# Class-leading resolution at a distance.

## ZEISS Xradia 515 Versa 3D X-ray Microscope

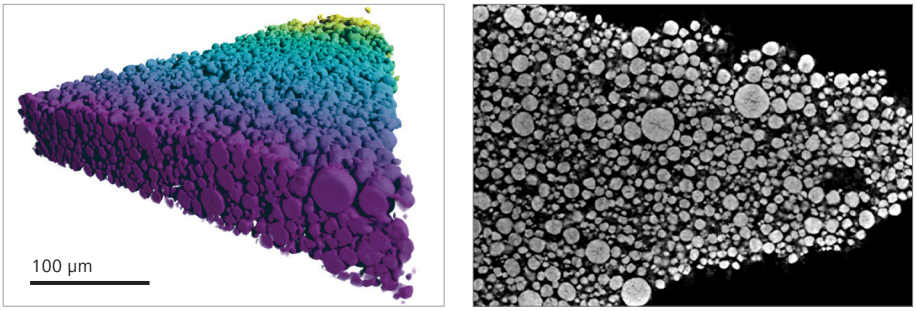
### The workhorse for your research

ZEISS X-ray microscopes (XRM) are advanced research solutions that have removed major technological hurdles for 3D imaging by achieving high contrast and submicron resolution even for relatively large samples. ZEISS Xradia 515 Versa uses a two-stage magnification technique that enables you to uniquely achieve resolution at a distance (RaaD). Combined with the flexibility and stability of the ZEISS Xradia platform, this unparalleled versatility delivers a fast time to results for your research.

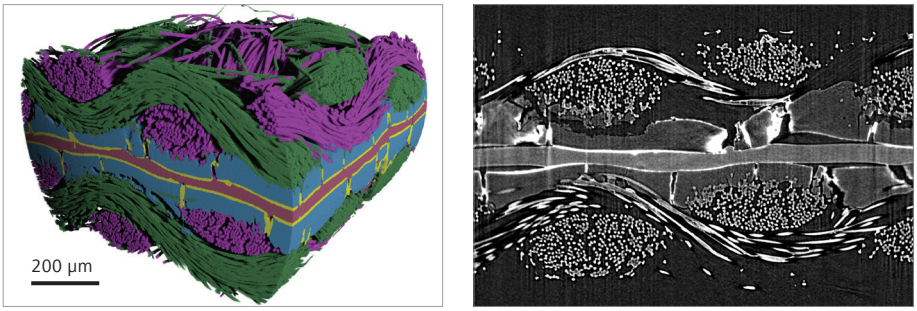
These ground-breaking advances in non-destructive 3D imaging empower a breadth of technical disciplines with a diverse range of sample sizes, geometries and compositions. The versatility of the platform enables unique applications like interior tomography, phase contrast, 4D, and high resolution *in situ* imaging.

ZEISS 3D X-ray microscopes are built on upgradeable, extensible, and reliable platforms that help protect your capital investment.

ZEISS Xradia 515 Versa is the foundation of the Xradia Versa family for those who simply need the best 3D imaging capability.




*3D rendering (left) and virtual cross section (right) of a section of a lithium ion battery cathode showing the particles that comprise the electrode, as well as internal particle cracking*




*3D rendering (left) and virtual cross section (right) of a polymer electrolyte fuel cell showing gas diffusion layer fibers (purple/green), microporous layer (blue), catalyst layer (yellow), and electrolyte (orange)*

ZEISS

Seeing beyond

| Imaging | ZEISS Xradia 410 Versa | ZEISS Xradia 515 Versa | ZEISS Xradia 610 Versa | ZEISS Xradia 620 Versa |
|---|---|---|---|---|
| Spatial Resolution[a] | 0.9 µm | 0.5 µm | 0.5 µm | 0.5 µm |
| Resolution at a Distance (RaaD)[a,b] | 1.5 µm | 1.0 µm | 1.0 µm | 1.0 µm |
| Minimum Achievable Voxel[c] (Voxel size at sample at maximum magnification) | 100 nm | 40 nm | 40 nm | 40 nm |
| **X-ray Source** | | | | |
| Architecture | Sealed Reflection | Sealed Transmission | Sealed Transmission, Fast Activation | Sealed Transmission, Fast Activation |
| Voltage Range | 20 – 90 kV | 30 – 160 kV | 30 – 160 kV | 30 – 160 kV |
| Maximum Output | 8 W | 10 W | 25 W | 25 W |
| **Detector System** | | | | |
| ZEISS X-ray microscopes feature an innovative detector turret with multiple objectives at different magnifications. Each objective features optimized scintillators that deliver the highest absorption contrast details. | | | | |
| Standard Objectives | 0.4x, 4x, 10x, 20x | 0.4x, 4x, 20x | 0.4x, 4x, 20x | 0.4x, 4x, 20x |
| Optional Objectives | 40x | 40x, Flat Panel Extension (FPX) | 40x, Flat Panel Extension (FPX) | 40x, Flat Panel Extension (FPX) |
| **Stages** | | | | |
| Sample Stage (load capacity) | 25 kg | 25 kg | 25 kg | 25 kg |
| Sample Stage Travel (x, y, z) | 50, 100, 50 mm | 50, 100, 50 mm | 50, 100, 50 mm | 50, 100, 50 mm |
| Sample Size Limit | 300 mm diameter | 300 mm diameter | 300 mm diameter | 300 mm diameter |
| **Features** | | | | |
| Scout-and-Scan Control System | ■ | ■ | ■ | ■ |
| Scout-and-Zoom | ■ | ■ | ■ | ■ |
| Vertical Stitch | ■ | ■ | ■ | ■ |
| XRM Python API | ■ | ■ | ■ | ■ |
| ZEISS SmartShield | | ■ | ■ | ■ |
| Automated Filter Changer (AFC) | | | | ■ |
| High Aspect Ratio Tomography (HART) | | | | ■ |
| Dual Scan Contrast Visualizer (DSCoVer) | | | | ■ |
| ZEISS LabDCT for Diffraction Contrast Tomography | | | | Optional |
| Wide Field Mode | 0.4x | 0.4x | 0.4x | 0.4x and 4x |
| GPU CUDA-based Reconstruction | Single | Single | Dual | Dual |
| ZEISS Autoloader | Optional | Optional | Optional | Optional |
| *In Situ* Interface Kit | Optional | Optional | Optional | Optional |
| ZEISS DeepRecon | Optional | Optional | Optional | Optional |
| ZEISS OptiRecon | Optional | Optional | Optional | Optional |
| ZEISS ZEN Intellesis | Optional | Optional | Optional | Optional |
| ORS Dragonfly Pro | Optional | Optional | Optional | Optional |

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

## Benefits

- Non-destructive 3D imaging
- Highest resolution at the largest working distance with unique RaaD (Resolution at a Distance) capability
- Multi-length scale imaging of the same sample across a wide range of magnifications
- Advanced contrast solutions, including absorption and phase contrast
- Industry-leading 4D and *in situ* capabilities for flexible sample sizes and types
- SmartShield for sample protection and setup optimization
- Scout-and-Scan control system for easy-to-use workflow set-up, ideal in multi-user environments
- Automated precision sample positioning for seamless 3D imaging and navigation
- Program up to 14 samples at a time to run sequentially with optional Autoloader
- Expand the field of view (FOV) to image larger samples with optional Flat Panel Extension (FPX)
- XRM Python API for customized instrument control
- Continuous access to advanced reconstruction technologies such as OptiRecon and DeepRecon for enhanced performance (e.g., throughput, image quality)

## Field of Application

### Materials Research

Characterize materials in 3D, observe failure mechanisms and degradation, investigate properties at multiple length scales, quantify and analyze microstructural evolution with 4D and *in situ* studies.

### Battery and Energy Storage

Failure analysis, quality inspection of separator and electrodes for defects and inclusions, track aging mechanisms.

### Electronics and Semiconductor

Image and characterize regions of interest during failure analysis on intact packages before cutting or polishing.

### Natural Resources

Characterize and quantify pore structures, measure fluid flow, acquire multi-phase particle information and large volume statistics for oil and gas, mining, and other natural resources requirements.

### Manufacturing Technology

Analyze internal tomographies of 3D printed parts, perform *in situ* mechanical testing.

### Life Sciences

Visualize and characterize tissues, cells, and microstructures within entire plants and fixed small animal models.

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