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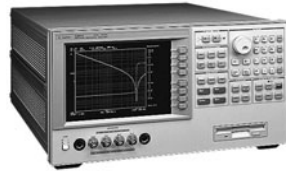
ELECTRONIC INSTRUMENTS IN NANOTECHNOLOGY, NANOSCALE MICROSCOPY

Electronic Instruments used in Nanotechnology	608
Scanning Probe Microscopes/Atomic Force Microscopes for NanoScience Research	610

- Broad portfolio of electronic instruments
- High precision measurements
- Flexible functionality
- Ease of operation



B1500A



4294A



34410A



E4980A



N6705A

Features and Specifications

Semiconductor and Parametric Analyzers

Model	Maximum Force Voltage	Maximum Force Current	Voltage Resolution	Current Measurement Resolution	PC and Software
B1500A Semiconductor Device Analyzer	100 V	100 mA	0.5 μ V	100 aA	Internal (built-in)
4157B Modular Semiconductor Parameter Analyzer	200 V	1 A	0.5 μ V	100 aA	External
4156C Precision Semiconductor Parameter Analyzer	100 V	100 mA	0.2 μ V	1 fA	External
4155C Semiconductor Parameter Analyzer	100 V	100 mA	0.2 μ V	10 fA	External

Impedance and Materials Analyzers

Model	Frequency Range	10% Accuracy Range	Basic Impedance Accuracy	Test Signal Level	DC Bias
4294A Precision Impedance Analyzer	40 Hz to 110 MHz	25 m Ω to 40 M Ω	\pm 0.08%	5 mV to 1 V _{rms} or 200 μ A to 20 mA _{rms}	0 V to \pm 40 V or 0 mA to \pm 100 mA
E4991A RF Impedance/Material Analyzer	1 MHz to 3 GHz	200 m Ω to 20 k Ω	\pm 0.8%	–	0 to \pm 40 V or +100 μ A to +50 mA

Precision LCR and Resistance Meters

Model	Frequency Range	Measurement Range
E4980A Precision LCR Meter	20 Hz to 2 MHz	0.001 f Ω to 999.9999 T Ω
4284A Precision LCR Meter	20 Hz to 1 MHz	0.01 m Ω to 100 M Ω
4285A Precision LCR Meter	75 kHz to 30 MHz	0.01 m Ω to 100 M Ω
4338B Milliohm Meter	1 kHz	10 μ Ω to 100 k Ω

Digital Multimeters

Model	DC Voltage Sensitivity	Resistance Sensitivity	DC Current Sensitivity	Frequency Measurement	Capacitance Sensitivity	Max Digitizing Speed
34410A Digital Multimeter	100 nV	100 μ Ω	100 μ A	3 Hz to 300 kHz	0.1 pF	10 kHz
34411A Digital Multimeter	100 nV	100 μ Ω	100 μ A	3 Hz to 300 kHz	0.1 pF	50 kHz
34420A NanoVolt, Micro-Ohm Meter	100 pV	100 n Ω	–	1 Hz to 10 MHz	–	–
3458A Digital Multimeter	10 nV	10 μ Ω	1 pA	–	–	100 kHz

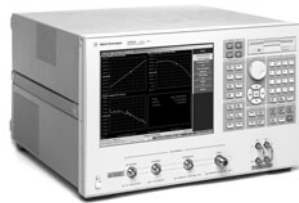
Power Supplies

Model	Power Level	Channels	Voltage Range	Voltage Resolution	Current Range	Current Resolution
N6700 Modular Power System, N6705A DC Power Analyzer¹	Up to 400 W in a 4-slot frame	Up to 4 per frame	12 mV to 5.5 V	90 μ V	100 μ A to 100 mA	2 μ A
6610 Series High Performance DC Power Supplies	Up to 50 W in a compact 2U, 1/2-rack	1	0 to 100V	As low as 2 mV	0 to 5 A	As low as 0.25 mA
E3630A DC Bench Power Supply	35W total output power for basic bench top use	3	0 to 20V	10 mV	0 to 2.5 A	10 mA

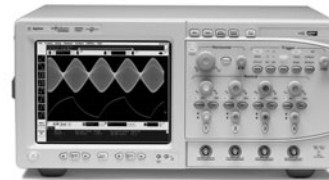
¹ Using the N6761A/N6762A high precision power modules.



E8361A



E5052A



8000 Series



81100 Series

E8361A
N5230A
E5071C
E5062A
E5052A
E5053A
11970A
DSO3000
DSO6000
DSO8000
DSO80000
33220A
33250A
81100
N5181A

Network Analyzers

Model	Frequency Range	Dynamic Range	Trace Noise	Other Products in the Family
E8361A PNA Network Analyzer	10 MHz to 67 GHz	136 dB	<0.006 dB	E8362B PNA E8363B PNA E8364B PNA
N5230A PNA-L Network Analyzer	300 kHz to 50 GHz	79 – 122 dB	<0.004 dB	N5250A Millimeter Wave PNA
E5071C ENA RF Network Analyzer	9 kHz to 8.5 GHz	123 dB	<0.004 dB @70 kHz IFBW	E5070B
E5062A ENA-L RF Network Analyzer	300 kHz to 3.0 GHz	115 dB	<0.005 dB	E5061A ENA-L

Signal Source Analyzers

Model	Frequency Range	Phase Noise	Frequency	RF Power	DC Current (10 μ A resolution)	Frequency Over Time	Phase Over Time	Power Over Time	Transients Over Time
E5052A Signal Source Analyzer	10 MHz to 7 GHz	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Plus E5053A Microwave Downconverter¹	10 MHz to 26.5 GHz	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11970A Waveguide Harmonic Mixer²	10 MHz to 110 GHz	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

¹ Add the E5053A to the E5052A to increase the frequency.

² Add the E5053A and the 11970 Series Mixers to the E5052A to increase the frequency.

Oscilloscopes

Model	Application	Bandwidth	Sample Rate	Channels
3000 Series Economy Oscilloscopes	Low cost general purpose benchtop	60 MHz to 200 MHz	Up to 1 GSa/s	2 Analog
6000 Series High Performance Oscilloscopes	Medium performance in portable package	100 MHz to 1 GHz	2/4 GSa/s	4 Analog 16 Digital (with MSO option)
8000 Series Infiniium Oscilloscopes	General purpose for laboratory research	600 MHz to 1 GHz	4 GSa/s	4 Analog 16 Digital (with MSO option)
80000 Series Ultra-high Performance Oscilloscopes	Highest performance for laboratory research	2 GHz to 13 GHz	40 GSa/s	4 Analog

Function Generators

Model	Frequency Range	Built-In Waveforms	Arbitrary Waveform Memory	Minimum Pulse Width	Pulse Rise/Fall Time
33220A Function/Arbitrary Waveform Generator	1 μ Hz to 20 MHz	Sine, square, triangle, ramp, pulse, noise, sin(x)/x, exponential rise & fall, cardiac, DC volts, arbitrary, AM, FM, PM, FSK, PWM	64 K points	20 ns	<13 ns
33250A Function/Arbitrary Waveform Generator	1 μ Hz to 80 MHz	Sine, square, pulse, triangle, ramp, noise, sin(x)/x, exponential rise & fall, cardiac, DC volts, arbitrary, AM, FM, FSK	64 K points	8 ns	<8 ns
81100 Series Pulse Pattern Generators	1 mHz to 330 MHz	Pulse, pattern	12 Mbit/channel	1.5 ns to 20 ns	500 ps to 5 ns
N5181A MXG Analog Signal Generator	250 kHz to 6 GHz	AM, FM, Φ M, Pulse Modulation	100 MSa	500 ns	<50 ns

Key Literature & Web Link

5989-5839EN

www.agilent.com/find/nano

N9410S
N9430S
N9435S
N9490S
N9420A

- **Highly modular AFM system affords utmost flexibility**
- **Unrivalled environmental and temperature control while imaging**
- **Superior scanning in liquids, gases, or ambient conditions**
- **High-resolution scanner with large scan range**
- **Complete set of imaging modes**
- **Options and accessories compatible on ALL systems**
- **Ideal for life science, materials science, electrochemistry and polymer research**

The Ultimate AFM Platform

Agilent 5500 System

The 5500 atomic force microscope is an ideal multiple-user research system. In addition to atomic-scale resolution, the 5500 offers many unique features, including true modularity that enables you to add application-specific options when the need arises.

The intelligent, modular design of this exceptional microscope permits the simple integration of numerous imaging modes with easy-to-use nose cones, MAC Mode for imaging soft materials in liquid, application-specific sample-handling plates, as well as setting the industry standard for environmental and temperature control. Our balanced-pendulum, top-down-design multipurpose scanners come in a range of sizes, both open and closed loop, all offering outstanding linearity and accuracy.

Agilent 5500 LS

The 5500 LS AFM large stage enables fast, accurate probe positioning for imaging and mapping large specimens in high-resolution. This large, motorized stage allows you to precisely locate and identify an area of interest and, with the coordinates stored, automatically repositions the sample rapidly and accurately for further study. The 5500 LS stage is very well suited for imaging large samples in air, liquid, and under temperature control.

Agilent 5500 ILM

The 5500 inverted light microscope (ILM) adapter combines high-resolution AFM imaging with the direct optical viewing capability of an inverted light microscope to provide both atomic force and optical microscopy data. This system's advanced design allows the atomic force microscope to sit on top of an inverted microscope and under the illumination pillar, resulting in better optical contrast for the images.

The 5500 ILM offers unparalleled performance and ease of use for imaging in liquids or ambient air. Atomic force and optical (or fluorescence) microscopy data can be obtained simultaneously enabling a wide range of complementary techniques, such as FRET, darkfield, and brightfield.

Emphasis on Education

Agilent 5400 AFM System

The 5400 atomic force microscope is a high-precision instrument engineered to provide superb ease of use and versatility. This scientific-grade microscope delivers atomic-scale resolution at a remarkably affordable price, making it an outstanding choice for education as well as research.

Complete with its Agilent-developed microscope curriculum, the 5400 offers educators an unprecedented opportunity to introduce their students to a wide range of powerful AFM techniques. This AFM is ideal for material sciences, polymers and general surface characterization such as adhesion, friction and elasticity.

Price and Performance

Agilent 5100 AFM System

The 5100 atomic force microscope is a high-resolution system that provides excellent imaging capabilities in an easy-to-upgrade package. The entry-level priced 5100 offers easy upgradeability to our flagship 5500 microscope as your research needs occur.

The 5100 microscope delivers atomic-scale resolution as well as direct video access to the scan area. The 5100 comes with our multipurpose scanners and imaging modes. It is compatible with MACMode for imaging soft materials in liquid and Agilent's superior temperature control allowing a versatile solution for a diverse set of applications.

Scanning Probe Microscopes/Atomic Force Microscopes

Scanning Probe Microscopes/Atomic Force Microscopes for NanoScience Research (cont.)

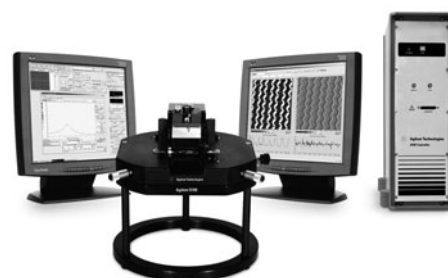
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N9410S



N9435S



N9420A



N9430S



N9490S

N9410S
N9430S
N9435S
N9490S
N9420A

Agilent's SPM/AFM Systems for Superior Application Flexibility

SPM/AFM	N9410S 5500 AFM	N9430S 5500LS AFM	N9435S 5500 ILM AFM	N9490S 5400 AFM	N9420A 5100 AFM
Sample Size	20 mm x 20 mm	150 mm or 200 mm	20 mm x 20 mm	20 mm x 20 mm	20 mm x 20 mm
Imaging Modes	Contact Mode Acoustic AC Mode MAC Mode Phase Imaging STM LFM EFM MFM Force Modulation Current Sensing	Contact Mode Acoustic AC Mode MAC Mode Phase Imaging STM LFM EFM MFM Force Modulation Current Sensing	Contact Mode Acoustic AC Mode MAC Mode Phase Imaging STM LFM EFM MFM Force Modulation Current Sensing	Contact Mode Acoustic AC Mode MAC Mode Phase Imaging STM LFM EFM MFM Force Modulation Current Sensing	Contact Mode Acoustic AC Mode MAC Mode Phase Imaging STM LFM EFM MFM Force Modulation Current Sensing
Options	Electrochemical Environment Control Temp Control MAC Mode PicoTREC Multi-purpose Scanner Nose Cones Glove Box	Temp Control Multi-purpose Scanner Nose Cones MAC Mode	Temp Control Multi-purpose Scanner Nose Cones MAC Mode PicoTREC	Temp Control Multi-purpose Scanner Nose Cones Mac Mode	Electrochemical Environment Control Temp Control MAC Mode Multi-purpose Scanner Nose Cones Glove Box
Accessories	Liquid Cell Sample Plates Vibration Isolation Q-Control Breakaway Box Video	Liquid Cell Sample Plates Q-Control Breakaway Box	Liquid Cell Sample Plates Q-Control Breakaway Box	Liquid Cell Sample Plates Vibration Isolation Q-Control Breakaway Box	Liquid Cell Sample Plates Vibration Isolation Q-Control Breakaway Box Video
Applications	Electrochemistry Polymers Nanolithography Nanografting Life Science Materials Science	Materials Science Semiconductor	Life Science	Materials Science Polymers Surface Characterization Nanolithography Education	Electrochemistry Polymers Materials Science

Key Literature & Web Link

www.agilent.com/find/afm

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