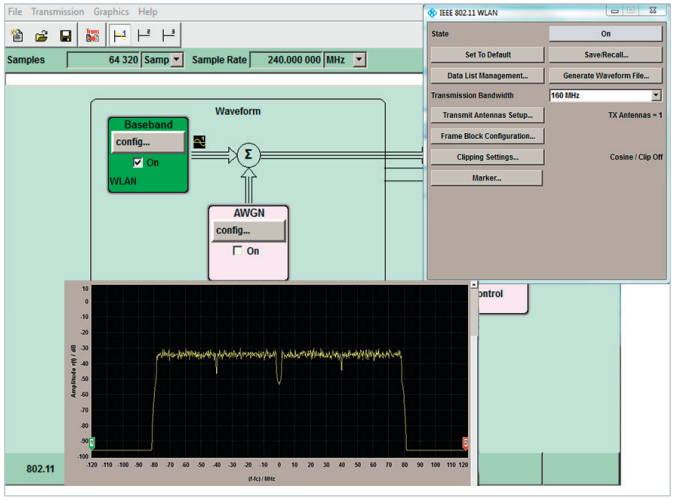
WLAN IEEE 802.11ac – wideband signal testing

Flexible signal generation and accurate signal analysis make Rohde & Schwarz instruments ideal for testing IEEE 802.11ac signals with bandwidths up to 160 MHz



R&S®WinIQSIM2 simplifies IEEE 802.11ac waveform generation

Your task

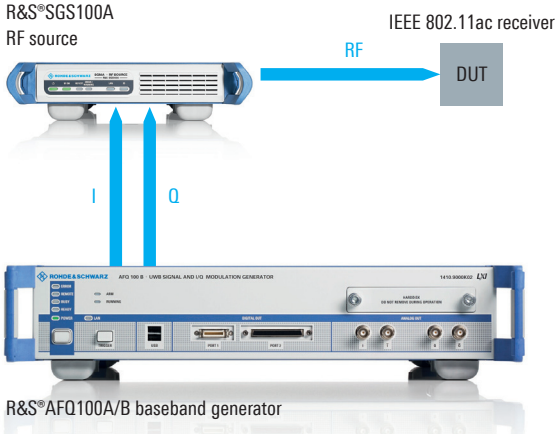
The WLAN IEEE 802.11ac standard aims to significantly increase data rates, opening up new use cases for WLAN devices such as wireless displays. To achieve a higher throughput, IEEE 802.11ac has several new features, including a mandatory channel bandwidth of 80 MHz and optional wider bandwidths of 160 MHz and 80 + 80 MHz. Further enhancements are 256QAM modulation and multiple input multiple output (MIMO) with up to eight spatial streams. Multi-user MIMO allows a single access point to simultaneously communicate with multiple users in the same band on individual spatial streams. These features enable data rates of up to 870 Mbit/s on a single spatial stream and 6.9 Gbit/s with eight spatial streams. IEEE 802.11ac only supports the 5 GHz band. The new signal features place high demands on the performance of WLAN devices in terms of modulation accuracy and adjacent channel leakage. 256QAM modulation, for instance, requires a maximum error vector magnitude (EVM) of –32 dB. Bandwidths of 80 + 80 MHz and 160 MHz present further challenges when designing IEEE 802.11ac devices.

T&M solution

Development of IEEE 802.11ac transmitters and receivers requires comprehensive testing, including flexible signal generation and accurate signal analysis. The complex signal configurations and high modulation bandwidths of the IEEE 802.11ac standard call for state-of-the-art measurement equipment. Rohde & Schwarz signal generators and spectrum analyzers are the ideal instruments for in-depth design analysis, precise measurements and fast localization of impairments in TX and RX paths.

Receiver tests require reference signals with very low distortion. The PC-based R&S®WinIQSIM2 simulation software generates IEEE 802.11ac compliant digital waveforms and loads them into a baseband generator such as the R&S®AFQ100B, which offers a bandwidth of up to 528 MHz. The R&S®AFQ100B transforms the waveform into an analog I/Q signal and feeds it to the external

IEEE 802.11ac signal generation



Convenient IEEE 802.11ac signal generation with non-contiguous 80 + 80 MHz and contiguous 160 MHz bandwidth

I/Q inputs of an RF source (e.g. the R&S®SGS100A) for upconversion to the 5 GHz band.

Fading is essential in order to test and optimize receivers under realistic channel conditions. The R&S®SMU200A or R&S®AMU200A can be used to simulate realtime fading of an IEEE 802.11ac signal with a bandwidth of 20 MHz, 40 MHz or 80 MHz.

Transmitter design analysis requires spectral measurements such as ACLR and spurious emissions as well as demodulation of the IEEE 802.11ac signal. Demodulating the signal allows measurement of the modulation accuracy (e.g. EVM) and analysis of the signal content. Rohde&Schwarz signal and spectrum analyzers, such as the R&S®FSQ and R&S®FSW, perform both tasks easily and accurately. The R&S®FSW offers the necessary 160 MHz demodulation bandwidth. The WLAN measurement software allows comprehensive, detailed analysis of IEEE 802.11ac signals and fast switching between different measurement modes.

The outstanding performance of the R&S®FSW in the RF and I/Q domains permits precise signal analysis. For a 160 MHz bandwidth and 256QAM modulation, the residual EVM is as low as –47 dB. The high speed of the spectrum analyzer enables fast measurements during conformance and verification tests. The EVM value, for example, can be acquired in less than 40 ms.

Key features and benefits of T&M solutions:

Vector signal generators

- 20 MHz, 40 MHz, 80 MHz, 80+80 MHz and 160 MHz modes
- Frame block sequencer for alternating legacy (IEEE 802.11a/b/g), IEEE 802.11n or IEEE 802.11ac frames within one ARB waveform
- MIMO modes with up to eight transmit antennas

Signal and spectrum analyzers

- Very low residual EVM
- 160 MHz demodulation bandwidth
- Fast switching and measurement times

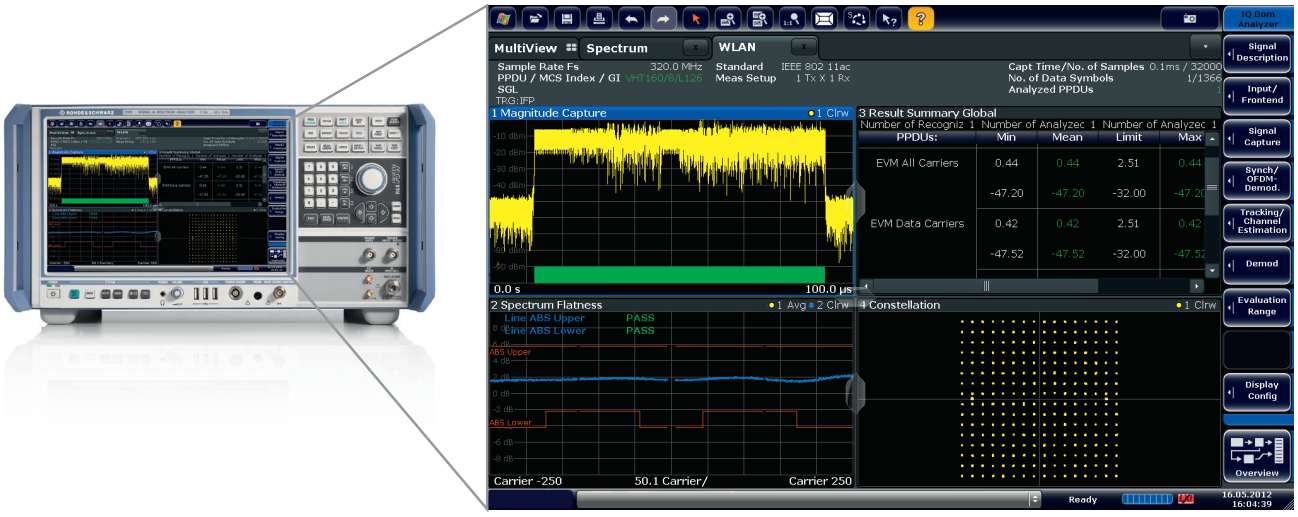
See also

www.rohde-schwarz.com/technologies
www.rohde-schwarz.com/product/FSW
www.rohde-schwarz.com/product/AFQ100B

Application Notes

IEEE 802.11ac Technology Introduction:
www.rohde-schwarz.com/appnote/1MA192
Generating Signals for WLAN 802.11ac:
www.rohde-schwarz.com/appnote/1GP94

Simultaneous view of multiple IEEE 802.11ac measurements



The R&S®FSW-K91ac measurement option for the R&S®FSW enables detailed analysis of IEEE 802.11ac WLAN signals with bandwidths up to 160 MHz.

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