

Seeing **beyond**



Extending the frontiers of semiconductor failure analysis

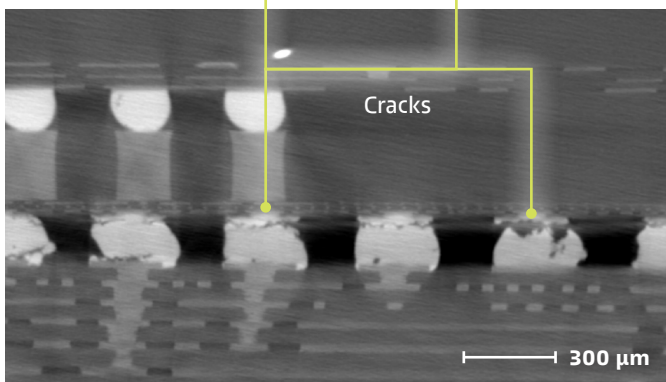
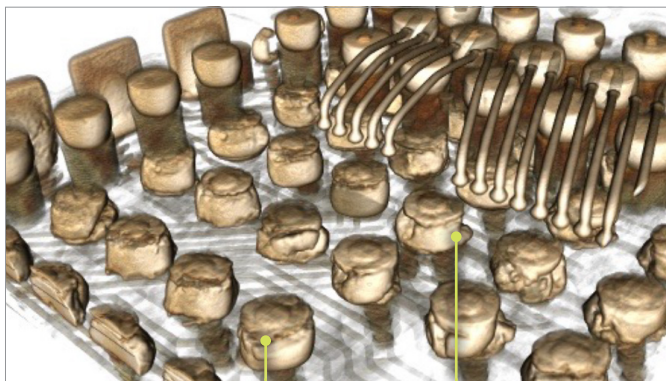
ZEISS VersaXRM 730

Extending the frontiers of semiconductor failure analysis

The ZEISS VersaXRM® family of 3D X-ray microscopes (XRM) are the next-generation non-destructive imaging solution in failure analysis and process development for semiconductor packages, components, and devices.

ZEISS VersaXRM 730 extends the limits of submicron-resolution 3D imaging and analysis, enabling unprecedented 450 nm spatial resolution. Through hardware and software innovations, it accelerates productivity and root cause analysis with faster scans and shorter time-to-results. ZEN navx® delivers effortless data acquisition workflows and sample intelligence for all level of users.

- Advanced packaging for AI and HPC
- Heterogenous integration of devices and chiplets
- 2.5D/3D packages with TSVs
- Fan-out wafer level packages with redistribution layers
- HBM and V-NAND
- Flip-chip C4 bumps and microbumps
- Smartphones and components



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

Highest-resolution 3D X-ray imaging in all dimensions

- Achieve industry-leading 450 nm spatial resolution, maintaining 500 nm spatial resolution even at high energies.
- Experience unsurpassed high-resolution performance across all three dimensions for large-sized packages, circuit boards, and electronic devices with ZEISS's unique Resolution at a Distance™ (RaaD™) technology.
- Visualize virtual cross-section images of fault locations and buried features without cutting the samples.

Fast throughput & superior imaging

- Fast acquisition scanning technology (FAST) mode enables quick 3D navigation of samples and precise localization of deeply embedded structures and defects, allowing ~1 minute fast scans with the flat panel detector (FPX).
- Broader length scales of sample sizes and fields of view (FOV) with the optional FPX.
- AI-enabled DeepRecon Pro module is included in the base model to improve scan speed and image quality.
- Award-winning optional DeepScout module allows scanning of large fields of view with recovered resolution and faster throughput.
- High Aspect Ratio Tomography (HART) for faster imaging of semiconductor packages and electronic samples.

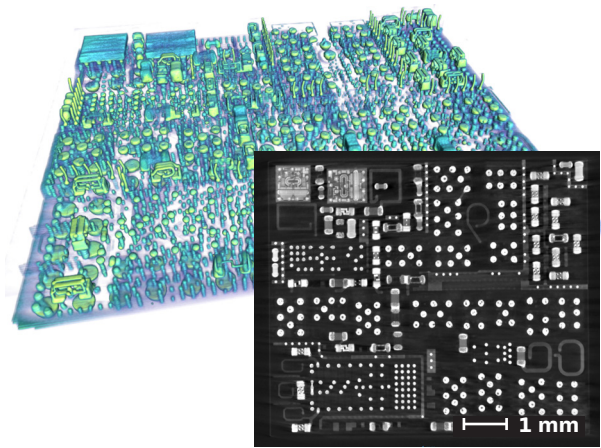
Enhanced productivity & usability

- ZEN navx data acquisition system uses Human-Centered Design (HCD) principles. It improves scan setup efficiency and reduces learning curves for all users.
- Infographic mental models and guidance provide instant and easy access to procedural suggestions and feedback, eliminating the need for costly training.
- Integrated Volume Scout workflow streamlines user interactions during scan setup and delivers instant access to regions of interest through submicron navigation.
- ZEN navx enables high-productivity data acquisition and improves the success rate of root cause analyses.

Benefits

- Highest resolution and contrast for a multitude of package applications: failure analysis, process development, construction analysis, and production validation.
- Unprecedented 450 nm spatial resolution, 40 nm min. voxel size.
- Uncomplicated scan operations with the intuitive ZEN navx user interface and streamlined workflows.
- FAST mode allows fast access to deeply buried ROI with an optional flat panel detector.
- Flexible system configurations and upgradable path.

The VersaXRM portfolio is designed to fit a range of budgets and applications. These models deliver the benefits of RaaD and sample diversity, with feature configurations chosen to match specific needs.



3D view of a high/mid-band power amplifier package in a smartphone acquired at 5.5 μm voxel resolution with FAST mode acquisition for a 90 second scan. Right: a virtual cross-section shows the planar view of the package layout.

Specifications

Imaging	ZEISS VersaXRM 730	ZEISS VersaXRM 615	ZEISS VersaXRM 5 Insight
Spatial resolution ¹	450 nm	500 nm	500 nm
Resolution performance ²	500 nm		
Resolution at a Distance (RaaD) ³ (at working distance)	700 nm @ 50 mm 750 nm @ 100 mm	1.0 μm at 50 mm	1.0 μm at 50 mm
Minimum achievable voxel ⁴	40 nm	40 nm	40 nm
X-ray source	ZEISS X-ray source (ZXR-1)	High voltage X-ray source	High voltage 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 power output	25 W	25 W	10 W

Detector system

ZEISS X-ray microscopes combine advanced detectors and objectives to leverage both geometrical and optical magnification. Coupled with optimized scintillators, they deliver outstanding absorption contrast and reveal the finest details.

Standard detectors	0.4x, 4x, 20x	0.4x, 4x, 20x	Flat panel, 4x
Optional detectors	FPX, 40x-P ⁵	FPX, 40x	20x
FAST mode	with optional FPX	with optional FPX	Flat panel standard, 4x optional

Stage

Sample stage, load capacity	25 kg	25 kg	25 kg
Sample stage travel, X, Y, Z	50 mm, 100 mm, 50 mm	50 mm, 100 mm, 50 mm	50 mm, 100 mm, 50 mm
Stage travel, rotation	360°	360°	360°
Source travel, Z direction	190 mm	190 mm	190 mm
Detector travel, Z direction	Objectives: 290 mm, FPX: 250 mm	Objectives: 290 mm, FPX: 250 mm	425 mm
Max detector distance (flat panel detector) ⁶	250 mm	250 mm	515 mm

VersaXRM features

Control system	ZEN navx w/ SmartShield	ZEN navx w/ SmartShield	ZEN navx w/ SmartShield
Source filter	Automated Filter Changer (AFC) 24-filter capacity, 12 standard filters included	Single manual filter holder, 12 standard filters included	Single manual filter holder, 12 standard filters included
High Aspect Ratio Tomography (HART)	•		
Autoloader	Optional	Optional	
Wide field mode	4x		
GPU CUDA-based reconstruction	Dual	Dual	Dual

Advanced Reconstruction Toolbox

DeepRecon Pro	2 year included or optional perpetual license	2 year included or optional perpetual license	Optional 2 year or perpetual license
High performance workstation	•	•	Optional

1. Spatial resolution measured with ZEISS XRM 2D resolution target, normal field mode, optional 40x-Prime (VersaXRM 730), 40x (VersaXRM 615), and 20x (VersaXRM 5 Insight) objectives. 2. Spatial resolution measured with ZEISS XRM 2D resolution target, normal field mode, optional 40x-P objective, at 160 kV, LE6 source filter (1.3 mm Al equivalent). 3. RaaD measured with ZEISS XRM 2D resolution target, normal field mode, optional 40x-P objective, at 140 kV, LE4 source filter (0.6 mm Al equivalent). 4. Voxel is a geometric term that contributes to but does not determine resolution, and is provided here only for comparison. ZEISS specifies resolution via spatial resolution, the true overall measurement of instrument resolution. 5. 40x-Prime objective. 6. Distance is measured from the rotational axes.

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