



E6680A Wireless Test Set

Verify Your Wi-Fi 6E and 802.11be Designs

Look to the Future with a New Solution for IEEE 802.11 Testing

While fifth generation (5G) gets a lot of attention, the Institute of Electrical and Electronics Engineers (IEEE) 802.11 is not standing still. Higher data rates are available today with 802.11ax. Further improvements in speed with higher-order modulation and larger signal bandwidth are planned. The next wireless local area network (WLAN) standard, 802.11be, will support higher bandwidth and modulation than 5G does today.

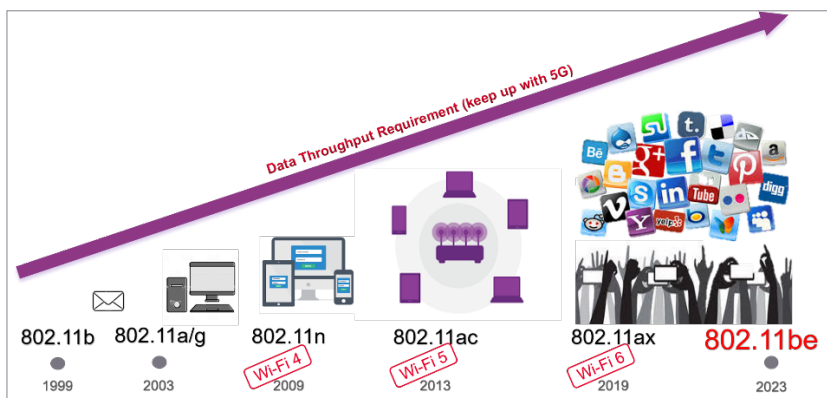


Figure 1. Evolution of WLAN technologies

Signal bandwidths up to 320 MHz – twice the bandwidth of 802.11ax signals today – and 4096 quadrature amplitude modulation (QAM) are two of the biggest changes introduced within the physical layer (PHY) of this new technology.

The E6680A is ready. Verifying Wi-Fi 6E and 802.11be devices is quick and easy with bandwidth to 800 MHz and frequency to 7.3 GHz. Generating and analyzing 1024QAM and 4096QAM signals uses application software based on Keysight's familiar PathWave Signal Generation and X-Series Applications.



The 3rd Generation Partnership Project (3GPP) is investigating the extension of Long-Term Evolution (LTE) and 5G into unlicensed spectrum above 6 GHz as part of Release 17, planned for December 2021. The E6680A is ready today with applications to test LTE and 5G.

Optimize Throughput without Sacrificing Flexibility

More bands and more antennas would seem to add test time and reduce throughput. The 32 ports of the E6680A flexibly test multiple bands, multiple antennas, and multiple devices supporting many use cases.

Simplify your test system

The E6680A makes it easy to test the three WLAN bands. Each of the 32 ports supports all three bands and is configurable as half duplex or full duplex. Disconnecting and reconnecting your device to test in a different band is unnecessary saving valuable test time.

Internal switching and splitting of signals eliminate the need for separate test system components reducing calibration time and test system maintenance. Configure each port to calibrate and verify every antenna, no matter the frequency or bandwidth. Testing multiple devices and/or multiple antennas is your choice.

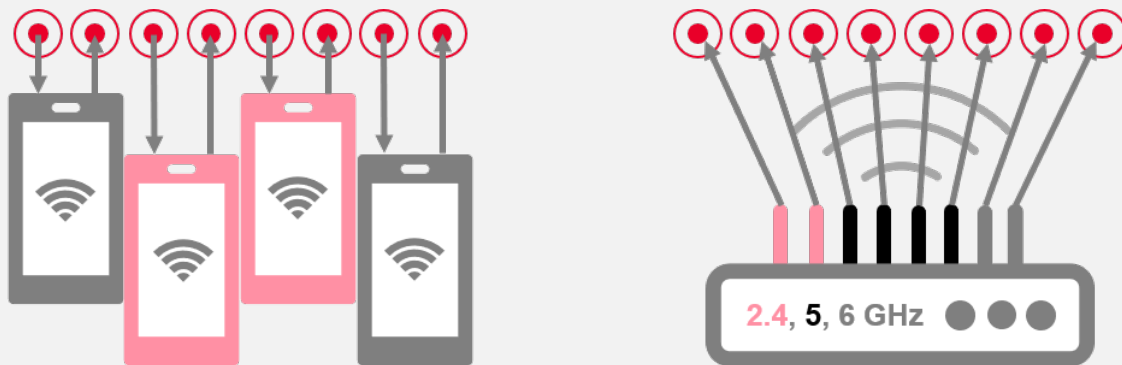


Figure 2. Test four mobile phones or one Access Point (AP) with eight antennas

Making startup quick and painless, a controller is embedded within the E6680A. Software licenses and applications are loaded before shipment - just plug it in, switch it on, and you are ready to test.

Reduce test time with sequencing and parallel test

Sequencing is one method of decreasing overall test time. A set of test steps is prepared in one sequence and then initiated with a single trigger. Test speed increases since fewer commands are used. The sequence analyzer of the E6680A supports measurement sequences with varying power levels and frequencies.

Parallel test is another method of decreasing overall test time. The V9065EM2E parallel analysis of multiple devices software application runs with or without the sequence analyzer to provide fast test speed. Test time is significantly reduced when data is analyzed while configuring the device for the next tests and acquiring the next sets of data.

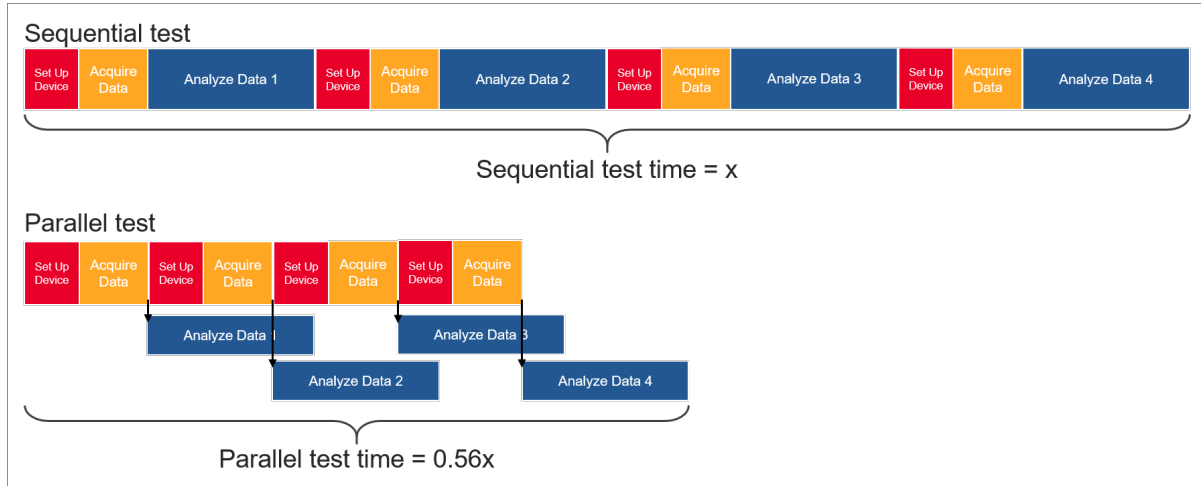


Figure 3. Example of speed improvement using parallel test

Up to eight devices can be tested in less than half the time when parallel test is combined with broadcasting. Connect the Tx/Rx antenna of each device to one port of the E6680A. Configure four ports to transmit the same signal to four devices simultaneously and perform Rx tests on four devices. Configure the other four ports to make desired measurements on four more devices using the V9065EM2E parallel analysis of multiple devices application. Re-configure each port between output and input to complete testing eight devices without changing physical connections.

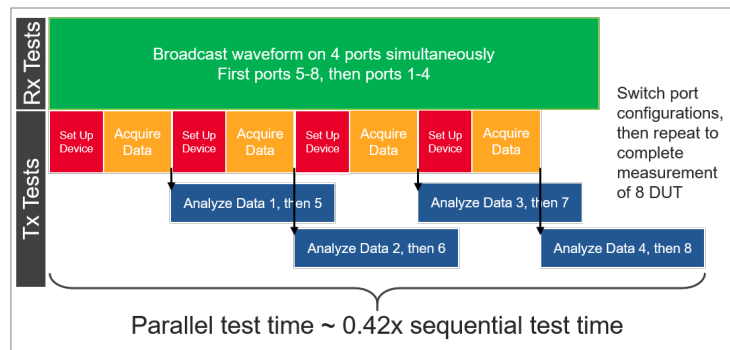


Figure 4. Example of speed improvement using parallel test and broadcasting

Verify multiple wireless technologies

The evolution of 5G and WLAN creates a market for devices using both technologies. Consumer Premises Equipment (CPE) and mobile phones are two examples. Verifying 5G and WLAN in one test plan is easy using the E6680A.

Bluetooth[®] and IEEE 802.15.4, used for short-range communications, are commonly combined with WLAN in devices. Adding these technologies to a WLAN test plan is simple with the E6680A.

A Full-Featured Solution for Design Verification Test (DVT)

Essential to every WLAN test solution are chipset control, automation, and test sequencing. In addition to these, the E6680A supports:

- IEEE 802.11a/b/g/j/p/n/ac/af/ah/ax/be
- Modulation up to 4096QAM
- Multi-User Multiple Input Multiple Output (MU-MIMO) and Orthogonal Frequency-Division Multiple Access (OFDMA) with statistics and RF performance for each user

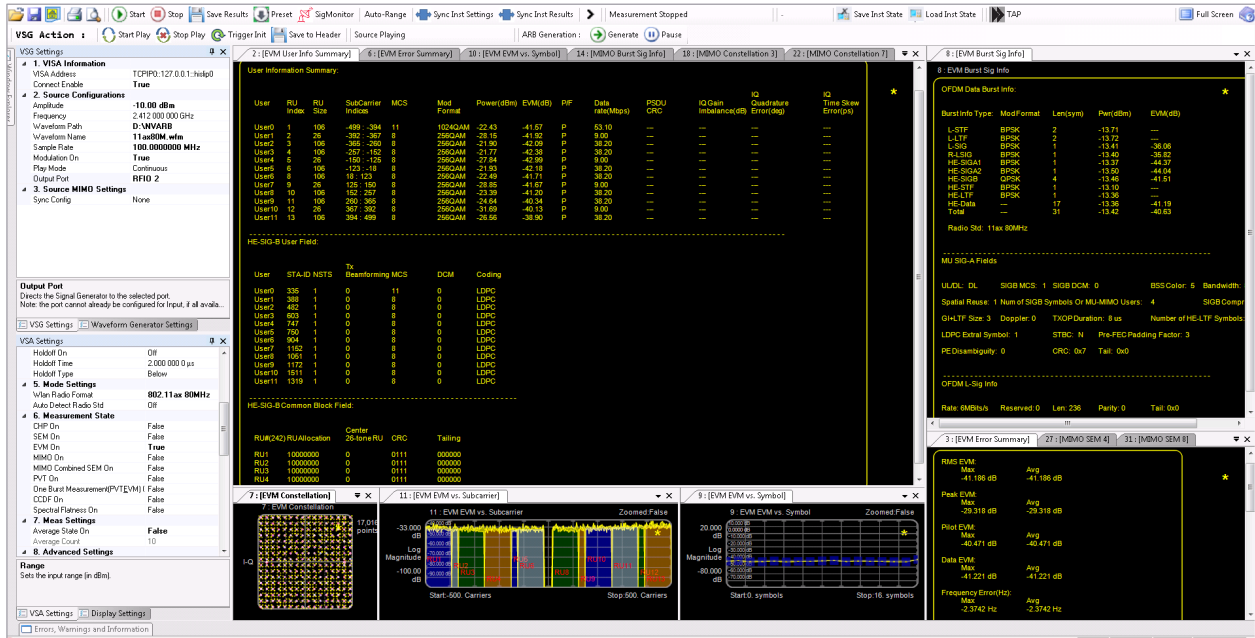


Figure 5. 802.11ax MU signal generation and analysis

- Arbitrary waveform generation for Single-User (SU) Physical Layer Convergence Protocol (PLCP) Protocol Data Units (PPDU) and MU PPDU with different Resource Unit (RU) sizes, power levels, etc.
- Up to 4x4 true MIMO
- Channel power, transmit spectral mask, spectral flatness, and Error Vector Magnitude (EVM) measurements

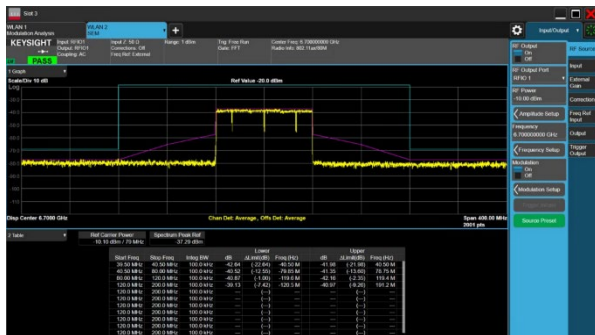


Figure 6. Transmit spectral mask results

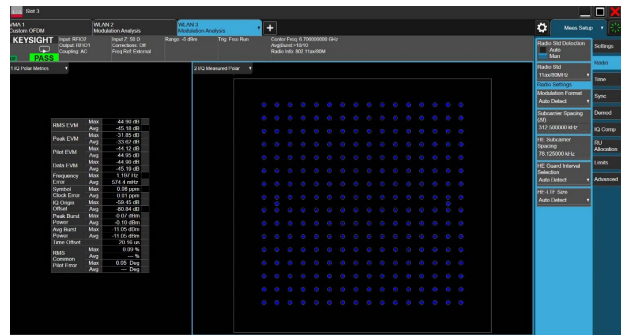


Figure 7. EVM results

IEEE 802.11ax Measurement Summary

Transmit specification

WLAN application software analyzes WLAN signals captured by the Vector Signal Analyzer (VSA).

IEEE 802.11ax (D6.1)	Description	WLAN application software
27.3.19.1	Transmit spectral mask	Spectrum emission mas
27.3.19.2	Spectral flatness	Spectral flatness
27.3.19.3	Transmit center frequency and symbol clock frequency tolerance	Frequency error and symbol (chip) clock error
27.3.19.4.2	Transmit center frequency leakage	IQ origin offset
27.3.19.4.3	Transmitter constellation error	RMS EVM
27.3.19.4.4	Transmitter modulation accuracy (EVM) test	Modulation analysis

Receiver specification

WLAN application software generates baseband waveforms, downloads them into the Vector Signal Generator (VSG) memory, then modulates and transmits WLAN signals at Radio Frequencies (RF) with power levels as required for WLAN receiver testing.

IEEE 802.11ax (D6.1)	Description	WLAN application software
27.3.20.2	Receiver minimum input sensitivity	Waveforms for defined PPDU
27.3.20.3	Adjacent channel rejection	Waveforms for wanted and adjacent signals
27.3.20.4	Nonadjacent channel rejection	Waveforms for wanted and non-adjacent signals
27.3.20.5	Receiver maximum input level	Waveforms for defined PPDU

Verify Wi-Fi 6E Devices across the Workflow with Keysight Solutions

Two non-signaling solutions available from Keysight provide RF test coverage for Wi-Fi 6E devices from design through high-volume manufacturing. Test confidently across the workflow using the same industry-proven waveforms and measurement algorithms enhanced regularly to support the latest IEEE and 3GPP releases.

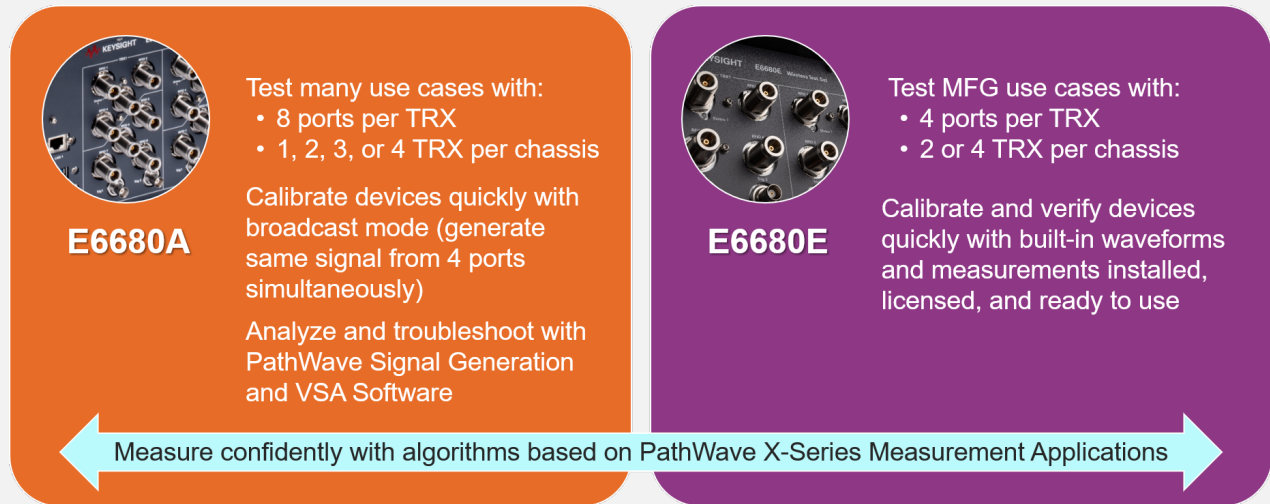


Figure 8. Keysight solutions for RF test of Wi-Fi 6E devices

Ordering Information

Hardware

Upgrades to additional bandwidth and frequency, and addition of downlink measurements and MIMO are available after initial purchase.

Option number	Description	Requirement
E6680A-001, 002, 003, 004	Transceivers (TRX) 1, 2, 3, and 4	TRX 1 is mandatory TRX 2, 3, 4 are optional
• E6680A-B2X	Bandwidth, 200 MHz	Default
• E6680A-B4X	Bandwidth, 400 MHz	Optional
• E6680A-B8X	Bandwidth, 800 MHz	Optional
• E6680A-F06	Frequency range, 380 MHz to 6 GHz	Default

Option number	Description	Requirement
• E6680A-F07	Frequency range, 380 MHz to 7.3 GHz	Optional
E6680A-250, 251, 252	Waveform license 50 pack 1 to 3	Included
E6680A-BTS	Downlink measurement capability	Optional
E6680A-M44	Up to 4x4 true MIMO in one chassis	Optional
E6680A-MTS	Synchronization for up to 8x8 MIMO with 2 chassis	Optional
E6680A-UK6	Commercial calibration certificate with test data	Optional

Accessories

Option number	Description	Requirement
Y1206A	USB keyboard and optical mouse	Optional
Y1217A	Rack mount and rack rail kit	Optional

Software

Software applications are purchased once for use with all TRX installed in the E6680A chassis. Software applications purchased with new hardware are installed before shipment. Additional software applications can be added later with a software license.

Software applications are based on Keysight's PathWave Signal Generation and Signal Analysis software with modifications to support chipset control, sequencing, and parallel test.

Two types of software applications are available:

- V90nnEMnE measurement applications for device transmit analysis (for example, V9077EM2E 802.11be measurement application)
- Y90nnEMnE waveform and measurement applications for signal generation of arbitrary waveforms and analysis (for example, Y9077EM2E WLAN 802.11be waveform and measurement application)

Refer to the E6680A Configuration Guide at www.keysight.com/find/e6680a for a complete list of software applications.

The E6680A Is the Solution to Verify Your WLAN Designs

Speed your test development and design verification with just the right capability and flexibility.

- Be ready for the future with bandwidth to 800 MHz and frequency to 7.3 GHz.
- Get the flexibility you need to optimize your test cases with up to 32 ports.
- Simplify your test system configuration with internal switching between ports.
- Analyze performance using industry-proven application software.

E6680A Wireless Test Set: Easy to Use, Flexible, and Future-Proof

A solution for your lab, your bench, and your production line, the E6680A is ready to test your WLAN designs. Right out of the box, its familiar application software is licensed to your specifications. Software-only upgrades, three bandwidth options, and two frequency options ensure you get just what you need today and tomorrow.

Visit www.keysight.com/find/e6680a, or contact your sales representative for details.

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