

N7617C Signal Studio for WLAN 802.11

802.11a/b/g/j/p/n/ac/ah/ax/be/bn (2026 release)

Key Features

- Create Keysight validated and performance optimized reference signals compliant with the IEEE 802.11a/b/g/j/p, 802.11n/ac/ah/ax/be and 802.11bn standards
- Use basic options to provide partially-coded signals for testing components such as power amplifiers
- Use advanced options to provide signals with full channel coding, flexible configuration of MAC headers, spatial stream mapping, and application of channel models for testing receivers
- Support MIMO testing with up to 8 streams/antennas
- Use N7607C Signal Studio for DFS and DAA to enable creation of FCC, ETSI, Japan MIC, Korean or Chinese radar test signals for DFS test
- Accelerate the signal creation process with a user interface based on parameterized and graphical signal configuration and tree-style navigation

Simplify Custom Signal Creation

Keysight Technologies, Inc. Signal Studio software is a flexible suite of signal-creation tools that will reduce time spent on signal simulation. Signal Studio's performance-optimized WLAN reference signals validated by Keysight - enhance the characterization and verification of your devices. Through its application-specific user interface, you'll create standards-based and custom test signals for component, transmitter, and receiver tests.

Typical measurements

Test components with basic capabilities:

- IMD/NPR
- ACLR
- CCDF
- EVM
- Modulation accuracy
- Channel power
- Occupied bandwidth

Verify receivers with advanced capabilities:

- Sensitivity
- Maximum input level
- Adjacent and nonadjacent channel rejection
- Clear channel assessment

Component and transmitter test

Signal Studio's basic capabilities use waveform playback mode to create and customize waveform files needed to test components and transmitters. Its user-friendly interface lets you configure signal parameters, calculate the resulting waveforms, and download files for playback.

The applications for these partially-coded, statistically correct signals include:

- Parametric test of components, such as amplifiers and filters
- Performance characterization and verification of RF sub-systems

Receiver test

Signal Studio's advanced capabilities enable you to create fully channel-coded signals for receiver Packet-Error-Rate (PER) analysis. Applications include:

- Performance verification and functional test of receivers, during RF/baseband integration and system verification
- Coding verification of baseband subsystems, including FPGAs, ASICs, and DSPs

Performance test

N7617C Signal Studio for WLAN 802.11 and N7607C Signal Studio for DFS and DAA can be integrated to set up a test system for WLAN performance tests including DFS and DAA test.

Apply Your Signals in Real-World Testing

Once you have set up your signals in Signal Studio, you can download them to a variety of Keysight instruments and software platforms. Signal Studio software complements these platforms by providing a cost-effective way to tailor them to your test needs in design, development, and production test.

Benchtop

- N5186A MXG vector signal generator
- X-Series RF vector signal generator:
 - N5182B MXG
 - N5172B EXG
 - N5166B CXG
- E8267D PSG vector signal generator
- M9384B VXG microwave vector signal generator
- M9484C VXG signal generator
- E6640A¹/E6680A/E6680E EXM wireless test set

Modular

- M9381A PXIe vector signal generator
- M9383A PXIe microwave signal generator
- M9383B VXG-m microwave signal generator
- PXI vector transceiver
 - M9421A VXT
 - M9410A VXT
 - M9411A VXT
 - M9415A VXT
 - M9416A VXT
- M8190A² arbitrary waveform generator

1. Support 802.11a/b/g/j/p/n/af/ah/ac/ax.
2. Support 802.11a/b/g/n/ac.

Component and Transmitter Test

Once you set up your signals in PathWave Signal Generation Desktop, you can download them to a variety of Keysight instruments.



Figure 1. Typical component test configuration using Signal Studio's basic capabilities with a Keysight X-Series signal generator and an X-Series signal analyzer

Signal Studio's basic capabilities enable you to create and customize a variety of WLAN 802.11 waveforms including 802.11a/b/g/j/p/n/ac/ah/ax/be/bn to characterize the power and modulation performance of your transmitter or receiver components, such as amplifiers and IQ modulators. Easy manipulation of a variety of signal parameters, including standard format, transmission bandwidth, guard interval, data rate, and modulation type, simplifies signal creation.

- Create spectrally-correct signals for channel power, ACP, spectral mask, and spurious testing
- Set parameters such as channel bandwidth and Modulation and Coding Scheme (MCS) for modulation verification and analysis, such as EVM tests
- Configure up to three 802.11a/b/g/j/p carriers with individual channel parameters such as data rate, modulation type, payload data, PN data seed value, and frequency offset
- 802.11ac provides a downclocking ratio parameter to allow creation of signals proposed by IEEE 802.11af
- 802.11be provides up to 4096 QAM and 320 MHz signal generation
- 802.11bn supports Distributed-tone Resource Units (DRU), unequal modulation and Ultra High Reliability (UHR) PPDU formats
- View CCDF, spectrum, and time domain graphs to investigate the effects of modulation formats, power changes, filtering, and other effects on the test signal

Receiver Test

Once you set up your signals in PathWave Signal Generation Desktop, you can download them to a variety of Keysight instruments.

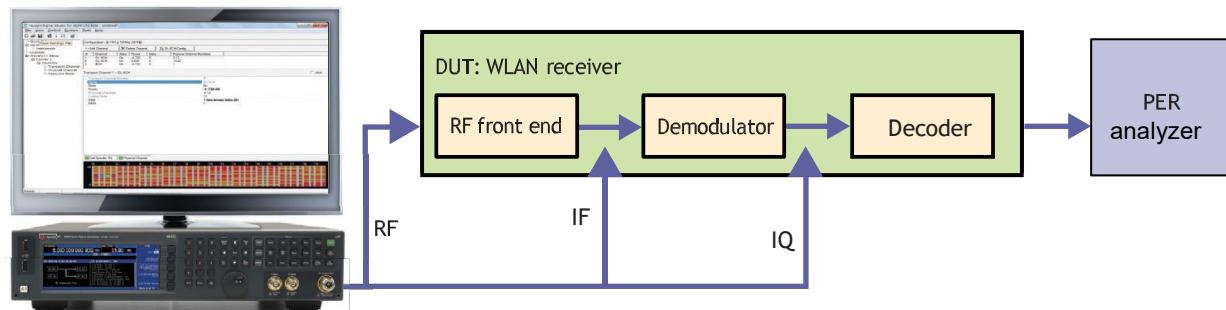


Figure 2. Generate fully channel-coded signals to evaluate the PER of your receiver with Keysight X-Series signal generators and Signal Studio's advanced capabilities

Signal Studio's advanced mode capabilities provide additional features to help you create IEEE 802.11 WLAN standard-compliant signals for testing receiver designs in all stages of development. Use the baseband signal to perform demodulation and decoding verification on ASIC and DSP chips. To thoroughly test the demodulation capabilities of a receiver, a fully-coded test signal is necessary. This level of coding enables you to determine if each functional stage of a receiver is operating correctly and enables you to use this test signal to perform PER measurements.

- Enable or disable channel coding, scrambling, and interleaving

- Configure MAC header settings, MAC FCS, sequence control, data type, and data length
- A multi-frame waveform with an incrementing Sequence Control field can be created for PER testing
- For the 802.11n, 802.11ac, 802.11ah, 802.11ax, 802.11be and 802.11bn standards, the software also supports Aggregation MPDU mode and LDPC encoding
- Test MIMO receivers with up to 4 antennas for 802.11n and 802.11ah or up to 8 antennas for 802.11ac, 802.11ax, 802.11be and 802.11bn (hardware dependent). Choose the number of transmit chains and space-time streams and select direct mapping or configure a spatial expansion matrix. The effects of fading can also be incorporated into a longer waveform file with MIMO channel modeling. Users can choose one of the 802.11n or 802.11ac channel models (A through F), or select a user-defined channel model. A beamforming matrix can be added for 802.11ac
- Support 802.11ax OFMDA testing with configuration of different number and location of allocated Resource Units (RU) in the 20/40/80/80+80/160 MHz signal bandwidths. For each RU, the user can further configure Single-User or Multi-User MIMO and the spatial mapping will be applied at the RU level instead of the entire signal bandwidth
- Support 802.11be/bn testing based on the draft specification with the full bandwidth support from 20 MHz to 320 MHz

N7617C WLAN Feature Summary

802.11 WLAN	Component and transmitter testing	Receiver testing
802.11a/b/g/j/p		
Modulation types: OFDM, DSSS-OFDM, DSSS/PBCC/CCK, ERP-PBCC	✓	✓
Data source types: all 0s, PN9, PN15, or user-defined file	✓	✓
PN9 and PN15 seed value	✓	✓
Preamble type: long DSSS, short DSSS, OFDM	✓	✓
Framed generation mode for all carriers ¹	✓	✓
Multi-carrier support (up to 5) ¹	✓	✓
Baseband I/Q impairments	✓	✓
OFDM subcarrier mask configuration	✓	✓
Windowing and filtering for spectrum control	✓	✓
Multipath configuration, up to 20 paths	✓	✓
Multi-frame control	✓	✓
Scrambler ON/OFF		✓
Convolutional encoder ON/OFF		✓
OFDM scrambler and reserved service bits		✓
PBCC encoder ON/OFF		✓
DSSS scrambler		✓
MAC parameter configuration		
Header		✓
FCS ON/OFF		✓
Sequence number		✓
802.11n		
20 or 40 MHz bandwidth	✓	✓
MCS index from 0 to 32, and from 33 to 76	✓	✓

802.11 WLAN	Component and transmitter testing	Receiver testing
Data source types: all 0s, PN9, PN15, user-defined file	✓	✓
PN9 and PN15 seed value	✓	✓
Operating mode: legacy, mixed, green field	✓	✓
Beacon frame (Framed generation)		✓
Windowing and filtering for spectrum control	✓	✓
MIMO configurations for up to 4 transmitter signals	✓	✓
Direct mapping or spatial expansion	✓	✓
Space-time block coding	✓	✓
MIMO channel models A through F or user-defined	✓	✓
Channel encoder		
Scrambler ON/OFF		✓
Channel coding ON/OFF		✓
BCC encoding		✓
LDPC encoding		✓
Interleaver ON/OFF		✓
Aggregation MPDU		✓
Minimum MPDU start spacing		✓
Frequency selective I/Q impairment	✓	✓
MAC parameter configuration		
Header (general, RTS, CTS, ACK)		✓
FCS ON/OFF		✓
Sequence number		✓
802.11ac	Basic waveform playback	Advanced waveform playback
20, 40, 80, 80+80, or 160 MHz bandwidth	✓	✓
VHT PPDU, VHT NDP and Non-HT format generation	✓	✓
Beacon frame (VHT PPDU and Non-HT)		✓
MCS index from 0 to 11, and MCS index from 12 to 13 (see 2)	✓	✓
Data source types: all 0s, PN9, PN15, user-defined file	✓	✓
PN9 and PN15 seed value	✓	✓
Windowing and filtering for spectrum control	✓	✓
Downclocking ratio	✓	✓
MIMO configurations for up to 8 transmitter signals	✓	✓
Spatial mapping scheme: direct mapping, spatial expansion, or beamforming	✓	✓
Space-time block coding	✓	✓
802.11ac MIMO channel models A through F or user-defined	✓	✓
Channel encoder ON/OFF		✓
Scrambler ON/OFF		✓
BCC or LDPC channel coding		✓
Interleaver ON/OFF		✓
Aggregated MPDU		✓
Minimum MPDU start spacing		✓
Frequency selective I/Q impairment (VHT PPDU format and VHT NDP format)	✓	✓
MAC parameter configuration		
Header (general, RTS, CTS, ACK)		✓
FCS ON/OFF		✓
Sequence number		✓
802.11ah	Basic waveform playback	Advanced waveform playback

802.11 WLAN	Component and transmitter testing	Receiver testing
1, 2, 4, 8, 16 MHz bandwidth	✓	✓
PPDU, NDP for sounding and NPD for NDP MAC format generation	✓	✓
Format of S1G, 1 MHz duplicate, 2 MHz duplicate	✓	✓
Preamble of S1G Short and S1G Long	✓	✓
MCS index from 0 to 9, and MCS 10	✓	✓
Data Source types: all 0s, PN9, PN15, user-defined file	✓	✓
Windowing and filtering for spectrum control	✓	✓
Oversampling ratio	✓	✓
MIMO configuration for up to 4 transmitter signals	✓	✓
Spatial mapping scheme: direct mapping, spatial expansion, beamforming, or user defined	✓	✓
Space-time block coding	✓	✓
Channel encoder ON/OFF		✓
Scrambler ON/OFF		✓
BCC or LDPC channel coding		✓
Interleaver ON/OFF		✓
Aggregated MPDU		✓
Minimum MPDU start spacing		✓
Frequency selective I/Q impairment	✓	✓
MAC parameter configuration		
Header (general, RTS, CTS, short frame)		✓
FCS ON/OFF		✓
Sequence number		✓
802.11ax		
20, 40, 80, 80+80, or 160 MHz bandwidth	✓	✓
Number of transmit chains up to 16 ¹	✓	✓
Non-HT (data and control, or trigger), HE NDP, HE SU/extended range SU, HE MU PPDU formats generation	✓	✓
HE trigger based PPDU generation (20/40/80/160 and 80+80 MHz)	✓	✓
Masked HE-LTF sequence mode for HE trigger based PPDU ⁴		
HE extended-range SU PPDU with single 106-tone RU	✓	✓
LTF symbol interval mode	✓	✓
OFDMA resource units configuration	✓	✓
Dual-carrier modulation	✓	✓
MCS index from 0 to 11, and MCS index from 12 to 13 ¹ (see 2)	✓	✓
Data source types: all 0s, PN9, PN15, user-defined file	✓	✓
PN9 and PN15 seed value	✓	✓
Windowing and filtering for spectrum control	✓	✓
MIMO configurations for up to 8 transmitter signals	✓	✓
Spatial mapping matrix	✓	✓
Space-time block coding	✓	✓
Channel encoder ON/OFF	✓	✓
Scrambler ON/OFF	✓	✓
BCC or LDPC channel coding	✓	✓
BCC interleaver ON/OFF	✓	✓
Trigger frame	✓	✓
Combined waveform generation for 80+80 MHz configuration ²	✓	✓
Constant I/Q impairment ⁵	✓	✓
Aggregated MPDU	✓	✓

	Component and transmitter testing	Receiver testing
802.11 WLAN		
Minimum MPDU start spacing	✓	✓
Single or multi-user MIMO (up to 8 streams)	✓	✓
MAC parameter configuration		
Header (general, RTS, CTS, or ACK)	✓	✓
FCS ON/OFF	✓	✓
Sequencer number	✓	✓
802.11be		
20, 40, 80, 160, 320 MHz bandwidth	✓	✓
EHT MU PPDU (compressed mode ² and OFDMA mode ³)	✓	✓
EHT trigger based PPDU ³	✓	✓
RU/MRU configuration 4x996 and 996+484+242 for non-OFDMA EHT trigger based PPDU ⁴	✓	✓
Non-HT mode	✓	✓
Preamble puncture for Non-HT PPDU ⁴	✓	✓
Single or multi-user MIMO (up to 8 streams) ³	✓	✓
U-SIG settings: UL or DL; BSS color, TXOP duration	✓	✓
MCS index from 0 to 13, MCS index from 14 to 15 ³	✓	✓
Dual carrier modulation	✓	✓
Data source types: all 0s, PN9, PN15, user-defined file	✓	✓
PN9 and PN15 seed value	✓	✓
Windowing and filtering for spectrum control	✓	✓
Spatial mapping matrix	✓	✓
Aggregated MPDU	✓	✓
Minimum MPDU start spacing	✓	✓
Channel coding state ON/OFF	✓	✓
Channel coding BCC or LDPC	✓	✓
BCC interleaver ON/OFF	✓	✓
Phase rotation coefficients for preamble of 320 MHz configuration ³	✓	✓
Constant I/Q impairment ⁵	✓	✓
MAC parameter configuration		
Header (general, RTS, CTS, or ACK)	✓	✓
FCS ON/OFF	✓	✓
802.11bn⁶		
PPDU formats: MU, TB and ELR	✓	✓
MCS index from 0 to 15, new MCS index 17, 19, 20, 23 ⁶	✓	✓
Distributed-tone resource units (DRU)	✓	✓
Longer block-length codes for LDPC	✓	✓
Unequal modulation (UEQM)	✓	✓

1. This feature requires N7617EMBC valid license working with N7617C software 2020 Update 1.0 or above release.

2. This feature requires N7617EMBC valid license above 2021.0201 with N7617C software 2021 or above release.

3. This feature requires N7617EMBC valid license above 2021.0801 with N7617C software 2022 or above release.

4. This feature requires N7617EMBC valid license with N7617C software 2023 Update 1.0 or above release.

5. This feature requires N7617EMBC valid license with N7617C software 2024 Update 1.0 or above release.

6. This feature requires N7617EMBC valid license with N7617C software 2026 or above release.

Supported standards

WLAN format	Approval date	IEEE specification
802.11a	1999	802.11-2007
802.11b	1999	802.11-2010
802.11g	2003	802.11-2012
802.11j	2004	802.11-03/940r41
802.11p	2010	802.11-09/0308r122
802.11n	2009	
802.11ac	2013	802.11ac/D7.0
802.11ah	2016	802.11ah/D1.1
802.11ax	2020	802.11ax/D7.0
802.11be	2023	802.11be/D3.1
802.11bn	2024	802.11bn/D0.1

Performance characteristics

Definitions

Typical values are designated with the abbreviation "typ." These are performance beyond specification that 80% of the units exhibit with a 95% confidence. These values are not covered by the product warranty.

Measured (meas) is an attribute measured during the design phase for purposes of communicating expected performance, such as amplitude drift vs. time. This data is not warranted and is measured at room temperature (approximately 25 °C).

Standard	Frequency	N5172B/N5182B	E8267D	M9381A	M9421A
EVM (typical), valid power range					
802.11a/g/j/p OFDM	2.412 GHz	< 0.28%, $\leq +10$ dBm	< 0.8%, ≤ -1 dBm	< 0.27%, $\leq +6$ dBm	-
	5.805 GHz	< 0.35%, $\leq +4$ dBm	< 0.6%, $\leq +6$ dBm	< 0.47%, ≤ 0 dBm	0.6%, -5 dBm
802.11b/g DSSS	2.412 GHz	< 0.34%, $\leq +10$ dBm	< 0.7%, $\leq +8$ dBm	< 0.24%, $\leq +10$ dBm	4%, 0 dBm
802.11n OFDM 20 MHz BW	2.412 GHz	< 0.35%, $\leq +10$ dBm	< 0.8%, ≤ -2 dBm	< 0.27%, $\leq +4$ dBm	-
	5.805 GHz	< 0.5%, $\leq +6$ dBm	< 0.5%, $\leq +6$ dBm	< 0.49%, ≤ 0 dBm	0.7%, -5 dBm
802.11n OFDM 40 MHz BW	2.422 GHz	< 0.35%, $\leq +10$ dBm	< 0.8%, ≤ -2 dBm	< 0.24%, $\leq +4$ dBm	-
	5.795 GHz	< 0.4%, $\leq +6$ dBm	< 0.5%, $\leq +6$ dBm	< 0.49%, ≤ 0 dBm	0.6%, -5 dBm
802.11ac OFDM 40 MHz BW	5.795 GHz	< 0.5%, $\leq +4$ dBm	< 0.5%, $\leq +6$ dBm	< 0.45%, ≤ 0 dBm	-
	5.795 GHz	< 0.5%, $\leq +4$ dBm	< 0.6%, $\leq +6$ dBm	< 0.49%, ≤ 0 dBm	-
802.11ac OFDM 80 MHz BW	5.795 GHz	< 0.5%, $\leq +4$ dBm	Not supported	< 0.64%, $\leq +2$ dBm	-
	5.25 GHz	< 0.5%, $\leq +4$ dBm			
802.11ah 1 MHz BW	850 MHz	< 0.34%, $\leq +10$ dBm	< 0.72%, $\leq +10$ dBm	-	-
	920 MHz	< 0.20%, $\leq +10$ dBm	< 0.4%, $\leq +10$ dBm	-	-
802.11ax OFDM 80 MHz BW	5.775 GHz	< 0.5%, $\leq +5$ dBm	-	-	-
	5.25 GHz	< 0.5%, $\leq +5$ dBm	-	-	-

Ordering Information

PathWave signal generation software offers flexible licensing options, including:

- Node-locked: Allows you to use the license on one specified instrument/computer.
- Transportable: Allows you to use the license on one instrument/computer at a time. This license may be transferred to another instrument/computer using Keysight's online tool.
- Floating: Allows you to access the license on networked instruments/computers from a server, one at a time. For concurrent access, multiple licenses may be purchased. Floating support single site, single region and worldwide three different types.
- USB portable: Allows you to move the license from one instrument/computer to another by end-user only with certified USB dongle, purchased separately.
- Subscription (Time-based): License is time limited to a defined period, such as 6, 12, 24 or 36 months

Waveform playback license

- N7617EMBC for WLAN 802.11a/b/g/j/p/n/ac/ah/ax/be/bn

Software license type	Software license	KeysightCare subscription
Node-locked perpetual	SW1000-LIC-01	SW1000-SUP-01
Node-locked time-based	SW1000-SUB-01	Included
Transportable perpetual ¹	SW1000-LIC-01	SW1000-SUP-01
Transportable time-based ¹	SW1000-SUB-01	Included

One-month KeysightCare Support and Subscription

Software license	Software license type
SW1000-SUP-01	1-month extension for node-locked perpetual license
SW1000-SUP-01	1-month extension for transportable perpetual license

Try before you buy

Download the PathWave signal studio software and use it free for 30 days.

Request your free trial license today: www.keysight.com/find/signalstudio_trial

Compatible Hardware Platforms

To learn more about compatible hardware and required configurations, please visit:
www.keysight.com/find/SignalStudio_platforms

Websites

www.keysight.com/find/PWSG or www.keysight.com/find/signalstudio

Comprehensive Online Documentation: www.keysight.com/find/signalstudio_support

Signal Studio for WLAN: www.keysight.com/find/n7617c

Signal Studio for DFS and DAA: www.keysight.com/find/n7607c

Keysight's WLAN Design and Test Solutions: www.keysight.com/find/wlan

Signal Studio Software: www.keysight.com/find/signalstudio_software

Literature

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