Specifications

Agilent Technologies E4406A VSA Series Transmitter Tester

Agilent Technologies

Manufacturing Part Number: E4406-90085

Printed in USA

April 2000

The information contained in this document is subject to change without notice.

Agilent Technologies makes no warranty of any kind with regard to this material, including but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Agilent Technologies shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

Warranty

This Agilent Technologies instrument product is warranted against defects in material and workmanship for a period of three years from date of shipment. During the warranty period, Agilent Technologies will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by Agilent Technologies. Buyer shall prepay shipping charges to Agilent Technologies and Agilent Technologies shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to Agilent Technologies from another country.

Agilent Technologies warrants that its software and firmware designated by Agilent Technologies for use with an instrument will execute its programming instructions when properly installed on that instrument. Agilent Technologies does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error-free.

Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. AGILENT TECHNOLOGIES SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Exclusive Remedies

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. AGILENT TECHNOLOGIES SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

Contents

Contents

1 Transmitter Tester Specifications

All specifications apply over 0 °C to +55 °C, except when otherwise specified. The instrument will meet its specifications after 2 hours of storage at a constant temperature, within the operating temperature range, 1 hour after the instrument is turned on and within 24 hours after “Align All Now” has been run.

Frequency

	Specifications	Supplemental Information
Frequency Range (RF Input)	7 MHz to 314 MHz 329 MHz to 4 GHz	

	Specifications	Supplemental Information
Frequency Setting Resolution	1 Hz	

	Specifications	Supplemental Information
Frequency Reference		
Accuracy	±[(time since last adjustment × aging rate) + temperature stability + calibration accuracy][a]	
Initial calibration accuracy	$\pm 5 \times 10^{-8}$	
Settability	$\pm 2 \times 10^{-9}$	
Aging rate		
During any 24 hours, following 24-hour warmup		$\pm 5 \times 10^{-10}$, characteristic
Per year		$\pm 1 \times 10^{-7}$, characteristic
Temperature stability	$\pm 5 \times 10^{-8}$ variation from frequency at +25 °C over the temperature range of 0 to +55 °C	
Warm-up time		1 hour, characteristic
Within 10 minutes after turn-on		$\pm 1 \times 10^{-7}$ (relative to measurement after 1 hour)
Within 20 minutes after turn-on		$\pm 1 \times 10^{-8}$ (relative to measurement after 1 hour)
Within 15 minutes at ambient temperature of +25 ±3 °C		$\pm 5 \times 10^{-8}$, relative to the frequency at the previous turn-off time (powered for at least 72 hours prior to removing power for 24 hours)

a. Initial calibration accuracy depends on how accurately the frequency standard was adjusted to 10 MHz.

	Specifications		
Stability RMS residual FM 3.3 ms data acquisition time, 3 kHz pre-ADC bandwidth	7 to 678.59 MHz ≤4.0 Hz	678.6 to 1678.59 MHz ≤8.0 Hz	1678.60 to 4000 MHz ≤16.0 Hz

	Specifications	Supplemental Information
Noise Sidebands[a,b]		
7 to 678.59 MHz		
Offset 100 Hz		≤–89 dBc/Hz, characteristic
Offset 1 kHz		≤–96 dBc/Hz, characteristic
Offset 10 kHz		≤–105 dBc/Hz, characteristic
Offset 30 kHz		≤–123 dBc/Hz, characteristic
Offset 100 kHz		≤–132 dBc/Hz, characteristic
Offset 200 kHz		≤–136 dBc/Hz, characteristic
Offset 250 kHz		≤–138 dBc/Hz, characteristic
Offset 400 kHz		≤–138 dBc/Hz, characteristic
Offset 600 kHz		≤–139 dBc/Hz, characteristic
Offset 1.0 MHz		≤–150 dBc/Hz, characteristic
Offset 1.2 MHz		≤–150 dBc/Hz, characteristic
Offset 1.8 MHz		≤–150 dBc/Hz, characteristic
Offset 6.0 MHz		≤–150 dBc/Hz, characteristic
678.60 to 1678.59 MHz		
Offset 100 Hz		≤–83 dBc/Hz, characteristic
Offset 1 kHz		≤–90 dBc/Hz, characteristic
Offset 10 kHz		≤–99 dBc/Hz, characteristic
Offset 30 kHz		≤–117 dBc/Hz, characteristic
Offset 100 kHz		≤–126 dBc/Hz, characteristic
Offset 200 kHz		≤–132 dBc/Hz, characteristic
Offset 250 kHz		≤–134 dBc/Hz, characteristic
Offset 400 kHz		≤–136 dBc/Hz, characteristic
Offset 600 kHz		≤–138 dBc/Hz, characteristic
Offset 1.0 MHz		≤–150 dBc/Hz, characteristic
Offset 1.2 MHz		≤–150 dBc/Hz, characteristic
Offset 1.8 MHz		≤–150 dBc/Hz, characteristic
Offset 6.0 MHz		≤–150 dBc/Hz, characteristic
1678.60 to 4000 MHz		
Offset 100 Hz		≤–77 dBc/Hz, characteristic
Offset 1 kHz		≤–84 dBc/Hz, characteristic
Offset 10 kHz		≤–93 dBc/Hz, characteristic
Offset 30 kHz		≤–111 dBc/Hz, characteristic
Offset 100 kHz		≤–120 dBc/Hz, characteristic
Offset 200 kHz		≤–126 dBc/Hz, characteristic
Offset 250 kHz		≤–128 dBc/Hz, characteristic
Offset 400 kHz		≤–131 dBc/Hz, characteristic
Offset 600 kHz		≤–134 dBc/Hz, characteristic
Offset 1.0 MHz		≤–146 dBc/Hz, characteristic
Offset 1.2 MHz		≤–146 dBc/Hz, characteristic
Offset 1.8 MHz		≤–146 dBc/Hz, characteristic
Offset 6.0 MHz		≤–146 dBc/Hz, characteristic

a. Noise sidebands and spurious responses may be affected by the quality of the external reference when an external reference is used.

b. Offsets <1 MHz measured with RF Input ≥–2 dBm; Offsets ≥1 MHz measured with RF Input >+12 dBm.

	Specifications	Supplemental Information
Spurious Responses[a] –10 dBm at input mixer,[b] Manual ADC range		
Input CW frequency from 700 MHz to < 793 MHz 3kHz ≤ |offset| ≤ 50 MHz	≤–59 dBc	
Input CW frequency from 793 MHz to 1678.6 MHz 3kHz ≤ |offset| ≤ 150 MHz Except for 2 × input frequency – 964.2 MHz	≤–59 dBc	
Input CW frequency from > 1678.6 MHz to < 2200 MHz 3kHz ≤ |offset| ≤ 150 MHz	≤–53 dBc	
Input CW frequency from 2200 MHz to 3700 MHz 3kHz ≤ |offset| ≤ 1200 MHz Except for offsets of –160.7 MHz, –482.1 MHz, and –642.8 MHz	≤–53 dBc	
Input CW frequency from > 3700 MHz to 4000 MHz 3kHz ≤ |offset| ≤ 150 MHz	≤–53 dBc	

a. Noise sidebands and spurious responses may be affected by the quality of the external reference when an external reference is used.
b. Mixer power level (dBm) = input power (dBm) – input attenuation (dB).

	Specifications	Supplemental Information
Residual Responses 50 Ω Input terminated, 0 dB input attenuation, +24 dB ADC gain		
20 MHz to 2 GHz 2 GHz to 4 GHz	≤–85 dBm ≤–80 dBm	

Amplitude

	Specifications	Supplemental Information
RF Input		
Maximum measurement power	+30 dBm (1 W)	
Maximum safe dc voltage	±26 Vdc	
Maximum safe input power	+35 dBm (3.16 W)	

	Specifications	Supplemental Information
Input Attenuator		
Range	0 to +40 dB	
Step size	1 dB steps	
Accuracy at 50 MHz	±0.3 dB relative to 10 dB attenuation	

	Specifications	Supplemental Information
1st LO Emission from RF Input		
$f_{emission}$= Center Freq. ±321.4 MHz		≤(–23 dBm – Input Attenuation), characteristic

	Specifications	Supplemental Information
Third-order Intermodulation Distortion Input power ≤ +27 dBm Pre-ADC Filter ON		
30 MHz to 800 MHz	≤–54 dBc for two –10 dBm tones at the input mixer[a] with greater than 5 MHz separation	+20 dBm third order intercept, characteristic
800 MHz to 4 GHz	≤–54 dBc for two –10 dBm tones at the input mixer[a] with greater than 5 MHz separation	+24 dBm third order intercept, characteristic
30 MHz to 4 GHz	≤–48 dBc for two –10 dBm tones at the input mixer[a] with greater than 50 kHz separation	+17 dBm third order intercept, characteristic

a. Mixer power level (dBm) = input power (dBm) – input attenuation (dB).

	Specifications	Supplemental Information
1 dB Gain Compression Pre-ADC Filter ON Total power at input mixer[a]		
1 tone	0 dBm	
2 tones, separation ≥ 3 MHz	+2 dBm	+6 dBm, typical
2 tones, separation ≥ 40 MHz	+5 dBm	+10 dBm, typical

a. Mixer power level (dBm) = input power (dBm) – input attenuation (dB).

	Specifications	Supplemental Information
Absolute Power Measurement Accuracy Excluding mismatch errors Excluding FFT scalloping errors Frequency tuned to the input CW frequency		
0 to 40 dB input attenuation (–2 dBm to –28 dBm) + attenuation, +18 °C to +30 °C		
810 MHz to 960 MHz	±0.50 dB	±0.4 dB, typical
1710 MHz to 2205 MHz		
Input Attenuation ≤ 28 dB	±0.50 dB	±0.4 dB, typical
Input Attenuation > 28 dB	±0.55 dB	±0.4 dB, typical
1428 MHz to 1503 MHz	±0.60 dB	±0.5 dB, typical
10 dB input attenuation +8 dBm to –18 dBm 400 MHz to 2205 MHz		
+18 °C to +30 °C	±0.75 dB	
20 dB input attenuation +18 dBm to –8 dBm 400 MHz to 2205 MHz		
+18 °C to +30 °C	±0.80 dB	
0 to 20 dB input attenuation (–2 dBm to –28 dBm) + attenuation		
7 MHz to 1000 MHz	±1.0 dB	
1000 MHz to 2205 MHz	±1.3 dB	
2205 MHz to 4000 MHz	±1.8 dB	
21 to 30 dB input attenuation (–2 dBm to –28 dBm) + attenuation		
7 MHz to 1000 MHz	±1.1 dB	
1000 MHz to 2205 MHz	±1.5 dB	
2205 MHz to 4000 MHz	±2.0 dB	
31 to 40 dB input attenuation (–2 dBm to –28 dBm) + attenuation		
7 MHz to 1000 MHz	±1.1 dB	
1000 MHz to 2205 MHz	±1.6 dB	
2205 MHz to 4000 MHz	±2.6 dB	

	Specifications	Supplemental Information
Amplitude Accuracy Relative to –2 dBm at the Input Mixer[a]		
Power level at the mixer, no averaging		
–2 dBm to –78 dBm[b]	±0.25 dB	±0.15 dB, typical
–78 dBm to –88 dBm[c]	±0.70 dB	±0.40 dB, typical
–88 dBm to –98 dBm[c]	±1.20 dB	±0.80 dB, typical
Power level at the mixer, with 10 averages		
–78 dBm to –88 dBm[c]		±0.25 dB, characteristic
–88 dBm to –98 dBm[c]		±0.35 dB, characteristic

a. Mixer power level (dBm) = input power (dBm) – input attenuation (dB).
b. Uncertainty due to amplitude linearity. Does not include uncertainty due to noise.
c. Uncertainty due to amplitude linearity and noise (1 Hz resolution bandwidth)

	Specifications	Supplemental Information
Amplitude Accuracy Relative to –12 dBm at the Input Mixer[a]		
Power level at the mixer, no averaging		
–12 dBm to –62 dBm[b]	±0.15 dB	±0.10 dB, typical

a. Mixer power level (dBm) = input power (dBm) – input attenuation (dB).
b. Uncertainty due to amplitude linearity. Does not include uncertainty due to noise.

	Specifications	Supplemental Information
Displayed Average Noise Level Input terminated in 50 Ω, 0 dB attenuation, 1 kHz RBW, 10 kHz span, +24 dB ADC gain		
7 MHz to 20 MHz	–103 dBm	–111 dBm, typical
20 MHz to 2000 MHz	–106 dBm	–111 dBm, typical
2000 MHz to 2700 MHz	–103 dBm	–108 dBm, typical
2700 MHz to 4000 MHz	–98 dBm	–104 dBm, typical

Measurements

	Specifications	Supplemental Information
Waveform Measurement		
Range at RF Input		
Maximum:	+30 dBm (1 W)	
Minimum:	Displayed average noise level	
Sweep time range		
RBW ≤ 7.5 MHz:	10 µs to 200 ms	Minimum with decimation = 1
RBW ≤ 1 MHz:	10 µs to 400 ms	Maximum with decimation = 4
RBW ≤ 100 kHz:	10 µs to 2 s	
RBW ≤ 10 kHz:	10 µs to 20 s	
Time record length		2 to >900 k points, characteristic
Resolution bandwidth		1, 1.5, 2, 3, 5, 7.5, 10 sequence or arbitrary user-definable
Gaussian filter:	10 Hz to 7.5 MHz	
Flat filter:	10 Hz to 6.6 MHz	
Averaging		
Avg Number:	1 to 10,000	
Avg Mode:	Exponential, Repeat	
Avg Type:	Power Avg (RMS), Log-power Avg (Video), Maximum, Minimum	
Displays	RF envelope, I/Q waveform	
Y-axis display		
Dynamic range:	10 divisions × scale/div	
Log scale/div range:	0.1 to 20 dB	
Log scale/div increment:	0.01 dB	
Voltage scale/div range:	1 nV to 1 V	50 Ω voltage equivalent at RF Input.
Controls:	Scale/Div, Ref Value, and Ref Position	Allows expanded views of portions of the trace data.
X-axis display		
Range:	10 divisions × scale/div	
Controls:	Scale/Div, Ref Value, and Ref Position	Allows expanded views of portions of the trace data.
Markers	Normal, Delta, Band Power	
Measurement resolution		
Displayed:	0.01 dB	
Remote query:	0.001 dB	

	Specifications	Supplemental Information
Trigger Source: Delay, Holdoff, and Auto:	Free Run (immediate), Video (IF envelope), RF Burst (wideband), Ext Front, Ext Rear, Frame, Line	 See Trigger Specifications

	Specifications	Supplemental Information
Spectrum Measurement		
Range at RF Input		
Maximum:	+30 dBm (1 W)	
Minimum:	Displayed Avg Noise Level	
Span range	10 Hz to 10 MHz	Maximum is 15 MHz in Service Mode 1, 1.5, 2, 3, 5, 7.5, 10 sequence or arbitrary user-definable
Capture time		66 ns to 40 s 2 points to 200 k points Coupled to span and resolution bandwidth
Resolution BW range		
Overall:	100 mHz to 1 MHz	1, 1.5, 2, 3, 5, 7.5, 10 sequence or arbitrary user-definable
Span = 10 MHz:	3 kHz to 1 MHz	
Span = 100 kHz:	30 Hz to 500 kHz	
Span = 1 kHz:	400 mHz to 7.5 kHz	
Span = 100 Hz:	100 mHz to 2 kHz	
Pre-FFT filter		
Type:	Gaussian, Flat	
BW:	Auto, Manual 1 Hz to 10 MHz	
FFT window:	Flat Top; (high amplitude accuracy); Uniform: Hanning; Hamming; Gaussian; Blackman; Blackman-Harris; Kaiser-Bessel 70, 90, 110	
Averaging		
Avg number:	1 to 10,000	
Avg mode:	Exponential, Repeat	
Avg type:	Power Avg (RMS), Log-Power Avg (Video), Voltage Avg, Maximum, Minimum	
Displays	Spectrum, I/Q waveform, Spectrum & I/Q waveform	Service Mode also has RF Envelope and Quad-View
Y-axis display		
Dynamic range:	10 divisions × scale/div	
Log scale/div range:	0.1 to 20 dB	
Log scale/div increment:	0.01 dB	
Voltage scale/div range:	1 nV to 1 V	50 Ω voltage equivalent at RF Input
Controls:	Scale/Div, Ref Value, and Ref Position	Allows expanded views of portions of the trace data

	Specifications	Supplemental Information
Markers	Normal, Delta, Band power, Noise	
Measurement resolution		
Displayed:	0.01 dB	
Remote query:	0.001 dB	
Trigger		
Source:	Free Run (immediate), Video (IF envelope), RF Burst (wideband), Ext Front, Ext Rear, Frame, Line	
Delay, Holdoff, & Auto:		See Trigger Specifications

	Specifications	Supplemental Information
Trigger		
Trigger delay Range: Repeatability: Resolution:	 –500 ms to +500 ms ±33 ns 33 ns	For Video, RF Burst, Ext Front, Ext Rear
Trigger slope	Positive, Negative	
Trigger holdoff Range: Resolution:	 0 to 500 ms 1 µs	
Auto trigger Time interval range:	On, Off	0 to 10 s, characteristic Does an immediate trigger if no trigger occurs before the set time interval.
RF burst trigger Peak carrier power range at RF Input:	 +30 dBm to –40 dBm	Wideband IF for repetitive burst signals.
Trigger level range:	0 to –25 dB	Relative to signal peak
Bandwidth:		>15 MHz, characteristic
Video (IF envelope) trigger Range:	 +30 dBm to noise floor	

	Specifications	Supplemental Information
Measurement Control		Single, Continuous, Restart, Pause, Resume

Options

Option BAC: cdmaOne Personality

Option BAH: GSM Personality

Option BAE: NADC, PDC Personalities

Option B78: cdma2000 Personality

Option BAF: W-CDMA Personality

Option 300: Provides a 321.4 MHz IF rear-panel output

General

	Specifications	Supplemental Information
Temperature Range		
Operating	0 °C to +55 °C	
Non-operating	–40 °C to +71 °C	

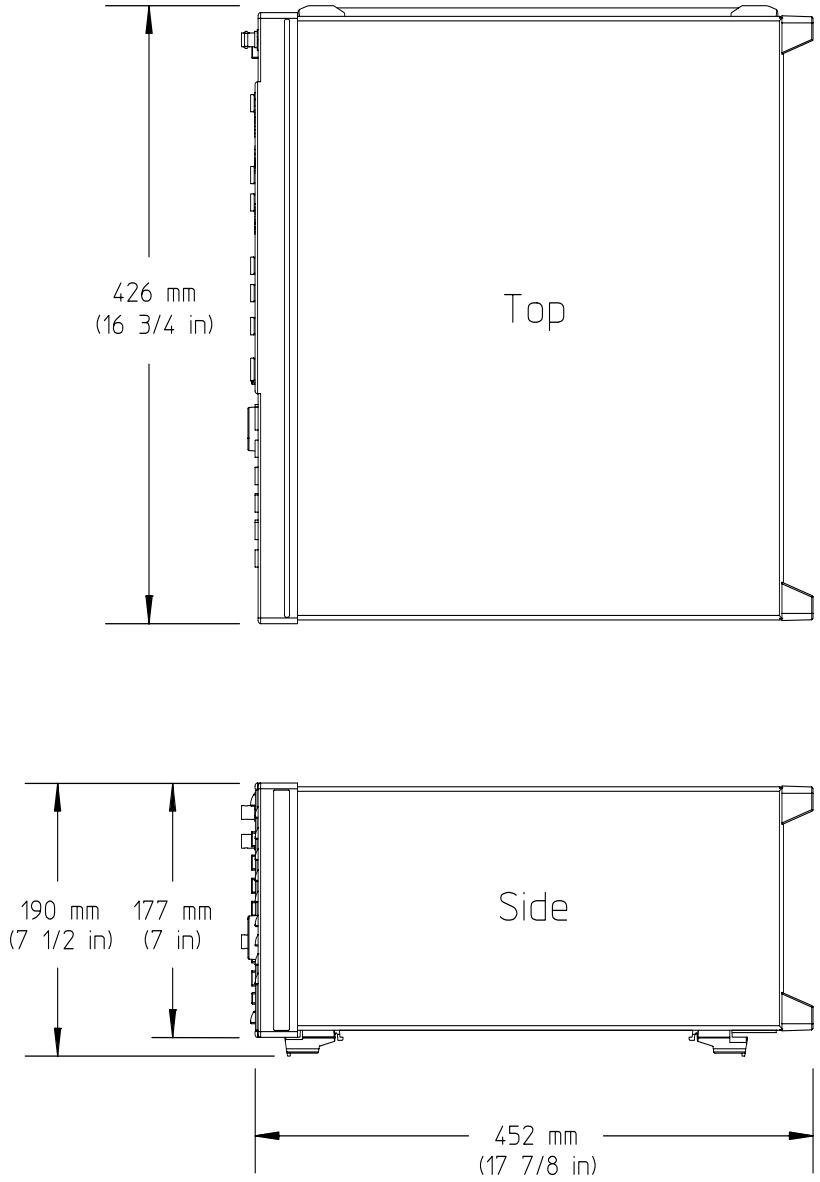
	Specifications	Supplemental Information
EMI Compatibility	Conducted and radiated emission is in compliance with CISPR Pub. 11/1990 Group 1 Class A.	

	Specifications	Supplemental Information
Immunity Testing		
Radiated Immunity		When tested at 3 V/m according to IEC 801-3/1984, the displayed average noise level will be within specifications over the full immunity test frequency range of 27 to 500 MHz, except that at immunity test frequencies of 278.6 MHz ± selected resolution bandwidth and 321.4 MHz ± selected resolution bandwidth, the displayed average noise level may be up to –90 dBm. When the analyzer tuned frequency is identical to the immunity test signal frequency there may be signals of up to –90 dBm displayed on the screen.
Electrostatic Discharge		In accordance with IEC 801-2/1991, an air discharge of up to 8 kV, or a contact discharge of up to 4 kV, will not cause any change of instrument state or measurement data. However, discharges to center pins of front or rear panel connectors may cause damage to the associated circuitry.

	Specifications	Supplemental Information
Power Requirements		
Voltage, frequency	90 to 132 V rms, 47 to 440 Hz 195 to 250 V rms, 47 to 66 Hz	
Power consumption, ON	<350 W	
Power consumption, Standby	<20 W	

	Specifications	Supplemental Information
Weight		
Net		19 kg (42 lb), characteristic
Shipping		39 kg (86 lb), characteristic

Dimensions


426 mm
(16 3/4 in)
Top
190 mm
(7 1/2 in)
177 mm
(7 in)
Side
452 mm
(17 7/8 in)
ea81a

Inputs and Outputs

Front Panel

	Specifications	Supplemental Information
RF INPUT		
Connector	Type N female	
Impedance		50 Ω, nominal
VSWR		
20 MHz to 2205 MHz	≤1.4 : 1	≤1.24 : 1, typical
2205 MHz to 4 GHz	≤1.6 : 1	≤1.4 : 1, typical
50 MHz	≤1.4 : 1	≤1.08 : 1, typical

	Specifications	Supplemental Information
I/Q INPUT		Feature not implemented

	Specifications	Supplemental Information
PROBE PWR		
Voltage/Current		+15 Vdc ±7% at 150 mA max.
		–12.6 Vdc ±10% at 150 mA max.

	Specifications	Supplemental Information
EXT TRIGGER INPUT		
Connector	BNC female	
Impedance		>10 kΩ, nominal
Trigger level		–5 V to +5 V

	Specifications	Supplemental Information
Disk Device		Accepts 10-cm (3 1/2-inch) 1.44 megabyte flexible disk (MS-DOS® format)

Rear Panel

	Specifications	Supplemental Information
10 MHz OUT (SWITCHED)		
Connector	BNC female	
Impedance		50 Ω, nominal
Output amplitude		≥0 dBm, characteristic

	Specifications	Supplemental Information
EXT REF IN		
Connector	BNC female	Note: Instrument noise sidebands and spurious responses may be affected by the quality of the external reference used.
Impedance		50 Ω, nominal
Input amplitude range		–5 to +10 dBm, characteristic
Maximum dc level	±28 V dc	
Frequency		1 MHz to 30 MHz, selectable
Internal 10 MHz[a] error		
When EXT REF IN is an integer multiple of 500 kHz or 1.25 MHz		0 Hz
When EXT REF IN is not an integer multiple of 500 kHz or 1.25 MHz		≤0.533 nHz (≤1 degree phase error in 60 days)
Frequency lock range		5×10^{-6} of the specified external reference input frequency

a. 100 MHz VCXO divided by 10.

	Specifications	Supplemental Information
TRIGGER IN		
Connector	BNC female	
Impedance		>10 kΩ, nominal
Trigger level		–5 V to +5 V

	Specifications	Supplemental Information
TRIGGER 1 OUT		
Connector	BNC female	
Impedance		50 Ω, nominal
Level		0 V to +5 V (No load)

	Specifications	Supplemental Information
TRIGGER 2 OUT		
Connector	BNC female	
Impedance		50 Ω, nominal
Level		0 V to +5 V (No load)

	Specifications	Supplemental Information
321.4 MHz OUT (Opt. 300)		
Connector	BNC female	
Impedance		50 Ω, nominal
Bandwidth		>300 MHz, characteristic
Conversion Gain (Input Attenuator 0 dB)		
Tuned Frequency:		
50 MHz		–3.5 dB, characteristic
400 MHz		–4.5 dB, characteristic
600 MHz		–5.0 dB, characteristic
800 MHz		–6.0 dB, characteristic
1000 MHz		–5.5 dB, characteristic
2000 MHz		–7.0 dB, characteristic
2500 MHz		–7.5 dB, characteristic
3000 MHz		–10.5 dB, characteristic
4000 MHz		–13.0 dB, characteristic

	Specifications	Supplemental Information
MONITOR Output		
Connector	VGA compatible, 15-pin mini D-SUB	
Format		VGA (31.5 kHz horizontal, 60 Hz vertical sync rates, non-interlaced)
Resolution	640 × 480	

	Specifications	Supplemental Information
PARALLEL Interface		Printer port only
Connector	25-pin D-SUB	

	Specifications	Supplemental Information
SERIAL Interface		RS 232 serial interface
Connector	9-pin D-SUB	Feature not implemented

	Specifications	Supplemental Information
LAN-TP		
Connector	RJ45 Ethertwist	

	Specifications	Supplemental Information
GP-IB Interface		
Connector	IEEE-488 bus connector	
GP-IB codes		SH1, AH1, T6, SR1, RL1, PP0, DC1, DT1, L4, C0

	Specifications	Supplemental Information
SCSI Interface		SCSI 2 (Slow narrow single-ended)
Connector	Mini D50, female	Feature not implemented

	Specifications	Supplemental Information
KYBD		Interface compatible with most IBM-compatible PC keyboards
Connector	6-pin mini-DIN	

2 Regulatory Information

Safety Warnings and Cautions

WARNING **Warning denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.**

CAUTION Caution denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a caution sign until the indicated conditions are fully understood and met.

WARNING **This is a Safety Class 1 Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protected earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.**

WARNING **The power cord is connected to internal capacitors that may remain live for 5 seconds after disconnecting the plug from its power supply.**

International Regulatory Information

CAUTION This product is designed for use in Installation Category II and Pollution Degree 2 per IEC 1010 and 664 respectively.

NOTE This product has been designed and tested in accordance with IEC Publication 1010, Safety Requirements for Electronic Measuring Apparatus, and has been supplied in a safe condition. The instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

The CE mark is a registered trademark of the European Community.

The CSA mark is the Canadian Standards Association safety mark.

ISM 1-A This is a symbol of an Industrial Scientific and Medical Group 1 Class A product (CISPR 11, Clause 4).

Compliance with German Noise Requirements

This is to declare that this instrument is in conformance with the German Regulation on Noise Declaration for Machines (Laermangabe nach der Maschinenlaermrerordnung -3.GSGV Deutschland).

Acoustic Noise Emission/Geraeuschemission	
LpA <70 dB	LpA <70 dB
Operator position	am Arbeitsplatz
Normal position	normaler Betrieb
per ISO 7779	nach DIN 45635 t.19

Declaration of Conformity

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name:	Hewlett-Packard Co.
Manufacturer's Address:	1400 Fountaingrove Parkway Santa Rosa, CA 95403-1799 USA

Declares that the product:

Product Name:	VSA Series Transmitter Tester
Model Number:	HP E4406A
Product Options:	This declaration covers all options of the above product.

Conforms to the following product specifications:

Safety: IEC 61010-1:1990 / EN 61010-1:1993
CAN/CSA-C22.2 No. 1010.1-92

EMC: CISPR 11:1990/EN 55011:1991 Group 1, Class A
IEC 801-2:1984/EN 50082-1:1992 4 kV CD, 8 kV AD
IEC 801-3:1984/EN 50082-1:1992 3 V/m, 27-500 MHz
IEC 801-4:1988/EN 50082-1:1992 0.5 kV sig. lines, 1 kV power lines

Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carries the CE-marking accordingly.

Santa Rosa, CA, USA 16 Nov. 1998

Greg Pfeiffer/Quality Engineering Manager

European Contact: Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH Department HQ-TRE, Herreneberger Strasse 130, D71034 Boblingen, Germany (FAX +49-7031-14-3143)

3 cdmaOne Specifications

All specifications apply over 0 °C to +55 °C, except when otherwise specified. The instrument will meet its specifications after 2 hours of storage at a constant temperature, within the operating temperature range, 1 hour after the instrument is turned on and within 24 hours after “Align All Now” has been run. The specifications for each measurement apply for the measurement’s factory default setup.

Measurements

Measurement	Specifications	Supplemental Information
Channel Power Measurement (1.23 MHz Integration BW)		Integration BW range 1 kHz to 10 MHz
Range at UUT[a]		
Base station maximum:	+47 dBm (50 W)	With ≥20 dB external attenuation
Mobile station maximum:	+40 dBm (10 W)	With ≥13 dB external attenuation
Minimum:	–70 dBm	With ≤10 dB external attenuation
Range at RF Input		
Maximum:	+30 dBm (1 W)	
Minimum:	–80 dBm	
Absolute power accuracy for in-band signal (excluding mismatch error)		
+30 dBm to –28 dBm at RF Input:		
+18 °C to +30 °C:	±0.6 dB	±0.4 dB, typical
0 °C to +55 °C:	±1.1 dB	±0.7 dB, typical
–28 dBm to –50 dBm at RF Input:		
+18 °C to +30 °C:	±0.8 dB	±0.7 dB, typical
0 °C to +55 °C:	±1.3 dB	±0.9 dB, typical
–50 dBm to –80 dBm at RF Input[b]:		
+18 °C to +30 °C:	±1.0 dB	±0.9 dB, typical
0 °C to +55 °C:	±1.2 dB	
Relative power accuracy (same channel, different Tx power, input attenuator fixed)[b]		
Input level change 0 to –76 dB[c]:	±0.2 dB	±0.1 dB, typical
Resolution		
Displayed:	0.01 dB	
Remote query:	0.001 dB	
Instrument repeatability (over 30 days with daily internal self-alignment)		±0.05 dB, characteristic Measurement repeatability = instrument repeatability + signal repeatability

a. UUT = Unit Under Test
b. Does not include uncertainty due to noise.
c. Minimum value is for RF Input ≥–2 dBm and optimum input attenuation.

Measurement	Specifications	Supplemental Information
Code Domain (Base Station)		
Carrier power range at UUT[a] Base station: Mobile station:	 +47 dBm to –10 dBm +40 dBm to –17 dBm	 With 20 dB external attenuation With 13 dB external attenuation
Carrier power range at RF Input	+30 dBm to –30 dBm	
Measurement interval range	0.25 ms to 30 ms	
Code domain power Display dynamic range: Accuracy (Walsh channel power within 20 dB of total power): Resolution:	 50 dB ±0.3 dB 0.01 dB	 Measurement interval ≥1.25 ms.
Other reported power parameters (dB referenced to total power)	Average active traffic Maximum inactive traffic Average inactive traffic Pilot, paging, sync channels	
Carrier frequency error measurement accuracy	10 Hz	Excludes frequency reference. Measurement interval ≥1.25 ms.
Pilot time offset Range: Accuracy: Resolution:	 –13.33 ms to +13.33 ms ±250 ns 10 ns	(From even second signal to start of PN sequence)
Code domain timing Range: Accuracy: Resolution:	 ±200 ns ±10 ns 0.1 ns	(Pilot to code channel time tolerance) Measurement interval ≥1.25 ms.
Code domain phase Range: Accuracy: Resolution:	 ±200 mrad ±20 mrad 0.1 mrad	(Pilot to code channel phase tolerance) Measurement interval ≥1.25 ms.
Displays		Power graph & metrics Power graph & 4 markers Power, timing, & phase graphs

a. UUT = Unit Under Test

Measurement	Specifications	Supplemental Information
Modulation Accuracy		
Carrier power range at UUT[a] Base station: Mobile station:	 +47 dBm to –20 dBm +40 dBm to –27 dBm	 With 20 dB external attenuation With 13 dB external attenuation
Carrier power range at RF Input:	+30 dBm to –40 dBm	
Measurement interval range	0.25 ms to 30 ms	
Rho (waveform quality) Range: Accuracy: Resolution:	 0.9 to 1.0 ±0.005 0.0001	 Usable range 0.5 to 1.0
Frequency error Input frequency error range: Accuracy: Resolution:	 ±900 Hz ±10 Hz 0.1 Hz	Frequency error excludes instrument time base error. Measurement interval ≥1.25 ms.
Base station pilot time offset Range: Accuracy: Resolution:	 –13.33 ms to +13.33 ms ±250 ns 10 ns	(From even second signal to start of PN sequence)
EVM Floor: Accuracy: Resolution:	 2.5% ±0.5% 0.1%	 1.8% typical
Carrier feedthrough Floor: Accuracy: Resolution:	 –55 dBc ±2.0 dB 0.1 dB	
Magnitude error Floor: Accuracy: Resolution:	 2.5% ±0.5% ±0.01%	
Phase error Accuracy: Resolution:	 ±1.0 degrees 0.1 degrees	
Displays	Metric summary Magnitude error graph Phase error graph EVM graph I/Q measured polar graph	

a. UUT = Unit Under Test

Measurement	Specifications	Supplemental Information
Adjacent Channel Power Ratio		
Carrier power range at UUT[a]	+47 to 0 dBm	With 20 dB external attenuation
Carrier power range at RF Input	+30 to –20 dBm	
Dynamic range		Referenced to average power of carrier in 1.23 MHz BW
Offset Freq. Integ. BW		
750 kHz 30 kHz	–82 dBc	
885 kHz 30 kHz	–82 dBc	
1.25625 MHz 12.5 kHz	–86 dBc	
1.98 MHz 30 kHz	–85 dBc	
2.75 MHz 1 MHz	–56 dBc	
Relative accuracy[b]	±0.9 dB	
Resolution	0.01 dB	

a. UUT = Unit Under Test
b. Does not include uncertainty due to noise.

Measurement	Specifications	Supplemental Information
Spur Close		At Tx Max Power
Carrier power range at UUT[a] Base station: Mobile station:	 +47 dBm to +13 dBm +40 dBm to +6 dBm	 With 20 dB external attenuation With 13 dB external attenuation
Carrier power range at RF Input	+30 dBm to –30 dBm	
Minimum spurious emission power sensitivity at RF Input	–70 dBm	30 kHz BW
Absolute accuracy for in-band signal (excluding mismatch error)	±1.0 dB	
Relative accuracy[b]	±1.0 dB	
Resolution	0.01 dB	

a. UUT = Unit Under Test
b. Does not include uncertainty due to noise.

Measurement	Specifications	Supplemental Information
Spectrum	See “Spectrum Measurement” under Transmitter Tester Specifications (Measurements)	

Measurement	Specifications	Supplemental Information
Waveform (Time Domain)	See “Waveform Measurement” under Transmitter Tester Specifications (Measurements)	

Frequency

	Specifications	Supplemental Information
In-Band Frequency Range	824 to 849 MHz 869 to 894 MHz 1850 to 1910 MHz 1930 to 1990 MHz	IS-95 J-STD-008

General

	Specifications	Supplemental Information
Trigger		
Trigger source		RF burst (wideband), Video (IF envelope), Ext Front, Ext Rear. Actual available choices dependent on measurement.
Trigger delay, level, and slope		Each trigger source has a separate set of these parameters.
Trigger delay Range: Repeatability: Resolution:	 –500 to +500 ms ±33 ns 33 ns	
External trigger inputs Level: Impedance:		 –5 V to +5 V, characteristic > 10 kΩ, nominal

	Specifications	Supplemental Information
Demod Sync		
Even second input		Level and impedance same as Ext Trigger
PN offset range	0 to 511 x 64[chips]	

4 GSM Specifications

All specifications apply over 0 °C to +55 °C, except when otherwise specified. The instrument will meet its specifications after 2 hours of storage at a constant temperature, within the operating temperature range, 1 hour after the instrument is turned on and within 24 hours after “Align All Now” has been run. The specifications for each measurement apply for the measurement’s factory default setup.

Measurements

Measurement	Specifications	Supplemental Information
Transmit Power		Measures mean transmitted RF carrier power during the whole burst using a power threshold method. RBW is 500 kHz.
Range at UUT[a] BTS maximum: MS maximum: Minimum:	 +50 dBm (100 W) +40 dBm (10 W) –40 dBm	 With ≥20 dB external attenuation With ≥10 dB external attenuation With ≤20 dB external attenuation
Range at RF Input Maximum: Minimum:	 +30 dBm (1 W) –60 dBm	
Absolute power accuracy for in-band signal (excluding mismatch error) +30 to –40 dBm at RF Input, 10 db or 20 dB attenuator +18 °C to +30 °C: 0 °C to +55 °C:	 ±0.6 dB ±0.9 dB	 ±0.4 dB typical
Relative power accuracy (same channel, different Tx power, input attenuator fixed)[b] Input level change 0 to –76 dB[c]:	 ±0.25 dB	 ±0.1 dB typical
Resolution Displayed: Remote query:	 0.01 dB 0.001 dB	
Instrument repeatability (over 30 days with daily internal self-alignment)		±0.05 dB, characteristic Measurement repeatability = instrument repeatability + signal repeatability.

a. UUT = Unit Under Test
b. Does not include uncertainty due to noise.
c. Minimum value is for RF Input ≥–2 dBm and optimum input attenuation.

Measurement	Specifications	Supplemental Information
Power vs. Time		Measures mean transmitted RF carrier power during the useful part of the burst (GSM method) and the power vs. time ramping. 500 kHz RBW
Carrier power range at UUT[a] BTS maximum: MS maximum: Minimum:	 +50 dBm (100 W) +40 dBm (10 W) –40 dBm	 With >20 dB external attenuation With >10 dB external attenuation With <20 dB external attenuation
Carrier power range at RF Input Maximum: Minimum:	 +30 dBm (1 W) –50 dBm	 –40 dBm with training sequence burst sync
Transmit power Absolute accuracy: Relative power linearity: Instrument repeatability:	Same as Transmit power measurement	
Power ramp relative accuracy[b] 0 to +6 dB 0 to –70 dB[c]	 ±0.25 dB ±0.20 dB	Referenced to mean RF transmitted carrier power.
Resolution Displayed: Remote query:	 0.01 dB 0.001 dB	
Instrument repeatability (over 30 days with daily internal self-alignment)		±0.05 dB, characteristic Measurement repeatability = instrument repeatability + signal repeatability
Time resolution	≤0.2 µs	
Maximum record length	50 slots (29 ms)	145 k points, characteristic With default pre-trigger
Burst to mask uncertainty	±0.2 bit (approx ±0.7 µs)	

a. UUT = Unit Under Test
b. Does not include uncertainty due to noise.
c. Minimum value is for RF Input ≥–2 dBm and optimum input attenuation.

Measurement	Specifications	Supplemental Information
Phase and Frequency Error		
Carrier power range at UUT[a]		
BTS:	+50 dBm to –20 dBm	With >20 dB external attenuation
MS:	+40 dBm to –30 dBm	With >10 dB external attenuation
Carrier power range at RF Input	+30 dBm to –40 dBm	
Phase error (phase trajectory)		
Range:	–180 ° to +180 °	
Resolution:	±0.01 °	
Peak measurement accuracy:	±2 °	
RMS measurement accuracy:	±1.0 °	±0.5 °, typical
Frequency error		Frequency error excludes instrument time base error.
Initial frequency error range:	±200 kHz	
Accuracy:	±5 Hz	
I/Q offset		
Range:	–80 dBc to –10 dBc	
Accuracy:	± 0.5 dB	
Burst sync time uncertainty	±0.1 bit (approx ±0.4 µs)	
Displays	I/Q error quad view Phase error vs. bit Phase error with frequency vs. bit RF envelope vs. bit Numeric summary I/Q measured polar vector Data bits	

a. UUT = Unit Under Test

Measurement	Specifications	Supplemental Information
Output RF Spectrum		
Carrier power range at UUT[a]		
Offsets ≤1800 kHz, 30 kHz RBW		
BTS:	+50 dBm to +15 dBm	With >20 dB external attenuation
MS:	+40 dBm to +5 dBm	With >10 dB external attenuation
Carrier power range at RF Input		
Offsets ≤1800 kHz, 30 kHz RBW:	+30 dBm to –5 dBm	
Offsets >1800 kHz, 100 kHz RBW:	+30 dBm to +10 dBm	
Reference power accuracy	Same as Transmit Power measurement	
Relative accuracy[b]		
0 to –76 dB[c]	±0.25 dB	±0.1 dB, typical
–76 to –86 dB[c]	±0.70 dB	±0.4 dB, typical
Spectrum due to modulation displayed dynamic range[d]		Offset freq ≤400 kHz, RBW filter is an exact 5-pole sync-tuned filter. Offset freq > 400 kHz, RBW filter has noise BW and Impulse BW equivalent to 5-pole sync-tuned filter. 30 kHz RBW
100 kHz offset	30 dB	35 dB, typical
200 kHz offset	60 dB	65 dB, typical
250 kHz offset	60 dB	65 dB, typical
400 kHz offset	70 dB	75 dB, typical
600 kHz offset	80 dB	85 dB, typical
1200 kHz offset	80 dB	85 dB, typical
1.8 to 6.0 MHz offset	82 dB	87 dB, typical, (100 kHz RBW)
Spectrum due to switching transients displayed dynamic range[d]		
400 kHz offset	62 dB	65 dB typical
600 kHz offset	80 dB	85 dB typical
1200 kHz offset	85 dB	90 dB typical
1800 kHz offset	85 dB	90 dB typical

a. UUT = Unit Under Test
b. Does not include uncertainty due to noise.
c. Minimum value is for RF Input ≥–2 dBm and optimum input attenuation.
d. Maximum dynamic range is for RF Input ≥+12 dBm.

Measurement	Specifications	Supplemental Information
Spectrum	See “Spectrum Measurement” under Transmitter Tester Specifications (Measurements)	

Measurement	Specifications	Supplemental Information
Waveform (Time Domain)	See “Waveform Measurement” under Transmitter Tester Specifications (Measurements)	

Frequency

	Specifications	Supplemental Information
In-Band Frequency Range		
Down Band GSM	400 to 500 MHz	
GSM 900, P-GSM	890 to 915 MHz 935 to 960 MHz	
GSM 900, E-GSM	880 to 915 MHz 925 to 960 MHz	
DCS1800	1710 to 1785 MHz 1805 to 1880 MHz	
PCS1900	1850 to 1910 MHz 1930 to 1990 MHz	

Amplitude

	Specifications	Supplemental Information
Range Control		RF Input Autorange Manually set **Max Total Pwr** Manually set **Input Atten**

	Specifications	Supplemental Information
External Loss Correction		BTS Ext Atten and MS Ext Atten (in dB)

General

	Specifications	Supplemental Information
Trigger		
Trigger source		RF burst (wideband), Video (IF envelope), Ext Front, Ext Rear, Frame Timer. Actual available choices dependent on measurement.
Trigger delay, level, and slope		Each trigger source has a separate set of these parameters.
Trigger delay Range: Repeatability: Resolution:	 –500 to +500 ms ±33 ns 33 ns	
External trigger inputs Level: Impedance:		 –5 V to +5 V, characteristic >10 kΩ, nominal

	Specifications	Supplemental Information
Burst Sync		
Source		Training sequence, RF amplitude, Ext Rear, None. Actual available choices dependent on measurement.
Training sequence code		GSM defined 0 to 7 Auto (search) or Manual
Burst type		Normal (TCH & CCH) Sync (SCH) Access (RACH)

5 NADC Specifications

All specifications apply over 0 °C to +55 °C, except when otherwise specified. The instrument will meet its specifications after 2 hours of storage at a constant temperature, within the operating temperature range, 1 hour after the instrument is turned on and within 24 hours after “Align All Now”has been run. The specifications for each measurement apply for the measurement’s factory default setup.

Measurements

Measurement	Specifications	Supplemental Information
Adjacent Channel Power Ratio		
Carrier Power Range at UUT[a]	+36 to –11 dBm	With 11 dB external atten.
Carrier Powr Range at RF Input	+27 to –20 dBm	
Adjacent Channel Power Ratio Range:		
At 30 KHz offset		0 to –35 dB, characteristic
At 60 KHz offset	0 to –65 dB	
At 90 KHz offset	0 to –70 dB	
Accuracy	±1.0 dB	
Resolution	0.01 dB	Display resolution

a. UUT = Unit Under Test

Measurement	Specifications	Supplemental Information
Error Vector Magnitude (EVM)		
Carrier Power Range at UUT[a]	+36 to –11 dBm	With 11 dB external atten.
Carrier Power Range at RF Input	+27 to –20 dBm	
EVM		
Range	0 to 25 %	
Floor	1.0 %	
Accuracy	±0.6 %	±0.5 %, typical
Resolution	0.01 %	Display resolution
I/Q Origin offset		
Range	–10 to –50 dBc	
Resolution	0.01 dB	Display resolution
Carrier Frequency Error		
Frequency Resolution	0.01 Hz	Display resolution

a. UUT = Unit Under Test

Measurement	Specifications	Supplemental Information
Spectrum	See “Spectrum Measurement” under Transmitter Tester Specifications (Measurements)	

Measurement	Specifications	Supplemental Information
Waveform (Time Domain)	See “Waveform Measurement” under Transmitter Tester Specifications (Measurements)	

Frequency

	Specifications	Supplemental Information
In-Band Frequency Range		
800 MHz Band	824 to 849 MHz 869 to 894 MHz	
PCS Band	1850 to 1910 MHz 1930 to 1990MHz	

General

	Specifications	Supplemental Information
Trigger		
Trigger source		RF burst (wideband), Video (IF envelope), Ext Front, Ext Rear. Actual available choices dependent on measurement.
Trigger delay, level, and slope		Each trigger source has a separate set of these parameters.
Trigger delay Range: Repeatability: Resolution:	 –500 to +500 ms ±33 ns 33 ns	
External trigger inputs Level: Impedance:		 –5 V to +5 V, characteristic > 10 kΩ, nominal

6 PDC Specifications

All specifications apply over 0 °C to +55 °C, except when otherwise specified. The instrument will meet its specifications after 2 hours of storage at a constant temperature, within the operating temperature range, 1 hour after the instrument is turned on and within 24 hours after “Align All Now” has been run. The specifications for each measurement apply for the measurement’s factory default setup.

Measurements

Measurement	Specifications	Supplemental Information
Adjacent Channel Power Ratio		
Carrier Power Range at UUT[a]	+37 to –10 dBm	With 10 dB external atten.
Carrier Powr Range at RF Input	+27 to –20 dBm	
Adjacent Channel Power Ratio		
Range		
At 50 KHz offset	0 to –55 dB	
At 100 KHz offset	0 to –70 dB	
Accuracy	±1.0 dB	
Resolutio:	0.01 dB	Display resolution

a. UUT = Unit Under Test

Measurement	Specifications	Supplemental Information
Error Vector Magnitude (EVM)		
Carrier Power Range at UUT[a]	+37 to –10 dBm	With 10 dB external atten.
Carrier Power Range at RF Input	+27 to –20 dBm	
EVM		
Range	0 to 25 %	
Floor	1.0 %	
Accuracy	±0.6 %	±0.5 %, typical
Resolution	0.01 %	Display resolution
I/Q Origin offset		
Range	–10 to –50 dBc	
Resolution	0.01 dB	Display resolution
Carrier Frequency Error		
Frequency Resolution	0.01 Hz	Display resolution

a. UUT = Unit Under Test

Measurement	Specifications	Supplemental Information
Occupied Bandwidth		
Carrier power range at UUT[a]	+37 to –10 dBm	With 10 dB external atten.
Carrier power range at RF Input	+27 to –20dBm	
Frequency		
Resolution	0.1 kHz	
Accuracy	+400 Hz, –100 Hz	

a. UUT = Unit Under Test

Measurement	Specifications	Supplemental Information
Spectrum	See “Spectrum Measurement” under Transmitter Tester Specifications (Measurements)	

Measurement	Specifications	Supplemental Information
Waveform (Time Domain)	See “Waveform Measurement” under Transmitter Tester Specifications (Measurements)	

Frequency

	Specifications	Supplemental Information
In-Band Frequency Range		
800MHz Band #1	810 to 828 MHz 940to 958MHz	
800MHz Band #2	870 to 885 MHz 925 to 940 MHz	
800MHz Band #3	838 to 840 MHz 893 to 895 MHz	
1500 MHz Band	1477 to 1501MHz 1429 to 1453 MHz	

General

	Specifications	Supplemental Information
Trigger		
Trigger source		RF burst (wideband), Video (IF envelope), Ext Front, Ext Rear, Frame Timer. Actual available choices dependent on measurement.
Trigger delay, level, and slope		Each trigger source has a separate set of these parameters.
Trigger delay Range: Repeatability: Resolution:	 –500 to +500 ms ±33 ns 33 ns	
External trigger inputs Level: Impedance:		 –5 V to +5 V, characteristic >10 kΩ, nominal

7 W-CDMA Specifications

All specifications apply over 0 °C to +55 °C, except when otherwise specified. The instrument will meet its specifications after 2 hours of storage at a constant temperature, within the operating temperature range, 1 hour after the instrument is turned on and within 24 hours after “Align All Now” has been run. The specifications for each measurement apply for the measurement’s factory default setup.

Measurements

Measurement	Specifications	Supplemental Information
Channel Power		
Power range at RF Input	+30 to –70 dBm	
Absolute power accuracy for in-band signal (excluding mismatch error), 18 °C to 30 °C		
+30 to –28 dBm at RF Input	±0.6 dB	
–28 to –50 dBm at RF Input	±0.8 dB	
–50 to –80 dBm at RF Input	±1.0 dB	

Measurement	Specifications	Supplemental Information
Adjacent Channel Power Ratio		
Power range at RF Input	+30 to –20 dBm	
Dynamic range		Referenced to average power of carrier in 4.096 MHz BW.
Offset Freq. Integ. BW		
5 MHz 4.096 MHz		–68 dBc, characteristic
10 MHz 4.096 MHz		–72 dBc, characteristic
Relative accuracy	±1.0 dB	At 0 dB to (minimum measurement + 10 dB).

Measurement	Specifications	Supplemental Information
Power Statistics CCDF		
Power range at RF Input Maximum:	+30 dBm (average) +40 dBm (peak)	
Minimum:	–40 dBm (average)	

Measurement	Specifications	Supplemental Information
Code Domain		
Code domain power Power range at RF Input:	+30 to –40 dBm	
Accuracy:	±0.3 dB	Spread channel power is within 20 dB of total power.
Symbol power vs. time Power range at RF Input:	+30 to –40 dBm	
Accuracy:	±0.3 dB	Spread Channel Power is within 20 dB of Total Power. Averaged power over a slot.
Symbol error vector magnitude Power range at RF Input:	+30 to –20 dBm	

Measurement	Specifications	Supplemental Information
QPSK EVM		
Power range at RF Input	+30 to –20 dBm	
EVM Range:	0 to 25%	
Floor:	3.0%	
Accuracy:	±1.0%	
I/Q origin offset Range:	–10 to –50 dBc	
Frequency error Range:	±500 Hz	
Accuracy:	±10 Hz	

Measurement	Specifications	Supplemental Information
Modulation Accuracy		
Power range at RF Input	+30 to –40 dBm	
Rho Range:	0.9 to 1.0	
Accuracy:	±0.005	

Measurement	Specifications	Supplemental Information
Spectrum (Frequency Domain)	See “Spectrum Measurement” under Transmitter Tester Specifications (Measurements).	

Measurement	Specifications	Supplemental Information
Waveform (Time Domain)	See “Waveform Measurement” under Transmitter Tester Specifications (Measurements).	

Frequency

	Specifications	Supplemental Information
In-Band Frequency Range	2110 to 2170 MHz 1920 to 1980 MHz	

General

	Specifications	Supplemental Information
Trigger		
Trigger source		RF burst (wideband), Video (IF envelope), Ext Front, Ext Rear. Actual available choices are dependent on measurement.
Trigger delay, level, and slope		Each trigger source has a separate set of these parameters.
Trigger delay		
Range:	–100 to +500 ms	
Repeatability:	±33 ns	
Resolution:	33 ns	
External trigger inputs		
Level:		–5 V to +5 V, characteristic
Impedance:		> 10 kΩ, nominal

8 cdma2000 Specifications

All specifications apply over 0 °C to +55 °C, except when otherwise specified. The instrument will meet its specifications after 2 hours of storage at a constant temperature, within the operating temperature range, 1 hour after the instrument is turned on and within 24 hours after “Align All Now” has been run. The specifications for each measurement apply for the measurement’s factory default setup.

Measurements

Measurement	Specifications	Supplemental Information
Channel Power		
Power range at RF input		
SR1	+30 to –80 dBm	
SR2	+30 to –70 dBm	
Absolute power accuracy for in-band signal (excluding mismatch error) 18 °C to 30 °C		
+30 to –28 dBm at RF Input	±0.6 dB	
–28 to –50 dBm at RF Input	±0.8 dB	
–50 to –80 dBm at RF Input	±1.0 dB	

Measurement	Specifications	Supplemental Information
Adjacent Channel Power Ratio		
SR1		
Power range at RF input	+30 to –20 dBm	
Dynamic range		Referenced to average power of carrier in 1.25 MHz BW.
Offset Freq. Integ. BW		
750 kHz 30 kHz	–82 dBc	
885 kHz 30 kHz	–82 dBc	
1.98 MHz 30 kHz	–85 dBc	
SR3		
Power range at RF Input	+30 to –20 dBm	
Relative accuracy	±0.9 dB	

Measurement	Specifications	Supplemental Information
Power Statistics CCDF		
Range at RF Input		
Maximum:	+30 dBm (average)	
	+40 dBm (peak)	
Minimum:	–40 dBm (average)	

Measurement	Specifications	Supplemental Information
QPSK EVM for SR1		
Power range at RF input	+30 to –20 dBm	
EVM		
Range:	0 to 25%	
Floor:	1.5%	
Accuracy:	±1.0%	
I/Q origin offset		
Range:	–10 to –50 dBc	
Frequency Error		
Range:	±500 Hz	
Accuracy:	±10 Hz	

Measurement	Specifications	Supplemental Information
Modulation Accuracy		
Power range at RF input	+30 to –40 dBm	
Rho		
Range:	0.9 to 1.0	
Accuracy:	±0.005	

Measurement	Specifications	Supplemental Information
Spectrum (Frequency Domain)	See “Spectrum Measurement” under Transmitter Tester Specifications (Measurements).	

Measurement	Specifications	Supplemental Information
Waveform (Time Domain)	See “Waveform Measurement” under Transmitter Tester Specifications (Measurements).	

Frequency

	Specifications	Supplemental Information
In-Band Frequency Range	2110 to 2170 MHz 1920 to 1980 MHz	ITM-2000
	869 to 894 MHz 824 to 849 MHz	IS-95
	1930 to 1990 MHz 1850 to 1910 MHz	J-STD-008

General

	Specifications	Supplemental Information
Trigger		
Trigger source		RF burst (wideband), Video (IF envelope), Ext Front, Ext Rear. Actual available choices are dependent on measurement.
Trigger delay, level, and slope		Each trigger source has a separate set of these parameters.
Trigger delay Range: Repeatability: Resolution:	 –100 to +500 ms ±33 ns 33 ns	
External trigger inputs Level: Impedance:		 –5 V to +5 V, characteristic > 10 kΩ, nominal