

Dimension Edge with ScanAsyst

- Most Accessible High-Performance AFM

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The Dimension Edge™

Atomic Force Microscope

(AFM) incorporates Bruker's

PeakForce Tapping™

technology to provide the

highest levels of performance,

functionality, and accessibility in its class. Based on the Dimension Icon® platform,

the Edge system has been designed from top to bottom to deliver the low drift and low noise necessary to achieve publication-ready data in minutes instead of hours, all

at price points well below expectations for such performance. ScanAsyst® imaging, integrated visual feedback, and preconfigured settings enable expert-level results

simply and consistently, making the most advanced large-sample atomic force microscopy capabilities and techniques available to every facility and user.



Highest Productivity for Any User

- Proprietary ScanAsyst imaging enables instant expert results
- High-resolution, 5MP camera and integrated stage control provide fast sample navigation and efficient multi-site measurements
- Linear workflow and seamless transition from survey to highest resolution delivers accurate results in a short time

Best Value Closed-Loop Dimension AFM

- Proprietary sensor design achieves closed-loop accuracy with open-loop noise levels
- Significantly reduced noise and drift values bring small-sample imaging performance to a large-sample AFM
- Modular microscope and electronics design enable high image fidelity at moderate cost

Solutions for All Applications on Any Sample

- Open stage access accommodates wide variety of experiments and samples
- New instrument design and software take full advantage of Bruker's full suite of AFM modes, including advanced electrical and electrochemical applications
- Built-in access to signal routing enables custom measurements to take research in new directions

● Streamlined Access to Top AFM Performance

Expert AFM Made Easy

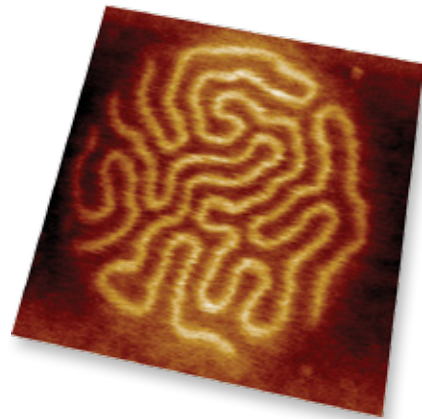
Dimension Edge utilizes ScanAsyst, the world's first automatic image optimization technology for atomic force microscopy. This patent-pending innovation uses intelligent algorithms to automatically and continuously monitor image quality and make the appropriate parameter adjustments. This frees researchers from the complex and tedious task of adjusting setpoints, feedback gains, and scan rates, making imaging as easy as simply selecting a scan area and scan size for almost any sample, in air or fluid.

ScanAsyst is based on Bruker's revolutionary PeakForce Tapping technology, which performs a very fast force curve at every pixel in the image. The peak force of each of these curves is then used as the imaging feedback signal. This allows it to operate at even lower forces than TappingMode, which helps protect delicate samples and tips and provides streamlined access to top AFM capabilities

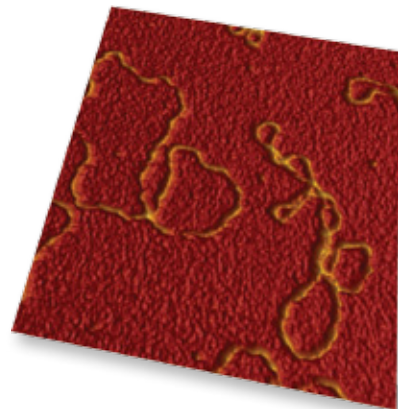
Closed-Loop Accuracy at Open-Loop Resolution

Dimension Edge leverages the many innovations of the Dimension Icon system to provide astounding performance in a mid-priced AFM. At the heart of this system's capabilities is Bruker's renowned closed-loop scanner. Incorporating temperature-compensating position sensors and driven by modular, low-noise control electronics, this tip-scanning component reduces closed-loop positioning noise levels to the length scale of a single chemical bond.

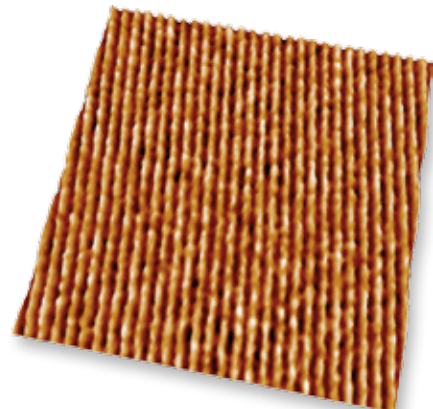
To maximize this benefit, the scanner is mounted to a rigid, drift-compensated bridge structure that features FPGA-based thermal control and provides fast stabilization to ultra-low drift rates. Thus, Dimension Edge combines the productivity, accuracy, and sample versatility of a large-sample, closed-loop platform with the acquisition of high-resolution images traditionally only achieved by small-sample, open-loop instruments. The result is superior image fidelity on any sample, to reveal previously unseen aspects in your research.



ScanAsyst image of polymer brush.
Image size 200nm.



In situ ScanAsyst image of DNA in buffer solution.
Image size 500nm.



Closed-loop phase image of $C_{36}H_{74}$ alkane on HOPG. Individual lamellae clearly visible with spacing (~ 4.5 nm) consistent with length of $C_{36}H_{74}$ chains in all-trans configuration.
Image size 130nm.

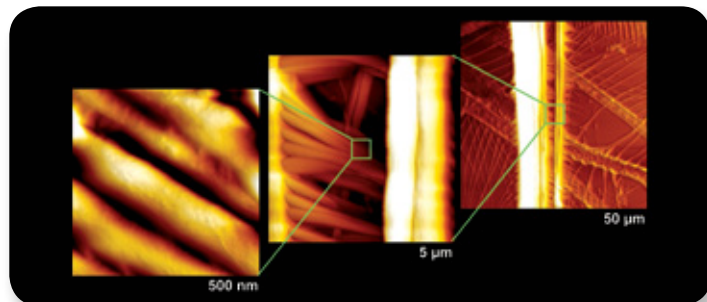
New Standard in Time to Publication-Ready Data

With more published research results than any other large-sample AFM, the Dimension® AFM platform is widely recognized as the industry leader in productivity. With ScanAsyst, streamlined software workflow, and user-friendly design, Dimension Edge raises the bar yet again. The software ensures the most efficient setup in both basic and advanced modes, while providing integrated real-time control of the motorized stage and high-resolution optics, including programmed stage movement for automated, multi-site measurements.

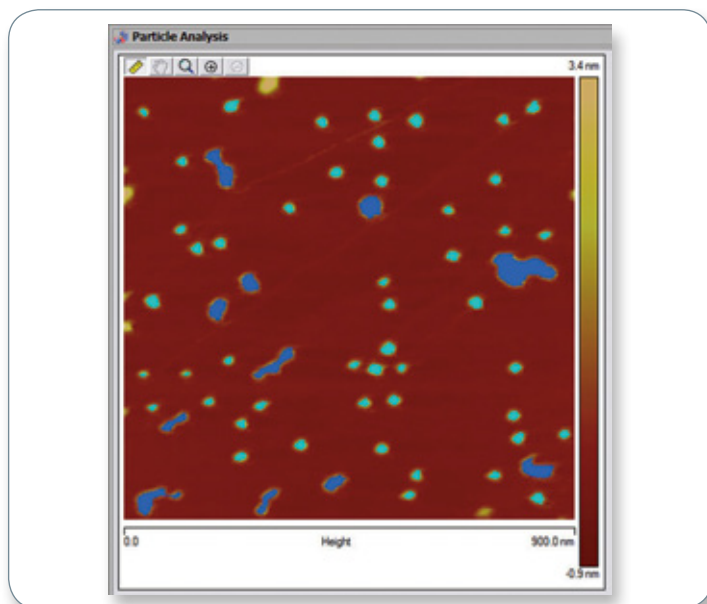
The hardware combines high performance with easy sample access to seriously accelerate your time to expert-level data. The Dimension Edge features a seamless path from sample placement through optical identification of the region of interest, continuing from AFM survey mode to zoomed-in feature identification. There are no sample-cutting issues, no closed-loop versus open-loop worries, and no lengthy parameter setups or disruptive scanner exchanges. The highest resolution challenges become routine measurements.

Exceptional Versatility

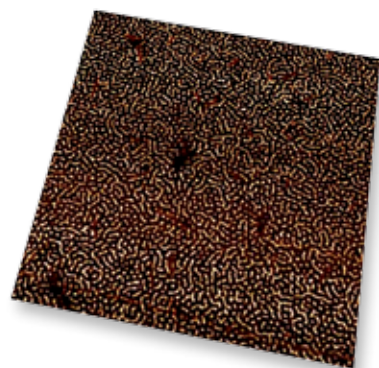
Dimension Edge also offers standard and proprietary AFM modes, as well as application-specific solutions, for such techniques as nanoscale electrical and electrochemical measurements and materials characterization in controlled environments. PeakForce Tapping enabled modes provides instant and unambiguous material contrast on samples such as polymers with an adhesion channel. This functionality enables accurate imaging and single-point spectroscopy for a wide range of applications, from the characterization of solar and semiconductor devices and the mapping of heterogeneous polymer-based materials to in situ imaging of life science samples, and from single molecules to whole cells and the interrogation of individual nanoparticles.



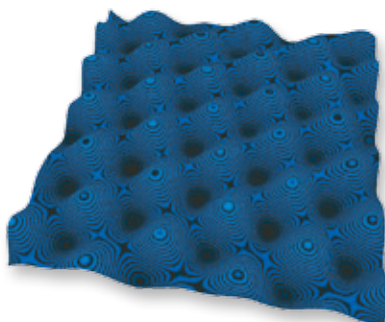
Daphnia are small crustaceans (400 μm to 3mm) that are extremely resistant to environmental factors, such as high pH levels in waters (up to 9.5). The causes underlying this unique resistance are not well known. Therefore studying the nanoscale properties of their carapaces, and why things do not adhere to them, are of particular interest in the development and design of industrial surfaces, as well as for biologists.



A complete set of processing and analysis functions is embedded in the system's architecture. A single mouse click transfers images from real-time to analysis without interrupting ongoing data acquisition. Here, a particle analysis is performed on silver nanoparticles, which are potent and broad-spectrum antimicrobial agents. Image size 900nm. Sample courtesy of Dr. Perry, School of Medicine, Loma Linda University, CA.



Closed-loop phase image revealing the micro-phase separation in a poly(styrene-*b*-butadiene-*b*-styrene) triblock copolymer. Image size of 2 μm.



Contact mode atomic mica lattices. Image size 1.5nm.

• Effective Solutions for Advanced Applications

Electrical Characterization

Utilizing Dark Lift, Dimension Edge goes beyond merely connecting an AFM probe to a low-noise current amplifier. Dark Lift is the only means to distinguish unambiguously intrinsic sample conductivity from photoelectric effects in conductive AFM data. It is based upon Bruker's patented LiftMode™, which has become well known for its capabilities in magnetic and electric force microscopy. The system draws upon both of these to ensure the optimized approach for any electrostatic potential mapping application. Combining Dark Lift with closed-loop (constant depletion volume) scanning capacitance microscopy (SCM) provides the most accurate dopant profiling solution available today. However, if instead researchers want the highest sensitivity to detect small potential variations, then they can easily combine LiftMode with surface potential microscopy. By offering the dual frequency approach, Dimension Edge provides the ideal solution to any electrostatic potential mapping application.

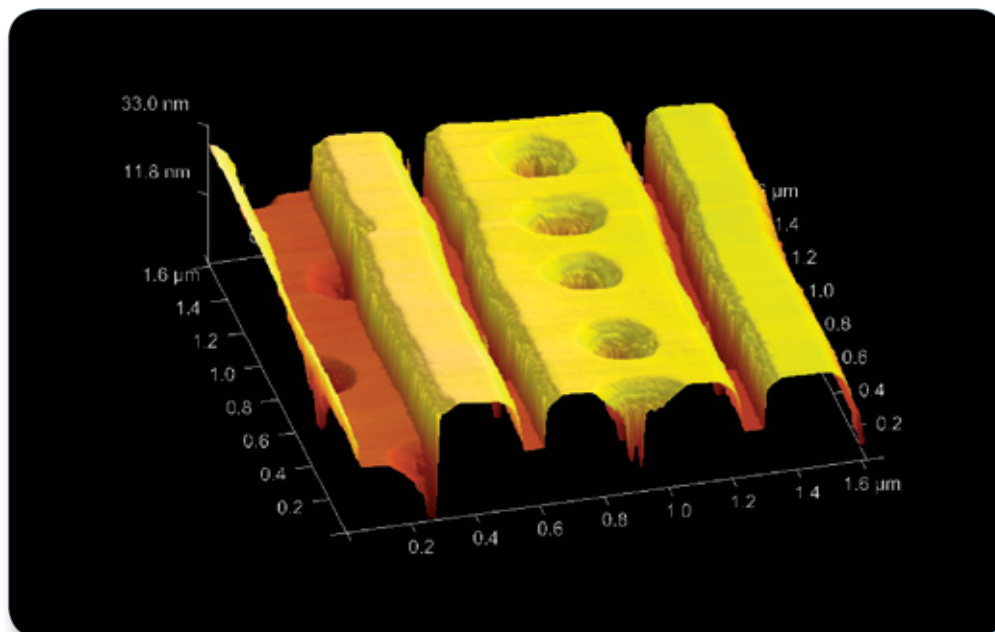


Accurate 2D dopant profiling on SRAM sample using Dark Lift SCM. Image size 15µm.

Controlled Environments

Dimension Edge also offers unique application solutions in mechanical characterization and material mapping. Using the heater-cooler accessory, sample structure and properties can be tracked over a temperature range from -35°C to +250°C in a controlled atmosphere. Alternatively, nanoscale thermal analysis can be performed using local heating up to 400°C. A glovebox configuration can be selected on turnkey solutions for high-end environmental control with <1 pp, O₂ and H₂O levels while guaranteeing high AFM performance, for applications such as organic photovoltaics, lithium battery research, and semiconductors.

Biological specimens can be interrogated in situ simply and effectively with the combination of the liquid accessory and ScanAsyst, which provides the easiest available liquid imaging. The system's closed-loop control on all axes ensures the most accurate force ramps with thermal tune, which provides force calibration, as well as simplified resonance identification in liquid.



Closed-loop topography map of a kerf test structure showing contact holes inside dual-damascene trenches. The combination of the Dimension scanner and a Bruker FIB probe enabled mapping of this challenging geometry without damage to the probe tip.

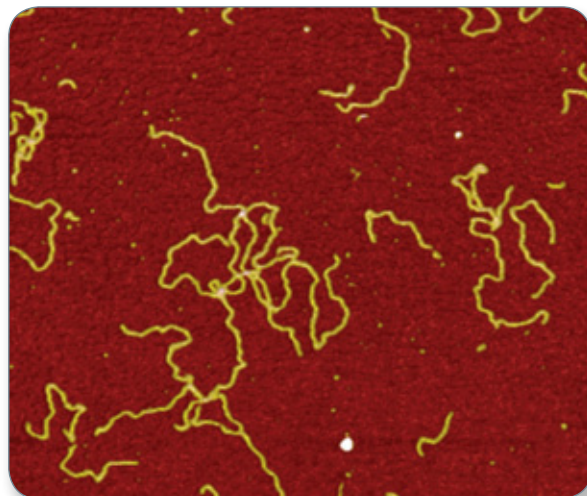
Easy Access and Control

The large sample stage of the Dimension Edge is not only motorized and programmable for efficient multi-site measurements, but it also lets you fit more types of samples directly under the AFM scanner with less preparation time. The physically open access to the probe-sample junction enables more direct investigation of geometrically challenging device structures, as well as the attachment of electrical connections or other custom experiment accessories. The same streamlined functionality is found in the controller, which provides cost-effective but powerful customization capabilities with its standard internal signal access and user-accessible configuration of signal routing, digital feedback, and dual digital lock-in amplifiers.

High Performance for All

Dimension Edge is about moving quickly in a competitive environment and making steady advances in challenging research. Building on Bruker's proprietary PeakForceTapping technology, its modular low noise digital control electronics, and ergonomic microscope stage, Dimension Edge offers not only high-end AFM performance but also the most efficient setup, even for challenging experiments. Streamlined control of advanced modules from within the main user interface shortens the setup time and learning curve. Likewise, the integrated stage control enables intuitive navigation as well as powerful stage programming.

You will find that every step of your Dimension Edge AFM research follows a logical workflow with linear setup progression, from your first encounter with the graphical interface and experiment selection, through visual status feedback, to direct access to relevant help on each active window. The result is trustworthy, publishable results right away.



In situ closed-loop image of lambda digest DNA on mica, in buffer solution. Image size 2 μ m.



- **Exceptional Productivity for Research & Industry**

Productive, easy-to-use interface.



High-performance AFM is able to investigate the nanometer-scaled organization of the component biopolymers of wheat grain, leading to improved understanding of their relationship to the macroscopic properties of the resulting cereal products. Image size 90 μ m.

With its focus on streamlined access to a new performance level, the Dimension Edge AFM with ScanAsyst represents a new standard of productivity and attainability for the most advanced nanoscale research. Just place a sample on the stage to discover new information about your samples faster than you thought was possible.

Dimension Edge Specifications

X-Y Scan Range	90µm x 90µm typical, 85µm minimum
Z Range	10µm typical in imaging and force ramp modes, 9.5µm minimum
Vertical Noise Floor	<50pm RMS in appropriate environment, typical imaging bandwidth (up to 625Hz)
XY Position Sensor Noise Level (Closed Loop)	<0.5nm RMS typical imaging bandwidth (up to 625Hz)
Z Position Sensor Noise Level (Closed Loop)	<0.2nm RMS typical imaging bandwidth (up to 625Hz)
Sample/Size/Holder	150mm vacuum chuck, 15mm thick; Up to 40mm thick with optional frame spacer
Motorized Positioning Stage (X-Y axis)	150mm x 150mm inspectable area; Programmable for multi-site measurements
Microscope Optics	5-megapixel digital camera; 180µm to 1465µm viewing area; Digital zoom and motorized focus
Signal Access	Configurable I/O signal access built into controller; Includes customizable signal routing, digital feedback, and dual digital lock-in
Single Point Spectroscopy	Three-axis closed loop control for point-and-shoot positioning and ramping; Spring constant calibration with built-in thermal tune
Sample Temperature Control	-35 to +250°C with optional heater/cooler accessory; Includes gas purging capability

AFM Modes

Standard	Contact Mode, Lateral Force Microscopy, TappingMode™, PhaseImaging™, LiftMode, Magnetic Force Microscopy, Electric Force Microscopy, Dark Lift, Force Spectroscopy, Nanoindentation, Nanolithography, Adhesion, ScanAsyst
Optional	Scanning Tunneling Microscopy, Conductive AFM, Tunneling AFM, Scanning Capacitance Microscopy, Surface Potential Microscopy, Piezoresponse Microscopy, Force Modulation Microscopy, Liquid Imaging, Thermal Analysis, Electrochemical AFM
Probes	Visit www.brukerAFMprobes.com to see our ocmprehensive listing of probes, including Bruker-exclusive ScanAsyst probes

Facility Requirements

Vibration Isolation	Vibration isolation table or integrated vibration/acoustic isolation enclosure required
Laser Classification	Class 2M
Certification	CE

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