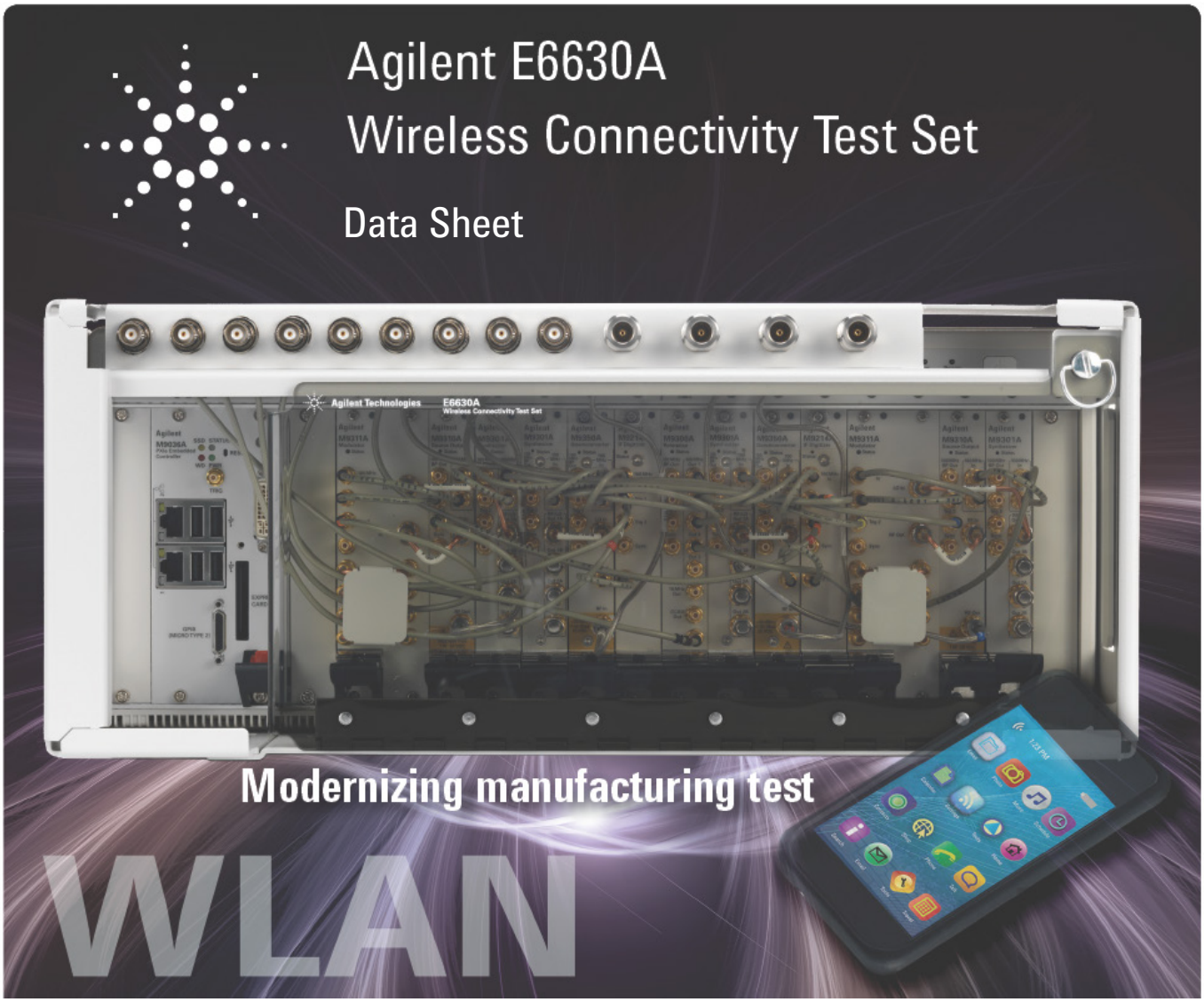
Agilent E6630A
Wireless Connectivity Test Set

Data Sheet



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.

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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 (≈2 σ) 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	
Frequency range	2.4 to 2.5 GHz 4.85 to 6 GHz
Frequency reference (100 MHz)	
Accuracy	± [(time since last adjustment x aging rate) ± temperature effects ± calibration accuracy]
Aging rate	Daily < ±0.5 ppb/day, after 72 hours of warm-up Yearly < ±0.10 ppm/year, after 72 hours of warm-up Total 10 years < ±0.6 ppm/10 years, after 72 hours of warm-up
Achievable initial calibration accuracy (at time of shipment, after warm-up)	±0.05 ppm
Temperature effects	< ±10 ppb, 20 to 30 °C < ±50 ppb, 5 to 50 °C
Residual FM	≤ 0.25 Hz p-p in 20 ms nominal
CW measurement frequency accuracy	
Accuracy	(transmitter frequency x frequency reference accuracy) ±50 Hz
Resolution	1 Hz
Arbitrary frequency switching speed	400 µs 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 µs

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: < *±0.42 dB typical*
Input signal –50 to +23 dBm	4.85 to 6 GHz: < *±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
Amplitude switching speed	≤ 1.5 ms nominal
Spurious responses	
f ≥ 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

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 µs typical*

Amplitude specifications	
Output level ranges[1]	
RF OUT	*–110 to +10 dBm typical*
Absolute level accuracy	
RF OUT	1.1 to 1.7 GHz, –110 to +10 dBm: *< ±0.5 dB typical* 2.4 to 2.5 GHz, –110 to +10 dBm: *< ±0.5 dB typical* 4.85 to 6 GHz, –110 to +10 dBm: *< ±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

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 • IEC/EN 61326-2-1 • CISPR Pub 11 Group 1, Class A • AS/NZS CISPR 11 • ICES/NMB-001 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 • IEC/EN 61010-1 • Canada: CSA C22.2 No. 61010-1-04 • USA: UL Std. 61010-1

General Specifications (continued)

Acoustic emissions		
	Auto fan (25 °C ambient)	**High fan**
Sound pressure level[1,2]	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 Ethertwist

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 kΩ nominal

10 MHz Ref IN	
Connector	BNC female, 50 Ω nominal
Trigger input level range	–5 to +5 V, impedance > 10 kΩ nominal
Trigger output level range	3.3 V LVTTL, impedance 50 Ω 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 Ω nominal
Output amplitude	> 0 dBm nominal
Frequency	10 MHz ± (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[1]

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)
Modulation analysis				
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			●	●
Channel power	●	●	●	●
Occupied bandwidth	●	●	●	●
Spectrum emission mask (SEM)	●	●	●	●
Spurious emissions	●	●	●	●
Power vs. time	●	●	●	●
Spectral flatness	●	●	●	●
I/Q waveform	●	●	●	●

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

V9077A WLAN Measurement Application Key Specifications[1] (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*® Measurement Application Key Specifications[1]

Supported *Bluetooth* standards			
Standard version	*Bluetooth* Basic Rate	*Bluetooth* EDR	*Bluetooth* Low Energy
Modulation formats	GFSK	Header: GFSK Data: π/4-DQPSK, 8DPSK	GFSK

Supported *Bluetooth* measurements	*Bluetooth* Basic Rate	*Bluetooth* EDR	*Bluetooth* Low Energy
Transmit analysis			
Output power (in time domain)			
Peak power	●		●
Average power	●		●
Modulation characteristics			
ΔF1 avg (11110000)	●		●
ΔF2 avg (10101010)	●		●
Min ΔF1/ΔF2 max	●		●
Max ΔF1/ΔF2 max	●		●
ΔF2 > 115 kHz	●		●
Initial carrier frequency tolerance (ICFT)	●		●
Carrier frequency drift			
Frequency drift	●		●
Max drift rate	●		●
Adjacent channel power	●		
Output power –20 dB bandwidth	●		
EDR transmit analysis			
Relative transmit power			
GFSK average power		●	
DPSK average power		●	
Relative power		●	
Frequency stability and modulation accuracy			
Freq offset ωi/ω0, ωi + ω0		●	
RMS DEVM (differential DVM)		●	
Peak DEVM		●	
Differential phase decoding			
BER		●	
Bit error		●	
99% DEVM		●	
EDR in-band spurious emissions		●	
LE in-band emissions			●

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

V9081A *Bluetooth*® Measurement Application Key Specifications[1] (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 frequncy 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		0.65%
	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.*

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