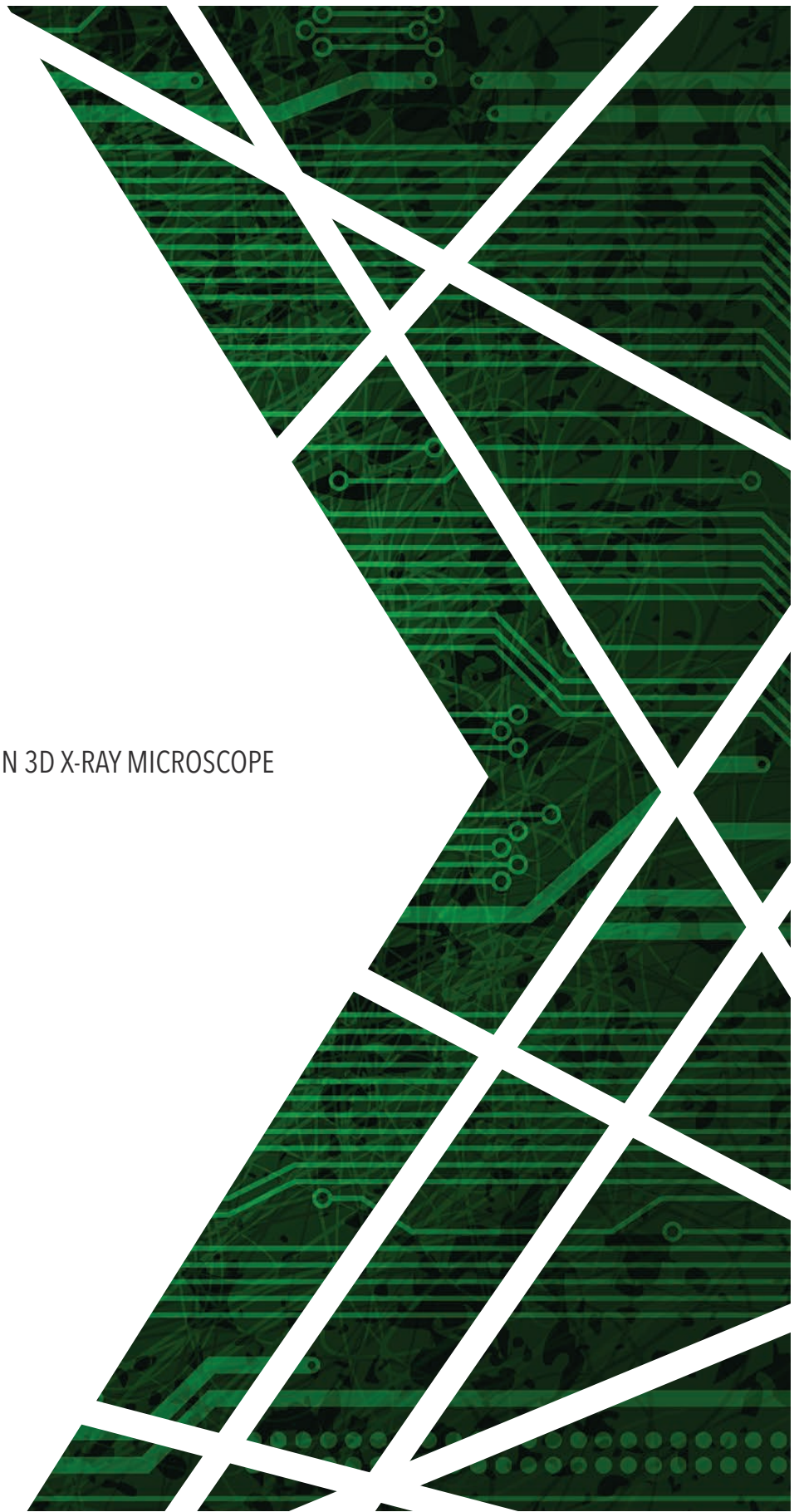

Apex XCT
High throughput submicron 3D X-ray microscope



SIGRAY
Apex XCT

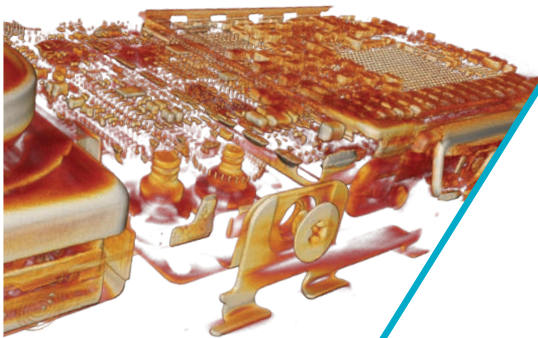
HIGH THROUGHPUT SUBMICRON 3D X-RAY MICROSCOPE



Apex XCT

High throughput submicron 3D X-ray microscope

Patent-pending acquisition approach enables submicron imaging of large samples.
Below is the microlens assembly and packaging of intact iPhone 7 Plus (158 mm
Height x 78 mm Width x 7.3 mm Depth)



size **does not matter...**
submicron 3D x-ray for
large samples in minutes

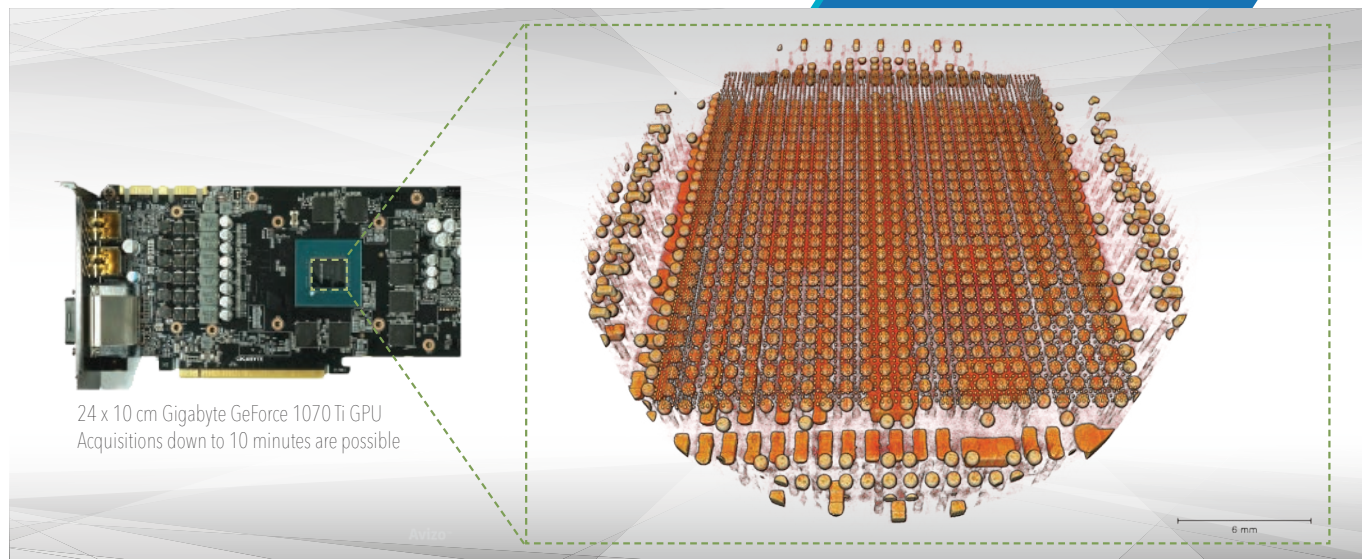
Apex XCT Advantages at a Glance

- » Achieves 3D images with submicron spatial resolution within minutes
- » Elimination of streak artifacts provides crisp cross-sectional views for straightforward segmentation and easy identification of defects
- » Ideal for intact extended samples such as PCBs, battery pouch cells, and wafers

Apex XCT

High throughput submicron 3D X-ray microscope

Apex XCT provides rapid throughput independent of sample size. Intact boards (such as the one shown below) can be acquired within minutes at high res.



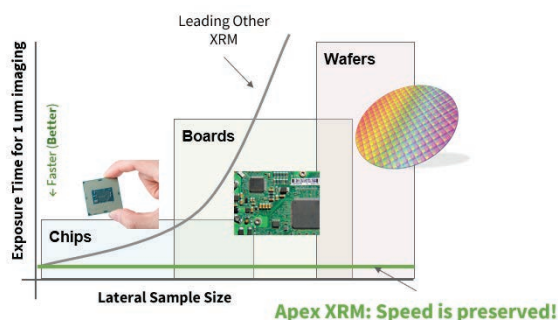
24 x 10 cm Gigabyte GeForce 1070 Ti GPU
Acquisitions down to 10 minutes are possible

Patent-pending Breakthrough for Flat Samples

>10X Higher Throughput than Conventional 3D X-ray

Sigray's Apex-XCT™ is a revolutionary 3D x-ray computed tomography (XCT) system optimized for flat samples, such as for failure analysis of advanced packages, printed circuit boards (PCBs), cell phones, pouch cell batteries, and wafers. The system achieves **submicron spatial resolution** within 10 minutes, even for very large flat samples.

The Apex-XCT was designed to address a well-known problem in 3D x-ray imaging approaches in which the required acquisition time **exponentially** increases with sample diameter. This makes tomography of large samples such as intact, uncut PCBs and 300mm wafers practically impossible. Apex-XCT uses a breakthrough patent-pending acquisition method in which the source-sample distance is minimized throughout acquisition, thus preserving high speeds that are independent of sample diameter.



Comparison of Apex-XCT and Leading Other 3D X-ray Microscope: Apex XCT achieves high resolution imaging at fast throughputs that are independent of sample size (see green flat line), while other 3D x-ray approaches get exponentially slower for larger samples and thus require cutting down the sample.



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SIGRAY

Apex XCT

High throughput submicron 3D X-ray microscope

Empowering Research in...

Energy	Pouch cell batteries - in operando or time-based without disassembling
Yield Analysis	Semiconductor yield analysis of die-to-wafer packaging and TSVs
Failure Analysis	Cracks (in bumps, silicon, and underfill), voids, cold joints, head-in-pillow, misaligns, and chip gaps

Apex XCT™ Specifications

Parameter	Specification
Spatial Resolution	Submicron spatial resolution, 0.3 µm voxel
Source(s)	Sealed Tube Transmission
Target	Tungsten on diamond substrate
Voltage	30 - 160 kV
Feature Recognition	100 nm
X-ray Detector	
Pitch	49.5 µm
Field of View	1 - 24 mm
Software	
Data Acquisition	Sigray3D Intuitive workflow-based acquisition software
Reconstruction	GigaRecon Fastest reconstruction software available
Advanced Analysis	Avizo (or DragonFly)



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