

Agilent N4456A, N4457A Noise-Parameter Measurement Systems

Product Overview



**Fully characterize
noise parameters and
S-parameters for RF
and microwave devices.**



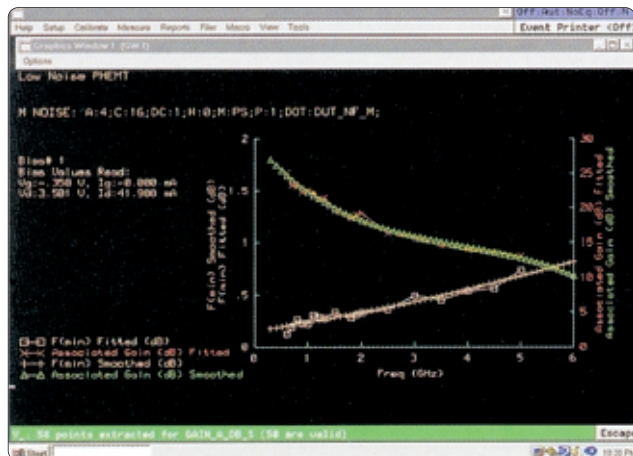
Agilent Technologies

Complete noise characterization

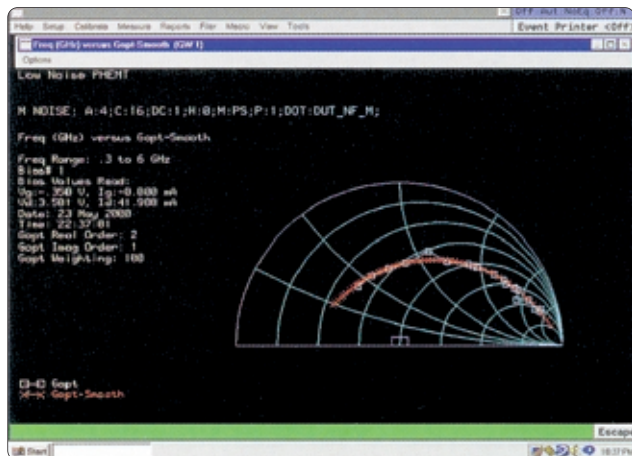
Agilent's N4456A and N4457A noise-parameter measurement systems provide solid-state-tuner-based small-signal characterization of RF and microwave semiconductor devices. From high gain, sub-1-dB noise-figure transistors, to millimeter wave low-noise amplifiers, Agilent's noise-parameter measurement systems can handle the most challenging assignments.

The systems combine an Agilent vector network analyzer and Agilent NFA series noise figure analyzer to provide fast and accurate S-parameter, noise parameters, and device characterization-versus-bias measurements and analysis, from 300 MHz to 26.5 GHz.

The noise-parameter measurement software controls the system hardware, including power supplies for DC bias, and wafer probe stations (not included with the systems). Full test plans can be generated, and complex measurement sequences can be stored using the powerful built-in macro utility. Graphical and tabular report generation and data transfer to external electronic design automation (EDA) programs is fast and easy.



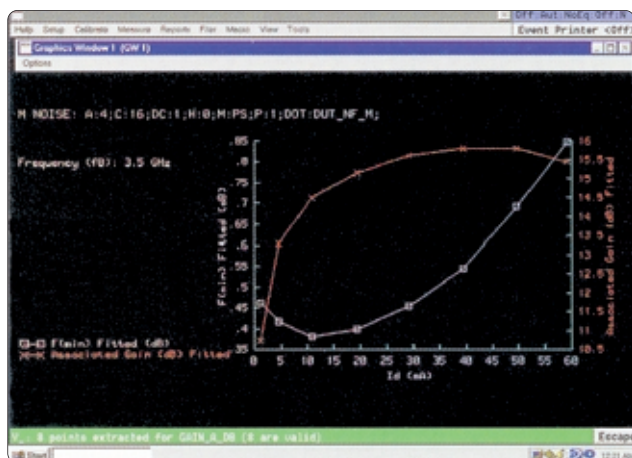
Example plot of Fmin and gain versus frequency of a low-noise PHEMT. Device shows high gain with sub-1-dB noise figure.



Example plot of a smoothed Gopt versus frequency of a low-noise PHEMT, showing optimum reflection coefficient.



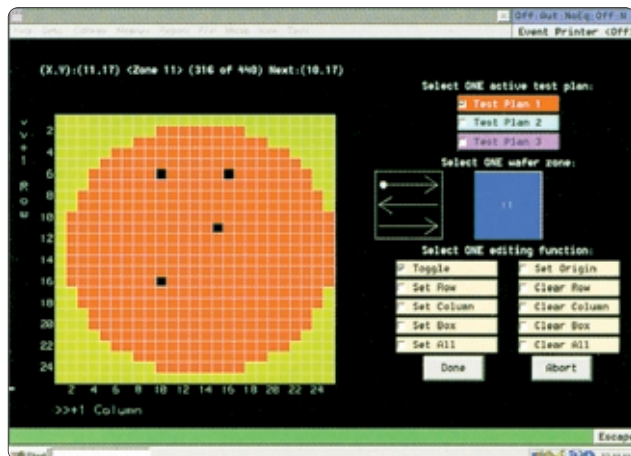
Example plot of noise figure versus the source states presented by the input tuner to a low-noise PHEMT. Note the full spread across the Smith chart and noise circles.



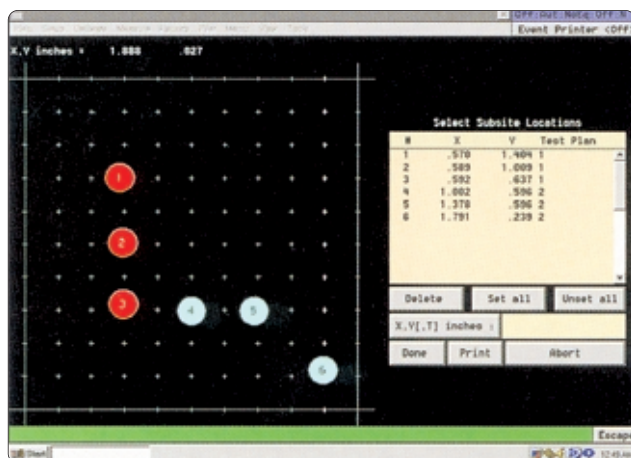
Example plot showing the tradeoff between high gain and noise figure versus current of a low-noise PHEMT. This type of plot is a valuable design tool to help select the optimum device bias.

Support for in-fixture or on-wafer testing

Agilent noise-parameter measurement systems provide comprehensive support for in-fixture testing of packaged devices or circuits, or for on-wafer test. Ideal for transistor characterization, these systems can perform device-parasitic de-embedding. De-embedding provides the device's intrinsic noise parameters, which are important for the development of accurate noise models including device scaling and yield characterization. The system's integrated wafer environment enables automated characterization of entire wafers, and eliminates the expense and labor of dedicated test boards.



Example of a wafer map demonstrating some of the system's on-wafer test planning capabilities.

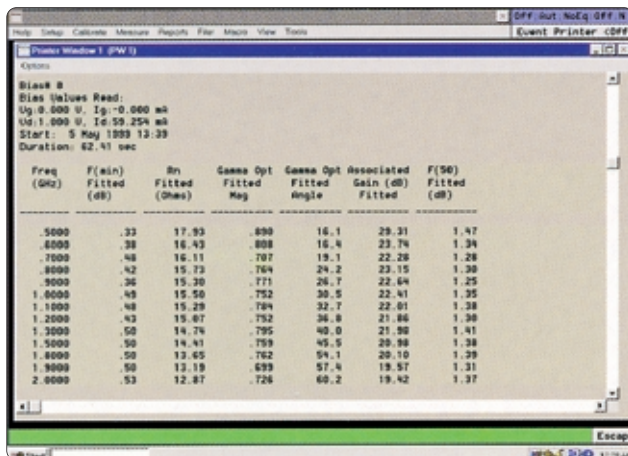


Example of a subsite (reticle) map, demonstrating some of the system's on-wafer test planning capabilities.

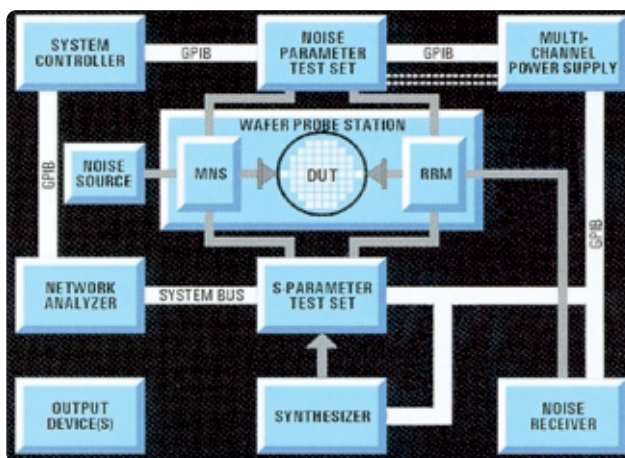
Designed for maximum accuracy

Overall measurement accuracy depends on the accuracy of the S-parameter measurements, and the spread, repeatability, and number of impedance states used. Agilent noise-parameter measurement systems are designed to maximize all of these. From the tuner's 369 impedances, a subset is selected that has the maximum vectorial difference at each frequency. This ensures a broad distribution in the impedance plane, across the entire frequency range.

To guarantee impedance repeatability and maximize the magnitude of the tuning mismatch, careful consideration is given to the design of the system hardware. For example, the system is designed without any switches between the tuner and the device under test (DUT). This allows more accurate measurement of smaller devices with higher reflection coefficients.



Example showing the device noise parameters in a tabulated, easy-to-read (and export) format.



Block diagram of the N4457A noise-parameter measurement system and customer-supplied wafer probe station.

Ordering information

N4456A Noise-parameter measurement system, 300 MHz to 6 GHz

Includes Agilent noise-parameter mainframe, lowband mismatch noise source (MNS) and remote receiver module (RRM), system rack, and system software, plus the following Agilent test equipment:

N8974A NFA series noise figure analyzer, 10 MHz to 6.7 GHz
E8357A PNA series vector network analyzer, 300 kHz to 6 GHz
85033E 3.5mm calibration kit
6625A Dual-output programmable power supply

Options (must order at least one or both of the following options):

304 N4000A SNS excess-noise source, 10 MHz-18 GHz,
6 dB ENR
305 N4001A SNS excess-noise source, 10 MHz-18 GHz,
15 dB ENR

N4457A Noise-parameter measurement system, 2 GHz to 26.5 GHz (with optional 300 MHz to 6 GHz lowband coverage)

Includes Agilent noise-parameter mainframe, highband mismatch noise source (MNS) and remote receiver module (RRM), system rack, and system software, plus the following Agilent test equipment:

N8975A NFA series noise figure analyzer, 10 MHz to 26.5 GHz
8510C Vector network analyzer, 45 MHz to 26.5 GHz (includes
8515A S-parameter test set and 83631B synthesized
source)
85052C Precision 3.5mm calibration kit
11752D 3.5mm gauge kit
6625A Dual-output programmable power supply

Options:

303 Add lowband MNS and RRM, 300 MHz to 6 GHz

Must order at least one or both of the following options:

304 N4000A SNS excess-noise source, 10 MHz-18 GHz,
6 dB ENR (note: limits system operation to 18 GHz)
306 N4002A SNS excess-noise source, 10 MHz-26.5 GHz,
5 dB ENR

System specifications:

Resolution, noise figure and gain:	0.01 dB
Tuner range:	1.1:1 to 10:1, 369 states
Tuner repeatability:	< -50 dB (residual error vector)
Bias-tee current:	port 1: 125 mA fused port 2: 500 mA fused
RRM impedance:	50 ohm (nominal)
Measurement speed:	S-parameters: see network analyzer specifications Noise parameters: for 16 states the typical system speed is 2 frequency points per minute
Temperature	
Operating:	0° to 55° C
Storage:	-55° to 75° C
Power supply	
Line voltage:	100 to 240 volts AC (+5%, -10%)
Frequency:	48 to 66 Hz
Power consumption:	150 VA maximum

Web resources

For additional information about the noise-parameter measurement system please visit:

www.agilent.com/find/np

For additional information about component manufacturing please visit:

www.agilent.com/find/component_test

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 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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www.agilent.com/find/assist

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