Technical Specifications

Agilent Technologies
PNA Series Network Analyzers
N5230A
Options 220/225, 420/425, and 520/525 (2-Port PNA)

Manufacturing Part Number: 5989-1079ENUS
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Technical Specifications for the N5230A

Options 220/225, 420/425, and 520/525 (2-Port PNA)

(Rev. 2004-04-23)

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.

Corrected System Performance

The specifications in this section apply for measurements made with the N5230A analyzer with the following conditions:

- 10 Hz IF bandwidth
- No averaging applied to data
- Isolation calibration with an averaging factor of 8

Table 1. System Dynamic Range[1]

Description	Specification (dB) at Test Port			Typical (dB) at Test Port		
	Option 220	Option 420	Option 520	Option 220	Option 420	Option 520
Standard Configuration and Standard Power Range						
10 MHz to 45 MHz	--	--	--	103	89	89
45 MHz to 500 MHz[2]	105	90	90	--	--	--
500 MHz to 2 GHz	110	110	110	--	--	--
2 GHz to 8 GHz	110	110	110	--	--	--
8 GHz to 10.5 GHz	110	100	100	--	--	--
10.5 GHz to 12.5 GHz	110	100	100	--	--	--
12.5 GHz to 20 GHz	108	100	100	--	--	--
20 GHz to 31.25 GHz	--	95	95	--	--	--
31.25 GHz to 40 GHz	--	90	90	--	--	--
40 GHz to 50 GHz	--	--	79	--	--	--

Table 1. System Dynamic Range[1] (Continued)

Description	Specification (dB) at Test Port			Typical (dB) at Test Port		
	Option 225	Option 425	Option 525	Option 225	Option 425	Option 525
Configurable Test Set and Extended Power Range						
10 MHz to 45 MHz	--	--	--	103	88	88
45 MHz to 500 MHz[2]	105	90	90	--	--	--
500 MHz to 2 GHz	110	110	110	--	--	--
2 GHz to 8 GHz	110	110	110	--	--	--
8 GHz to 10.5 GHz	110	100	100	--	--	--
10.5 GHz to 12.5 GHz	110	100	100	--	--	--
12.5 GHz to 20 GHz	108	100	100	--	--	--
20 GHz to 31.25 GHz	--	92	92	--	--	--
31.25 GHz to 40 GHz	--	87	87	--	--	--
40 GHz to 50 GHz	--	--	75	--	--	--

[1] The system dynamic range is calculated as the difference between the noise floor and the specified source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account.
[2] May be degraded by 10 dB at particular frequencies (multiples of 5 MHz) below 500 MHz due to spurious receiver residuals. Methods are available to regain the full dynamic range.

Receiver Dynamic Range technical specifications are not provided in this N5230A specs document.

Table 2. Extended Dynamic Range[1]

Description	Specification (dB) at Direct Receiver Access Input			Typical (dB) at Direct Receiver Access Input		
	Option 225	Option 425	Option 525	Option 225	Option 425	Option 525
Configurable Test Set and Extended Power Range						
10 MHz to 45 MHz	--	--	--	115	109	109
45 MHz to 500 MHz[2]	117	111	111	--	--	--
500 MHz to 2 GHz	122	122	122	--	--	--
2 GHz to 8 GHz	122	122	122	--	--	--
8 GHz to 10.5 GHz	122	112	112	--	--	--
10.5 GHz to 12.5 GHz	122	112	112	--	--	--
12.5 GHz to 20 GHz	120	112	112	--	--	--
20 GHz to 31.25 GHz	--	103	103	--	--	--
31.25 GHz to 40 GHz	--	98	98	--	--	--
40 GHz to 50 GHz	--	--	83	--	--	--

[1] The direct receiver access input extended dynamic range is calculated as the difference between the direct receiver access input noise floor and the source maximum output power. 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 compression or damage level. 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 receiver compression or damage may occur (i.e. devices with low insertion loss). The extended range is only available in one-path transmission measurements.

[2] May be degraded by 10 dB at particular frequencies (multiples of 5 MHz) below 500 MHz due to spurious receiver residuals. Methods are available to regain the full dynamic range.

Corrected System Performance with 3.5mm Connectors[1]

[1] From 10 MHz to 45 MHz, performance is characterized as "Typical". To generate these Typical values, please download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator.

Table 3. 85052B Calibration Kit
N5230A - Option 220 (Standard Test Set and Standard Power Range)

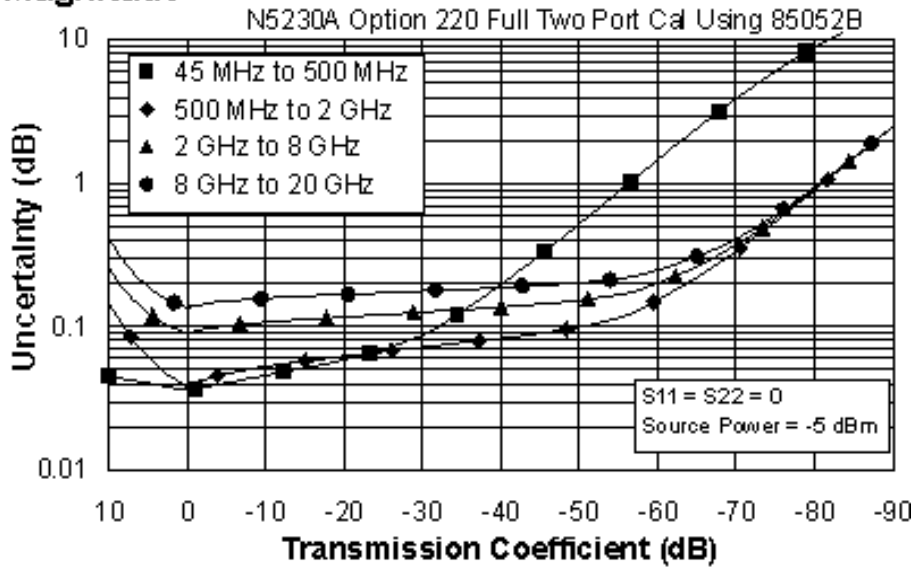
Applies to the, N5230A Option 220 analyzers, 85052B (3.5mm) calibration kit, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

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

Description	**Specification (dB)**			
	45 MHz to 500 MHz	**500 MHz to 2 GHz**	**2 to 8 GHz**	**8 to 20 GHz**
Directivity	48	48	44	44
Source Match	40	40	33	31
Load Match	48	48	44	44
Reflection Tracking	±0.003 +0.02/°C	±0.003 +0.02/°C	±0.003 +0.03/°C	±0.006 +0.03/°C
Transmission Tracking	±0.010 +0.02/°C	±0.014 +0.02/°C	±0.062 +0.03/°C	±0.104 +0.03/°C

Transmission Uncertainty (Specifications)

Magnitude



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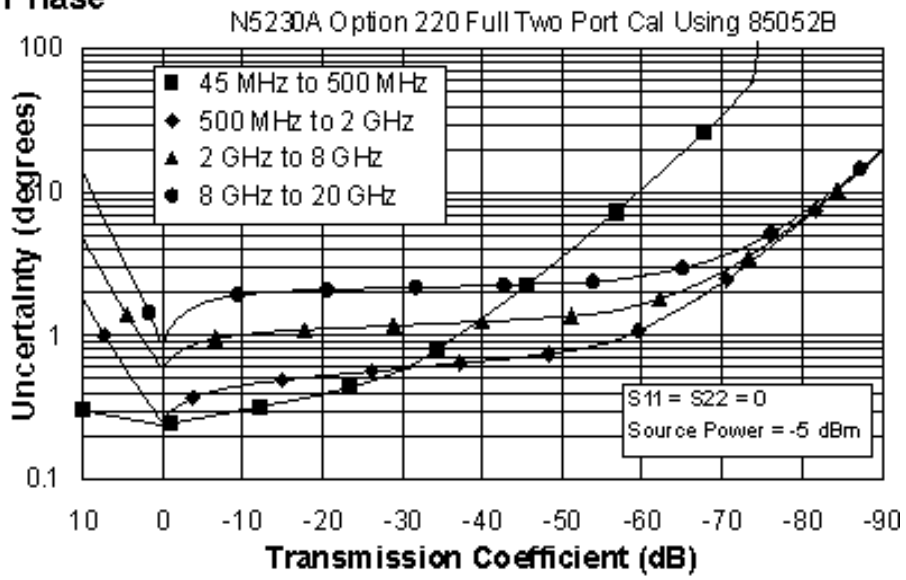

Reflection Uncertainty (Specifications)

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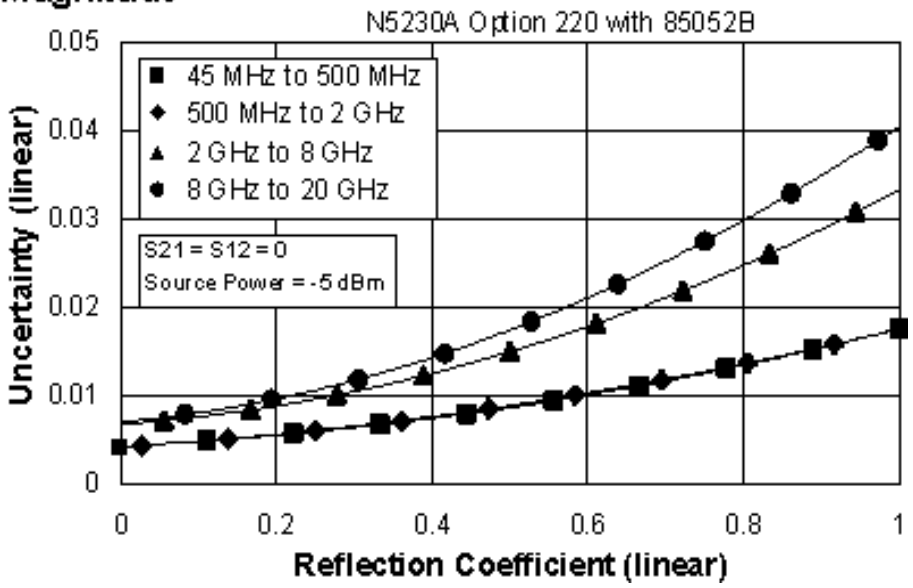

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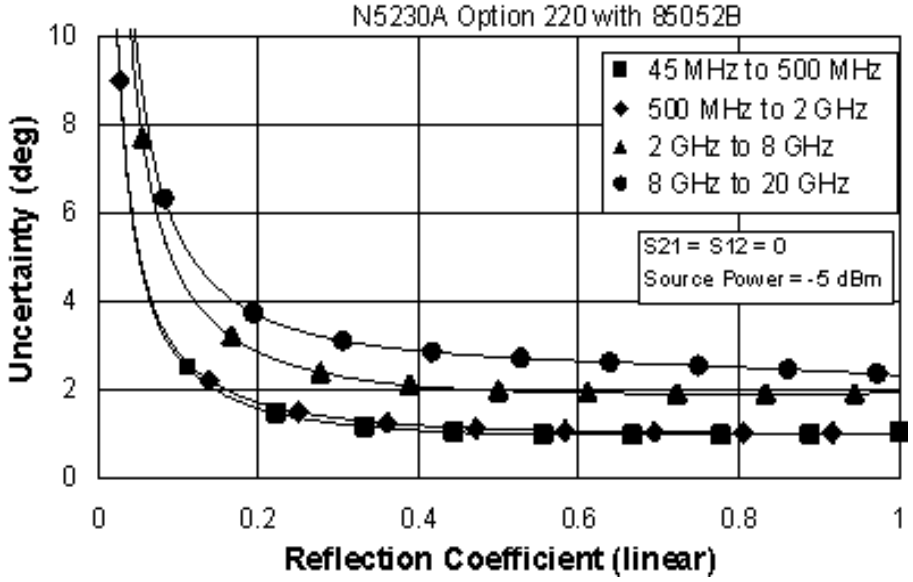


Table 4. 85052B Calibration Kit
N5230A - Option 225 (Configurable Test Set and Extended Power Range)

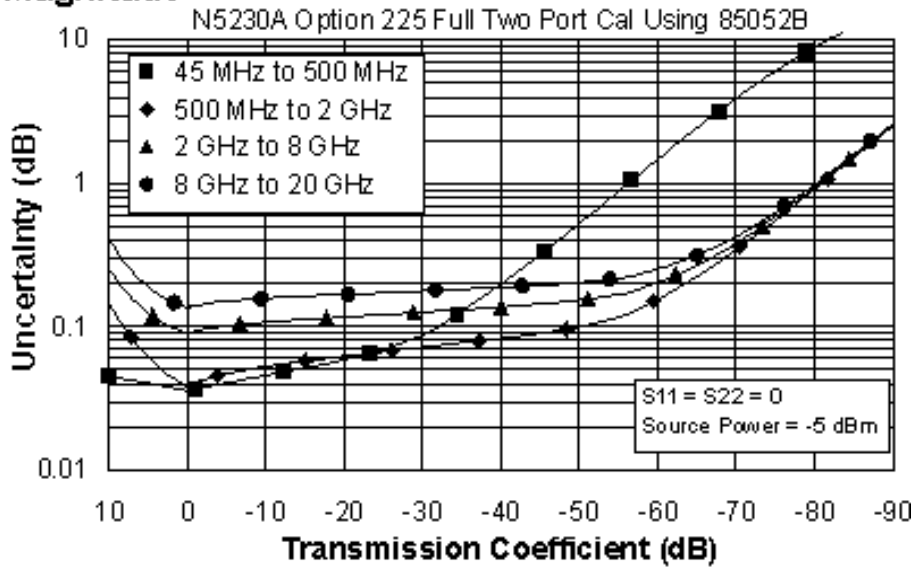
Applies to the, N5230A Option 225 analyzers, 85052B (3.5mm) calibration kit, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

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

Description	**Specification (dB)**			
	45 MHz to 500 MHz	**500 MHz to 2 GHz**	**2 to 8 GHz**	**8 to 20 GHz**
Directivity	48	48	44	44
Source Match	40	40	33	31
Load Match	48	48	44	44
Reflection Tracking	±0.003 +0.02/°C	±0.003 +0.02/°C	±0.003 +0.03/°C	±0.006 +0.03/°C
Transmission Tracking	±0.010 +0.02/°C	±0.014 +0.02/°C	±0.062 +0.03/°C	±0.104 +0.03/°C

Transmission Uncertainty (Specifications)

Magnitude



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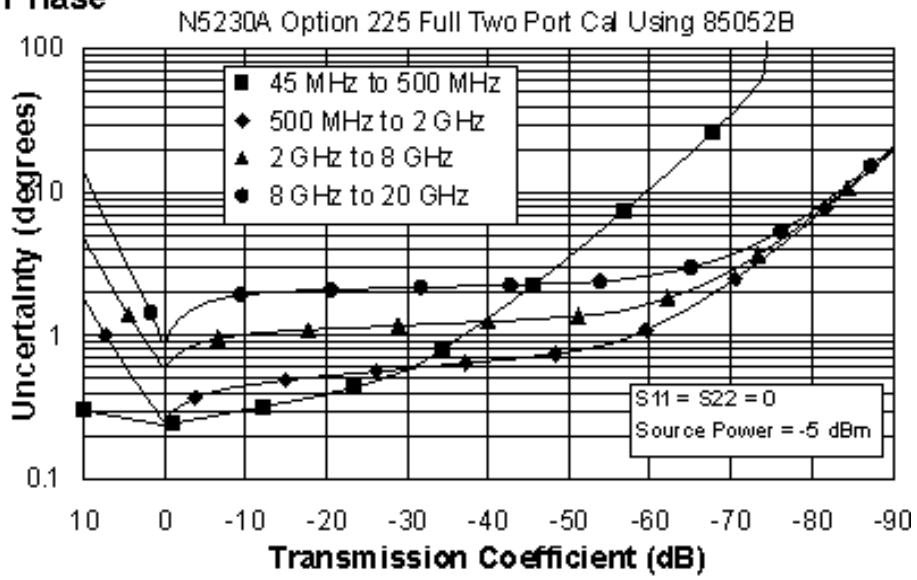
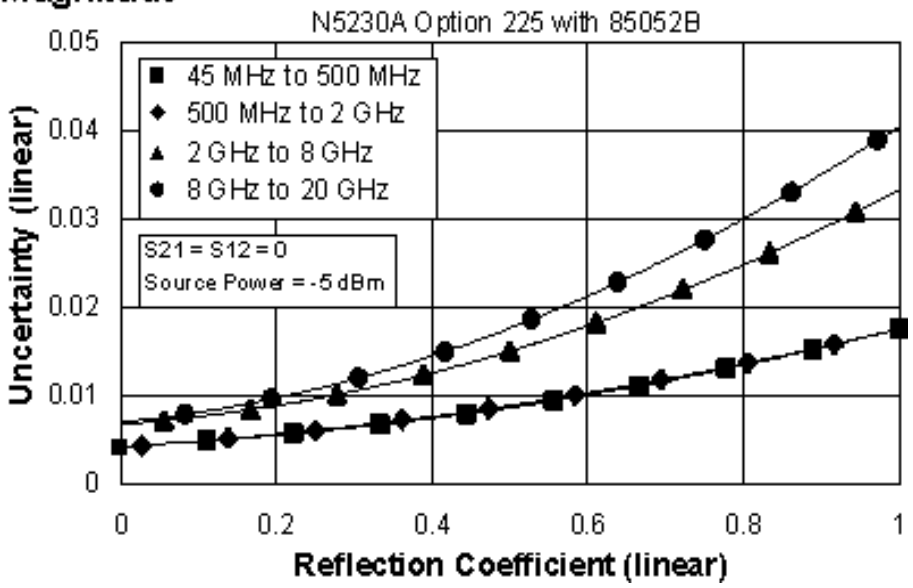


Reflection Uncertainty (Specifications)

Magnitude



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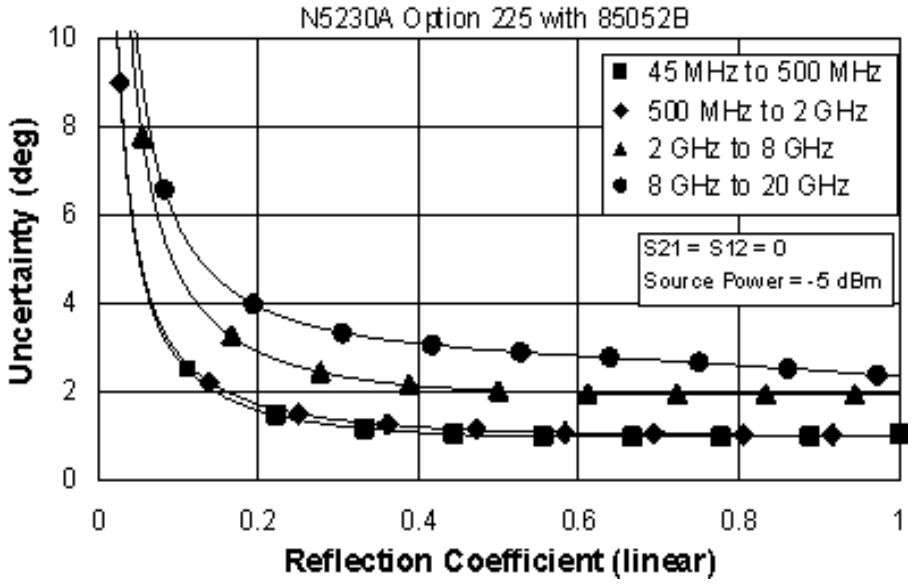


Table 5. N4691A Electronic Calibration Module
N5230A - Option 220 (Standard Test Set and Standard Power Range)

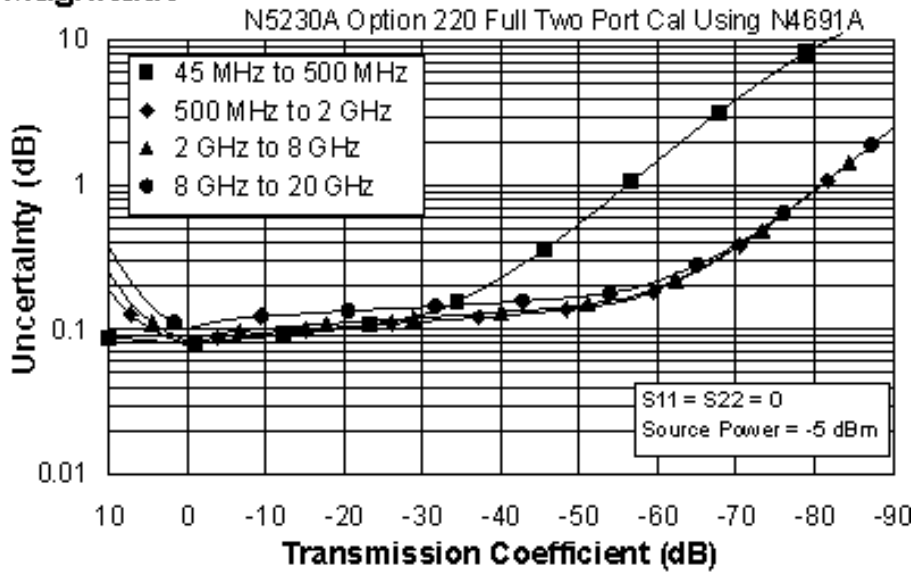
Applies to the, N5230A Option 220 analyzers, N4691A (3.5mm) electronic calibration module, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

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

Description	**Specification (dB)**			
	45 MHz to 500 MHz	**500 MHz to 2 GHz**	**2 to 8 GHz**	**8 to 20 GHz**
Directivity	56	56	54	49
Source Match	47	47	45	44
Load Match	46	46	45	43
Reflection Tracking	±0.050 +0.02/°C	±0.050 +0.02/°C	±0.070 +0.03/°C	±0.090 +0.03/°C
Transmission Tracking	±0.054 +0.02/°C	±0.056 +0.02/°C	±0.057 +0.03/°C	±0.070 +0.03/°C

Transmission Uncertainty (Specifications)

Magnitude



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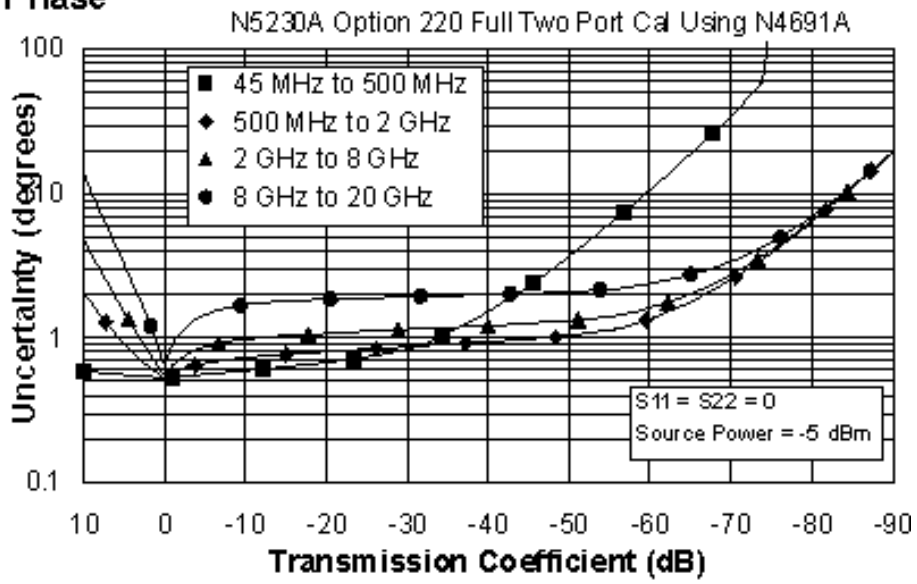

Reflection Uncertainty (Specifications)

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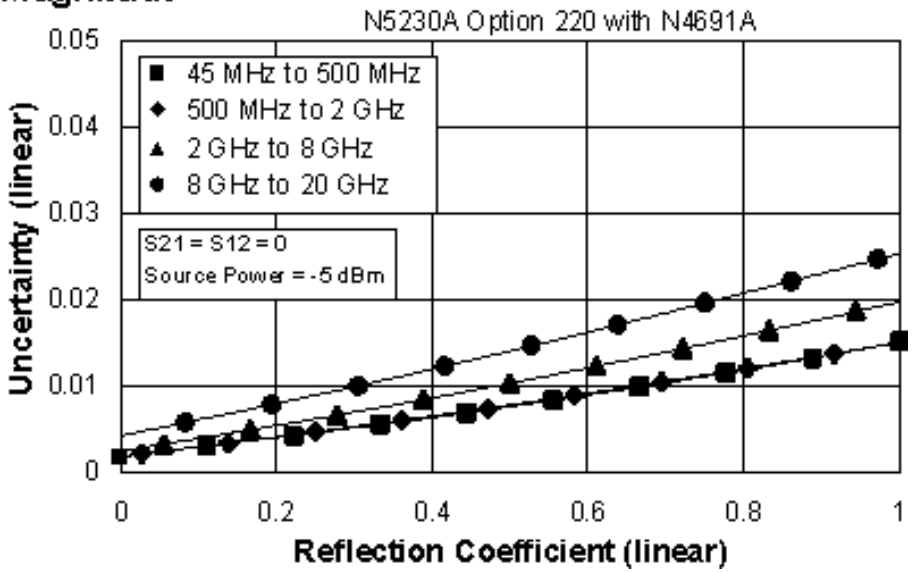

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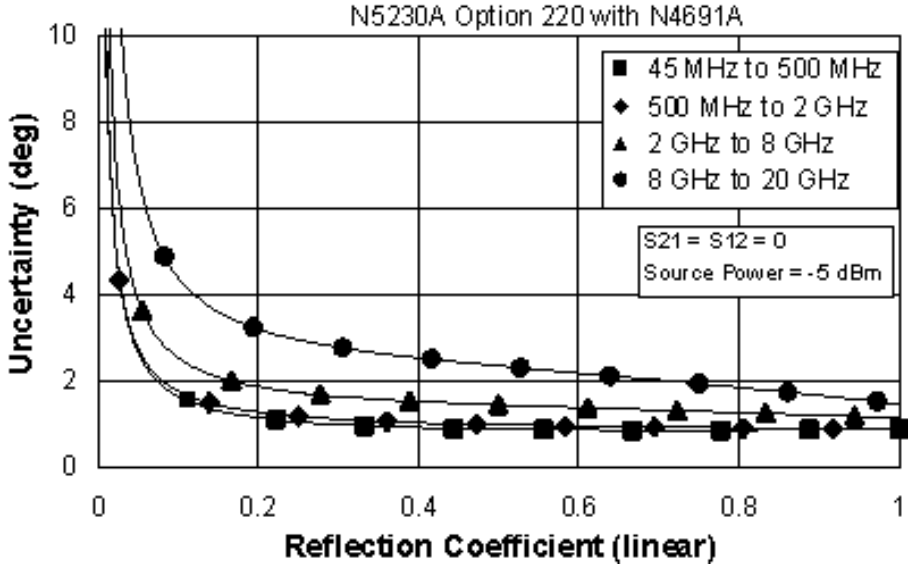


Table 6. N4691A Electronic Calibration Module N5230A - Option 225 (Configurable Test Set and Extended Power Range)

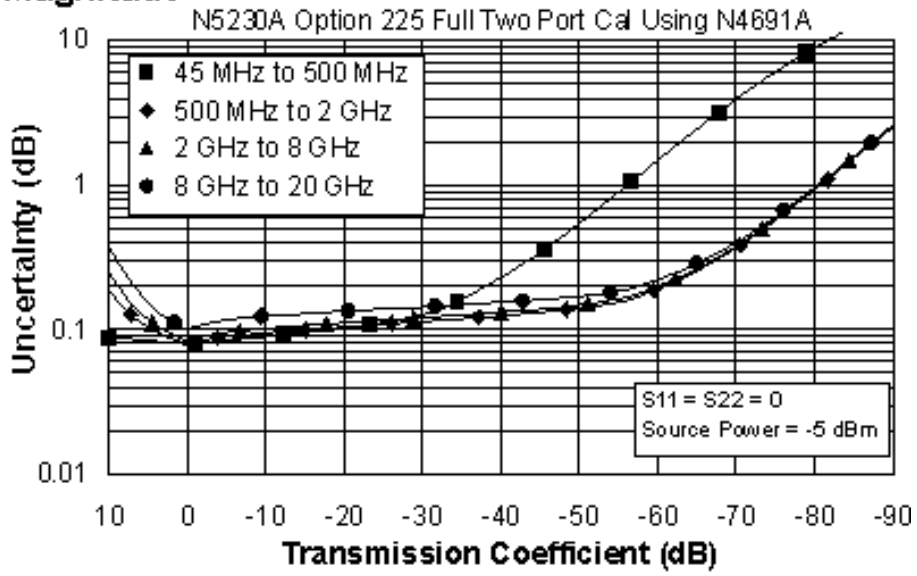
Applies to the, N5230A Option 225 analyzers, N4691A Electronic Calibration Module, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

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

Description	**Specification (dB)**			
	45 MHz to 500 MHz	**500 MHz to 2 GHz**	**2 to 8 GHz**	**8 to 20 GHz**
Directivity	56	56	54	49
Source Match	47	47	45	44
Load Match	46	46	45	43
Reflection Tracking	±0.050 +0.02/°C	±0.050 +0.02/°C	±0.070 +0.03/°C	±0.090 +0.03/°C
Transmission Tracking	±0.054 +0.02/°C	±0.056 +0.02/°C	±0.057 +0.03/°C	±0.070 +0.03/°C

Transmission Uncertainty (Specifications)

Magnitude



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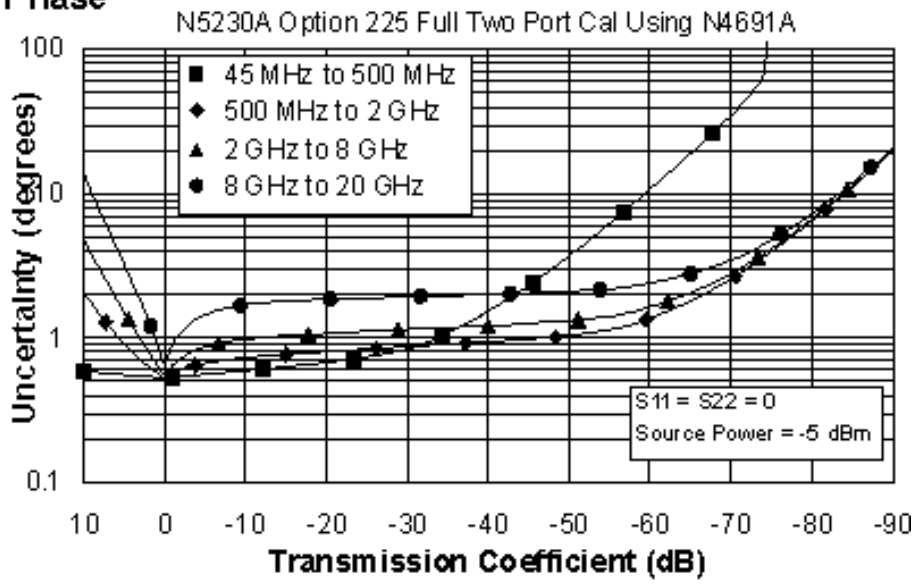

Reflection Uncertainty (Specifications)

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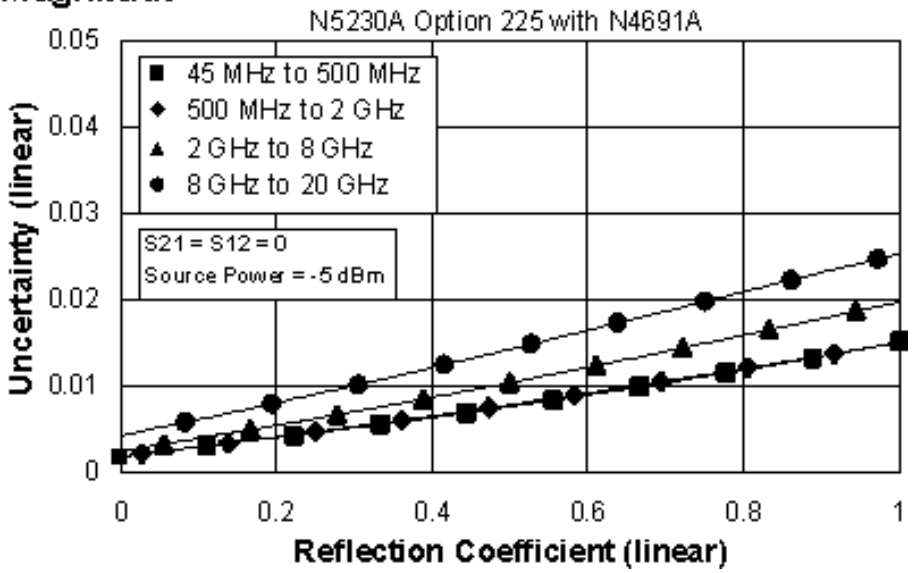

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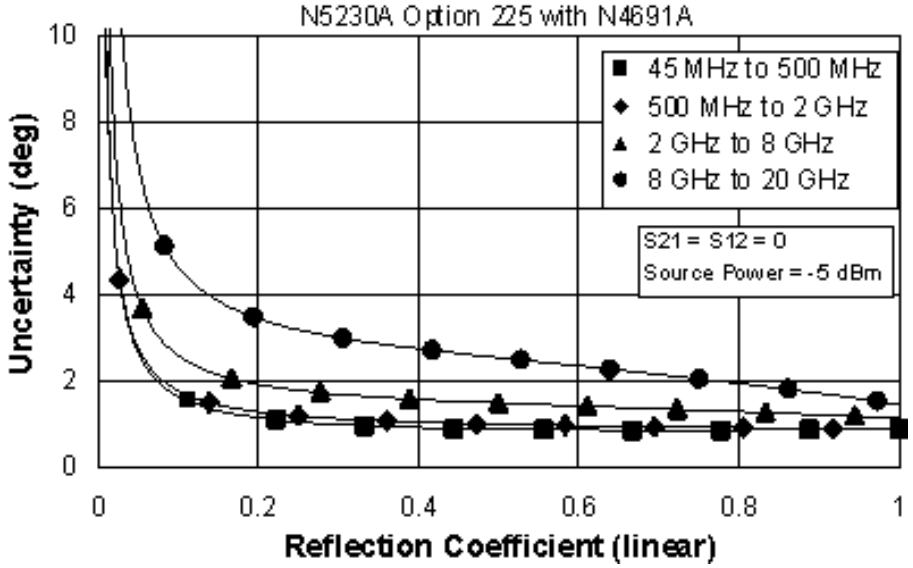


This N5230A document does not present specifications for the 85052C or 85052D Calibration Kit. Please download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator to generate the data and curves for the 85052C or the 85052D Calibration Kit or your PNA setup. View the equations used to generate the uncertainty curves.

N5230A Corrected System Performance with 2.4mm Connectors

Table 7. 85056A Calibration Kit
N5230A - Option 420 or 520 (Standard Test Set and Standard Power Range)

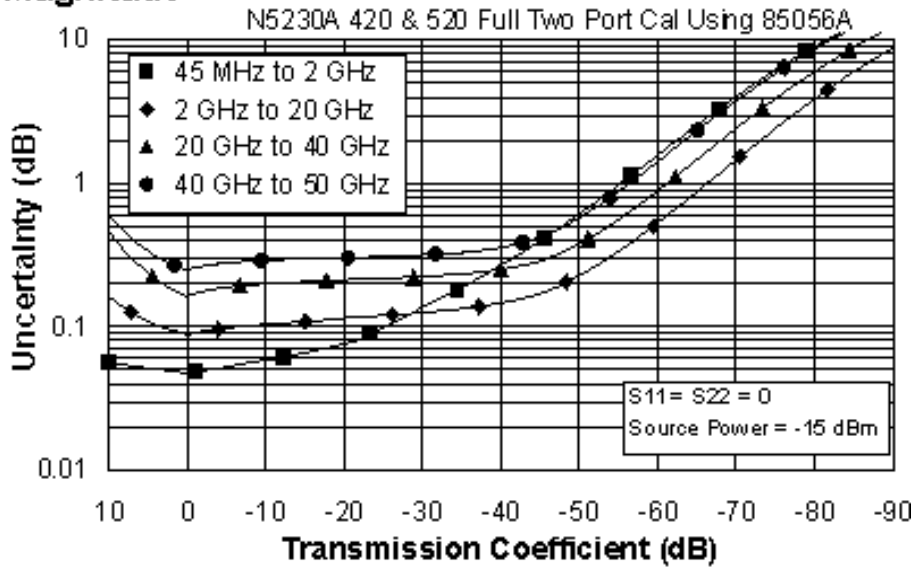
Applies to the N5230A Option 420 or 520 analyzers, 85056A (2.4mm) Electronic Calibration Module, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

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

Description	**Specification (dB)**			
	45 MHz to 2 GHz	**2 to 20 GHz**	**20 to 40 GHz**	**40 to 50 GHz**
Directivity	42	42	38	36
Source Match	41	38	33	31
Load Match	42	42	37	35
Reflection Tracking	±0.001 +0.02/°C	±0.008 +0.02/°C	±0.020 +0.02/°C	±0.027 +0.03/°C
Transmission Tracking	±0.019 +0.02/°C	±0.060 +0.02/°C	±0.129 +0.02/°C	±0.211 +0.03/°C

Transmission Uncertainty (Specifications)

Magnitude



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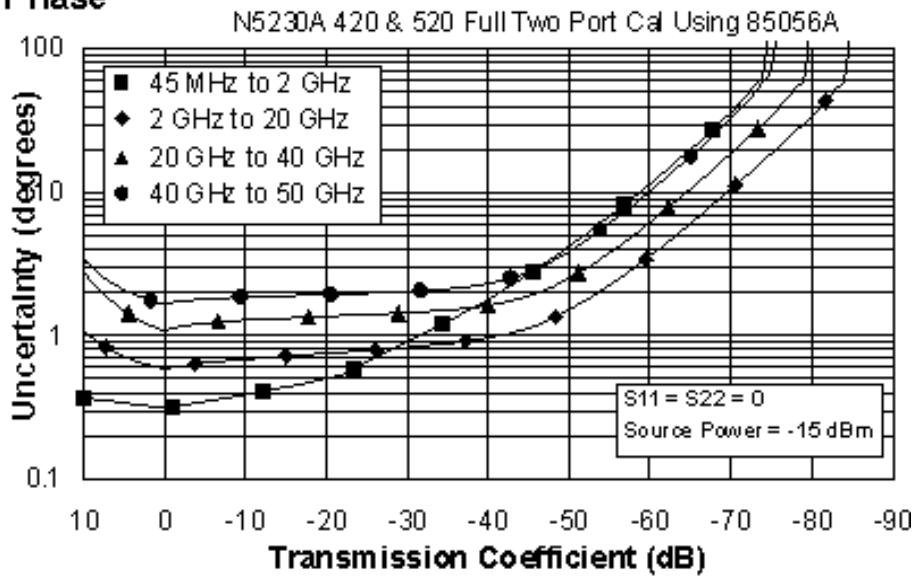

Reflection Uncertainty (Specifications)

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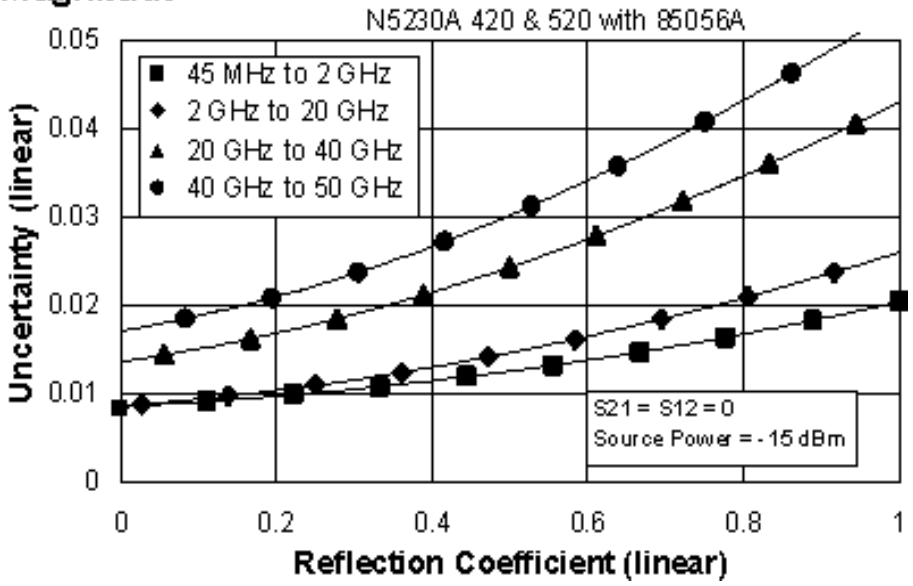

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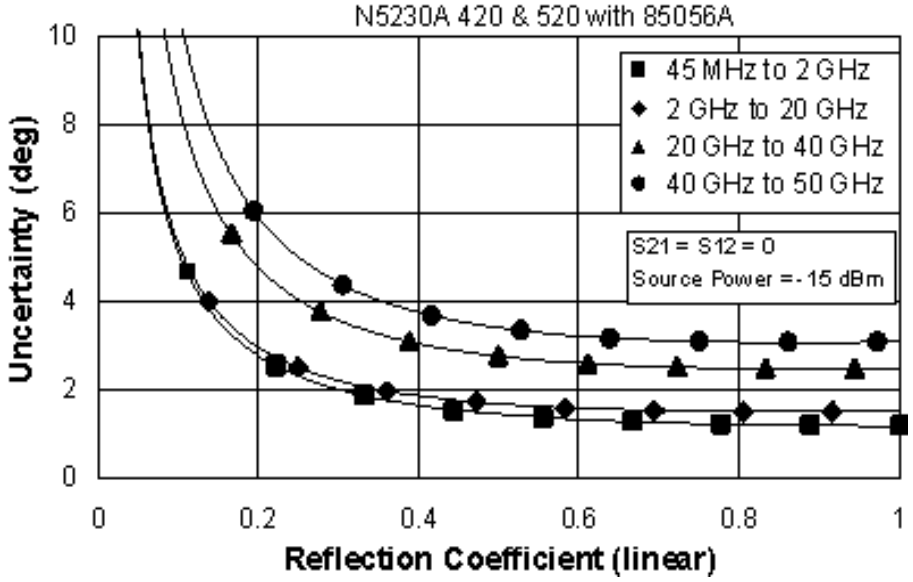


Table 8. 85056A Calibration Kit
N5230A - Option 425 or 525 (Configurable Test Set and Extended Power Range)

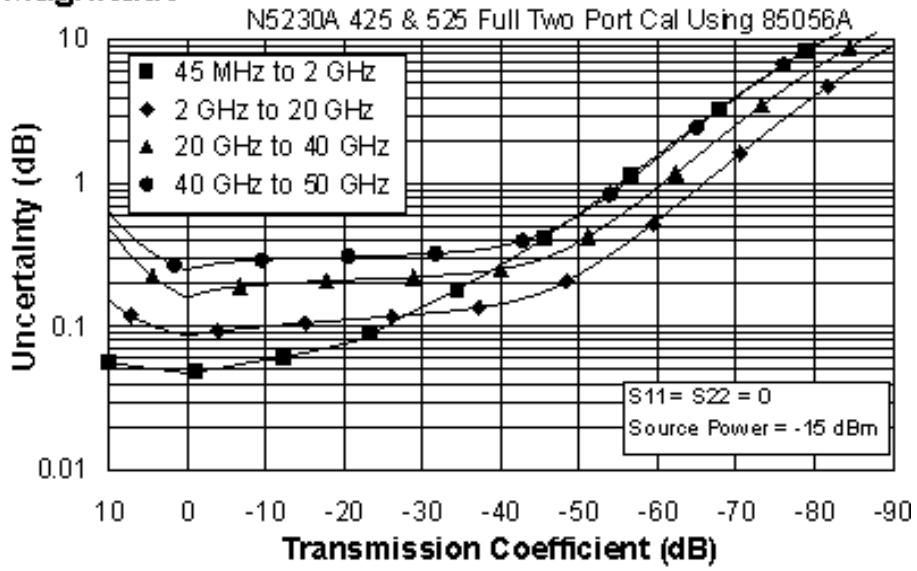
Applies to the N5230A Option 425 or 525 analyzers, 85056A (2.4mm) Electronic Calibration Module, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

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

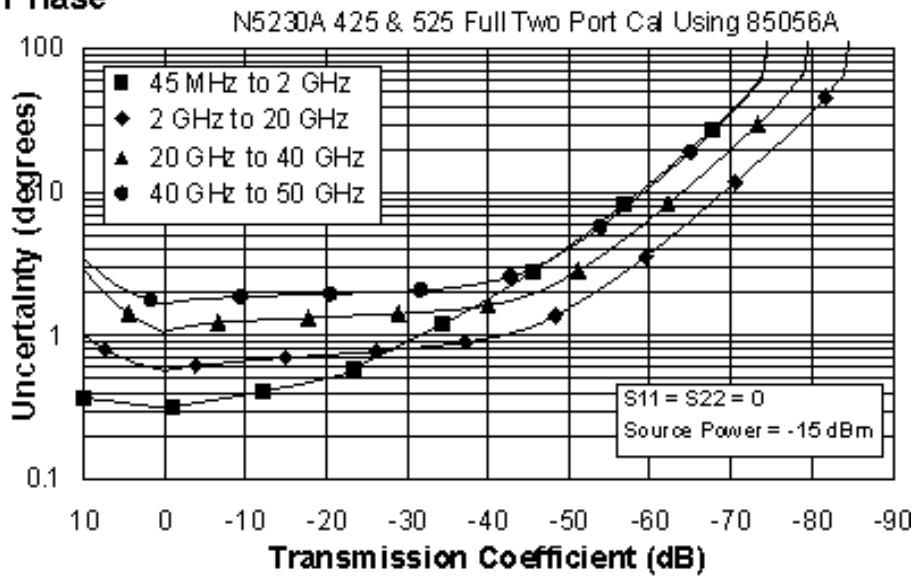
Description	**Specification (dB)**			
	45 MHz to 2 GHz	**2 to 20 GHz**	**20 to 40 GHz**	**40 to 50 GHz**
Directivity	42	42	38	36
Source Match	41	38	33	31
Load Match	42	42	37	35
Reflection Tracking	±0.001 +0.02/°C	±0.008 +0.02/°C	±0.020 +0.02/°C	±0.027 +0.03/°C
Transmission Tracking	±0.019 +0.02/°C	±0.057 +0.02/°C	±0.124 +0.02/°C	±0.211 +0.03/°C

Transmission Uncertainty (Specifications)

Magnitude

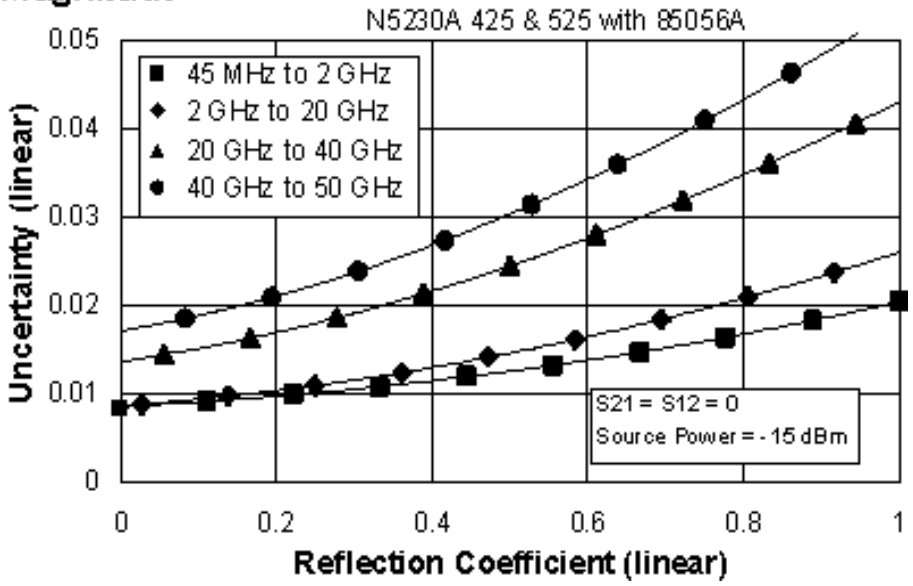


Phase



Reflection Uncertainty (Specifications)

Magnitude



Phase

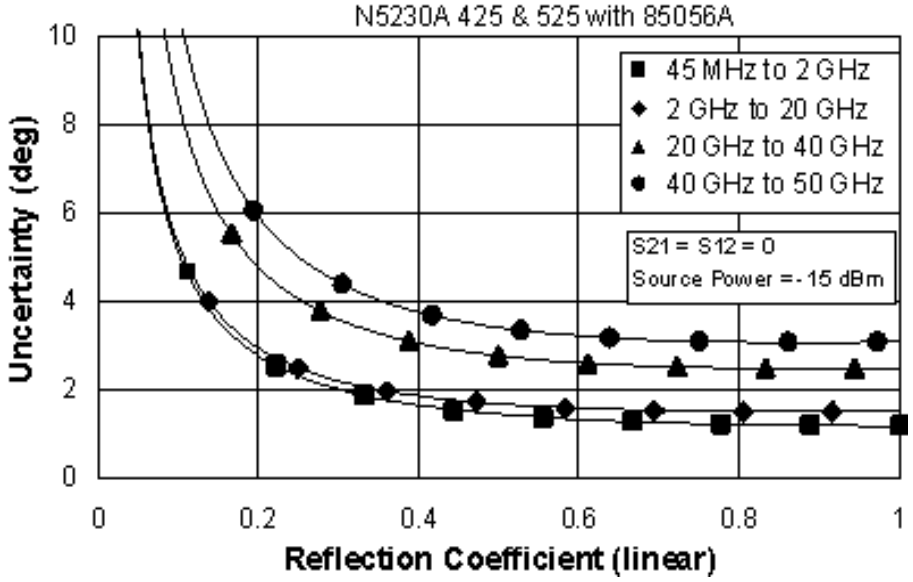


Table 9. N4693A Electronic Calibration Module
N5230A - Option 420 or 520 (Standard Test Set and Standard Power Range)

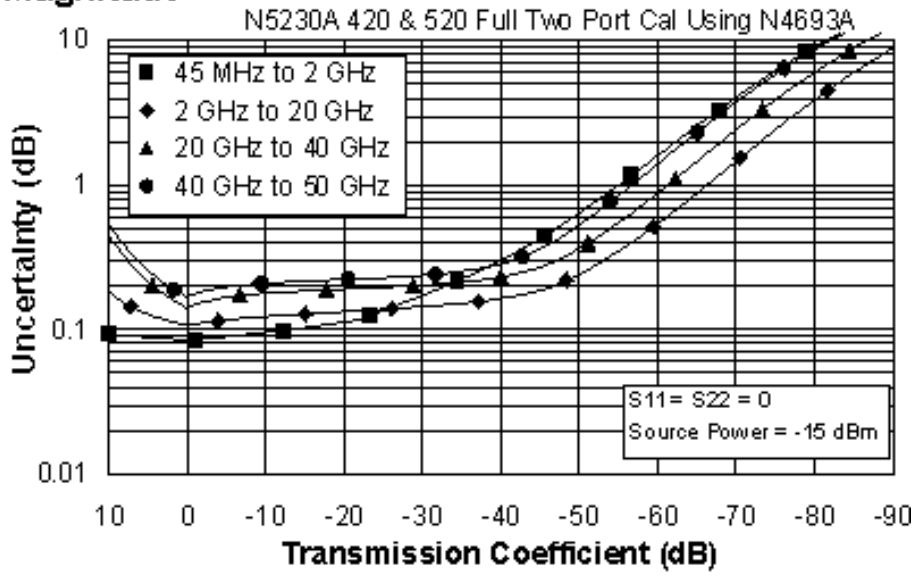
Applies to the N5230A Option 420 or 520 analyzers, N4693A (2.4mm) Electronic Calibration Module, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

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

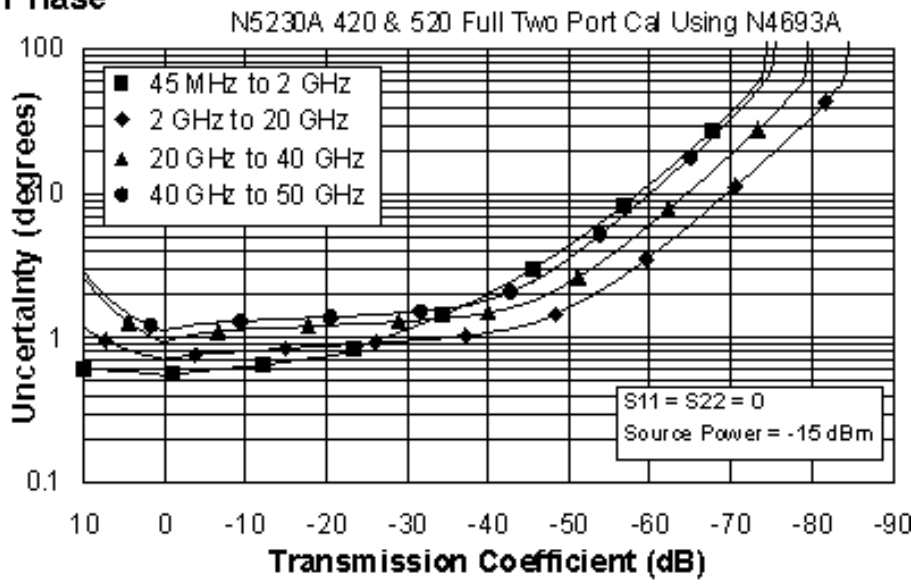
Description	**Specification (dB)**			
	45 MHz to 2 GHz	**2 to 20 GHz**	**20 to 40 GHz**	**40 to 50 GHz**
Directivity	55	49	43	41
Source Match	46	42	35	30
Load Match	43	41	37	36
Reflection Tracking	±0.030 +0.02/°C	±0.040 +0.02/°C	±0.060 +0.02/°C	±0.080 +0.03/°C
Transmission Tracking	±0.056 +0.02/°C	±0.079 +0.02/°C	±0.107 +0.02/°C	±0.130 +0.03/°C

Transmission Uncertainty (Specifications)

Magnitude

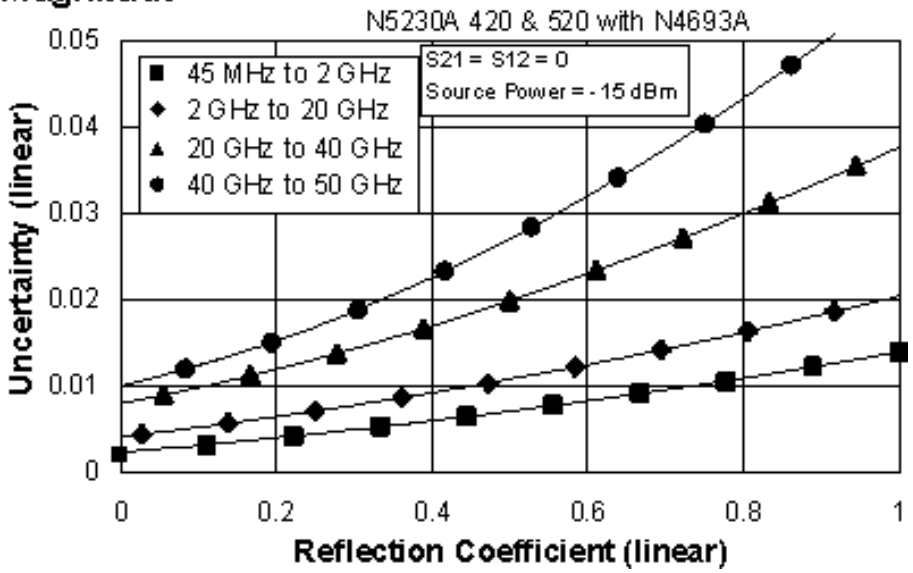


Phase



Reflection Uncertainty (Specifications)

Magnitude



Phase

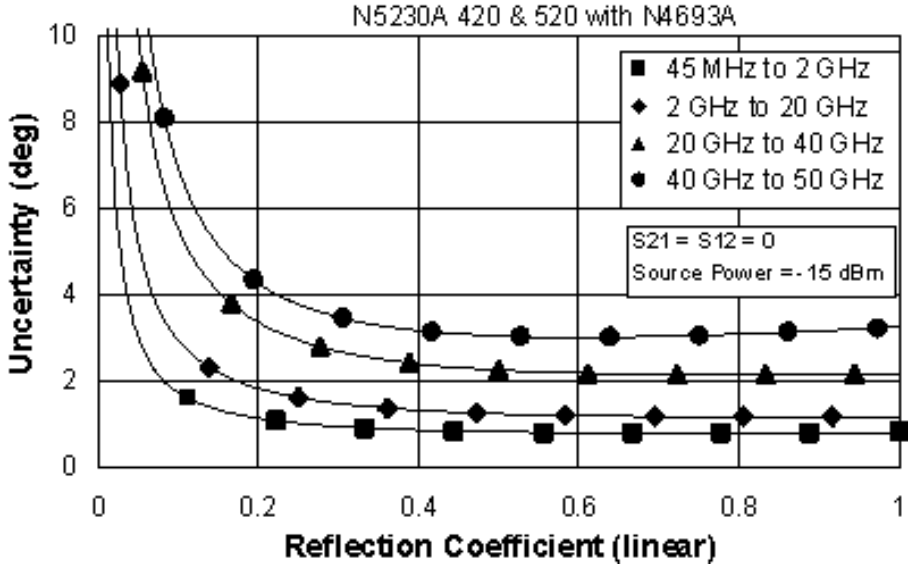


Table 10. N4693A Electronic Calibration Module
N5230A - Option 425 or 525 (Configurable Test Set and Extended Power Range)

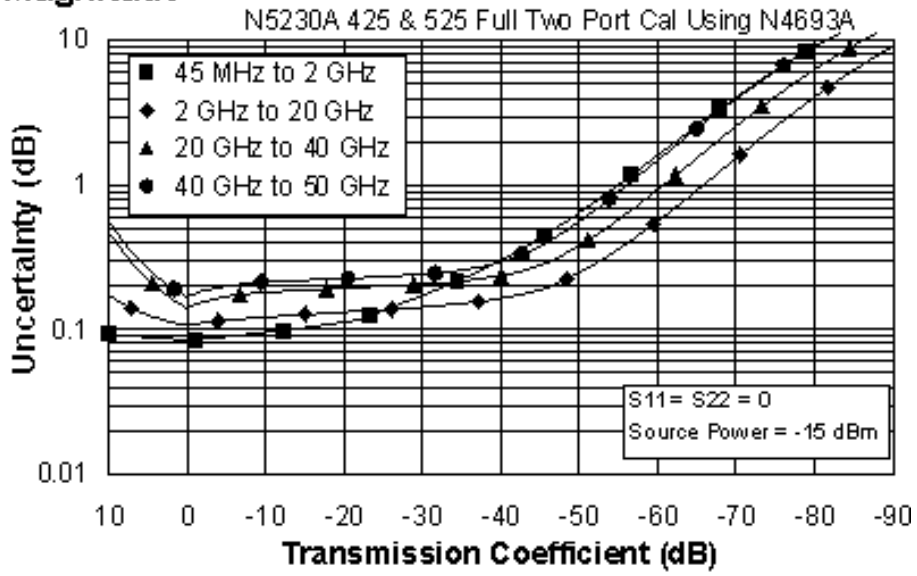
Applies to the N5230A Option 425 or 525 analyzers, N4693A (2.4mm) Electronic Calibration Module, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

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

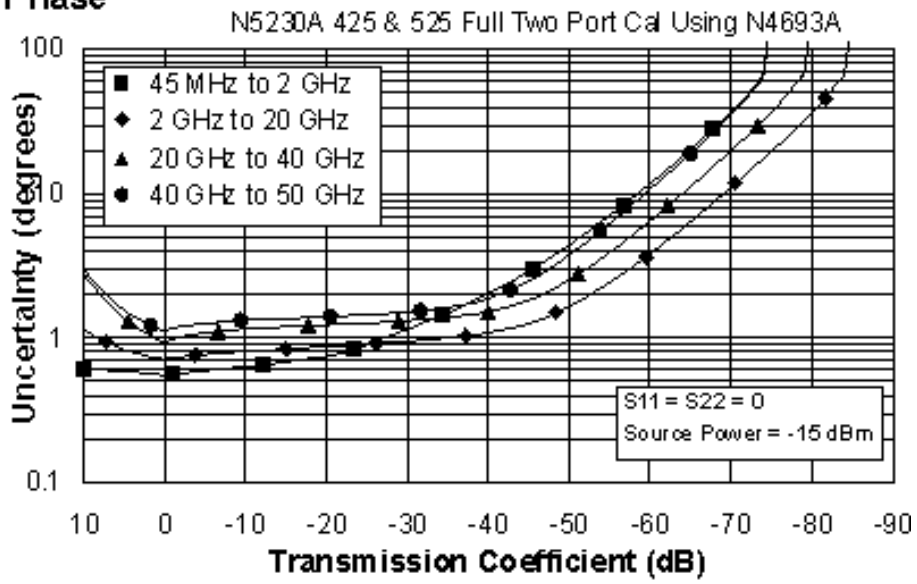
Description	**Specification (dB)**			
	45 MHz to 2 GHz	**2 to 20 GHz**	**20 to 40 GHz**	**40 to 50 GHz**
Directivity	55	49	43	41
Source Match	46	42	35	30
Load Match	43	41	37	36
Reflection Tracking	±0.030 +0.02/°C	±0.040 +0.02/°C	±0.060 +0.02/°C	±0.080 +0.03/°C
Transmission Tracking	±0.056 +0.02/°C	±0.078 +0.02/°C	±0.107 +0.02/°C	±0.130 +0.03/°C

Transmission Uncertainty (Specifications)

Magnitude

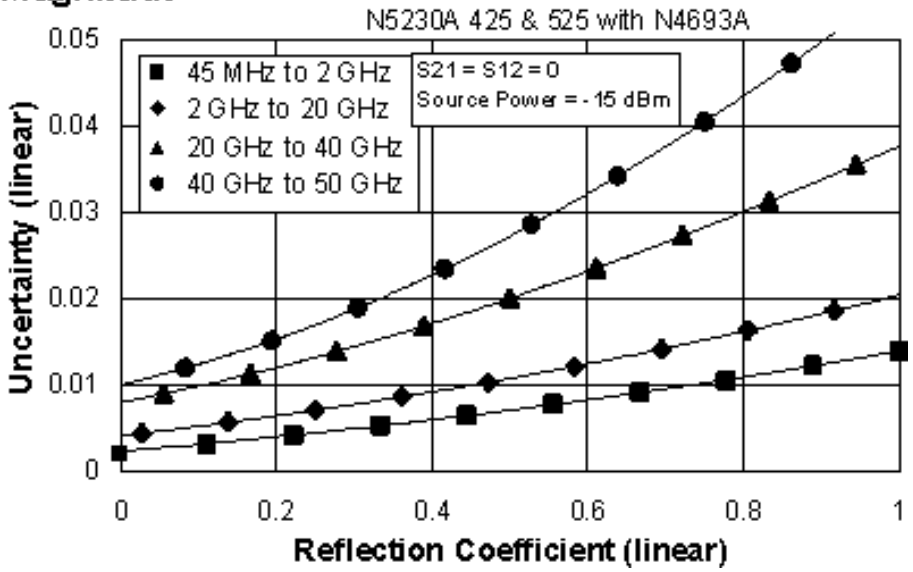


Phase

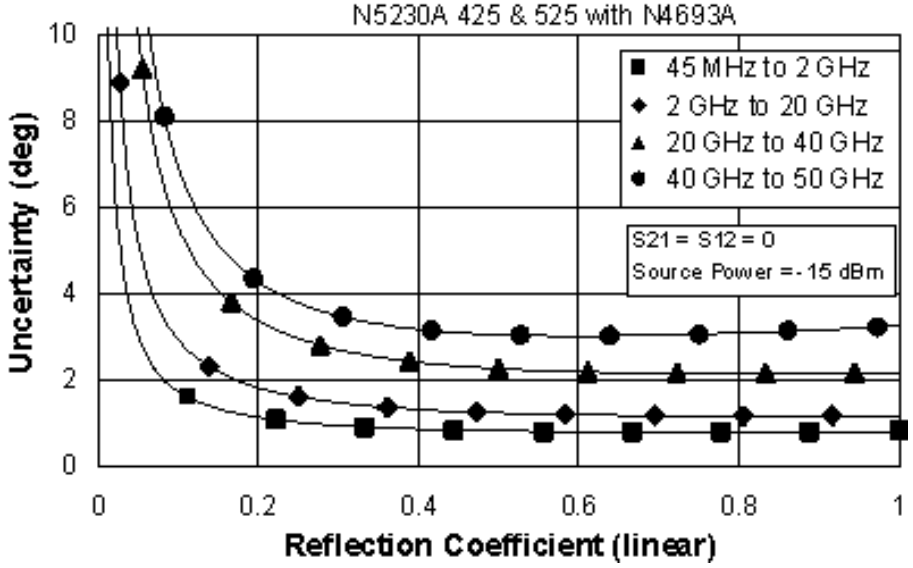


Reflection Uncertainty (Specifications)

Magnitude



Phase



This N5230A document does not present specifications for the 85056D or 85056K Calibration Kit. Please download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator to generate the data and curves for the 85056D and 85056K Calibration Kit or your PNA setup. View the equations used to generate the uncertainty curves.

Table 11. Uncorrected System Performance

Description	Specifications			Typical		
	Options 220, 225	Options 420, 425	Options 520, 525	Options 220, 225	Options 420, 425	Options 520, 525
Directivity						
10 MHz to 45 MHz	--	--	--	24 dB	20 dB	20 dB
45 MHz to 500 MHz	24 dB	23 dB	23 dB	--	--	--
500 MHz to 2 GHz	27 dB	23 dB	23 dB	--	--	--
2 GHz to 8 GHz	21 dB	21 dB	21 dB	--	--	--
8 GHz to 12.5 GHz	16 dB	16 dB	16 dB	--	--	--
12.5 GHz to 20 GHz	16 dB	16 dB	16 dB	--	--	--
20 GHz to 40 GHz	--	15 dB	15 dB	--	--	--
45 GHz to 50 GHz	--	--	13 dB	--	--	--
Source Match						
10 MHz to 45 MHz	--	--	--	12 dB	11 dB	11 dB
45 MHz to 500 MHz	20 dB	17 dB	17 dB	--	--	--
500 MHz to 2 GHz	17 dB	17 dB	17 dB	--	--	--
2 GHz to 8 GHz	12 dB	12 dB	12 dB	--	--	--
8 GHz to 12.5 GHz	11 dB	11 dB	11 dB	--	--	--
12.5 GHz to 20 GHz	10 dB	11 dB	11 dB	--	--	--
20 GHz to 40 GHz	--	7 dB	7 dB	--	--	--
40 GHz to 50 GHz	--	--	6 dB	--	--	--

Table 11. Uncorrected System Performance (Continued)

Description	Specifications			Typical		
	Options 220, 225	Options 420, 520	Options 425, 525	Options 220, 225	Options 420, 520	Options 425, 525
Load Match						
10 MHz to 45 MHz				15 dB	13 dB	13 dB
45 MHz to 500 MHz	22 dB	18 dB	18 dB			
500 MHz to 2 GHz	20 dB	18 dB	18 dB			
2 GHz to 8 GHz	12 dB	14 dB	14 dB			
8 GHz to 12.5 GHz	10 dB	12 dB	12 dB			
12.5 GHz to 20 GHz	9 dB	9 dB	9.5 dB			
20 GHz to 40 GHz		8 dB	8.5 dB			
40 GHz to 50 GHz		5 dB	5 dB			

Table 11. Uncorrected System Performance (Continued)

Description	Specifications			Typical		
	Options 220, 225	Options 420, 425	Options 520, 525	Options 220, 225	Options 420, 425	Options 520, 525
Crosstalk[1]						
10 MHz to 45 MHz				88 dB	88 dB	88 dB
45 MHz to 500 MHz				95 dB	94 dB	94 dB
500 MHz to 2 GHz				96 dB	95 dB	95 dB
2 GHz to 8 GHz				110 dB	108 dB	108 dB
8 GHz to 12.5 GHz				116 dB	113 dB	113 dB
12.5 GHz to 20 GHz				115 dB	112 dB	112 dB
20 GHz to 40 GHz					97 dB	97 dB
40 GHz to 50 GHz						89 dB

[1] Measurement conditions: normalized to a thru, measured with two shorts, 10 Hz IF bandwidth, averaging factor of 8, alternate mode, source power set to the specified maximum power output.

Table 12. Test Port Output[1]

Description	Specifications			Typical		
	Options 220, 225	**Options 420, 425**	**Options 520, 525**	**Options 220, 225**	**Options 420, 425**	**Options 520, 525**
Frequency Range						
N5230A	10 MHz to 20 GHz	10 MHz to 40 GHz	10 MHz to 50 GHz	--		
Nominal Power						
Preset power; attenuator switch point 10 dB below nominal power						
	-5 dBm	-10 dBm	-15 dBm	--		
Frequency Resolution						
	1 Hz			--		
CW Accuracy						
	+/-1 ppm			--		
Frequency Stability						
	--			+/-0.05 ppm. -10° to 70° C +/-0.1 ppm/yr maximum		

Table 12. Test Port Output[1] (Continued)

Description	Specifications				Typical	
	Options 220, 225	**Options 420, 425**	**Option 520**	**Option 525**	**Option 220, 225**	**Option 420, 425, 520, 525**
Power Level Accuracy						
Variation from nominal power in range 0						
10 MHz to 45 MHz	--	--	--	--	+/-0.5 dB	+/-0.5 dB
45 MHz to 8 GHz	+/-1 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	--	--
8 GHz to 12.5 GHz	+/-1 dB	+/-1.5 dB	+/-1.5 dB	+/-1.5 dB	--	--
12.5 GHz to 20 GHz	+/-1 dB	+/-1.5 dB	+/-1.5 dB	+/-1.5 dB	--	--
20 GHz to 40 GHz	--	+/-2.5 dB	+/-2.5 dB	+/-2.5 dB	--	**--**
40 GHz to 50 GHz	--	--	+/-3.5 dB	+/-3.5 dB	--	**--**

Table 12. Test Port Output[1] (Continued)

	Specifications					Typical
	Options 220, 225	**Option 420**	**Option 425**	**Option 520**	**Option 525**	**Options as Indicated**
Max Leveled Power						
45 MHz to 12.5 GHz	5 dBm	0 dBm	0 dBm	0 dBm	0 dBm	--
12.5 GHz to 20 GHz	3 dBm	0 dBm	0 dBm	0 dBm	0 dBm	--
20 GHz to 40 GHz	--	-5 dBm	-8 dBm	-5 dBm	-8 dBm	**--**
40 GHz to 50 GHz	--	--	--	-11 dBm	-15 dBm	**--**
Power Level Linearity[2]						
Test reference is at the nominal power level						
10 MHz to 45 MHz	--	--	--	--	--	+/-0.35 dB (Opt 220 & 225) +/-0.40 dB (Opt 420, 425, 520, 525)
45 MHz to 12.5 GHz	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	--
12.5 GHz to 20 GHz	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	--
20 GHz to 40 GHz	--	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	**--**
40 GHz to 50 GHz	--	--	--	+/-1.0 dB	+/-1.0 dB	**--**
Power Sweep Range (ALC)[3]						
45 MHz to 12.5 GHz	25 dB	25 dB	25 dB	25 dB	25 dB	--
12.5 GHz to 20 GHz	23 dB	25 dB	25 dB	25 dB	25 dB	--
20 GHz to 40 GHz	--	20 dB	17 dB	20 dB	17 dB	--
40 GHz to 50 GHz	--	--	--	14 dB	10 dB	--
Power Resolution						
	0.01 dB					--

Table 12. Test Port Output[1] (Continued)

Description	Specifications	Typical			
		Option 220	**Option 225**	**Option 420, 520**	**Option 425, 525**
Power Range					
10 MHz to 45 MHz	--	-27 to +14 dBm	-87 to +12 dBm	-27 to +9 dBm	-87 to +8 dBm
45 MHz to 12.5 MHz	--	-27 to +14 dBm	-87 to +12 dBm	-27 to +8 dBm	-87 to +8 dBm
12.5 GHz to 20 GHz	--	-27 to +10 dBm	-87 to +7 dBm	-27 to +5 dBm	-87 to +4 dBm
20 GHz to 40 GHz	--	--	--	-27 to +1 dBm	-87 to -2 dBm
40 GHz to 50 GHz	--	--	--	-27 to -5 dBm	-87 to -9 dBm
Power Settings					
Minimum Power Setting	--	-30 dBm	-90 dBm	-30 dBm	-90 dBm
Maximum Power Setting	--	+20 dBm			

Table 12. Test Port Output[1] (Continued)

Description	Specifications	Typical		
		Options 220, 225, 420, 425, 520, 525		
Phase Noise (Nominal power at test port)				
	--	**10 kHz Offset**	**100 kHz Offset**	**1 MHz Offset**
10 MHz to 1.5 GHz	--	-77 dBc/Hz	-77 dBc/Hz	-89 dBc/Hz
1.5 GHz to 3.125 GHz	--	-83 dBc/Hz	-91 dBc/Hz	-95 dBc/Hz
3.125 GHz to 6.25 GHz	--	-77 dBc/Hz	-85 dBc/Hz	-89 dBc/Hz
6.25 GHz to 12.5 GHz		-71 dBc/Hz	-79 dBc/Hz	-83 dBc/Hz
12.5 GHz to 20 GHz	--	-65 dBc/Hz	-73 dBc/Hz	-77 dBc/Hz
20 GHz to 40 GHz	--	-59 dBc/Hz	-67 dBc/Hz	-71 dBc/Hz
40 GHz to 50 GHz	--	-59 dBc/Hz	-67 dBc/Hz	-71 dBc/Hz
Non-Harmonic Spurious (at Nominal Output Power)				
10 MHz to 20 GHz	--	-50 dBc for offset frequency > 1 kHz		
20 GHz to 40 GHz	--	-30 dBc for offset frequency > 1 kHz		
40 GHz to 50 GHz	--	-30 dBc for offset frequency > 1 kHz		

Table 12. Test Port Output[1] (Continued)

Description	Specifications	Typical		
		Option 220, 225	Option 420, 425	Option 520, 525
Harmonics (2nd or 3rd) at Maximum Output Power				
10 MHz to 500 MHz	--	-22 dBc	-15 dBc	-15 dBc
500 MHz to 20 GHz	--	-22 dBc	-20 dBc	-20 dBc
20 GHz to 40 GHz	--	--	-22 dBc	-22 dBc
40 GHz to 50 GHz	--	--	--	-22 dBc

[1]Performance specified on Port 1 only. Port 2 performance is a characteristic.

[2]Power level linearity specified on Port 1 only. Port 2 performance is Typical. Test reference is at the nominal power level.

[3]ALC range starts at maximum-leveled power and goes down the power level indicated by the dB amount specified here.

Table 13. Test Port Input

Description	Specification			Typical		
	Options 220, 225	Options 420, 425	Options 520, 525	Options 220, 225	Options 420, 425	Options 520, 525
Test Port Noise Floor[1]						
10 Hz IF Bandwidth						
10 MHz to 45 MHz	--	--	--	<-89 dBm	<-80 dBm	<-80 dBm
45 MHz to 500 MHz	<-100 dBm	<-90 dBm	<-90 dBm	--	--	--
500 MHz to 2 GHz	<-105 dBm	<-110 dBm	<-110 dBm	--	--	--
2 GHz to 8 GHz	<-105 dBm	<-110 dBm	<-110 dBm	--	--	--
8 GHz to 10.5 GHz	<-105 dBm	<-100 dBm	<-100 dBm	--	--	--
10.5 GHz to 20 GHz	<-105 dBm	<-100 dBm	<-100 dBm	--	--	--
20 GHz to 31.25 GHz	--	<-100 dBm	<-100 dBm	--	--	--
31.25 GHz to 40 GHz	--	<-95 dBm	<-95 dBm	--	--	--
40 GHz to 50 GHz	--	--	<-90 dBm	--	--	--
1 KHz IF Bandwidth						
10 MHz to 45 MHz	--	--	--	<-69 dBm	<-60 dBm	<-60 dBm
45 MHz to 500 MHz	<-80 dBm	<-70 dBm	<-70 dBm	--	--	--
500 MHz to 2 GHz	<-85 dBm	<-90 dBm	<-90 dBm	--	--	--
2 GHz to 8 GHz	<-85 dBm	<-90 dBm	<-90 dBm	--	--	--
8 GHz to 10.5 GHz	<-85 dBm	<-80 dBm	<-80 dBm	--	--	--
10.5 GHz to 20 GHz	<-85 dBm	<-80 dBm	<-80 dBm	--	--	--
20 GHz to 31.25 GHz	--	<-80 dBm	<-80 dBm	--	--	--
31.25 GHz to 40 GHz	--	<-75 dBm	<-75 dBm	--	--	--
40 GHz to 50 GHz	--	--	<-70 dBm	--	--	--

Table 13. Test Port Input (Continued)

Description	Specification			Typical		
	Options 220, 225	Options 420, 425	Options 520, 525	Options 220, 225	Options 420, 425	Options 520, 525
Direct Receiver Access Input Noise Floor[1] (Options 225, 425, and 525 only)						
10 Hz IF Bandwidth						
10 MHz to 45 MHz	--	--	--	<-120 dBm	<-126 dBm	<-126 dBm
45 MHz to 500 MHz	<-112 dBm	<-111 dBm	<-111 dBm	--	--	--
500 MHz to 2 GHz	<-117 dBm	<-122 dBm	<-122 dBm	--	--	--
2 GHz to 8 GHz	<-117 dBm	<-122 dBm	<-122 dBm	--	--	--
8 GHz to 10.5 GHz	<-117 dBm	<-112 dBm	<-112 dBm	--	--	--
10.5 GHz to 20 GHz	<-117 dBm	<-112 dBm	<-112 dBm	--	--	--
20 GHz to 31.25 GHz	--	<-111 dBm	<-111 dBm	--	--	--
31.25 GHz to 40 GHz	--	<-106 dBm	<-106 dBm	--	--	--
40 GHz to 50 GHz	--	--	<-98 dBm	--	--	--
1 KHz IF Bandwidth						
10 MHz to 45 MHz	--	--	--	<-100 dBm	<-106 dBm	<-106 dBm
45 MHz to 500 MHz	<-92 dBm	<-91 dBm	<-91 dBm	--	--	--
500 MHz to 2 GHz	<-97 dBm	<-102 dBm	<-102 dBm	--	--	--
2 GHz to 8 GHz	<-97 dBm	<-102 dBm	<-102 dBm	--	--	--
8 GHz to 10.5 GHz	<-97 dBm	<-92 dBm	<-92 dBm	--	--	--
10.5 GHz to 20 GHz	<-97 dBm	<-92 dBm	<-92 dBm	--	--	--
20 GHz to 31.25 GHz	--	<-91 dBm	<-91 dBm	--	--	--
31.25 GHz to 40 GHz	--	<-86 dBm	<-86 dBm	--	--	--
40 GHz to 50 GHz	--	--	<-78 dBm	--	--	--

Table 13. Test Port Input (Continued)

Description	Specification						Typical		
	Options 220, 225		Options 420, 520		Options 425, 525				
Compression Level									
	Power	Com-pression	Power	Com-pression	Power	Com-pression	--	--	--
10 MHz to 45 MHz[2]	--	--	--	--	--	--	--	--	--
45 MHz to 500 MHz	+5 dBm	0.10 dB	+5 dBm	0.40 dB	+5 dBm	0.40 dB	--	--	--
500 MHz to 2 GHz	+5 dBm	0.15 dB	+5 dBm	0.77 dB	+5 dBm	0.67 dB	--	--	--
2 GHz to 8 GHz	+5 dBm	0.21 dB	+5 dBm	0.75 dB	+5 dBm	0.55 dB	--	--	--
8 GHz to 12.5 GHz	+5 dBm	0.21 dB	+5 dBm	0.56 dB	+5 dBm	0.51 dB	--	--	--
12.5 GHz to 20 GHz	+3 dBm	0.20 dB	+5 dBm	0.79 dB	+5 dBm	0.69 dB	--	--	--
20 GHz to 31.25 GHz	--	--	0 dBm	0.60 dB	0 dBm	0.50 dB	--	--	--
31.25 GHz to 40 GHz	--	--	-3 dBm	0.55 dB	-3 dBm	0.60 dB	--	--	--
40 GHz to 50 GHz	--	--	-3 dBm	0.66 dB	-3 dBm	0.71 dB	--	--	--

Table 13. Test Port Input (Continued)

Description	Specification			Typical		
	Options 220, 225	Options 420, 520	Options 425, 525	Options 220, 225	Options 420, 520	Options 425, 525
Test Port Compression - 0.1 dB						
10 MHz to 45 MHz[2]	--	--	--	negligible	negligible	negligible
45 MHz to 500 MHz	--	--	--	+10 dBm	0.0 dBm	+1.0 dBm
500 MHz to 2 GHz	--	--	--	+9 dBm	0.0 dBm	+1.0 dBm
2 GHz to 12.5 GHz	--	--	--	+6 dBm	0.0 dBm	+1.5 dBm
12.5 GHz to 20 GHz	--	--	--	+6 dBm	-1.0 dBm	0.0 dBm
20 GHz to 31.25 GHz	--	--	--	--	-5.5 dBm	-3.0 dBm
31.25 GHz to 40 GHz	--	--	--	--	-8.5 dBm	-7.5 dBm
40 GHz to 50 GHz	--	--	--	--	-11.5 dBm	-10.0 dBm
Trace Noise Magnitude[3] 1 kHz IF bandwidth, ratioed measurement, nominal power at test port.						
10 MHz to 45 MHz	--	--	--	0.004 dB rms	0.015 dB rms	0.015 dB rms
45 MHz to 500 MHz	0.004 dB rms	0.010 dB rms	0.010 dB rms	--	--	--
500 MHz to 2 GHz	0.004 dB rms	0.006 dB rms	0.006 dB rms	--	--	--
2 GHz to 10.5 GHz	0.004 dB rms	0.006 dB rms	0.006 dB rms	--	--	--
10.5 GHz to 20 GHz	0.006 dB rms	0.010 dB rms	0.010 dB rms	--	--	--
20 GHz to 31.25 GHz	--	0.010 dB rms	0.010 dB rms	--	--	--
31.25 GHz to 40 GHz	--	0.020 dB rms	0.020 dB rms	--	--	--
40 GHz to 50 GHz	--	--	0.020 dB rms	--	--	--

Table 13. Test Port Input (Continued)

Description	Specifications			Typical		
	Options 220, 225	**Options 420, 425**	**Options 520, 525**	**Options 220, 225**	**Options 420, 425**	**Options 520, 525**
Trace Noise Phase[3] 1 kHz IF bandwidth, ratioed measurement, nominal power at test port.						
10 MHz to 45 MHz	--	--	--	0.025° rms	0.100° rms	0.100° rms
45 MHz to 500 MHz	0.060° rms	0.100° rms	0.100° rms	--	--	--
500 MHz to 2 GHz	0.060° rms	0.060° rms	0.060° rms	--	--	--
2 GHz to 10.5 GHz	0.060° rms	0.060° rms	0.060° rms	--	--	--
10.5 GHz to 20 GHz	0.060° rms	0.100° rms	0.100° rms	--	--	--
20 GHz to 31.25 GHz	--	0.100° rms	0.100° rms	--	--	--
31.25 GHz to 40 GHz	--	0.200° rms	0.200° rms	--	--	--
40 GHz to 50 GHz	--	--	0.200° rms	--	--	--
Reference Level Magnitude						
Range	+/-200 dB			--	--	--
Resolution	0.001dB			--	--	--
Reference Level Phase						
Range	+/-500°			--	--	--
Resolution	0.01°			--	--	--

Table 13. Test Port Input (Continued)

Description	Specification	Typical	
	--	**Options 220, 225**	**Options 420, 425, 520, 525**
Stability Magnitude[4]			
10 MHz to 45 MHz	--	+/-0.015 dB/°C	+/-0.015 dB/°C
45 MHz to 500 MHz	--	+/-0.010 dB/°C	+/-0.010 dB/°C
500 MHz to 2 GHz	--	+/-0.010 dB/°C	+/-0.010 dB/°C
2 GHz to 8 GHz	--	+/-0.020 dB/°C	+/-0.010 dB/°C
8 GHz to 20 GHz	--	+/-0.030 dB/°C	+/-0.015 dB/°C
20 GHz to 40 GHz	--	--	+/-0.040 dB/°C
40 GHz to 50 GHz	--	--	+/-0.060 dB/°C
Stability Phase[4]			
10 MHz to 45 MHz	--	+/-0.25°/°C	+/-0.25°/°C
45 MHz to 500 MHz	--	+/-0.20°/°C	+/-0.22°/°C
500 MHz to 2 GHz	--	+/-0.15°/°C	+/-0.22°/°C
2 GHz to 8 GHz	--	+/-0.15°/°C	+/-0.10°/°C
8 GHz to 20 GHz	--	+/-0.45°/°C	+/-0.15°/°C
20 GHz to 40 GHz	--	--	+/-0.40°/°C
40 GHz to 50 GHz	--	--	+/-0.40°/°C

Table 13. Test Port Input (Continued)

Description	Specifications	Typical	
	--	**Options 220, 420, 520**	**Options 225, 425, 525**
Damage Input Level			
Test Port 1 & 2	--	+30 dBm or +/- 40 VDC	+30 dBm or +/- 7 VDC
R1, R2 in	--	--	+15 dBm or +/-7 VDC
A, B in	--	--	+15 dBm or +/-7 VDC
Coupler Thru	--	--	+30 dBm or +/-40 VDC
Coupler Arm	--	--	+30 dBm or +/-7 VDC

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

[2]Coupler roll-off will reduce compression to a negligible level below 45 MHz.

[3]1 kHz IF BW, ratioed measurement, nominal power at the test port.

[4]Stability is defined as a ratio measurement made at the test port.

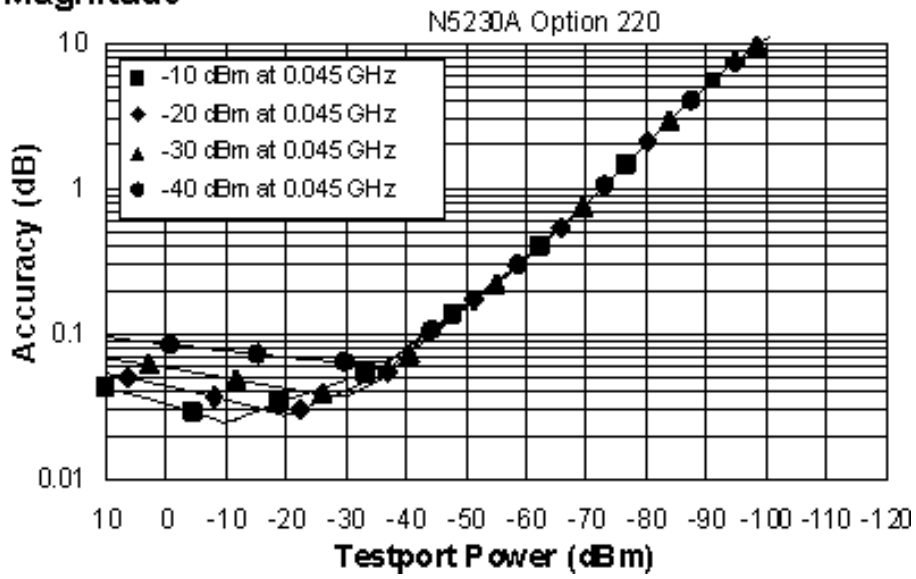
Table 14. Dynamic Accuracy (Specification[a])

Accuracy of the test port input power reading relative to the reference input power level.

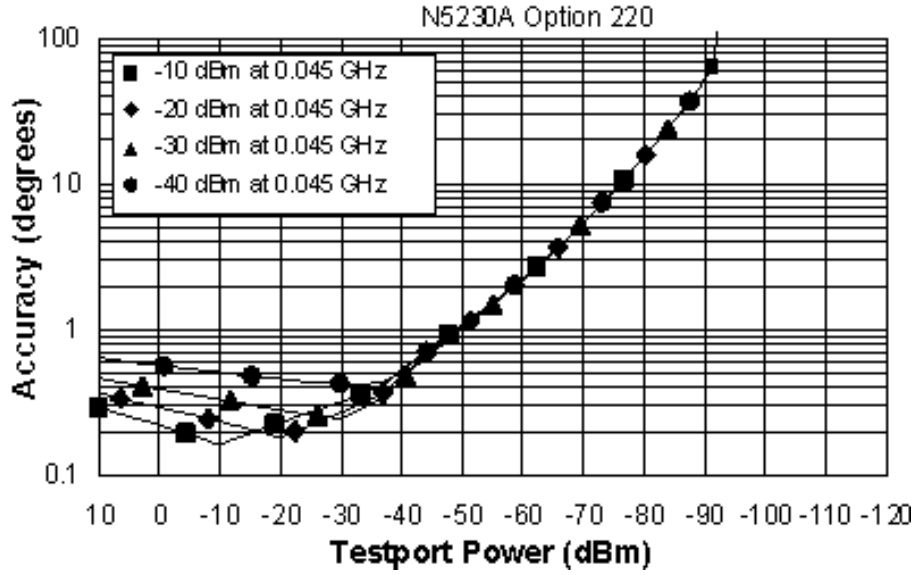
Options 220, 225

Dynamic Accuracy, 0.045 GHz

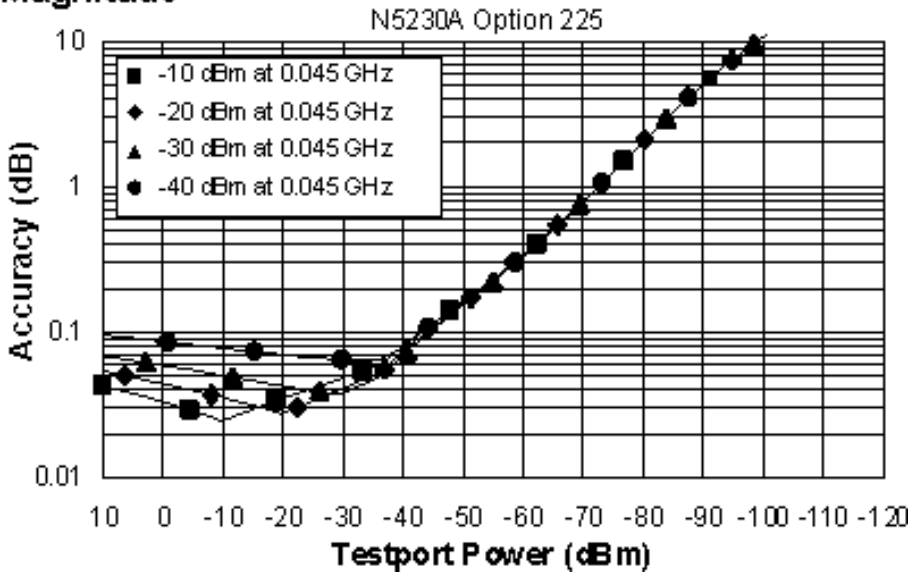
Magnitude



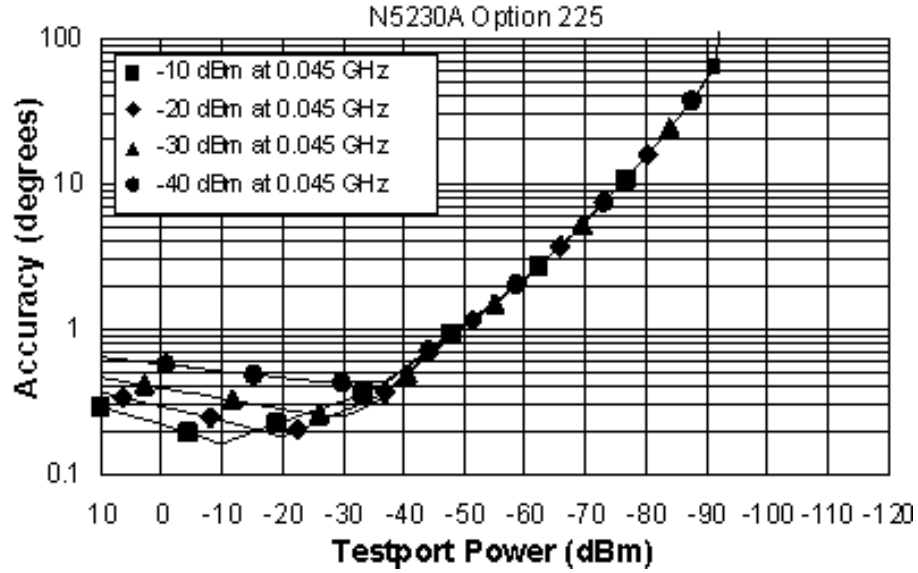
Phase



Magnitude

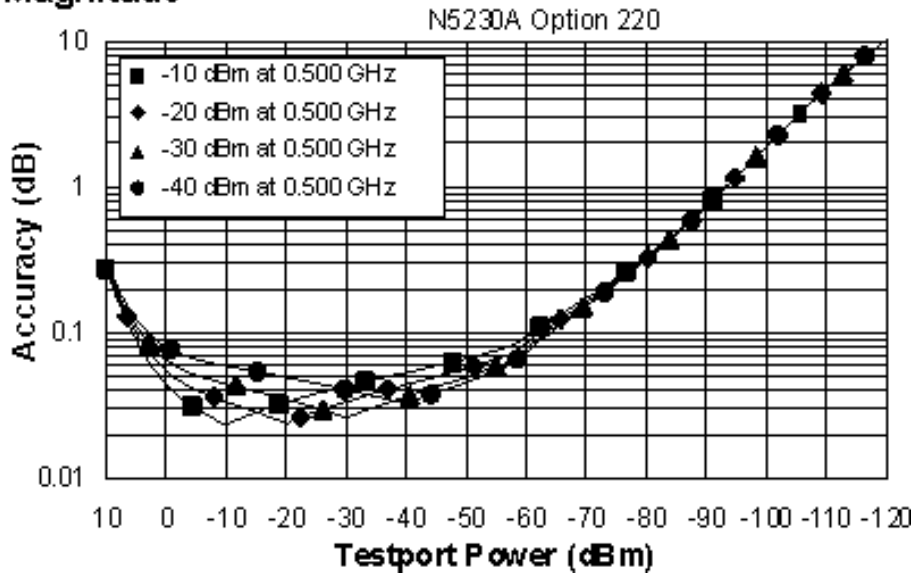


Phase

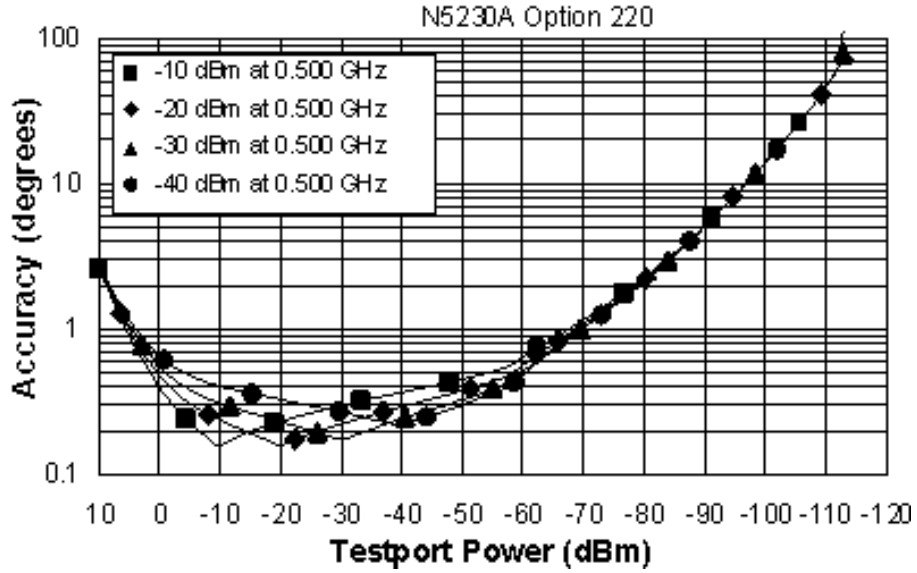


Dynamic Accuracy, 0.500 GHz

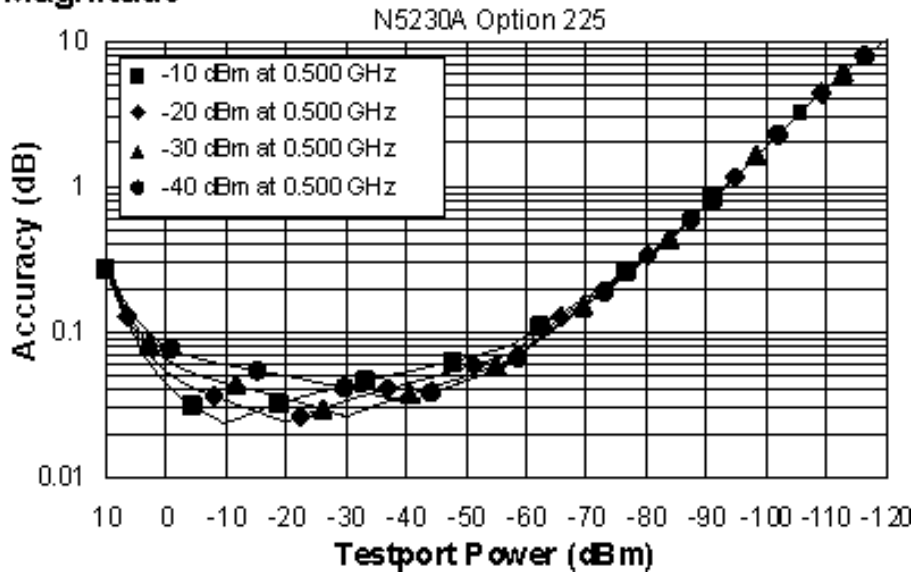
Magnitude



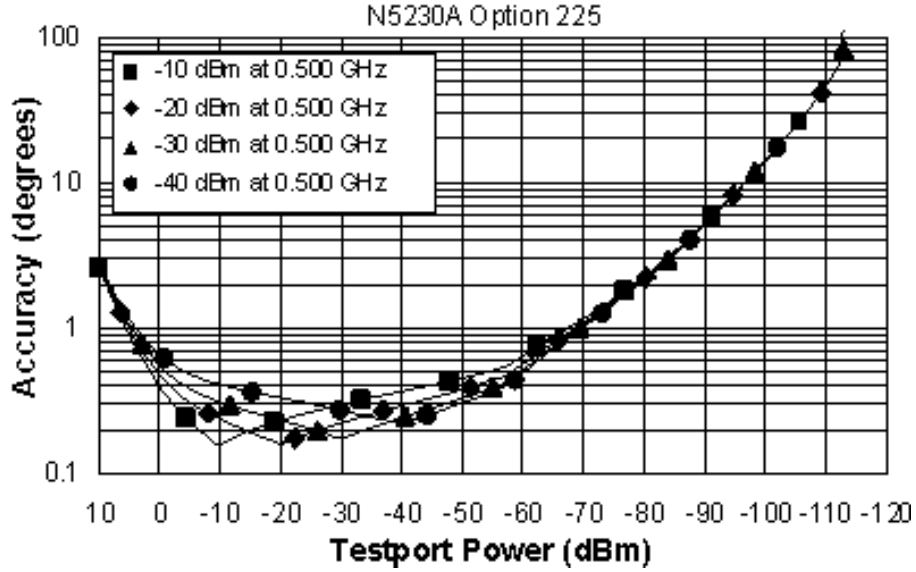
Phase



Magnitude

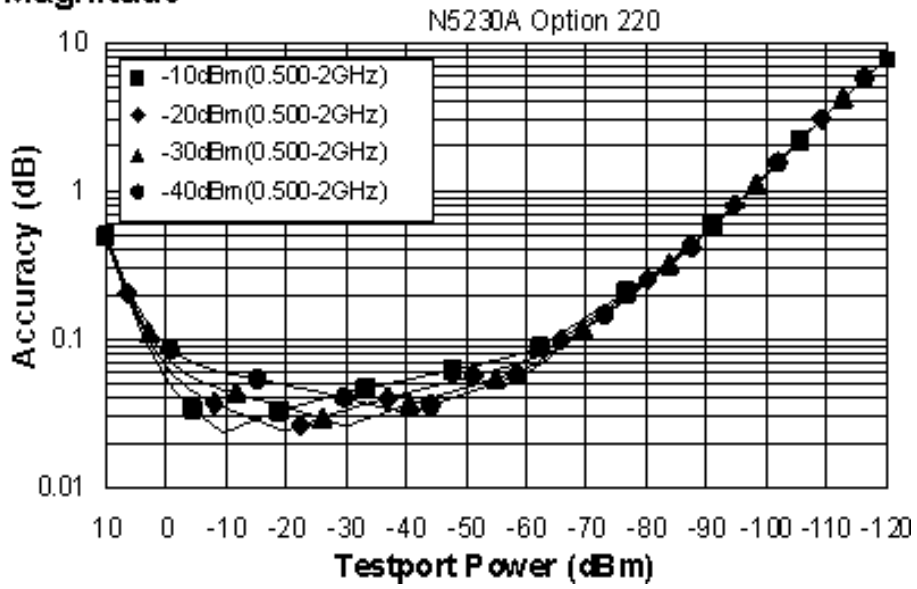


Phase

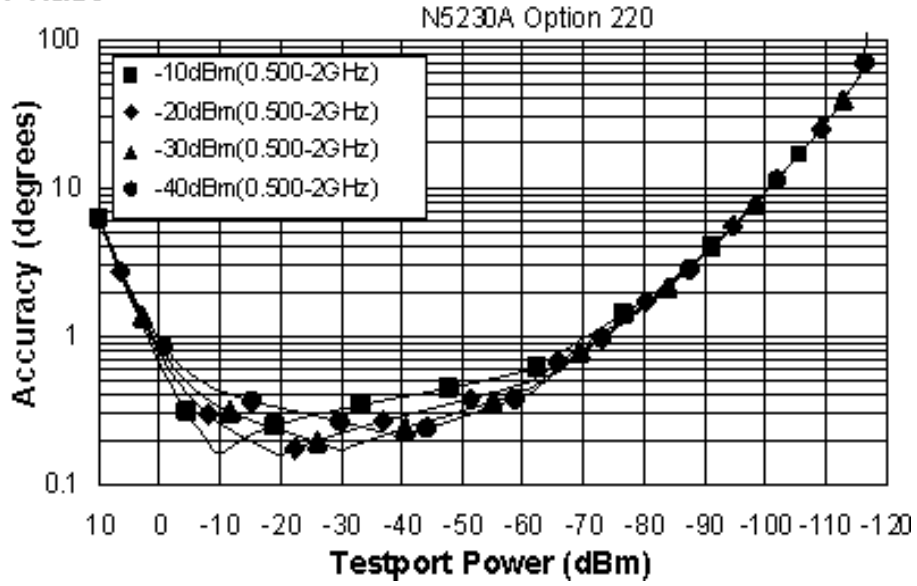


Dynamic Accuracy, 0.500 - 2 GHz

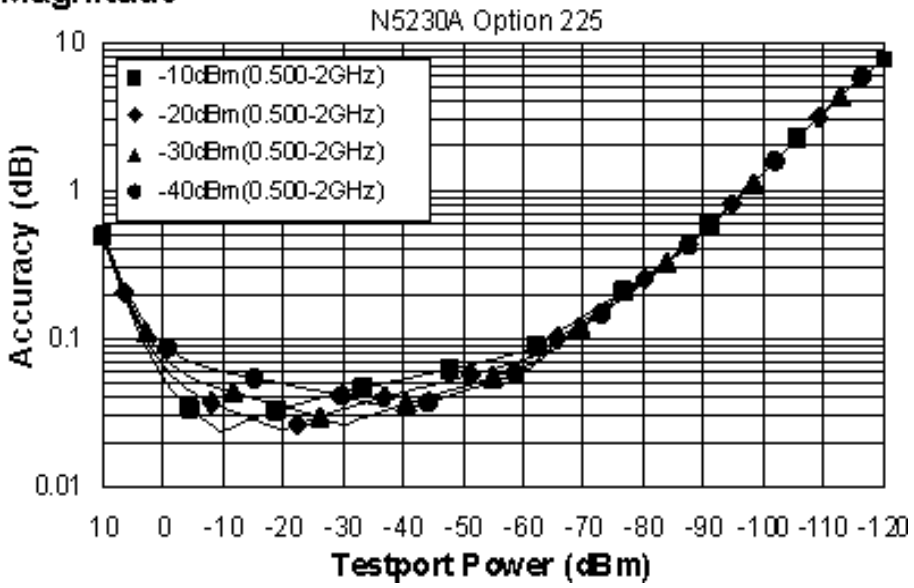
Magnitude



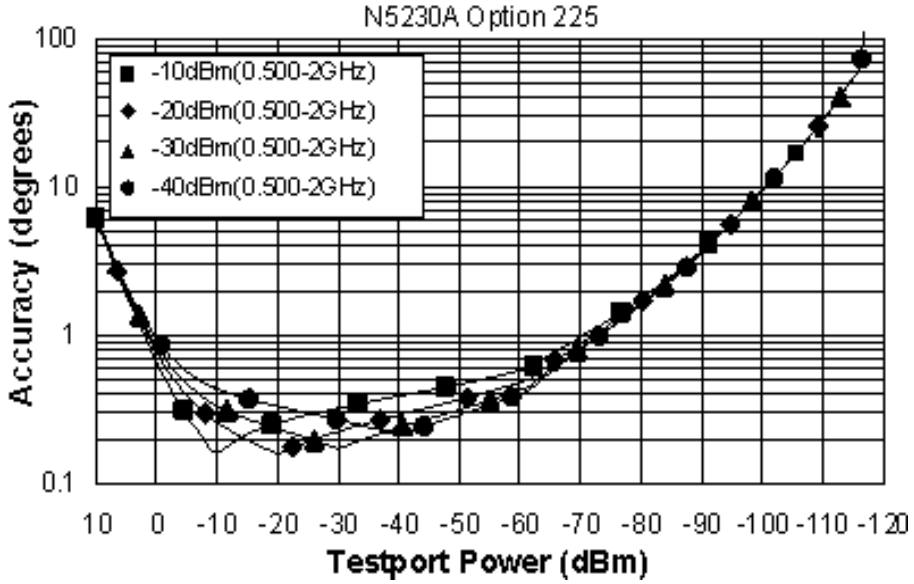
Phase



Magnitude

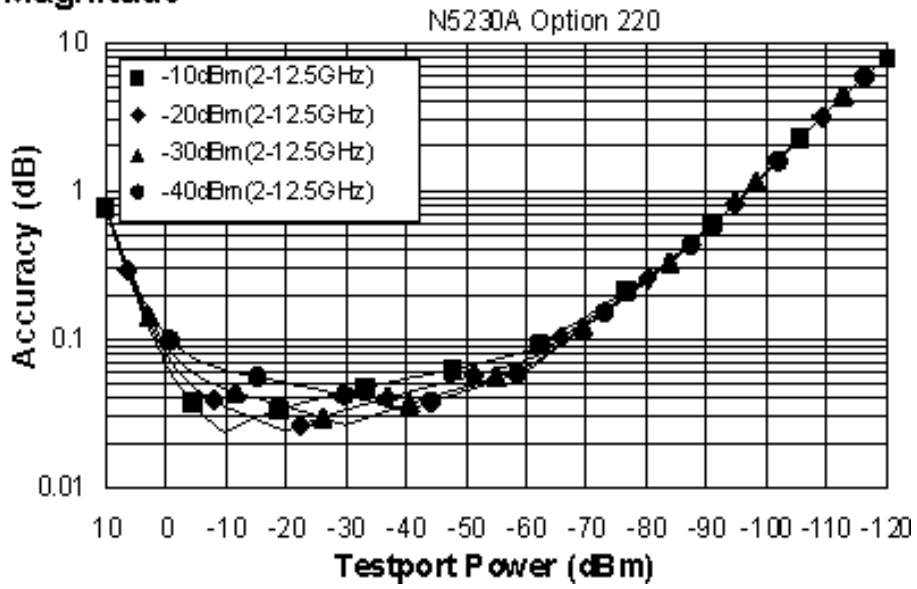


Phase

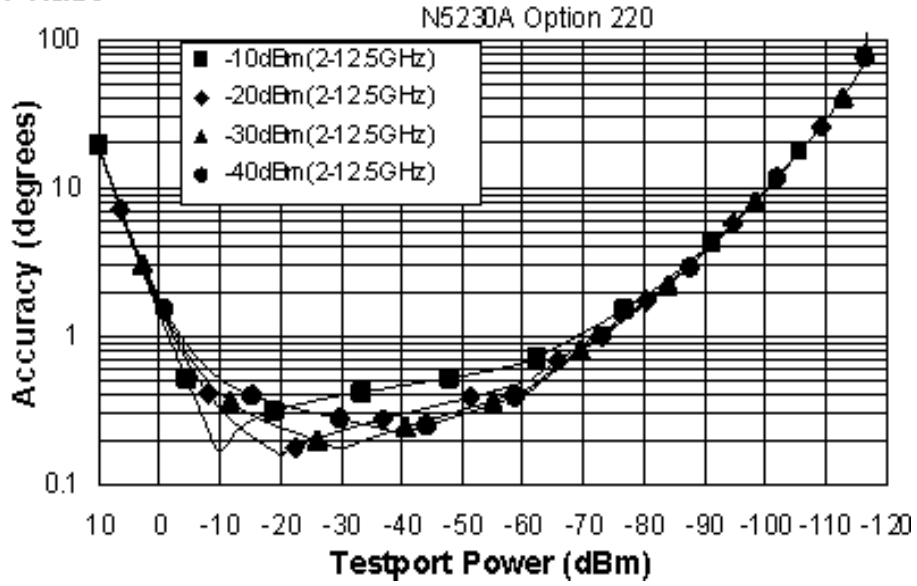


Dynamic Accuracy, 2 - 12.5 GHz

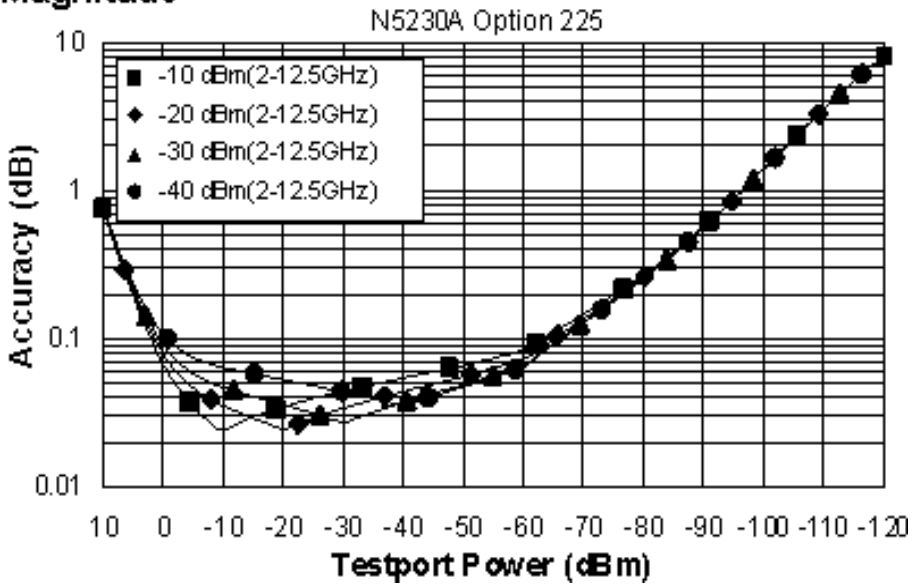
Magnitude



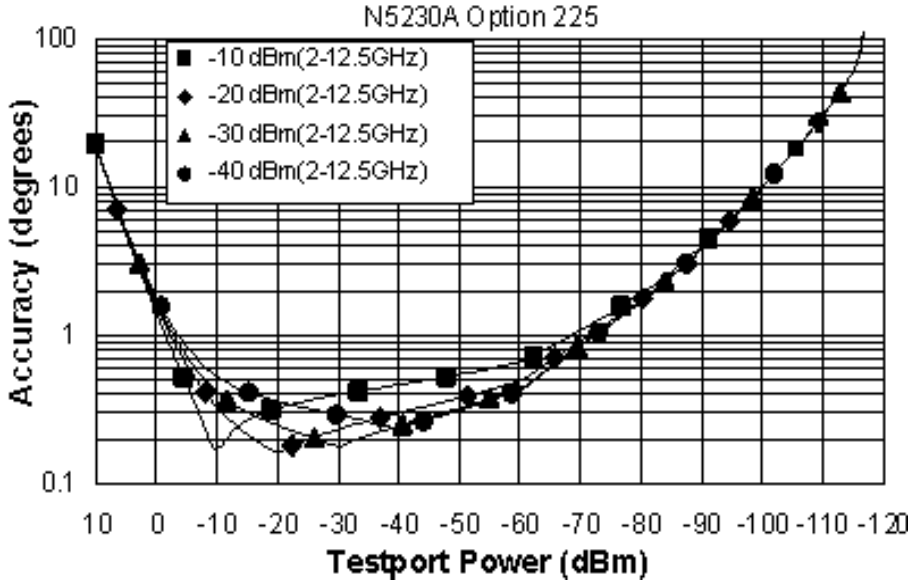
Phase



Magnitude

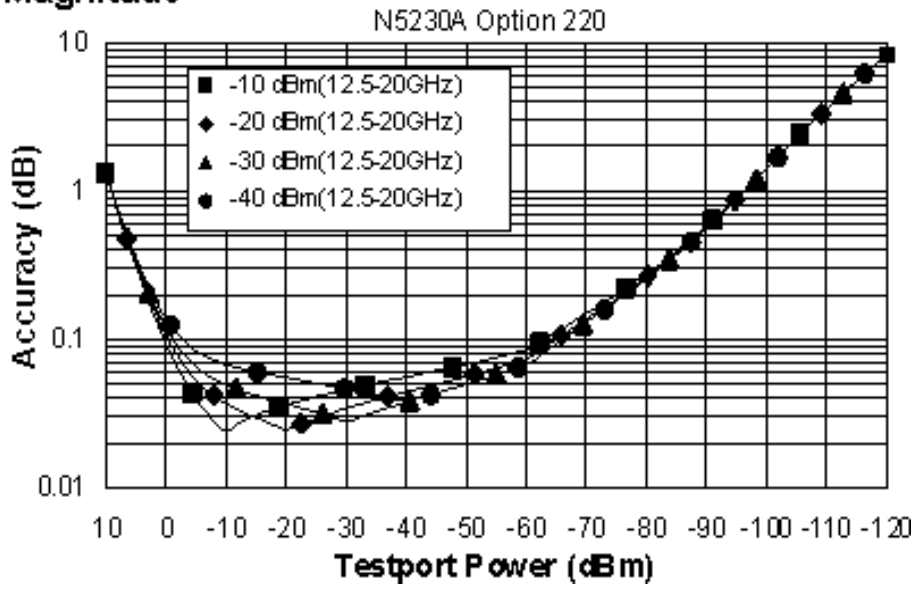


Phase

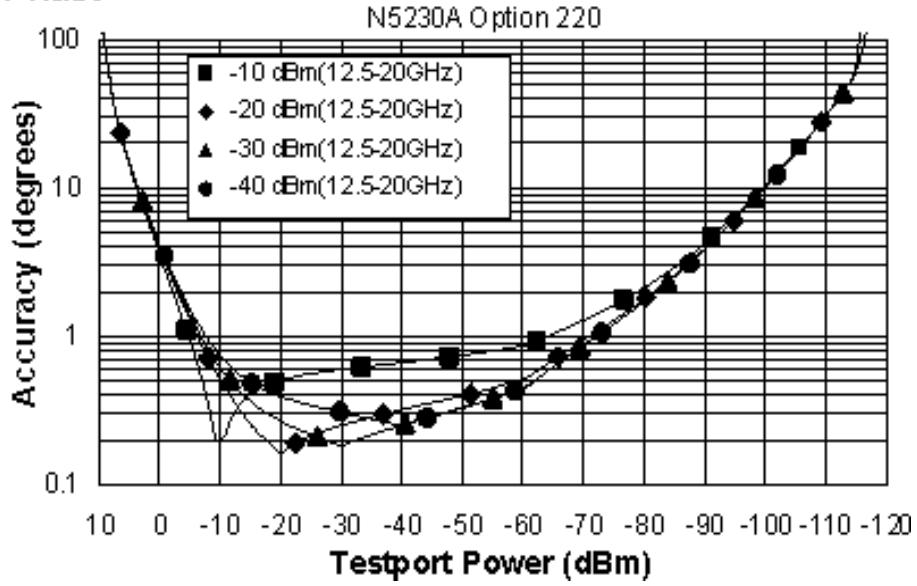


Dynamic Accuracy, 12.5 - 20 GHz

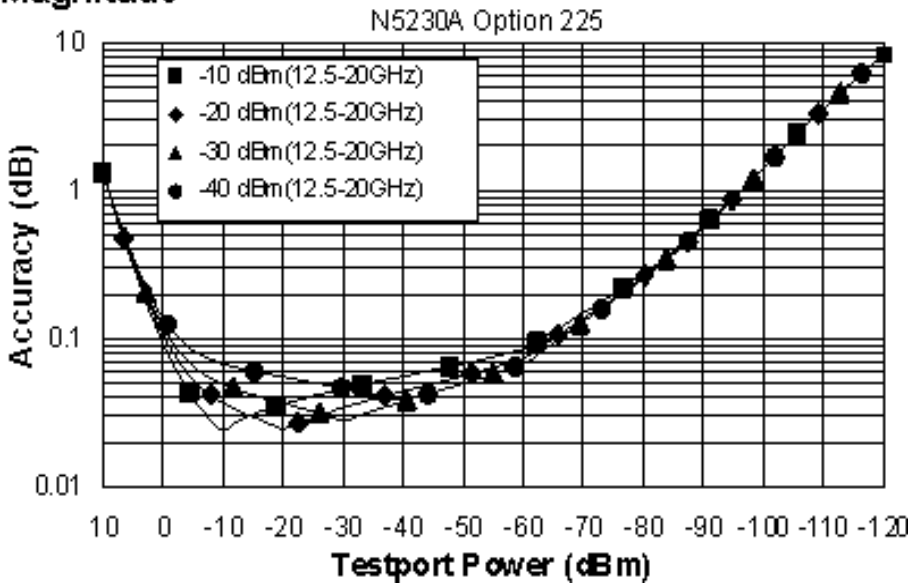
Magnitude



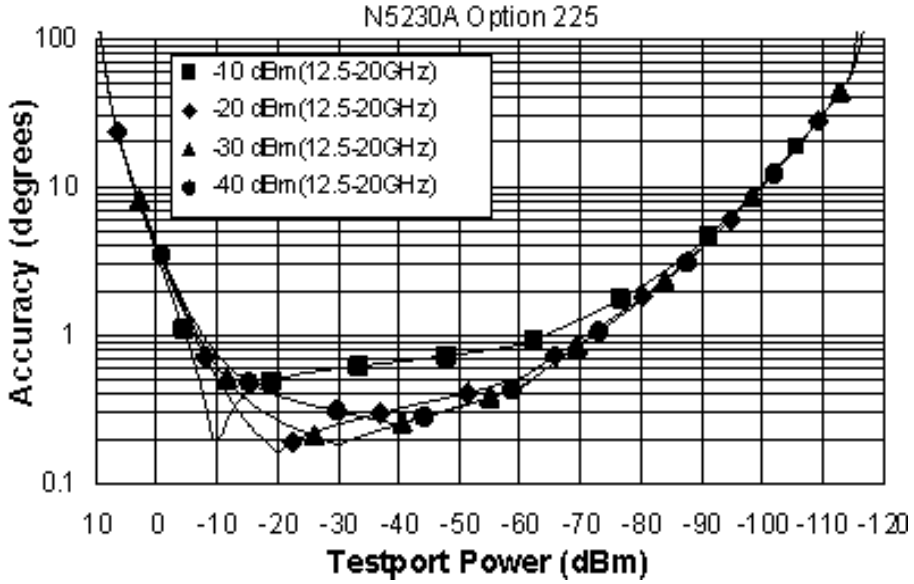
Phase



Magnitude



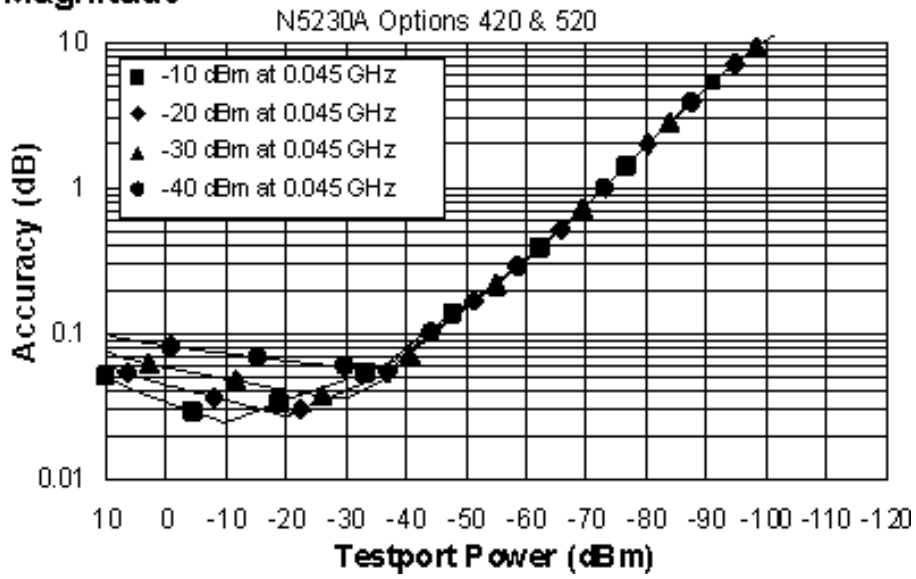
Phase



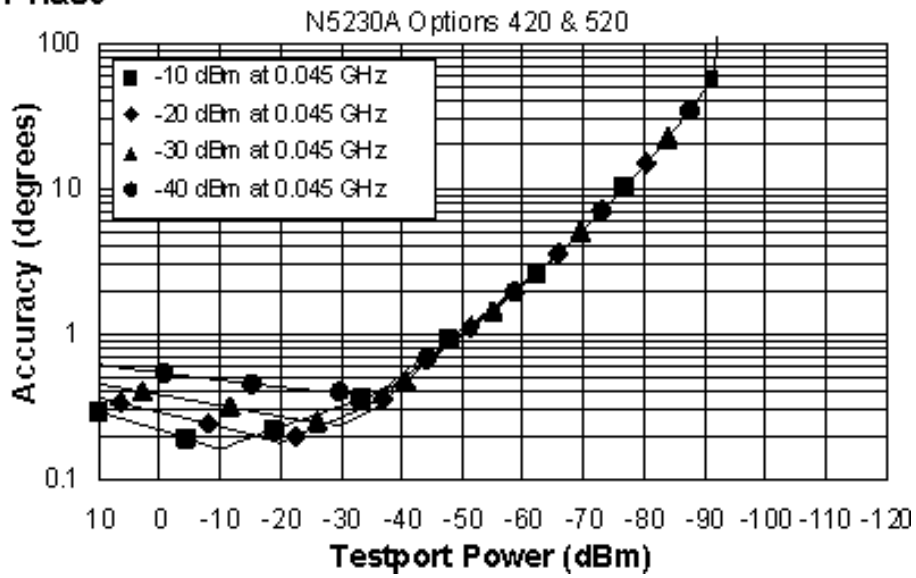
Options 420, 425, 520, 525

Dynamic Accuracy, 0.045 GHz

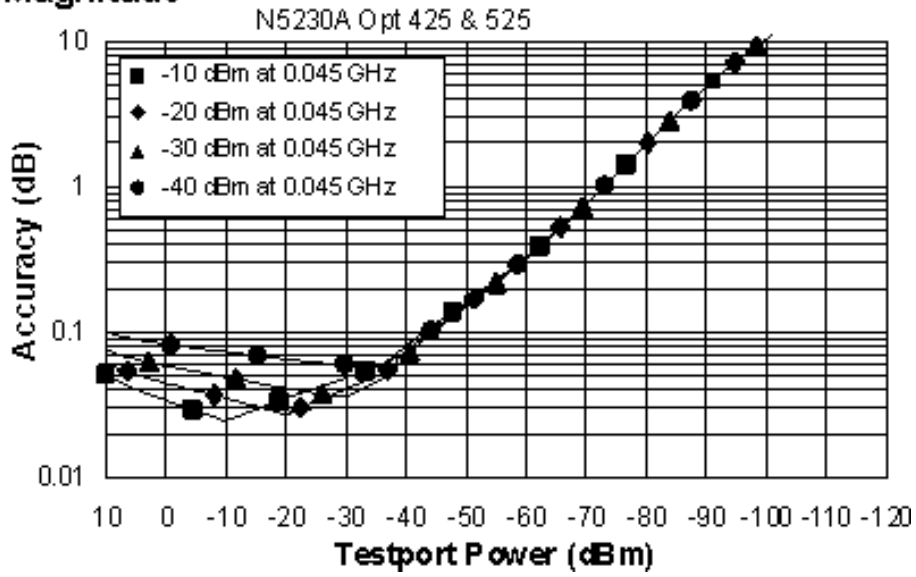
Magnitude



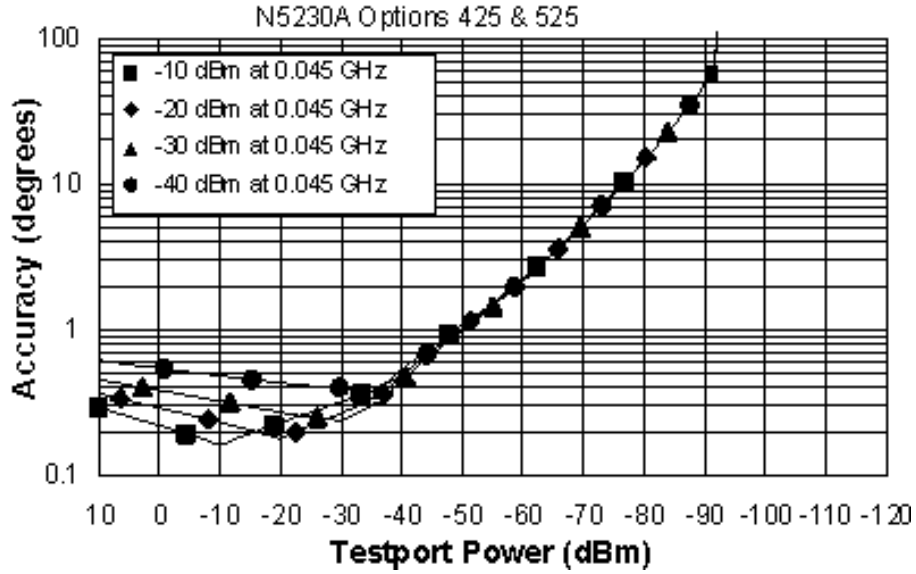
Phase



Magnitude

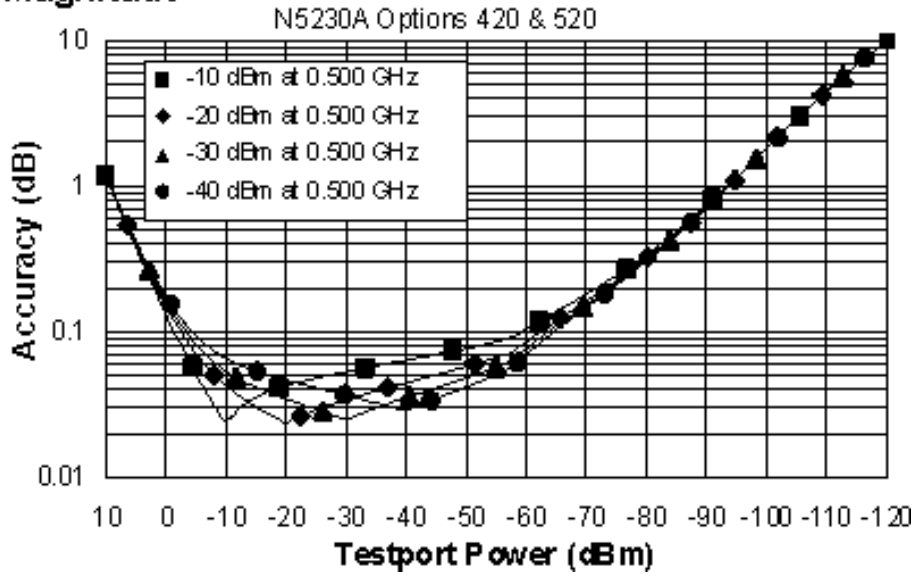


Phase

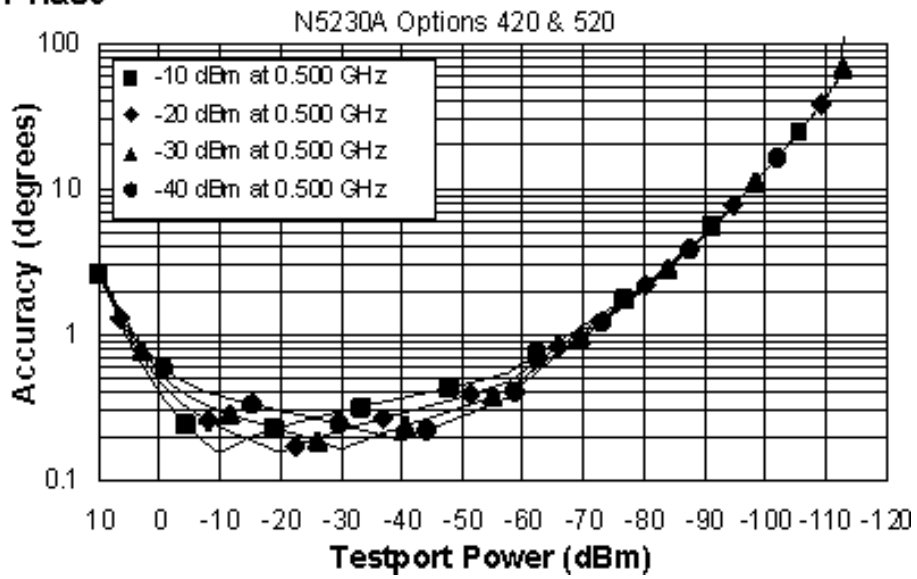


Dynamic Accuracy, 0.500 GHz

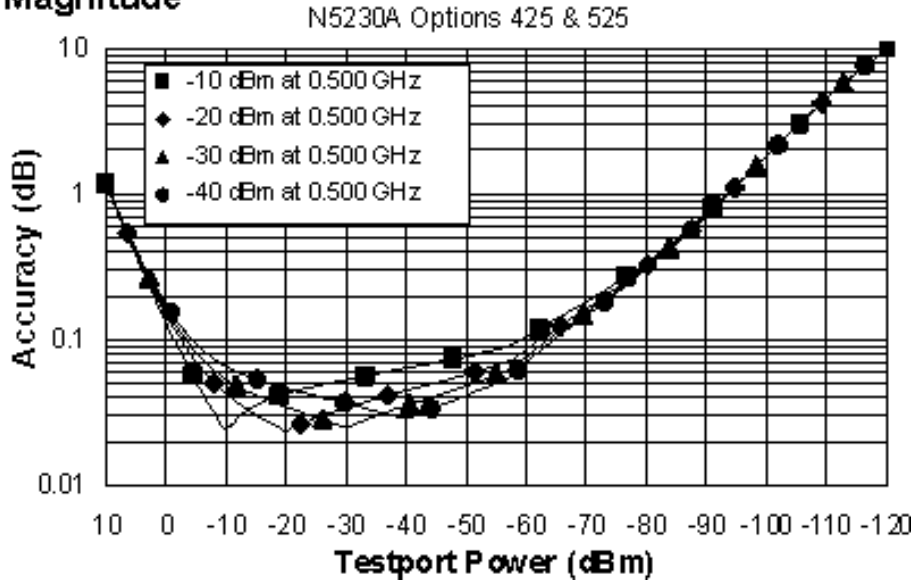
Magnitude



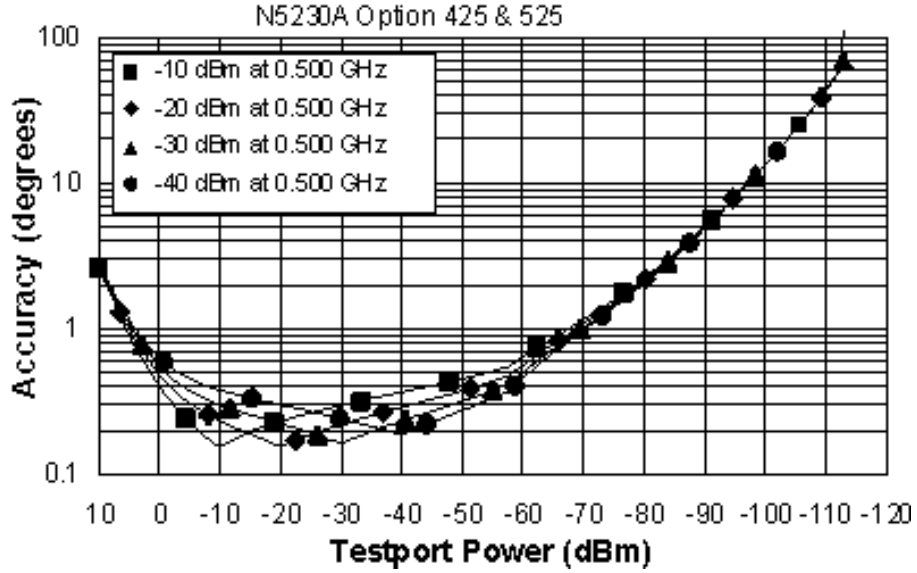
Phase



Magnitude

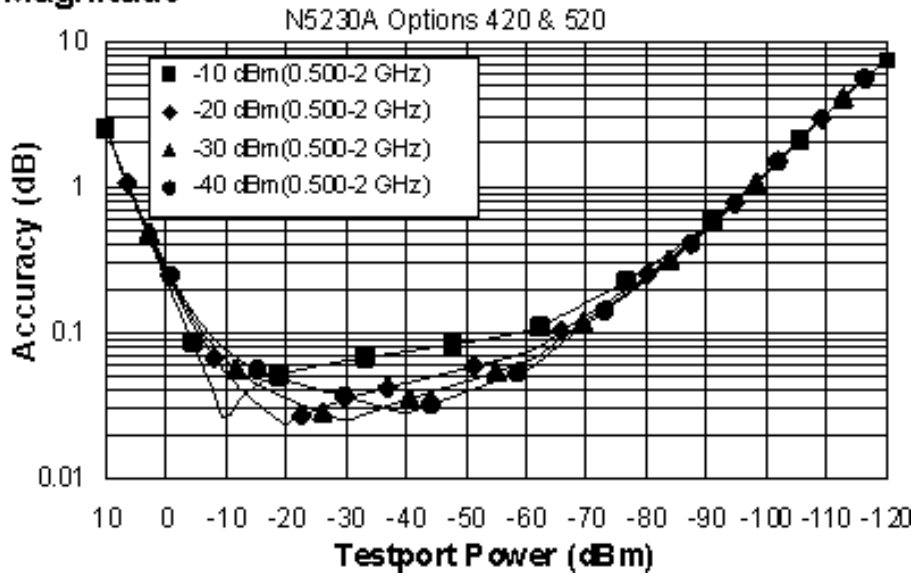


Phase

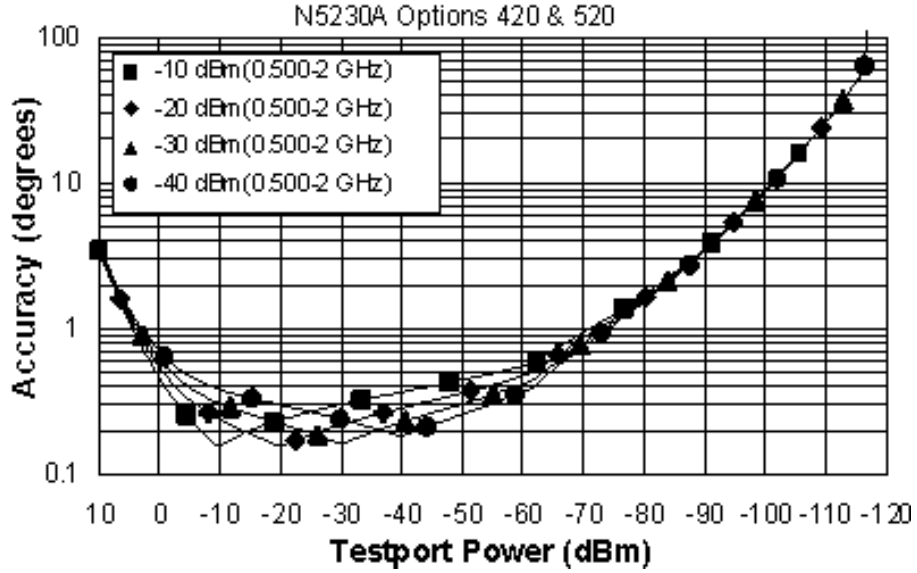


Dynamic Accuracy, 0.500 - 2 GHz

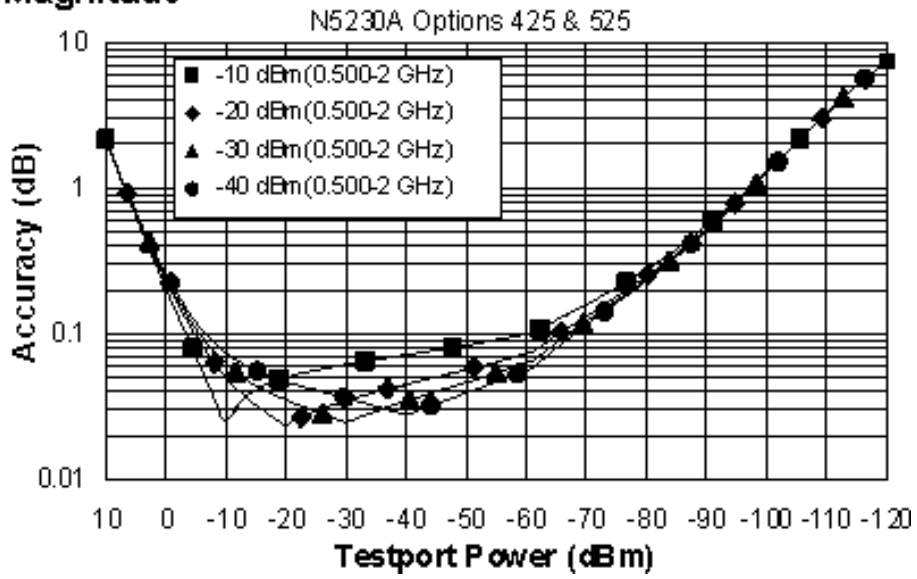
Magnitude



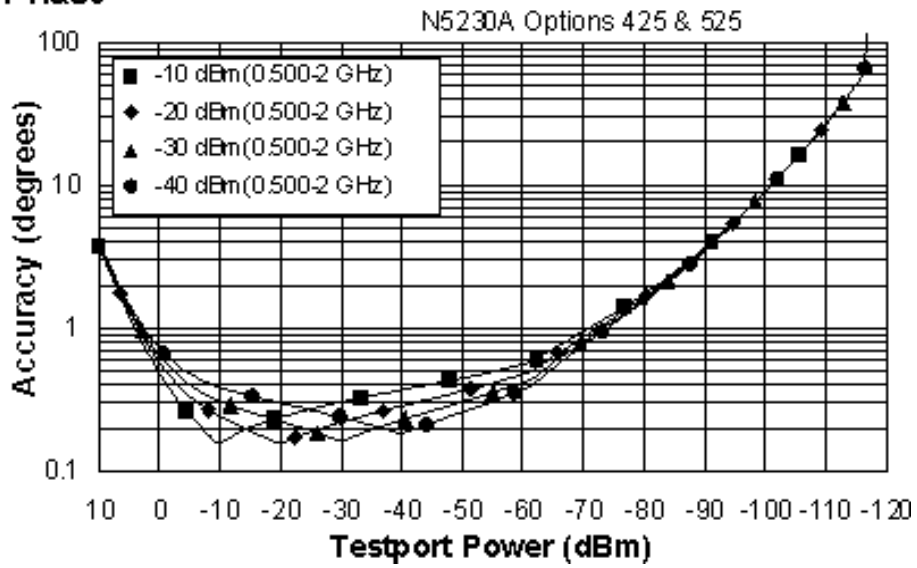
Phase



Magnitude

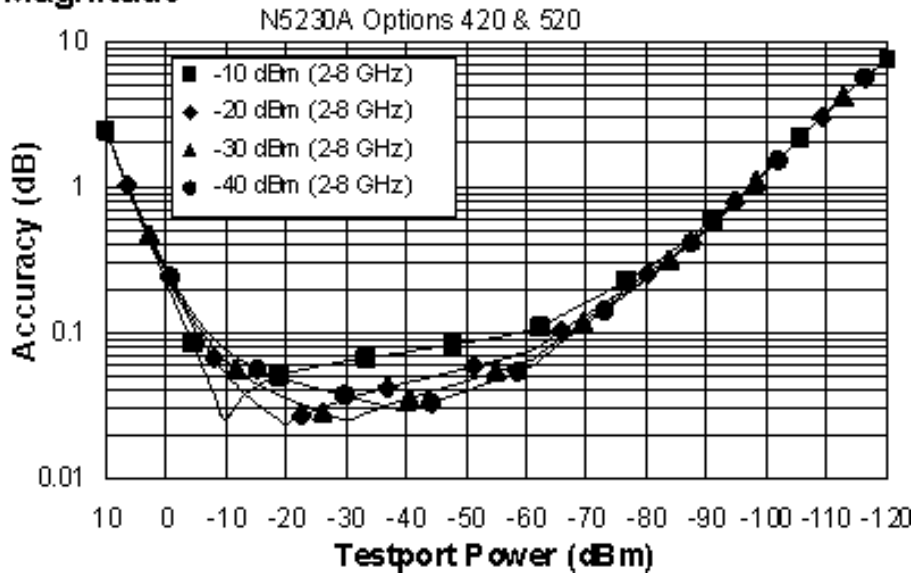


Phase

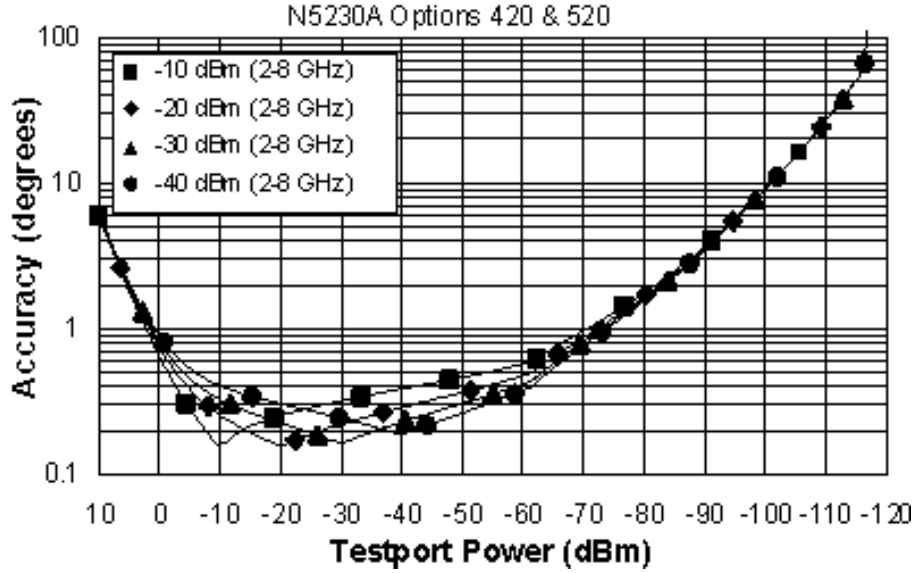


Dynamic Accuracy, 2 - 8 GHz

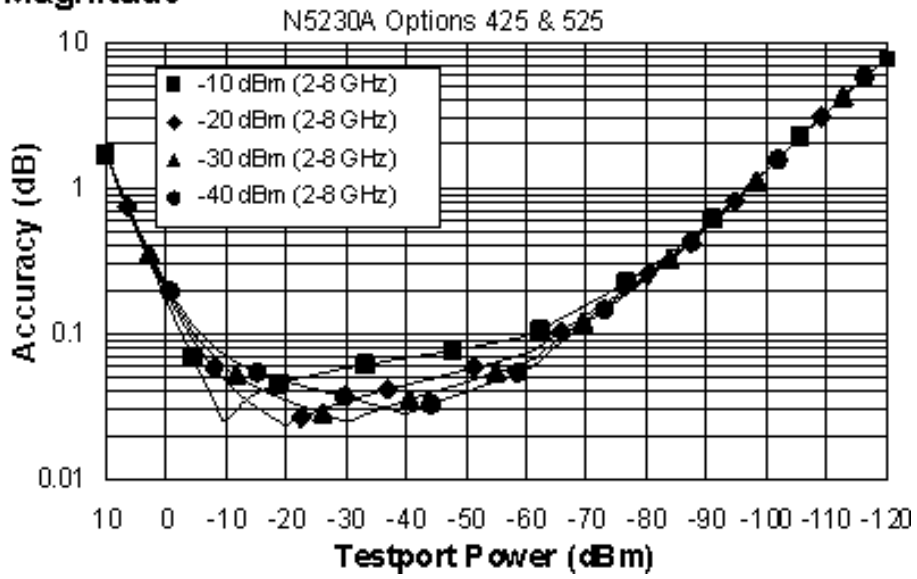
Magnitude



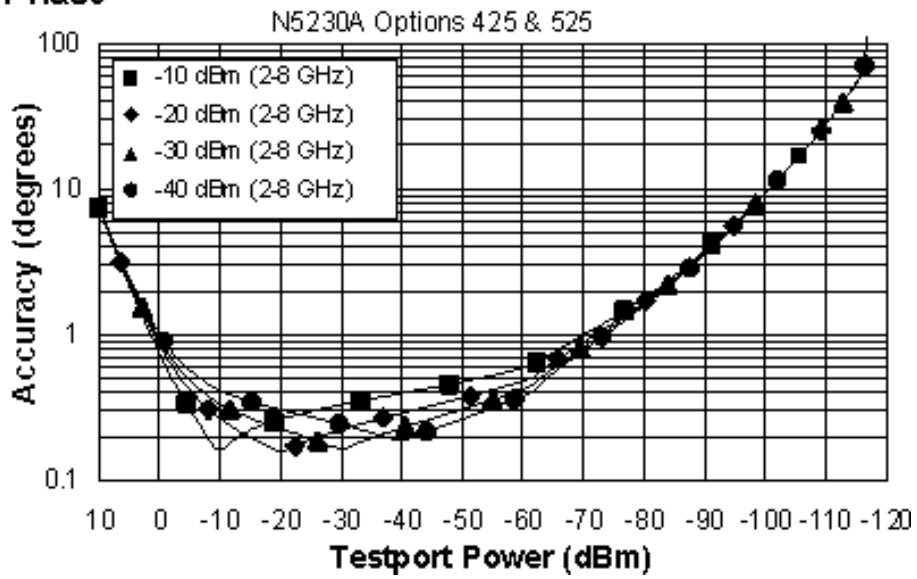
Phase



Magnitude

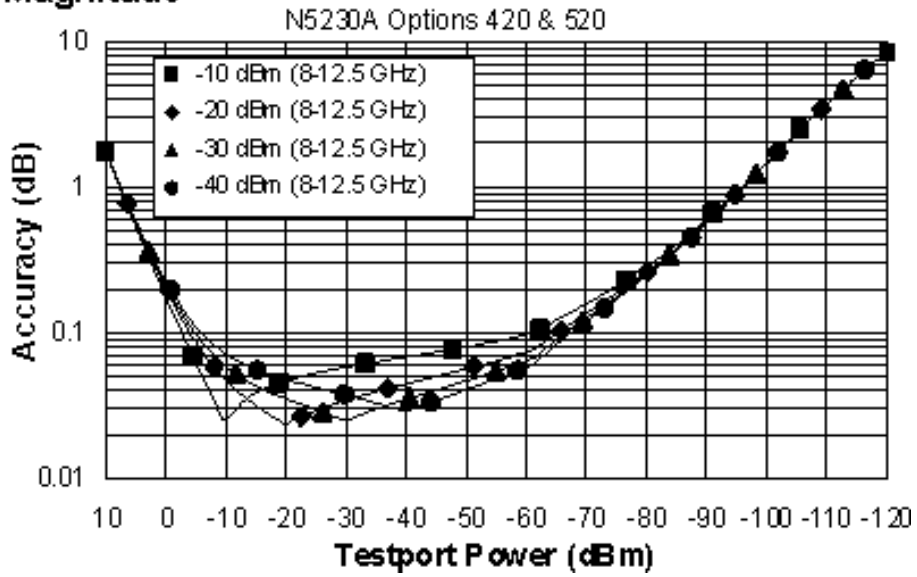


Phase

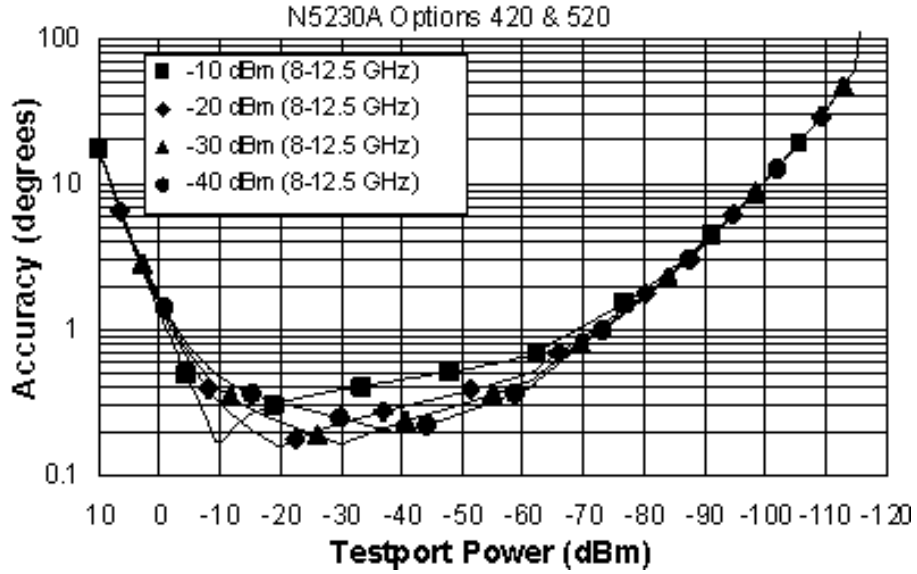


Dynamic Accuracy, 8 - 12.5 GHz

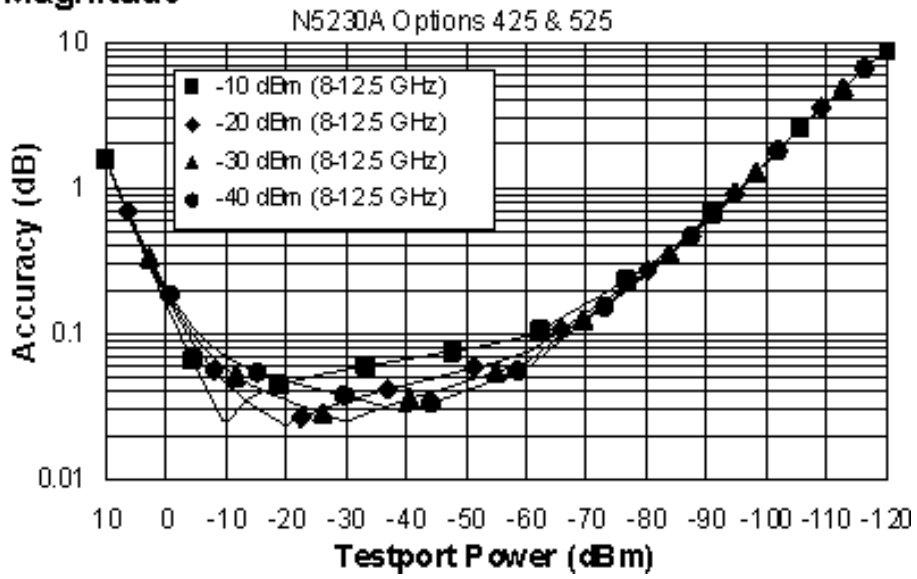
Magnitude



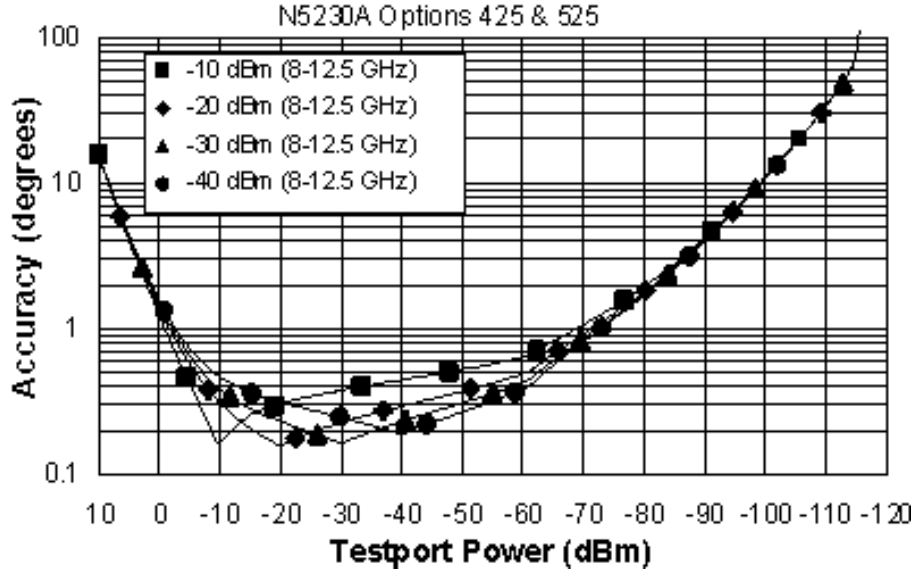
Phase



Magnitude

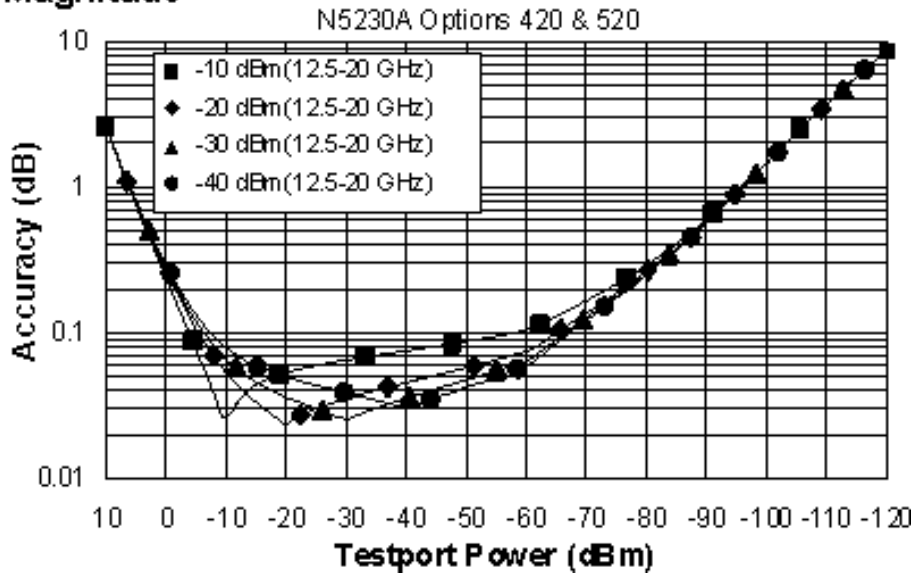


Phase

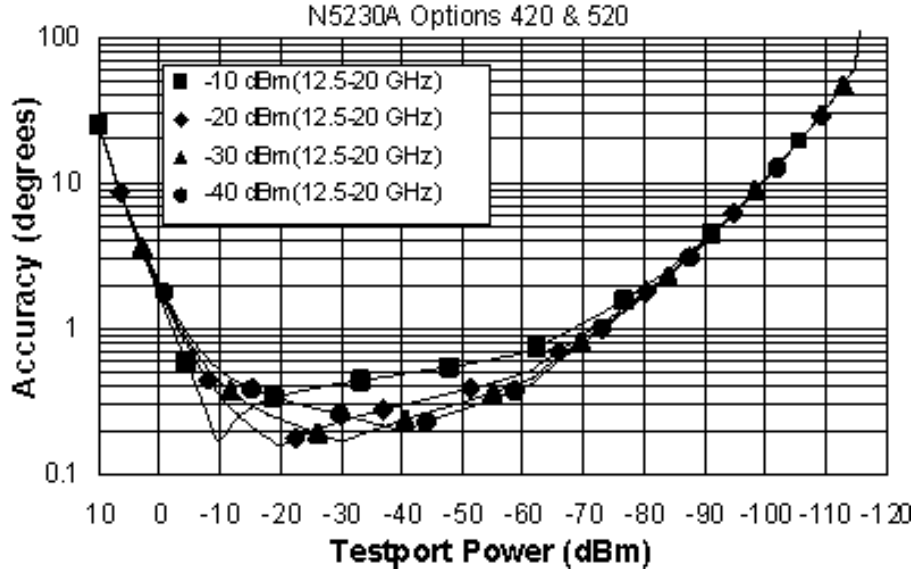


Dynamic Accuracy, 12.5 - 20 GHz

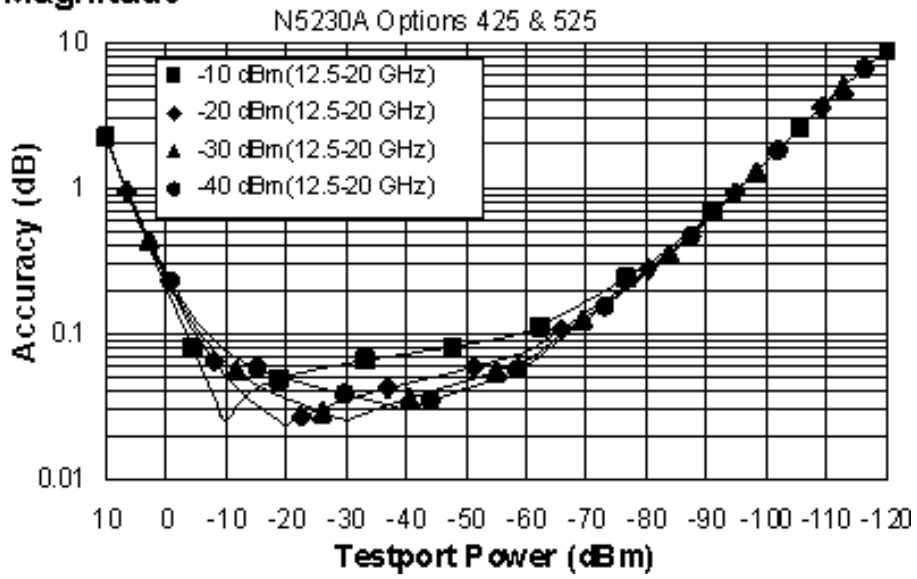
Magnitude



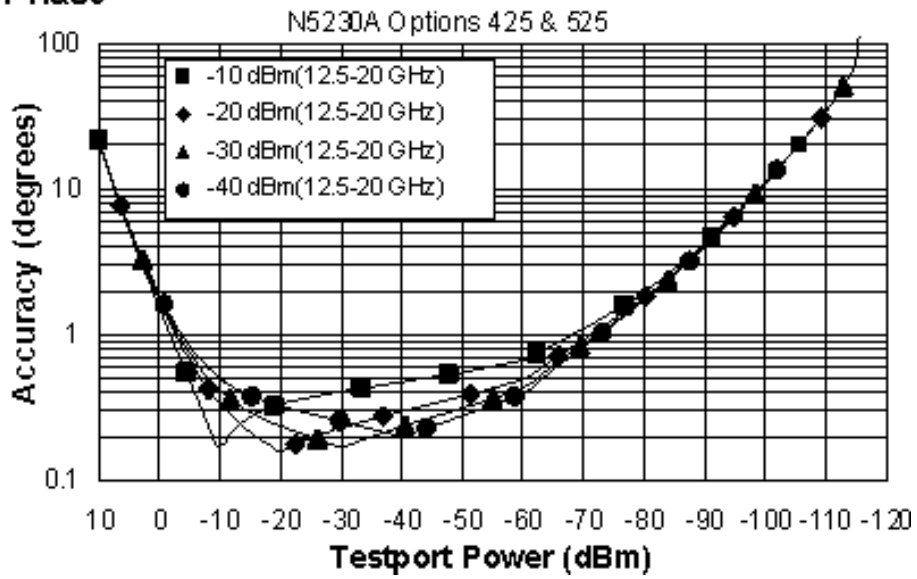
Phase



Magnitude

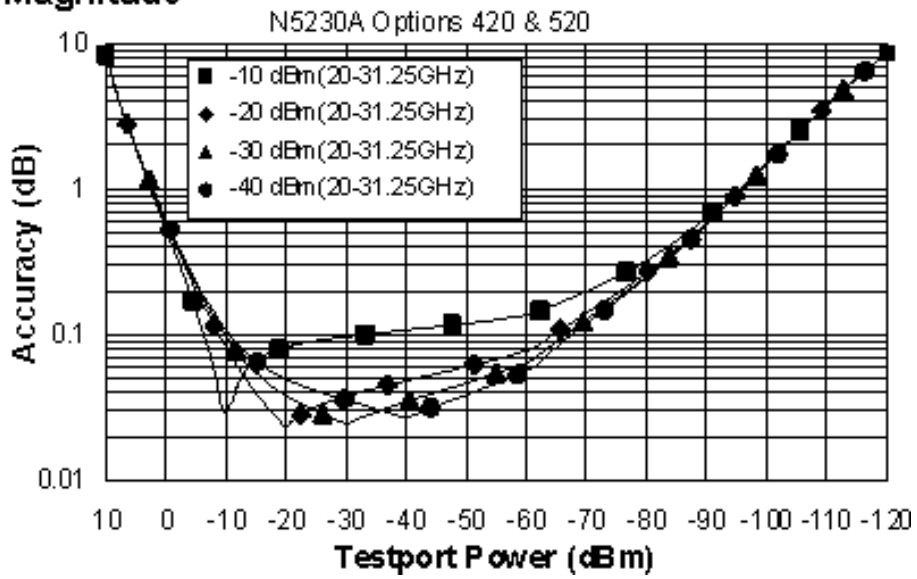


Phase

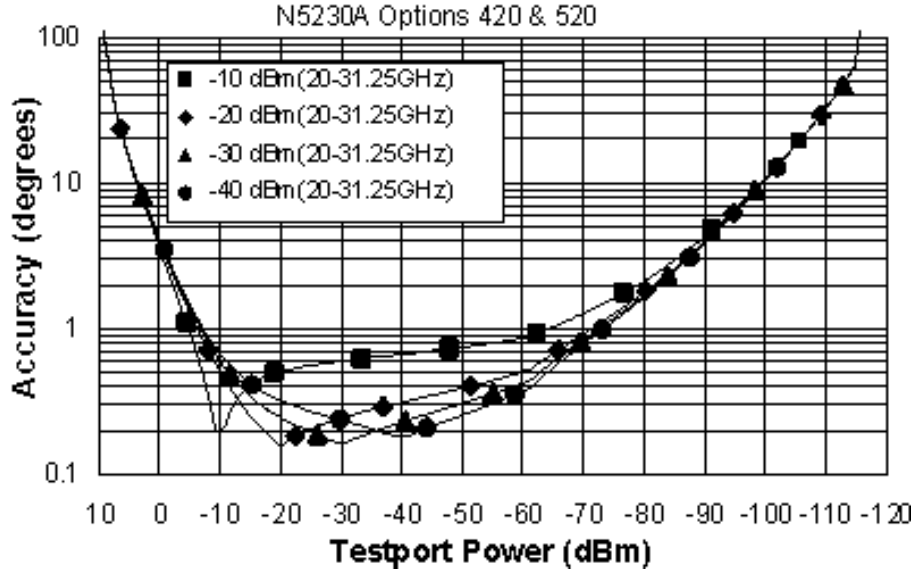


Dynamic Accuracy, 20 - 31.25 GHz

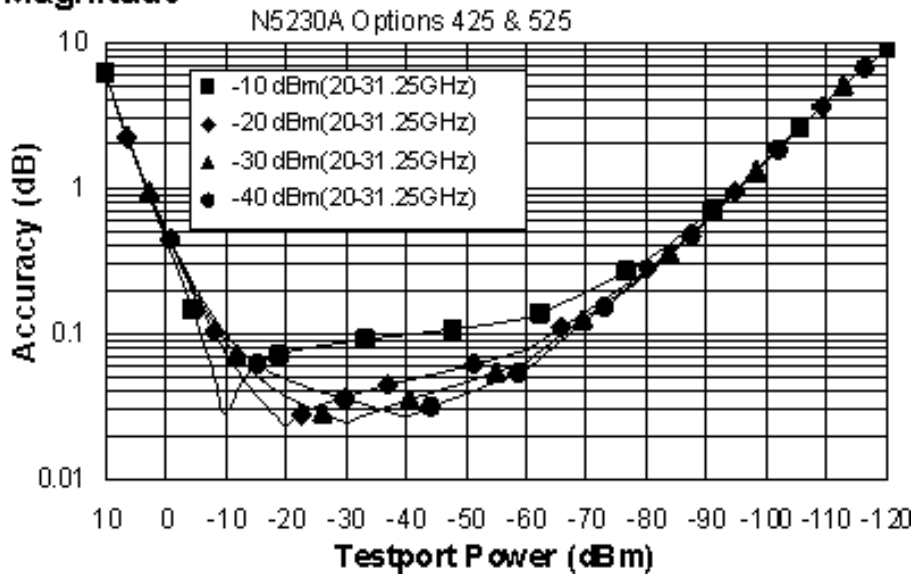
Magnitude



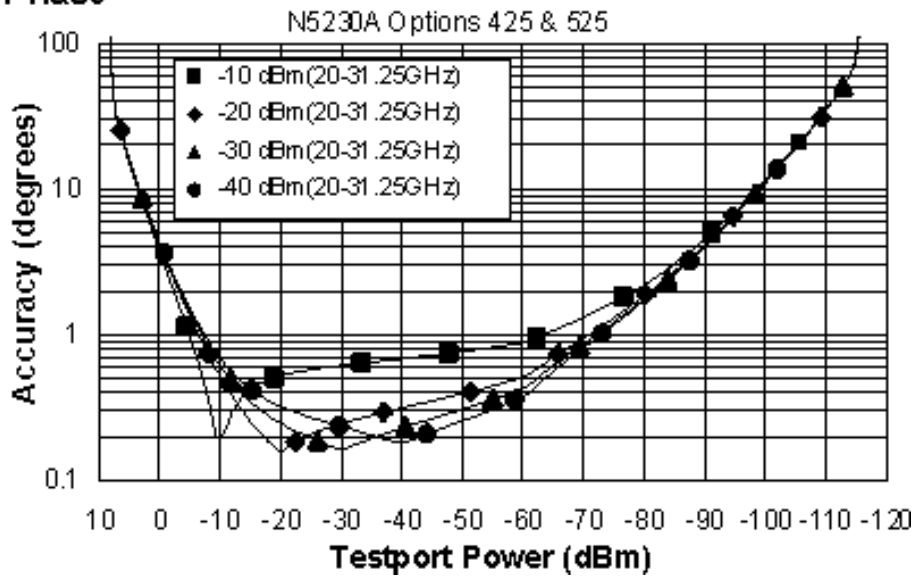
Phase



Magnitude

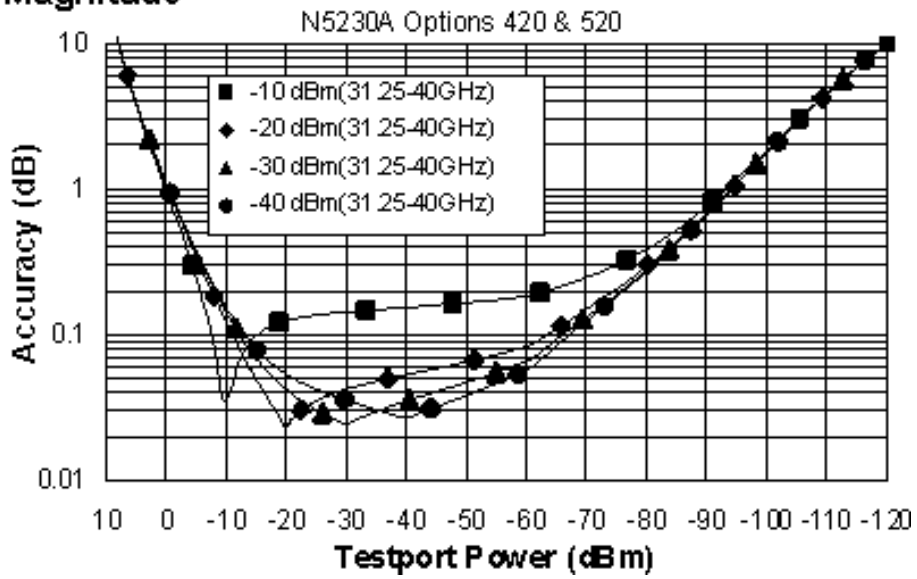


Phase

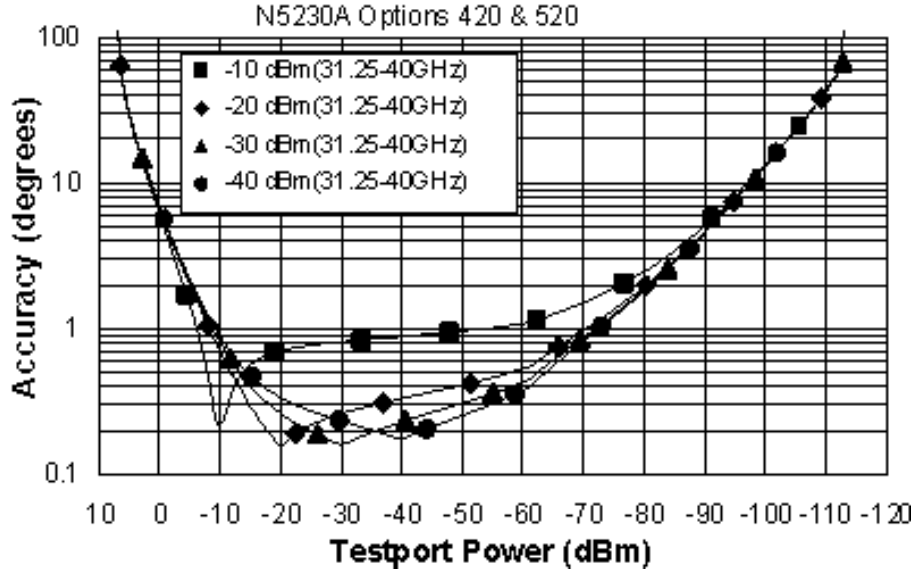


Dynamic Accuracy, 31.25 - 40 GHz

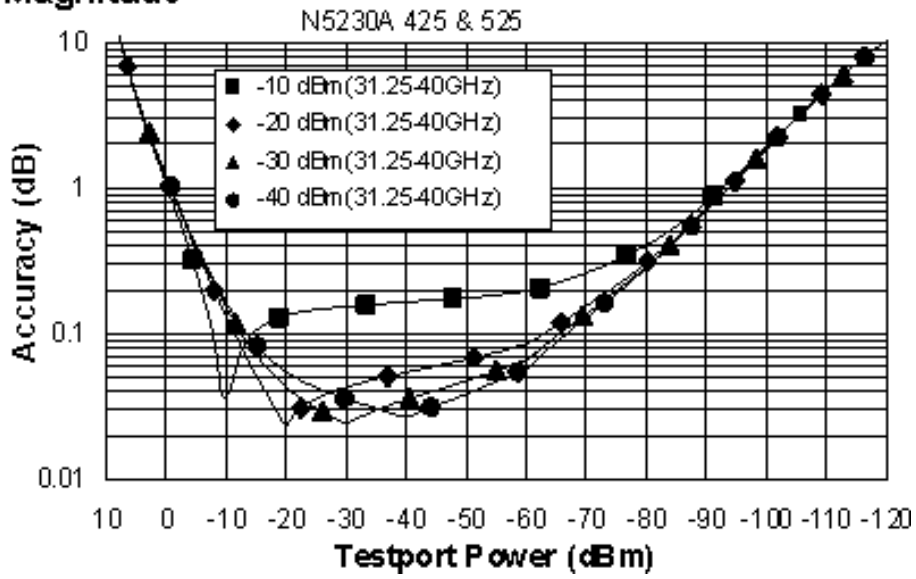
Magnitude



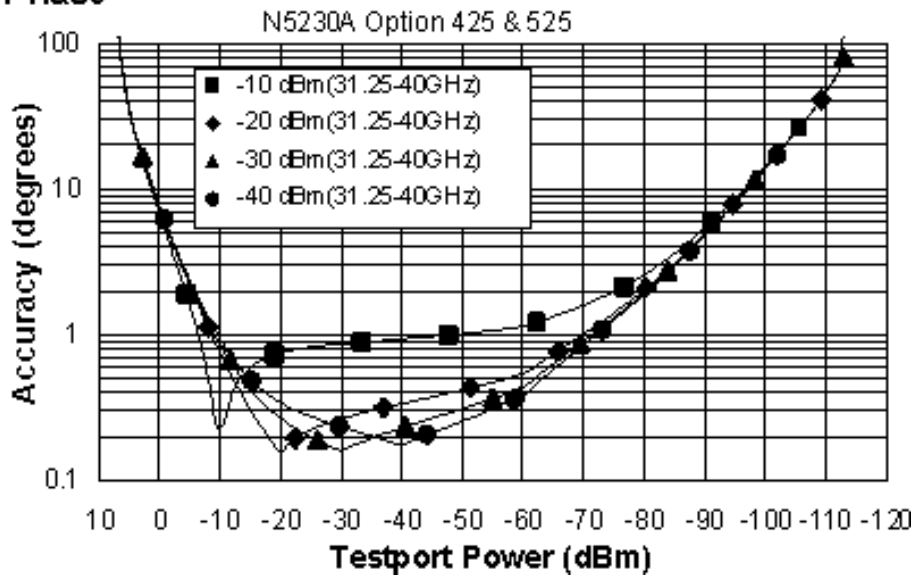
Phase



Magnitude

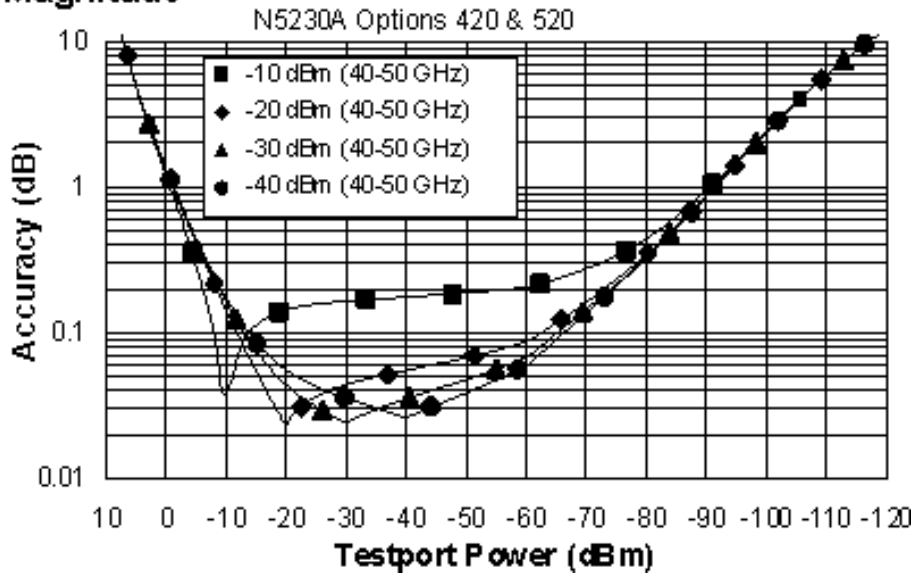


Phase

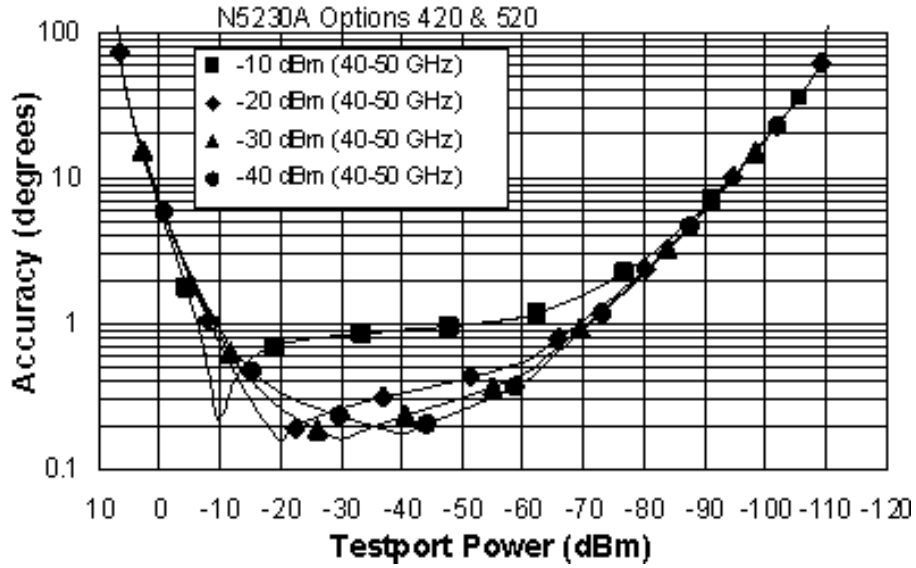


Dynamic Accuracy, 40 - 50 GHz

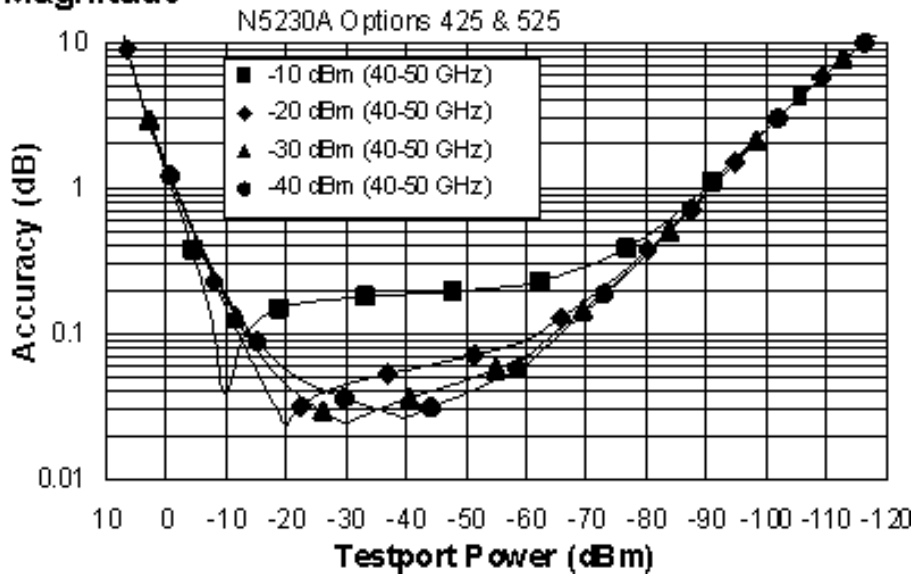
Magnitude



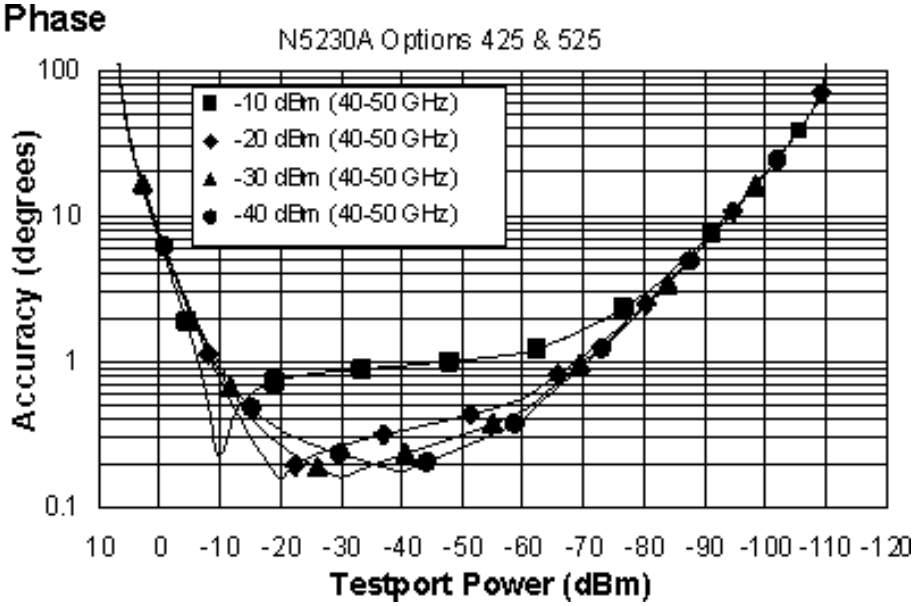
Phase



Magnitude



Phase



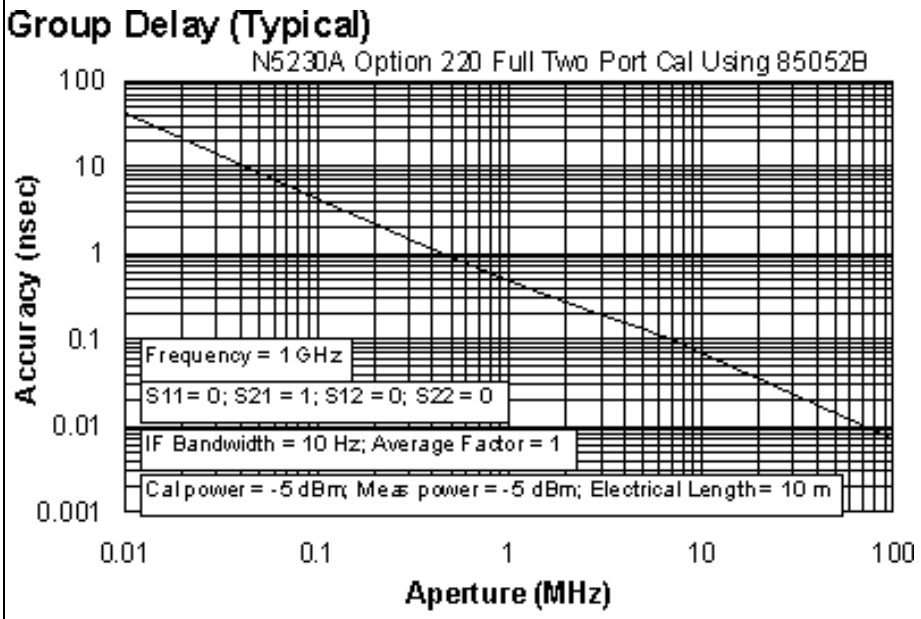
[a] Dynamic accuracy is verified with the following measurements:

- Compression over frequency
- IF linearity at a single frequency of 1.195 GHz using a reference level of -20 dBm for an input power range of 0 to -110 dBm.

Table 15. Test Port Input (Group Delay)[a]

Description	Specification	Supplemental Information (typ.)
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.)
Accuracy		See graph below. Char.

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.



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.

[a] 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).

General Information

Table 16. Miscellaneous Information

Description	Specification	Supplemental Information
System IF Bandwidth Range		1 Hz to 250 kHz, nominal
CPU		Intel® 500 MHz Pentium® III

Table 17. Front Panel Information

Description	Supplemental Information
RF Connectors	
N5230A	
Type	Option 220 or 225: 3.5 mm (male), 50 ohm, (nominal) Option 420, 425, 520, or 525: 2.4 mm (male), 50 ohm, (nominal)
Center Pin Recession	0.002 in. (characteristic)
Display	
Size	21.3 cm (8.4 in) diagonal color active matrix LCD; 640 (horizontal) X 480 (vertical) resolution
Refresh Rate	Vertical 59.83 Hz; Horizontal 31.41 kHz
Display Range	
Magnitude	±500 dB (at 20 dB/div), max
Phase	±500°, max
Polar	10 pUnits, min 1000 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	0.01 mUnit, min; 0.01°, min

Table 18. Rear Panel Information

Description	Supplemental Information
10 MHz Reference In	
Connector	BNC, female
Input Frequency	10 MHz ± 10 ppm, Typical
Input Level	-15 dBm to +20 dBm, Typical
Input Impedance	200 Ω, nom.
10 MHz Reference Out	
Connector	BNC, female
Output Frequency	10 MHz ± 1 ppm, Typical
Signal Type	Sine Wave, Typical
Output Level	+10 dBm ± 4 dB into 50 Ω, Typical
Output Impedance	50 Ω, nominal
Harmonics	<-40 dBc, Typical
VGA Video Output	
Connector	15-pin mini D-Sub; Drives VGA compatible monitors
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").
Test Set IO	
	25-pin D-Sub connector, available for external test set control
Aux IO	
	25-pin D-Sub connector, male, 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
GPIB	
	24-pin D-sub (Type D-24), female; compatible with IEEE-488.
Parallel Port (LPT1)	
	25-pin D-Sub miniature connector, female; provides connection to printers or any other parallel port peripherals
Serial Port (COM 1)	
	9-pin D-Sub, male; compatible with RS-232
USB Port	
	One port on front panel and five ports on rear panel. Universal Serial Bus jack, Type A configuration (4 contacts inline, contact 1 on left); female
Contact 1	Vcc: 4.75 to 5.25 VDC, 500 mA, maximum
Contact 2	-Data
Contact 3	+Data
Contact 4	Ground

Table 18. Rear Panel Information (Continued)

Description	Supplemental Information
LAN	
	10/100BaseT Ethernet, 8-pin configuration; auto selects between the two data rates
Line Power[1]	
Frequency	48 Hz to 66 Hz
Voltage at 115 V Setting	90 to 132 VAC; 120 VAC, nominal
Voltage at 220 V Setting	198 to 264 VAC; 240 VAC, nominal
VA Max	600 VA maximum

[1] A third-wire ground is required.

Note: Option H08 and Option H11 are not available with the N5230A.

Table 19. Analyzer Environment and Dimensions

Description	Supplemental Information
General Environmental	
RFI/EMI Susceptibility	Defined by CISPR Pub. 11, Group 1, Class A, and IEC 50082-1
ESD	Minimize using static-safe work procedures and an antistatic bench mat
Dust	Minimize for optimum reliability
Operating Environment	
Temperature	0 °C to +40 °C Instrument powers up and displays no error messages within this temperature range (except for "source unleveled" error message that may occur at temperatures outside the specified performance temperature range of 25 +/- 5°C).
Error-Corrected Temperature Range	23°C ± 3°C with less than 1°C deviation from calibration temp.
Humidity	5% to 95% at +40 °C
Altitude	0 to 4500 m (14,760 ft.)
Non-Operating Storage Environment	
Temperature	-40 °C to +70 °C
Humidity	0% to 90% at +65 °C (non-condensing)
Altitude	0 to 15,240 m (50,000 ft.)

Cabinet Dimensions			
	Height	**Width**	**Depth**
Excluding front and rear panel hardware and feet	267 mm 10.5 in	426 mm 16.75 in	427 mm 16.8 in
As shipped - includes front panel connectors, rear panel bumpers, and feet.	280 mm 11.0 in	435 mm 17.1 in	470 mm 18.5 in
As shipped plus handles	280 mm 11.0 in	458 mm 18 in	501 mm 19.7 in
As shipped plus rack-mount flanges	280 mm 11.0 in	483 mm 19 in	470 mm 18.5 in
As shipped plus handles and rack-mount flanges	280 mm 11.0 in	483 mm 19 in	501 mm 19.7 in
Weight			
Net			
N5230A	24.9 kg (55 lb), nominal		
Shipping			
N5230A	36.3 kg (80 lb), nominal		

Measurement Throughput Summary

Table 20 Typical Cycle Time[a] (ms) for Measurement Completion

Description	Typical				
	Number of Points				
	201	401	801	1601	16,001
Start 8 GHz, Stop 18 GHz, 30 kHz IF bandwidth					
Uncorrected	97.5	102.7	103.8	108.2	683.9
2-Port cal	203.7	213.5	218.5	234.6	1504.3
Start 10 MHz, Stop 10 GHz, 30 kHz IF bandwidth					
Uncorrected	112.6	120.6	124.8	138.2	738.4
2-Port cal	232.8	251.8	265.2	304.3	1623.4
Start 10 MHz, Stop 20 GHz, 30 kHz IF bandwidth					
Uncorrected	146	199.3	210.9	217.2	753.9
2-Port cal	302.3	410.5	438.7	462.5	1660.5
Start 8 GHz, Stop 18 GHz, 50 kHz IF bandwidth					
Uncorrected	79.1	81	81.7	86.6	482
2-Port cal	164.5	170.3	175.3	193.5	1104.7
Start 10 MHz, Stop 10 GHz, 50 kHz IF bandwidth					
Uncorrected	96.8	101.7	108.8	122.2	524.6
2-Port cal	202.1	215.6	236.7	276.7	1198.8
Start 10 MHz, Stop 20 GHz, 50 kHz IF bandwidth					
Uncorrected	141.6	163.9	170.7	179.7	546.5
2-Port cal	293.6	341	360	389.5	1248.8

[a] 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 21. Cycle Time vs. IF Bandwidth

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)

Description	Typical	
IF Bandwidth (Hz)	Cycle Time (ms)[a]	Cycle Time (ms) Option 080 enabled
250,000	8.9	37.9
200,000	9.3	39.3
150,000	9.9	40.1
100,000	10.5	41.8
70,000	11.5	43.6
50,000	12.8	45.4
30,000	15.4	50
20,000	18.3	53.9
15,000	21	57.5
10,000	27	65.8
7000	34	75.4
5000	48.5	93
3000	72.8	124
2000	108.8	169
1500	126.8	187.1
1000	272.5	
700	357.7	
500	460	
300	697.7	
200	1003.5	
150	1307.8	
100	1917.6	
30	6173.8	
10	18214.8	
1	181699.2	

[a] Cycle time includes sweep and retrace time.

Table 22. Cycle Time vs. Number of Points

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)

Description	Typical	
IF Bandwidth (Hz)	**Number of Points**	**Cycle Time (ms)[a]**
30,000	3	8
	11	8
	51	9.38
	101	11.4
	201	15.5
	401	23.6
	801	39.9
	1,601	71.6
	6,401	265.4
	16,001	650.8
50,000	3	7.7
	11	7.7
	51	8.7
	101	10.1
	201	13
	401	18.6
	801	29.8
	1,601	52.3
	6,401	184.5
	16,001	448.8
250,000	101	8.7
	201	9.05
	401	10.85
	801	14.42
	1,601	21.63
	6,401	61.1
	16,001	147.7

[a] Cycle time includes sweep and retrace time.

Table 23. Data Transfer Time (ms)

Description	Typical			
	Number of Points			
	201	401	1601	16,001
SCPI over GPIB (Program executed on external PC)				
32-bit floating point	7	12	43	435
64-bit floating point	12	22	84	856
ASCII	64	124	489	5054
SCPI (Program executed in the analyzer)				
32-bit floating point	1	2	3	30
64-bit floating point	2	2	4	40
ASCII	29	56	222	2220
COM (program executed in the analyzer)				
32-bit floating point	<0.4	0.4	0.5	1.9
Variant type	0.7	1	3	32
DCOM over LAN (Program executed on external PC)				
32-bit floating point	<0.8	1	1.5	7.1
Variant type	1.8	2.7	8.5	80

Note: Specifications for Recall & Sweep Speed are not provided for the N5230A analyzers.

Specifications: Front-Panel Jumpers

Table 24: Measurement Receiver Inputs (Rcvr A In, Rcvr B In) 0.1dB Typical Compression

Description	Specification	Typical	
		Option 225	Options 425, 525
Maximum Input Level			
10 MHz to 45 MHz	--	- 2 dBm	- 20 dBm
45 MHz to 500 MHz	--	- 2 dBm	- 19 dBm
500 MHz to 2 GHz	--	- 3 dBm	- 14 dBm
2 GHz to 8 GHz	--	- 6 dBm	- 14 dBm
8 GHz to 12.5 GHz	--	- 6 dBm	- 14 dBm
12.5 GHz to 20 GHz	--	- 6 dBm	- 15 dBm
20 GHZ to 31.25 GHz	--	--	- 16 dBm
31.25 GHZ to 40 GHz	--	--	- 21 dBm
40 GHZ to 45 GHz	--	--	- 24 dBm
45 GHZ to 50 GHz	--	--	- 22 dBm
Damage Level			
N5230A	--	+ 15 dBm	
Maximum DC Level			
N5230A	--	+/- 7 V	

Table 25: Reference Receiver Inputs (Rcvr R1, Rcvr R2) @ Max Specified Output Power

Description	Specification	Typical	
		Option 225	Options 425, 525
Maximum Input Level			
10 MHz to 45 MHz	--	- 18 dBm	- 28 dBm
45 MHz to 500 MHz	--	- 18 dBm	- 28 dBm
500 MHz to 2 GHz	--	- 18 dBm	- 28 dBm
2 GHz to 8 GHz	--	- 19 dBm	- 28 dBm
8 GHz to 12.5 GHz	--	- 21 dBm	- 27 dBm
12.5 GHz to 20 GHz	--	- 23 dBm	- 26 dBm
20 GHz to 31.25 GHz	--	--	- 33 dBm
31.25 GHz to 40 GHz	--	--	- 27 dBm
40 GHz to 45 GHz	--	--	- 29 dBm
45 GHz to 50 GHz	--	--	- 28 dBm
Damage Level			
N5230A	--	+ 15 dBm	
Maximum DC Level			
N5230A	--	+/- 7 V	

Table 26: Reference Outputs (Reference 1 Source Out, Reference 2 Source Out) @ Max Specified Output Power

Description	Specification	Typical	
		Option 225	Options 425, 525
Maximum Output Level			
10 MHz to 45 MHz	--	- 18 dBm	- 28 dBm
45 MHz to 500 MHz	--	- 18 dBm	- 28 dBm
500 MHz to 2 GHz	--	- 18 dBm	- 28 dBm
2 GHz to 8 GHz	--	- 19 dBm	- 28 dBm
8 GHz to 12.5 GHz	--	- 20 dBm	- 27 dBm
12.5 GHz to 20 GHz	--	- 23 dBm	- 26 dBm
20 GHz to 31.25 GHz	--	--	- 32 dBm
31.25 GHz to 40 GHz	--	--	- 26 dBm
40 GHz to 45 GHz	--	--	- 29 dBm
45 GHz to 50 GHz	--	--	- 28 dBm
Damage Level			
N5230A	--	+ 20 dBm	
Maximum DC Level			
N5230A	--	+/- 7 V	

Table 27: Source Outputs (Port 1 Source Out, Port 2 Source Out) @ Max Specified Output Power

Description	Specification	Typical	
		Option 225	Option 425, 525
Maximum Output Level			
10 MHz to 45 MHz	--	+ 6 dBm	+ 1 dBm
45 MHz to 500 MHz	--	+ 6 dBm	+ 1 dBm
500 MHz to 2 GHz	--	+ 7 dBm	+ 1 dBm
2 GHz to 8 GHz	--	+ 7 dBm	+ 1 dBm
8 GHz to 12.5 GHz	--	+ 7 dBm	+ 1 dBm
12.5 GHz to 20 GHz	--	+ 5 dBm	+ 3 dBm
24 GHZ to 30 GHz	--	--	- 5 dBm
30 GHZ to 40 GHz	--	--	- 4 dBm
40 GHZ to 45 GHz	--	--	-11dBm
45 GHZ to 50 GHz	--	--	-11dBm
Damage Level			
N5230A	--	+ 30 dBm	
Maximum DC Level			
N5230A	--	+/- 7V	

Table 28: Coupler Inputs (Port 1 Cplr Thru, Port 2 Cplr Thru) Insertion Loss of Coupler Thru

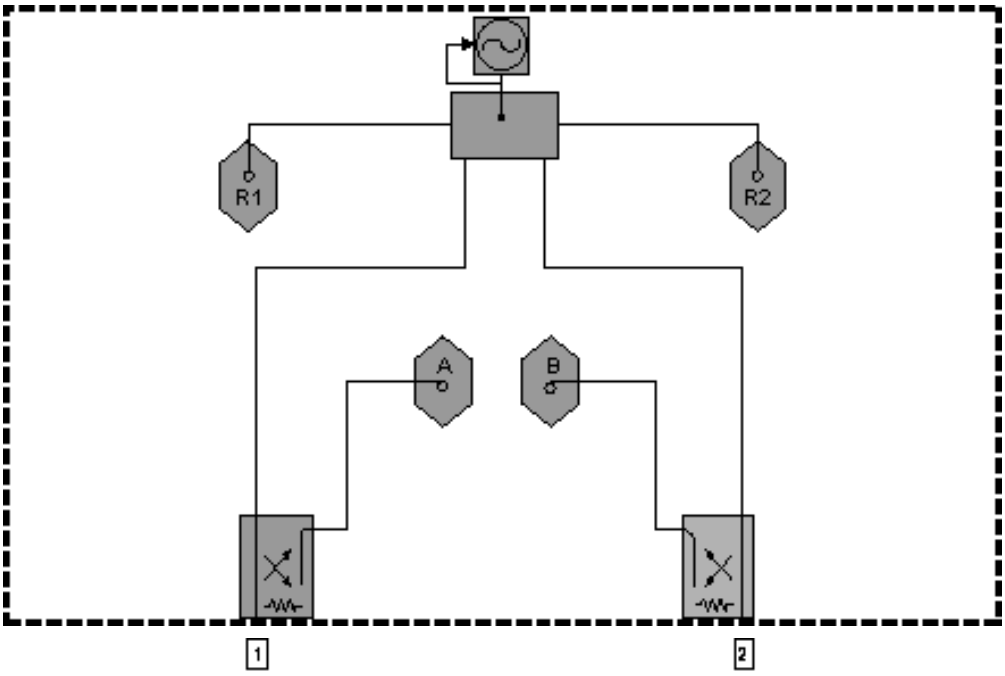
Description	Specification	Typical	
		Option 225	Option 425, 525
Insertion Loss to Test Port			
10 MHz to 45 MHz	--	0.6 dB	0.6 dB
45 MHz to 500 MHz	--	0.6 dB	0.6 dB
500 MHz to 2 GHz	--	1.6 dB	0.8 dB
2 GHz to 8 GHz	--	1.8 dB	1.0 dB
8 GHz to 12.5 GHz	--	1.9 dB	1.0 dB
12.5 GHz to 20 GHz	--	2.0 dB	2.0 dB
20 GHz to 31.25 GHz	--	--	3.0 dB
31.25 GHz to 40 GHz	--	--	4.0 dB
40 GHz to 45 GHz	--	--	4.0 dB
45 GHz to 50 GHz	--	--	4.0 dB
Damage Level			
N5230A	--	+ 30 dBm	
Maximum DC Level			
N5230A	--	+/- 40 V	

Table 29: Coupler Outputs (Port 1 Cplr Arm, Port 2 Cplr Arm)

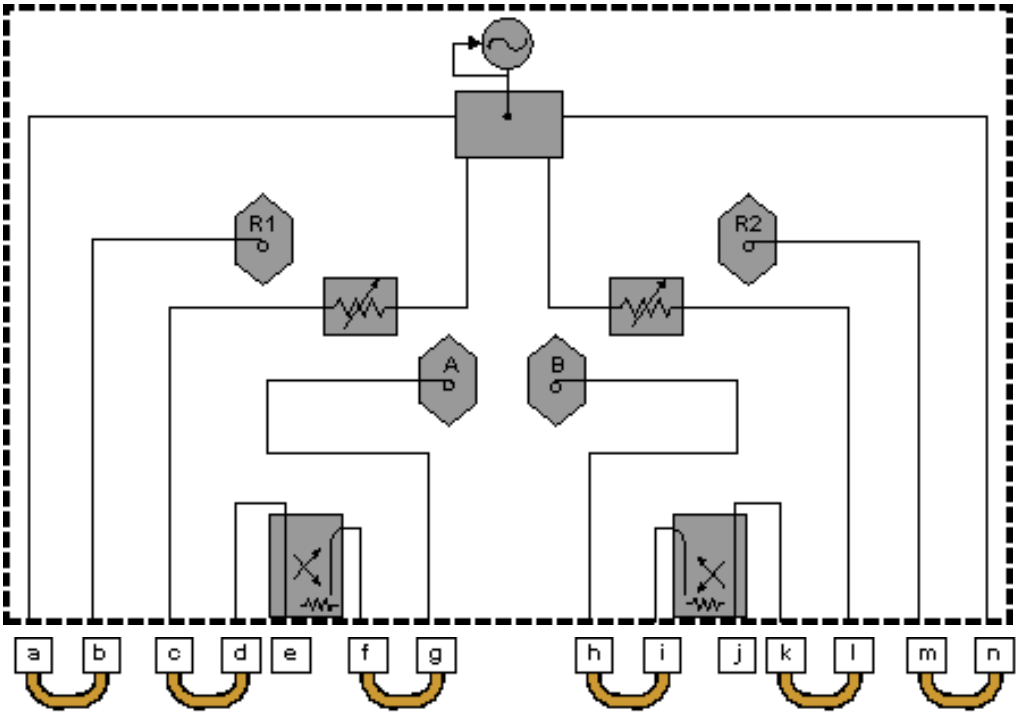
Description	Specification	Typical	
		Option 225	Option 425, 525
Damage Level			
N5230A	--	+ 30 dBm	
Maximum DC Level			
N5230A	--	+/- 7 V	

Test Set Block Diagrams

N5230A Option 220, or 420, or 520 (Standard Test Set and Standard Power Range)



N5230A Option 225, or 425, or 525 (Configurable Test Set and Extended Power Range)



Item	Description	Item	Description
a	SOURCE OUT	**h**	RCVR B IN
b	RCVR R1 IN	**i**	CPLR ARM
c	SOURCE OUT	**j**	PORT 2
d	CPLR THRU	**k**	CPLR THRU
e	PORT 1	**l**	SOURCE OUT
f	CPLR ARM	**m**	RCVR R2 IN
g	RCVR A IN	**n**	SOURCE OUT