Agilent N8300A Wireless Networking Test Set With N630XA Measurement Applications

The Agilent N8300A wireless networking test set is a one-box radio frequency (RF) parametric test set based on an architecture that includes an integrated vector signal analyzer (VSA) and a vector signal generator (VSG).

The Agilent N630XA measurement applications add one-button measurements and modulation analysis capabilities to help with your design, evaluation, and manufacturing test of WiMAX™ and WLAN (Wi-Fi) devices and modules.

Agilent Technologies

Definitions and Conditions

Specification

Specifications describe the performance parameters covered by the product warranty and apply over 20 to 30 °C unless otherwise noted. Warranted specifications include measurement uncertainty calculated with a 95 percent confidence. Data represented in this document are specifications unless otherwise noted.

Typical

Represents characteristic performance, which 80 percent of the instruments manufactured will meet. This data, shown in italics, is not warranted, does not include measurement uncertainty, and is valid only at room temperature (approximately 25 °C).

Nominal

The expected mean or average performance, or an attribute whose performance is by design, such as the 50 Ω connector. This data is not warranted and is measured at room temperature (approximately 25 °C).

The test set will meet its specification when:

- The test set is within its calibration cycle
- The test set is within the temperature range 20 to 30 °C
- The test set has been turned on for at least 45 minutes

N8300A Hardware Specifications

VSA performance

Performance	
Quantization	14 bits
Sampling frequency	100 MHz digital down-conversion
Sampling resolution	10 ns
Acquisition buffer	5 ms

Frequency specifications	
Frequency range	75 MHz to 4.8 GHz (Option 505); 75 MHz to 6.0 GHz (Option 506) also refer to Application Software section
Frequency resolution	Refer to Application Software section
IF bandwidth	Variable to 40 MHz

Amplitude specifications	
Maximum safe input level	+25 dBm (CW)
Absolute power measurement accuracy	Refer to Application Software section
Input amplitude range	Refer to Application Software section

VSG performance

Performance	
Sample rate	To 125 MSa/s
Bandwidth	100 MHz
Effective DAC resolution	16 bits

Frequency specifications	
Frequency range	250 kHz to 6.0 GHz; also refer to Application Software section
Frequency accuracy	±aging rate; ±temperature effects; ±line voltage effects
Internal time base reference oscillator aging rate	*≤ ±5.0 ppm/10 yrs, < ±1.0 ppm/yr*
Temperature effects	*±1.0 ppm (0 to 50 °C)*
Line voltage effects	*±0.1 ppm (nominal), over line voltage range 5 to –10% (nominal)*
Frequency resolution	0.01 Hz

Amplitude specifications	
Absolute amplitude accuracy	Refer to Application Software section
Output amplitude range	Refer to Application Software section
Amplitude resolution	0.02 dB (nominal)
RF Output port Spurious (non-harmonics)	250 kHz to 3 GHz: < *–62 dBc typical (out-of-band)* 3 to 6 GHz: < *–56 dBc typical (out-of-band)*
RF Output port VSWR[1]	*1.4:1 nominal* (≤ 1.7 GHz) *1.55:1 nominal* (> 1.7 to 3 GHz) *1.7:1 nominal* (> 3.0 to 4.0 GHz) *1.6:1 nominal* (> 4.0 to 6.0 GHz)
RF In/Out port VSWR	*1.5:1 nominal* (75 MHz to 2.7 GHz; 3.3 to 3.8 GHz) *2.4:1 nominal* (4.8 to 6.0 GHz)

[1] This specification applies to instruments serial prefix MY4832 or greater, otherwise the specification is 1.7:1 nominal (< 1.4 GHz), 2.3:1 nominal (> 1.4 to 4.0 GHz), 2.4:1 nominal (> 4.0 to 5.0 GHz), 2..2:1 nominal (> 5.0 to 6.0 GHz)

VSA performance (RFIO 1 to 4 specifications)[1]

Frequency specifications	
Frequency range	Refer to Application Software section

Amplitude specifications	
Input amplitude range	+33 to -60 dBm; frequency bands < 4.8 GHz +33 to -50 dBm; frequency bands ≥ 4.8 GHz
Maximum safe input level	+36 dBm
Absolute power measurement accuracy frequency bands < 4.8 GHz frequency bands ≥ 4.8 GHz	*±0.5 dB (CW) typical;* (>+23 to +33 dBm) ±0.8 dB (CW); (+23 to -50 dBm); *±0.35 dB (CW) typical;* (+23 to -50 dBm); ±1.0 dB (CW); (+23 to -40 dBm); *±0.35 dB (CW) typical;* (+23 to -40 dBm);
RFIO ports VSWR	*< 1.6:1 (return loss > 12.5 dB) typical;* frequency bands 1.765 to 1.815GHz and 2.15 to 2.7 GHz *< 1.8:1 (return loss > 10.5 dB) typical;* frequency bands 3.3 to 3.8GHz and 4.8 to 6 GHz
Residual error vector magnitude (EVM)	Refer to Application Software section
Signal-to-noise ratio	*> 65 dB typical;* frequency bands < 4.8 GHz *> 52 dB typical;* frequency bands ≥ 4.8 GHz
Isolation between RFIO ports	*> 50 dB typical*

VSG performance (RFIO 1 to 4 and RF Output specifications)[1]

Frequency specifications	
Frequency range	Refer to Application Software section

Amplitude specifications for the RF Output port	
Amplitude range	Frequency bands < 4.8 GHz +17 to -100 dBm (CW) Frequency bands ≥ 4.8 GHz: +13 to -100 dBm (CW)
Absolute amplitude accuracy	Frequency bands ≤ 1.815 GHz: *±0.5 dB (CW) typical* (+7 to -90 dBm) Frequency bands > 1.815 GHz: ±1.0 dB (CW) (+7 to -90 dBm) *±0.5 dB (CW) typical* (+7 to -90 dBm)
Error vector magnitude (EVM)	OFDM signals: *< -44 dB (< 0.6% rms typical),* up to +6 dBm
RF Output port VSWR	*< 1.7:1 (return loss > 12 dB) typical*

Amplitude specifications for the RFIO 1 to 4 ports	
Amplitude range	+17 to -100 dBm (CW)
Absolute amplitude accuracy	Single RF IO port: *±0.6 dB (CW) typical*; (+17 to -90 dBm) RFIO 1 to 4 ports (Broadcast mode): *±0.8 dB (CW) typical; (*+17 to -90 dBm)
Error vector magnitude (EVM)	OFDM signals: *< -44 dB (< 0.6% rms typical),* up to +6 dBm
RFIO ports VSWR	*< 1.7:1 (return loss > 12 dB) typical*
Isolation between RFIO ports	*> 50 dB typical*

[1] This specification applies to instruments with option 404 (MIMO/Multi-port Connectivity) and 506 (Frequency range to 6.0 GHz), instruments serial prefix MY4832 or greater

Power requirements

Power consumption	< 270 W maximum

Data storage

External	Supports USB 2.0-compatible memory devices

Size and weight

Dimensions (H x W x L)	177 mm x 425 mm x 495 mm 7.0 in x 16.8 in x 19.5 in
Weight	18.5 kg (net) 24 kg (shipping)

Environmental characteristics

Operating temperature	5 to 50 °C
Storage temperature	–40 to 65 °C
Operating humidity	15 to 95% relative humidity (non-condensing)
EMC	The conformity assessment requirements have been met using the technical construction file route for compliance with the requirements of the EMC Directive 89/336/EEC, amended by 93/68/ECC • IEC/EN 61326 • CISPR Pub 11 Group 1, Class A • AS/NZS CISPR 11.2002 • ICES/NMB-001

Safety

Complies with European Low Voltage Directive 73/23/EEC, amended by 93/68/EEC

- IEC/EN 61010-1
- Canada: CSA C22.2 No. 61010-1
- USA: UL 61010-1

Warranty

This test set is supplied with a one-year warranty.

Calibration cycle

The recommended calibration cycle is one year. Calibration services are available through Agilent service centers.

Inputs and Outputs

Front panel

RF In/Out	
Connector	Type-N female, 50 Ω nominal

RF output	
Connector	Type-N female, 50 Ω nominal

USB ports	
Master (2 ports)	
Standard	Compatible with USB 2.0
Connector	USB Type-A female
Output current	0.5 A nominal

Others (not used)	
Probe power	
Voltage/Current	+15 Vdc, ±7% at 150 mA max nominal -12.6 Vdc, ±10% at 150 mA max nominal
Headphone jack	

Rear panel

SOURCE REF IN	Accepts a 10 MHz reference signal used to frequency lock the internal timebase
Connector	BNC female, 50 Ω nominal
Input amplitude range	–3.5 to +20 dBm nominal

SOURCE 10 MHz OUT	Outputs the 10 MHz reference signal used by the internal timebase. Permanently connected to the ANALYZER 10 MHz IN port
Connector	BNC female, 50 Ω nominal
Output amplitude	+3.9 dBm nominal
Input damage level	+16 dBm

ANALYZER 10 MHz IN	Permanently connected to the SOURCE 10 MHz OUT port
Connector	BNC female, 50 Ω nominal
Input amplitude range	–5 to +10 dBm nominal
Input frequency	1 to 50 MHz nominal
Frequency range lock	$\pm 5 \times 10^{-6}$ of specified external reference input frequency

ANALYZER 10 MHz OUT	
Connector	BNC female, 50 Ω nominal
Output amplitude	≥ 0 dBm nominal
Frequency	10 MHz (±10 MHz x frequency reference accuracy)

Rear panel (continued)

SOURCE TRIG IN	Accepts TTL and CMOS level signals for triggering point-to-point in sweep mode. Damage levels are ≤ –0.3 V and ≥ +5.3 V
SOURCE TRIG OUT	Outputs a TTL- and CMOS-compatible signal level for use with sweep mode. Input damage levels are ≤ –0.3 V and ≥ +5.3 V

ANALYZER TRIG IN	
Connector	BNC female
Impedance	> 10 kΩ nominal
Trigger level range	–5 to +5 V

ANALYZER TRIG OUT	
Connector	BNC female
Impedance	50 Ω nominal
Level	5 V TTL nominal

Monitor output	
Connector	VGA compatible, 15-pin mini D-SUB
Format	XGA (60 Hz vertical sync rates, non-interlaced) analog RGB
Resolution	1024 x 768

USB 2.0 ports	
Master (4 ports)	Note: One port is permanently connected; three ports are available for use
Standard	Compatible with USB 2.0
Connector	USB Type-A female
Output current	0.5 A nominal
Slave (1 port)	
Standard	Compatible with USB 2.0
Connector	USB Type-B female
Output current	0.5 A nominal

GPIB interface	
Connector	IEEE-488 bus connector
GPIB codes	SH1, AH1, T6, SR1, PP0, DC1, C1, C2, C3, C28, DT1, L4, C0

LAN TCP/IP interface	*Connector located middle of rear panel*
Standard	100 Base-T
Connector	RJ45 Ethertwist

LAN	*Connector located bottom right hand side of rear panel*
Standard	100 Base-T
Connector	RJ45 Ethertwist

Application Software

N6301A-1FP 802.16 OFDMA measurement application (Mobile WiMAX)
N6301A-2FP 802.16 OFDM measurement application (Fixed WiMAX)

Available measurements

Transmitter

- Modulation analysis, results include:
  - Spectral flatness
  - Relative constellation error (RCE)
  - Power versus time
  - Channel power
  - IQ offset
  - Frequency error
  - Symbol clock error
- Adjacent channel leakage ratio (ACLR)
- Power statistics CCDF
- Spectrum emissions mask (SEM)
- Waveform
  - Average power
  - Peak power

Receiver[1]

- PER
- RSSI

N6301A key specifications

Analyzer performance

Frequency specifications	
Frequency range	1.765 to 1.815 GHz; 2.15 to 2.71 GHz; 3.3 to 3.8 GHz (Options 505 and 506); 4.8 to 5.875 GHz (Option 506 only)
Frequency resolution	250 kHz
Measurement bandwidth	10 MHz, 8.75 MHz, 7 MHz, 5 MHz

Amplitude specifications	
Input amplitude range	+23 to –70 dBm
Absolute power measurement accuracy	1.765 to 1.815 GHz: *0.35dB (CW) typical* (+23 to -60 dBm)
2.15 to 2.71 GHz; 3.3 to 3.8 GHz:	±0.6 dB (CW) (+23 to -50 dBm) *±0.3 dB (CW) typical* (+23 to -70 dBm)
4.8 to 5.875 GHz:	±0.8 dB (CW) (+23 to -50 dBm) *±0.35 dB (CW) typical* (+23 to -50 dBm)
Residual error vector magnitude (EVM)	2.15 to 2.71 GHz; 3.3 to 3.8 GHz, 64QAM OFDMA: *<-40 dB (< 1% rms typical)*
Signal-to-Noise Ratio (SNR)	> *65 dB typical* (2.15 to 2.71 GHz; 3.3 to 3.8 GHz) *>52dB typical* (4.8 to 5.875 GHz)
RF Input VSWR	< *1.6:1 typical (return loss >12.5 dB);* (2.15 to 2.71 GHz); < *1.8:1 typical (return loss:* > *10 dB*); (3.3 to 3.8 GHz; 4.8 to 5.875 GHz)

[1]. Device under test (DUT) chipset control software is required for receiver measurements.

N6301A key specifications (continued)

Source performance

Frequency specifications	
Frequency range	1.765 to 1.815 GHz; 2.15 to 2.71 GHz; 3.3 to 3.8 GHz (Options 505 and 506); 4.8 to 5.875 GHz (Option 506 only)

Amplitude specifications for the RF Output port	
Output amplitude range[1]	1.765 to 1.815 GHz; 2.15 to 2.71 GHz; 3.3 to 3.8 GHz: +20 to –100 dBm (CW); 4.8 to 5.875 GHz: +13 to -100 dBm (CW) See EVM specification for information on modulated signals
Absolute amplitude accuracy	1.765 to 1.815 GHz; *±0.5 dB (CW) typical* (+7 to -90 dBm) 2.15 to 2.71 GHz; 3.3 to 3.8 GHz: ±0.9 dB (CW) (+7 to -90 dBm) *±0.5 dB (CW) typical* (+7 to -90 dBm) 4.8 to 5.875 GHz: ±1.0 dB (CW) (+7 to -90 dBm) *±0.5 dB (CW) typical* (+7 to -90 dBm)
Error vector magnitude (EVM)[2]	1.765 to 5.875 GHz; 64QAM OFDMA: *<-44 dB (< 0.6% rms typical),* up to +6 dBm
Spurious (non-harmonics)	250 kHz to 3 GHz; *< –62 dBc typical (in-band)* 3 to 6 GHz; *< –56 dBc typical (in-band)*

Amplitude specifications for the RF In/Out port	
Output amplitude range[3]	1.765 to 1.815 GHz; 2.15 to 2.71 GHz; 3.3 to 3.8 GHz: +10 to –100 dBm (CW); 4.8 to 5.875 GHz: +3 to -100 dBm (CW)
Absolute amplitude accuracy[4]	1.765 to 1.815 GHz; 2.15 to 2.71 GHz; 3.3 to 3.8 GHz: *±0.6 dB (CW) typical (0 to -90 dBm)* 4.8 to 5.875 GHz: *±0.8 dB (CW) typical (0 to -90 dBm)*

[1] This specification applies to instruments serial prefix MY4832 or greater, otherwise the specification is 2.15 to 2.71GHz; 3.3 to 3.8 GHz: +10 to –100 dBm (CW); 4.8 to 5.875 GHz: +6 to -100 dBm (CW).

[2] This specification applies to instruments serial prefix MY4832 or greater, otherwise the specification is <-40 dB (<1% rms typical)

[3] This specification applies to instruments serial prefix MY4832 or greater, otherwise the specification is 2.15 to 2.71 GHz; 3.3 to 3.8 GHz: 0 to –100 dBm (CW); 4.8 to 5.875 GHz: -4 to -100 dBm (CW).

[4] This specification applies to instruments serial prefix MY4832 or greater, otherwise the specification is 2.15 to 2.71 GHz; 3.3 to 3.8 GHz: *±0.6 dB (CW) typical (-10 to -90 dBm);* 4.8 to 5.8756.0 GHz: *±0.8 dB (CW) typical (-10 to -90 dBm).*

Application Software

N6302A-1FP - 802.11a,b,g,n WLAN measurement application, fixed perpetual license

N6302A-2FP – 802.11b and g WLAN measurement application, fixed perpetual license

The table below shows the key measurements covered by the N8300A and the N6302A WLAN measurement applications.

Transmitter functionality	N8300A and N6302A
Auto-range	Yes
CW	
Average power	Yes
CW frequency offset	Yes
Bursted OFDM	
Average power	Yes
Peak power	Yes
Center frequency tolerance	Yes (Frequency error)
Clock frequency tolerance	Yes
Constellation error (EVM)	Yes
Center frequency leakage	Yes
Spectral flatness	Yes
Spectral mask	Yes
EVM	Yes
Frequency error	Yes
IQ offset	Yes
Gated power	Yes
Gated spectrum	Yes
Bursted DSSS	
Average power	Yes
Peak power	Yes
Center frequency tolerance	Yes (Frequency error)
Chip clock frequency tolerance	Yes
Center frequency leakage	Yes (Carrier suppression)
Predicted suppression	Yes
EVM (RMS)	Yes
EVM (peak)	Yes
Power up ramp	Yes
Power down ramp	Yes
Spectral mask	Yes
EVM (peak)	Yes
EVM (RMS)	Yes
Frequency error	Yes
IQ offset	Yes
Gated power	Yes
Gated spectrum	Yes
Receiver functionality	
Standard DSSS waveform file	Yes
Standard DSSS sequence file	Yes
Standard OFDM waveform file	Yes
Standard OFDM sequence file	Yes
Blanking marker files	Yes
High power mode	Yes
CW tone	Yes
Sampling rate	Yes

Analyzer performance

Frequency specifications	
Frequency range	2.381 to 2.519 GHz (Options 505 and 506) 4.800 to 5.875 GHz (Option 506 only)
Frequency resolution	250 kHz
Measurement bandwidth	Switchable between 22 and 40 MHz
Frequency accuracy	As VSG hardware performance
Phase Noise	10 kHz: < *–87 dBc/Hz (nominal)* 100 kHz: < *–100 dBc/Hz (nominal)*

Amplitude specifications	
Input amplitude range	+23 to -70 dBm
Absolute power measurement accuracy	2.381 to 2.519 GHz: ±0.6 dB (CW) (+23 to -50 dBm) *±0.3 dB (CW) typical* (+23 to -70 dBm) 4.800 to 5.875 GHz: ±0.8 dB (CW) (+23 to -50 dBm) *±0.35 dB (CW) typical* (+23 to -50 dBm)
RF input VSWR	*< 1.6:1 (return loss: > 12.5 dB);* 2.381 to 2.519 GHz *< 1.8:1 (return loss: > 10 dB*); 4.800 to 5.875 GHz
Signal-to-Noise Ratio (SNR)	*>65 dB typical for 22 MHz bandwidth* (2.381 to 2.519 GHz) *>52 dB for 22 MHz bandwidth* (4.800 to 5.875 GHz)

Modulation specifications	
Residual error vector magnitude (EVM)	802.11a: 5 GHz band; 54 Mbps 64QAM OFDM: *<-36 dB (< 1.5%), power range +5 to -20 dBm* 802.11b: DSSS: *<-30 dB (< 3.0%), power range +5 to -30 dBm; equalization off* 802.11b: DSSS: *<-40 dB (< 1.0%), power range +5 to -30 dBm; equalization on* 802.11g: 2.4 GHz band; 54 Mbps 64QAM OFDM: *<-43 dB (< 0.7%), power range +5 to -30 dBm* 802.11n: 5 GHz band; 54 Mbps 64QAM OFDM; MCS7: *<-34 dB (< 2.0%), power range +5 to -20 dBm*

Source performance

Frequency specifications	
Frequency range	2.402 to 2.484 GHz (Options 505 and 506) 4.800 to 5.875 GHz (Option 506 only)
Frequency accuracy	As VSG hardware performance

Amplitude specifications for the RF In/Out port	
Output amplitude range[1]	2.402 to 2.484 GHz: +10 to -100 dBm (CW); 4.8 to 5.875 GHz: +3 to -100 dBm (CW); See EVM specification for information on modulated signals
Absolute amplitude accuracy[2]	2.402 to 2.484 GHz: *±0.6 dB (CW) typical (0 to -90 dBm)* 4.8 to 5.875 GHz: *±0.8 dB (CW) typical (0 to -90 dBm)*

[1] This specification applies to instruments serial prefix MY4832 or greater, otherwise the specification is 2.402 to 2.484 GHz: 0 to -100 dBm (CW); 4.8 to 5.875 GHz: -4 to -100 dBm (CW)

[2] This specification applies to instruments serial prefix MY4832 or greater, otherwise the specification is 2.402 to 2.484 GHz: *±0.6 dB (CW) typical (-10 to -90 dBm);* 4.8 to 5.875 GHz: ±0.8 dB (CW) typical (-10 to -90 dBm)

Amplitude specifications for the RF Output port	
Output amplitude range[1]	2.402 to 2.484 GHz: +20 to -100 dBm (CW); 4.8 to 5.875 GHz: +13 to -100 dBm (CW); See EVM specification for information on modulated signals
Absolute amplitude accuracy	2.402 to 2.484 GHz: ±0.9 dB (CW) (+7 to -90 dBm) *±0.5 dB (CW) typical (+7 to -90 dBm)* 4.8 to 5.875 GHz: ±1.0 dB (CW) (+7 to -90 dBm) *±0.5 dB (CW) typical (+7 to -90 dBm)*
Error vector magnitude (EVM)	*802.11a,g,n: 2.4 GHz band; 54 Mbps 64QAM OFDM: -44 dB (<0.6%), up to +6 dBm* *802.11a,g,n: 5 GHz band; 54 Mbps 64QAM OFDM: -44 dB (<0.6%), up to +2 dBm* *802.11b: DSSS: <-36 dB (< 1.5%), up to +6 dBm*
Spurious (non-harmonics)	2.402 to 2.484 GHz: *< -62 dBc typical (in-band)* 4.8 to 5.875 GHz: *< -56 dBc typical (in-band)*

[1] This specification applies to instruments serial prefix MY4832 or greater, otherwise the specification is 2.402 to 2.484 GHz:+10 to -100 dBm (CW); 4.8 to 5.875 GHz: +6 to -100 dBm (CW)

Related Literature

Agilent N8300A Wireless Networking Test Set, brochure,
literature number 5989-7063EN

N6301A 802.16 OFDMA Measurement Application,
technical overview, literature number 5989-7609EN

Agilent N8300A Wireless Networking Test Set, N7300 Series Chipset Software and N630XA Measurement Applications,
configuration guide, literature number 5989-7919EN

Agilent N7300 Series Chipset Software,
brochure, literature number 5989-7920EN

Application notes

WiMAX Manufacturing Test with the N8300A:
The First Steps Towards Test Automation, application note,
literature number 5989-7610EN

IEEE 802.16e WiMAX OFDMA Signal Measurements and Troubleshooting, application note 1578,
literature number 5989-2382EN

IEEE 802.11a,b,g,n Manufacturing Test with the N8300A:
application notes:
a) Theory and Techniques (Part 1);
literature number 5989-9958EN
b) The First Steps Towards Test Automation (Part 2);
literature number 5989-9959EN
c) Test Optimization (Part 3);
literature number 5989-9960EN
d) Transitioning from the N4010A wireless connectivity test set (Part 4);
literature number 5989-9961EN

WiMAX Concepts and RF Measurements, application note,
literature number 5989-2027EN

VSA literature

89600 Series Vector Signal Analysis Software
89601A/89601AN/89601N12, datasheet,
literature number 5989-1786EN

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