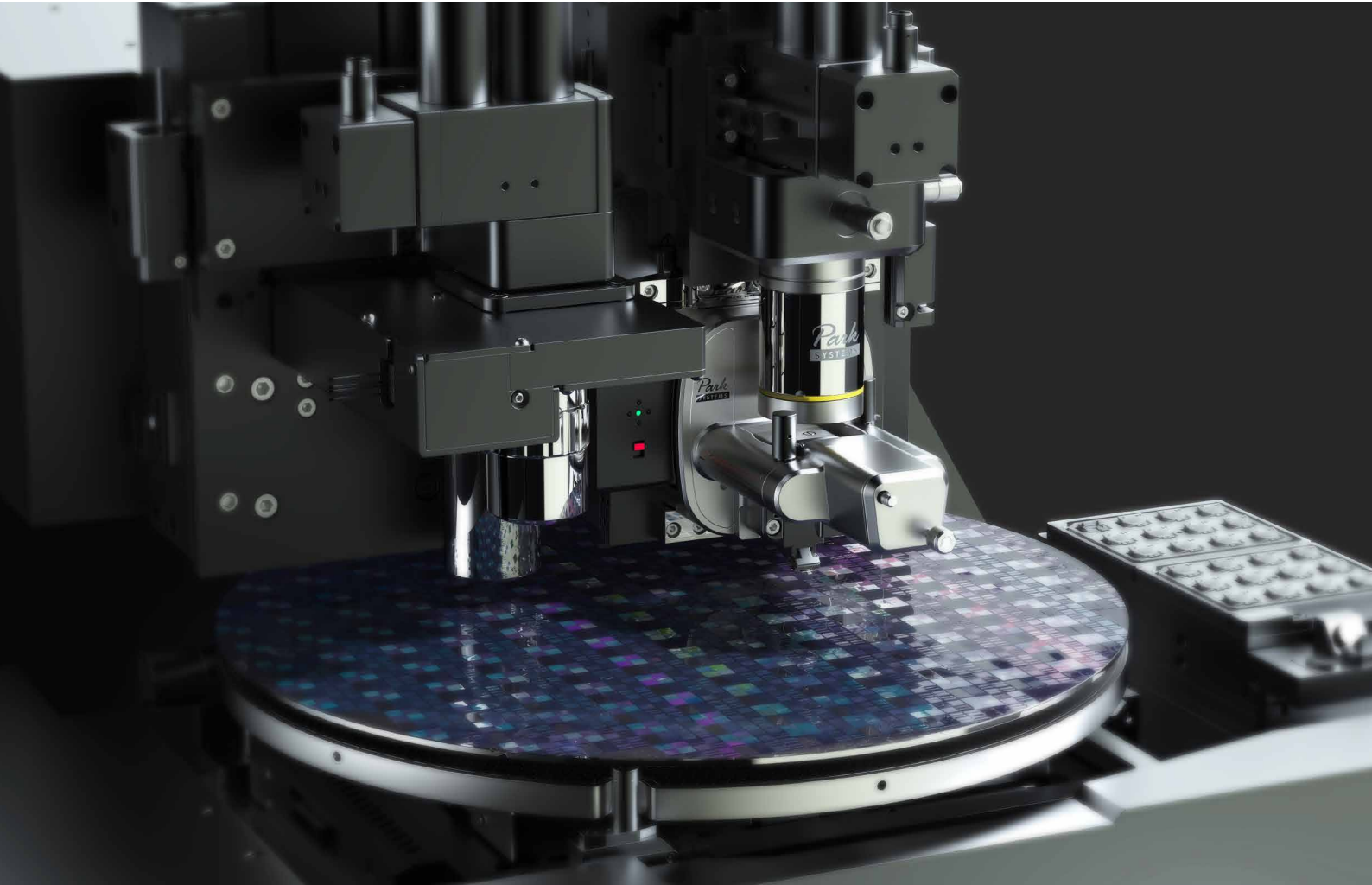


Park NX-Wafer Plus

Industry's Leading Automated AFM
for In-line Metrology Solutions



Park
SYSTEMS

Park NX-Wafer Plus is a leading-edge atomic force microscope (AFM) designed for seamless integration into semiconductor fabrication environments. Leveraging Park Systems' proven AFM technology, it delivers advanced measurement capabilities with full compliance with SEMI standards and complete automation. It has been enhanced with a sample rotation stage for high-throughput wafer edge profiling and an off-axis optics module with dual objectives (2× / 50×) for easy sample navigation. Building on the reliability of NX-Wafer, it delivers next-level performance to meet the evolving metrology demands.

Park NX-Wafer Plus

Key Features

NX-Wafer Plus Enhancements

- Sample rotation stage for high-throughput wafer edge profiling
- Off-axis optics module with dual objective (2× / 50×) for wide-area navigation

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

Versatile Applications

- Comprehensive 3D nano-metrology
- High-aspect-ratio structure metrology
- CMP metrology with long-range profiling
- High-throughput Cu pad measurement and automatic defect review



Park NX-Wafer Plus

Semiconductor Fab Integrability

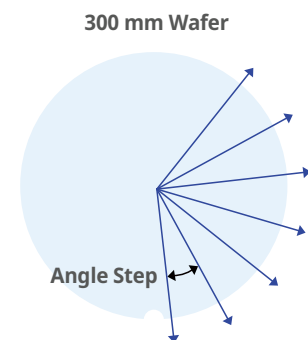
Fully Automated Operation

NX-Wafer Plus enables fully automated operation from wafer handling to measurement and analysis. It automatically receives a recipe from a host, performs end-to-end automation by selecting the appropriate tip, scanning multiple target areas, analyzing data, and generating reports.



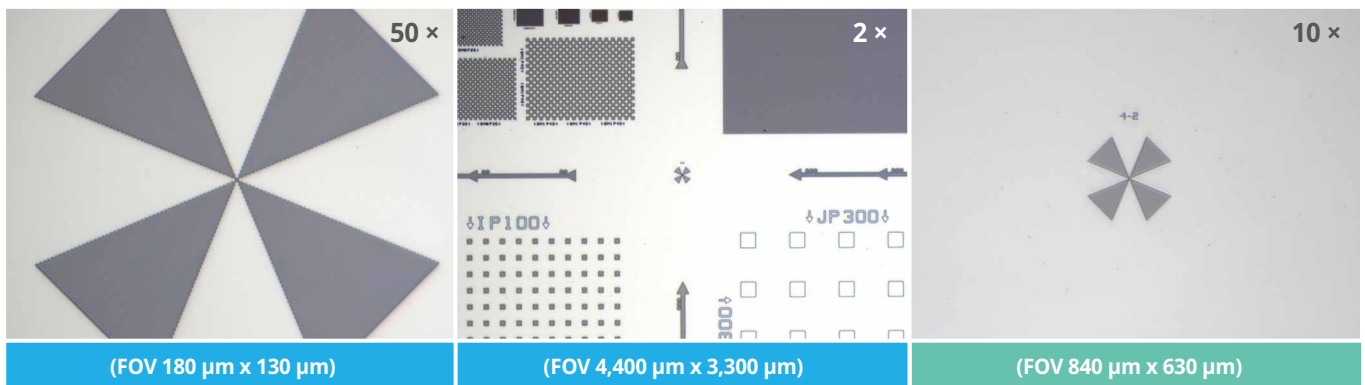
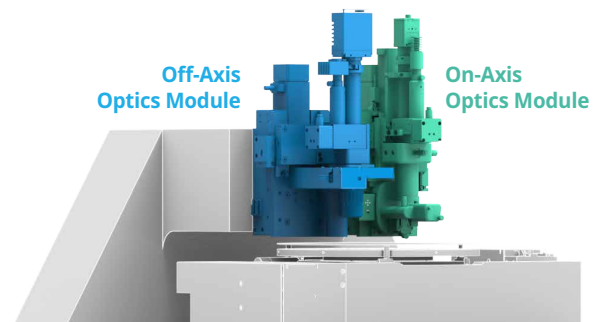
Sample Rotation Stage for Wafer Edge Profiling

The integrated sample rotation stage allows NX-Wafer Plus to measure full wafer edge profiles in a single continuous run. It rotates the 300 mm wafer at defined angle steps to systematically cover all edge positions, substantially improving measurement throughput compared to conventional step-by-step approaches.



Off-Axis Optics Module for Easy Sample Navigation

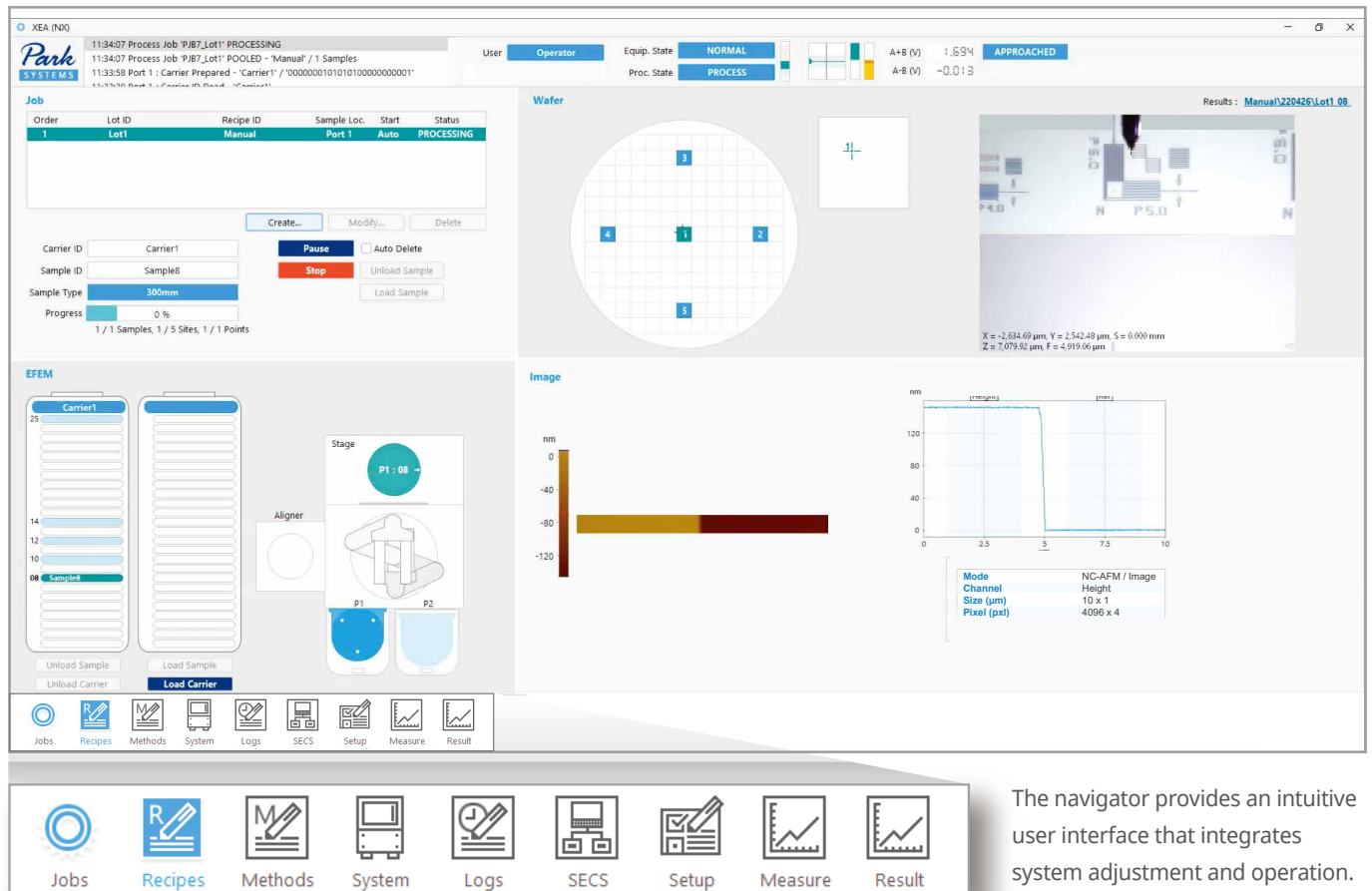
NX-Wafer Plus is equipped with an off-axis optics module offering two objective options to suit different inspection needs. The 2× objective provides a wide field of view (4.4 mm × 3.3 mm), facilitating initial wafer studies and intuitive die-level navigation. For finer inspection, the 50× objective delivers 300 nm optical resolution, enabling clear observation of smaller sample patterns and precise measurement targeting.



Surface Profile on MetroCal Standard Sample

Easy-to-Use Operation Software XEA

XEA offers practical features such as easy copy/paste of recipes, specialized editing modes, and real-time recipe updates. With built-in functions providing comprehensive system operation—including parameter adjustment, database management, and maintenance—the interface remains straightforward and user-friendly.



Fab Host

Wafer ID
Recipe ID

↕

Data
Event



Fab Host Communication via SECS/GEM Protocol

The system 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

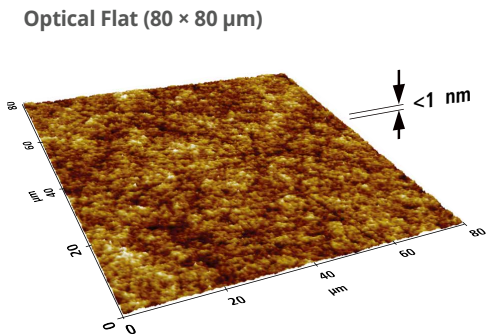
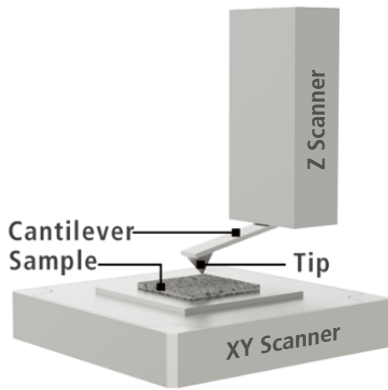
NX-Wafer Plus ensures optimal compatibility with cleanroom environments in semiconductor fabs. The system achieves ISO Cleanliness Class 1 (≤ 10 particles/ $m^3 \geq 0.1 \mu m$ and ≤ 2 particles/ $m^3 \geq 0.2 \mu m$) and minimizes particle contamination along the wafer movement path through its engineered 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-Wafer Plus

Park High-Precision AFM Technology

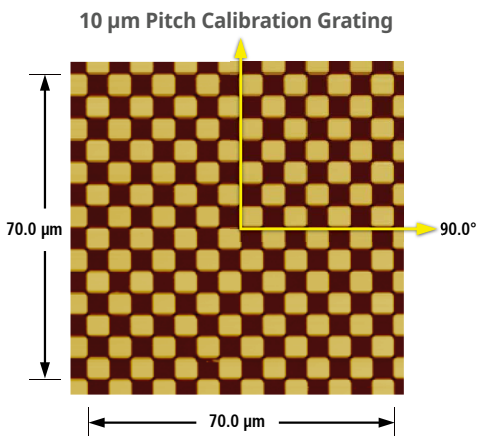
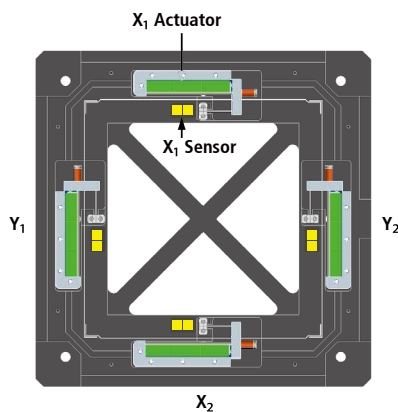
Decoupled XY and Z Scanner System

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.



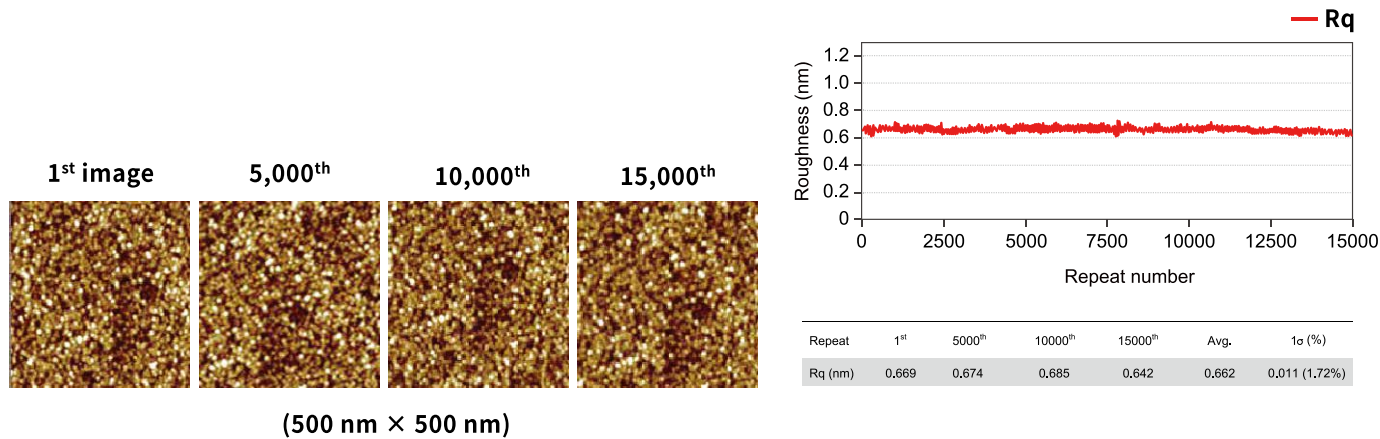
Orthogonal Scan for XY Scanner

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.

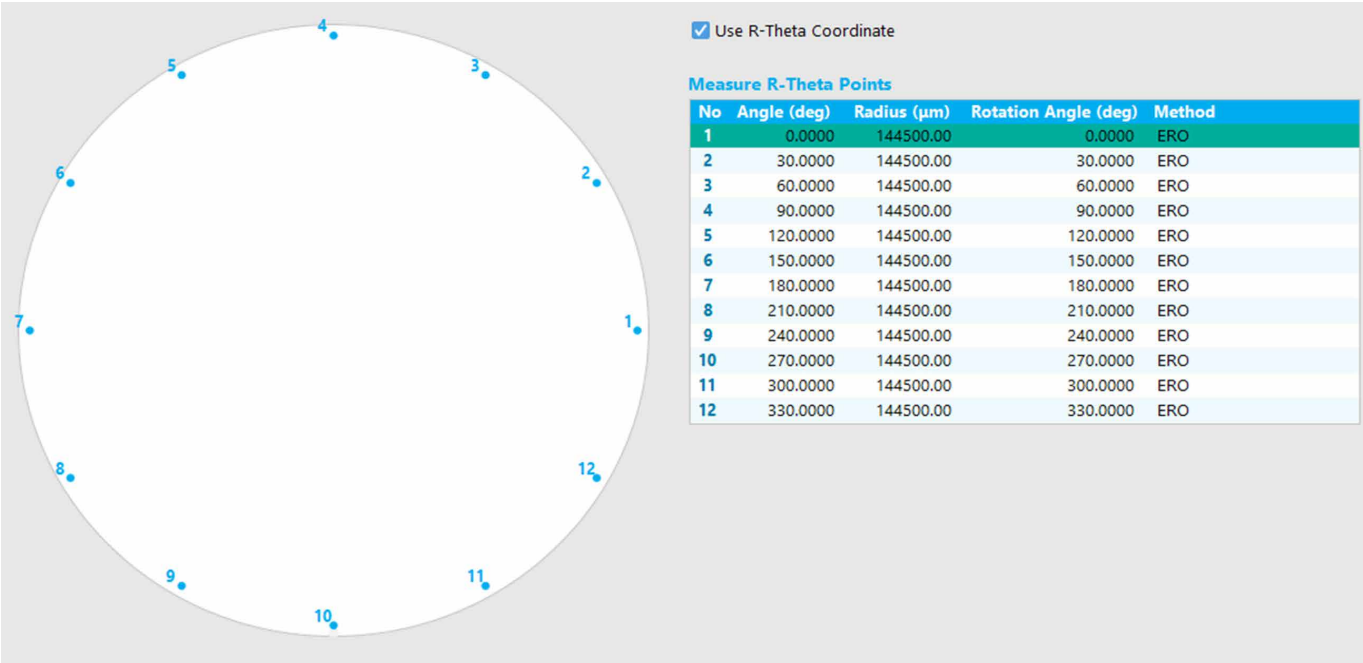


Park NX-Wafer Plus

Versatile Applications

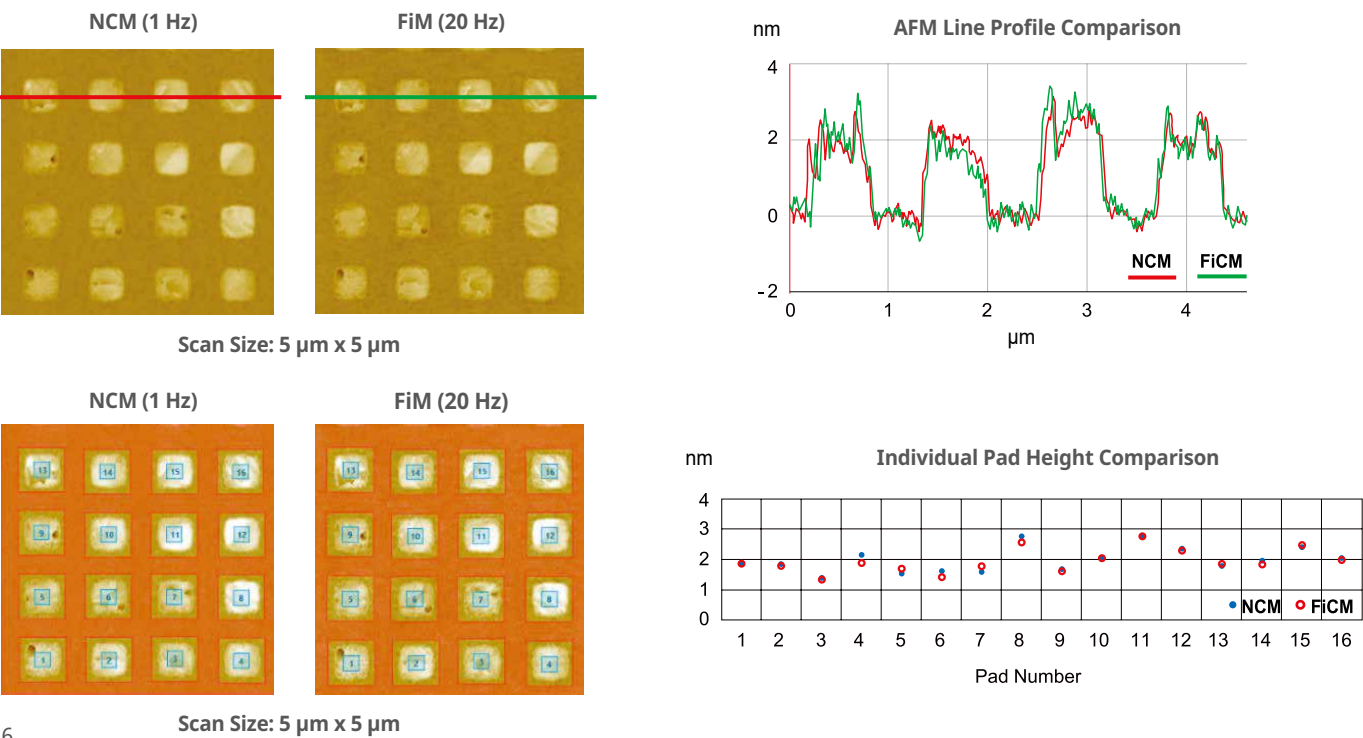
Wafer Edge Roll-Off (ERO) Measurement

In wafer-to-wafer bonding for advanced packaging, accurate characterization of wafer edge roll-off (ERO) is critical to ensuring bonding quality and yield. NX-Wafer Plus addresses this requirement with its integrated sample rotation stage, which rotates the wafer to user-defined angles for rapid and precise ERO measurement across the full wafer edge. Recipe-based R-Theta coordination delivers rapid and intuitive recipe creation.



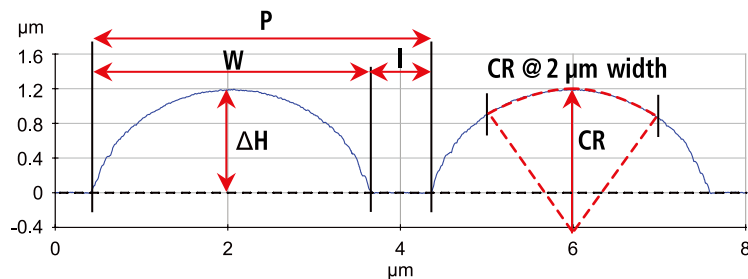
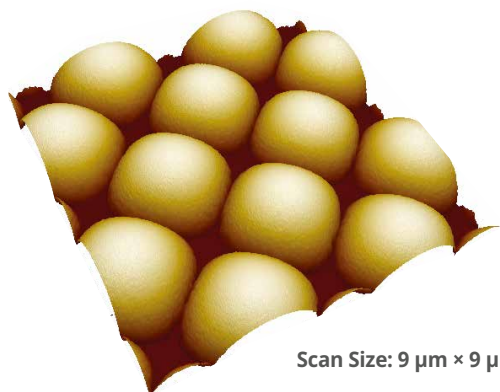
High-Throughput Measurement for Cu Pad

Park's fast imaging mode (FiM) provides reliable data for Cu pad measurements with high throughput. The Cu pad data from the fast imaging mode delivers line profiles and height values equivalent to those obtained in True Non-contact™ mode. The proprietary analysis algorithm can analyze each Cu pad regardless of pad shape or array arrangement.



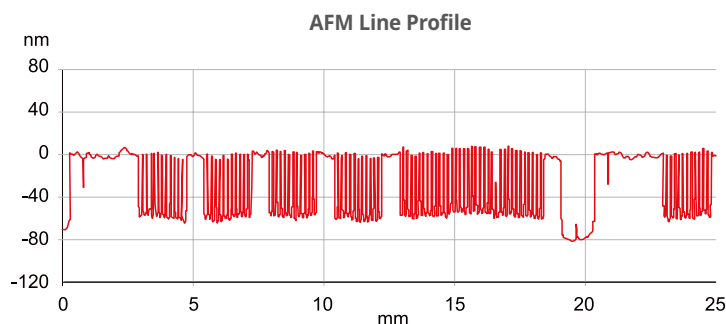
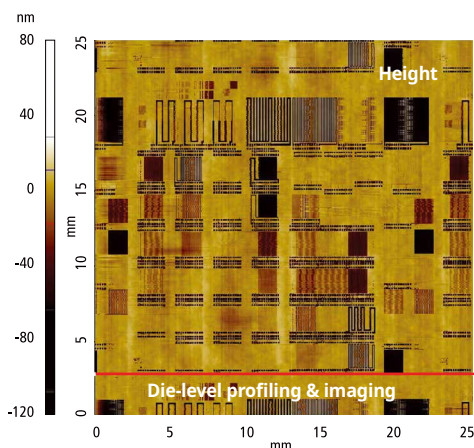
Comprehensive 3D Nano-Metrology

Park AFM accurately measures challenging patterns such as micro-lenses that are difficult to characterize with optical metrology tools, while providing comprehensive analytical capabilities including measurements of width, interval, pitch, height, and radius of curvature.



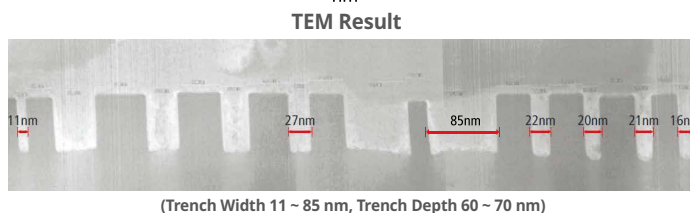
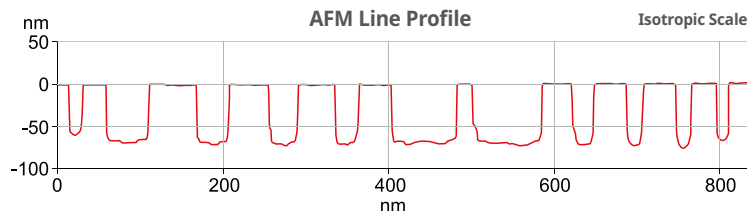
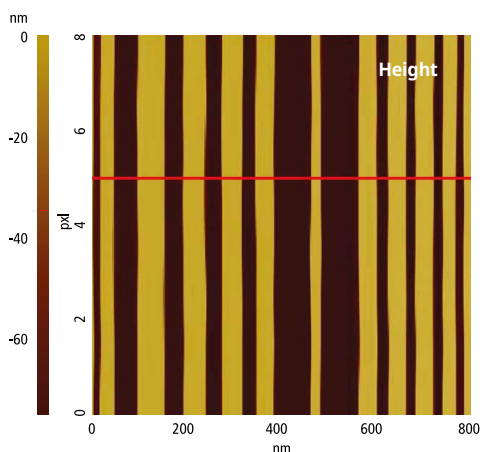
CMP Metrology with Long Range Profiling

Combining NX-Wafer Plus with a sliding stage provides a long range profiling capability for CMP metrology. Due to the unique sliding stage design of Park's automated AFM, the combined system provides very flat profiling and enables unprecedented CMP metrology of both local and global planarity measurements including dishing, erosion, and edge-over-erosion (EOE).



High Aspect Ratio Structure Metrology

Park AFM technology can measure high aspect ratio and nanometer-scale trenches in advanced semiconductor processes. Narrow trench mode (NTM) is optimized for nanometer-scale trench measurements. The data below show excellent NTM measurement results for nanometer-scale trenches with various aspect ratios. Specialized tips are available for specific requirements.



Park NX-Wafer Plus

Technical Specifications

AFM Modes

- True Non-contact™ Mode
- Tapping Mode
- Contact Mode
- Fast imaging Mode (FiM) **
- Narrow Trench Mode (NTM) **

Scanner

- Dual-servo XY scanner (100 μm $\times$ 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 $\times$ 630 μm (w/ 10 $\times$ objective lens)
- CCD: 5 M pixels

Off-Axis Optics

- For easy sample navigation
 - Field of view: 4.4 mm $\times$ 3.3 mm (w/ 2 $\times$ objective lens)
 - Field of view: 180 μm $\times$ 130 μm (w/ 50 $\times$ objective lens)
- CMOS: 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.)

- 300 mm system: 3,854 mm $\times$ 1,582 mm $\times$ 2,228 mm (3,995 kg)

Required Environment

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

* Requires additional options

** Consult with Park Systems

