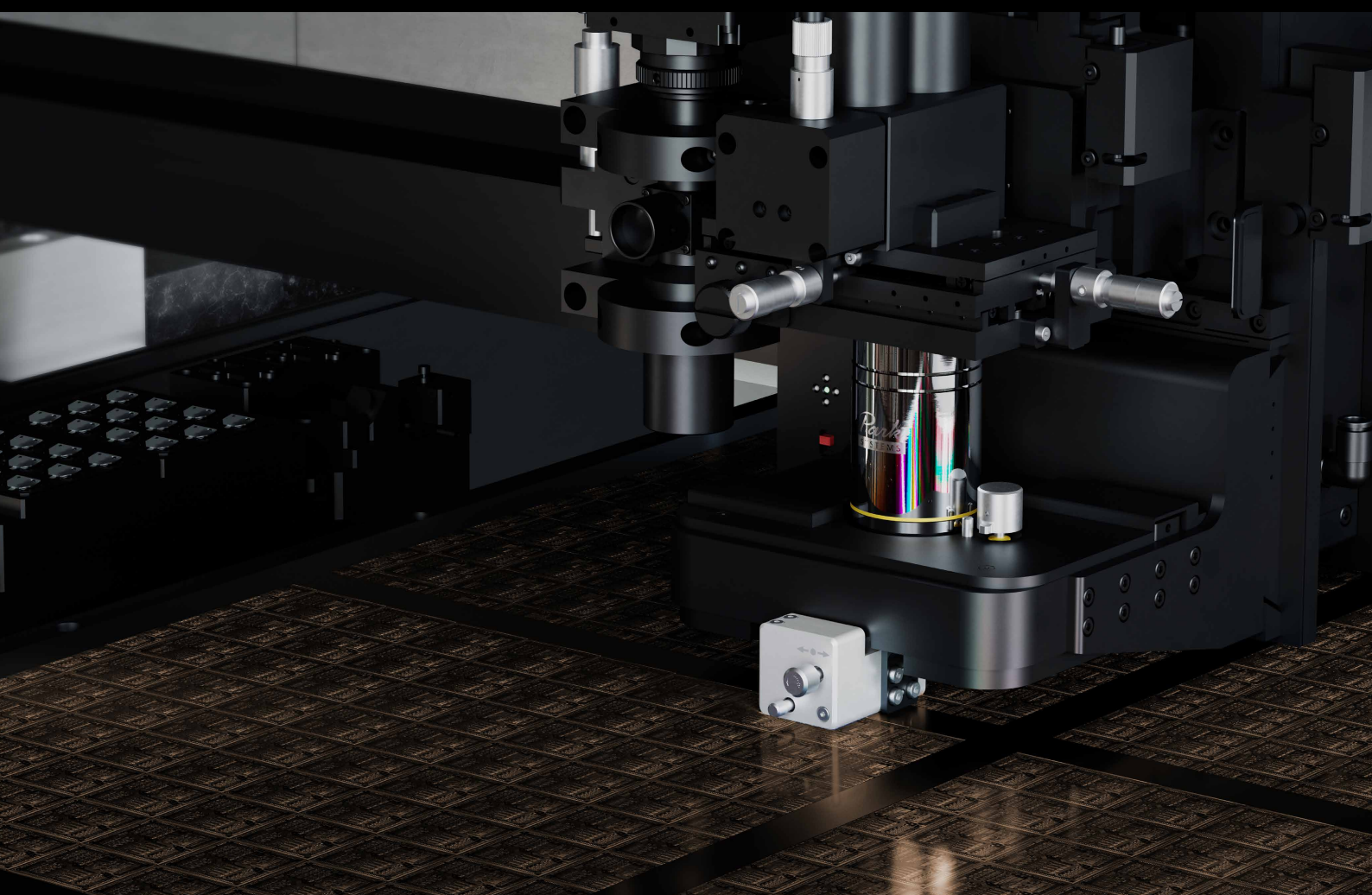


# Park NX-TSH600

Industry's Leading Automated AFM  
for Panel Level Packaging



*Park*  
SYSTEMS

Park NX-TSH600 is an advanced atomic force microscope designed for seamless integration into semiconductor panel level packaging environments, capable of accurately measuring samples up to 600 mm × 600 mm. Leveraging Park Systems' proven AFM technology, the NX-TSH600 delivers reliable nanoscale measurement capabilities with full compliance with SEMI standards and complete automation. NX-TSH600 is trusted by leading global semiconductor manufacturers and actively deployed in PLP production, with its installed base continuing to grow.

## Park NX-TSH600

### Key Features

#### Semiconductor Fab Integration

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

#### 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 nano-metrology
- Roughness measurement on various panels

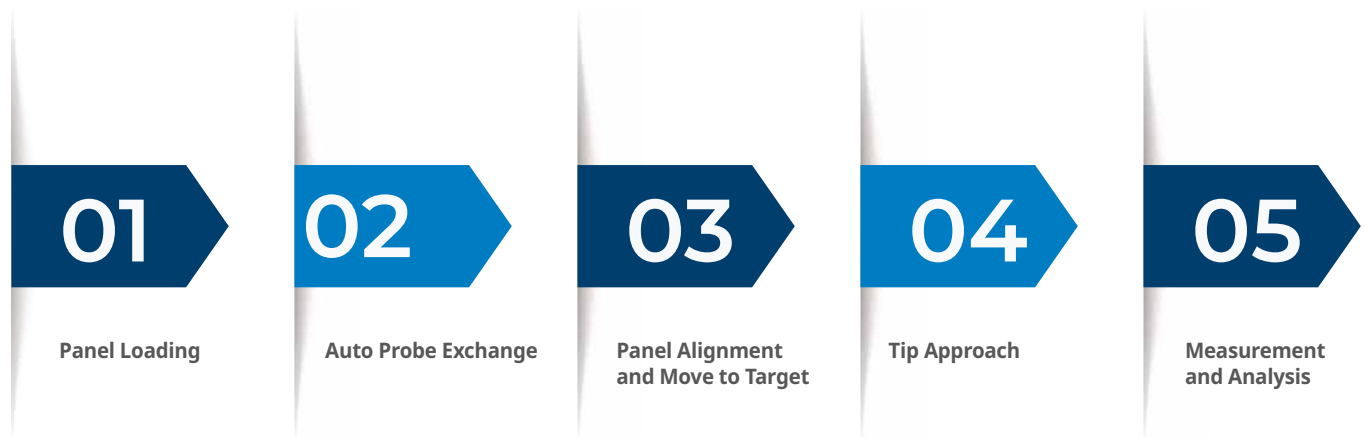


# Park NX-TSH600

## Semiconductor Fab Integration

### Fully Automated Operation

The NX-TSH600 enables fully automated operation from panel handling to measurement and analysis. The system automatically receives a recipe from a host, performs end-to-end automation, including selecting the appropriate probe, scanning multiple target areas, analyzing measurement data, and generating reports.



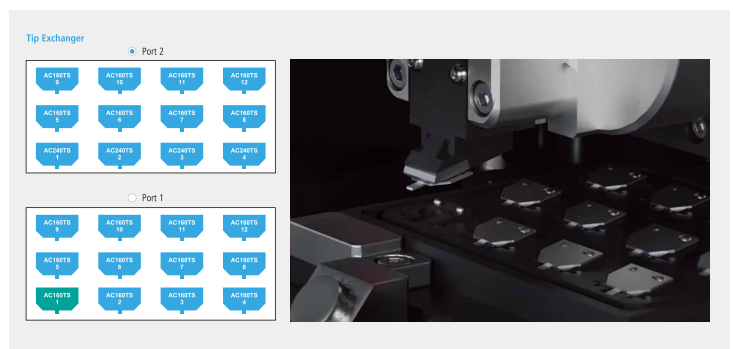
### Automated Panel Handling Capability

Panel 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 panels.



### 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).



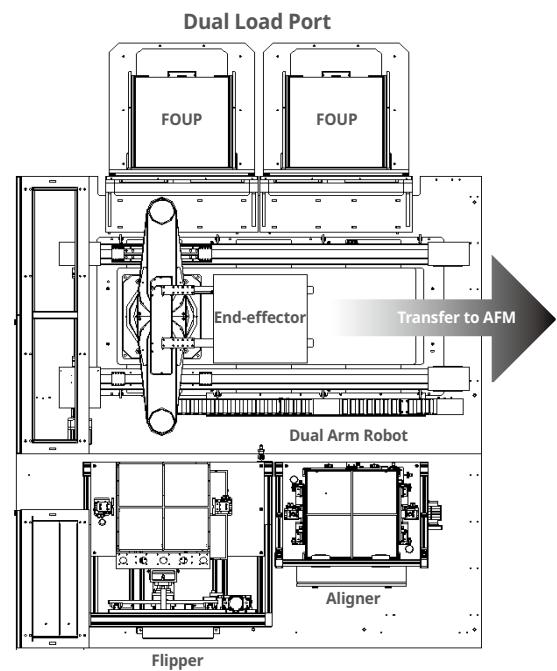


# Park NX-TSH600

Semiconductor Fab Integration

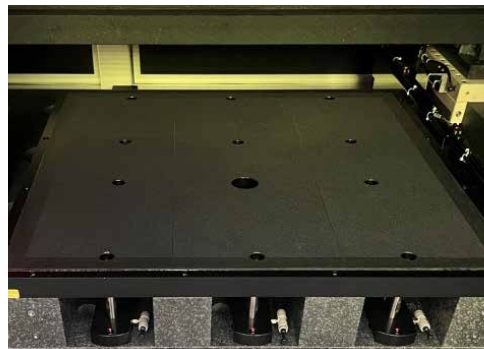
## Equipment Front End Module (EFEM)

The NX-TSH600 is equipped with an EFEM featuring dual load ports and a dual arm robot for efficient panel handling. The pre-aligner precisely positions samples at the center and rotates them to the desired angle, while ID readers recognize sample IDs to determine the type and orientation of each sample. An automated flipper enables AFM measurements on both the front and back sides of the panel.



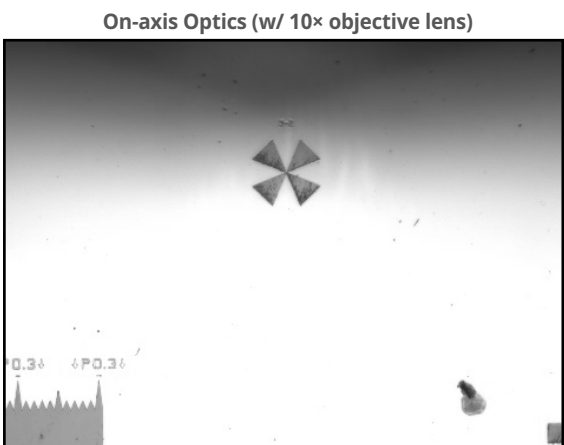
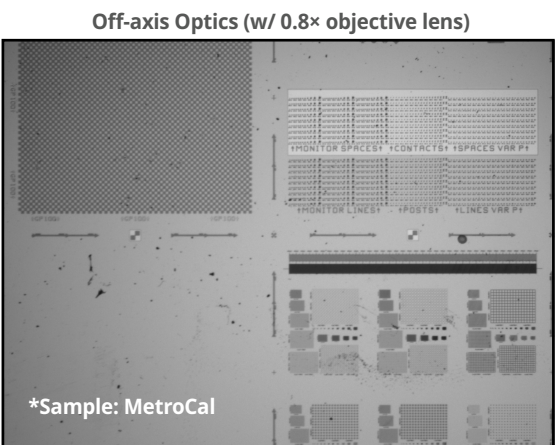
## Sample Chuck for Panel Samples

The sample chuck is composed of a ceramic cell with evenly distributed pores, enabling uniform vacuum application across the entire surface to securely hold large PLP samples.



## Off-axis Optics for Panel Alignment

The NX-TSH600 is equipped with off-axis optics featuring a 0.8× objective lens for easy identification of fiducial marks across wide PLP sample areas. The on-axis optics with a 10× objective lens enables zoomed-in views of fine sample patterns, allowing quick and precise identification of desired measurement locations.



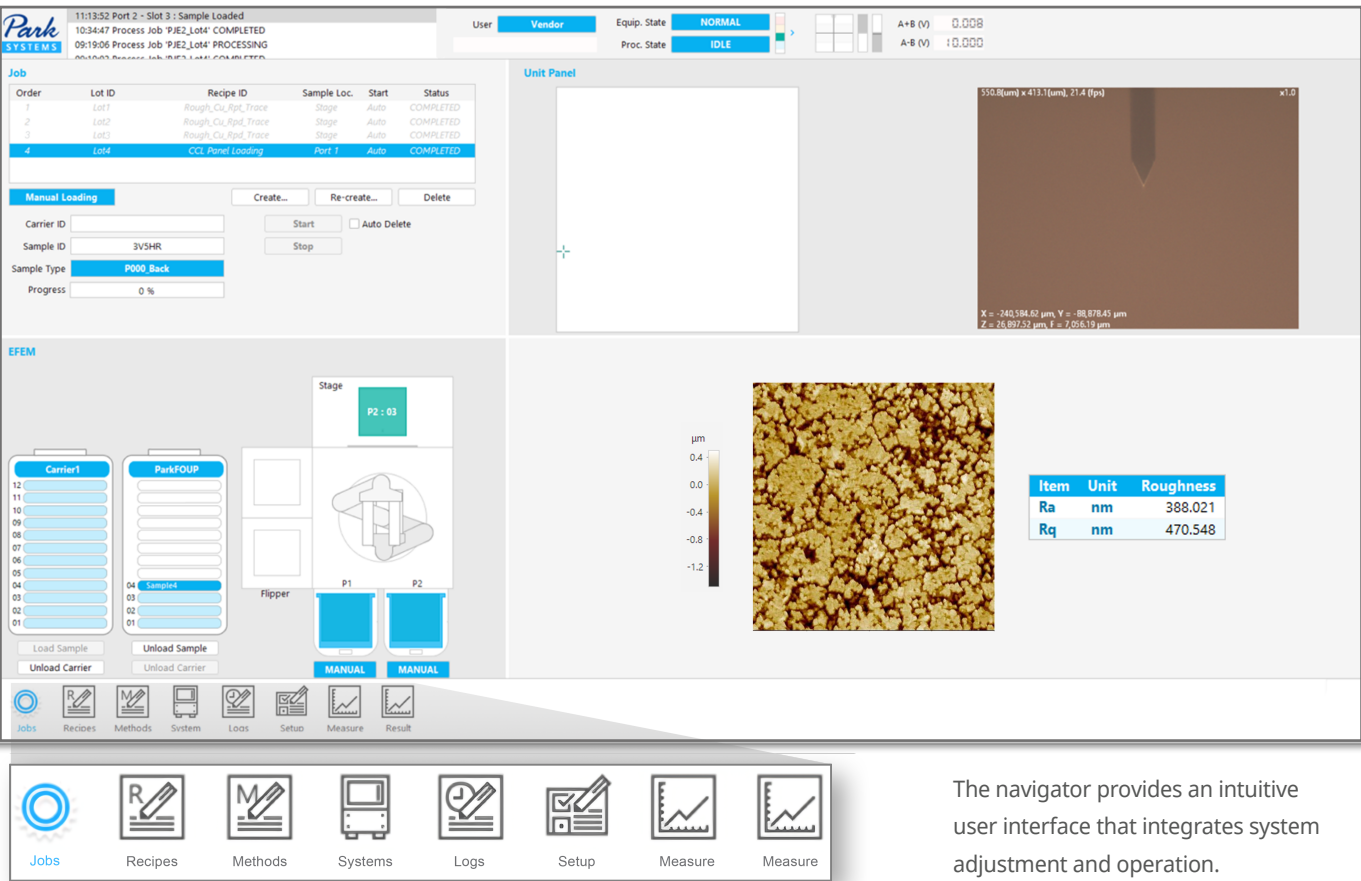


# Park NX-TSH600

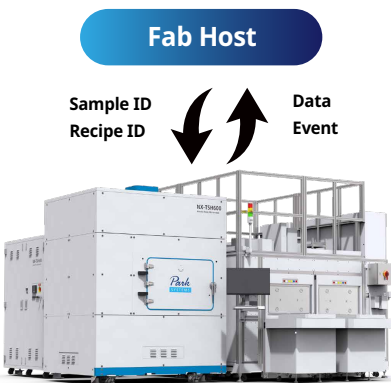
## Semiconductor Fab Integration

### 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 SECS/GEM protocol, ensuring full compliance with SEMI standards, including E30, E40, E87, E90, E94, and E84 PI/O for AMHS integration.

### Fab Compatibility

The NX-TSH600 ensures optimal compatibility with cleanroom environments in semiconductor fabs. The system achieves ISO Cleanliness Class 1 ( $\leq 10$  particles/ $m^3 \geq 0.1 \mu m$  and  $\leq 2$  particles/ $m^3 \geq 0.2 \mu m$ ) and minimizes particle contamination along the panel movement path through its engineered fan filter unit and ventilation system, while maintaining efficient noise shielding. Furthermore, the system is equipped with advanced monitoring capabilities that can detect and alert users to potential fire hazards or voltage sags.

# Park NX-TSH600

## Park High-Precision AFM Technology

### Tip Scanning Head (TSH) System

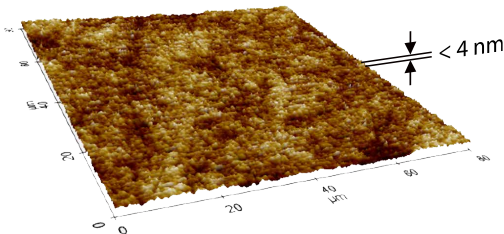
The sample is secured on the chuck while the gantry-mounted tip scanning head moves to desired measurement positions on the sample surface. This tip scanning approach eliminates sample size and weight limitations. The tip scanning head features a fully decoupled XY scanner and Z scanner, enabling precise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



Optical Flat (80 μm × 80 μm)

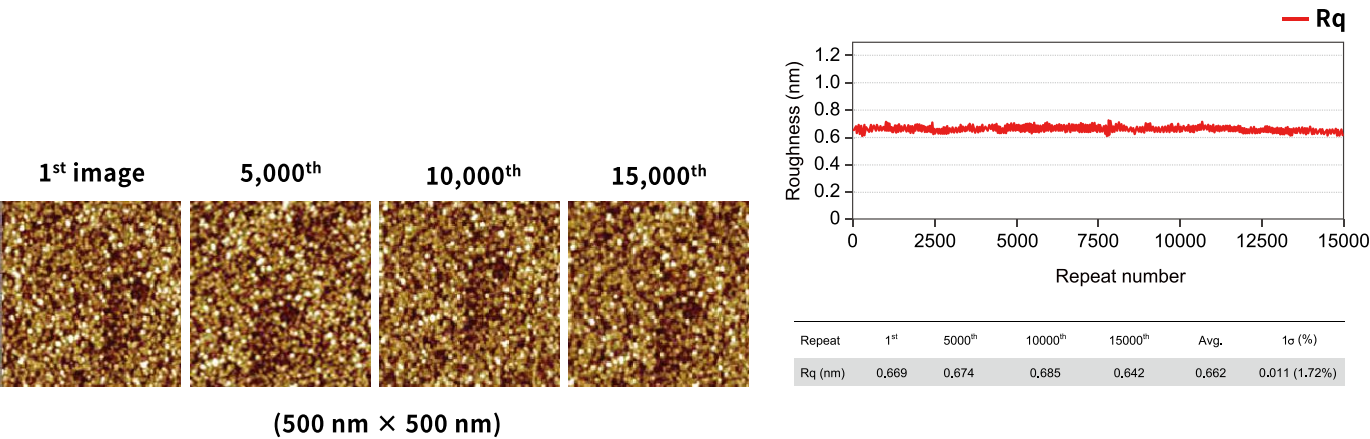
### Decoupled XY and Z Scanner System

The separate 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



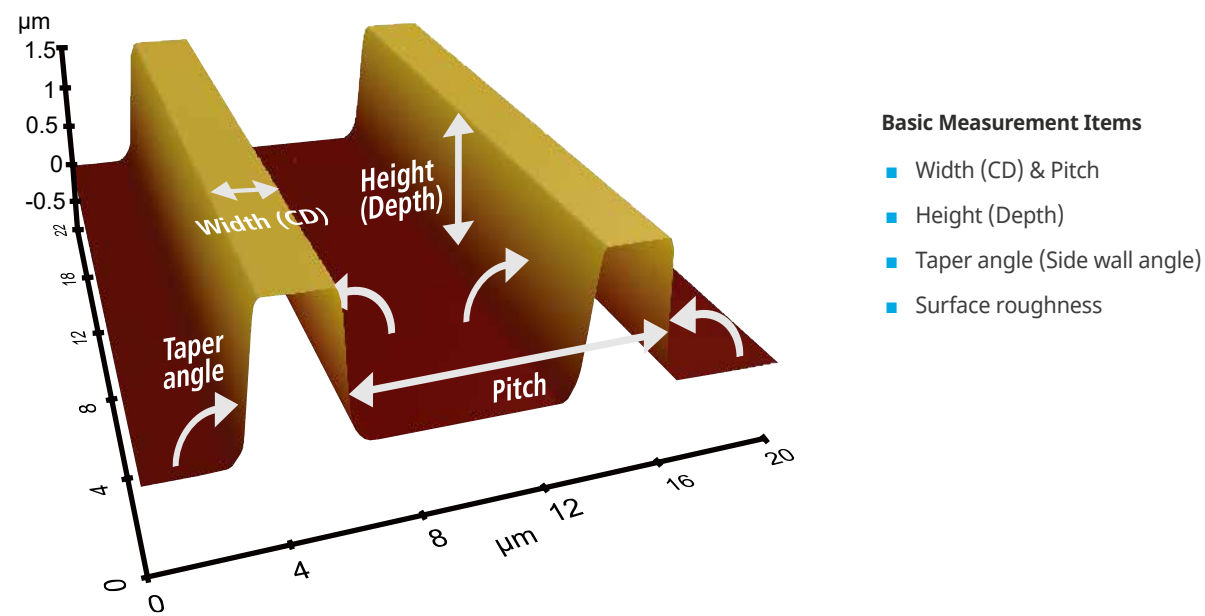
### True Non-Contact™ Mode

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.



Comprehensive 3D Nano-Metrology

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



Roughness Measurement for Various Panels in PLP

The NX-TSH600 is used for surface roughness measurement in Panel Level Packaging (PLP) process. The PLP process uses samples of various thicknesses and materials. Measuring the surface roughness of each sample is essential to improving and managing adhesion across a wide range of samples.

| Sample Material |                | Rough Copper | Smooth Copper | ABF* (inside the panel) |
|-----------------|----------------|--------------|---------------|-------------------------|
| AFM Image       |                |              |               |                         |
| Roughness       | R <sub>a</sub> | 388.0 nm     | 46.3 nm       | 90.7 nm                 |



# Park NX-TSH600

## 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 glass position mark
- 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 \*

- 515 mm × 510 mm panel (max. 600 mm × 600 mm)

### Dimension and Weight

- 4,682 mm × 4,718 mm × 2,795 mm (8,355 kg)

### 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
  - AFM: 208-240 V, single phase, 50/60 Hz
  - EFEM: 208 V, 3-phase + N
- Ground resistance: Below 1 Ω

