

# Agilent E4438C ESG Vector Signal Generator

- 6 GHz Frequency Range
- 160 MHz RF Modulation Bandwidth
- 160 Mbytes Baseband Memory
- 6 Gbyte Non-Volatile Waveform Storage





## Meet the new E4438C ESG vector signal generator...

The Agilent E4438C ESG vector signal generator meets the needs of engineers who are designing and developing the next generation of wireless communication systems and is well suited for production test environments. An assortment of standards-based receiver and component test personalities for 3G and emerging communications formats are available to simplify the signal configuration process. The E4438C ESG vector signal generator's improved performance, extended frequency range, increased memory for waveform playback and storage, and application-specific personalities make it the clear choice for development and manufacturing from the component to the system level.

### 6 GHz frequency range

- Select the frequency band you need: 250 kHz to 1, 2, 3, 4 or 6 GHz
  - 1 GHz option provides a low-cost alternative for a high-performance arbitrary waveform generator and real-time baseband generator with IF capability
  - 2, 3, and 4 GHz options cover the cellular and lower ISM band applications
  - 6 GHz option provides all of the above and the ability to test emerging communication formats in the UNII and upper ISM bands

### 160 MHz RF modulation bandwidth

- Ideal for multi-carrier signals
- Up to 160 MHz RF modulation bandwidth using external I/Q inputs
- 80 MHz RF modulation bandwidth using internal baseband generator

### 160 Mbytes baseband memory

- 32 Msamples (160 Mbytes) for waveform playback
- 32x the memory of the previous generation
- Playback complete test scenarios without rebuilding waveforms or recalling them from non-volatile storage
- Build longer, more complex waveforms

### 6 Gbytes non-volatile memory

- 1.2 Gsamples (6 Gbytes) for storing waveforms and instrument states
- Store waveforms indefinitely and quickly recall for playback
- Eliminate waveform build times in manufacturing and development
- Transfer files to non-volatile memory via LAN or GPIB

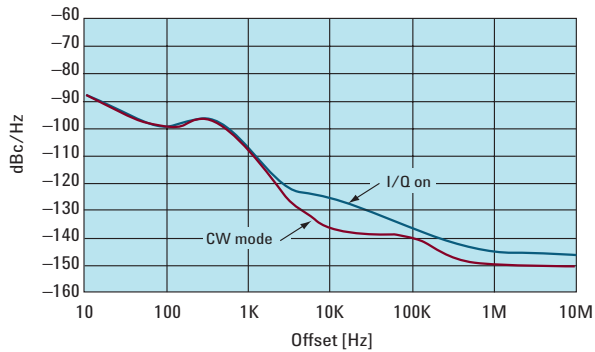


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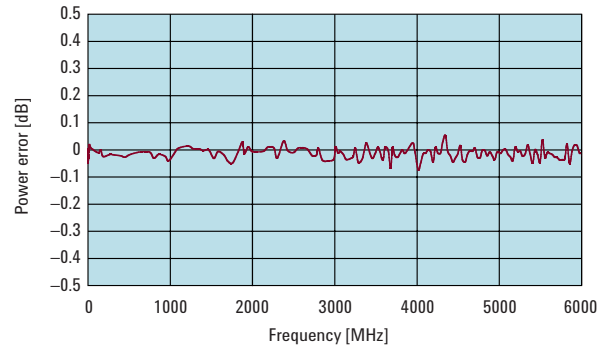
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## ... with the performance you require

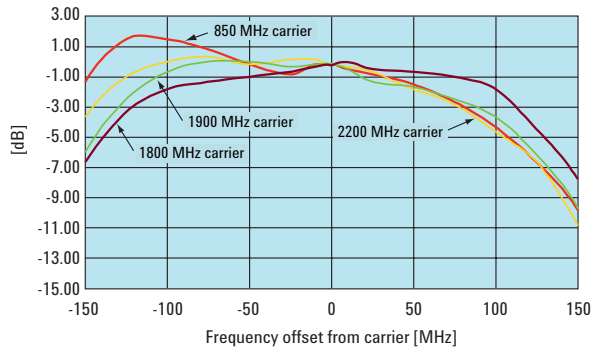
Typical SSB phase noise (option UNJ) at  $f_c = 850$  MHz



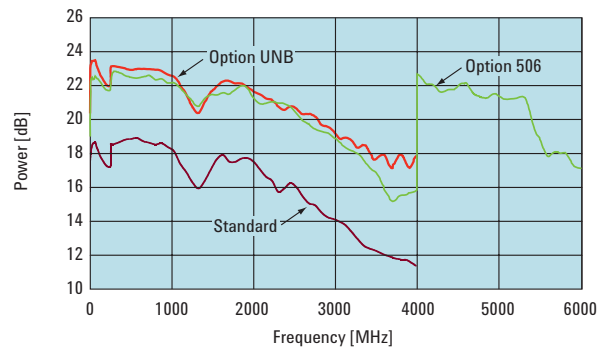
Typical level accuracy



External I/Q modulation bandwidth



Typical maximum power performance



### Specification summary

Frequency range	250 kHz to 1, 2, 3, 4, or 6 GHz
Frequency switching speed	<14 ms in CW mode
Output power, typical	+17 dBm at 1 GHz
Level accuracy	$\pm 0.5$ dB, up to 2 GHz
Amplitude switching speed	<19 ms in CW mode
Phase noise, typical (Option UNJ)	<-133 dBc/Hz at 20 kHz offset, 1 GHz carrier frequency
RF modulation bandwidth	160 MHz using external I/Q inputs
	80 MHz using internal baseband generator
Baseband memory	8 or 32 Msamples (40 or 160 Mbytes)
Baseband sample rate	Up to 100 Msamples/s
Non-volatile waveform storage	1.2 Gsamples (6 GBytes)
Connectivity	10BaseT LAN, GPIB, RS-232

### Modulation formats

- TD-SCDMA (TSM)
- W-CDMA
- EDGE
- GSM
- 1xEV-DO
- cdma2000
- cdmaOne
- NADC
- PDC
- PHS
- DECT
- TETRA
- GPS
- 802.11a WLAN
- 802.11b WLAN
- Bluetooth™
- AWGN
- Enhanced multitone
- Custom
- Pulse
- $\Phi$ M
- FM
- AM

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## Designed for component manufacturing with speed and dynamic range

### Focused set of applications tailored for component testing

- W-CDMA
  - EDGE
  - GSM
  - TD-SCDMA (TSM)
  - 1xEV-DO
  - cdma2000
  - cdmaOne
  - NADC
  - 802.11a WLAN
  - 802.11b WLAN
  - *Bluetooth*
  - PHS
  - PDC
  - DECT
  - TETRA
  - Enhanced multitone
- Customize each format
    - Add more channels to create high crest factors for stressing components
    - Modify key channel parameters, including data rates, data types, and power levels
    - Transmit built-in pseudorandom sequences or your own custom data
  - Create and download your own waveforms to baseband memory for playback or to non-volatile storage

### 80 MHz RF modulation bandwidth

- Generate multi-carrier, multi-format waveforms
- Wide bandwidth to support proprietary test signals and emerging communication formats
- Test predistortion techniques that require 3x or 5x the bandwidth of the modulated signal
- Test across multiple frequency bands

### 160 Mbytes (32 Msamples) baseband memory

- Ample memory to playback multiple test scenarios
- Hardware resampling increases effective available memory to 64 Msamples or more
- Eliminate the need to rebuild a new waveform for each different test
- Flexible waveform sequencer to customize your test scenarios
  - Playback multiple waveform segments with repeat capability for each segment
  - Simulate changing power levels of channels
  - Set up custom packet sequences

### 6 Gbyte (1.2 Gsamples) non-volatile memory

- Quickly save and recall waveforms
- Build once, store indefinitely
- Store a library of test scenarios in memory
- Store instrument states

### Performance

- Outstanding phase noise characteristics
- 16-bit DAC for improved ACPR performance
- Superior level accuracy
- High-speed microprocessor
  - Rapid waveform build times – up to four times faster than the previous generation
  - Quickly transfer waveforms from non-volatile storage to baseband memory for playback
- Fast I/O operations
  - Download waveforms to the instrument via GPIB or LAN
  - Upgrade firmware in minutes

### Connectivity – automate, upgrade, download waveforms and more

- 10BaseT LAN
- GPIB
- RS-232
- IntuiLink software
- Upgrade Assistant software

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# Built for receiver test with flexible channel coding for bit error rate testing

## Focused applications for receiver testing

- Generate a continuous, real-time stream of frames with fully-coded channels
- Verify baseband coding algorithms
- Full control over frame structure
  - Generate standards-based waveforms
  - Easily synchronize to base stations or mobile handsets
  - Modify frame structure to suit your test needs
  - Select data sources: pseudorandom sequences or user generated data
- Supports multiple communications formats
  - W-CDMA
  - EDGE
  - GSM
  - TD-SCDMA (TSM)
  - *Bluetooth*
  - 802.11a WLAN
  - 802.11b WLAN
  - GPS
  - 1xEV-DO
  - cdma2000
  - cdmaOne
  - NADC
  - PHS
  - PDC

## Calibrated noise personality

- Generate AWGN
- Truly uncorrelated real-time noise signal with variable bandwidth up to 80 MHz
- Set  $E_b/N_0$  or C/N within the W-CDMA and cdma2000 personalities
- Generate a repeated noise waveform to debug receiver susceptibility issues

## Perform bit error rate tests

- Supports data rates up to 60 Mbps
- Analyze PN9, PN11, PN15, PN20, and PN23 data sequences
- Accommodating connectivity: 5V CMOS, 3V CMOS, TTL, or 75Ω

## State of the art flexibility

- Modular platform is ready for future upgrades
- Load all firmware personalities in the instrument at one time
- Create FSK, PSK, MSK, QAM, and custom I/Q modulation formats



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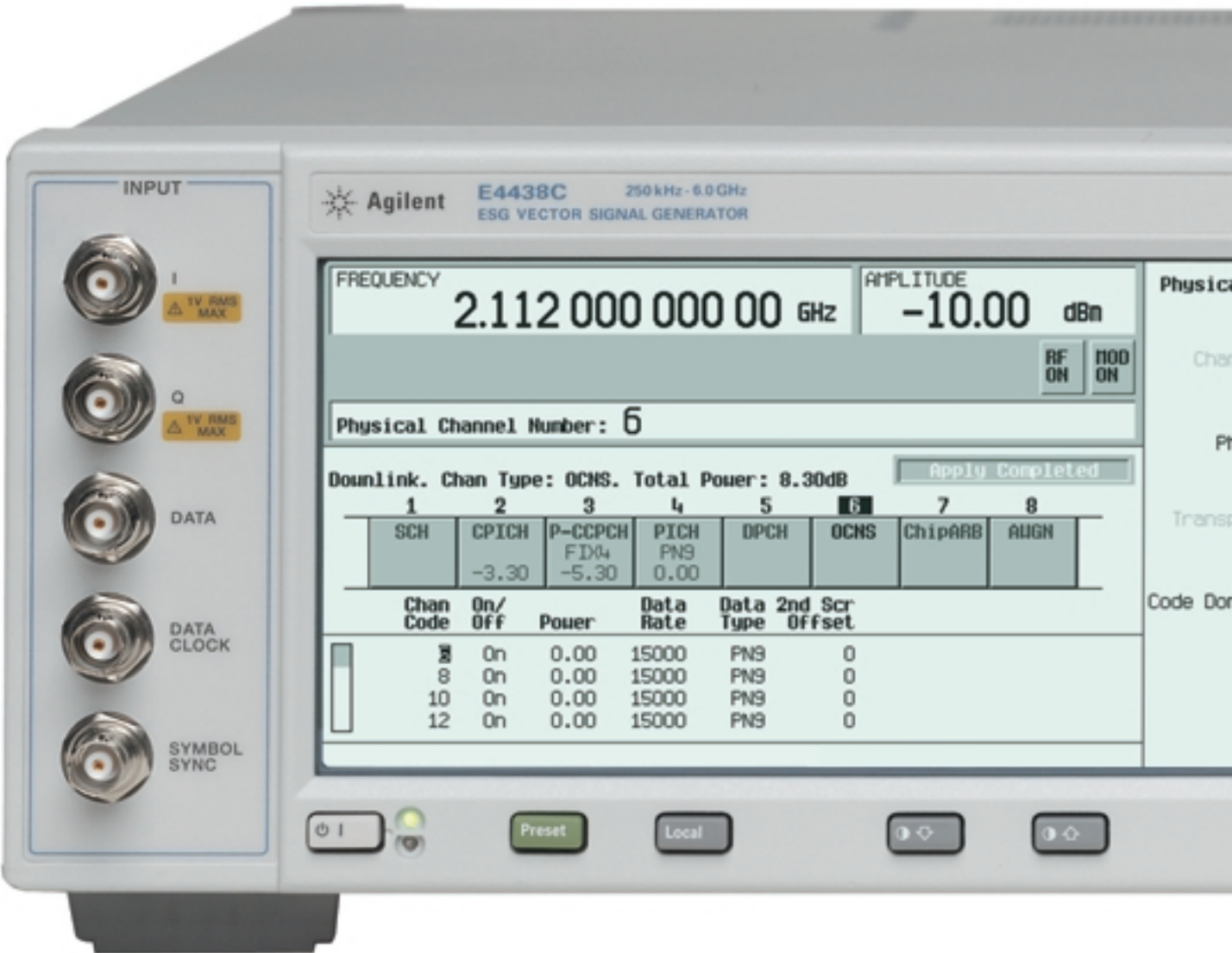
# The next generation ESG vector signal generator is ready ...

## Applications for component and receiver test, and R&D

- W-CDMA
- EDGE
- GSM
- TD-SCDMA (TSM)
- 1xEV-DO
- cdma2000
- cdmaOne
- GPS
- 802.11a WLAN
- 802.11b WLAN
- *Bluetooth*
- AWGN
- Enhanced multitone
- NADC
- PDC
- PHS
- DECT
- TETRA
- Custom modulation

## Powerful standard features

- Excellent spectral purity
- Electronic attenuator
- Simple softkey menu structure allows access to sophisticated features
- Built-in help
- Differential and single-ended I/Q outputs
- Suite of I/Q adjustments: gain, DC offsets, quadrature skew
- Save and recall instrument settings
- IntuiLink software allows easy data exchange from Microsoft® applications
- 10BaseT LAN



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## ... to take you into the wireless revolution

### Superior dual mode baseband generator

- Dual mode capability supports both waveform playback and real-time signal generation
- 80 MHz RF modulation bandwidth
- 32 Msamples (160 Mbytes) of waveform playback memory
- Generate waveforms at up to 100 Msamples/s
- Hardware resampling technology eliminates need for multiple reconstruction filters
- 16-bit DAC for improved dynamic range
- Flexible baseband reference clock 250 kHz to 100 MHz
- Industry standard filters or user-definable FIR filters
- Set  $E_b/N_0$  or C/N ratio for W-CDMA and cdma2000
- Generate AWGN with up to 80 MHz bandwidth



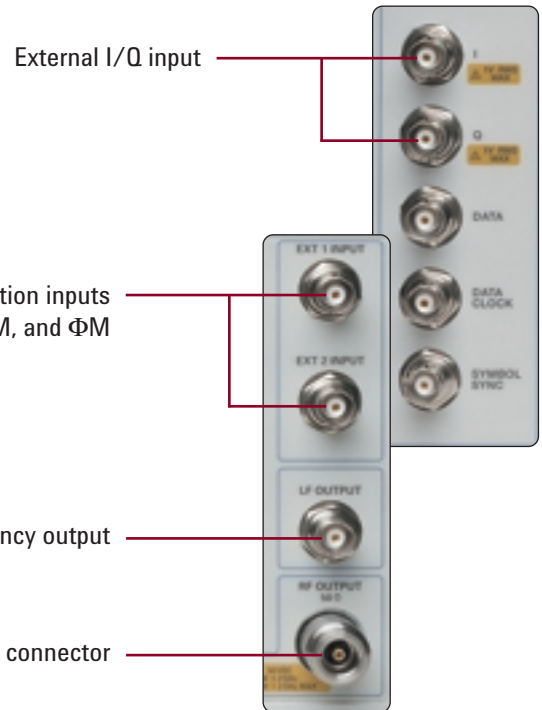
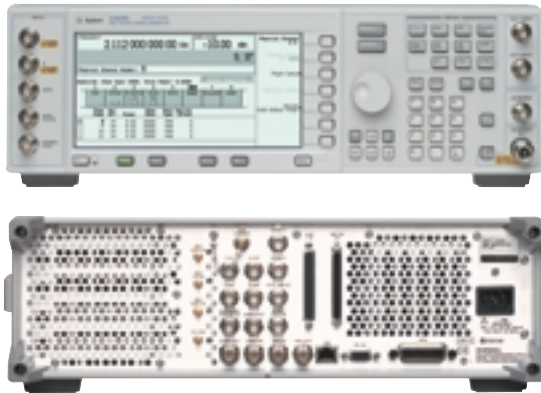
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# Connectivity for your demanding test applications



Wide array of input and output timing signals including markers

Coherent carrier output

BERT

Differential and single-ended I/Q outputs

External baseband reference

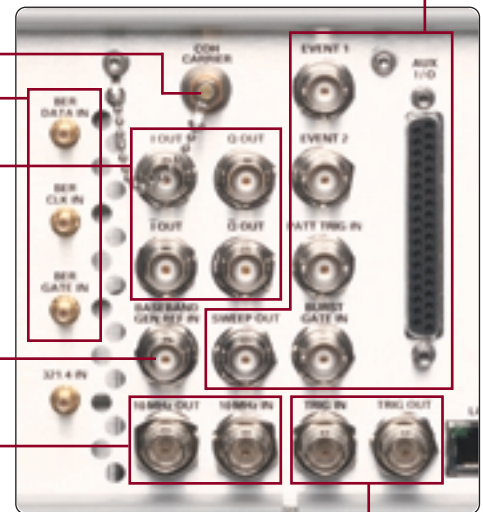
External frequency reference

Trigger signals

10BaseT LAN interface

RS-232 interface

GPIB interface



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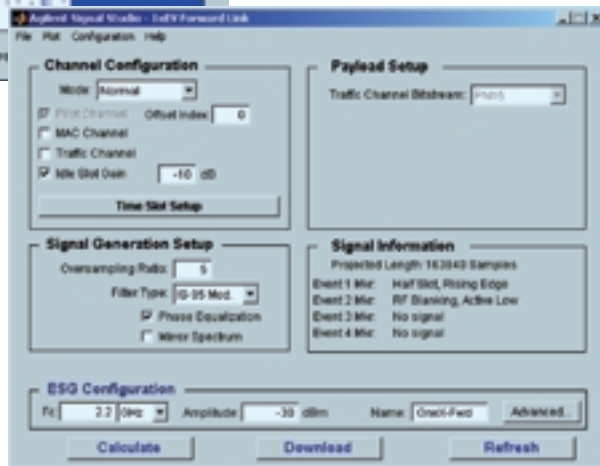
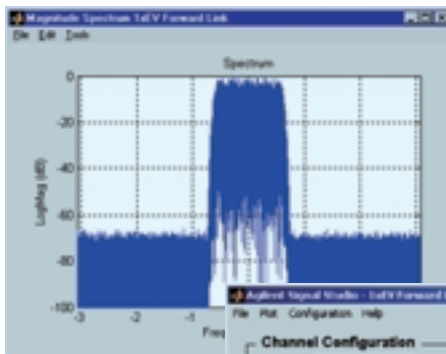


## Striving to meet all your measurement needs ...

### Signal Studio

Signal Studio is a collection of independent software applications that enable users to create waveform files for specific communications formats. The intuitive, easy-to-use graphical interface allows various signal parameters to be set for flexible waveform generation. Signal Studio downloads the waveforms into the ESG vector signal generator and then configures the instrument to automatically generate the signal.<sup>1</sup> Supported formats include:

- 802.11a WLAN
- 802.11b WLAN
- *Bluetooth*
- 1xEV-DO
- TD-SCDMA (TSM)
- Enhanced multitone



Agilent Technologies is committed to providing the latest emerging communications formats. Signal Studio software enables you to support new applications so you can get your product to market quickly. The list of supported formats will grow as the industry evolves.

### PC connectivity and software

- Signal Studio software
- IntuiLink connectivity software
- 10BaseT LAN and GPIB interfaces

1. Download Signal Studio for evaluation at [www.agilent.com/find/signalstudio](http://www.agilent.com/find/signalstudio). Each Signal Studio application requires the purchase of a license key to download the waveforms into the ESG.

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



## Agilent service and support

### Providing greater certainty with services...

*The ease-of-use and performance of the E4438C ESG vector signal generator is only a small part of what is available from Agilent Technologies. Agilent's ability to understand your business needs and quickly provide the latest end-to-end service and support solution gives you the certainty and confidence to accelerate the development and deployment of winning technologies for you and your customers.*

#### Support solutions

Agilent's support solutions can help you get more from your ESG vector signal generator as well as your other test equipment by increasing productivity and maximizing uptime. Our programs are designed with flexibility and can be tailored to meet your needs, including billing and response times.

#### Calibration services

You can choose return-to-Agilent or on-site service. And, the service can be ordered as needed or on a regularly scheduled basis. Consider our 3- or 5-year up-front calibration options when you are purchasing your new ESG vector signal generator. These services provide you with significant savings over per-incident charges and the measurement confidence you need to achieve your business goals.

#### Repair services

Ensure your instrument is up and running as quickly as possible. The ESG vector signal generator comes with a 3-year return-to-Agilent warranty. Additional repair options are available at the time of purchase such as a 5-year plan.

For more information on Agilent support solutions visit: [www.agilent.com/find/tm\\_services](http://www.agilent.com/find/tm_services)

#### Knowledge services

Our goal at Agilent is to provide you with the key resources that will help you build the comprehensive solutions that keep you competitive. Agilent's knowledge services are the industry's most reputable, and encompass a wide range of solutions designed with you in mind.

#### Test instrument consulting

Agilent provides you with the technical expertise to complete and implement your test strategies in your R&D or manufacturing application.

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Agilent's experts help you integrate new R&D or manufacturing test processes and technology into your current environment.

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# Simplified ordering structure for the E4438C ESG vector signal generator

## Frequency options

- 501 250 kHz to 1 GHz
- 502 250 kHz to 2 GHz
- 503 250 kHz to 3 GHz
- 504 250 kHz to 4 GHz
- 506 250 kHz to 6 GHz

## Hardware options

- 001 Internal baseband generator (8 Msamples memory)
- 002 Internal baseband generator (32 Msamples memory)
- 005 6 Gbyte non-volatile waveform storage
- UNB High output power with mechanical attenuator
- UNJ Enhanced phase noise performance
- 1E5 High-stability time base
- UN7 Internal bit-error-rate analyzer
- 300 GSM/EDGE basestation loopback BER test capability
- 1EM Move all front panel connectors to rear

## Signal generation firmware personalities

- 400 3GPP W-CDMA (FDD)
- 401 cdma2000 and IS-95-A
- 402 TDMA (GSM/EDGE/NADC/PDC/PHS/TETRA/DECT)
- 403 Calibrated noise
- 409 GPS

## Signal Studio software personalities

- 404 1xEV-DO
- 405 802.11b WLAN
- 406 *Bluetooth*
- 408 Enhanced multitone
- 410 802.11a WLAN
- 411 TD-SCDMA (TSM)



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# Product literature

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5988-3935EN

## E4438C ESG vector signal generator platform

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- *E4438C ESG Vector Signal Generator*, Data Sheet, literature number 5988-4093EN.
- *E4438C ESG Vector Signal Generator*, Configuration Guide, literature number 5988-4085EN.

## E4438C ESG signal generation firmware personalities

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- *3GPP W-CDMA (FDD) Personalities - Option 400*, Product Overview, literature number 5988-4449EN
- *cdma2000 and IS-95-A Personalities - Option 401*, Product Overview, literature number 5988-4430EN
- *GPS Personality - Option 409*, Product Overview, literature number 5988-6256EN
- *TDMA Personalities (GSM/EDGE/NADC/PDC/PHS/TETRA/DECT) - Option 402*, Product Overview, literature number 5988-4431EN

## E4438C ESG Signal Studio software personalities

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- *1xEV-DO Signal Studio Software - Option 404*, Product Overview, literature number 5988-5459EN
- *802.11a WLAN Signal Studio Software - Option 410*, Product Overview, literature number 5988-5765EN
- *802.11b WLAN Signal Studio Software - Option 405*, Product Overview, literature number 5988-5766EN
- *Bluetooth Signal Studio Software - Option 406*, Product Overview, literature number 5988-5458EN
- *Enhanced Multitone Signal Studio Software - Option 408*, Product Overview, literature number 5988-5639EN
- *TD-SCDMA (TSM) Signal Studio Software - Option 411*, Product Overview, literature number 5988-6552EN



## Agilent Email Updates

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Get the latest information on the products and applications you select.

## See the ESG Web page for the latest information

Get the latest news, product and support information, application literature, firmware upgrades and more. Agilent's Internet address for the ESG is:

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