Enabling Nanosacle Advances

Park NX-Hybrid WLI

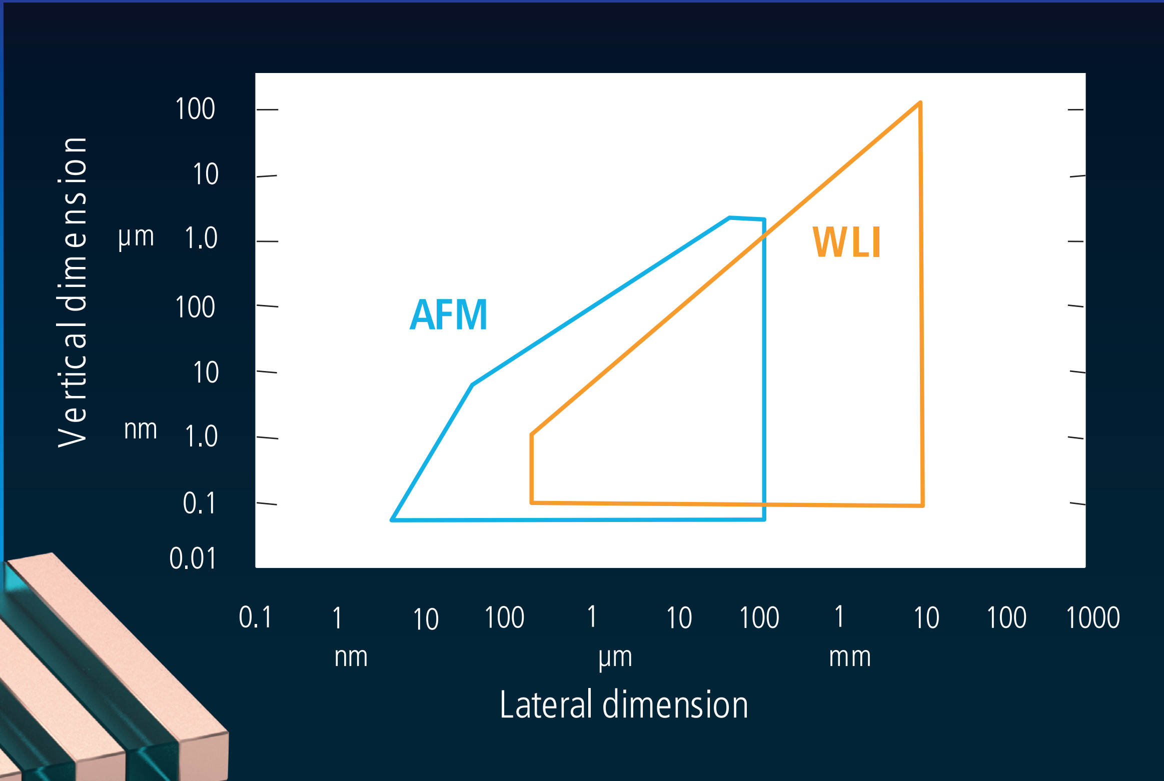
The AFM and WLI technologies built into one seamless system

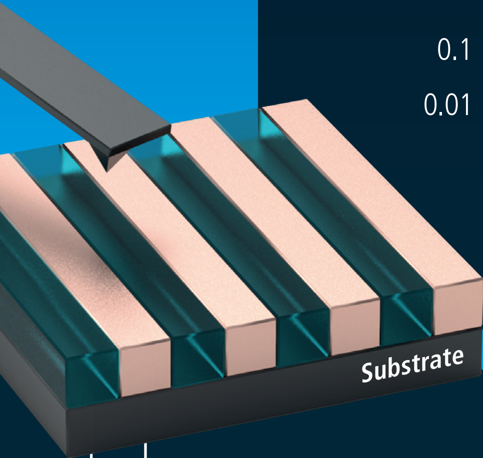
Please scan for more information about the WLI + AFM Hybrid system

Park NX-Hybrid WLI

The fully automated industrial AFM-WLI system for 200mm to 300mm wafers is the fastest, most accurate, and most versatile semiconductor metrology tool in the industry.

- Park NX-Hybrid WLI is the first ever AFM system with built in White Light Interferometer profilometry for R&D metrology, process control, and manufacturing quality assurance of semiconductor devices.
- Park NX-Hybrid WLI provides high throughput imaging over a very large area with the WLI module, and nanoscale metrology with sub-angstrom height resolution over the areas of interest using AFM.
- Park NX-Hybrid WLI offers the ultimate solution, ranging from large area scanning to nanoscale metrology, for various applications including quality assurance, automatic defect review, front-end semiconductor process control, and back-end advanced packaging.
- Park NX-Hybrid WLI seamlessly integrates an automated industrial AFM system and a WLI profilometer, bringing significant cost savings, reduced tool footprint, and new metrology solutions compared to the previous two tool solution.





Park NX-Hybrid WLI measures step heights with sub-angstrom accuracy

The same sample! Different result!

Scanned by WLI

White Light Interferometry

Scanned by AFM

Atomic Force Microscopy

WLI and AFM

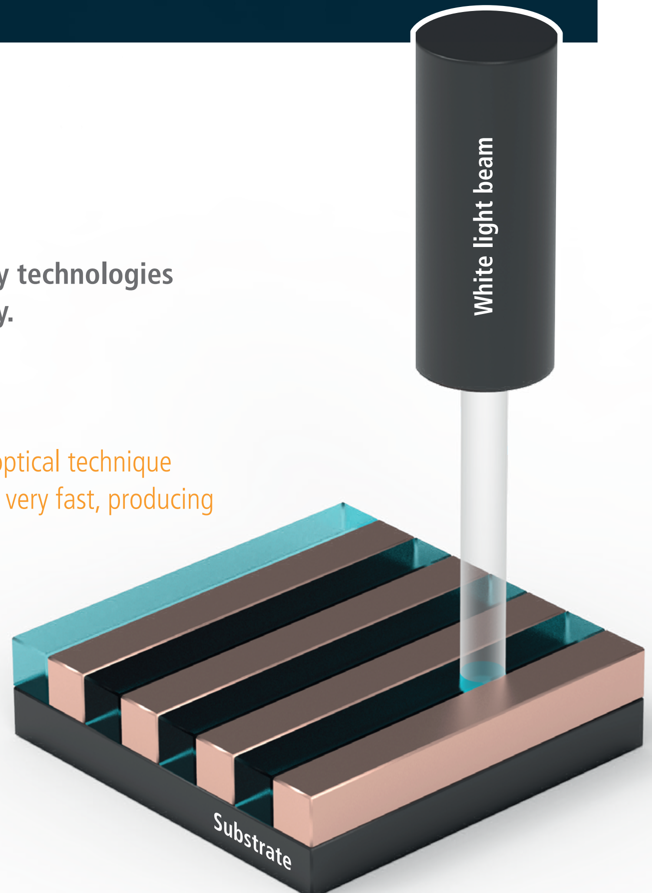
The two best complementary technologies for semiconductor metrology.

WLI

White light interferometry is an optical technique that can image a very wide area, very fast, producing high throughput measurements.

AFM

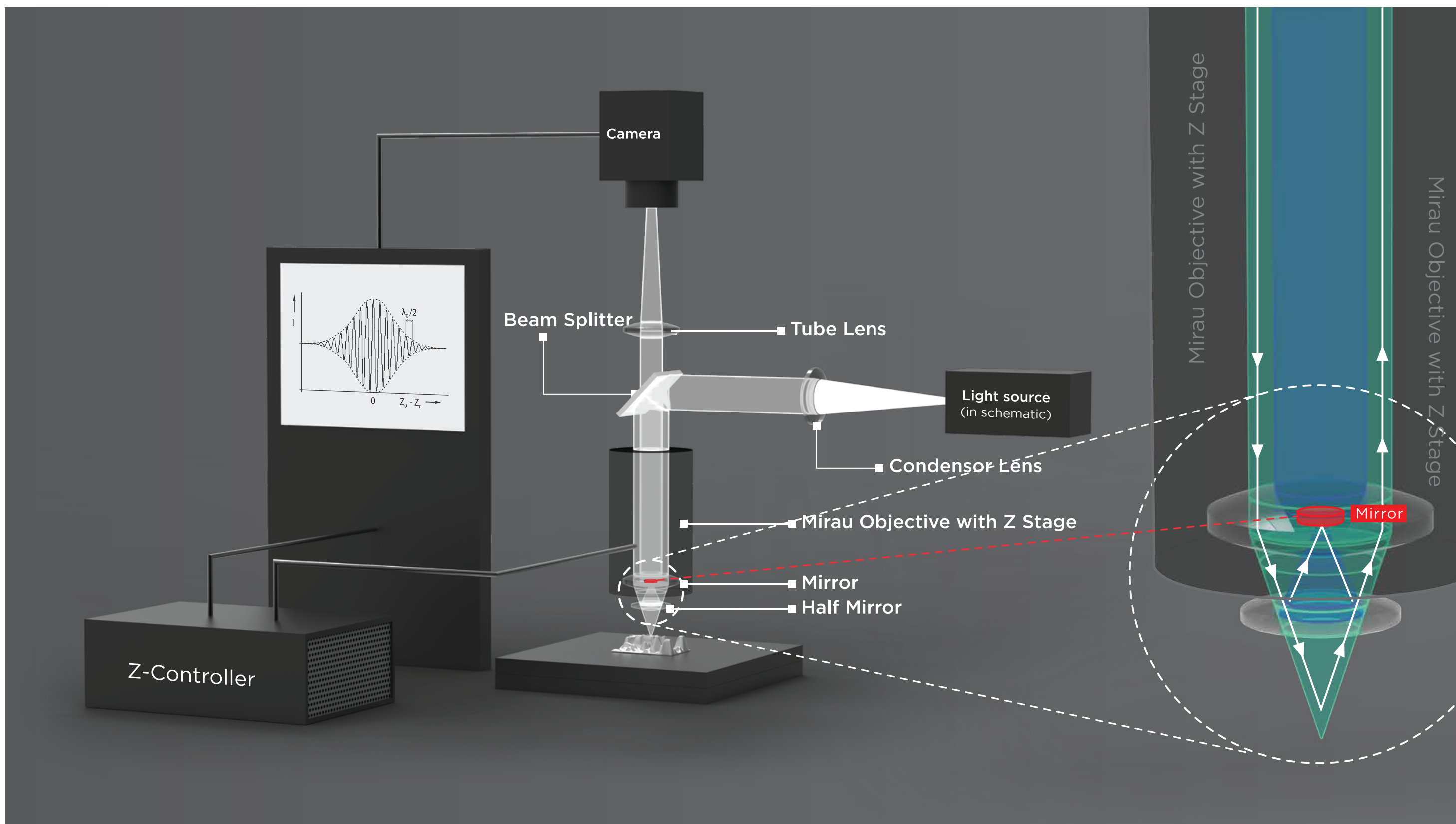
Atomic force microscopy is a scanning probe technique that delivers the highest nanoscale resolution measurements even for transparent materials.



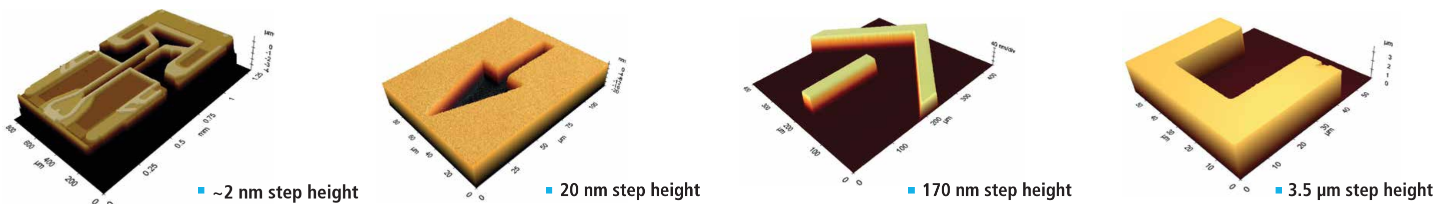
Park NX-Hybrid WLI
WLI-AFM Technology

The Principles of White Light Interferometry (WLI)

A white light such as an LED or a halogen lamp is used as the light source to beam onto the sample through various lenses. While the sample is scanned with this beam, light intensity variations occur due to the light interference during the scan. Using this principle, WLI calculates the surface height at each point, producing a surface topography map.

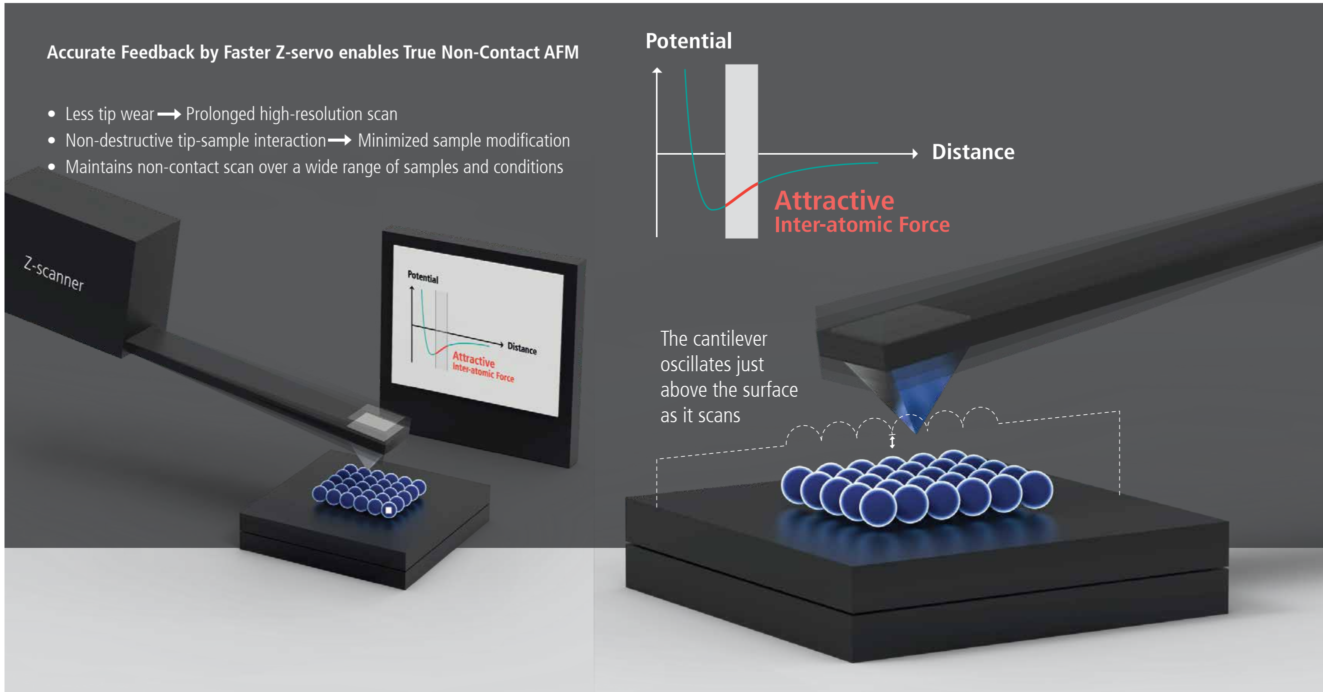


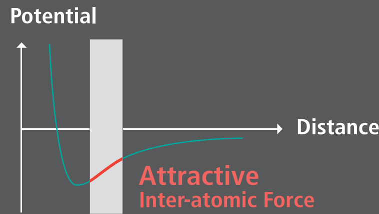
WLI Standard Sample Measurements by Different Step Height



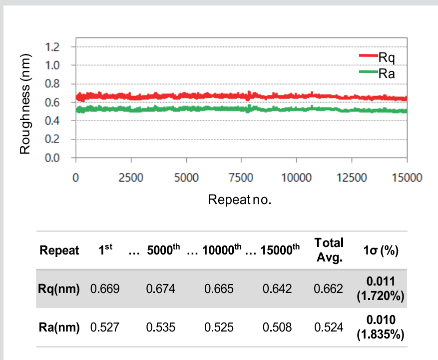
Park AFM Technology (True Non-Contact™ Mode)

True Non-Contact™ Mode is a scan mode unique to Park AFM systems that produces high resolution and accurate data by preventing destructive tip-sample interaction during scanning.



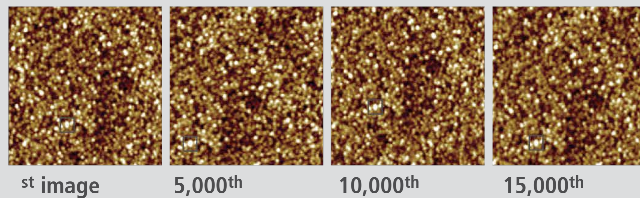


Unlike in contact mode, where the tip contacts the sample continuously during a scan, or in tapping mode, where the tip touches the sample periodically, a tip used in non-contact mode does not touch the sample.



Repeat	1st	... 5000th	... 10000th	... 15000th	Total Avg.	1σ (%)
Rq(nm)	0.669	0.674	0.665	0.642	0.662	0.011 (1.720%)
Ra(nm)	0.527	0.535	0.525	0.508	0.524	0.010 (1.835%)

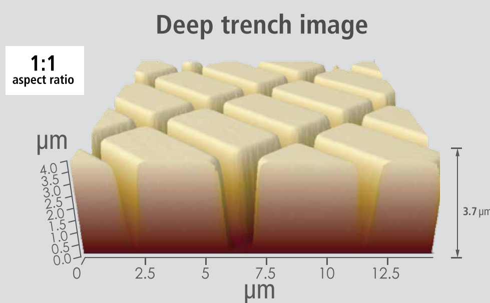
As a result, non-contact mode has several key advantages. The most important being preservation of the sharp tip while also eliminating sample damage by avoiding direct contact with the surface.



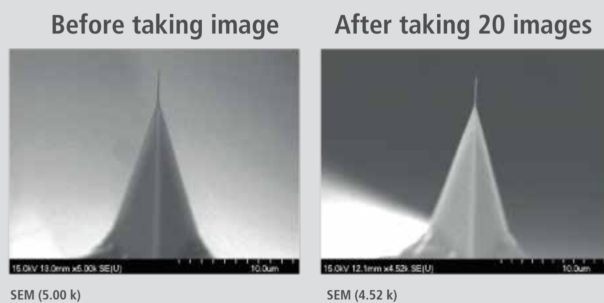
st image 5,000th 10,000th 15,000th

Furthermore, non-contact mode senses tip-sample interactions coming from all directions. Lateral forces are detected in addition to forces at the end of the tip. Therefore, tips used in non-contact mode can avoid crashing into tall structures that may suddenly appear on a sample surface. Contact and tapping modes only detect the force coming from below the tip and are vulnerable to suchcrashes.

Deep trench image



Before taking image After taking 20 images



SEM (5.00 k) SEM (4.52 k)

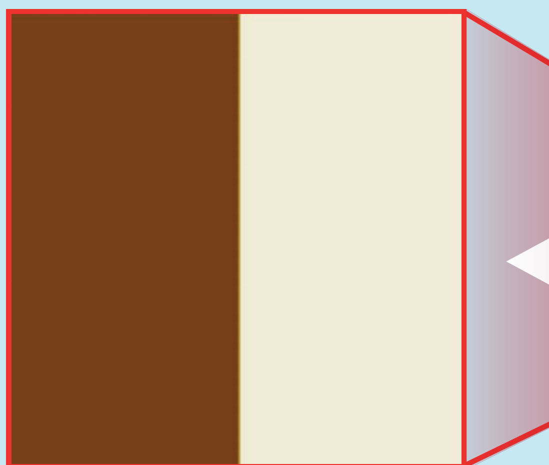
Park NX-Hybrid WLI

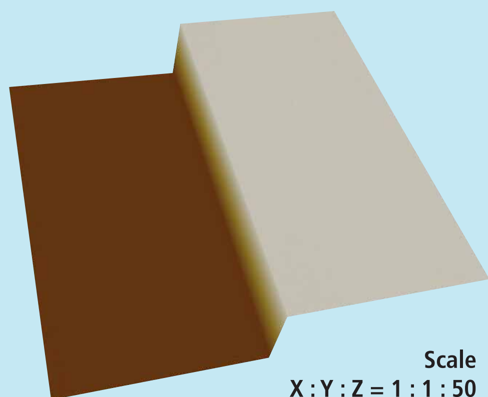
Throughput Meets Accuracy

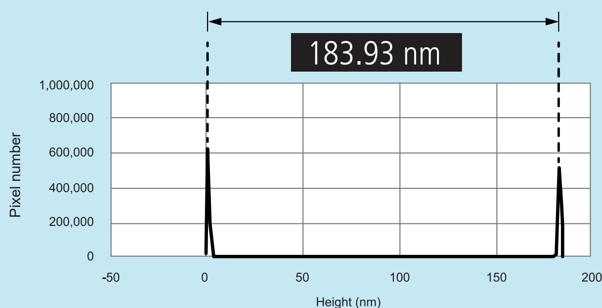
▪ AFM and WLI Images of VLSI Step Height Standard

AFM image

- Scan mode: Non-contact
- Scan size: 50 μm × 50 μm

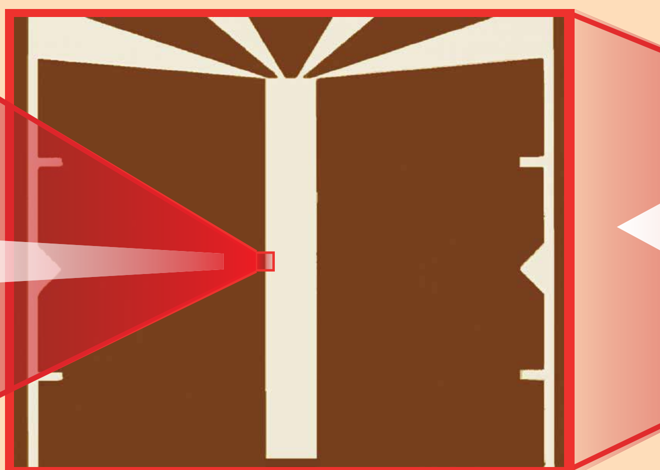


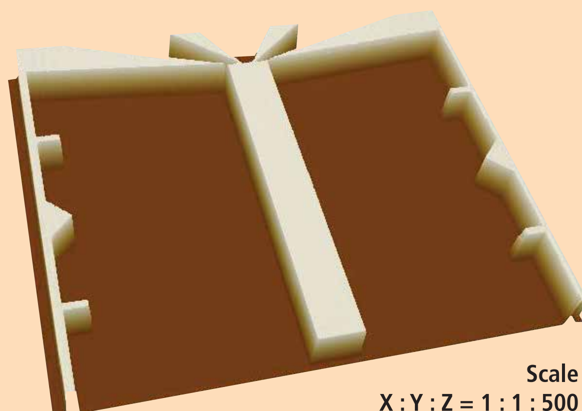


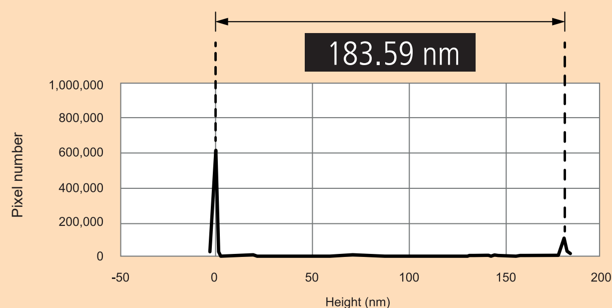


WLI image (single shot)

- Lens magnification: ×10
- FOV: 1,120 μm × 930 μm





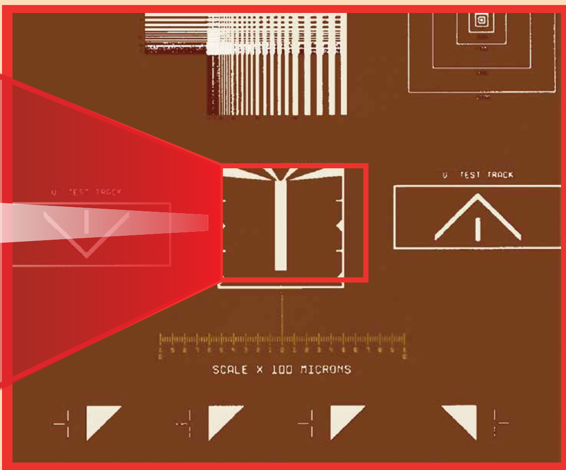


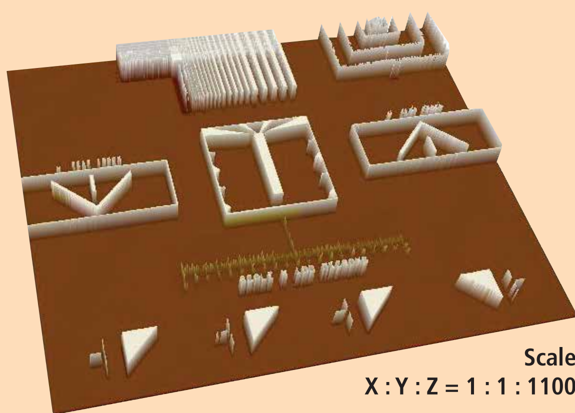
Sample information

- VLSI step height standard: SHS - 1800 QC (Chrome-coated)
- Certified step height: 183.9 ± 2.0 nm

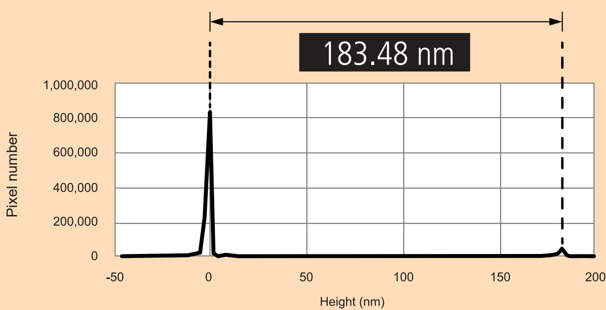
WLI image (single shot)

- Lens magnification: ×2.5
- FOV: 4,500 µm × 3,755 µm



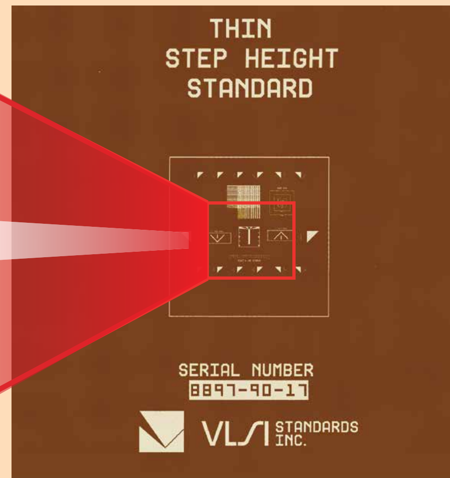


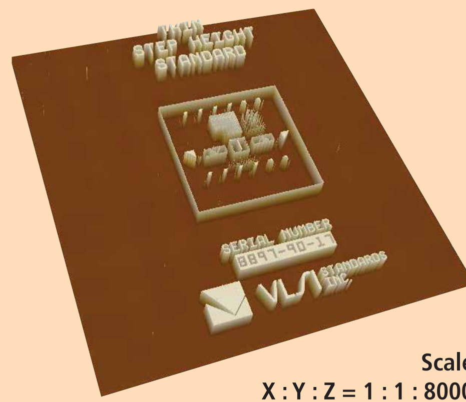
Scale
X : Y : Z = 1 : 1 : 1100



WLI image (Auto stitched)

- Lens magnification: ×2.5
- FOV: 22,510 µm × 23,930 µm





Scale
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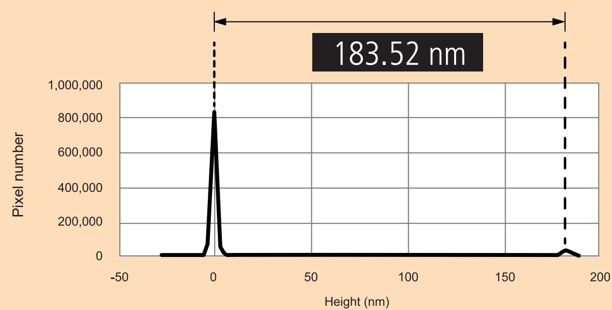


WLI Specification	Mode	Maximum Scan Range	Vertical Resolution	Motorized Linear Lens Changer
	WLI, PSI	WLI: 28 µm PSI: 100 nm (0~5 µm)	0.1 nm	2 lens

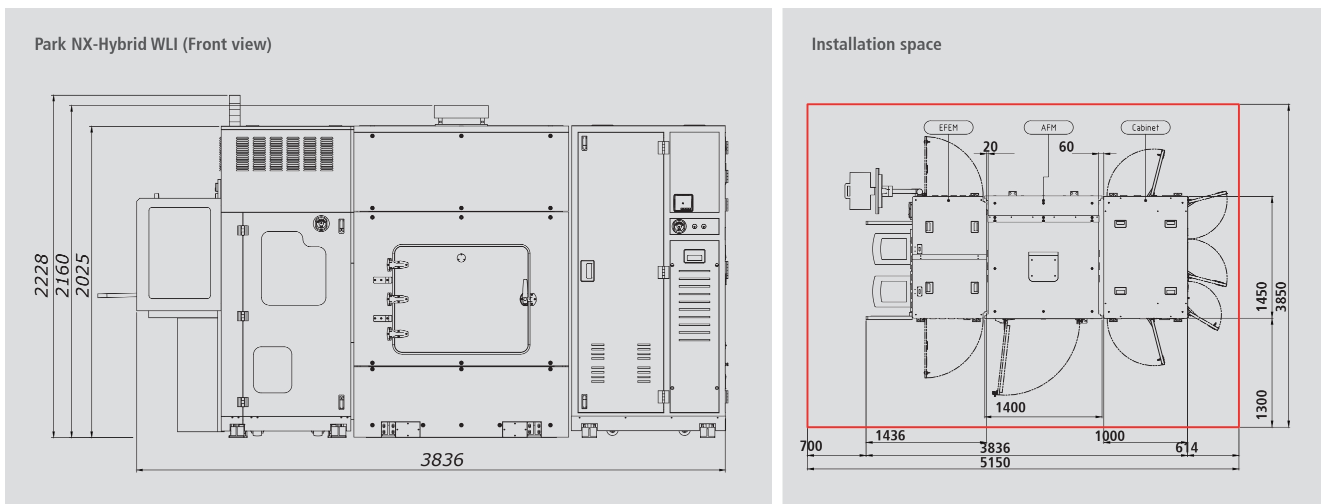
WLI Specification by Objective Lens Magnification	Feild Of View (FOV)				
	2.5 x 4500 µm x 3754 µm	**10 x** 1125 µm x 938 µm	**20 x** 562 µm x 469 µm	**50 x** 225 µm x 187 µm	**100 x** 112 µm x 93 µm

AFM Specification	XY Scanner	Z Scanner Range
	100 µm × 100 µm	15 µm

System Specification	300 mm Motorized XY stage	Motorized Z Stage	Motorized Focus Stage	Sample Thickness Allowance
	travels up to 400 mm × 300 mm, 0.05 µm encoders	25 mm Z travel distance	8 mm Z travel distance for on-axis optics	Up to 20 mm

Dimension & Weight	300 mm Full System
	3836 mm (w) x 1450 mm (d) x 2160 mm (h) w/ EFEM, 2950 kg approx. (incl. Control Cabinet) Ceiling Height: 3000 mm or more Operator Working Space: 5150 mm (w) x 3850 mm (d)

Facility Requirement	Room Temperature (Stand By)	Room Temperature (Operating)	Humidity	Floor Vibration Level	Acoustic Noise
	10 °C ~ 40 °C	18 °C ~ 24 °C	30% to 60% (not condensing)	VC-D (6 µm/sec)	Below 65 dB
	Pneumatics	Power Supply Rating	Total Power Consumption	Ground Resistance	
	Vacuum: -80 kPa CDA (or N_2): 0.7 MPa	208 ~ 240 V, single phase, 15 A (max)	2 kW (typical)	Below 100 ohms	



Committed to contributing to impactful science and technology

Park Systems Corporation is a leading manufacturer of nanoscale microscopy and metrology solutions that encompasses the atomic force microscopy, white light interferometry, infrared spectroscopy and ellipsometry systems. Its products are widely used for scientific research, nanoscale engineering, and semiconductor fabrication and quality assurance. Park Systems provides a full range of AFM products from desktop to fully automated systems with integrated robotic arms. Furthermore, its product line includes WLI AFM, Photo-induced Force Microscopy spectroscopy and ellipsometry systems for those in the chemistry, materials, physics, life sciences, and semiconductor industries. In 2022, Park Systems acquired and merged Accurion GmbH, a leader in high-end ellipsometry and active vibration isolation, to form Park Systems GmbH, Accurion Division.

Park Systems Americas
+1-408-986-1110 (USA)
+52-55-7100-2354 (Mexico)

Park Systems Europe
+49 (0)-621-490896-50 (Germany)
+33 (0)-6-07-10-87-36 (France)
+44 (0)-115-784-0046 (UK&Ireland)

Park Systems GmbH - Accurion
+49-551-999600 (Germany)

Park Systems Japan
+81-3-3219-1001 (Japan)

Park Systems Greater China
+86-10-6254-4360 (China)
+886-3-5601189 (Taiwan)

Park Systems SE Asia
+65-6634-7470 (Singapore)

Park Systems Korea
+82-31-546-6800 (Republic of Korea)

Park Systems India
+91-96869 51464 (India)

Park Systems Corporate Headquarters
To learn more about Park Systems, please visit **www.parksystems.com** or e-mail **inquiry@parksystems.com**

KANC 15F, Gwanggyo-ro 109, Suwon 16229, Korea Tel.+82-31-546-6800

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