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Agilent
Spectrum Analyzer Measurement Solutions for GSM Systems

Product Overview

Agilent 8590 E-series
Agilent 85727A
Agilent 85715B
Agilent 85722B
Agilent 85722B Option H19

General purpose spectrum analysis with GSM transmitter measurements in the field, in the rack or on the bench.



Agilent Technologies
Innovating the HP Way

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Flexible spectrum analyzer with GSM application solutions

Whatever frequency band your GSM system operates in, Agilent Technologies' portfolio of GSM measurement personalities for the Agilent 8590 E-series spectrum analyzer ensures you have the right solution for your testing needs.

Performance and flexibility

On the bench, in the rack or in the field, the 8590 E-series of portable spectrum analyzers provides the measurement functionality to meet your testing needs head on. Advanced GSM900, DCS1800 and PCS1900 measurements are blended with the versatility and performance of a multi-purpose spectrum analyzer.

A change of personality

Using the 8590 E-series spectrum analyzer with one of Agilent's range of GSM transmitter measurement personalities completely transforms its measurement capabilities. Complex GSM measurements are reduced to single button operations. Easy-to-use softkey menus are labeled with familiar GSM measurement names. Results are displayed real-time with standard GSM limit lines and masks.



Operating in more than one GSM band?

The next generation of GSM systems offers inter-working between GSM900, DCS1800 and PCS1900 systems. The 85727A measurement personality with the 8590 E-series analyzer gives you confidence that your new multiband systems conform to worldwide GSM standards, and helps guarantee that your new products or services are aligned with the next stage of the evolution of the GSM market.

Complete transmitter testing

Based on the GSM 05.05, 11.10 and 11.21 specifications, the measurement personalities provide the capability to completely characterize the transmitters listed below.

Key measurements include:

- Phase and frequency error
- Demodulated data display
- Mean TX carrier power
- Power versus time
- Output RF spectrum
- Intermodulation attenuation
- Spurious emissions
- Combiner tuning

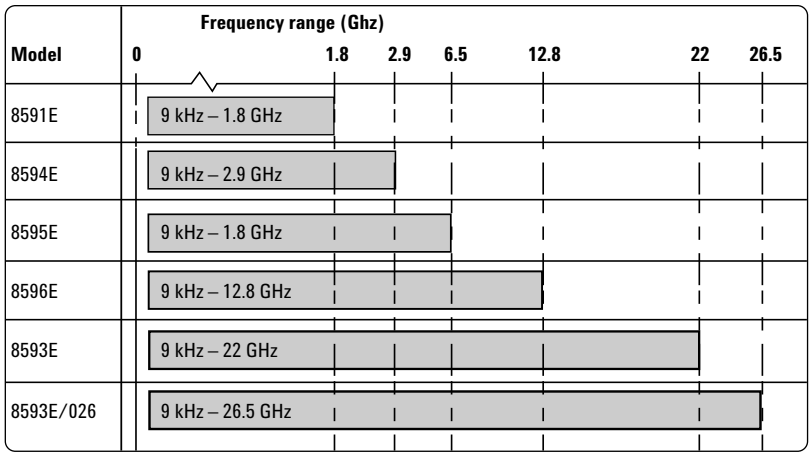
• GSM multi-band	85727A
• GSM900	85715B
• DCS1800	85722B
• PCS1900	85722B Option H19

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GSM900/E-GSM/ R-GSM/DCS1800/ PCS1900

On-site performance

For Base Transceiver Station (BTS) installation, acceptance testing or maintenance, the 8590 E-series provides an unbeatable combination of GSM performance and ease-of-use. The 8590 E-series can also be customized to take on other cellsite measurement challenges. For example, adding options and measurement personalities allows detailed characterization of microwave links.



Manufacturing test

Easy to integrate into GPIB controlled test systems, the 8590 E-series is ideal for manufacturing test. With measurements tailored to the demanding needs of high-volume production, it is especially suited to RF module pre-test, for mobiles or base stations. The ease-of-use and troubleshooting power of the 8590 E-series is also ideal for repair and rework benches.

Research & development

Spectrum analyzers are essential measurement tools for all RF designers. The 8590 E-series has the performance for all your design needs, even up to 26.5 GHz. With measurement personalities, the 8590 E-series brings complex GSM tests and advanced spectrum analysis to the designer's bench. The optional digital signal processor boards (Options 151 and 163) allow accurate GSM modulation measurement. Specialized and expensive test equipment is no longer necessary to analyze GMSK modulation; the 8590 E-series brings the GSM phase and frequency error measurement to every designer's bench.

A multi-purpose test tool

The GSM transmitter measurement personalities are members of a large family of software and measurement boards for the 8590 E-series. As a flexible measurement platform, the 8590 E-series can grow and change with your company. If GSM is today's business, but CDMA, NADC, DECT or EMC is tomorrow's, the 8590 E-series can be upgraded to meet your needs.

Fit an analyzer to your frequency range needs

Offering high quality spectrum analysis with customized measurements, the 8590E series provides the right combination of power and portability. For spurious checking up to 26.5 GHz, the 8590 E-series of spectrum analyzers have frequency ranges which match your requirements and budget.

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GSM900/E-GSM/ R-GSM/DCS1800/ PCS1900 *continued*

Complete transmitter testing at the press of a button

Based on the GSM 05.05, 11.10 and 11.21 specifications, the 85727A, 85715B and 85722B provide the capability to completely characterize GSM900, DCS 1800 or PCS1900 transmitters.

Key measurements include:

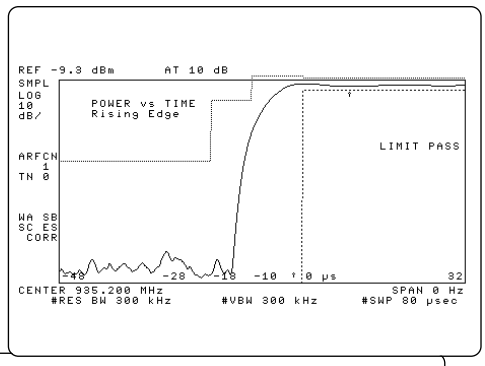
Power, frequency and timing measurement ...

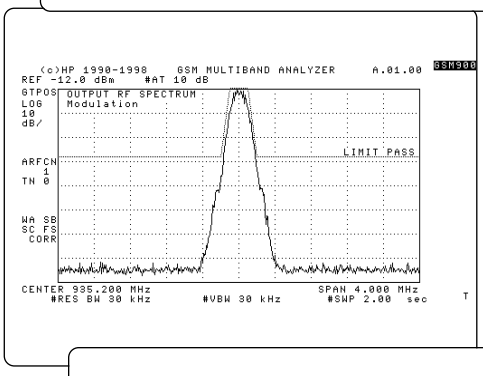
Tuning by channel number (ARCFN) for standard GSM, E-GSM, R-GSM, DCS1800 and PCS1900

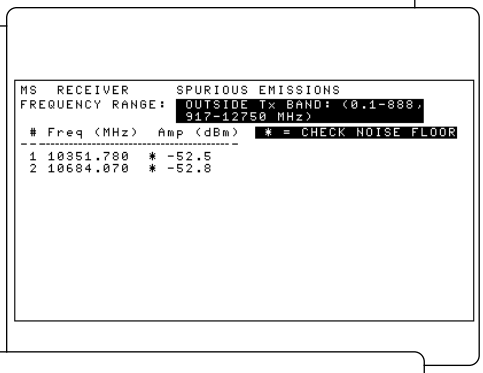
- Automatic channel search
- Mean TX carrier power
- Burst ramp-up, on and ramp-down power versus time mask
- Output RF spectrum
- Intermodulation attenuation
- Spurious emissions
- Combiner tuning

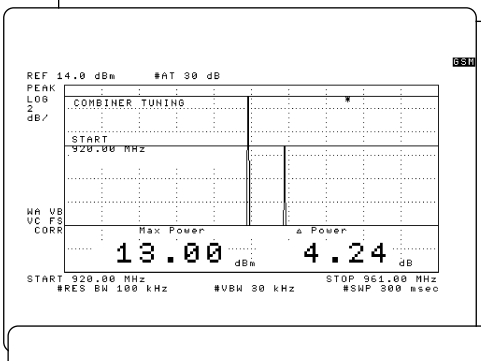
Modulation accuracy measurements ...

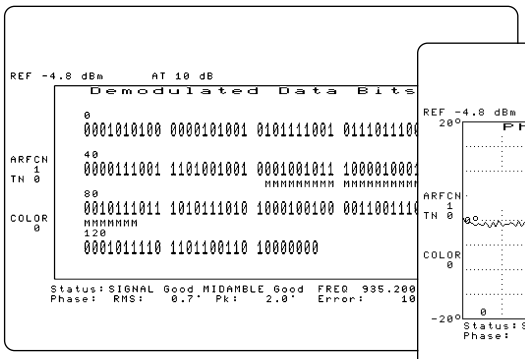
- Phase and frequency error
- Demodulated data display

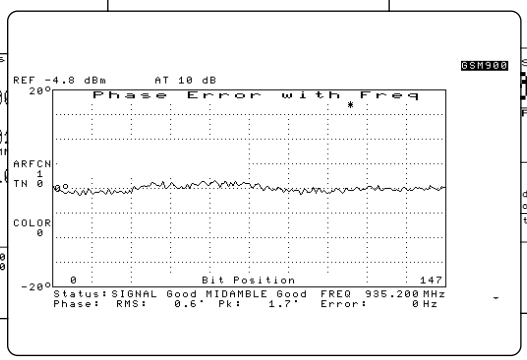


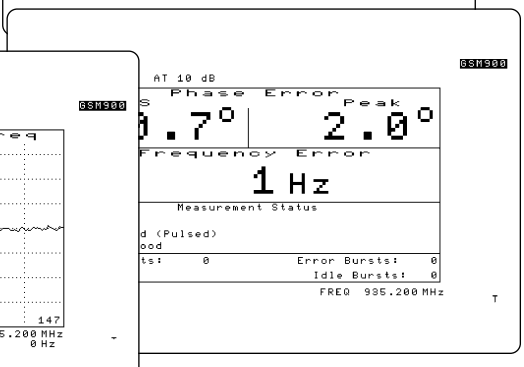












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BTS installation and maintenance

Ensured system quality

If you are responsible for the test and verification of GSM base stations you will be faced with many problems that can reduce the quality of signal to and from the subscriber. The 8590 E-series of spectrum analyzers, with a GSM transmitter measurement personality has easy-to-use GSM measurement functionality, while providing the versatility and performance of a great general-purpose spectrum analyzer.

As well as a full range of GSM RF measurements, the 8590 E-series analyzer with additional measurement personality and optional measurement hardware can offer:

- Stimulus response measurements
  - Flatness
  - SWR
- Spurious or interfering signal analysis (up to 26.5 GHz)
- Combiner tuning AM or FM demodulation (available option for interfering signal identification)

Base station and RF interface testing

Whether you are performing RF measurements in the field or the service depot, the ensured RF performance a quality spectrum analyzer can give, alongside more dedicated base station test solutions, helps guarantee that your RF interface is operating optimally and free from interference.

Portable and rugged by design

The 8590 E-series spectrum analyzer is ideal for demanding field applications. A selection of durable carrying cases is available that makes the analyzer easy to transport and protects it from moisture and dirt. The analyzer is fully operational within the case so you never need to remove it.

Adding the 85901A portable AC power source makes a truly complete mobile system.

More than just a BTS tester

For complete cell-site RF testing, the 85710A and 85713A digital radio personalities or the 11770A link measurement personality and hardware options add the capability to characterize microwave links. You can make measurements such as group delay, amplitude flatness, Diversity Antenna Delay Equalization (DADE) and IF return loss.

Eliminating the need for separate link-analysis equipment provides significant cost and space savings.

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Manufacturing

Ensured manufacturing quality

Being responsible for the test and verification of GSM-based assemblies or modules, you will know that testing them involves some complex RF measurement challenges. The 8590 E-series of spectrum analyzers provides easy to use measurement functionality that ensures reduced operator training and easy integration into your existing test processes.

Reduce rework time and improve yield

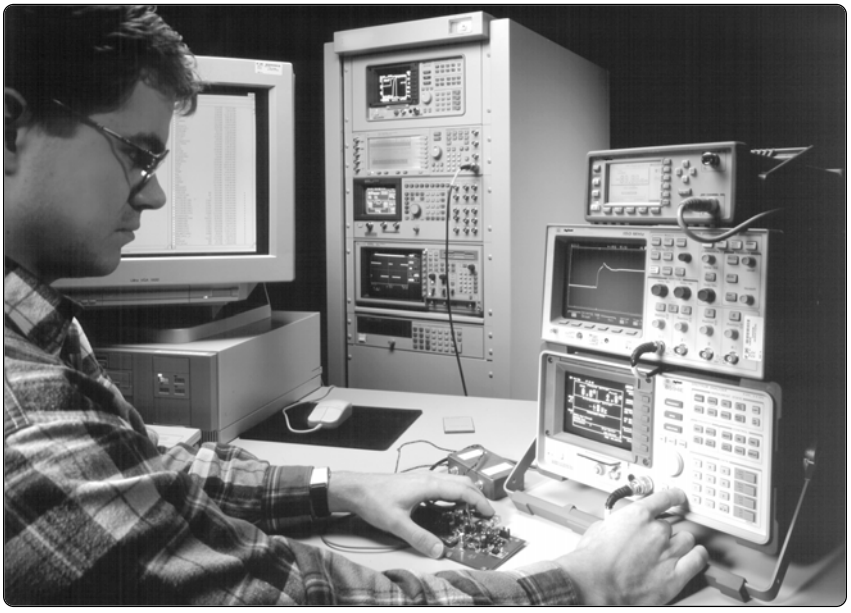
To guarantee that printed circuit assemblies pass into box-up and final test free from defects, the 85727A offers pass/fail limit checking on a number of complex RF tests at the press of a single button. If an assembly needs rework, the flexibility and accuracy of the Agilent 8590 E-series spectrum analyzer provides all the capability needed for RF circuit debugging.

General purpose manufacturing test tool

The 8590 E-series is ideal for manufacturing test. It is especially suited to RF assembly or module pre-test, for both mobile and base station manufacture. The measurements are tailored to the demanding needs of high volume production. The 8590 E-series also offers ease-of-use and troubleshooting power ideal for repair and rework benches.

Easy test-system integration

A comprehensive remote control command language and product documentation, combined with Agilent's world-wide network of support centers, ensure trouble-free integration into GPIB controlled test systems.



Flexibility

To help ensure that your investment in test equipment withstands the future evolution of cellular communications, the 8590 E-series spectrum analyzer has a range of cellular and cordless measurement personalities and hardware options. In addition to GSM, these include CDMA, NADC, DECT and EMC.

High performance test solutions tailored to your needs

Agilent Technologies realizes that testing RF communications systems requires more than just good RF test equipment. We have the test hardware, software, computers, system integrators, consultants and training classes to provide all you need to be successful. From offering you single instruments, such as the 8590 E-series spectrum analyzer, to setting up complete test lines and programs — we can work with you to meet your needs.

Team up with Agilent

Agilent Technologies has earned a reputation as the premier test and measurement company, with a continued leadership in technology. Agilent has also built a strong reputation for our technical consulting and product support services, focused on ensuring that you receive the best possible value from Agilent products.

Focus on your competencies

Agilent Technologies can play a larger role, and is willing to understand your total test needs to provide a quality-engineered, integrated test solution that meets your unique requirements. This service allows you to focus on your core business, helping you manage your time and resources effectively, ultimately contributing to bringing your products to market faster with increased volume and cost savings.

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Advanced features for design and verification

Ensure design integrity

The design and verification of GSM-based systems requires comprehensive RF analysis. The 8590 E-series of spectrum analyzers provides the essential measurement functionality and flexibility that you would expect from an industry standard bench-top RF tool, as well as the ability to perform standard GSM measurements. This powerful alliance of a feature-rich general-purpose spectrum analyzer and GSM measurements in a single box helps you confidently prove the integrity of your design throughout the product development cycle.

GSM testing plus powerful spectrum analysis

In product design and verification it is imperative that your test equipment not only tests to the requirements specified by GSM, but also ensures your design is verified to the highest possible standard. As well as offering all the features of a great general-purpose spectrum analyzer, the 8590 E-series analyzers have been designed to do more for you. The in-built advanced operation functions give you the features you need to verify your design.

Zoom window

Allows you to zoom in quickly on any portion of the display. It splits the display into two half-size displays: one half is your original display; the other half is your zoom window.

Peaks table

Automatically determines the ten largest peaks, and displays their values in a tabular format by frequency or amplitude.

FFT

Analyze close in AM components.

Gate utility

Advanced time-gated spectrum analysis measurements out with the GSM specification.

Built in RF diagnostic measurements

- Adjacent channel power
- Occupied bandwidth power
- Third-order intercept
- Percent AM
- N dB points bandwidth

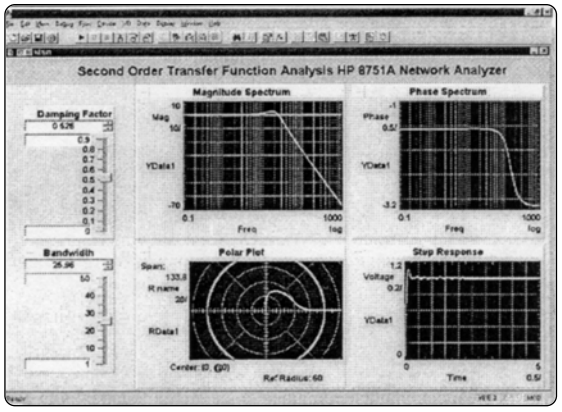
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Remote control, data storage and analysis

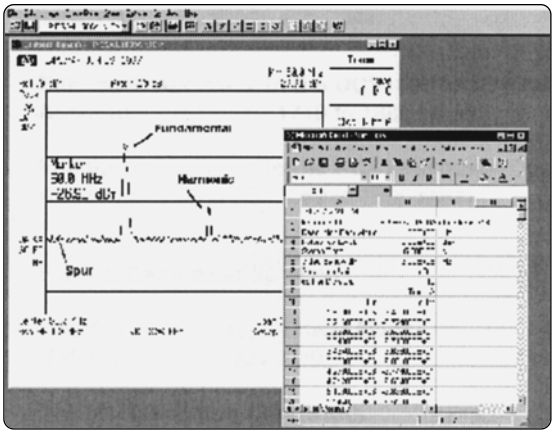
Data storage and output

Measurement data can be saved to internal memory or to external memory cards. Up to 50 states and traces can be stored in the analyzer's non-volatile internal memory. You can also save entire displays to memory cards, including data tables and other on-screen text. Memory cards are available with 32, 128, 256 or 512 Kbytes RAM.

With Agilent VEE (E2120E or E2111E) you can control the Agilent 8590 E-series analyzer using GPIB or RS232, offering fast and efficient direct I/O. Agilent VEE provides over 200 math and analysis functions that range from elementary math to calculus, digital signal processing, and regression analysis. It brings data and test results to life with indicators, meters, XY plot and stripcharts. You can display complex data including waveforms and spectra on polar plots, Smith charts, and magnitude and phase plots.



Agilent Benchlink (E4444A) is a software program that provides a method of easily transferring measurement results from the 8590 E-series spectrum analyzer to a PC. It can be used to capture screen and trace data over GPIB or RS-232 interfaces for the purposes of analysis or archiving. Screen images can be saved as PCX, TIF, GIF, HP-GL and BMP formats. Trace data for analysis is in the form of frequency/amplitude pairs and can be exported to many popular spreadsheet programs. Instrument setups may also be stored and recalled to recreate previous instrument settings.



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Specifications

Specifications describe the instrument's fully warranted performance and apply after a 30 minute warm-up. **Supplemental characteristics** (shown in *italics*) are intended to provide additional information, useful in applying the instrument, by giving typical (expected) but non-warranted performance parameters.

A positive or negative TTL transition is required to synchronize the measurement system with the transmitter under test. The synchronization signal must occur once per GSM (GSM900, DCS1800 or PCS1900) frame. A trigger signal is required for the carrier power, power vs. time, ORFS, data bit demodulation, and phase and frequency error measurements.

Minimum specifications for the required preamplifier, used in spurious and intermodulation measurements are: noise figure of <10 dB, gain of >22 dB, SWR of 1.7. Minimum specifications for the required bandpass filter centered on the receive band: insertion loss <4 dB, band rejection >90 dB outside of the receive band.

General

Safe maximum input power
Total power: <+30 dBm or 1 watt

Power levels >+30 dBm require an external attenuator. *(Specifications and characteristics have been written assuming a 30 dB input power attenuator. The recommended power attenuator is 8498A Option 030. Using this attenuator, the system input power range is +43 to +13 dBm. Higher or lower values of input power can be accommodated by using different input power attenuators.)*

Internal frequency reference (Option 004):
Aging ±1 x 10^{-7}/year

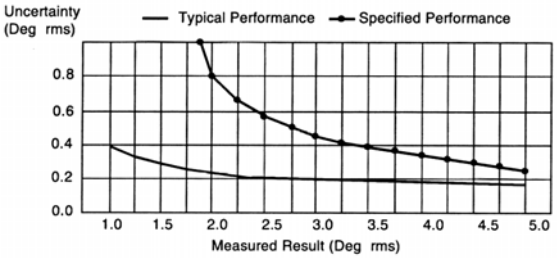
Typical measurement speed:
(Does not include set-up time)

	1 burst	*10 bursts*
Phase and frequency error	*2 sec*	*20 sec*
Carrier power	*3 sec*	*8 sec*
Power vs time	*4 sec*	*8 sec*
Output RF spectrum (swept)	*5 sec*	*24 sec*
Spurious emissions	*40 sec*	
Intermodulation attenuation	*15 sec*	

Phase and frequency error measurement

RMS phase error
Accuracy: <1° rms (for readings >1.8° rms)

RMS phase error uncertainty vs measured value

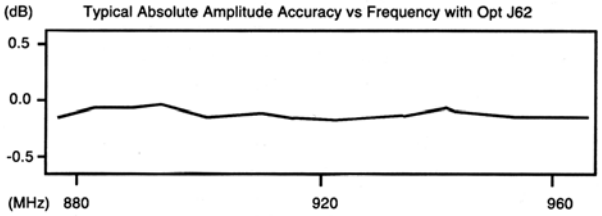


Peak phase error
Accuracy: <4° peak (for readings >1.8° rms)
Frequency error
Accuracy: 7 Hz+noise+reference (at 900 MHz)
9 Hz+noise+reference (at 1800 MHz)
(Noise is in Gaussian distribution with a mean value of 0 Hz and a standard deviation of 7 Hz at 900 MHz and 9 Hz at 1800 MHz)

Mean transmitter RF carrier power

Amplitude accuracy
Relative: ±1.0 dB
Absolute: ±2.3 dB
(RSS error derived from spectrum analyzer, Option 105 and 8498A Option 030 external attenuator specifications.)

Enhanced accuracy in the GSM900 band (Option J62)
Absolute: ±1.0 dB (880 to 960 MHz)



Enhanced accuracy in the DCS1800 band (Option J63)
Absolute: ±1.0 dB (1710 to 1880 MHz)

Enhanced accuracy in the PCS1900 band (Option J66)
Absolute: ±1.0 dB (1850 to 1990 MHz)

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Transmitted power vs time

Amplitude accuracy (linear mode)
Relative *±3% (0.25 dB)*

Default resolution bandwidth:

Test	*Resolution bandwidth*
Full timeslot	*1 MHz*
Top 10 dB	*1 MHz*
Rising edge	*300 kHz*
Falling edge	*300 kHz*

Dynamic range:

Input power	*Resolution bandwidth*	
	300 kHz	*1 MHz*
+43 to + 13 dBm	*70 dB*	
68 dB		

Time resolution:

Test	*Displayed time resolution*
Full timeslot	*2.0 µs*
Top 10 dB	*2. 0 µs*
Rising edge	*0.25 µs*
Falling edge	*0.25 µs*

Error with respect to external trigger:

Input power	*Resolution bandwidth*	
	300 kHz	*1 MHz*
Full timeslot	*–4.0/+6.5 µs*	*–4.0/+5. 0 µs*
Top 10 dB	*–4.0/+6.5 µs*	*–4.0/+5. 0 µs*
Rising edge	*–2.2/+5.9 µs*	*–2.2/+3.1 µs*
Falling edge	*–2.2/+6. 0 µs*	*–2.2/+3.2 µs*

Intermodulation attenuation

Dynamic range (100 kHz to 12.75 GHz, excluding relevant GSM900, OCS1800 or PCS1900 receive band):
(30 kHz RBW, maximum hold on)

Input power	*Dynamic range*	
	<6 GHz	>6 GHz
+43 to +13 dBm	75 dB	68 dB

Receive band sensitivity (dBm):

Resolution bandwidth	*Displayed average noise level (includes maximum hold on, peak detector on)*
30 kHz	*–107 dBm + filter insertion loss*
100 kHz	*–102 dBm + filter insertion loss*
300 kHz	*–97 dBm + filter insertion loss*

Amplitude accuracy
Absolute *±4.9 dB*
Relative *±1.0 dB*[1]

Output RF spectrum

Modulation spectra dynamic range (dB):
(30 kHz RBW)

Input power	*Offset from carrier (kHz)*				
	100	*200*	*250*	*400*	*600 to 1800*
+43 to +13 dBm	*–30*	*–52*	*–60*	*–72*	*–75*

Switching transient spectra dynamic range (dB):
(30 kHz RBW, maximum hold)

Input power	Offset from carrier (kHz)			
	400	600	1200	1800
+43 to +13 dB	–72	–75	–75	–75

Spurious emissions

Outside receive band sensitivity (dBm):
(maximum hold on)

Total power (kHz)	Resolution bandwidth (kHz)						(MHz)	
	1	3	10	30	100	300	1	3
43	–42	–36	–30	–26	–21	–16	–11	–6
40	–52	–46	–40	–36	–31	–26	–21	–16
39	–52	–46	–40	–36	–31	–26	–21	–16
37	–52	–46	–40	–36	–31	–26	–21	–16
34	–52	–46	–40	–36	–31	–26	–21	–16
33	–52	–46	–40	–36	–31	–26	–21	–16
30	–62	–56	–50	–46	–41	–36	–31	–26
29	–62	–56	–50	–46	–41	–36	–31	–26
24	–62	–56	–50	–46	–41	–36	–31	–26
21	–62	–56	–50	–46	–41	–36	–31	–26
13	–72	–66	–60	–56	–51	–46	–41	–36

Within transmit band, sensitivities are valid only at offsets greater than 600 kHz from the carrier.

Receive band sensitivity (dBm):
(Bandpass filter and preamplifier are required)

Resolution bandwidth	Displayed average noise level (includes maximum hold on, peak detector on)
30 kHz	–107 dBm + filter insertion loss
100 kHz	–102 dBm + filter insertion loss
300 kHz	–97 dBm + filter insertion loss

Absolute accuracy
Absolute *±4.9 dB*
Relative *±1.0 dB*[1]

1 (RSS of typical error for bandpass filter, 87405A preamplifier and 859x E-series spectrum analyzer)

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Ordering Information

Recommended configuration
With GSM phase and frequency error measurement:

859xE	Portable spectrum analyzer[1]
Option BD1	Global system for mobile communication (GSM)

This option includes:

Option 004	Precision frequency reference[2]
Option 105	Time-gated spectrum analysis[5]
Option 151	Fast ADC and digital demodulator[3]
Option 163	GSM/DCS firmware for Option 1513

The* 85727 *includes:

85727A	GSM multi-band transmitter Measurement personality[6]
85715B	GSM900 transmitter measurement personality
85722B	DCS1800 transmitter Measurement personality
85722B Option H19	PCS1900 measurement personality

Without GSM phase and frequency error measurement:

859xE	Portable spectrum analyzer[4]
Option 004	Precision frequency reference[2]
Option 101	Fast time domain sweep card[5]
Option 105	Time-gated spectrum analysis card[5]

Related spectrum analyzer options:

Option 010	Built-in tracking generator
Option 015	Soft tan operating/carrying case
Option 016	Soft yellow operating/carrying case
Option 040	Front panel protective cover
Option 041	GPIB interface
Option 043	RS232 interface
Option 908	Rackmount kit without handles
Option 909	Rackmount kit with handles
Option J62	Enhanced power measurement accuracy in the GSM900 band (880 to 960 MHz)
Option J63	Enhanced power measurement accuracy in the DCS1800 band (1710 to 1880 MHz)
Option J66	Enhanced power measurement accuracy in the PCS 1900 band (1850 to 1990 MHz)

Accessories:

8498A	Option 030 power attenuator
85901A	Portable AC power source
85902A	Burst carrier trigger
87405A	Preamplifier 0.01 to 3 GHz, 22 dB gain
C1405A	Option ABA keyboard

Measurement personalities:

11770A	Link measurement personality
85710A	Digital radio measurement personality
85712D	EMC measurement personality
85713A	Digital radio measurement personality
85714A	Scalar measurement personality
85717A	CT2-CAI measurement personality
85718B	NADC/PCS-TDMA measurement personality
85719A	Noise figure measurement personality
85720C	PDC test personality
85721A	CATV measurement personality
85723A	DECT measurement personality
85724A	Broadcast personality
85725C	CDMA test personality
85726B	PHS measurement personality

Related products:

8560 E-series	**spectrum analyzers.** Combine outstanding phase noise, sensitivity, 1 Hz resolution bandwidth and wide dynamic range.
8922	Series of GSM MS test sets
89441A	**RF vector signal analyzer.** Provides the highest quality digital modulation analysis.
ESA-E1500L	**1.5 GHz portable spectrum analyzer** Cost effective general purpose spectrum analyzer.
ESG-D series	**digital signal generators**
E2120E	VEE for Windows 95/NT
E2111E	VEE for series 700/HP-UX 9.x and 10
E4444A	Benchlink

1 Phase and frequency error measurement is supported on the 8593E, 94E, 95E and 96E. The 8591E is not supported with Option 163, and is not supported for phase and frequency error measurement. 8590E-series firmware datecode later than 930923 is required for compatibility with Option 163.
2 Required unless 10 MHz external reference is available.
3 Required for proper operation of 85715B or 85722B with phase and frequency error measurement option.
4 85715B and 85722B without the phase and frequency error measurement capability are supported on 8593E, 8594E, 8595E and 8596E. 85715B is also supported on 8591E. The spectrum analyzer firmware datecode 26.10.90 or later is required.
5 Required for proper operation of 85715B or 85722B.
6 The 85727A is not available on the 8591E.

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