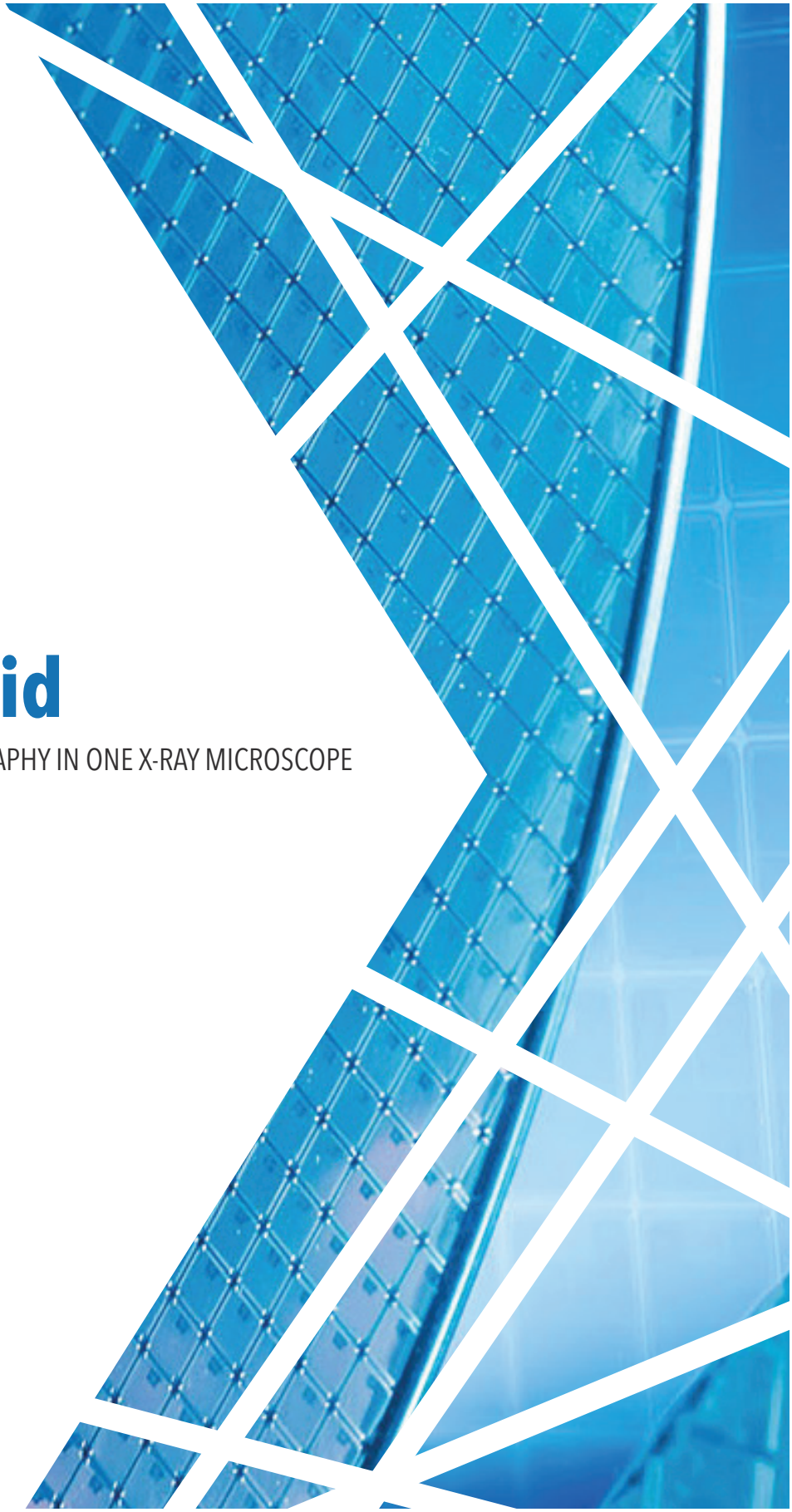
Apex Hybrid
Laminography and Tomography in one X-ray microscope



SIGRAY

Apex Hybrid

LAMINOGRAPHY AND TOMOGRAPHY IN ONE X-RAY MICROSCOPE

Quantum Design

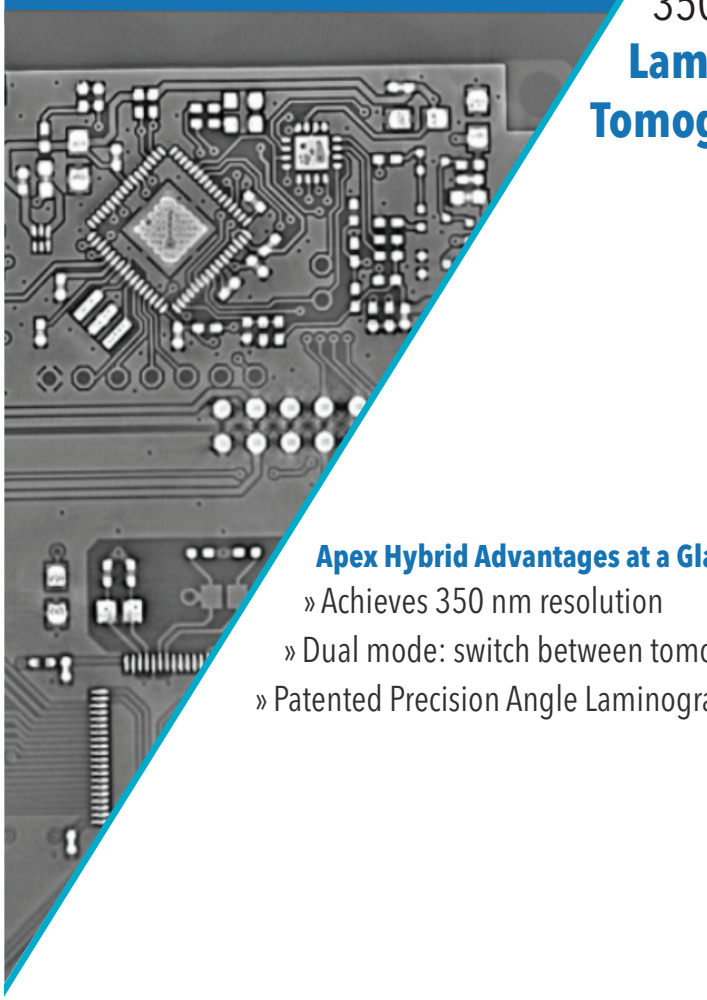
Quantum Design
1 avenue de l'Atlantique
Bâtiment Fuji-Yama
91940 Les Ulis - France

Tél. : +33 1 69 19 49 49
france@qd-europe.com
www.qd-europe.com

SIGRAY

Apex Hybrid
Laminography and Tomography in one X-ray microscope

Apex-Hybrid builds on the highly-successful & fab-tested Apex product family, designed from the ground-up to maximize throughput and deliver the highest quality images in a slanted-angle geometry.



350 nm resolution.
Laminography & Tomography in one.

Apex Hybrid Advantages at a Glance

» Achieves 350 nm resolution
» Dual mode: switch between tomography and laminography
» Patented Precision Angle Laminography for artifact-free imaging

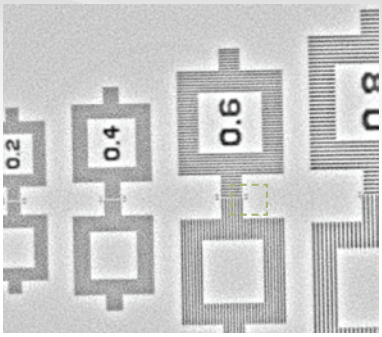
Quantum Design
Quantum Design
1 avenue de l'Atlantique
Bâtiment Fuji-Yama
91940 Les Ulis - France

Tél. : +33 1 69 19 49 49
france@qd-europe.com
www.qd-europe.com

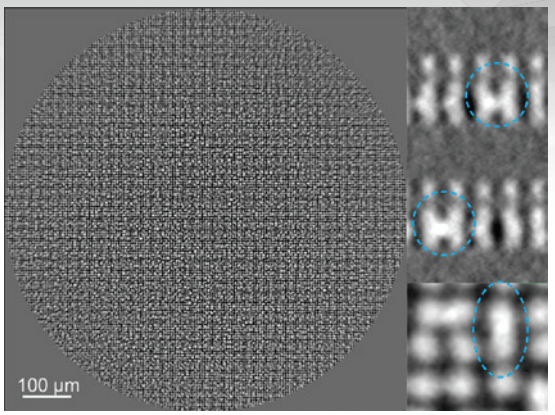
SIGRAY

Apex Hybrid
Laminography and Tomography in one X-ray microscope

Apex Hybrid allows seamless switching between Laminography mode and Tomography mode, giving high-quality imaging for samples.



3D Resolution – Tomography of a NTT resolution standard with line pairs, showing <0.4 µm (<400 nm) spatial resolution capabilities.



Large array of 5 µm diameter TSVs on a 300 mm wafer. The full FOV appears in the left image, while bridging– highlighted with teal dotted circles–is visible in the three zoomed-in images on the right.

Patented Breakthrough for Advanced Packaging

Solutions for Failure Analysis and Hardware Trust

Sigray's Apex-Hybrid™ is a revolutionary 3D x-ray system that combines the power of computed tomography and laminography in a single system. The system achieves ~100 nm pixel (350 nm spatial) resolution, making it the highest resolution laminography tool on the market. The Apex-Hybrid addresses well-known challenges in the semiconductor industry: ever increasing package size with rapidly shrinking packaging features.

By seamlessly switching between laminography and tomography mode, users can image large intact samples with ease. Apex Hybrid employs a patented angular sampling technique **(PAL: Precision Angle Laminography)** that maximizes contrast and minimizes out of plane artifacts for the best-in-market imaging of buried features at high throughputs.

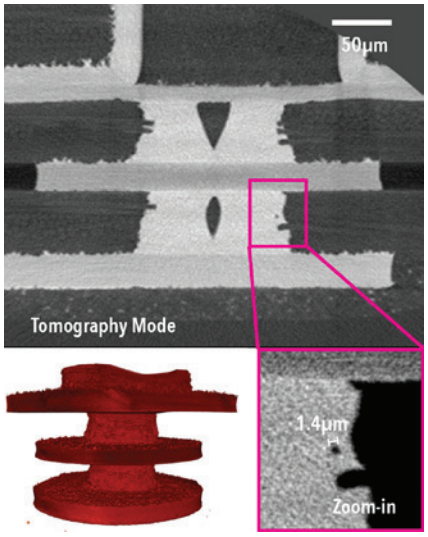


Figure 1: A memory device was acquired at 270 nm in **tomography mode** on the Apex-Hybrid. Fine details, such as burrs, are visible, and a ~1 µm defect is clearly resolved.

Quantum Design

Quantum Design
1 avenue de l'Atlantique
Bâtiment Fuji-Yama
91940 Les Ulis - France

Tél. : +33 1 69 19 49 49
france@qd-europe.com
www.qd-europe.com

SIGRAY

Apex Hybrid
Laminography and Tomography in one X-ray microscope

Empowering Research in...

Advanced Packaging	Microbumps, TSVs, RDLs, and hybrid bonds in large packages
Reverse Engineering	Montage mode for seamlessly stitching a large number of datasets to cover a full PCB at high resolutions
Battery	Operando studies on pouch cell batteries
In-line	Fully automated version for emerging packaging applications - inquire with Sigray

Apex Hybrid™ Specifications

Parameter	Specification
Spatial Resolution	350 nm (100 nm minimum effective voxel)
Maximum Sample Size	Laminography Mode: 300 mm diameter* (wafer) | 213 mm x 213 mm (panel/tray) Computed Tomography mode: 150 mm x 150 mm
Stage Travel	100 x 20 x 100 mm (XYZ)
Source(s)	Open with low cost of ownership
Target	Tungsten on diamond
Voltage | Power	40 to 160 kV | 16W
Calibration	Patented calibration approach for determining spot size
X-ray Detector	
Pitch	50 um
Detector	6.7 MP or 13 MP available
Software and Computer	
Computers	Separate top-of-the-line controls and reconstruction workstations. Reconstruction workstation is GPU accelerated with 10-gigabit (10GBE)
Data Acquisition	XRM Companion | Intuitive workflow-based acquisition software
Reconstruction	GigaRecon | Fastest reconstruction engine
Python API	User-friendly API to control microscope parameters
Advanced Analysis	Optional Dragonfly 3D World and/or Avizo
Viewer	Sigray 3D Viewer

*Note: To scan a 300mm wafer, note the stage travel is limited to 100mm. To map the entire wafer, the user must remount the sample. If scanning a 300mm wafer is needed, please speak to us about our in-line option (laminography mode only).

Quantum Design

Quantum Design
1 avenue de l'Atlantique
Bâtiment Fuji-Yama
91940 Les Ulis - France

Tél. : +33 1 69 19 49 49
france@qd-europe.com
www.qd-europe.com

SIGRAY