N7617APPC
PathWave Signal Generation
for WLAN, Embedded Application
802.11ax/be

Key Features

- Create Keysight validated and performance optimized reference signals compliant with the IEEE 802.11ax and 802.11be standards (up to 320 MHz bandwidth, 4096QAM modulation)

- 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 multi-touch graphic user interface

- Support SCPI programming

KEYSIGHT

PATHWAVE

Simplify Custom Signal Creation

N7617APPC PathWave Signal Generation for WLAN embedded application is a flexible signal creation tool that will reduce the time you spend on signal simulation and enables you to easily create test signals through its multi-touch graphic user interface.

N7617APPC PathWave Signal Generation for WLAN embedded application allows you to quickly and easily generate WLAN 802.11ax/be signals for component, transmitter, and receiver test.

Figure 1. Multi-touch graphic user interface of N7617APPC WLAN embedded application

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

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Component and transmitter test

PathWave Signal Generation for WLAN embedded application can 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 signals include:

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

Receiver test

PathWave Signal Generation for WLAN embedded application enables 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

State-of-art MIMO signal creation

N7617APPC PathWave Signal Generation for WLAN greatly simplifies the MIMO signal creation for multiple transmit chains. You just need to select one of the MIMO presets, then "Generate" function will automatically generate all the waveforms and playback on the multiple channels of signal generator instrument that supports multiple channels.

Figure 2 shows the front panel display with spectrum view of first transmit chain (Antenna 0) when you select MIMO configuration as Mx4. You can also select different transit chains to view the waveform or spectrum. Figure 3 shows the front panel when the waveform is generated and played.

Figure 2. Configure the MIMO as Mx4 and generate the waveform on the user interface of N7617APPC software
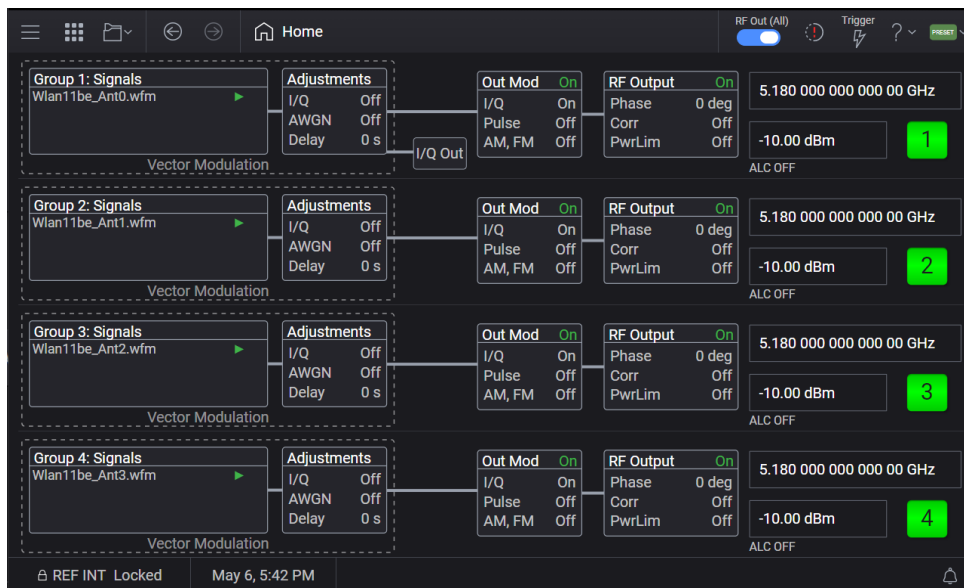
Figure 3. The front panel screen of the M9484C VXG when switching to Home and turning on four channels RF output after the waveform is generated and played.

Apply Your Signals in Real-World Testing

Currently, N7617APPC PathWave Signal Generation for WLAN embedded application runs on Keysight M9484C VXG vector signal generator to generate WLAN 802.11ax/be signals for your test in design, development, and production.

Benchtop

- M9484C VXG signal generator [1]

1. Firmware version A.17 and later

Component and Transmitter Test
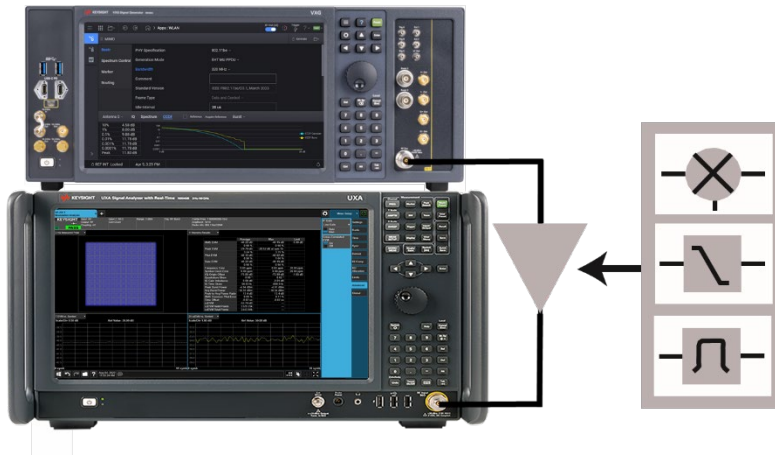
Figure 4. Typical component test configuration using N7617APPC WLAN embedded application running on M9484C VXG signal generator with N9040B UXA signal analyzer

N7617APPC PathWave Signal Generation for WLAN enables you to create and customize WLAN 802.11ax/be waveforms 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 802.11ax/be carriers with individual channel parameters such as data rate, modulation type, payload data, PN data seed value, and frequency offset
- 802.11be provides up to 4096 QAM and 320 MHz signal generation
- 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
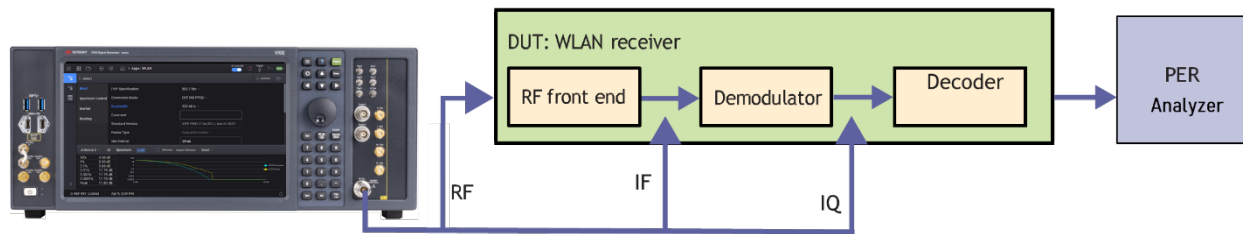
Figure 5. Generate fully channel-coded signals to evaluate the PER of your receiver with N7617APPC PathWave Signal Generation for WLAN embedded application running on M9484C VXG vector signal generator

N7617APPC PathWave Signal Generation for WLAN capabilities provide additional features to help you create IEEE 802.11ax/be 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 802.11ax and 802.11be standards, the software also supports Aggregation MPDU mode and LDPC encoding
- Test MIMO receivers with up to 8 antennas for 802.11ax and 802.11be (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
- 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 testing based on the draft specification with the full bandwidth support from 20 MHz to 320 MHz

N7617APPC WLAN Feature Summary

802.11 WLAN

802.11ax
20, 40, 80, 80+80, or 160 MHz bandwidth
Number of transmit chains up to 16
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
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
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
Constant I/Q impairment
Aggregated MPDU
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)
EHT trigger based PPDU
RU/MRU configuration 4x996 and 996+484+242 for non-OFDMA EHT trigger based PPDU
Non-HT mode
Preamble puncture for Non-HT PPDU
Single or multi-user MIMO (up to 8 streams)
U-SIG settings: UL or DL; BSS color, TXOP duration
MCS index from 0 to 13, MCS index from 14 to 15
Dual carrier modulation
Data source types: all 0s, PN9, PN15, user-defined file

802.11 WLAN

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
Constant I/Q impairment
MAC parameter configuration
Header (general, RTS, CTS, or ACK)
FCS ON/OFF

Supported standards

WLAN format	Approval date	IEEE specification
802.11ax	2020	802.11ax/D7.0
802.11be	2023	802.11be/D3.1

Ordering Information

PWSG embedded application 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

PathWave Signal Generation for WLAN embedded application license
- **N7617APPC [1] for WLAN 802.11ax/be**

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	SW1000-LIC-01	SW1000-SUP-01
Transportable time-based [1]	SW1000-SUB-01	Included

1. Support M9484C VXG vector signal generator with firmware version A.17 and later

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 Generation software and use it free for 30 days to do evaluation for your test. 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

PathWave Signal Generation for WLAN embedded application: www.keysight.com/find/n7617appc

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

Literature

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History of 802.11 - White Paper, 5992-1581EN

89600 VSA Option 89601BHXC High Throughput WLAN Modulation Analysis, Technical Overview, 5992-4202EN

WLAN 802.11 Measurement Application, Technical Overview, 5992-2840EN