Keysight E6640A
EXM Wireless Test Set

Data Sheet



Solve today, evolve tomorrow

KEYSIGHT TECHNOLOGIES

Introduction

Keysight EXM Benefits

- Optimize multi-device testing with up to four TRX channels per EXM: each is a complete vector signal analyzer/vector signal generator (VSA/VSG) instrument
- Easily test multi-format devices with standard-specific X-Series measurement applications
- Maximize throughput with raw hardware speed and advanced sequencing
- Increase first-pass yield with superior signal purity and measurement accuracy
- Get up and running in hours, not days, with validated turnkey chipset solutions

In wireless device manufacturing, meeting ever-tougher goals and tighter schedules is easier when you have access to the best resources. The Keysight Technologies, Inc. EXM wireless test set scales with your production needs and is in sync with the latest cellular and WLAN chipsets. Better yet, it delivers the speed, accuracy, and port density you need to ramp up rapidly and optimize full-volume manufacturing. The EXM is designed for multi-device testing with up to four TRXs: each is a complete vector signal analyzer (VSA), vector signal generator (VSG), and four-port RFIO. It can easily test multi-format cellular and WLAN devices including the latest technologies such as:

- LTE-Advanced Carrier Aggregation (CA)
- 802.11n/ac Multiple Input Multiple Output (MIMO)
- LTE/LTE-Advanced FDD
- LTE/LTE-Advanced TDD
- TD-SCDMA
- HSPA+, W-CDMA
- 1xEV-DO, cdma2000®
- GSM/EDGE/Evo
- 802.11a/b/g/n/j/p/ac
- PHS
- DECT

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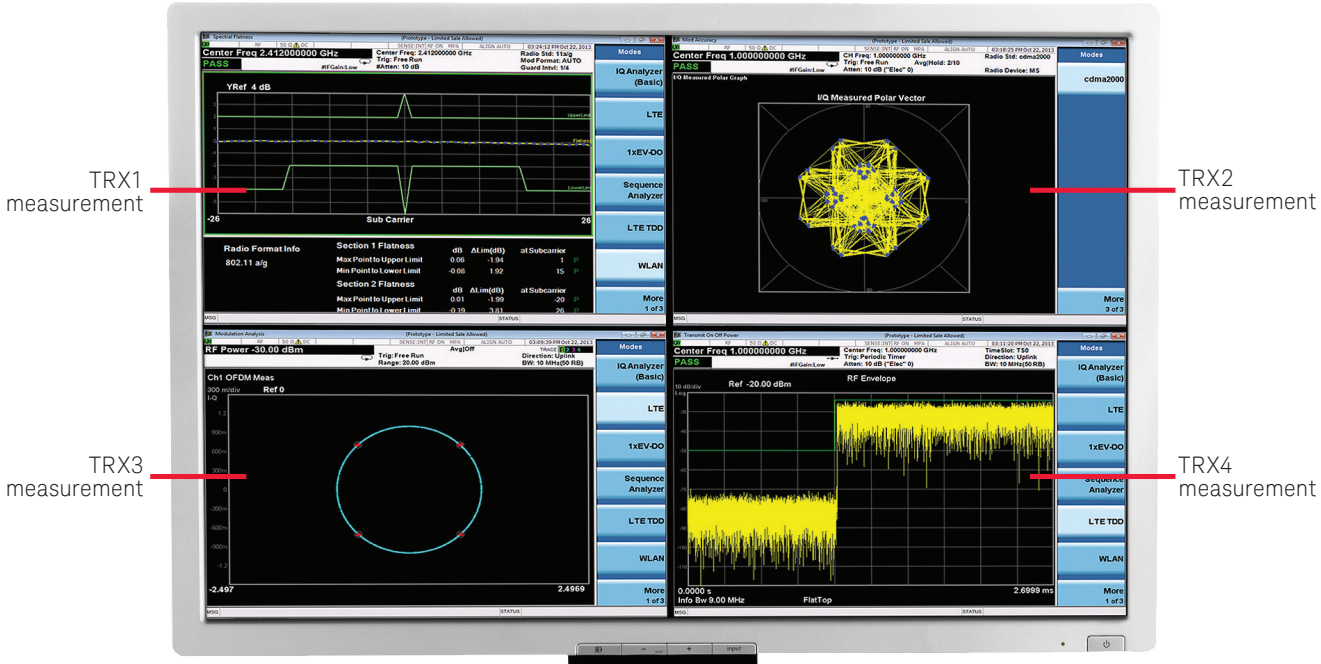
Product Features

X-Series user interface[1]



E6640A EXM



1. Technology-specific software. Sold seperately.
2. Each TRX module has either two full duplex and two half duplex ports (E6640A-2FD) or four full duplex ports (E6640A-4FD), depending on your application requirements. A full-duplex port can act as an input and output simultaneously. For example, it can connect to both the VSA/VSG of a single TRX at the same time. Full-duplex ports are designated as follows: RFIOx where x can be 1 or 2 for the E6640A-2FD option (default) (e.g. RFIO1); and x can be 1, 2, 3, or 4 on the E6640A-4FD option (e.g. RFIO3). A half-duplex port is one that can act as either input or output but not both simultaneously. The configuration of the half-duplex ports can be set via the front panel or remote programming. The half-duplex ports are designated as RFx I|O where x is either 3 or 4 (e.g. RF3 I|O).

E6640A EXM Applications

Cellular

- LTE/LTE-Advanced FDD
- LTE/LTE-Advanced TDD
- HSPA+, W-CDMA
- 1xEV-DO, cdma2000
- GSM/EDGE/EDGE Evo
- TD-SCDMA

Wireless connectivity

- 802.11a/b/g/n/j/p/ac
- WiMAX™
- *Bluetooth* 1.0 to 4.2
- GNSS: GPS, Galileo, GLONASS, Beidou, SBAS, QZSS
- Digital video

MIMO (2x2, 3x3, 4x4) and carrier aggregation

- Switched MIMO for manufacturing test
- True MIMO (multi-TRX) for design validation
- LTE-A CA inter- and intra-band

Application Flexibility

- Consistent repeatability of standard-based X-Series measurement applications
- One application license covers up to four TRX units per mainframe
- SCPI-controlled PXIe OBT compatible with EXT/E6630A

Scale your production line with TRX modules

Each TRX module contains

- A fully integrated VSA/VSG
- Integrated RFIO with either two full duplex and two half duplex ports (E6640A-2FD) or four full duplex ports (E6640A-4FD)
- Rugged N-type connectors designed for manufacturing environment

Each TRX is upgradable

- Add a new TRX (hardware) as needed
- Upgrade frequency and bandwidth (license key)

Each TRX is configurable

- Frequency range
  - 380 MHz to 3.8 GHz or 6 GHz
  - Banded or WLAN, *Bluetooth*, GNSS
- Bandwidth: 40/80/160 MHz

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 has 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[1] have been run within the previous 7 days
- An ALL Alignment[1] 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 EXM 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 E6640A-504	380 MHz to 3.8 GHz
Option E6640A-5WC	1.1 to 1.8 GHz, 2.3 to 2.6 GHz, and 4.8 to 6.0 GHz
Option E6640A-506	380 MHz to 6.0 GHz
Specified frequency range (dependent on selected frequency range option)	
	380 to 495 MHz
	695 to 920 MHz
	1425 to 1485 MHz
	1620 to 2030 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	*(Transmitter frequency x frequency reference accuracy) ± 50 Hz typical*
Resolution	*1 Hz typical*
Analysis bandwidth	
Maximum bandwidth	
E6640A-B40	Up to 40 MHz analysis bandwidth
E6640A-B85	
380 to 495 MHz	Up to 40 MHz
695 to 800 MHz	Up to 60 MHz
All other specified frequency ranges	Up to 80 MHz
E6640A-B1X	
380 to 495 MHz	Up to 40 MHz
695 to 800 MHz	Up to 60 MHz
3400 to 3800 MHz	Up to 100 MHz
All other specified frequency ranges	Up to 160 MHz
Triggering	
Trigger	
Sequence analyzer	Free run, external 1, external 2, RF burst, video, internal
IQ analyzer	Free run, external 1, external 2, RF burst, video, line, periodic
Trigger delay range	–15 to 500 ms
Resolution	0.1 µs
Amplitude accuracy and range specifications	
Input level ranges (average power)	
RF3 I|O and RF4 I|O, E6640A-2FD (half duplex)	–70 to +30 dBm
RFIO3 and RFIO4, E6640A-4FD (full duplex)	–65 to +36 dBm
RFIO1 and RFIO2 (full duplex)	–65 to +36 dBm

Vector signal analyzer performance *(continued)*

Amplitude accuracy and range specifications *(continued)*

CW absolute amplitude accuracy

RF3 I|O and RF4 I|O ports, E6640A-2FD (configured to input mode in specified frequencies)

Frequency range	Input level ≤ –8 to –70 dBm	Input level > –8 to +24 dBm
380 to 495 MHz	< ±0.60 dB, < *±0.30 dB typical*	< ±0.40 dB, < *±0.20 dB typical*
695 to 920 MHz	< ±0.60 dB, < *±0.30 dB typical*	< ±0.65 dB, < *±0.35 dB typical*
1425 to 1485 MHz	< ±0.65 dB, < *±0.30 dB typical*	< ±0.55 dB, < *±0.25 dB typical*
1620 to 2030 MHz		
40 MHz BW	< ±0.45 dB, < *±0.20 dB typical*	< ±0.45 dB, < *±0.25 dB typical*
160 MHz BW	< ±0.70 dB, < *±0.35 dB typical*	< ±0.70 dB, < *±0.35 dB typical*
2300 to 2700 MHz		
40 MHz BW	< ±0.55 dB, < *±0.25 dB typical*	< ±0.50 dB, < *±0.20 dB typical*
160 MHz BW	< ±0.80 dB, < *±0.45 dB typical*	< ±0.65 dB, < *±0.30 dB typical*
3400 to 3800 MHz	< ±0.65 dB, < ±0.30 dB typical	< ±0.65 dB, < *±0.30 dB typical*
4900 to 6000 MHz		
40 MHz BW	< ±0.75 dB, < *±0.30 dB typical*	< ±0.60 dB, < *±0.25 dB typical*
160 MHz BW	< ±0.90 dB, < *±0.50 dB typical*	< ±0.75 dB, < *±0.40 dB typical*

RFIO1 and RFIO2 ports (in specified frequencies); RFIO3 and RFIO4 ports, E6640A-4FD (in specified frequencies) only typical specifications apply

Frequency range	Input level < –8 to –65 dBm	Input level ≤ –8 to +33 dBm
380 to 495 MHz	< ±0.50 dB, < *±0.25 dB typical*	< ±0.50 dB, < *±0.25 dB typical*
695 to 920 MHz	< ±0.60 dB, < *±0.40 dB typical*	< ±0.65 dB, < *±0.35 dB typical*
1425 to 1485 MHz	< ±0.65 dB, < *±0.35 dB typical*	< ±0.50 dB, < ±0.25 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*
2300 to 2700 MHz		
40 MHz BW	< ±0.55 dB, < *±0.30 dB typical*	< ±0.50 dB, < *±0.25 dB typical*
160 MHz BW	< ±0.75 dB, < *±0.40 dB typical*	< ±0.55 dB, < *±0.25 dB typical*
3400 to 3800 MHz	< ±0.65 dB, < *±0.30 dB typical*	< ±0.65 dB, < *±0.30 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, E6640A-2FD (configured to input mode in specified frequencies)

380 to 2030 MHz	< *1.4:1 typical*
2300 to 6000 MHz	< *1.6:1 typical*

RFIO1 and RFIO2 ports (in specified frequencies); RFIO3 and RFIO4 ports, E6640A-4FD (in specified frequencies)

380 to 2030 MHz	< *1.25:1 typical*
2300 to 3800 MHz	< *1.5:1 typical*
4900 to 6000 MHz	< *1.7:1 typical*

Spurious responses (in specified frequencies); RFIO1, RFIO2, RFIO3, RFIO4; RF3 I|O and 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	< –107 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[1] Up to 20 MHz, 207 to 222 MHz[1] Up to 40 MHz, 380 to 490 MHz Up to 80 MHz, 695 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 E6640A-504	380 MHz to 3.8 GHz
Option E6640A-5WC	1.1 to 1.8 GHz, 2.3 to 2.6 GHz, and 4.8 to 6 GHz
Option E6640A-506	380 MHz to 6.0 GHz
Specified frequency range (dependent on selected frequency range option)	
	76 to 110 MHz[1] 207 to 222 MHz[1] 380 to 490 MHz 490 to 695 MHz[1] 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, E6640A-2FD (configured to output mode)	
380 MHz to 6 GHz	–130 to +5 dBm, *–130 to +15 dBm CW typical*
RFIO1 and RFIO2 ports ; RFIO3 and RFIO4 ports, E6640A-4FD (only typical specifications apply)	
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*
Absolute level accuracy (specified frequencies, CW)	
RF3 I|O and RF4 I|O ports, E6640A-2FD (configured to output mode in specified frequencies)	
76 to 110 MHz, 207 to 222 MHz, and 490 to < 695 MHz[1]	
Level ≤ +5 to –15 dBm	< ± 0.15 dB nominal
Level < –15 to –80 dBm	< ± 0.20 dB nominal
Level < –80 to –120 dBm	< ± 0.30 dB nominal
380 to 1325 MHz	
Level ≤ +5 to –15 dBm	< ±0.50 dB, < *±0.15 dB typical*
Level ≤ –15 to –80 dBm	< ±0.50 dB, < *±0.20 dB typical*
Level ≤ –80 to –120 dBm	< ±0.65 dB, < *±0.30 dB typical*
1425 to 2700 MHz	
Level ≤ +5 to –15 dBm	< ±0.55 dB, < *±0.15 dB typical*
Level ≤ –15 to –80 dBm	< ±0.75 dB, < *±0.35 dB typical*
Level ≤ –80 to –120 dBm	< ±0.85 dB, < *±0.45 dB typical*
3400 to 3800 MHz	
Level ≤ +5 to –15 dBm	< ±0.60 dB, < *±0.20 dB typical*
Level ≤ –15 to –80 dBm	< ±0.60 dB, < *±0.30 dB typical*
Level ≤ –80 to –110 dBm	< ±1.10 dB, < *±0.55 dB typical*
4900 to 6000 MHz	
Level ≤ +5 to –15 dBm	< ±0.70 dB, < *±0.25 dB typical*
Level ≤ –15 to –80 dBm	< ±0.75 dB, < *±0.30 dB typical*
Level ≤ –80 to –100 dBm	< ±1.00 dB, < *±0.50 dB typical*

1. With M9432A TRX with Option-5LF installed

Vector signal generator performance *(continued)*

Amplitude accuracy and range specifications *(continued)*	
Absolute level accuracy (specified frequencies, CW) *continued*	
RFIO1 and RFIO2 ports (in specified frequencies); RFIO3 and RFIO4 ports, E6640A-4FD (in specified frequencies) only typical specifications apply	
76 to 110 MHz, 207 to 222 MHz, and 490 to < 695 MHz[1]	
Level ≤ –15 to –80 dBm	< ± 0.30 dB nominal
Level < –80 to –120 dBm	< ± 0.35 dB nominal
380 to 1325 MHz	
Level ≤ –15 to –80 dBm	< ±0.65 dB, < *±0.30 dB typical*
Level ≤ –80 to –120 dBm	< ±0.75 dB, < *±0.35 dB typical*
1425 to 2700 MHz	
Level ≤ –15 to –80 dBm	< ±0.65 dB, < *±0.40 dB typical*
Level ≤ –80 to –120 dBm	< ±0.75 dB, < *±0.50 dB typical*
3400 to 3800 MHz	
Level ≤ –15 to –80 dBm	< ±0.60 dB, < *±0.30 dB typical*
Level ≤ –80 to –110 dBm	< ±1.10 dB, < *±0.55 dB typical*
4900 to 6000 MHz	
Level ≤ –20 to –80 dBm	< ±0.90 dB, < *±0.30 dB typical*
Level ≤ –80 to –100 dBm	< ±1.00 dB, < *±0.50 dB typical*
Setting resolution	0.01 dB
VSWR RF3 I|O and RF4 I|O ports, E6640A-2FD (configured to output mode in specified frequencies)	
76 to 110 MHz[1]	< *1.9:1 typical*
207 to 222 MHz[1]	< *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 and RFIO2 ports (in specified frequency ranges); RFIO3 and RFIO4 ports, E6640A-4FD (in specified frequency ranges	
76 to 2030 MHz[2]	< *1.25:1 typical*
> 2030 to 3800 MHz	< *1.5:1 typical*
4900 to 6000 MHz	< *1.7:1 typical*
Harmonics and spurious (in specified frequencies)	
RF3 I|O and RF4 I|O ports, E6640A-2FD harmonics and sub-harmonics	
+0 dBm output power	< *–30 dBc typical*
RFIO1 and RFIO2 ports; RFIO3 and RFIO4 ports, E6640A-4FD harmonics and sub-harmonics	
–15 dBm output power	< –30 dBc nominal
All ports; non-harmonic spurious (CW mode, specified frequency ranges)	
≤ 110 MHz[2]	< –45 dBc nominal
207 to 222 MHz[2], 380 MHz to 3.8 GHz	< –62 dBc nominal
4.85 to 6 GHz	< –58 dBc nominal
Phase noise	
RFIO1 and RFIO2 ports, –5 dBm; RFIO3 and RFIO4 ports, E6640A-4FD: –10 dBm; RF3 I|O and RF4 I|O ports, E6640A-2FD: 0 dBm; 1 MHz offset	
380 MHz to 3 GHz	≤ –132 dBc nominal
3 to 3.8 GHz	≤ –130 dBc nominal
3.8 to 6 GHz	≤ –128 dBc nominal

1. With M9432A TRX with Option-5LF installed
2. Frequencies below 380 MHz only applicable with M9432A TRX with Option-5LF

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 10–8 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

General specifications *(continued)*

Environmental characteristics *(continued)*	
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

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, E6640A-2FD	+30 dBm, CW
RFIO3 and RFIO4 ports, E6640A-4FD	+36 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

Warranty
Standard 3-year warranty

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	16 GB
Operating system	Microsoft Windows 7 Professional, 64-bit

Data storage	
Type	2.5 inch SATA II
Size	240 GB

Remote programming	
Interface	LAN RJ45

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
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 Ω nominal
Output amplitude	9.5 dBm nominal
Ref In	
Connector	Type-BNC female, 50 Ω nominal
Characteristics	(see Timebase Specifications)
RF connections per installed TRX module	
E6640A-2FD (default option)	
RF3 I|O and RF4 I|O ports (half duplex)	N-Type female, 50 Ω nominal
RFIO1 and RFIO2 ports (full duplex)	N-Type female, 50 Ω nominal
E6640A-4FD (optional)	
RFIO3 and RFIO4 ports (full duplex)	N-Type female, 50 Ω nominal
RFIO1 and RFIO2 ports (full duplex)	N-Type female, 50 Ω nominal
Trigger In 1, Trigger In 2, connections per installed TRX module	
Connector	BNC female
Impedance	> 10 kΩ 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 Ω nominal
Trigger level range	3.3 V LVTTL
Indicators	
TRX status	LED indicator

Application Specifications

V9071B GSM/EDGE/Evo measurement application key specifications[1]

Power versus time (PvT)	
Absolute power accuracy	*±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[2]

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[1]

Channel power	
Absolute power accuracy	*±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) and adjacent channel power ratio (ACPR)	
Residual relative power in 3.84 MHz bandwidth (offsets)	
5 MHz	*–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[2]

Signal quality (RF I|O ports: 0 dBm, RFIO ports: –15 dBm)	
Composite EVM	
RMS	< 1% 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

Application Specifications *(continued)*

V9072B cdma2000 and V9076B 1xEV-DO measurement application key specifications[1]

Channel power	
Absolute power accuracy	*±0.36 dB typical at 0 dBm input power*
Error vector magnitude (EVM)	
Residual EVM	*0.85% typical at –10 dBm input power*
Adjacent channel power (ACP)	
Residual relative power in 30 kHz bandwidth (offsets)	
885 kHz	*–71 dBc typical at 0 dBm input power*
1.98 MHz	*–83 dBc typical at 0 dBm input power*
4.0 MHz	*–82 dBc typical at 0 dBm input power*

cdma2000 and 1xEV-DO source key specifications[2]

Signal quality (RF I|O ports: 0 dBm, RFIO ports: –15 dBm)	
Composite EVM	
RMS	< 1.1% nominal

1. For frequencies from 410 to 484 MHz, 776 to 920 MHz, and 1710 to 1980 MHz
2. For frequencies from 380 to 490 MHz, 695 to 960 MHz, and 1425 to 2180 MHz

Application Specifications *(continued)*

V9080B LTE/LTE-Advanced FDD and V9082B LTE/LTE-Advanced TDD measurement application key specifications[1]

Transmit power	
Absolute power accuracy	*±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

LTE source key specifications[1]

Signal quality (RF I|O ports: 0 dBm, RFIO ports: –15 dBm)	
Composite EVM	
380 MHz to 3.9 GHz RMS	< 1.1% nominal
> 3.9 to 6 GHz RMS	< 1.5% nominal

1. For specified frequency ranges between 695 and 3800 MHz

Application Specifications *(continued)*

V9081B *Bluetooth* measurement application key specifications[1]

Channel power	
Absolute power accuracy	*±0.26 dB typical at 0 dBm input power*
Modulation characteristics	
Deviation range	±250 kHz nominal
EDR modulation accuracy	
Range (rms DEVM)	0 to 12% nominal
Floor	*0.6% typical at –20 dBm input power*

Bluetooth source key specifications[2]

***Bluetooth* source performance**	
***Bluetooth* signal using Signal Studio waveform**	
Basic data rate (ACL)	
FSK error at –10 dBm at RF I|O ports	0.65% nominal, DH1 packet, GFSK, standard packet, 2402 MHz
Enhanced data rate	
ACP for –10 dBm signal at RF I|O ports	3-DH1 packet, GFSK +D8PSK, standard packet, 2402 MHz
	–69 dBm nominal, k=2
	–72 dBm nominal, k= 3, 4, 5, ...78
EDR rms DEVM error	< 1% nominal

1. Specifications apply for frequencies between 2400 and 2486 MHz
2. For specified frequency ranges between 1620 and 2700 MHz

Application Specifications *(continued)*

V9079B TD-SCDMA measurement application key specifications[1]

Channel power	
Absolute power accuracy	*±0.36 dB typical at 0 dBm input power*
Error vector magnitude (EVM)	
Residual EVM , 1.6 MHz channel bandwidth	*0.75% typical at 0 dBm input power*
Adjacent channel leakage ratio (ACLR) and adjacent channel power ratio (ACPR)	
Residual relative power in 1.28 MHz bandwidth (offsets)	
1.6 MHz	*–55 dBc typical at 0 dBm input power*
3.2 MHz	*–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 bandwidth typical at 0 dBm input power*
4 to 7.5 MHz	*–68 dBc in a 1 MHz bandwidth typical at 0 dBm input power*
7.5 to 8.5 MHz	*–71 dBc in a 1 MHz bandwidth typical at 0 dBm input power*

TD-SCDMA source key specifications[2]

Signal quality (RF I|O ports: 0 dBm, RFIO ports: –20 dBm)	
Composite EVM	
RMS	< 0.5% nominal

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

Application Specifications *(continued)*

V9077B WLAN measurement application key specifications[1]

Modulated power	
Absolute power accuracy	
2400 to 2483.5 MHz	*±0.27 dB typical at 0 dBm input power*
5150 to 5185 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 (half duplex) 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*

SEM	
802.11a/g at 2. 4 GHz with 20 MHz bandwidth	See Figure 2
802.11a/g at 5.8 GHz with 20 MHz bandwidth	See Figure 3
802.11n at 5.8 GHz with 40 MHz bandwidth	See Figure 4
802.11ac at 5.8 GHz with 80 MHz bandwidth	See Figure 5

1. SEM transmitter test signal generated by the Keysight Technologies N5182B MXG signal generator

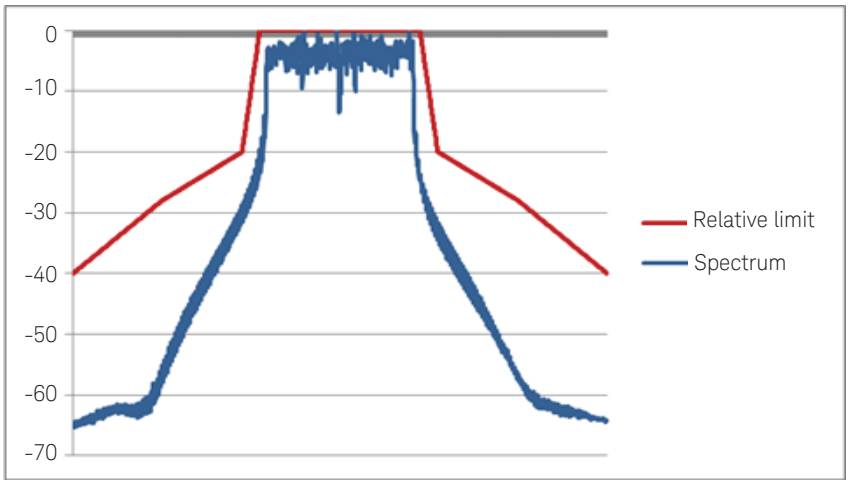


Figure 2. 802.11a/g SEM nominal performance at 2.4 GHz with 20 MHz bandwidth

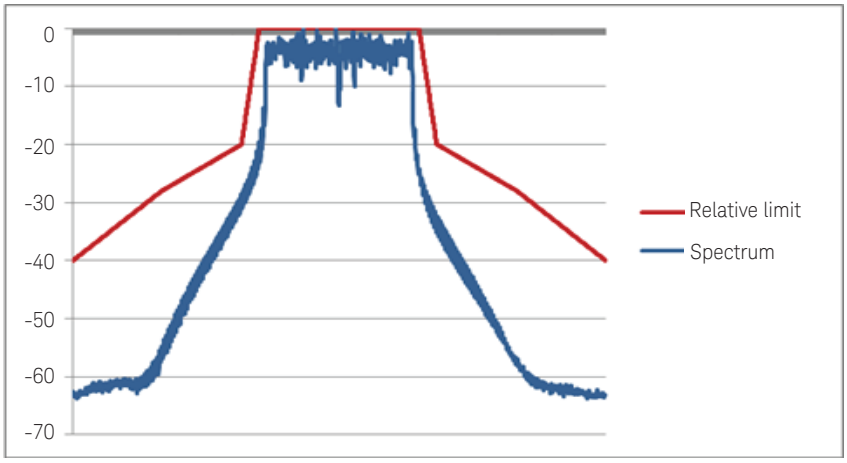


Figure 3. 802.11a/g SEM nominal performance at 5.8 GHz with 20 MHz bandwidth

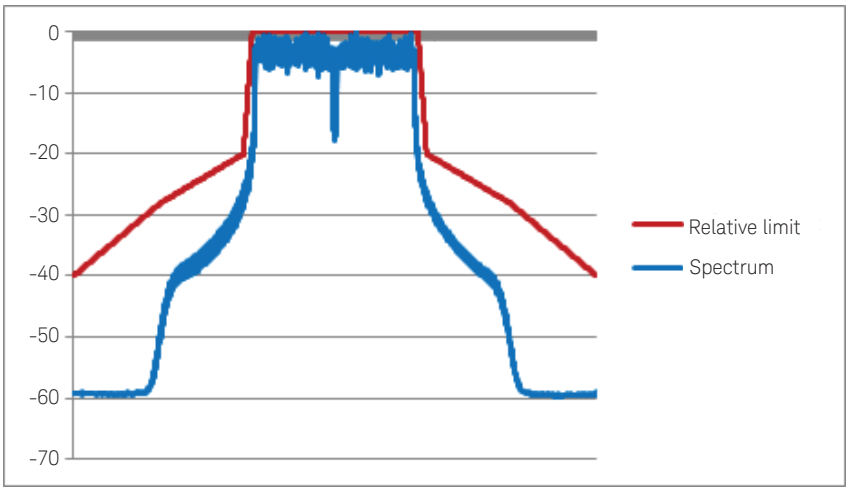


Figure 4. 802.11n SEM nominal performance at 5.8 GHz with 40 MHz bandwidth

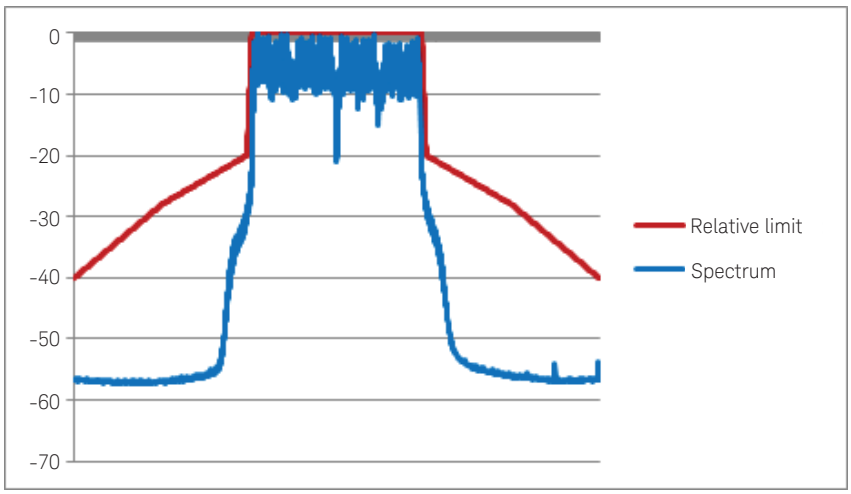


Figure 5. 802.11ac SEM nominal performance at 5.8 GHz with 80 MHz bandwidth

Wireless LAN source key specifications

Error vector magnitude (EVM)	
Wireless LAN error vector magnitude (EVM performance (using Signal Studio signal noted)) RF I|O (half duplex) 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 bandwidth	< *–43 dB typical (–5 to –15 dBm)*
802.11n: 5.8 GHz at 40 MHz bandwidth	< *–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

Keysight E6640A EXM Wireless Test Set, Configuration Guide, literature number 5991-3533EN

Keysight E6640A EXM Wireless Test Set, Brochure, literature number 5991-3532EN

Solutions for LTE-Advanced Manufacturing Test, Application Note, literature number 5991-3762EN

Solutions for WLAN 802.11ac Manufacturing Test, Application Note, literature number 5991-4113EN

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