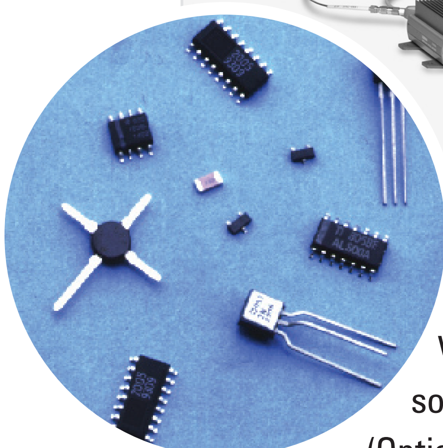
Agilent
PSA Series Spectrum Analyzers
External Source Control Measurement Personality, Option 215

Technical Overview with Self-Guided Demonstration



Expand your PSA Series from spectrum analysis to scaler network analysis. With the Agilent PSA Series external source control measurement personality (Option 215) and an Agilent PSG, or ESG, or MXG signal generator, the PSA Series spectrum analyzers now enable scalar stimulus-response tests up to 50 GHz for component characterization.

Agilent Technologies

Empower the PSA Series High-Performance Spectrum Analyzers with the Scalar Network Analysis Capability Up to 50 GHz

Stimulus-response measurements are a necessity in component and subsystem characterization. Typically, most stimulus-response measurements are conducted with network analyzers. However, adding an external source control measurement personality (Option 215) to the Agilent PSA Series spectrum analyzers, along with an Agilent PSG, or ESG, or MXG signal generator[1], can provide single-channel scalar-network-analysis in addition to all the benefits from a general-purpose spectrum analyzer and a stand-alone analog or digital signal source.

Now, you can use the PSA Series spectrum analyzers not only for analyzing and identifying unknown signals by measuring parameters such as power, frequency, noise, distortion, and modulation quality, but also for characterizing the behavior of components or subsystems including frequency response, conversion loss, insertion loss/gain, and return loss.

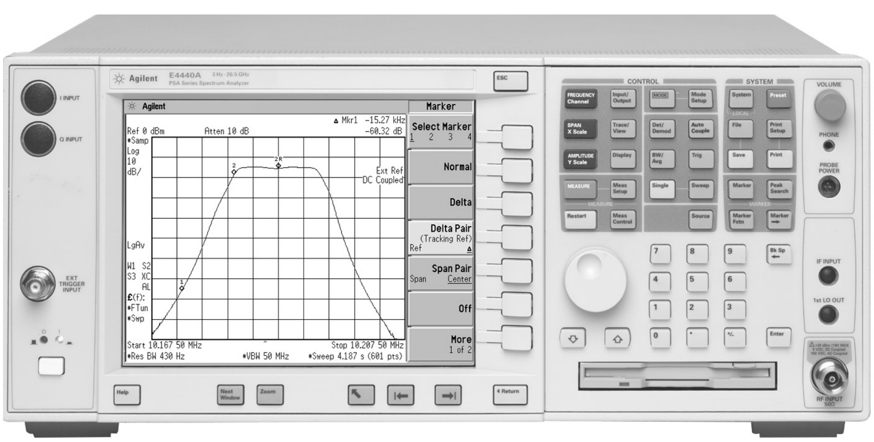
Key features

- Perform scalar stimulus-response measurements up to 50 GHz[2], extending component tests to the millimeter-wave range with minimal extra investment.
- Characterize a component with the presence of high and low power levels at the same time, such as measurements of pass-band and block-band of a filter with the instrument's wide dynamic range (up to 108.9 dB on Option 215's defaulted setting).
- Eliminate distortions caused by harmonics from swept signal sources when measuring passive devices using the narrow resolution bandwidths (up to 1 Hz with the manual setting).
- Save time performing component tests with the instrument's easy set up and intuitive user interface.
- Perform tests on different components with a variety of sweep modes, including standard sweep, harmonic sweep, offset sweep, reverse sweep, and power sweep.
- Improve the accuracy of the test system providing satisfactory measurements for scattering or S-parameters such as S_{11} and S_{21} using the normalization and Open/Short calibration.

The Agilent PSA Series offers a leading-edge combination of flexibility, speed, accuracy and dynamic range along with powerful one-button measurements and a versatile feature set. Expand the PSA Series to include an external source control capability with the downloadable external source control measurement personality (Option 215).

This technical overview includes:
- Measurement details
- Demonstrations
- PSA Series key specifications for the external source control personality
- Ordering information
- Related literature

All demonstrations use the Agilent E4440A PSA Series with Option 215, Agilent E8257D PSG analog signal generator, and accessories included in the PSA Series Option 015 (6 GHz return loss measurement accessory kit), and an appropriate device under test (DUT). The keystrokes surrounded by [] indicate hard keys while keystrokes surrounded by {} indicate soft keys located on the right edge of the display.



1. Refer to "Key Specifications" on page 14 for supported signal generator models and firmware requirements.
2. PSA Option 215 does not support "frequency band crossing".

Demonstration preparation

To perform the following demonstrations, a PSA Series and a PSG-D requires the following configurations.

Figure 1a shows demo system set up. The LAN connection between the PSA and the PSG can be made either through a LAN cross-over cable or through the office LAN environment by using two normal LAN cables connected to the PSA and the PSG, respectively.

The hardware connection instructions can also be obtained by pressing [Source] {Ext Src Config} {HW Connection Instructions} on the PSA Series (Figure 1b).

Product type	Model number	Required configurations
PSA Series spectrum analyzer	E4440A/43A/ 45A/46A/ 47A/48A	Option 215 external source control measurement personality Instrument firmware version A.07.10 or later
PSG-D Series signal generator	E8257D/67D	Instrument firmware version A.04.05 or later

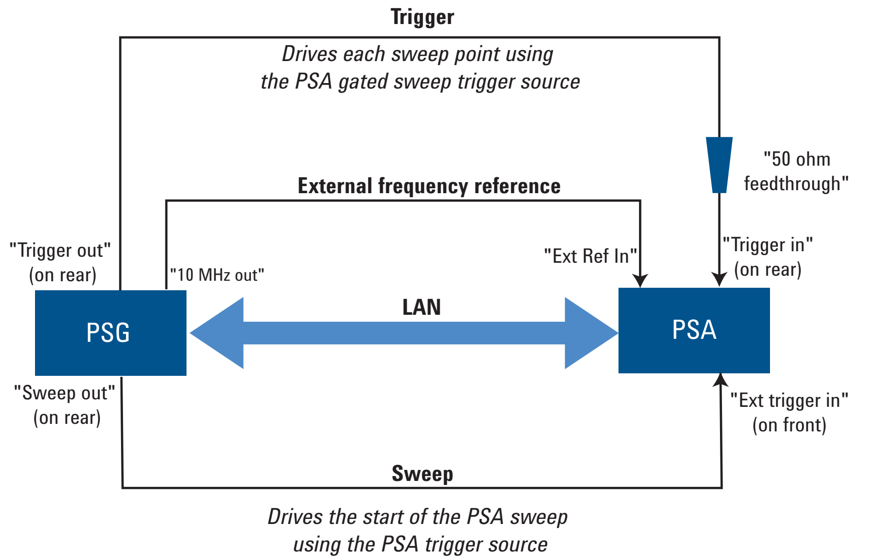


Figure 1a. Set up of the demonstration system

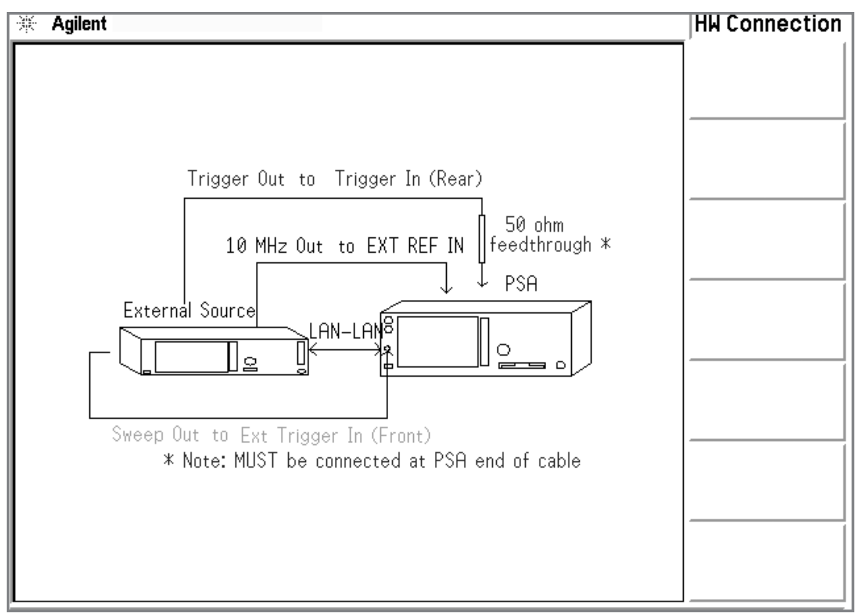


Figure 1b. Graphic instructions for the hardware connection on the PSA Series display

Configure IP addresses

The PSA Series with Option 215 controls the external source through a LAN connection based on the TCP/IP protocol. The TCP/IP protocol can only be established with correct IP addressing. Upon completion of the hardware set up, you need to assign an appropriate IP address to the external source. This section is an example for the IP addressing based on a LAN crossover cable connection between the PSA Series and the PSG.

Instructions	Keystrokes
Set IP address and subnet mask on the PSA.	On PSA: [System], {Config I/O} {IP Address}, key in [198.168.100.2], and [Enter]; {Subnet}, key in [255.255.0.0], and [Enter].
Assign IP address to the PSG.	On PSG: [Utility], {GPIB/RS-232/LAN} {LAN Setup} {IP Address} {Clear Text}, key in [198.168.100.1], and {Enter}.
Save the assigned IP address to the PSG.	{Proceed With Reconfiguration}, {Confirm Change (Instrument will Reboot)}
Set the PSG IP address to the PSA "External source control".	On PSA: [Source] {Ext Src Config} {IP Address}, key in [198.168.100.1], and [Enter].
Verify the IP connection.	On PSA: [Source] {Ext Src Config} {Show Setup}, you should see information for the external source including its start and stop frequencies.

Filter tests with "standard sweep"

Filters are one of the most important and most commonly used frequency selective devices. With the external source control capability, you can easily characterize a filter's behavior by using the PSA Series coupled with a supported external source. In this section, we will use a 10.1875 MHz bandpass filter as a DUT to determine its bandwidth, passband ripple, and shape factor. In the "standard sweep" mode, the PSA Series will sweep synchronically with the PSG at the same start and stop frequencies.

Connect the input port of the filter to the PSG RF output, and the output to the PSA RF input as shown in Figure 2.

> This exercise demonstrates filter characterization for 3 dB bandwidth, selectivity, and passband ripple.

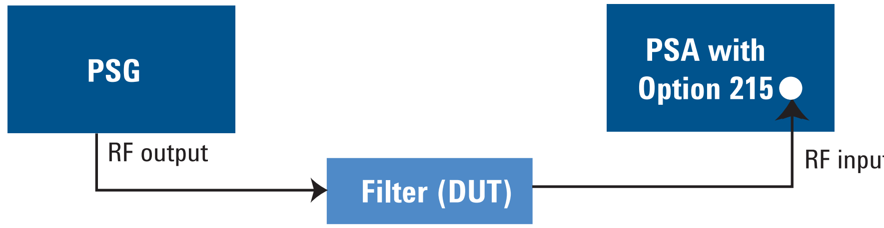


Figure 2. Set up for filter tests

Instructions	Keystrokes
Preset PSA.	[Preset]
Set PSA input as "DC couple".	[Input/Output], {RF Coupling}, and toggle to underline "DC".
Set sweep range from 10.1675 MHz to 10.2075 MHz on the PSA.	[FREQUENCY], {Start Freq} [10.1675] {MHz}, {Stop Freq} [10.2075] {MHz}
Turn on external source control.	[Source], {Amplitude}, toggle to underline "On".
Use Marker functions to determine: 1. Bandwidth (–3 dB)	[Marker], {Normal} {Delta Pair}, toggle to underline "Δ", turn the knob to move Marker 1 toward left and stop at –3 dB down from Marker 1R; {Delta}, turn the knob to move Marker 1 to right and stop at 0 dB. Now the frequency reading after "Δ Mkr1" at the top right of the PSA display show the –3 dB bandwidth. See Figure 3.
2. Selectivity or shape factor (–3 dB vs. –60 dB)	[Measure] {Meas Off}, [Marker], {Normal}, {Delta Pair}, toggle to underline "Ref", turn the knob to move the Marker 1R to 3 dB below Marker 1 and get the frequency offset reading A (for example: 7 kHz); then {Delta Pair}, toggle to underline "Δ", turn the knob to move Marker 1 to 57 dB below Marker 1R and get the frequency offset reading B (for example: 8.3 kHz). Now, the shape factor of this filter can be calculated as (a+b)/b (for example: (7+8)/7, or 2.1:1). See Figure 4.
3. Passband ripple	[SPAN], [20] {kHz}, [AMPLITUDE], {Ref Level}, [±] [14] {dBm}, {Scale Div} [1] {dB}. See Figure 5 for the measurement result.

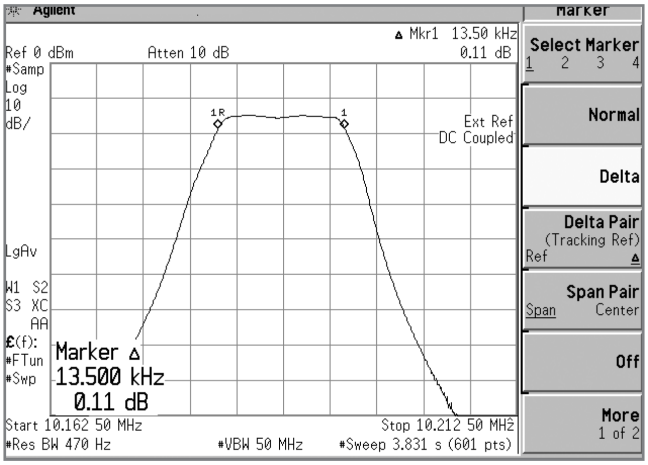


Figure 3. Determining the "–3 dB bandwidth" for a bandpass filter

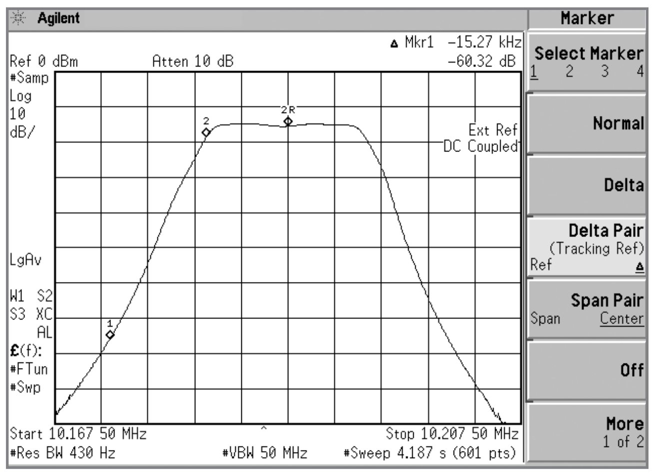


Figure 4. Calculating the filter's shape factor

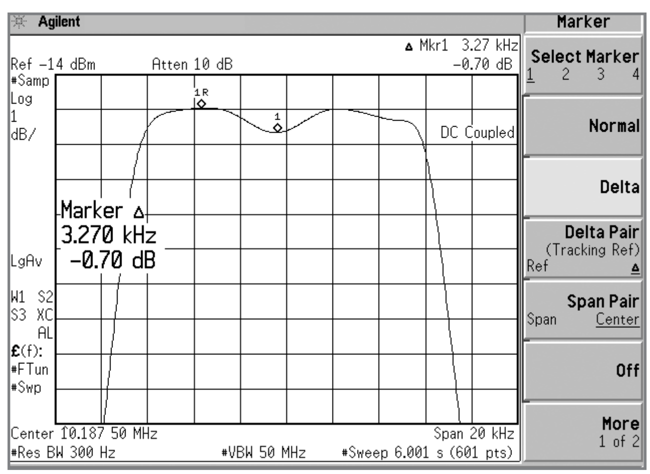


Figure 5. Characterizing flatness or ripple of the filter's passband

Amplifier harmonic tests with "harmonic sweep"

Amplifiers are the most common active devices. Harmonic distortion is one of the critical characteristics when evaluating the quality of an amplifier. In this section, we will demonstrate how to measure harmonic distortion for an Agilent 8447C amplifier (30 – 300 MHz) with the "harmonic sweep" setting in the PSA Series external source control measurement personality. In the "harmonic sweep" mode, the starting and stopping frequencies of the PSA Series are N times of those of the PSG, where, N (0.1 < N < 10) is the harmonic number.

Connect the input port and output port of the amplifier to the PSG RF Output and to the PSA RF Input, respectively (Figure 6).

This exercise demonstrates how to test harmonic behaviors of an amplifier.

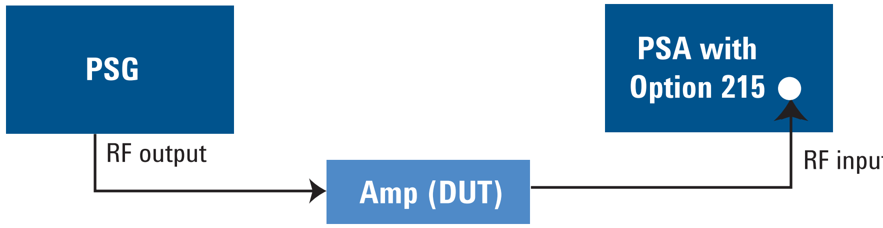


Figure 6. Set up for amplifier harmonic tests

Instructions	Keystrokes
Preset PSA.	[Preset]
Set PSA to sweep from 100 MHz to 900 MHz.	[FREQUENCY], {Start Freq} [100] {MHz}, {Stop Freq} [900] {MHz}
Turn on external source control.	[Source], {Amplitude}, toggle to underline "On". See Figure 7 for the amplifier's frequency response between 100 MHz and 900 MHz.
Verify sweep range of the PSG and compare it to that of the PSA.	{Ext Src Config} {Show Setup}, you'll see the source information including start frequency = 100 MHz and stop frequency = 900 MHz.
Set PSA to sweep from 300 MHz to 2700 MHz.	[FREQUENCY], {Start Freq} [300] {MHz}, {Stop Freq} [2700] {MHz}
Set the 3rd harmonic and activate the harmonic sweep.	[Source] {Config Sweep}, toggle {Harmonic} to underline "On", then [3] [Enter].
Ensure the external source control is "On".	[Source], {Amplitude}, toggle to underline "On". See Figure 8 for the amplifier's response at range of 300 ~ 2700 MHz to the input signal between 100 MHz and 900 MHz.
Verify sweep range of the PSG and compare it to that of the PSA.	{Ext Src Config} {Show Setup}, you'll see the source information including start frequency = 100 MHz and stop frequency = 300 MHz.

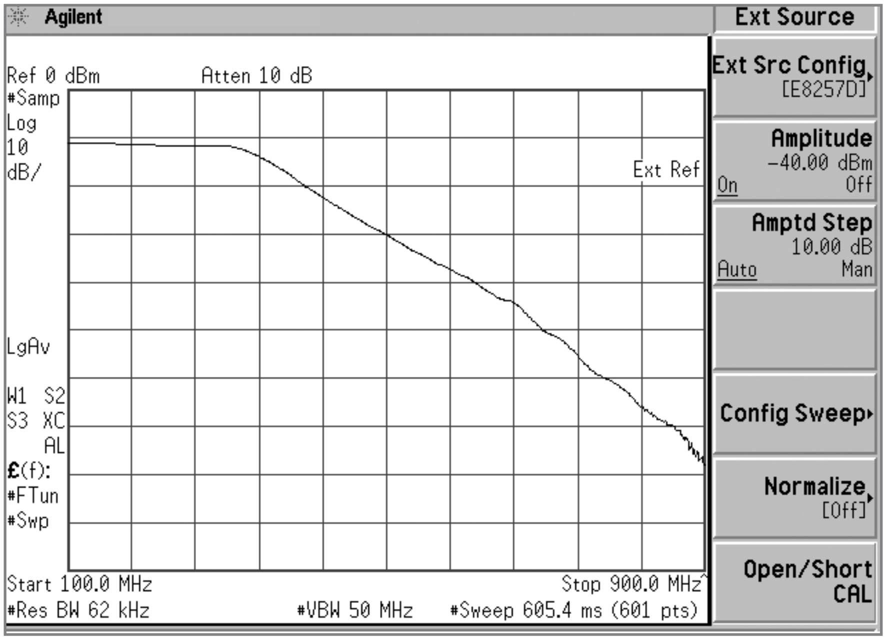


Figure 7. Amplifier's frequency response at the fundamental harmonic (N = 1)

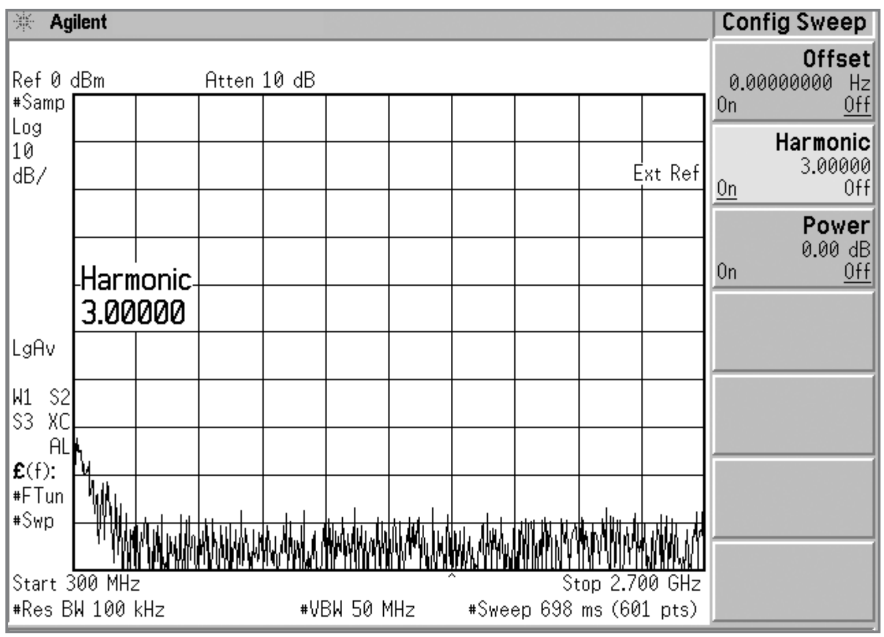


Figure 8. Amplifier's frequency response at the third harmonic (N = 3)

Amplifier linearity tests with "power sweep"

Another important parameter in characterizing an amplifier is the "gain compression" or how the amplifier behaves in saturation. Gain compression limits the amplifier's dynamic range. The "power sweep" mode in the PSA Series external source control measurement personality enables you to easily measure the gain compression. In this section, we will demonstrate how to perform the CW gain compression measurement. The external source is controlled so that its power output is swept incrementally in a linear fashion as the frequency remains constant. Additionally, the swept gain compression of an amplifier can easily be measured by setting the frequency span to an appropriate range.

Connect the input and output ports of an amplifier (ZFL-1000LN-3, from Mini-Circuits) to the RF output of the PSG and the RF input of the PSA Series, respectively (Figure 9).

This exercise demonstrates how to determine linearity of an amplifier.

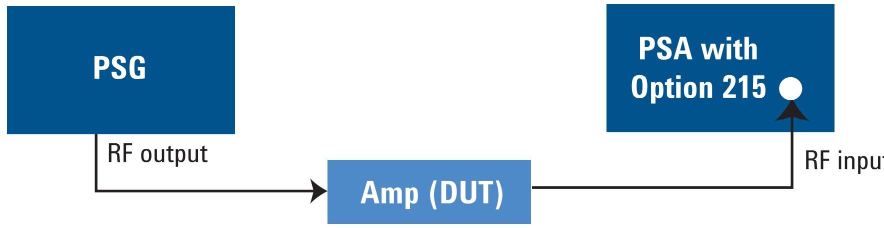


Figure 9. Set up for amplifier gain compression tests

Instructions	Keystrokes
Preset PSA.	[Preset]
Set PSA to "Zero span" at 750 MHz.	[FREQUENCY], {Center Freq} [750] {MHz}, [SPAN] {Zero Span}
Set power sweep at 30 dB.	[Source], {Config Sweep}, toggle {Power} to underline "On", [30] {dB}.
Turn on external source control.	[Return], toggle {Amplitude} to underline "On", [±] [40] {dBm}.
Readjust the display amplitude level.	[AMPLITUDE], {Ref Level} [10] {dBm}, {Scale/Div} [2] {dB}
Observe the curve of the output power vs. input power of the amplifier (as the full span of the input power is set to 30 dB, the horizontal axis is translated to 3 dB/division).	See Figure 10 for the amplifier's behavior when entering the saturation.

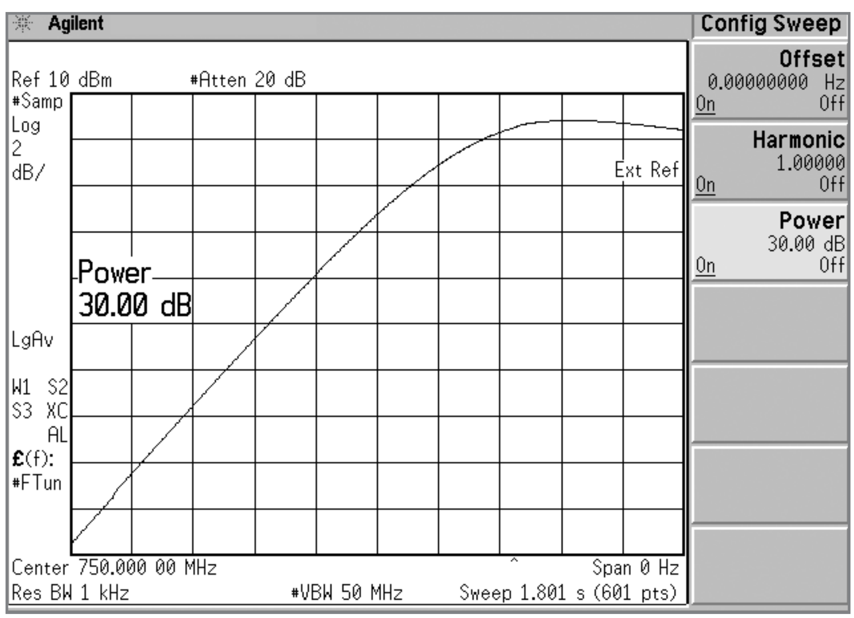


Figure 10. Amplifier's gain compression at a fixed frequency

Mixer tests with "offset sweep"

Mixers are widely used as frequency translation devices. They provide a signal at the output whose frequency is the sum and difference of the signals on the two inputs. The "offset sweep" mode, available in the PSA Series external source control measurement personality, allows you to measure behavior of a mixer output level while synchronizing the PSG to sweep with an offset frequency to generate an appropriate intermediate frequency (IF) span.

Connect the RF input and IF output of the mixer to the PSG RF output and the PSA RF input, respectively. For the mixer tests we need an additional signal source to generate a CW signal with a fixed frequency as the LO input. Refer to Figure 11 for the test system set up.

This exercise demonstrates mixer tests and shows how to determine sweep directions.

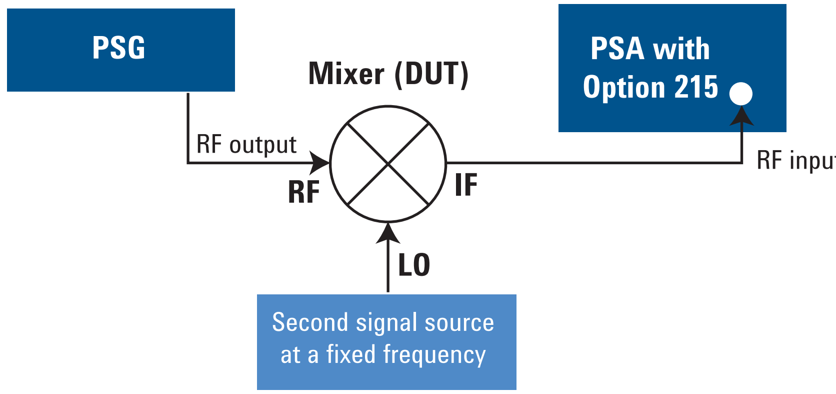


Figure 11. Set up for mixer tests

Instructions	Keystrokes
Set the signal generator (II) to generate a 400 MHz and 5 dBm output as the LO signal.	On the signal generator (II): [Frequency] [400] {MHz}, [Amplitude] [5] {dBm}
Preset PSA.	[Preset]
Set PSA start frequency = 100 MHz and stop frequency = 200 MHz.	[FREQUENCY], {Start Freq} [100] {MHz}, {Stop Freq} [200] {MHz}
Turn the "offset sweep" mode on and set the offset to 400 MHz.	[Source], {Config Sweep}, toggle {Offset} to underline "On", [400] {MHz}
Turn on external source control.	[Return], toggle {Amplitude} to underline "On". See the mixer output as shown in Figure 12.
Verify the PSG sweeps "up", i.e., in "normal" direction.	{Ext Src Config} {Show Setup}, you'll see the source information including start frequency = 500 MHz and stop frequency = 600 MHz as shown in Figure 13.

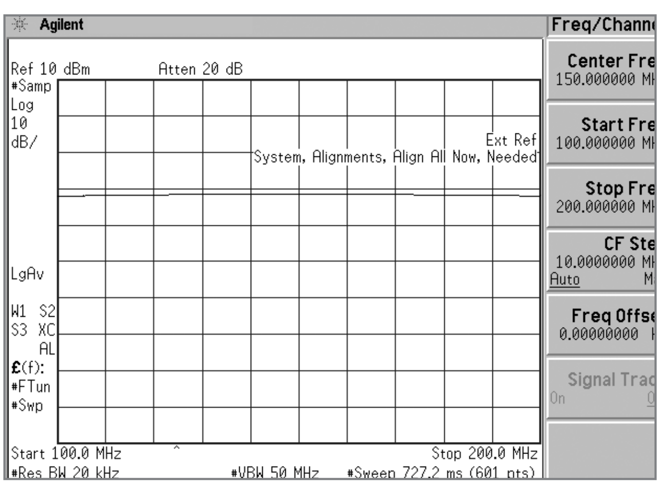


Figure 12. Measuring mixer output with normal sweep

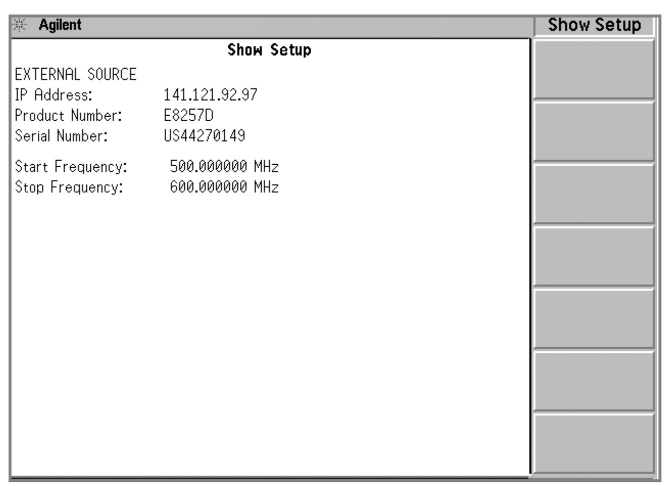


Figure 13. Source set up status showing the normal sweep (start frequency < start frequency)

In some use cases, particularly for the mixer tests at the low side, a “reverse” sweep becomes desirable. By setting up an offset frequency of different values you can control the direction that the PSG sweeps. The PSG sweep frequency and direction are governed by the following equations:

- $Freq_{source} = \text{Abs val} [(Freq_{analyzer} + Freq_{offset} - Freq_{point\text{-}spacing})/\text{Harmonic}]$
  Equation 1

- $\text{Sweep direction} = \text{sgn} [(Freq_{analyzer} + Freq_{offset} - Freq_{point\text{-}spacing})/\text{Harmonic}]$

  Equation 2

  where,
  Abs val [x] is the absolute value of x, sgn [x] the sign (positive or negative) of x, and the “$Freq_{point\text{-}spacing}$” is given by the span divided by (number of sweep points – 1).

In equation (2), the positive sign means the PSG sweeps at the “normal” direction (start frequency < stop frequency), whereas the negative sign means the “reverse” direction (start frequency > stop frequency). The following demo shows how to configure a “reverse sweep” for the hardware set up shown in Figure 11.

Instructions	Keystrokes
Set PSA start frequency = 100 MHz and stop frequency = 200 MHz.	[FREQUENCY], {Start Freq} [100] {MHz}, {Stop Freq} [200] {MHz}
Turn the “offset sweep” mode on and set the offset to –400 MHz.	[Source], {Config Sweep}, toggle {Offset} to underline “On”, [±] [400] {MHz}.
Turn on external source control.	[Return], toggle {Amplitude} to underline “On”. See the mixer output as shown in Figure 14.
Verify the PSG sweeps “Down”, i.e., in “reverse” direction.	{Ext Src Config} {Show Setup}, you’ll see the source information including start frequency = 300 MHz and stop frequency = 200 MHz as shown in Figure 15.

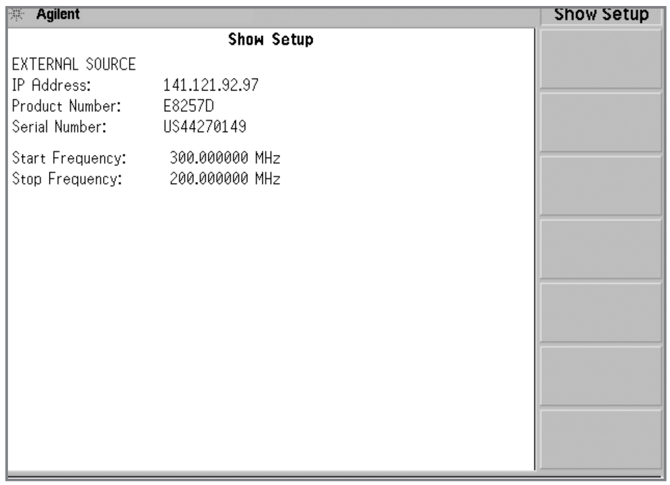


Figure 15. Source set up status showing the reverse sweep (Note: start frequency > stop frequency)

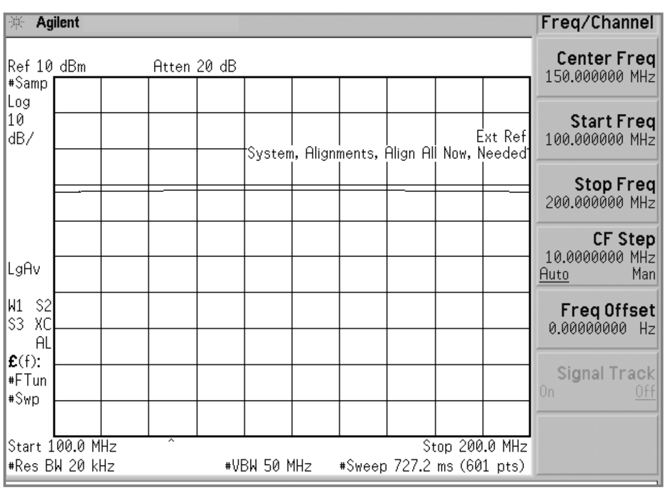


Figure 14. Measuring mixer output with the reverse sweep

Normalization

Normalization is often used in a transmission measurement to correct for systemic frequency errors. The frequency response of the test system must first be measured and then normalization is used to eliminate the frequency response errors caused by the system.

To measure the frequency response of the test system, set up the system as desired for the DUT tests. Then relace the DUT with a thru connection (See Figure 16).

This exercise demonstrates how to use normalization to correct for systemic frequency errors in a transmission measurement.

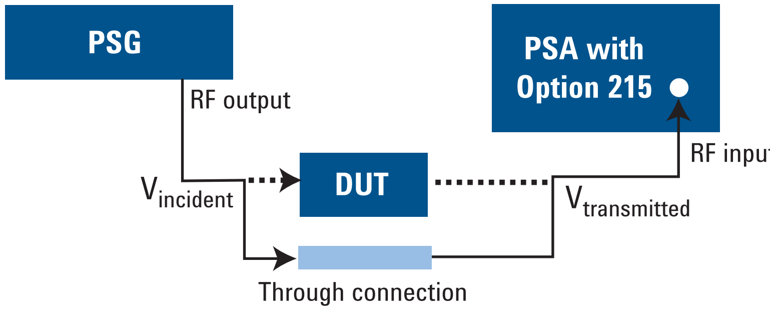


Figure 16. Set up for normalization

Instructions	Keystrokes
Preset PSA.	[Preset]
With the thru connection connected, measure the frequency response of the test system.	[Source], {Normalize}
Store the frequency response curve of the test system as the reference.	{Store Ref (1-> 3)}
Activate the normalization, and observe the active trace is now the ratio of the input to the stored reference.	[Source], {Normalize}, toggle {Normalize} to underline "On".
Reconnect the DUT to the test system and measure the normalized DUT frequency response.	Note that the units of the reference level have changed to dB, indicating that it is now a relative measurement (Figure 17).

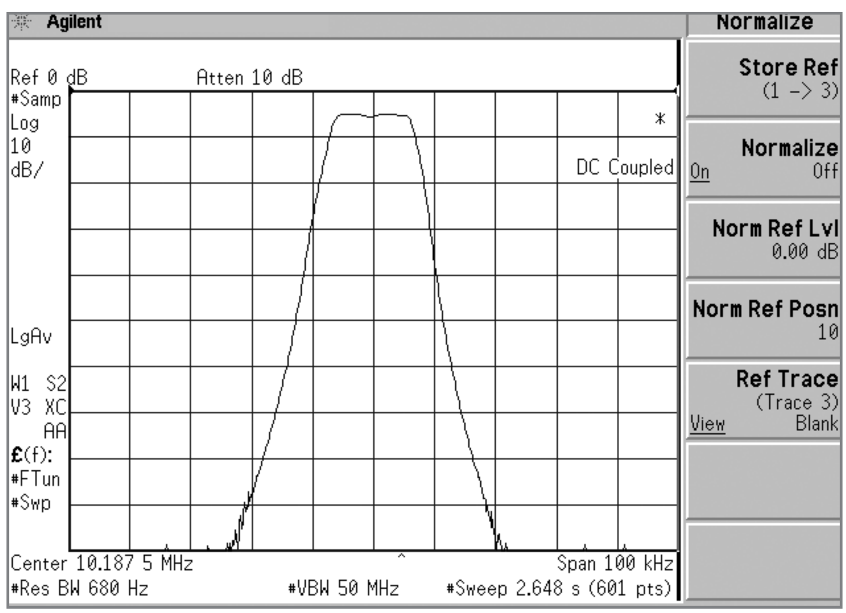


Figure 17. Frequency response of the bandpass filter with normalization

Open/Short calibration

The PSA with a tracking source and an external directional coupler or directional bridge enables reflection measurements. Performing reflection measurements allows you to determine some critical characteristics for a device, such as reflection coefficient, return loss, and SWR (standing wave ratio). An Open/Short calibration is used for reflection measurements and corrects for system frequency response errors. Essentially, this type of calibration is a normalized measurement in which a reference trace is stored in memory and will then be subtracted from later measurement data.

A calibration created by measuring both an open and a short is more accurate than using only one or the other. Since the open data and short data are 180 degrees out of phase, their average tends to average out the calibration errors.

Figure 18 is a diagrammatic presentation for reflection measurements and the Open/Short calibration. The PSA Series Option 015 (6 GHz return-loss measurement accessory kit) provides the accessory parts, such as directional bridge, short, and coaxial cables, required for reflection measurements and is therefore ideal for the Open/Short calibration.

This exercise demonstrates how to initiate an Open/Short calibration that helps reduce systemic errors in a reflection measurement.

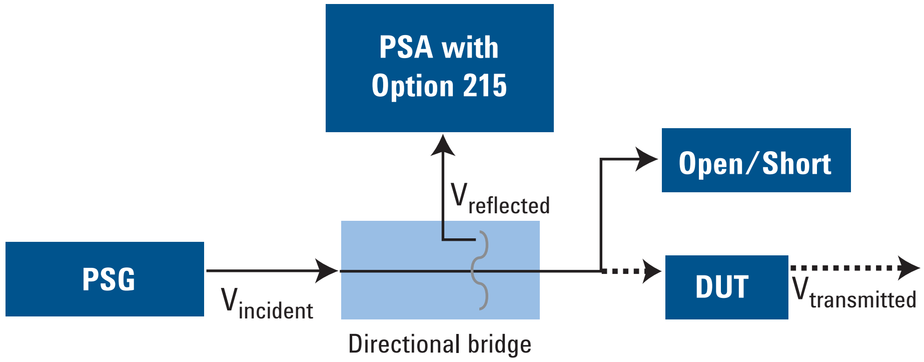


Figure 18. Set up for Open/Short calibration

Instructions	Keystrokes
Preset PSA.	[Preset]
Start the "Open/Short calibration".	[Source], {Open/Short Cal}
Follow the graphical instructions given on the PSA display and "Open" the bridge output and proceed.	{Continue}
Follow the graphical instructions given on the PSA display and apply a "Short" to the bridge output and proceed.	{Continue}
Complete the Open/Short calibration.	{Done Open/Short Cal}

Key Specifications

PSA Option 215: external source control measurement personality

Description	Specifications	Supplemental information
Operating frequency range	3 Hz to 50 GHz (The start/stop frequencies of the swept span must be within the same PSA Series mixing band as shown in right column)	PSA mixing bands: Band 0: 3 Hz to 3.05 GHz Band 1: 2.85 to 6.6 GHz Band 2: 6.2 to 13.2 GHz Band 3: 12.8 to 19.2 GHz Band 4: 18.7 to 26.8 GHz Band 5: 26.4 to 31.15 GHz Band 6: 31.0 to 50 GHz
Sweep offset setting range		Limited by the source and analyzer operating range
Sweep offset setting resolution	1 Hz	
Harmonic sweep setting range		N= 0.1 to 10, where N is the harmonic number
Sweep direction		Normal, reverse
Dynamic range (10 MHz to 3 GHz, input terminated, sample detector, average typ = log, 20 °C to 30 °C)		

PSA span	PSA RBW	Dynamic range
1 MHz	2 kHz	108.9 dB
10 MHz	6.8 kHz	103.6 dB
100 MHz	20 kHz	98.9 dB
1000 MHz	68 kHz	93.6 dB

Description	Specifications	Supplemental information
Minimum/maximum power sweep range	0 to ±30 dB	Relative to the original power level and limited by the source to be controlled
Measurement time (default RBW setting of the PSA Series determined by Option 215)		ESG or PSG / MXG
101 Sweep points		2.9 s (nominal) / 1.1 s (nominal)
601 Sweep points		9.5 s (nominal) / 1.9 s (nominal)
Supported external sources		
Agilent PSG signal generators		Models: E8257D, E8267D (firmware version C.04.05 or later). E8247C, E8257C, E8267C (firmware version C.03.78 or later).
Agilent ESG signal generators		Model: E4438C (firmware version C.03.73 or later), E4428C (firmware version C.04.60 or later).
Agilent MXG signal generators		Models: N5181A, N5182A, N5183A (firmware version A.01.41 or later).

PSA Series Ordering Information

For further information, refer to PSA Series Configuration Guide, 5989-2773EN

PSA Series spectrum analyzer

E4443A 3 Hz to 6.7 GHz
E4445A 3 Hz to 13.2 GHz
E4440A 3 Hz to 26.5 GHz
E4447A 3 Hz to 42.98 GHz
E4446A 3 Hz to 44 GHz
E4448A 3 Hz to 50 GHz

Options

To add options to a product,
use the following ordering scheme:
Model E444xA (x = 0, 3, 5, 6, 7 or 8)
Example options E4440A-B7J, E4448A-1DS

Warranty & Service

Standard warranty is three years.

R-51B-001-5C	Warranty Assurance Plan, Return to Agilent, 5 years

Calibration [1]

R-50C-011-3	Calibration Assurance Plan, Return to Agilent, 3 years
R-50C-011-5	Calibration Assurance Plan, Return to Agilent, 5 years
R-50C-016-3	Agilent Calibration + Uncertainties + Guardbanding, 3 years
R-50C-016-5	Agilent Calibration + Uncertainties + Guardbanding, 5 years
AMG	Agilent Calibration + Uncertainties + Guardbanding (accredited cal)
A6J	ANSI Z540-1-1994 Calibration
R-50C-021-3	ANSI Z540-1-1994 Calibration, 3 years
R-50C-021-5	ANSI Z540-1-1994 Calibration, 5 years
UK6	Commercial calibration certificate with data To be ordered with PSA
E444xA-0BW	Service manual
R-52A	Calibration software and licensing (ordered with PSA)
N7810A	PSA Series calibration application software (stand-alone order)

1. Options not available in all countries

Measurement Personalities

E444xA-226	Phase noise	
E444xA-219	Noise figure	Requires Option IDS or 110 to meet specifications
E444xA-241	Flexible digital modulation analysis	
E444xA-BAF	W-CDMA	Requires B7J
E444xA-210	HSDPA/HSUPA (for W-CDMA)	Requires B7J and BAF
E444xA-202	GSM w/ EDGE	Requires B7J
E444xA-B78	cdma2000	Requires B7J
E444xA-214	1xEV-DV	Requires B7J and B78
E444xA-204	1xEV-DO	Requires B7J
E444xA-BAC	cdmaOne	Requires B7J
E444xA-BAE	NADC, PCD	Requires B7J
E444xA-217	WLAN	Requires 122 or 140
E444xA-211	TD-SCDMA power measurement	
E444xA-212	TD-SCDMA modulation	
E444xA-213	HSPA for TD-SCDMA	Requires Option 212
E444xA-215	External source control	
E444xA-266	Programming code compatibility suite	
E444xA-233	Built-in measuring receiver personality	
E444xA-23A	AM/FM/PM triggering	Requires Option 233
E444xA-23B	CCITT filter	Requires Options 233
E444xA-239	N9039A RF preselector control	

Hardware

E444xA-1DS	RF internal preamplifier (100 kHz to 3 GHz)	Excludes 110
E444xA-110	RF/μW internal preamplifier (10 MHz to upper frequency limit of the PSA)	Excludes 1DS
E444xA-B7J	Digital demodulation hardware	
E444xA-122	80 MHz bandwidth digitizer	E4440A/43A/45A/46A/48A, excludes 140, 107, H70
E444xA-140	40 MHz bandwidth digitizer	E4440A/43A/45A/46A/48A, excludes 122, 107, H70
E444xA-123	Switchable MW preselector bypass	Excludes AYZ
E444xA-124	Y-axis video output	
E444xA-AYZ	External mixing	E4440A/47A/46A/48A only, excludes 123
E444xA-107	Audio input 100 kΩ	Requires 233 to operate; excludes 122, 140
E444xA-111	USB device side I/O interface	Now shipped standard
E444xA-115	512 MB user memory	Excludes 117, Shipped standard in all PSA instruments with serial number prefix ≥ MY4615 unless 117 is installed
E4440A-BAB	Replaces type-N input connector with APC 3.5 connector	
E444xA-H70	70 MHz IF output	Excludes 122, 140. Not available for E4447A
E444xA-HYX	21.4 MHz IF output	Available for all PSA models

PC Software

E444xA-230	BenchLink Web Remote Control Software	
E444xA-235	Wide BW digitizer external calibration wizard	Requires 122 or 140 E4443A/45A/40A/46A/48A

Accessories

E444xA-1CM	Rack mount kit
E444xA-1CN	Front handle kit
E444xA-1CP	Rack mount with handles
E444xA-1CR	Rack slide kit
E444xA-015	6 GHz return loss measurement accessory kit
E444xA-045	Millimeter wave accessory kit
E444xA-0B1	Extra manual set including CD ROM

Product Literature

Publication Title	Publication Type Number	Publication
PSA Series		
Selecting the Right Signal Analyzer for Your Needs	Selection Guide	5968-3413E
PSA Series	Brochure	5980-1283E
PSA Series	Data Sheet	5980-1284E
PSA Series	Configuration Guide	5989-2773EN
Self-Guided Demonstration for Spectrum Analysis	Product Note	5988-0735EN
Wide bandwidth and vector signal analysis		
40/80 MHz Bandwidth Digitizer	Technical Overview	5989-1115EN
Using Extended Calibration Software for Wide Bandwidth Measurements, PSA Option 122 & 89600 VSA	Application Note 1443	5988-7814EN
PSA Series Spectrum Analyzer Performance Guide Using 89601A Vector Signal Analysis Software	Product Note	5988-5015EN
89650S Wideband VSA System with High Performance Spectrum Analysis	Technical Overview	5989-0871EN
Measurement personalities and applications		
Phase Noise Measurement Personality	Technical Overview	5988-3698EN
Noise Figure Measurement Personality	Technical Overview	5988-7884EN
External Source Measurement Personality	Technical Overview	5989-2240EN
Flexible Modulation Analysis Measurement Personality	Technical Overview	5989-1119EN
W-CDMA and HSDPA/HSUPA Measurement Personalities	Technical Overview	5988-2388EN
GSM with EDGE Measurement Personality	Technical Overview	5988-2389EN
cdma2000 and 1xEV-DV Measurement Personalities	Technical Overview	5988-3694EN
1xEV-DO Measurement Personality	Technical Overview	5988-4828EN
cdmaOne Measurement Personality	Technical Overview	5988-3695EN
WLAN Measurement Personality	Technical Overview	5989-2781EN
NADC/PDC Measurement Personality	Technical Overview	5988-3697EN
TD-SCDMA Measurement Personality	Technical Overview	5989-0056EN
Built-in Measuring Receiver Personality / Agilent N5531S Measuring Receiver	Technical Overview	5989-4795EN
BenchLink Web Remote Control Software	Product Overview	5988-2610EN
IntuiLink Software	Data Sheet	5980-3115EN
Programming Code Compatibility Suite	Technical Overview	5989-1111EN
EMI Measurement Receiver	Product Overview	5989-6807EN
Hardware options		
PSA Series Spectrum Analyzers Video Output (Option 124)	Technical Overview	5989-1118EN
PSA Series Spectrum Analyzers, Option H70,70 MHz IF Output	Product Overview	5988-5261EN
Spectrum analyzer fundamentals		
Optimizing Dynamic Range for Distortion Measurements	Product Note	5980-3079EN
PSA Series Amplitude Accuracy	Product Note	5980-3080EN
PSA Series Swept and FFT Analysis	Product Note	5980-3081EN
PSA Series Measurement Innovations and Benefits	Product Note	5980-3082EN
Spectrum Analysis Basics	Application Note 150	5952-0292
Vector Signal Analysis Basics	Application Note 150-15	5989-1121EN
8 Hints for Millimeter Wave Spectrum Measurements	Application Note	5988-5680EN
Spectrum Analyzer Measurements to 325 GHz with the Use of External Mixers	Application Note 1453	5988-9414EN
EMI	Application Note 150-10	5968-3661E

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