



# Agilent E6630A Wireless Connectivity Test Set Data Sheet



Modernizing manufacturing test

# WLAN



The Agilent Technologies E6630A wireless connectivity test set integrates up to two vector signal analyzers, and two vector signal generators in a single PXI frame, creating a one-box tester that accelerates your wireless connectivity devices time to market with fast and accurate RF test for 802.11a/b/g/n/ac WLAN, *Bluetooth*® 1.0 to 4.1, and multi-satellite GNSS.

*Anticipate* \_\_\_ *Accelerate* \_\_\_ *Achieve*



**Agilent Technologies**

# Definitions and Conditions

## Specification

Specifications describe the performance parameters covered by the product warranty and are valid only at room temperature (approximately 25 °C) unless otherwise noted. Warranted specifications indicate the breadth of the population ( $\approx 2\sigma$ ) of performance tolerances expected to be met in 95 percent of the cases with a 95 percent confidence. Data represented in this document are specifications unless otherwise noted.

## Typical

Typical describes additional product performance information that is not covered by the product warranty. It is performance beyond specifications that 95 percent of the units exhibit with a 95 percent confidence level. This data, shown in italics, does not include measurement uncertainty and is valid only at room temperature (approximately 25 °C).

## Nominal

Nominal values indicate expected performance, or describe product performance that is useful in the application of the product, such as a 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 has been turned on for at least 30 minutes

## Recommended best practices in use

At environment temperatures above 45 °C, chassis fan should be set to high.

# Vector Signal Analyzer Performance

Performance	
Maximum capture memory	1 GSa (4 GB)
Frequency and time specifications	
<b>Frequency range</b>	2.4 to 2.5 GHz 4.85 to 6 GHz
Frequency reference (100 MHz)	
Accuracy	$\pm$ [(time since last adjustment x aging rate) $\pm$ temperature effects $\pm$ calibration accuracy]
Aging rate	Daily < $\pm 0.5$ ppb/day, after 72 hours of warm-up Yearly < $\pm 0.10$ ppm/year, after 72 hours of warm-up Total 10 years < $\pm 0.6$ ppm/10 years, after 72 hours of warm-up
Achievable initial calibration accuracy (at time of shipment, after warm-up)	$\pm 0.05$ ppm
Temperature effects	< $\pm 10$ ppb, 20 to 30 °C < $\pm 50$ ppb, 5 to 50 °C
<b>Residual FM</b>	$\leq 0.25$ Hz p-p in 20 ms nominal
CW measurement frequency accuracy	
Accuracy	(transmitter frequency x frequency reference accuracy) $\pm 50$ Hz
Resolution	1 Hz
<b>Arbitrary frequency switching speed</b>	400 $\mu$ s nominal
Analysis bandwidth	
Maximum bandwidth	80 MHz/160 MHz
Triggering	
Trigger	Free run, external 1, external 2, video, line, periodic
Trigger delay range	-150 to 500 ms
Resolution	0.1 $\mu$ s
Amplitude accuracy and range specifications	
Input level ranges (average power)	
RF IN	-70 to +30 dBm
Total absolute amplitude accuracy	
RF IN	2.4 to 2.5 GHz: < $\pm 0.42$ dB typical
Input signal -50 to +23 dBm	4.85 to 6 GHz: < $\pm 0.42$ dB typical
Input voltage standing wave ratio (VSWR)	
RF IN	2.4 to 2.5 GHz: < 1.3:1 nominal 4.85 to 6 GHz: < 1.7:1 nominal
<b>Amplitude switching speed</b>	$\leq 1.5$ ms nominal
Spurious responses	
$f \geq 10$ MHz from carrier	2.4 to 2.5 GHz, 4.85 to 6 GHz: < -55 dBc typical
Phase noise	
5.8 GHz, 10 kHz offset	< -105 dBc/Hz nominal

# Analyzer

# Vector Signal Generator Performance

Performance	
Arb sample rate range and bandwidth	Clock rate: 100 to 200 MSa/s
Arb sample memory (storage capacity)	4 GB memory; 1024 MSa of IQ data
Frequency specifications	
Frequency range	All specifications apply over the range 1.1 to 1.7 GHz 2.4 to 2.5 GHz 4.85 to 6 GHz
Frequency accuracy	Refer to VSA frequency reference accuracy
Frequency resolution	0.01 Hz
Arbitrary frequency settling	< 240 $\mu$ s typical
Amplitude specifications	
Output level ranges <sup>1</sup>	
RF OUT	-110 to +10 dBm typical
Absolute level accuracy	
RF OUT	1.1 to 1.7 GHz, -110 to +10 dBm: < $\pm 0.5$ dB typical 2.4 to 2.5 GHz, -110 to +10 dBm: < $\pm 0.5$ dB typical 4.85 to 6 GHz, -110 to +10 dBm: < $\pm 0.5$ dB typical
Setting resolution	0.01 dB
Level settling time	< 1.5 ms to within 0.2 dB nominal
Output voltage standing wave ratio (VSWR)	
RF OUT	1.1 to 1.7 GHz: < 1.25:1 nominal 2.4 to 2.5 GHz: < 1.4:1 nominal 4.85 to 6.0 GHz: < 1.6:1 nominal
Spectral purity	
Harmonics and spurious	
VSG RF OUT; harmonics at -10 dBm output power	< -30 dBc nominal
RF OUT; non-harmonic spurious (CW mode; > 220 kHz offset)	< -62 dBc nominal
Phase noise	
RF OUT; 20 kHz offset	1.1 to 1.7 GHz: -122 dBc/Hz nominal 2.4 to 2.5 GHz: -116 dBc/Hz nominal 4.85 to 6 GHz: -108 dBc/Hz nominal

# Generator

1. Power level is user-settable beyond the specified range (from -150 to +18 dBm)

# General Specifications

Power requirements	
Voltage	100/120 V, 1000 W 220/240 V, 1200 W
Input frequency range	50/60 Hz
Power consumption	E6630A-001, 1-port: 330 W maximum E6630A-002, 2-port: 520 W maximum

  

Data storage	
Internal	160 GB (SSD)
External	Supports four USB 2.0 (Type A) compatible memory devices

  

Size and weight	
Dimensions (W x H x D)	With feet: 450 mm x 197 mm x 545 mm (18 in x 8 in x 21.5 in) Without feet: 450 mm x 188 mm x 545 mm (18 in x 7.5 in x 21.5 in)
Weight	1-port: 21.12 kg (47 lbs) (with power cord) 2-port: 24.01 kg (53 lbs) (with power cord)

  

Environmental characteristics	
Operating temperature	+5 to +50 °C
Storage temperature	−40 to +65 °C
EMC	Complies with European EMC Directive 2004/108/EC <ul style="list-style-type: none"><li>• IEC/EN 61326-2-1</li><li>• CISPR Pub 11 Group 1, Class A</li><li>• AS/NZS CISPR 11</li><li>• ICES/NMB-001</li></ul> This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada
Environmental stress	Samples of this product have been type tested in accordance with the Agilent Environmental Test Manual and verified to be robust against the environmental stresses of storage, transportation, and end-use; those stresses include, but are not limited to, temperature, humidity, shock, vibration, altitude, and power line conditions; test methods are aligned with IEC 60068-2 and levels are similar to MILPRF-28800F Class 3

  

Safety	
	Complies with European Low Voltage Directive 73/23/EEC, amended by 93/68/EEC <ul style="list-style-type: none"><li>• IEC/EN 61010-1</li><li>• Canada: CSA C22.2 No. 61010-1-04</li><li>• USA: UL Std. 61010-1</li></ul>

## General Specifications (continued)

Acoustic emissions		
	Auto fan (25 °C ambient)	High fan
Sound pressure level <sup>1,2</sup>	53 dBA	69 dBA

  

Remote programming	
Ethernet	Two 10/100/1000Base-T (RJ45)

  

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

  

Warranty	
	This test set is supplied with a standard three year warranty. Optional 5-year warranty available

  

Maximum applied CW power		
	RF IN	+30 dBm (1 W)
	RF OUT	+30 dBm (1 W)
	Max DC voltage	25 Vdc

## Front Panel

LAN TCP/IP interface	
Standard	10/100/1000Base-T
Connector	RJ45 Ethernet

  

RF IN	
Connector	Type-N female, 50 Ω nominal

  

RF OUT	
Connector	Type-N female, 50 Ω nominal

  

REF IN	
Connector	BNC female, 50 Ω nominal
Input amplitude range	-0.5 to +10 dBm nominal
Frequency lock range	$\pm 5 \times 10^{-6}$ of specified external reference input frequency

  

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

1. At operator position.

2. Referenced to 1 pW.

## Front Panel (continued)

TRIG 1/2/3 (configurable)	
Connector	BNC female
Trigger input level range	-5 to +5 V, impedance > 10 k $\Omega$ nominal

  

10 MHz Ref IN	
Connector	BNC female, 50 $\Omega$ nominal
Trigger input level range	-5 to +5 V, impedance > 10 k $\Omega$ nominal
Trigger output level range	3.3 V LVTTTL, impedance 50 $\Omega$ nominal

  

USB 2.0 ports	
Master (4 ports)	
Standard	Compatible with USB 2.0
Connector	USB Type-A female
Output current	0.5 A nominal

  

GPIB interface	
Connector	Micro-D 25-pin, IEEE-488 bus connector
GPIB code	SH1, AH1, T6, SR1, RL1, PP0, DC1, C1, C2, C3, C28, DT1, L4, C0

  

Video	
Connector	DVI-I (VGA with DVI/VGA adapter)
Resolution	Up to 1920 x 1200, 60 Hz Up to 2048 x 1536, 75 Hz

  

10 MHz Ref OUT	
Connector	BNC female, 50 $\Omega$ nominal
Output amplitude	> 0 dBm nominal
Frequency	10 MHz $\pm$ (10 MHz x frequency reference accuracy)
Input amplitude range	-0.5 to +10 dBm nominal
Frequency lock range	$\pm 5 \times 10^{-6}$ of specified external reference input frequency

# V9077A WLAN Measurement Application Key Specifications<sup>1</sup>

Supported WLAN standards	
Standard version	802.11a, 802.11a turbo mode 802.11b/g DSSS/CCK/PBCC 802.11g ERP-OFDM, 802.11g DSSS-OFDM 802.11n (20 MHz, 40 MHz) HT Mixed, HT Greenfield, Non-HT, MCS = 0-7 802.11ac (20/40/80/160 MHz) MCS = 0-9
Modulation formats	BPSK, QPSK, 16QAM, 64QAM, 256QAM

Technology	IEEE 802.11b/g (DSSS/CCK/PBCC)	IEEE 802.11a/g (ERP-OFDM, DSSS-OFDM)	IEEE 802.11n (20 and 40 MHz)	IEEE 802.11ac (20/40/80 MHz)
<b>Modulation analysis</b>				
RMS EVM	•	•	•	•
Peak EVM	•	•	•	•
Pilot EVM		•	•	•
Data EVM		•	•	•
1K chips EVM	•			
RMS magnitude error	•			
Peak magnitude error	•			
RMS phase error	•			
Peak phase error	•			
Frequency error	•	•	•	•
Chip clock error	•			
Symbol clock error		•	•	•
I/Q origin offset (CFL)	•	•	•	•
Quadrature skew	•	•	•	•
I/Q gain imbalance	•	•	•	•
Carrier suppression	•			
Average burst power	•	•	•	•
Peak burst power	•	•	•	•
Peak-to-average power ratio	•	•	•	•
Modulation format	•	•	•	•
Preamble frequency error			•	•
OFDM data burst info			•	•
OFDM HT-sig info			•	•
<b>Channel power</b>	•	•	•	•
<b>Occupied bandwidth</b>	•	•	•	•
<b>Spectrum emission mask (SEM)</b>	•	•	•	•
<b>Spurious emissions</b>	•	•	•	•
<b>Power vs. time</b>	•	•	•	•
<b>Spectral flatness</b>	•	•	•	•
<b>I/Q waveform</b>	•	•	•	•

1. Specifications apply to frequencies between 2.4 to 2.5 GHz and 4.85 to 6 GHz.

# V9077A WLAN Measurement Application Key Specifications<sup>1</sup> (continued)

WLAN analyzer error vector magnitude (EVM)		
Residual EVM		
Phase tracking on, pre-amble only		
802.11b: 2.4 to 2.5 GHz, 20 MHz		≤ 4% nominal, -20 to 0 dBm
802.11g: 2.4 to 2.5 GHz, 20 MHz		≤ -51 dB typical, -20 to 0 dBm
802.11a: 4.85 to 6 GHz, 20 MHz		≤ -46 dB typical, -20 to 0 dBm
802.11n: 4.85 to 6 GHz, 20 MHz		≤ -47 dB typical, -20 to 0 dBm
802.11n: 4.85 to 6 GHz, 40 MHz		≤ -46 dB typical, -20 to 0 dBm
802.11ac: 4.85 to 6 GHz, 80 MHz		≤ -43 dB typical, -20 to 0 dBm
802.11ac: 4.85 to 6 GHz, 160 MHz		≤ -40 dB typical, -20 to 0 dBm

WLAN spectral emission mask(SEM)			
WLAN format 802.11	± Ranges [MHz]	Relative power [dBc(avg)]	
		-20 dBm average in	0 dBm average in
802.11n, 40 MHz	40 to 60	≤ -53 dBc (nominal)	≤ -57 dBc (nominal)
802.11ac, 80 MHz	80 to 120	≤ -49 dBc (nominal)	≤ -50 dBc (nominal)
802.11ac, 160 MHz	160 to 240	≤ -48 dBc (nominal)	≤ -51 dBc (nominal)

WLAN source error vector magnitude (EVM)		
802.11b: 2.4 to 2.5 GHz, 20 MHz		≤ 4% nominal, -7 dBm
802.11g: 2.4 to 2.5 GHz, 20 MHz		≤ -50 dB typical, -7 dBm
802.11a: 4.85 to 6 GHz, 20 MHz		≤ -44 dB typical, -7 dBm
802.11n: 4.85 to 6 GHz, 20 MHz		≤ -43 dB typical, -7 dBm
802.11n: 4.85 to 6 GHz, 40 MHz		≤ -44 dB typical, -7 dBm
802.11ac: 4.85 to 6 GHz, 80 MHz		≤ -42 dB typical, -7 dBm
802.11ac: 4.85 to 6 GHz, 160 MHz		≤ -42 dB typical, -7 dBm

1. Specifications apply to frequencies between 2.4 to 2.5 GHz and 4.85 to 6 GHz.

# V9081A *Bluetooth*<sup>®</sup> Measurement Application Key Specifications<sup>1</sup>

Supported <i>Bluetooth</i> standards			
Standard version	<i>Bluetooth</i> Basic Rate	<i>Bluetooth</i> EDR	<i>Bluetooth</i> Low Energy
Modulation formats	GFSK	Header: GFSK Data: $\pi/4$ -DQPSK, 8DPSK	GFSK

  

Supported <i>Bluetooth</i> measurements	<i>Bluetooth</i> Basic Rate	<i>Bluetooth</i> EDR	<i>Bluetooth</i> Low Energy
<b>Transmit analysis</b>			
<b>Output power (in time domain)</b>			
Peak power	•		•
Average power	•		•
<b>Modulation characteristics</b>			
$\Delta F1$ avg (11110000)	•		•
$\Delta F2$ avg (10101010)	•		•
Min $\Delta F1/\Delta F2$ max	•		•
Max $\Delta F1/\Delta F2$ max	•		•
$\Delta F2 > 115$ kHz	•		•
Initial carrier frequency tolerance (ICFT)	•		•
<b>Carrier frequency drift</b>			
Frequency drift	•		•
Max drift rate	•		•
Adjacent channel power	•		
Output power $-20$ dB bandwidth	•		
<b>EDR transmit analysis</b>			
<b>Relative transmit power</b>			
GFSK average power		•	
DPSK average power		•	
Relative power		•	
<b>Frequency stability and modulation accuracy</b>			
Freq offset $\omega_i/\omega_0$ , $\omega_i + \omega_0$		•	
RMS DEVM (differential DVM)		•	
Peak DEVM		•	
<b>Differential phase decoding</b>			
BER		•	
Bit error		•	
99% DEVM		•	
<b>EDR in-band spurious emissions</b>			
<b>LE in-band emissions</b>			
			•

1. Specifications apply for frequencies between 2.4 to 2.5 GHz.

# V9081A Bluetooth® Measurement Application Key Specifications<sup>1</sup> (continued)

Modulation characteristics	
Signal level range	+23 to –50 dBm
Deviation range	±250 kHz nominal
Deviation resolution	100 Hz nominal
Measurement accuracy	±100 Hz + $tfa^2$ nominal

Initial carrier frequency tolerance	
Signal level range	+23 to –50 dBm
Measurement range	Nominal channel freq ±100 kHz nominal
Measurement accuracy	±100 Hz + $tfa^2$ nominal

Carrier frequency drift	
Signal level range	+23 to –50 dBm
Measurement range	±100 kHz nominal
Measurement accuracy	±100 Hz + $tfa^2$ nominal

EDR modulation accuracy	
Carrier power range at RF input	+24 to –70 dBm (RF I O ports), +33 to –56 dBm (RFIO ports)
Range (rms DEVM)	0 to 12% nominal
Residual DEVM	1.5% nominal

**Bluetooth source performance**

*Bluetooth* (using Signal Studio signal noted) nominal specifications over range 0 to –90 dBm, the specifications in this section apply for frequencies between 2400 and 2486 MHz.

Link type	Parameters	Characteristic	Performance		
Basic data rate (ACL)	Packet type	DH1	FSK error		
	Modulation type	GFSK (BT = 0.5)			
	Packet data type	Standard			
	Frequency	2402 MHz			
	Amplitude	–10 dBm			
Enhanced data rate (ACL)	Packet type	3-DH1	ACP at frequency = 2402 + k MHz	k = 2	–68.75 dBm
	Modulation type	GFSK (BT = 0.5) + D8PSK		k = 3, 4, 5, ..., 78	–71 dBm
	Packet data type	Standard			
	Frequency	2402 MHz	rms DEVM error		< 5%

1. Specifications apply for frequencies between 2.4 to 2.5 GHz.

2.  $tfa$  = transmitter frequency x frequency reference accuracy.

[www.agilent.com](http://www.agilent.com)  
[www.agilent.com/find/E6630A](http://www.agilent.com/find/E6630A)



### myAgilent

[www.agilent.com/find/myagilent](http://www.agilent.com/find/myagilent)

A personalized view into the information most relevant to you.



### [www.pxisa.org](http://www.pxisa.org)

PCI eXtensions for Instrumentation (PXI) modular instrumentation delivers a rugged, PC-based high-performance measurement and automation system.



### Three-Year Warranty

[www.agilent.com/find/ThreeYearWarranty](http://www.agilent.com/find/ThreeYearWarranty)

Agilent's combination of product reliability and three-year warranty coverage is another way we help you achieve your business goals: increased confidence in uptime, reduced cost of ownership and greater convenience.



### Agilent Assurance Plans

[www.agilent.com/find/AssurancePlans](http://www.agilent.com/find/AssurancePlans)

Five years of protection and no budgetary surprises to ensure your instruments are operating to specifications and you can continually rely on accurate measurements.



### [www.agilent.com/quality](http://www.agilent.com/quality)



Agilent Electronic Measurement Group  
DEKRA Certified ISO 9001:2008  
Quality Management System

*Bluetooth* is a trademark owned by *Bluetooth SIG, Inc.*, U.S.A. and licensed to Agilent Technologies, Inc. *cdma2000* is a US registered certification mark of the Telecommunications Industry Association.

For more information on Agilent Technologies' products, applications or services, please contact your local Agilent office. The complete list is available at:  
[www.agilent.com/find/contactus](http://www.agilent.com/find/contactus)

### Americas

Canada	(877) 894 4414
Brazil	(11) 4197 3600
Mexico	01800 5064 800
United States	(800) 829 4444

### Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Other AP Countries	(65) 375 8100

### Europe & Middle East

Belgium	32 (0) 2 404 93 40
Denmark	45 45 80 12 15
Finland	358 (0) 10 855 2100
France	0825 010 700* *0.125 €/minute
Germany	49 (0) 7031 464 6333
Ireland	1890 924 204
Israel	972-3-9288-504/544
Italy	39 02 92 60 8484
Netherlands	31 (0) 20 547 2111
Spain	34 (91) 631 3300
Sweden	0200-88 22 55
United Kingdom	44 (0) 118 927 6201

For other unlisted countries:

[www.agilent.com/find/contactus](http://www.agilent.com/find/contactus)

(BP-1-15-14)

Product specifications and descriptions in this document subject to change without notice.

© Agilent Technologies, Inc. 2013, 2014  
Published in USA, February 21, 2014  
5991-3668EN



**Agilent Technologies**