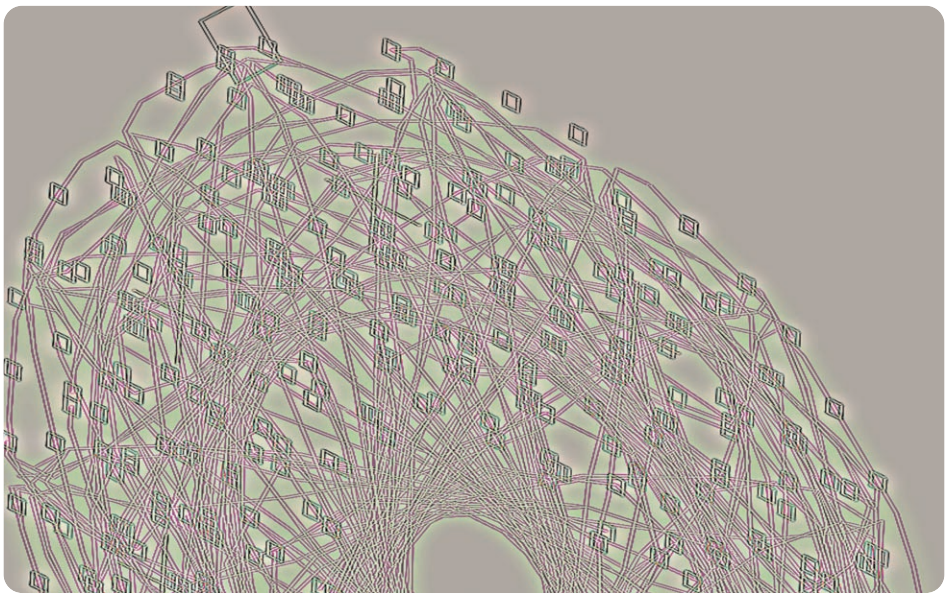
Agilent 89400 Series

Vector Signal Analyzer

Product Overview

W-CDMA, EDGE and Bluetooth Technology — Developing next-generation communications with the Agilent 89400 Series



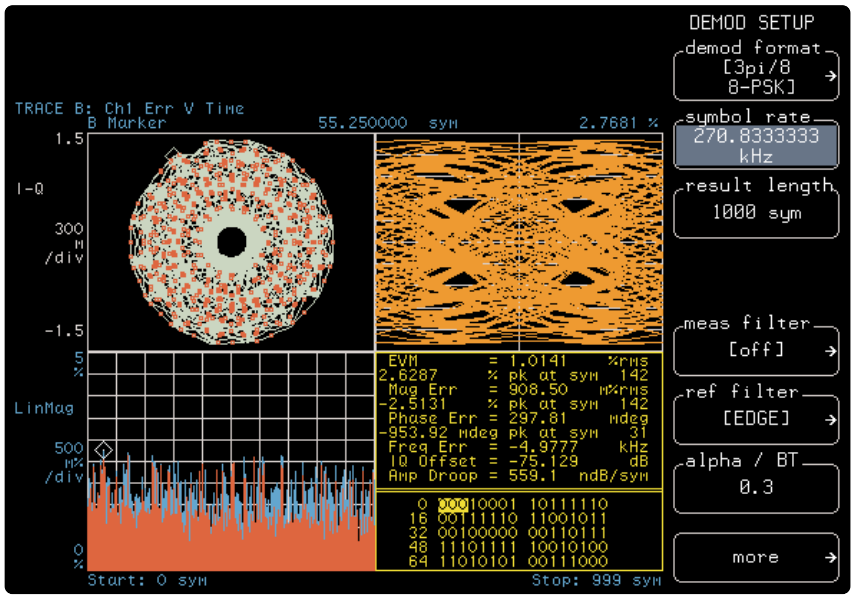
Efficient development of next-generation wireless systems demands a comprehensive suite of test capabilities. New options enhance the Agilent 89400 series vector signal analyzers to keep up with evolving standards such as EDGE and W-CDMA. These enhancements build on the 89400 series and its existing measurements for GSM and BTS transmitter tests of W-CDMA experimental systems. Optional new capabilities for EDGE are described on pages 2 – 4. See pages 5 – 7 for details on new measurements for W-CDMA systems.

Advanced digital RF transmission techniques are also being applied to short range, low power applications. The Bluetooth standard combines digital modulation, bursting and a frequency hopping spread-spectrum technique. See pages 8 – 11 for details on measurements of Bluetooth signals with 89400 series vector signal analyzers.

Agilent Technologies
Innovating the HP Way

EDGE in the Agilent 89400 Series

- Perform complete EDGE and GSM demodulation.
- Separately measure and demodulate EDGE bursts within GSM frames.
- Use all existing 89400 series analysis and troubleshooting tools on the new EDGE format.
- Make precision power and timing measurements in the frequency and time domains, including statistical power measurements such as peak/average power ratio and CCDF.
- Use trace math, signal storage and multiple display modes to compare the performance of components and systems on both GSM and EDGE signals.

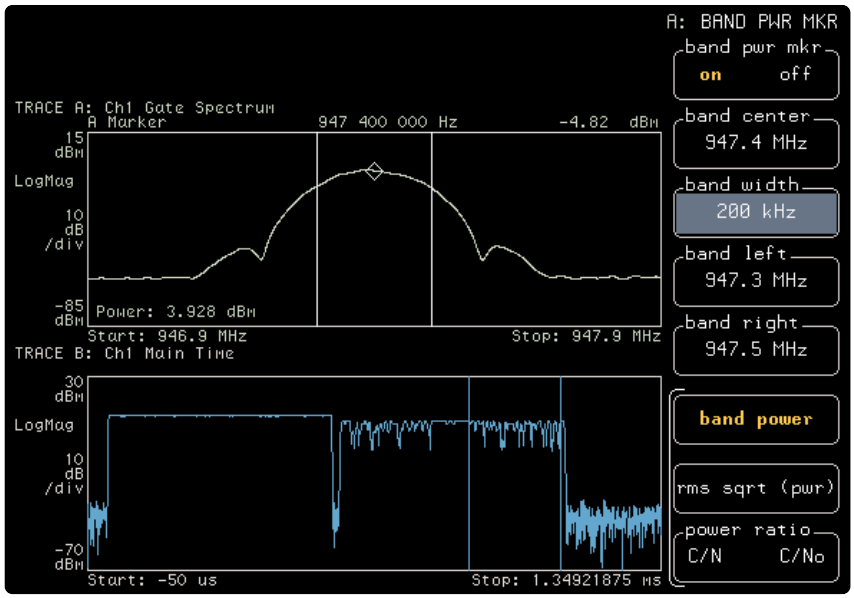


The Agilent 89400 series can now directly demodulate the EDGE 3π/8 shifted 8PSK signal with appropriate filtering, symbol detection, sync search, and more. This multi-trace display shows a vector/constellation diagram, EVM, an eye diagram and modulation metrics.

All the powerful design and troubleshooting capabilities of the 89400 series are now available for EDGE, GSM and composite systems. Individual EDGE and GSM bursts can be separately measured and demodulated from a frame containing both types of signals.

Key Features

- RF, IF and Baseband (including analog I/Q) measurements with one instrument. Compare errors, power and spectrum at different points in the block diagram.
- Adaptive equalization to measure channel and filter characteristics and to separate linear from nonlinear distortion mechanisms.
- Spectrogram and waterfall displays to uncover transients and spectral regrowth.
- Multiple error measurements and displays including EVM, magnitude and phase error, error spectrum.
- Comprehensive time-capture, post-processing and storage.
- Flexible triggering including IF trigger, negative trigger delay and trigger holdoff combined with sync (pattern) search to isolate and measure the desired signal or burst.



Simultaneous display of burst envelope (lower trace) and signal spectrum (upper trace) of a GSM frame containing GSM and EDGE bursts. The measurement takes advantage of time gating, IF triggering and pre-trigger delay to provide measurement of only one portion (data bits) of the EDGE burst. Band power markers are then used on the averaged EDGE spectrum to precisely measure the power in a 200 kHz band.

Composite frames containing EDGE and GSM bursts can be analyzed together or separately in the frequency domain (spectrum) or time domain (burst envelope). IF triggering, flexible averaging, gated sweep and band power markers provide all the measurements needed to characterize a signal, system or component.

Key Specifications

Please refer to the Agilent 89410A or 89441A Technical Specifications for complete information on the RF performance specifications.

Frequency Range

89410	DC to 10 MHz
89441A	2 MHz to 2650 MHz
71910A	DC to 26.5 GHz

IF Bandwidth

89410	1 Hz to 10 MHz
89441A	1 Hz to 8 MHz
71910A	1 Hz to 20 MHz

Input Power Range (RF)

89441A	-50 dBm to +25 dBm

EDGE Options:

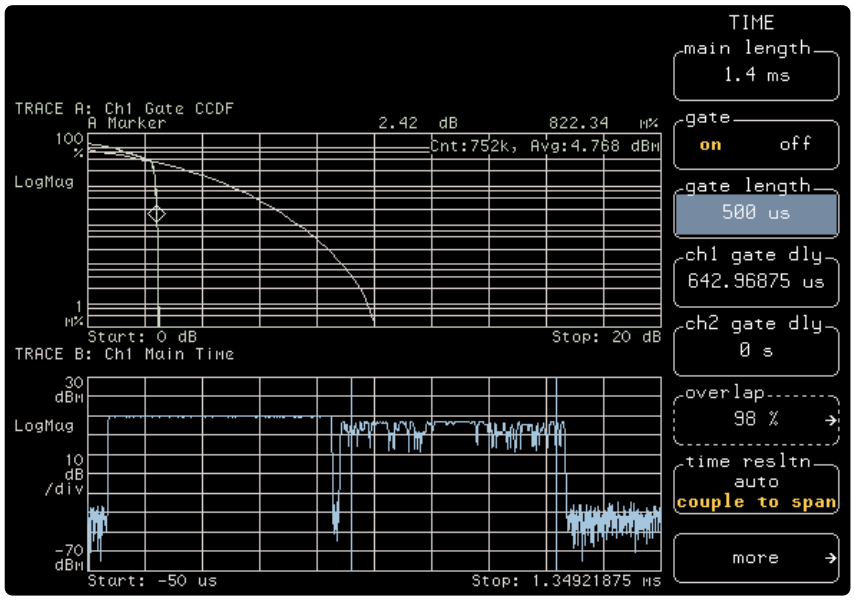
Option B7A Enhanced Data Rate for GSM Evolution (EDGE) adds EDGE demodulation to option AYA.

Also required for EDGE demodulation is Option AYA (vector modulation analysis).

Recommended options are:

- Option UTH (20 Mbytes extended RAM and LAN interface). Option UTH is now included as a standard feature in the 89400 series.
- Option AYB (waterfall and spectrogram)

Firmware and hardware upgrades for existing instruments are available.

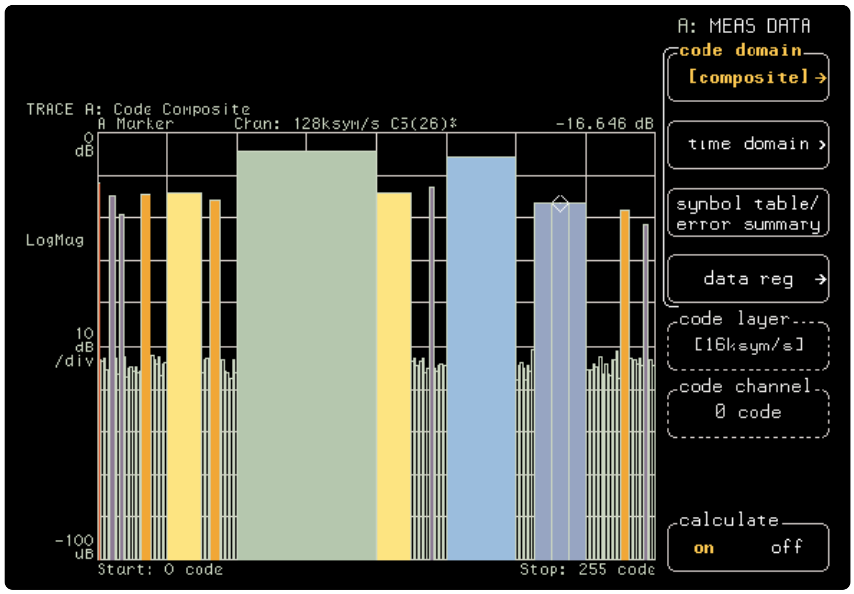


CCDF measurements are a powerful tool for setting amplifier operating points and determining headroom. In the lower trace, gate markers are positioned in the active portion of the EDGE burst. The result in the upper trace is a CCDF measurement of only the "on" portion of the EDGE bursts, representing over 750,000 power measurements.

EDGE and GSM have different power characteristics, and efficient operation of systems handling both signals demands special analysis and tuning. 89400 series analyzers provide high amplitude accuracy plus statistically-based power measurements such as peak/average power ratio and CCDF (complementary cumulative distribution function). Amplifier back-offs or operating points can be set to optimal values and measurements can be made at any point in the block diagram and on individual signal components. CCDF measurements are especially useful where any component or system must handle multiple signals.

W-CDMA in the Agilent 89400 Series

- Designed for W-CDMA systems including ARIB 1.0-1.2 and the experimental system in Japan.
- View code power for all code layers and symbol rates on a single composite display.
- Measure 4 Mchips/second in the 89441A and 8-16 Mchips/second with other downconverters.
- Zoom screen views for more display resolution of code channel power.
- Isolate a single code channel for modulation analysis.
- View power versus time in a selected code channel.
- Employ standard 89400 series modulation analysis and spectrum analysis tools.



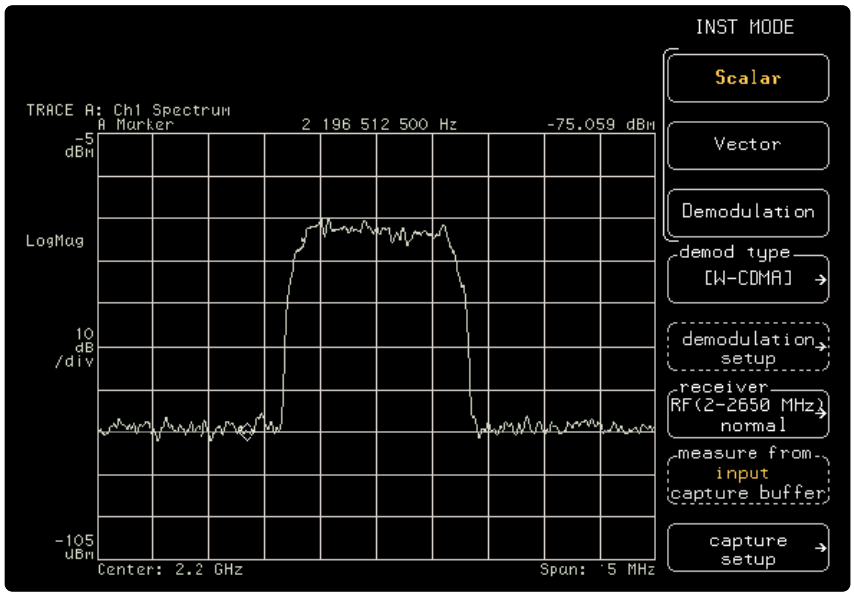
Automatically determines and color codes active channels of any code layer.

Use the Agilent W-CDMA code domain power (CDP) measurement system for BTS transmitter tests of W-CDMA experimental systems. The system automatically determines active channels of any code layer. It can display the code domain power information in a composite multi-rate view or in single-rate views of any code rate. The active channel identification lets you examine and analyze unknown signals with ease. The 89441A can support up to 8 MHz of bandwith in its base configuration and up to 20 MHz in other configurations. The robust decoding algorithm can decode heavily-loaded signals, which means you can evaluate and stress test your transmitter designs.

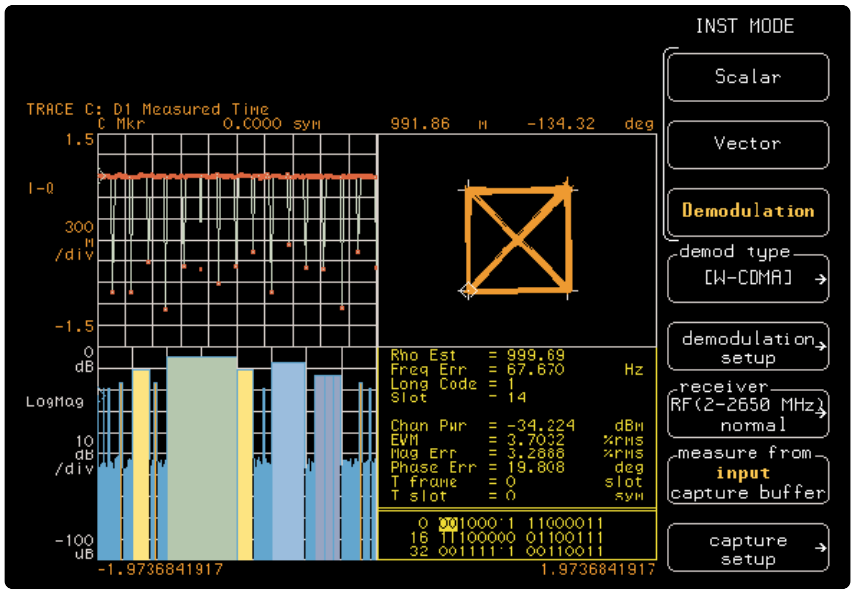
The 89400 analyzers provide complete characterization of the W-CDMA signal in the time domain, frequency domain, and the modulation domain. Measure rho, channel power, frequency, error vector magnitude (EVM), average power, peak to average power statistics and channel frequency response.

Key Features

- Measure at RF, IF and Baseband.
- Apply automatic channel identification of layered codes (8 ksym/sec to 4096 ksym/sec).
- Utilize composite display of all code layers and symbol rates.
- Isolate single code channels to examine constellation, power versus time, despread symbol stream, and modulation quality metrics.
- Measure in relative or absolute power.
- Perform manual or automatic long code selection.
- View normal/mirrored spectrums (for Inverted IFs).
- Display CDP for each of 20 contiguous time slots.
- Measure T slot and T frame metrics and timing relative to trigger.
- Recover bits from any code channel.
- Capture up to 15 frames of W-CDMA data for post processing analysis in the 4 Mchip system.



Examine the W-CDMA spectrum and make power measurements using band power markers.



Examine the composite code-domain power display while viewing the constellation power versus time, the despread symbol streams of sixteen timeslots, and the modulation metrics of a specific code channel in the remaining display views.

Key Specifications

Please refer to the Agilent 89410A or 89441A Technical Specifications for complete information on the RF performance specifications.

Frequency Range

89410	DC to 10 MHz
89441A	2 MHz to 2650 MHz
71910A	DC to 26.5 GHz

IF Bandwidth

89410	1 Hz to 10 MHz
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71910A	1 Hz to 20 MHz

Input Power Range (RF)

89441A	-50 dBm to +25 dBm

W-CDMA Options:

Option B73 covers BTS transmitter tests of W-CDMA experimental systems.

Option B79 ARIB 1.0–1.2 W-CDMA Analysis is added to option B73 to cover ARIB 1.0-1.2.

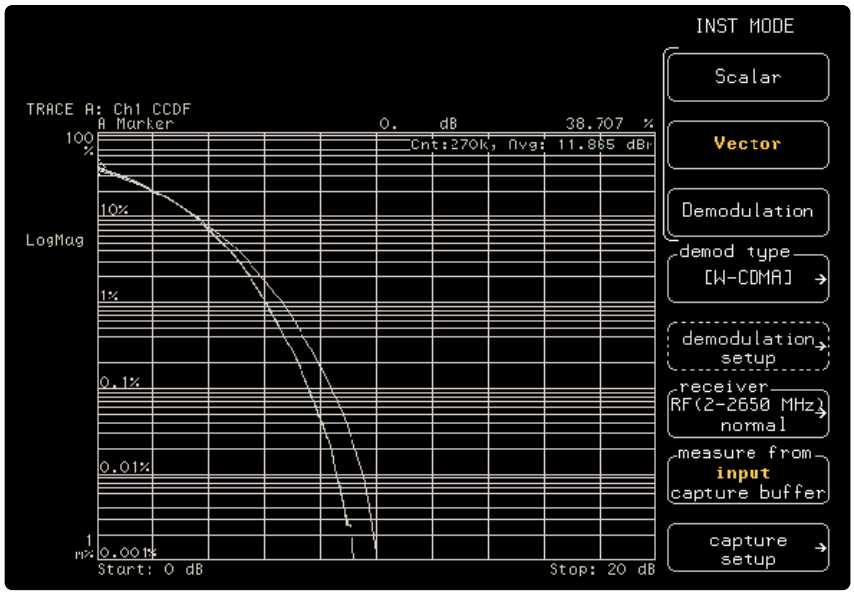
Also required for W-CDMA demodulation are:

- Option AYA (vector modulation analysis)
- Option AY9 (extended time capture)
- Option UTH (20 Mbytes extended RAM and LAN interface). Option UTH is now included as a standard feature in the 89400 series.

Recommended option is:

- Option AYB (waterfall and spectrogram)

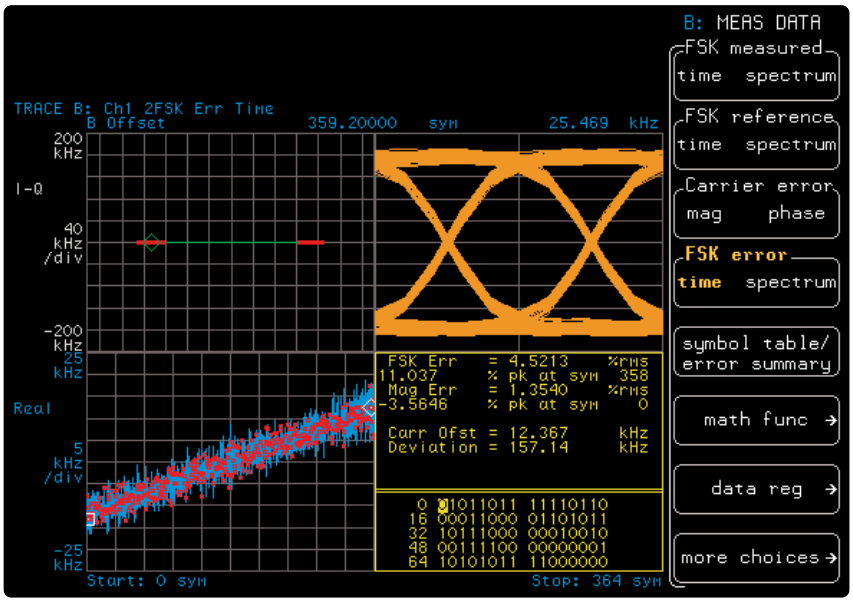
Firmware and hardware upgrades for existing instruments are available.



Complementary cumulative distribution function (CCDF) measurements characterize the peak-to-average time statistics of the W-CDMA signal.

Bluetooth Technology in the Agilent 89400 Series

- Completely analyze frequency-hopped signals.
- Perform frequency, time and modulation domain measurements of signal bursts.
- Make required measurements quickly and with excellent margins.
- Capture signals for replay and for analysis using multiple measurement techniques.
- Quickly troubleshoot and optimize devices using the analyzer's extraordinary measurement flexibility.
- Completely demodulate a wide range of digital formats to evaluate Bluetooth signals in environments with other signals.
- Use the built-in flexible RF+baseband source (optional) for stimulus/response and interference testing.
- Isolate individual portions of Bluetooth or other signals for detailed analysis.



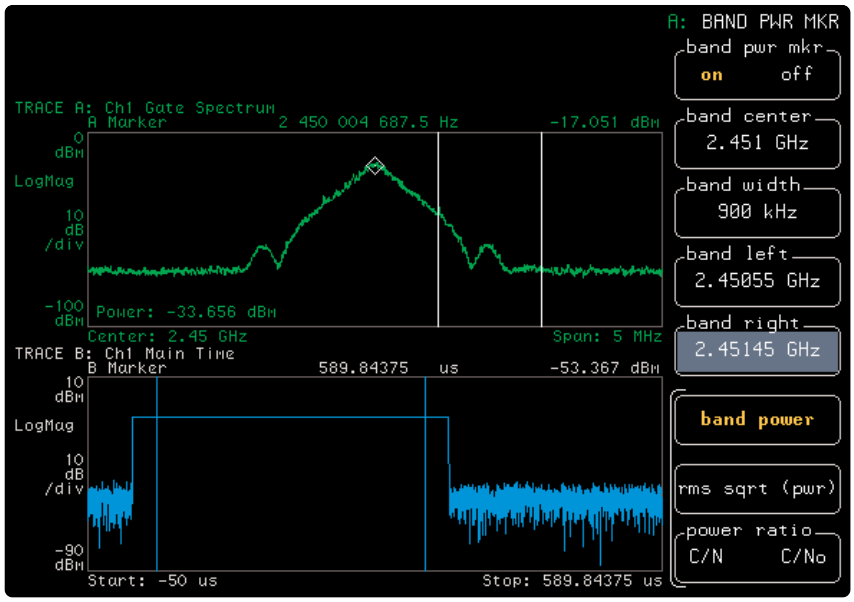
The Agilent 89400 series provides complete modulation quality analysis for Bluetooth signals, including constellation and eye diagrams, frequency deviation displays and a combined symbol table/result summary. The marker on trace B indicates a 25 kHz drift during a burst.

Successful R&D means meeting performance targets while achieving goals such as rapid development, low cost, low power and compact size. The 89400 series provides complete measurements in the time, frequency and modulation domains in a single analyzer.

Bluetooth™

Key Features

- Time capture mode allows signals to be captured once and analyzed in many different ways. Different measurements can be used in different domains (time, frequency, modulation) to find and resolve problems such as unanticipated transient behavior.
- Time-gated measurements allow individual signals or portions of bursts to be isolated for analysis. Time gating works with other instrument modes and features such as spectrum, demodulation, triggering, averaging and band power measurements.
- Pre-trigger delay (negative trigger delay) allows the earliest part of signal bursts to be viewed, measured and demodulated.
- Precision, time-selective and frequency-selective power measurements provide precision analysis of any part of the spectrum or any part of a signal burst.
- Flexible digital demodulation handles Bluetooth signals and many others. All signals and systems in the frequency band can be characterized with one analyzer.
- Built-in flexible RF+baseband source (optional) provides arbitrary waveforms, sinewaves, noise and digitally-modulated signals. The integrated source can be used for stimulus/response or interference testing.
- Advanced display types such as waterfall and spectrogram can be used to put hundreds of measurements on screen at once. These powerful displays allow the amplitude, frequency and modulation characteristics of a burst to be understood in a single glance.

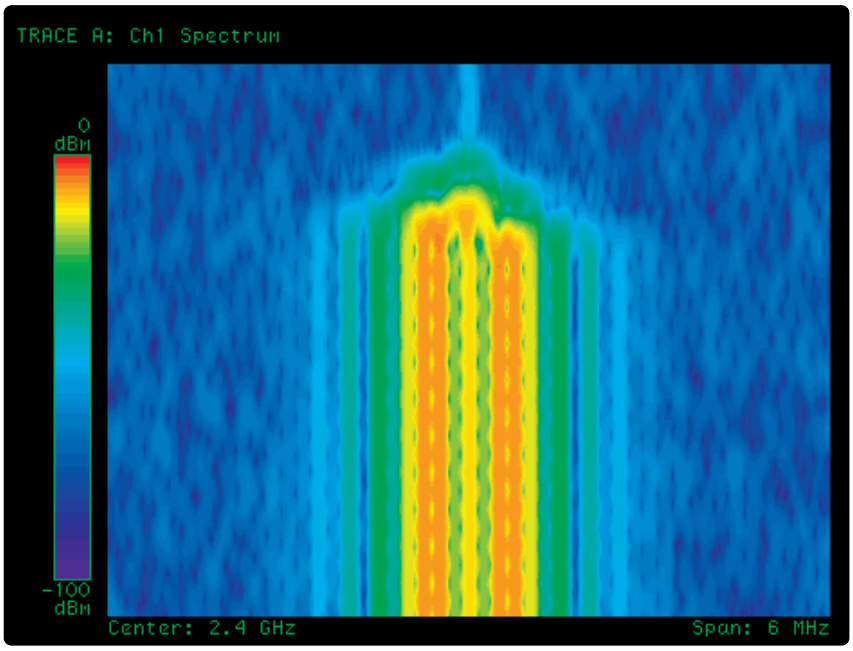


A Bluetooth signal is digitally-modulated with variable burst length. Precise and flexible triggering, time-gated sweeps and signal capture allow any part of the signal to be measured in the time, frequency and modulation domains. Here the upper trace is gated spectrum with a band power measurement and the lower one is burst power profile.

Measuring Bluetooth signals is a challenge due to the combination of frequency hopping, bursting, digital modulation and variable length bursts. The agility of the signals demands the broad array of features provided by the 89400 Series.

Key Measurements

- RF transmit output power
- RF transmit power control
- Transmitter output spectrum
- Frequency deviation
- Initial carrier frequency tolerance
- Carrier frequency drift
- Out-of-band Spurious Emissions
- Timing tests—jitter and symbol rate
- PLL settling



The spectrogram presents hundreds of successive measurements at once in a display of frequency, amplitude and time. A single spectrogram can characterize turn-on/settling behavior, spectral purity and modulation.

Testing to a set of standard specifications is only part of the design task. Efficient design verification, troubleshooting and system integration all require a more comprehensive set of measurement and analysis capabilities.

Key Specifications

Refer to the Agilent 89441A Technical Specifications for complete information on RF and baseband performance.

Frequency Range

89441A	DC to 2650 MHz

IF Bandwidth

89441A	1 Hz to 7 MHz (8 MHz with option AYH)

Input Power Range (RF full scale)

89441A	-50 dBm to +25 dBm

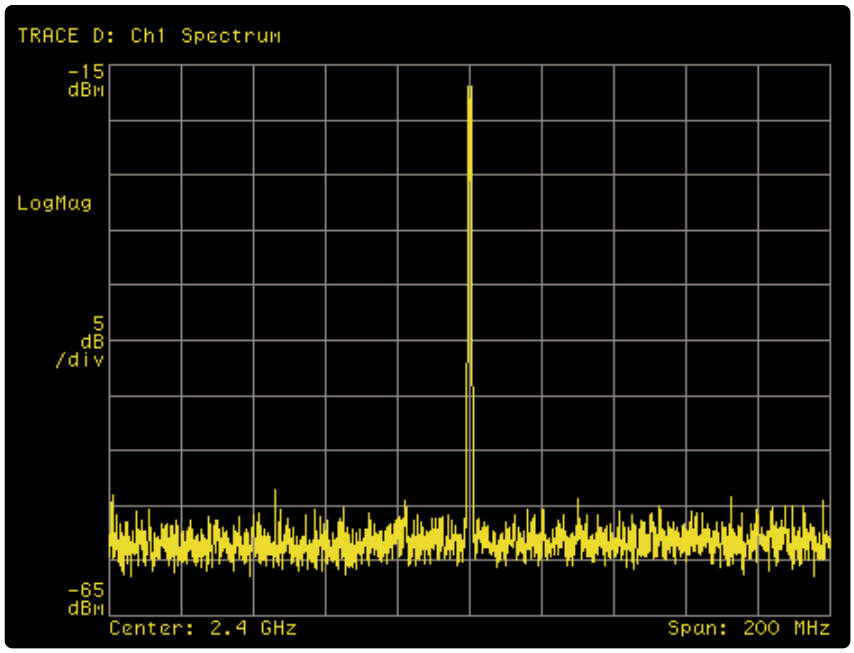
Configuration for analysis of Bluetooth signals:

Option AYA (vector modulation analysis) is required for digital demodulation. It provides analysis of the 2GFSK Bluetooth signal and many others.

Recommended options are:

- Option AYB (waterfall and spectrogram)
- Option AY8 (internal RF source)
- Option AY9 (extend time capture to 1 Msample).

Firmware and hardware upgrades for existing instruments are available.



More familiar spectrum measurements are also a part of testing Bluetooth signals. For example, transmitter output spectrum must be measured for spurious signals. The Agilent 89441A can perform high resolution spectrum measurements with an exceptional combination of speed and accuracy.

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Our Promise

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Your Advantage

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