Keysight 2-Port and 4-Port Broadband Network Analyzer

N5251A

10 MHz to 110 GHz

Technical Specifications

KEYSIGHT TECHNOLOGIES

Documentation Warranty

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N5251A System Options

This is a complete list of the technical specifications for the N5251A PNA network analyzer with the following options:

Option 200 • *N5227A 2-port, opt 201* • *N5261A test set* • *2 modules with bias tees* • *Attenuator on left module only*	*Option 400* • *N5227A 4-port, opt 401* • *N5262A test set* • *4 modules with bias tees* • *Attenuator on left modules only*
Option 217 • *N5227A 2-port, opt 201* • *N5261A test set* • *2 modules with bias tees* • *Attenuators on both modules*	*Option 417* • *N5227A 4-port, opt 401* • *N5262A test set* • *4 modules with bias tees* • *Attenuators on all modules*
Option 218 • *N5227A 2-port, opt 219* • *N5261A test set* • *2 modules with bias tees* • *Attenuator on left module only*	*Option 418* • *N5227A 4-port, opt 419* • *N5262A test set* • *4 modules with bias tees* • *Attenuator on left modules only*
Option 219 • *N5227A 2-port, opt 219* • *N5261A test set* • *2 modules with bias tees* • *Attenuators on both modules*	*Option 419* • *N5227A 4-port, opt 419* • *N5262A test set* • *4 modules with bias tees* • *Attenuators on all modules*

Definitions

All specifications and characteristics apply over a 25 °C ±5 °C range (unless otherwise stated) and 90 minutes after the instrument has been turned on.

Specification (spec.): Warranted performance. Specifications include guardbands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions.

Characteristic (char.): A performance parameter that the product is expected to meet before it leaves the factory, but that is not verified in the field and is not covered by the product warranty. A characteristic includes the same guardbands as a specification.

Typical (typ.): Expected performance of an average unit which does not include guardbands. It is not covered by the product warranty.

Nominal (nom.): A general, descriptive term that does not imply a level of performance. It is not covered by the product warranty.

Calibration: The process of measuring known standards to characterize a network analyzer's systematic (repeatable) errors.

Corrected (residual): Indicates performance after error correction (calibration). It is determined by the quality of calibration standards and how well "known" they are, plus system repeatability, stability, and noise.

Uncorrected (raw): Indicates instrument performance without error correction. The uncorrected performance affects the stability of a calibration.

Standard: When referring to the analyzer, this includes no options unless noted otherwise.

Notes:

Please download our free Uncertainty Calculator from ***http://www.Keysight.com/find/na_calculator*** *to generate the curves for your calibration kit and PNA setup.*

Typical performance information between 10 MHz and 110 GHz is shown in this document where available.

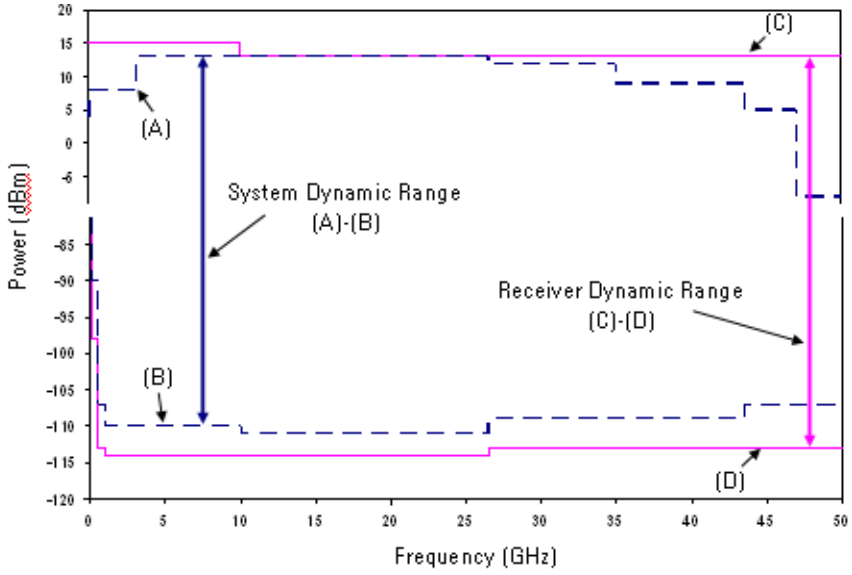
Corrected System Performance

The specifications in this section apply for measurements made with the N5251A PNA network analyzer with the following conditions:

- *10 Hz IF bandwidth*
- *No averaging applied to data*

System Dynamic Range and Receiver Dynamic Range

- *System Dynamic Range is defined as the specified source maximum output power (spec) minus the noise floor (spec).*
- *Receiver Dynamic Range is defined as the test port compression at 0.1 dB (typical) minus the noise floor (typical).*



NOTE

The effective dynamic range must take measurement uncertainties and interfering signals into account. This set-up should only be used when the receiver input will never exceed its maximum receiver input. When the analyzer is in segment sweep mode, it can have predefined frequency segments which will output a higher power level when the extended dynamic range is required (i.e. devices with high insertion loss), and reduced power when the maximum receiver input level will occur (i.e. devices with low insertion loss). The extended range is only available in one-path transmission measurements.

It may typically be degraded at particular frequencies below 500 MHz due to spurious receiver residuals.

Table 1. System Dynamic Range at Test Port (dB)

Description	*Specification*
10 MHz to 50 MHz[1]	*86*
50 MHz to 100 MHz	*99*
100 MHz to 500 MHz	*109*
500 MHz to 1 GHz	*119*
1 GHz to 2 GHz	*123*
2 GHz to 3.2 GHz	*119*
3.2 GHz to 10 GHz	*119*
10 GHz to 24 GHz	*117*
24 GHz to 30 GHz	*106*
30 GHz to 40 GHz	*94*
40 GHz to 43.5 GHz	*92*
43.5 GHz to 50 GHz	*92*
50 GHz to 60 GHz	*85*
60 GHz to 67 GHz	*85*
67 GHz to 70 GHz	*69*
70 GHz to 75 GHz	*70*
75 GHz to 80 GHz	*82*
80 GHz to 100 GHz	*78*
100 GHz to 110 GHz	*76*

N5251A Corrected System Performance, All Options

For any Sii reflection measurement:

Sjj = 0.

For any Sij transmission measurement:

Sji = Sij when Sij ≤ 1

Sji = 1/Sij when Sij > 1

Skk = 0 for all k

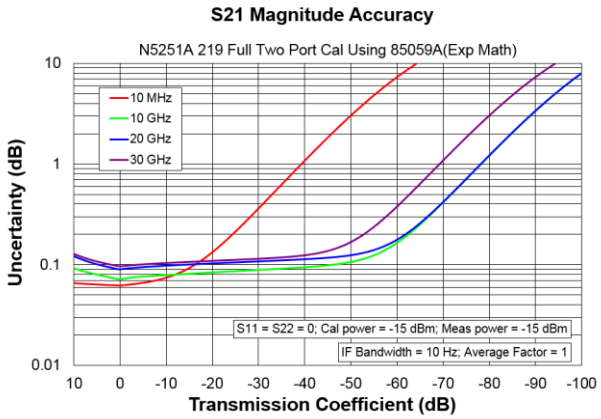
Applies to the N5251A Option 200, 201, 219, 400, 401, or 419 analyzers, N4697F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

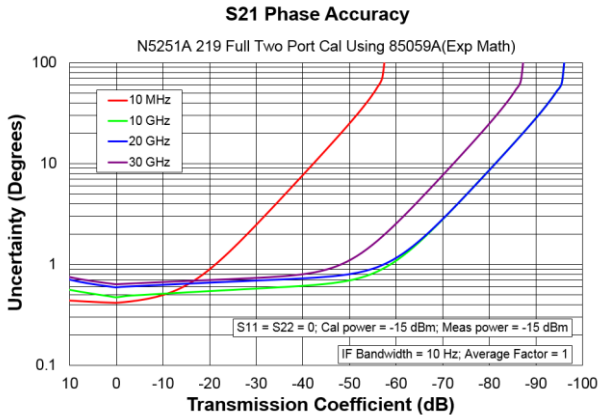
Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

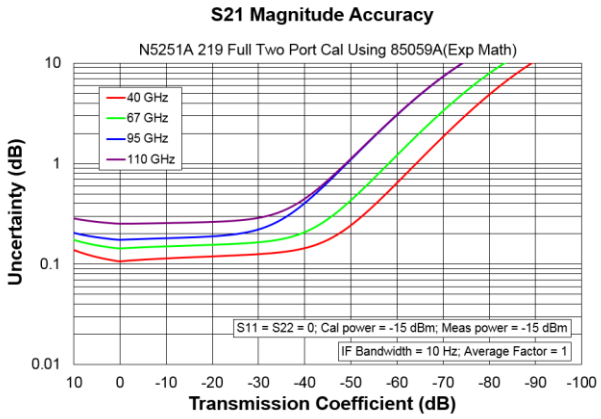
Table 2. N5251A with 85059A Calibration Kit

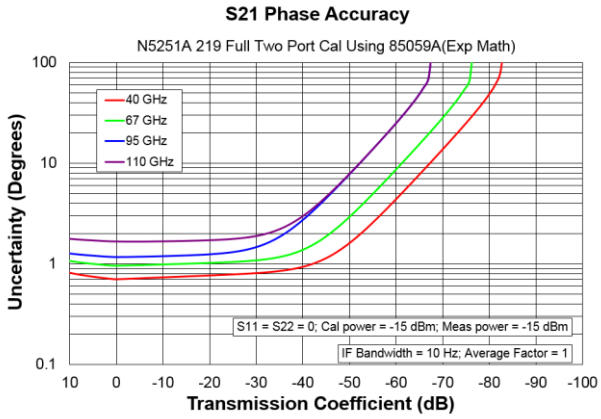
Description	*Specification (dB)*							
	10 MHz to 2 GHz	*2 GHz to 10 GHz*	*10 GHz to 20 GHz*	*20 GHz to 30 GHz*	*30 GHz to 40 GHz*	*60 GHz to 67 GHz*	*67 GHz to 95 GHz*	*95 GHz to 110 GHz*
Directivity	*43*	*43*	*43*	*43*	*41*	*38*	*36*	*32*
Source Match	*40*	*40*	*40*	*40*	*40*	*38*	*36*	*32*
Load Match	*40*	*40*	*43*	*39*	*37*	*35*	*33*	*29*
Reflection Tracking								
Mag	*±0.070*	*±0.070*	*±0.070*	*±0.090*	*±0.090*	*±0.100*	*±0.140*	*±0.200*
Phase (degree)	*±0.462*	*±0.462*	*±0.462*	*±0.594*	*±0.594*	*±0.660*	*±0.924*	*±1.320*
Transmission Tracking								
Mag	*±0.048*	*±0.061*	*±0.036*	*±0.084*	*±0.091*	*±0.117*	*±0.131*	*±0.203*
Phase (degree)	*±0.319*	*±0.404*	*±0.234*	*±0.554*	*±0.600*	*±0.772*	*±0.864*	*±1.342*

Transmission Uncertainty, All Options

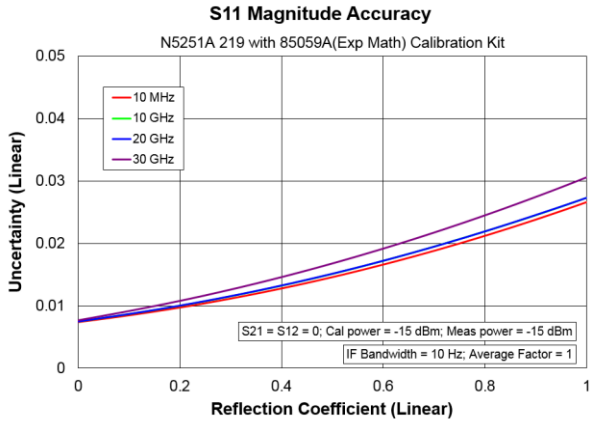


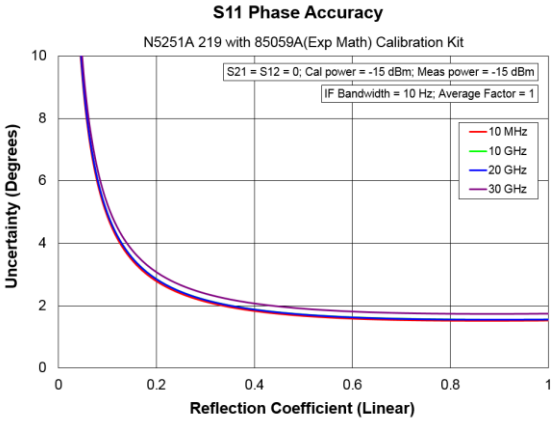


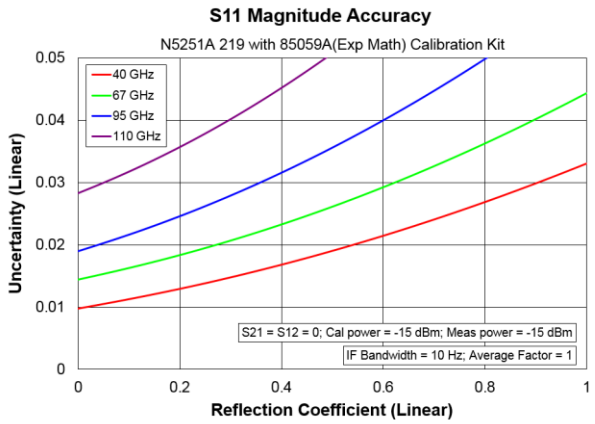


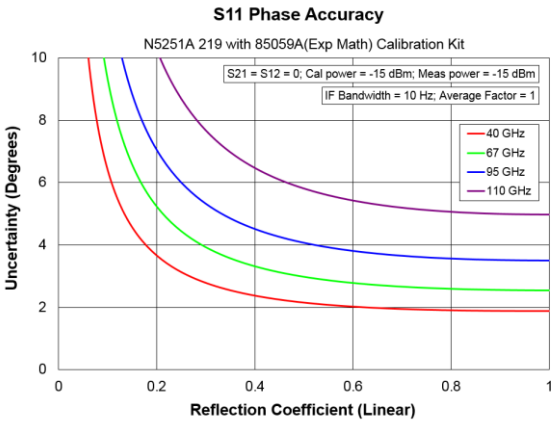


Reflection Uncertainty, All Options









Uncorrected System Performance

Specifications apply to following conditions:

- *Over environmental temperature of 25 °C ±5 °C, with less than 1°C variation from the calibration temperature.*

Table 3a. Error Terms (dB), All Ports, All Options – Specifications

	Directivity	*Source Match*	*Load Match*
10 MHz to 45 MHz	*-23*	*-12*	*-10*
45 MHz to 500 MHz	*-20*	*-15*	*-15*
500 MHz to 2 GHz	*-20*	*-13*	*-12*
2 GHz to 10 GHz	*-16*	*-9*	*-9*
10 GHz to 24 GHz	*-16*	*-7*	*-7*
24 GHz to 30 GHz	*-16*	*-7*	*-7*
30 GHz to 40 GHz	*-16*	*-7*	*-7*
40 GHz to 50 GHz	*-16*	*-6*	*-6*
50 GHz to 60 GHz	*-16*	*-6*	*-6*
60 GHz to 67 GHz	*-16*	*-7*	*-7*
67 GHz to 70 GHz	*-2*	*-9*	*-8*
70 GHz to 75 GHz	*-2*	*-9*	*-8*
75 GHz to 80 GHz	*-1.5*	*-9*	*-8*
80 GHz to 100 GHz	*-1*	*-8*	*-8*
100 GHz to 110 GHz	*-1*	*-8*	*-8*

***Table 3b. Error Terms** (dB), All Ports, All Options – Typical*

	Directivity	*Source Match*	*Load Match*	*Transmission Tracking*	*Reflection Tracking*
10 MHz to 45 MHz	*-23.0*	*-12.0*	*-10.0*	*-2*	*-2*
45 MHz to 500 MHz	*-30.6*	*-21.6*	*-19.7*	*-2*	*-2*
500 MHz to 2 GHz	*-25.7*	*-18.5*	*-17.3*	*-2*	*-3*
2 GHz to 10 GHz	*-19.5*	*-14.7*	*-14.9*	*-6*	*-7*
10 GHz to 24 GHz	*-20.8*	*-12.0*	*-11.7*	*-11*	*-11*
24 GHz to 30 GHz	*-20.1*	*-12.9*	*-12.7*	*-12*	*-12*
30 GHz to 40 GHz	*-19.1*	*-11.4*	*-11.4*	*-14*	*-14*
40 GHz to 50 GHz	*-20.8*	*-8.9*	*-8.9*	*-17*	*-17*
50 GHz to 60 GHz	*-22.1*	*-9.0*	*-8.9*	*-21*	*-21*
60 GHz to 67 GHz	*-20.0*	*-10.1*	*-10.1*	*-23*	*-23*
67 GHz to 70 GHz	*-7.0*	*-15.4*	*-15.6*	*-22*	*-22*
70 GHz to 75 GHz	*-8.1*	*-12.1*	*-12.2*	*-15*	*-16*
75 GHz to 80 GHz	*-5.5*	*-13.5*	*-13.4*	*-13*	*-14*
80 GHz to 100 GHz	*-5.5*	*-11.8*	*-11.7*	*-13*	*-14*
100 GHz to 110 GHz	*-5.1*	*-11.9*	*-11.8*	*-11*	*-13*

Test Port Output

Table 4. Frequency Information, All Options

Description	Specification	Typical
N5251A Frequency Range	50 MHz to 110 GHz	--
Frequency Resolution	1 Hz	--
Frequency [1]Accuracy	+/- 1 ppm	--
Frequency Stability	--	+/-0.05 ppm, -10° to 70° C1 +/-0.1 ppm/yr maximum[2]

[1] Assumes no variation in time.
[2] Assumes no variation in temperature.

Table 5. Maximum Power (dBm) – Specification

Description	
10 MHz to 50 MHz[1]	13.40
50 MHz to 100 MHz	10.00
100 MHz to 500 MHz	10.00
500 MHz to 1 GHz	10.00
1 GHz to 2 GHz	10.00
2 GHz to 3.2 GHz	7.00
3.2 GHz to 10 GHz	7.00
10 GHz to 24 GHz	5.00
24 GHz to 30 GHz	3.00
30 GHz to 40 GHz	-4.00
40 GHz to 43.5 GHz	-2.00
43.5 GHz to 50 GHz	-2.00
50 GHz to 60 GHz	-7.00
60 GHz to 67 GHz	-7.00
67 GHz to 70 GHz	-7.00
70 GHz to 75 GHz	-6.00
75 GHz to 80 GHz	-5.00
80 GHz to 100 GHz	-5.50
100 GHz to 110 GHz	-7.00

[1] Typical below 50 MHz

Test Port Input

Table 6. Test Port Noise Floor (dBm) @ 10 Hz IFBW, All Options

Total average (rms) noise power calculated as the mean value of a linear magnitude trace expressed in dBm.

May typically be degraded at particular frequencies below 500 MHz due to spurious receiver residuals.

Description	*Specification*	*Typical*
10 MHz to 50 MHz[1]	*-73*	
50 MHz to 100 MHz	*-89*	
100 MHz to 500 MHz	*-99*	
500 MHz to 1 GHz	*-109*	
1 GHz to 2 GHz	*-113*	
2 GHz to 3.2 GHz	*-112*	
3.2 GHz to 10 GHz	*-112*	
10 GHz to 24 GHz	*-112*	
24 GHz to 30 GHz	*-103*	
30 GHz to 40 GHz	*-98*	
40 GHz to 43.5 GHz	*-94*	
43.5 GHz to 50 GHz	*-94*	
50 GHz to 60 GHz	*-92*	
60 GHz to 67 GHz	*-92*	
67 GHz to 70 GHz	*-76*	
70 GHz to 75 GHz	*-76*	
75 GHz to 80 GHz	*-87*	
80 GHz to 100 GHz	*-83*	
100 GHz to 110 GHz	*-83*	

[1] *Typical below 50 MHz*

Table 7. Receiver Compression at Test Port Power - Specification

Description	*Test Port Power (dBm)*		*Receiver Compression*	
	Option 200, 217, 400, 417	***Option 218, 219, 418, 419***	*Magnitude (dB)*	*Phase (degrees)*
10 MHz to 500 MHz[1]	--	--	--	--
500 MHz to 2 GHz	*13*	*13*	*0.15*	*1.2*
2 GHz to 3.2 GHz	*12*	*11*	*0.15*	*1.2*
3.2 GHz to 10 GHz	*13*	*12*	*0.15*	*1.2*
10 GHz to 13.5 GHz	*11*	*9*	*0.15*	*1.2*
13.5 GHz to 16 GHz	*12*	*10*	*0.15*	*1.2*
16 GHz to 20 GHz	*11*	*8*	*0.15*	*1.2*
20 GHz to 24 GHz	*11*	*8*	*0.15*	*1.2*
24 GHz to 30 GHz	*10*	*8*	*0.15*	*1.2*
30 GHz to 35 GHz	*9*	*8*	*0.15*	*1.2*
35 GHz to 40 GHz	*8*	*8*	*0.15*	*1.2*
40 GHz to 67 GHz	*10*	*8*	*0.15*	*1.2*

[1]*Test port receiver compression is not specified below 500 MHz due to coupler rolloff in this frequency range.*

Table 8. N5251A Trace Noise Magnitude (dB rms)

Ratioed measurement, nominal power at test port.

Description	*Specification*	*Typical*
	1 kHz IFBW	*1 kHz IFBW*
10 MHz to 50 MHz	*--*	*0.026*
50 MHz to 67 GHz	*0.004*	*0.0007*
67 GHz to 72 GHz	*0.01*	*0.0021*
72 GHz to 110 GHz	*0.009*	*0.0011*

Table 9. N5227A Trace Noise Phase (deg rms)

Ratioed measurement, nominal power at test port.

Description	*Specification*	*Typical*
	1 kHz IFBW	*1 kHz IFBW*
10 MHz to 50 MHz	*--*	*0.191*
50 MHz to 67 GHz	*0.08*	*0.028*
67 GHz to 72 GHz	*0.09*	*0.032*
72 GHz to 110 GHz	*0.11*	*0.031*

Table 10. N5251A Stability

The following table shows the worst case measured stability data of two N5251A systems.

	System 1		System 2	
Worst Case (10 MHz to 110 GHz)	*S11*	*S22*	*S11*	*S22*
Mag Drift over Time	*.02 dB*	*.04 dB*	*.04 dB*	*.03 dB*
Mag Drift over Temp	*2.0 dB*	*2.0 dB*	*1.4 dB*	*1.4 dB*
Phase Drift over Time	*.22 deg*	*.29 deg*	*.30 deg*	*.42 deg*
Phase Drift over Temp	*3.8 deg/C*	*4.8 deg/C*	*3.1 deg/C*	*3.9 deg/C*
Vector Difference Mag over Time	*.04 dB*	*.05 dB*	*.05 dB*	*.07 dB*

Notes

1. *For system 1, results above do not include an increase for 12 and 24 hours, believed to be due to a movement of a 1.85 mm cable.*
2. *For System 1, results do not include instability around 95 GHz which was attributed to a loose cable in the coupler/combiner.*
3. *All measurements were made in Thermotron 7800 ovens (ovens 78 and 80 in ETL lab).*
4. *Thermal measurements were made at oven settings of 18C and 32C and are relative to data at 25C.*
5. *Time measurements are made at 30,60 90,120, and 150 minutes, then at 12 and 24 hours.*

Table 11. Damage Input Level at 1mm Test Port, All Options

Description	*RF (dBm)*	*DC (V)*
All Options	*+20*	*40*

Dynamic Accuracy

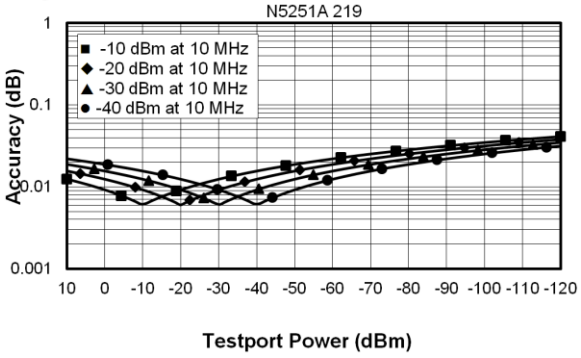
Dynamic accuracy is verified with the following measurements: Compression over frequency

*IF linearity at a single frequency of 1.998765GHz using a reference level of -20 dBm for an input power range of 0 to -60 dBm. For values below -60 dBm, refer to "**VNA Receiver Dynamic Accuracy Specifications and Uncertainties**".*

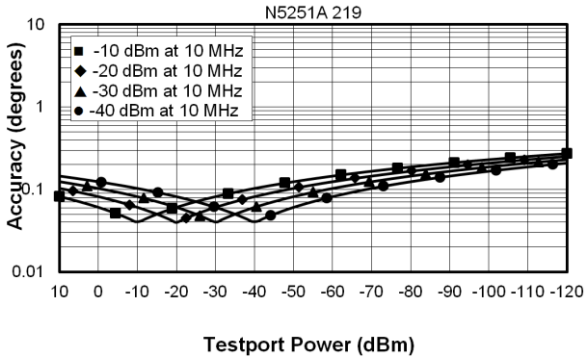
Table 12. N5251A Dynamic Accuracy

N5251A Dynamic Accuracy, 10 MHz - Specification

Magnitude

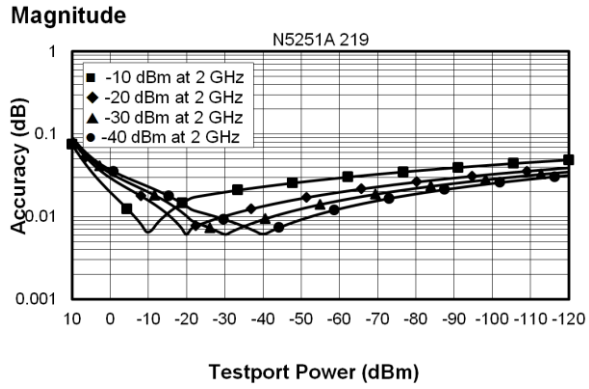


Phase

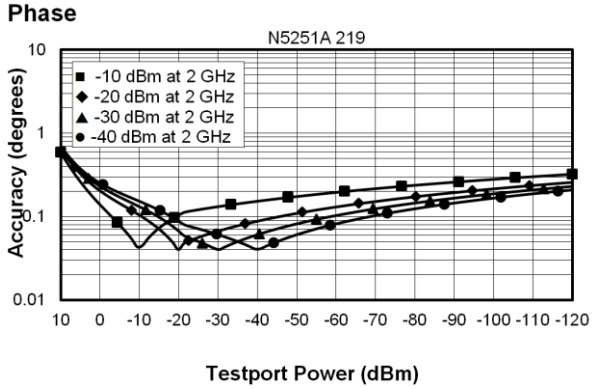


N5251A Dynamic Accuracy, 2 GHz - Specification

Magnitude

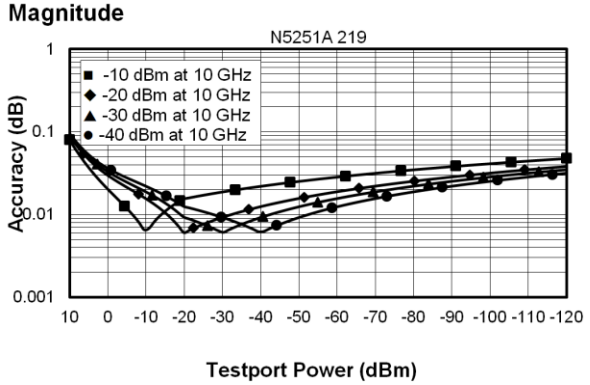


Phase



N5251A Dynamic Accuracy, 10 GHz - Specification

Magnitude



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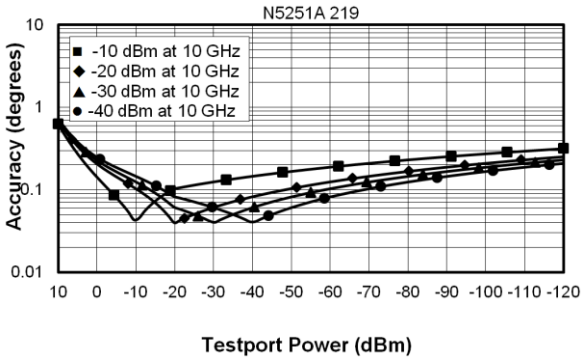
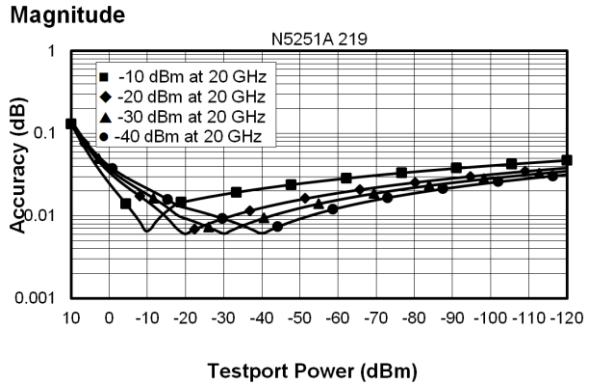


N5251A Dynamic Accuracy, 20 GHz - Specification

Magnitude



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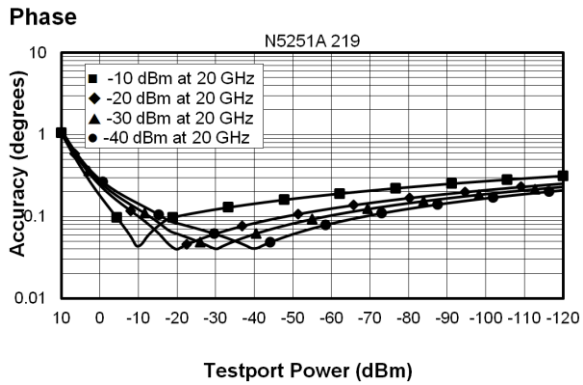
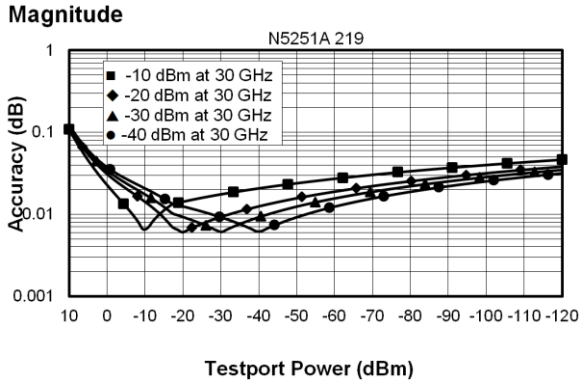


N5251A Dynamic Accuracy, 30 GHz - Specification

Magnitude



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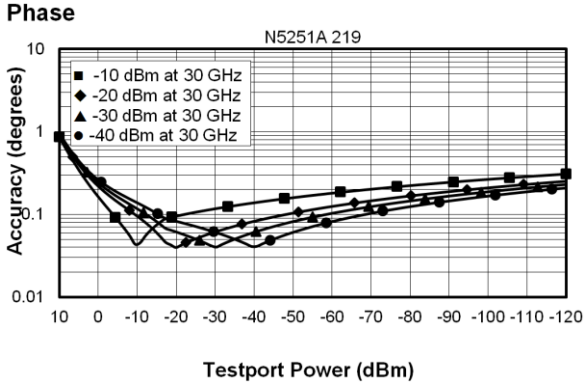
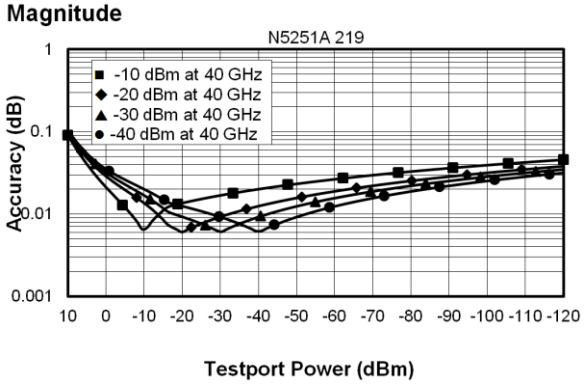
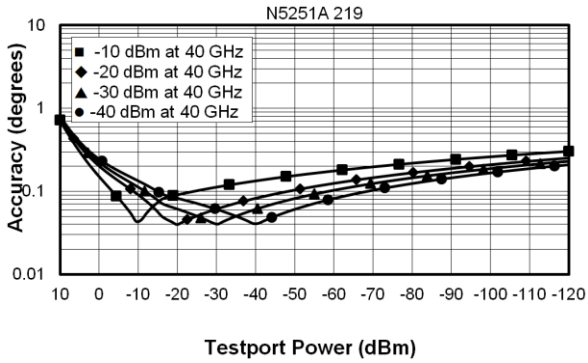


N5251A Dynamic Accuracy, 40 GHz - Specification

Magnitude

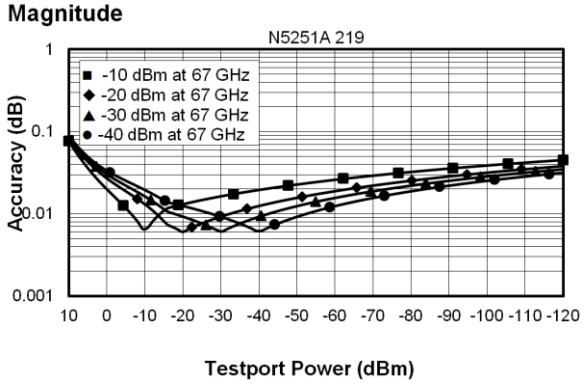


Phase

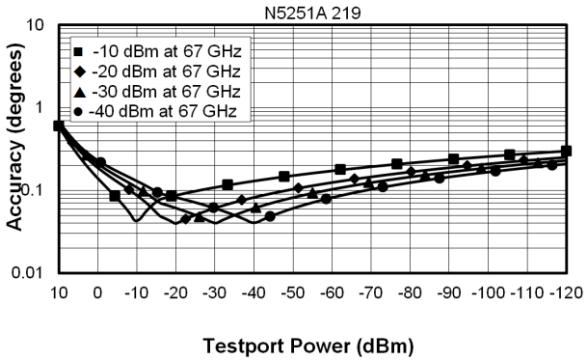


N5251A Dynamic Accuracy, 67 GHz - Specification

Magnitude

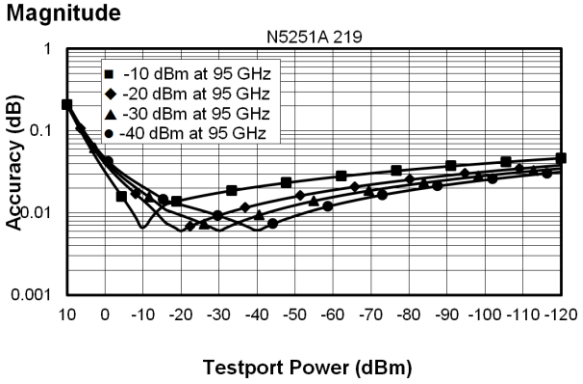


Phase

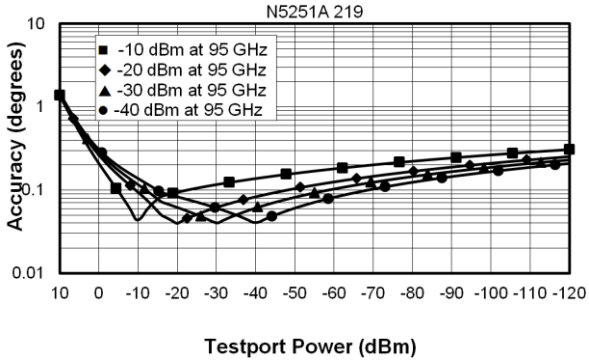


N5251A Dynamic Accuracy, 95 GHz - Specification

Magnitude

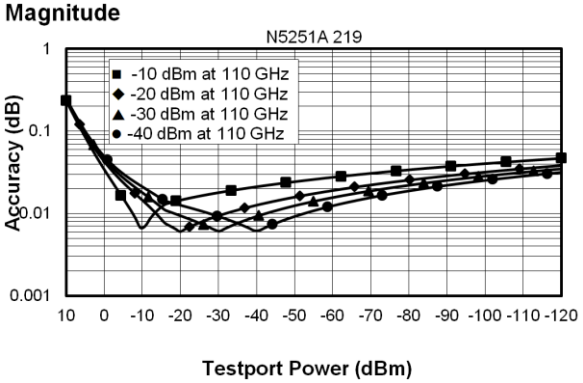


Phase



N5251A Dynamic Accuracy, 110 GHz - Specification

Magnitude



Phase

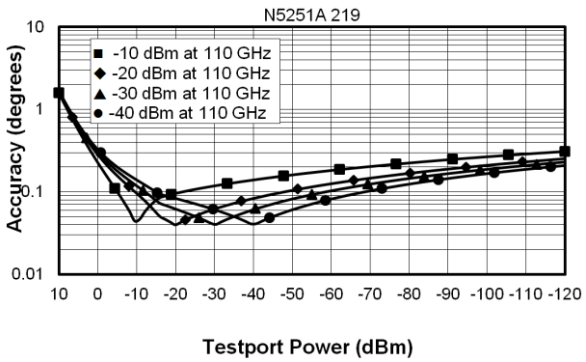


Table 13. Group Delay - Typical

Group delay is computed by measuring the phase change within a specified frequency step (determined by the frequency span and the number of points per sweep). In general, the following formula can be used to determine the accuracy, in seconds, of specific group delay measurement:

±Phase Accuracy (deg)/[360 × Aperture (Hz)]

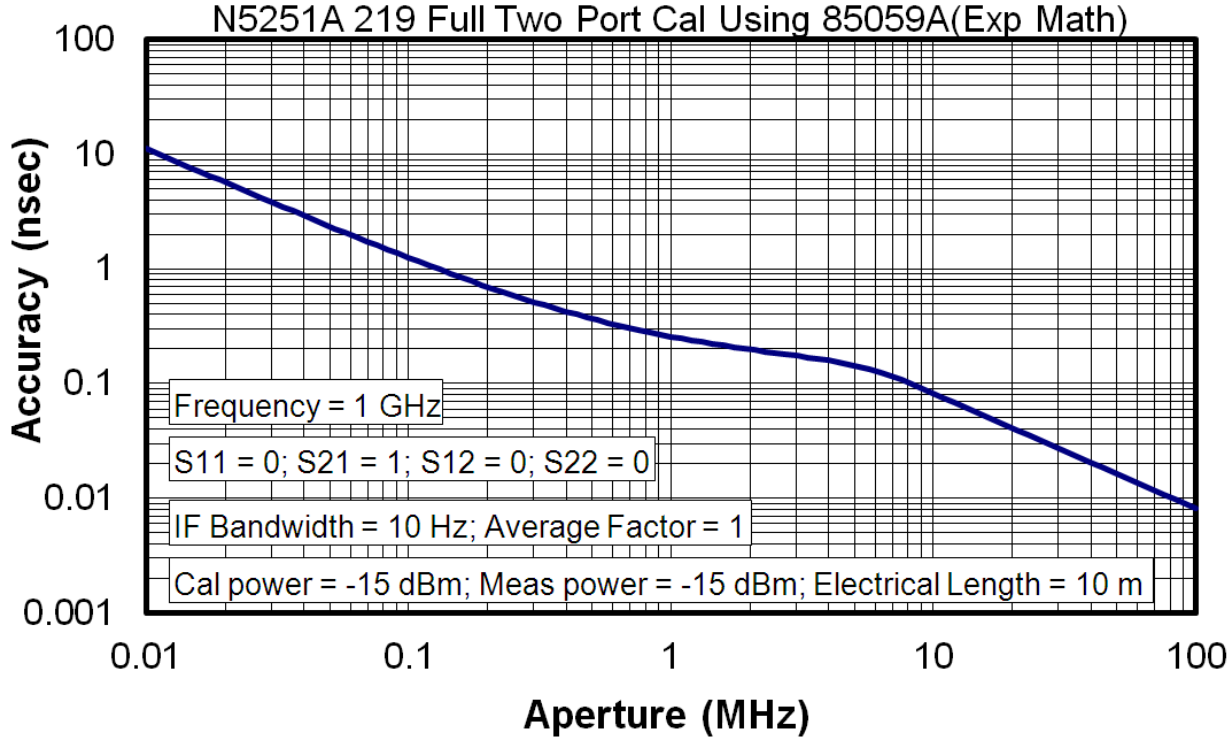
Depending on the aperture and device length, the phase accuracy used is either incremental phase accuracy or worst-case phase accuracy

Description	*Typical Performance*
Aperture (selectable)	*(frequency span)/(number of points -1)*
Maximum Aperture	*20% of frequency span*
Range	*0.5 x (1/minimum aperture)*
Maximum Delay	*Limited to measuring no more than 180° of phase change within the minimum aperture.)*

The following graph shows characteristic group delay accuracy with full 2-port calibration and a 10 Hz IF bandwidth. Insertion loss is assumed to be < 2 dB and electrical length to be ten meters.

For any S_{ij} Group Delay measurement, $S_{ii} = 0$, $S_{ij} = 1$, $S_{ji} = 0$, $S_{kl} = 0$ for all $kl \neq ij$

Group Delay (Typical)



General Information

- Miscellaneous Information
- Front Panel
- Rear Panel
- Environment and Dimensions

Table 14. Miscellaneous Information

Description	Supplemental Information
System IF Bandwidth Range	1 Hz to 5 MHz, nominal
CPU	For the latest information on CPUs and associated hard drives, visit: http://na.support.keysight.com/pna/hdnumbers.html
LXI	Class C

Table 15. Front Panel Information, All Options

Description	Typical Performance
Display Range	
Magnitude	+/-2500 dB (at 500 dB/div), max
Phase	+/-2500° (at 500 dB/div), max
Polar	10 pUnits, min 10,000 Units, max
Display Resolution	
Magnitude	0.001 dB/div, min
Phase	0.01°/div, min
Marker Resolution	
Magnitude	0.001 dB, min
Phase	0.01°, min
Polar	10 pUnit, min

Table 16. Rear Panel Information, All Options

Description	*Typical Performance*
10 MHz Reference In	
Connector	*BNC, female*
Input Frequency	*10 MHz ± 10 ppm*
Input Level	*-15 dBm to +20 dBm*
Input Impedance	*200 Ω, nom.*
10 MHz Reference Out	
Connector	*BNC, female*
Output Frequency	*10 MHz ± 1 ppm*
Signal Type	*Sine Wave*
Output Level	*+10 dBm ± 4 dB into 50 Ω*
Output Impedance	*50 Ω, nominal*
Harmonics	*<-40 dBc, typical*

Table 16. (Continued) Rear Panel Information, All Options

Description	*Typical Performance*
External IF Inputs	
Function	*Allows use of external IF signals from remote mixers, bypassing the PNA's first converters*
Connectors	*SMA (female); A, B, C, D, R (4-port); A, B, R1, R2 (2-port)*
Input Frequency	
Normal IF path	*RF < 53 MHz: IF = 826.446 KHz* *RF >= 53 MHz: IF = 7.438 MHz*
Narrowband IF path	*IF = 10.70 MHz*
Input Impedance	*50 Ω*
RF Damage Level	*+23 dBm*
DC Damage Level	*5.5 VDC*
0.1 dB Compression Point	
Normal IF path	*-9.0 dBm at 7.438 MHz*
Narrowband IF path	*-17 dBm at 10.70 MHz*
Pulse Inputs (IF Gates)	
Function	*Internal receiver gates used for point-in-pulse and pulse-profile measurements*
Connectors	*15-pin mini D-sub*
Input Impedance	*1 K Ohm*
Minimum Pulse Width, Source Modulators	*33 ns*
Minimum Pulse Width, Receiver Gates	*20 ns*
DC Damage Level	*5.5 VDC*
Drive Voltage	*0 V (off), +3.3 V (on), nominal*
RF Pulse Modulator Input (Source Modulator)	
On/Off Ratio	
10 MHz to 3.2 GHz	*-64*
3.2 GHz to 67 GHz	*-80*
Pulse Period	
Minimum	*33 ns*
Maximum	*70 s*

Table 16. (Continued) Rear Panel Information, All Options

Description	*Typical Performance*
Pulse Outputs	
Voltage (TTL)	*High: 3.3V to 3.5V* *Low: <1V*
Impedance	*50 Ohm*
External Test Set Driver	
Function	*Used for driving remote mixers*
Connections	*3.5 mm (female)*
RF Output Frequency Range	*3.2 GHz to 19 GHz*
LO Output Frequency Range	*1.76 GHz to 26.5 GHz*

Rear Panel LO Power[1]		
	Upper Limit, Typical (dBm)	*Lower Limit, Typical (dBm)*
1.7 GHz to 16 GHz	*5*	*-3*
16 GHz to 21 GHz	*0*	*-6*
21 GHz to 26.5 GHz	*4*	*-5*

Rear Panel RF1/RF2 Power	
	Maximum Output Power, Typical (dBm)
3.2 GHz to 5 GHz	*+3*
5 GHz to 19 GHz	*+8*

Devices Supported	*Resolutions*
Flat Panel (TFT)	*1024 X 768, 800 X 600, 640 X 480*
Flat Panel (DSTN)	*800 X 600, 640 X 480*
CRT Monitor	*1280 X 1024, 1024 X 768, 800 X 600, 640 X 480*

Simultaneous operation of the internal and external displays is allowed, but with 640 X 480 resolution only. If you change resolution, you can only view the external display (internal display will "white out").

[1] *LO output available in full analyzer's frequency range. The power is tested only from 3.2 GHz to 26.5 GHz.*

Table 16. (Continued) Rear Panel Information, All Options

Description	*Typical Performance*
Bias Tee Inputs (N5227A)	
Connectors	*Triaxial - for ports 1, 2, 3 and 4*
Fuse	*500 mA, bi-pin style*
Maximum Bias Current	*+/-200 mA with no degradation of RF specifications*
Maximum Bias Voltage	*+/-40 VDC*
Trigger Inputs/Outputs	*BNC(f), TTL/CMOS compatible*
Test Set IO	*25-pin D-Sub connector, available for external test set control*
Power IO	*9-pin D-Sub, female; analog and digital IO*
Handler IO	*36-pin parallel I/O port; all input/output signals are default set to negative logic; can be reset to positive logic via GPIB command*
Pulse I/O	*15-pin D connector provides access to Pulse Modulators and Generators*
GPIB	*Two ports - dedicated controller and dedicated talker/listener. 24-pin D-sub (Type D-24), female; compatible with IEEE-488*
PCIe	*Cabled PCIe x4 connector is a 4-lane slot (not currently used)*
USB Ports	*Two SuperSpeed USB ports (900 mA each), one USB port below LAN connector, and one USB device port. There are also four USB ports (500 mA each) on the front panel. The total current limit for all rear panel USB ports is 2.3 amps. The total current limit for all front panel USB ports is 2 amps.*
LAN	*10/100/1000 BaseT Ethernet, 8-pin configuration; auto selects between the data rates*
VGA Video Output	*15-pin mini D-Sub; Drives VGA compatible monitors*
Mini DisplayPort	*Miniature DisplayPort connector for connection to external displays*
Line Power	
Frequency, Voltage	*50/60/400 Hz for 100 to 120 VAC* *50/60 Hz for 220 to 240 VAC*
	Power supply is auto switching
Max	*450 watts*

System Dimensions and Weight

For System Dimensions and Weight, refer to the N5251A System Installation Manual, located online at http://cp.literature.Keysight.com/litweb/pdf/N5251-90001.pdf.

Regulatory and Environmental Information

For Regulatory and Environmental information, refer to the PNA Series Installation and Quick Start Guide, located online at http://cp.literature.Keysight.com/litweb/pdf/E8356-90001.pdf.

Measurement Throughput Summary

- Typical Cycle Time for Measurement Completion
- Cycle Time vs. IF Bandwidth
- Cycle Time vs. Number of Points
- Data Transfer Time

Cycle time Includes sweep time, retrace time and band-crossing time. Analyzer display turned off with DISPLAY:ENABLE OFF. Add 21 ms for display on. Data for one trace (S_{11}) measurement.

Table 17. Typical Cycle Time (ms) for Measurement Completion, All Models and Options

Sweep Range	IF Bandwidth		Number of Points				
			201	401	1601	16001	32001
9 GHz to 10 GHz	600 kHz	Uncorrected	6.3	7	10.9	69.5	135
		2-Port cal	18.8	20.3	30.5	152	291
	10 kHz	Uncorrected	28.1	54.7	205	2003	4006
		2-Port cal	67.2	117	418	4028	8062
	1 kHz	Uncorrected	225	444	1744	17041	33853
		2-Port cal	463	900	3500	34100	67744
10 GHz to 20 GHz	600 kHz	Uncorrected	19.5	20.3	25.8	79.7	141
		2-Port cal	46.9	49.2	60.2	174	310
	10 kHz	Uncorrected	69.5	128	259	2012	4012
		2-Port cal	146	264	528	4041	8072
	1 kHz	Uncorrected	235	459	1783	17384	34538
		2-Port cal	477	924	3575	34788	69103

Table 18. Typical Cycle Time (ms) for Full-Span Measurement Completion

10 MHz to 67 GHz		*Number of Points*				
IF Bandwidth		*201*	*401*	*1601*	*16001*	*32001*
600 kHz	*Uncorrected*	*55.5*	*72.7*	*94.5*	*182*	*248*
	2-Port cal	*117*	*152*	*195*	*374*	*509*
10 kHz	*Uncorrected*	*89.1*	*153*	*519*	*2219*	*4223*
	2-Port cal	*185*	*313*	*1042*	*4448*	*8462*
1 kHz	*Uncorrected*	*255*	*483*	*1834*	*17716*	*35172*
	2-Port cal	*515*	*972*	*3675*	*35444*	*70375*

Table 19. Cycle Time vs. IF Bandwidth - Typical

Applies to the ***Preset condition*** *(201 points, correction off) except for the following changes:*

- *CF = 10 GHz*
- *Span = 100 MHz*
- *Display off (add 21 ms for display on)*

Cycle time includes sweep and retrace time.

Description	*N5251A*	
IF Bandwidth (Hz)	*Cycle Time (ms)*	*Trace Noise Magnitude (dB rms)*
600,000	*6.3*	*0.0044*
100,000	*7*	*0.0021*
30,000	*10.2*	*0.0011*
10,000	*29.7*	*0.0007*
3,000	*71.9*	*0.0006*
1,000	*223*	*0.0004*
300	*641*	*0.0004*
100	*1825*	*0.0003*
30	*5981*	*0.0003*
10	*17834*	*0.0003*
3	*59273*	*0.0003*

Table 20. Cycle Time vs. Number of Points - Typical

Applies to the **Preset condition** *(correction off) except for the following changes:*

- *CF = 10 GHz*
- *Span = 100 MHz*
- *Display off (add 21 ms for display on)*

Cycle time includes sweep and retrace time.

Description	*IF Bandwidth (Hz)*			
Number of Points	*1,000*	*10,000*	*30,000*	*600,000*
3	*7.8*	*6.3*	*6.3*	*6.3*
11	*16.4*	*6.3*	*6.3*	*6.3*
51	*60*	*11*	*6.3*	*6.3*
101	*114*	*17.2*	*7*	*6.3*
201	*223*	*29.7*	*9.4*	*6.3*
401	*437*	*54.7*	*14.9*	*7.1*
801	*862*	*105*	*25*	*7.8*
1,601	*1708*	*205*	*46*	*11*
6,401	*6728*	*805*	*169*	*30.5*
16,001	*16672*	*2005*	*417*	*68.8*
32,001	*33112*	*4006*	*833*	*134*

Table 21. Data Transfer Time (ms) - Typical

Measured with the analyzer display off.

Values will increase slightly if the analyzer display is on.

Description	Number of Points				
	201	401	1601	16,001	32,001
SCPI over GPIB (Program executed on external PC[2])					
32-bit floating point	4.6	9.3	38	352	720
64-bit floating point	9.4	18.8	73.4	730	1455
ASCII	36.7	72.5	288	2882	5762
SCPI over SICL/LAN or TCP/IP Socket[1] (Program executed in the analyzer)					
32-bit floating point	<1	<1	<1	1.2	2.4
64-bit floating point	<1	<1	<1	2.3	4.6
ASCII	2.1	4	15	148	295
COM[1] (Program executed in the analyzer)					
32-bit floating point	<1	<1	<1	<1	<1
Variant type	<1	<1	1.4	12.4	25.5
DCOM over LAN[1] (Program executed on external PC)					
32-bit floating point	<1	<1	<1	2.3	4.4
Variant type	<1	1.6	5.3	52	105.5

[1] *Values are for real and imaginary pairs, with the analyzer display off, using Gigabit Ethernet.*

NOTE *Specifications for Recall & Sweep Speed are not provided for the N522xA analyzers.*

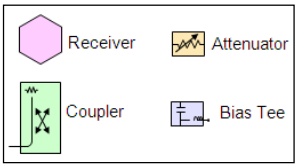
Table 22. Damage Level, All Options - Typical

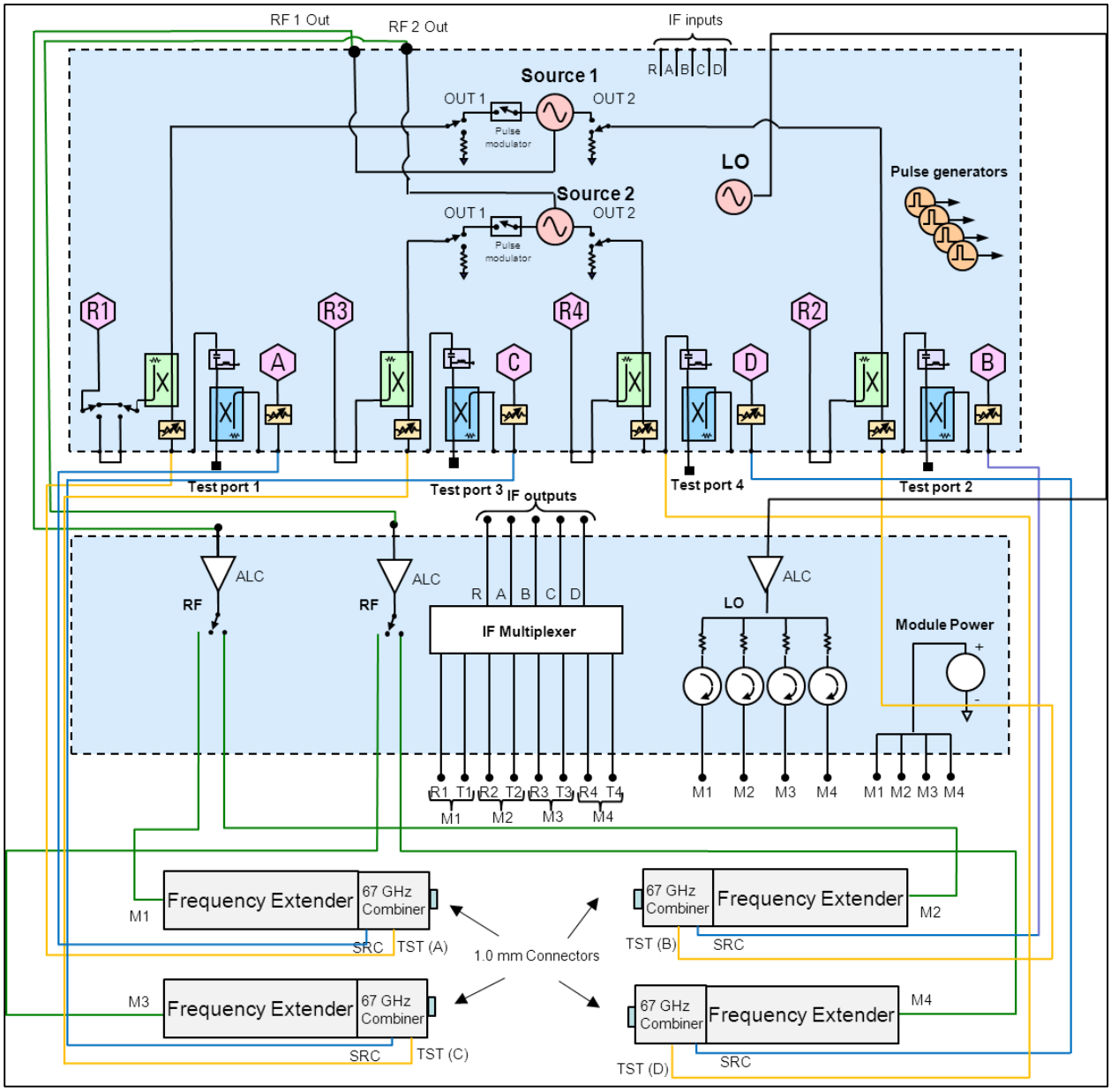
Description	*RF (dBm)*	*DC (V)*
RCVR A, B, C, D IN	*15*	*7*
RCVR R1, R2, R3, R4 IN	*15*	*7*
REF 1 SOURCE OUT	*15*	*7*
REF 2, 3, 4 SOURCE OUT	*30*	*7*
PORT 1, 2, 3, 4 SOURCE OUT	*27*	*7*
PORT 1, 2, 3, 4 CPLR THRU	*27*	*40*
PORT 1, 2, 3, 4 CPLR ARM	*30*	*7*

N5251A System Block Diagram

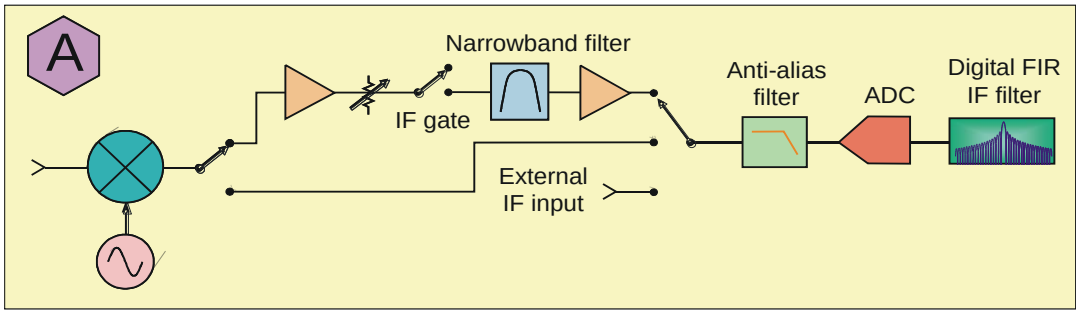
NOTE: For best readability, use a color printer for printing the following graphics.

Legend





Receiver Block Diagram



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