

# Keysight E6650A

## EXF Wireless Test Set for Femtocell



## Table of Contents

Product Specifications.....	3
Definitions and conditions .....	3
Vector signal analyzer performance .....	4
Vector signal generator performance.....	7
Timebase specifications.....	9
General specifications.....	10
Front panel .....	11
Application Specifications .....	13
V9071B GSM/EDGE/Evo measurement application key specifications.....	13
GSM/EDGE/Evo source key specifications .....	13
V9073B W-CDMA/HSPA+ measurement application key specifications .....	14
W-CDMA/HSPA+ source key specifications.....	14
V9080B LTE FDD and V9082B LTE TDD measurement application key specifications .....	14
LTE source key specifications .....	15
V9079B TD-SCDMA measurement application key specifications .....	15
TD-SCDMA source key specifications.....	15
V9077B WLAN measurement application key specifications.....	15
Wireless LAN source key specifications .....	18
Related Literature .....	18

# Product Specifications

## Definitions and conditions

### Specification

Specifications describe the performance parameters covered by the product warranty and are valid from 20 to 35 °C 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) after alignment within the stated alignment time and temperature limits.

### Nominal

Nominal values indicate expected performance, or describe product performance that is useful in the application of the product, but are not covered by the product warranty.

The test set will meet its specification when:

- The test set is within its calibration cycle
- The test set has been stored at an ambient temperature within the allowed operating range for at least two hours before being turned on; if it had previously been stored at a temperature range inside the allowed storage range, but outside the allowed operating range
- The test set has been turned on for at least 45 minutes
- The RF, IF, and Source Alignments<sup>1</sup> have been run within the previous 7 days
- An ALL Alignment<sup>1</sup> has been run:
  - Within the previous 8 hours
  - If the temperature has changed more than 5 °C from the previous “ALL” alignment

1. For more information on using alignments in a manufacturing environment, please see the EXF user documentation.

## Vector signal analyzer performance

Performance	
Capture depth	4 GB memory, 512 MSa of IQ data
Frequency and time specifications	
Frequency range	
All RF ports (options are per TRX module)	
Option E6650A-504	380 MHz to 3.8 GHz
Option E6650A-5WC	1.1 to 1.8 GHz, 2.3 to 2.6 GHz, and 4.8 to 6.0 GHz
Option E6650A-506	380 MHz to 6.0 GHz
Specified frequency range (dependent on selected frequency range option)	
	380 to 490 MHz
	490 to 695 MHz
	695 to 920 MHz
	920 to 960 MHz
	1425 to 1485 MHz
	1485 to 1560 MHz
	1620 to 2030 MHz
	2100 to 2200 MHz
	2300 to 2700 MHz
	3400 to 3800 MHz
	4900 to 6000 MHz
Frequency reference	
Accuracy, aging rate, stability	Refer to Timebase specifications
CW measurement frequency accuracy	
Accuracy	<i>(Transmitter frequency x frequency reference accuracy) ± 50 Hz typical</i>
Resolution	<i>1 Hz typical</i>
Analysis bandwidth	
Maximum bandwidth	
E6650A-B40	Up to 40 MHz analysis bandwidth
E6650A-B85	
380 to < 640 MHz	Up to 40 MHz
640 to 800 MHz	Up to 80 MHz
All other specified frequency ranges	Up to 80 MHz
E6650A-B1X	
380 to < 640 MHz	Up to 40 MHz
640 to 800 MHz	Up to 80 MHz
3400 to 3800 MHz	Up to 100 MHz
All other specified frequency ranges	Up to 160 MHz

## Vector signal analyzer performance (continued)

Triggering	
Trigger	Free run, external 1, external 2, RF burst, video, internal
Sequence analyzer	Free run, external 1, external 2, RF burst, video, line,
IQ analyzer	periodic
Trigger delay range	-15 to 500 ms
Resolution	0.1 $\mu$ s

### Amplitude accuracy and range specifications

#### Input level ranges (average power)

RF3 I/O and RF4 I/O (half duplex)	-70 to +30 dBm
RFIO1 and RFIO2 (full duplex)	-65 to +36 dBm

#### CW absolute amplitude accuracy

RF3 I/O and RF4 I/O ports (configured to input mode in specified frequencies)

Frequency range	Input level $\leq -8$ to $-70$ dBm	Input level $> -8$ to $+24$ dBm
380 to $< 490$ MHz	$< \pm 0.55$ dB, $< \pm 0.30$ dB typical	$< \pm 0.45$ dB, $< \pm 0.20$ dB typical
490 to $< 600$ MHz	$< \pm 0.20$ dB typical	$< \pm 0.20$ dB typical
600 to $< 640$ MHz	$< \pm 0.40$ dB typical	$< \pm 0.45$ dB typical
640 to $< 695$ MHz	$< \pm 0.20$ dB typical	$< \pm 0.20$ dB typical
695 to $< 800$ MHz	$< \pm 0.60$ dB, $< \pm 0.30$ dB typical	$< \pm 0.60$ dB, $< \pm 0.30$ dB typical
800 to $< 920$ MHz	$< \pm 0.40$ dB, $< \pm 0.20$ dB typical	$< \pm 0.40$ dB, $< \pm 0.20$ dB typical
920 to 960 MHz	$< \pm 0.20$ dB typical	$< \pm 0.20$ dB typical
1425 to $< 1485$ MHz	$< \pm 0.65$ dB, $< \pm 0.30$ dB typical	$< \pm 0.55$ dB, $< \pm 0.25$ dB typical
1485 to 1560 MHz	$< \pm 0.20$ dB typical	$< \pm 0.25$ dB typical
1620 to 2030 MHz		
40 MHz BW	$< \pm 0.45$ dB, $< \pm 0.20$ dB typical	$< \pm 0.45$ dB, $< \pm 0.25$ dB typical
160 MHz BW	$< \pm 0.70$ dB, $< \pm 0.35$ dB typical	$< \pm 0.70$ dB, $< \pm 0.35$ dB typical
2100 to 2200 MHz	$< \pm 0.25$ dB typical	$< \pm 0.20$ dB typical
2300 to 2700 MHz		
40 MHz BW	$< \pm 0.55$ dB, $< \pm 0.25$ dB typical	$< \pm 0.50$ dB, $< \pm 0.20$ dB typical
160 MHz BW	$< \pm 0.80$ dB, $< \pm 0.45$ dB typical	$< \pm 0.65$ dB, $< \pm 0.30$ dB typical
3400 to 3800 MHz	$< \pm 0.65$ dB, $< \pm 0.30$ dB typical	$< \pm 0.65$ dB, $< \pm 0.25$ dB typical
4900 to 6000 MHz		
40 MHz BW	$< \pm 0.75$ dB, $< \pm 0.30$ dB typical	$< \pm 0.60$ dB, $< \pm 0.25$ dB typical
160 MHz BW	$< \pm 0.90$ dB, $< \pm 0.50$ dB typical	$< \pm 0.75$ dB, $< \pm 0.40$ dB typical

## Vector signal analyzer performance (continued)

### Amplitude accuracy and range specifications (continued)

#### RFIO1 and RFIO2 ports (in specified frequencies)

Frequency range	Input level < -8 to -65 dBm	Input level ≤ -8 to +33 dBm
380 to < 490 MHz	< ± 0.50 dB, < ± 0.25 dB typical	< ± 0.50 dB, < ± 0.25 dB typical
490 to < 600 MHz	< ± 0.20 dB typical	< ± 0.20 dB typical
600 to < 640 MHz	< ± 0.40 dB typical	< ± 0.60 dB typical
640 to < 695 MHz	< ± 0.20 dB typical	< ± 0.30 dB typical
695 to < 800 MHz	< ± 0.60 dB, < ± 0.40 dB typical	< ± 0.60 dB, < ± 0.35 dB typical
800 to < 920 MHz	< ± 0.50 dB, < ± 0.20 dB typical	< ± 0.40 dB, < ± 0.25 dB typical
920 to 960 MHz	< ± 0.20 dB typical	< ± 0.20 dB typical
1425 to < 1485 MHz	< ± 0.65 dB, < ± 0.30 dB typical	< ± 0.50 dB, < ± 0.20 dB typical
1485 to 1560 MHz	< ± 0.20 dB typical	< ± 0.20 dB typical
1620 to 2030 MHz		
40 MHz BW	< ± 0.50 dB, < ± 0.25 dB typical	< ± 0.45 dB, < ± 0.20 dB typical
160 MHz BW	< ± 0.65 dB, < ± 0.35 dB typical	< ± 0.60 dB, < ± 0.30 dB typical
2100 to 2200 MHz	< ± 0.20 dB typical	< ± 0.25 dB typical
2300 to 2700 MHz	< ± 0.55 dB, < ± 0.25 dB typical	< ± 0.50 dB, < ± 0.25 dB typical
3400 to 3800 MHz	< ± 0.65 dB, < ± 0.30 dB typical	< ± 0.65 dB, < ± 0.25 dB typical
4900 to 6000 MHz		
40 MHz BW	< ± 0.85 dB, < ± 0.45 dB typical	< ± 0.65 dB, < ± 0.30 dB typical
160 MHz BW	< ± 0.95 dB, < ± 0.55 dB typical	< ± 0.90 dB, < ± 0.45 dB typical

#### Input voltage standing wave ratio (VSWR)

##### RF3 I/O and RF4 I/O ports (configured to input mode in specified frequencies)

380 to 2030 MHz	< 1.4:1 typical
2100 to 2200 MHz,	< 1.6:1 typical
2300 to 6000 MHz	

##### RFIO1 and RFIO2 ports (in specified frequencies)

380 to 2030 MHz	< 1.25:1 typical
2100 to 2200 MHz,	< 1.5:1 typical
2300 to 3800 MHz	
4900 to 6000 MHz	< 1.7:1 typical

#### Spurious responses (In specified frequencies; RFIO1, RFIO2; RF3 I/O & RF4 I/O ports configured to input mode)

##### Residual responses in specified frequency ranges with analyzer ranged to < -30 dBm

380 to 5790 MHz	< -85 dBm typical
> 5790 to 6000 MHz	< -82 dBm typical

##### Other spurious, for offsets from 10 MHz up to half the maximum analysis bandwidth from the signal in specified frequency bands

< -62 dBc typical with analyzer ranged to signal peak power level

#### Phase noise (noise sidebands, CF = 900 MHz)

10 kHz offset	< -110 dBc/Hz nominal
1 MHz offset	< -130 dBc/Hz nominal

## Vector signal generator performance

Performance	
Arb bandwidth	up to 200 kHz, 76 to 110 MHz
	up to 20 MHz, 207 to 222 MHz
	up to 40 MHz, 380 to 490 MHz
	up to 80 MHz, 490 to 800 MHz
	up to 160 MHz, all other frequency ranges
Arb sample memory (storage capacity)	4 GB memory, 512 MSa of IQ data
Frequency specifications	
Frequency range	
All RF ports (options are per TRX module)	
Option E6650-5LF (standard)	< 380 MHz
Option E6650A-504	380 MHz to 3.8 GHz
Option E6650A-5WC	1.1 to 1.8 GHz, 2.3 to 2.6 GHz, and 4.8 to 6 GHz
Option E6650A-506	380 MHz to 6.0 GHz
Specified frequency range (dependent on selected frequency range option)	
	76 to 110 MHz
	207 to 222 MHz
	380 to 490 MHz
	490 to 695 MHz
	695 to 960 MHz
	1100 to 1325 MHz
	1425 to 2180 MHz
	2300 to 2700 MHz
	3400 to 3800 MHz
	4900 to 6000 MHz
Frequency reference	
Accuracy, aging rate, stability	Refer to Timebase specifications
Amplitude accuracy and range specifications	
Output level ranges	
RF3 I/O and RF4 I/O ports (configured to output mode)	
76 to 110 MHz, 207 to 222 MHz	-130 to +5 dBm (-130 to +15 dBm CW typical)
380 MHz to 6 GHz	-130 to +5 dBm (-130 to +15 dBm CW typical)
RFIO1 and RFIO2 ports	
76 to 110 MHz, 207 to 222 MHz	-130 to -15 dBm (-130 to -5 dBm CW typical)
380 MHz to 3.8 GHz	-130 to -15 dBm (-130 to -5 dBm CW typical)
3.8 to 6 GHz	-120 to -20 dBm (-120 to -15 dBm CW typical)

## Vector signal generator performance (continued)

### Amplitude accuracy and range specifications (continued)

#### Absolute level accuracy (specified frequencies, CW)

RF3 I/O and RF4 I/O ports (configured to output mode in specified frequencies)

76 to 110 MHz, 207 to 222 MHz, and 490 to < 695 MHz

Level ≤ +5 dBm to –15 dBm < ± 0.15 dB nominal

Level ≤ –15 dBm to –80 dBm < ± 0.20 dB nominal

Level ≤ –80 dBm to –120 dBm < ± 0.30 dB nominal

380 to 490 MHz, 695 to 1325 MHz

Level ≤ +5 dBm to –15 dBm < ± 0.50 dB, < ± 0.15 dB typical

Level ≤ –15 dBm to –80 dBm < ± 0.50 dB, < ± 0.20 dB typical

Level ≤ –80 dBm to –120 dBm < ± 0.65 dB, < ± 0.30 dB typical

1425 to 2700 MHz

Level ≤ +5 dBm to –15 dBm < ± 0.55 dB, < ± 0.15 dB typical

Level ≤ –15 dBm to –80 dBm < ± 0.75 dB, < ± 0.35 dB typical

Level ≤ –80 dBm to –120 dBm < ± 0.85 dB, < ± 0.45 dB typical

3400 to 3800 MHz

Level ≤ +5 dBm to –15 dBm < ± 0.60 dB, < ± 0.20 dB typical

Level ≤ –15 dBm to –80 dBm < ± 0.60 dB, < ± 0.30 dB typical

Level ≤ –80 dBm to –110 dBm < ± 1.10 dB, < ± 0.55 dB typical

4900 to 6000 MHz

Level ≤ +5 dBm to –15 dBm < ± 0.70 dB, < ± 0.25 dB typical

Level ≤ –15 dBm to –80 dBm < ± 0.75 dB, < ± 0.30 dB typical

Level ≤ –80 dBm to –100 dBm < ± 1.00 dB, < ± 0.50 dB typical

RFIO1 and RFIO2 ports (in specified frequencies)

76 to 110 MHz, 207 to 222 MHz, and 490 to < 695 MHz

Level ≤ –15 dBm to –80 dBm < ± 0.30 dB nominal

Level ≤ –80 dBm to –120 dBm < ± 0.35 dB nominal

380 to 490 MHz, 695 to 1325 MHz

Level ≤ –15 dBm to –80 dBm < ± 0.65 dB, < ± 0.30 dB typical

Level ≤ –80 dBm to –120 dBm < ± 0.75 dB, < ± 0.35 dB typical

1425 to 2700 MHz

Level ≤ –15 dBm to –80 dBm < ± 0.65 dB, < ± 0.40 dB typical

Level ≤ –80 dBm to –120 dBm < ± 0.75 dB, < ± 0.50 dB typical

3400 to 3800 MHz

Level ≤ –15 dBm to –80 dBm < ± 0.60 dB, < ± 0.30 dB typical

Level ≤ –80 dBm to –110 dBm < ± 1.10 dB, < ± 0.55 dB typical

4900 to 6000 MHz

Level ≤ –20 dBm to –80 dBm < ± 0.90 dB, < ± 0.30 dB typical

Level ≤ –80 dBm to –100 dBm < ± 1.00 dB, < ± 0.50 dB typical

Setting resolution 0.01 dB

VSWR RF3 I/O & RF4 I/O ports (configured to output mode in specified frequencies)

76 to 110 MHz < 1.9:1 typical

207 to 222 MHz < 1.45:1 typical

> 380 to 2030 MHz < 1.4:1 typical

> 2030 to 5800 MHz < 1.7:1 typical

> 5800 MHz < 1.9:1 typical

VSWR RFIO1 & RFIO2 ports (specified frequency ranges)

76 to 2030 MHz < 1.25:1 typical

> 2030 to 3800 MHz < 1.5:1 typical

4900 to 6000 MHz < 1.7:1 typical



## Vector signal generator performance (continued)

Harmonics and spurious (in specified frequencies)	
RF3 I/O & RF4 I/O ports; harmonics and sub-harmonics +0 dBm output power	< -30 dBc typical
RFIO1 & RFIO2 ports; harmonics and sub-harmonics -15 dBm output power	< -30 dBc nominal
All ports; non-harmonic spurious (CW mode, specified frequency ranges)	
≤ 110MHz	< -45 dBc nominal
207 to 222 MHz, 380 MHz to 3.8 GHz	< -62 dBc nominal
4.85 to 6 GHz	< -58 dBc nominal
Phase noise	
RFIO1 & RFIO2 ports, -10 dBm; RF3 I/O & RF4 I/O ports, 0 dBm; 1 MHz offset	
380 MHz to 3 GHz	≤ -125 dBc nominal
3 to 3.8 GHz	≤ -123 dBc nominal
3.8 to 6 GHz	≤ -121 dBc nominal

## Timebase specifications

Internal timebase	
Accuracy	± [(time since last adjustment x aging rate) + temperature stability + calibration accuracy] typical
Frequency stability – aging rate	
Daily	< ± 0.5 ppb/day typical, after 72 hour warm-up
Yearly	< ± 0.10 ppm/year typical, after 72 hours warm-up
Total 10 years	< ± 0.6 ppm/10 yrs typical, after 72 hours warm-up
Achievable initial calibration accuracy	± 5 x 10 <sup>-8</sup> typical
Frequency stability – temperature effects	
20 to 30 °C	< ± 10 ppb typical
Full temperature range	< ± 50 ppb typical
Frequency stability – warm up	
5 minutes over +20 to +30 °C, 1 hour	< ± 0.1 ppm typical
15 minutes over +20 to +30 °C, 1 hour	< ± 0.01 ppm typical
Recommended calibration cycle	2 years
External reference input	
Frequency	1 to 50 MHz, sine wave
Lock range	± 1 ppm nominal
Amplitude	0 to 10 dBm nominal
Connector	1 BNC
Impedance	50 Ω nominal

## General specifications

Power requirements	
Voltage and frequency	100/120 V, 50/60 Hz and 220/240 V, 50/60 Hz nominal
Power consumption	870 W (220 to 240 VAC input) 720 W (100 to 120 VAC input)
Size and weight	
Dimensions	
With feet installed (W x H x D mm)	449.9 x 190.4 x 581
With feet removed (W x H x D mm)	449.9 x 177.8 x 581
Rack space	4U x 1 rack width
Weight (with specified number of TRX modules installed)	
1	21.4 kg (47 lbs)
2	22.7 kg (50 lbs)
3	24.5 kg (54 lbs)
4	25.9 kg (57 lbs)
Environmental characteristics	
Operating temperature	+5 to +45 °C
Storage temperature	-40 to +65 °C
EMC	Complies with European EMC Directive 2004/108/EC – IEC/EN 61326-1, IEC/EN 61326-2-1 – CISPR Pub 11 Group 1, class A – AS/NZS CISPR 11:2002 – ICES/NMB-001 This ISM device complies with Canadian ICES-00. 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 Keysight 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 2006/95/EC – IEC/EN 61010-1 – Canada: CSA C22.2 No. 61010-1-04 – USA: UL Std. 61010-1
Audio noise	
Acoustic noise emission	Geraeuschemission
LpA < 70 dB	LpA < 70 dB
Operator position	Am Arbeitsplatz
Normal position	Normaler Betrieb
Per ISO 7779	Nach DIN 45635 t.19

## General specifications (continued)

### Calibration cycle

The recommended calibration cycle is two years; calibration services available through Keysight service centers

### Maximum applied reverse power

RF3 I/O and RF4 I/O ports	+30 dBm, CW
RFIO1 and RFIO2 ports	+36 dBm, CW

### RF I/O port isolation

Single TRX, port (as input) to port (as output)	
< 2700 MHz	> 90 dB nominal
3400 to 3800 MHz	> 85 dB nominal
> 4900 MHz	> 80 dB nominal

### Controller characteristics

CPU	Intel i7-3610QE quad-core
CPU clock frequency	2.3 GHz, 3.3 GHz (single-core Turbo Boost)
Memory	
L3 cache	6 MB
RAM type	DDR3, PC3- 12800 204-pin SODIMM sockets
RAM capacity	12 GB
Operating system	Microsoft Windows 7 Professional, 64-bit

### Data storage

Type	2.5 inch SATA II
Size	256 GB

### Remote programming

Interface	LAN RJ45
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## Front panel

### Controller status

Power	Green LED indicating power supply is good
Hard drive	Yellow LED indicating disc drive activity
User	Red LED reserved for future use

### Controller trigger

Connector	BNC female
Trigger	Programmable direction

## Front panel (continued)

LAN TCP/IP interface	
Standard x 2	1000 Base-T
Connector x 2	RJ45 Ethertwist

Monitor output	
Connector	DisplayPort, compatible with DisplayPort to VGA adapter

USB 3.0 ports	
Master (2 ports)	
Standard	Compatible with USB 3.0/2.0
Connector	USB Type-A female
Output current	0.5 A 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

10 MHz Out	
Connector	Type-BNC female, 50 $\Omega$ nominal
Output amplitude	9.5 dBm nominal

Ref In	
Connector	Type-BNC female, 50 $\Omega$ nominal
Characteristics	(see Timebase specifications)

RF connections per installed TRX module	
RF3 I/O and RF4 I/O ports (half duplex)	N-Type female, 50 $\Omega$ nominal
RFIO1 and RFIO2 ports (full duplex)	N-Type female, 50 $\Omega$ nominal

Trigger In 1, Trigger In 2, connections per installed TRX module	
Connector	BNC female
Impedance	> 10 k $\Omega$ nominal
Trigger level range	-3.5 to +3.5 V

Trigger Out 1, Trigger Out 2, connections per installed TRX module	
Connector	BNC female
Impedance	50 k $\Omega$ nominal
Trigger level range	3.3 V LVTTTL

Indicators	
TRX status	LED indicator

## Application Specifications

### V9071B GSM/EDGE/Evo measurement application key specifications<sup>1</sup>

Power versus time (PvT)	
Absolute power accuracy	$\pm 0.36$ dB typical at 0 dBm input power

Phase error (GMSK modulation)	
Average floor	0.30 ° typical at 0 dBm input power
Peak floor	0.85 ° typical at 0 dBm input power

EDGE error vector magnitude (EVM)	
RMS floor	0.65% typical at 0 dBm input power
Peak floor	2.0% typical at 0 dBm input power

Output RF spectrum (ORFS for GMSK and 8PSK modulation)	
Residual relative power, spectrum due to modulation	
Offset frequency	
600 kHz	-70 dBc typical at 0 dBm input power
1.2 MHz	-75 dBc typical at 0 dBm input power
1.8 MHz	-73 dBc typical at 0 dBm input power

Residual relative power, spectrum due to switching	
Offset frequency	
600 kHz	-67 dBc typical at 0 dBm input power
1.2 MHz	-74 dBc typical at 0 dBm input power
1.8 MHz	-76 dBc typical at 0 dBm input power

### GSM/EDGE/Evo source key specifications<sup>2</sup>

Signal quality (RF I/O ports: 0 dBm, RFIO ports: -15 dBm)	
Phase error (GMSK)	
RMS	< 0.3 ° nominal
Peak	< 2.0 ° nominal
EVM (EDGE)	
RMS	< 1% nominal

1. For frequencies from 450 to 490 MHz, 820 to 820 MHz, and 1710 to 1910 MHz
2. For frequencies from 380 to 490 MHz, 695 to 960 MHz, and 1425 to 2180 MHz

## Application Specifications *(continued)*

### V9073B W-CDMA/HSPA+ measurement application key specifications<sup>1</sup>

Channel power	
Absolute power accuracy	$\pm 0.36$ dB typical at 0 dBm input power
QPSK EVM	
Residual EVM	0.85% typical at $-10$ dBm input power
Adjacent channel leakage ratio (ACLR)	
Residual relative power in 3.84 MHz noise bandwidth 5 MHz offsets	$-65$ dBc typical at 0 dBm input power
Spectrum emission mask (SEM)	
Residual relative power (offsets)	
2.515 to 3.485 MHz	$-80$ dBc in a 30 kHz bandwidth typical at 0 dBm input power
4 to 7.5 MHz	$-65$ dBc in a 1 MHz bandwidth typical at 0 dBm input power
7.5 to 8.5 MHz	$-70$ dBc in a 1 MHz bandwidth typical at 0 dBm input power
8.5 to 12 MHz	$-70$ dBc in a 1 MHz bandwidth typical at 0 dBm input power

### W-CDMA/HSPA+ source key specifications<sup>2</sup>

Signal quality (RF I/O ports: 0 dBm, RFIO ports: $-15$ dBm)	
Composite EVM	
RMS	$< 1\%$ nominal

### V9080B LTE FDD and V9082B LTE TDD measurement application key specifications<sup>3</sup>

Transmit power	
Absolute power accuracy	$\pm 0.36$ dB typical at 0 dBm input power
Error vector magnitude (EVM)	
Residual EVM	
5, 10, 15, 20 MHz bandwidth	0.8% typical at $-10$ dBm input power
Adjacent channel power	
Minimum carrier power at RF input	
RF I/O ports	$-20$ dBm
RFIO ports	$-5$ dBm
Dynamic range	
E-UTRA	$-58$ dBc nominal
UTRA	$-60$ dBc nominal

1. For frequencies from 695 to 920 MHz and specified ranges from 1425 to 2700 MHz
2. For frequencies from 695 to 960 MHz, and 1425 to 2180 MHz
3. For specified frequency ranges between 600 and 3800 MHz

## Application Specifications *(continued)*

### LTE source key specifications<sup>1</sup>

#### Signal quality (RF I/O ports: -10 dBm, RFIO ports: -15 dBm)

Composite EVM	
380 MHz to 3.9 GHz RMS	< 1.1% nominal
> 3.9 GHz to 6 GHz RMS	< 1.5% nominal

### V9079B TD-SCDMA measurement application key specifications<sup>2</sup>

#### Channel power

Absolute power accuracy	± 0.36 dB typical at 0 dBm input power
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#### Error vector magnitude (EVM)

Residual EVM, 1.6 MHz channel BW	0.75% typical at 0 dBm input power
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#### Adjacent channel leakage ratio (ACLR) and adjacent channel power ratio (ACPR)

##### Residual relative power in 1.28 MHz BW

1.6 MHz offsets	-55 dBc typical at 0 dBm input power
3.2 MHz offsets	-70 dBc typical at 0 dBm input power

#### Spectrum emission mask (SEM)

##### Residual relative power (offsets)

2.515 to 3.485 MHz	-54 dBc in a 30 kHz BW typical at 0 dBm input power
4 to 7.5 MHz	-68 dBc in a 1 MHz BW typical at 0 dBm input power
7.5 to 8.5 MHz	-71 dBc in a 1 MHz BW typical at 0 dBm input power

### TD-SCDMA source key specifications<sup>3</sup>

#### Signal quality (RF I/O ports: 0 dBm, RFIO ports: -20 dBm)

Composite EVM RMS	< 0.5% nominal
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### V9077B WLAN measurement application key specifications

#### Modulated power

Absolute power accuracy	
2400 MHz to 2483.5 MHz	± 0.27 dB typical at 0 dBm input power
5150 MHz to 5825 MHz	± 0.49 dB typical at 0 dBm input power

#### Error vector magnitude (EVM)

##### EVM Floor conditions Phase Tracking on, pre-amble only, RF I/O ports

802.11b: 2.4 GHz	< -40.9 dB typical at -20 dBm input power
802.11g: 2.4 GHz	< -47 dB typical at -20 dBm input power
802.11a: 5.8 GHz	< -48 dB typical at -20 dBm input power
802.11n: 5.8 GHz at 20 MHz bandwidth	< -48 dB typical at -20 dBm input power
802.11n: 5.8 GHz at 40 MHz bandwidth	< -44 dB typical at -20 dBm input power
802.11ac: 5.8 GHz at 80 MHz bandwidth	< -45 dB typical at -20 dBm input power
802.11ac: 5.8 GHz at 160 MHz bandwidth	< -43 dB typical at -20 dBm input power

1. For specified frequency ranges between 600 and 3800 MHz
2. For specified frequency ranges between 695 and 3800 MHz
3. For specified frequency ranges between 1620 and 2700 MHz

## Application Specifications (continued)

### SEM

802.11a/g at 2.4 GHz with 20 MHz bandwidth	See Figure 1
802.11a/g at 5.8 GHz with 20 MHz bandwidth	See Figure 2
802.11n at 5.8 GHz with 40 MHz bandwidth	See Figure 3
802.11ac at 5.8 GHz with 80 MHz bandwidth	See Figure 4

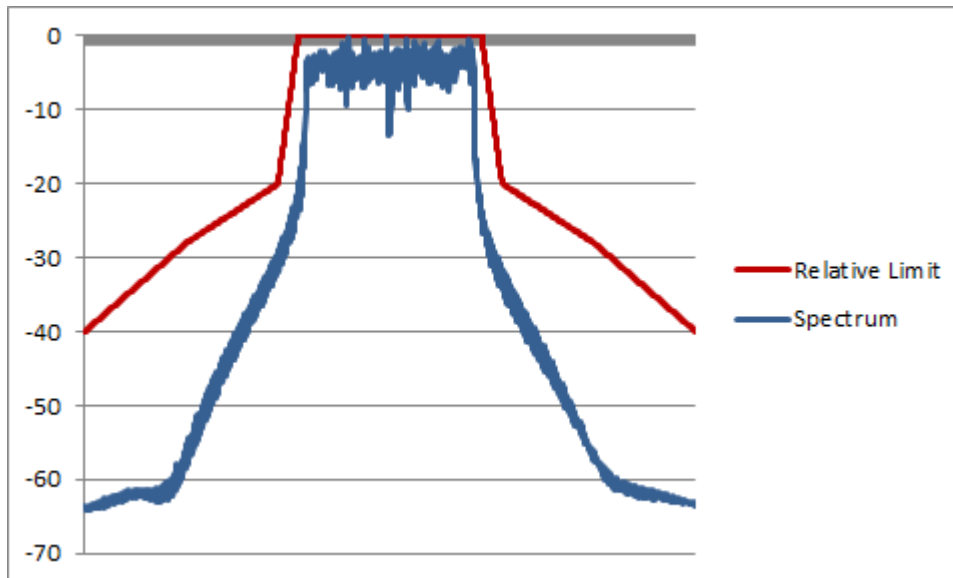


Figure 1. 802.11a/g SEM nominal performance at 2.4 GHz with 20 MHz bandwidth

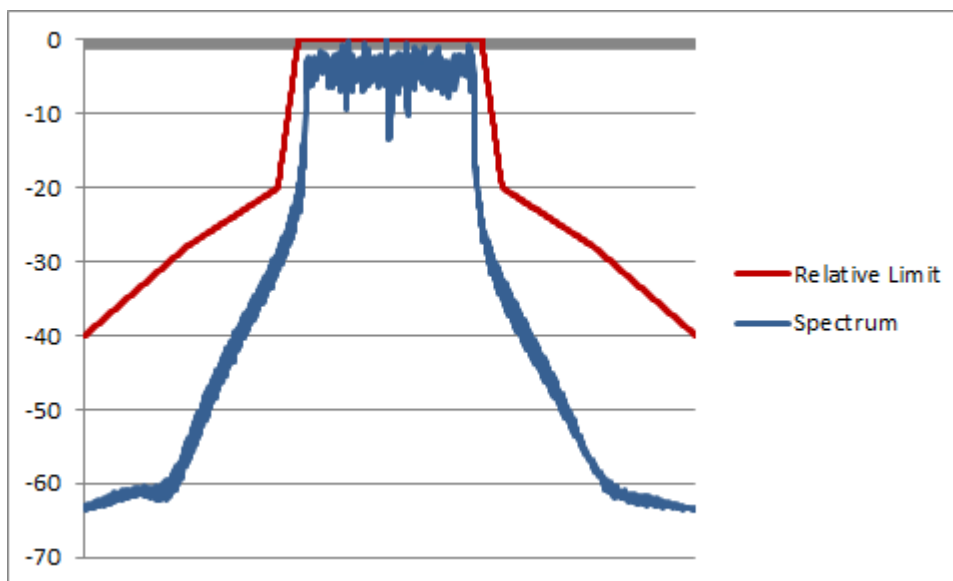


Figure 2. 802.11a/g SEM nominal performance at 5.8 GHz with 20 MHz bandwidth



## Application Specifications (continued)

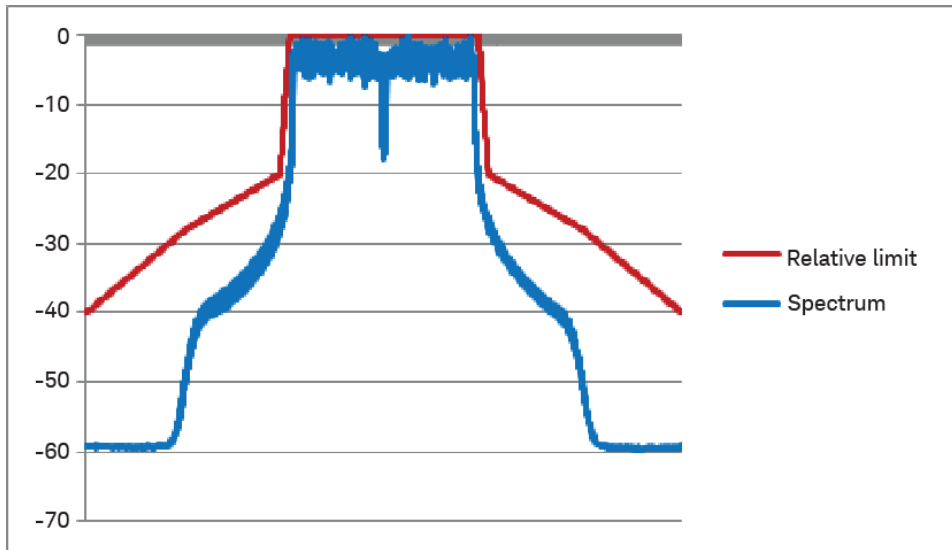


Figure 3. 802.11n SEM nominal performance at 5.8 GHz with 40 MHz bandwidth

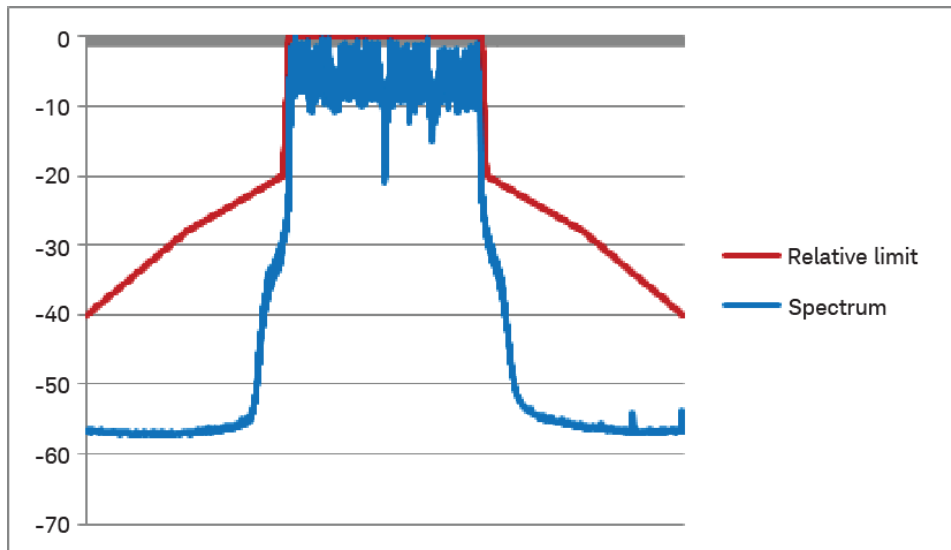


Figure 4. 802.11ac SEM nominal performance at 5.8 GHz with 80 MHz bandwidth

## Application Specifications (continued)

### Wireless LAN source key specifications

#### Error vector magnitude (EVM)

Wireless LAN error vector magnitude (EVM performance (using Signal Studio signal noted)) RF I/O ports	
802.11b: 2.4 GHz	< -28 dB typical (0 to -30 dBm)
802.11g: 2.4 GHz	< -50 dB typical (-5 to -15 dBm)
802.11a: 5.8 GHz	< -44 dB typical (-5 to -15 dBm)
802.11n: 5.8 GHz at 20 MHz band-width	< -43 dB typical (-5 to -15 dBm)
802.11n: 5.8 GHz at 40 MHz band-width	< -44 dB typical (-5 to -15 dBm)
802.11ac: 5.57 GHz at 160 MHz bandwidth	< -42 dB typical (-5 to -15 dBm)

### Related Literature

Title	Literature Number
<i>E6650A EXF Wireless Test Set for Femtocell, Configuration Guide</i>	5991-4993EN
<i>E6650A EXF Wireless Test Set for Femtocell, Getting Started Guide</i>	E6650-90001
<i>E6650A EXF Wireless Test Set for Femtocell, V9065B Sequence Analyzer Measurement Guide</i>	E6650-90011
<i>E6650A EXF Wireless Test Set for Femtocell, Programmer's Guide</i>	E6650-90007

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