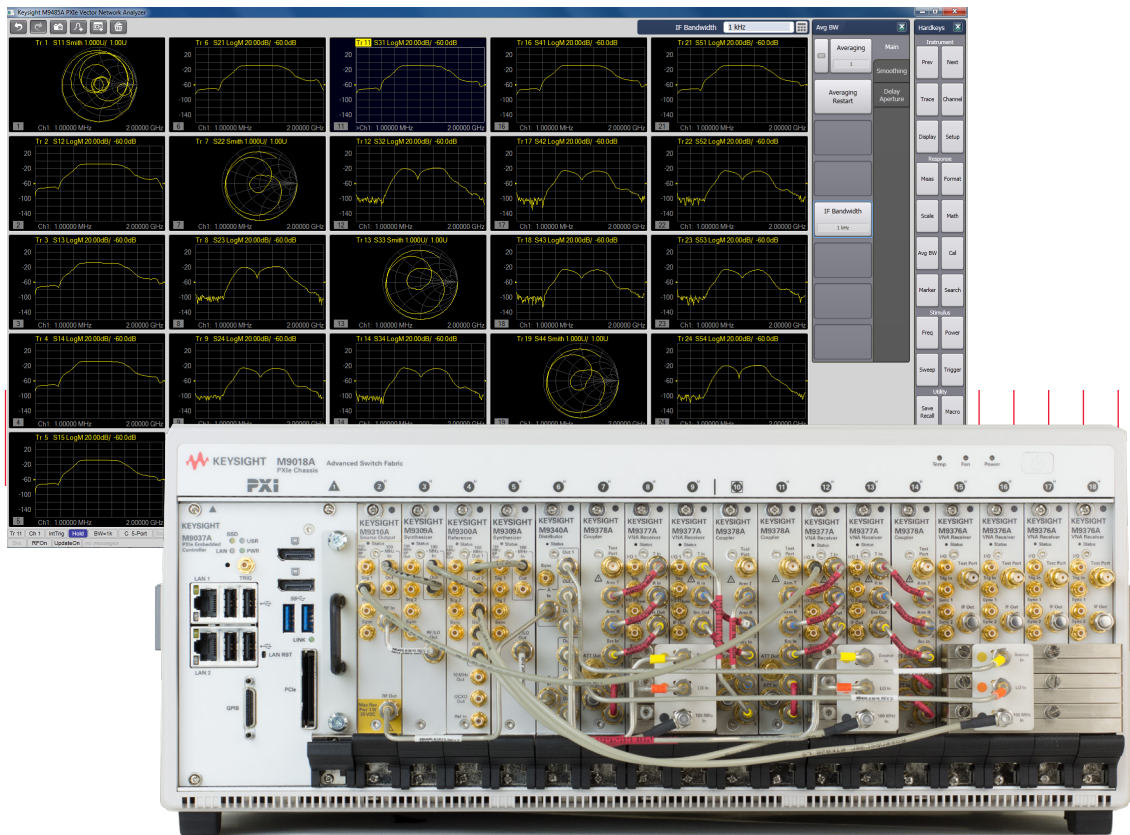


Keysight M9485A

PXIe Multiport Vector Network Analyzer



High-Performance PXI Multiport Vector Network Analyzer (VNA)

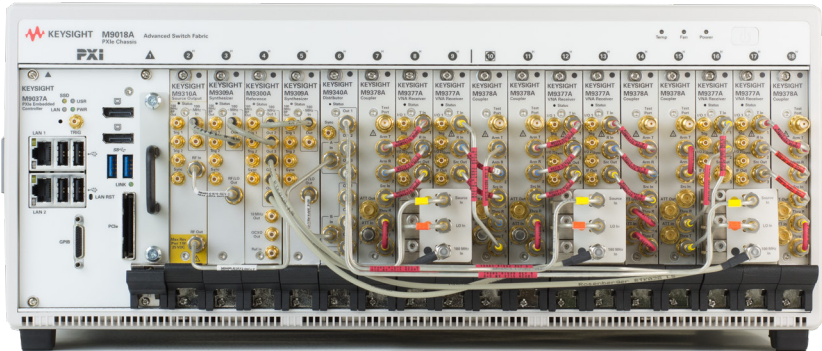
Innovative solution

Today’s measurement requirements of components or modules used for wireless communication are getting more complicated based on growing technology and multi-carrier and multi-band coverage needs. The Keysight M9485A PXI multiport VNA is an ideal solution that provides a flexible and scalable configuration, and solves your increasing challenges. Adapting independent source and receiver configuration, it offers the best measurement performance in multiport network analysis. Using the latest converged software platform that leverages the best attributes of the ENA and PNA families, it also offers comprehensive functions to test multiport components like front-end modules, filters, and switches. Build the production line with the M9485A and drive down the cost of test.

Superior performance for multiport testing

The M9485A provides fast measurement speed and wide dynamic range, as well as Keysight VNA’s common high stability and low trace noise for multiport testing. It helps you achieve the lowest cost of test with fast throughput, high accuracy, better yields and less down time.

Product feature	Product performance (typ.)	Fast throughput	High accuracy	Better yield	Less down time
Fast speed	Max 5 msec at 201 point, full 2-port calibration	Yes			
Wide dynamic range	Up to 160 dB at 10 Hz IFBW	Yes	Yes	Yes	
High stability	Min 0.005 dB/°C		Yes	Yes	Yes
Low trace noise	Min 0.001 dBrms at 10 kHz IFBW	Yes	Yes	Yes	



Product feature	Option 1xx (=M9376A) Standard receiver	Option 2xx (=M9377A/78A/78B) Standard configuration	Option 2xx (=M9377A/78A/78B) Wide D-range configuration	Option 2xx (=M9377A/78A/78B) High power receiving configuration	Option 3xx (=M9377A) Direct receiver access (DRA) port
Max dynamic range at 10 Hz, typ.	+142 dB	+144 dB	+160 dB		
Max output power (typ.)	+17 dBm	+17 dBm	+3 dBm	-3 dBm	+21 dBm
0.1 dB compression input level (typ.)	+15 dBm	+25 dBm ¹	+10 dBm ¹	+40 dBm ¹	+25 dBm ¹

1. Reference/Test Attenuator 35 dB

Fast speed

The M9485A's measurement speed increases throughput and decreases cost of test, especially in high-volume manufacturing, with enhanced measurement speed in multiport network analysis.

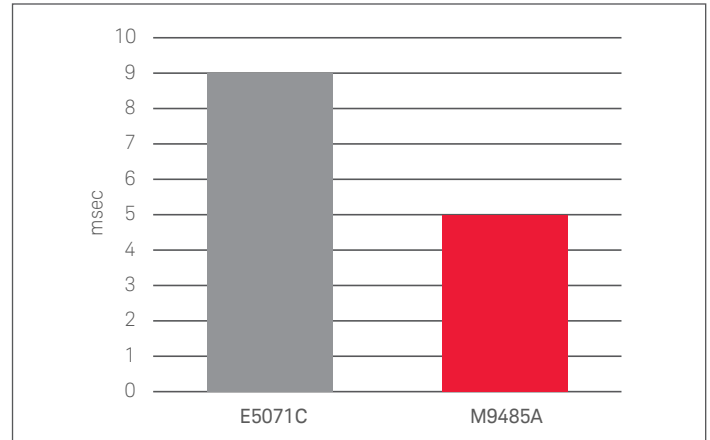


Figure 1. Fast measurement speed¹

Wide dynamic range

Wide dynamic range not only helps increase throughput of high rejection device test, but also improves test accuracy and yield. The M9485A has up to 160 dB² dynamic range, best-in-class in PXI VNA, and comparable to the best bench-top VNAs.

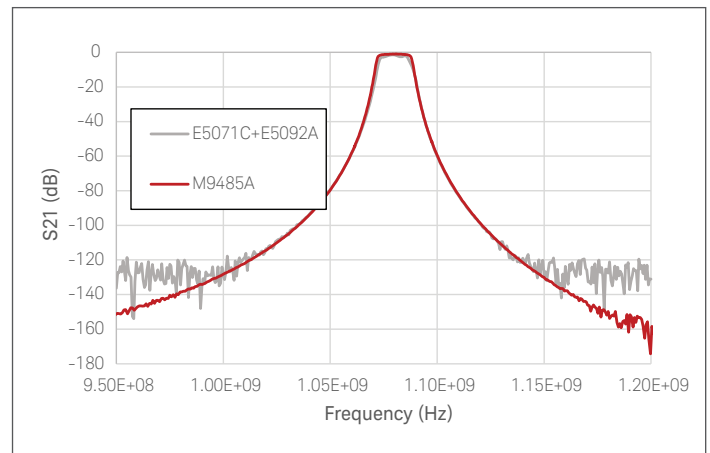


Figure 2. Wide dynamic range²

Low trace noise and high stability

The M9485A inherits excellent low trace noise and high stability, common factors to all Keysight VNAs. Low trace noise of 0.001 dBrms³ enables fast and accurate measurements. High stability of 0.005 dB/°C⁴ increases calibration interval time and maintains accurate measurement performance, which decreases the operation down time for calibration.

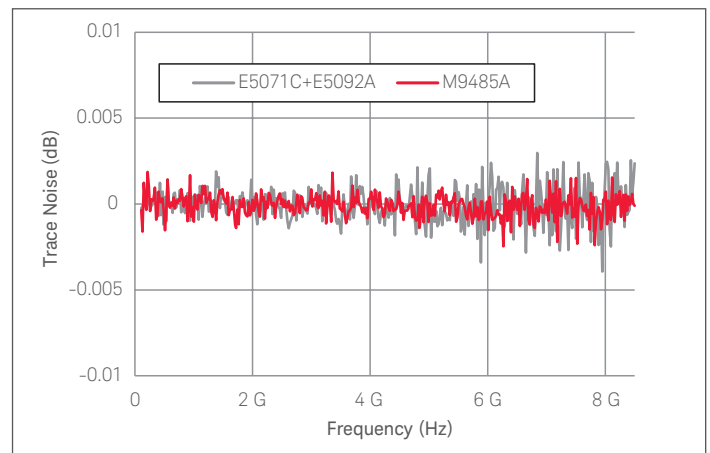


Figure 3. Low trace noise³

1. 1601 pts, linear sweep, full span, full 2-port calibration, typical
2. IFBW 10 Hz, max output power, typical. The M9485A uses wide dynamic range configuration with Option 2xx configurable test set.
3. IFBW 10 kHz, max output power, typical
4. Up to 3 GHz, typical

Flexible Modular Multiport Configuration

- 3 types of receivers to select from Standard (Option 1xx, 1 slot/port), Configurable test set (Option 2xx, slots/port) and direct receiver access (Option 3xx, 1 slot/port)
- Up to 24 ports using two chassis (Option 1xx and 3xx)
- Ability to mix different types of receivers in the same chassis
- Easy to add / delete / change configuration for upgrade or repair

4 to 12 ports with one chassis

14 to 24 ports with two chassis

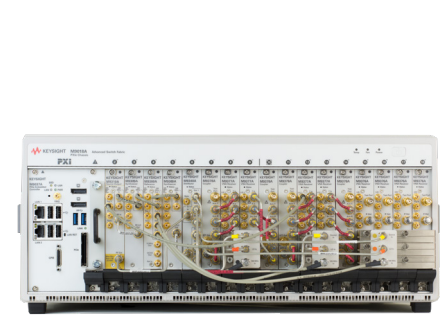


Figure 4. 4-port configurable + 4-port standard configuration



Figure 6. 24-port configuration

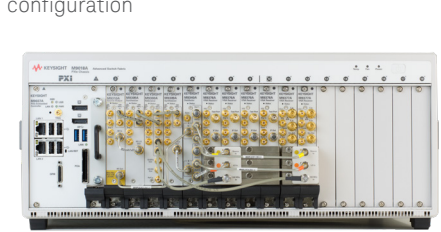
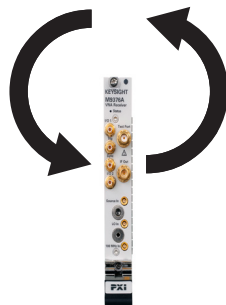


Figure 5. 4-port standard + 2- direct receiver access port w/o coupler configuration



If one of the M9485A modules has damage, you can minimize production downtime by just sending that module for repair, or swap the module with a spare one.

Full N-Port Correction

The M9485A is a true multiport VNA with up to 24 ports, independent receivers at each port. This configuration drastically decreases the total number of sweep times for multiport measurements compared to a switch matrix based solution. For example, a 16 port measurement takes 16 sweeps for the M9485A, but takes up to 240 sweeps for a 2-port VNA with a switch matrix. By using the M9485A, you can dramatically increase test throughput.

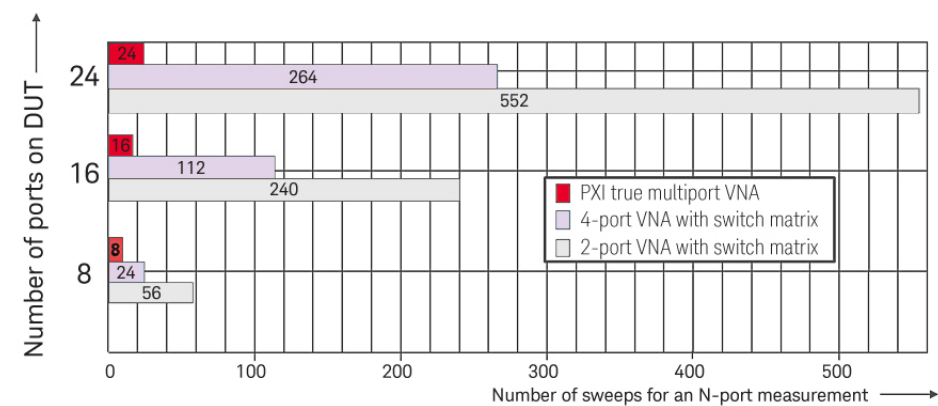


Figure 7. Number of sweeps comparison

Multiport measurements

The M9485A uses the latest Keysight VNA software platform. It helps you set and measure multiple trace easily and intuitively. Up to 200 measurement channels and unlimited trace setups enable flexible multiport measurements. A guided calibration menu and copy channel feature enable full N-port calibrations and set stimulus conditions quickly.

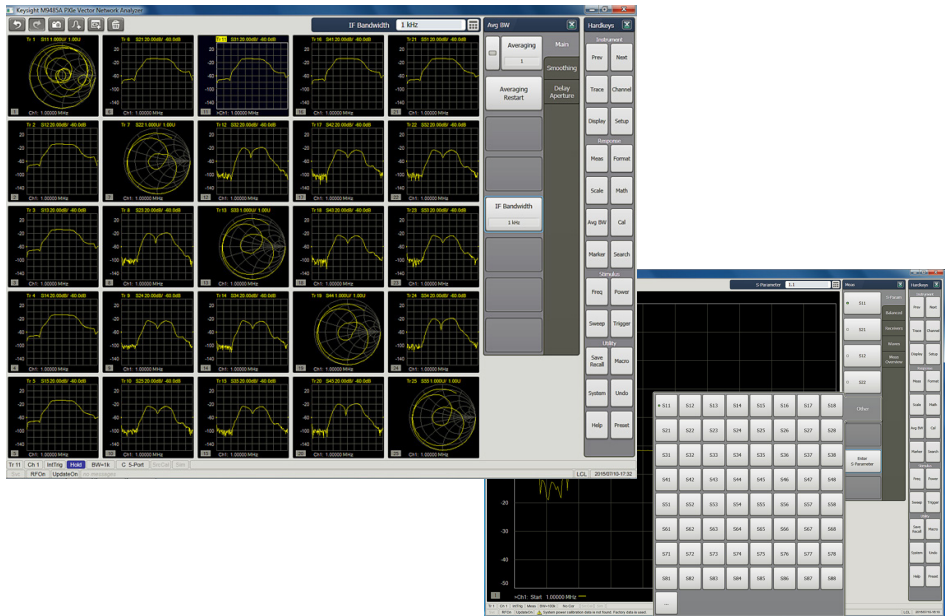


Figure 8. Measurement and setting display

Flexible setting for multi-site measurements

You can set a single stimulus source for multiple test ports at the same time. This feature enables simultaneous and flexible multiport and multi-site measurements. The multi DUT measurement tool helps setup multiport and multi-site measurement by the M9485A. You can drastically increase total test throughput and lower cost of test per device by this capability.

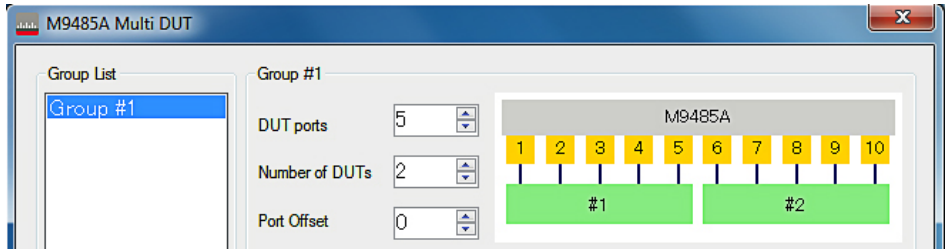


Figure 9. Multi DUT measurement tool

Flexible traces and windows layout

The layout of traces and windows can be easily achieved with the intuitive drag-and-drop feature. It enables you to overlay traces with different channel settings on the same windows.

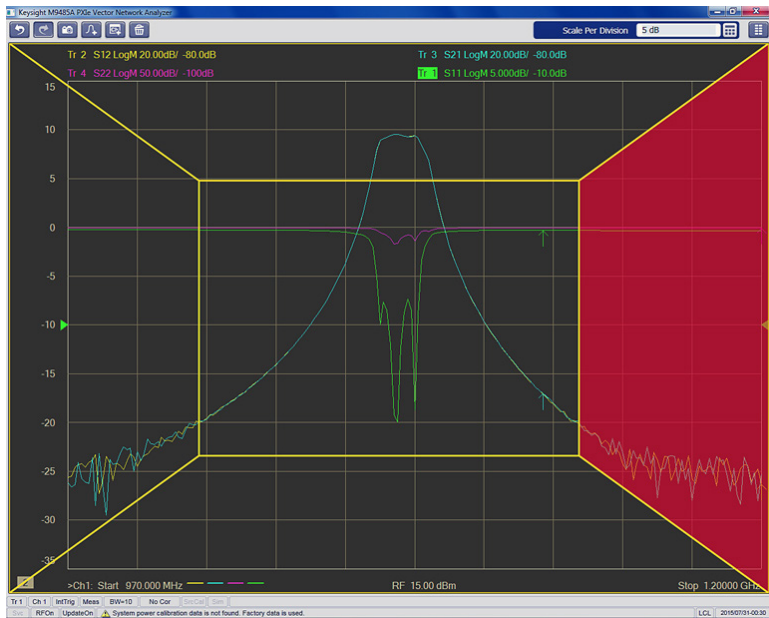


Figure 10. Drag-and-drop operatoin

Powerful Measurement Capability for a Variety of Applications

The M9485A combines the highest RF performance with powerful analysis capabilities that enables you to address a variety of applications and increase test efficiency.

Frequency offset mode, SMC and VMC for mixers

The Scalar Mixer Calibration (SMC) provides the most accurate conversion loss/gain measurements. The Vector Mixer Calibration (VMC) is Keysight's VNA unique feature that enables you to measure the phase and group delay. External sources can be synchronized by the handshake trigger function that realizes high-speed swept LO measurements.

Time domain analysis and gating function for cables, PCB and filters

The M9485A offers comprehensive time domain analysis functions including time gating. The 100,001 maximum points enable the analysis of electrically long DUTs. The Quick Start dialog offers easy setup for complicated time domain setting.

PMAR (power meter as receiver)

The PMAR plots the measured data of an external power meter/sensor on the display. This function enables you to monitor RF power levels in amplifier measurements. Also, you can use the power sensor as a scalar detector for measuring devices like frequency converters.

Segment sweep

Features such as IFBW, source power, and receiver attenuator can be set per test port to optimize measurement speed.

Extensive analysis functions

- Equation editor: MATLAB functions can be utilized from the equation editor to execute complex analysis.
- Ripple limit & BW limit (for filter tuning)
- Point limit (for antenna tests)
- Multi peak search
- Fifteen markers per trace
- Trace Max/Min hold for EMC chamber site attenuation

Peripheral device support

The M9485A supports a wide variety of peripheral devices.

- M9111A PXIe High-Speed Source/Measure Unit
- M9341A PXIe Digital I/O
- M9341B PXIe Digital and Analog I/O
- M9379A RF Amp Module
- Other external devices (RF source, DC source/meter, power meter, pulse generator)

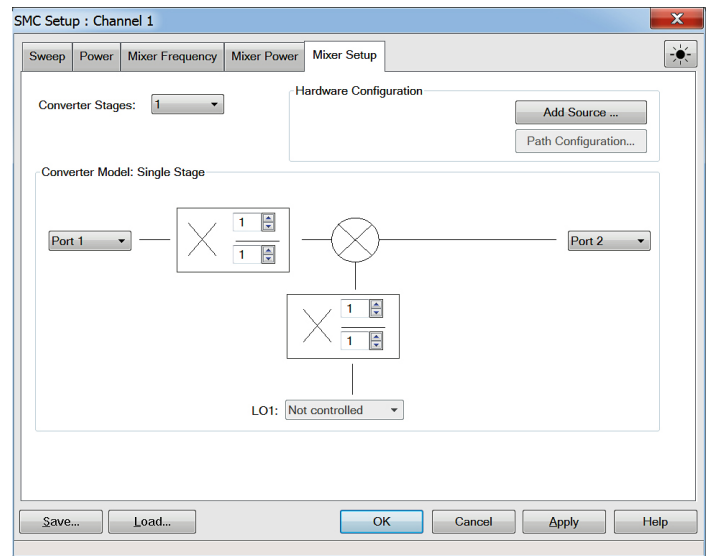


Figure 11. Mixer Setup

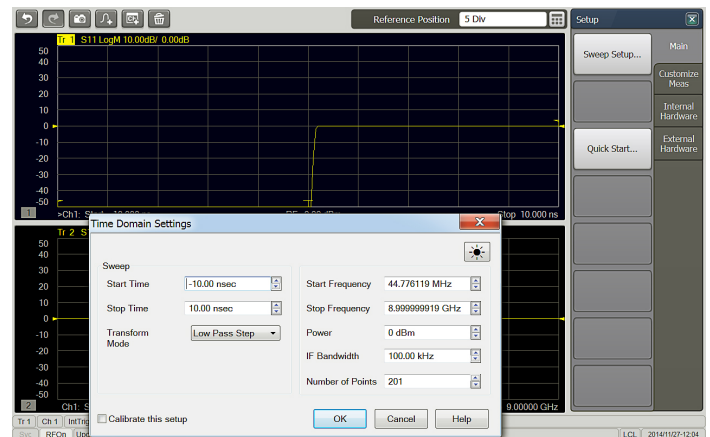


Figure 12. Time domain settings on Quick Start

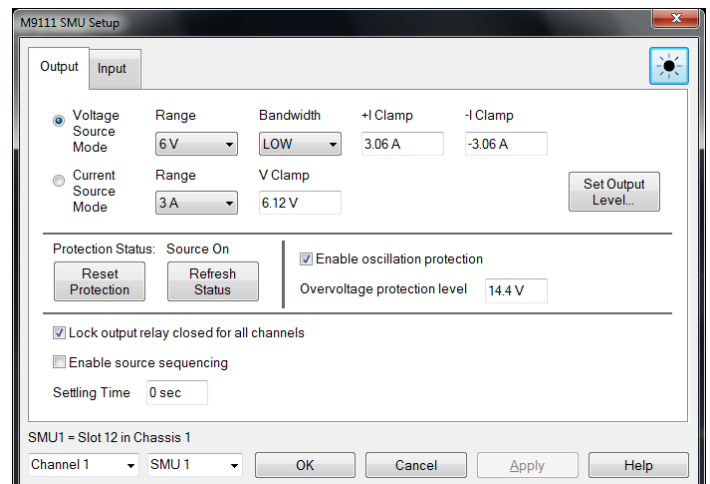


Figure 13. M9111A SMU Setup

Basic RF Pulse Measurements

The Basic RF pulse measurement option performs point-in-pulse and pulse profile measurements down to a pulse width on the order of 1 microsecond. Minimum resolution at pulse profile measurement is 70 nanoseconds. Four built-in pulse generators can be controlled by the Keysight VNA common user interface. The M9485A provides easy-to-use RF pulse measurement capabilities when used with the M9389A VNA source pulse modulator.

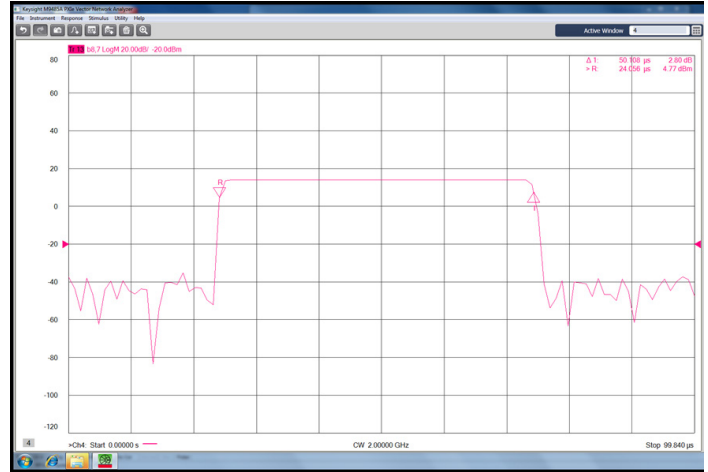


Figure 14. Pulse profile measurement

Gain Compression Analysis

Characterizing amplifier compression over its operating frequency range requires measurements at many frequency and power points, so setting up the measurements, calibration, and data manipulation takes a lot of time and effort. The M9485A gain compression application (GCA) quickly and easily performs measurements to search for the gain compression point over frequency.

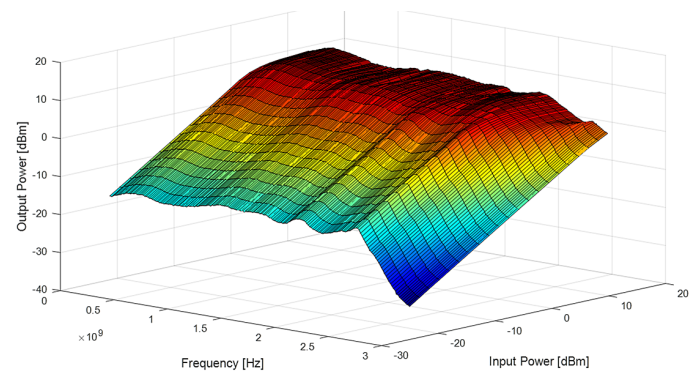
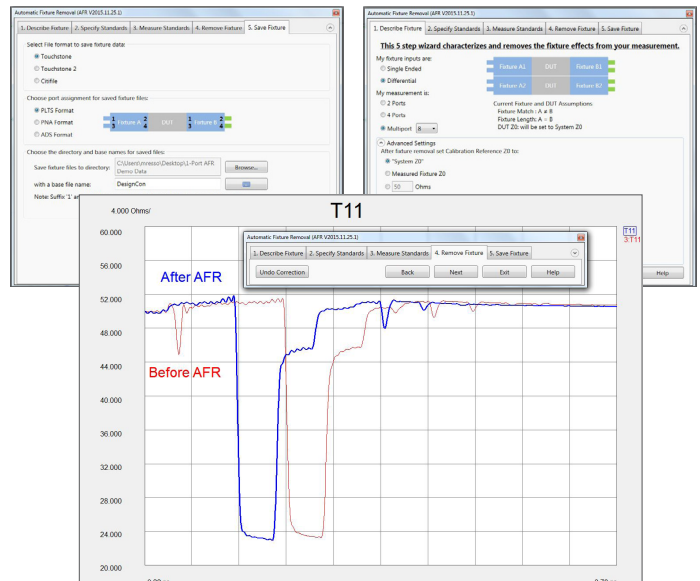


Figure 15. Device response to 2D sweeps - Gain versus frequency and power

Automatic Fixture Removal

Many devices do not have coaxial connectors and are put in fixtures in order to measure them in a coaxial environment. Accurately removing the effects of the fixture is required to get a good measurement of the device under test (DUT). Automatic fixture removal adds a powerful application wizard to guide you through characterizing a fixture and removing it from the measurement.

- Easiest way to remove fixture effects from non-coaxial device measurements
- Extract fixture S-parameters from 2x thru or one-port measurements
- Step-by-step wizard to characterize your fixture and remove it from your measurements



Wide Dynamic Range and Fast Tuning for High Rejection Filters

The configurable test set option M9485A-2xx occupies two modules for each test port: M9377A for direct access receiver and M9378A for coupler. This architecture offers the flexibility to set the signal path of the test port and bypass the loss caused by the coupler arm. Therefore the forward measurement receiver sensitivity and the dynamic range can be improved by 15 dB. Combined with segment sweep and the flexible electrical receiver attenuator, high rejection filters with up to 160 dB dynamic range can be characterized.

The wide dynamic range capability of the M9485A-2xx option also means faster measurement speed can be achieved for filter tuning. You can select wider IF bandwidth (IFBW) while maintaining the same noise floor as a standard receiver configuration. For example, if dynamic range is increased with the configuration by 20 dB then 100-times wider IFBW can be selected, thus 100-times faster measurements can be performed to get the same noise floor level (Figure 17).

When combined with Keysight's M9379A PXI RF amplifier, the M9485A-2xx option can greatly improve the noise floor of the measurement system.

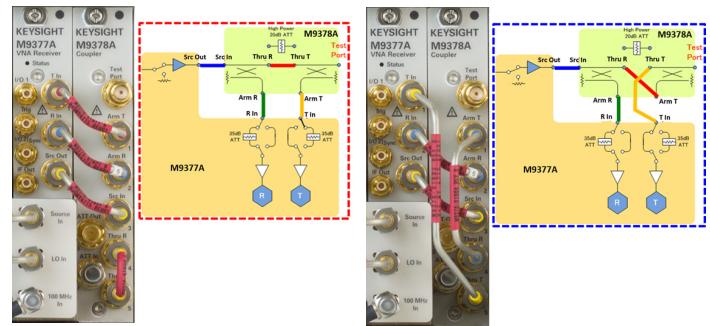
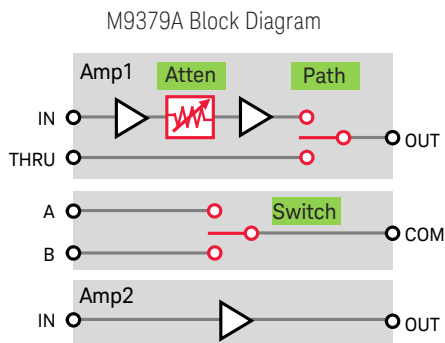


Figure 16. Configurable test set for standard configuration (left) and wide dynamic range receiver configuration (right)

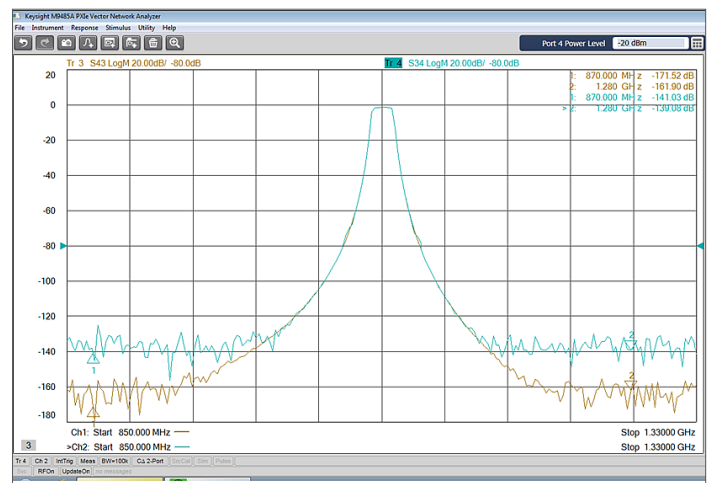


Figure 17. Wide dynamic range (160 dB in forward and 140 dB in reverse measurement, in 2 channels)

Highest Throughput for Multiport BTS Components

The M9485A supports full N-port calibration and is a true multiport VNA with independent receivers at each port. The M9485A offers a robust dynamic range performance. All these features make it the ideal solution for BTS multiport components that have more ports and requires more and more strict specifications.

One typical case is the Point of Interface (POI) which is used between base station and the distributed antenna system. The port number is often 11 or 14 ports. To guarantee low signal loss and high system coverage, the signal transmission/leakage between each two ports has to be measured. The M9485A only takes several minutes to fully characterize the 11 port POI while the traditional two port VNA method takes almost an hour.

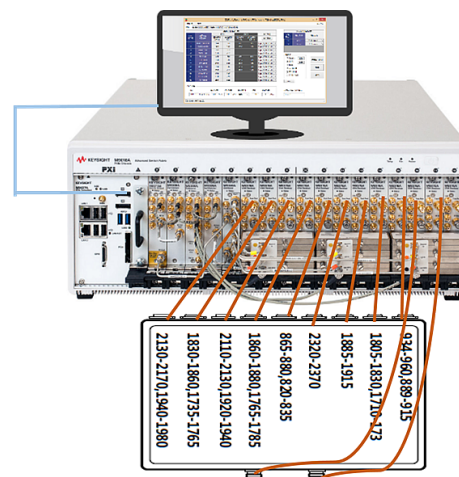


Figure 18. Measurement setup example for an 11 port POI

Noise Figure Measurements

The noise figure measurement option performs fast and accurate noise figure measurements of RF amplifiers utilizing Keysight's unique error correction technique. The true multiport architecture provides speed and accuracy for both multiport S-parameter and noise figure measurement with a single connection by combining the PXI solid state dual SP4T switch module, the M9379A RF amp module and the M9341B PXIe digital and analog I/O. This flexible configuration allows the M9485A to be used for RF Frontend Modules (FEM) test in an automated test environment.

Key features

- Measure noise figure of amplifiers up to 9 GHz¹
- With a single connection, obtain fast, high accuracy measurements of S-parameters and noise figure
- Surpasses the accuracy provided by Y-factor-based noise-figure analyzers or spectrum analyzers with utilizing Keysight's unique error correction technique²
- Supports M9161D PXI switch, M9379A PXI RF amplifier and M9341A/B I/O³
- Fast sweep times improve throughput in manufacturing
- Fast external switch/preamp control for more flexible configuration

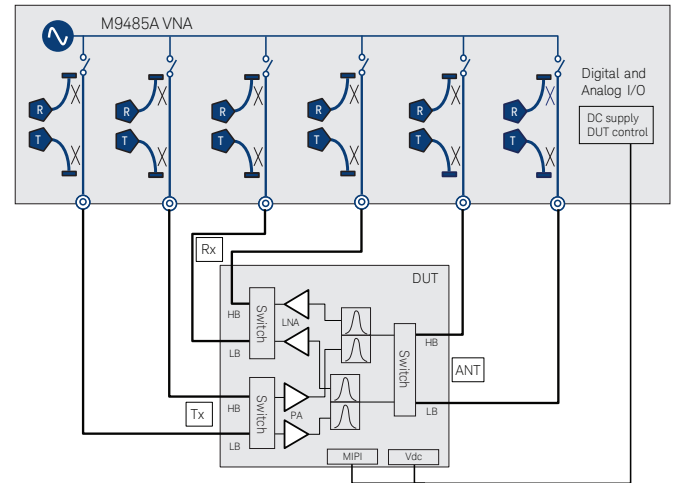


Figure 19. Example of multiport S-parameter and noise figure measurement

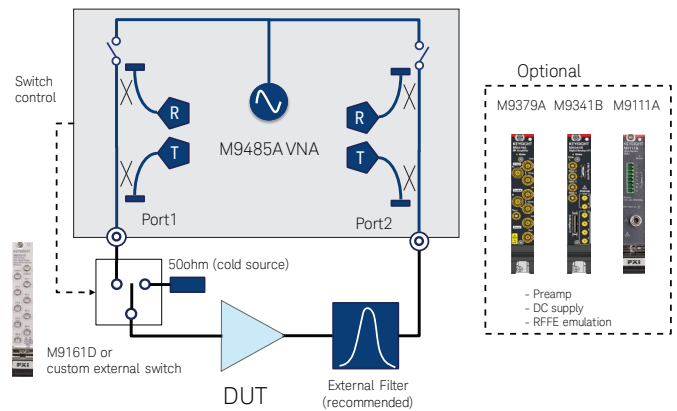


Figure 20. Simplified block diagram for noise figure measurement

1. Not support frequency converter noise figure
 2. Not support Vector Noise Calibration with Noise Tuner
 3. For receiver configuration, the M9485A-2xx configurable test set option combined with the M9379A is recommended.

Product Configuration

M9485A

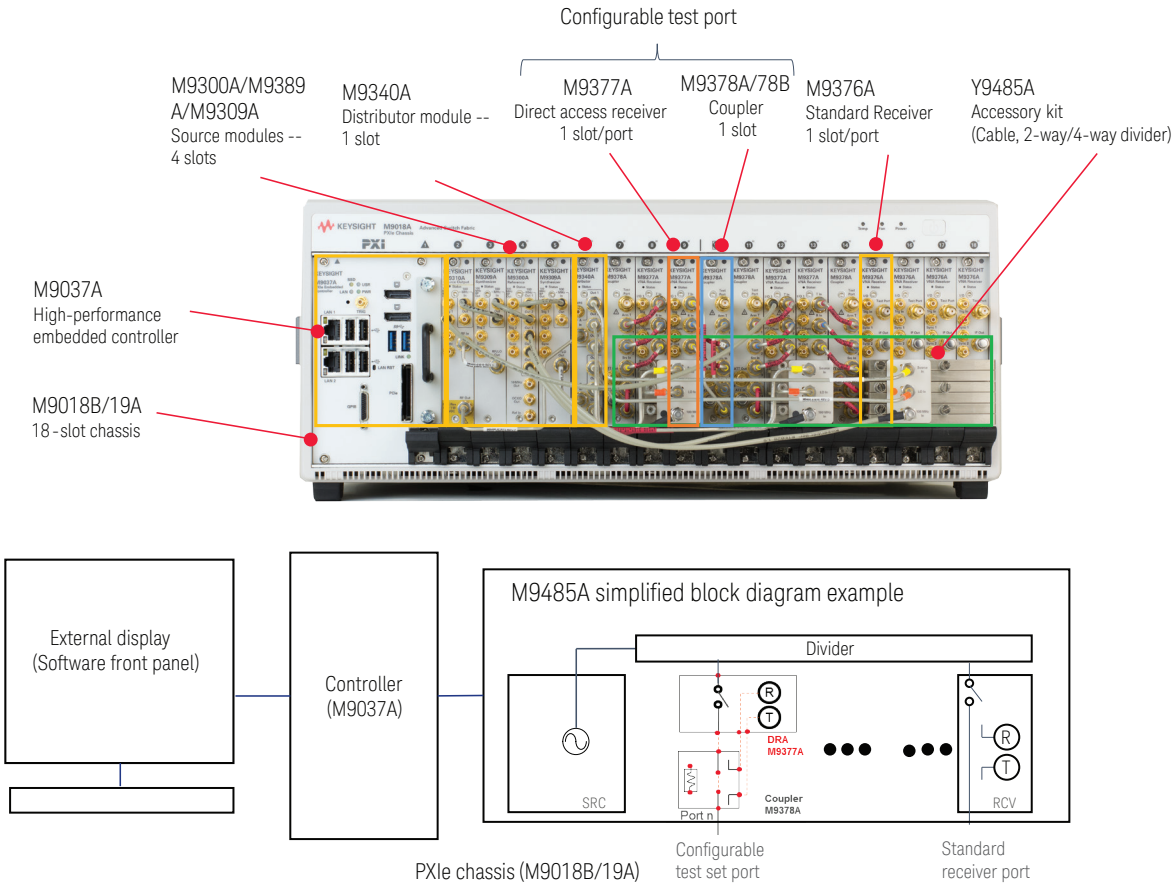


Figure 21. Simplified block diagram (4 configurable test port plus 4 standard port)

M9485A Software Front Panel

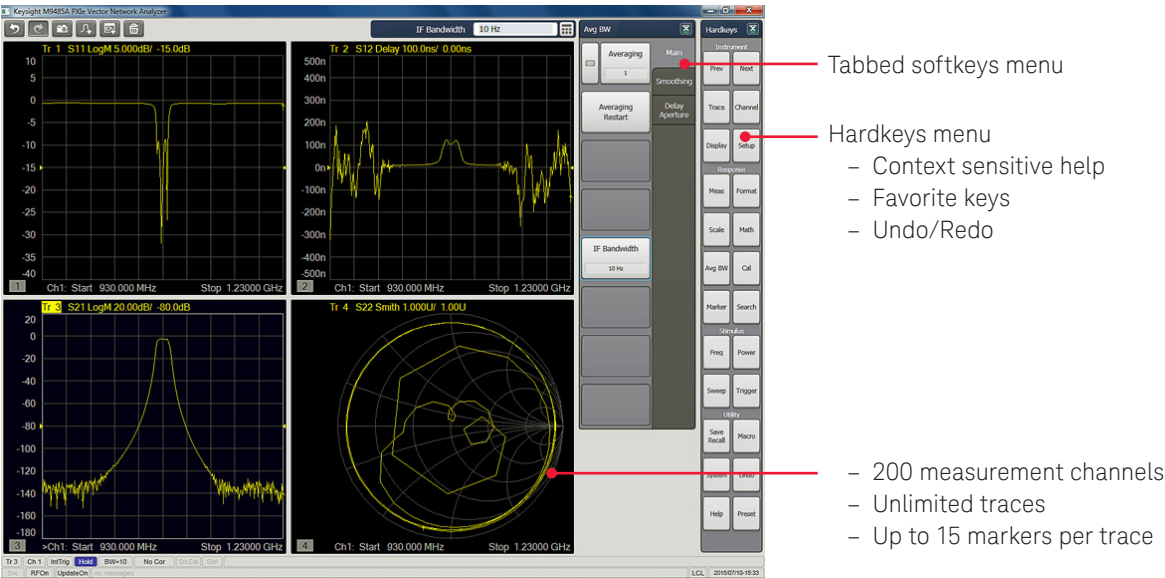
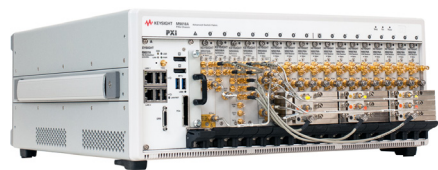


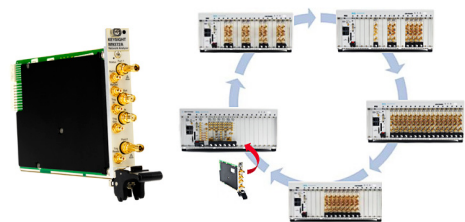
Figure 22. software front panel

Keysight PXIe VNA Comparison



High-performance multiport

True modular expands capabilities



Integrated 2-port VNA in one slot

Flexible, scalable, and re-configurable

	M9485A	M9370/71/72/73/74/75A
Frequency	1 MHz/50 MHz to 9 GHz	300 kHz to 4, 6.5, 9, 14, 20, or 26.5 GHz
Dynamic range, typ at10 Hz IFBW	142 dB ~ 160 dB ¹	122 dB
Cycle time, typ (201 pts, 2-port cal)	5 msec	11.9 msec
Trace noise, typ at 10 kHz IFBW	0.001 dBrms	0.001 dBrms
Source power max.	15 dBm ~ 17 dBm	7 dBm
# of test ports	Up to 24-ports, 12-ports maximum per chassis	Up to 32-ports in single chassis
Built-in Bias-T	Yes (Option)	No
Multi-site test	YES (with same stimulus, 1 for one system)	YES (with independent stimulus, 1 for 2-port VNA)
Options	* N-port calibrated meas (551) (mandatory for > 4-port) * Automatic fixture removal (007) * Time domain (010) * Frequency offset mode (009) * Basic RF pulse measurements (025) * Noise figure measurements (028) * Gain compression analysis (086)	* N-port calibrated meas (551) (mandatory for > 2-port) * Automatic fixture removal (007) * Time domain (010) * Frequency offset mode and scalar calibrated converter measurements (009)

1. Option 2xx wide dynamic range configuration

Ordering Information

Hardware option	
M9485A-1xx	X-port standard test set option. 1 MHz to 9 GHz. X is available as even number from 4-port (Option 104) to 24-port (Option 124). 1 slot/port.
M9485A-2xx	X-port configurable test set option. 50 MHz to 9 GHz. X is available as even number from 2-port (option 202 w/o bias-T, 232 w bias-T) to 12-port (option 212 w/o bias-T, 242 w bias-T). 2 slots/port.
M9485A-3xx	X-port direct receiver access (DRA) without coupler option. 50 MHz to 9 GHz. X is available as even number from 2-port (Option 302) to 12-port (Option 312). 1 slot/port. Option 1xx/2xx/3xx include M9389A, M9309A, and M9340A source modules; M9376A/M9377A/M9378A/M9378B receivers, necessary cables, and dividers ¹ .
M9485A-4xx	Add options to mix different type of receivers, etc.
M9485A-300	PXIe frequency reference

Software option	
M9485A-007	Automatic fixture removal
M9485A-009	Frequency offset mode
M9485A-010	Time domain analysis
M9485A-025	Basic RF pulse measurements
M9485A-028	Noise figure measurements
M9485A-086	Gain compression application
M9485A-551 ²	N-port calibrated measurement

Accessories	
M9018B/19A	PXIe 18-slot chassis ³
M9022A	PXIe System Module: Single Port (x8), Gen 3
M9111A	PXIe High-Speed Source/Measure Unit
M9037A	PXIe high-performance embedded controller
M9341A/B	PXIe Digital and Analog I/O
M9379A	PXIe RF Amplifier
Calibration	Electronic and mechanical kits available

System requirement	
Operating systems	Windows 7 (32 bit and 64 bit) or Windows 8.1 (32-bit and 64-bit)
Processor speed	1.5 GHz dual core (x86 or x64) minimum (2.4 GHz recommended)
Available memory	4 GB minimum (8 GB recommended)
Keysight IO libraries (version 17.1 or newer)	Includes: VISA libraries, Keysight Connection Expert, IO Monitor

1. Includes additional M9340As and one M9022A PXIe system module also when the configuration needs. Refer to configuration guide (5992-0758EN) for detail.
2. Required for > 4-port configurations. M9485A runs as maximum 4-port receiver configuration without Option 551.
3. M9485A-114 to -124 requires two M9018B/19A chassis.

Literature Resource

Description	Publication number
M9485A data sheet	5992-0756EN
M9485A configuration guide	5992-0758EN
M9485A startup guide	M9485-90010
M9111A PXIe High-Speed Source/Measure Unit data sheet	5992-1541EN
M9341A/B PXIe Digital and Analog I/O data sheet	5992-1856EN
M9379A RF Amp Module data sheet	5992-1795EN

More literature is available on our web site.

Web Resource

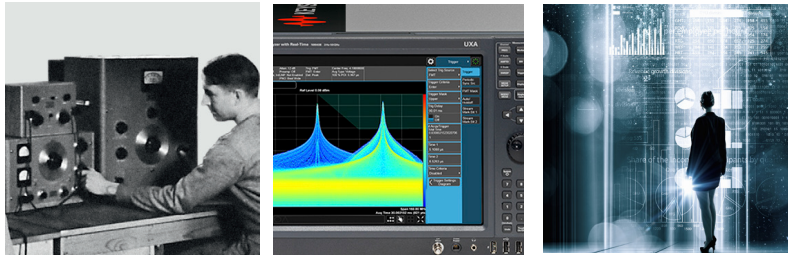
Get the latest news, product and support information, application literature and more.

<http://www.keysight.com/find/m9485a>

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