Agilent

N4420B S-Parameter Test Set

10 MHz to 40 GHz

Technical Overview

Expand your 2-port PNA Series network analyzer to a complete 4-port solution

- Compatible with Agilent PNA & PNA-L network analyzers
- Solid-state switches for fast and reliable measurement
- Balanced measurement capability
- Control via network analyzer with PNA/PNA-L Option 550

Agilent Technologies

Multiport Measurements – An Introduction

2-port PNA network analyzer utilizing the 2-port N4420B Test Set.

Many of today's wireless communications and broadband components have four or more ports. These components require multiple connections for complete characterization with a network analyzer. However, time-to-market pressures require that today's components be tested quickly while maintaining high levels of accuracy and high repeatability to achieve production volumes.

Network analyzer sweep speed is only one factor that contributes to the overall throughput that can be achieved in measuring multiport components. The overall throughput depends on how quickly the component can be connected and the system can transition from one measurement path to the next and process that data. Multiport test sets dramatically reduce overall tune and test times because the DUT only needs to be connected once to test multiple signal paths. Minimizing the number of connections also reduces operator fatigue and lowers the chance of connection to the wrong port. In addition, fewer connections mean less wear on cables, connectors, fixtures and DUTs. A multiport test set is especially valuable in manufacturing applications where the time required for device connection, handling, and/or configuration is significantly greater than the test time. In these situations, a test set provides a solution that supports operators or part-handlers in increasing throughput.

N4420B S-Parameter Test Set

N4420B S-Parameter Test Set front and rear panels.

The Agilent N4420B S-parameter test set, combined with a 2-port PNA or PNA-L network analyzer and Option 550, offers a complete solution for 4-port measurements.

Features:

- Compatible with Agilent PNA & PNA-L network analyzers
- Solid-state switches for fast and reliable measurement
- Balanced measurement capability
- Control via network analyzer with PNA/PNA-L Option 550

Signal Integrity Applications

Agilent N1955B Physical Layer Test System for 4-port, 40 GHz signal integrity measurements.

Agilent's Physical Layer Test Systems (PLTS) solutions provide the highest accuracy and most comprehensive tool set for model extraction and characterization of single-ended and differential physical-layer interconnects, or balanced-RF and microwave components with frequency coverage up to 67 GHz. These test solutions offer single-ended, balanced, and mixed-mode measurements in both frequency and time-domain, and eye-diagram analysis with a simple to use graphical user interface.

Features

- Analyze eye diagram for high bit rates
- Extract RLCG for differential transmission line modeling
- Improve design with spatial resolution of 18 ps

For additional PLTS information, please visit:
www.agilent.com/find/plts

RF & Microwave Electronic Calibration (ECal)

Agilent offers both 2-and 4-port ECal modules from 300 kHz to 67 GHz.

Multiport applications can quickly increase calibration complexity. Connecting mechanical standards to multiple ports requires intensive operator interaction, which is prone to error. With ECal, a full one- to four-port calibration can be accomplished with a single connection to the ECal module with minimal operator interaction. The operator simply connects the ECal module via a single USB cable to the network analyzer. The network analyzer controls the calibration process. Easy-to-use operation of the multiport system minimizes measurement setup time and results in faster and more repeatable calibrations.

Features:

- Fast 2-, 3- and 4-port calibrations up to 67 GHz with a single connection (2-port up to 67 GHz and 4-port up to 20 GHz)
- NIST traceable, accurate calibration
- Direct control via single USB interface
- Reliable solid-state switching
- Reduced connector wear and less error prone (compared to mechanical calibration)
- Nine connector types available and mixed connectors options

For additional Electronic Calibration and ECal information, please visit:
www.agilent.com/find/ecal

System Performance Characteristics*

N4420B 4-port Test Set with PNA
10 MHz to 40 GHz

* The following characteristics are applicable for a system with the following configuration:

Network analyzer:	E8363B with Option 014
Test set:	Agilent N4420B
Calibration technique:	Four-port SOLT

Dynamic range
Transmission measurements at 10 Hz IF bandwidth, with four-port error correction.

	Dynamic range		Max
Frequency range	Max power	–6 dBm	power
10 to 45 MHz	73	65	2
45 to 500 MHz	89	81	2
500 MHz to 2 GHz	112	101	5
2 to 10 GHz	113	102	5
10 to 20 GHz	107	99	2
20 to 30 GHz	95	91	–2
30 to 40 GHz	85	85	–6

Measurement port characteristics
Residual uncertainties for corrected data. These apply for 25 ˚C with less than 1 ˚C variation from calibration.

Calibration kit: 85056A

Description	45 MHz to 2 GHz	2 to 20 GHz	20 to 40 GHz
Directivity (dB)	42	42	38
Source match (dB)	41	38	33
Load match (dB)	42	42	37
Refl. tracking (mag)	0.001	0.008	0.020
Refl. tracking (phase)	0.009	0.054	0.133
Trans. tracking (mag)	0.016	0.045	0.097
Trans. tracking (phase)	0.107	0.296	0.643

Calibration kit: 85056D

Description	45 MHz to 2 GHz	2 to 20 GHz	20 to 40 GHz
Directivity (dB)	42	34	26
Source match (dB)	40	30	24
Load match (dB)	42	33	25
Refl. tracking (mag)	0.002	0.029	0.079
Refl. tracking (phase)	0.016	0.189	0.525
Trans. tracking (mag)	0.018	0.111	0.326
Trans. tracking (phase)	0.118	0.734	2.149

Test set typical performance

Frequency range	10 MHz to 40 GHz
Transition time (10 to 90%)	14 ps
Impedance	50 Ohms (nom)
Maximum operating level	+20 dBm
Damage level	+30 dBm
Test port connectors	2.4 mm (m)
RF connectors	2.4 mm (f)
Weight	9 kg

System Performance Characteristics*

N4420B 4-port Test Set with PNA-L
10 MHz to 40 GHz

* The following characteristics are applicable for a system in the following configuration:

Network analyzer:	N5230A with Option 425
Test set:	Agilent N4420B
Calibration technique:	Four-port SOLT

Dynamic range
Transmission measurements at 10 Hz IF bandwidth, with four-port error correction.

	Dynamic range		Max
Frequency range	Max power	–8 dBm	power
10 to 45 MHz**	82	74	0
45 to 500 MHz	85	77	0
500 to 2 GHz	103	95	0
2 to 10 GHz	91	83	0
10 to 20 GHz	86	78	0
20 to 30 GHz	76	76	–8
30 to 40 GHz	65	65	–8

** typical

Measurement port characteristics
Residual uncertainties for corrected data. These apply for 25 ˚C with less than 1 ˚C variation from calibration.

Calibration kit: 85056A

Description	45 MHz to 2 GHz	2 to 20 GHz	20 to 40 GHz
Directivity (dB)	42	42	38
Source match (dB)	41	38	33
Load match (dB)	42	42	37
Refl. tracking (mag)	0.001	0.008	0.020
Refl. tracking (phase)	0.009	0.054	0.133
Trans. tracking (mag)	0.016	0.045	0.098
Trans. tracking (phase)	0.107	0.296	0.644

Calibration kit: 85056D

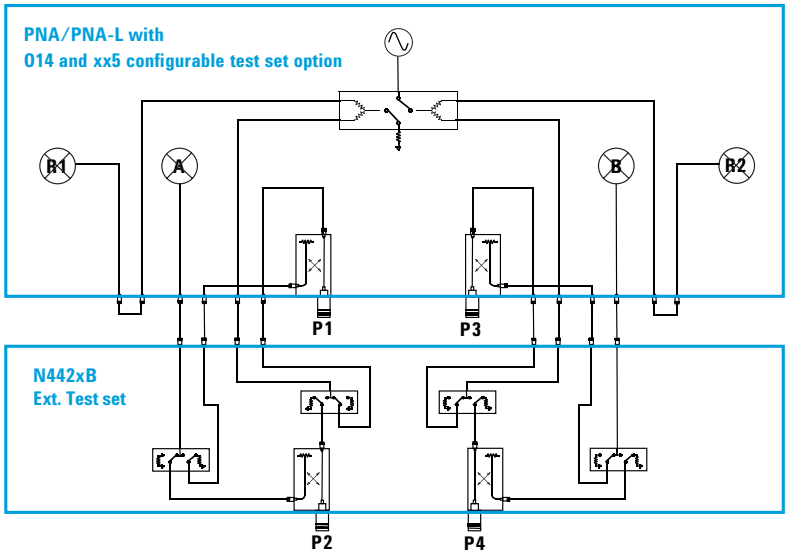
Description	45 MHz to 2 GHz	2 to 20 GHz	20 to 40 GHz
Directivity (dB)	42	34	26
Source match (dB)	40	30	24
Load match (dB)	42	33	25
Refl. tracking (mag)	0.002	0.029	0.079
Refl. tracking (phase)	0.016	0.189	0.525
Trans. tracking (mag)	0.018	0.111	0.326
Trans. tracking (phase)	0.118	0.735	2.152

Test set typical performance

Frequency range	10 MHz to 40 GHz
Transition time (10 to 90%)	14 ps
Impedance	50 Ohms (nom)
Maximum operating level	+20 dBm
Damage level	+30 dBm
Test port connectors	2.4 mm (m)
RF connectors	2.4 mm (f)
Weight	9 kg

Microwave 4-port Block Diagram

2-port PNA network analyzer utilizing the 2-port N4420B Test Set.



N44xxB block diagram.

Configuration Options for N4420B Test Sets
(10 MHz to 40 GHz)

Recommended network analyzers:

N5230A PNA-L Network Analyzer with Option 425 and 550
Powerful general-purpose network analyzer.

E8363B PNA Network Analyzer with Option 014 and 550
Highest performance network analyzer with capabilities for advanced applications.

Options descriptions:

Option 425:
Front panel access to source output, receiver inputs and couplers for a custom test set. Adds source attenuators for wider source power output. Compatible network analyzers: N5230A

Option 550:
Enables full, 4-port error correction and differential measurements on a 2-port network analyzer. External test set required. Compatible network analyzers: E8362/3/4B, E8361A, N5230A

Option 014:
Provides front panel access to source output, receiver inputs and couplers to configure a custom test set. Compatible network analyzers: E8362/3/4B, E8361A, N5250A

Web Resources

The N4420B S-parameter test set is one of many Agilent multiport solutions from 2 to 16 ports.

Agilent multiport solutions are designed to test a variety devices; from simple duplexers, for both front-end passive and active and wireless infrastructure components, to more complex integrated modules. These solutions optimize key hardware, firmware, and software features, which provide the best accuracy with the convenience of multiport connections and electronic calibration to achieve exceptionally fast measurement speeds.

*For a complete list of Agilent multiport solutions, view or download the *"Agilent Test Solutions for Multiport and Balanced Devices"* Selection Guide (literature number 5988-2461EN) from our Web site.

Visit our Web sites for additional application and product information:

*Multiport Measurements
www.agilent.com/find/multiport

PNA and PNA-L Network Analyzers
www.agilent.com/find/pna

Electronic Calibration Modules (ECal)
www.agilent.com/find/ecal

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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 receive your new Agilent equipment, we can help verify that it works properly and help with initial product operation.

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 onsite 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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Product specifications and descriptions in this document subject to change without notice.

Printed in USA, September 1, 2006
5989-5538EN

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