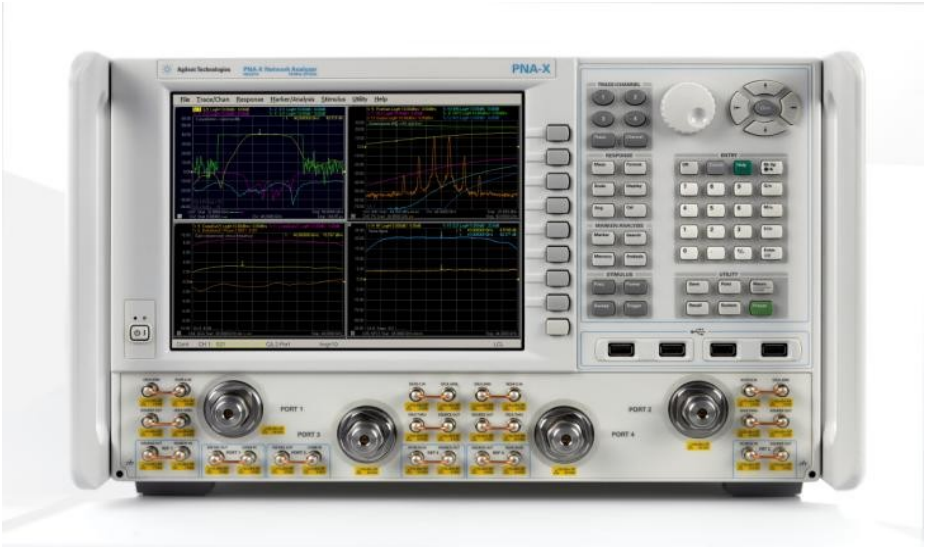
Agilent
2-Port and 4-Port
PNA-X Network Analyzer

N5247A - 10 MHz to 67 GHz

Data Sheet and

Technical Specifications



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This is a complete list of the technical specifications for the N5247A PNA-X network analyzer with the following options:

Option 200, 2-port standard test set (includes six front-panel access loops) and power range. See the block diagram.

Option 219, adds 2-port extended power range, source and receiver attenuators, and bias-tees (requires Option 200). See the block diagram.

Option 224, adds an internal second source, a combiner, and mechanical switches to the 2-port analyzer (requires Option 200, 219, and 080). See the block diagram.

Option 400, 4-port standard test set (includes twelve front-panel access loops), power range, and an internal second source (Option 080 recommended). See the block diagram.

Option 419, adds 4-port extended power range, source and receiver attenuators, and bias-tees (requires Option 400). See the block diagram.

Option 423, adds an internal combiner, and mechanical switches to the 4-port analyzer (requires Option 400, 419, and 080). See the block diagram.

Note

This document provides technical specifications for the 85058B calibration kit and the N4694A 2-Port ECal module. Please download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator to generate the curves for your calibration kit and PNA setup.

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.

Note:

Typical performance information between 67 GHz and 70 GHz is shown in this document where available. The performance is degraded at particular frequencies in this range due to the modes of the 1.85 mm connectors used in the analyzer, test port cables and adapters.

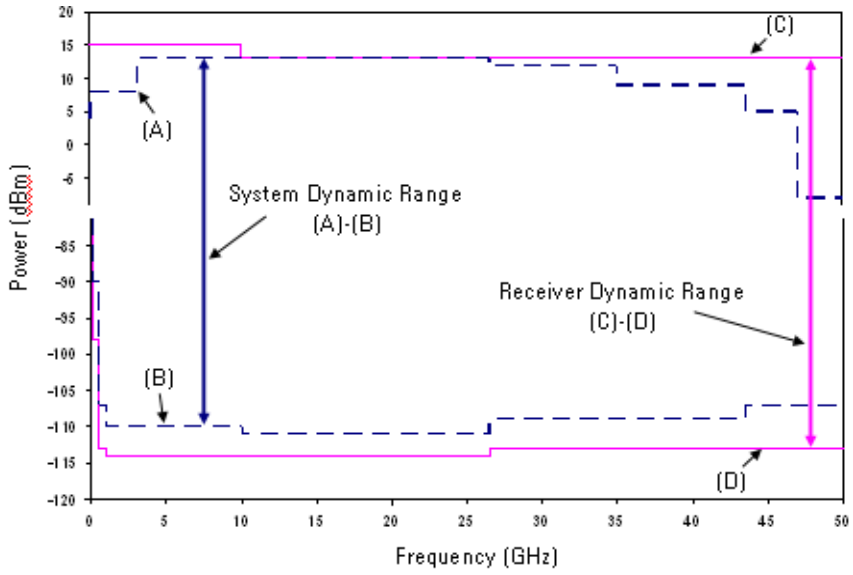
Corrected System Performance

The specifications in this section apply for measurements made with the N5247A analyzer with the following conditions:

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

System Dynamic Range and Receiver Dynamic Range

- **System Dynamic Range** is defined as the max leveled 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 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.

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 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 - Option 200 or 400, and Receiver Dynamic Range - All Options

Description	Specification			Typical		
	System Dynamic Range (dB) (A)-(B)	Max Leveled Output Power (dBm) (A)	Test Port Noise Floor (dBm) (B)	Receiver Dynamic Range (dB) (C)-(D)	Test Port Compression at 0.1 dB (dBm) (C)	Test Port Noise Floor (dBm) (D)
Ports	**1,3[1]**	**1,3[1]**	**All[1]**	**All[1]**	**All[1]**	**All[1]**
10 MHz to 50 MHz	74	4	-70	91	15	-76
50 MHz to 100 MHz	100	8	-92	113	15	-98
100 MHz to 500 MHz	108	8	-100	122	15	-107
500 MHz to 1 GHz	118	8	-110	131	15	-116
1 GHz to 2 GHz	123	8	-115	134	15	-119
2 GHz to 3.2 GHz	125	10	-115	134	15	-119
3.2 GHz to 10 GHz	128	13	-115	134	15	-119
10 GHz to 13.5 GHz	127	11	-116	133	12	-121
13.5 GHz to 16 GHz	129	12	-117	133	12	-121
16 GHz to 19 GHz	128	10	-118	134	12	-122
19 GHz to 24 GHz	129	11	-118	134	12	-122
24 GHz to 26.5 GHz	129	11	-118	134	12	-122
26.5 GHz to 30 GHz	116	10	-106	122	12	-110
30 GHz to 32 GHz	113	7	-106	121	11	-110
32 GHz to 35 GHz	115	9	-106	121	11	-110
35 GHz to 40 GHz	110	5	-105	121	11	-110
40 GHz to 50 GHz	112	10	-102	119	11	-108
50 GHz to 60 GHz	111	10	-101	118	11	-107
60 GHz to 64 GHz	110	10	-100	118	11	-107
64 GHz to 67 GHz	110	10	-100	118	11	-107
67 GHz to 70 GHz				106	11	-95

[1] Either port can be used as the source port. Any other port can be used as the receiver port.

Table 2a. System Dynamic Range at Test Port - Option 200 or 400

Description	Specification (dB) at Test Port		Typical (dB) at Test Port	
	Port 1 or 3[1]	Port 2 or 4[1]	Port 1 or 3[1]	Port 2 or 4[1]
10 MHz to 50 MHz	74	82	88	93
50 MHz to 100 MHz	100	105	111	118
100 MHz to 500 MHz	108	113	120	127
500 MHz to 1 GHz	118	123	130	136
1 GHz to 2 GHz	123	128	131	139
2 GHz to 3.2 GHz	125	128	134	136
3.2 GHz to 10 GHz	128	128	137	137
10 GHz to 13.5 GHz	127	127	137	136
13.5 GHz to 16 GHz	129	129	137	137
16 GHz to 19 GHz	128	128	137	137
19 GHz to 24 GHz	129	129	137	137
24 GHz to 26.5 GHz	129	129	136	136
26.5 GHz to 30 GHz	116	116	124	124
30 GHz to 32 GHz	113	113	122	122
32 GHz to 35 GHz	115	115	123	123
35 GHz to 40 GHz	110	110	119	119
40 GHz to 50 GHz	112	112	121	121
50 GHz to 60 GHz	111	111	120	120
60 GHz to 64 GHz	110	110	120	120
64 GHz to 67 GHz	110	110	120	120
67 GHz to 70 GHz			107	107

[1] Either port can be used as the source port. Any other port can be used as the receiver port.

Table 2b. System Dynamic Range at Test Port - Option 219 or 419

Description	Specification (dB) at Test Port		Typical (dB) at Test Port	
	Port 1 or 3[1]	Port 2 or 4[1]	Port 1 or 3[1]	Port 2 or 4[1]
10 MHz to 50 MHz	74	81	88	93
50 MHz to 100 MHz	100	105	111	118
100 MHz to 500 MHz	108	113	120	127
500 MHz to 1 GHz	118	123	130	136
1 GHz to 2 GHz	123	128	131	139
2 GHz to 3.2 GHz	124	128	134	136
3.2 GHz to 10 GHz	126	127	137	137
10 GHz to 13.5 GHz	125	125	136	136
13.5 GHz to 16 GHz	127	127	136	136
16 GHz to 19 GHz	126	126	135	135
19 GHz to 24 GHz	126	126	134	134
24 GHz to 26.5 GHz	125	125	134	134
26.5 GHz to 30 GHz	113	113	122	122
30 GHz to 32 GHz	111	111	120	120
32 GHz to 35 GHz	112	112	121	121
35 GHz to 40 GHz	106	106	118	118
40 GHz to 50 GHz	108	108	118	118
50 GHz to 60 GHz	106	106	117	117
60 GHz to 64 GHz	104	104	117	117
64 GHz to 67 GHz	104	104	116	116
67 GHz to 70 GHz			101	101

[1] Either port can be used as the source port. Any other port can be used as the receiver port.

Table 2c. System Dynamic Range at Test Port - Option 224

Description	Specification (dB) at Test Port		Typical (dB) at Test Port	
	Source 2 Out 1	Source 2 Out 2	Source 2 Out 1	Source 2 Out 2
10 MHz to 50 MHz	74	83	86	93
50 MHz to 100 MHz	100	107	110	119
100 MHz to 500 MHz	108	115	119	128
500 MHz to 1 GHz	118	125	130	137
1 GHz to 2 GHz	123	130	133	140
2 GHz to 3.2 GHz	125	130	133	137
3.2 GHz to 10 GHz	129	131	138	139
10 GHz to 13.5 GHz	128	128	138	140
13.5 GHz to 16 GHz	130	130	138	139
16 GHz to 19 GHz	129	130	139	139
19 GHz to 24 GHz	129	130	139	139
24 GHz to 26.5 GHz	129	130	138	138
26.5 GHz to 30 GHz	117	118	126	126
30 GHz to 32 GHz	115	116	124	124
32 GHz to 35 GHz	117	117	125	125
35 GHz to 40 GHz	111	111	123	123
40 GHz to 50 GHz	113	113	124	125
50 GHz to 60 GHz	113	115	124	125
60 GHz to 64 GHz	112	114	124	126
64 GHz to 67 GHz	112	114	124	126

Table 2d. System Dynamic Range at Test Port - Option 224 or 423

Description	Specification (dB) at Test Port		Typical (dB) at Test Port			
	Port 1 or 3[1]	Port 2 or 4[1]	Port 1 or 3[1]	Port 2 or 4[1]	Source1-Port1 Combine Mode	Source 2-Port1 Combine Mode
10 MHz to 50 MHz	74	80	87	93	81	81
50 MHz to 100 MHz	99	105	110	117	104	104
100 MHz to 500 MHz	107	113	120	126	113	113
500 MHz to 1 GHz	117	123	129	135	123	123
1 GHz to 2 GHz	122	128	131	138	125	125
2 GHz to 3.2 GHz	124	128	133	135	127	127
3.2 GHz to 10 GHz	126	127	136	136	128	128
10 GHz to 13.5 GHz	124	124	135	135	127	127
13.5 GHz to 16 GHz	126	126	135	135	127	127
16 GHz to 19 GHz	125	125	134	134	126	126
19 GHz to 24 GHz	125	125	133	133	124	124
24 GHz to 26.5 GHz	124	124	133	133	124	124
26.5 GHz to 30 GHz	112	112	121	121	112	112
30 GHz to 32 GHz	110	110	119	119	109	109
32 GHz to 35 GHz	111	111	120	120	110	110
35 GHz to 40 GHz	105	105	117	117	107	107
40 GHz to 50 GHz	107	107	118	118	108	108
50 GHz to 60 GHz	105	105	116	116	105	105
60 GHz to 64 GHz	102	102	116	116	104	104
64 GHz to 67 GHz	102	102	115	115	103	103

[1] Either port can be used as the source port. Any other port can be used as the receiver port.

Table 3a. Extended Dynamic Range at Direct Receiver Access Input - Option 200 or 400

Description	Specification (dB) at Direct Receiver Access Input	
	Port 1 or 3[1]	Port 2 or 4[1]
10 MHz to 50 MHz	104	112
50 MHz to 100 MHz	113	118
100 MHz to 500 MHz	121	126
500 MHz to 1 GHz	131	136
1 GHz to 2 GHz	135	140
2 GHz to 3.2 GHz	137	140
3.2 GHz to 10 GHz	140	140
10 GHz to 13.5 GHz	139	139
13.5 GHz to 16 GHz	141	141
16 GHz to 19 GHz	139	139
19 GHz to 24 GHz	140	140
24 GHz to 26.5 GHz	140	140
26.5 GHz to 30 GHz	127	127
30 GHz to 32 GHz	124	124
32 GHz to 35 GHz	126	126
35 GHz to 40 GHz	121	121
40 GHz to 50 GHz	122	122
50 GHz to 60 GHz	120	120
60 GHz to 64 GHz	118	118
64 GHz to 67 GHz	118	118

[1] Either port can be used as the source port. Any other port can be used as the receiver port.

Table 3b. Extended Dynamic Range at Direct Receiver Access Input - Option 219 or 419

Description	Specification (dB) at Direct Receiver Access Input	
	Port 1 or 3[1]	Port 2 or 4[1]
10 MHz to 50 MHz	104	111
50 MHz to 100 MHz	113	118
100 MHz to 500 MHz	121	126
500 MHz to 1 GHz	131	136
1 GHz to 2 GHz	135	140
2 GHz to 3.2 GHz	136	140
3.2 GHz to 10 GHz	138	139
10 GHz to 13.5 GHz	137	137
13.5 GHz to 16 GHz	139	139
16 GHz to 19 GHz	137	137
19 GHz to 24 GHz	137	137
24 GHz to 26.5 GHz	136	136
26.5 GHz to 30 GHz	124	124
30 GHz to 32 GHz	122	122
32 GHz to 35 GHz	123	123
35 GHz to 40 GHz	117	117
40 GHz to 50 GHz	118	118
50 GHz to 60 GHz	115	115
60 GHz to 64 GHz	112	112
64 GHz to 67 GHz	112	112

[1] Either port can be used as the source port. Any other port can be used as the receiver port.

Table 3c. Extended Dynamic Range at Direct Receiver Access Input - Option 224

Description	Specification (dB) at Direct Receiver Access Input	
	Source 2 Out 1	Source 2 Out 2
10 MHz to 50 MHz	104	113
50 MHz to 100 MHz	113	120
100 MHz to 500 MHz	121	128
500 MHz to 1 GHz	131	138
1 GHz to 2 GHz	135	142
2 GHz to 3.2 GHz	137	142
3.2 GHz to 10 GHz	141	143
10 GHz to 13.5 GHz	140	140
13.5 GHz to 16 GHz	142	142
16 GHz to 19 GHz	140	140
19 GHz to 24 GHz	140	140
24 GHz to 26.5 GHz	140	140
26.5 GHz to 30 GHz	128	128
30 GHz to 32 GHz	126	126
32 GHz to 35 GHz	128	128
35 GHz to 40 GHz	122	122
40 GHz to 50 GHz	123	123
50 GHz to 60 GHz	122	122
60 GHz to 64 GHz	120	120
64 GHz to 67 GHz	120	120

Table 3d. Extended Dynamic Range at Direct Receiver Access Input - Option 224 or 423

Description	Specification (dB)		Typical (dB)	
	Port 1 or 3[1]	Port 2 or 4[1]	Source 1, Port 1 Combine Mode	Source 2, Port 1 Combine Mode
10 MHz to 50 MHz	104	110	111	111
50 MHz to 100 MHz	112	118	117	117
100 MHz to 500 MHz	120	126	126	126
500 MHz to 1 GHz	130	136	136	136
1 GHz to 2 GHz	134	140	137	137
2 GHz to 3.2 GHz	136	140	139	139
3.2 GHz to 10 GHz	138	139	140	140
10 GHz to 13.5 GHz	136	136	139	139
13.5 GHz to 16 GHz	138	138	139	139
16 GHz to 19 GHz	136	136	137	137
19 GHz to 24 GHz	136	136	135	135
24 GHz to 26.5 GHz	135	135	135	135
26.5 GHz to 30 GHz	123	123	123	123
30 GHz to 32 GHz	121	121	120	120
32 GHz to 35 GHz	122	122	121	121
35 GHz to 40 GHz	116	116	118	118
40 GHz to 50 GHz	117	117	118	118
50 GHz to 60 GHz	114	114	114	114
60 GHz to 64 GHz	110	110	112	112
64 GHz to 67 GHz	110	110	111	111

[1] Either port can be used as the source port. Any other port can be used as the receiver port.

N5247A Corrected System Performance - All Options

Note: 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

Table 4. 85058B Calibration Kit

N5247A All Options

Applies to the N5247A Option 200 or 219 or 224 or 400 or 419 or 423 analyzers, 85058B (1.85 mm) calibration kit, 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

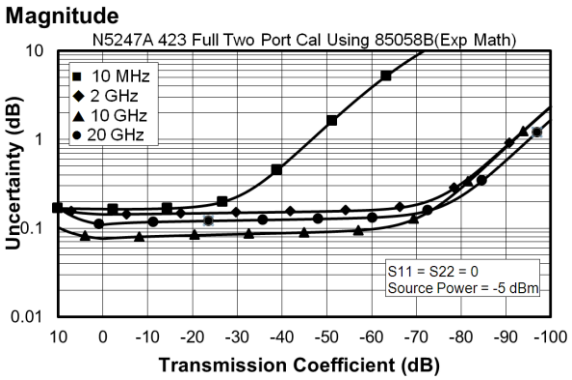
Description	Specification (dB)							
	10 MHz to 45 MHz	45 MHz to 2 GHz	2 GHz to 10 GHz	10 GHz to 20 GHz	20 GHz to 35 GHz	35 GHz to 50 GHz	50 GHz to 60 GHz	60 GHz to 67 GHz
Directivity	-35	-35	-41	-38	-37	-37	-34	-34
Source Match	-34	-34	-44	-40	-41	-42	-40	-40
Load Match	-35	-35	-41	-37	-36	-36	-33	-33
Reflection Tracking [1]								
Mag	0.019	0.019	0.010	0.033	0.033	0.020	0.030	0.030
Phase	0.125	0.125	0.066	0.218	0.218	0.132	0.198	0.198
Transmission Tracking [1]								
Mag	0.149	0.149	0.061	0.094	0.100	0.093	0.121	0.137
Phase	0.983	0.983	0.402	0.619	0.663	0.616	0.801	0.903

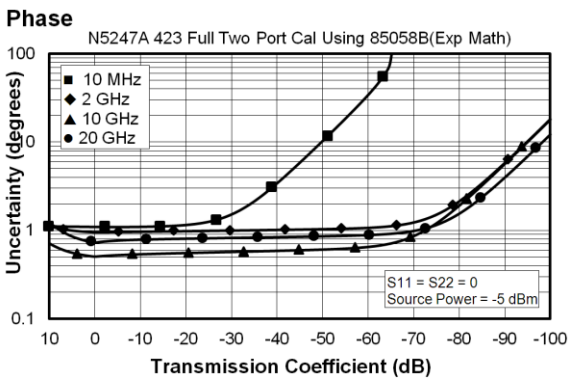
[1]Temperature deviation is a characteristic value.

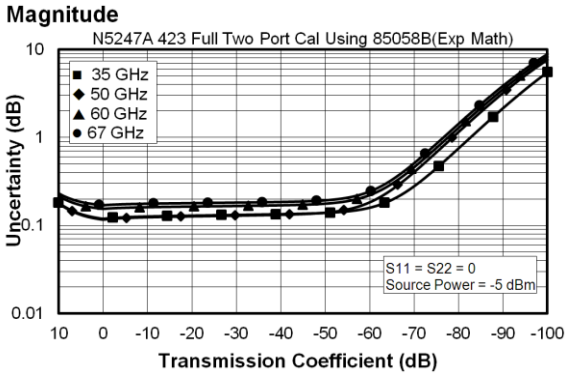
Transmission Uncertainty

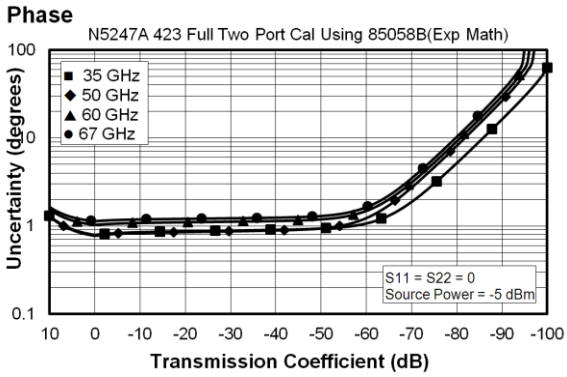
The following charts were generated for Option 423, although they are applicable for any option.

N5247A Opt 423 with 85058B









Reflection Uncertainty

The following charts were generated for Option 423, although they are applicable for any option.

N5247A Opt 423 with 85058B

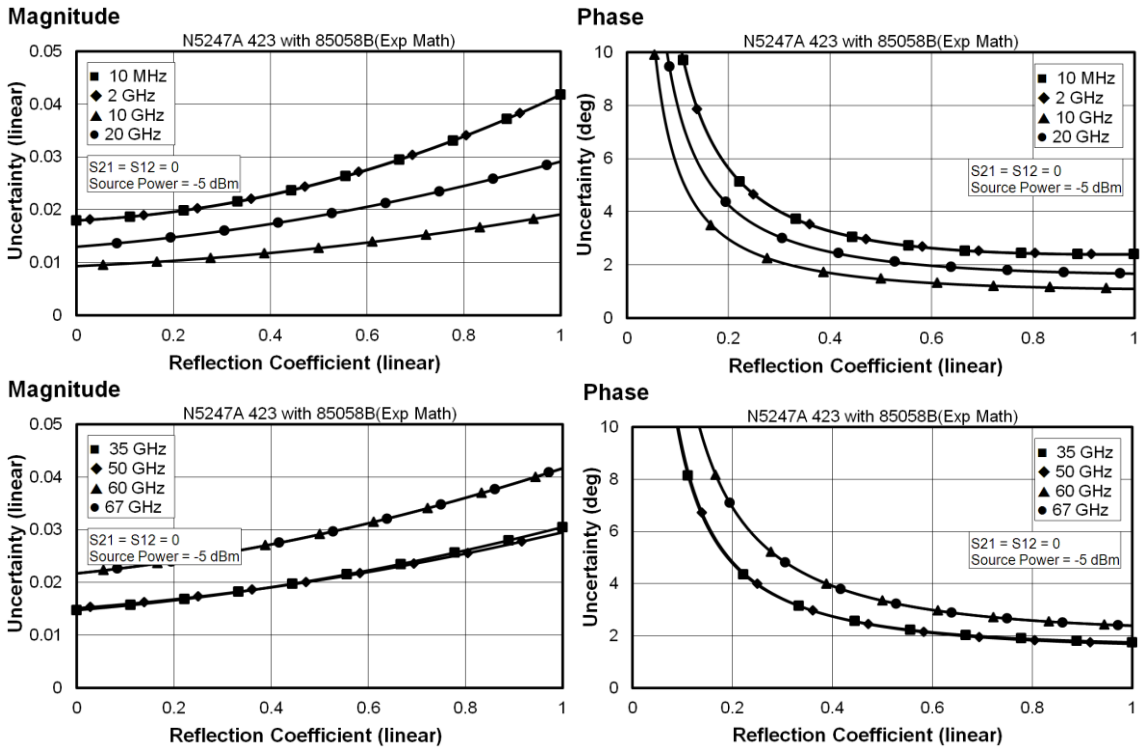


Table 5. N4694A 2-Port Electronic Calibration Module

N5247A All Options

Note: Uncertainty curves for the N4694A are created using a 2-port calibration. Multiport uncertainties are not supported at this time.

Applies to the N5247A Option 200 or 219 or 224 or 400 or 419 or 423 analyzers, N4694A (1.85 mm) electronic calibration module, 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

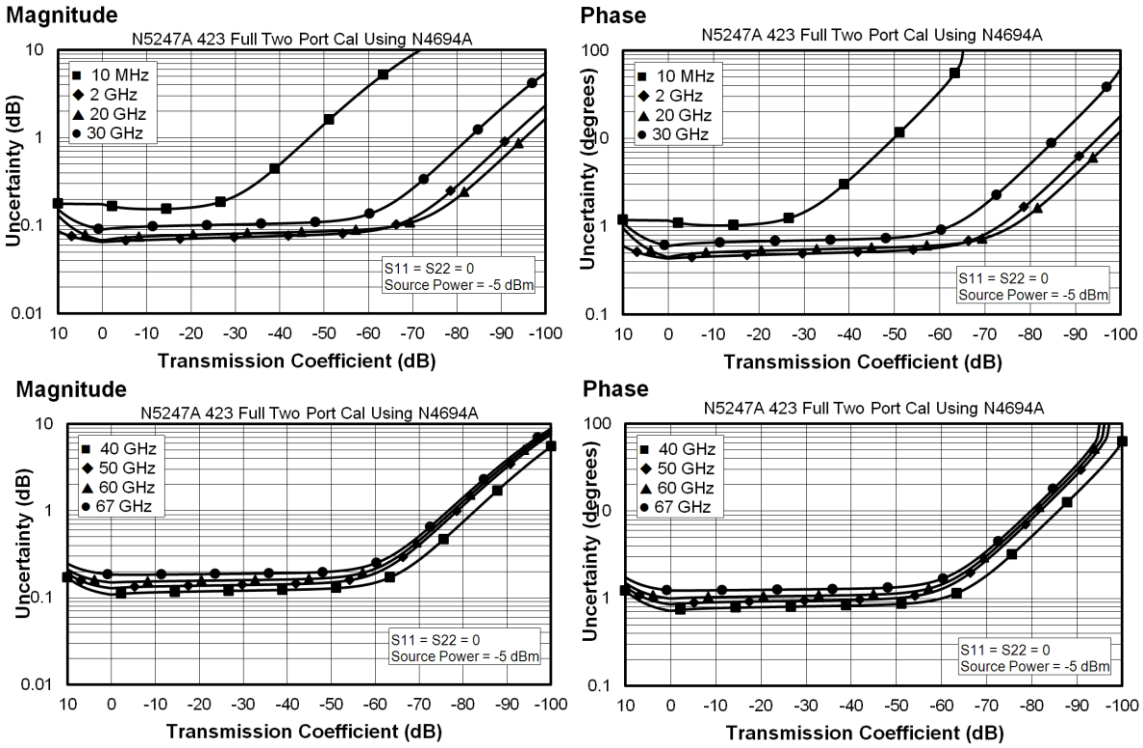
Description	Specification (dB)							
	10 MHz to 200 MHz	200 MHz to 2 GHz	2 GHz to 20 GHz	20 GHz to 30 GHz	30 GHz to 40 GHz	40 GHz to 50 GHz	50 GHz to 60 GHz	60 GHz to 67 GHz
Directivity	-33	-50	-50	-46	-44	-42	-41	-38
Source Match	-25	-38	-39	-35	-34	-33	-30	-27
Load Match	-25	-37	-38	-34	-33	-32	-29	-26
Reflection Tracking [1]								
Mag	0.050	0.040	0.040	0.050	0.060	0.070	0.080	0.090
Phase	0.330	0.264	0.264	0.330	0.396	0.462	0.528	0.594
Transmission Tracking [1]								
Mag	0.136	0.048	0.052	0.072	0.087	0.104	0.114	0.144
Phase	0.897	0.315	0.345	0.473	0.576	0.688	0.754	0.951

[1]Temperature deviation is a characteristic value.

Transmission Uncertainty

The following charts were generated for Option 423, although they are applicable for any option.

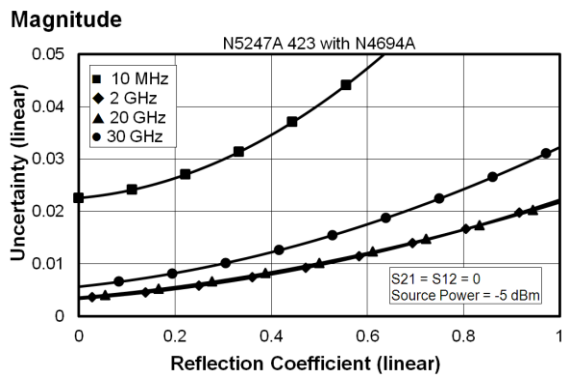
N5247A Opt 423 with N4694A

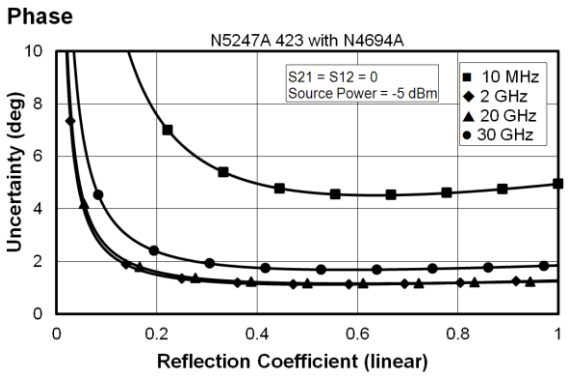


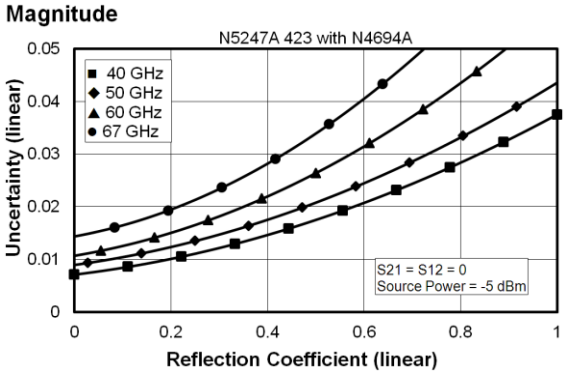
Reflection Uncertainty

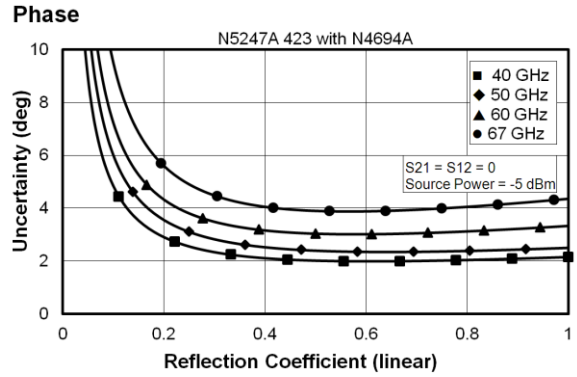
The following charts were generated for Option 423, although they are applicable for any option.

N5247A Opt 423 with N4694A









Uncorrected System Performance

Table 6. Error Terms[1]

Ports 1, 2, 3, 4 - All Options

Directivity (dB)	Specification	Typical
10 MHz to 50 MHz	17	20
50 MHz to 200 MHz	24	28
200 MHz to 500 MHz	24	28
500 MHz to 2 GHz	24	31
2 GHz to 3.2 GHz	20	28
3.2 GHz to 10 GHz	20	25
10 GHz to 13.5 GHz	16	23
13.5 GHz to 16 GHz	16	23
16 GHz to 20 GHz	16	20
20 GHz to 24 GHz	14	18
24 GHz to 26.5 GHz	14	18
26.5 GHz to 43.5 GHz	13	16
43.5 GHz to 46 GHz	13	19
46 GHz to 50 GHz	13	19
50 GHz to 60 GHz	13	16
60 GHz to 67 GHz	10	16
67 GHz to 70 GHz		15

Table 6. (Continued) Error Terms[1]

Source Match (dB)	Specification	Typical
10 MHz to 50 MHz	7	9
50 MHz to 500 MHz	15	19
500 MHz to 2 GHz	10	14
2 GHz to 3.2 GHz	10	14
3.2 GHz to 10 GHz	7	11
10 GHz to 13.5 GHz	7	10
13.5 GHz to 16 GHz	7	11
16 GHz to 20 GHz	7	11
20 GHz to 24 GHz	7	11
24 GHz to 26.5 GHz	7	11
26.5 GHz to 43.5 GHz	7	11
43.5 GHz to 46 GHz	7	11
46 GHz to 50 GHz	7	11
50 GHz to 60 GHz	7	11
60 GHz to 67 GHz	6	9
67 GHz to 70 GHz		10

Table 6. (Continued) Error Terms[1]

Load Match (dB)	Specification	Typical
10 MHz to 50 MHz	6	8
50 MHz to 500 MHz	11	17
500 MHz to 2 GHz	7	12
2 GHz to 3.2 GHz	7	12
3.2 GHz to 10 GHz	7	10
10 GHz to 13.5 GHz	6	10
13.5 GHz to 16 GHz	6	11
16 GHz to 20 GHz	7	11
20 GHz to 24 GHz	7	11
24 GHz to 26.5 GHz	7	11
26.5 GHz to 43.5 GHz	6	11
43.5 GHz to 46 GHz	6	11
46 GHz to 50 GHz	6	12
50 GHz to 60 GHz	7	12
60 GHz to 67 GHz	6	10
67 GHz to 70 GHz		10

Transmission Tracking[2] (dB)	Specification	Typical
10 MHz to 43.5 GHz		+/- 1.5
43.5 GHz to 50 GHz		+/- 1.5
50 GHz to 65 GHz		+/- 1.5
65 GHz to 67 GHz		+/- 1.5
67 GHz to 70 GHz		+/- 1.5

Table 6. (Continued) Error Terms[1]

Reflection Tracking (dB)	Specification	Typical
10 MHz to 43.5 GHz		+/- 1.5
43.5 GHz to 50 GHz		+/- 1.5
50 GHz to 65 GHz		+/- 1.5
65 GHz to 67 GHz		+/- 1.5
67 GHz to 70 GHz		+/- 1.5

Crosstalk[3](dB)	Specification	Typical
10 MHz to 50 MHz		-90
50 MHz to 100 MHz		-109
100 MHz to 500 MHz		-123
500 MHz to 26.5 GHz		-124
26.5 GHz to 35 GHz		-117
35 GHz to 43.5 GHz		-115
43.5 GHz to 50 GHz		-113
50 GHz to 65 GHz		-113
65 GHz to 67 GHz		-113
67 GHz to 70 GHz		-110

[1] Specifications apply over environmental temperature of 25 °C ±5 °C, with less than 1°C variation from the calibration temperature.

[2] Cable loss not included.

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

Test Port Output

Table 7. Frequency Information - All Options

Description	Specification	Typical
Frequency Range	10 MHz to 67 GHz	67 GHz to 70 GHz
Frequency Resolution	1 Hz	--
Frequency Accuracy	+/- 1 ppm	--
Frequency Stability	--	+/-0.05 ppm, -10° to 70° C[1] +/-0.1 ppm/yr maximum[2]

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

Table 8a. Maximum Leveled Power - Option 200 or 400

Description	Specification (dBm)			Typical (dBm)		
	Port 1 or 3[1] Filtered Mode[2] Figure 2 or Figure 5	Port 1 or 3[1] Hi Pwr Mode[2] Figure 3 or Figure 6	Port 2 or 4[1]	Port 1 or 3[1] Filtered Mode[2] Figure 2 or Figure 5	Port 1 or 3[1] Hi Pwr Mode[2] Figure 3 or Figure 6	Port 2 or 4[1]
10 MHz to 50 MHz	4	12	12	12	19	17
50 MHz to 500 MHz	8	13	13	13	20	20
500 MHz to 1 GHz	8	13	13	14	19	20
1 GHz to 2 GHz	8	13	13	12	18	20
2 GHz to 3.2 GHz	10	10	13	15	16	17
3.2 GHz to 10 GHz	13	13	13	18	18	18
10 GHz to 13.5 GHz	11	11	11	16	16	15
13.5 GHz to 16 GHz	12	12	12	16	16	16
16 GHz to 19 GHz	10	10	10	15	15	15
19 GHz to 24 GHz	11	11	11	15	15	15
24 GHz to 26.5 GHz	11	11	11	14	14	14
26.5 GHz to 30 GHz	10	10	10	14	14	14
30 GHz to 32 GHz	7	7	7	12	12	12
32 GHz to 35 GHz	9	9	9	13	13	13
35 GHz to 40 GHz	5	5	5	9	9	9

40 GHz to 50 GHz	10	10	10	13	13	13
50 GHz to 60 GHz	10	10	10	13	13	13
60 GHz to 64 GHz	10	10	10	13	13	13
64 GHz to 67 GHz	10	10	10	13	13	13
67 GHz to 70 GHz				12	12	12

[1] Either port can be used as the source port.

[2] In Filtered Mode, the signal path goes through filters to minimize harmonics below 3.2 GHz. In Hi Pwr Mode, the signal bypasses the filters to maximize output power.

Figure 1. Block Diagram, N5247A Option 200

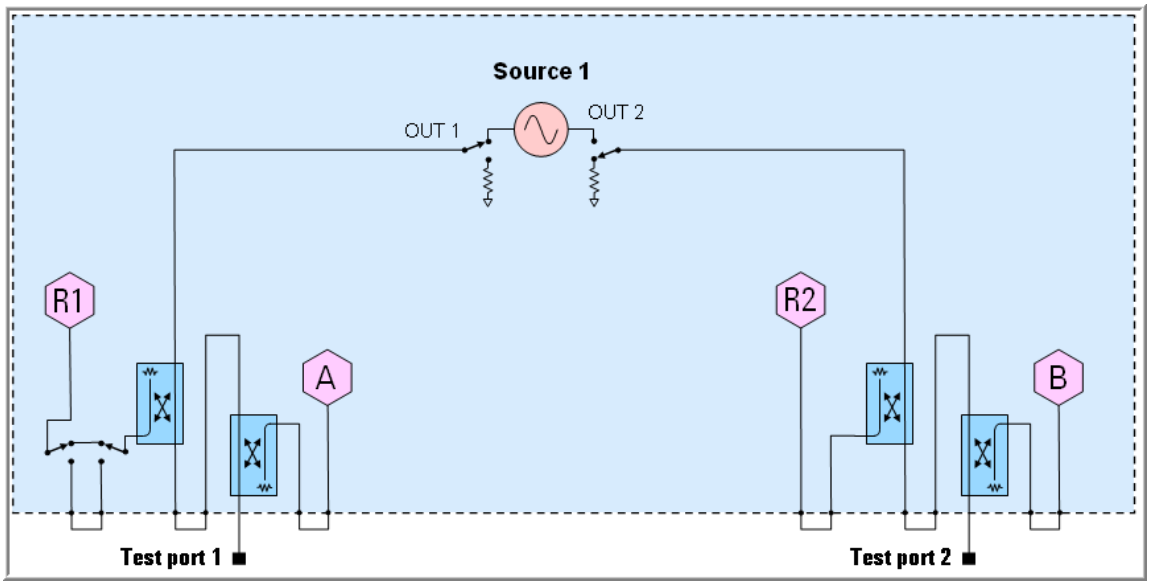


Figure 2. Path Configuration Diagram, N5247A Option 200, Port 1 Filtered Mode

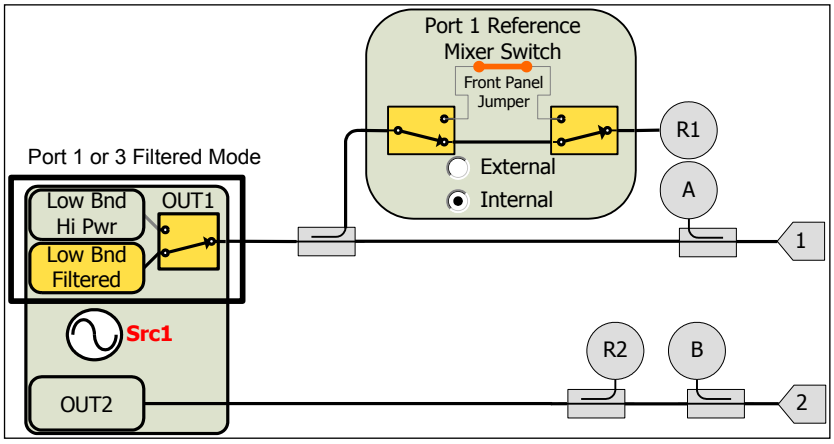


Figure 3. Path Configuration Diagram, N5247A Option 200, Port 1 Hi Pwr Mode

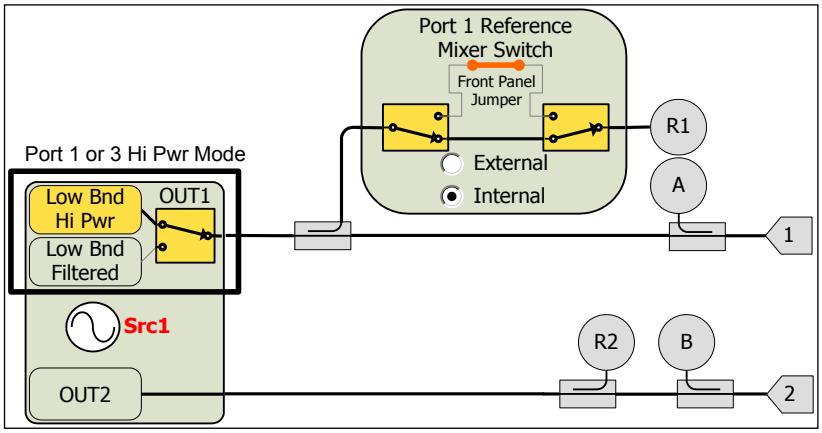


Figure 4. Block Diagram, N5247A Option 400

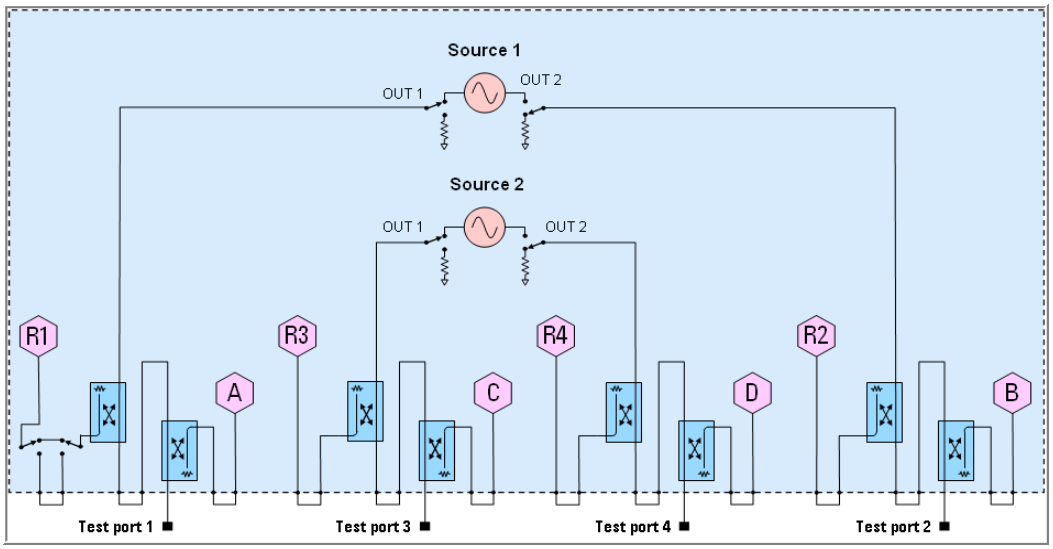


Figure 5. Path Configuration Diagram, N5247A Option 400, Port 1 or 3 Filtered Mode

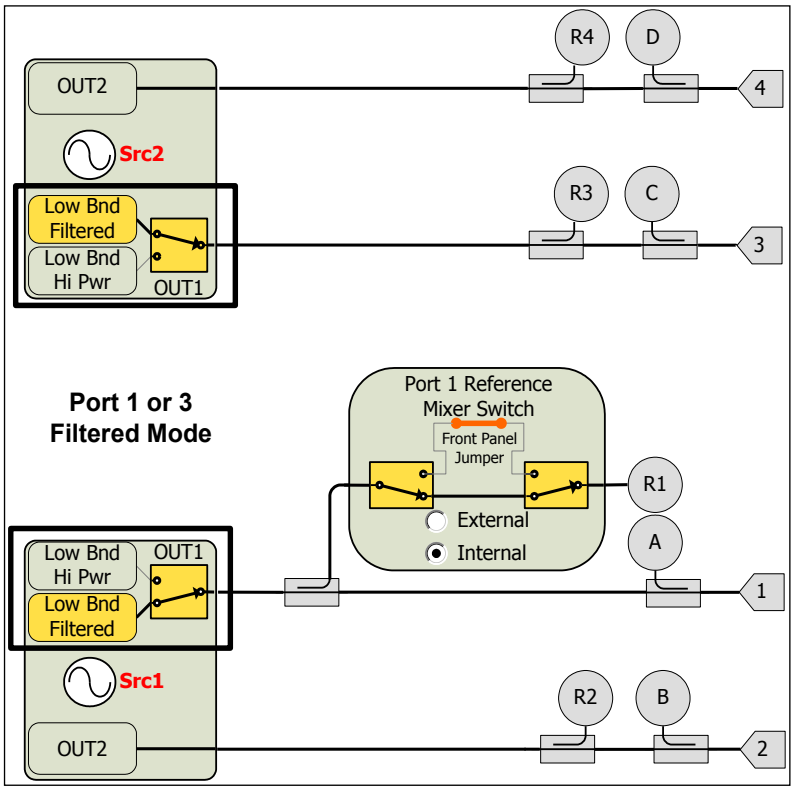


Figure 6. Path Configuration Diagram, N5247A Option 400, Port 1 or 3 Hi Pwr Mode

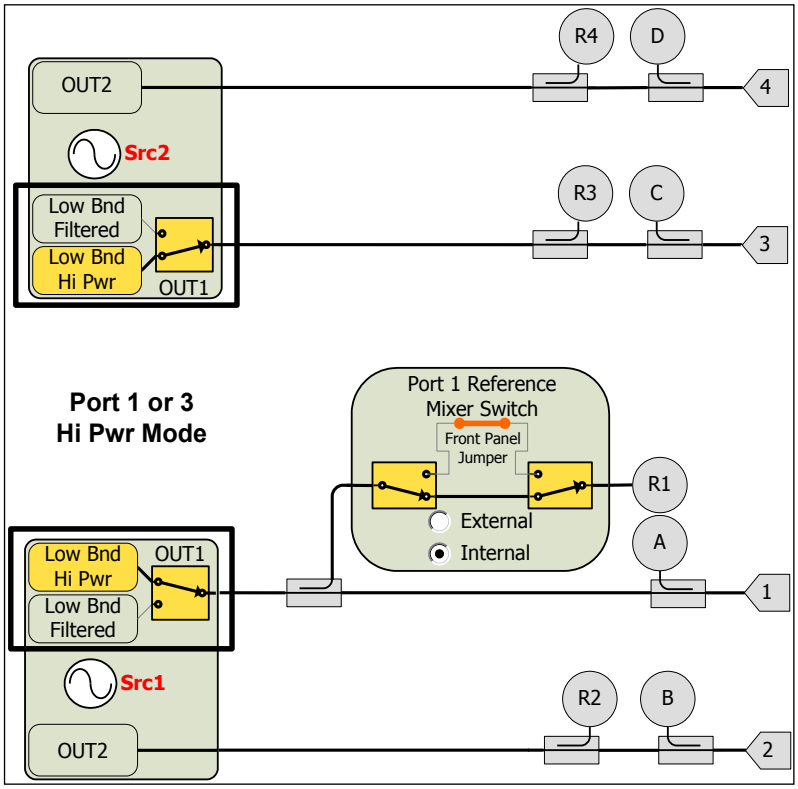


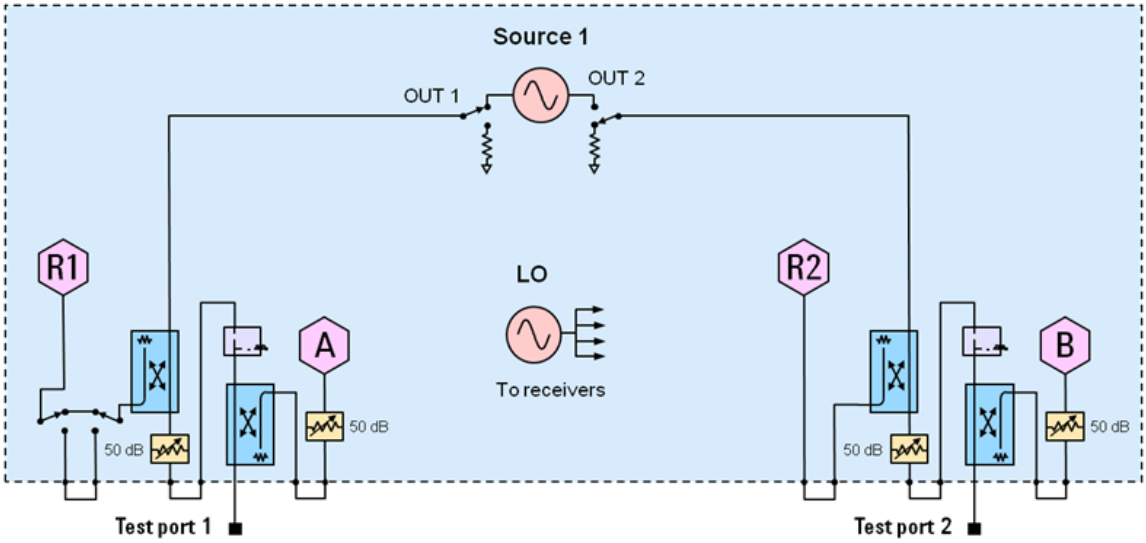
Table 8b. Maximum Leveled Power - Option 219 or 419

Description	Specification (dBm)			Typical (dBm)		
	Port 1 or 3[1] Filtered Mode[2]	Port 1 or 3[1] Hi Pwr Mode[2]	Port 2 or 4[1]	Port 1 or 3[1] Filtered Mode[2]	Port 1 or 3[1] Hi Pwr Mode[2]	Port 2 or 4[1]
10 MHz to 50 MHz	4	11	11	12	19	17
50 MHz to 500 MHz	8	13	13	13	20	20
500 MHz to 1 GHz	8	13	13	14	19	20
1 GHz to 2 GHz	8	13	13	12	18	20
2 GHz to 3.2 GHz	9	9	13	15	15	17
3.2 GHz to 10 GHz	11	11	12	18	18	18
10 GHz to 13.5 GHz	9	9	9	15	15	15
13.5 GHz to 16 GHz	10	10	10	15	15	15
16 GHz to 19 GHz	8	8	8	13	13	13
19 GHz to 24 GHz	8	8	8	12	12	12
24 GHz to 26.5 GHz	7	7	7	12	12	12
26.5 GHz to 30 GHz	7	7	7	12	12	12
30 GHz to 32 GHz	5	5	5	10	10	10
32 GHz to 35 GHz	6	6	6	11	11	11
35 GHz to 40 GHz	1	1	1	8	8	8
40 GHz to 50 GHz	6	6	6	10	10	10
50 GHz to 60 GHz	5	5	5	10	10	10
60 GHz to 64 GHz	4	4	4	10	10	10
64 GHz to 67 GHz	4	4	4	9	9	9
67 GHz to 70 GHz				6	6	6

[1] Either port can be used as the source port.

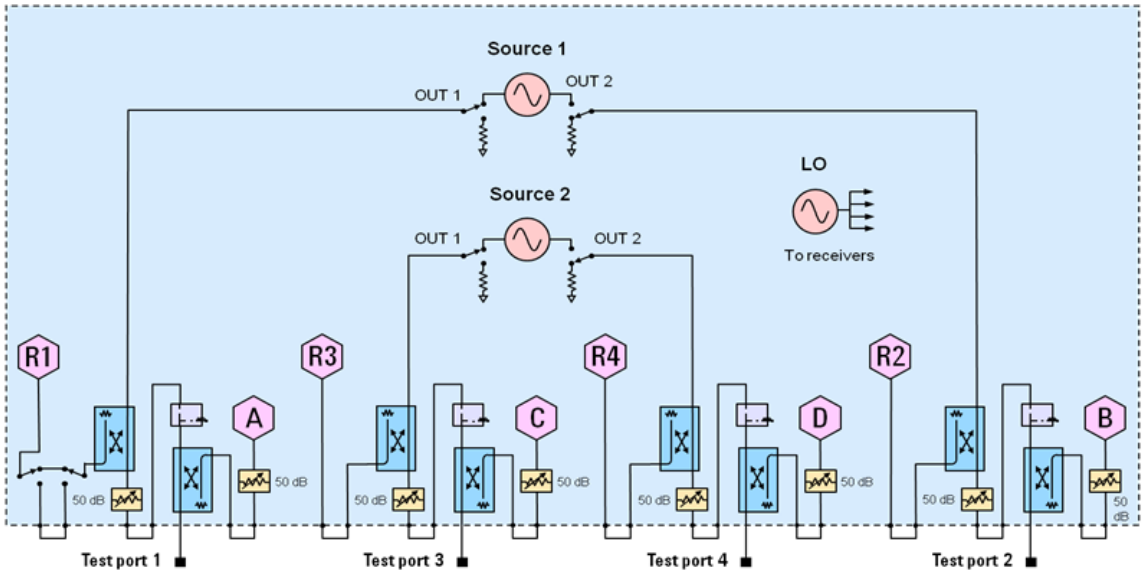
[2] In Filtered Mode, the signal path goes through filters to minimize harmonics below 3.2 GHz. In Hi Pwr Mode, the signal bypasses the filters to maximize output power.

Figure 7. Block Diagram, N5247A Option 219



Note: The path configuration drawing for Option 219 is identical to the path configuration drawings for Option 200, which are shown in Figure 2 and Figure 3.

Figure 8. Block Diagram, N5247A Option 419



Note: The path configuration drawing for Option 419 is identical to the path configuration drawings for Option 400, which are shown in Figure 5 and Figure 6.

Table 8c. Maximum Leveled Power - Option 224 - Source 1

Description	Specification (dBm)			Typical (dBm)		
	Port 1 Filtered Mode[1]	Port 1 Hi Pwr Mode[1]	Port 2	Port 1 Filtered Mode[1]	Port 1 Hi Pwr Mode[1]	Port 2
10 MHz to 50 MHz	4	10	10	11	18	17
50 MHz to 500 MHz	7	13	13	12	19	19
500 MHz to 1 GHz	7	13	13	13	18	19
1 GHz to 2 GHz	7	13	13	12	17	19
2 GHz to 3.2 GHz	9	9	13	14	14	16
3.2 GHz to 10 GHz	11	11	12	17	17	17
10 GHz to 13.5 GHz	8	8	8	14	14	14
13.5 GHz to 16 GHz	9	9	9	14	14	14
16 GHz to 19 GHz	7	7	7	12	12	12
19 GHz to 24 GHz	7	7	7	11	11	11
24 GHz to 26.5 GHz	6	6	6	11	11	11
26.5 GHz to 30 GHz	6	6	6	11	11	11
30 GHz to 32 GHz	4	4	4	9	9	9
32 GHz to 35 GHz	5	5	5	10	10	10
35 GHz to 40 GHz	0	0	0	7	7	7
40 GHz to 50 GHz	5	5	5	10	10	10
50 GHz to 60 GHz	4	4	4	9	9	9
60 GHz to 64 GHz	2	2	2	9	9	9
64 GHz to 67 GHz	2	2	2	8	8	8

[1] In Filtered Mode, the signal path goes through filters to minimize harmonics below 3.2 GHz. In Hi Pwr Mode, the signal bypasses the filters to maximize output power.

Table 8d. Maximum Leveled Power - Option 224 - Source 2

Description	Specification (dBm)			Typical (dBm)		
	Source 2, Out 1 Filtered Mode[1]	Source 2, Out 1 Hi Pwr Mode[1]	Source 2 Out 2	Source 2 Out 1 Filtered Mode[1]	Source 2 Out 1 Hi Pwr Mode[1]	Source 2 Out 2
10 MHz to 50 MHz	4	13	13	10	18	17
50 MHz to 500 MHz	8	17	15	12	21	21
500 MHz to 1 GHz	8	16	15	14	20	21
1 GHz to 2 GHz	8	15	15	14	19	21
2 GHz to 3.2 GHz	10	10	15	14	14	18
3.2 GHz to 10 GHz	14	14	16	19	19	20
10 GHz to 13.5 GHz	12	12	12	17	17	19
13.5 GHz to 16 GHz	13	13	13	17	17	18
16 GHz to 19 GHz	11	11	12	17	17	17
19 GHz to 24 GHz	11	11	12	17	17	17
24 GHz to 26.5 GHz	11	11	12	16	16	16
26.5 GHz to 30 GHz	11	11	12	16	16	16
30 GHz to 32 GHz	9	9	10	14	14	14
32 GHz to 35 GHz	11	11	11	15	15	15
35 GHz to 40 GHz	6	6	6	13	13	13
40 GHz to 50 GHz	11	11	11	16	16	17
50 GHz to 60 GHz	12	12	14	17	17	18
60 GHz to 64 GHz	12	12	14	17	17	19
64 GHz to 67 GHz	12	12	14	17	17	19

[1] In Filtered Mode, the signal path goes through filters to minimize harmonics below 3.2 GHz. In Hi Pwr Mode, the signal bypasses the filters to maximize output power.

Figure 9. Block Diagram: N5247A Option 224

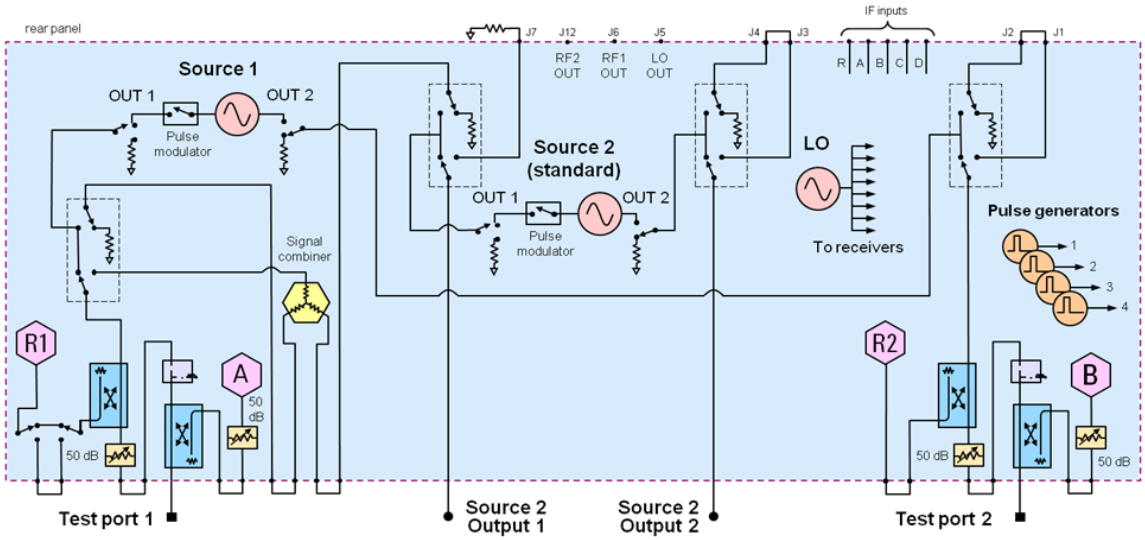


Figure 10. Path Configuration Diagram, N5247A Option 224

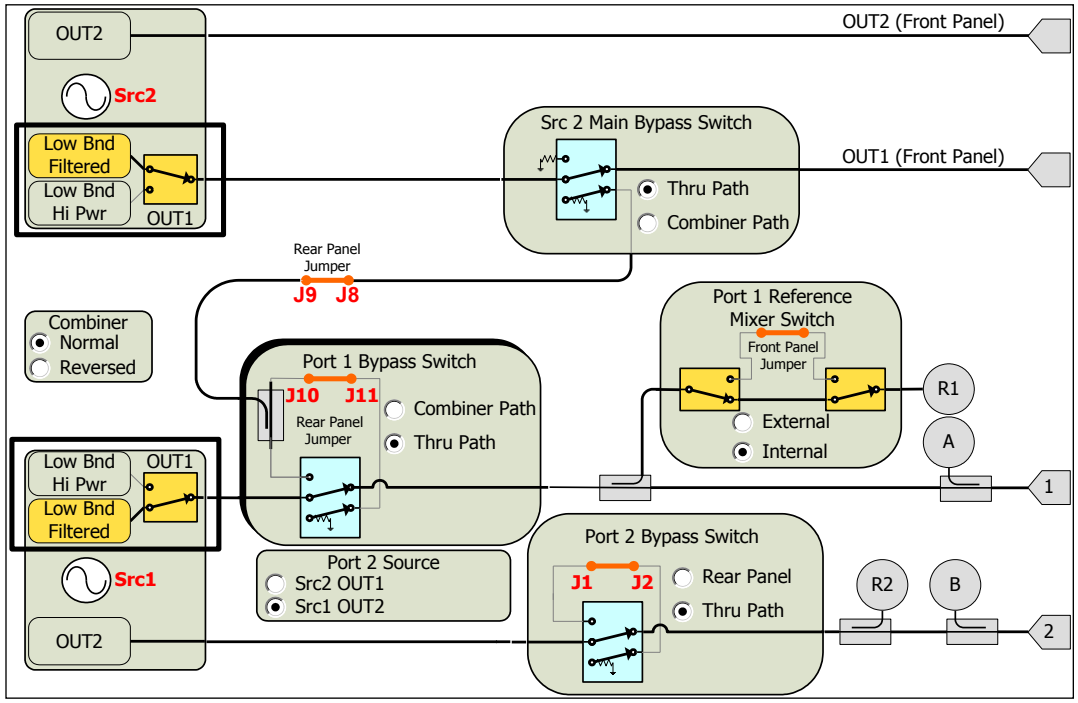


Table 8e. Maximum Leveled Power - Option 423

Description	Specification (dBm)			Typical (dBm)		
	Port 1 or 3[1] Filtered Mode[2]	Port 1 or 3[1] Hi Pwr Mode[2]	Port 2 or 4[1]	Port 1 or 3[1] Filtered Mode[2]	Port 1 or 3[1] Hi Pwr Mode[2]	Port 2 or 4[1]
10 MHz to 50 MHz	4	10	10	11	18	17
50 MHz to 500 MHz	7	13	13	12	19	19
500 MHz to 1 GHz	7	13	13	13	18	19
1 GHz to 2 GHz	7	13	13	12	17	19
2 GHz to 3.2 GHz	9	9	13	14	14	16
3.2 GHz to 10 GHz	11	11	12	17	17	17
10 GHz to 13.5 GHz	8	8	8	14	14	14
13.5 GHz to 16 GHz	9	9	9	14	14	14
16 GHz to 19 GHz	7	7	7	12	12	12
19 GHz to 24 GHz	7	7	7	11	11	11
24 GHz to 26.5 GHz	6	6	6	11	11	11
26.5 GHz to 30 GHz	6	6	6	11	11	11
30 GHz to 32 GHz	4	4	4	9	9	9
32 GHz to 35 GHz	5	5	5	10	10	10
35 GHz to 40 GHz	0	0	0	7	7	7
40 GHz to 50 GHz	5	5	5	10	10	10
50 GHz to 60 GHz	4	4	4	9	9	9
60 GHz to 64 GHz	2	2	2	9	9	9
64 GHz to 67 GHz	2	2	2	8	8	8

[1] Either port can be used as the source port.

[2] In Filtered Mode, the signal path goes through filters to minimize harmonics below 3.2 GHz. In Hi Pwr Mode, the signal bypasses the filters to maximize output power.

Table 8f. Maximum Leveled Power - Option 224 or 423

Description	Typical (dBm)			
	Source 1, Port 1 Combine Mode Filtered Mode[1]	Source 1, Port 1 Combine Mode Hi Pwr Mode[1]	Source 2, Port 1 Combine Mode Filtered Mode[1]	Source 2, Port 1 Combine Mode Hi Pwr Mode[1]
10 MHz to 50 MHz	5	12	5	12
50 MHz to 500 MHz	6	13	6	13
500 MHz to 1 GHz	7	12	7	12
1 GHz to 2 GHz	6	11	6	11
2 GHz to 3.2 GHz	8	8	8	8
3.2 GHz to 10 GHz	9	9	9	9
10 GHz to 13.5 GHz	6	6	6	6
13.5 GHz to 16 GHz	6	6	6	6
16 GHz to 19 GHz	4	4	4	4
19 GHz to 24 GHz	2	2	2	2
24 GHz to 26.5 GHz	2	2	2	2
26.5 GHz to 30 GHz	2	2	2	2
30 GHz to 32 GHz	-1	-1	-1	-1
32 GHz to 35 GHz	0	0	0	0
35 GHz to 40 GHz	-3	-3	-3	-3
40 GHz to 50 GHz	0	0	0	0
50 GHz to 60 GHz	-2	-2	-2	-2
60 GHz to 64 GHz	-3	-3	-3	-3
64 GHz to 67 GHz	-4	-5	-4	-5

[1] In Filtered Mode, the signal path goes through filters to minimize harmonics below 3.2 GHz. In Hi Pwr Mode, the signal bypasses the filters to maximize output power.

Figure 11. Block Diagram: N5247A Option 423

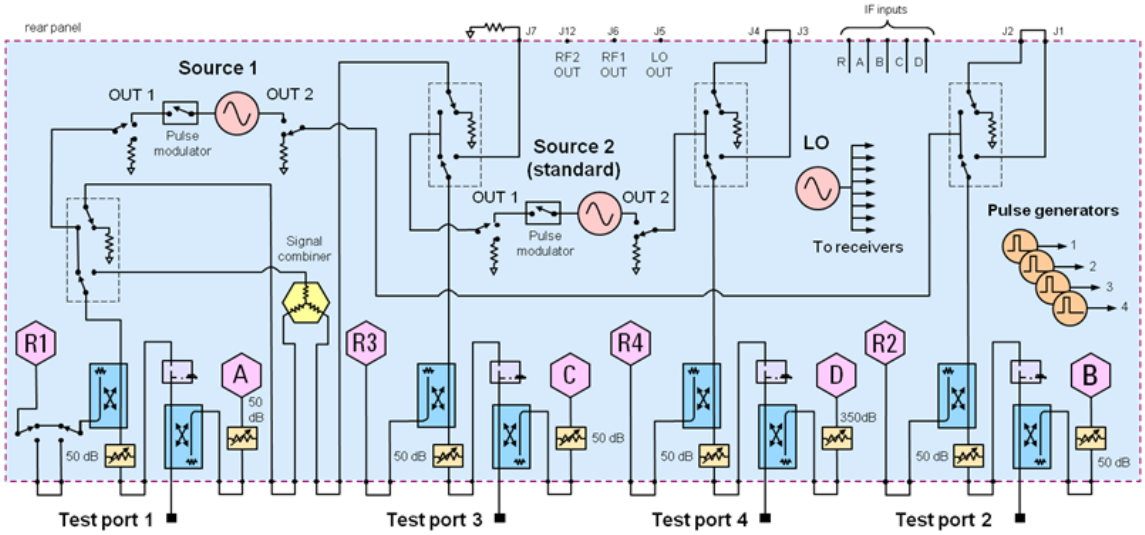


Figure 12. Path Configuration Diagram, N5247A Option 423

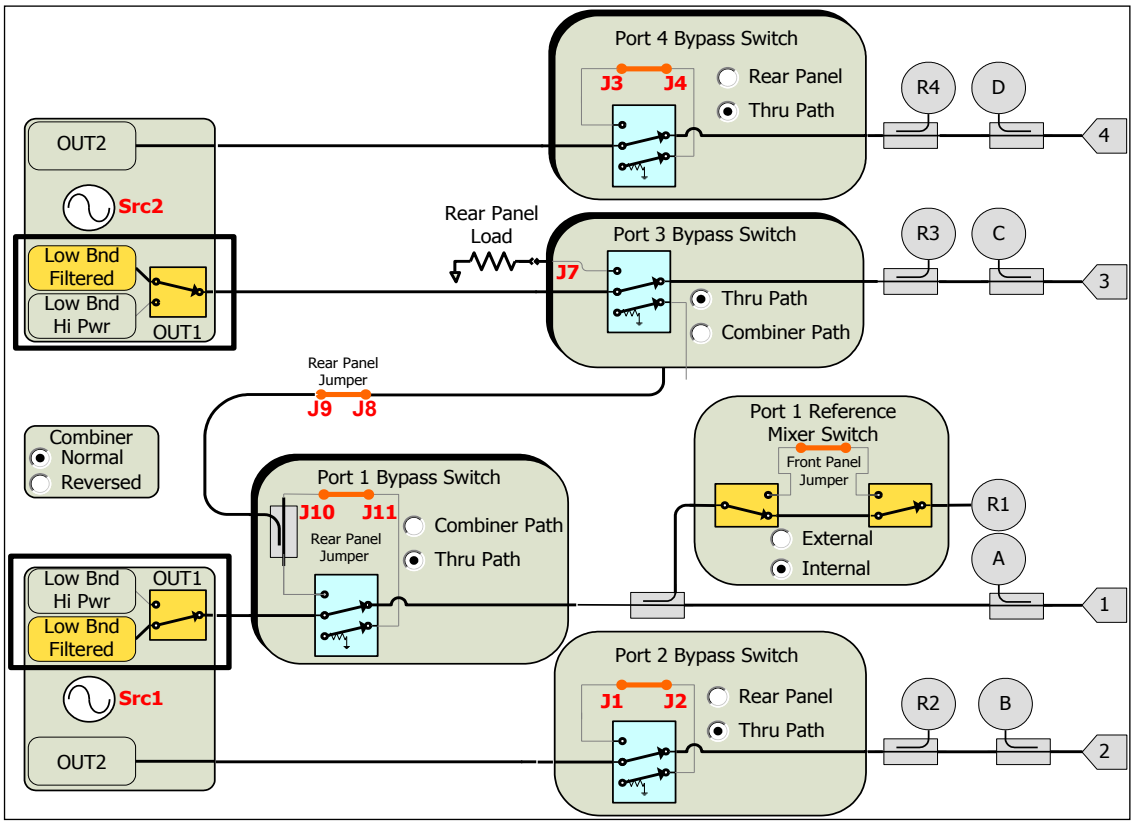


Table 9a. Power Level Accuracy - All Options

Description	Specification (dB)		Typical (dB)	
	Ports 1, 2, 3, 4[1]	Source 2, Out 1 Source 2, Out 2	Ports 1, 2, 3, 4[1]	Source 2, Out 1 Source 2, Out 2
10 MHz to 50 MHz	+/- 1.0	+/- 2.0	+/- 0.40	+/- 0.86
50 MHz to 1 GHz	+/- 1.0	+/- 2.0	+/- 0.29	+/- 0.40
1 GHz to 3.2 GHz	+/- 1.2	+/- 2.0	+/- 0.32	+/- 0.28
3.2 GHz to 10 GHz	+/- 1.5	+/- 2.0	+/- 0.39	+/- 0.80
10 GHz to 13.5 GHz	+/- 2.25	+/- 2.0	+/- 0.93	+/- 0.77
13.5 GHz to 20 GHz	+/- 2.25	+/- 2.5	+/- 0.51	+/- 0.68
20 GHz to 26.5 GHz	+/- 2.25	+/- 2.5	+/- 0.60	+/- 1.01
26.5 GHz to 40 GHz	+/- 3.0	+/- 3.5	+/- 0.83	+/- 1.26
40 GHz to 50 GHz	+/- 3.0	+/- 3.5	+/- 0.65	+/- 1.04
50 GHz to 60 GHz	+/- 4.0	+/- 4.0	+/- 1.03	+/- 1.57
60 GHz to 67 GHz	+/- 4.5	+/- 4.5	+/- 1.17	+/- 3.14
67 GHz to 70 GHz			+/- 4.62	+/- 7.22

[1]Any port can be used as the source port. Source in filtered mode where applicable.

Table 9b. Power Level Linearity - All Options

Description	Specification (dB)		
	Port 1 or 3[1] -25dBm ≤ P<-20dBm	Port 1 or 3[1] -20dBm ≤ P < -15dBm	Port 1 or 3[1] -15dBm ≤ P ≤ Max Specified Port Power
10 MHz to 50 MHz	+/- 2.5	+/- 2.0	+/- 1.5
50 MHz to 3.2 GHz	+/- 1.5	+/- 1.5	+/- 1.5
3.2 GHz to 67 GHz	+/- 1.5	+/- 1.5	+/- 1.5

[1] Either port can be used as the source port. Source in filtered mode.

Table 9c. Power Level Linearity - All Options

Description	Specification (dB)	
	Port 2 or 4[1] -25dBm ≤P<-20dBm	**Port 2 or 4[1] -20dBm ≤P≤ Max Specified Port Power**
10 MHz to 50 MHz	+/- 4.0	+/- 2.0
50 MHz to 10 GHz	+/- 2.5	+/- 1.5
10 GHz to 16 GHz	+/- 2.0	+/- 1.5
16 GHz to 67 GHz	+/- 1.5	+/- 1.5

[1] Either port can be used as the source port.

Table 9d. Power Level Linearity - Option 224

Description	Specification (dB)	
	Source 2, Out 1[1] -15dBm ≤ P ≤ Max Specified Port Power	**Source 2, Out 2 -15dBm ≤P≤ Max Specified Port Power**
10 MHz to 50 MHz	+/- 1.5	+/- 1.5
50 MHz to 3.2 GHz	+/- 1.0	+/- 1.0
3.2 GHz to 67 GHz	+/- 1.0	+/- 1.0

[1]Source in filtered mode.

Table 10a. Power Sweep Range - Option 200 or 400

Description	Specification (dB)		Typical (dB)	
	Port 1 or 3[1]	Port 2 or 4[1]	Port 1 or 3[1]	Port 2 or 4[1]
10 MHz to 50 MHz	37	37	46	44
50 MHz to 500 MHz	38	38	47	47
500 MHz to 1 GHz	38	38	46	47
1 GHz to 2 GHz	38	38	45	47
2 GHz to 3.2 GHz	35	38	43	44
3.2 GHz to 10 GHz	38	38	45	45
10 GHz to 13.5 GHz	36	36	43	42
13.5 GHz to 16 GHz	37	37	43	43
16 GHz to 19 GHz	35	35	42	42
19 GHz to 24 GHz	36	36	42	42
24 GHz to 26.5 GHz	36	36	41	41
26.5 GHz to 30 GHz	35	35	41	41
30 GHz to 32 GHz	32	32	39	39
32 GHz to 35 GHz	34	34	40	40
35 GHz to 40 GHz	30	30	36	36
40 GHz to 50 GHz	35	35	40	40
50 GHz to 60 GHz	35	35	40	40
60 GHz to 64 GHz	35	35	40	40
64 GHz to 67 GHz	35	35	40	40
67 GHz to 70 GHz			39	39

[1] Either port can be used as the source port. Source in Hi Pwr mode where applicable.

Table 10b. Power Sweep Range - Option 219 or 419

Description	Specification (dB)		Typical (dB)	
	Port 1 or 3[1]	Port 2 or 4[1]	Port 1 or 3[1]	Port 2 or 4[1]
10 MHz to 50 MHz	36	36	46	44
50 MHz to 500 MHz	38	38	47	47
500 MHz to 1 GHz	38	38	46	47
1 GHz to 2 GHz	38	38	45	47
2 GHz to 3.2 GHz	34	38	42	44
3.2 GHz to 10 GHz	36	37	45	45
10 GHz to 13.5 GHz	34	34	42	42
13.5 GHz to 16 GHz	35	35	42	42
16 GHz to 19 GHz	33	33	40	40
19 GHz to 24 GHz	33	33	39	39
24 GHz to 26.5 GHz	32	32	39	39
26.5 GHz to 30 GHz	32	32	39	39
30 GHz to 32 GHz	30	30	37	37
32 GHz to 35 GHz	31	31	38	38
35 GHz to 40 GHz	26	26	35	35
40 GHz to 50 GHz	31	31	37	37
50 GHz to 60 GHz	30	30	37	37
60 GHz to 64 GHz	29	29	37	37
64 GHz to 67 GHz	29	29	36	36
67 GHz to 70 GHz			33	33

[1] Either port can be used as the source port. Source in Hi Pwr mode where applicable.

Table 10c. Power Sweep Range - Option 224 or 423

Description	Specification (dB)		Typical (dB)	
	Port 1 or 3[1]	Port 2 or 4[1]	Port 1 or 3[1]	Port 2 or 4[1]
10 MHz to 50 MHz	35	35	45	44
50 MHz to 500 MHz	38	38	46	46
500 MHz to 1 GHz	38	38	45	46
1 GHz to 2 GHz	38	38	44	46
2 GHz to 3.2 GHz	34	38	41	43
3.2 GHz to 10 GHz	36	37	44	44
10 GHz to 13.5 GHz	33	33	41	41
13.5 GHz to 16 GHz	34	34	41	41
16 GHz to 19 GHz	32	32	39	39
19 GHz to 24 GHz	32	32	38	38
24 GHz to 26.5 GHz	31	31	38	38
26.5 GHz to 30 GHz	31	31	38	38
30 GHz to 32 GHz	29	29	36	36
32 GHz to 35 GHz	30	30	37	37
35 GHz to 40 GHz	25	25	34	34
40 GHz to 50 GHz	30	30	37	37
50 GHz to 60 GHz	29	29	36	36
60 GHz to 64 GHz	27	27	36	36
64 GHz to 67 GHz	27	27	35	35

[1] Either port can be used as the source port. Source in Hi Pwr mode where applicable.

Table 10d. Power Sweep Range - Option 224

Description	Specification (dB)		Typical (dB)	
	Source 2[1] Out 1	Source 2 Out 2	Source 2[1] Out 1	Source 2 Out 2
10 MHz to 50 MHz	38	38	45	44
50 MHz to 500 MHz	42	40	48	48
500 MHz to 1 GHz	41	40	47	48
1 GHz to 2 GHz	40	40	46	48
2 GHz to 3.2 GHz	35	40	41	45
3.2 GHz to 10 GHz	39	41	46	47
10 GHz to 13.5 GHz	37	37	44	46
13.5 GHz to 16 GHz	38	38	44	45
16 GHz to 19 GHz	36	37	44	44
19 GHz to 24 GHz	36	37	44	44
24 GHz to 26.5 GHz	36	37	43	43
26.5 GHz to 30 GHz	36	37	43	43
30 GHz to 32 GHz	34	35	41	41
32 GHz to 35 GHz	36	36	42	42
35 GHz to 40 GHz	31	31	40	40
40 GHz to 50 GHz	36	36	43	44
50 GHz to 60 GHz	37	39	44	45
60 GHz to 64 GHz	37	39	44	46
64 GHz to 67 GHz	37	39	44	46

[1]Source in Hi Pwr mode where applicable.

Table 11. N5247A Nominal Power (Preset Power)

	Option 200, 400	Option 219, 419, 224, 423	Option 224		Option 224, 423	
	Ports 1, 2, 3, 4[1]	Ports 1, 2, 3, 4[1]	Source 2, Out 1	Source 2, Out 2	Source 1 Port 1 Combine Mode	Source 2 Port 1 Combine Mode
Preset Power	0 dBm	-5 dBm	0 dBm	0 dBm	-5 dBm	-5 dBm

[1] Any port can be used as the source port. Any other port can be used as the receiver port.

Table 12. Power Resolution and Maximum/Minimum Settable Power

Description	Specification at Ports 1,2,3,4 [1]	Typical at Ports 1,2,3,4 [1]		
	All Options	All Options	Option 200 or 400	Option 219, 419, 224, 423
Power Resolution	0.01 dB			
Maximum Settable Power		30 dBm		
Minimum Settable Power			-30 dBm	-80 dBm

[1] Any port can be used as the source port·

Table 13. Harmonics at Max Specified Power - All Options

See Table 8a. Maximum Leveled Power - Option 200 or 400 on page27.

Description	Typical (dBc)	
2nd and 3rd Harmonics[4]	Port 1 or 3[1,2] Source 2 Out 1[3]	Port 2 or 4[1] Source 2 Out 2
10 MHz to 2 GHz	-51	-13
2 GHz to 13.5 GHz	-60	-21
13.5 GHz to 50 GHz	-60	-60
50 GHz to 64 GHz	-60	-60
64 GHz to 67 GHz	-60	-60
67 GHz to 70 GHz	-60	-60

[1] Any port can be used as the source port.

[2] < 3.2 GHz Filtered Mode

[3] At port 1 max specified power.

[4] Listed frequency is fundamental frequency; test at max specified power

Table 14. Non-Harmonic Spurs at Nominal Power - All Options

Description Offset frequency = 30 kHz to 5 MHz	Typical (dBc) at Ports 1, 2, 3, 4 Source 2 Out 1, Source 2 Out 2 Based on 8kHz offset Frac-N	Typical (dBc) at Ports 1, 2, 3, 4 Source 2 Out 1, Source 2 Out 2 Based on 100kHz offset Frac-N
10 MHz to 500 MHz	-50	-50
500 MHz to 1GHz	-60	-42
1 GHz to 2 GHz	-60	-42
2 GHz to 4 GHz	-57	-45
4 GHz to 8 GHz	-51	-39
8 GHz to 16 GHz	-45	-33
16 GHz to 24 GHz	-39	-27
24 GHz to 26.5 GHz	-39	-27
26.5 GHz to 32 GHz	-39	-27
32 GHz to 43.5 GHz	-39	-27
43.5 GHz to 48 GHz	-39	-27
48 GHz to 64 GHz	-33	-21
64 GHz to 67 GHz	-27	-15
67 GHz to 70 GHz	-27	-15

Table 15. Phase Noise - All Options

Description	Typical (dBc/Hz) Ports 1, 2, 3, 4, Source 2 Out 1, Source 2 Out 2			
	1 kHz Offset	10 kHz Offset	100 kHz Offset	1 MHz Offset
10 MHz to 500 MHz	-100	-95	-95	-120
500 MHz to 1 GHz	-107	-117	-112	-127
1 GHz to 2 GHz	-101	-111	-106	-121
2 GHz to 4 GHz	-95	-105	-100	-115
4 GHz to 8 GHz	-89	-99	-94	-109
8 GHz to 16 GHz	-83	-93	-88	-103
16 GHz to 32 GHz	-77	-87	-82	-97
32 GHz to 43.5 GHz	-71	-81	-76	-91
43.5 GHz to 54 GHz	-71	-81	-76	-91
54 GHz to 64 GHz	-71	-81	-76	-91
64 GHz to 67 GHz	-65	-75	-70	-85
67 GHz to 70 GHz	-65	-75	-70	-85

Test Port Input – All Options

Ports 1, 2, 3, 4

Table 16. Test Port Noise Floor[1] (dBm)

Description	Specification	Typical
10 Hz IFBW		
10 MHz to 50 MHz[2]	-70	-76
50 MHz to 100 MHz[2]	-92	-98
100 MHz to 500 MHz[2]	-100	-107
500 MHz to 1 GHz	-110	-116
1 GHz to 10 GHz	-115	-119
10 GHz to 13.5 GHz	-116	-121
13.5 GHz to 16 GHz	-117	-121
16 GHz to 26.5 GHz	-118	-122
26.5 GHz to 35 GHz	-106	-110
35 GHz to 40 GHz	-105	-110
40 GHz to 50 GHz	-102	-108
50 GHz to 60 GHz	-101	-107
60 GHz to 67 GHz	-100	-107
67 GHz to 70 GHz		-95

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

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

Table 17. Direct Receiver Access Input Noise Floor[1] (dBm)

Description	Specification	Typical
10 MHz to 50 MHz[2]	-100	-106
50 MHz to 100 MHz[2]	-105	-111
100 MHz to 500 MHz[2]	-113	-120
500 MHz to 1 GHz	-123	-129
1 GHz to 10 GHz	-127	-131
10 GHz to 13.5 GHz	-128	-133
13.5 GHz to 16 GHz	-129	-133
16 GHz to 26.5 GHz	-129	-133
26.5 GHz to 35 GHz	-117	-121
35 GHz to 40 GHz	-116	-121
40 GHz to 50 GHz	-112	-118
50 GHz to 60 GHz	-110	-116
60 GHz to 67 GHz	-108	-115
67 GHz to 70 GHz		-101

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

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

Table 18. Test Port Compression at 0.1 dB (dBm) - All Options

Description	Specification	Typical
10 MHz to-10 GHz		+15
10 GHz to 30 GHz		+12
30 GHz to 67 GHz		+11

Table 19. Receiver Compression Test Port Power (dBm) - Ports 1, 2, 3, 4

Description	Test Port Power			Receiver compression Magnitude (dB)	Receiver compression Phase (degree)
	Options 200 and 400	Options 219 and 419	Options 224 and 423		
500 MHz to 3.2 GHz[1]	13	13	13	0.15	1.2
3.2 GHz to 10 GHz	13	12	12	0.15	1.2
10 GHz to 13.5 GHz	11	9	8	0.15	1.2
13.5 GHz to 16 GHz	12	10	9	0.15	1.2
16 GHz to 19 GHz	10	8	8	0.15	1.2
19 GHz to 24 GHz	11	8	8	0.15	1.2
24 GHz to 26.5 GHz	11	8	8	0.15	1.2
26.5 GHz to 30 GHz	10	8	8	0.15	1.2
30 GHz to 32 GHz	8	8	8	0.15	1.2
32 GHz to 35 GHz	9	8	8	0.15	1.2
35 GHz to 40 GHz	8	8	8	0.15	1.2
40 GHz to 50 GHz	10	8	8	0.15	1.2
50 GHz to 60 GHz	10	8	8	0.15	1.2
60 GHz to 67 GHz	10	8	8	0.15	1.2

[1] Test port receiver compression at input levels below 500 MHz is negligible due to coupler roll off in this frequency range.

Table 20. Trace Noise Magnitude (dB rms)

Ratioed measurement, nominal power at test port.

Description	1 kHz IFBW Specification	1 kHz IFBW Typical	100 kHz IFBW Typical	600 kHz IFBW Typical
10 MHz to 50 MHz	0.05	0.0249	0.240	0.580
50 MHz to 100 MHz	0.004	0.0017	0.016	0.040
100 MHz to 500 MHz	0.002	0.0007	0.007	0.016
500 MHz to 1 GHz	0.002	0.0004	0.003	0.007

1 GHz to 26.5 GHz	0.002	0.0005	0.003	0.006
26.5 GHz to 43.5 GHz	0.003	0.0008	0.008	0.017
43.5 GHz to 46 GHz	0.003	0.0009	0.008	0.017
46 GHz to 47 GHz	0.003	0.0009	0.008	0.017
47 GHz to 50 GHz	0.003	0.0009	0.008	0.017
50 GHz to 65 GHz	0.003	0.0009	0.008	0.017
65 GHz to 67 GHz	0.003	0.0009	0.008	0.017
67 GHz to 70 GHz		0.0015	0.023	0.028

Table 21. Trace Noise Phase (deg rms)

Ratioed measurement, nominal power at test port.

Description	1 kHz IFBW Specification	1 kHz IFBW Typical	100 kHz IFBW Typical	600 kHz IFBW Typical
10 MHz to 50 MHz	0.40	0.1441	1.400	4.000
50 MHz to 100 MHz	0.02	0.0095	0.092	0.220
100 MHz to 500 MHz	0.02	0.0046	0.044	0.110
500 MHz to 1 GHz	0.02	0.0018	0.017	0.041
1 GHz to 26.5 GHz	0.02	0.0075	0.016	0.039
26.5 GHz to 43.5 GHz	0.03	0.0120	0.044	0.130
43.5 GHz to 46 GHz	0.03	0.0193	0.055	0.130
46 GHz to 47 GHz	0.03	0.0193	0.055	0.130
47 GHz to 50 GHz	0.03	0.0193	0.055	0.130
50 GHz to 65 GHz	0.04	0.0193	0.055	0.130
65 GHz to 67 GHz	0.04	0.0193	0.055	0.130
67 GHz to 70 GHz		0.0200	0.086	0.200

Table 22. Reference Level Magnitude

Description	Specification (dB)
Range	+/-500
Resolution	0.001

Table 23. Reference Level Phase

Description	Specification (degree)
Range	+/-500
Resolution	0.01

Table 24. Stability Magnitude (dB/°C)

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

Description	Specification	Typical
10 MHz to 50 MHz		0.05
50 MHz to 3.2 GHz		0.01
3.2 GHz to 10 GHz		0.01
10 GHz to 16 GHz		0.01
16 GHz to 20 GHz		0.01
20 GHz to 26.5 GHz		0.02
26.5 GHz to 32 GHz		0.02
32 GHz to 40 GHz		0.02
40 GHz to 43.5 GHz		0.02
43.5 GHz to 47 GHz		0.02
47 GHz to 50 GHz		0.02
50 GHz to 65 GHz		0.03
65 GHz to 67 GHz		0.03
67 GHz to 70 GHz		0.05

Table 25. Stability Phase (°/°C)

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

Description	Specification	Typical
10 MHz to 50 MHz		0.4
50 MHz to 3.2 GHz		0.2
3.2 GHz to 10 GHz		0.2
10 GHz to 16 GHz		0.2
16 GHz to 20 GHz		0.3
20 GHz to 26.5 GHz		0.7
26.5 GHz to 32 GHz		0.7
32 GHz to 40 GHz		0.7
40 GHz to 43.5 GHz		0.7
43.5 GHz to 47 GHz		0.7
47 GHz to 50 GHz		0.7
50 GHz to 65 GHz		1.0
65 GHz to 67 GHz		1.0
67 GHz to 70 GHz		1.1

Table 26. Damage Input Level

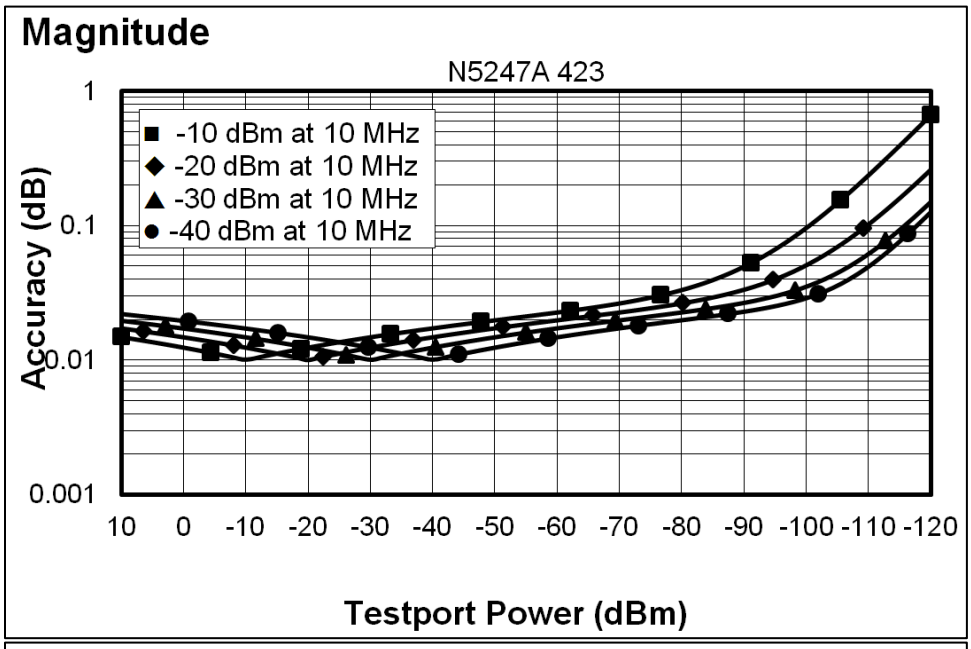
Description	Specification
Test Port 1 or 2 or 3 or 4	> +24 dBm RF, 40 VDC
(Option 224 only) Source 2 Out 1 or Source 2 Out 2	> +24 dBm RF, 0 VDC

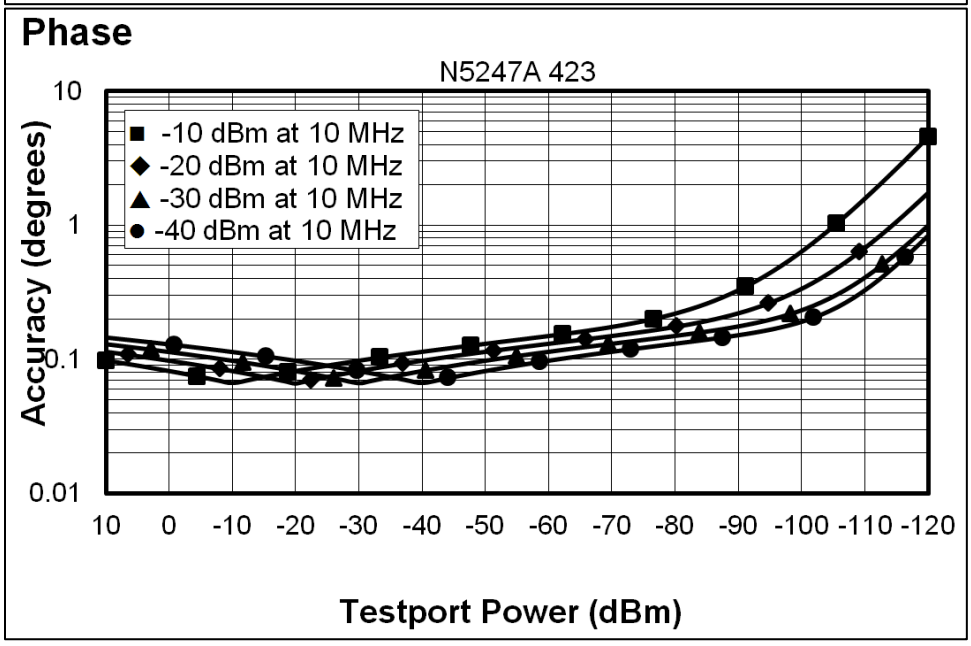
Dynamic Accuracy

Table 27. Dynamic Accuracy [1] (Specification)

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

Dynamic Accuracy [1], 10 MHz

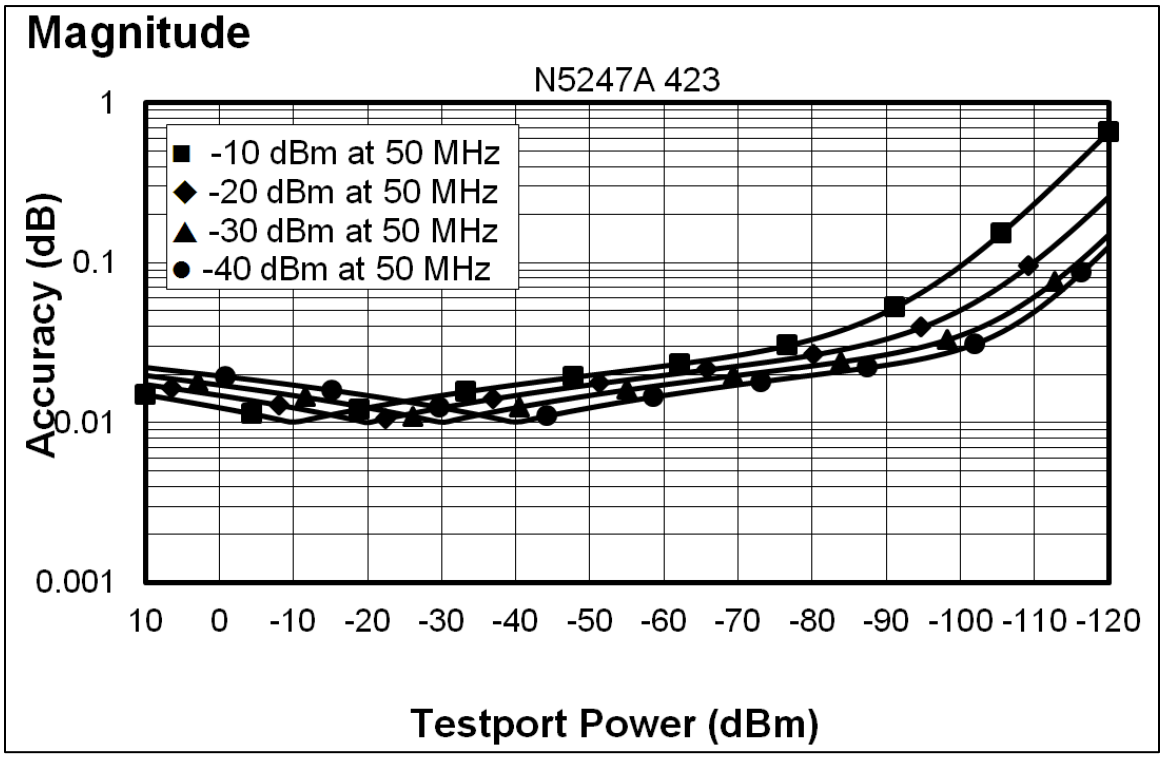


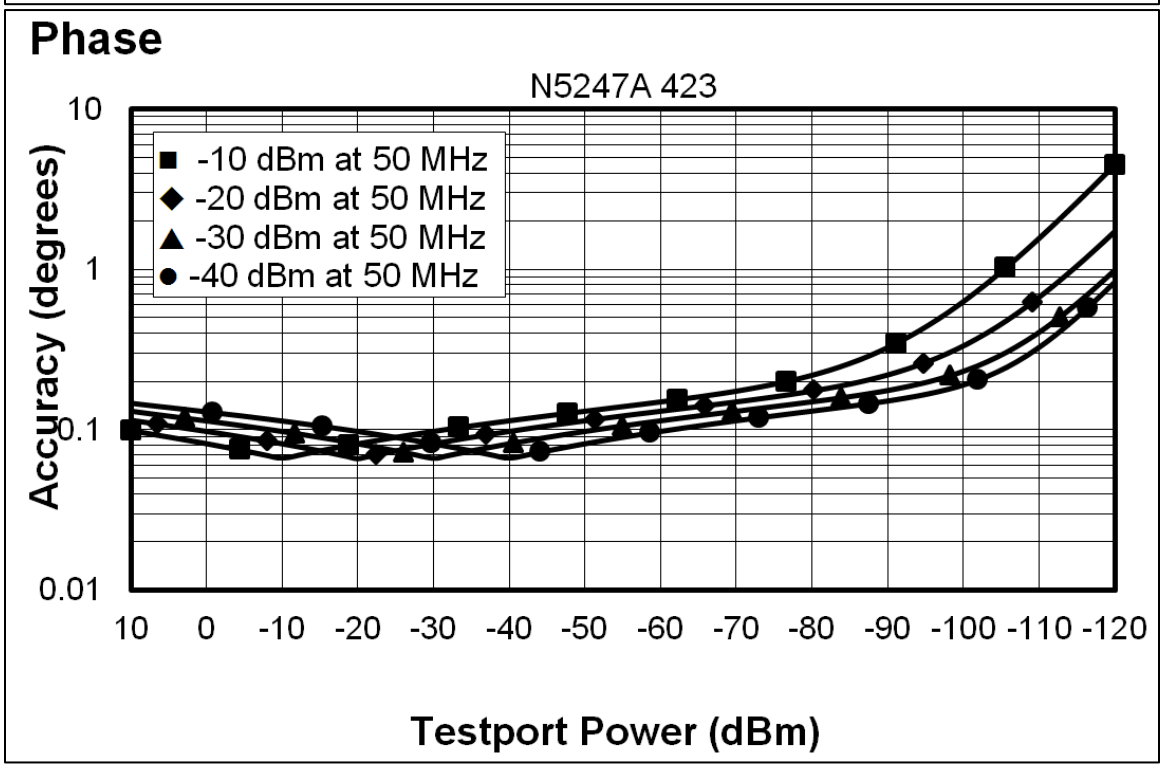


[1] Dynamic accuracy is verified with the following measurements:

- 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"

Dynamic Accuracy [1], 50 MHz

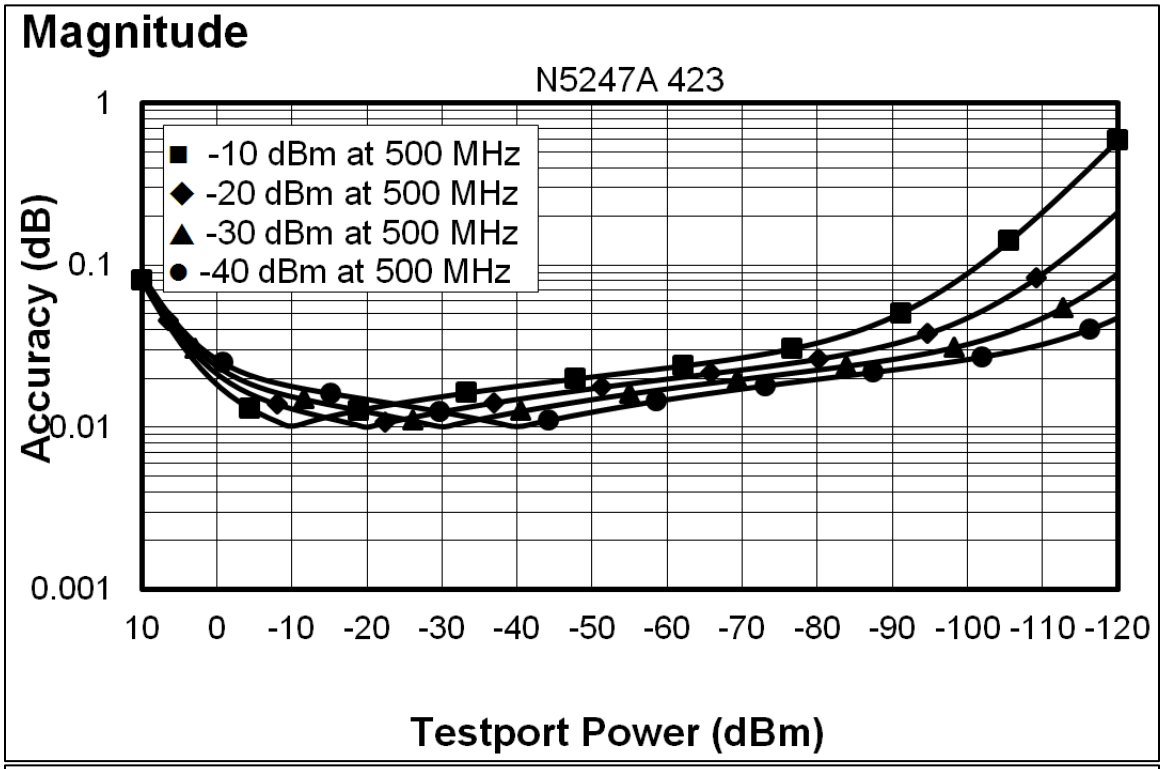


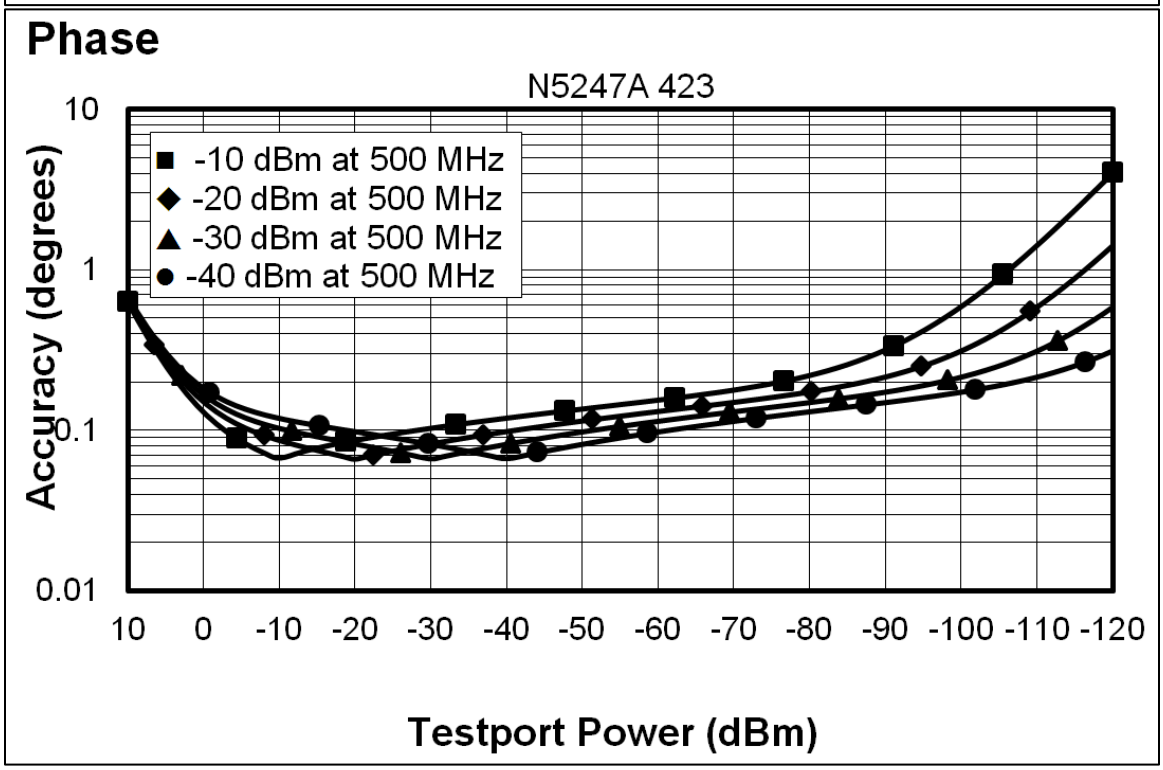


[1] Dynamic accuracy is verified with the following measurements:

- 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"

Dynamic Accuracy [1], 500 MHz

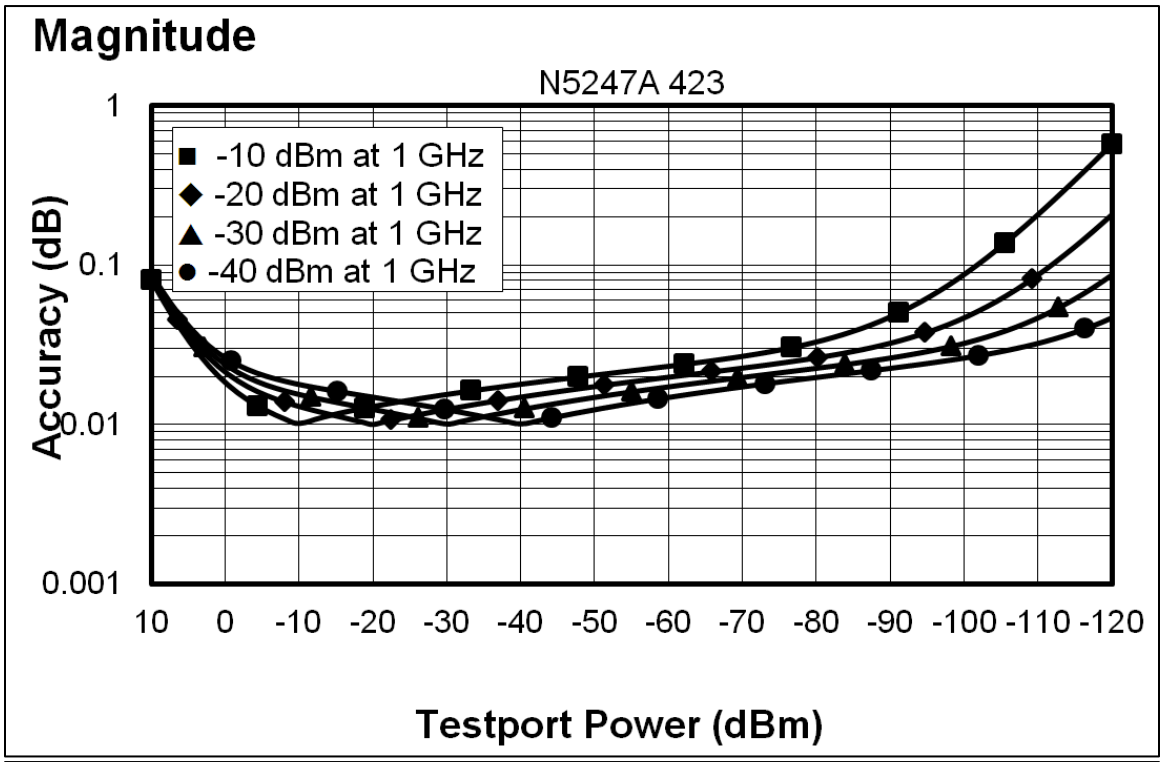


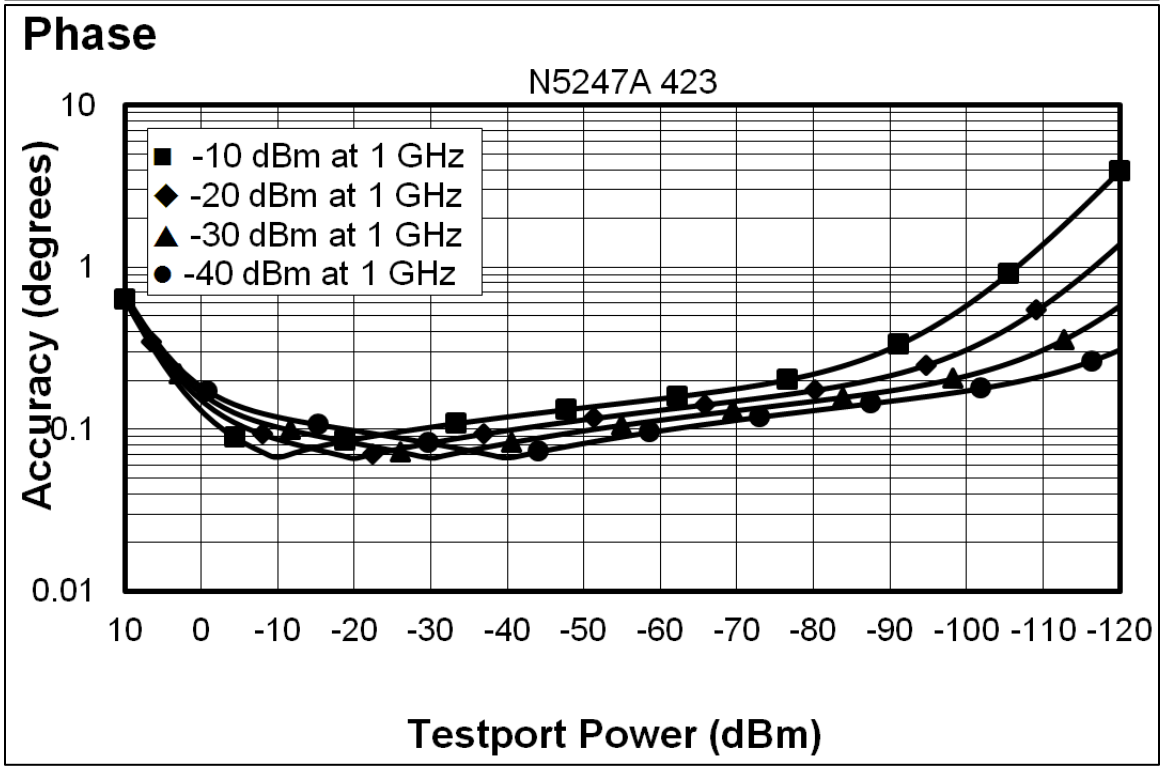


[1] Dynamic accuracy is verified with the following measurements:

- 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"

Dynamic Accuracy [1], 1 GHz

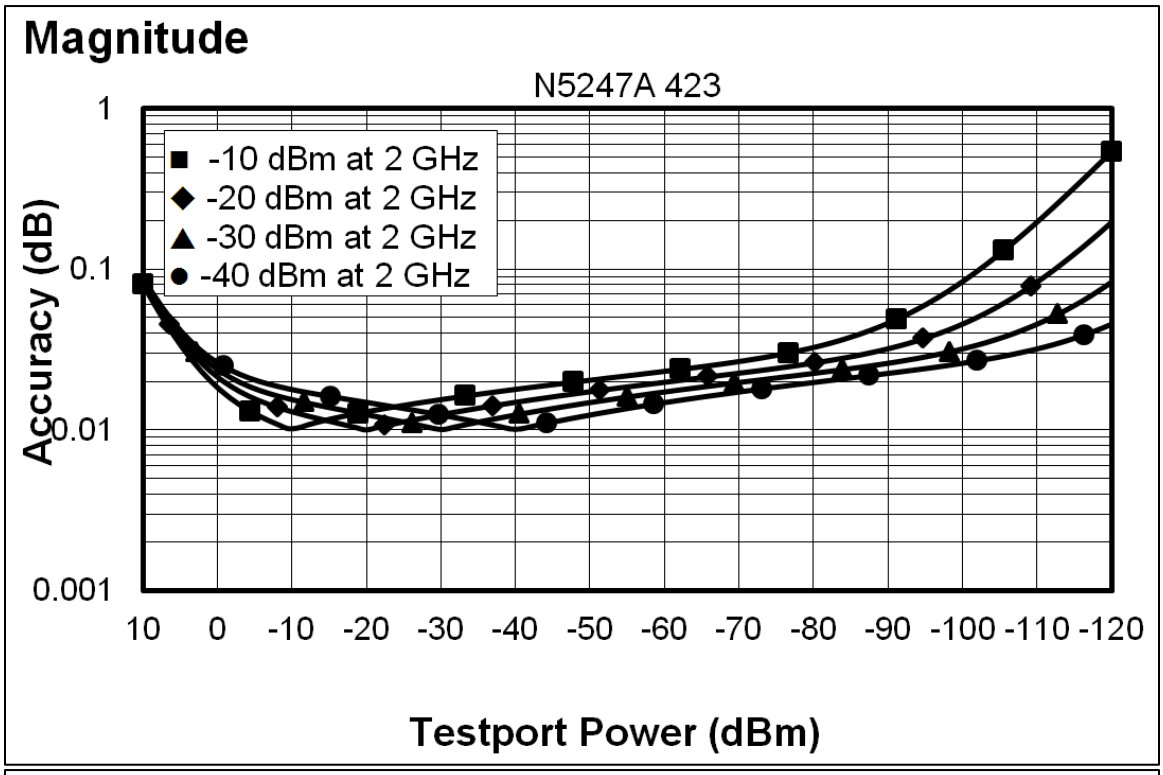


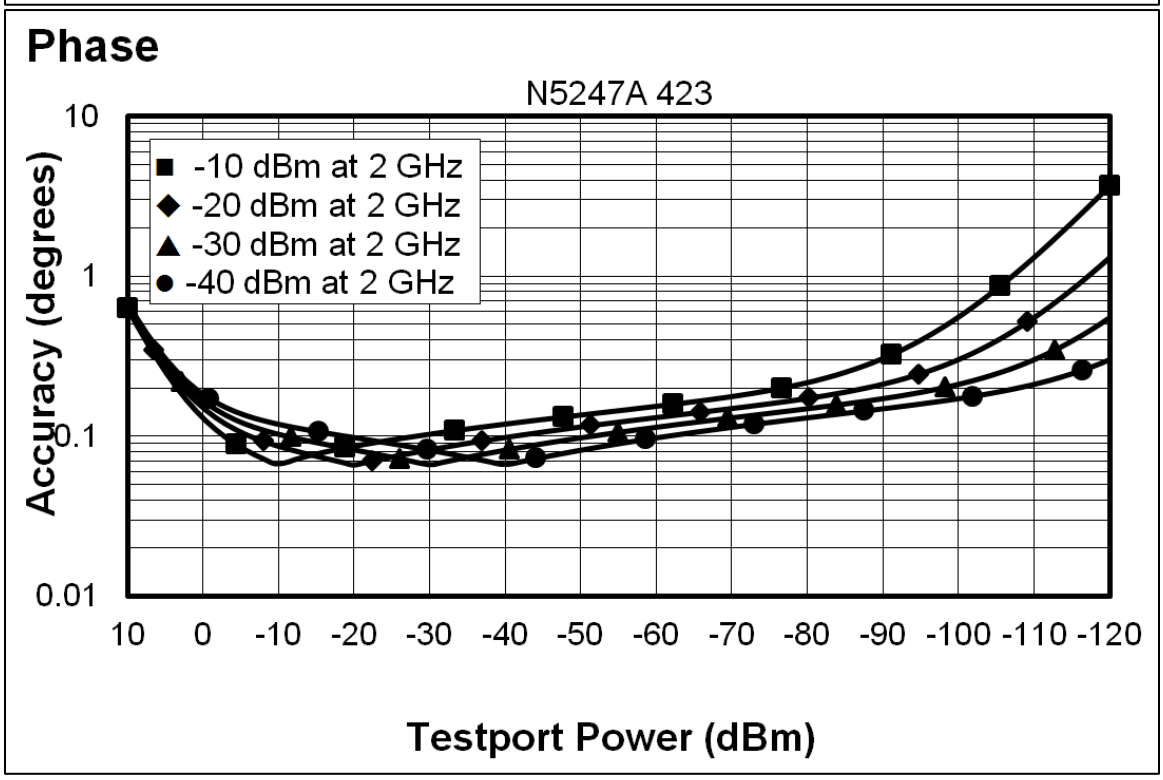


[1] Dynamic accuracy is verified with the following measurements:

- 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"

Dynamic Accuracy [1], 2 GHz

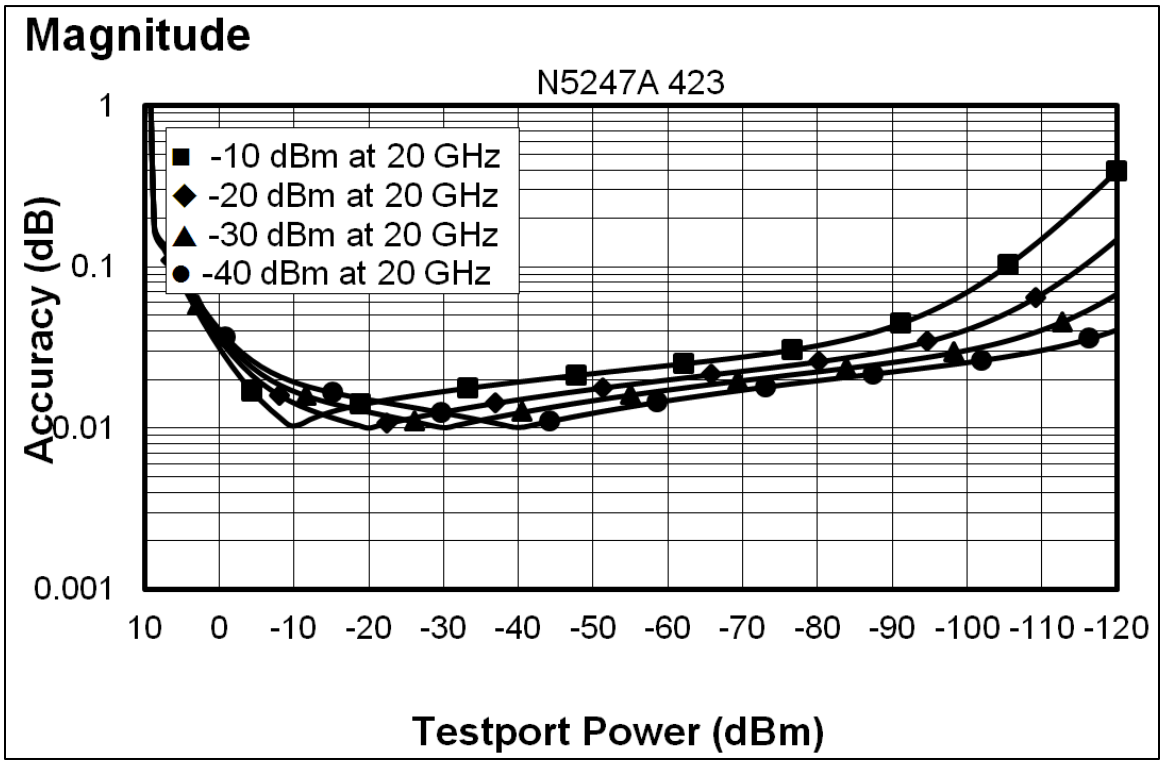


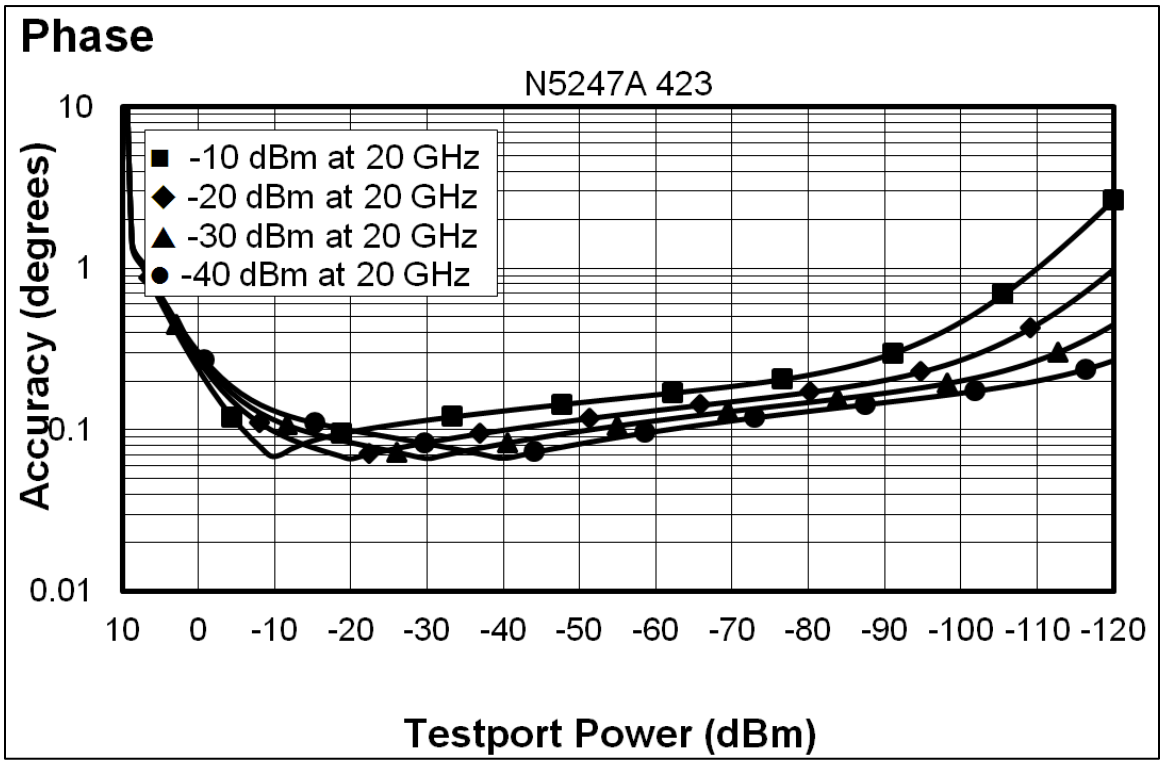


[1] Dynamic accuracy is verified with the following measurements:

- 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"

Dynamic Accuracy [1], 20 GHz

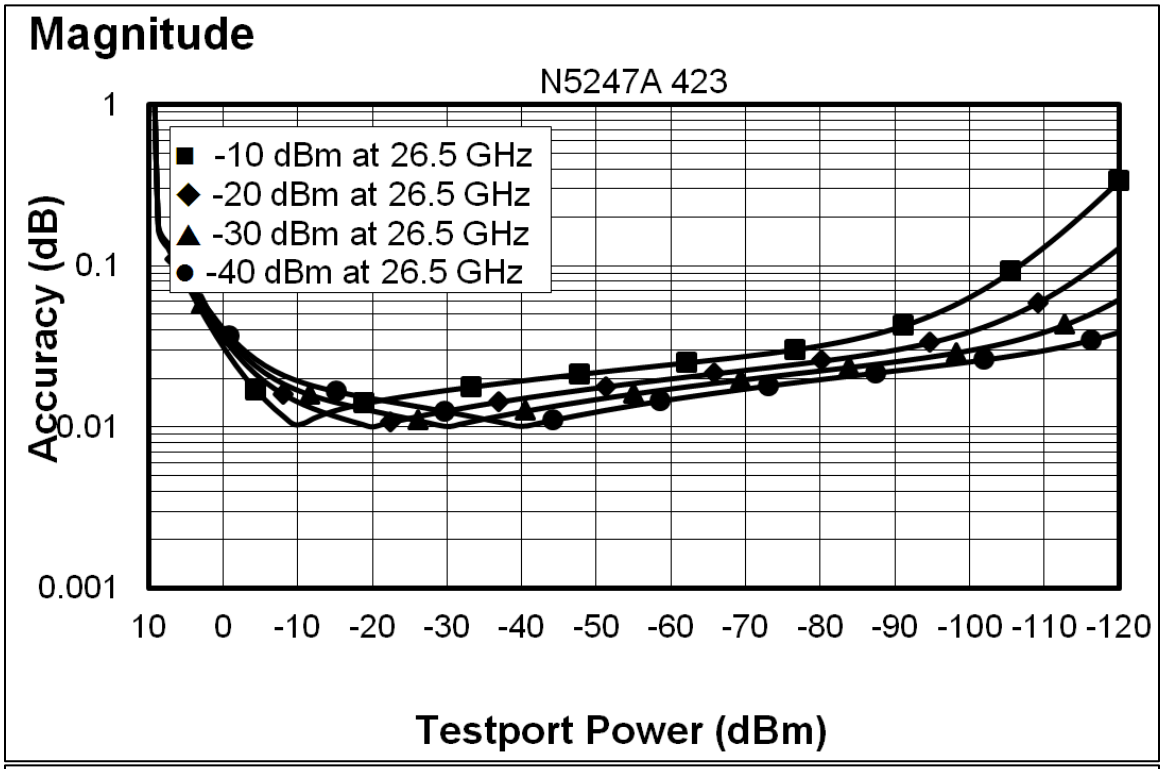


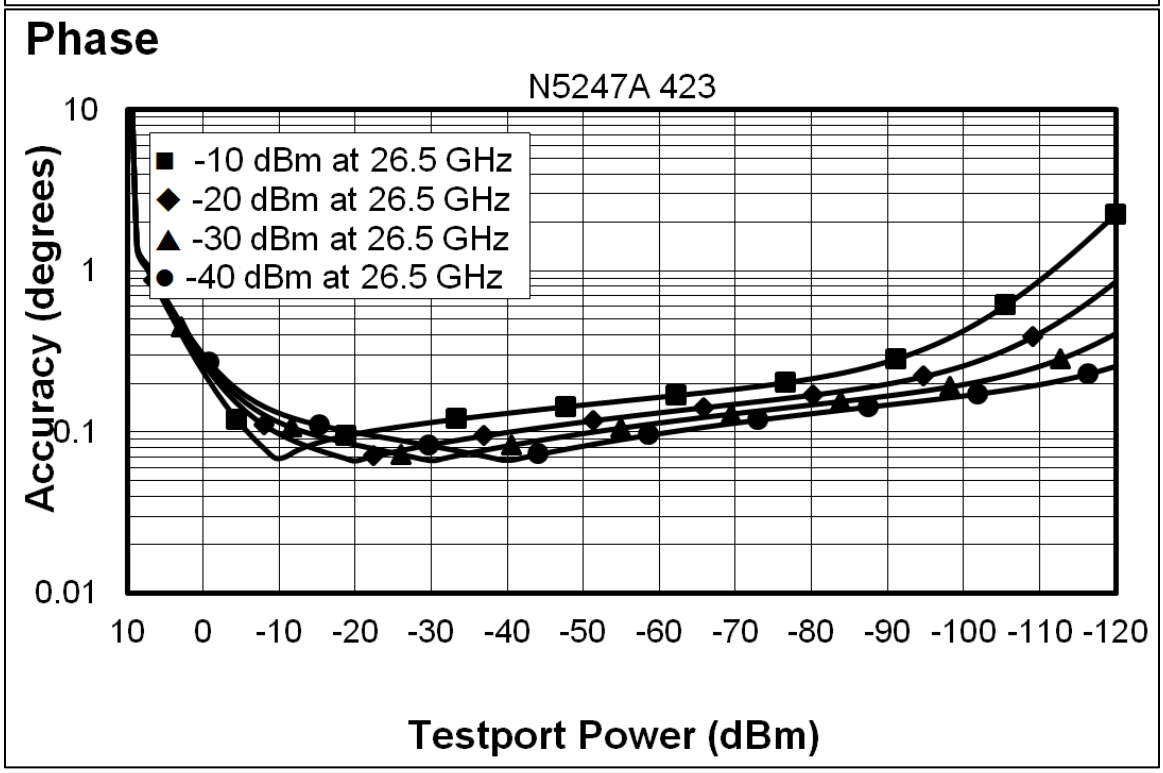


[1] Dynamic accuracy is verified with the following measurements:

- 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"

Dynamic Accuracy [1], 26.5 GHz

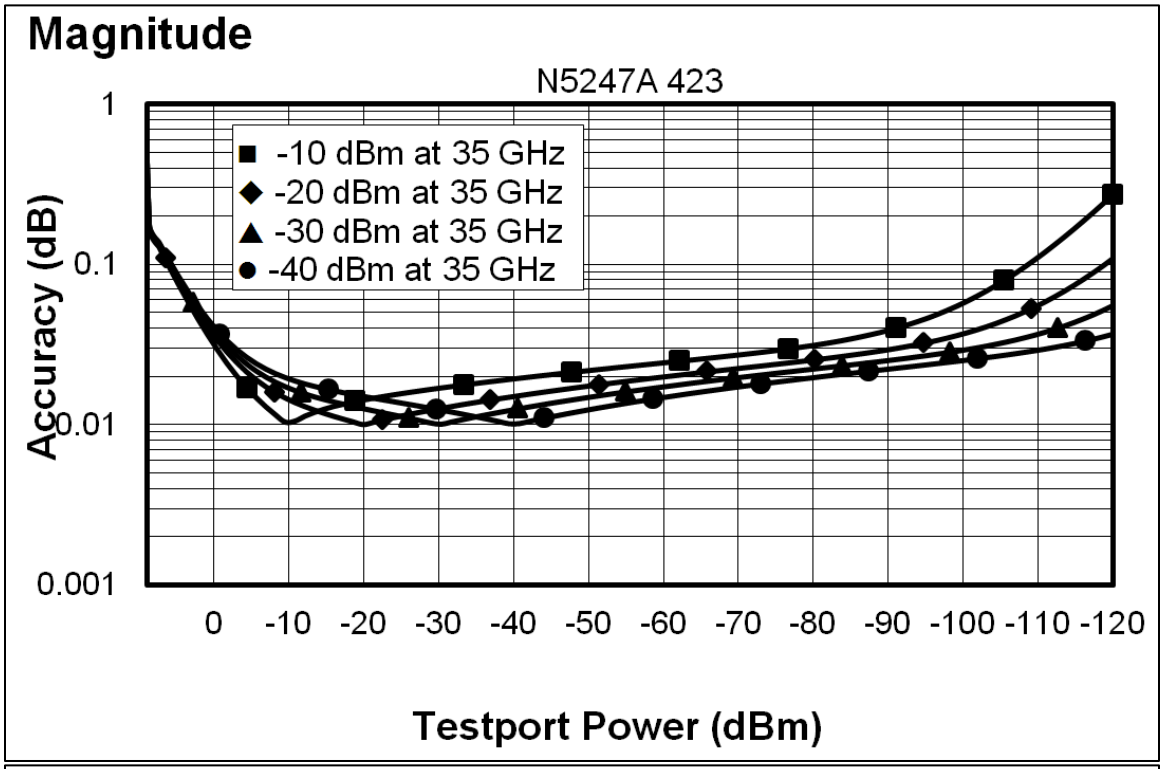


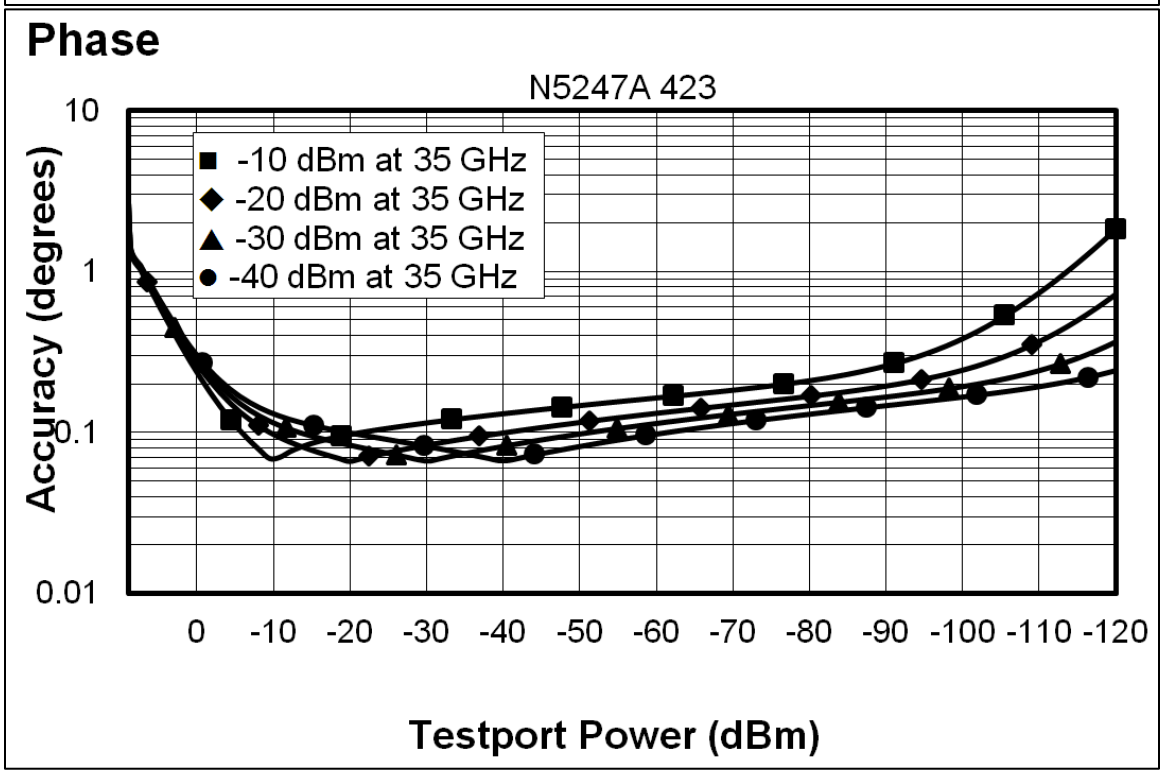


[1] Dynamic accuracy is verified with the following measurements:

- 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"

Dynamic Accuracy [1], 35 GHz

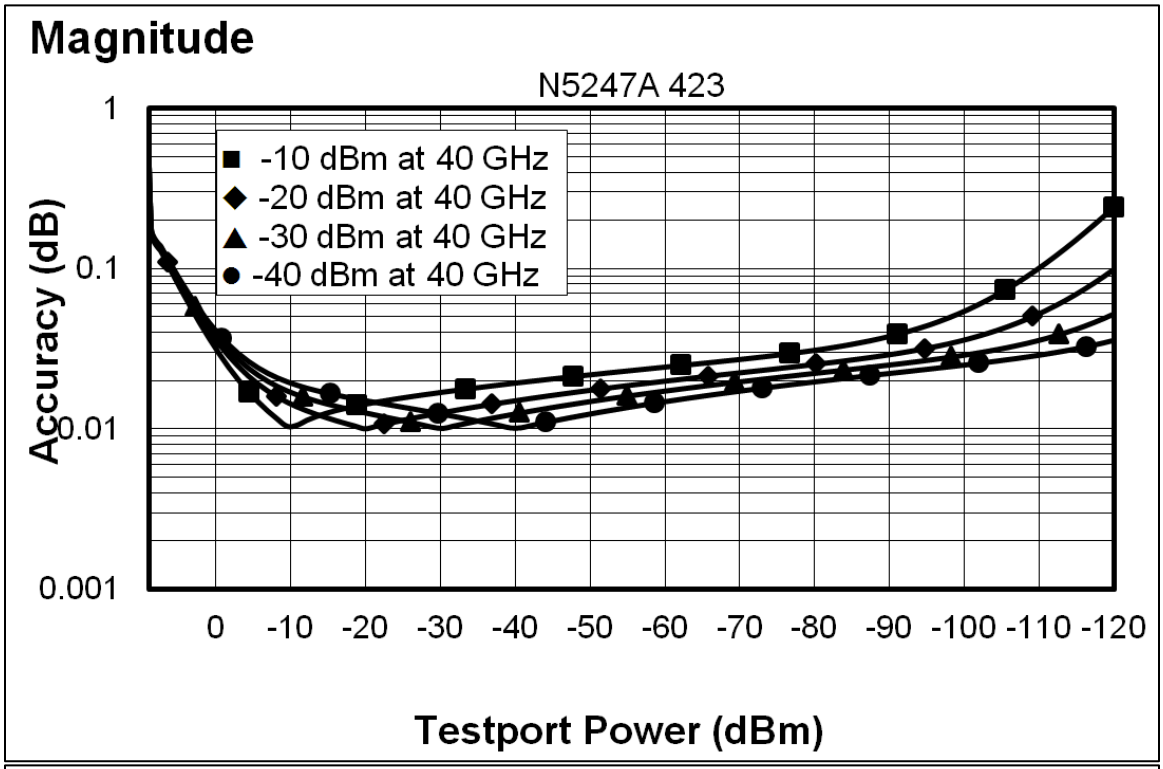


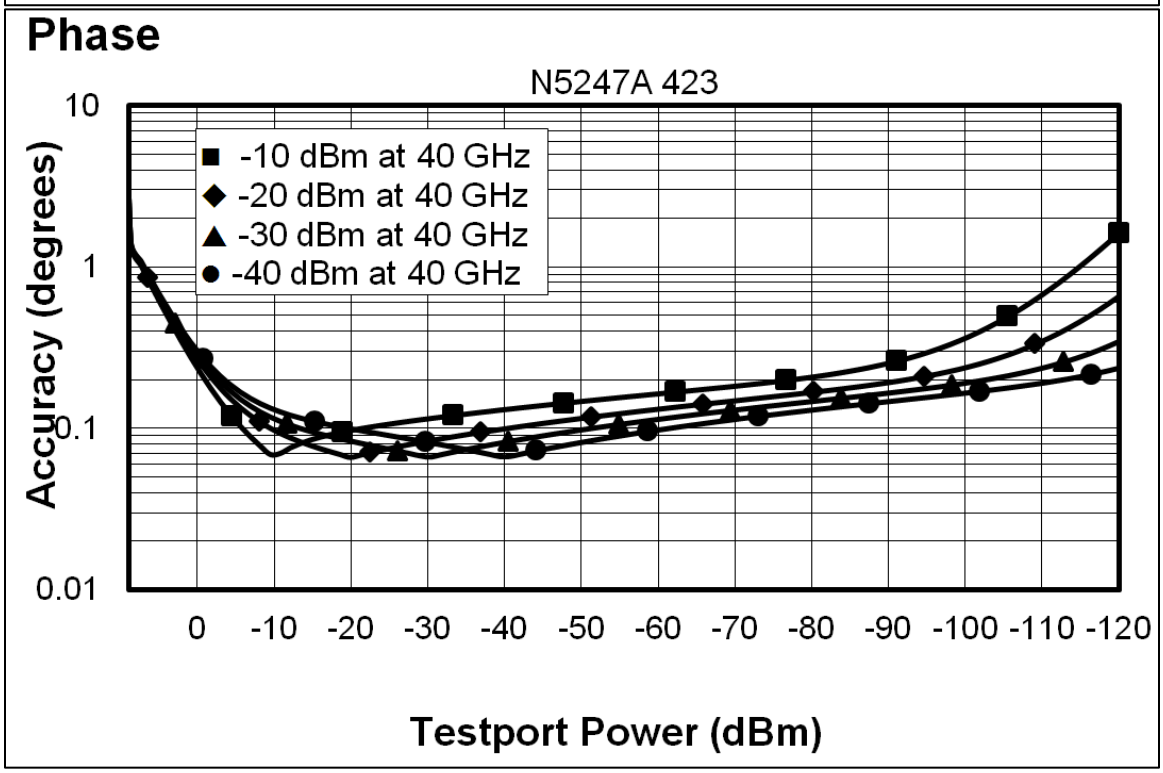


[1] Dynamic accuracy is verified with the following measurements:

- 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"

Dynamic Accuracy [1], 40 GHz

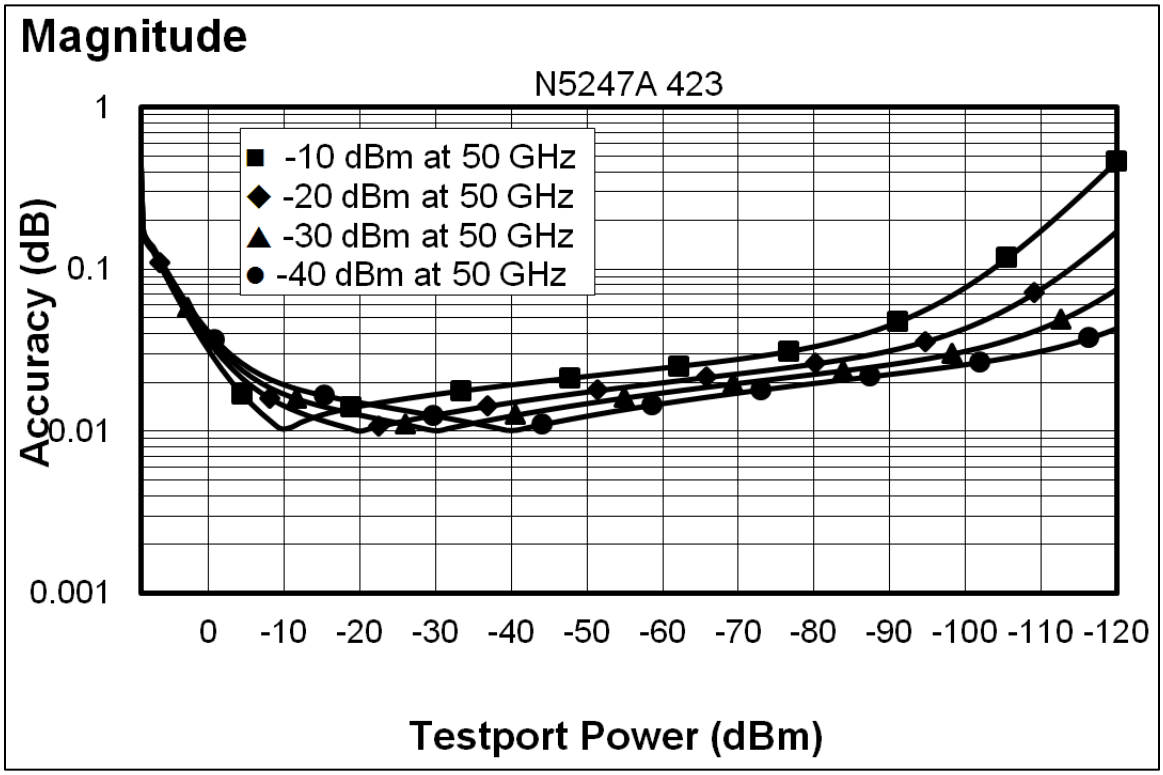


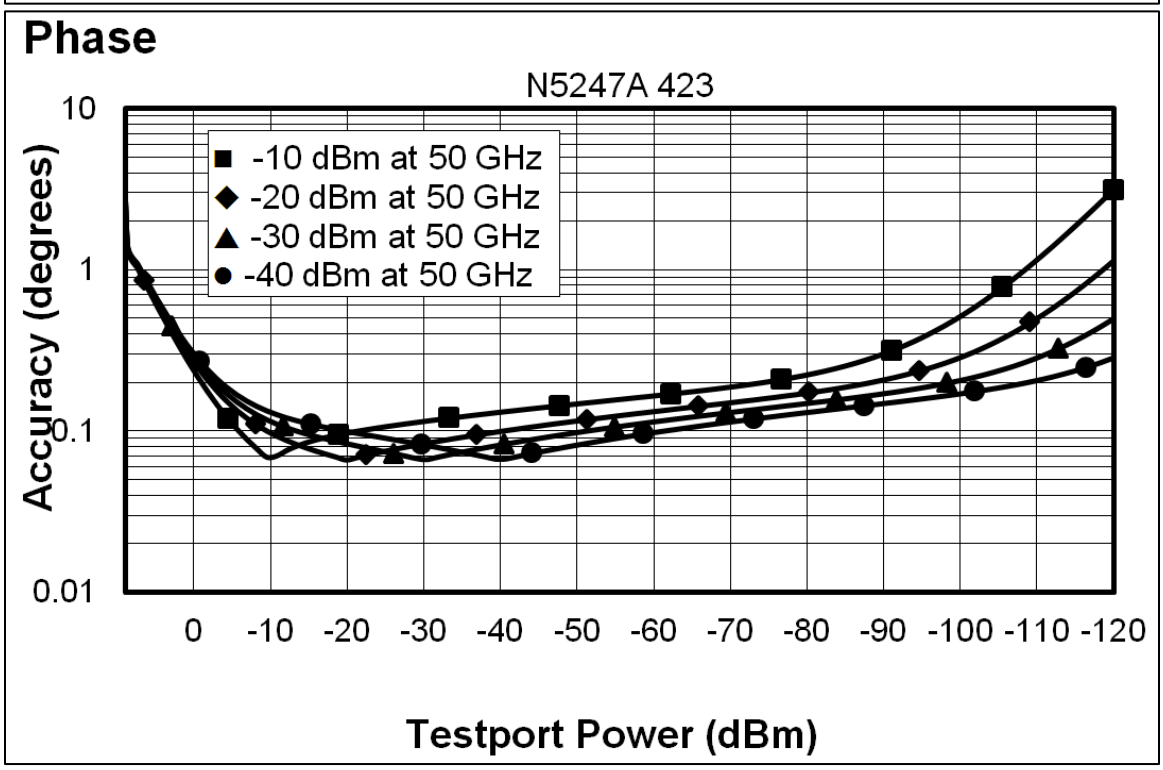


[1] Dynamic accuracy is verified with the following measurements:

- 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"

Dynamic Accuracy [1], 50 GHz

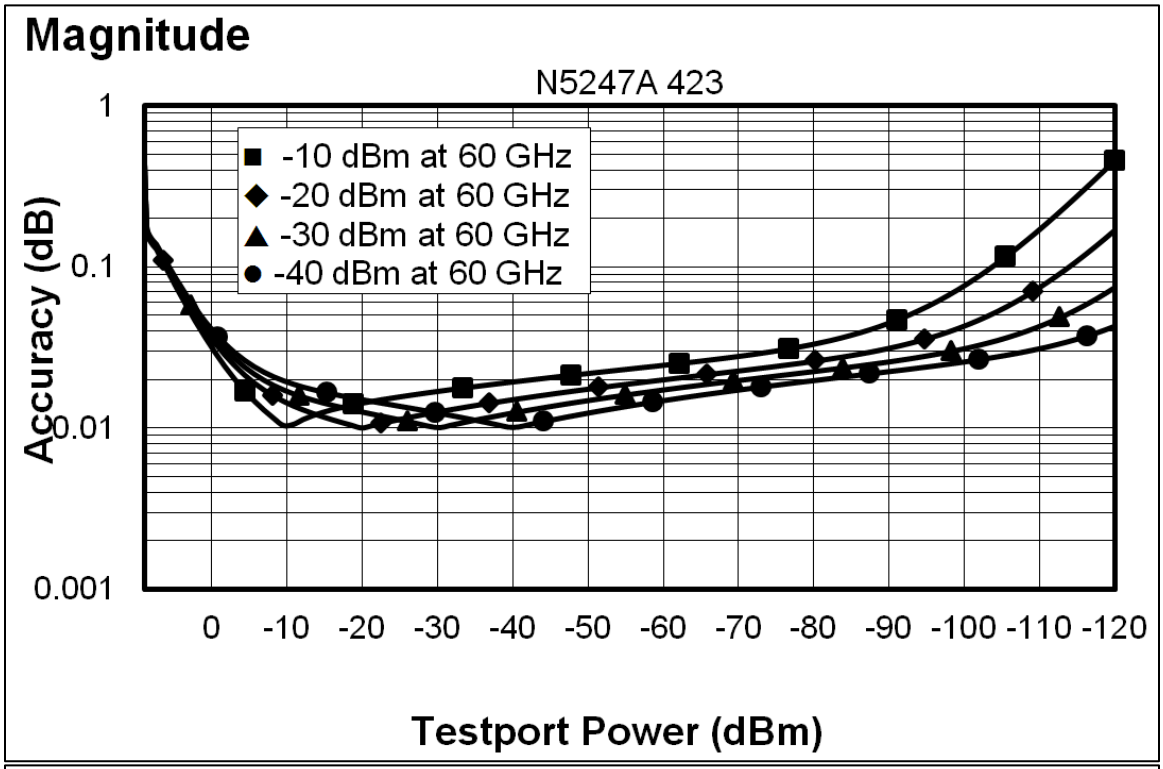


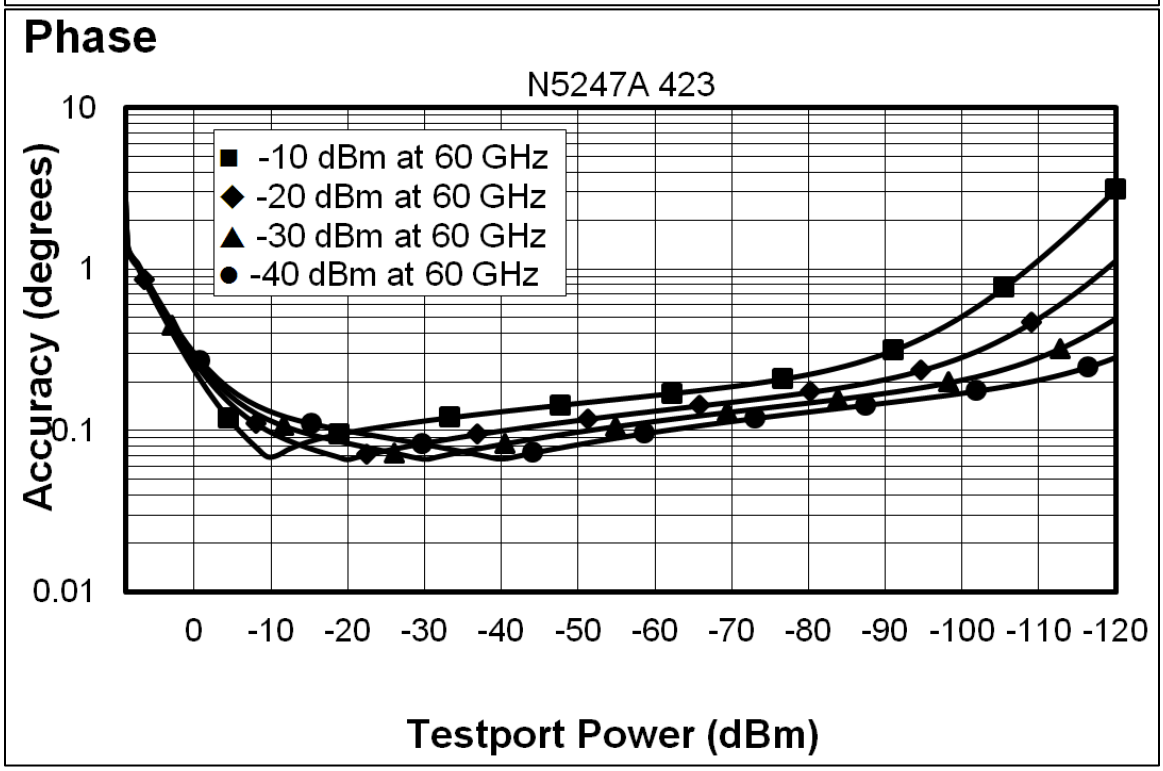


[1] Dynamic accuracy is verified with the following measurements:

- 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"

Dynamic Accuracy [1], 60 GHz

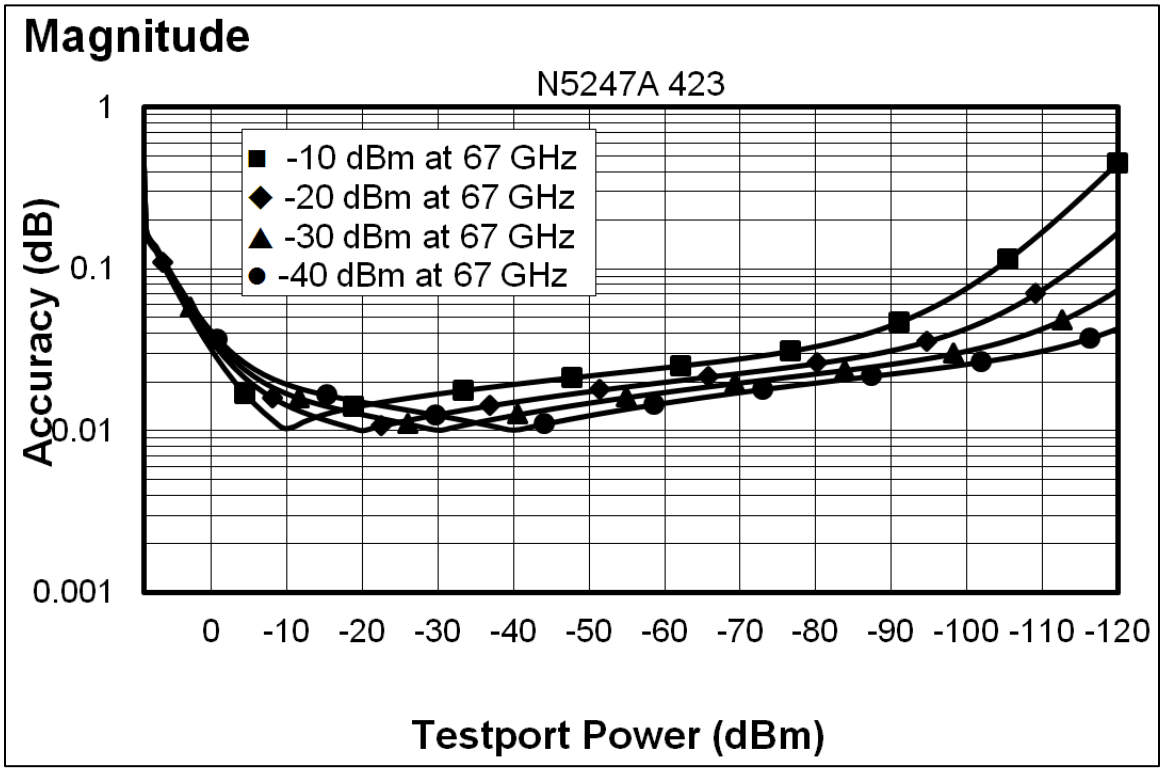


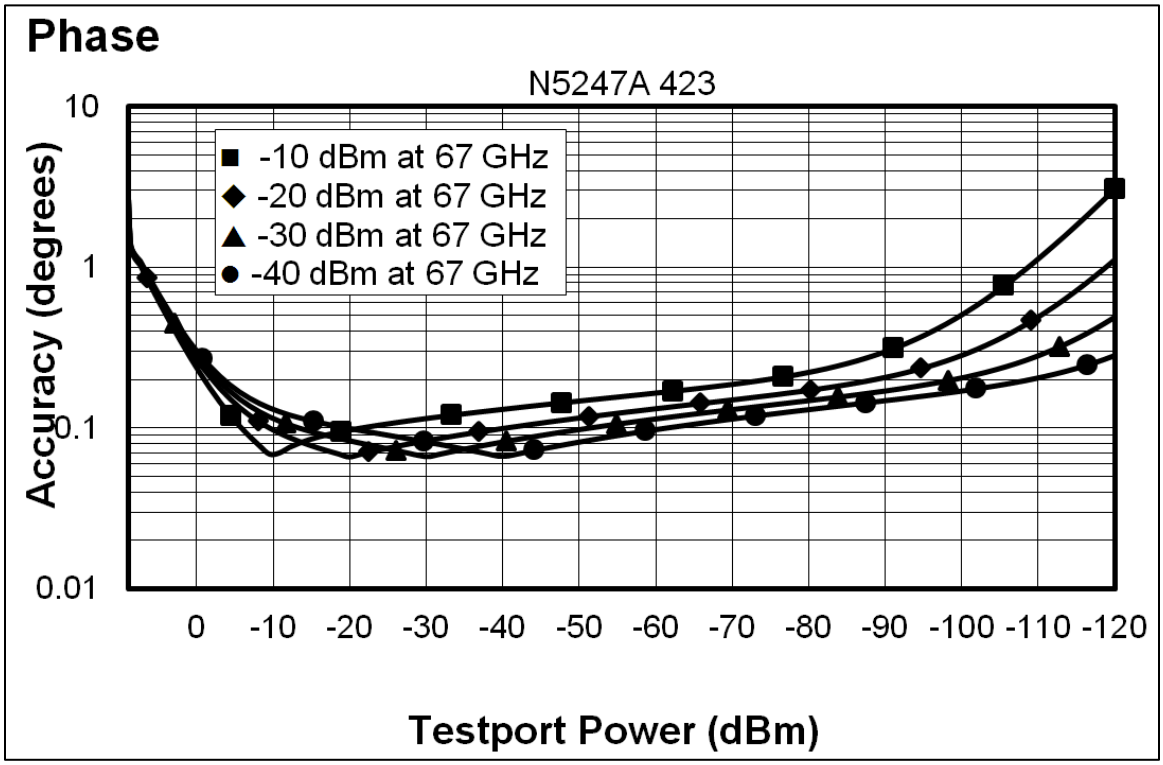


[1] Dynamic accuracy is verified with the following measurements:

- 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"

Dynamic Accuracy [1], 67 GHz





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

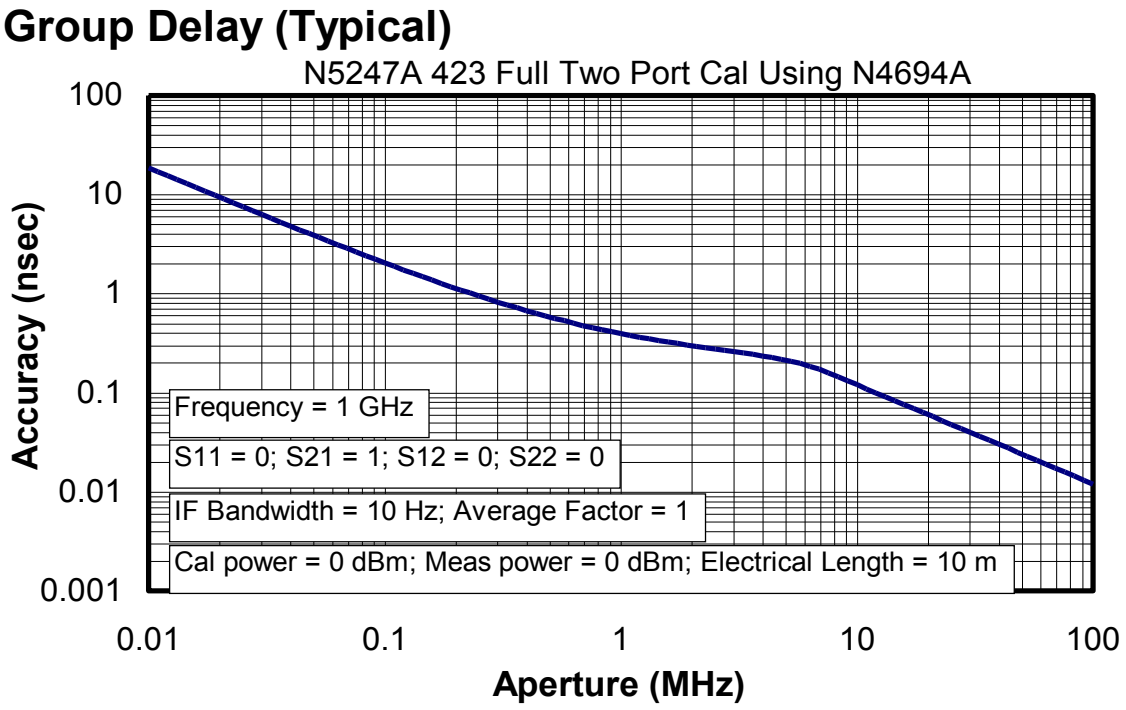
- Compression over frequency
- IF linearity at a single frequency of 1.998765GHz using a reference level of -20 dBm for an input power range of 0 to -60 dBm. For values below -60 dBm, refer to "VNA Receiver Dynamic Accuracy Specifications and Uncertainties"

Table 28. Test Port Input (Group Delay)[1]

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.)
Accuracy	See graph below

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 $kl \neq ij$



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.

[1] 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

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

Table 29. Miscellaneous Information

Description	Supplemental Information
System IF Bandwidth Range	1 Hz to 15 MHz (7 MHz, 10 MHz, and 15 MHz IFBWs are available ONLY with FW A.09.42 and later)
CPU	Intel® 2.0 GHz Core 2 Duo® with 4 GByte RAM
LXI	Class C

Table 30. Front Panel Information - All Options

Description	Typical Performance
RF Connectors	
Type	1.85 mm (male) , 50 ohm, (nominal)
Center Pin Recession	0.002 in. (characteristic)
USB 2.0 Ports - Master (4 ports)	
Standard	Compatible with USB 2.0
Connector	USB Type-A female
Display	
Size	26.3 cm (10.4 in) diagonal color active matrix LCD; 1024 (horizontal) X 768 (vertical) resolution
Refresh Rate	Vertical 60 Hz; Horizontal 46.08 kHz
Pixels	Any of the following would cause a display to be considered faulty: • A complete row or column consists of “stuck” or “dark” pixels. • More than six “stuck on” pixels (but not more than three green) or more than 0.002% of the total pixels are within the LCD specifications. • More than twelve “dark” pixels (but no more than seven of the same color) or more than 0.004% of the total pixels are within the LCD specifications. • Two or more consecutive "stuck on" pixels or three or more consecutive "dark" pixel (but no more than one set of two consecutive dark pixels) • “Stuck on” “dark” pixels are less than 6.5 mm apart (excluding consecutive pixels)

Table 30. (Continued) Front Panel Information - All Options

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 31. 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 31. (Continued) Rear Panel Information

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 = 2.479 MHz 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

Table 31. (Continued) Rear Panel Information

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
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 70 GHz

Rear Panel LO Power[1]	Upper Limit, Typical (dBm)	Lower Limit, Typical (dBm)
1.7 GHz to 6.759 GHz	5	-3
6.759 GHz to 15.5 GHz	0	-6
15.5 GHz to 26.5 GHz	4	-5

Rear Panel RF Power	Maximum Output Power, Typical (dBm)
3.2 GHz to 5 GHz	+3
5 GHz to 19 GHz	+8

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

Table 31. (Continued) Rear Panel Information

Description	Typical Performance
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").	
Bias Tee Inputs	
Connectors	BNC(f) 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.
GPIB	Two ports - dedicated controller and dedicated talker/listener. 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
USB Ports	Four ports on front panel (all Host) and five ports (four Host and one Device) on rear panel. Type A configuration (eight Host) and Type B configuration (one Device), USB 2.0 compatible. The total current limit for all rear panel USB ports is 2.0 amps. The total current limit for all front panel USB is 0.9 amps.
LAN	10/100BaseT Ethernet, 8-pin configuration; auto selects between the two data rates

Table 31. (Continued) Rear Panel Information

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

Table 32. Analyzer Dimensions and Weight

All N5247A models are shipped with bottom feet, handles, and front and rear hardware.

Cabinet Dimensions		Metric (mm)	Imperial (inches)
Height			
Without bottom feet:	[1] EIA RU1 = 6	266.1	10.5
With bottom feet		280.0	11.0
Width			
Without handles or rack-mount flanges		425.9	16.8
With handles, without rack-mount flanges		458.7	18.1
With handles and rack-mount flanges		482.9	19.0
Depth			
Without front and rear panel hardware		582.3	22.9
With front and rear panel hardware, handles		649.6	25.6

[1]Electronics Industry Association rack units. 1 RU = 1.75 in.

See detailed PNA dimension drawings at: http://na.tm.agilent.com/pna/PNADimensions.pdf

Weight		
	2-port models (Option 200 or 219 or 224)	**4-port models (Option 400 or 419 or 423)**
Net	42.2 kg (93 lb), nominal	44.9 kg (99 lb), nominal
Shipping	57.6 kg (127 lb), nominal	60.3 kg (133 lb), nominal

Operating Environment

For Regulatory and Environmental information, refer to the PNA Series Installation and Quick Start Guide, located online at http://cp.literature.agilent.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

Table 33. Typical Cycle Time[1] (ms) for Measurement Completion

All Options

	Number of Points				
	201	**401**	**1601**	**16001**	**32001**
Start 9 GHz, Stop 10 GHz, 600 kHz IF bandwidth					
Uncorrected	9.7	12.2	31	258	524
2-Port cal	25.3	31	69	539	1077
Start 9 GHz, Stop 10 GHz, 10 kHz IF bandwidth					
Uncorrected	39	60	224	2194	4396
2-Port cal	84	128	456	4405	8822
Start 9 GHz, Stop 10 GHz, 1 kHz IF bandwidth					
Uncorrected	230	451	1764	17219	34220
2-Port cal	468	909	3536	34459	68474
Start 10 GHz, Stop 20 GHz, 600 kHz IF bandwidth					
Uncorrected	25	29	50	276	533
2-Port cal	58	65	107	563	1109
Start 10 GHz, Stop 20 GHz, 10 kHz IF bandwidth					
Uncorrected	73	134	287	2205	4405
2-Port cal	154	276	582	4431	8844
Start 10 GHz, Stop 20 GHz, 1 kHz IF bandwidth					
Uncorrected	238	464	1803	17564	34908
2-Port cal	484	935	3613	35156	69849

[1] 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 33. (Continued) Typical Cycle Time[1] (ms) for Measurement Completion

	Number of Points				
	201	**401**	**1601**	**16001**	**32001**
Start 10 MHz, Stop 67 GHz, 600 kHz IF bandwidth					
Uncorrected	60	82	121	393	664
2-Port cal	128	172	251	820	1420
Start 10 MHz, Stop 67 GHz, 10 kHz IF bandwidth					
Uncorrected	94	161	541	2433	4641
2-Port cal	232	366	1143	5197	10091
Start 10 MHz, Stop 67 GHz, 1 kHz IF bandwidth					
Uncorrected	260	491	1856	17908	35559
2-Port cal	879	1351	4259	38991	77239

[1] 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 34. 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 Performance	
IF Bandwidth (Hz)	**Cycle Time (ms)[1]**	**Trace Noise Magnitude (dB rms)**
600,000	10	0.035
100,000	9.3	0.013
30,000	12.5	0.009
10,000	33	0.005
3,000	75	0.0032
1,000	225	0.003
300	644	0.002
100	1828	0.0015
30	5986	0.0013
10	17837	0.0013
3	59282	0.0014

[1] Cycle time includes sweep and retrace time.

Table 35. Cycle Time[1] 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 Performance			
	IF Bandwidth (Hz)			
Number of Points	1,000	10,000	30,000	600,000
3	9.1	7.8	7.8	7.8
11	18.2	9.1	8.2	8.2
51	62	12.8	8.5	8.5
101	117	20	9.7	9.4
201	226	33	13.2	10
401	443	61	21	13.5
801	873	115	37	19.1
1,601	1729	225	67	32
6,401	6806	884	252	112
16,001	16859	2205	620	272
32,001	33503	4416	1241	544

[1] Cycle time includes sweep and retrace time. Typical performance.

Table 36. Data Transfer Time (ms)

Description	Typical Performance				
	Number of Points				
	201	401	1601	16,001	32,001
SCPI over GPIB (Program executed on external PC[2])					
32-bit floating point	5.6	10.5	39.9	400	800
64-bit floating point	10.5	20.3	79.2	788	1576
ASCII	46	92.5	370	3702	5404
SCPI over SICL/LAN or TCP/IP Socket (Program executed in the analyzer)					
32-bit floating point	0.18	0.21	0.5	3.6	7.2
64-bit floating point	0.22	0.28	0.62	5.3	10.6
ASCII	6.3	12.3	47.3	47.0	940
COM[3] (Program executed in the analyzer)					
32-bit floating point	<0.2	<0.2	<0.2	0.46	0.9
Variant type	0.6	1	3.5	35	75
DCOM over LAN[3] (Program executed on external PC)					
32-bit floating point	0.35	0.35	0.54	2.65	5.3
Variant type	1.1	1.8	6.5	64	128

[1] Measured with the analyzer display off. Values will increase slightly if the analyzer display is on.

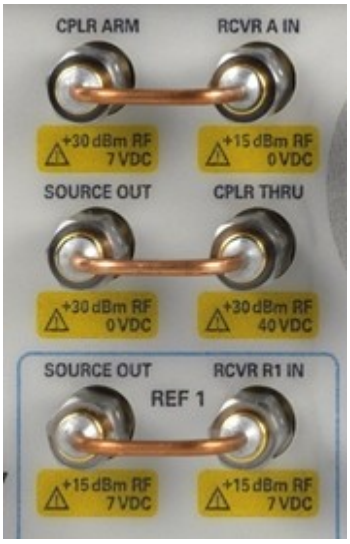
[2] Measured when using the SCPI command DISPlay: VISible OFF.

[3] 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 N5247A analyzers.

Specifications: Front-Panel Jumpers

Note: All PNA-X options have the following front-panel jumpers for each port.



- Measurement Receiver Inputs
- Reference Receiver Inputs
- Reference Outputs (Source Out)
- Source Outputs
- Coupler Inputs

Table 37. Measurement Receiver Inputs

(RCVR A, B, C, D IN) @ 0.1dB Typical Compression

Description	Typical Performance
	Maximum Input Level (dBm), All Options
10 MHz to 50 MHz[1]	--
50 MHz to 500 MHz[1]	--
500 MHz-to 1 GHz	-4
1 GHz to 2 GHz	-4
2 GHz to 3.2 GHz	-4
3.2 GHz to 10 GHz	-5
10 GHz to 16 GHz	-5
16 GHz to 26.5 GHz	-5
26.5 GHz to 30 GHz	-4
30 GHz to 32 GHz	-4
32 GHz to 35 GHz	-4
35 GHz to 40 GHz	-4
40 GHz to 50 GHz	-4
50 GHz to 60 GHz	-3
60 GHz to 64 GHz	-3
64 GHz to 67 GHz	-4
67 GHz to 70 GHz	-2
Damage Level	+15 dBm
Maximum DC Level	0 V

[1]Test port receiver compression at specified input levels below 500 MHz is negligible due to coupler roll off in this frequency range.

Table 38. Reference Receiver Input

(RCVR R1 IN) @ Max Specified Output Power

Description	Typical Performance					
	Maximum Input Level (dBm)					
	Option 200 or 400 Filtered Mode	Option 200 or 400 Hi Pwr Mode	Option 224 or 423 Filtered Mode	Option 219 or 419 Filtered Mode	Option 219 or 419 Hi Pwr Mode	Option 224 or 423 Hi Pwr Mode
10 MHz to 50 MHz	-33	-25	-32	-32	-27	-25
50 MHz to 500 MHz	-21	-16	-19	-19	-14	-14
500 MHz-to 1 GHz	-14	-9	-15	-14	-9	-9
1 GHz to 2 GHz	-11	-6	-12	-11	-5	-6
2 GHz to 3.2 GHz	-10	-10	-11	-11	-11	-11
3.2 GHz to 10 GHz	-8	-8	-9	-9	-9	-9
10 GHz to 16 GHz	-10	-10	-12	-11	-11	-12
16 GHz to 26.5 GHz	-12	-12	-14	-13	-13	-14
26.5 GHz to 30 GHz	-13	-13	-15	-14	-14	-15
30 GHz to 32 GHz	-16	-16	-17	-16	-16	-17
32 GHz to 35 GHz	-14	-14	-16	-15	-15	-16
35 GHz to 40 GHz	-17	-17	-20	-19	-19	-20
40 GHz to 50 GHz	-12	-12	-15	-14	-14	-15
50 GHz to 60 GHz	-12	-12	-15	-14	-14	-15
60 GHz to 64 GHz	-12	-12	-17	-15	-15	-17
64 GHz to 67 GHz	-12	-12	-16	-14	-14	-16
67 GHz to 70 GHz	-21	-21		-22	-22	
Damage Level	+15 dBm					
Maximum DC Level	+/-7 VDC					

Table 39a. Reference Receiver Input

(RCVR R2, R3, R4 IN) @ Max Specified Output Power

Description	Typical Performance					
	Maximum Input Level (dBm)					
	Option 400 RCVR R3 IN Filtered Mode	Option 400 RCVR R3 IN Hi Pwr Mode	Option 200 or 400 RCVR R2 IN RCVR R4 IN	Option 419 RCVR R3 IN Filtered Mode	Option 419 RCVR R3 IN Hi Pwr Mode	Option 219 or 419 RCVR R2 IN RCVR R4 IN
10 MHz to 50 MHz	-31	-23	-27	-31	-26	-25
50 MHz to 500 MHz	-19	-14	-14	-18	-13	-14
500 MHz-to 1 GHz	-9	-4	-4	-9	-4	-4
1 GHz to 2 GHz	-6	-1	-1	-6	-1	-1
2 GHz to 3.2 GHz	-5	-5	-1	-6	-6	-1
3.2 GHz to 10 GHz	-2	-2	-2	-3	-3	-2
10 GHz to 16 GHz	-4	-4	-4	-5	-5	-5
16 GHz to 26.5 GHz	-5	-5	-5	-6	-6	-6
26.5 GHz to 30 GHz	-5	-5	-5	-7	-7	-7
30 GHz to 32 GHz	-9	-9	-9	-9	-9	-9
32 GHz to 35 GHz	-6	-6	-6	-7	-7	-8
35 GHz to 40 GHz	-10	-10	-10	-11	-11	-12
40 GHz to 50 GHz	-4	-4	-4	-5	-5	-6
50 GHz to 60 GHz	-3	-3	-3	-5	-5	-6
60 GHz to 64 GHz	-2	-2	-2	-4	-4	-6
64 GHz to 67 GHz	-1	-1	-1	-3	-3	-5
67 GHz to 70 GHz	-2	-2	-2	-6	-6	-8
Damage Level	+15 dBm					
Maximum DC Level	0 VDC					

Table 39b. Reference Receiver Input

(RCVR R2, R3, R4 IN) @ Max Specified Output Power

Description	Typical Performance		
	Maximum Input Level (dBm)		
	Option 423 RCVR R3 IN Filtered Mode	Option 423 RCVR R3 IN Hi Pwr Mode	Option 224 or 423 RCVR R2 IN RCVR R4 IN Filtered Mode Note: No filtered mode for ports 2 & 4
10 MHz to 50 MHz	-31	-25	-29
50 MHz to 500 MHz	-18	-13	-16
500 MHz-to 1 GHz	-11	-5	-4
1 GHz to 2 GHz	-7	-1	-1
2 GHz to 3.2 GHz	-6	-6	-1
3.2 GHz to 10 GHz	-3	-3	-2
10 GHz to 16 GHz	-5	-5	-6
16 GHz to 26.5 GHz	-7	-7	-7
26.5 GHz to 30 GHz	-7	-7	-8
30 GHz to 32 GHz	-9	-9	-10
32 GHz to 35 GHz	-8	-8	-9
35 GHz to 40 GHz	-12	-12	-13
40 GHz to 50 GHz	-6	-6	-7
50 GHz to 60 GHz	-6	-6	-7
60 GHz to 64 GHz	-7	-7	-9
64 GHz to 67 GHz	-5	-5	-7
Damage Level	+15 dBm		
Maximum DC Level	0 VDC		

Table 40. Reference Output

(REF 1 SOURCE OUT) @ Max Specified Output Power

Description	Typical Performance					
	Maximum Input Level (dBm)					
	Option 200 or 400 Filtered Mode	Option 200 or 400 Hi Pwr Mode	Option 219 or 419 Filtered Mode	Option 219 or 419 Hi Pwr Mode	Option 224 or 423 Filtered Mode	Option 224 or 423 Hi Pwr Mode
10 MHz to 50 MHz	-33	-25	-32	-27	-32	-25
50 MHz to 500 MHz	-21	-16	-19	-14	-19	-14
500 MHz-to 1 GHz	-14	-9	-14	-9	-15	-9
1 GHz to 2 GHz	-11	-6	-11	-5	-12	-6
2 GHz to 3.2 GHz	-10	-10	-11	-11	-11	-11
3.2 GHz to 10 GHz	-8	-8	-9	-9	-9	-9
10 GHz to 16 GHz	-10	-10	-11	-11	-12	-12
16 GHz to 26.5 GHz	-12	-12	-13	-13	-14	-14
26.5 GHz to 30 GHz	-13	-13	-14	-14	-15	-15
30 GHz to 32 GHz	-16	-16	-16	-16	-17	-17
32 GHz to 35 GHz	-14	-14	-15	-15	-16	-16
35 GHz to 40 GHz	-17	-17	-19	-19	-20	-20
40 GHz to 50 GHz	-12	-12	-14	-14	-15	-15
50 GHz to 60 GHz	-12	-12	-14	-14	-15	-15
60 GHz to 64 GHz	-12	-12	-15	-15	-17	-17
64 GHz to 67 GHz	-12	-12	-14	-14	-16	-16
67 GHz to 70 GHz	-21	-21	-22	-22		
Damage Level	+15 dBm					
Maximum DC Level	+/-7 VDC					

Table 41a. Reference Output

(REF 2, 3, 4 SOURCE OUT) @ Max Specified Output Power

Description	Typical Performance					
	Maximum Input Level (dBm)					
	Option 400 REF 3 Source Out Filtered Mode	Option 400 REF 3 Source Out Hi Pwr Mode	Option 200 or 400 REF 2, 4 Source Out Filtered Mode	Option 419 REF 3 Source Out Filtered Mode	Option 419 REF 3 Source Out Hi Pwr Mode	Option 219 or 419 REF 2, 4 Source Out Filtered Mode
10 MHz to 50 MHz	-31	-23	-27	-31	-26	-25
50 MHz to 500 MHz	-19	-14	-14	-18	-13	-14
500 MHz-to 1 GHz	-9	-4	-4	-9	-4	-4
1 GHz to 2 GHz	-6	-1	-1	-6	-1	-1
2 GHz to 3.2 GHz	-5	-5	-1	-6	-6	-1
3.2 GHz to 10 GHz	-2	-2	-2	-3	-3	-2
10 GHz to 16 GHz	-4	-4	-4	-5	-5	-5
16 GHz to 26.5 GHz	-5	-5	-5	-6	-6	-6
26.5 GHz to 30 GHz	-5	-5	-5	-7	-7	-7
30 GHz to 32 GHz	-9	-9	-9	-9	-9	-9
32 GHz to 35 GHz	-6	-6	-6	-7	-7	-8
35 GHz to 40 GHz	-10	-10	-10	-11	-11	-12
40 GHz to 50 GHz	-4	-4	-4	-5	-5	-6
50 GHz to 60 GHz	-3	-3	-3	-5	-5	-6
60 GHz to 64 GHz	-2	-2	-2	-4	-4	-6
64 GHz to 67 GHz	-1	-1	-1	-3	-3	-5
67 GHz to 70 GHz	-2	-2	-2	-6	-6	-8
Damage Level	+15 dBm					
Maximum DC Level	+/-7 VDC					

Table 41b. Reference Output

(REF 2, 3, 4 SOURCE OUT) @ Max Specified Output Power

Description	Typical Performance		
	Maximum Input Level (dBm)		
	Option 423 REF 3 Source Out Filtered Mode	Options 423 REF 3 Source Out Hi Pwr Mode	Option 224 or 423 REF 2, 4 Source Out
10 MHz to 50 MHz	-31	-25	-29
50 MHz to 500 MHz	-18	-13	-16
500 MHz-to 1 GHz	-11	-5	-4
1 GHz to 2 GHz	-7	-1	-1
2 GHz to 3.2 GHz	-6	-6	-1
3.2 GHz to 10 GHz	-3	-3	-2
10 GHz to 16 GHz	-5	-5	-6
16 GHz to 26.5 GHz	-7	-7	-7
26.5 GHz to 30 GHz	-7	-7	-8
30 GHz to 32 GHz	-9	-9	-10
32 GHz to 35 GHz	-8	-8	-9
35 GHz to 40 GHz	-12	-12	-13
40 GHz to 50 GHz	-6	-6	-7
50 GHz to 60 GHz	-6	-6	-7
60 GHz to 64 GHz	-7	-7	-9
64 GHz to 67 GHz	-5	-5	-7
Damage Level	+15 dBm		
Maximum DC Level	+/-7 VDC		

Table 42a. Source Outputs

(PORT 1, 2, 3, 4 SOURCE OUT) @ Max Specified Output Power

Description	Typical Performance					
	Maximum Input Level (dBm)					
	Option 200 or 400 Port 1, 3 Source Out Filtered Mode	Option 200 or 400 Port 1, 3 Source Out Hi Pwr Mode	Option 200 or 400 Port 2, 4 Source Out	Option 219 or 419 Port 1, 3 Source Out Filtered Mode	Option 219 or 419 Port 1, 3 Source Out Hi Pwr Mode	Option 219 or 419 Port 2, 4 Source Out
10 MHz to 50 MHz[1]	4	12	12	4	12	12
50 MHz to 500 MHz[1]	8	13	13	8	13	13
500 MHz-to 1 GHz	8	13	13	8	13	13
1 GHz to 2 GHz	8	13	13	9	14	14
2 GHz to 3.2 GHz	10	10	13	10	10	14
3.2 GHz to 10 GHz	13	13	13	12	12	13
10 GHz to 16 GHz	12	12	12	11	11	11
16 GHz to 26.5 GHz	12	12	12	10	10	10
26.5 GHz to 30 GHz	11	11	11	10	10	10
30 GHz to 32 GHz	8	8	8	7	7	7
32 GHz to 35 GHz	10	10	10	8	8	8
35 GHz to 40 GHz	6	6	6	3	3	3
40 GHz to 50 GHz	11	11	11	9	9	9
50 GHz to 60 GHz	12	12	12	8	8	8
60 GHz to 64 GHz	12	12	12	8	8	8
64 GHz to 67 GHz	12	12	12	8	8	8
67 GHz to 70 GHz	12	12	12	8	8	8
Damage Level	+24 dBm					
Maximum DC Level	+/-5 VDC					

Table 42b. Source Outputs

(PORT 1, 2, 3, 4 SOURCE OUT) @ Max Specified Output Power

Description	Typical		
	Maximum Input Level (dBm)		
	Option 224 or 423 Port 1, 3 Source Out Filtered Mode	Option 224 or 423 Port 1, 3 Source Out Hi Pwr Mode	Option 224 or 423 Port 2, 4 Source Out
10 MHz to 50 MHz[1]	4	11	11
50 MHz to 500 MHz[1]	7	13	13
500 MHz-to 1 GHz	7	13	13
1 GHz to 2 GHz	8	14	14
2 GHz to 3.2 GHz	10	10	14
3.2 GHz to 10 GHz	12	12	13
10 GHz to 16 GHz	10	10	10
16 GHz to 26.5 GHz	9	9	9
26.5 GHz to 30 GHz	9	9	9
30 GHz to 32 GHz	6	6	6
32 GHz to 35 GHz	7	7	7
35 GHz to 40 GHz	2	2	2
40 GHz to 50 GHz	8	8	8
50 GHz to 60 GHz	7	7	7
60 GHz to 64 GHz	6	6	6
64 GHz to 67 GHz	6	6	6
Damage Level	+24 dBm		
Maximum DC Level	+/-5 VDC		

Table 43. Coupler Inputs

(PORT 1, 2, 3, 4 CPLR THRU) Insertion Loss of Coupler Thru

Description	Typical	
	Maximum Input Level (dB)	
	Option 200 or 400	Option 219, 419, 224, or 423
10 MHz to 50 MHz[1]	-0.2	-0.7
50 MHz to 500 MHz[1]	-0.2	-0.3
500 MHz-to 1 GHz	-0.3	-0.5
1 GHz to 2 GHz	-0.4	-0.7
2 GHz to 3.2 GHz	-0.4	-0.8
3.2 GHz to 10 GHz	-0.6	-1.3
10 GHz to 16 GHz	-0.8	-1.8
16 GHz to 26.5 GHz	-1.0	-2.7
26.5 GHz to 30 GHz	-1.0	-2.6
30 GHz to 32 GHz	-1.2	-2.2
32 GHz to 35 GHz	-1.2	-2.2
35 GHz to 40 GHz	-1.3	-2.4
40 GHz to 50 GHz	-1.5	-2.8
50 GHz to 60 GHz	-1.7	-3.2
60 GHz to 64 GHz	-1.9	-3.7
64 GHz to 67 GHz	-2.0	-4.0
67 GHz to 70 GHz	-2.2	-4.5
Damage Level	+24 dBm	
Maximum DC Level	+/-40 VDC	

Test Set Block Diagrams

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

Figure 15. 2-Port N5247A Base Unit Option 200

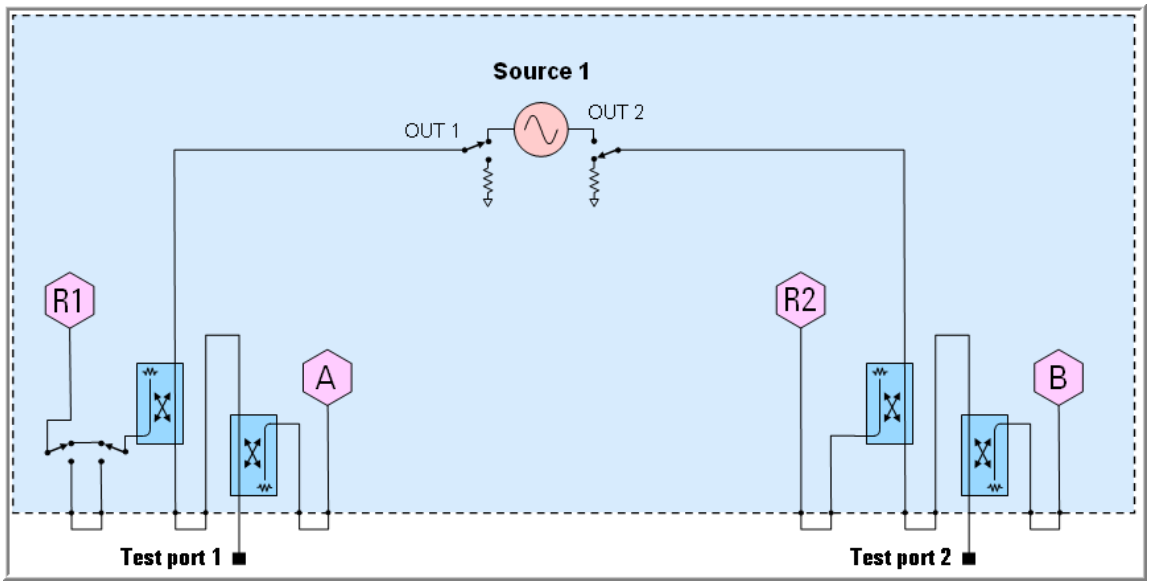
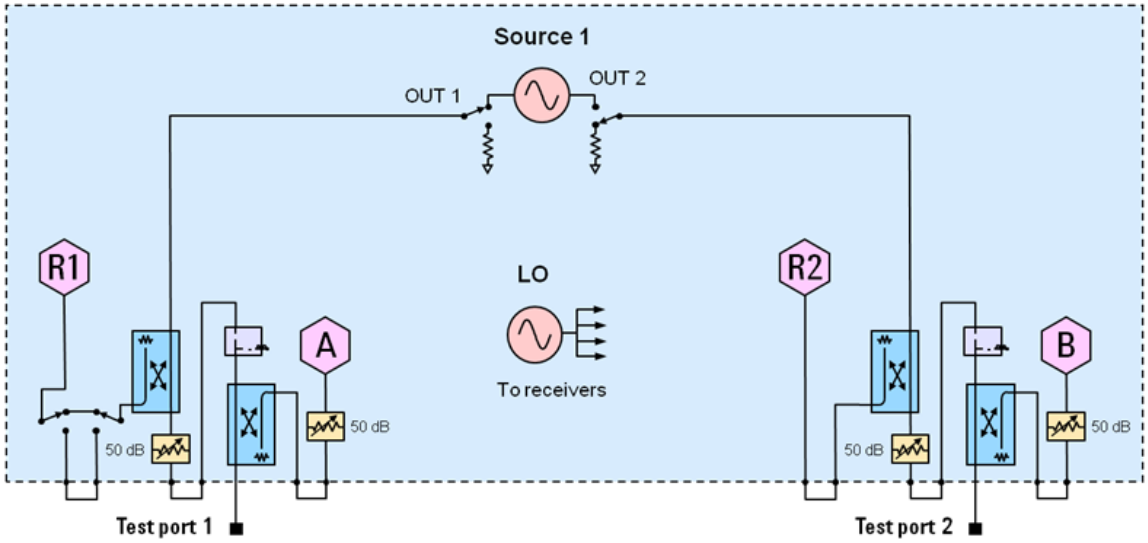


Figure 16. 2-Port N5247A Option 219

Adds Extended power range: source and receiver attenuators, and bias-tees



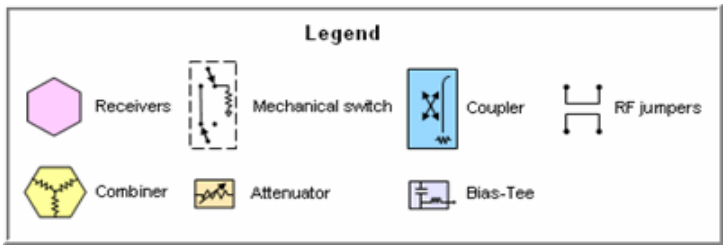


Figure 17. 2-Port N5247A Option 224

Adds internal second source, combiner, and mechanical switches

Also shown, Option 025 adds 4 pulse generators. Option 021 and 022 adds pulse modulators.

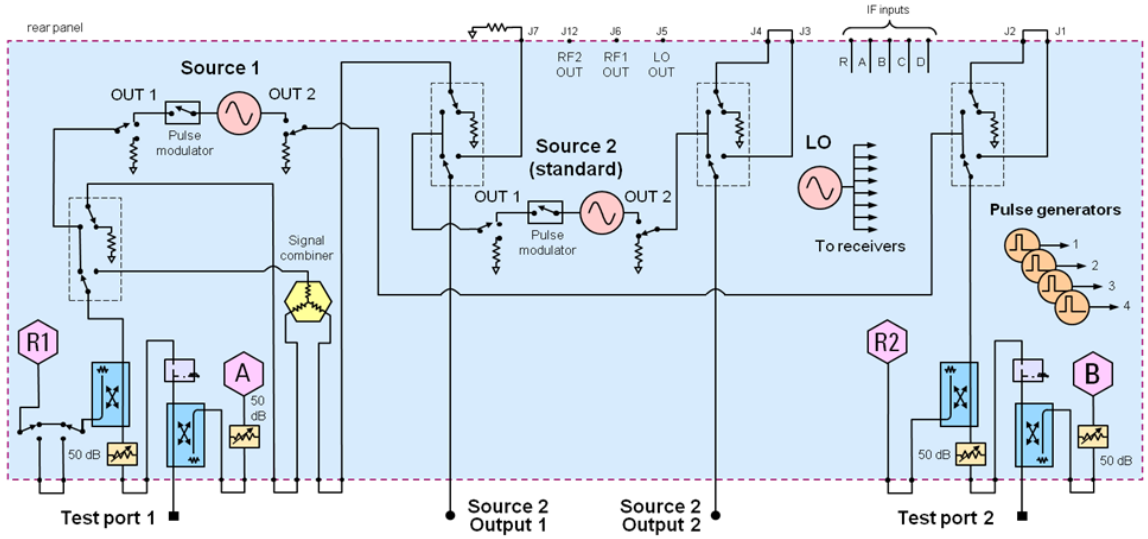
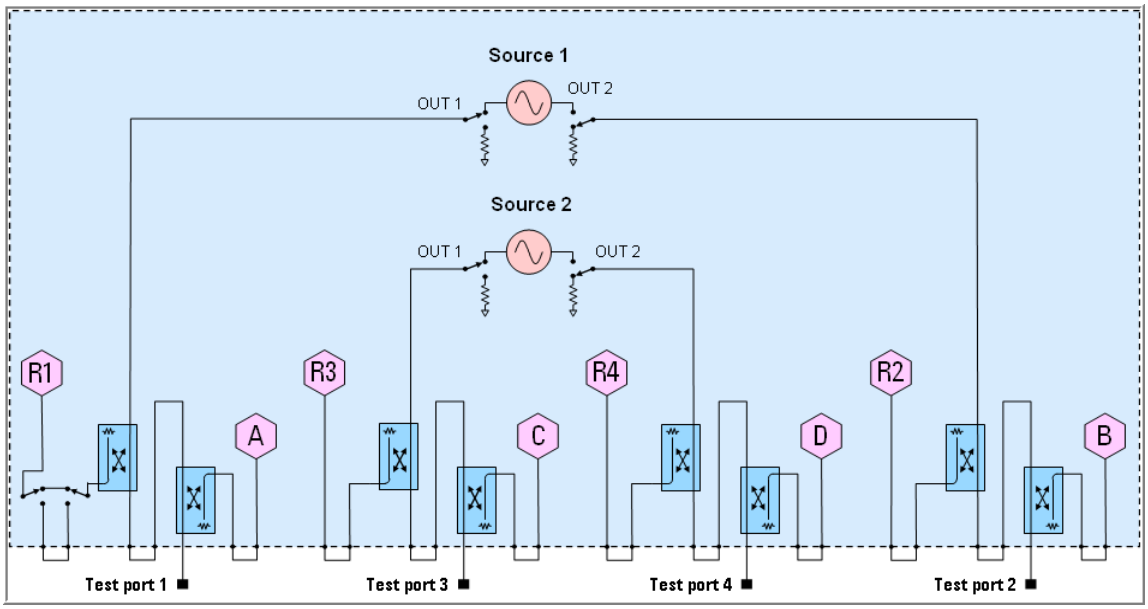


Figure 18. 4-Port N5247A Base Unit - Option 400



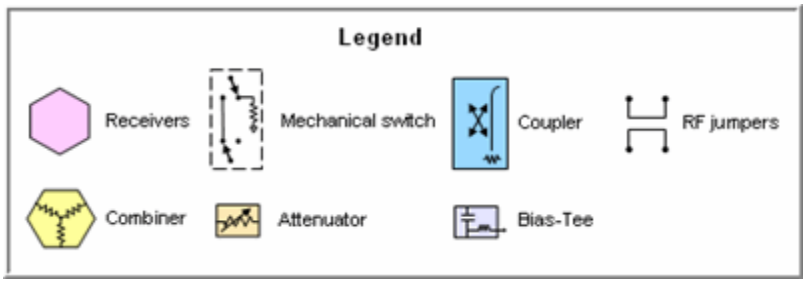


Figure 19. 4-Port N5247A Option 419

Adds Extended power range: source and receiver attenuators, and bias-tees.

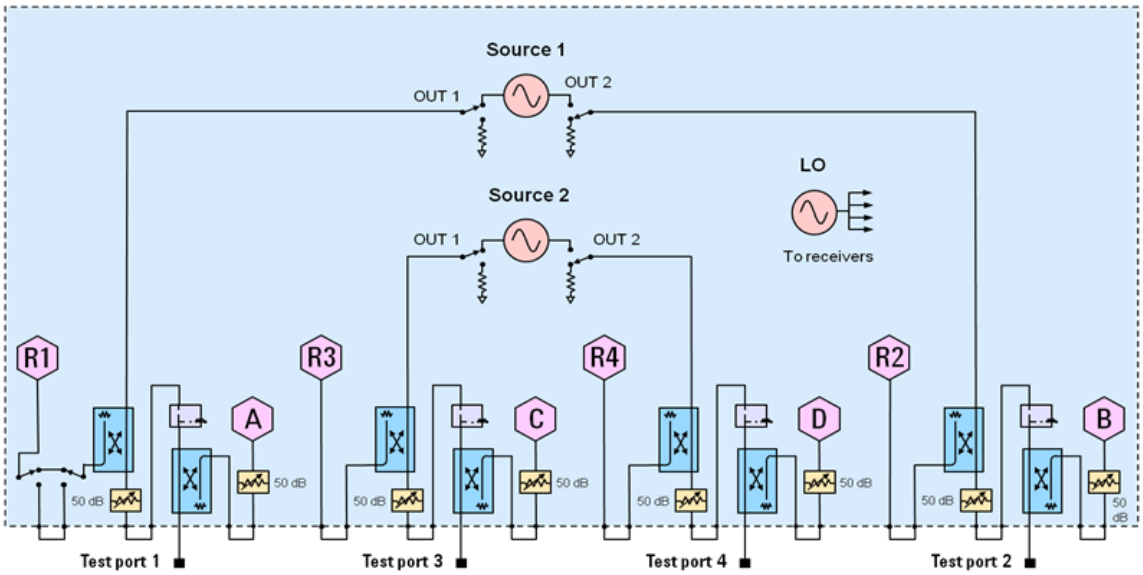


Figure 20. 4-Port N5247A Option 423

Adds internal combiner and mechanical switches.

Also shown, Option 025 adds 4 pulse generators. Option 021 and 022 adds pulse modulators.

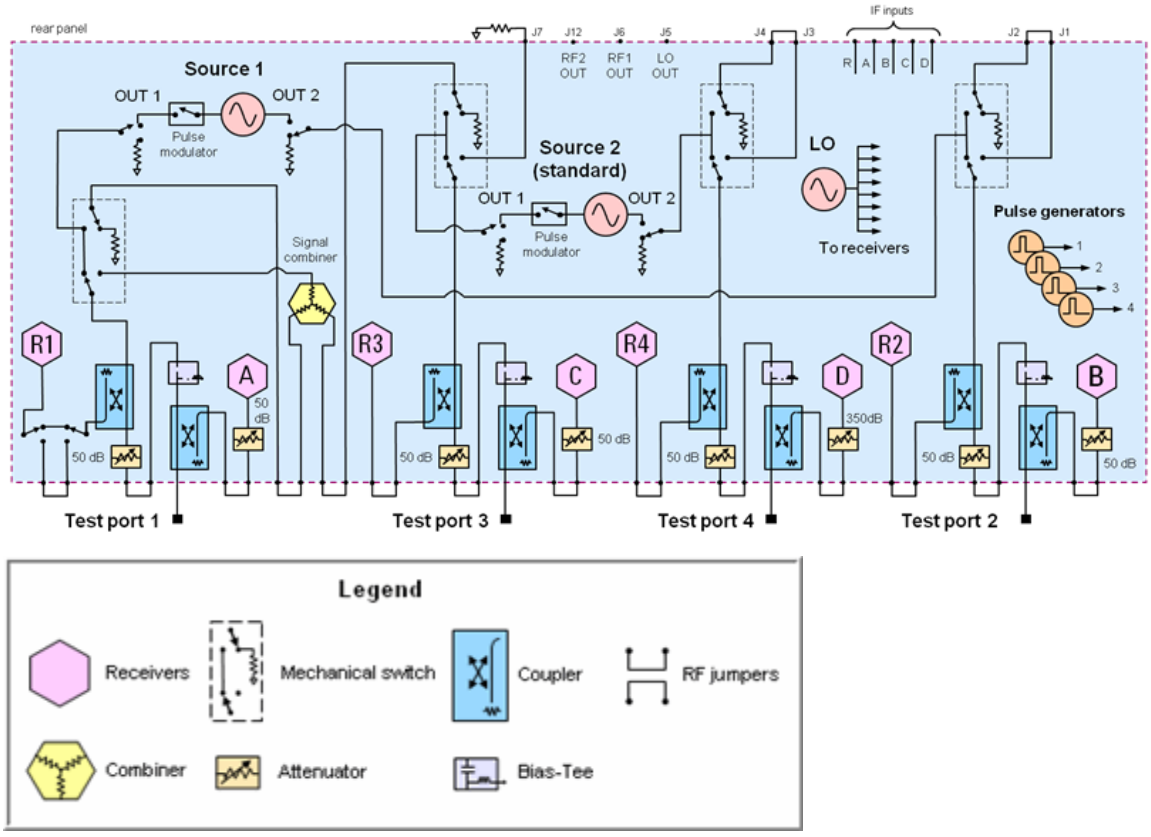
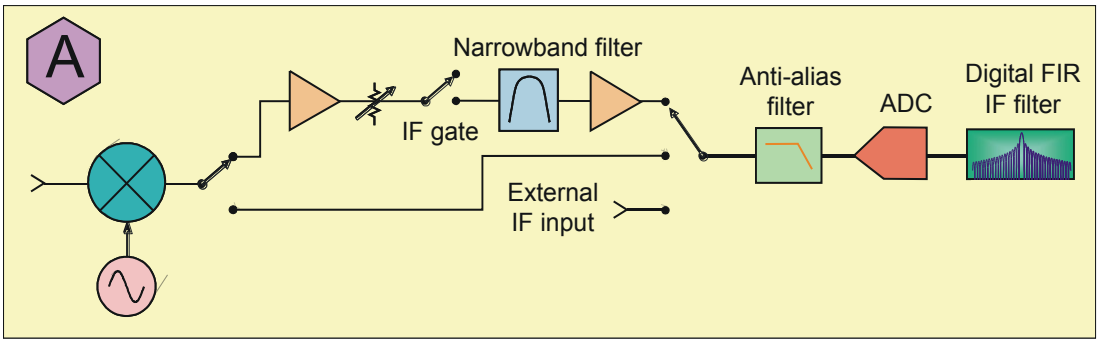


Figure 21. Receiver Block Diagram



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