Agilent 85719A

Noise Figure Measurements Personality

Data Sheet

The Agilent Technologies 85719A noise figure measurements personality adds noise-figure measurement capability to the Agilent 8590 E-series Option 119 spectrum analyzers. Combined with the 346B noise source, 87405A preamplifier, and Option 119, this measurement personality provides displayed swept noise figure and gain measurements from 10 MHz to 2.9 GHz.

The 85719A offers one-point measurement capability for quick results, a repeatability calculator for determining measurement time/repeatability tradeoffs, noise figure/spectrum analyzer mode switching for stray-signal detection, and selectable measurement bandwidths to directly measure narrowband devices, such as IF/receiver systems. No other noise figure instrument offers comparable measurement capability in a portable package. In addition, the 85719A incorporates many of the features found in the Agilent 8590 E-series spectrum analyzers, including save/recall functions and memory card reader for storage of measurement data, displays, states, and excess noise ratio (ENR) data tables.

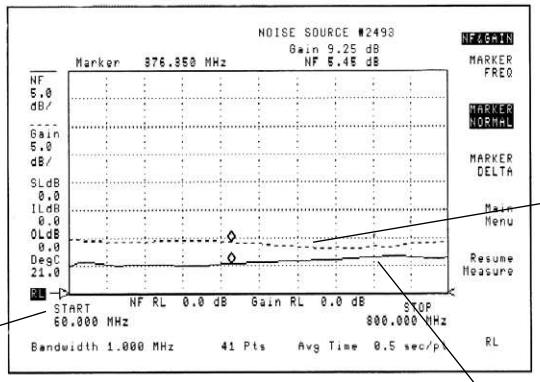
The 85719A, with its menu driven interface and marker functions, simplifies measurements. Marker-function capability makes noise figure and gain for the entire sweep easy to read. Its user-friendly interface makes this measurement system easy to use.

When performance and portability are required, the 85719A noise figure measurements personality for the Agilent 8590 E-series is an ideal noise figure solution.

Agilent Technologies
Innovating the HP Way

Your Key to Displayed Swept Noise Figure and Gain Measurements

Until now, displayed swept noise figure and gain measurement capability in a single noise figure instrument has been unavailable. The 85719A, Agilent's spectrum analyzer–based noise figure measurement personality, allows you to perform these measurements easily. Marker functions allow noise figure and gain values to be read along the entire sweep.

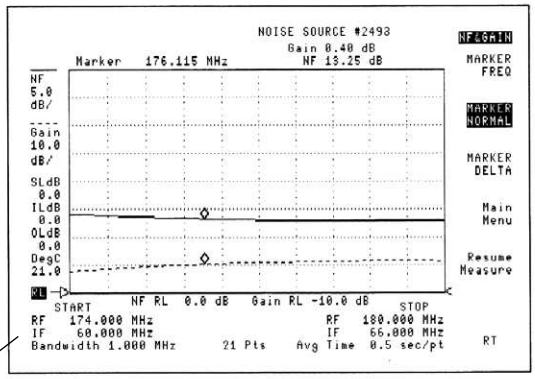


Swept gain on amplifier

Start and stop frequencies for amplifier measurement

Swept noise figure on amplifier

With the 85719A, both amplifiers and frequency converters are easy to measure. For amplifiers just press the (**CONVERSATION** YES, NO) softkey and enter the RF start and stop frequencies. Frequency converters are just as easy. Just press the (**CONVERSION** YES, NO) softkey and enter the RF start and stop frequencies and IF start and stop frequencies. It's that simple!

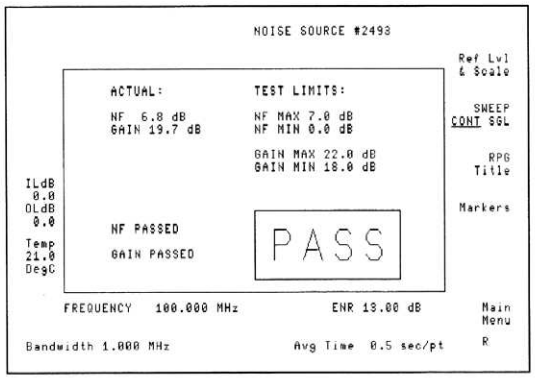


RF and IF start and stop frequencies for frequency converter measurement

Measurement results for an amplifier (top) and frequency converter (bottom)

One-point measurements with limits

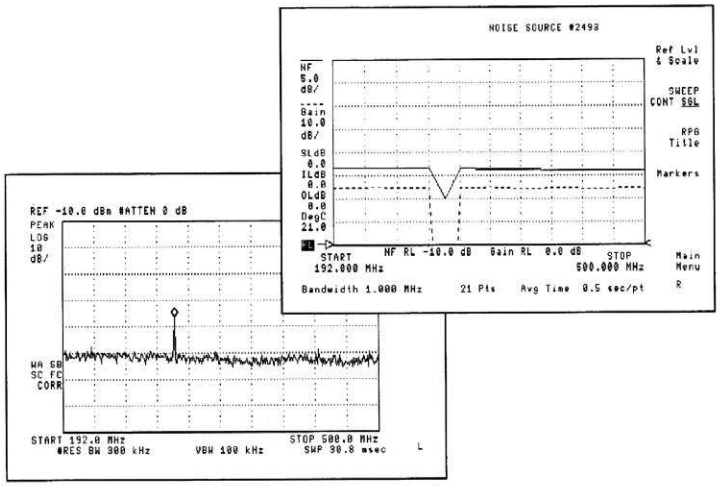
In addition to swept measurements with up to 401 measurement points across the display, one-point measurements provide quick and easy-to-read measurement information and facilitate testing while decreasing your measurement time. The 85719A displays PASS/FAIL information and test limits simultaneously with measurement results when in one-point measurement mode, allowing for easy interpretation by nontechnical operators.



Measured noise figure and gain at 100 MHz

Noise figure/spectrum analyzer mode switching

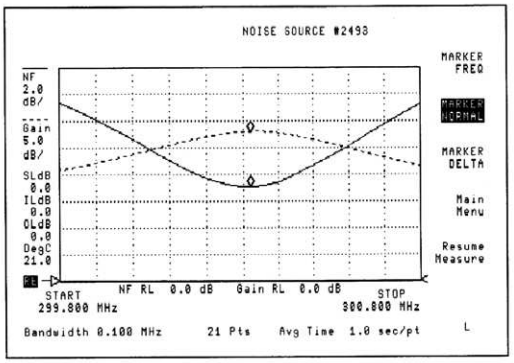
Noise figure measurements are enhanced using the 85719A's capability of switching between noise figure and spectrum analyzer measurement modes. Stray signals that may get coupled into a noise figure measurement can be easily detected by switching to spectrum analyzer mode. Measurement accuracy can be ensured because if spurious signals exist, they can be identified.



Spurious signals that affect noise figure measurements (top right) can be easily detected by entering spectrum analyzer mode (left).

Narrowband device measurements

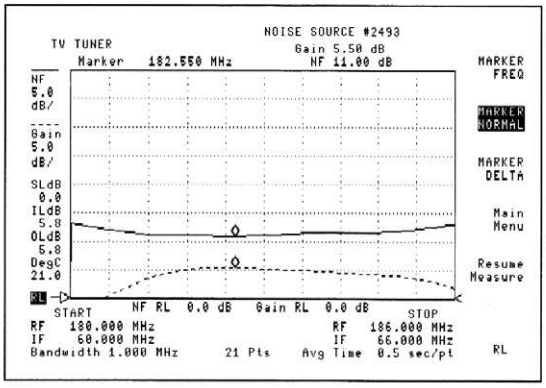
Measure narrowband circuits directly using the 85719A noise figure measurements personality. Agilent 8590 E-series spectrum analyzers provide selectable narrow bandwidths of 3 MHz down to 1 kHz in the noise figure measurements mode, allowing for measurement of narrow bandwidth circuits found in many receivers. This capability reduces errors introduced by using resolution bandwidths that are wider than the bandwidth of the measured circuit.



A narrowband amplifier is measured in a 100 kHz bandwidth.

75-ohm measurements[1]

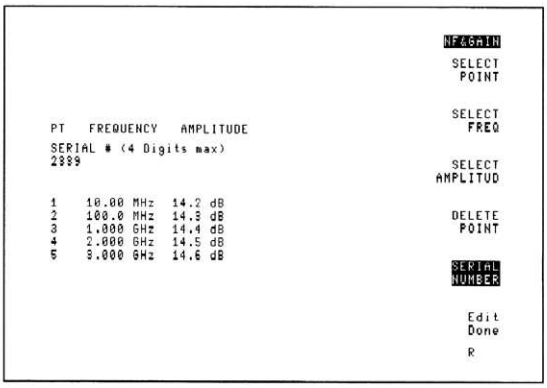
You have the option of making 75-ohm measurements rather than 50-ohm by using 75- to 50-ohm transformers or minimum loss pads. Simply enter the loss correction of the transformer or pads. A 75-ohm measurement of a TV tuner, shown here, was made using a 75- to 50-ohm minimum loss pad affixed to both the device input and output.



75-ohm measurement with corrections for minimum loss pads

ENR data entry and editor

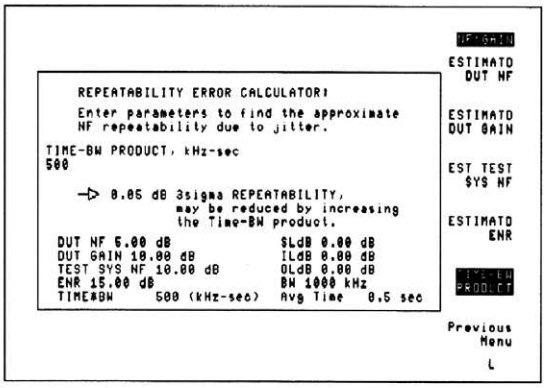
Multiple noise source ENR data tables can be entered and stored in the spectrum analyzer's internal memory or on a memory card. The ENR data editor makes it easy to edit existing ENR data tables.



ENR data for measurement frequencies 10 MHz to 3 GHz

Repeatability calculator

Since jitter affects the accuracy of noise measurements, the 85719A includes a repeatability calculator that provides an easy way to determine what the repeatability due to jitter will be for a specific noise figure measurement. The repeatability calculator allows for easy determination of the measurement time/repeatability tradeoffs. You only need to enter the estimated system parameters[2] and time-bandwidth product[3] corresponding to the measurement bandwidth and averaging time.



Repeatability calculated for averaging time of 0.5 sec in a 1 MHz bandwidth

1. Either the standard or 75-ohm spectrum analyzer input impedance (Option 001) may be used.
2. Estimated system parameters are the estimated DUT noise figure and gain, estimated test system noise figure, and estimated ENR.
3. Time-bandwidth product corresponds to averaging time times measurement bandwidth in kHz-sec.

Save/recall functions

Save to external memory cards using the save/recall function available in the noise figure measurement mode. Entire displays and ENR data tables can also be stored. Internal memory allows for storage of up to 53 states and ENR tables. Memory cards with 32, 128, 256, and 512 Kbytes of RAM are available for use with the spectrum analyzer.[4] The memory card reader comes standard with the Agilent 8590 E-series spectrum analyzers.

Noise figure measurement uncertainty

Noise figure measurement uncertainty is shown for DUT (device-under-test) noise figures of 0 to 20 dB. These curves represent the typical performance for the 85719A and illustrate the effect of device gain on the noise figure error. For device gains of over 15 dB, ±0.3 dB uncertainty or better can be obtained for DUT noise figures up to 10 dB. Lower uncertainties at lower device gains may be obtained with low-noise, user-supplied system amplifiers.

Agilent Product Note 85719A–1 (literature number 5091-4801E) provides more information on noise-figure measurement uncertainty.

Note: Non-threaded connectors are susceptible to stray signals that can introduce errors into your measurements. It is recommended that threaded connectors, such as N-connectors, be used to eliminate this source of error.

4. The 128 Kbyte RAM cards can store up to 99 states and ENR data tables, 32 traces, or 22 displays.

Menu-driven interface

The menu-driven interface of Agilent spectrum analyzers makes this noise figure solution easy to use. The simple menu structure guides the user through noise figure measurements, making them easier than ever. No other noise figure meter offers the variety of noise figure measurement features in such a user-friendly interface.

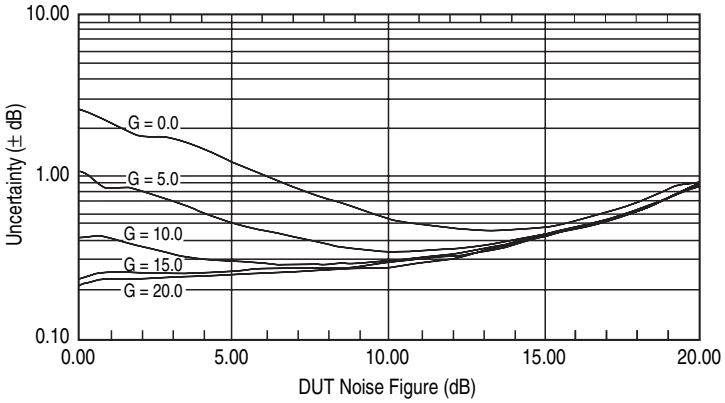
Remote control

Programmability adds simplicity to many of your measurement needs. Programming the spectrum analyzer to perform measurements saves time and money. With the optional remote interfaces available, you can make measurements via GPIB or RS-232 interfaces.

Instrument BASIC for Windows (E2200A) is available for use with the 8590 E-series spectrum analyzers.

TYPICAL NOISE FIGURE MEASUREMENT UNCERTAINTY

Noise Source ENR = 15.00 (dB)
Noise Source ENR Error = 0.10 (dB)
Noise Source SWR = 1.25
Noise Source RHO Delta = 0.050
System Input SWR = 1.70
System Noise Figure = 8.00 (dB)
Amplitude Jitter = ±0.00 (dB)
DUT Input SWR = 1.50
DUT Output SWR = 1.50



Spectrum Analyzers That Meet More Than Just Your Noise Figure Measurement Needs

In addition to noise figure measurement capabilities, the Agilent 8590 E-series spectrum analyzers offer many other component measurement capabilities, including harmonic and spurious response measurements, and one-button third-order intercept and N dB bandwidth measurements.

For measuring transmission and reflection characteristics of components, add the Agilent 85714A scalar measurements personality, 85630A scalar transmission/reflection test set, and built-in tracking generator. This system allows scalar measurements to 2.9 GHz. For your scalar measurements needs to 6.5 GHz or 26.5 GHz, Agilent offers the 85644A and 85645A tracking sources.

Performance

Agilent 8590 E-series spectrum analyzers offer performance enhancements and versatiltity that are the key to meeting many of your measurement needs. Besides offering a wide range of resolution bandwidths (30 Hz to 3 MHz), these analyzers provide very good phase noise of –105 dBc/Hz (30 kHz offset) and specify frequency accuracy of ±230 Hz. For more information on performance capabilities, please refer to the 8590 E-series data sheet (literature number 5091-3271E).

Functions, measurements, and utilities

Measurement functions and features offered on the 8590 E-series spectrum analyzers provide enhanced measurement capabilities. These offerings include Zoom Window, marker tables, downloadable program editor, and limit lines.

Additional features include a memory card reader, downloadable program capablility, and storage of traces, states, and displays. An external keyboard for analyzer control and trace labels is available, as well as output to various printers or plotters with the optional remote interface.

Configuring the spectrum analyzer to meet your needs

With the option cardcage in the 8590 E-series, you can customize your spectrum analyzer to meet your specific measurement needs. Up to four circuit-card options can be configured in the option cardcage. The 8590 E-series data sheet provides more information about available options.

Portability

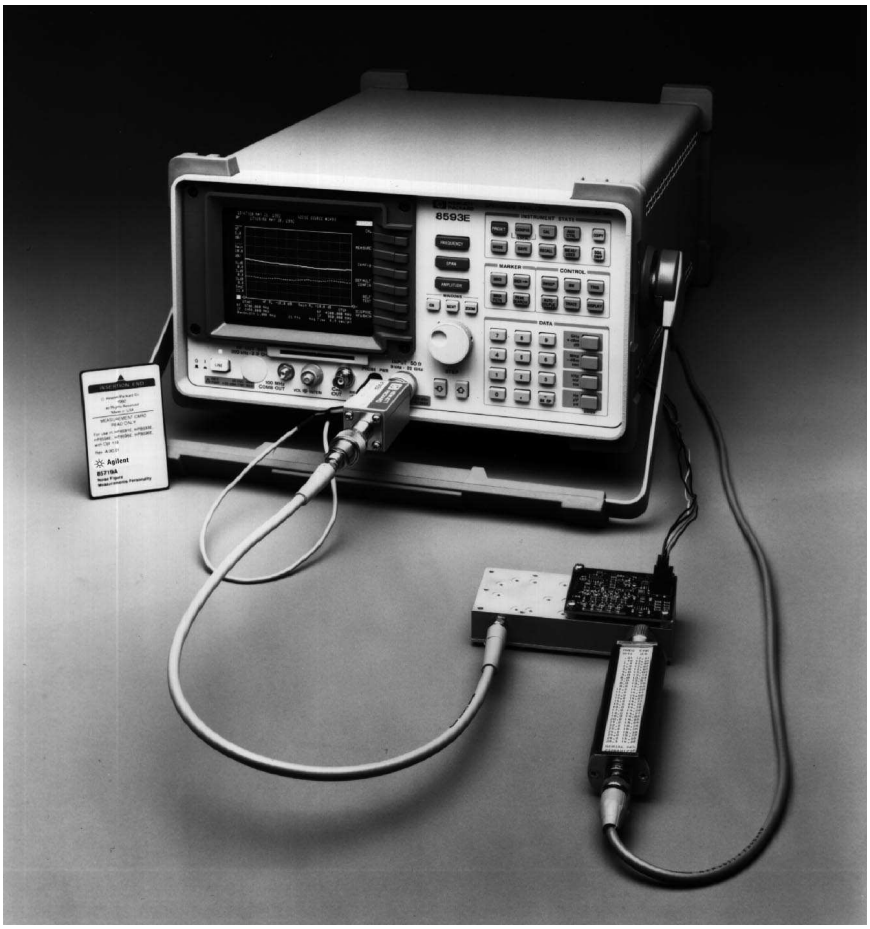
Compact, portable, and easy to handle, the 8590 E-series spectrum analyzers are ideal for field applications. The Agilent 85901A portable ac power source can be used in your remote applications when power is unavailable.

Service and support

Agilent service and support adds value to your spectrum analyzer investment. Thorough documentation and available technical counseling provides a standard that is unmet by other spectrum analyzer manufacturers.

Additional noise figure measurement solutions

The Agilent 8970B noise figure meter offers high-accuracy noise figure and gain measurements from 10 MHz to 1.6 GHz. With Option 020, measurements are extended to 2 GHz. For more information on the noise figure meter, please refer to the 8970B data sheet (literature number 5091-3975E).



Specifications

All specifications apply over 0 ° to 55 °C. The Noise Figure and Gain measurement personality specifications are valid after 2 hours of storage at a constant temperature, within the operating temperature range, 30 minutes after the spectrum analyzer is turned on, and after CAL FREQ and CAL AMPTD have been run.

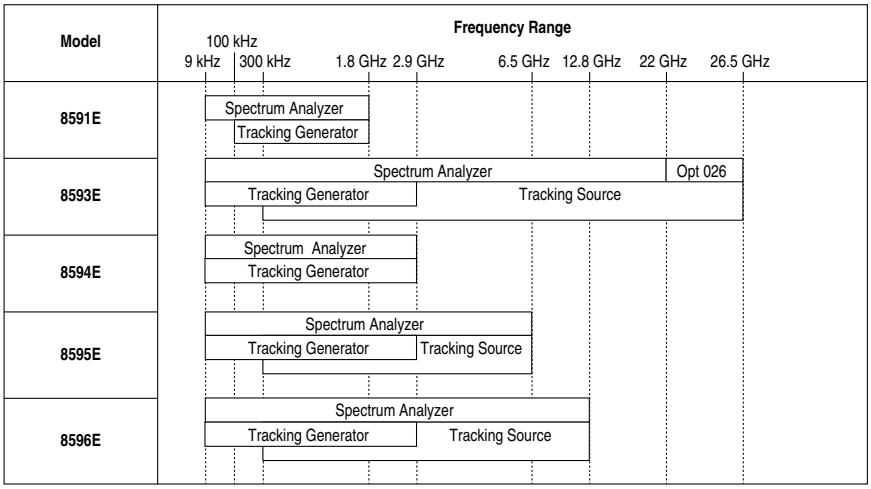
Agilent 85719A Specification Table

Specification	Performance Limits	Conditions
Noise Figure Measurement		
Range	0 to 25 dB	
Resolution	0.01 dB	
Instrumentation Uncertainty*		For Noise Figure ≤15 dB
	±0.55 dB	Measurement Bandwidth = 3 kHz
	±0.5 dB	Measurement Bandwidth = 1 MHz
Instrumentation Uncertainty (typical)*	±0.3 dB	For Noise Figure ≤20 dB Measurement Bandwidth = 3 kHz to 1 MHz
Gain Measurement		
Range	0 to +40 dB	
Resolution	0.01 dB	
Instrumentation Uncertainty*		For Noise Figure ≤15 dB
	±0.65 dB	Measurement Bandwidth = 3 kHz
	±0.5 dB	Measurement Bandwidth = 1 MHz
Instrumentation Uncertainty (typical)*	±0.3 dB	Measurement Bandwidth = 3 kHz to 1 MHz
Input		
Frequency Range	10 MHz to 2.9 GHz**	When used with 8594E Spectrum Analyzer
System Noise Figure	<12 dB	
Input SWR	<2:1	
Maximum System Input Power	–45 dBm	At 87405A Preamplifier Input
Measurement		
Measurement Bandwidth (3 dB Resolution Bandwidths)	1 kHz to 3 MHz	

* For (NF + gain) ≤35 dB

** Noise figure measurements down to 100 kHz and up to 26.5 GHz can be made with the 8590 E-series spectrum analyzers. Specifications are guaranteed for measurements from 10 MHz to 2.9 GHz only.

Agilent 8590 E-series Specification Summary



Ordering Information

Recommended Configuration[5]

8591E/3E/4E/5E/6E
Option 119[6,7] Noise Card Option
85719A Noise Figure Measurements Personality
346B Noise Source (10 MHz to 18 GHz)
87405A Preamplifier (10 MHz to 3 GHz)

Product Literature

5091-4801E Agilent 85719A-1 Product Note
5091-3271E Agilent 8590 E-series Data Sheet
5091-3975E Agilent 8970B Data Sheet

5. Specifications are guaranteed with recommended configuration.
6. Includes noise card-to-noise source BNC cable.
7. Option R19, noise card retrofit kit, is available.

Agilent Technologies' Test and Measurement Support, Services, and Assistance
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 resources 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 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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