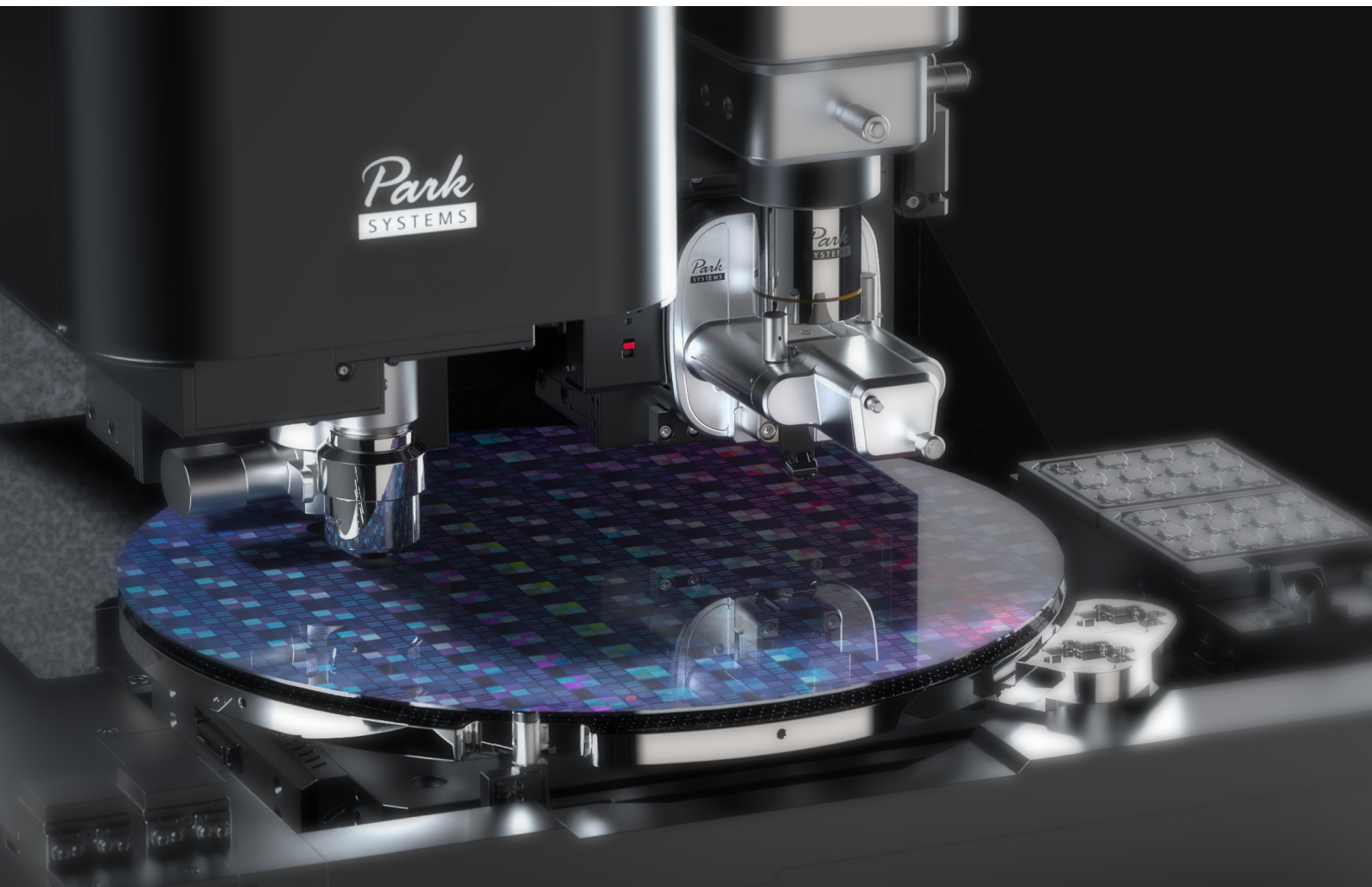


Park NX-Hybrid WLI

Industry's Leading Dual Instruments
for Multi-Scale Metrology Solutions



Park
SYSTEMS

Park NX-Hybrid WLI is a multi-scale metrology system integrating AFM and White Light Interferometry (WLI) within a single platform. It combines high-throughput, large-area WLI imaging with sub-nanometer-precision AFM measurement for comprehensive surface characterization. Leveraging Park's proven AFM technology, the NX-Hybrid WLI enhances WLI performance using the AFM Z-scanner for optical height scanning, enabling precise optical control and seamless image stitching. A motorized dual-objective turret enables efficient switching between wide field-of-view and high-resolution imaging modes. Reliable sub-nanometer measurement is ensured by advanced AFM technologies, including a decoupled XY scan system, independent dual-servo XY control, a high-resonance-frequency Z scanner, and True Non-contact™ operation for extended probe lifetime.

Park NX-Hybrid WLI

Key Features

Integrated AFM-WLI Hybrid Platform

- Low-noise platform for stable interferometric measurements
- Combines wide-area WLI imaging with AFM nanoscale precision in a single platform
- Seamless metrology from wafer-level inspection to nanoscale surface analysis in a minimal compact footprint

Semiconductor Fab Integrability

- Fully automated operation through XEA software with an intuitive UI
- SECS/GEM communication for fab host integration
- Automated wafer handling and probe exchange
- Full compatibility according to SEMI standards

High-Precision AFM Technology

- Reduced out-of-plane motion through a decoupled XY and Z scanner architecture
- High orthogonality and precise positioning via dual-servo XY control
- Extended probe lifetime through True Non-contact operation

Advanced WLI Technologies

- Dual interferometry modes: WLI and PSI
- Automatic stitching for seamless large-area imaging
- Motorized dual-objective turret for flexible magnification



NX-Hybrid WLI
Atomic Force Microscope

Park NX-Hybrid WLI

Semiconductor Fab Integrability

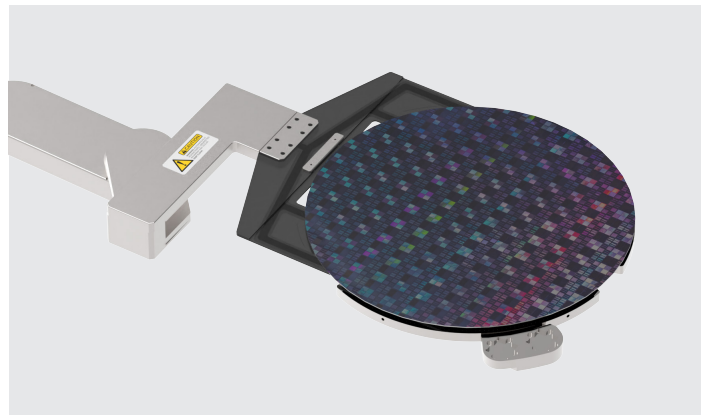
Integrated AFM-WLI Metrology Platform

The NX-Hybrid WLI seamlessly integrates an automated industrial AFM system and a WLI profilometer on a single platform, replacing conventional two-tool solutions while reducing cost and tool footprint. It combines AFM and WLI into a unified workflow, enabling seamless switching between measurement modes within a single recipe depending on application requirements. The NX-Hybrid WLI supports fully automated operation from wafer handling to measurement and analysis, including automatic recipe execution, tip selection, multi-site scanning, data analysis, and report generation.



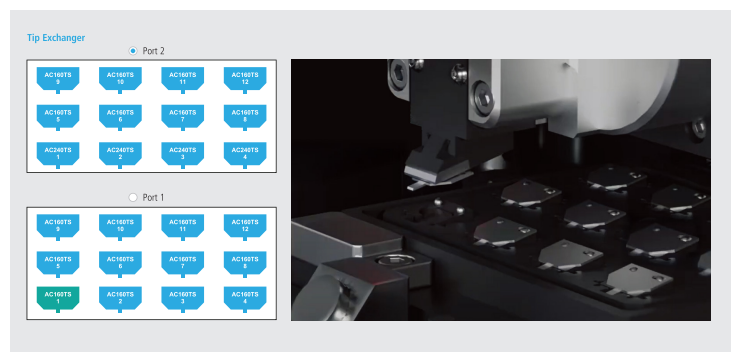
Automated Wafer Handling Capability

Wafer transfer is performed automatically by an equipment front-end module (EFEM). It uses robotic mechanisms, sensors, and algorithms to ensure precise alignment and reliable handling of various materials, including warped wafers. The N₂ purge load port is available as an option.



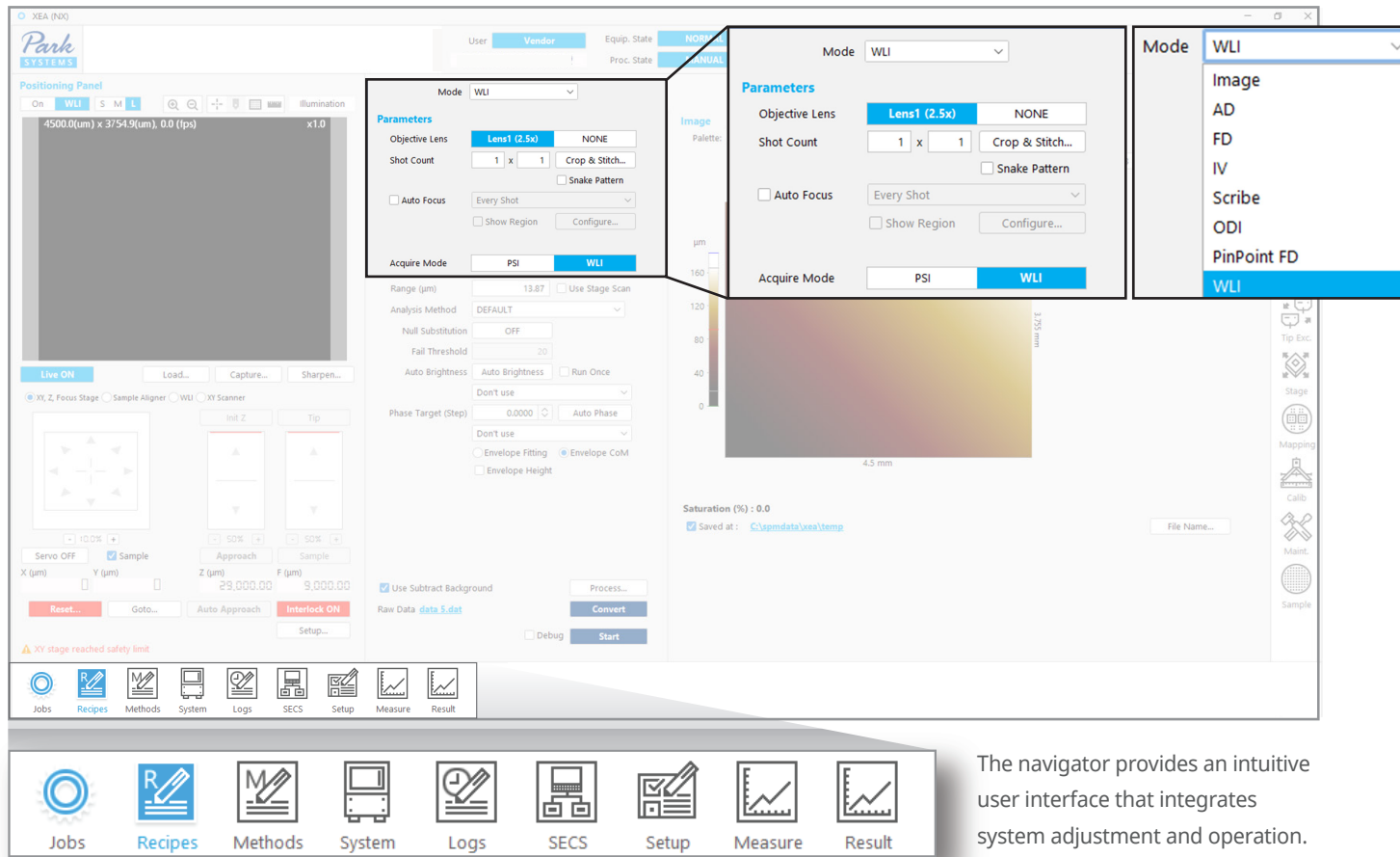
Automatic Probe Exchange

The automatic tip exchanger seamlessly replaces the probe when a threshold is exceeded. It can store up to 24 pre-mounted probes (12 probes per cassette).



Integrated AFM-WLI Software Platform

XEA software integrates AFM and WLI measurement and analysis into a single automated workflow, enabling seamless mode switching within a single recipe. It offers practical features such as easy recipe copy and paste, specialized editing modes, and real-time recipe updates. Built-in functions support comprehensive system operations, including parameter adjustment, database management, and maintenance, while maintaining an intuitive and user-friendly interface.



The navigator provides an intuitive user interface that integrates system adjustment and operation.



Fab Host Communication via SECS/GEM Protocol

The NX-Hybrid WLI enables Fab host communication via the SECS/GEM protocol, ensuring full compliance with SEMI standards, including E30, E40, E87, E90, E94, and E84 PI/O for AMHS integration.

Fab Compatibility According to SEMI Standards

The NX-Hybrid WLI ensures optimal compatibility with cleanroom environments in semiconductor fabs. The system achieves ISO Cleanliness Class 1 (≤ 10 particles/ $m^3 \geq 0.1 \mu m$ and ≤ 2 particles/ $m^3 \geq 0.2 \mu m$) and minimizes particle contamination along the wafer movement path through its engineered fan filter unit and ventilation system, while maintaining efficient noise shielding. Additional chemical filters are available as options to effectively block airborne molecular contamination (AMC), which can adversely affect sensitive samples. Furthermore, the system is equipped with advanced monitoring capabilities that can detect and alert users to potential fire hazards or voltage sags.

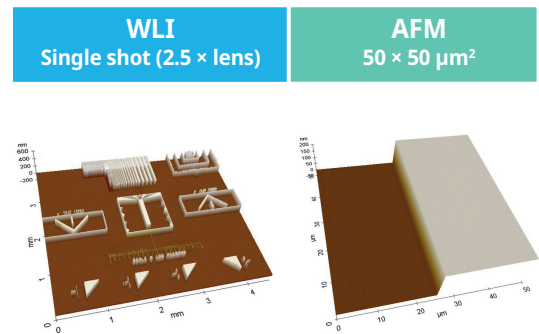
Park NX-Hybrid WLI

Integrated AFM-WLI Hybrid Platform

Integrated AFM-WLI Hybrid Metrology

Advanced packaging technologies are driving the need for multi-scale metrology, where both large-area inspection and nanoscale surface characterization are required. Conventional optical methods enable fast wide-area imaging, while nanoscale techniques provide the resolution required for detailed analysis.

The NX-Hybrid WLI integrates AFM and White Light Interferometry (WLI) into a single metrology platform. By combining high-throughput large-area WLI imaging with nanoscale AFM measurement, the system enables efficient multi-scale inspection with sub-nanometer precision.



Streamlined Process and Reduced Footprint

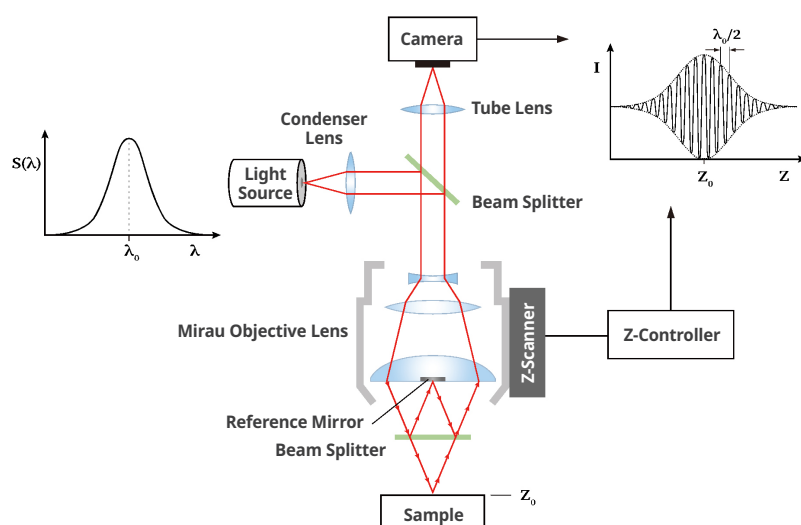
With AFM and WLI integrated into a single tool and served by a single EFEM, the system reduces fab footprint and improves throughput. It enables continuous wafer measurement without reloading, simplifying workflow and minimizing contamination risk.

Low-Noise Platform for High-Quality WLI Imaging

The NX-Hybrid WLI performs WLI imaging on an AFM-grade low-noise platform ($< 1 \text{ \AA}$ rms), providing exceptional mechanical and electronic stability. This ultra-stable platform enables low-noise interferometric imaging with clear fringes and highly repeatable results.

The Principles of White Light Interferometry (WLI)

White light, such as from an LED or a halogen lamp, is used to illuminate the sample through various lenses. As the sample is scanned, variations in light intensity occur due to interference. Based on this principle, WLI calculates surface height at each point to generate a topography map.

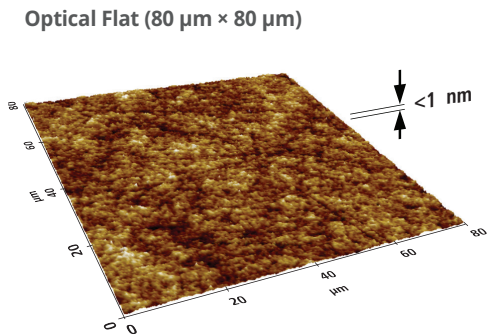
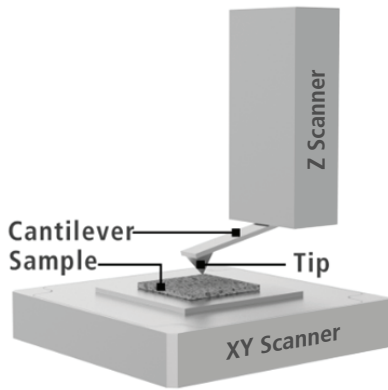


Park NX-Hybrid WLI

Park High-Precision AFM Technology

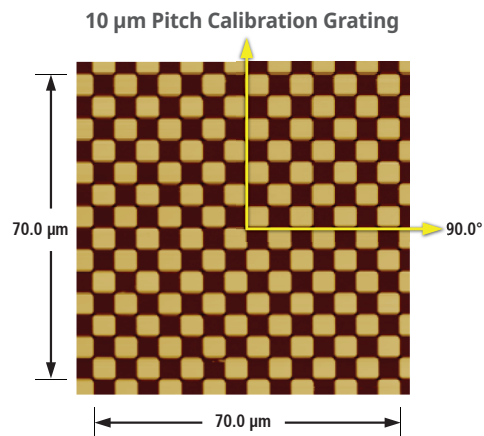
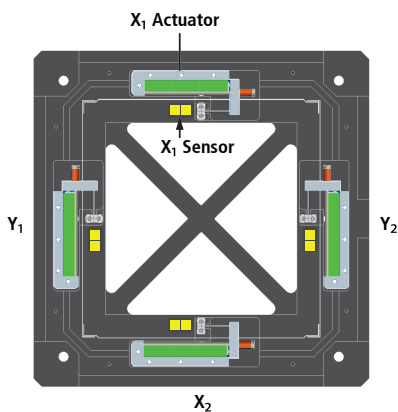
Decoupled XY and Z Scanner System

The separated flexure-guided 2D XY scanner and 1D Z scanner system minimizes out-of-plane motion by eliminating crosstalk between horizontal and vertical motion. The independent Z scanner enables precise, linear, and fast dynamic performance.



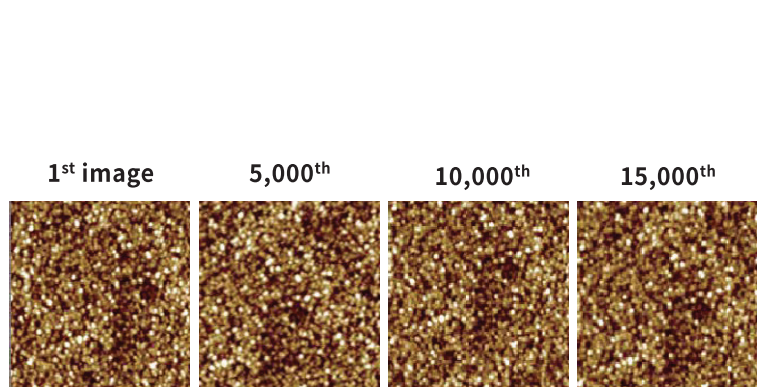
Orthogonal Scan for XY Scanner

The XY scanner features a dual-servo architecture with two pairs of actuators and position sensors mounted on opposite sides of each axis, providing precise orthogonality and accurate positioning across the entire scan area.

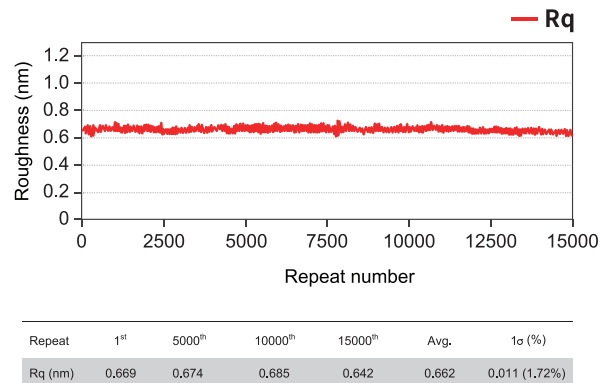


True Non-Contact™ Mode

True Non-contact™ mode, a proprietary technology offered by Park Systems, obtains topography by detecting the attractive van der Waals force between the tip and sample surface. The key advantage of True Non-contact mode is the prevention of tip wear and sample damage, ensuring consistent results with superior data reliability. This also reduces the total cost of ownership by extending tip life. The system also supports contact mode and tapping mode when required.



(500 nm × 500 nm)



Park NX-Hybrid WLI

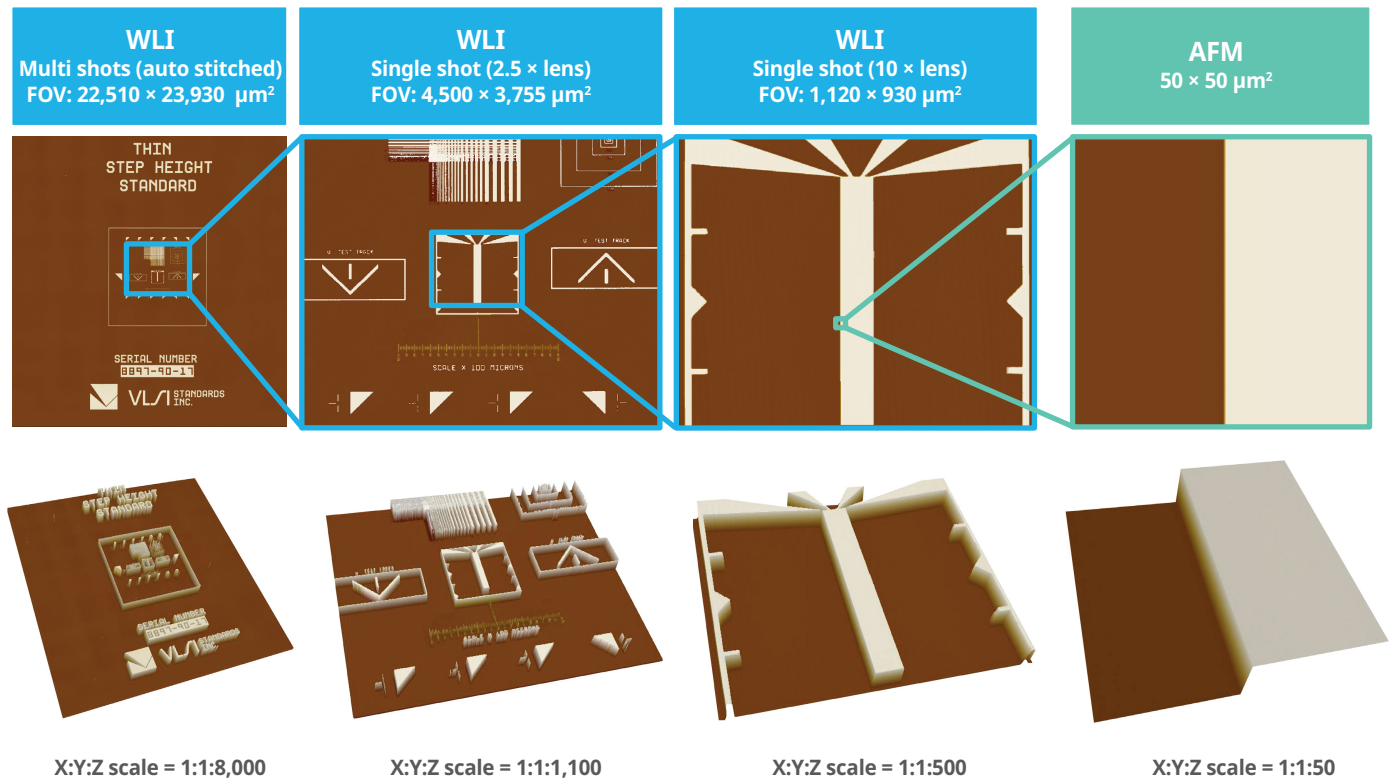
Advanced WLI Technologies

Dual interferometry modes: WLI and PSI

The NX-Hybrid WLI supports both WLI and PSI modes, covering a wide Z range from sub-nanometer to tens of micrometers.

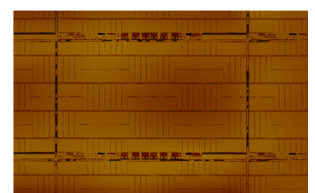
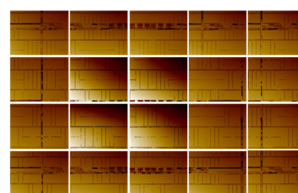
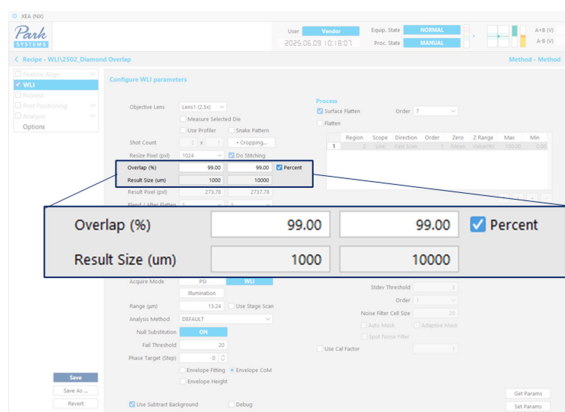
Seamless Multi-Scale Measurement from WLI to AFM

The NX-Hybrid WLI combines the speed of WLI with the nanoscale precision of AFM in a single platform. This integration enables efficient large-area measurements with WLI and detailed surface analysis with AFM, significantly reducing total measurement time while maintaining accuracy.



Advanced Optical Interferometry and Large-Area Measurement

The system integrates dual-mode interferometry (WLI and PSI), supporting a wide Z measurement range from sub-nanometer to tens of micrometers. A motorized linear lens changer enables automatic switching between two objective lenses from a range of 2.5×, 10×, 20×, 50×, and 100×, allowing flexible measurement configurations for various inspection requirements and improved throughput. In addition, automatic stitching precisely aligns adjacent images during large-area scans, minimizing overlap errors and distortion while reducing the need for manual realignment.



Park NX-Hybrid WLI

Technical Specifications

AFM Modes

- True Non-contact™ Mode
- Tapping Mode
- Contact Mode

WLI Modes

- WLI (up to 28 µm)
- PSI (up to 100 nm)

Objective Lens for WLI

- Two-objective selection: 2.5×, 10×, 20×, 50×, 100×

Scanner

- Dual-servo XY scanner (100 µm × 100 µm)
- Flexure-guided Z scanner (15 µm or 30 µm) *

Long Range Sliding Stage

- Up to 50 mm *

On-Axis Optics

- Direct on-axis vision of sample surface and cantilever
- Field of view: 840 µm × 630 µm (w/ 10× objective lens)
- CCD: 5 M pixels

Automatic Tip Exchanger

- 24 pre-mounted probes (12 probes per cassette)

Sample Handling Capability **

- 300 mm system: 200 mm, 300 mm wafer

Dimension and Weight (Approx.)

- 3,836 mm × 1,450 mm × 2,160 mm (2,950 kg)

Required Environment

- Room Temperature (Stand By): 10 °C ~ 40 °C
- Room Temperature (Operating): 18 °C ~ 24 °C
- Humidity: 30% to 60% (not condensing)
- Floor Vibration Level: VC-D (6.25 µm/sec)
- Acoustic Noise: Below 65 dB
- Pneumatics: CDA 0.7 MPa, Vacuum -80 kPa
- Power Supply Rating: 208 ~ 240 V, Single Phase, 50/60 Hz
- Ground Resistance: Below 1 Ω

* Requires additional options

** Consult with Park Systems



Park
SYSTEMS
www.parksystems.com