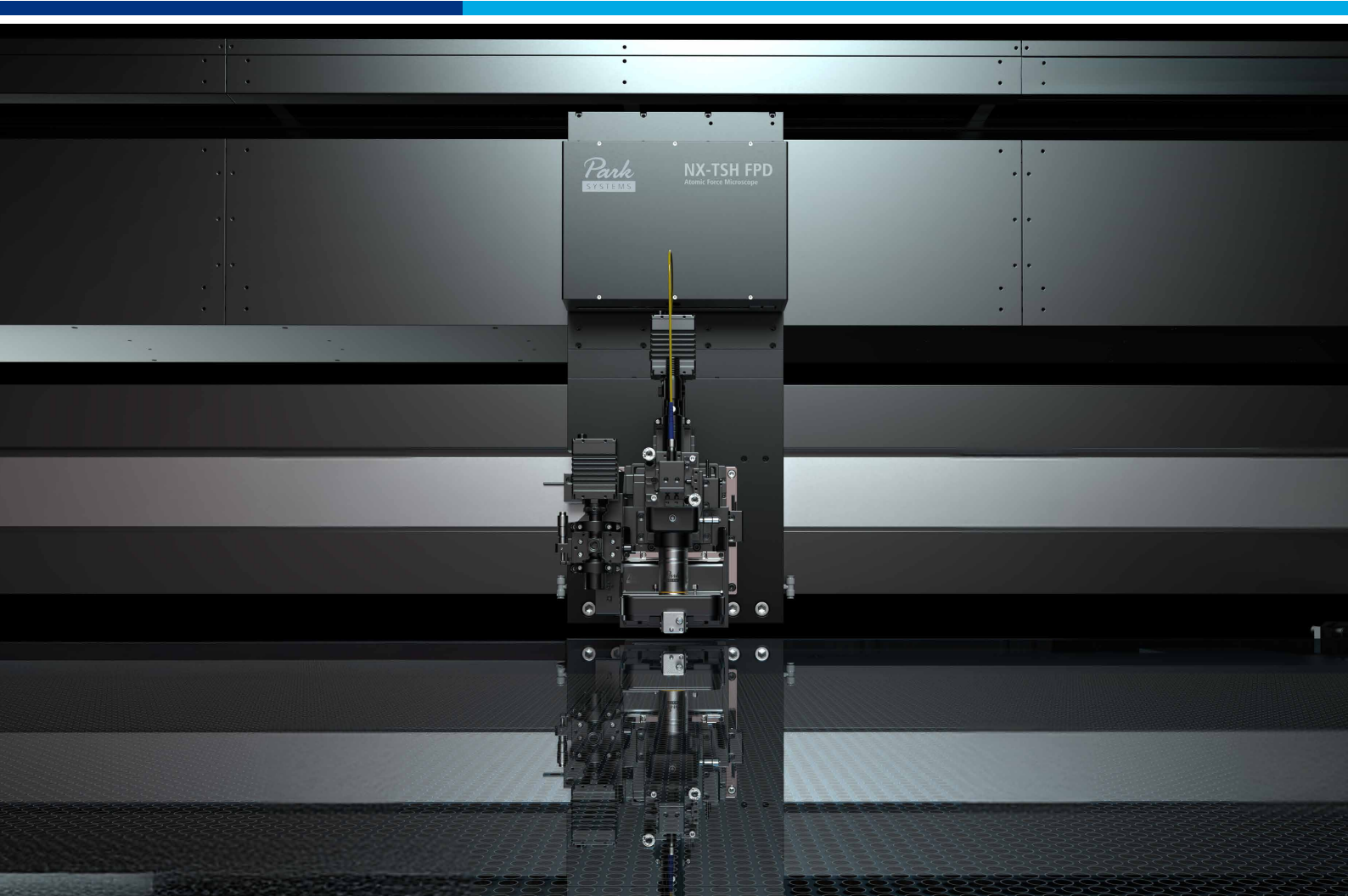


Park NX-TSH FPD

Industry's Leading AFM for Flat Panel Display
Ultra Large and Heavy Sample Metrology Solutions



Park
SYSTEMS

Park NX-TSH FPD series is an in-line AFM systems designed for nanometer-scale metrology on large flat panel display (FPD) glass substrates up to Gen 8.6 (2,290 mm × 2,620 mm). During operation, the measurement module rapidly traverses the glass to each target location, where the Tip Scanning Head (TSH) performs fast, high-precision AFM scans for localized surface analysis. These systems are engineered for seamless integration into display fabrication environments. Built on Park Systems' proven NX AFM platform, NX-TSH FPD series delivers high-accuracy measurements across ultra-large glass areas and is widely adopted by leading display manufacturers for advanced process metrology.

Park NX-TSH FPD

Key Features

Display Fab Integrability

- Fully automated operation through XEA software with an intuitive UI
- Fab Host Communication via CIM (Computer Integrated Manufacturing)
- Dual (upper/lower) FFU configuration for controlled enclosure cleanliness

Engineered for Large-Format Glass Substrates

- Stationary substrate with fast-moving measurement module
- High-precision surface measurement via Tip Scanning Head (TSH)
- Ultra-flat sample chuck with sub-20 µm flatness control

High-Precision AFM Technology

- Minimized out-of-plane motion through a decoupled XY and Z scanner architecture
- True Non-contact™ mode preserves tip shape and extends tip lifetime

Versatile Applications

- Comprehensive 3D nanometrology



Park NX-TSH FPD

Display Fab Integrability

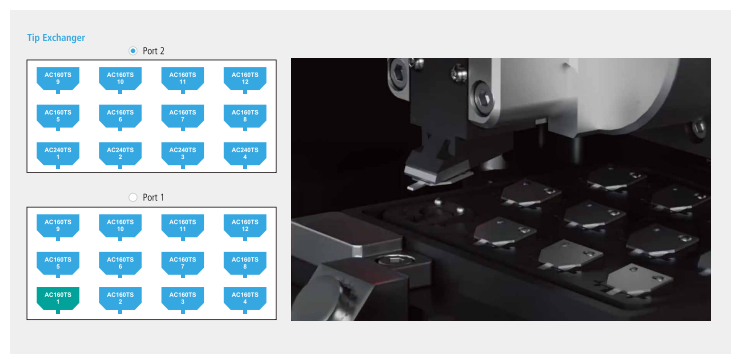
Fully Automated Operation

The NX-TSH FPD enables fully automated operation from glass handling to measurement and analysis. The system automatically receives a recipe from the host, performs end-to-end automation, including selecting the appropriate probe, scanning multiple target areas, analyzing measurement data, and generating reports.



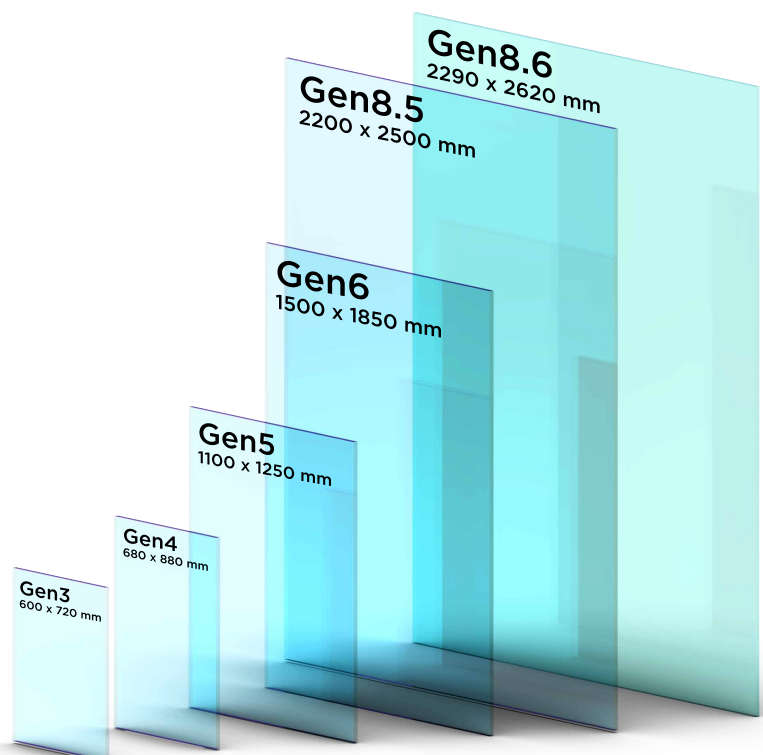
Automatic Probe Exchange

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).



Designed for OLED, LCD and Other Large Sample Analysis

Park Systems has expanded its AFM capabilities to support large flat panel displays up to Gen 8.6 and beyond with Park NX-TSH FPD. It provides a scan range of up to 100 μm $\times$ 100 μm in the XY direction and 15 μm in the Z direction, enabling precise analysis of large display samples. The system also features a flexible chuck designed to accommodate large and heavy glass substrates, making it ideal for OLED, LCD, and other large-sample analyses.

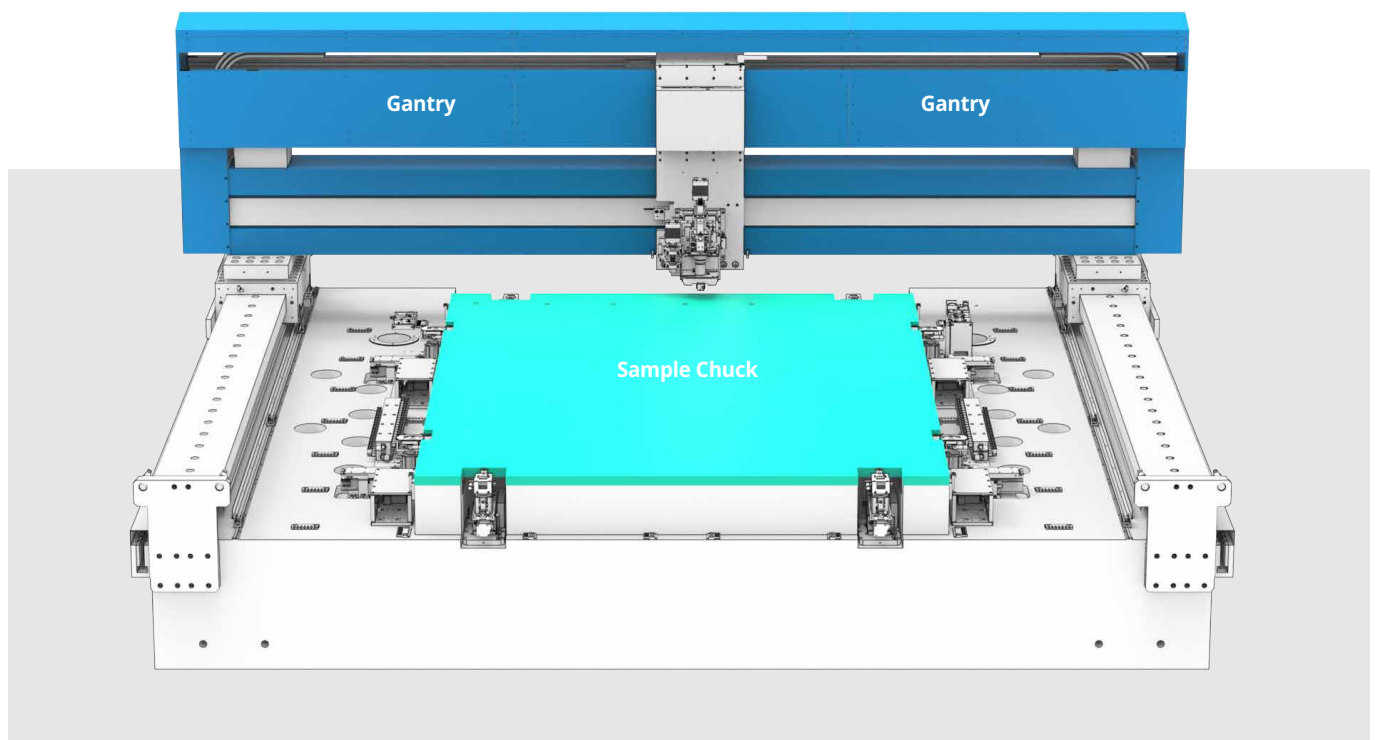


Park NX-TSH FPD

Display Fab Integrability

Stationary Substrate with Fast-Moving Measurement Module

The NX-TSH FPD enables nanometer-scale topography measurement on large glass substrates. Due to the considerable size and weight of the glass, the substrate is loaded onto the sample chuck via the EFEM and remains stationary throughout operation, while the measurement module rapidly traverses to the target coordinates using an air-bearing and linear motor system. The Tip Scanning Head within the measurement module then performs high-precision scanning. Additionally, by individually controlling eight separate sample chucks, the NX-TSH FPD maintains an ultra-flat sample chuck surface with an overall flatness of less than 20 μm .

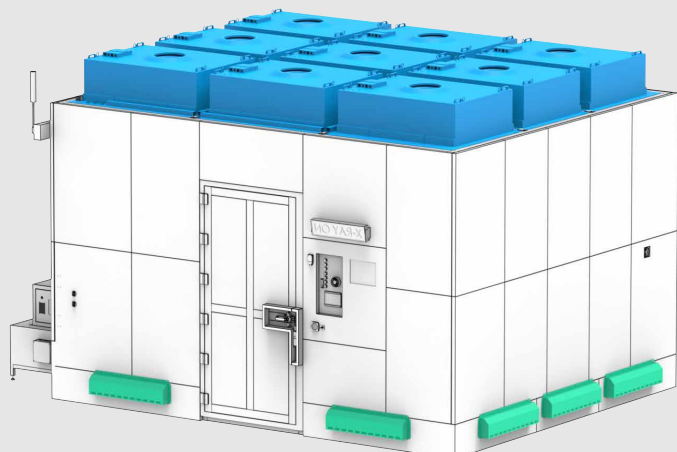


Fab Compatibility

The NX-TSH FPD ensures optimal compatibility with cleanroom environments in display fabs. The system utilizes dual engineered fan filter units (FFUs) to generate a consistent downflow, maintaining cleanliness within the equipment and preventing particle contamination on the glass surface.

With this design, the NX-TSH FPD achieves ISO Cleanliness Class 1 (ISO 14644-1) (≤ 10 particles/ $\text{m}^3 \geq 0.1 \mu\text{m}$ and ≤ 2 particles/ $\text{m}^3 \geq 0.2 \mu\text{m}$) and minimizes particle contamination along the glass movement path through an optimized ventilation system, while maintaining efficient noise shielding.

Top FFU: 9EA (ULPA Filter)



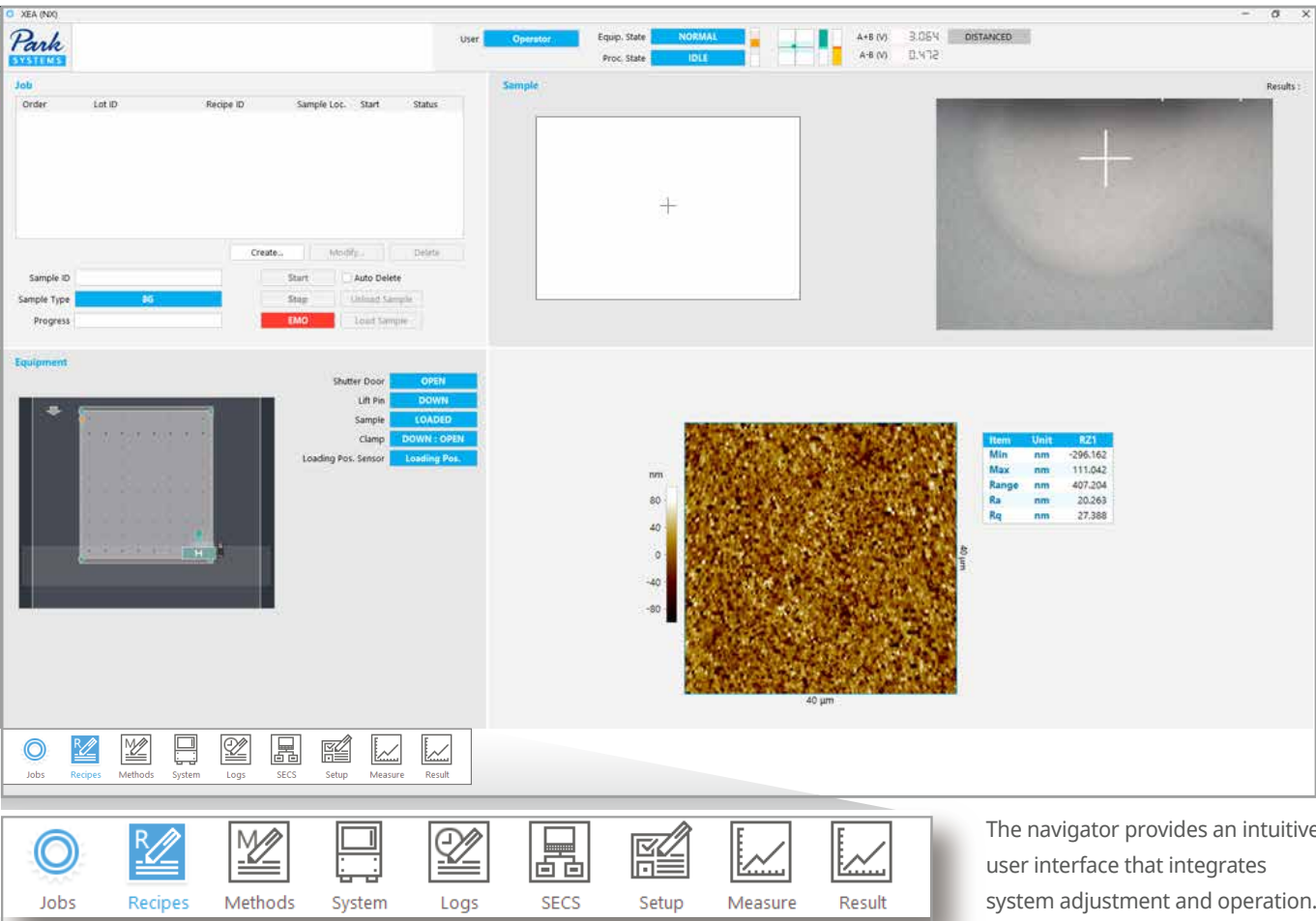
Bottom FFU: 10EA (Exhaust Fan)

Park NX-TSH FPD

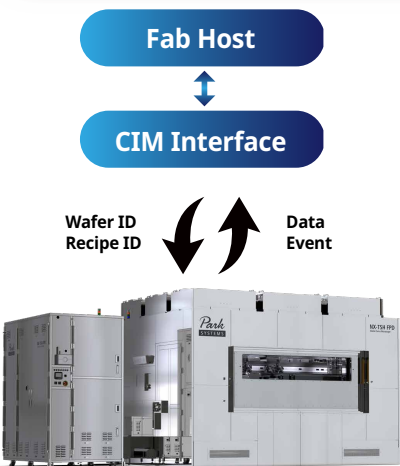
Display Fab Integrability

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.



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



Fab Host Communication via SECS/GEM Protocol

The system enables Fab host communication via the Computer Integrated Manufacturing (CIM) communication configured to customer-specific protocols. Various sensor data are uploaded to the Fault Detection & Classification (FDC) system.

Fab Compatibility

The NX-TSH FPD series ensures optimal compatibility with cleanroom environments in display fabs. The system achieves ISO Cleanliness Class 1 (ISO 14644-1) (≤ 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 glass movement path through its engineered fan filter unit (FFU) and ventilation system, while maintaining efficient noise shielding. Additionally, the system is equipped with advanced monitoring capabilities that can detect and alert users to potential fire hazards or voltage sags.

Park NX-TSH FPD

Park High-Precision AFM Technology

Tip Scanning Head (TSH) System

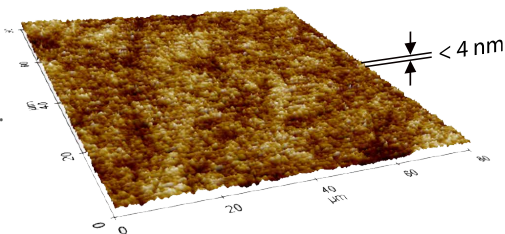
The sample is secured on the chuck while the gantry-mounted tip scanning head moves to desired measurement positions on the sample surface. This tip scanning approach eliminates sample size and weight limitations. The tip scanning head features a fully decoupled XY scanner and Z scanner, enabling precise control in each direction



Optical Flat (80 μm × 80 μm)

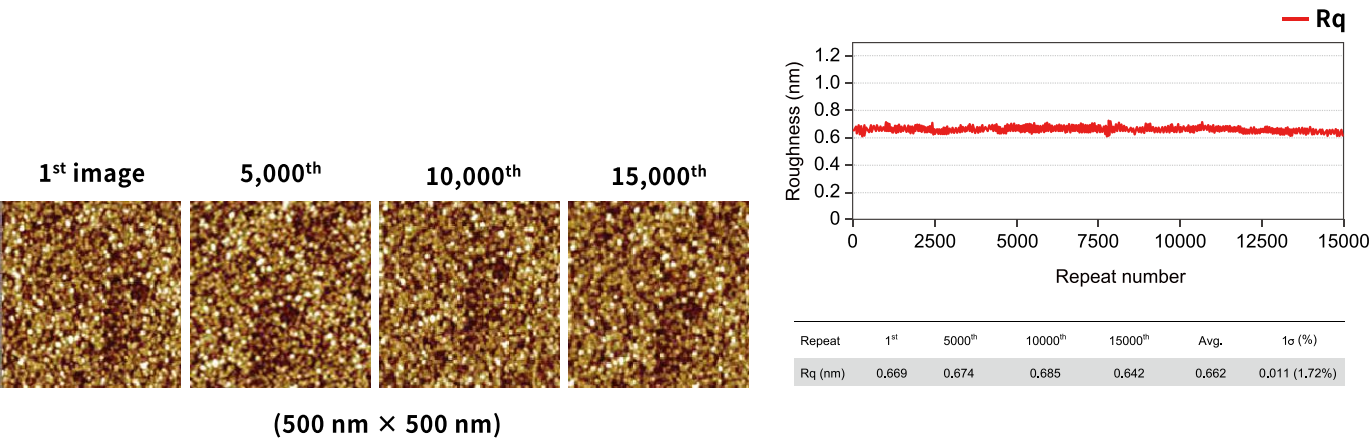
Decoupled XY and Z Scanner System

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



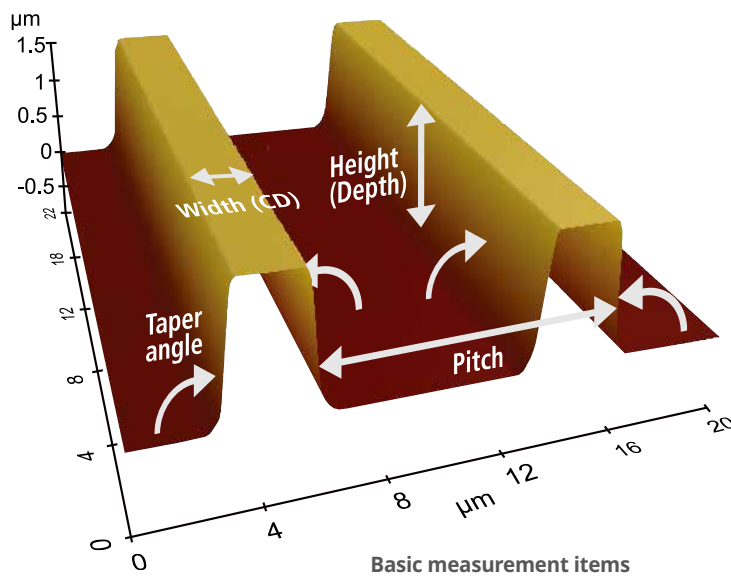
True Non-Contact™ Mode

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-TSH FPD

Versatile Application



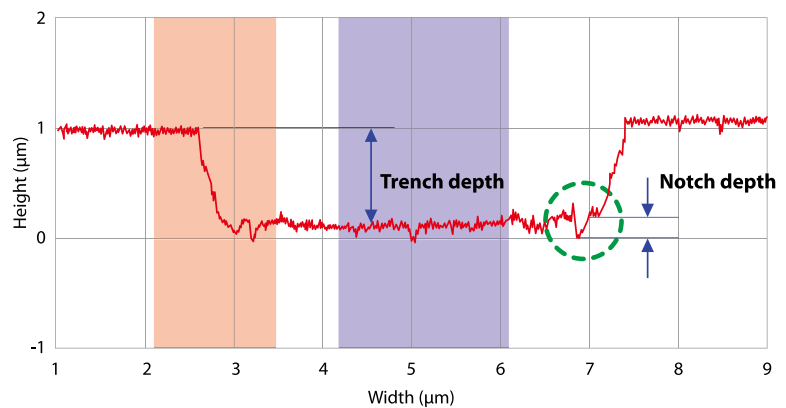
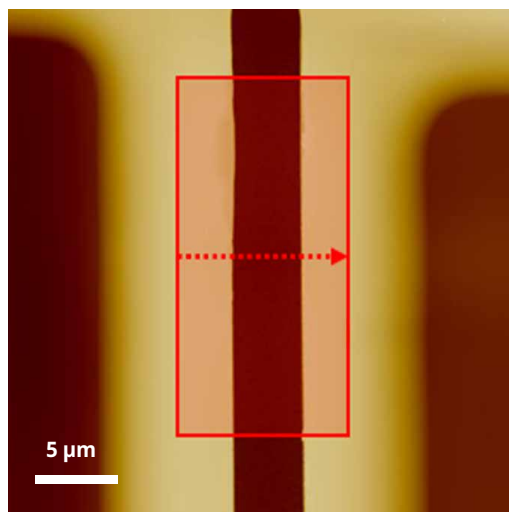
Comprehensive 3D Nano-Metrology

Park AFM precisely measures width (critical dimension), pitch, height (depth), taper angle (side wall angle), and surface roughness.

- Width (CD) & Pitch
- Height (Depth)
- Taper angle (Side wall angle)
- Surface roughness

Advanced OLED Backplane Metrology

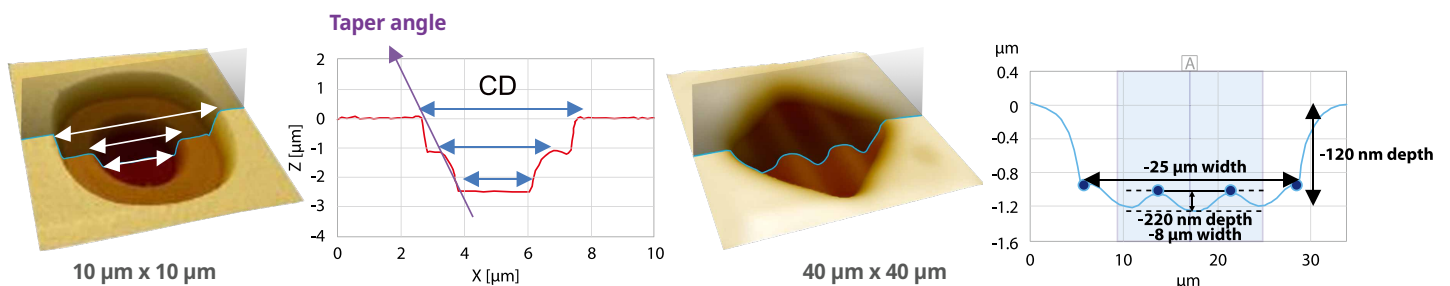
NX-TSH FPD is used for TFT backplane measurement in advanced OLED process. Measurement of the trench structure of the TFT backplane is very useful. It is possible to measure and monitor the taper angle, depth, and notch of the trench structure.



- Width $\sim 4 \mu\text{m}$
- Taper angle $65\sim 75^\circ$
- Height $\sim 1 \mu\text{m}$
- Notch $\sim 0.2 \mu\text{m}$

Thin Film Transistor (TFT) Backplane Metrology

NX-TSH FPD series is used to measure various structures and layers of TFT backplane. It can measure various hole structures that can monitor contact performance. Width (CD) and height measurements are possible for lines of various layers, and roughness measurements are also possible.



Park NX-TSH FPD

Technical Specifications

AFM Modes

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

Tip Scanning Head

- XY scan range (90 µm × 90 µm)
- Z scan range (15 µm)

On-Axis Optics

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

Off-Axis Optics

- Large field of view for easy sample navigation
- Field of view: 10.5 mm × 8.8 mm (w/ 0.8× objective lens)
- CMOS: 5 M pixels

Automatic Tip Exchanger

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

Sample Handling Capability

- Max. 2290 mm × 2620 mm *

Dimension and Weight (Approx.)

- NX-TSH1518 for 6 G glass (1,500 mm × 1,850 mm)
 - 5,645 mm × 4,020 mm × 3,992 mm (22.7 ton)
- NX-TSH2225 for 8.5 G glass (2,200 mm × 2,500 mm)
 - 6,280 mm × 4,337 mm × 4,050 mm (40.0 ton)
- NX-TSH2326 for 8.6 G glass (2,290 mm × 2,620 mm)
 - 6,501 mm × 4,850 mm × 4,100 mm (51.0 ton)

Required Environment

- Room Temperature (Stand By): 10 °C–40 °C
- Room Temperature (Operating): 18 °C–24 °C
- Humidity: 30%–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, 3-phase, 50/60 Hz
- Ground Resistance: Below 1 Ω

