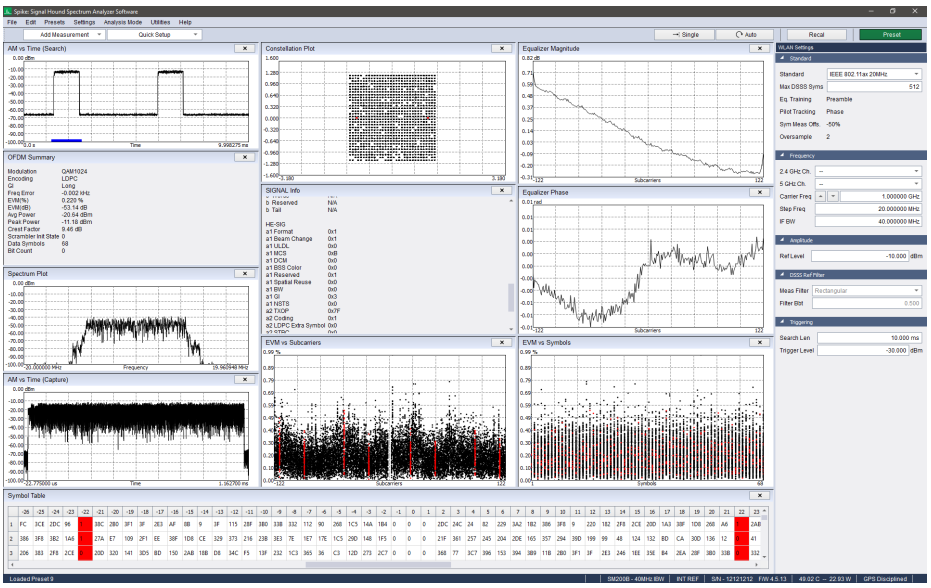
Feature Overview-

802.11b/a/g/n/ac/ax WLAN modulation analysis in Spike™

Key features of Spike's WLAN analysis module —

- Support for 802.11b/a/g/n/ac/ax WLAN standards
- Demodulate WLAN signals with bandwidths up to 40 MHz and all QAM formats
- View important signal details with up to 15 different measurement windows
- Accurately evaluate your signal performance and quality
- Analyze modulation quality down to the bit level
- Capture and analyze transient rogue signals
- Troubleshoot spurious and out-of-band emissions



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Overview

The Internet of Things, or IoT, is accelerating the need for connectivity to a wide range of applications. Technologies like WLAN and Bluetooth™ are positioned to capture large portions of this market segment. WLAN (or Wi-Fi) standards are being expanded to address higher data rates, transmit range and even battery efficiency.

Our Spike spectrum analyzer software now includes specialized WLAN modulation analysis features. This capability is designed specifically for making physical (PHY) layer measurements on WLAN transmitting devices. It provides RF metrics to accurately evaluate your signal performance and quality. You can demodulate your waveforms to see the header signal information and analyze modulation quality down to the bit level.

In addition, our traditional spectrum analyzer features provide several WLAN troubleshooting tools. Pre-configured emission masks help you capture and analyze transient rogue signals. Our real-time spectrum analysis capability allows you to troubleshoot spurious/out-of-band emissions by monitoring over-the-air dynamic conditions of the 2.4 and 5 GHz ISM bands.

While we believe that many WLAN users will be focused on transmitter measurements for WLAN standard compliance, there are additional uses as well. There are many field applications where portable spectrum analyzers are widely used. Adding this WLAN modulation analysis capability further expands the role and value of performing measurements in the field.

Many test equipment manufacturers charge extra for IoT and cellular application packages. At Signal Hound we are proud to offer these as part of our free software package that comes with all our spectrum analyzers.

RF Metrics for Signal Performance and Quality

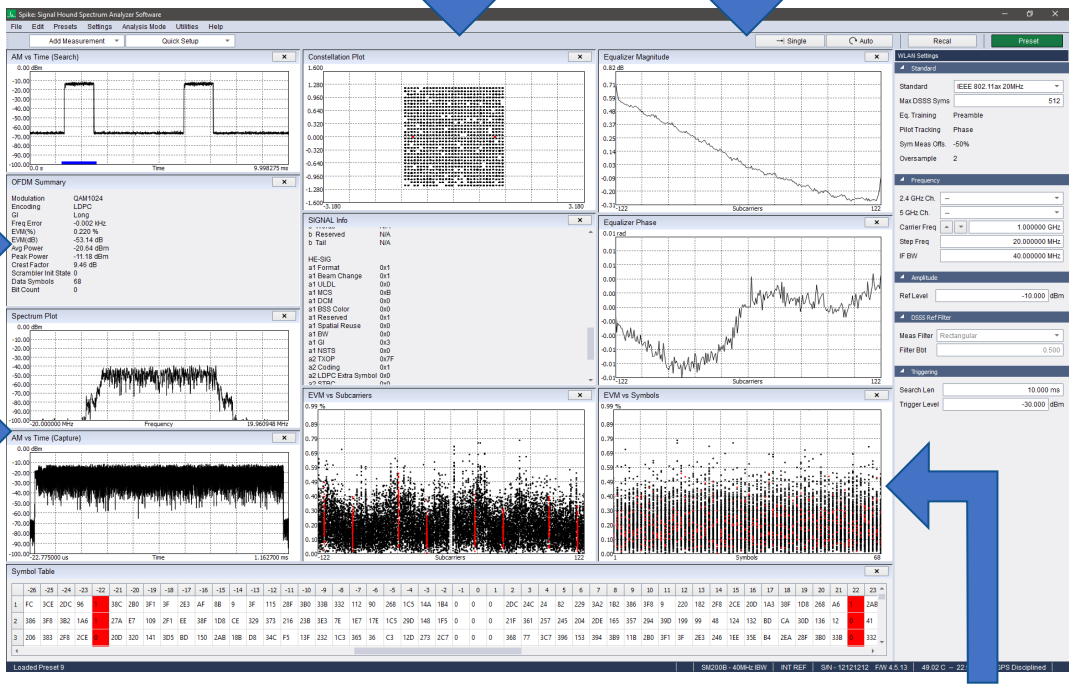
Spike software provides a wide range of measurement windows that let you evaluate your WLAN signal performance in detail. Evaluate the Error Vector Magnitude (EVM) for every single data and pilot subcarrier from every single OFDM symbol in a WLAN packet. Use constellation plots to visualize RF metrics such as I/Q offset, skew, EVM, phase noise, sample timing jitter, and compression.

Constellation Plot

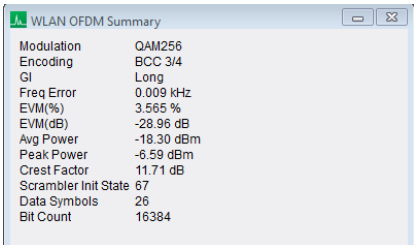
OFDM Channel/ Equalizer Magnitude and Phase Response

Modulation Summary

Time and Spectrum Domain

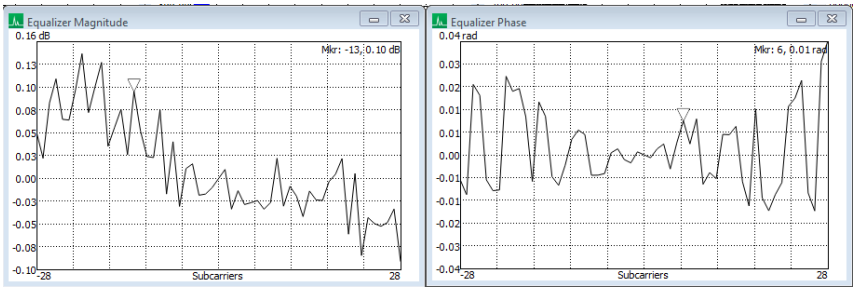


EVM vs OFDM Subcarrier and Symbol



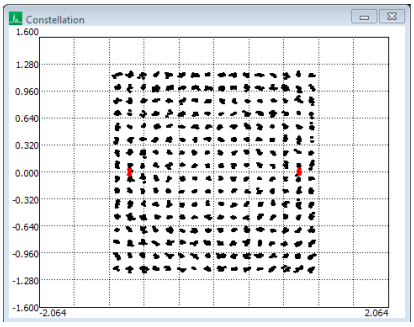
Modulation Summary

The modulation summary windows display all RF quality and performance metrics in one place. This information includes EVM, modulation format information, and measurement offsets such as frequency and sample rate errors.



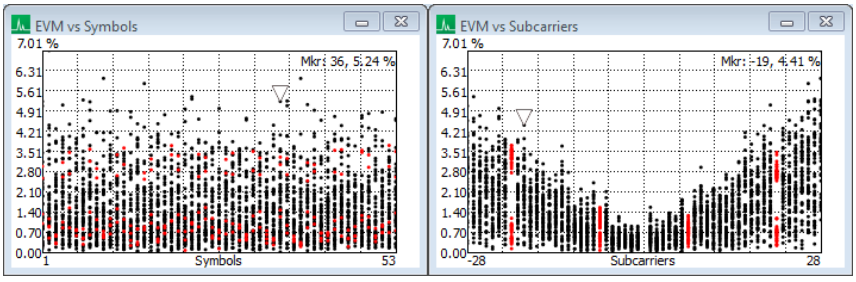
OFDM Channel/Equalizer Magnitude and Phase Response

Visualize the effects of multi-path in your environment. Use the magnitude response to learn the effects of fading across all the subcarriers and bandwidths of your signal. The linearly normalized phase response shows the effects of delay and fading across your channel.



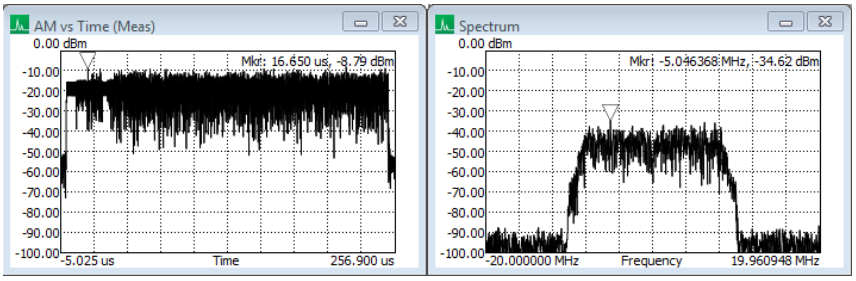
Constellation Plots for all WLAN Signals

Visualize I/Q offset, skew, EVM, phase noise, sample timing jitter, and compression for all PSDU pilot and data subcarriers. Verify correct symbol positions and orientations and use markers to measure the I/Q value of any constellation point. Supports modulation up to QAM1024.



EVM vs OFDM Subcarrier and Symbol

Evaluate the EVM for every single data and pilot subcarrier from every single OFDM symbol in the WLAN packet. Visualize LO stability, frequency drift, sample timing errors, EVM, amplifier stability, fading, phase noise and other errors using these plots.

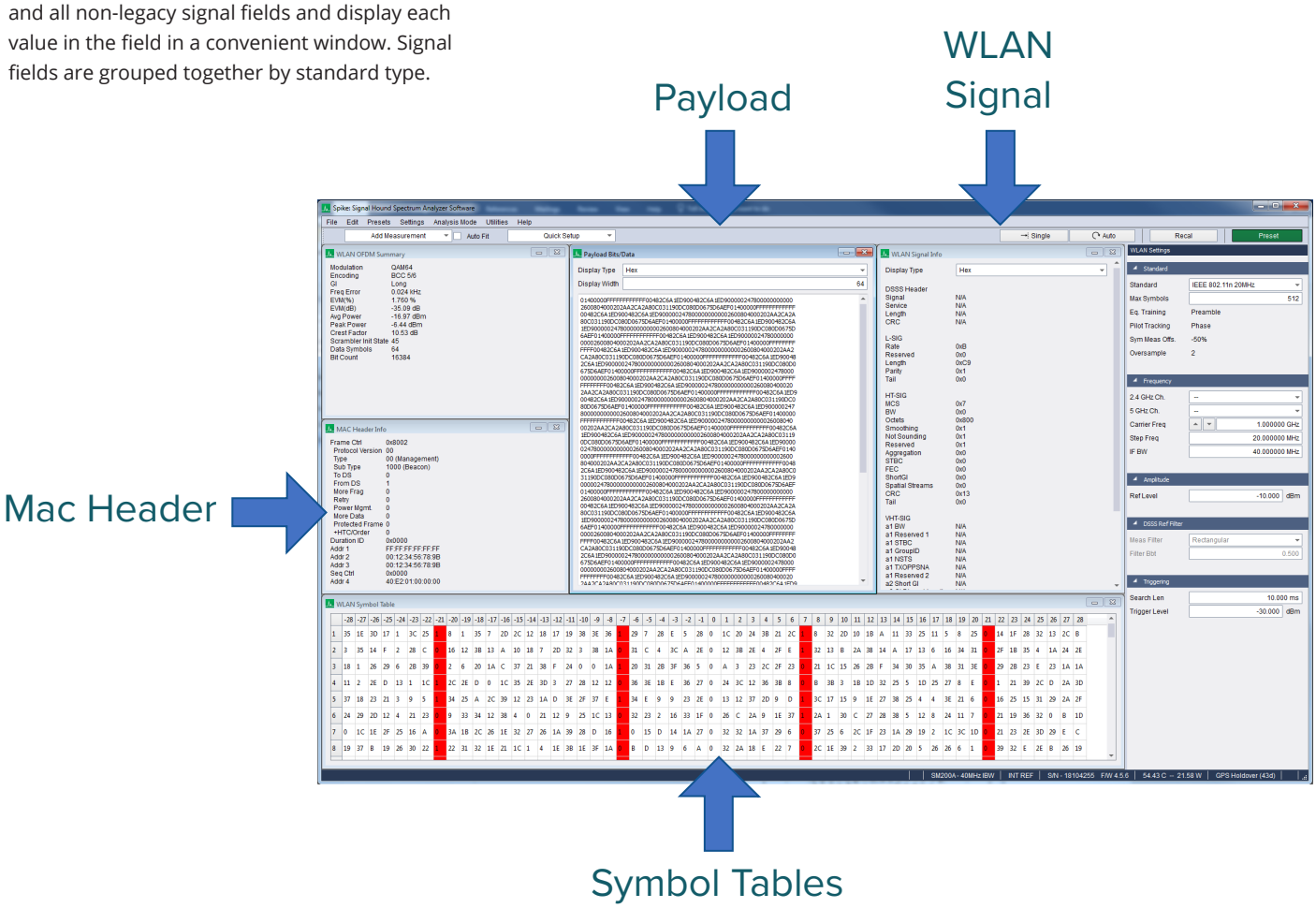


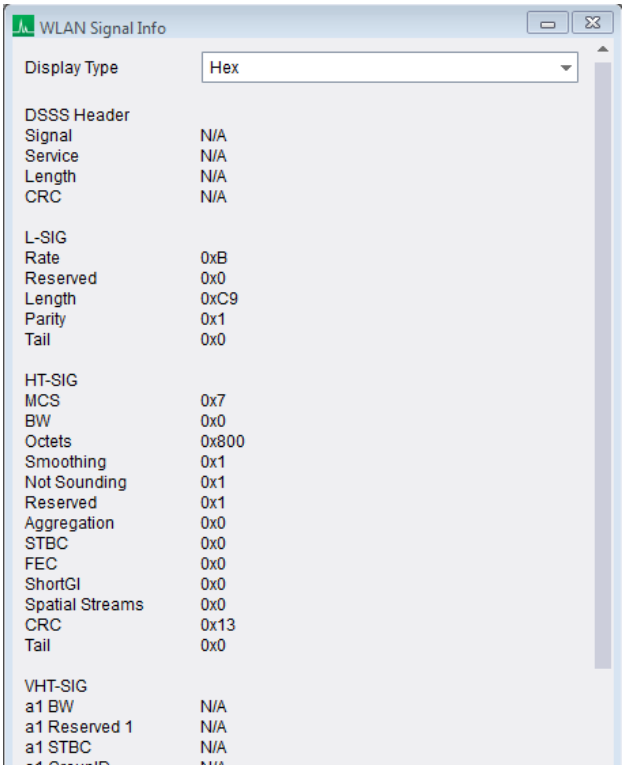
Time and Spectrum Domain

Plot the WLAN measurement in either the frequency or time domain. Add markers for precise measurements and to evaluatebandwidths, min/max amplitudes, etc.

Header Signal Information for All WLAN Waveforms

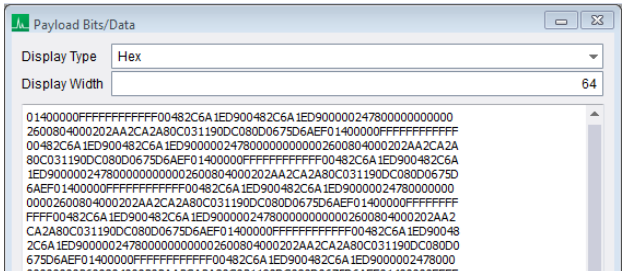
In WLAN terminology, the signal field in the PPDU conveys transmission parameters. The Spike software can decode the legacy signal field (L-SIG) and all non-legacy signal fields and display each value in the field in a convenient window. Signal fields are grouped together by standard type.





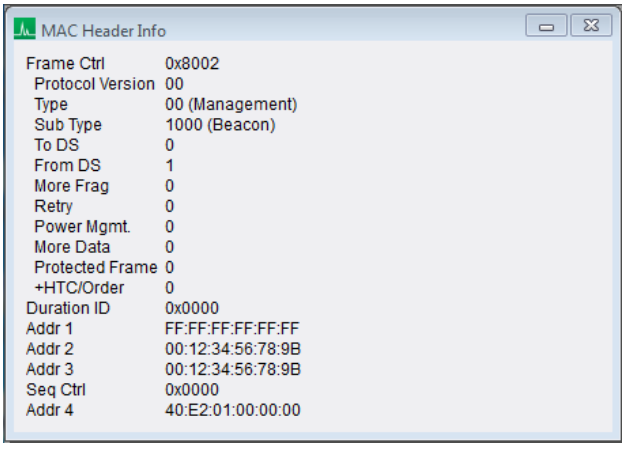
Header / Signal Information

Use the Header/SIGNAL information to break down and visualize all fields in the WLAN signal structures. Verify transmitter configuration and state.



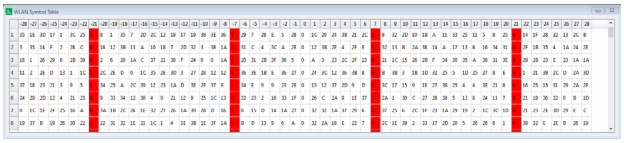
Payload Information

Show payload data after the payload has been detected, de-scrambled, de-interleaved, and de-coded. This allows you to troubleshoot bit level errors in the PSDU.



MAC Header Information

Pull the MAC header information from the decoded payload bits. This is an alternative way to display some of the payload bits. It displays the type of transmission and the various addresses for the transmission.

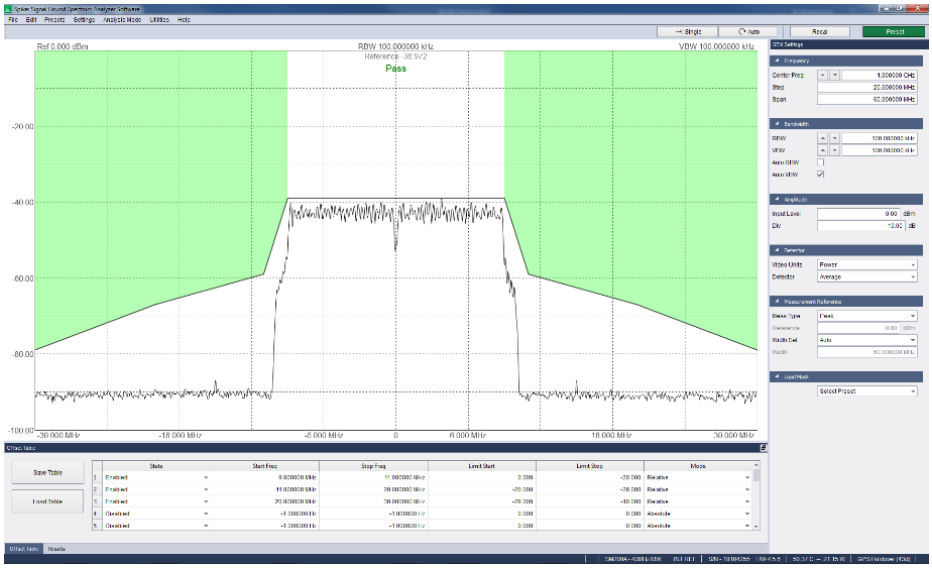


Symbol Tables

See the PHY layer symbol values for all data and pilot subcarriers for each OFDM symbol in the transmission. This enables you to detect transmission errors down to the subcarrier.

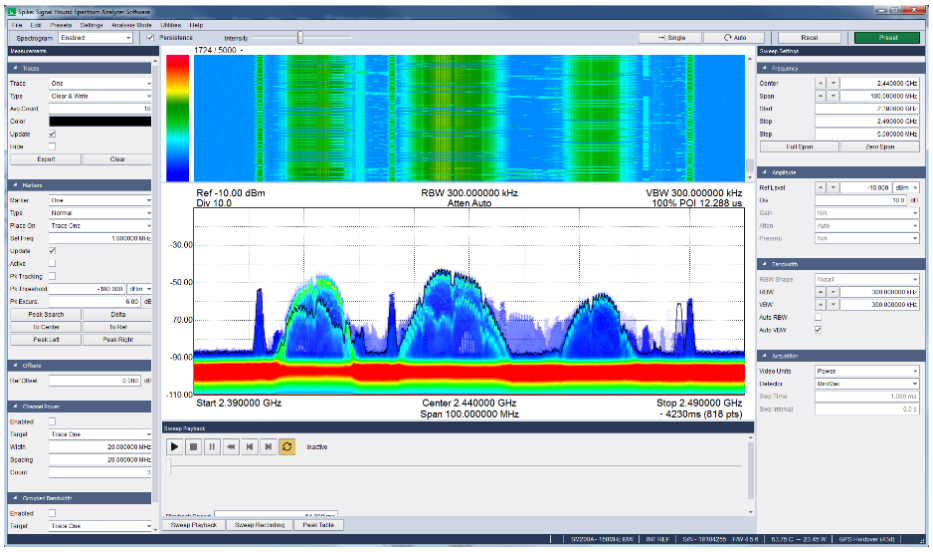
Troubleshooting Tools

WLAN signals are fast moving, modulated waveforms. Their sporadic nature can sometimes make it difficult to locate potential problems. Utilizing the real-time and suite mode features of our spectrum analyzers enables troubleshooting tools for analyzing these transient signals.



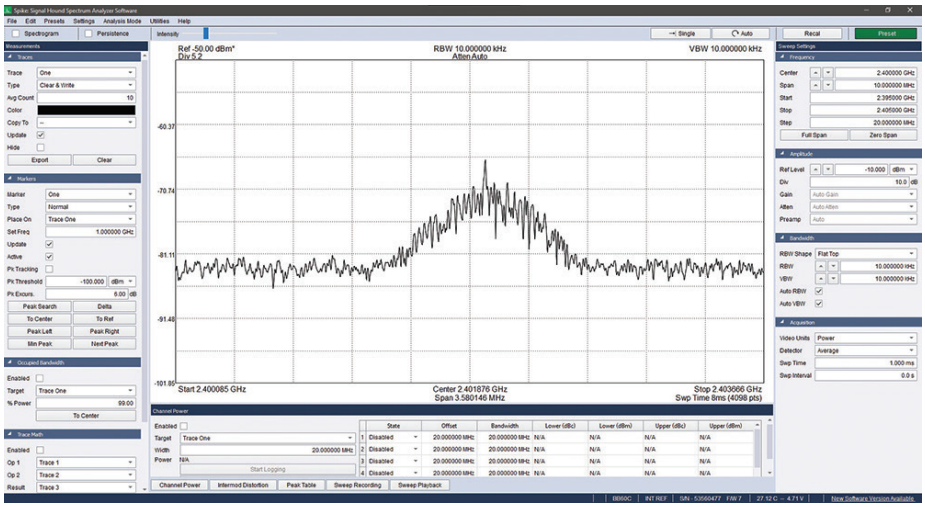
Spectrum Emission Mask Measurements

Our Spike software comes with built in 802.11 emission masks. It offers single button presets for all the WLAN 802.11b/a/g/n/ac/ax standards. This allows you to easily test out of channel spurious and adjacent channel power against the standard specified transmission mask.



Real-Time Spectrum Analysis

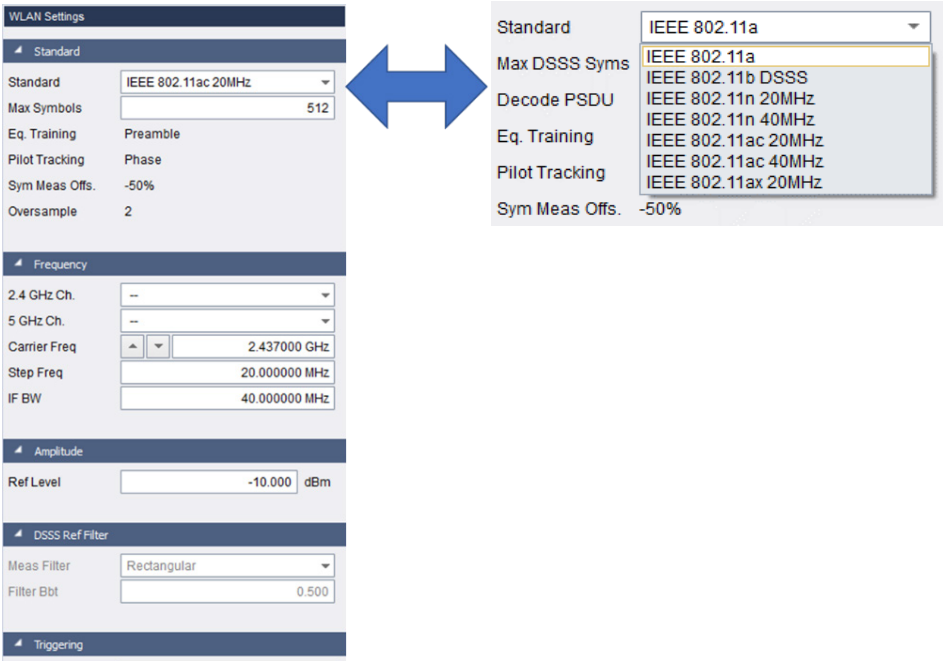
Troubleshoot spurious/out of band emissions by monitoring over-the-air dynamic conditions of the 2.4 and 5 GHz ISM bands. The SM200 and SM435 offer a real-time bandwidth of 160 MHz, which is enough to monitor the entire 2.4 GHz ISM band.



Traditional Spectrum Analyzer Measurements

In addition to the specialized WLAN diagnostic capabilities, using a spectrum analyzer allows for use of typical features such as adding markers, traces, channel power, adjacent channel power, occupied bandwidth, spectrogram, phase noise, trace export and sweep recording.

Easy Setup with WLAN Control Panel



WLAN Standards Control Panel

Setting up your measurement is easy using Spike's WLAN settings menu. Just select the standard and the menu updates to reflect the measurement parameters.

- Single button setup for making standard measurements
- Easily change your center frequency using our built in 2.4/5GHz channel selections
- Uses industry standard defaults to simplify parameter selections

Key WLAN Software Features

TECHNOLOGIES	802.11b DSSS	802.11a	802.11n	802.11ac	802.11ax
Modes Supported	802.11b 1 Mb/s 802.11b 2 Mb/s 802.11b 5.5 Mb/s 802.11b 11 Mb/s	802.11a 20 MHz (SISO only)	802.11n 20 MHz 802.11n 40 MHz* (SISO only)	802.11ac 20 MHz 802.11ac 40 MHz* (SISO only)	802.11ax SU 20 MHz (SISO only)
Modulation Formats	DBPSK Barker DQPSK Barker 5.5Mb/s CCK 11Mb/s CCK	BPSK QPSK QAM16 QAM64	BPSK QPSK QAM16 QAM64	BPSK QPSK QAM16 QAM64 QAM256	BPSK QPSK QAM16 QAM64 QAM256 QAM1024

* 40 MHz modes are only supported with the SM200 and SM435

SOFTWARE FEATURES AND MEASUREMENTS	802.11b DSSS	802.11a	802.11n	802.11ac	802.11ax
AM vs Time	Y	Y	Y	Y	Y
AM vs Time (Search)	Y	Y	Y	Y	Y
Spectrum	Y	Y	Y	Y	Y
Constellation Plot	Y	Y	Y	Y	Y
EVM Symbols/Subcarriers	Y	Y	Y	Y	Y
Equalizer Mag/Phase	NA	Y	Y	Y	Y
Signal Info L-SIG/HT-SIG/VHT-SIG/HE-SIG	NA	Y	Y	Y	Y
DSSS Header Info	Y	NA	NA	NA	NA
Symbol Table Subcarriers/Pilots	NA	Y	Y	Y	Y
EVM vs Time/Symbols	Y	NA	NA	NA	Y
Transmit Power	Y	Y	Y	Y	Y
Crest Factor	Y	Y	Y	Y	Y
Payload Data (BCC encodings only)	Y	Y	Y	Y	Y
MAC header Info (Does not support frame aggregation)	Y	Y	Y	Y	Y
Channel Power Measurements	Y	Y	Y	Y	Y
Adjacent Power Measurements	Y	Y	Y	Y	Y
Spectrum Emission Mask Measurements	Y	Y	Y	Y	Y
Real-Time Spectrum Measurements	Y	Y	Y	Y	Y

Typical WLAN Spectrum Analyzer Performance

SIGNAL HOUND SPECTRUM ANALYZER	BB60C 	SM200B SM200C 	SM435B SM435C 
Price*	$3,600 USD	$15,550 USD (SM200B) $18,900 USD (SM200C)	$24,200 USD (SM435B) $27,925 USD (SM435B)
Min/Max signal detection at maximum sensitivity, 20 MHz OFDM (typical)	-77/-50 dBm	-81/-20 dBm	-79/-20 dBm
Dynamic Range 2.4 GHz (typical)	95 dB	118 dB	118 dB
Dynamic Range 5.8 GHz (typical)	92 dB	112 dB	112 dB
DANL 2.4 GHz (spec/typical)	-154/-159.5 dBm/Hz	-160/-163.0 dBm/Hz	-155/-161.0 dBm/Hz
DANL 5.8 GHz (spec/typical)	-154/-159.0 dBm/Hz	-153/-158.7 dBm/Hz	-155/-159.5 dBm/Hz
Measured EVM Using a VSG25A into analyzer** 2.4 GHz center frequency -20 dBm signal level 20 MHz BW 802.11a**	-32 dB	-37.5 dB	-37.5 dB
IF amplitude flatness, 20 MHz span, max sensitivity (typical)	± 0.5 dB	± 0.5 dB	± 0.5 dB
IF bandwidth	27 MHz I/Q 27 MHz Real-time spectrum	40 MHz I/Q (SM200B) 160 MHz I/Q (SM200C) 160 MHz Real-time spectrum	40 MHz I/Q (SM435B) 160 MHz I/Q (SM435C) 160 MHz Real-time spectrum
Maximum search length**	200ms	200ms	200ms
Frequency Lock Range (20/40M MHz OFDM)**	± 624 kHz	± 624 kHz	± 624 kHz
Frequency Lock Range (DSSS/CCK)**	± 2.7 MHz	± 2.7 MHz	± 2.7 MHz

* Prices are current as of 1/1/22 and are subject to change.
** Values were generated on 3/30/21 and are subject to change.

Further Reading

Learn more about Signal Hound's robust, real-time spectrum analyzers at signalhound.com/learn.

About Signal Hound

Signal Hound designs and builds powerful, affordable spectrum analyzers and signal generators for engineers and RF professionals around the globe. Whether you're needing EMC precompliance capabilities in a small two-person shop or spectrum monitoring on a national scale, our test equipment is designed with you in mind. Accurate and powerful enough for mission-critical RF analysis, priced at a point accessible to most, and supported by a talented group of engineers committed to what they do – we truly believe that our devices offer unrivaled value in the test equipment industry.

In business since 1996 and selling our own line of Signal Hound test equipment since 2010, we've built the foundation of our company on years of test equipment repair, service, hardware and software development, and manufacturing experience. Signal Hound is a small company with big goals – and an even bigger commitment to providing our customers with an outstanding experience when purchasing and using our products.

Signal Hound®