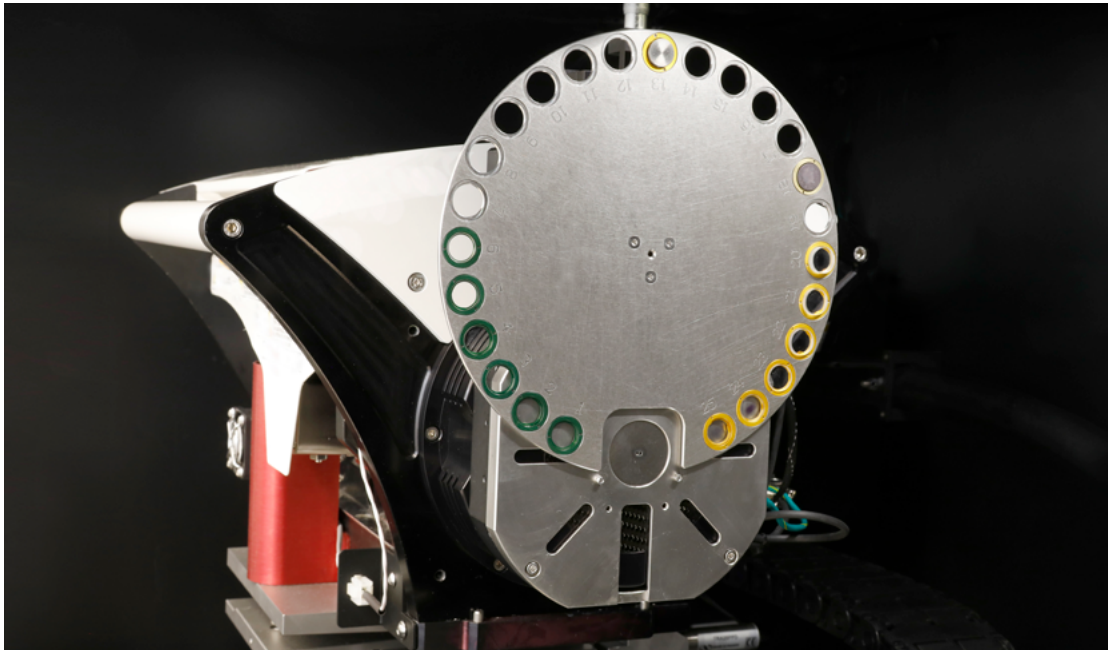
What Higher X-ray Flux Offers

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



10 W source **25 W source**

Higher power translates to more X-rays that mean better images and faster imaging for your applications.



ZEISS Versa XRM series 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 Versa XRM series platforms with a 25 W high power source are able to achieve faster scans without compromising renowned Versa submicron resolution performance. Throughput improvement depends on the sample type. Denser, larger, and high Z samples require higher X-ray energy such as that offered by ZEISS VersaXRM 730 to penetrate and image. The higher power source provides exceptional performance at high energy (kV), without compromising resolution.

	Geology	Materials Science	Electronics	Life Sciences
30 – 60 kV	Liberation Analysis, Mineral Separates (1-3 mm)	Polymers, Wood	Camera-lens Assembly	Soft Tissue, Insect, Plant Material, Small Bone (<5 mm)
60 – 90 kV	Sedimentary/Soft Rock (5-10 mm)	Fiber Composite, Electrodes	De-packaged Components, Battery Electrode	Stained Tissue, Embryo, Medium Bone (5 mm-10 mm)
90 – 120 kV	Crystalline/Hard Rock (25 mm)	Concrete, Ceramics	Multi-layer Printed Circuit Board	Large Bones (>10 mm), e.g., Mandible, Femur
120 – 160 kV	Whole Core, Hand Specimen (100 mm)	Full Battery, Metals	Intact Device, Package, Battery	Teeth, Implants

Typical X-ray microscopy imaging applications.

	Power Increase Compared to Versa 500-series	Estimated Throughput Improvement Compared to Versa 500-series Baseline Tomography Scan	
		<2 hours	>2 hours
30 – 60 kV	1.0× – 1.3×	1.0× – 1.2×	1.0× – 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× – 2.0×

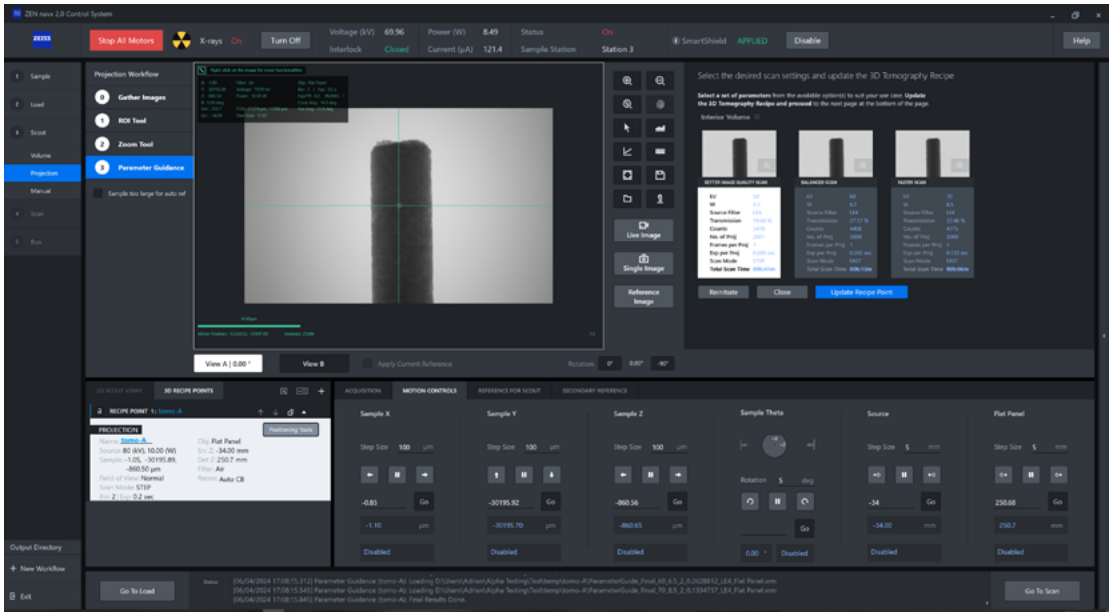
Throughput improvement shown is a representation of Versa XRM series that is sample/application dependent and based on typical tomography acquisition settings.

Your Insight into the Technology Behind It

Powering Accessibility with Human-Centered Design Principles

To design the ZEN navx guidance and control system, ZEISS researchers studied XRM users to develop a solid understanding of the issues and challenges you face, including your biases, how you compensate, and what work-arounds you employ. With that data in hand, our expert team developed a systematic approach of built-in guidance, automated workflows and intelligent system insights to enable novice users to achieve experimental results more easily and efficiently.

If you are an expert user, ZEN navx offers significant efficiency benefits and the system is "unlocked" to allow you to explore the full versatility of ZEISS Versa XRM. ZEN navx enables you to automate your workflow and provides guidance on the impact the parameters you've chosen will have on your setup. That guidance is directly embedded in the software, taking you through choices in a natural and familiar way. ZEN navx also provides a special visualization capability that helps you to understand the trade-offs of parameters, e.g., between resolution, field of view, and throughput. Also included is the ZEN navx File Transfer Utility, or FTU, which puts your microscope data exactly where you need it, when you need it, without having to manually transfer from system to workstation, or to save on a hard-drive to carry from place to place.



ZEN navx guides users through automated workflows with intelligent system insights, a digital mentor for novices.

Additionally, ZEN navx includes an embedded 3D viewer to integrate Volume Scout capability. This streamlines access to RaaD with a 3D volume of your sample to pinpoint and identify specific regions of interest to target for higher resolution imaging.

These advancements make ZEN navx much more capable of remote operation, further advancing user productivity.

ZEN navx intuitive navigation follows the evolution of the XRM user base, revolutionizing X-ray navigation and control with seamless and integrated workflows. ZEN navx complements the planning and execution of advanced correlative workflows with other ZEISS platforms that use the ZEN environment.

Your Insight into the Technology Behind It

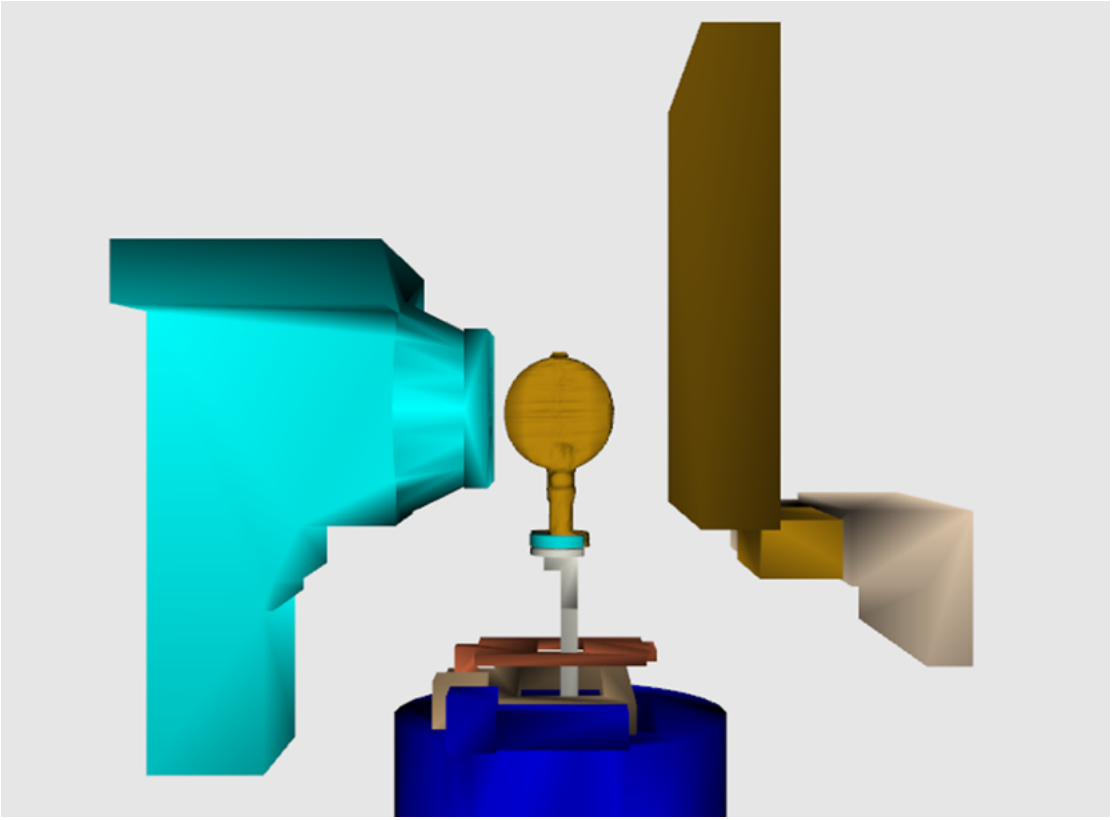
ZEISS SmartShield – Protect Your Sample and Optimize Experiment Setup

ZEISS SmartShield protects your sample and your microscope, working within the ZEN navx guidance and 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 XRM series along with enhanced guidance specific to their sample geometry.

Use SmartShield Lite for instant protection of highly transparent, reflective, and flat samples, or samples smaller than 1 mm in diameter.

What ZEISS SmartShield Offers:

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



SmartShield creates a "digital envelope" around your sample to protect it and your optics. XRM system model view.

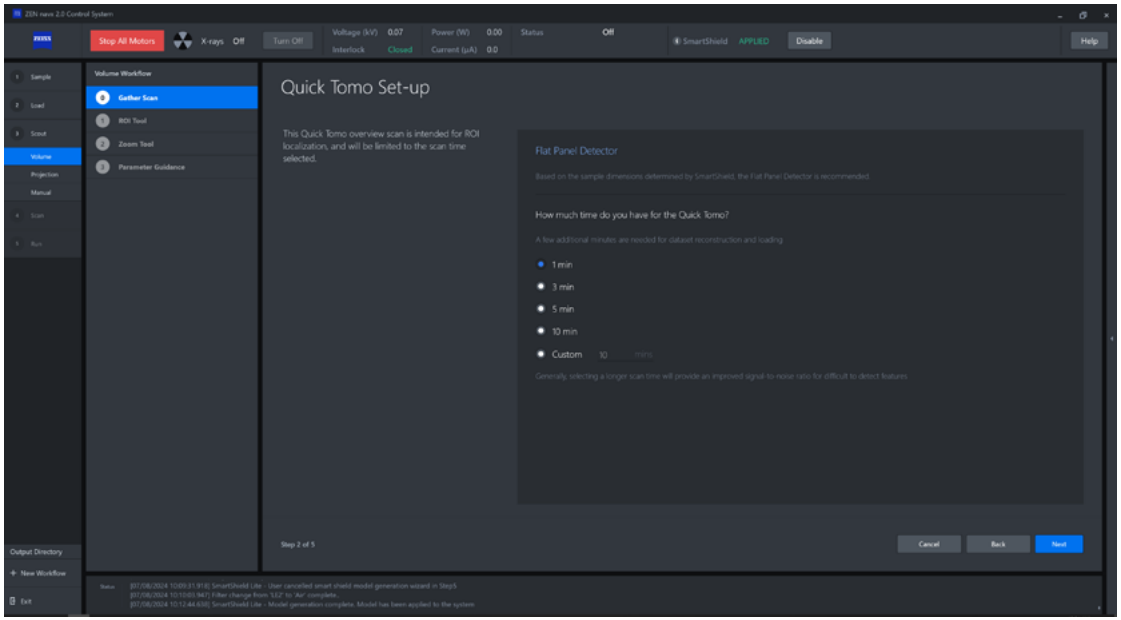
Your Insight into the Technology Behind It

Fast Acquisition Scanning Technology (FAST)

FAST Mode is a mode of data collection that allows for continuous motion scanning for 3D navigation and Volume Scout via ZEN navx for all samples. It is built into ZEISS VersaXRM 730 and is used with the flat panel extension.

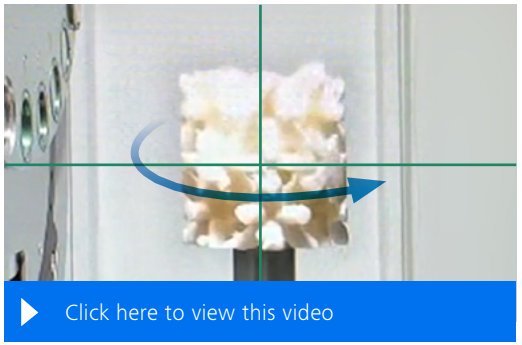
In FAST Mode, the sample rotates continuously while X-ray transmission images are acquired at different angles. This continuous rotation eliminates the overhead time of starting and stopping the rotation movements in a traditional step-and-shoot acquisition mode. By eliminating this overhead, dramatically faster scan times can be attained when exposure times are below 0.5 seconds (typical for the large, sensitive FPX detector). In practice, whole sample data collection times in the ~1 to 5-minute range are now possible, and data collection times sub-20 seconds are achievable with relaxed image quality considerations.

FAST Mode on Versa XRM maintains the high standards for artifact compensation users have come to expect through proprietary scan trajectories and data handling and reconstruction approaches.



Parameter Guidance enables the user to choose FAST Mode for <1-minute tomography (top). The continuously rotating sample removes the overhead of step-and-shoot acquisition (right).

FAST Mode acquisition integrates seamlessly with the Volume Scout workflow of ZEN navx to allow for nearly immediate feedback and true 3D navigation to the correct region of interest in your complex samples.



Your Insight into the Technology Behind It

Gain An Edge In Contrast

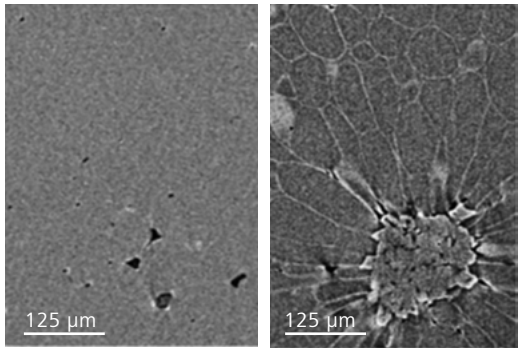
Your imaging requires superior contrast capabilities to reveal details necessary to accurately visualize and quantify features. ZEISS Versa XRM deliver flexible, high contrast imaging for even your most challenging materials – low atomic number (low Z) materials, soft tissue, polymers, fossilized organisms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

The Versa XRM series of 3D X-ray microscopes increase material imaging flexibility by employing several contrast enhancing features. These unique system features enable ZEISS X-ray microscopes to provide superior contrast for arange of difficult-to-image materials.

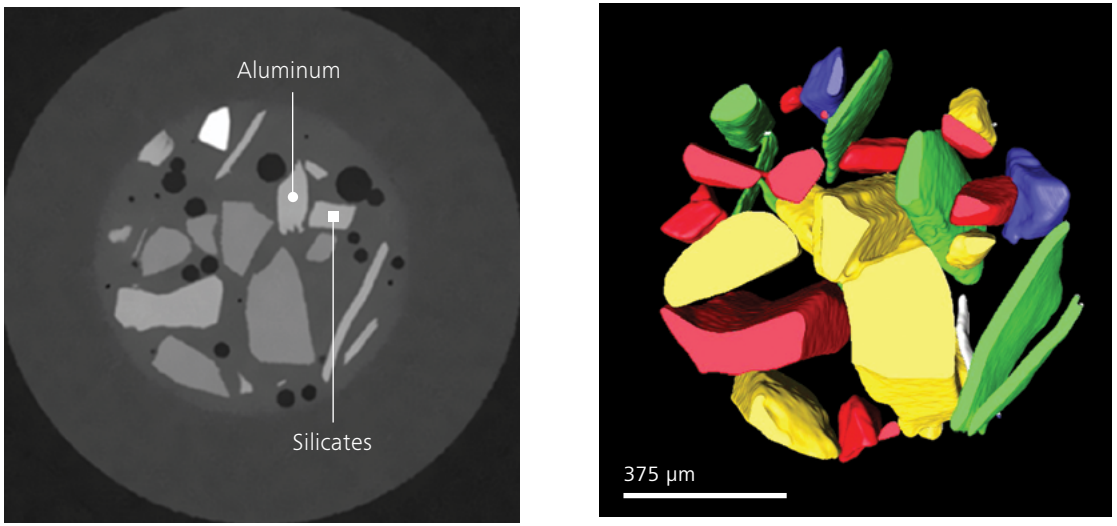
1. Enhanced absorption contrast: the ZEISS detector system consists of multiple highly specialized proprietary detectors that are each optimized to maximize collection of contrast-forming low energy X-ray photons.

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 VersaXRM 730, 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 enables separation of the particles. 3D rendering shows Aluminum/green; Silicates/red (right).

Your Insight into the Technology Behind It

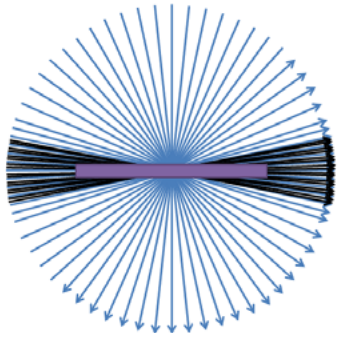
Achieve Higher Throughput – Obtain Faster Time to Results

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 VersaXRM 730, 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.

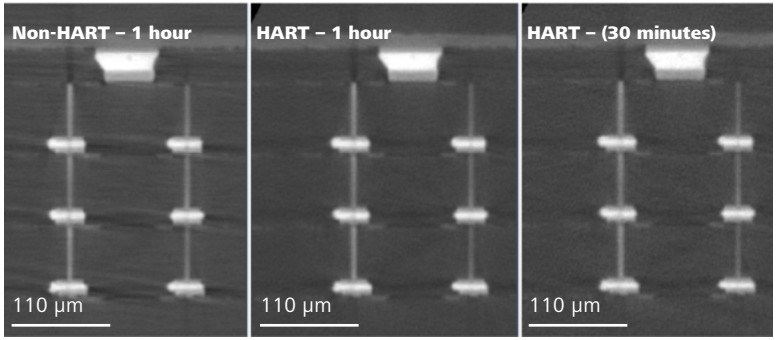
You can also tune HART to emphasize higher throughput or better image quality, thereby potentially accelerating image acquisition speed by 2×. This faster acquisition mode is in addition to a powerful dual GPU workstation that accelerates image reconstruction time by up to 40%. Add the optional FPX to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

Challenging Sample Imaging Made Easier

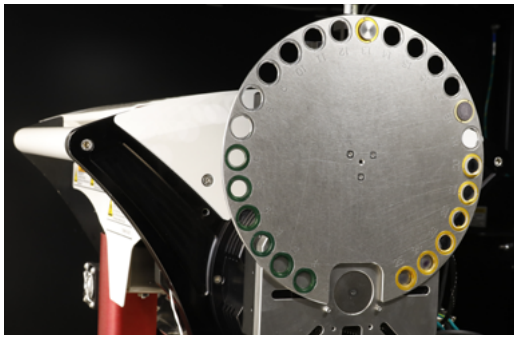
Researchers commonly use source filters to tune the X-ray energy spectrum and every VersaXRM 730 comes with a standard set of 12 filters. VersaXRM 730 system features Automated Filter Changer (AFC), which improves ease of use for seamlessly changing filters without manual intervention. In addition to the standard range of filters, you will find 11 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 workflow with ZEN navx. 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 can be tuned to emphasize either better image quality or higher throughput.



Automated Filter Changer (AFC) exclusive to the ZEISS VersaXRM 730 offers 12 standard filters with room for 11 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.

Wide Field Mode is featured on ZEISS VersaRM 730 with the 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.

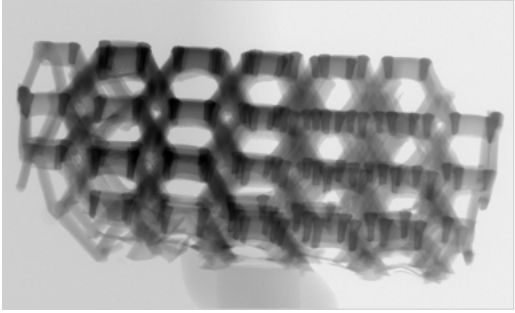
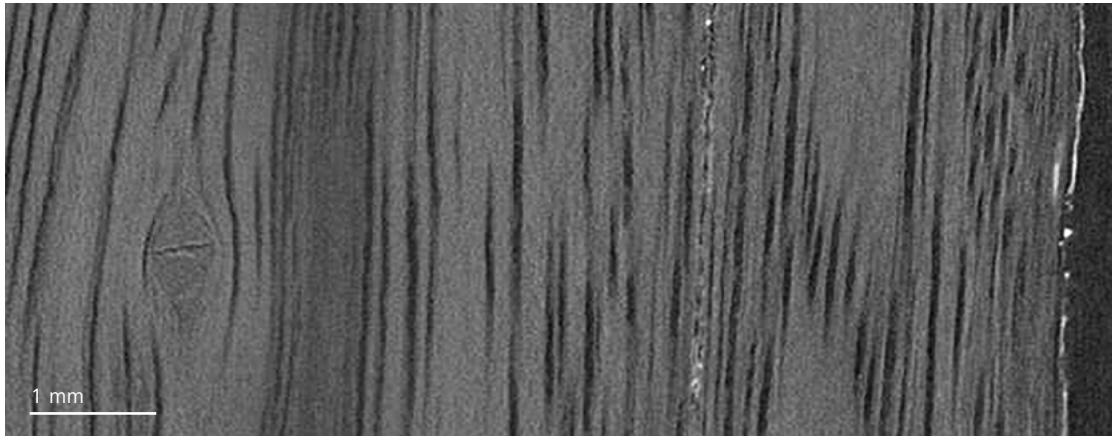


Image large samples with Wide Field Mode such as this 7.5 mm additively manufactured lattice.



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

Expand Your Possibilities

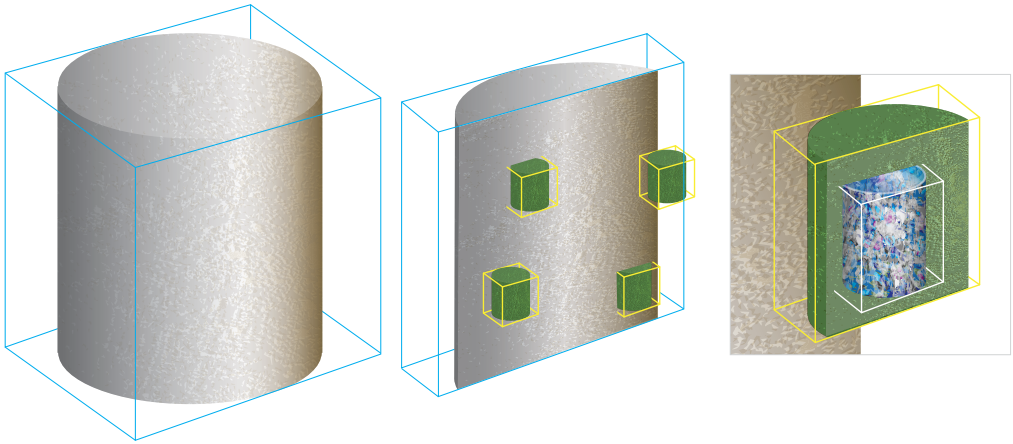
Image Even Larger Samples with High Throughput

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

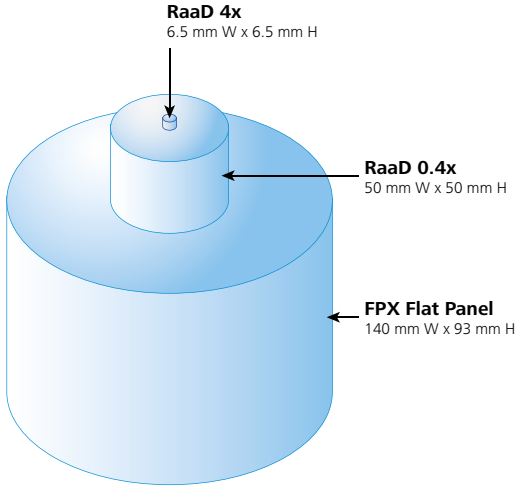
Scout-and-Zoom is a unique capability of ZEISS X-ray microscopes that leverages FPX to perform a low resolution, large field of view, scout scan, and identify interior regions for higher resolution zoom scans on a variety of different sample types. The Volume Scout workflow streamlines this process within ZEN navx.

These powerful techniques are achieved only by the Versa dual magnification microscope objectives that enable 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 a large semiconductor package, or a specific area of cracks or voids in a composite sample.

Advanced reconstruction technologies, such as ZEISS DeepRecon Pro, included with advanced Versa XRM systems, can improve the image quality of challenging zoom scans without increasing image acquisition time, while ZEISS DeepScout improves the scout scan, providing resolution at FOV.



Scout-and-Zoom enables large sample imaging at high throughput and subsequent high resolution sub-sampling.



Comparison of reconstructions of single FOV volumes performed with different objectives.

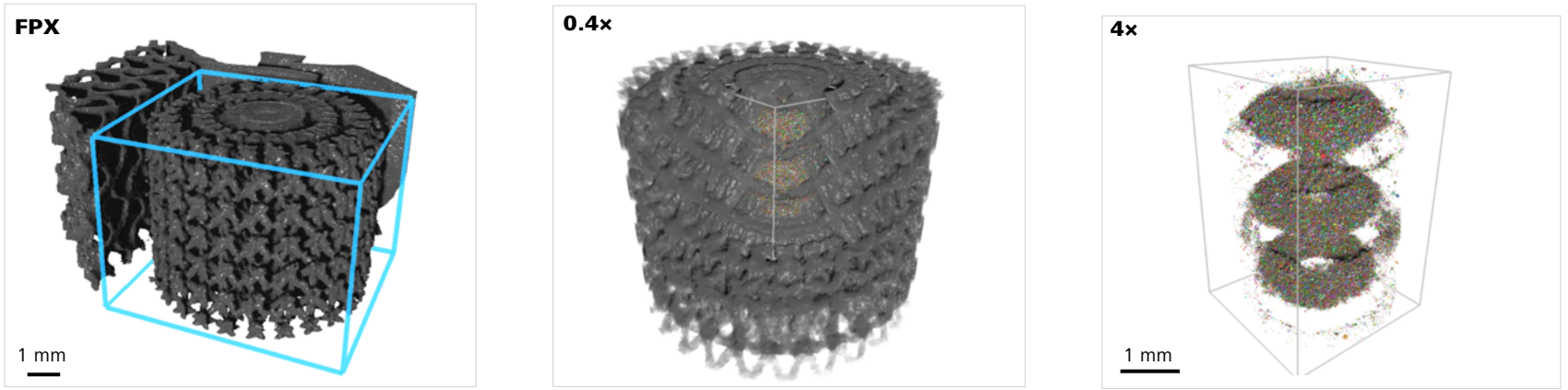
FPX Specifications

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

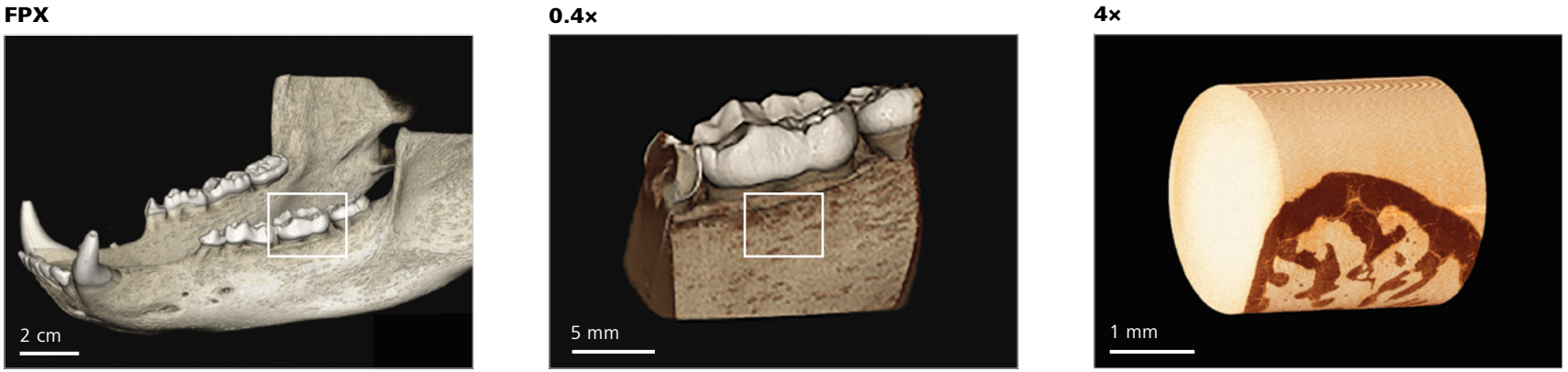
Expand Your Possibilities

Large Object Volume Scout Workflows with FPX

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



Three-stage Scout-and-Zoom workflow. Rapidly scan large field of view with FPX i n FAST Mode and then zoom to r egions of interest with RaaD objectives.

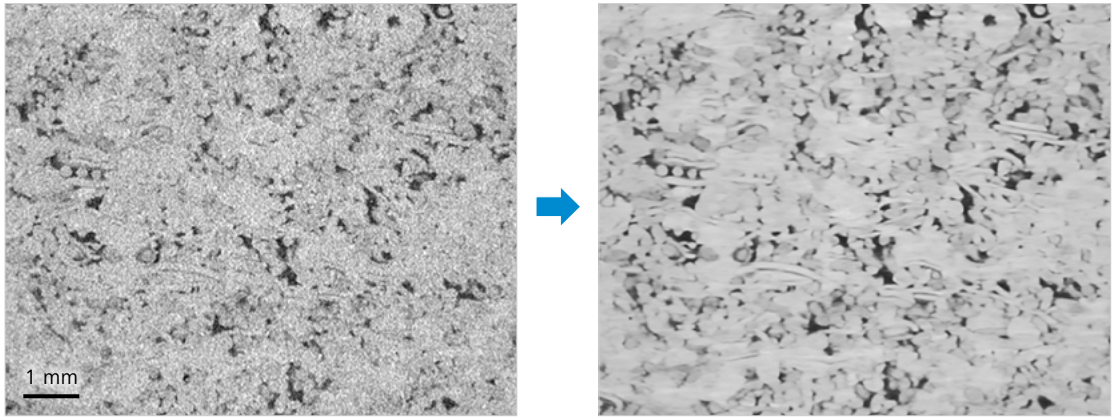


Sample set: Bear jaw, 15 cm long.

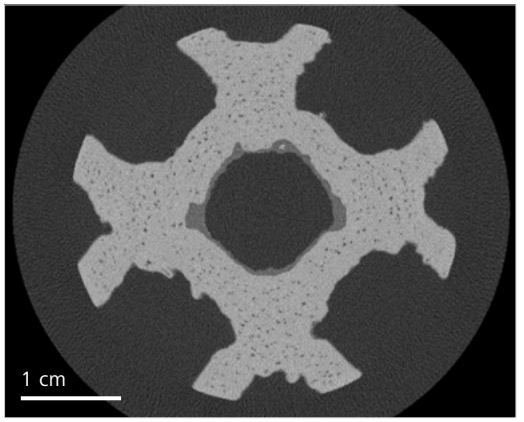
Expand Your Possibilities

FAST Mode for FPX

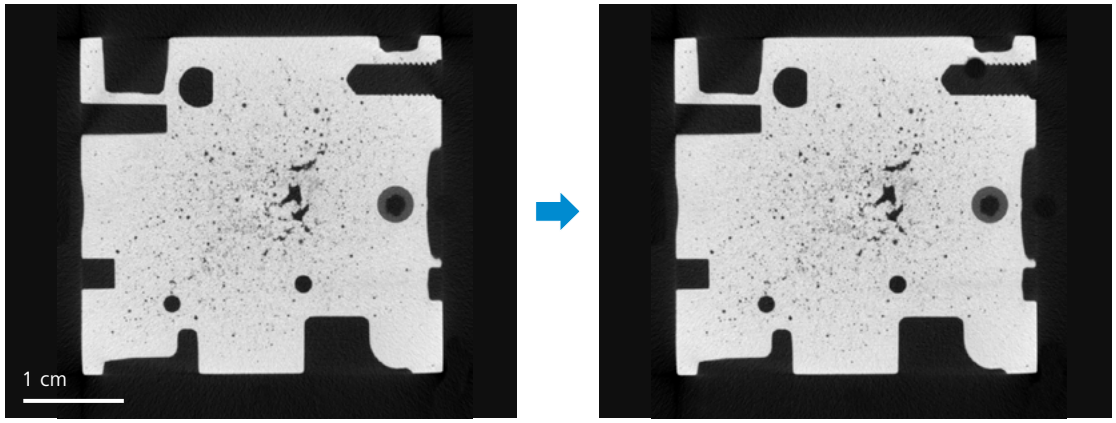
Sub-minute tomography possibilities for efficient 3D navigation and rapid sample inspection.



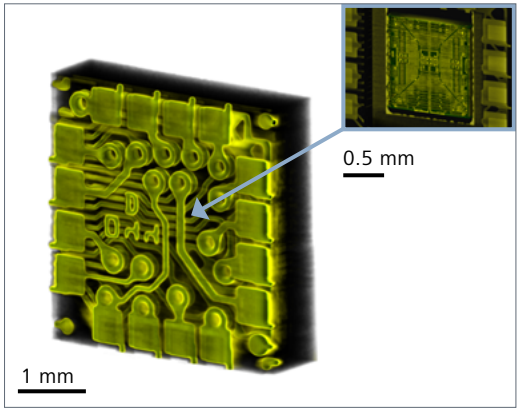
Sandstone sample imaged with FAST Mode for FPX in 39 seconds and reconstructed with the standard FDK algorithm (left). Image quality for FAST Mode scans can be improved, e.g., noise reduction, by using DeepRecon Pro (right).



3D printed plastic lattice imaged in 17 seconds.



Aluminum block part imaged in traditional STEP mode (24 minutes 29 seconds, left) and with FAST Mode (4 minutes 7 seconds, right) for comparable image quality over 80% faster.



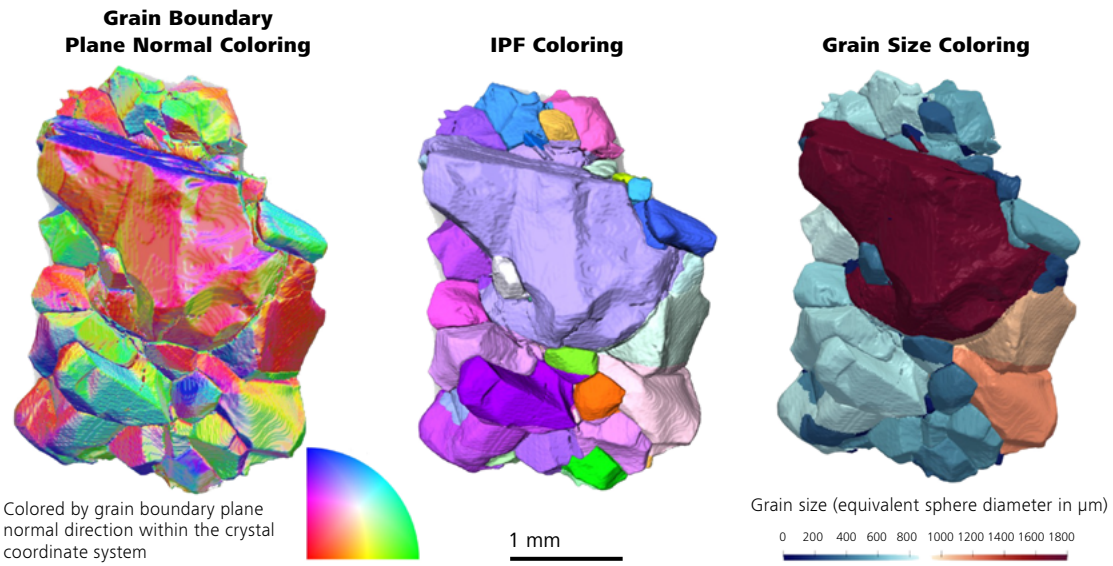
MEMS Gyroscope: one-minute FAST Mode scan of this intact sample using Volume Scout to find interior ROI for high resolution scan without destroying the sample.

Expand Your Possibilities

ZEISS LabDCT Pro – Unlocking Crystallographic Information in Your Lab

With the LabDCT Pro option exclusively available on VersaXRM 730, 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 Pro 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 contrast tomography. Combine modalities to understand structure-property relationships between grains, voids, inclusions, and other morphological details.
- LabDCT Pro now supports specimens with crystal structures from high cubic symmetry to systems with lower symmetry such as monoclinic materials.



Peridotite sample consisting of large olivine and pyroxene grains in the form of a fused mass. LabDCT Pro imaging reveals the crystallographic microstructure of both phases. Analysis produces detailed information on grain boundary characteristics and grain size. Sample courtesy of Dr. Kirste Lutz, Fraunhofer Institute, IAF, Freiburg.

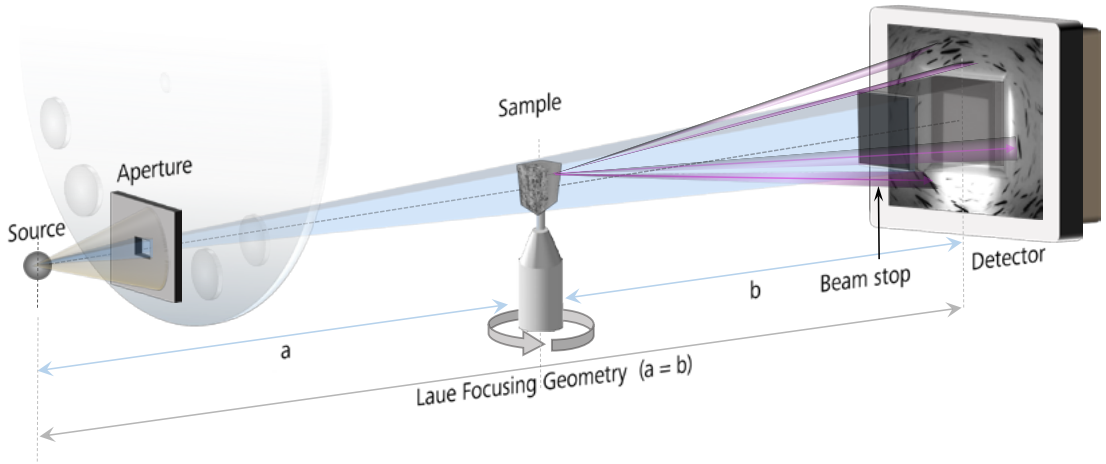
Expand Your Possibilities

ZEISS LabDCT Pro – How it Works

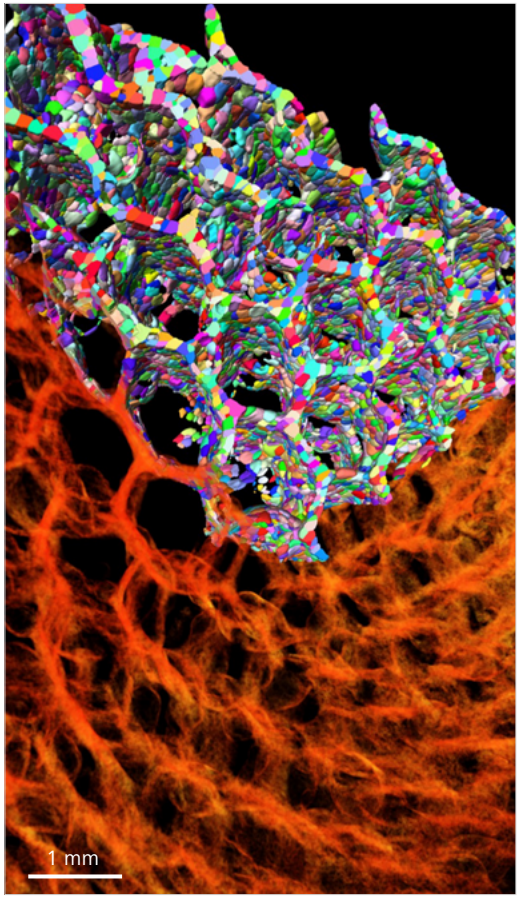
The LabDCT Pro option on ZEISS VersaXRM 730 is a fully integrated analytical module. The sample is illuminated through an aperture in front of the X-ray source. Both the sample absorption and diffraction information are recorded with a high-resolution detection system. A beamstop is added to the set-up 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 Pro Advanced Imaging Module

- Dedicated hardware: apertures, beam stop
- Integrated acquisition with ZEN navx
- GrainMapper3D advanced and interactive crystallographic reconstruction software
- Dedicated high performance workstation
- The LabDCT Pro module enables DCT data acquisition on the 4x DCT objective and the flat panel detector



Schematic of the LabDCT setup.



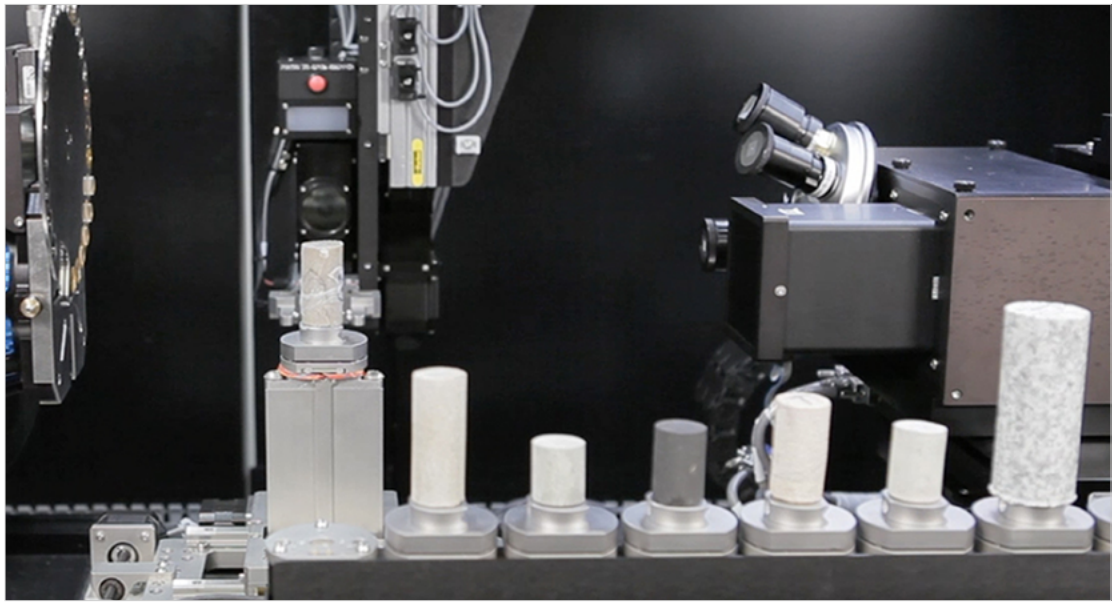
Twisted Iron honeycomb prepared by Hydrogel Infusion Additive Manufacturing (HIAM). Sample courtesy: Dr. Sammy Shaker, CalTech.
Number of DCT projections: 16652
Number of grains: > 100,000

Expand Your Possibilities

Increase Your Sample Handling Efficiency with ZEISS Autoloader

Maximize your instrument's utilization by minimizing user intervention with the optional robotic Autoloader available for all instruments in the ZEISS Versa XRM series of submicron 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 that 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 ZEN navx 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.

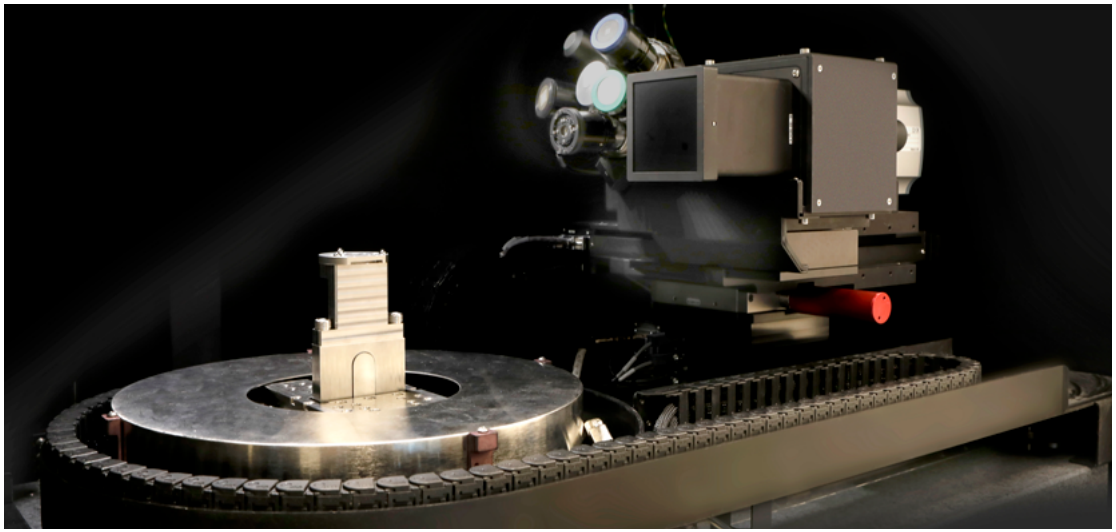
Expand Your Possibilities

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

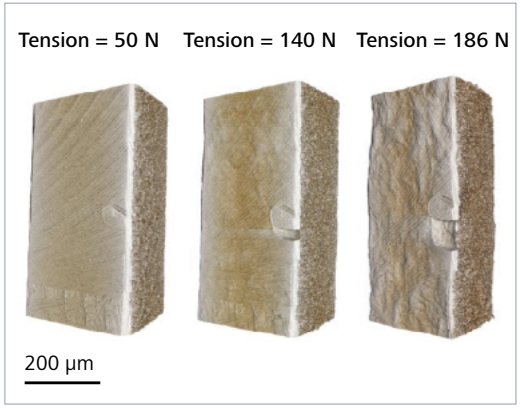
Continuing to push the limits for scientific advancement, ZEISS Versa XRM solutions have evolved to provide you with the industry's premier 3D imaging solution for the widest variety of *in situ* rigs, from high pressure flow cells to tension, compression and thermal stages. ZEISS X-ray microscopes uniquely 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 Versa XRM are equipped with dual-stage magnification architecture with RaaD technology that enables the highest resolution for *in situ* imaging. The optional *In Situ* Interface Kit can be added to any Versa instrument.

Contents include a mechanical integration kit, a robust cabling guide and other facilities (feedthroughs) along with recipe-based software that simplifies your operation from within the ZEN navx user interface. Experience the highest level of stability, flexibility and controlled integration of such *in situ* devices on Versa XRM, which benefit from an optical architecture that doesn't compromise resolution in varying environmental conditions.



Making the industry's best in situ *solution even better: interface kit and tracking for a variety of* in situ *rigs.*



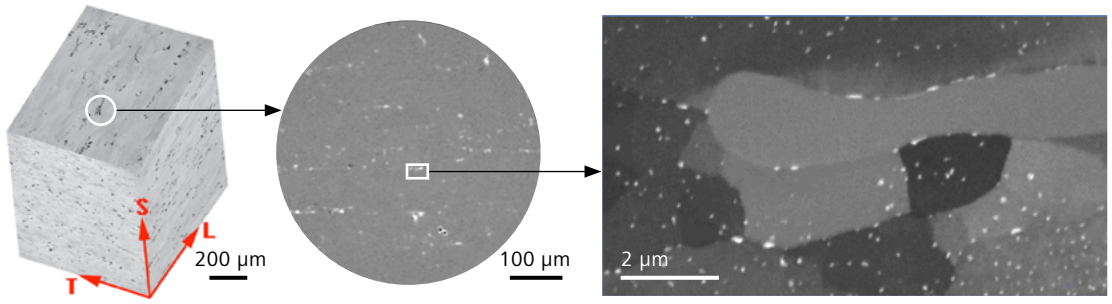
Tensile testing of a steel laser weld under increasing load. The data reveal a crack initiating and propagating from a rough surface imperfection, as well as the elongation of internal voids. Sample courtesy of Sandia National Laboratories.

Expand Your Possibilities

Correlative Microscopy

Drive correlative workflows starting with non-destructive X-ray imaging to seamlessly connect 3D X-ray, optical, and SEM analyses.

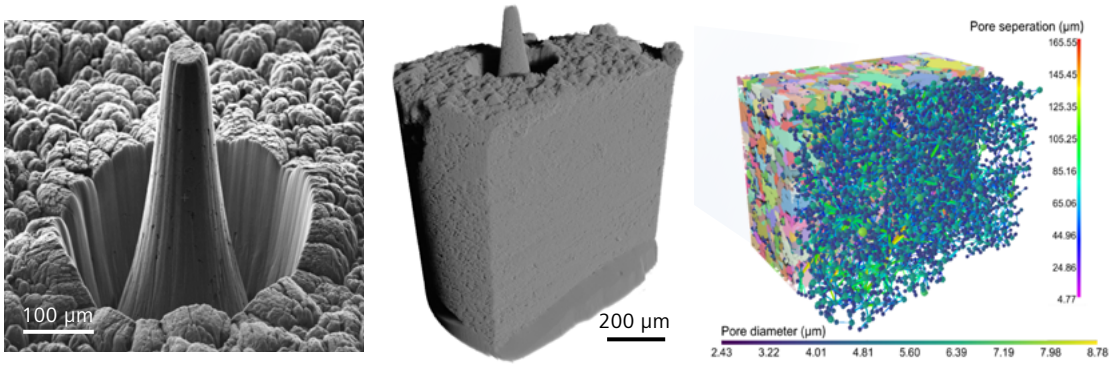
- Non-destructively scan your sample with ZEISS Versa XRM
- Drive your FIB-SEM analysis to the particular region of interest (ROI) guided by 3D tomography data
- Rapidly access deeply buried ROI with femto-second laser milling
- Carry out TEM or atom probe sample preparation of deeply buried structures of interest
- Conduct FIB-SEM tomography with industry-leading 3D resolution



Multiscale analysis of an aluminum 7075 alloy. ZEISS Versa XRM scan of the sample (left). XRM interior tomography of a 0.75 mm field of view with 750 nm voxel size (center). FIB-SEM tomography slice showing a silicon inclusion (right). In collaboration with S. Singh and N. Chawla, Arizona State University.

Prepare Site-specific Samples for Your High-resolution XRM Scans with ZEISS Crossbeam laser

- Rapidly prepare site-specific small diameter pillars for XRM analysis on extremely dense samples with ablation rates of up to 15 mio. µm³/s (silicon)
- Reduce sample damage and heat affected zones to a minimum thanks to ultrashort femtosecond laser pulses
- Enjoy site-specific laser preparation with down to 2 µm targeting accuracy



Pillar preparation of nuclear graphite with ZEISS Crossbeam laser for imaging in ZEISS Ultra XRM (left); Versa XRM overview scan of the complete sample (center); 3D reconstructed and segmented data showing pore diameter and distances between pores (right).

Your Insight into the Software Behind It

ZEISS Advanced Reconstruction Toolbox

ZEISS Advanced Reconstruction Toolbox (ART) is an innovative platform through 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 3D XRM.

These unique offerings leverage AI and a deep understanding at ZEISS 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.

ZEISS DeepRecon Pro

ZEISS DeepRecon Pro has become such a powerful tool for XRM reconstruction that the ART high-performance workstation and DeepRecon Pro with a two-year license are included with VersaXRM 730.

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 DeepScout

ZEISS DeepScout uses high-resolution 3D X-ray microscopy datasets as training data for lower resolution, larger field of view datasets and upscales the larger volume data using a neural network model. DeepScout, developed through continued algorithmic innovation enabled by the unique AI infrastructure from ZEISS, employs the unique Scout-and-Zoom capability to acquire richer information at higher resolution, including interior tomographies for large samples.

Now you can take your large overview scan, feed it through the DeepScout reconstruction algorithm, and get resolution that approaches the resolution of a zoom scan, but over a much larger field of view. At its core, DeepScout relies on the ability to generate multiscale, spatially registered datasets and uses that ability to train neural networks to improve the reconstruction.

New capabilities, fueled by deep learning, mitigate the traditional trade-off between field of view and resolution.

ZEISS DeepRecon Pro and ZEISS DeepScout are offered as part of the AI Supercharger package for the Advanced Reconstruction Toolbox.

	FDK Standard Analytical Reconstruction	**OptiRecon** Iterative Reconstruction	**DeepRecon Pro** AI (Deep-Learning) based Reconstruction	**DeepScout**
Throughput	1×	up to 4×	up to 10×	up to 100×
Image Quality*	Standard	Better	Best	Unprecedented over LVOV, FVOV**
Ease-of-use	Minimal	Requires parameter optimization	One-click setup	Simple setup Familiar Scout-and-Zoom, user-friendly ZEN navx

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

Your Insight into the Software Behind It

ZEISS PhaseEvolve

ZEISS PhaseEvolve is a patented* post-processing reconstruction algorithm that enhances 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.

ZEISS Materials Aware Reconstruction Solution (MARS)

ZEISS MARS is a reconstruction algorithm that is aware of the constituents within a reconstruction. A challenge in X-ray reconstruction in a lab setting is that imaging with a polychromatic source creates different X-ray energies to generate a phenomenon called beam hardening.

This effect is particularly challenging when your material is very dense and embedded in a relatively less dense material. MARS tells the reconstruction system how to compensate for the effect of extreme beam hardening in the regions between very dense objects.

This is important in applications like biomaterials, where you might be looking at implants next to bone or tissue. Or electronics where extremely dense solder balls appear next to other less dense materials on a printed circuit board, generating strong artifacts. MARS reconstructs your images to compensate for these effects.

ZEISS PhaseEvolve and MARS form the Artifact Reduction package of ART.

ZEISS OptiRecon

ZEISS OptiRecon is 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.

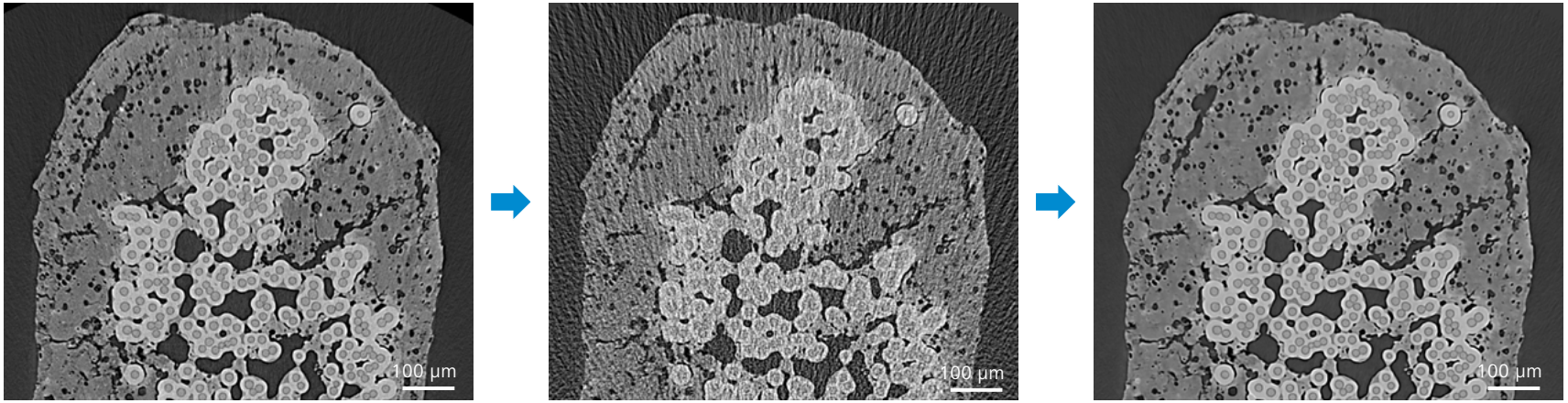
ZEISS OptiRecon bonds with ZEISS DeepRecon to create the Recon package of ART.

The ART Premium package includes all ZEISS ART modules.

**US Patent 11645792B2*

Your Insight into the Software Behind It

ZEISS DeepRecon Pro

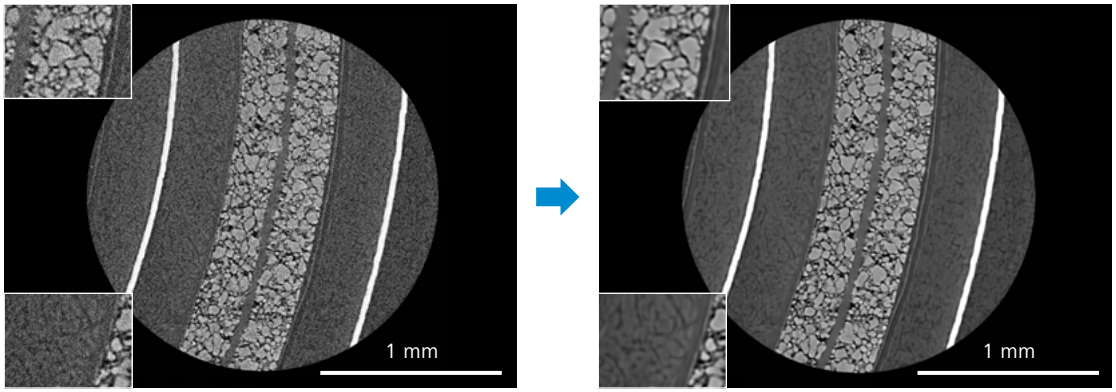


Standard reconstruction (FDK): Scan time 9 hrs (3001 projections)

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

ZEISS DeepRecon Pro: Scan time 53 mins (301 projections)

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



Standard Reconstruction (FDK)

ZEISS DeepRecon Pro

ZEISS 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 Software Behind It

ZEISS DeepScout

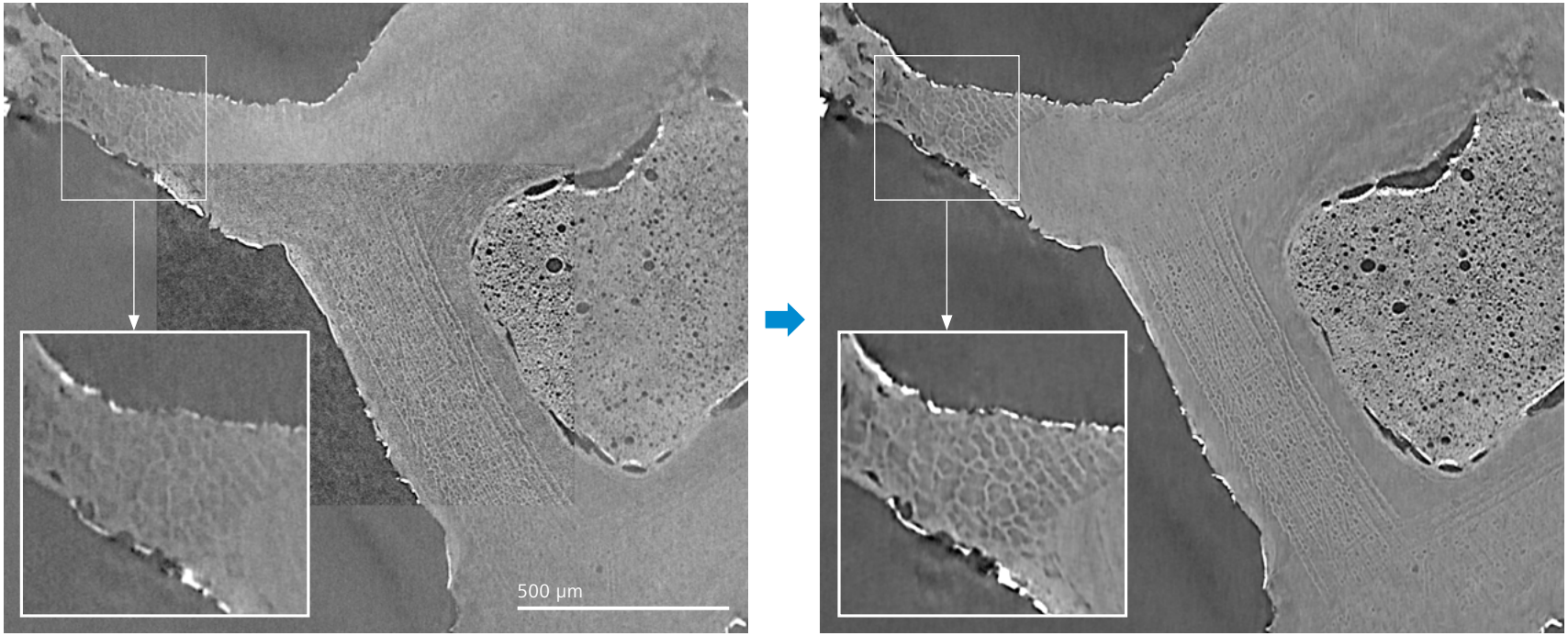


Image data from a TiC composite additive lattice sample. Left: 2D reconstructed slice with a low resolution (5 µm/pixel) overview and high resolution (1 µm/pixel) region of interest scan enclosed within the box. Right: High resolution ZEISS DeepScout processed image extends higher resolution to larger field of view. ZEISS DeepScout enables high resolution everywhere in a large FOV volume with no need for numerous high-resolution scans. The DeepScout example above required five total hours of image acquisition. A volume stitched together from individual high-resolution images would have required over 25 hours of instrument time. Inset images between left and right image show feature enhancement in the low resolution dataset after DeepScout processing.

Your Insight into the Software Behind It

ZEISS DeepScout

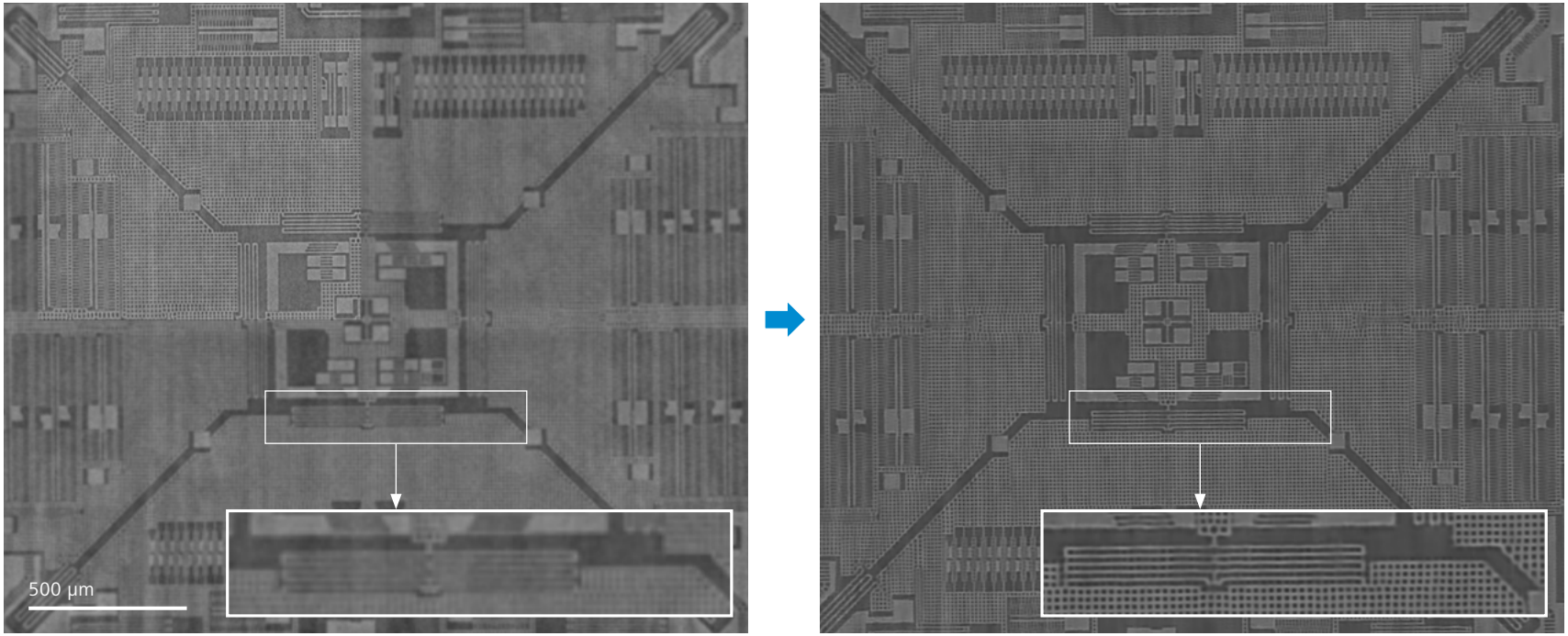
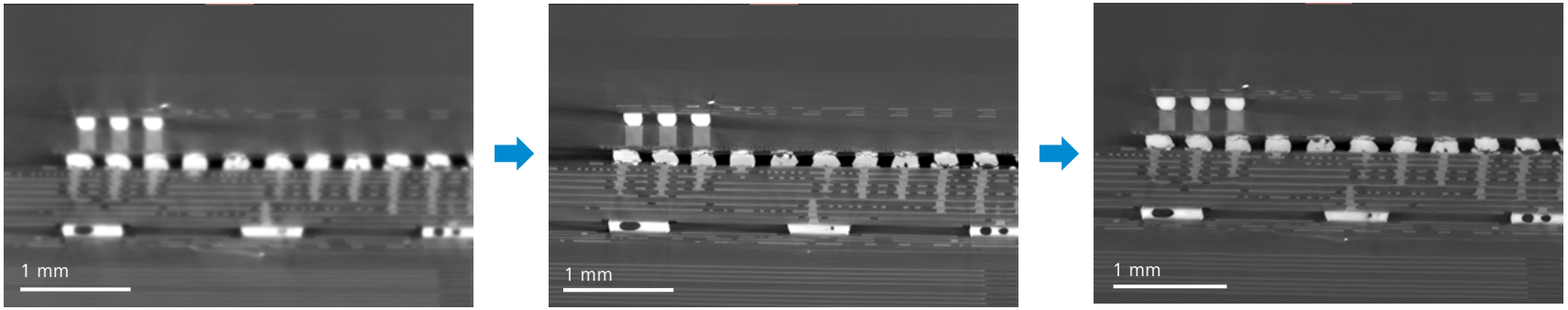


Image data from a MEMS gyroscope package. Left: 2D reconstructed slice with a low resolution (5 µm/pixel) overview and high resolution (1 µm/pixel) region of interest scan enclosed within the box. Right: High resolution ZEISS DeepScout processed image extends higher resolution to larger field of view. DeepScout enables high resolution everywhere in a large FOV volume with no need for numerous high-resolution scans. Inset images between left and right image show feature enhancement in the low resolution dataset after DeepScout processing. Fine MEMS structural members not seen in the low resolution data (left inset) are clearly resolved in DeepScout data (right inset).

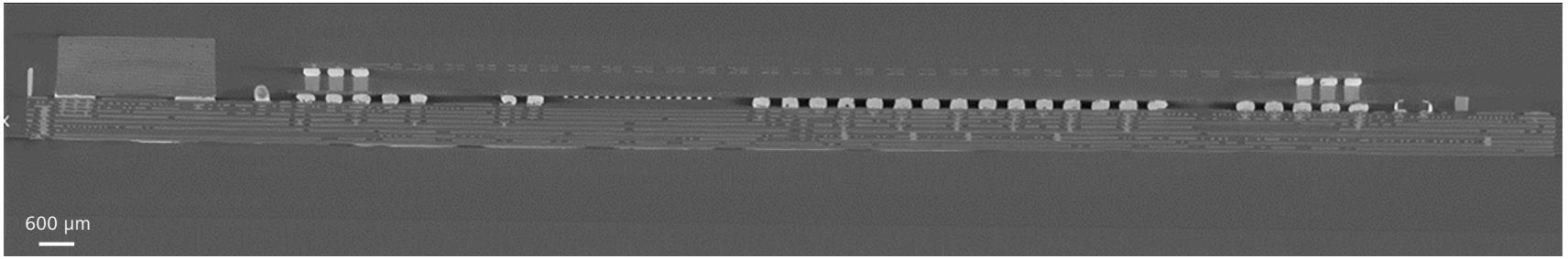
Your Insight into the Software Behind It

ZEISS DeepScout



Low resolution *High resolution* *ZEISS DeepScout*

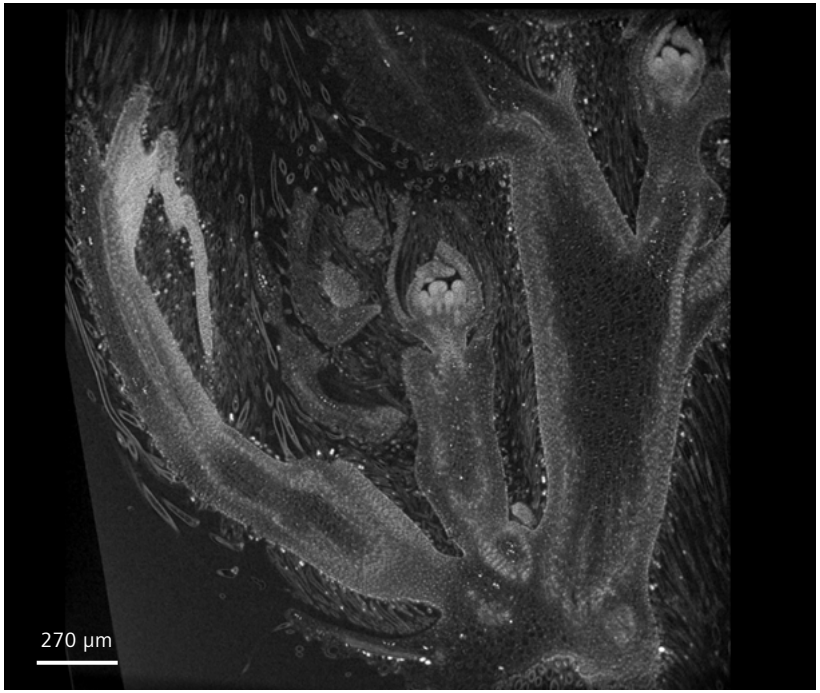
ZEISS DeepScout enables high resolution everywhere in a large FOV volume with no need for numerous high-resolution scans. The DeepScout example shown above took only 3 hours in data acquisition, achieving the large and high-resolution volume that would require at least 81 hours with standard data acquisition. The DeepScout images clearly show fatigue solder cracks in a commercial smartphone control board, with the image quality comparable to the actual high-resolution scan.



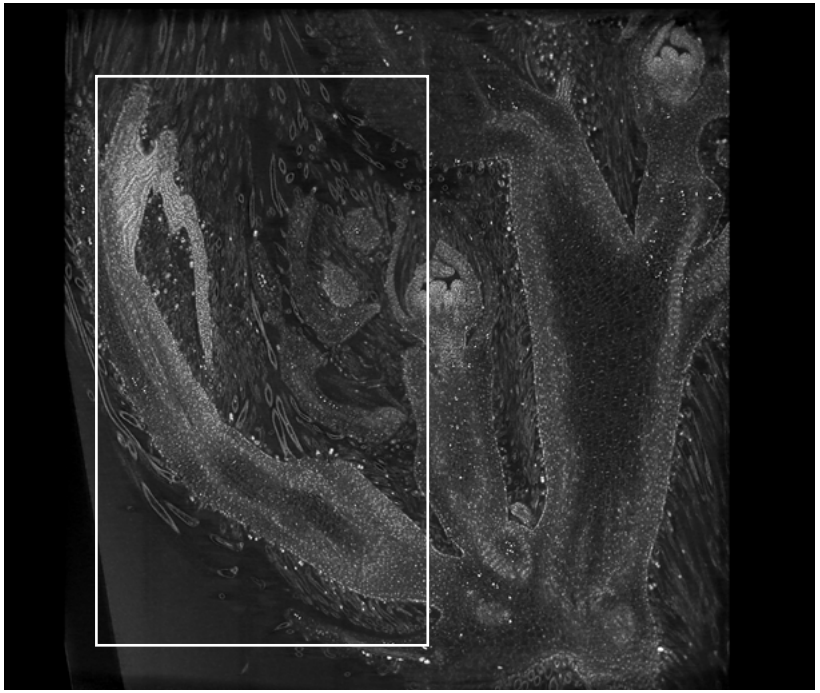
The single full field of view DeepScout scan was generated in 1.6 hours. A single high-resolution scan took 2.5 hours. It would require 27 scans, or 67.5 hours, to achieve the same volume of data as the DeepScout scan.

Your Insight into the Software Behind It

ZEISS DeepScout



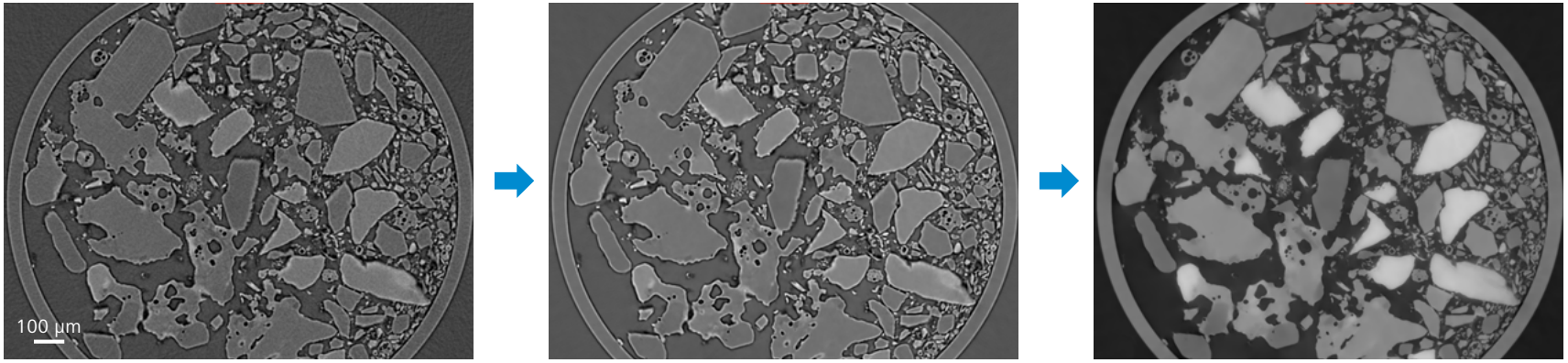
Soybean flower: Without ZEISS DeepScout



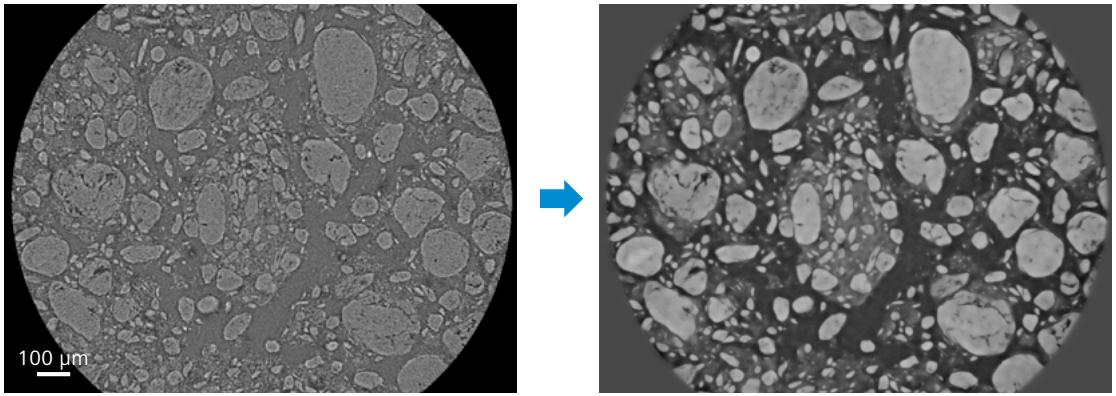
Significantly more cellular information generated in soybean flower sample using ZEISS DeepScout. Sample courtesy of Keith Duncan, Donald Danforth Plant Science Center

Your Insight into the Software Behind It

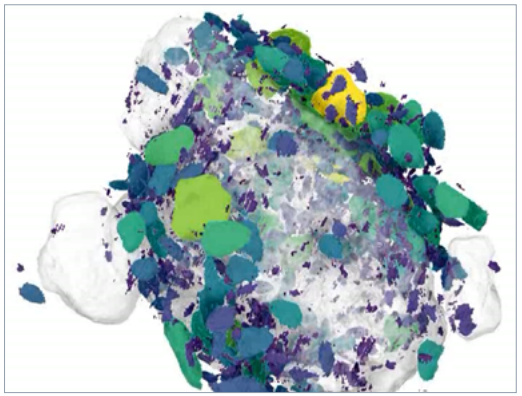
ZEISS PhaseEvolve



ZEISS PhaseEvolve and DeepRecon Pro applied to pharmaceutical cold and flu relief powder. The first image shows a regularly reconstructed FDK dataset with noise and phase fringe artifacts around the outside of powder grains. The middle image shows the same data following DeepRecon Pro; data is denoised and materials contrast is improved. The final image shows the data following PhaseEvolve reconstruction; phase fringe are removed, and subtle chemical and greyscale differences in the powder grains are enhanced, leading to more quantitative segmentations of groups of particles.



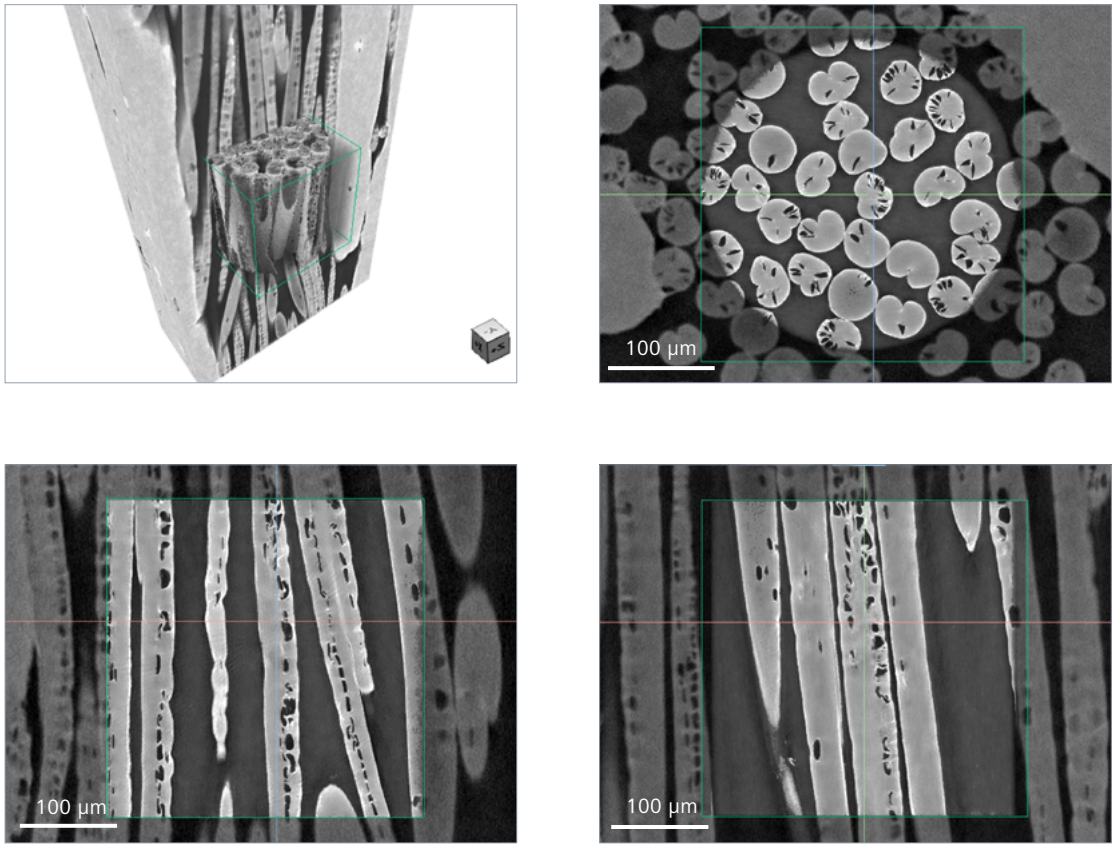
ZEISS PhaseEvolve applied to a pharmaceutical vitamin supplement powder sample. High resolution, low kV imaging produces images with material contrast being obscured by phase contrast artifacts. ZEISS PhaseEvolve effectively removes phase fringes to enhance image contrast, additionally revealing a binder phase that was otherwise unobservable, leading to much more accurate segmentations.



3D segmentation of agglomerate grain of pharmaceutical powder using the PhaseEvolve data and segmented with 3D World ZEISS edition. This segmentation shows the volume/ surface area ratio of grains adhered to each other via the previously unobservable binder material, allowing for quantifiable data acquisition via high resolution segmentation.

Your Insight into the Software Behind It

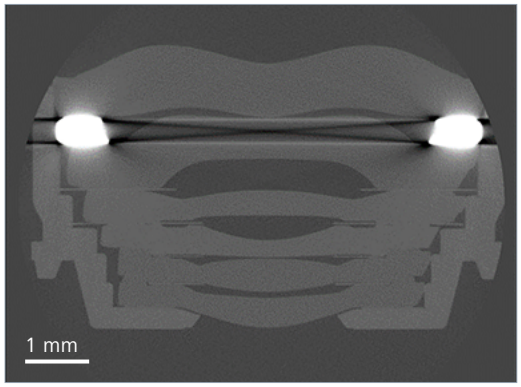
ZEISS PhaseEvolve



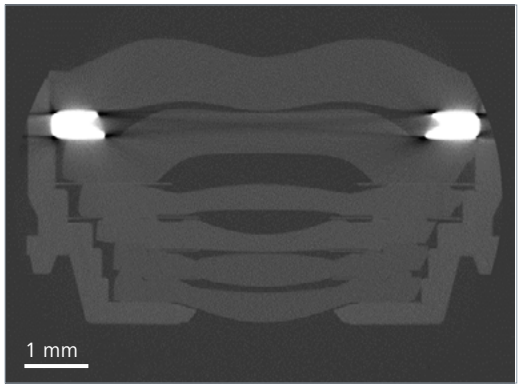
Rayon fibers were imaged at 1.5 µm/voxel resolution and processed using ZEISS PhaseEvolve revealing the large distribution of radial porosity along the length of the fibers. Sample courtesy Dr. Sherry Mayo & Dr. David Fox, CSIRO, Australia.

Your Insight into the Software Behind It

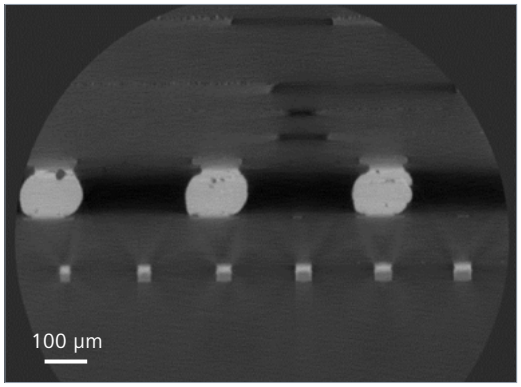
ZEISS Material Aware Reconstruction Solution (MARS) for Reducing Beam Hardening



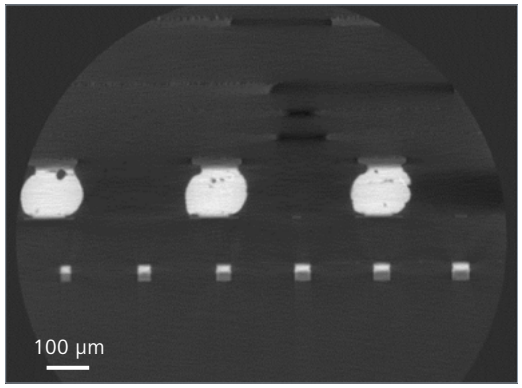
Without MARS



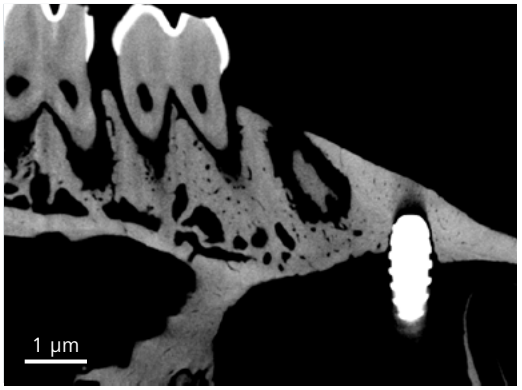
Camera module image using MARS.



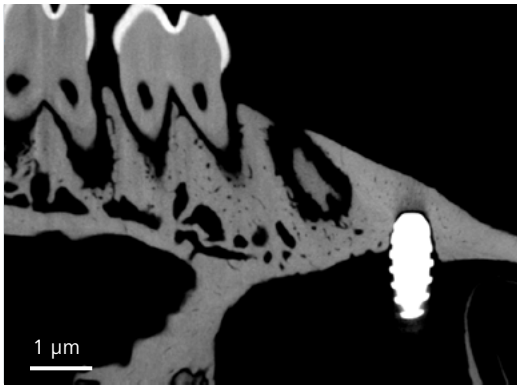
Without MARS



Semiconductor package image using MARS.



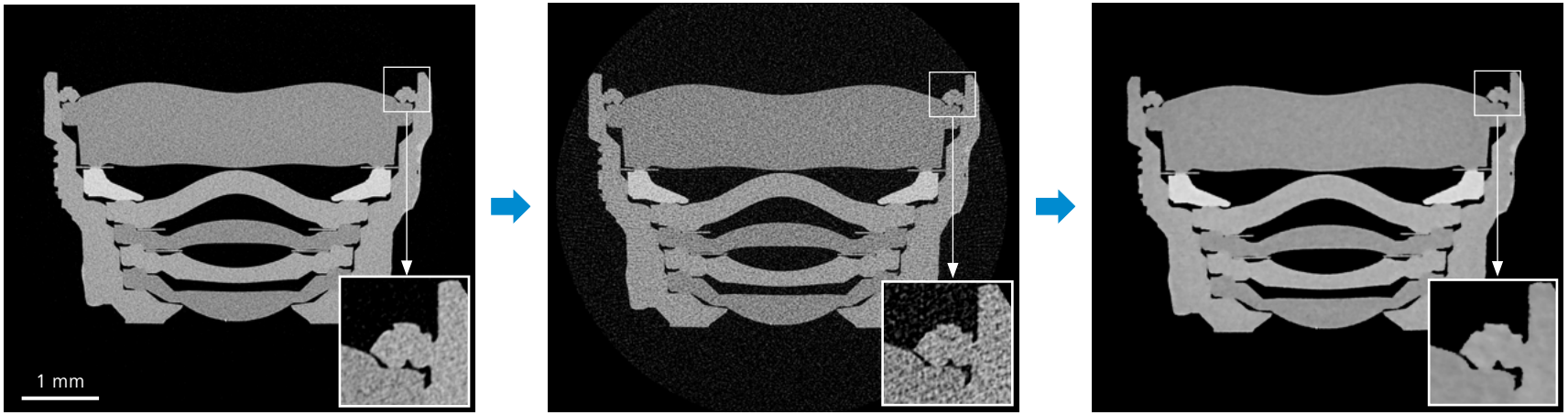
Without MARS



Biomedical implant image using MARS.

Your Insight into the Software Behind It

ZEISS OptiRecon



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.

Your Insight into the Software Behind It

Python API for Your Custom Use Case

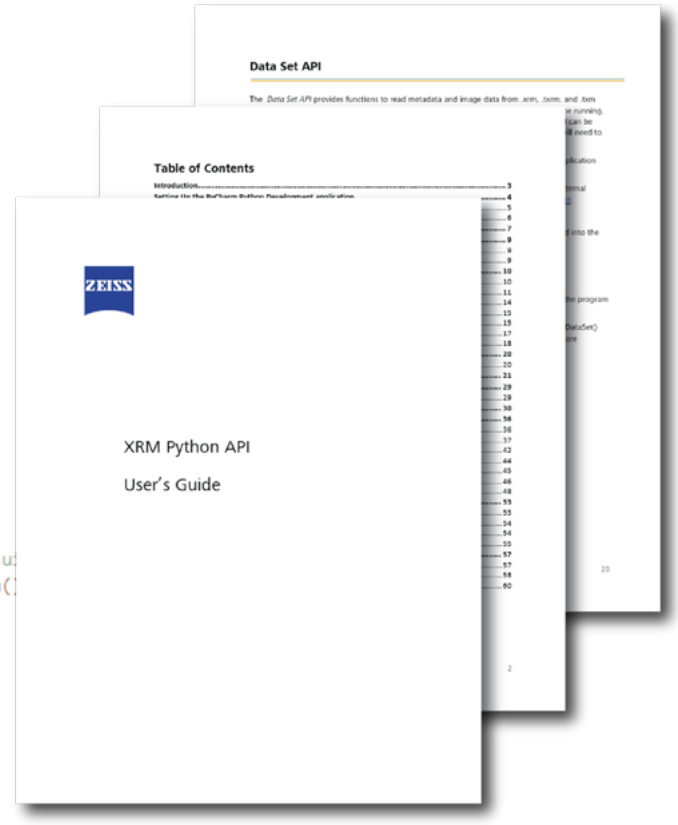
The ZEISS XRM Python API provides additional capability to interact with Versa X-ray microscopes. There are three different APIs that can be used in Python scripts for different use cases.

- 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.

main_txm.py

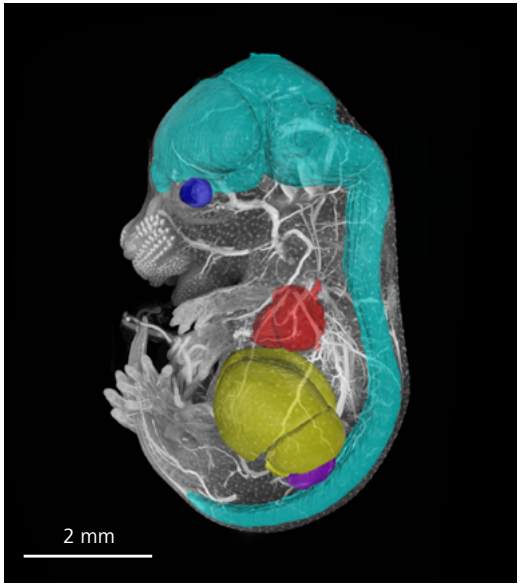
```python
from XradiaPy import Data
import numpy as np
from PIL import Image
import os
import json
import csv

save_dir = '.\Images_txm'
data_dir = r"\\foo\\bar\\dir"
group_name_id = 6
tomo_name_id = 7


def choose_image(myDataset):

    num_slices = myDataset.GetProjections()

    data = np.array(myDataset.GetImageData(num_slices // 2), dtype=np.u
    data = np.reshape(data, (myDataset.GetHeight(), myDataset.GetWidth(
    data = np.uint8(data / 256)

    im = Image.fromarray(data)
    #im.show()

    return im


```



Your Insight into the Software Behind It

Flexible, End-to-End Image Analysis Pipelines

ZEISS arivis Pro empowers you to automate image analysis and visualization pipelines. Leverage traditional methods or AI models effortlessly to create pipelines for any image size, dimension, or modality without the need to code.



Segmentation and visualization of a complete mouse embryo volume performed with ZEISS arivis software. Sample courtesy of Chih-Wei Logan Hsu, Baylor College of Medicine

The software supports and handles more than 30 commercial file formats. Efficiently process large files with ease. Pre-configured pipelines and standard assays are available for both simple and demanding analysis tasks. Or you can customize pipelines for your specific goals.

It takes just one click to repeat your analysis for consistent, quantitative results, boost productivity, and ensure reproducible results.

ZEN AI Toolkit including Intellesis

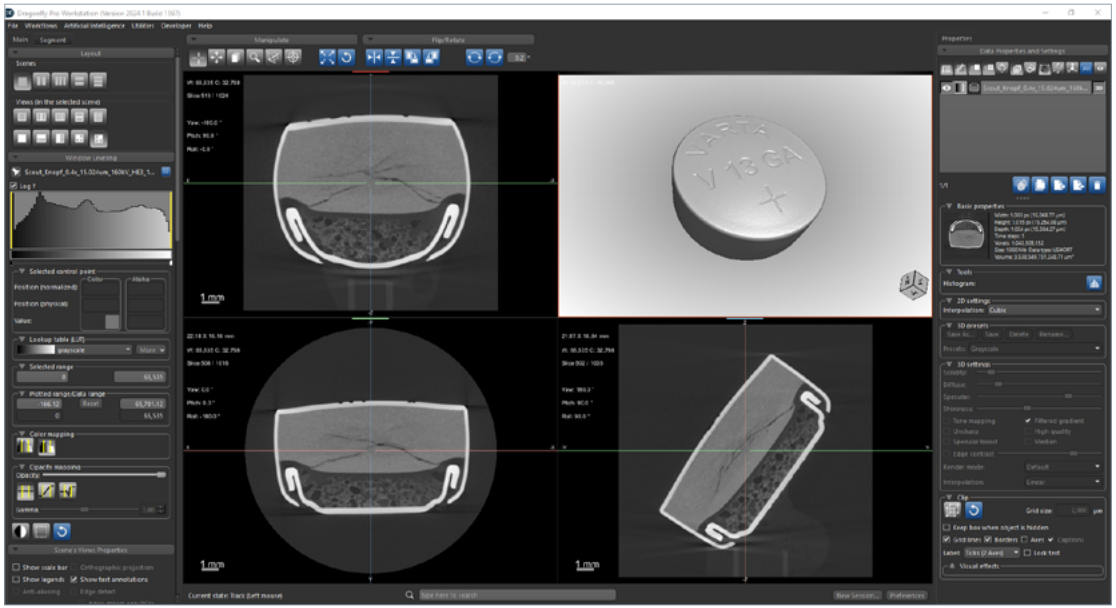
Machine learning can exponentially increase the throughput of image analysis and reduce the risk of human error. This toolkit contains solutions for image denoising, image segmentation, and object classification.

- Improve every step of the image analysis workflow
- Enable even new users to quickly gain proficiency
- Import third-party machine learning models

Your Insight into the Software Behind It

3D World ZEISS Edition – Your Visual Pathway to Quantitative Answers

3D World ZEISS edition from Dragonfly is advanced 3D visualization and analysis software. It is offered exclusively by ZEISS for processing XRM, SEM, and FIB-SEM data. Combining advanced image processing algorithms and state-of-the-art volume rendering, 3D World enables high definition exploration and powerful quantitative analysis of your data. 3D World 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 3D World 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, 3D World's cutting-edge image filters will make imaging artifacts disappear.



Tailor tools that are optimal to your workflow: choose plug-ins that allow you to control registration, map differences, and customize appearance. Commercial button cell battery, imaged on a ZEISS Versa XRM.

Your visual results will let your images speak for themselves. Capture and share insightful screenshots—as still images or 2D animations—or turn to 3D World's 3D Movie Maker for effortless high-impact 3D animations.

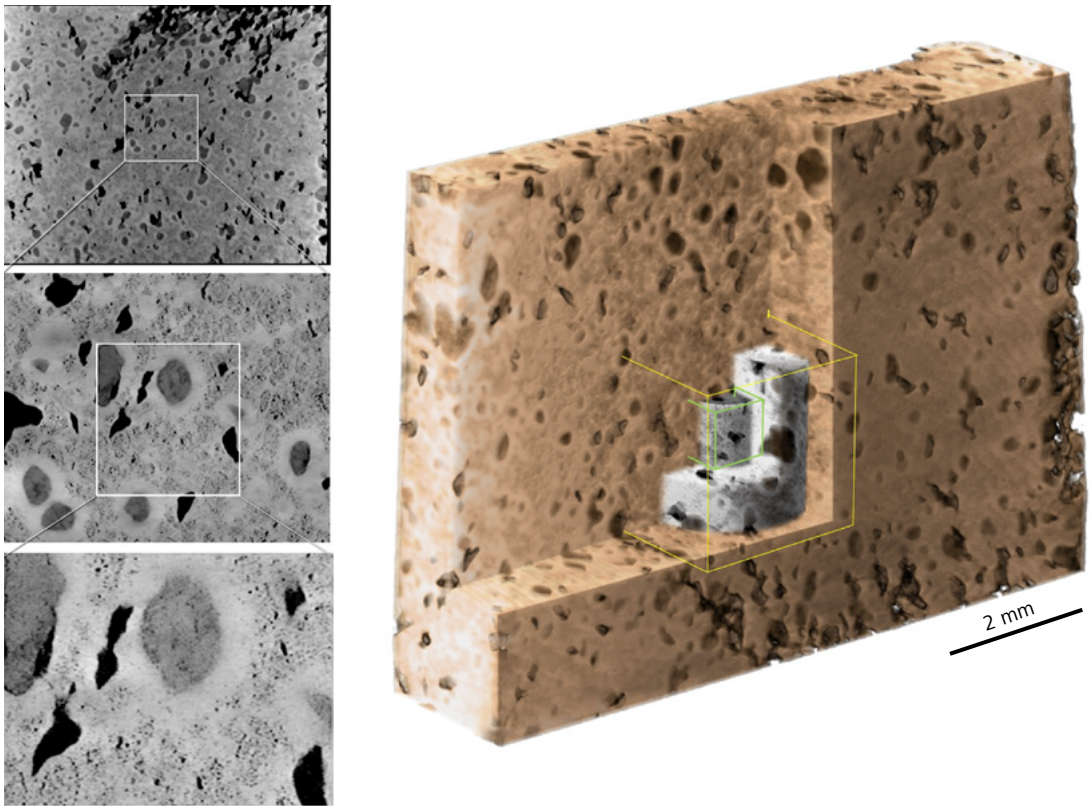
3D World's integrated machine learning engine solves segmentation of even the most challenging samples, while interactive painting and contouring tools make curation and fine edits a breeze. Record your workflows and replay them as needed or in batch. Even write custom Python code to drive the software to highly-customized and robust solutions.

Simple to use, but delivering the quantitative answers and visual impressions you demand, 3D World will accelerate your 2D/3D data productivity.

Key User Benefits

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

ZEISS X-ray Microscopy at Work: Materials Research



A metal matrix composite (MMC) sample with hierarchical microstructure. Using the Scout-and-Zoom workflow, the sample can be imaged non-destructively at multiple levels of magnification. Starting with the FAST Mode for a rapid full field of view overview to identify key regions of interest (ROI) followed by intermediate medium resolution and an ultra high resolution imaging to reveal the finest microstructural features as exemplified in the MMC. Sample courtesy of Prof. Rajarshi Banerjee, University of North Texas, Dallas.

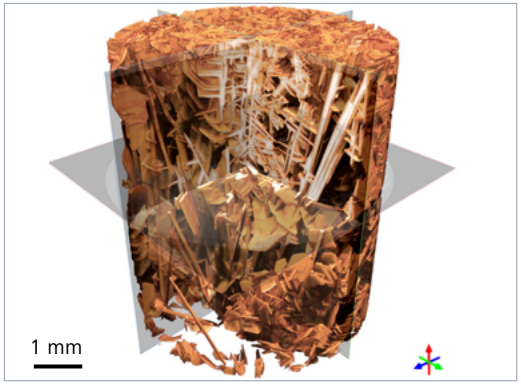
Typical Tasks and Applications

- 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

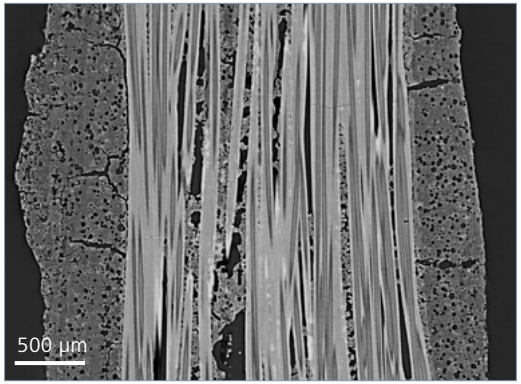
ZEISS VersaXRM 730 Benefits

- 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 RaaD for non-destructive *in situ* imaging experiments
- Fast, efficient, intuitive 3D navigation technology to inspect samples at the macro scale and easily determine regions of interest for high resolution imaging
- Faster throughput provides more sample runs for better data, increased sample statistics, more users, and improved instrument utilization
- Best image quality and resolution performance enables seeing more features at higher resolution than ever before

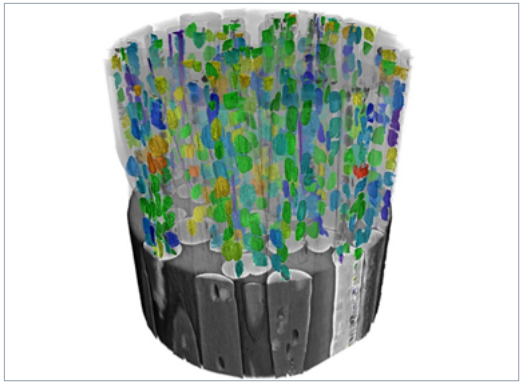
ZEISS X-ray Microscopy at Work: Materials Research



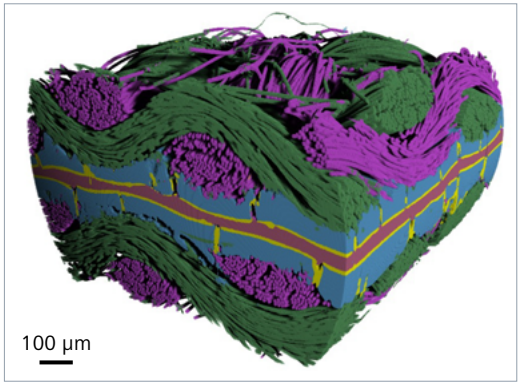
Flux grown layered KBiS2 semiconductor crystal. 3D volume rendering shows the complex 3D microstructure consisting of rod and needle structure. Sample courtesy of Prof. Daniel Shoemaker, UIUC



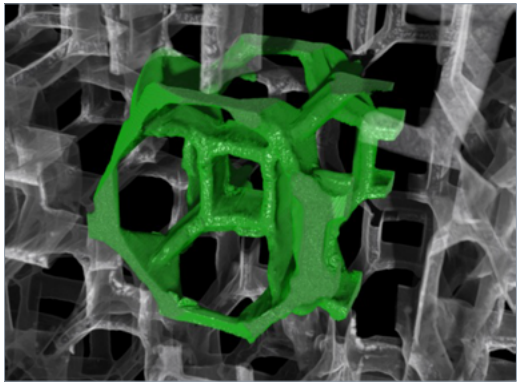
2D reconstructed slide of a ceramic matrix composite sample clearly discerns individual BN coated SiC fibers. Bright coating is CVI SiC followed with the outermost porous protective environmental barrier coating. Sample courtesy of Dr. David Marshall, CU Boulder, CO, US.



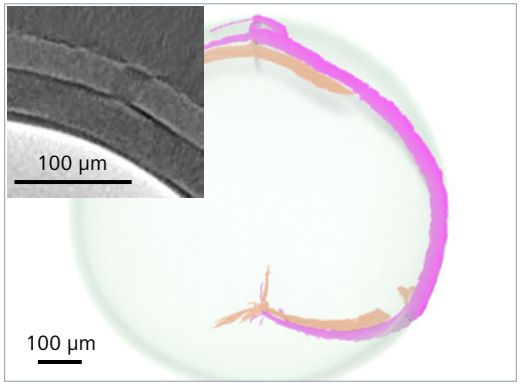
3D rendering of a bundle of Rayon polymer fibers that have been imaged in propagation phase contrast mode on the ZEISS Versa XRM microscope. The 3D rendering shows a high resolution 3D dataset processed using ZEISS PhaseEvolve to enhance the microvoids in individual fibers. Color represents void volume



Segmented 3D volume of a polymer electrolyte fuel cell membrane electrode assembly. Gas diffusion layer fiber weaves are visible in green and magenta, microporous layer in blue, catalyst in yellow, and electrolyte membrane in red.

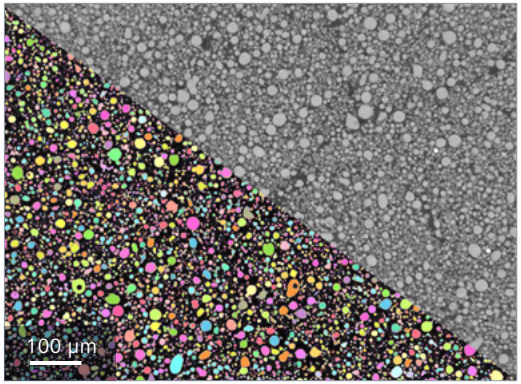


A single unit cell, highlighted in green, inside a Titanium-Carbide lattice. The sample was additively manufactured. Full field of view scans, highlighted in white, reveal the topological accuracy of the sample and large scale defects.

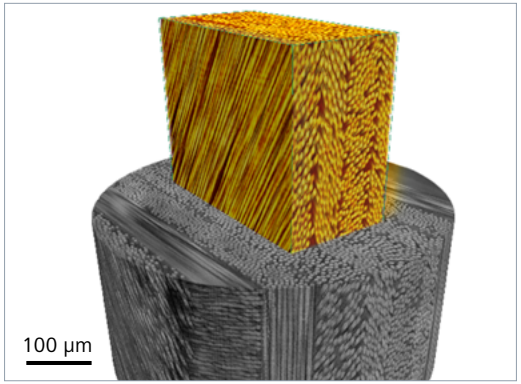


3D rendering of a surrogate TRISO (tristructural isotropic) fuel particle with cracks through the outer SiC and pyrolytic carbon layers highlighted in orange and magenta. The inset shows a 2D transverse slice view of the highlighted crack. Sample courtesy of Dr. Peter Hosemann, UC Berkeley, CA, US.

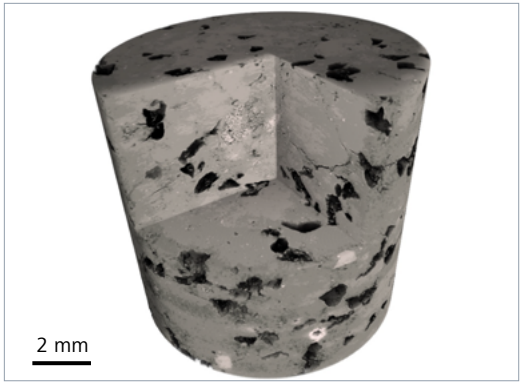
ZEISS X-ray Microscopy at Work: Materials Research



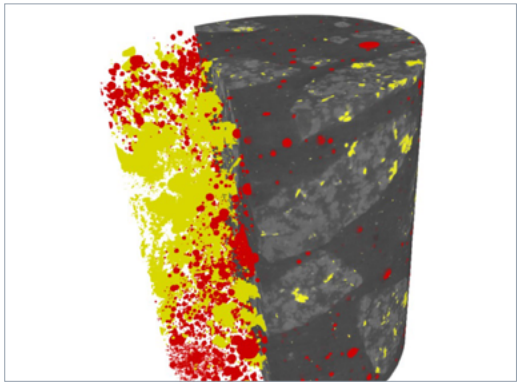
316L Stainless Steel additive manufacturing powder feedstock. Sample courtesy of Prof. Kate Black, The University of Liverpool, UK



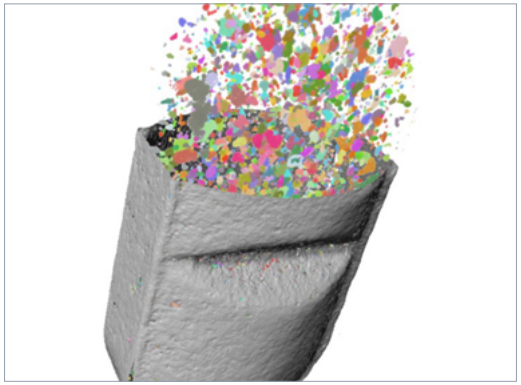
Carbon fiber reinforced polymer composite.



Porous ceramic filtration media. 3D rendered cutout shows contrast differences indicating different phases. Darker areas are porous regions with active sites for filtration.

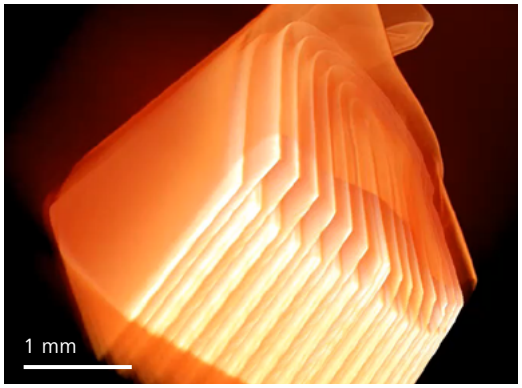


Tomography and segmentation of multiple phases in a high density concrete nuclear reactor vessel. 3D view shows segmentation of pores (red) and high density minerals titanomagnetite and ilmenite (yellow) in chips of dolerite within the concrete. Concrete core 15 mm diameter. Sample courtesy of Giacomo Torelli, University of Sheffield, UK

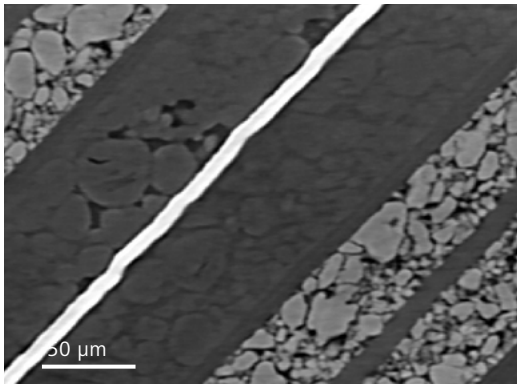


Segmented active ingredient particles in an antihistamine tablet. Following imaging on a ZEISS Versa XRM, the data was reconstructed using ZEISS DeepRecon Pro to improve contrast between similar low density materials for better segmentation. Widest width of tablet is 5 mm.

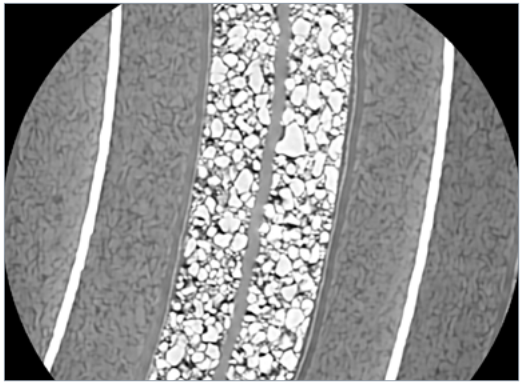
ZEISS X-ray Microscopy at Work: Lithium Ion Batteries



Small pouch cell: 0.4× overview scan; 4× RaaD.



2D virtual slice. Interior region imaged at 80 kV with 40x-Prime detector and reconstructed with DeepRecon Pro. Fine particles and cracks are visible in both the high density cathode particles and the low density graphite anode particles.



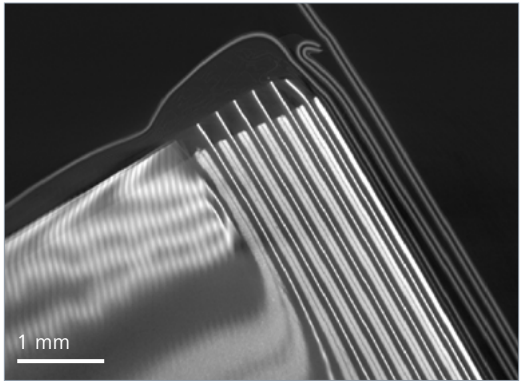
2D virtual slice from a small pouch cell battery reconstructed using DeepRecon Pro. Features like the cathode particles, anode particles, polymer separator membrane, and metal current collector foils are visible across the electrode stack.

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

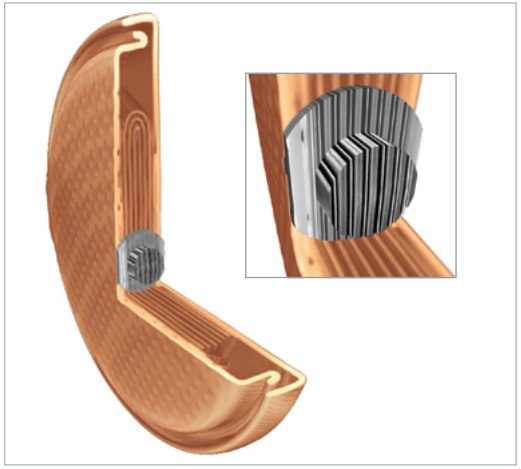
ZEISS VersaXRM 730 Benefits

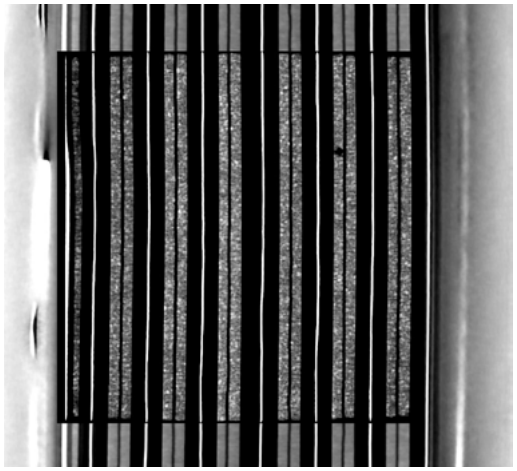
- Resolution at a Distance allows intact pouch and cylindrical cells to be imaged at high resolution, enabling longitudinal studies of aging effects, across hundreds of charge cycles.
- No other tool can look into an intact battery with such fidelity.
- Scout-and-Zoom enables a region of interest to be identified for a high resolution investigation.
- High resolution scan times are dramatically reduced with VersaXRM 730.
- ZEISS DeepScout offers high resolution interior tomographies across larger samples.



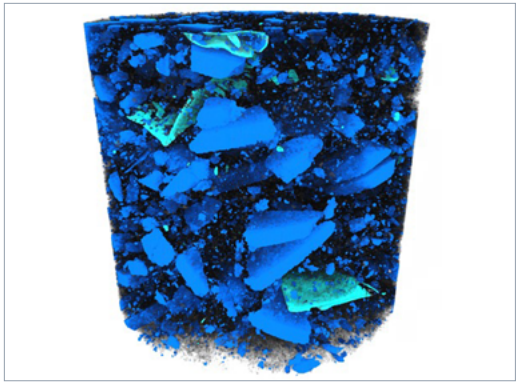
Small pouch cell (120 kV). Failure analysis, swelling, wetting, electrolyte gas evolution.

ZEISS X-ray Microscopy at Work: Lithium Ion Batteries



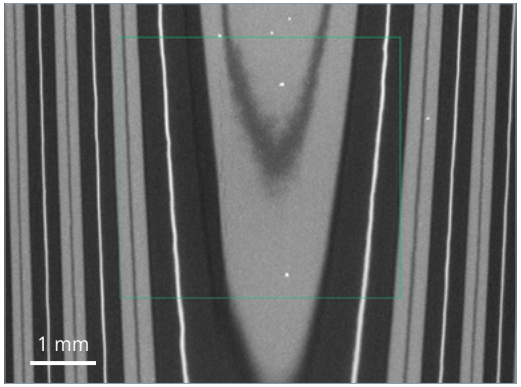


3D renderings and 2D slice view of rechargeable lithium ion 2025 coin cell battery. Using FAST Mode 1 minute quick overview scan is obtained followed by 3 µm/pixel resolution scan to resolve the layers and 1 µm/pixel resolution to image defects in the cathode and layers of the coin cell.

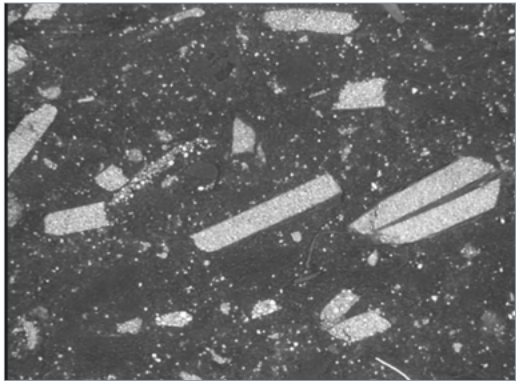


3D volume of materials within black mass, a powder generated from the crushing & shredding of recycled batteries. NMC cathode particles (blue) and residual foils (turquoise) individually segmented using Mineralogic 3D for quantification and analyses.

3D rendering of an intact 21700 automotive battery cell.

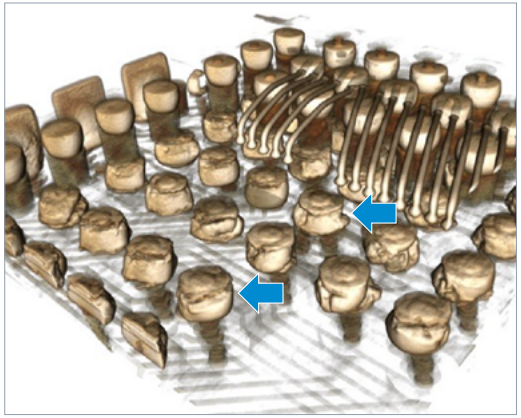


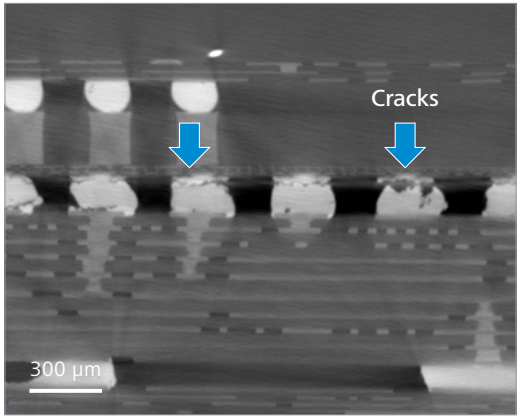
Inside an intact 21700 automotive battery cell (160 kV) – metallic inclusions, cracks, folds and kinks in conductive layers.



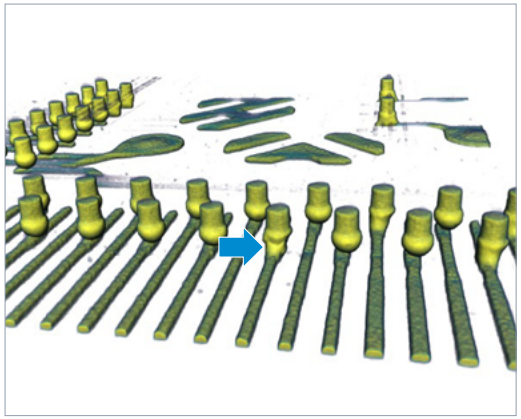
2D virtual slice through black mass powder; cathode material containing cathode particles clearly observed still intact with separator in between, together with liberated materials composing the rest of the powder. Features (e.g., cathode particles) enhanced by reconstruction using DeepRecon Pro.

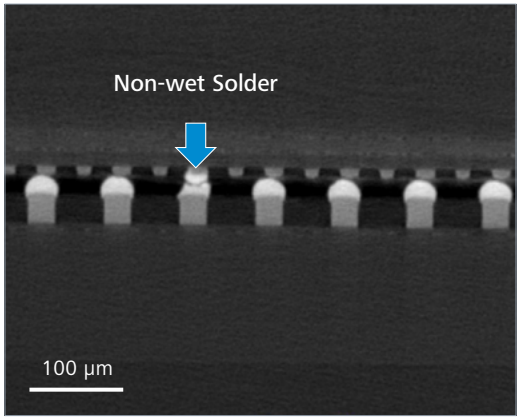
ZEISS X-ray Microscopy at Work: Electronics and Semiconductor Packaging





Non-destructive visualization and characterization of solder fatigue cracks in a thermal cycled smartphone control board at 2.5 µm voxel resolution.





Left: 3D visualization at 1 µm voxel resolution of the defective Cu pillar solder pins in a fingerprint sensor device.
Right: Virtual cross-section reveals non-wetting solder caps at all failing electrical pins.

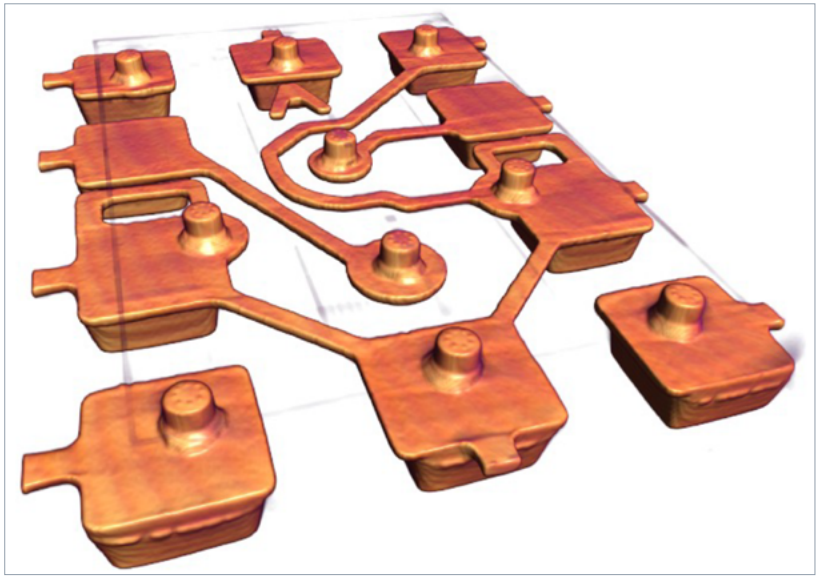
Typical Tasks and Applications

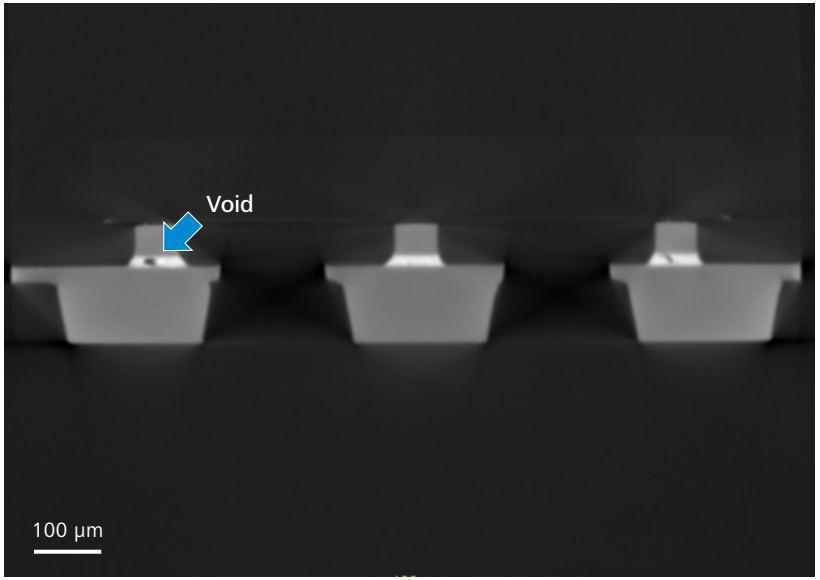
- Image and analyze microstructures and defects of advanced semiconductor packages, including 2.5D/3D and heterogenous integration packages and chiplets.
- Provide 3D navigational information to assist fast and accurate access to regions of interest in subsequent physical failure analysis.
- Proven best-in-class applications in failure analysis, packaging development, competitive analysis, and cybersecurity

ZEISS VersaXRM 730 Benefits

- Non-destructively image IC (integrated circuit) packages and internal defects with groundbreaking RaaD capability and AI-enabled fast scans.
- The intuitive ZEN navx user interface simplifies and optimizes your experience, improving operational efficiency with built-in onscreen guidance, sample intelligence, and streamlined workflows.
- Faster throughput at large field of view (FOV) enables faster time-to-results for identifying failures and root causes, allowing more sample runs to aid failure analysis, packaging development, and competitive analysis. applications.

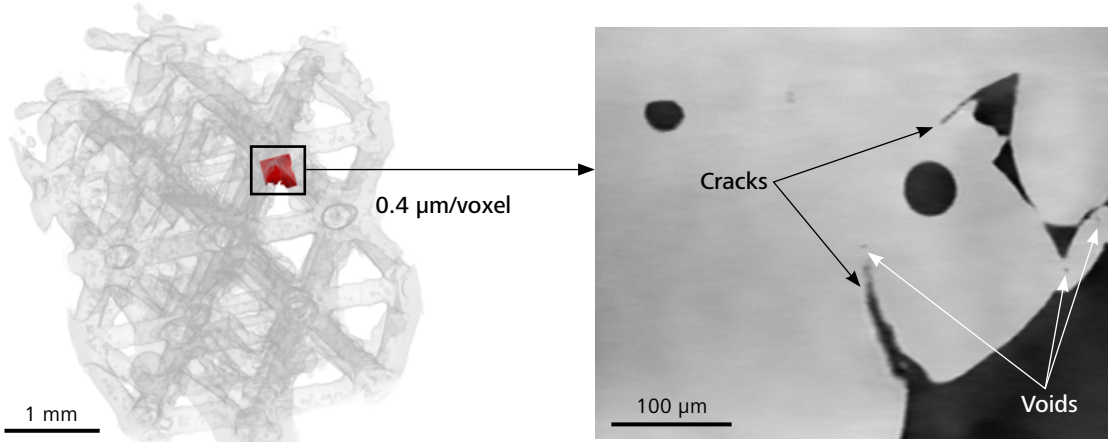
ZEISS X-ray Microscopy at Work: Electronics and Semiconductor Packaging



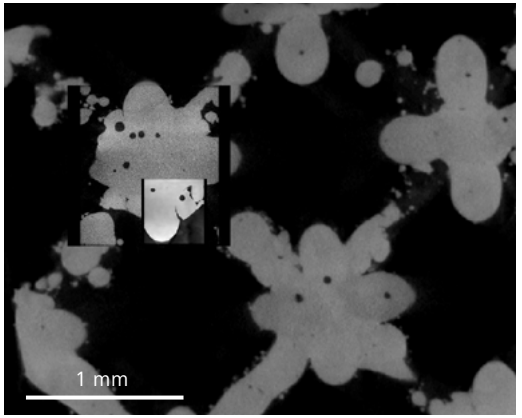


Left: 3D view of a radio frequency package acquired at 1.2 µm voxel resolution with FAST Mode acquisition for 10 min scan. Right: a virtual cross-section shows small voids in the solders and copper pillars.

ZEISS X-ray Microscopy at Work: Additive Manufacturing



3D rendering of an additively manufactured Inconel lattice structure at multiple scales. Full 5 mm sample is imaged at 5 µm/voxel and then targeted defect zone imaged at 140 kV with 40x-P detector at 0.4 µm/voxel and reconstructed with ZEISS DeepRecon Pro. Cracks and voids are visible in the high resolution image that are not visible at lower resolutions.



2D virtual slice of an additively manufactured Inconel lattice structure at multiple scales. Full sample is imaged at 5 µm/voxel, single node imaged with 4× detector at 1 µm/voxel, and then targeted defect zone imaged at 140 kV with 40x-P detector at 0.4 µm/voxel and reconstructed with ZEISS DeepRecon Pro.

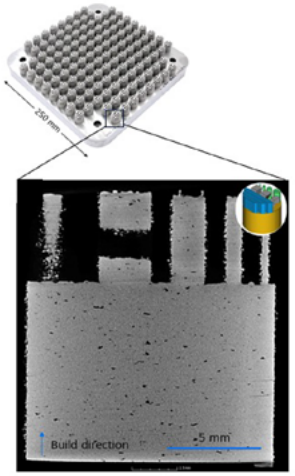
Typical Tasks and Applications

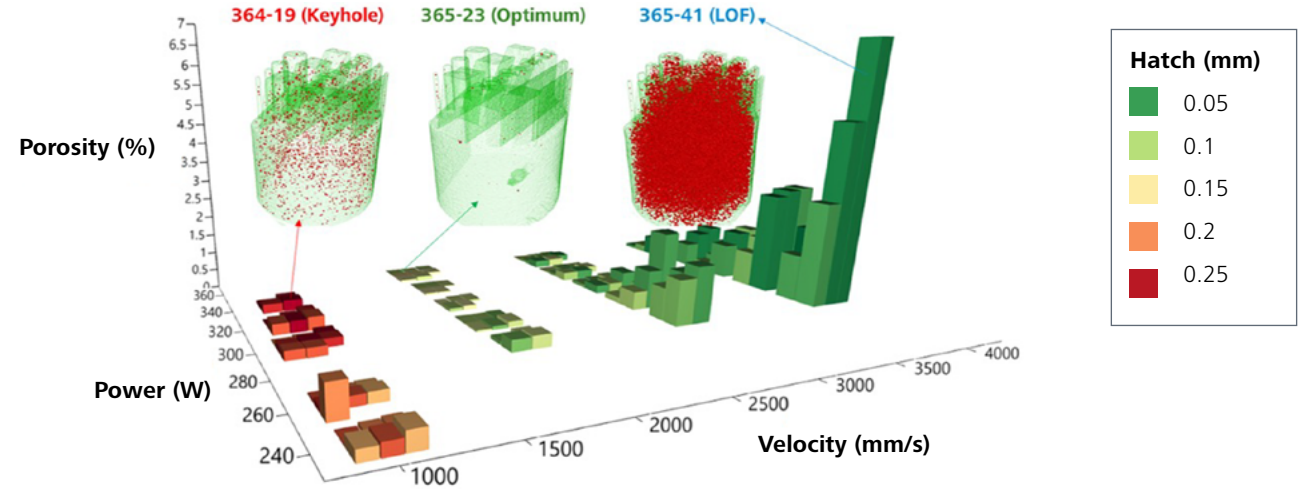
- Detailed shape, size, and volume distribution analysis of particles in additive manufacturing (AM) powder bed to determine proper process parameters
- High-resolution, non-destructive imaging for microstructural analysis of AM parts
- 3D imaging for comparison with the nominal CAD representation
-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

ZEISS VersaXRM 730 Benefits

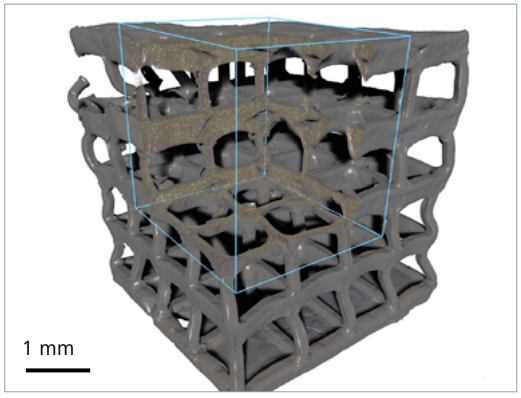
- Scout-and-Zoom technology enables fast access to inner structures without the need for any sample manipulation.
- Faster throughput allows quality inspection along the AM process chain.
- Class-leading submicron resolution enables detailed analysis of both process parameters and material characteristics.

ZEISS X-ray Microscopy at Work: Additive Manufacturing

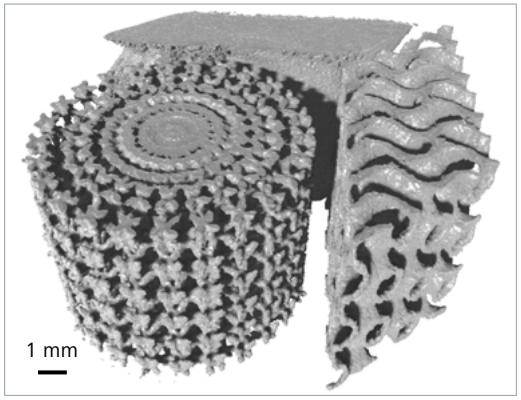




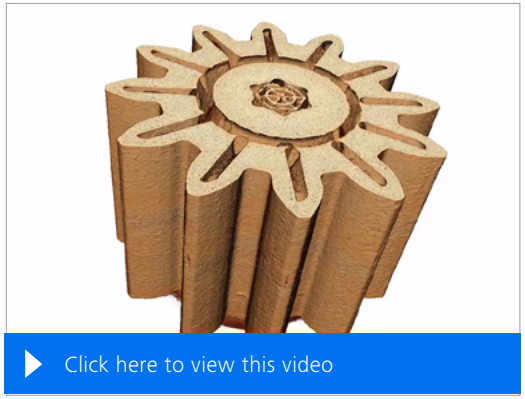
AM workflows incorporating deep-learning based processing of XRM data reduces total cycle time for parameter optimization for improved AM build quality. Faster and accurate imaging scans lead to significant improvements in defect detection and repeatability of segmentation for quantitative analysis.



Titanium-Carbide lattice printed in a Xerogel slurry and cured at 1450 degrees C, leaving only the Ti-C component behind. Sample courtesy of Prof. Giorgia Franchin, University of Padua



Metal AM manifold. Sample courtesy from Penn United Technologies Inc.

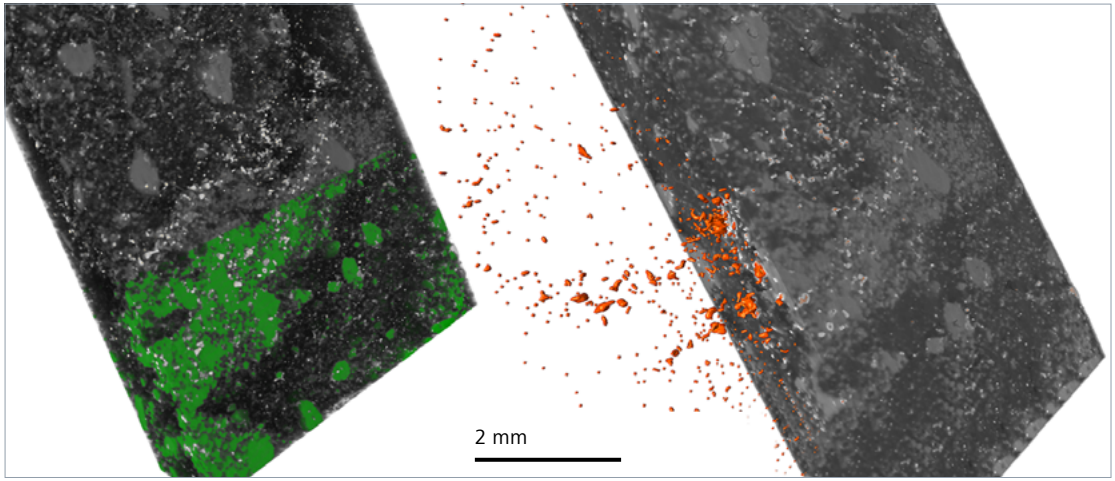


Comprehensive characterization of an AM aluminum gear wheel reveals inclusions, pores, and deviation of dimensions relative to the CAD model. Sample courtesy of Timo Bernthaler, University of Aalen, Germany.

ZEISS X-ray Microscopy at Work: Geological Research

Typical Tasks and Applications

- Observe and quantify the reality of your rock samples and fossils in 3D
- Gain initial insights of your precious planetary samples
- Understand textural relationships and pore networks
- Perform *in situ* flooding and imbibition tests to gain knowledge of saturation profiles and reactivity of reservoirs for CCS, CCU, and H_2 storage
- Directly measure pore scale, model fluid flow dynamics in core samples
- Automatically segment mineral phases for a full quantitative mineral description of cores and particles
- Evaluate liberation and reactive surface exposure in 3D without the limitations imposed by stereology

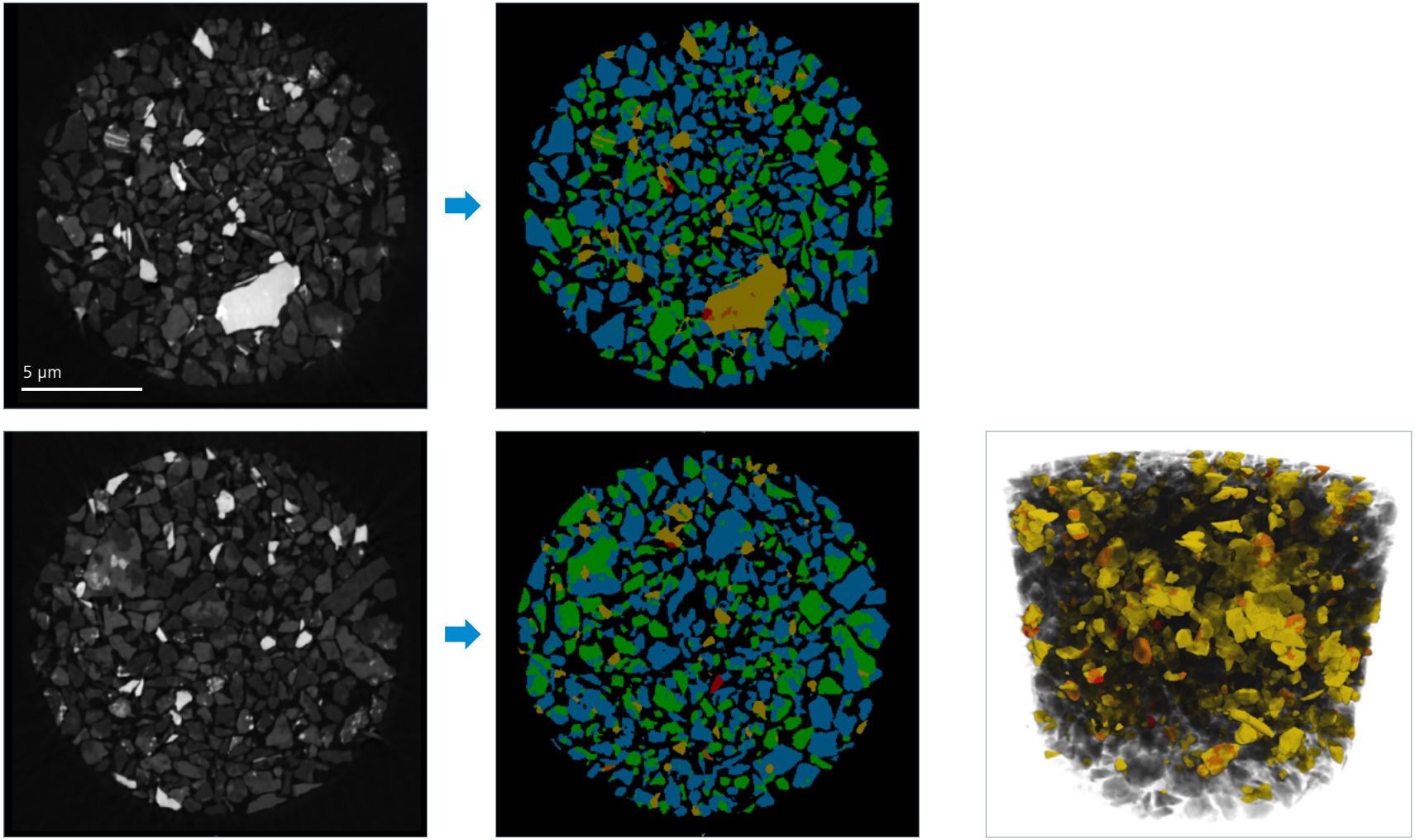


Segmentation of olivine (green) and heavy minerals (orange) in a silicate-rich Vesta meteorite sample

ZEISS VersaXRM 730 Benefits

- Fast, resolved, nanoscale tomography imaging for geological samples from Earth and beyond
- The most accurate 3D nanoscale support for *in situ* multiphase fluid flow and *in situ* time-lapse mineral reactivity studies, mineral phase segmentation and identification, and laboratory-based diffraction contrast tomography (ZEISS LabDCT Pro)
- High throughput multiscale imaging and characterization of rock and fossil samples, translating to efficiencies, freeing more time for data interpretation
- Higher quality data for better image analysis and AI application
- Higher power allows for high signal/noise diffraction patterns to be produced even from imperfect or low symmetry crystals
- Combine the power of ZEISS Versa XRM with automated segmentation software for CT automated quantitative mineralogy

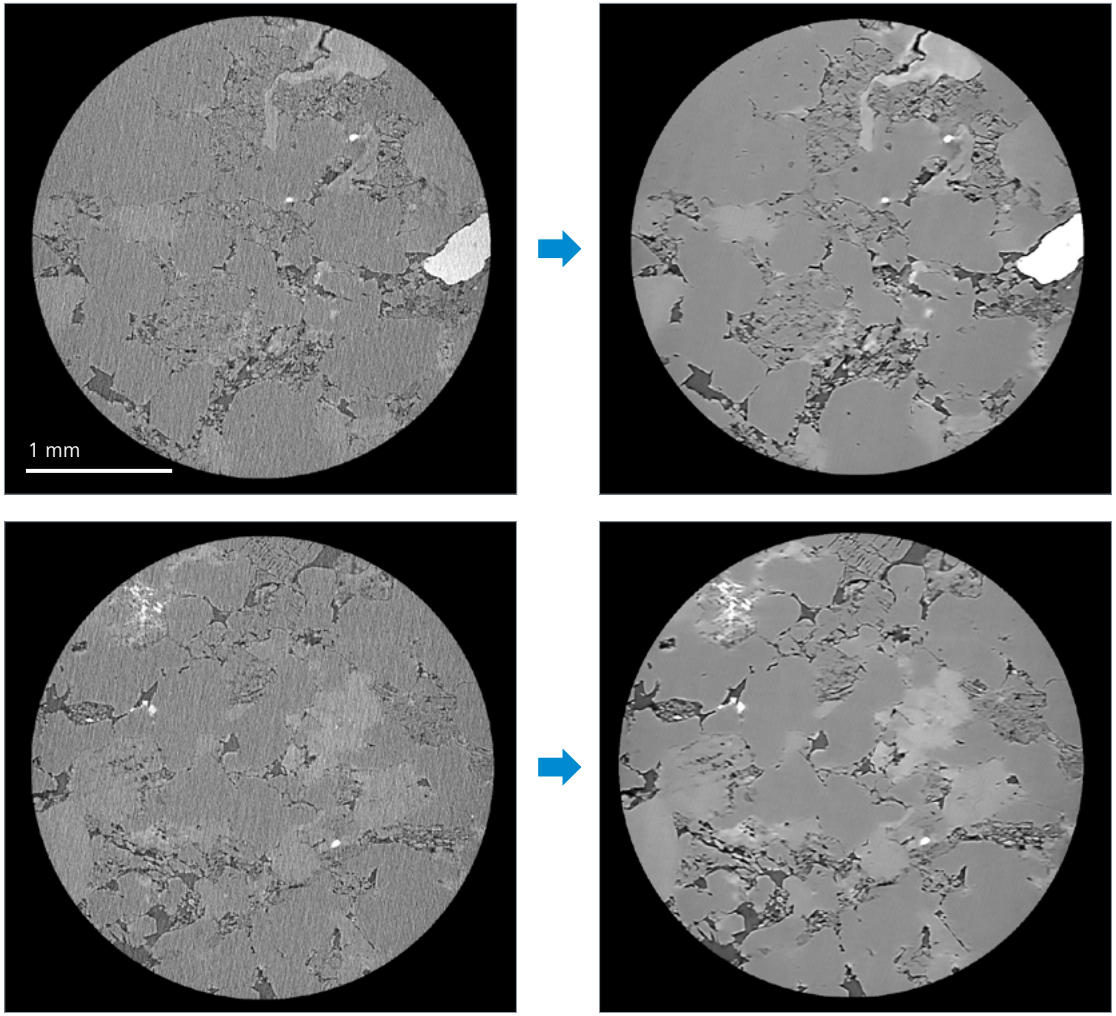
ZEISS X-ray Microscopy at Work: Geological Research



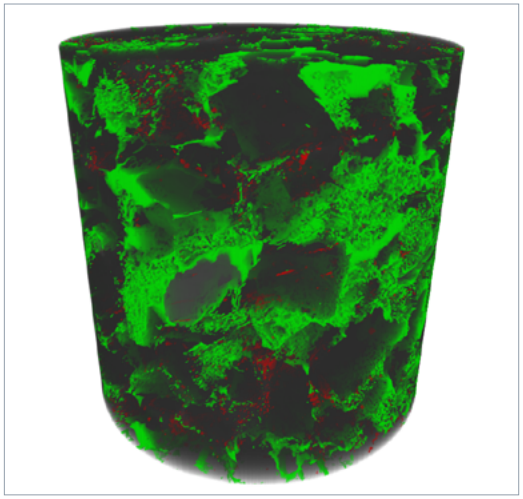
FAST Mode attenuation *FAST Mode segmentation* *FAST Mode 3D segmentation*

Cu-Ni ore: 4-minute FAST Mode scan with DeepRecon Pro AI-assisted automated mineralogy with Mineralogic 3D provides particle analysis and mineral identification direct from XRM data for process mineralogy, liberation, and locking.

ZEISS X-ray Microscopy at Work: Geological Research

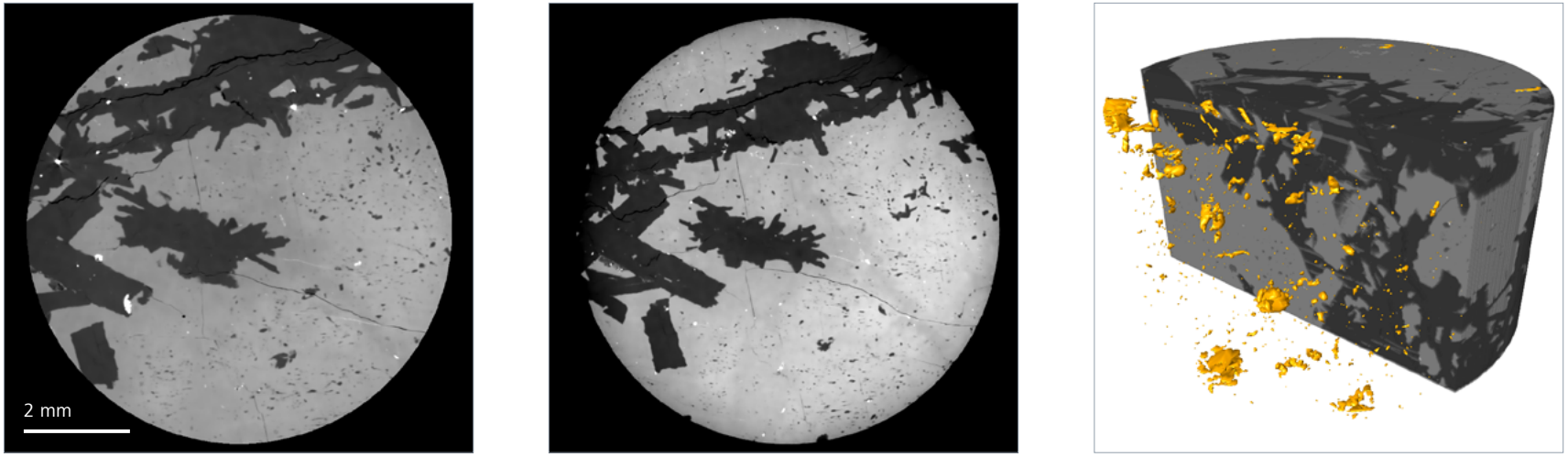


Porosity and permeability measurements in key sedimentary rocks for carbon capture and storage can be made with detailed characterization of porous media in 3D.



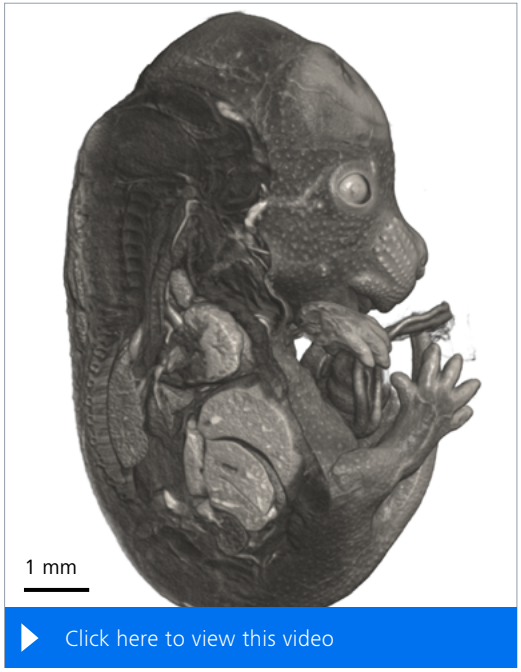
High resolution data allow for detailed analysis of connected (green) and isolated (red) porosity.

ZEISS X-ray Microscopy at Work: Geological Research



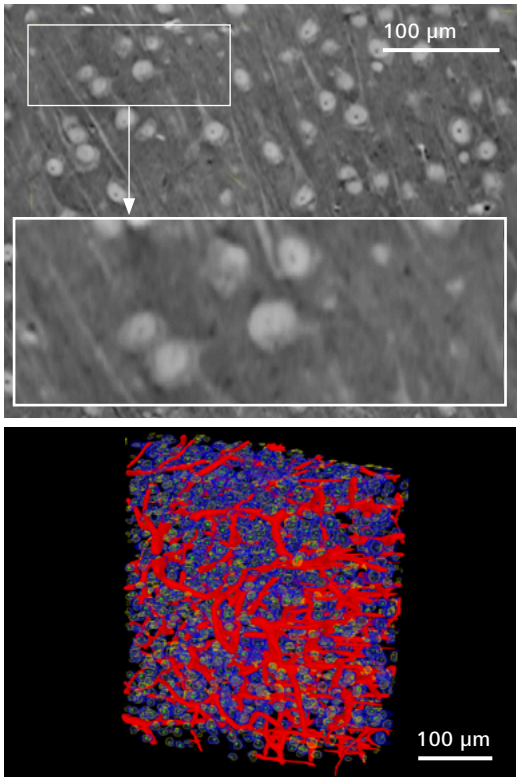
Quantitative XRM give a unique opportunity to identify key minerals in the battery raw materials supply chain. Spodumene and plagioclase feldspar can be clearly differentiated, and segmentation provides associated heavy mineral (gold color) relationships.

ZEISS X-ray Microscopy at Work: Life Sciences



Click here to view this video

Mouse models are valuable tools in genetic research since they closely resemble humans in terms of physiology and genetics. Comparing the phenotype of mouse embryos from different genetic lines enables researchers to examine the consequences of targeted gene alterations. XRM is an ideal imaging technology for analyzing the physical characteristics of mouse embryos since it is non-destructive and fast. The figure shows an iodine contrasted E15.5 mouse embryo imaged using FAST Mode on VersaXRM 730 with a total scanning time of 6 minutes (2,001 projections, 6.8 µm voxel size). A digital section through the sample is shown with the 3D rendering. Internal embryo organs and components can be visualized in 3D. Sample courtesy of Chih-Wei Logan Hsu, Baylor College of Medicine



Soft tissue specimens like brain can be imaged using XRM to generate 3D structural maps that provide context for other investigative approaches, such as light microscopy or electron microscopy. The greyscale image is a single slice from a 3D dataset of a mouse brain that was imaged with the 40×-P objective of ZEISS Versa XRM and reconstructed using ZEISS DeepRecon Pro. An inverted LUT has been applied to the greyscale data. This greyscale dataset was subsequently segmented by training a deep learning model on ZEISS arivis Cloud. The trained model was applied in ZEISS arivis Pro to perform segmentation and visualize the complete volume, providing comprehensive insights into the segmented structures: [blood vessels (red), soma (blue), nucleus (yellow), nucleolus (green)]. Sample courtesy of Dr. Kevin Boergens, the University of Illinois at Chicago, US

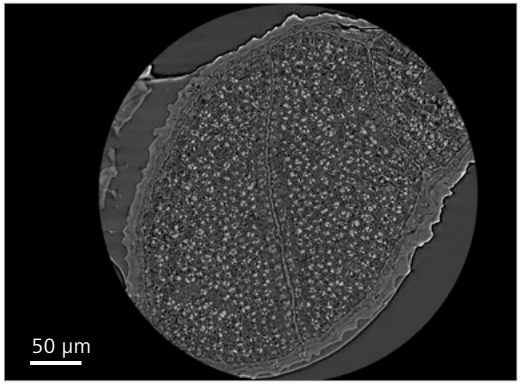
Typical Tasks and Applications

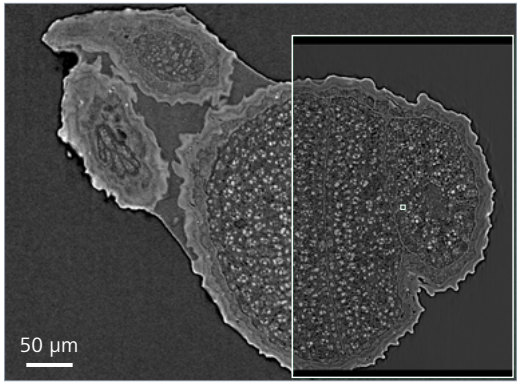
It is always a challenge to study the details of biological samples without losing the context of the larger specimen. X-ray microscopy allows high contrast, high resolution 3D imaging of your delicate biological samples including mineralized and soft tissues, individual organs and organoids, plant tissues and more. Study inside your specimen histologically, without destroying your sample with dissection, down to a cellular level without needing complex sample preparation routines. ZEISS VersaXRM 730 is particularly suitable when the highest resolution and best image quality is required.

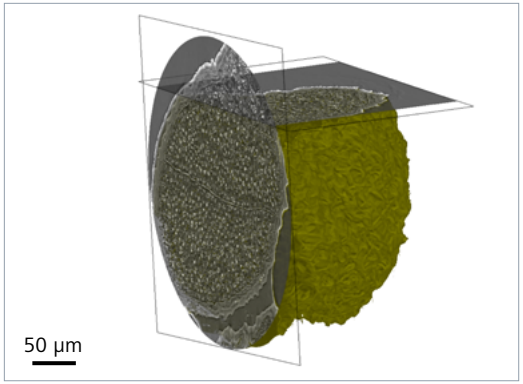
ZEISS VersaXRM 730 Benefits

- Whole samples can be imaged at multiple length scales with RaaD. Using FAST Mode, capture a quick overview of complete specimens like bones, organs, plants, embryos and then easily navigate to the region you want to capture at high resolution using Volume Scout and the higher magnification objective lenses. With VersaXRM 730, there are no compromises in resolution.
- Large sample volumes can be imaged and processed using ZEISS DeepScout to generate previously unreachable high-resolution overviews.
- High-contrast images acquired with VersaXRM 730 enable the identification of structures of interest for subsequent fail proof segmentation or precise localization for higher resolution acquisition using electron microscopy.

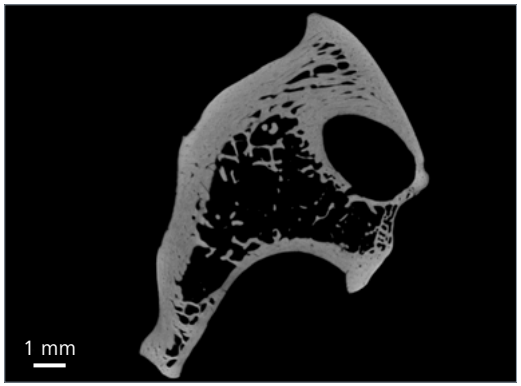
ZEISS X-ray Microscopy at Work: Life Sciences





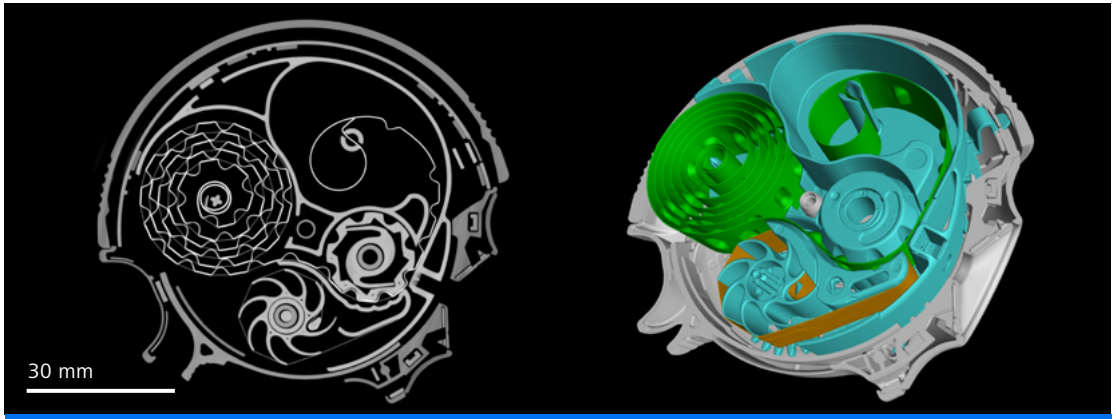


Seeds are solid and compact structures, and their inside is difficult to image without physically dissecting the sample. Using Versa XRM, the internal structure can be visualized non-destructively so the seed can remain whole. The image shows an Arabidopsis seed that was captured using the 40x-P objective of ZEISS VersaXRM 730. A 3D rendering that has been digitally cut to show the internal structure and a virtual cross section through the seed is shown. The internal structure is revealed down to cellular resolution without the need for any complex sample preparation.



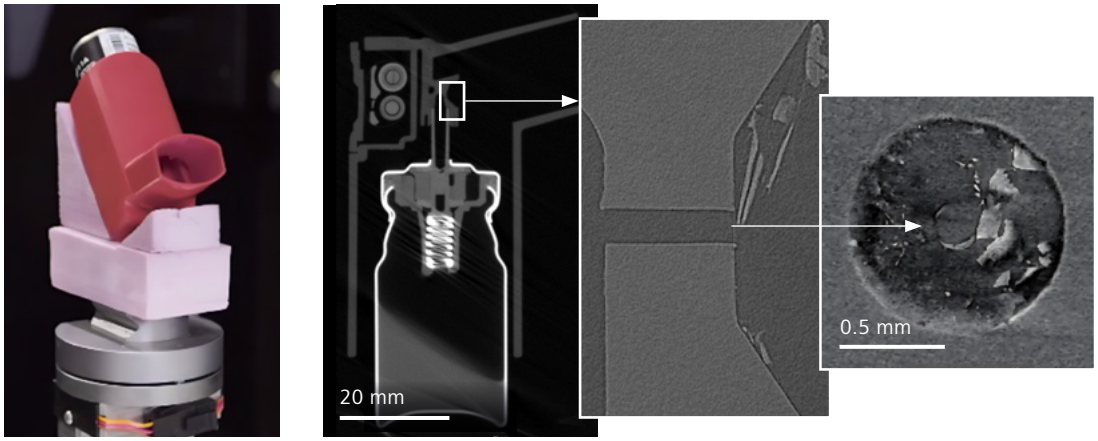
X-ray imaging is fundamental for exploring bone biology in order to understand variations in bone health, disease, development and age. This mole humerus has been imaged using FAST Mode of VersaXRM 730 with a total scanning time of 6 minutes (2,000 projections, 10 µm voxel size). The quality of the 3D reconstruction and 2D cross section show how quick it is to generate an overview of the whole specimen. The high resolution and contrast afforded by XRM provides the additional opportunity to use multiscale experiments to explore the hierarchical structure of bone and to combine this with in situ testing to simultaneously assess structural and mechanical properties. Sample courtesy of Danny Wescott, University of Texas at San Marcos, US.

ZEISS X-ray Microscopy at Work: Industrial Inspection and Quality Control



Click here to view this video

X-ray microscopy scan of a medical device, a dry powder inhaler. A cross-sectional virtual slice of a scan obtained using FPX is shown on the left and a clipped 3D rendering on the right. Different grayscale values on the left side correspond to different density materials.



XRM scan of a medical device, an asthma inhaler, showing details of a drug particulates blockage at the exit of the actuator. The 2D slice in the center was obtained from a full 3D scan of the device using FPX. The zoom-in image (2D virtual cross-sectional slice), obtained from a scan with a 4x lens and reconstructed with ZEISS DeepRecon Pro software, shows high-resolution details of the medicine blockage in the actuator.

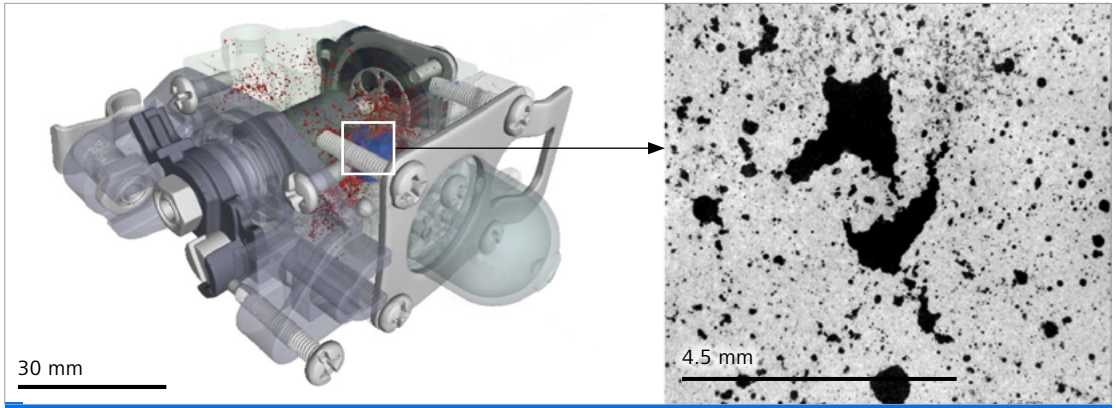
Typical Tasks and Applications

- Different part components in an assembly can be non-destructively inspected for function and fit
- High-resolution imaging of manufactured parts for microstructural analysis and quality control
- 3D imaging for comparison with the nominal computer aided design (CAD) model or master part
- Manufacturing development and reverse engineering to create CAD models from 3D volume data
- Detection defects, particle inclusions, cracks, and unwanted porosity inside plastic and metal parts
- Non-destructive analysis of internal features not accessible to tactile or optical inspection methods

ZEISS VersaXRM 730 Benefits

- Volume Scout technology embedded in ZEN navx enables fast access to a part's internal features without destroying or disassembling a device
- Faster throughput allows high-quality inspection of manufactured parts and assembled devices, non-destructively
- Class-leading submicron resolution enables detailed analysis of microstructures in parts and evaluation of its material characteristics

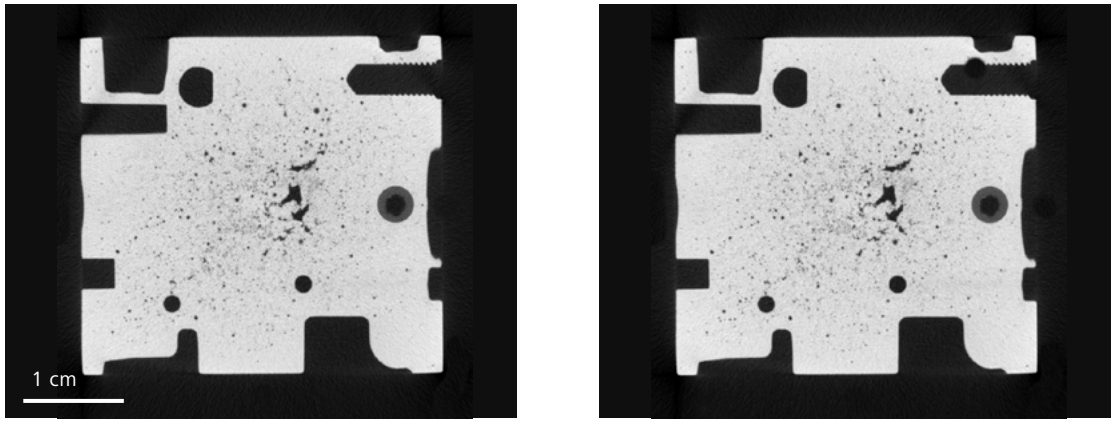
ZEISS X-ray Microscopy at Work: Industrial Inspection and Quality Control



X-ray microscopy scan of a small carburetor with a semi-transparent visualization of a 3D rendering showing its components, segmented in false colors, including porosity details segmented in red. The zoom-in image (2D virtual cross-sectional slice) on the right, obtained from a scan with a 4x lens, shows high-resolution details of some of the most critical porosity present in the aluminum casting.

STEP Mode: 24 minutes, 29 seconds

FAST Mode: 2 minutes, 47 seconds



Traditional STEP and FAST (continuous motion) scan can be performed in a large field of view, using FPX, to optimize scan time or to get a quick overview of the sample before performing interior (zoom-in) tomographies with ZEN navx.

ZEISS VersaXRM 730: Flexible, High-Performance Imaging Solution

1 High Throughput X-ray Microscope
- ZEISS VersaXRM 730 with Resolution Performance
- 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 Pro) for visualization of 3D crystallographic grain information

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

3 Contrast-Optimized Detector System
- Innovative dual-stage detector system offers turret of multiple objectives with different magnifications and optimized scintillators for highest contrast
- 2k × 2k pixels, noise suppressed charge-coupled detector
- Optional Flat Panel Extension (FPX) with Fast Acquisition Scanning Technology (FAST) Mode for larger field of view, high throughput macroscopic imaging, VolumeScout, and one-minute tomographies
- Optional 40x-Prime (40x-P) objective for up to 450 nm spatial resolution, 500 nm resolution at 160 kV

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 4× objective
- Vertical stitching for joining multiple tomographies vertically

6 ZEISS SmartShield for Sample Protection and Setup Optimization
- Fully integrated rapid envelope creation within ZEN navx control system
- Sample and instrument safety in 3D
- Enhanced operator efficiency during experiment setup
- Semi-manual SmartShield Lite for transparent, reflective samples

ZEISS VersaXRM 730: Your Flexible Imaging Solution

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. VersaXRM 730 now comes with a two-year DeepRecon Pro license and secondary high performance workstation.
- ZEISS DeepScout for resolution and throughput at full field of view for reconstruction that is 100× faster
- ZEISS OptiRecon with iterative reconstruction for up to 4× throughput or enhanced image quality
- ZEISS Material-Aware Reconstruction Solution (MARS) for highly attentuating samples, reducing the effects of beam hardening
- 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
- Combined with ZEN navx guidance enables easy access to remote data handling

9 Sample Stage

- FAST (continuous rotation) and STEP (step-and-shoot) acquisition modes
- 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 Instrument Workstation

- Powerful workstation with fast reconstruction
- Dual CUDA-based GPU
- Multi-core CPU
- 27" 4k display monitor

13 ZEN navx Guidance and Control System

- X-ray control system developed with human-centered design principles
- Seamless and integrated guided workflows
- Visualized guidance for a wide range of parameter choices
- Integrated File Transfer Utility (FTU) for automatic transfer of data to user workstation
- Guidance for correlative workflows
- Embedded Volume Scout for true 3D navigation

14 Software

- Acquisition: ZEN navx Guidance and Control System
- Reconstruction: Scout-and-Scan Reconstructor
- Viewer: 3D View ZEISS edition
- XRM Python API to expand instrument capabilities
- Optional ZEN AI Toolkit with Intellesis for image post-processing and segmentation using machine learning
- Optional ZEISS arivis Pro for automated image analysis
- Optional 3D World ZEISS edition from Dragonfly for 3D visualization and analysis
- Output data compatible with many 3D viewers and analysis software programs

Technical Specifications

Imaging	ZEISS VersaXRM 730	ZEISS VersaXRM 615	ZEISS Xradia 515 Versa
Spatial Resolution[a]	450 nm	500 nm	500 nm
Resolution Performance[b] (ZEISS Resolution Target at 160 kV/LE6, equivalent to 1.3 mm Al and 40x-P objective)	500 nm		
Resolution at a Distance (RaaD)[c] (50 mm working distance)		1.0 µm	1.0 µm
Resolution Performance at a Distance (ZEISS Resolution Target at 140 kV/LE4, equivalent to 0.6 mm Al)	700 nm @ 50 mm 750 nm @ 100 mm		
Minimum Achievable Voxel[d] (Voxel size at sample at maximum magnification)	40 nm	40 nm	40 nm

X-ray Source

Architecture	Sealed transmission, fast activation	Sealed transmission, fast activation	Sealed transmission, fast activation
Voltage Range	Spot size stable 30 - 160 kV	Spot size stable 30 - 160 kV	Spot size stable 30 - 160 kV
Maximum Output	25 W	25 W	10 W

Contrast-Optimized Detector System

ZEISS X-ray microscopes (XRM) feature an innovative detector turret with multiple objectives at different magnifications. Each objective features optimized scintillators that deliver the highest absorption contrast details.

	Standard			Optional		Standard			Optional		Standard			Optional	
Objectives & Detectors	0.4×	4×	20×	FPX	40×-P	0.4×	4×	20×	FPX	40×	0.4×	4×	20×	FPX	40×
Spatial Resolution	20 µm	1.9 µm	0.9 µm	12 µm	0.45 µm	20 µm	1.9 µm	0.9 µm	12 µm	0.5 µm	20 µm	1.9 µm	0.9 µm	12 µm	0.5 µm
Max 3D Field of View (FOV)	50 mm	6.5 mm	1.3 mm	140 mm	645 µm	50 mm	6.5 mm	1.3 mm	140 mm	645 µm	50 mm	6.5 mm	1.3 mm	140 mm	645 µm
Wide Field Mode, Max 3D FOV		11 mm													

Stages

Sample stage, load capacity	25 kg
Sample stage travel, X,Y,Z	50 mm, 100 mm, 50 mm
Sample stage travel, rotation	360°
Source travel, Z direction[e]	190 mm
Detector travel, Z direction (objectives)	290 mm
Detector travel, Z direction (FPX detector)	250 mm

a) Spatial resolution measured with ZEISS XRM 2D resolution target, normal field mode, optional 40×-P (730) or 40x (615, 515)
b) Resolution performance measured with ZEISS XRM 2D resolution target, normal field mode, optional 40×-P objective
c) RaaD working distance is defined as clearance around axis of rotation (sample radius). Resolution is measured with ZEISS 2D resolution target
d) 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 for Versa XRM, the true overall measurement of instrument resolution
e) Z-direction is defined along the X-ray beam path

Technical Specifications

Features	ZEISS VersaXRM 730	ZEISS VersaXRM 615	ZEISS Xradia 515 Versa
ZEN navx User Experience w/File Transfer Utility	■	■	
Scout-and-Scan Control System			■
Scout-and-Zoom	Volume Scout in ZEN navx	Volume Scout in ZEN navx	Manual or with 3D World ZEISS edition
Vertical Stitch	■	■	■
Source Filters	Automated Filter Changer (AFC) 24-filter capacity, 12 standard filters included	Single manual filter holder, 12 standard filters included	
High Aspect Ratio Tomography (HART)	■		
Dual Scan Contrast Visualizer (DSCoVer)	■		
Flat Panel Extension (FPX)	Optional FPX; uses FAST or STEP Mode	Optional FPX; uses FAST or STEP Mode	Optional FPX with STEP Mode only
ZEISS LabDCT Pro for Diffraction Contrast Tomography	Optional		
Wide Field Mode	4×		
GPU CUDA-based Reconstruction	Dual	Dual	Dual
ZEISS SmartShield	SmartShield, SmartShield Lite	SmartShield, SmartShield Lite	SmartShield
ZEISS Autoloader	Optional	Optional	Optional
In Situ Interface Kit	Optional	Optional	Optional
Optional High Resolution Objectives	40x-P	40x	40x
Software			
Python API	■	■	■
ZEN AI Toolkit (incl. Intellesis)	Optional	Optional	Optional
ZEISS arivis Pro	Optional	Optional	Optional
3D World ZEISS Edition Powered by Dragonfly	Optional	Optional	Optional
Advanced Reconstruction Toolbox			
Secondary High Performance Workstation	■	■	Optional
DeepRecon Pro (2-year license)	■	■	Optional 1 year or perpetual license
ZEISS ART AI Supercharger (DeepRecon Pro + DeepScout)	Upgrade	Upgrade	Optional
ZEISS ART Recon Package (DeepRecon Pro + OptiRecon)	Upgrade	Upgrade	Optional
ZEISS ART Contrast Package (PhaseEvolve + MARS)	Optional	Optional	Optional
ZEISS ART Premium (all modules)[a]	Upgrade	Upgrade	Optional

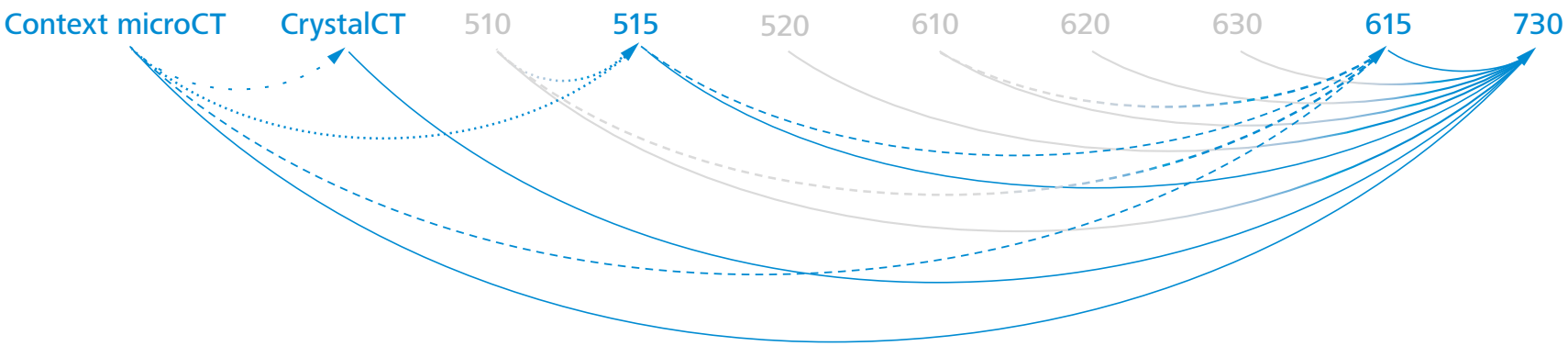
a) All ART modules are also available individually.

ZEISS Customer Focus: Continuous Improvement and Upgradeability

Protect Your Investment extends to ZEISS VersaXRM 730 microscopes – delivering unprecedented extendibility and unrelenting support to ensure you are not left behind.

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

To make certain your system offers the latest capabilities and remains serviceable, you can field-convert your platform to the latest X-ray technology: your ZEISS Context microCT can become a CrystalCT® or higher performance Versa X-ray microscope. Your CrystalCT can become VersaXRM 730 with LabDCT. And every mid-tier Versa platform can be upgraded to the most advanced VersaXRM from ZEISS. In addition to instrument conversions at your facility, new modules are 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 that are made available to existing instruments, thereby enhancing and extending the capabilities of your research.



ZEISS Service – Your Partner at All Times

Your microscope system from ZEISS is one of your most important tools. For over 175 years, the ZEISS brand and our experience have stood for reliable equipment with a long life in the field of microscopy. You can count on superior service and support - before and after installation. Our skilled ZEISS service team makes sure that your microscope is always ready for use.

Procurement

- Lab Planning & Construction Site Management
- Site Inspection & Environmental Analysis
- GMP-Qualification IQ/OQ
- Installation & Handover
- IT Integration Support
- Startup Training

Operation

- Predictive Service Remote Monitoring
- Inspection & Preventive Maintenance
- Software Maintenance Agreements
- Operation & Application Training
- Expert Phone & Remote Support
- Protect Service Agreements
- Metrological Calibration
- Instrument Relocation
- Consumables
- Repairs

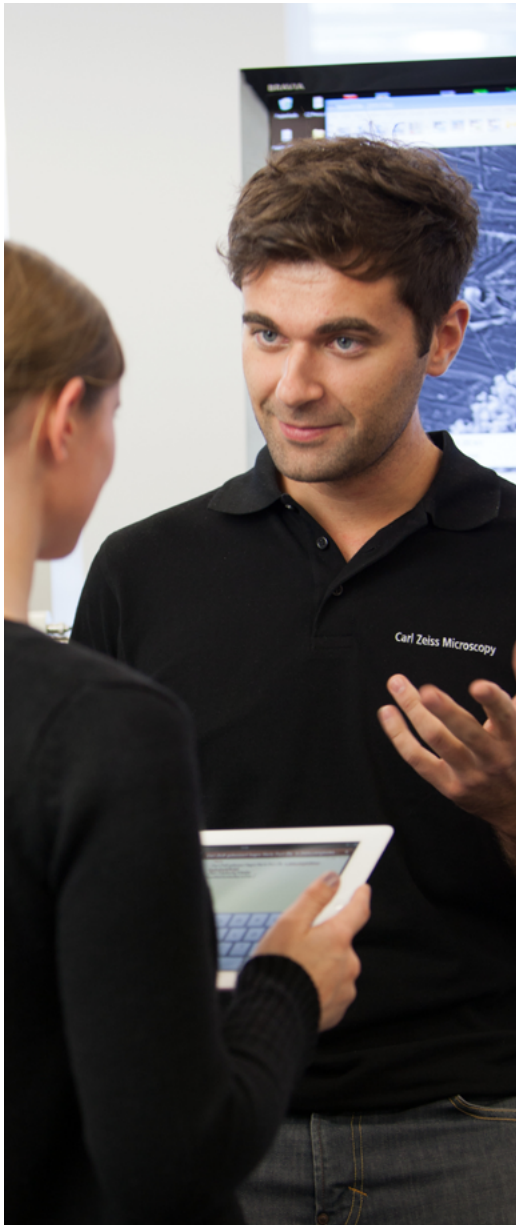
New Investment

- Decommissioning
- Trade In

Retrofit

- Customized Engineering
- Upgrades & Modernization
- Customized Workflows via ZEISS arivis Cloud

Please note: Availability of services depends on product line and location



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