

AFM
Asylum Research

Jupiter XR Atomic Force Microscope

Large-Sample AFM with Superior Resolution, Speed, Ease of Use, and Flexibility



OXFORD
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DISCOVER

Jupiter XR Eclipses Every Other Large-Sample AFM

Jupiter™ Offers Superior Resolution, Speed, Ease of Use, and Flexibility

The Asylum Research **Jupiter XR** Atomic Force Microscope from Oxford Instruments is the first and only large-sample AFM to offer both high-speed imaging and extended range in a single scanner. Jupiter provides complete 200 mm sample access and delivers higher resolution, faster results, a simpler user experience, and the versatility to excel in both academic research and industrial R&D laboratories.

Highest Performance

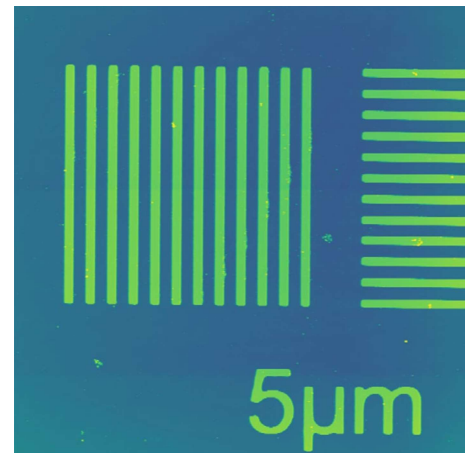
- Higher resolution than any other large-sample AFM
- Extended-range scanner is 5-20× faster than most AFMs and features large 100 μm X-Y & 12 μm Z range
- Exclusive blueDrive™ Tapping Mode gives more reproducible results and simplifies operation

Simpler User Experience

- Fully-motorized laser and detector setup eliminates manual adjustment of knobs
- Fully-addressable, high-speed stage rapidly reaches any point on 200 mm samples
- Sharp top-view optics help you easily locate your precise region of interest
- Go from atoms to large 100-μm scans and use any imaging mode, all with the single XR scanner

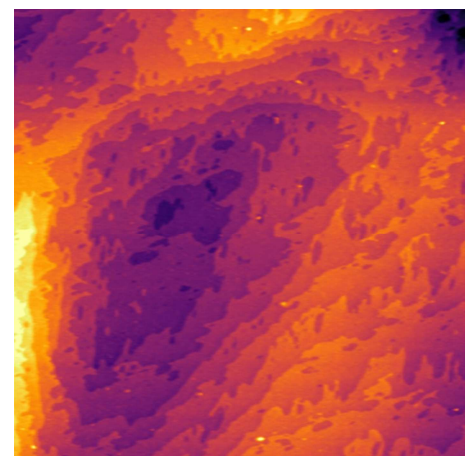
Versatility for Diverse Research Needs

- Support for a full range of imaging modes
- Modular design makes it fast and simple to add accessories and future upgrades
- Flexible software makes routine measurements easy while enabling advanced research



Optical standard, 100 μm scan

The large scan range on Jupiter XR allows it to scan from atomic-level to microscale features, all with a single scanner. This image was acquired with 512 lines in ~4.5 min at 2 Hz line rate.



HF-etched mica, 2 μm scan imaged in 26 s

The atomic layers in mica are a useful scan speed challenge sample—to track the steps accurately, a higher imaging bandwidth is necessary. This image was acquired with 512 lines in 26 s at 20 Hz line rate.

SPECIFICATIONS

Jupiter XR Scanner

X-Y range 100 μm (typical, closed-loop), 90 μm guaranteed

X-Y sensor noise <150 pm

Scan speed depends on samples and scan conditions, but many samples can be imaged at line rates ≥ 20 Hz for scan sizes of ≤ 10 μm with little or no degradation of image quality. Larger scans and rougher samples may require lower scan rates. In typical use, line rates between 5-20 Hz are routine.

Z range 12 μm

Z sensor noise <35 pm

(The X-Y and Z scanners and chucks are fully modular and easily exchanged for future upgrades and accessory options.)

Cantilever Deflection Sensing

Optical detection light source Superluminescent diode (SLD) source. Spot size of ~ 10 μm is compatible with small levers such as the Asylum FS-1500, Nanoworld Arrow UHF, and Olympus AC55 in addition to all conventional probes.

Wavelength 670 nm (nominal)

DC detector noise <10 pm

AC detector noise <30 $\text{fm}\cdot\text{Hz}^{-1/2}$ above 100 kHz

Detector bandwidth DC to 7 MHz

Point-and-click spot positioning and detector adjustment are fully motorized and software controlled.

blueDrive Tapping Mode

Asylum exclusive blueDrive Tapping Mode uses photothermal excitation at 640 nm to excite the cantilever resonance in all AC-based modes. It is included on all Jupiter XR systems. Point-and-click spot positioning and power adjustments are fully motorized and software controlled.

Imaging Performance

DC height noise <25 pm

AC height noise <25 pm

Top-view Bright-Field Optics

Resolution Diffraction limited (<1.5 μm), NA=0.30

Field of view 930 \times 1240 μm

Illumination Intensity, aperture diaphragm, and field diaphragm adjustable from software.

(All noise measurements are quoted as the average deviation measured with a 1 kHz bandwidth over a full 10 seconds at the center of the scanner range. Specifications assume required vibration and acoustic isolation in an appropriate laboratory environment.)

Sample Chuck and Motorized Stage

Sample chuck accommodates samples up to 210 mm in diameter and up to 35 mm tall. Wafer locating pins and vacuum rings are provided for 2 in, 4 in, 5 in, 150 mm, and 200 mm wafers. Eight magnetic mounting points are provided for samples prepared on standard 10-15 mm diameter discs.

Motor Stage allows positioning of any point on a 200 mm wafer under the AFM probe (i.e. fully addressable). Maximum stage velocity is 40 mm/s.

Instrument Isolation

Acoustic Included enclosure provides ~ 20 dB of isolation.

Vibration Active vibration isolators offer superior performance in a wide range of laboratory environments (sold separately).

Included Operating Modes

Basic Modes Contact mode; Force curves; Frequency modulation; Lateral force mode (LFM); Nanolithography and nanomanipulation; Phase imaging; Tapping mode (AC mode); Tapping mode with digital Q control

Nanomechanical Modes AM-FM Viscoelastic Mapping Mode; Bimodal Dual AC; Contact Resonance Viscoelastic Mapping Mode; Force mapping mode (force volume); Force modulation; Loss tangent imaging

Nanoelectrical, Functional & Electromechanical Modes

Electric force microscopy (EFM); Kelvin probe force microscopy (KPFM); Magnetic force microscopy (MFM); Dual AC Resonance Tracking (DART) piezoresponse force microscopy (PFM); Switching spectroscopy PFM; Vector PFM

Optional Operating Modes

Conductive AFM (CAFM) with ORCA™ and Eclipse™ Mode; Current mapping with Fast Force Mapping; Fast Force Mapping Mode. Other modes will be supported in future releases. Please inquire if needed.

Optional Accessories

High temperature sample heater; Liquid cell

(A full range of accessories similar to those available on the Asylum MFP-3D AFM family is planned. Please inquire if you have specific requirements.)

Warranty

Standard warranty One-year comprehensive warranty covering all parts and labor.

Extended warranty Asylum offers affordable extended warranties. Inquire for details.

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