

GSM/GPRS Measurement Solutions for the Agilent ESA-E Series Spectrum Analyzers

Product Overview



Now the best-in-class ESA-E series spectrum analyzers have one-button GSM measurements with GPRS capability, for accurate standards compliant measurements in any environment.

Accurate and easy cell site optimization and troubleshooting

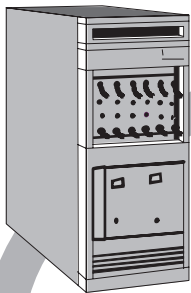
As a cellular network provider you are under increasing pressure to ensure optimal network performance. Interference free spectrum, combined with an optimized transmitter, means that the cellular system you maintain is performing at the peak of its operational capability.

The Agilent ESA-E series spectrum analyzers provide best-in-class general purpose spectrum analysis with built-in one-button standards compliant GSM/GPRS measurement capability 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

Transmitter tests

Test against GSM/GPRS standards with the touch of a button



General purpose spectrum analysis



Cable and antenna verification

Perform stimulus response measurements on components such as SWR and fault location with optional tracking generator



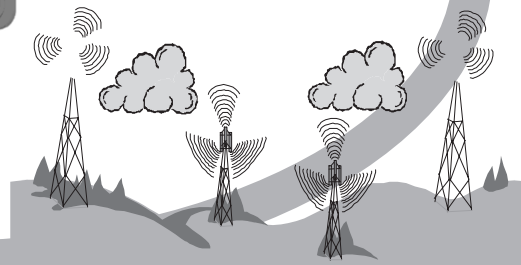
Microwave link verification

Operation to 26 GHz, >110 GHz with the external mixing option



Air interface quality

Identify low level interference with optional digital RBWs and optional built-in preamplifier



Here's how it benefits you

Accurate¹

Confidence in cell site performance

- ± 0.6 dB absolute channel power accuracy
- ± 10 Hz frequency accuracy
- $\pm 1.1^\circ$ RMS phase error accuracy

Easy-to-use

Faults are easy to find and installation verification is easy

- One-button, standards compliant GSM/GPRS measurements with pass/ fail messages for go/no-go testing
- Easy hook-up and triggering
- 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
- Custom channel tuning
- 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 software²
- 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 GSM/GPRS measurement set-up

With spectrum analysis

Maximize measurement capability and confidence

- 108 dB³ 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

- Affordable spectrum and modulation analysis on every engineer's bench

Manufacturing

- Spurious testing to 26.5 GHz
- 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. See specifications for complete details.

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

3. Typical

Here's the specific GSM450-850, DCS1800, PCS1900 or P/R/E-GSM900 measurements

The Agilent ESA-E series spectrum analyzer with built-in GSM/GPRS measurement capability allows accurate, fast qualification of GSM transmitter sites in all types of environmental conditions. All of the critical mobile measurements are also included. Based on ETS 300 607-1, 609-1, 910, and ANSI J-STD-007 specifications, the spectrum analyzer has enhanced capability to characterize GSM450-850, DCS1800, PCS1900 and P/R/E-GSM900 transmitters.

These key features are available at the press of a single button:

- Tune by ARFCN or carrier frequency
- Channel or band spectrum displays
- Mean TX power
- Power steps
- Power ramp (power versus time)
- Output RF spectrum (ORFS) due to modulation and switching transients
- Phase and frequency error
- In-band and out-of-band spurious measurements
- Distance to fault

Easy measurement execution is achieved with a new trigger system allowing measurements to be triggered on the mid-amble, RF burst or by using an external trigger.

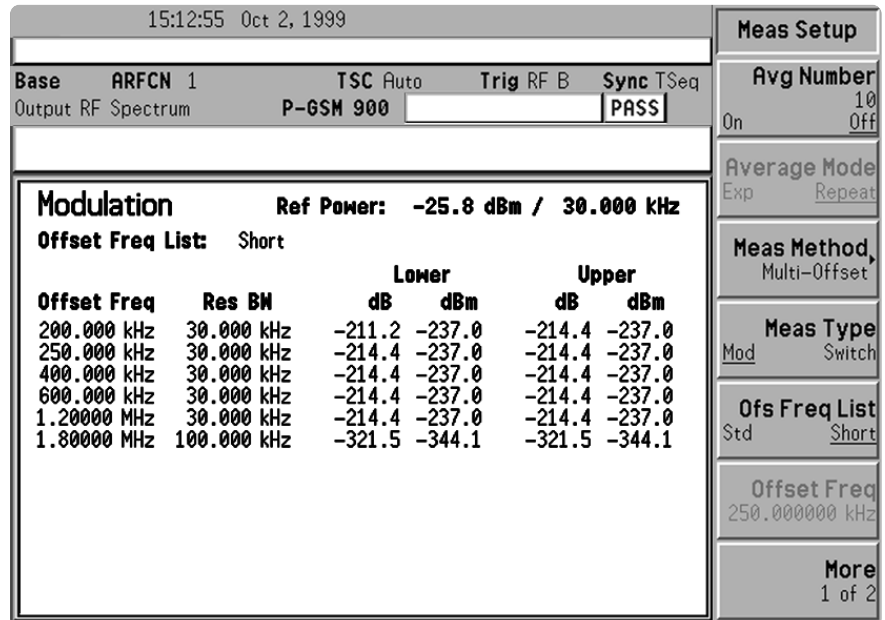


Figure 1. High-speed ORFS measurements, ensure that adjacent channel interference is quickly verified.

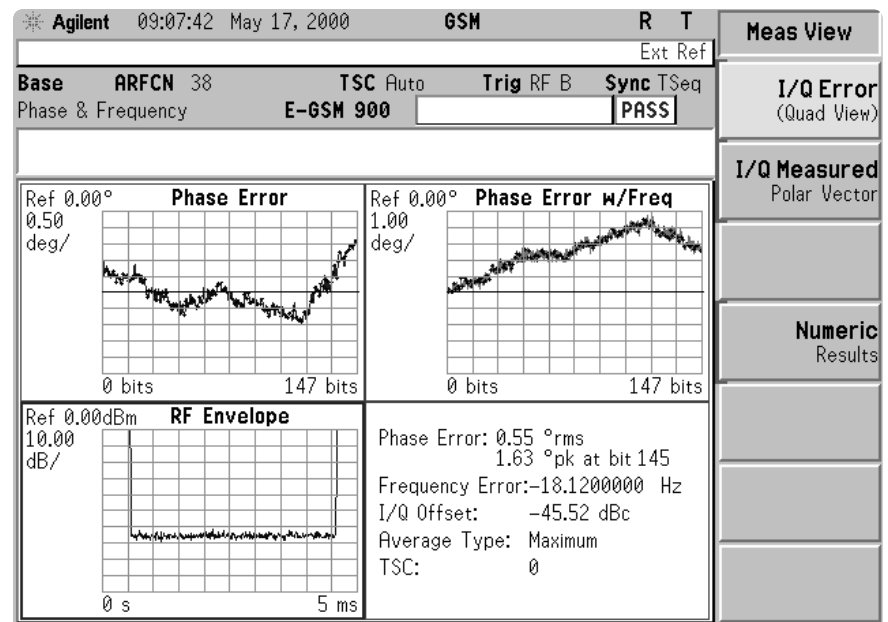


Figure 2. View modulation characteristics quickly and easily with the I/Q Error Quad View.

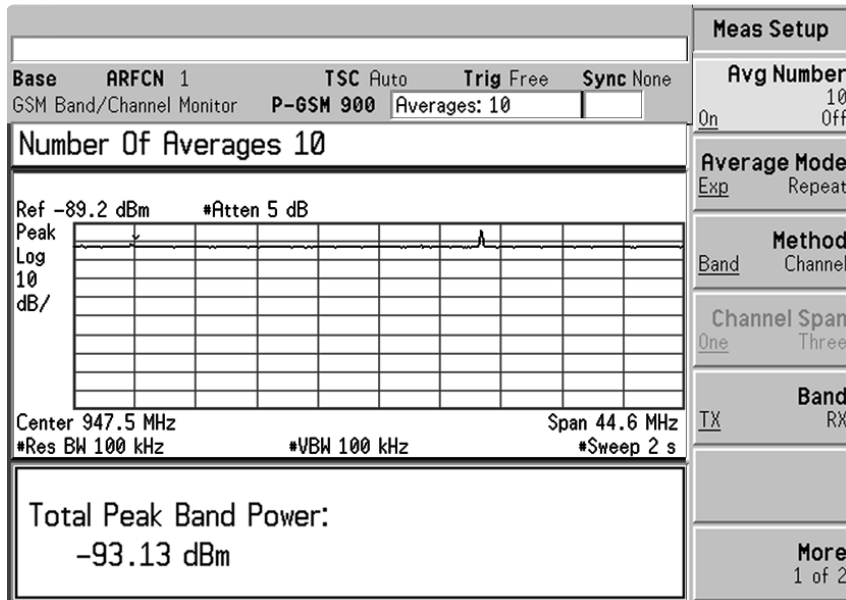


Figure 3. Easy identification of interference signals in-band using the monitor band feature combined with the analyzer's wide dynamic range and sensitivity.

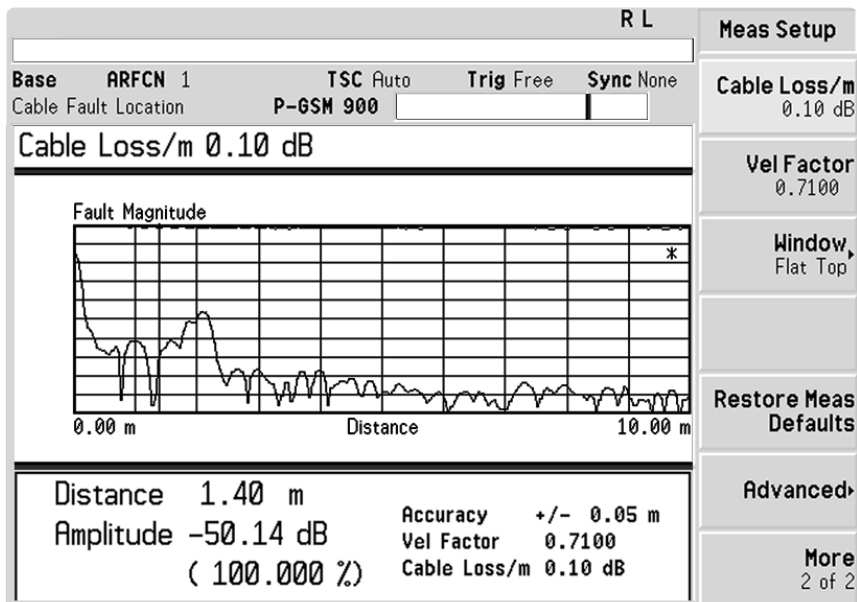
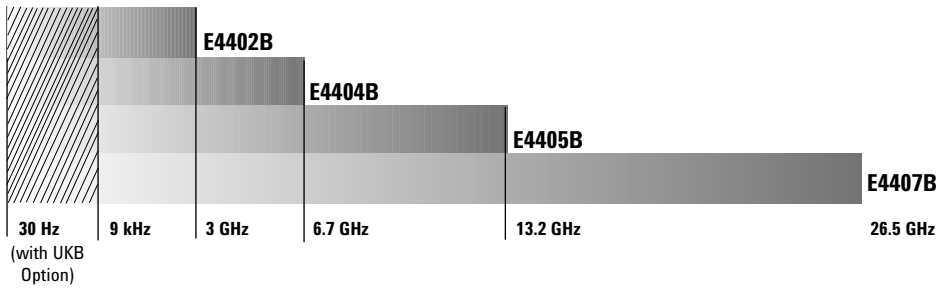


Figure 4. Cable and antenna faults can now be easily located using the built in high resolution distance to fault measurement.

Here's how you order it

First, choose your frequency range



ESA-E frequency ranges

Now, choose your option configuration

Use	Task	Option configurations	GSM/GPRS measurements
Transmission performance checks	<ul style="list-style-type: none"> Verifies equipment specifications Compliance to radio regulatory standards Verifying modulation quality and network synchronization 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 	<p>Required options: ESA-E series* spectrum analyzer plus options: BAH - GSM/GPRS 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)¹</p> <p>Recommended options: 1DN - 50 Ohm tracking generator</p>	<ul style="list-style-type: none"> Monitor channel/band Channel tuning Distance to fault (1DN required) Spurious emissions Power steps Output RF spectrum Power versus time Transmit power Phase and frequency error Easy triggering
Cell site functionality checks	<ul style="list-style-type: none"> Ensures that the RF transmission parameters are optimal Verifies the transmission and receive bands are free from interference Proves the quality of RF cables and connections 	<p>Required options: ESA-E series* spectrum analyzer plus options: BAH - GSM/GPRS measurement personality 1D6 - Time gated spectrum analysis AYX - Fast time domain sweep B72 - Memory extension¹</p> <p>Recommended options: B75 Performance bundle. Includes: High stability frequency reference (Option 1D5) Preamplifier (Option 1DS) Narrow resolution bandwidths (Option 1DR) 1DN - 50 Ohm tracking generator</p>	<ul style="list-style-type: none"> Monitor channel/band Channel tuning Distance to fault (1DN required) Spurious emissions Power steps Output RF spectrum Power versus time Transmit power
Basic cell site quality checks	<ul style="list-style-type: none"> Proves the quality of RF cables and connections Verifies the transmission and receive bands are free from interference 	<p>Required options: ESA-E series* spectrum analyzer plus options: BAH - GSM/GPRS measurement personality B72 - Memory extension¹</p> <p>Recommended options: B75 Performance bundle. Includes: High stability frequency reference (Option 1D5) Preamplifier (Option 1DS) Narrow resolution bandwidths (Option 1DR) 1DN - 50 Ohm tracking generator</p>	<ul style="list-style-type: none"> Monitor channel/band Channel tuning Distance to fault (1DN required) Spurious emissions Power steps

* GSM/GPRS measurement personality available for all ESA-E series analyzers except the E4401B 1.5 GHz analyzer.

1. Option B72 is standard if the serial prefix number is ≥ US4144 or MY4144.

GSM/GPRS specifications and characteristics

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.

Characteristics provide useful, but non-warranted, information about the functions and performance of the instrument. *Italics* = typical performance, or nominal values. For spectrum analyzer specifications, see the *ESA-E Series Spectrum Analyzers*, Technical Specifications, literature number 5968-3386E.

GSM in-band is defined as the following frequency ranges:

GSM 450	450.4 to 457.6 MHz, 460.4 to 467.6 MHz
GSM 480	478.8 to 486 MHz, 488.8 to 496 MHz
GSM 850	824 to 849 MHz, 869 to 894 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
GSM 900, R-GSM	876 to 915 MHz, 921 to 960 MHz
DCS1800	1710 to 1785 MHz, 1805 to 1880 MHz
PCS1900	1850 to 1910 MHz, 1930 to 1990 MHz

General specifications

Maximum safe input level: total power must not exceed +30 dBm (1 Ω). For use with higher power levels, an external attenuator must be used.

Precision frequency reference (Option 1D5)

Aging	±1 x 10 ⁻⁷ /year
Temperature stability	±5 x 10 ⁻⁸
External attenuation correction	0 to 81.9 dB
Resolution	0.01 dB

Transmit power specifications

Range at RF input: +30 dBm (1 Ω) to -60 dBm

Absolute power accuracy¹:

P-GSM, E-GSM, and R-GSM bands

E4402B	0 °C to 55 °C	20 °C to 30 °C
-20 dBm to 30 dBm	±1.5 dB	±1.0 dB, <i>0.4 typical</i>
-30 dBm to -20 dBm	±1.2 dB	±0.9 dB, <i>0.4 typical</i>
-40 dBm to -30 dBm	±1.2 dB	±1.0 dB, <i>0.4 typical</i>
-50 dBm to -40 dBm	±1.4 dB	±1.2 dB, <i>0.6 typical</i>
-60 dBm to -50 dBm	±1.5 dB	±1.3 dB, <i>0.7 typical</i>

E4404B, E4405B

-20 dBm to 30 dBm	±1.3 dB	±0.8 dB, <i>0.3 typical</i>
-30 dBm to -20 dBm	±1.1 dB	±0.7 dB, <i>0.3 typical</i>
-40 dBm to -30 dBm	±1.1 dB	±0.8 dB, <i>0.3 typical</i>
-50 dBm to -40 dBm	±1.2 dB	±1.0 dB, <i>0.5 typical</i>
-60 dBm to -50 dBm	±1.3 dB	±1.1 dB, <i>0.6 typical</i>

E4407B

-20 dBm to 30 dBm	±1.4 dB	±0.9 dB, <i>0.3 typical</i>
-30 dBm to -20 dBm	±1.1 dB	±0.8 dB, <i>0.3 typical</i>
-40 dBm to -30 dBm	±1.1 dB	±0.8 dB, <i>0.3 typical</i>
-50 dBm to -40 dBm	±1.2 dB	±1.0 dB, <i>0.4 typical</i>
-60 dBm to -50 dBm	±1.3 dB	±1.1 dB, <i>0.6 typical</i>

DCS1800 and PCS1900 bands

E4402B	0 °C to 55 °C	20 °C to 30 °C
-20 dBm to 30 dBm	±1.4 dB	±0.8 dB, <i>0.3 typical</i>
-30 dBm to -20 dBm	±1.1 dB	±0.7 dB, <i>0.3 typical</i>
-40 dBm to -30 dBm	±1.1 dB	±0.8 dB, <i>0.3 typical</i>
-50 dBm to -40 dBm	±1.2 dB	±1.0 dB, <i>0.5 typical</i>
-60 dBm to -50 dBm	±1.3 dB	±1.1 dB, <i>0.6 typical</i>

E4404B, E4405B

-20 dBm to 30 dBm	±1.3 dB	±0.8 dB, <i>0.3 typical</i>
-30 dBm to -20 dBm	±1.1 dB	±0.7 dB, <i>0.3 typical</i>
-40 dBm to -30 dBm	±1.0 dB	±0.8 dB, <i>0.3 typical</i>
-50 dBm to -40 dBm	±1.1 dB	±0.9 dB, <i>0.4 typical</i>
-60 dBm to -50 dBm	±1.3 dB	±1.1 dB, <i>0.6 typical</i>

E4407B

-20 dBm to 30 dBm	±1.5 dB	±0.9 dB, <i>0.3 typical</i>
-30 dBm to -20 dBm	±1.1 dB	±0.7 dB, <i>0.3 typical</i>
-40 dBm to -30 dBm	±1.1 dB	±0.8 dB, <i>0.3 typical</i>
-50 dBm to -40 dBm	±1.2 dB	±1.0 dB, <i>0.4 typical</i>
-60 dBm to -50 dBm	±1.3 dB	±1.1 dB, <i>0.6 typical</i>

1. Plus any external attenuation.

Power versus time characteristics

Range at RF input	+30 dBm (1 Ω) to -55 dBm
Time resolution accuracy	$\pm 1\%$ of sweep time
Maximum record length	8 timeslots
Burst to mask uncertainty	± 1 bit

Phase and frequency error specifications

Range at RF input: +30 dBm to -55 dBm, characteristic

Phase error

Range: 0° to $+180^\circ$

Display resolution: 0.01°

RMS measurement accuracy $\pm 1.1^\circ$, 0.6° typical

Peak measurement accuracy $\pm 2.1^\circ$, 1.5° typical

Frequency error accuracy¹ ± 10 Hz, 5 Hz typical

I/Q offset range -10 to -46 dBc

Output RF spectrum characteristics

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 -4 dBm

Spectrum due to modulation

Displayed dynamic range for specific offsets²

Offset (dB)	100 kHz	200 kHz	250 kHz	400 kHz	600 kHz to 1.8 MHz	> 6 MHz
	30	60	60	70	79	76

Swept mode dynamic range 70 dB

Spectrum due to switching transients

Displayed dynamic range for specific offsets²

Offset (dB)	400 kHz	600 kHz	1200kHz	1800kHz
	62	79	79	80

Swept mode dynamic range 70 dB

Transmit band spurious characteristics

Carrier power range at RF input: 30 to -12 dBm, typical

Dynamic range

upper and lower adjacent segments 55 dB

upper and lower segments 44 dB

Relative accuracy

± 0.3 dB -0.01 x (dB from reference level)

1. Averages ≥ 10 , excludes frequency reference error.

2. Applies to CW signal at the specified offset. Dynamic range with a GSM signal may differ.

Out-of-band spurious characteristics

The out-of-band spurious measurement is made in accordance with the tables defined in the appropriate ETS specifications document. The measurement is made over several frequency ranges (up to 10 spurs per range, 100 spurs maximum).

RBW	Sensitivity
1 kHz	-95 dBm, characteristic
3 kHz	-90 dBm, characteristic
10 kHz	-85 dBm, characteristic
30 kHz	-78 dBm, characteristic
100 kHz	-71 dBm, characteristic
300 kHz	-64 dBm, characteristic
1 MHz	-57 dBm, characteristic
3 MHz	-50 dBm, characteristic

Receive band spurious characteristics

Range at RF input:	-20 to -73 dBm
Preamp on (Option 1D5)	-40 to -91 dBm
Absolute spurious emission power accuracy	
-20 to -60 dBm	±1.5 dB, characteristic
-60 to -73 dBm	±2.1 dB, characteristic
Preamp on (Option 1D5)	
-40 to -70 dBm	±1.8 dB, characteristic
-70 to -91 dB	±3.0 dB, characteristic

General characteristics

Amplitude	
Range control	RF input auto-range, manually set max total power, or manually set input attenuation
Trigger	
Trigger source	Free run, external or RF burst and frame ¹ . Available settings vary with measurement selected.
RF burst trigger	
Peak carrier power range ²	+30 dBm to -50 dBm
Trigger level range	0 to -25 relative to signal peak
External trigger input	BNC (f), 5 V TTL
External Reference Input	
Frequency	1 MHz to 30 MHz, selectable

1. Enabled with options 87D and B7E.
2. With trigger level set to -6 dB.

Agilent ESA-E series spectrum analyzer product and application information

Additional recommended 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 IAX	RS-232 and parallel printer interfaces
Option ICP	Rackmount handle kit with slides
Option B7K	Distance to fault accessory kit
E1779A	Battery pack
8498A	(Option 030 high power attenuator)
E4444A	BenchLink spectrum analyzer software
11970/74	Series harmonic mixers
IntuiLink software	PC software included free

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

Product literature

ESA-E Series Spectrum Analyzer, Brochure, literature number 5968-3278E
ESA-E Series Spectrum Analyzer, Technical Specifications, literature number 5968-3386E
ESA/EMC Spectrum Analyzer, Configuration Guide, literature number 5968-3412E
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

AN 1312: Understanding GSM Transmitter Measurements for Base Transceiver Stations and Mobile Stations, literature number 5968-2320E

For further information

For the latest news, product, and support information, application literature and more visit our Web page at:

<http://www.agilent.com/find/esa>
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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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Japan:
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(fax) (81) 426 56 7840

Canada:
(tel) 1 877 894 4414
(fax) (905) 282 6495

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

China:
(tel) 800 810 0189
(fax) 1 0800 650 0121

Taiwan:
(tel) 080 004 7866
(fax) (886 2) 2545 6723

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

Other Asia Pacific Countries:
(tel) (65) 375 8100
(fax) (65) 836 0252

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

Email: tm_asia@agilent.com

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