cdmaOne Measurement Solutions for the Agilent ESA-E Series Spectrum Analyzers

Product Overview

Now the best-in-class spectrum analyzer has one-button cdmaOne measurements, including adjacent channel power ratio, modulation quality, and code domain digital demodulation.

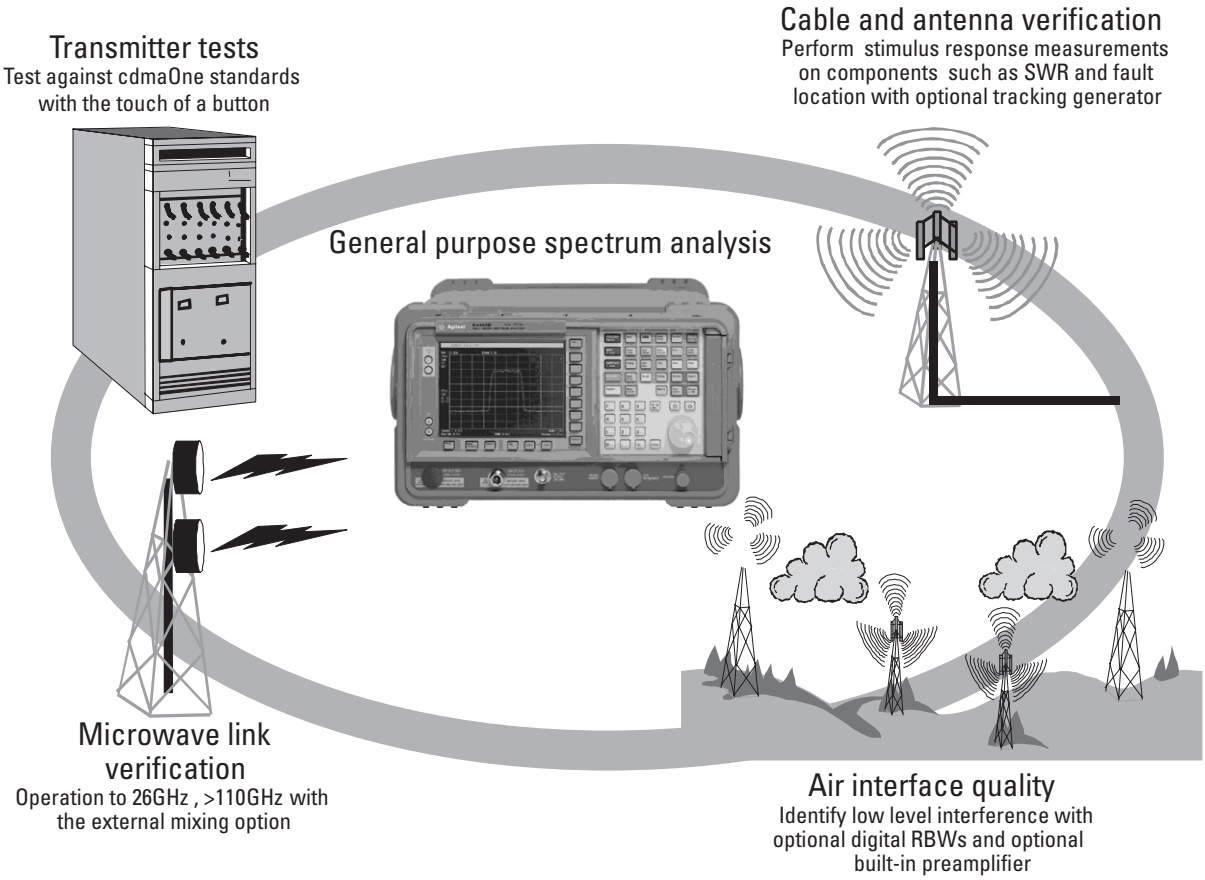
Agilent Technologies

Accurate and easy cell site optimization and troubleshooting

As a cellular network provider you are under increasing pressure to ensure optimal network performance. Interference free spectrum, combined with an optimized transmitter, means that the cellular system you maintain is performing at the peak of its operational capability.

The Agilent ESA-E series spectrum analyzers provide best-in-class general purpose spectrum analysis with built-in, one-button, standards compliant, cdmaOne measurement capability, including adjacent channel power ratio (ACPR), in a mid-priced portable rugged package. This provides enhanced capability to meet your performance goals accurately, easily, and quickly in the most demanding environmental conditions.

Verifying all troublesome parts of the cell site



Here's how it benefits you

Accurate
Confidence in cell site performance
- ±0.6 dB absolute channel power accuracy
- ±10 Hz frequency accuracy
- ±0.0015 modulation quality (rho)

Easy-to-use
Less training time needed
- One-button, standards compliant cdmaOne measurements with pass/fail messages for go/no-go testing, including adjacent channel power ratio (ACPR)
- Communications focused user interface
- Built-in help key for quick reference without manuals

Portable
Sophisticated measurement performance anywhere
- Rugged case, water resistant front panel
- Snap-on battery (E1779A) or 12 Vdc adapter (Option A5D)
- Carrying/operating case (Option AYT/AYU)

Upgradeable
Ready for the next generation of cellular standards
- Versatile card-cage architecture
- Instrument firmware and software upgrades from the Web
- Wide bandwidth digital demodulation platform

Flexible
Include just the options that you need now or in the future
- Multiple option configurations
- Spectrum analyzer mode or cdmaOne analyzer mode operation
- Choose just the frequency range that you need

PC connected
Easy analysis of cell site transmitter performance data
- Store measurement results in spreadsheet format to disk using the built-in floppy disk drive or IntuiLink software[1]
- Industry standard SCPI instrument language for remote control
- GPIB (Option A4H), RS-232 (Option 1AX) interface available

Fast
Finish your job quicker
- Five minute warm-up time for full accuracy
- 28 measurement updates per second for higher probability of intercept and real-time response
- Quick cdmaOne measurement set-up

With spectrum analysis
Maximize measurement capability and confidence
- 108 dB[2] third order dynamic range to view low level distortion and intermodulation
- 1 Hz digital resolution band width up to 200 times faster than analog
- Continuous automatic background alignment that guarantees repeatability over varying temperatures

Great for installation and maintenance plus more

R&D
- Continuous, standards-compliant ACPR measurements for design verification
- Affordable spectrum and modulation analysis on every engineer's bench

Manufacturing
- Spurious testing to 26.5 GHz
- Standards-compliant one-button ACPR measurement for fast product test throughput
- Flexible troubleshooting tool for production rework
- Engineering analysis of root cause

Installation and maintenance
- Fast, accurate whole cell site optimization
- In any weather condition
- Minimal training time
- Complete spectrum analysis capability

1. For more information about IntuiLink software visit our Web site at: **http://www.agilent.com/find/IntuiLink**
2. Typical

Here's the specific cdmaOne measurements

The cdmaOne measurement personality is software that resides in the ESA-E series spectrum analyzer that provides specialized features that perform measurements and calculations required to test the cdmaOne standard specifications at the press of a single button.

Key measurements:

- Adjacent channel power ratio (ACPR)
- Channel power
- Modulation accuracy (rho)
- Code domain power
- Receive channel power
- In-band and out-of-band spurious measurements
- Harmonics
- Occupied bandwidth
- Monitor band/channel
- Distance to fault

Additional features

- Color enhanced pass/fail messages with editable limits
- Graphic displays that add key information to numerical results
- Automatic signal level detection and analyzer setup
- Standards based channel tuning and band selection
- External reference configuration and control
- Remote control measurements, parameters, and limits with SCPI programming language
- Storage of measurement results to floppy disk or directly to a PC with IntuiLink software

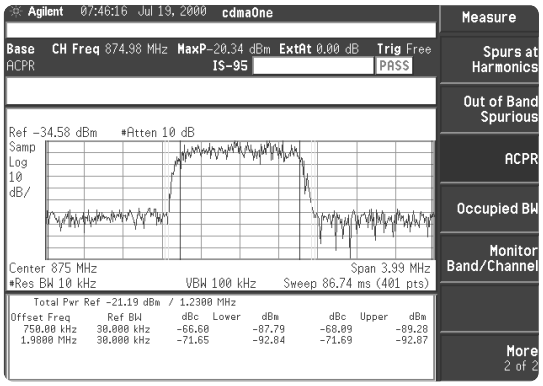


Figure 1. Adjacent channel power ratio measurement (ACPR) is one of the critical power measurements for the design and test of cdmaOne components and systems.

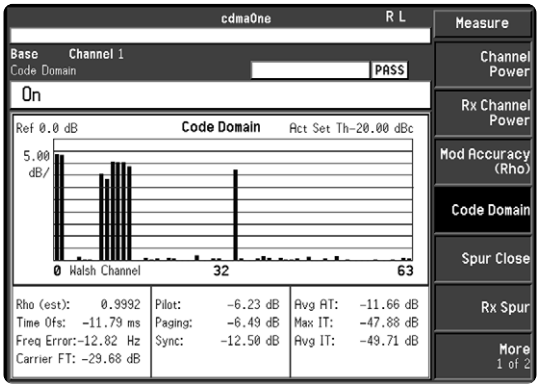


Figure 2. Code domain power provides insight into the modulation domain to verify that each Walsh channel is operating at its proper level. This measurement includes estimated rho, for on-air modulation quality.

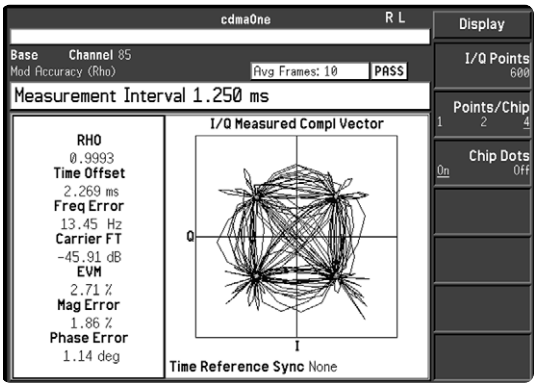


Figure 3. Waveform quality measurements uncover modulation problems

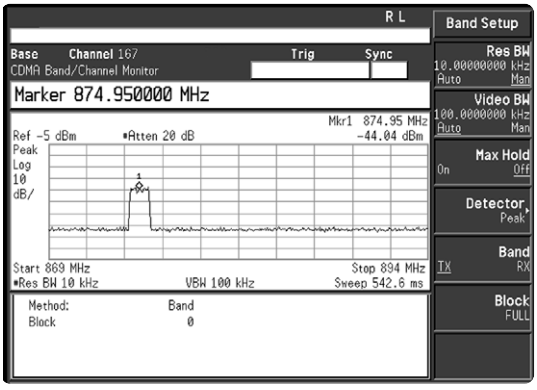
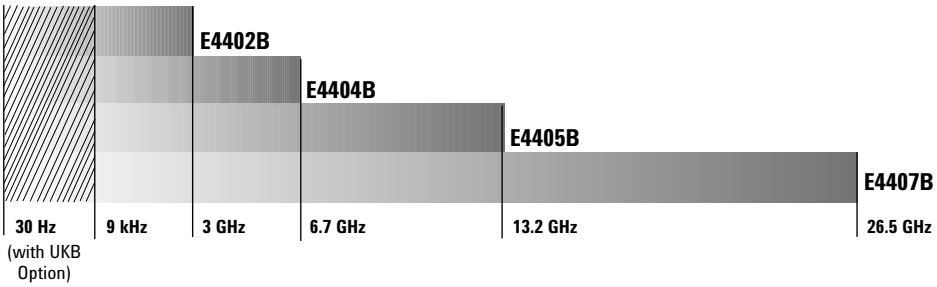


Figure 4. Identify interference signals using the monitor channel feature combined with the analyzer's wide dynamic range and sensitivity.

Here's how you order it

First, choose your frequency range



ESA-E frequency ranges

Now, choose your option configuration

Use	Task	Required option configurations	cdmaOne measurements
Transmission performance checks	• Verifies equipment specifications • Compliance to radio regulatory standards • Verifying modulation quality and network synchronization • Ensures the RF transmission parameters, including ACPR, are optimal • Verifies the transmission and receive bands are free from interference • Proves the quality of RF cables and connections	**ESA-E series**[1] **spectrum analyzer plus options:** **BAC**—cdmaOne measurement personality **B74**—RF and digital comms hardware bundle **Includes:** DSP and fast ADC (option B7D) RF Comms hardware (option B7E) High stability frequency reference (option 1D5) Time gated spectrum analysis (option 1D6) Preamplifier (option 1DS) Narrow resolution bandwidths (option 1DR) Memory extension (option B72)[2] **Recommended options:** **1DN**—50 Ohm tracking generator **225**—Distance to fault measurement personality	• Channel power • Modulation quality (rho) • Code domain power • Receive channel power • Monitor channel/band • In-band spurious • Out-of-band spurious • Harmonics • Occupied bandwidth • Distance to fault (1DN and 225 required)
Cell site functionality checks	• Ensures the RF transmission parameters are optimal • Verifies the transmission and receive bands are free from interference • Proves the quality of RF cables and connections	**ESA-E series**[1] **spectrum analyzer plus options:** **BAC**—cdmaOne measurement personality **B72**—Memory extension **1D5**—High stability frequency reference **Recommended options:** 1DS—Preamplifier 1DR—Narrow resolution bandwidths 1DN—50 Ohm tracking generator 225—Distance to fault measurement personality	• Channel power • Receive channel power • Monitor channel/band • In-band spurious • Out-of-band spurious • Harmonics • Occupied bandwidth • Distance to fault (1DN and 225 required)

1. cdmaOne measurement personality available for all ESA-E series analyzers except the E4401B 1.5 GHz analyzer.
2. Option B72 is standard if serial prefix number ≥ US4144 or MY4144.

cdmaOne specifications

All specifications apply over 0˚C to +55˚C unless otherwise noted and are covered by the product warranty. The analyzer will meet its specifications when: it's within the one year calibration cycle, AUTO ALIGN [ALL] is selected, stored a minimum 2 hours within the operating temperature range, turned on for at least 5 minutes, Align Now RF has been run once every 24 hour period. ***Italics*** = characteristics, typical performance, or nominal values. For spectrum analyzer specifications, see ESA-E Series Technical Specifications, literature number 5968-3386E.

Table 1. Industry supported standards

Supported standards			Supported tuning plan
IS-95A	IS-97A	IS-98A	US Cellular, Korean Cellular
J-STD-008	J-STD-018	J-STD-019	US PCS, Korean PCS
ARIB STD-53			Japan Cellular
TIA/EIA-95B	TIA/EIA-97B	TIA/EIA-98B	US Cellular, US PCS
TIA/EIA-95C	TIA/EIA-97C	TIA/EIA-98C US	Cellular, US PCS

General specifications

Maximum safe input level
Total power must not exceed +30 dBm (1 W)
Frequency reference
(with precision frequency reference, Option 1D5)
Aging ±1 x 10-7/year
Temperature stability ±5 x 10-6
External attenuation correction
–90 to +90 dB in 0.01 dB steps
Frequency bands
cdmaOne cellular bands
824 to 870 MHz, 869 to 925 MHz
cdmaOne PCS bands
1715 to 1780 MHz, 1805 to 1870 MHz,
1850 to 1910 MHz, 1930 to 1990 MHz

Channel power[1]

Channel power range +30 to –70 dBm
Absolute channel power accuracy[2]:
Cellular bands

E4402B	**0°C to 55°C**	**20°C to 30°C**
–5 to 30 dBm	±1.2 dB	±0.9 dB, 0.4 *typical*
–25 to –5 dBm	±1.1 dB	±0.9 dB, 0.4 *typical*
–45 to –25 dBm	±1.0 dB	±0.7 dB, 0.2 *typical*
–55 to –45 dBm	±1.0 dB	±0.8 dB, 0.3 *typical*
–70 to –55 dBm	±1.2 dB	±0.8 dB, 0.4 *typical*

E4404B, E4405B, E4407B	**0°C to 55°C**	**20°C to 30°C**
–5 to 30 dBm	±1.1 dB	±0.8 dB, 0.4 *typical*
–25 to –5 dBm	±1.1 dB	±0.8 dB, 0.3 *typical*
–45 to –25 dBm	±1.0 dB	±0.7 dB, 0.3 *typical*
–55 to –45 dBm	±1.0 dB	±0.7 dB, 0.4 *typical*
–70 to –55 dBm	±1.3 dB	±0.9dB, 0.5 *typical*

PCS bands

E4402B	**0°C to 55°C**	**20°C to 30°C**
–5 to 30 dBm	±1.1 dB	±0.8 dB, 0.3 *typical*
–25 to –5 dBm	±1.0 dB	±0.7 dB, 0.2 *typical*
–45 to –25 dBm	±1.0 dB	±0.7 dB, 0.3 *typical*
–55 to –45 dBm	±1.0 dB	±0.8 dB, 0.3 *typical*
–70 to –55 dBm	±1.3 dB	±0.9 dB, 0.4 *typical*

E4404B, E4405B, E4407B	**0°C to 55°C**	**20°C to 30°C**
–5 to 30 dBm	±1.3 dB	±1.0 dB, 0.3 *typical*
–25 to –5 dBm	±1.1 dB	±0.8 dB, 0.3 *typical*
–45 to –25 dBm	±1.1 dB	±0.9 dB, 0.3 *typical*
–55 to –45 dBm	±1.1 dB	±1.0 dB, 0.4 *typical*
–70 to –55 dBm	±1.4 dB	±1.0 dB, 0.5 *typical*

Adjacent channel power ratio (ACPR)

Carrier power range at RF input +30 dBm to –20 dBm
Dynamic range (referenced to the average power of the carrier in 1.23 MHz)

Offset frequency	**Integration BW**	**Dynamic range**
750 kHz	30 kHz	–70 dBc, characteristic
885 kHz	30 kHz	–73.5 dBc, characteristic
1.25625 MHz	12.5 kHz	–78 dBc, characteristic
1.98 MHz	30 kHz	–75.5 dBc, characteristic
2.75 MHz	1 MHz	–60.5 dBc, characteristic

Resolution: 0.01 dB

Receive channel power[1]

Absolute power accuracy
Cellular bands
E4402B
0 to 30 dB ±1.1 dB, ±0.6 typical
–85 to 0 dB ±1.6 dB, ±0.63 typical
E4404B, E4405B, E4407B
0 to 30 dB ±1.0 dB, ±0.6 typical
–85 to 0 dB ±2.0 dB, ±1.3 typical

Code domain[3]

Range at RF input +30 dBm to –82 dBm, characteristic
Measurement interval range 0.5 ms to 26.67 ms
Code domain power
Display dynamic range 50 dB
Accuracy[4] ±0.2 dB
Displayed resolution 0.01 dB
Frequency error range ±100 kHz, typical
Accuracy[5] ±10 Hz

1. Integrated 1.23 MHz bandwidth.
2. For mean channel power at RF input, plus any external attenuation, excluding mismatch error.
3. Requires Options 1DS, B7D, and B7E, measurement internal ≥ 1.25 ms.
4. Walsh channel power must be within 20 dB of total power.
5. Excludes frequency reference error, measurement interval ≥ 2.5 ms.

Code Domain specifications (continued)

Estimated rho

Range	0.5 to 1.0
Accuracy[1]	
(0.9 to 1.0 range)	±0.02, characteristic
Displayed resolution	0.0001
Pilot time offset[2]	
Range	–13.33 ms to +13.33 ms
Accuracy	±150 ns
Displayed resolution	four digits
Code domain timing[3]	
Range	±200 ns
Accuracy	±7 ns typical
Code domain phase[3]	
Range	±200 mrad
Accuracy	±15 mrad, ±10 mrad typical

Other reported power parameters
Average active traffic, maximum inactive traffic, average inactive traffic

Code domain displays
Power graph & metrics or power, timing & phase graphs

Modulation accuracy (rho) measurement[4]

Range at RF input	+30 dBm to –70 dBm
Preamp on (Option 1DS)	+30 dBm to –87 dBm
Measurement interval range	0.15 ms to 26.67 ms
Rho[5] (waveform quality)	
Range	0.5 to 1.0, characteristic
Accuracy (0.9 to 1.0 range)	±0.0015 typical
Displayed resolution	0.0001
Frequency error[6]	
Input frequency error range	±100 kHz
Accuracy	±10 Hz
Pilot time offset[2]	
Range	–13.33 ms to +13.33 ms
Accuracy	±150 ns
Displayed resolution	four digits
EVM	
Floor	3.8%, *typical*
Accuracy[7]	±1.1%, *typical*
Displayed resolution	0.01%
Carrier feedthrough	
Accuracy[7]	±2.3 dB
Displayed resolution	0.01 dB
Magnitude error	
Accuracy[7]	±1.1%, *typical*
Displayed resolution	0.01%
Phase error	
Accuracy[7]	±0.65 degrees, *typical*
Displayed resolution	0.01 degrees

Modulation accuracy displays
Numeric results or numeric results and IQ graph

Occupied bandwidth

Carrier power range	+30 dBm to –45 dBm
Frequency resolution	1.88 kHz

Frequency accuracy
(1.23 MHz channel bandwidth)
±15 kHz, characteristic

Frequency resolution of delta frequency
3.75 kHz

Frequency accuracy of delta frequency
± [35 kHz + (frequency reference error x carrier frequency)], characteristic

Spur close (in-band spur)

Carrier power range at RF input
+30 dBm to -12 dBm

Dynamic range

Input power	
25 to 30 dBm	55 dB
20 to 25 dBm	50 dB
–12 to 20 dBm	46 dB

Relative accuracy
±(2.7 dB + 0.01 x (dB from reference level)

Transmitter spurious emissions (out-of-band)

Out-of-band spurious emissions are made with user-defined tables with 20 frequency ranges each (up to the top 10 spurs per range, maximum 100 spurs). Table parameters include frequency range, RBW, video BW, detector type, and amplitude test limits.

Receiver spurious emissions (in IS-95 bands, 30 kHz RBW, 0 dB attenuation)

Spurious emission power range

–20 dBm to –83 dBm	
With preamplifier on (Option 1DS)	–40 dBm to –101 dBm

1. With active set threshold set less than all active channels but greater than –20 dBc, 9 channels active.
2. From even second signal to start of PN sequence, measurement interval ≥ 1.25 ms.
3. Pilot to code-channel time tolerance, measurement interval ≥ 1.25 ms, IS-97A nominal power levels.
4. Requires options 1D5, B7D and B7E.
5. Measurement interval ≥ 1.25 ms.
6. Excludes frequency reference error, measurement interval ≥ 2.5 ms.
7. Does not include noise floor.

Agilent ESA-E series spectrum analyzer product and application information

Option ordering information

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

Model:	E44xxB (xx = 02, 04, 05 or 07)
Model options:	E44xxB-Option 1 E44xxB-Option 2

Additional related options and accessories

Option A5D	12 Vdc power cable
Option AXT	Hard transit case
Option AYT	Soft carrying/operating case (grey)
Option AYU	Soft carrying/operating case (yellow)
Option AYZ	External mixing
Option UK9	Front panel cover
Option A4H	GPIB and parallel printer interfaces
Option 1AX	RS-232 and parallel printer interfaces
Option 1CP	Rackmount handle kit with slides
Option B7K	Distance to fault accessory kit
E1779A	Battery pack
11970/74	Series harmonic mixers
8498A	(Option 030) High power attenuator
IntuiLink software	PC software included free

Product literature

ESA-E Series Spectrum Analyzer, Brochure,
literature number 5968-3278E

ESA/EMC Spectrum Analyzer, Configuration Guide,
literature number 5968-3412E

ESA-E Series, Data Sheet,
literature number 5968-3386E

ESA-E Series Self-Guided Demo, Product Note,
literature number 5968-3658E

Select the Right Portable Spectrum Analyzer, Selection Guide,
literature number 5968-3413E

ESA BenchLink Spectrum Analyzer Software,
Product Overview, literature number 5966-0676E

ESA Snap-On Battery Pack, Product Overview,
literature number 5966-1851E

IntuiLink Software, Data Sheet,
literature number 5980-3115EN

Application notes

Understanding CDMA Measurement for Base Stations and Their Components, literature number 5968-0953E

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

Our Promise

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

Your Advantage

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

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