Agilent
PSA Series Spectrum Analyzers
E4406A Vector Signal Analyzer
1xEV-DO Measurement Personality

Technical Overview with Self-Guided Demonstration
Option 204

The 1xEV-DO measurement personality, available on the Agilent PSA Series high-performance spectrum analyzers and the E4406A vector signal analyzer (VSA), solves your problems in 1x evolution data only (1xEV-DO) measurements with powerful signal analysis capabilities designed for standards-based measurements and easy-to-use functions in one analyzer. That means you can accelerate your development schedule to quickly obtain manufacturing efficiency.

Agilent Technologies

Make the Transition to Third-Generation (3G) Wireless Technology Faster and Easier

Migrating from cdma2000 to 1xEV-DO will introduce new challenges in the design and test of base stations and mobile transmitters. Be at ease in this transition with a comprehensive, one-analyzer solution from Agilent.

- Expand design possibilities with powerful measurement capability and flexibility.
- Expedite troubleshooting and design verification with numerous features and an intuitive user interface.
- Streamline manufacturing with speed, reliability, and ease of use.
- Improve yields with highly accurate measurements and operator independent results.
- Simplify test systems with digital demodulation, RF power measurements, spur searches, and general high-performance spectrum analysis in one analyzer.

The Agilent PSA Series offers high-performance spectrum analysis up to 50 GHz with powerful one-button measurements, a versatile feature set, and a leading-edge combination of flexibility, speed, accuracy, and dynamic range. Expand the PSA to include 1xEV-DO digital signal analysis capability with the 1xEV-DO measurement personality (Option 204).

For many manufacturing needs, the E4406A VSA, a vector signal analyzer, is an affordable platform that also offers the 1xEV-DO personality.

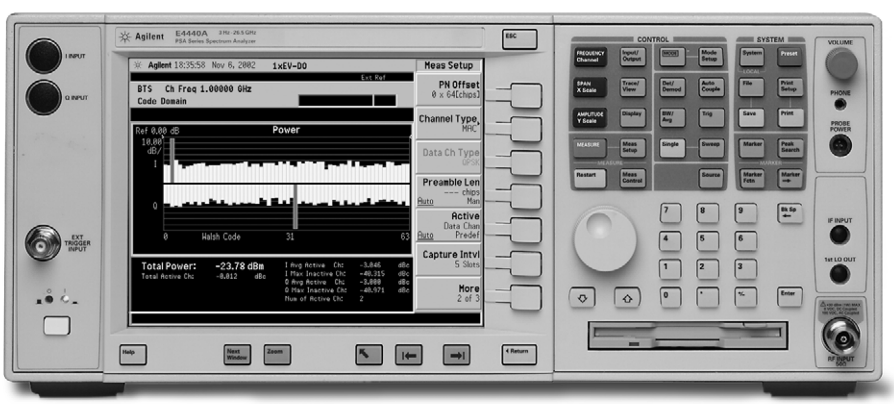
The 1xEV-DO measurement personality provides key transmitter measurements for analyzing systems based on the 3GPP2 Technical Specifications Group cdma2000 (TSG-C) specifications (C.S0032-A and C.S0033-A, December 2001). Measurements may be performed on the forward and reverse link signals.

This technical overview includes

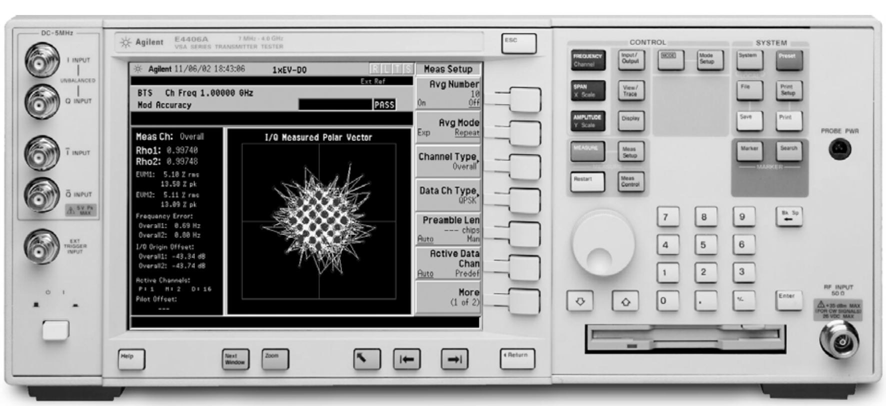
- measurement details
- demonstrations
- PSA Series key specifications for 1xEV-DO measurements
- ordering information
- related literature

All demonstrations utilize the PSA Series and the E4438C ESG vector signal generator; however, they can also be performed with the E4406A VSA. Keystrokes surrounded by [ ] indicate hard keys located on the front panel, while key names surrounded by { } indicate soft keys located on the right edge of the display.

Channel power page 4
Power vs. time page 5
Spurious emissions & ACP page 6
Occupied bandwidth page 7
Code domain analysis page 8
Modulation accuracy page 10
QPSK EVM page 12
Power statistics (CCDF) page 13
Intermodulation distortion page 13



PSA Series spectrum analyzer



E4406A vector signal analyzer

Demonstration preparation

To perform the demonstrations, the ESG and the PSA Series require the following options.

Product type	Model number	Required options
ESG vector signal generator	E4438C	502, 503, 504, or 506 – frequency range up to at least 2 GHz 001 or 002 – baseband generator 404 – Signal Studio 1xEV-DO software (rev A.02.00 or higher)
PSA Series spectrum analyzer	E4440A/E4443A/E4445A/ E4446A/E4448A	B7J – Digital demodulation hardware 204 – 1xEV-DO measurement personality

To configure the instruments, simply connect the ESG's 50 Ω RF output to the PSA's 50 Ω RF input with a 50 Ω RF cable. Turn on the power in both instruments.

Now set up the ESG and Signal Studio to provide a 1xEV-DO forward link signal via LAN connection from the external PC.

Instructions	Keystrokes
On the ESG:	
Preset the ESG.	[Preset]
Check the IP Address.	[Utility] {GPIB/RS-232/LAN} {LAN Setup} eg. {IP Addresss 192.168.100.1}
On the Signal Studio-1xEV:	
Run the Signal Studio-1xEV forward link software.	Double-click on the Signal Studio-1xEV Fwd Link shortcut or access the program via the Windows Start menu.
Verify that the software is communicationg with the instrument via the LAN TCP/IP link.	From {Configuration} pull-down menu at the top of the configuration window, select {Sig Gen I/O}. In the {Connection} pull-down menu, select TCP/IP. Next, enter your ESG's IP Address in the Address area, then click {Check} button.
After this operation is performed, the software should return "Succeed".	If this is the case, select {OK}. If this is not the case, re-verify the instrument is connected and re-check the IP Address and TCP/IP link.
On the Signal Studio-1xEV:	
Set the carrier frequency to 1GHz.	Enter [1] [GHz] into the Frequency field in the ESG configuration menu.
Set the amplitude to –20dBm.	Enter [-] [20] into the Amplitude field in the ESG Configuration menu.
Calculate the configured waveform. Note: At this point, you can optionally plot the spectrum, IQ signal, and CCDF curve via the [Plot] pull-down menu at the top of the configuration window. In the default setting, generated signal should have pilot channel only.	Click [Calculate].
Download the waveform to the ESG.	Click [Download].

Connect the PC, ESG and PSA

Connect a PC or laptop (loaded with the Signal Studio-1xEV software and Agilent I/O Library) to the ESG over the GPIB or LAN interface. The setup procedure for this guide assumes the LAN interface is used. To use LAN interface from Signal Studio, you need to set up LAN Client with I/O Configuration of Agilent I/O Library. Follow the steps below, using 50 Ω RF cables:

- Connect the ESG RF Output port to the PSA RF Input port.
- Connect the ESG 10 MHz Out to the PSA Ext Ref In port.
- Connect the ESG event 1 port to the PSA Ext Trigger Input (rear panel).

See Figure 1 for a diagram of this setup.

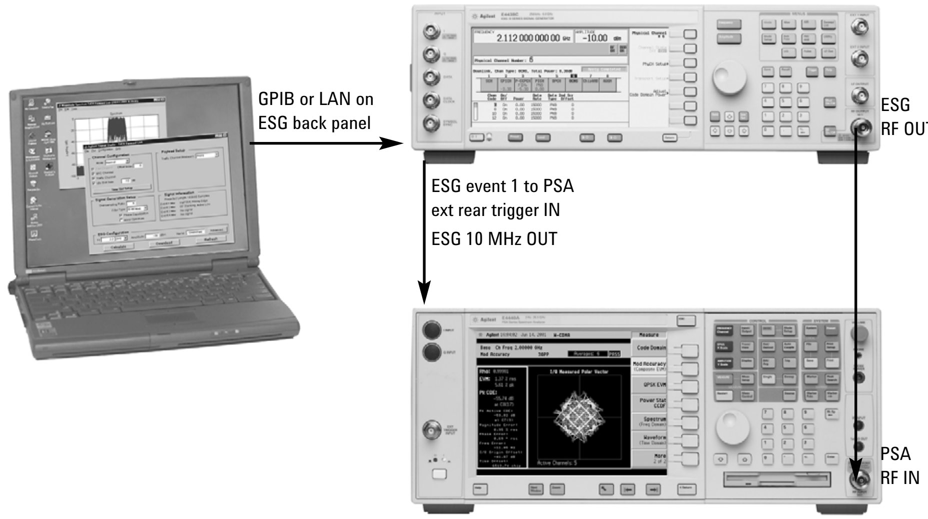


Figure 1. A computer running Signal Studio-1xEV software (top) is connected to the ESG Vector Signal Generator (middle). The RF output of the ESG is connected to the RF input of the PSA Series with 1xEV-DO measurement personality (bottom).

Channel power

The channel power measurement determines the total rms power in a user-specified bandwidth. The power spectral density (PSD) is also displayed in dBm/Hz.

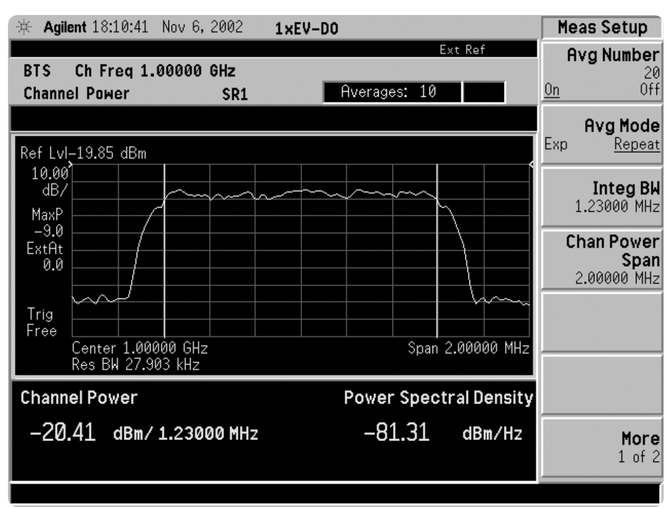
Control the following channel power measurement parameters:

- integration bandwidth (defaults to 1.23 MHz)
- channel power span (defaults to 2 MHz)
- number of trace averages (defaults to 20)
- data points displayed (64 to 65536, defaults to 512)

This exercise demonstrates the one-button channel power measurement on the PSA.

Instructions	Keystrokes
On the PSA:	
Perform factory preset. (skip this step for E4406A VSA)	[System] {Power On/Preset} {Preset Type} {Factory}
Enter the 1xEV-DO mode in the analyzer.	[Preset] [Mode] ({More} if necessary}) {1xEV-DO}
Choose transmitter device. The PSA can make measurements on both the forward and reverse links, but only the forward link will be demonstrated in this guide.	[Mode Setup] {Radio} {Device BTS}
Activate channel power measurement. Observe the white bars indicating the spectrum channel width and the quantitative values given beneath.	[MEASURE] {Channel Power}
Examine settings (Figure 2). Use this step to make setup changes in any measurement.	[Meas Setup]

Figure 2.
Channel power



Power versus time

Power versus time (PvT) is a key measurement for 1xEV-DO signals. 3GPP2 C.S0032 defines the "3.1.2.3.1 Total power" and "3.1.2.3.2 Pilot/MAC channel power". Measurement of the burst signal is necessary in the transmitter test for 1xEV-DO idle slot based on the "Pilot/MAC channel power" requirement. The burst mask test is very important for 1xEV-DO idle slot signal. As seen in the below window, the limit mask can be set for 5 regions.

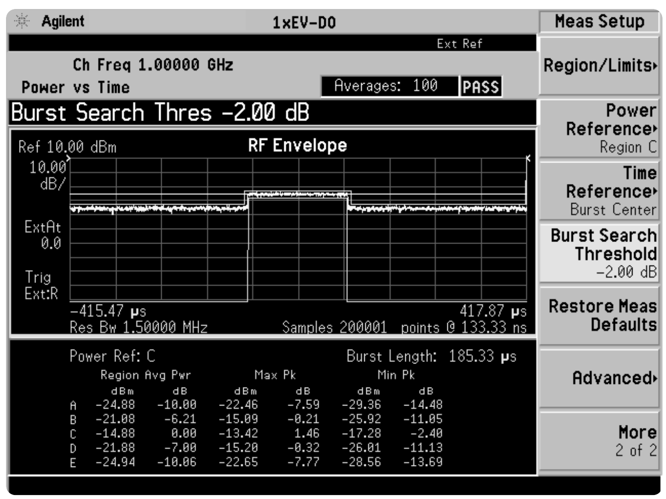
Active slot also can be measured in PvT to support the "Total power" test item. In this measurement, only upper and lower limit lines can be seen because the signal is continuous, not bursted.

In this exercise the PvT measurement will be made for idle slot signal with 10 dB idle slot gain.

Instructions	Keystrokes
On the Signal Studio-1xEV:	
Activate the MAC channel.	Check the box next to {MAC Channel} in the Channel Configuration menu.
Calculate the configured waveform. Note: Adding the MAC channel to the Pilot means generating idle slot signal of 1xEV-DO. This signal doesn't have any data channels and should be a burst signal.	Click [Calculate].
Download the waveform to the ESG.	Click [Download].

Instructions	Keystrokes
On the PSA:	
Activate PvT measurement.	[MEASURE] {Power vs Time}
Set triggering for external rear port.	[Meas Setup] {Trig Source} {Ext Rear}
Change burst search threshold from –10 dB to –2 dB (Figure 3).	{More} {Burst Search Threshold} [-2] [Enter]
Select single measurement (not continuous).	[Meas Control] {Measure Single}
Restart the measurement.	[Restart]

Figure 3.
Power versus time with a burst search threshold of –2 dB



Spurious emissions & ACP

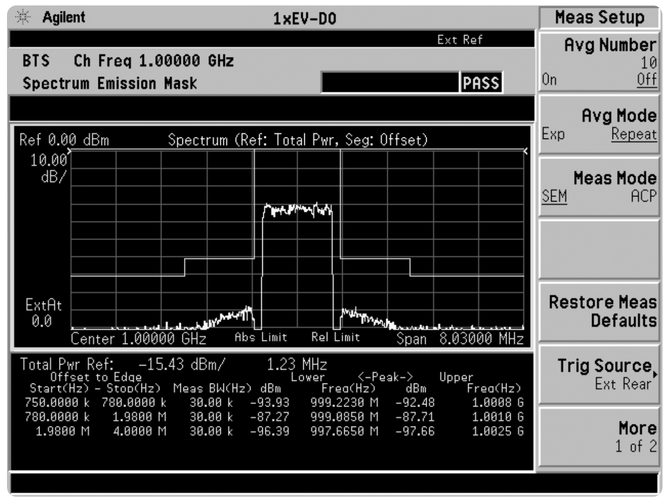
Because the ACP measurement for 1xEV-DO is based on "Conducted Spurious Emissions" by 3GPP2, this measurement is merged into the personality as well. The measurement mode can be selected as either ACP or SEM (spectrum emission mask). When switching modes between ACP and SEM, the offset frequency, RBW, and limit lines are automatically adjusted according to the measurement definition in the 3GPP2 standard. Even though this is a burst signal, a RMS detector can be selected and the measurement offset and measurement interval can be set in units of chips and microseconds. The spurious emissions & ACP measurement has default offset and interval settings that can be accessed via the {Pre-Defined Ofs/Intvl} soft key menu under [Meas Setup].

> This exercise illustrates SEM and ACP measurements for idle slots. Notice in the PSA measurement that the mask limit is represented by a green trace on the screen.

Note:
Because the PSA series performs fast Fourier transforms (FFT) for this measurement, the local oscillator (LO) steps in discrete frequency increments. (The step size is assigned under [Meas Setup] {Offset/Limits} {Step Freq}.) A measurement is made at each frequency point; offset segments group the points. For each segment, the resolution bandwidth can be individually specified. {Step Freq} and {Res BW} default to coupled mode. When these parameters are set manually, it is essential that the resolution bandwidth be larger than the step size. If not, some signal components will be missed when they fall between successive peaks of the resolution bandwidth filter. In fact, it is good practice to make the {Res BW} twice as wide as the step size given that the filter is Gaussian. This ensures that successive filter bandwidth steps will overlap.

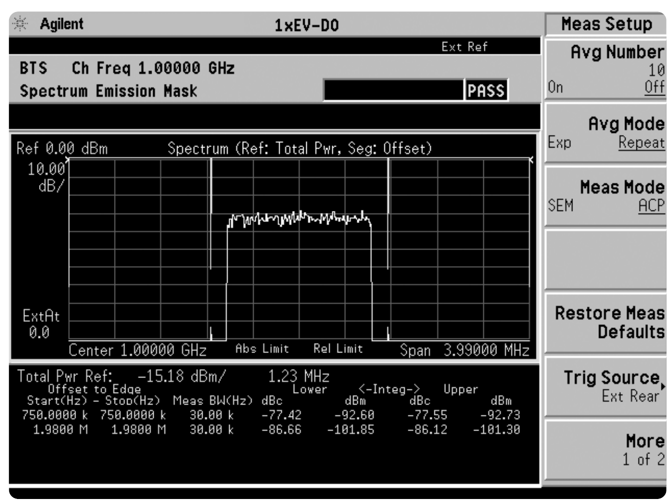
Instructions	Keystrokes
On the PSA:	
Activate the spurious emissions & ACP measurement.	[MEASURE] {Spurious emissions & ACP}
Set triggering for external rear port.	[Meas Setup] {Trig Source} {Ext Rear}
Restart the measurement (Figure 4).	[Restart]

Figure 4.
SEM (spectrum emission mask) measurement for idle slot



Instructions	Keystrokes
On the PSA:	
Change measurement mode from SEM to ACP.	[Meas Setup] {Meas Mode ACP}
Restart the measurement (Figure 5).	[Restart]

Figure 5.
ACP measurement for idle slot



Occupied bandwidth

The standards recommended by the 3GPP2 for 1xEV-DO have occupied bandwidth (OBW) requirements for some of the band classes. Effectively, OBW determines the frequency bandwidth that contains 99 percent of the total radiated power.

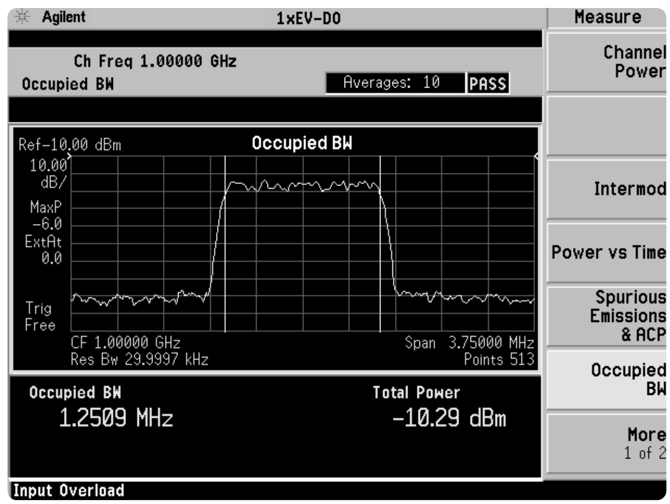
- Specify the resolution bandwidth (defaults to 30 kHz) and the span (defaults to 3.75 MHz).
- Customize a simple PASS/FAIL limit test (defaults to 1.48 MHz).
- Specify number of averages (defaults to 10).

In this measurement, the total power of the displayed span is measured. Then the power is measured inward from the right and left extremes until 0.5 percent of the power is accounted for in each of the upper and lower parts of the span. The calculated difference is the occupied bandwidth. For simple setup, the PSA defaults to a 1.48-MHz PASS/FAIL limit value.

Instructions	Keystrokes
On the Signal Studio-1xEV	
Activate all the pilot, MAC, and data channels.	Check the box next to {Traffic Channel} in the Channel Configuration menu.
Calculate the configured waveform Note: Adding the traffic channel to the idle slot means generating an active slot signal of 1xEV-DO. This signal has all channels and should be continuous.	Click [Calculate].
Download the waveform to the ESG.	Click [Download].

Instructions	Keystrokes
On the PSA:	
Change the occupied bandwidth (Figure 6).	[MEASURE] {Occupied BW}

Figure 6. Occupied bandwidth



Code domain analysis

The code domain analysis measurement provides a variety of results. First, code domain power analysis measures the distribution of signal power across the set of code channels, normalized to the total signal power. This measurement helps to verify that each code channel is operating at its proper level and helps to identify problems throughout the transmitter design from coding to the RF section. System imperfections, such as amplifier non-linearity, will present themselves as an undesired distribution of power in the code domain.

For the time division multiplexed (TDM) feature of 1xEV-DO signals, we need to verify that the access network (base station) is transmitting the correct power in each of the channels. Errors in the code domain usually arise from the channel elements that construct the individual channels or from incorrect network software settings. Since the pilot channel is the active channel, its power level relative to the carrier is displayed below the code domain plot. This can also be verified using the markers. Not only the pilot channel but also MAC and traffic channels can be seen in code domain. Once you capture a signal in the code domain measurement, you can change the channel types from pilot to MAC and traffic.

Instructions	Keystrokes
On the PSA:	
Activate the code domain measurement (Figure 7).	[MEASURE] {More} {Code Domain}
Change the channel type from pilot to MAC (Figure 8).	[Meas Setup] {More} {Channel Type} {MAC}

Figure 7.
1xEV-DO code domain power measurement for the pilot channel

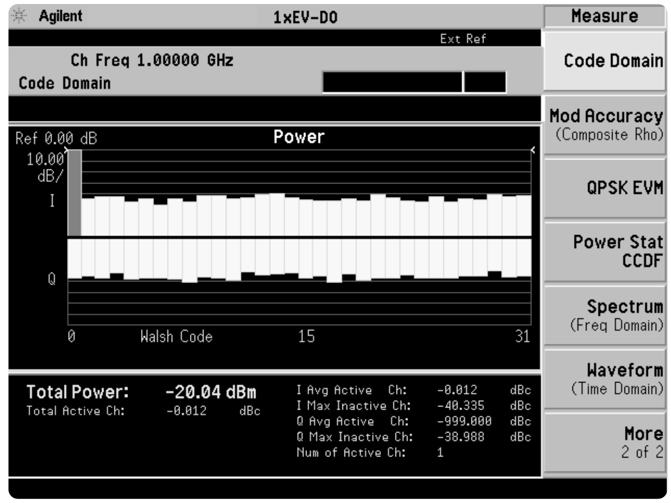
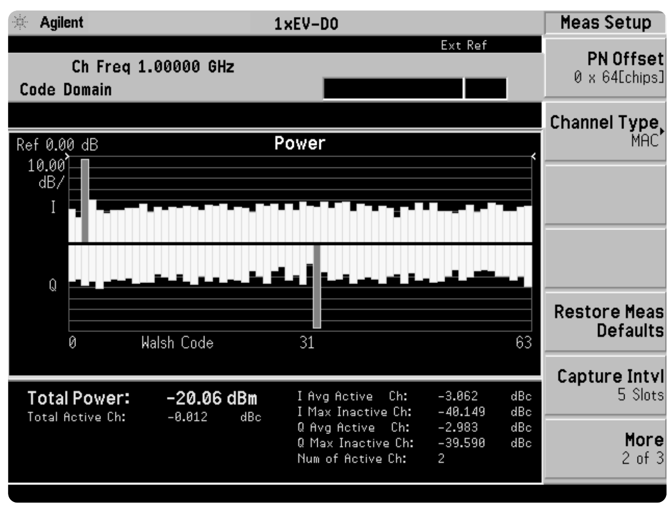


Figure 8.
1xEV-DO code domain power measurement for the MAC channel



Note:
Notice that there are two active MAC channels. Each MAC channel is identified by a MAC Index(I) value that is between 0 and 63 that defines an 64 ary Walsh cover. The Reverse Activity (RA) channel is assigned MAC index 4 and Reverse Power Control (RPC) channels are assigned MAC index 5 to 63. The Walsh code assigned to the MAC index values are determined using the following equation:

$W^{64}_{i/2}$ *for MAC Index i = 0,2,4,...,62*

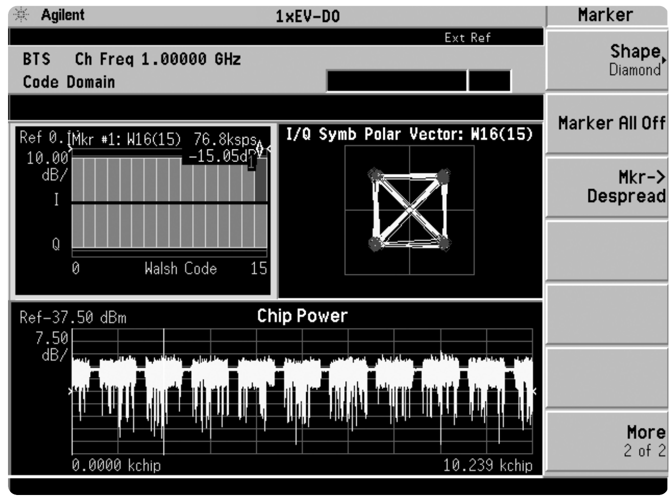
$W^{64}_{(i-1)/2+32}$ *for MAC Index i = 1,3,5,...,63*

A traffic channel of 1xEV-DO could have three modulation types; QPSK, 8PSK, and 16QAM. For the traffic channel code domain measurement, the PSA will de-spread any single code channel to provide chip power versus time plots and symbol polar vector plots.

Now examine the 1xEV-DO signal using each of the algorithms.

Instructions	Keystrokes
On the PSA:	
Change the channel type to data.	[Meas Setup] {More} {Channel Type} {Data}
View the constellation of the traffic channels.	[Trace/View] {I/Q Polar & Power Graph}
Place the marker on channel 15 and despread the channel to view the data (Figure 9).	[Marker] [15] {Enter} {More} {Mkr - > Despread}

Figure 9.
1xEV-DO code domain power measurement for the traffic channels



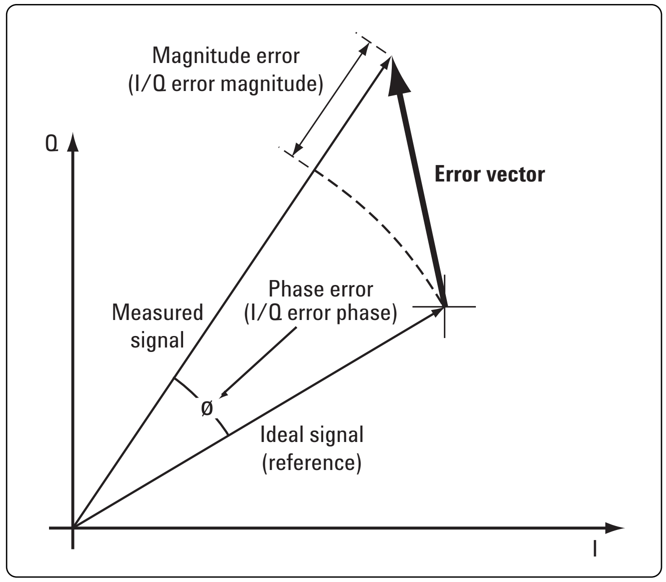
Modulation accuracy (composite rho)

An important measure of modulation accuracy for 1xEV-DO signals is rho. Rho is the ratio of the correlated power to the total power. The correlated power is computed by removing frequency, phase, and time offset and performing a cross correlation between the correlated signal and an ideal reference. Rho is important because uncorrelated power appears as interference to a receiver. However, a rho measurement can also be performed on signals with multiple code channels. This measurement is known as composite rho. It allows you to verify the overall modulation accuracy for a transmitter, regardless of the channel configuration, as long as a pilot channel is present. A composite rho measurement accounts for all spreading and scrambling problems in the active channels and for all baseband IF and RF impairment in the transmitter chain.

Another effective way to quantify modulation accuracy is to compare the signal being measured to an ideal signal. Figure 10 defines the error vector, a measure of the amplitude and phase differences between the ideal modulated signal and the actual modulated signal. The root-mean-square (RMS) of the error vector is computed and expressed as a percentage of the square root of the mean power of the ideal signal. This is the error vector magnitude (EVM). EVM is a common modulation quality metric widely used in digital communications.

Composite EVM measures the EVM of the multi-code channel signal. It is valuable for determining the quality of the transmitter for a multi-channel signal, detecting spreading or scrambling errors, identifying certain problems between baseband and RF sections, and analyzing errors that cause high interference in the signal.

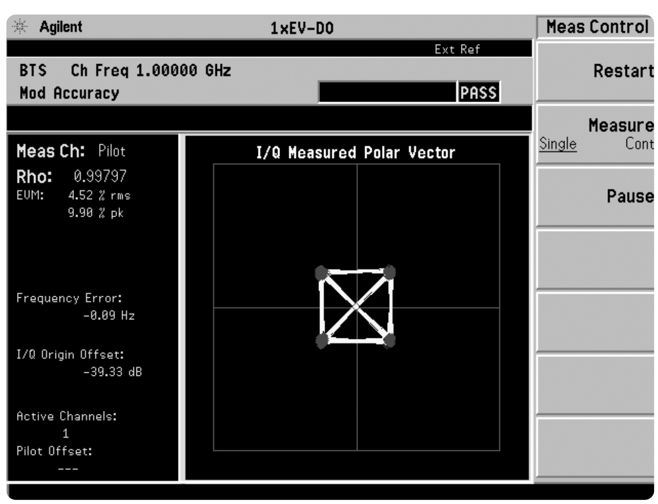
Figure 10.
Error vector magnitude



Instructions	Keystrokes
On the Signal Studio-1xEV	
Change the traffic channel modulation to QPSK.	Click {Time Slot Setup} in the Channel Configuration menu. In the yellow Fast Edit pull-down menu at the bottom of the "Modulation" column, select {QPSK}. Click {OK}.
Calculate the configured waveform	Click [Calculate].
Download the waveform to the ESG.	Click [Download].

Instructions	Keystrokes
On the PSA:	
Activate modulation accuracy measurement (Figure 11).	[MEASURE] {More} {Mod Accuracy}
Turn averaging off.	[Meas Setup] {Avg Number Off}
Select single measurement (not continuous).	[Meas Control] {Measure Single}.
Restart the modulation accuracy measurement.	[Restart]

Figure 11.
Pilot channel modulation accuracy



The PSA measures rho and EVM, as well as magnitude, phase, and code domain errors. In this exercise, the above measurements will be explored.

The measurement results are shown in the left window and the I/Q constellation is in the right window. If you prefer to view the numeric results only, please change displays in [Trace/View] key.

- Measure EVM, rho, frequency error, I/Q origin offset, and pilot offset with the active channel numbers for the selected channel type.
- Customize limits for rms EVM, peak EVM, rho, frequency error and I/Q origin offset.
- Select channel type from some selections: pilot, MAC, data, preamble, and overall in forward link. pilot, DRC, ACK, and data in reverse link.
- Comply the waveform quality measurements in 3GPP2 defined in C.S0032 (forward link) and C.S0033 (reverse link).
- View I/Q polar vector constellation, magnitude error, phase error, and EVM plots.
- Specify PN offset (forward link).
- Read power, timing, phase and EVM data for each active channel in Power Timing and Phase view (forward link).
- Set flexible long code mask for I and Q separately between 00000000000 and 3FFFFFFFFFF (reverse link).
- Choose to include or exclude the I/Q origin offset in the EVM calculation.
- Use the optional preamplifier to measure low-level signals.
- Enable adjacent carrier filtering.

This exercise explores the different ways in which the modulation accuracy measurement can be used.

Instructions	Keystrokes
On the PSA:	
Change channel type from pilot to overall.	[Meas Setup] {More} {Channel Type} {Overall}
Restart the measurement (Figure 12).	[Restart]
Change the view for numeric results only (Figure 13).	[Trace/View] {Result Metrics}

Figure 12. Modulation accuracy for overall rho

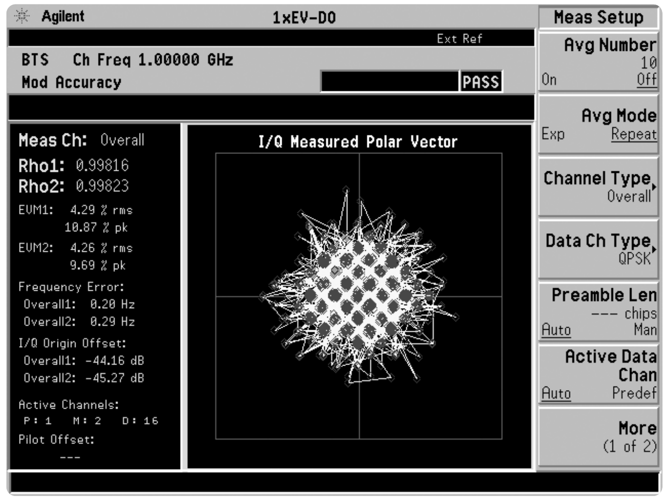
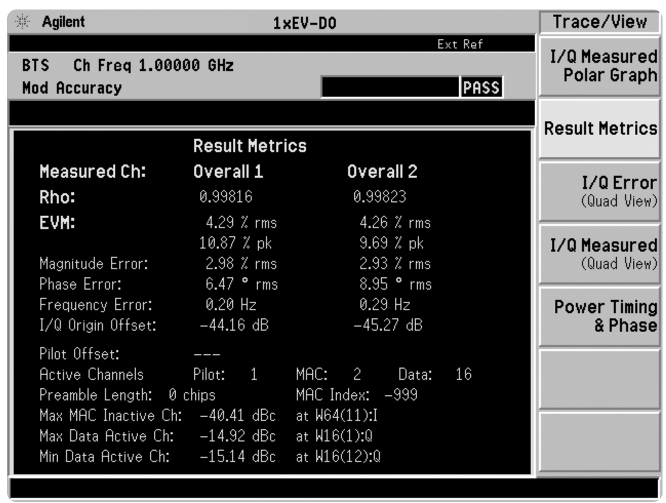


Figure 13. Numeric result table for rho of overall-1 and overall-2



QPSK EVM

The QPSK EVM measurement is used to get some indication of the modulation quality at the chip level for a single-channel signal. It can detect baseband filtering, modulation, and RF impairments, but does not detect spreading or scrambling errors.

In the default setting, the Meas Offset and Interval are set as: 464 chips and 96 chips, respectively. QPSK modulation can be found not only in the pilot channel, but also in the MAC and traffic (data) channels if selected. Using the modulation accuracy (composite rho) measurement, you can check the EVM results for each channel with QPSK modulation. To set the target segment in the 1xEV-DO signal, you can select the measurement offset and interval. The variable measurement offset and intervals are very useful selecting the desired slot to be analyzed with the QPSK EVM measurement. For example, Pilot #1, MAC #3, and Idle slot #2 can be selected in {Preset Meas Ofs/Intvl} under [Meas Setup] soft key menu.

- Determine rms and peak EVM (maximum and average).
- View I/Q polar vector diagram or magnitude error, phase error, and EVM plots.
- Enable adjacent carrier filtering.

This exercise involves changing the 1xEV-DO signal to a single-channel signal.

Instructions	Keystrokes
On the PSA:	
Perform the QPSK EVM measurement.	[MEASURE] {More} {QPSK EVM}
Turn averaging off.	[Meas Setup] {Avg Number Off}
Set triggering for external rear.	{Trig Source} {Ext Rear}
Select single measurement (not continuous).	[Meas Control] {Measure Single}
Restart the QPSK EVM measurement (Figure 14)	[Restart]
Change the measurement segment from Pilot #1 to MAC #3.	[Meas Setup] {Meas Offset & Interval} {Preset Meas Ofs/Intvl} {MAC} {MAC #3}
Restart the measurement (Figure 15).	[Restart]

Figure 14.
QPSK EVM for pilot

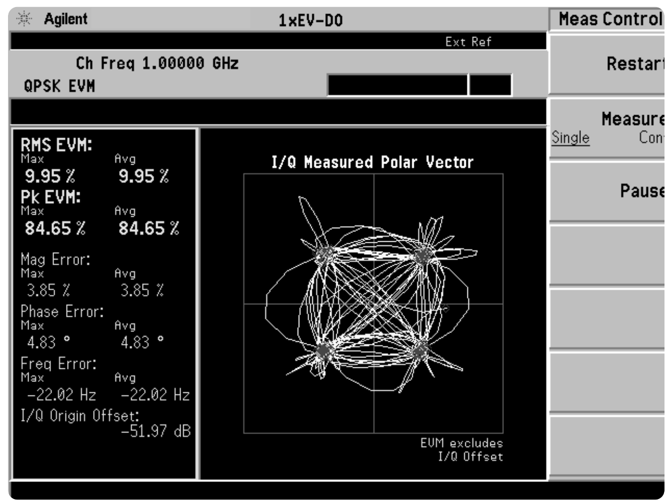
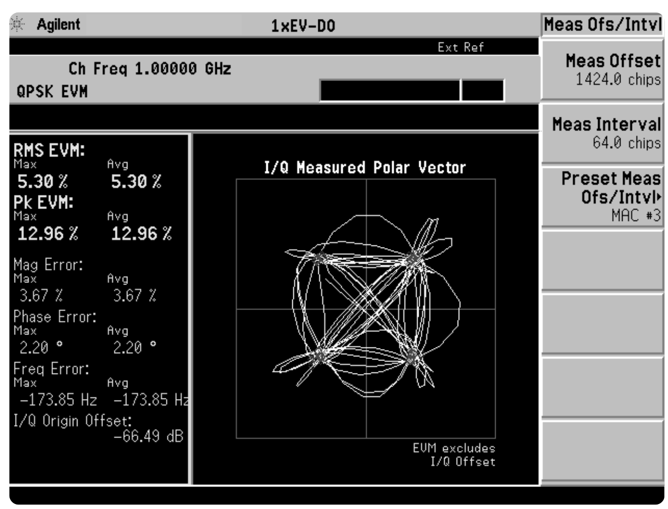


Figure 15.
QPSK EVM for MAC #3



Power statistics (CCDF)

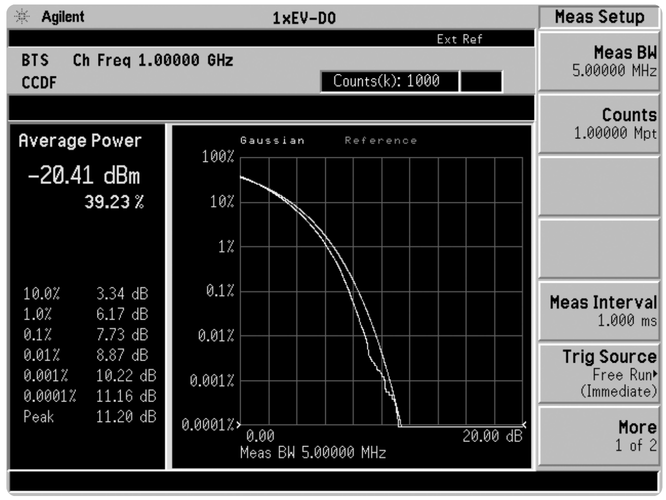
The complementary cumulative distribution function (CCDF) is a plot of peak-to-average power ratio (PAR) versus probability and it fully characterizes the power statistics of a signal. CCDF is a key tool for power amplifier design for 1xEV-DO base stations, which is particularly challenging because the amplifier must be capable of handling the high PAR the signal exhibits while maintaining good adjacent channel leakage performance. Designing multicarrier power amplifiers pushes complexity yet another step further.

- Customize measurement band width (defaults to 5 MHz).
- Specify measurement interval.
- Set a reference trace or compare to Gaussian noise trace.
- Take advantage of the 0.1 dB histogram resolution.

> This exercise illustrates the simplicity of measuring CCDF for 1xEV-DO transmitted signals.

Instructions	Keystrokes
On the PSA:	
Measure the CCDF (Figure 16). The yellow line is the input signal. The blue reference line is the CCDF of Gaussian noise.	[MEASURE] {More} {Power Stat CCDF}

Figure 16.
CCDF



Intermodulation distortion

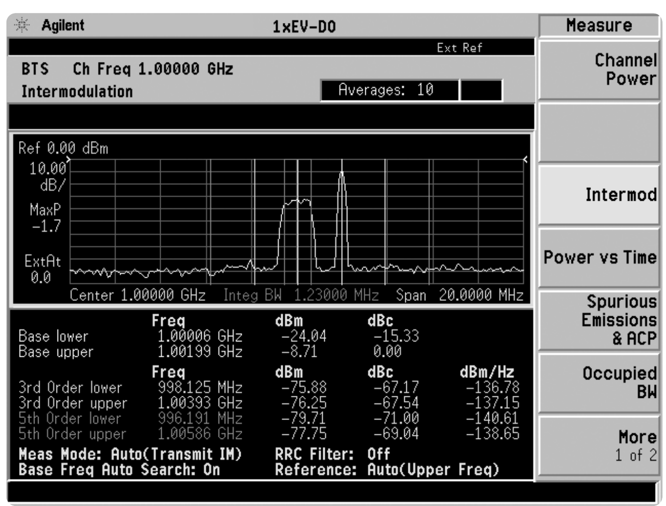
The harmonic distortion of a system is an indication of the linearity of its components. This measurement quantifies the third and fifth harmonic distortion components of two continuous wave (CW) signals or of a 1xEV-DO modulated signal and a CW signal.

- Select number of averages (defaults to 10).
- Measure two-tone or transmitted intermodulation (IM) distortion.
- Choose to specify base frequency or have it automatically detected.
- Apply RRC filtering if desired.

> This exercise requires two ESG vector signal generators, if available. The current ESG will be called ESG1 and should retain the current settings. The output of a second ESG, now called ESG2, should be added to that of ESG1 via a combiner.

Instructions	Keystrokes
On the ESG2:	
Set up a CW signal, offset by 5 MHz from the W-CDMA signal of ESG1.	[Preset] [Frequency] [1.002] {GHz} [Amplitude] [-5] {dBm} [RF On]
On the PSA:	
Activate the intermodulation distortion measurement (Figure 17).	[MEASURE] {Intermod}

Figure 17.
Intermodulation distortion



PSA Series Key Specifications[1]

1xEV-DO measurement personality (10 MHz to 3 GHz)

The following specifications apply to models E4443A/45A/40A/ only.
Models E4446 and E4448A have similar but not warranted performance.

Channel power

Minimum power at RF input	–74 dBm (nominal)
Absolute power accuracy	±0.67 dB (±0.18 dB typical)
Attenuation > 2 dB	
Relative power accuracy:	±0.08 dB (±0.03 dB typical)

Power vs. time (PvT)

Minimum power at RF input	–73 dBm (nominal)
Absolute power accuracy:	(20 to 30 °C)
Attenuation > 2 dB	±0.24 dB (nominal)
Attenuation < 2 dB	±0.30 dB (nominal)
Measurement floor	–84 dBm (nominal)
Relative power accuracy:	
Fixed channel, fixed input attenuator	
Mixer level –52 to –12dB	±0.03 dB (nominal)

CCDF

Minimum carrier power at RF input	–40 dBm (nominal)
Histogram resolution	0.01 dB

Intermodulation distortion

Minimum carrier power at RF input	–30 dBm (nominal)

Occupied bandwidth

Minimum carrier power at RF input	–40 dBm
Frequency accuracy	0.3 percent (nominal)

Spurious emissions & ACP

Minimum carrier power at RF input	–20 dBm
Dynamic range, relative:	
750 kHz offset (30 kHz RBW)	–84.7 dB (–86.4 dB typical)
Sensitivity, absolute:	
750 kHz offset (30 kHz RBW)	–97.9 dBm (–99.9 dBm typical)
Accuracy, relative:	
750 kHz offset	0.14 dB

Code domain

Specification applies at 0 dBm input power	
For pilot, 2 MAC channels,	
and 16 channels of QPSK data	
Relative code domain power accuracy	±0.15 dB

QPSK EVM

Minimum power at RF input	–20 dBm (nominal)
EVM accuracy	±1.0 percent (nominal)
Frequency error accuracy	±10 Hz (nominal) + (transmitter frequency x frequency reference error)

Modulation accuracy (composite rho)

Minimum carrier power at RF input	–50 dBm (nominal)
Accuracy	
Composite EVM	±1.0 dB (nominal)
Rho	±0.0010 (at rho = 0.99751, EVM 5 percent)
	±0.0044 (at rho = 0.94118, EVM 25 percent)
Frequency error	±10 Hz + (transmitter frequency x frequency reference error)

1. For specifications on the E4406A VSA, please refer to the E4406A VSA data sheet, literature number 5968-3030E.

Ordering Information

PSA Series spectrum analyzer

E4443A	3 Hz to 6.7 GHz
E4445A	3 Hz to 13.2 GHz
E4440A	3 Hz to 26.5 GHz
E4446A	3 Hz to 44 GHz
E4448A	3 Hz to 50 GHz

Options

To add options to a product, use the following ordering scheme:

Model	E444xA (x = 0, 3, 5, 6 or 8)
Example options	E4440A-B7J E4448A-1DS

Digital demodulation hardware

E444xA-B7J	Digital demodulation hardware (required for digital demodulation measurement personalities)

Digital demodulation measurements

E444xA-BAF	W-CDMA measurement personality
E444xA-202	GSM w/ EDGE measurement personality
E444xA-B78	cdma2000 measurement personality
E444xA-204	1xEV-DO measurement personality
E444xA-BAC	cdmaOne measurement personality
E444xA-BAE	NADC, PCD measurement personality

General purpose measurements

E444xA-226	Phase noise measurement personality
E444xA-219	Noise figure measurement personality

Amplifiers

E444xA-1DS	100 kHz to 3 GHz built-in preamplifier

Inputs and outputs

E4440A-BAB	Replaces type "N" input connector with APC 3.5 connector

Connectivity software

E444xA-230	BenchLink Web Remote Control Software

Warranty and service

For warranty and service of 5 years, please order 60 months of R-51B (quantity = 60). Standard warranty is 36 months.

R-51B	Return-to-Agilent warranty and service plan

Calibration[1]

For 3 years, order 36 months of the appropriate calibration plan shown below. For 5 years, specify 60 months.

R-50C-001	Standard calibration
R-50C-002	Standards compliant calibration

E4406A vector signal analyzer

E4406A 7 MHz to 4 GHz

Options

To add options to a product, use the following ordering scheme:

Model	E4406A
Example options	E4406A-BAH

Digital demodulation measurements

E4406A-BAF	W-CDMA measurement personality
E4406A-B78	cdma2000 measurement personality
E4406A-202	EDGE with GSM measurement personality
E4406A-204	1xEV-DO measurement personality
E4406A-BAH	GSM measurement personality
E4406A-BAC	cdmaOne measurement personality
E4406A-BAE	NADC, PDC measurement personality
E4406A-HN1	IDEN measurement personality

Inputs and outputs

E4406A-B7C	I/Q inputs

Connectivity software

E444xA-230	BenchLink Web Remote Control Software

Warranty and service

For warranty and service of 5 years, please order 60 months of R-51B (quantity = 60). Standard warranty is 36 months.

R-51B	Return-to-Agilent warranty and service plan

Calibration[1]

For 3 years, order 36 months of the appropriate calibration plan shown below. For 5 years, specify 60 months.

R-50C-001	Standard calibration
R-50C-002	Standards compliant calibration

1. Options not available in all countries.

Product Literature

Selecting the Right Signal Analyzer for Your Needs, selection guide, literature number 5968-3413E

PSA Series literature

PSA Series, brochure, literature number 5980-1283E

PSA Series, data sheet, literature number 5980-1284E

E4406A VSA literature

E4406A VSA, brochure, literature number 5968–7618E

E4406A VSA, data sheet, literature number 5968–3030E

Application literature

Agilent Forward Link Measurements for 1xEV-DO Access Networks, application note, literature number 5988–6125E

Agilent 1xEV-DO Signal Studio Software for ESG E4438C, application note, literature number 5988–5416E

For more information on the E4406A VSA or the PSA Series, please visit:

www.agilent.com/find/vsa

www.agilent.com/find/psa

By internet, phone, or fax, get assistance with all your test & measurement needs

Phone or Fax
United States:
(tel) 800 452 4844

Canada:
(tel) 877 894 4414
(fax) 905 282 6495

China:
(tel) 800 810 0189
(fax) 800 820 2816

Europe:
(tel) (31 20) 547 2323
(fax) (31 20) 547 2390

Japan:
(tel) (81) 426 56 7832
(fax) (81) 426 56 7840

Korea:
(tel) (82 2) 2004 5004
(fax) (82 2) 2004 5115

Latin America:
(tel) (305) 269 7500
(fax) (305) 269 7599

Taiwan:
(tel) 0800 047 866
(fax) 0800 286 331

Other Asia Pacific Countries:
(tel) (65) 6375 8100
(fax) (65) 6836 0252
Email: tm_asia@agilent.com

Online Assistance:
www.agilent.com/find/assist

Printed in U.S.A., December 16, 2002
5988-4828EN