

Agilent E4406A Vector Signal Analyzer

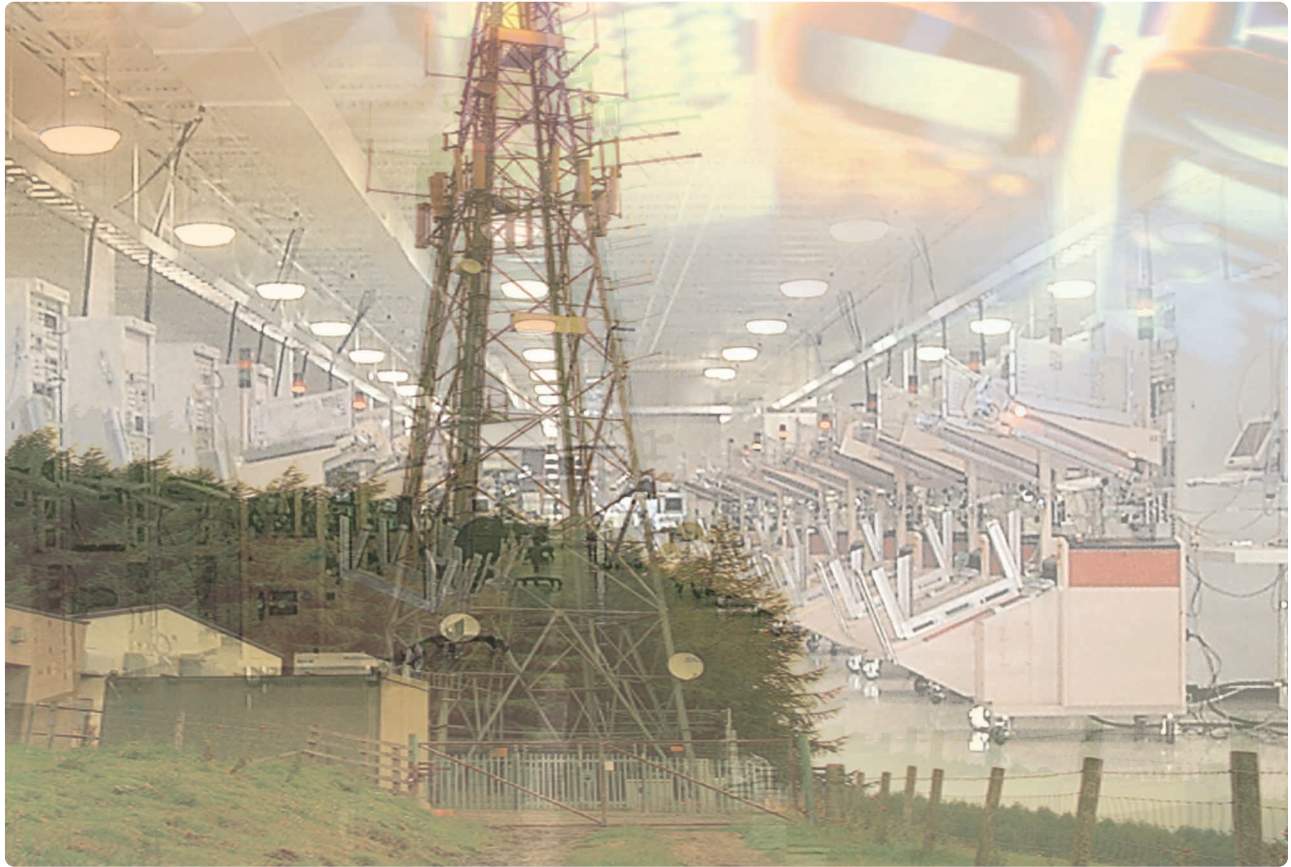


The image displays the Agilent E4406A Vector Signal Analyzer in its operating mode. The main screen shows a W-CDMA signal analysis interface with the following details:

- Agilent** logo and **W-CDMA** mode indicator.
- BTS Ch Freq 1.00000 GHz** and **Code Domain** display.
- Mode** menu on the right: W-CDMA (3GPP), EDGE w/GSM, cdma2000, cdmaOne, NADC, PDC, and More (1 of 2).
- I/Q Measured Polar Vector** plot showing a network of nodes.
- Demod** data on the left: I: 00, Q: 10, I: 00, Q: 01, I: 00, Q: 11, I: 01, Q: 10, I: 11, Q: 00, I: 00, Q: 10, I: 11, Q: 01, I: 10, Q: 00, I: 11, Q: 01, I: 10, Q: 00.
- Measure** section on the right: Code Domain, Mod Accuracy (Composite EVM), QPSK EVM, Power Stat CCDF, Spectrum (Freq Domain), Waveform (Time Domain), and More (2 of 2).
- Total Power: -10.33 dBm** and other metrics: Total Active Ch: 0.0052 dBc, PSCM: -22.542 dBc, PSCM: -28.467 dBc, Max Active Ch: -3.518 dBc, Avg Active Ch: -9.415 dBc, Max Inactive Ch: -28.532 dBc, Avg Inactive Ch: -69.713 dBc, No. of Active Ch: 8.

The physical device is shown in the foreground, featuring a color display, a numeric keypad, and various control buttons. The background includes a mobile phone and a cellular tower, illustrating the device's application in telecommunications testing.

You develop the wireless future...



Fast and accurate measurements

To stay competitive, wireless equipment manufacturers need flexible test equipment capable of testing different formats with little change in set-up. The Agilent E4406A vector signal analyzer (VSA) is the perfect fit, offering the best combination of speed and accuracy for making one-button, standards-based measurements.

2.5G and 3G formats

For engineers developing next-generation wireless components and systems, the E4406A provides W-CDMA, cdma2000, 1xEV-DO and EDGE/GSM formats. Using one-button measurements, engineers can quickly verify conformance to these new formats. As the standards have evolved, we have continued to enhance existing measurement personalities, and add new ones. The modular architecture of the E4406A makes it simple for you to upgrade and be ready for the latest standards.

Accuracy

Speed

...we provide the signal analysis.



Easy to use

An investment for your future

The number of wireless technologies deployed around the world is growing and the demand for any particular format can change quickly. The E4406A offers format and frequency flexibility.

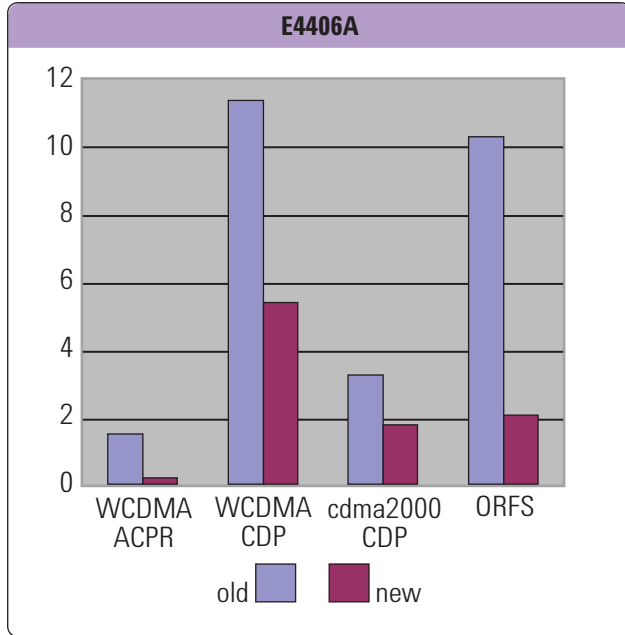
Multi-format

Comprehensive signal analysis

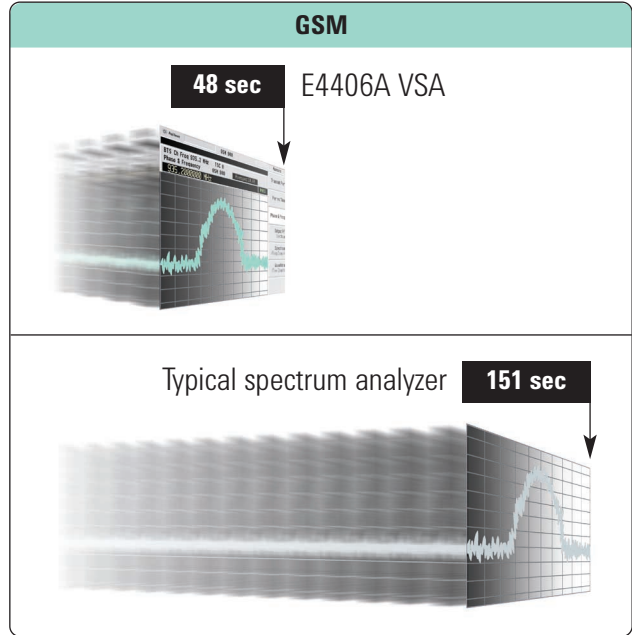
Speeding up production means being ready to manufacture anything and lose no time doing it. The E4406A easily adapts to virtually any popular format:

- W-CDMA
- cdma2000
- 1xEV-DO
- cdmaOne
- EDGE
- GSM
- NADC
- PDC
- iDEN
- Spectrum
- Waveform

Built for speed...



Speed enhancements since introduction



Base station transceiver suite of tests

Fast standards-based measurements

As a wireless system or component manufacturer, you are under pressure to increase throughput while minimizing capital investments. Long test times can severely limit your manufacturing throughput, so we designed the E4406A.

Since its introduction, progressive enhancements to the E4406A ensure its performance keeps pace with the ever-increasing need for speed.

Today's E4406A is faster than ever. For example, the WCDMA ACPR measurement is now nearly eight times faster than it used to be. ORFS is two times faster, WCDMA CDP is five times faster, and other measurements have improved as well.

The E4406A transmitter power calibration uses time record data and built-in algorithms to provide complete transmitter level calibration with incredible speed – with all the accuracy you expect from the affordably-priced E4406A.

In addition to high-speed throughput and accuracy in the manufacturing environment, the E4406A is designed to allow research and development engineers to quickly obtain results with minimal keystrokes.

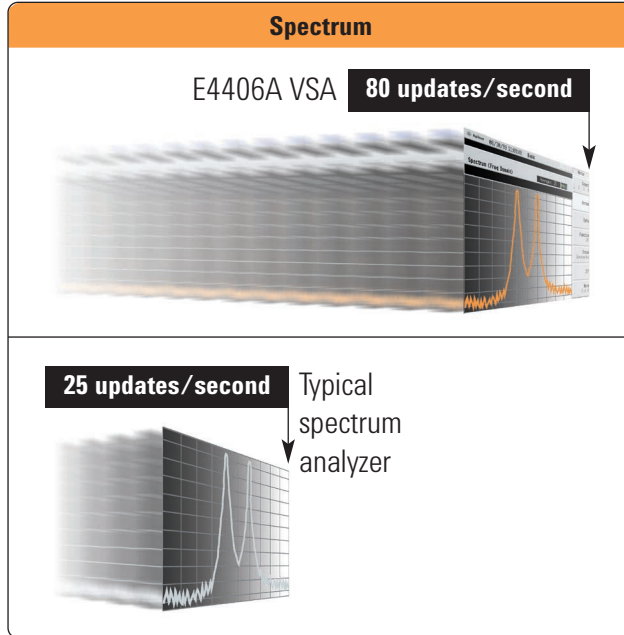
The E4406A delivers a logical user interface and a wealth of quick “one button” measurements, enabling designers to quickly try multiple test without getting bogged down in cryptic menus. The E4406A interface provides the edge needed to expediently evaluate new designs and successfully meet the demands of today's competitive environment.

Now even faster

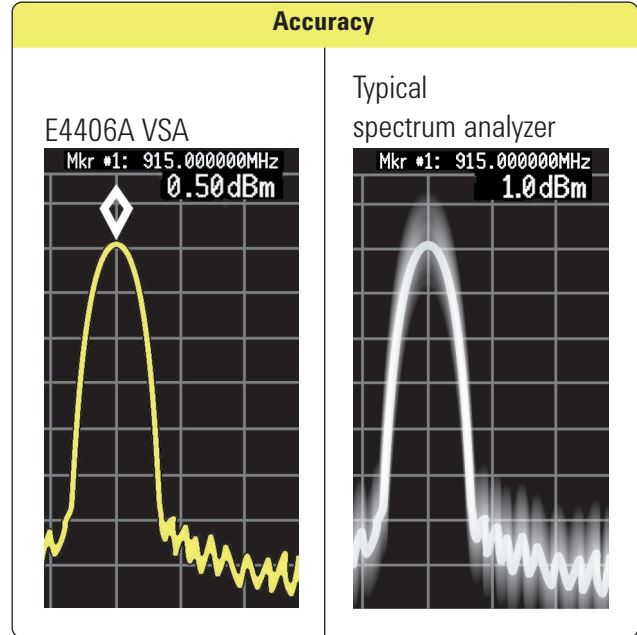
“We have decreased the (transmitter power calibration) test time by 25%.”

–Test Systems Designer

...without giving up accuracy.



Narrow span spectrum measurement over GPIB



Absolute level accuracy

Fast spectrum measurements

The E4406A features pre-configured, one-button measurements for many cellular standards and can also be used for narrowband spectrum measurements. Manufacturers can expect to make intermodulation distortion and other amplitude measurements up to three times faster using the E4406A.

Accuracy

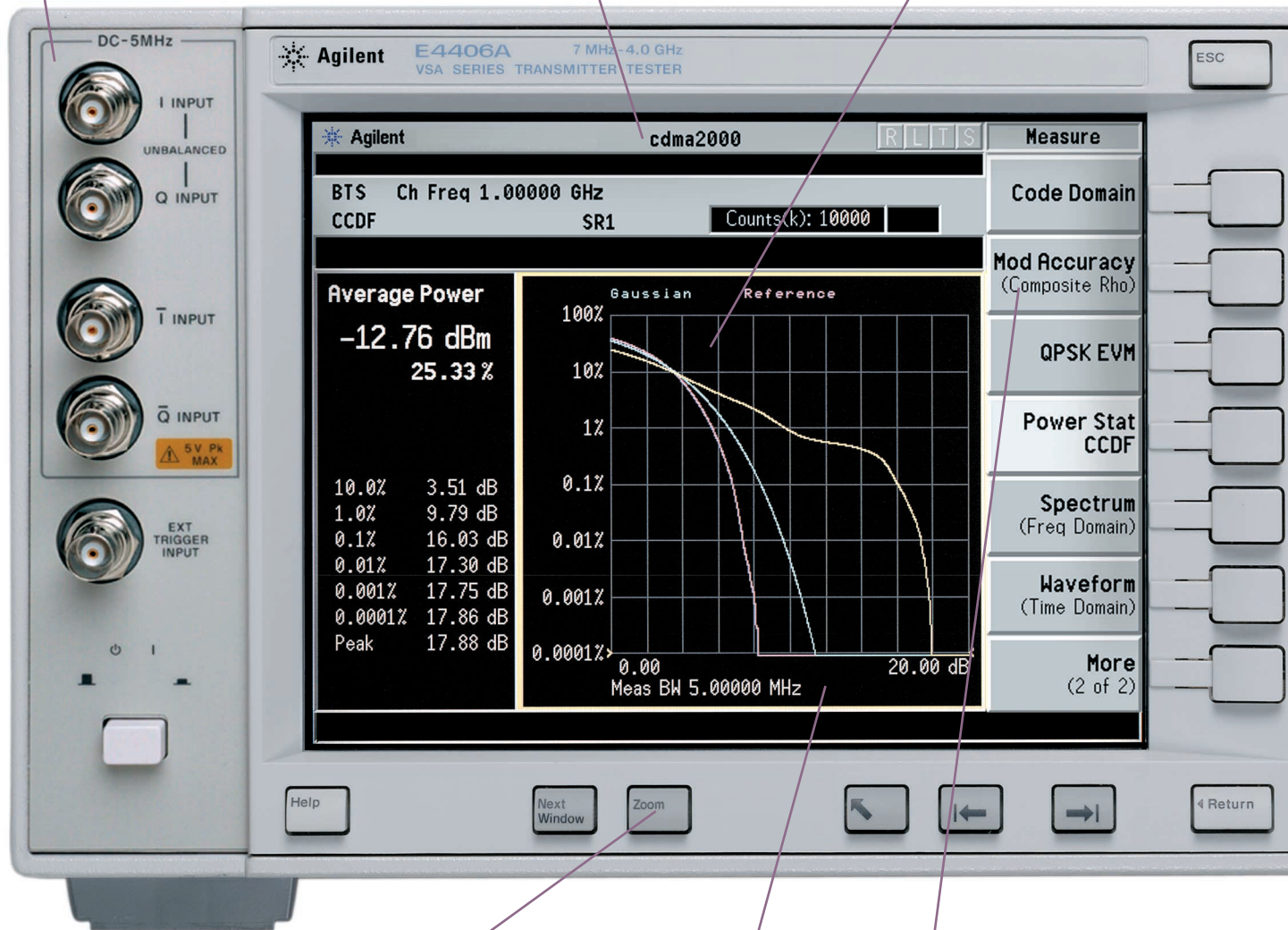
You don't need to reduce measurement speed to get accurate results. Superior absolute level accuracy of ± 0.6 dB (± 0.4 dB typical) provides unmatched performance and minimizes test uncertainty. Combined with a linearity of ± 0.25 dB over a 76 dB range, the E4406A is a state-of-the-art measurement tool.

The E4406A VSA...

Baseband measurements with balanced/unbalanced multiple impedance inputs

Focused applications including EDGE, GSM, W-CDMA, cdma2000, 1xEV-DO, cdmaOne, and NADC as well as narrow-span spectrum and waveform analysis

Large, high-resolution, color display makes viewing multiple traces easy



Zoom feature allows users to display selected measurement windows

One-button, standards-based measurements

Automatic alignment ensures accurate measurement results

...comprehensive signal analysis.



Intuitive key strokes

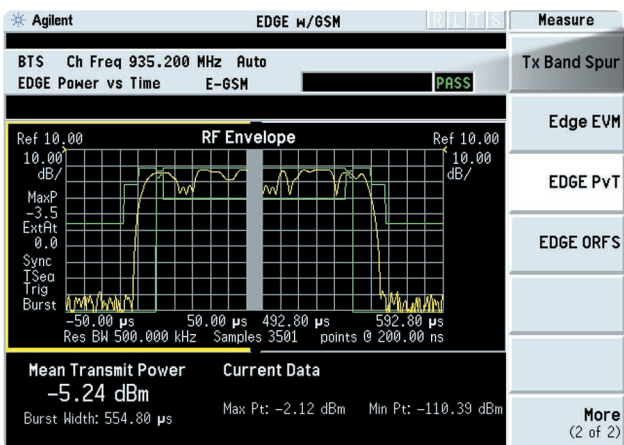


Built-in floppy disk drive provides PC compatibility and data archiving

High-speed LAN, parallel, and GPIB ports provide speed and flexibility when communicating with the outside world



Designed for manufacturing...



FAIL
PASS



Transmitter and receiver testing

In combination with the Agilent E4438C series signal generators, the E4406A offers base station receiver and transmitter testing for CDMA and GSM. The E4406A combined with an E4438C is a test solution that provides the required flexibility, without compromising accuracy, for maximum throughput in base station production with the ability to migrate to new formats.

Standards compliance

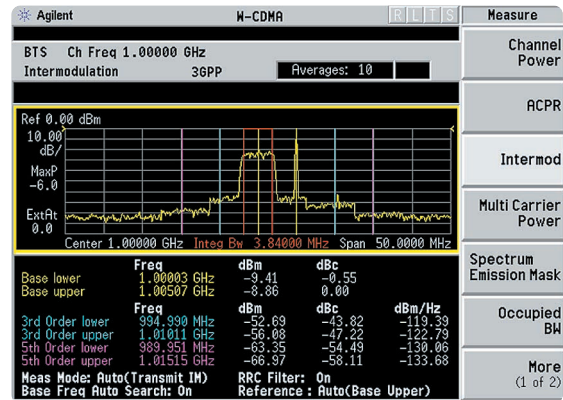
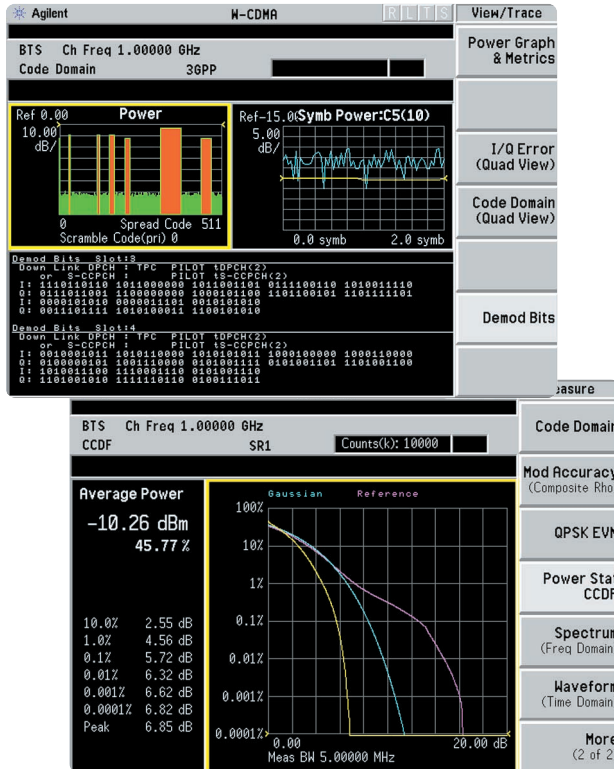
In manufacturing, you need straightforward pass/fail verification of critical specifications. With built-in test limits you don't have to keep track of every standard. The E4406A performs tests to the requirements of current industry standards.

Speed and throughput

In the world of high-speed manufacturing every millisecond counts. Identify your throughput restrictions and if measurement speed is creating a bottleneck, consider the significant speed advantage of the E4406A.

Manufacturing

...and product development.



Verify next-generation designs

For R&D engineers developing next-generation wireless components and systems, the E4406A is a low-cost tool that quickly verifies conformance. Your investment is secure because the E4406A has a modular architecture – making it easy to upgrade to the latest standards.

Characterize using leading test methods

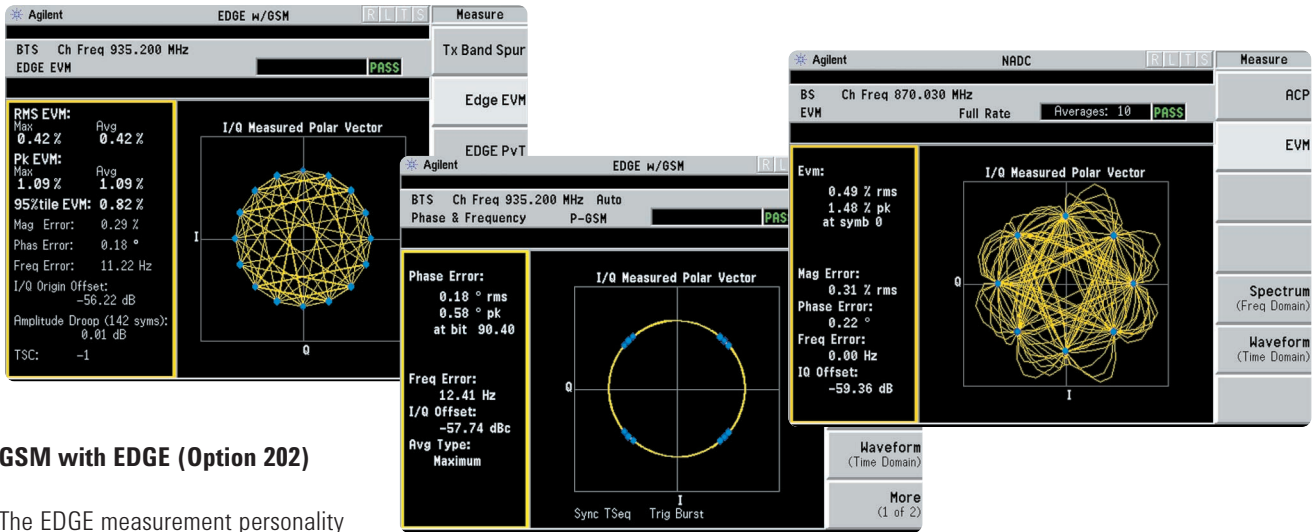
Digital modulation presents new challenges to amplifier manufacturers. Designers need effective methods to quickly characterize digital signals. The E4406A's complementary cumulative-distribution function (CCDF) is useful for determining a signal's power statistics, revealing the power peaks relative to the average power for assessing linearity requirements.

Flexible power measurements

Multi-carrier power amplifier (MCPA) designers are faced with new measurement challenges. Designers must characterize intermodulation distortion at many frequency offsets and evaluate the effects of different modulation formats over a wide dynamic range. The E4406A features a fully-configurable adjacent channel power (ACP) measurement that can test up to five frequency offsets and be optimized for dynamic range or speed.

Development

TDMA measurement personalities...



GSM with EDGE (Option 202)

The EDGE measurement personality performs the latest standards-based measurements, including:

- Error vector magnitude (EVM)
- Multi-slot PvT
- ORFS
- IQ offset
- Channel plans for 400, 800, 900, 1800, 1900 MHz
- GSM measurements from Option BAH

The EVM measurement features a unique algorithm to simultaneously display the EVM numerical results and the EDGE constellation diagram using the industry specified measurement filter.

GSM (Option BAH)

The GSM measurement personality lets you quickly perform measurements to the latest ETSI standards:

- Mean transmitter carrier power
- Multi-slot PvT
- ORFS
- PFER
- IQ offset
- Transmitter band spurious
- Channel plans for 400, 700, 800, 900, 1800, 1900 MHz

The personality features easy channel and timeslot selections, configurable PvT masks, and a typical ORFS dynamic range of 90 dB.

NADC and PDC (Option BAE)

Both the North American Digital Cellular (NADC) and Personal Digital Cellular (PDC) measurement personalities are included in this option. The NADC measurements are structured according to the IS-136 TDMA standard. Measurements included in this option are:

- Adjacent channel power (ACP)
- Error vector magnitude (EVM)
- Occupied bandwidth (for PDC)

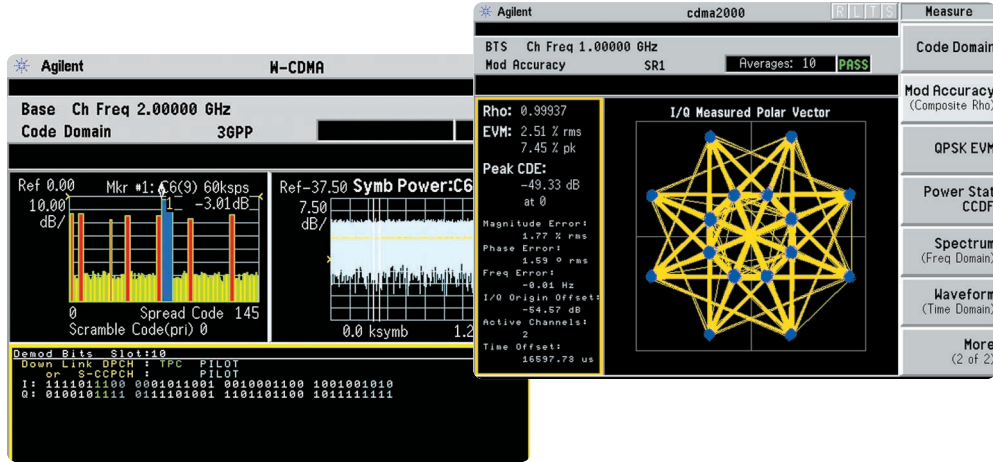
The personalities feature base station and mobile radio mode set-ups, as well as sync word search capability.

iDEN (Option HN1)

The iDEN measurement personality performs measurements to the Motorola iDEN specialized mobile radio format.

- Occupied bandwidth (OBW)
- Adjacent channel power ratio (ACPR)
- Transmitter bit error rate (BER)

... and CDMA measurement personalities.



W-CDMA (Option BAF)

The complexity of W-CDMA demands the flexibility and depth of demodulation capability provided by this personality. Perform the following measurements on the HPSK uplink or downlink QPSK signals:

- Code domain analysis
- QPSK EVM
- Modulation accuracy (composite rho and EVM)
- Channel power
- Adjacent channel power leakage ratio (ACLR)
- Intermodulation distortion
- Multi-carrier power
- Spectrum emission mask
- CCDF

This personality has the ability to automatically determine active channels, to synchronize with any W-CDMA channel, to display code domain power in a multi-rate view, and to demodulate down to the symbol level. Variable capture intervals and pre-defined test models enable the user to perform fast, accurate measurements for manufacturing or in-depth analysis for R&D.

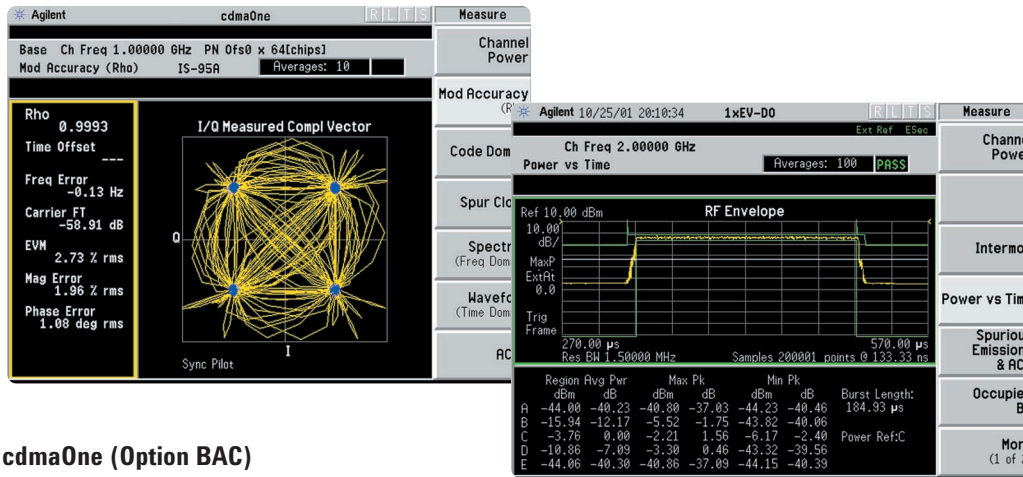
cdma2000 (Option B78)

The cdma2000 measurement personality offers the logical upgrade path from IS-95 to IS-2000 testing. Measurements support the forward and reverse links.

- Code domain analysis
- QPSK EVM
- Modulation accuracy (composite rho and EVM)
- Channel power
- Adjacent channel power ratio
- Intermodulation distortion
- Spectrum emission mask
- Occupied bandwidth
- CCDF

Advanced code domain analysis algorithms display Walsh codes for either Hadamard or OVSF coding schemes in a multi-rate view. Other capability includes code domain power error, symbol EVM, symbol power versus time, active channel identification, variable PN offset, quasi-orthogonal functions and demodulated symbol bit displays after de-spreading.

Expanding measurement potential...



cdmaOne (Option BAC)

Built on Agilent's pioneering efforts in CDMA measurement techniques, this personality provides quick and easy measurement set-ups for the TIA/EIA-95 and J-STD-008 standards:

- Modulation accuracy (rho)
- Code-domain analysis
- Channel power
- Adjacent channel power ratio (ACPR)
- Close-in spurious

Along with the world's fastest ACPR measurements, this personality features PN (pseudo-noise sequence) search, time offset, and carrier feed-through analysis.

1xEV-DO (Option 204)

With digital demodulation analysis, the 1xEV-DO measurement personality provides the most comprehensive, easy-to-use, 1xEV-DO forward-link measurement solution available in an analyzer. This personality, which performs measurements only for forward link signals, provides key transmitter measurements for analyzing systems based on the 3GPP2 and TIA/EIA/IS-856 standards.

- Channel power
- Power versus time mask
- Spurious emissions and ACP
- Intermodulation distortion
- Occupied bandwidth
- Code domain power
- Modulation accuracy (composite rho)
- QPSK EVM
- Power statistics (CCDF)

Power versus time mask measurement, and spurious emissions and ACP supporting 1xEV-DO idle slot (burst signal) and active slot (full power signal) offer the flexibility for auto burst search without time gated sweep. Code domain, modulation accuracy (composite rho), and QPSK EVM can also measure for each channel's Pilot, MAC, and Data in QPSK/8PSK/16QAM. Designed with flexibility in mind, this personality supports the unique 1xEV-DO forward link signals' feature of time divisions multiplex (TDM). The 1xEV-DO personality is a powerful measurement tool for the the lab or manufacturing floor, and combines instantly available one-button measurements along with flexible measurement setups.

...tailored to user requirements.

IQ Inputs (Option B7C)

Capitalize on the E4406A's demodulation capabilities by extending the measurement range to baseband. The baseband IQ input option enables engineers to measure the complete signal path of a receiver or transmitter and directly compare signals both before and after frequency conversion and IQ (de)modulation.

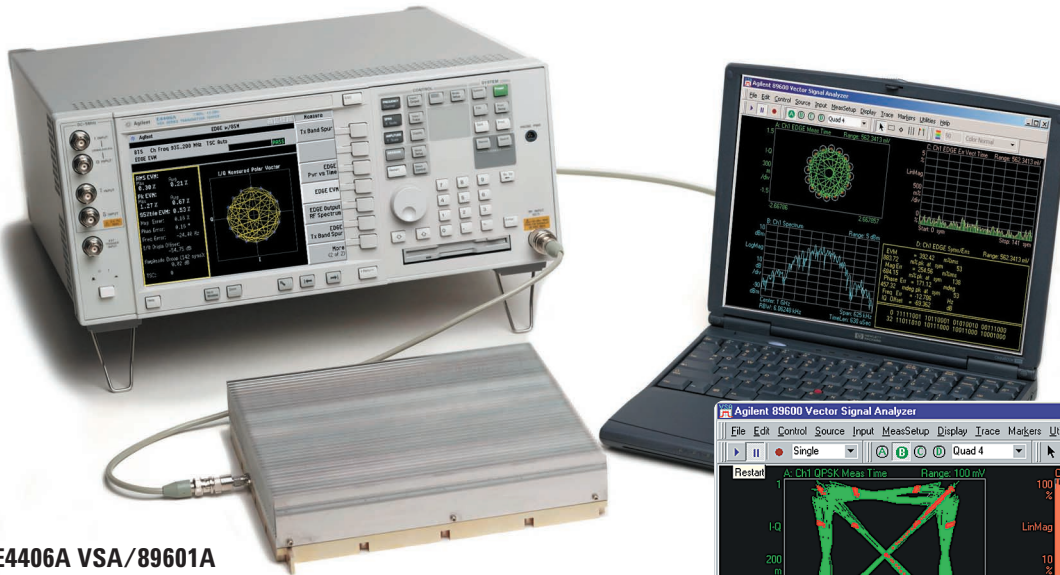
Ideally suited for R&D engineers and manufacturing environments, this option allows measurement of baseband I and Q signals in either balanced or unbalanced systems. Input configurations include 50-ohm unbalanced, 600-ohm balanced, and 1-Mohm balanced or unbalanced – enabling a variety of systems to be directly tested without cumbersome and error-inducing conversion networks.

Applicable in-band 3GPP W-CDMA, cdma2000, and Basic mode measurements are supported via RF and IQ inputs, enabling engineers to track down signal degradation both before and after RF/IF conversion.

Additional features include auto calibration of input signals, variable DC offsets and a DC to 5-MHz input frequency range (10 MHz in I + jQ mode).



Coupling speed and power...

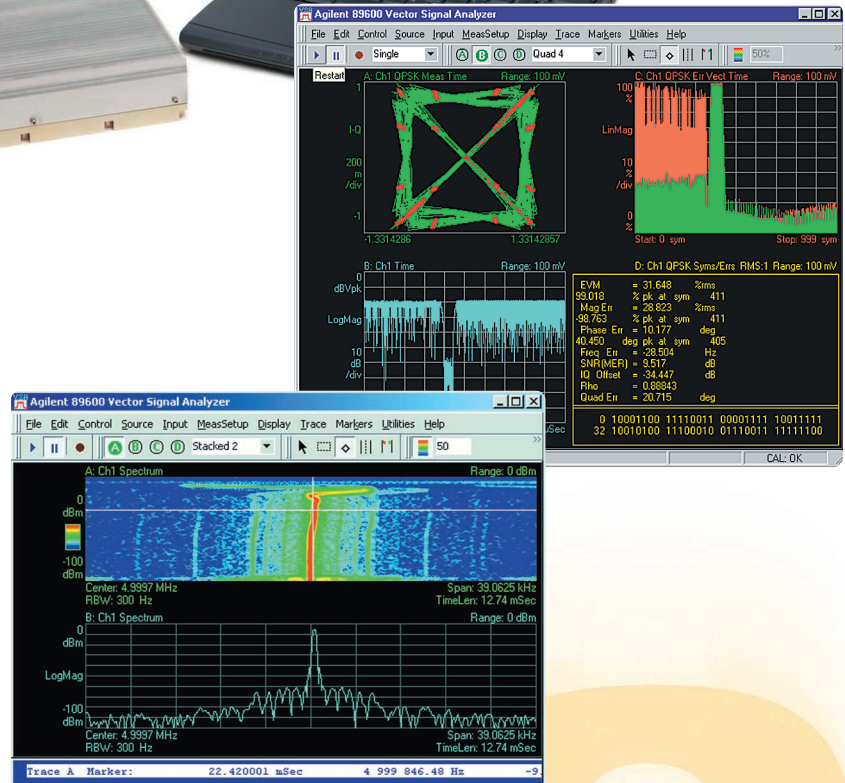


E4406A VSA/89601A software combination

The standards-based, one-button test capabilities of the E4406A can be expanded with the flexible digital demodulation and analysis capabilities of the Agilent 89601A PC software. This teaming provides fast and accurate data acquisition with powerful, flexible modulation analysis tools for, both common and evolving communications standards.

The 89601A vector signal analysis software is the heart of the Agilent 89600 series of vector signal analyzers. This software provides flexible tools for demodulating and analyzing even the most advanced digital modulations, whether or not they are contained in an established standard.

Features include variable block size signal acquisition with user-selectable pulse search and synch words, and a user-controllable adaptive equalizer. Filter types include cosine (raised and square-root raised), Gaussian, and low-pass – all with configurable alpha/BT. Supported modulation formats for both continuous and burst carriers include FSK (2, 4, 8, and 16 level), BPSK, QPSK, OQPSK, DQPSK, p/4DQPSK, 8PSK, QAM (16 to 256 level), VSB (8 and 16 level), EDGE, and MSK.



The software also provides signal capture and analysis features, such as the capability to download signal capture files for playback through signal generators, and display high-speed spectrograms.

The 89601A software runs on a PC connected to the E4406A, via LAN or GPIB, and provides hardware control and results displays along with modulation analysis.

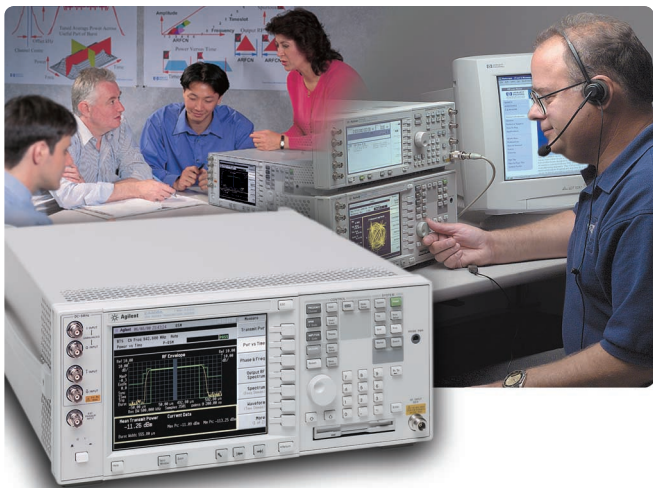
...with Agilent's tradition of excellence.

Service and support

The speed and accuracy of the E4406A VSA is only a small part of what you get from Agilent. We strive to provide complete solutions that go beyond our customers' expectations. Only Agilent offers the depth and breadth of enhancements, software, services, connectivity, accessibility, and support to help you reach your measurement objectives. **Visit our Web site at www.agilent.com/find/vsa**

Product literature

<i>E4406A VSA Data Sheet</i>	5968-3030E
<i>E4406A VSA Self-Guided Demo</i>	5968-7617E
<i>E4406A VSA Performance Guide</i>	
<i>Using the 89601A Vector Signal Analysis Software</i>	5988-2906EN



**[www.
agilent.com/
find/vsa](http://www.agilent.com/find/vsa)**

Pre-sales service

- rentals, leasing, and financing
- application engineering services
- application notes

Post-sales service

- standard three-year global warranty
- Worldwide Call Center and Service Center support network
- one-year calibration intervals
- firmware upgrades downloadable from the Web

PC connectivity

- 10 baseT LAN port
- floppy disk drive
- GPIB interface
- VXI Plug and Play drivers

Peripheral and product interfaces

- parallel printer port
- printer support
- VGA monitor output
- Agilent ESG-D series signal generator
- Agilent 89601A vector signal analysis software

Training and access to information

- on-site user training
- factory service training
- Web-based support of frequently asked questions
- manuals on CD-ROM and on the Web
- literature on the Web

Software

- programming examples on CD-ROM
- SCPI (Standard Commands for Programmable Instruments)
- PC-based performance verification and adjustment software

Agilent Technologies' Test and Measurement Support, Services, and Assistance

Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Support is available for at least five years beyond the production life of the product. Two concepts underlie Agilent's overall support policy: "Our Promise" and "Your Advantage."

Our Promise

Our Promise means your Agilent test and measurement equipment will meet its advertised performance and functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications and practical recommendations from experienced test engineers. When you use Agilent equipment, we can verify that it works properly, help with product operation, and provide basic measurement assistance for the use of specified capabilities, at no extra cost upon request. Many self-help tools are available.

Your Advantage

Your Advantage means that Agilent offers a wide range of additional expert test and measurement services, which you can purchase according to your unique technical and business needs. Solve problems efficiently and gain a competitive edge by contracting with us for calibration, extra-cost upgrades, out-of-warranty repairs, and on-site education and training, as well as design, system integration, project management, and other professional engineering services. Experienced Agilent engineers and technicians worldwide can help you maximize your productivity, optimize the return on investment of your Agilent instruments and systems, and obtain dependable measurement accuracy for the life of those products.

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