Product Brochure

Anritsu

MS2690A/MS2691A/MS2692A

Signal Analyzer

MS2690A: 50 Hz to 6.0 GHz
MS2691A: 50 Hz to 13.5 GHz
MS2692A: 50 Hz to 26.5 GHz

Excellent Eco Product

The MS2690A/MS2691A/MS2692A (MS269xA) Signal Analyzer has the excellent general level accuracy, dynamic range and performance of a high-end spectrum analyzer. Its easy operability and built-in functions are perfect for tests of Tx characteristics. Not only can it capture wideband signals but FFT technology supports multifunction signal analyses in both the time and frequency domains. Behavior in the time domain that cannot be handled by a sweep type spectrum analyzer can be checked in the frequency domain. A wide frequency can be analyzed using sweep type spectrum analysis functions while detailed signal analysis of a specific frequency band is supported too. Moreover, the built-in signal generator function outputs both continuous wave (CW) and modulated signals for use as a reference signal source when testing Tx characteristics of parts and as a signal source for evaluating Rx characteristics.

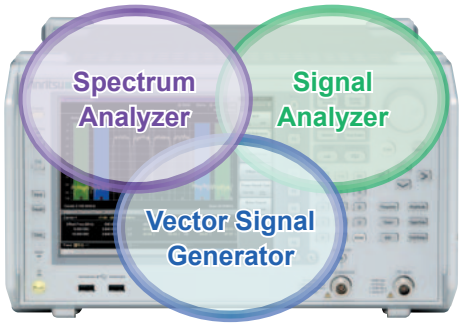
Wireless communications are tending toward use of higher frequencies above 3 GHz and wider bandwidths. However, general-purpose spectrum analyzers suffer from a degraded noise floor above 3 GHz due to the 3-GHz baseband, so they cannot be used to verify the true product performance. Because the MS269xA baseband can be extended up to 6 GHz it offers excellent level accuracy and modulation precision at frequencies from 50 Hz to 6 GHz. Adding the full line of versatile analysis software options eliminates the need for an external PC at wireless modulation analysis. Moreover, installing a pre-selector bypass option (MS2692A-067) enables use of the signal analyzer and modulation analysis functions up to 26.5 GHz (MS2692A). Waveform creation software generates modulation signal patterns for all common wireless technologies to output signals for the vector signal generator function.
The high-performance, multi-function MS269xA Signal Analyzer supports better analysis than more expensive standalone spectrum analyzers.

MS2690A/MS2691A/MS2692A

Signal Analyzer

MS2690A: 50 Hz to 6.0 GHz
MS2691A: 50 Hz to 13.5 GHz
MS2692A: 50 Hz to 26.5 GHz

Key Features



Basic Performance/Functions

■ **Frequency Range**
MS2690A: 50 Hz to 6.0 GHz
MS2691A: 50 Hz to 13.5 GHz
MS2692A: 50 Hz to 26.5 GHz

■ **Total Level Accuracy: ±0.3 dB (typ.)**
The Absolute Amplitude Accuracy specification described in catalogs of other spectrum analyzers ignores the important frequency characteristics, linearity, and attenuator switching errors. The MS269xA calibration technology supports excellent level accuracy over the wide frequency range from 50 Hz to 6 GHz even under measurement conditions including the above three errors.

■ **Dynamic Range[*1]: 177 dB**
TOI[*2]: ≥+22 dBm
DANL[*3]: –155 dBm/Hz

■ **Improved Level Linearity**

■ **Internal Reference Oscillator**
Pre-installed Reference Oscillator
Aging Rate: ±1 × 10^{-8}/day
Start-up Characteristics: ±5 × 10^{-8} (5 minutes after power-on)
Rubidium Reference Oscillator (Opt. 001)
Aging Rate: ±1 × 10^{-10}/month
Start-up Characteristics: ±1 × 10^{-9} (7 minutes after power-on)

■ **Versatile Built-in Functions**
- Channel Power
- Occupied Bandwidth
- Adjacent Channel Leakage Power
- Spectrum Emission Mask[*4]
- Spurious Emission[*4]
- Burst Average Power
- Frequency Counter[*4]
- AM Depth[*5]
- FM Deviation[*5]
- Multi-marker & Marker List
- Highest 10 Markers
- Limit Line[*4]
- Phase Noise

Signal Analyzer Functions

■ **Analysis Bandwidth**
Standard: 31.25 MHz max.
(50 MHz max. sampling rate = 20 ns resolution)
Opt. 004: 125 MHz max.
(200 MHz max. sampling rate = 5 ns resolution)
Opt. 077: 62.5 MHz max.
(100 MHz max. sampling rate = 10 ns resolution)
Opt. 078[*6]: 125 MHz max.
(200 MHz max. sampling rate = 5 ns resolution)

■ **Capture Function**
Saves analysis Span × Time signal to internal memory and writes to hard disk.
Up to 100 Msamples per measurement can be saved to internal memory.
Examples: Span 1 MHz: Max. capture time 50 s
Span 10 MHz: Max. capture time 5 s
Span 100 MHz: Max. capture time 0.5 s

■ **Replay Function**
Reads saved data and replays using signal analyzer function.
Examples:
1. Data sharing between separate R&D and manufacturing
2. Later laboratory bench-top analysis of on-site signals

■ **Measurement with Sub-trace Display**
Splits screen and confirms both main and sub-traces at same time to check errors.
Main: Spectrum, Frequency vs. Time, Power vs. Time, Phase vs. Time, CCDF/APD, Spectrogram
Sub: Power vs. Time, Spectrogram

■ **Supports 125 MHz Wideband Measurements up to 26.5 GHz**
Opt. 067 Microwave Preselector Bypass[*7]
Opt. 078 Analysis Bandwidth Extension to 125 MHz[*6]
Bypassing pre-selector improves RF frequency characteristics and in-band frequency characteristics. Supports modulation analysis and signal analyzer measurements for signals up to 26.5 GHz.

Vector Signal Generator (Opt.020)

■ **Frequency Range: 125 MHz to 6 GHz**

■ **Pre-installed Baseband Generator**
Vector Modulation Bandwidth: 120 MHz
Sampling Clock: 20 kHz to 160 MHz

■ **Level Accuracy: ±0.5 dB**

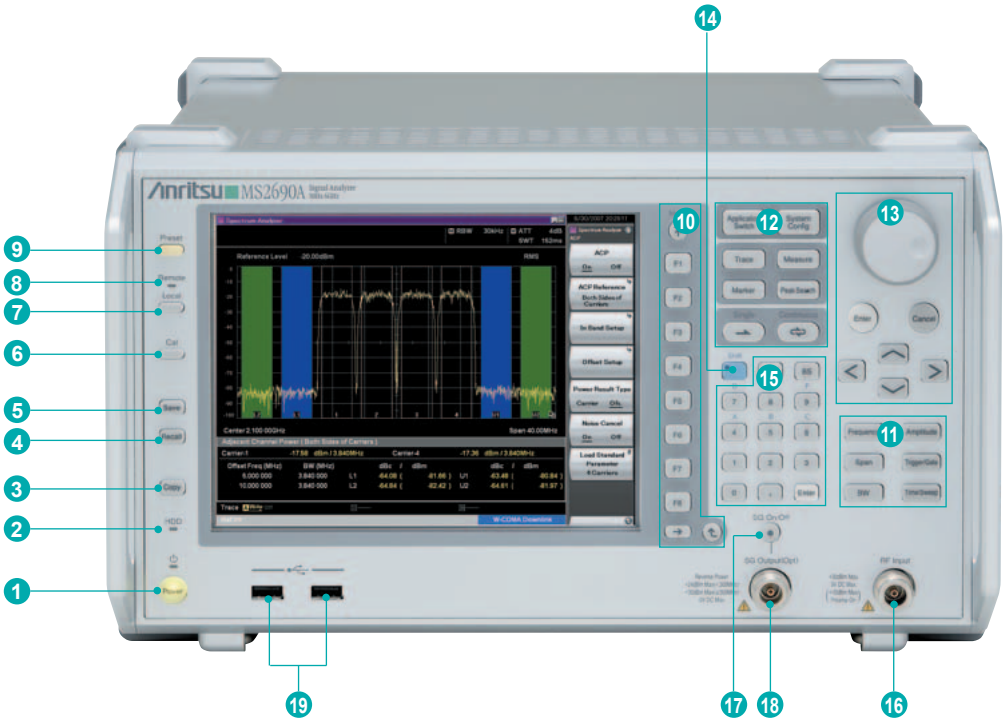
■ **Large-capacity Memory: 1 GB = 256 Msamples**

■ **Internal AWGN Generator**

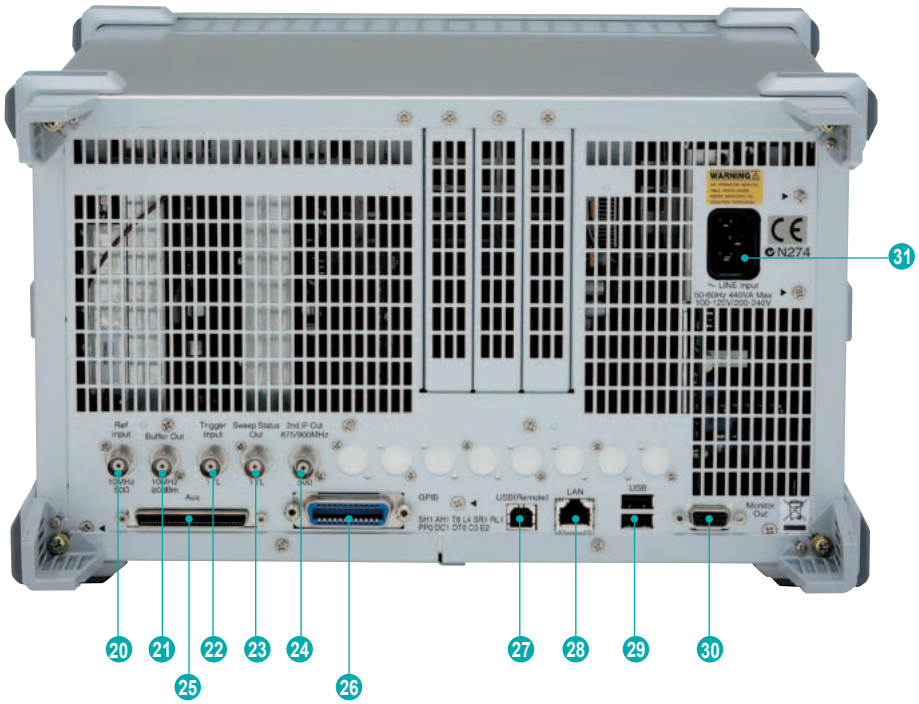
■ **Internal BER Measurement Function**
Bit Rate: 100 bps to 10 Mbps
Input Level: TTL

∗1: Difference between TOI and DANL as simple guide
∗2: TOI (Third Order Intercept)
∗3: DANL (Displayed Average Noise Level)
∗4: Spectrum Analyzer Functions
∗5: Signal Analyzer Functions
∗6: Requires MS269xA-077
∗7: Opt. 067 can be installed in MS2692A

Panel Layout



1. **Power switch:** Press to switch move between the standby state in which AC power is supplied and the Power On state in which the MS269xA in the operating mode.
2. **Hard disk access lamp:** Lights up when the MS269xA internal hard disk is being accessed.
3. **Copy key:** Press to capture a screen image from the display and save it to a file.
4. **Recall key:** Press to recall a parameter file.
5. **Save key:** Press to save a parameter file.
6. **Cal key:** Press to display the calibration execution menu.
7. **Local key:** Press to return to local operation from remote control operation through GPIB, Ethernet or USB (B), and enable panel settings.
8. **Remote lamp:** Lights up when the MS269xA is in a remote control state.
9. **Preset key:** Resets parameters to their initial settings.
10. **Function keys:** Used for selecting or executing function menu displayed on the right of the screen.
11. **Main function keys 1:** Used to set or execute main functions of the MS269xA.
    Executable functions vary depending on the application currently selected.
12. **Main function keys 2:** Used to set or execute main functions of the MS269xA.
    Executable functions vary depending on the application currently selected.
13. **Rotary knob/Cursor key/Enter key/Cancel key:** The rotary knob and cursor keys are used to select display items or change settings.
14. **Shift key:** Used to operate any keys with functions described in blue characters on the panel. First press the Shift key, then press the target key when the Shift key lamp lights up green.
15. **Numeric keypad:** Used to enter numbers on parameter setup screens.
16. **RF Input connector:** Inputs an RF signal.
17. **RF output control key:** If the MS269xA-020 Vector Signal Generator is installed, pressing enables (On) or disables (Off) the RF signal output. The lamp of the RF output control key lights up orange when the RF signal output is set to On.
18. **RF output connector (when MS269xA-020 installed):** Outputs an RF signal.
19. **USB connectors (type A):** Used to connect a USB keyboard or mouse or the USB memory supplied with the MS269xA.



20 **Ref Input connector (reference frequency signal input connector):** Inputs an external reference frequency signal (10 MHz/13 MHz). It is used for inputting reference frequency signals with accuracy higher than that of those inside the MS269xA, or for synchronizing the frequency of the MS269xA to that of another device.

21 **Buffer Out connector (reference frequency signal output connector):** Outputs the reference frequency signal (10 MHz) generated inside the MS269xA. It is used for synchronizing the frequencies between other devices and the MS269xA based on the reference frequency signal output from this connector.

22 **Trigger Input connector:** Inputs a trigger signal from an external device. Refer to the operation manual of each application for operations when a trigger signal is input.

23 **Sweep Status Out connector:** Outputs a signal that is enabled when an internal measurement is performed or measurement data is obtained.

24 **IF Out connector:** Outputs an IF signal. 874.988 MHz is specified as the center frequency during spectrum analyzer operations, and 875 or 900 MHz is specified during signal analyzer operations. (Bandwidth ≤31.25 MHz: 875 MHz, Bandwidth >31.25 MHz: 900 MHz) The IF signal is output without band limitation by RBW during both spectrum analyzer and signal analyzer operations.

25 **Aux connector:** Composite connector for Vector Signal Generator options with Marker 1 to 3 outputs, pulse modulation input, baseband reference clock signal input, and BER measurement Clock, Data, and Enable inputs. Converted to BNC using optional AUX Conversion Adaptor (J1373A).

26 **GPIB connector:** Used when controlling the MS269xA externally via GPIB.

27 **USB connector (type B):** Used when controlling the MS269xA externally via USB.

28 **Ethernet connector:** Used for connecting to a personal computer (PC) or for Ethernet connection.

29 **USB connectors (type A):** Used to connect a USB keyboard or mouse or the USB memory supplied with the MS269xA.

30 **Monitor Out connector:** Used for connection with an external display.

31 **AC inlet:** Used for supplying power.

Basic Performance

Excellent Total Level Accuracy: ±0.3 dB (typ.)

(Common to both Spectrum Analyzer and Signal Analyzer Functions)

With a 6-GHz basic band and level calibration over a wide frequency range, the MS269xA has excellent total level accuracy.

The Absolute Amplitude Accuracy specification described in catalogs of other spectrum analyzers ignores the important frequency characteristics, linearity, and attenuator switching errors. In contrast, the MS269xA Level Calibration technology assures excellent level accuracy over a wide frequency range from 50 Hz to 6 GHz even under measurement conditions including the above three errors. The level accuracy is assured even when the frequency and attenuator are switched.

Advantage of 6 GHz Basic Band

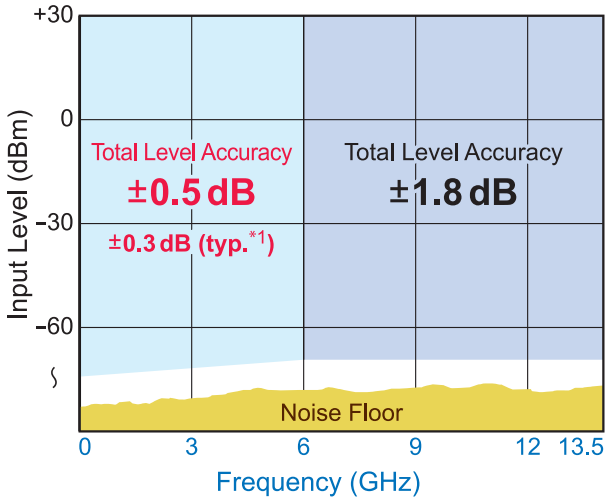
Conventional spectrum analyzers have a degraded noise floor above 3 GHz because they use a pre-selector at the 3-GHz basic band, which causes lowered measurement accuracy.
The MS269xA basic band of 6 GHz eliminates the degraded noise floor and improves measurement accuracy.

Advantage of MS269xA Level Accuracy Technology

Conventional spectrum analyzers perform level calibration at just one frequency point, which causes errors when the frequency changes. The MS269xA has two built-in signal generators for level calibration over a wide frequency range from 50 Hz to 6 GHz, minimizing measurement errors in this frequency range.

The MS269xA total level accuracy includes:

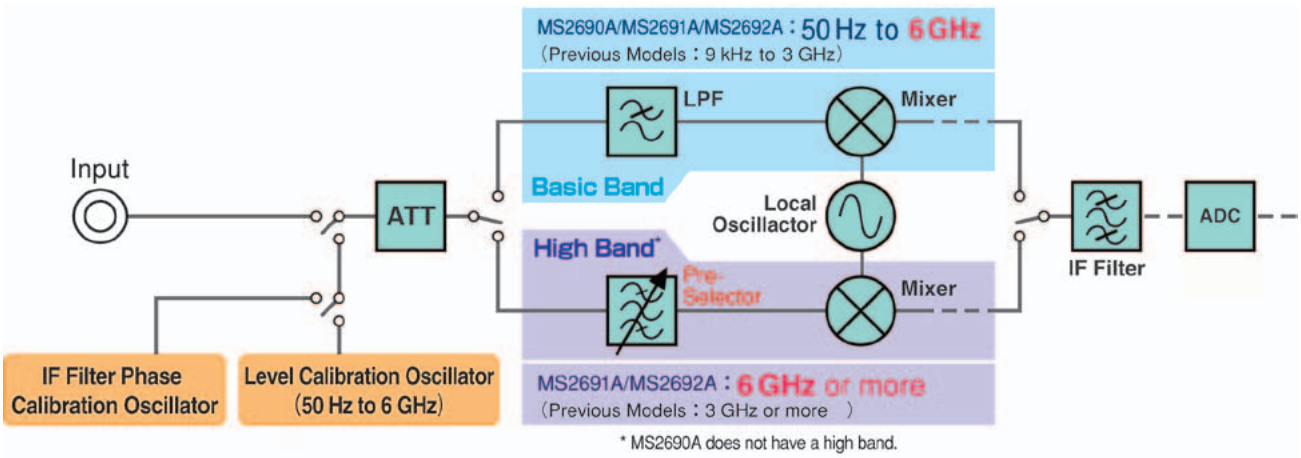
- **Frequency characteristics**
- **Linearity**
- **Attenuator switching error**



Note: Eliminates effect of noise floor
Used only when Uncal does not occur

∗1: Excluding Guard Band

MS269xA Block Diagram



Pre-selector

The MS269xA has a basic band that goes to 6 GHz without a pre-selector. Most spectrum analyzers may use a pre-selector in the high band to clean-up images but it is extremely difficult to stabilize the amplitude and frequency characteristics of the pre-selector. This instability is the main cause of degraded level accuracy and modulation precision in measuring instruments.
Additionally, the pre-selector passband frequency can cause limitations at analysis bandwidths. No pre-selector means greater measurement accuracy.

MS2692A-067* Microwave Preselector Bypass

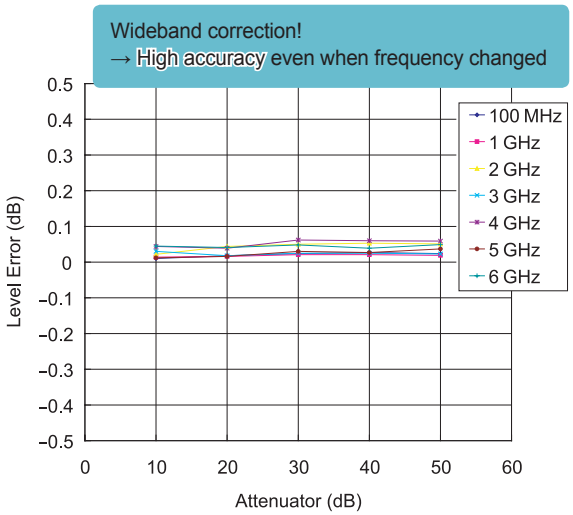
Bypasses the pre-selector to improve the RF frequency characteristics and the in-band frequency characteristics.
When the pre-selector option is set to On, the image response elimination filter is bypassed.
Therefore, this function is not appropriate for spurious measurement to receive the image response.

∗: Opt. 067 can be installed in MS2692A.

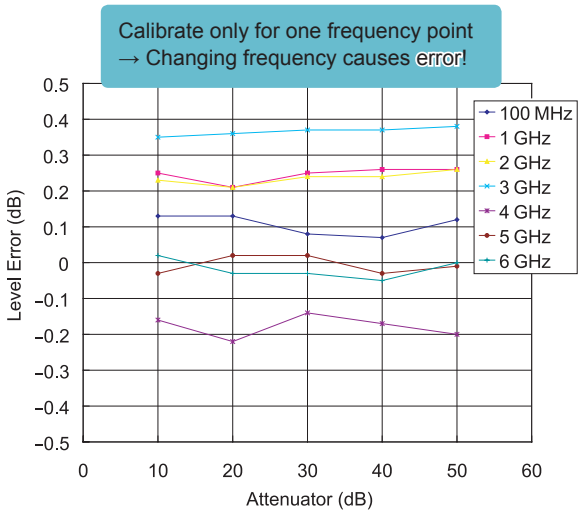
Basic Performance

Example: Level Error Comparison with Different Level Calibration Method

MS269xA



Conventional Spectrum Analyzer



The MS269xA total level accuracy includes:

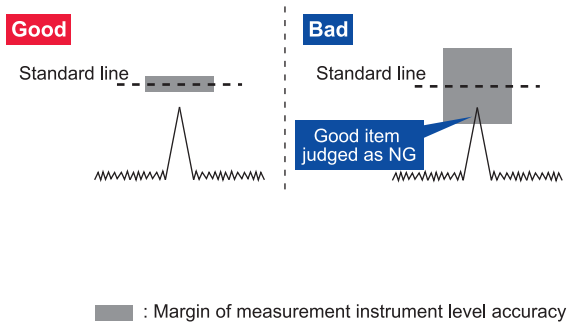
- **Frequency characteristics**
- **Linearity**
- **Attenuator switching error**

The absolute amplitude accuracy specifications of other spectrum analyzers excludes:

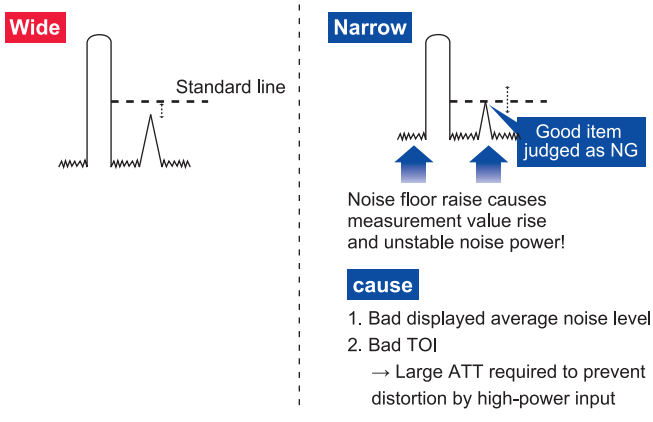
- **Frequency characteristics**
- **Linearity**
- **Attenuator switching error**

The measuring instrument level error cannot be said to really meet the specifications if measurement requires addition of a margin to the product test specification. Since specifications with added margin are severe, even genuinely passing products may sometimes be evaluated as failing due to this margin.

Level accuracy



Dynamic range



Basic Performance

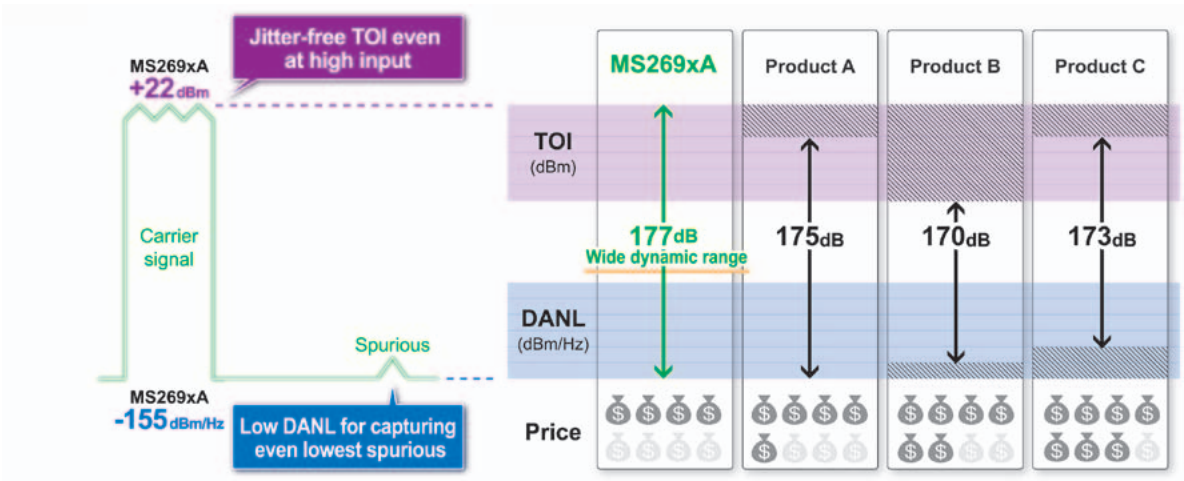
Top Class Dynamic Range

Dynamic range[*1]: 177 dB
TOI[*2]: ≥+22 dBm (700 MHz to 4 GHz)
DANL[*3]: –155 dBm/Hz (30 MHz to 2.4 GHz)

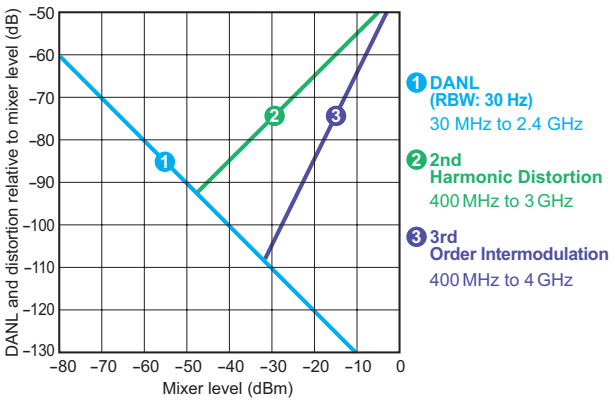
∗1: Difference between TOI and DANL as simple guide.
∗2: TOI (Third Order Intercept)
∗3: DANL (Displayed Average Noise Level)

Dynamic range is a key specification for spectrum analyzers. Low displayed average noise level (DANL) as well as high TOI are important too.
Low TOI may cause distortion with high-level carrier signals. Inserting an attenuator can lower the carrier level but this has the effect of lowering the level of weak spurious, making it hard to measure.

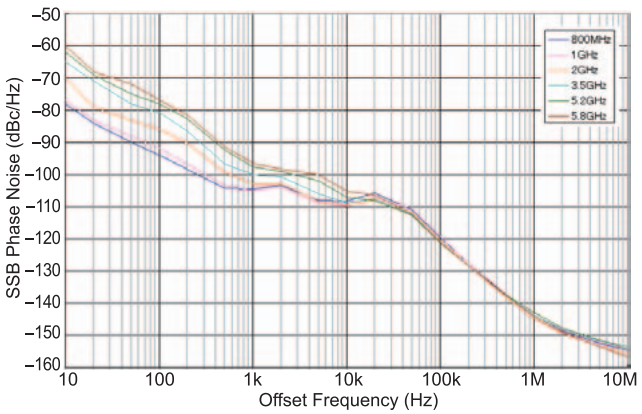
The MS269xA has an excellent dynamic range supporting true performance measurements of devices, such as base stations, requiring wideband measuring instruments.
For example, the 3GPP category-B spurious measurement specification requires a measuring instrument with severe dynamic range specifications. If the measurement is within the MS269xA dynamic range, measurement jigs such as filters and amplifiers are unnecessary and troublesome calibration is omitted, helping simplify setup and cut costs.



Distortion Characteristics (Spectrum Analyzer)



Example: SSB Phase Noise
(Spectrum Analyzer/Signal Analyzer Common)

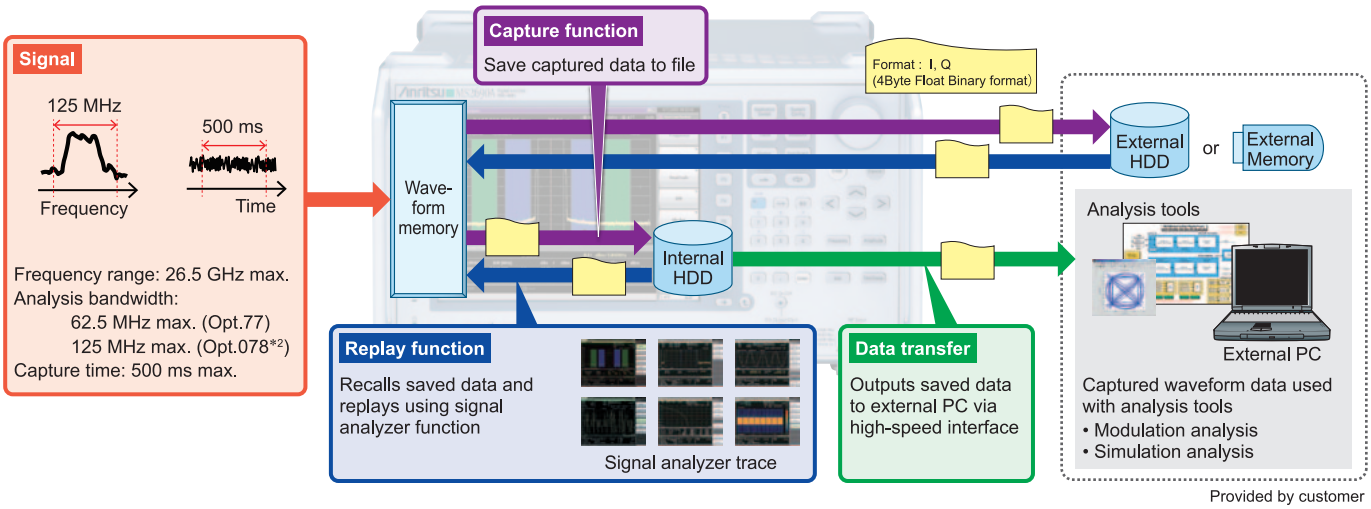


Supports 125 MHz Wideband Measurements up to 26.5 GHz

MS2692A-067 Microwave Preselector Bypass*1 + MS2692A-078 Analysis Bandwidth Extension to 125 MHz*2

*1: Can be installed in MS2692A.
*2: Require MS2692A-077.

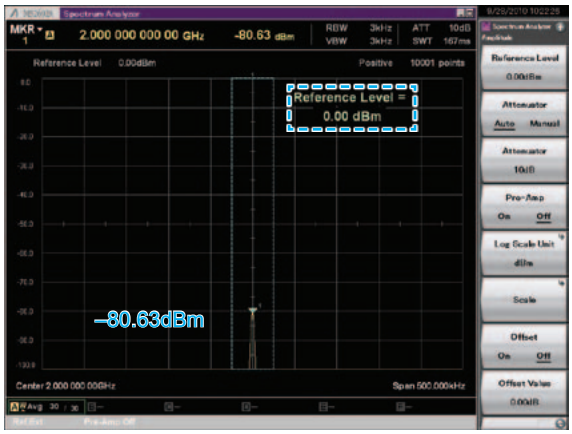
Supports wideband analysis with high frequencies for satellite communications
Microwave preselector bypass frequency range: 6 GHz to 26.5 GHz (MS2692A)
Installing the microwave preselector bypass supports signal analyzer measurement functions in the above frequency range.

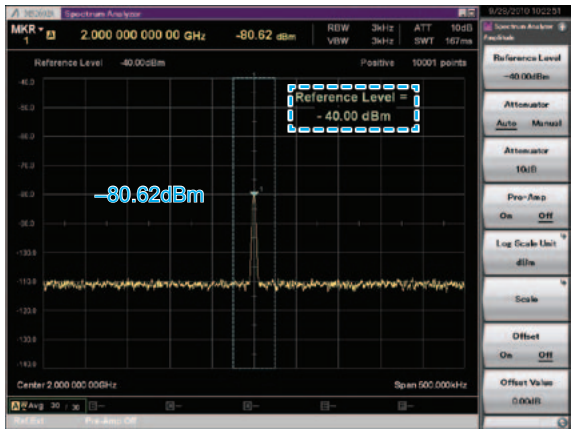


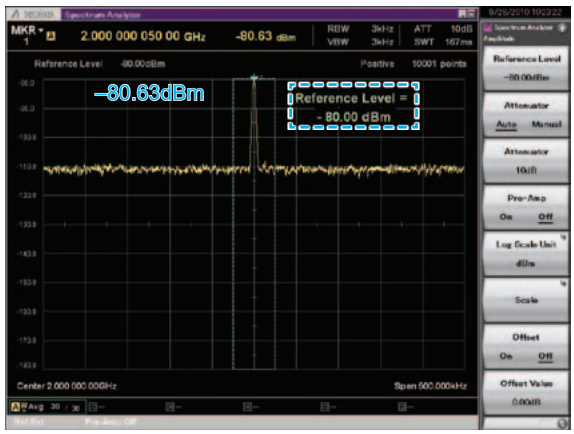
Improved Level Linearity

Conventional spectrum analyzers use an analog IF and log amp to achieve good level accuracy at points near the log scale reference level, but the accuracy degrades at points that are further away. The MS269xA uses a digital IF instead of a log amp, which supports measurements with excellent accuracy at any point.

Example: Level Stability by Switching Reference Level







Level Linearity:

The MS269xA total level accuracy is better than that of conventional spectrum analyzers but sometimes a power meter is used when wanting to measure with even higher accuracy. However, use of a power meter narrows the dynamic range and errors may also occur easily when switching the power range. Since a power meter has no frequency selection, the total power of the input signal is measured. In other words, the power of the target frequency components cannot be separated out.
Measurement can be performed with a wide dynamic range after checking the MS269xA level measurement reference value with a power meter.

The MS269xA total level accuracy includes:

- **Frequency characteristics**
- **Linearity**
- **Attenuator switching error**

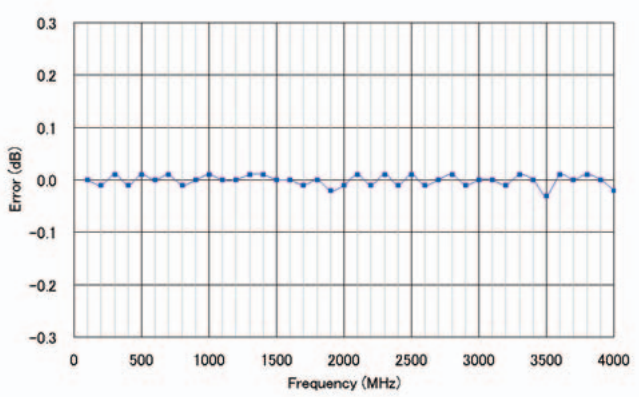
And supports excellent:

- **Log scale stability**

Dual Sweep Speed: Normal/Fast

When sweep time is set to [Auto], Normal (normal sweep) or Fast mode (high-speed sweep) can be set. The Fast mode sweeps six times faster than the Normal mode.

Example of Sweep Mode Switch Error: (CW –10 dBm input)
Level Error when Switching from Normal to Fast



Resolution Bandwidth (RBW)

Setting Range (Spectrum Analyzer):
30 Hz to 3 MHz (1-3 sequence),
50 kHz, 5 MHz, 10 MHz, 20 MHz, 31.25 MHz[*1]
Setting Range (Spectrum trace in signal analyzer mode):
1 Hz to 1 MHz (1-3 sequence), 3 MHz[*2, *3], 10 MHz[*3]

When monitoring two adjacent signals, the frequency resolution can be increased by reducing the resolution bandwidth (RBW). This also has the effect of reducing the noise level. Conversely, to confirm level variations of 20-MHz band signals such as LTE and WiMAX, set the RBW to 31.25 MHz.

∗1: Instead of Gaussian filter, 31.25 MHz RBW uses filter with flat top characteristics above 31.25 MHz.
∗2: With Opt. 077 installed and bandwidth setting ≥50 MHz
∗3: With Opt. 004 or Opt. 077+078 installed and bandwidth setting ≥50 MHz

Trigger Function

Trigger sweep executes sweeping using the specified trigger condition as the start point. In particular, “SG Marker” starts analyzer measurement in synchrony with the signal output by installing Opt.020. Using this function supports simple synchronized measurement even when evaluating signals with large level variation over time, such as modulation signals.

- Video trigger:
  Trigger sweeping starts in synchronization with the rise or fall of the waveform. A trigger level indicator showing the trigger level is displayed on the screen.
- Wide IF video trigger:
  An IF signal with a wide passing band of about 50 MHz is detected, and sweeping starts in synchronization with either the rise or fall of the detected signal.
- External trigger:
  Sweeping starts in synchronization with the rise or fall of the signal input via the Trigger Input connector.
- SG Marker trigger (Requires Opt.020):
  Sweeping starts in synchronization with the rise or fall of the marker signal output of Opt.020. This function supports measurement in synchronization with the output signal of Opt.020.

Gate Sweep

Gate sweep executes sweeping only for the length of time specified by the gate length, starting from when the trigger condition is met. A delay time until sweeping starts after the trigger condition is met can be set using trigger delay.

- The gate source can be selected from the following
  - Wide IF video trigger
  - External trigger
  - SG marker trigger (Requires Opt.020)
- Setting range and resolution for gate delay
  - Setting range: 0 to 1 s
  - Resolution: 20 ns
- Setting range and resolution for gate length
  - Setting range: 50 µs to 1 s
  - Resolution: 20 ns

Three Built-in External Interfaces

The built-in Gigabit Ethernet, USB2.0, and GPIB interfaces support remote operation.

GPIB: IEEE488.2, Rear panel, IEEE488 bus connector
Interface functions: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0, E2

Ethernet: 10/100/1000BASE-T, Rear panel, RJ-45

USB (B): USB2.0, Rear panel, USB-B connector

Saving Measurement Results

Measurement results can be saved to internal hard disk or external USB memory. Screen dumps and trace data can be saved too.

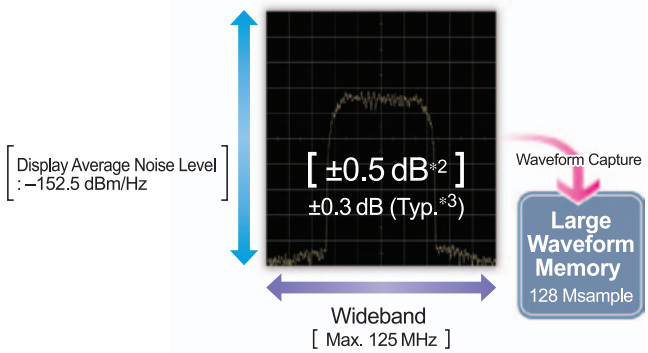
- Screen dump file type
  - BMP
  - PNG
- The color of the screen hard copy can be set as follows:
  - Normal (same as screen display)
  - Reverse
  - Monochrome
  - Reversed Monochrome

Signal Analyzer: Basic Performance/Functions

Wide bandwidth × High Accuracy FFT Analysis

Standard: 31.25 MHz max.
(Sampling rate 50 MHz max = Resolution 20 ns)
Opt. 004: 125 MHz max.
(Sampling rate 200 MHz max = Resolution 5 ns)
Opt. 077: 62.5 MHz max.
(Sampling rate 100 MHz max = Resolution 10 ns)
Opt. 078[*1]: 125 MHz max.
(Sampling rate 200 MHz max = Resolution 5 ns)

Based on the excellent level accuracy and wide dynamic range of the MS269xA, a signal with an FFT analysis bandwidth of up to 125 MHz can be captured with a level accuracy of ±0.3 dB.



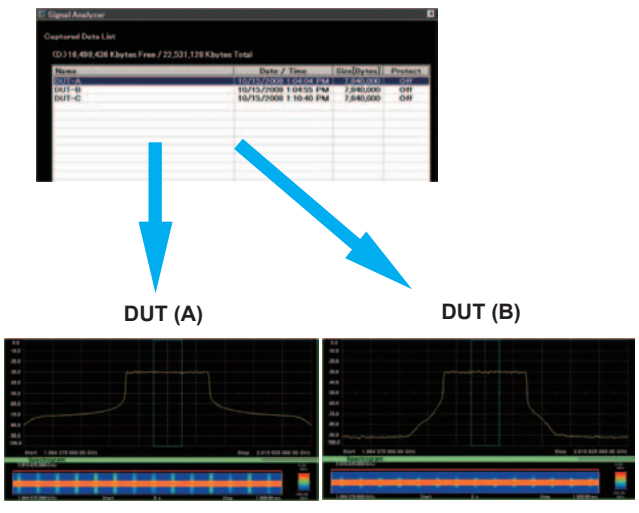
∗1: Requires Opt. 077
∗2: 50 Hz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal
∗3: Excluding Guard Band

Replay Function for Comparison Evaluation

This function reads saved data and replays it using the signal analyzer measurement function.

Examples:
1. Data sharing between separate R&D and manufacturing
2. Later laboratory bench-top analysis of on-site signals
3. Save data at shipment and re-verify if problem occurs

Captured Waveform Data: Selection Screen



Save Signals in Internal Memory

Max. Capture Time: 0.5 s to 2000 s
Max. Number of Samples: 100 Msamples

The “Analysis bandwidth × Analysis time” signal is held in internal memory and saved to hard disk.
Up to 100 Msamples of data can be saved to memory for one measurement. The frequency span determines the sampling rate. The following chart shows the maximum capture time per frequency span.

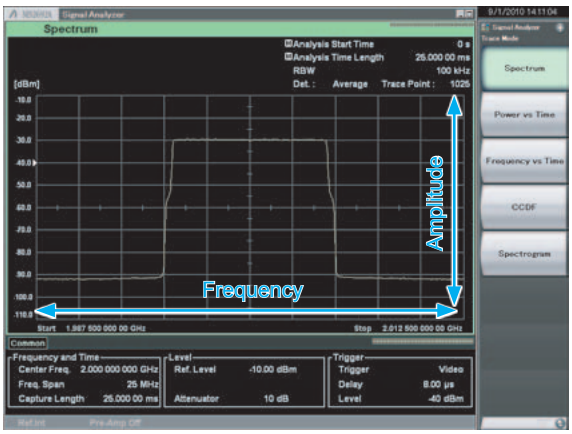
Span	Sampling Rate	Capture Time	Max. Sampling Data
1 kHz	2 kHz	2000 s	4M
2.5 kHz	5 kHz	2000 s	10M
5 kHz	10 kHz	2000 s	20M
10 kHz	20 kHz	2000 s	40M
25 kHz	50 kHz	2000 s	100M
50 kHz	100 kHz	1000 s	100M
100 kHz	200 kHz	500 s	100M
250 kHz	500 kHz	200 s	100M
500 kHz	1 MHz	100 s	100M
1 MHz	2 MHz	50 s	100M
2.5 MHz	5 MHz	20 s	100M
5 MHz	10 MHz	10 s	100M
10 MHz	20 MHz	5 s	100M
25 MHz	50 MHz	2 s	100M
31.25 MHz	50 MHz	2 s	100M
50 MHz*	100 MHz	500 ms	50M
62.5 MHz*	100 MHz	500 ms	50M
100 MHz*	200 MHz	500 ms	100M
125 MHz*	200 MHz	500 ms	100M

∗: With MS269xA-004: 50/100/125 MHz
With MS269xA-077: 50/62.5 MHz
With MS269xA-077/078: 50/62.5/100/125 MHz

Signal Analyzer: Trace

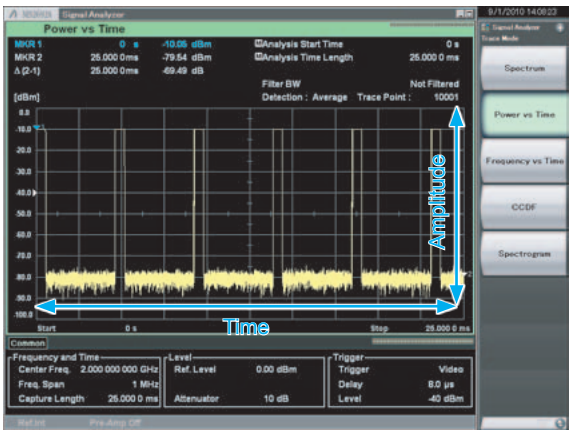
Spectrum

The Spectrum trace displays a graph with amplitude on the y-axis and frequency on the x-axis. The captured IQ data is FFT processed (fast Fourier transformed) and converted from the time domain to the frequency domain for display as a spectrum.



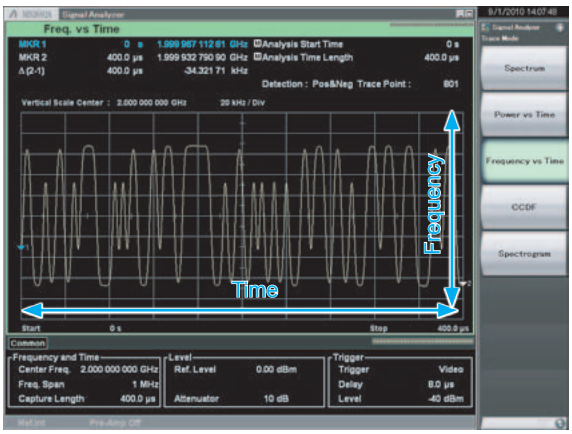
Power vs. Time

The Power vs. Time trace displays a graph with amplitude on the y-axis and time on the x-axis to confirm changes in power with time of measured signals.



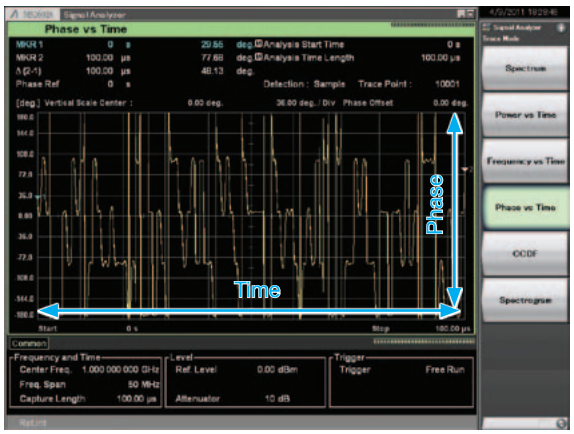
Frequency vs. Time

The Frequency vs. Time trace displays a graph with frequency on the y-axis and time on the x-axis to confirm time variation of the measured signal frequency.



Phase vs. Time

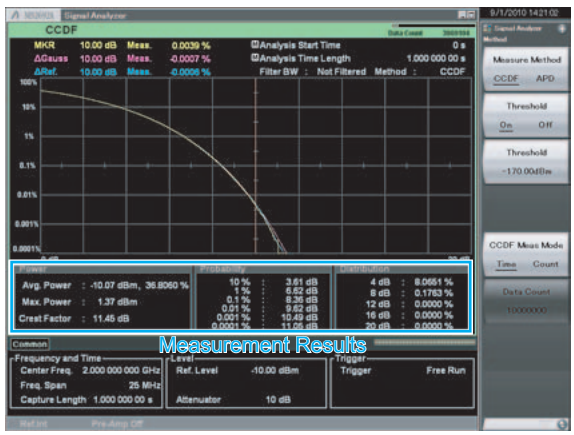
The Phase vs. Time trace displays a graph with phase on the y-axis and time on the x-axis to confirm time variation of the measured signal phase.



CCDF*1/APD*2

The CCDF trace displays the power variation probability on the y-axis and power variation on the y-axis to confirm the CCDF and APD of measured signals.

∗1: CCDF (Complementary Cumulative Distribution Function)
∗2: APD (Amplitude Probability Density)



Measurement Results

- CCDF: The CCDF display indicates the cumulative distribution of transient power variations compared to average power.
- APD: The APD display indicates the probability distribution of transient power fluctuations compared to average power.

Signal Analyzer: Trace

Spectrogram

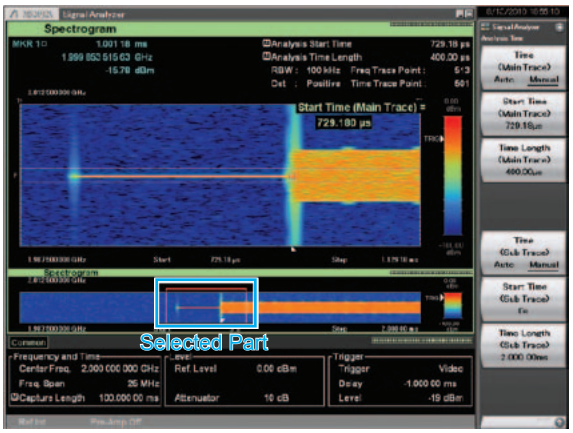
The Spectrogram trace displays the level as color with frequency on the y-axis and time on the x-axis. The captured IQ data is FFT processed to confirm time variations in the continuous spectrum. It is useful for monitoring frequency hopping and transient signals.

Measurement with Sub-trace Display

This function splits the screen into top and bottom halves; simultaneous display of the sub-trace supports easy monitoring of fault locations and transient phenomena.

Main: Spectrum, Frequency vs. Time, Power vs. Time, Phase vs. Time, CCDF/APD, Spectrogram
Sub: Power vs. Time, Spectrogram

The part of a previously captured long-term signal to be monitored can be selected (Blue part) on the sub-trace to display the problem part only on the main trace.



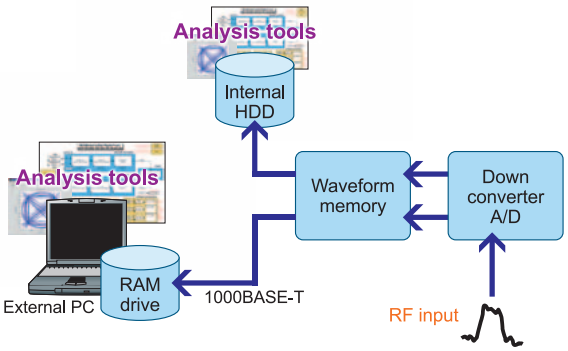
Example: Sub-trace Display

Confirm analysis range in sub-trace, and target signal status on main trace.

Signal Analyzer: Applications

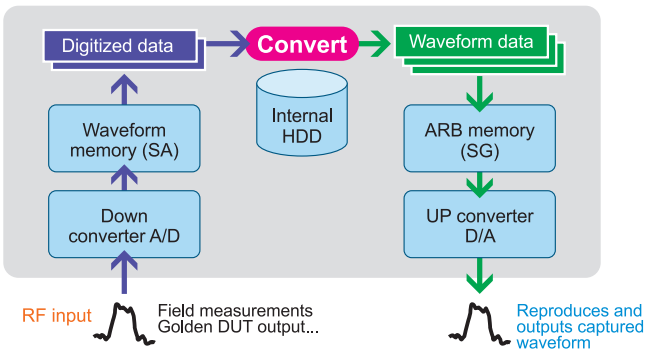
Captured Waveforms Analysis using Commercial Analysis Tools

Other digitizers may exhibit severe degradation of the RF channel during capture, requiring troublesome calibration of the captured data when using analysis tools.
The MS269xA uses high-performance RF and two built-in calibration oscillators to minimize the degradation and eliminate the need for calibration before using analysis tools.
The waveform data are saved to the internal hard disk and can be output to an external PC via a high-speed interface, such as the 1000BASE-T LAN port.



Captured Waveform Output from Vector Signal Generator Option

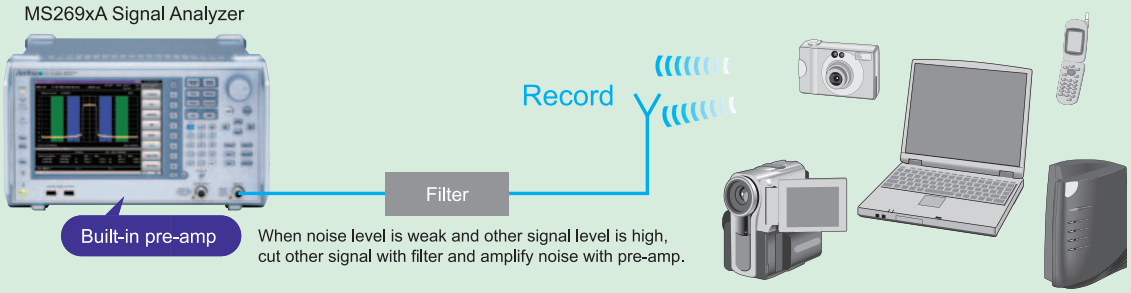
Waveforms captured using the digitizing function can be regenerated by using with the optional MS269xA-020 Vector Signal Generator. Signals captured in the field can be returned to the lab for analysis by replaying the signal using the Signal Generator. Signals captured from known good devices can provide a stable reference to increase debugging efficiency and test reliability.



Example: Noise Analysis and Record and Replay

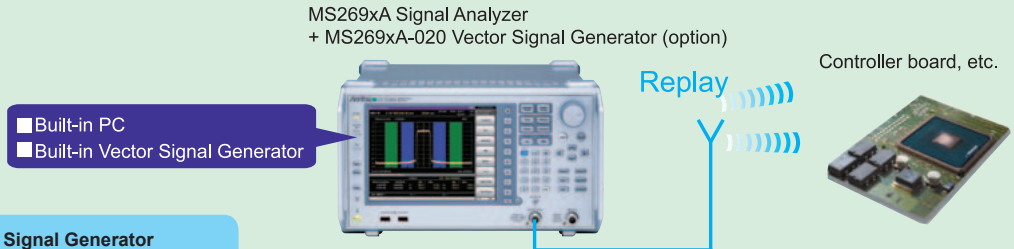
Signal Analyzer Capture Function Records Noise

- Save frequency span × Capture time as data file in memory
- Re-sample saved data and output as file to internal or external hard disk
- Recall data saved in internal or external hard disk and analyze as many times as necessary
- Perform multi-domain analysis, such as frequency axis, time axis, spectrogram, etc.



Replay Captured Noise from Vector Signal Generator

- Vector Signal Generator generates waveform pattern with built-in PC based on data captured by Signal Analyzer
- Outputs generated waveform at arbitrary level and frequency → Replay noise



MS269xA-020 Vector Signal Generator

- Frequency Range: 125 MHz to 6 GHz
- Output Level: –140 to 0 dBm
- Baseband Generator Clock: 20 kHz to 160 MHz
- Arbitrary Waveform Memory: 1 GB

Versatile Built-in Functions

Useful for Tx Characteristics Evaluation

The MS269xA is fully loaded with all the functions required for evaluating Tx characteristics. Tests can be performed simply and in accordance with standards using functions tailored to measurement contents.

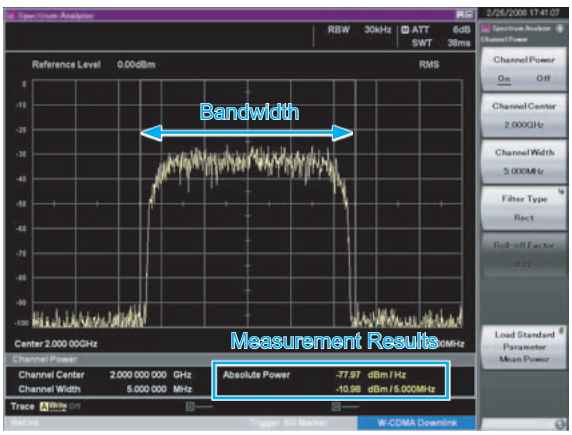
Measure Function	SPA*1	VSA*2
Channel Power	√	√
Occupied Bandwidth	√	√
Adjacent Channel Leakage Power	√	√
Spectrum Emission Mask	√	
Burst Average Power	√	√
Spurious Emission	√	
AM Depth		√
FM Deviation		√
Multi-marker & Marker List	√	√
Highest 10 Markers	√	√
Limit Line	√	
Frequency Counter	√	
Phase Noise	Independent function	

∗1: SPA (Spectrum Analyzer)
∗2: VSA (Vector Signal Analyzer)

Channel Power

SPA VSA

This function measures channel bandwidth power. Three types of filters (Rect, Nyquist, Root Nyquist) can be selected.
Pre-installed templates for each standard support easy parameter setting.

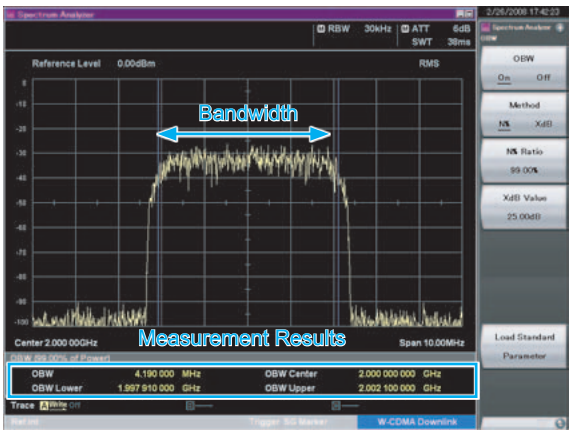


Measurement Results
- Absolute power per Hz in channel band
- Total power in channel band

Occupied Bandwidth

SPA VSA

Occupied bandwidth is measured by selecting either the N% or X-dB mode.
Pre-installed templates for each standard support easy parameter setting.



Measurement Results
- Bandwidth for specified conditions

Adjacent Channel Leakage Power

SPA VSA

This function measures carrier adjacent channel (offset) power (In-Band).
1 to 12 carriers can be set and switched instantaneously on-screen.
True ACLR performance is measured using the noise cancellation function to subtract main-frame noise from the measurement result.
Pre-installed templates for each standard support easy parameter setting.

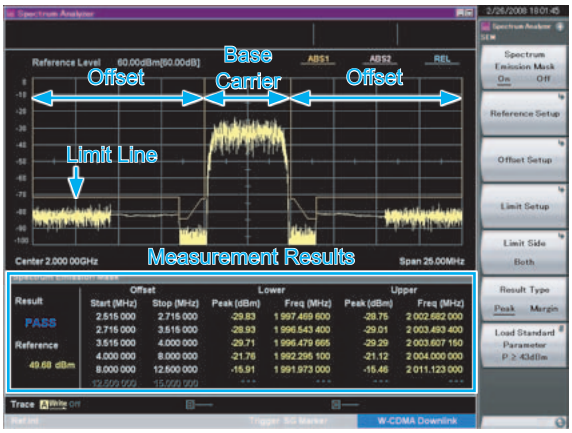
Measurement Results
- Absolute power of Offset channel
- Relative values in relation to reference power selected in ACP reference

Versatile Built-in Functions

Spectrum Emission Mask

SPA

This function splits the offset part into up to 6 segments; the measurement parameters and limit lines can be specified to measure the peak power and margin for each segment. The results are tabulated below the trace and marked PASS/FAIL. Pre-installed templates for each standard support easy parameter setting.



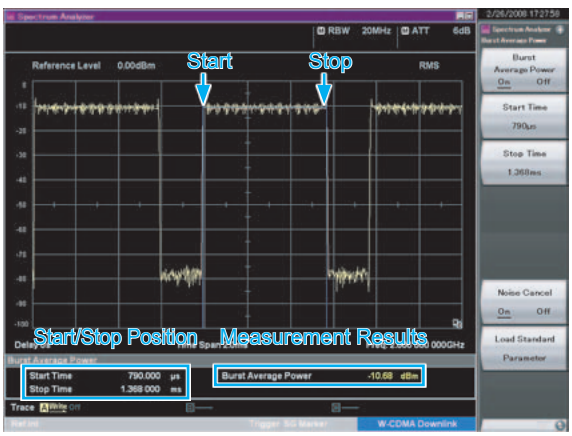
Measurement Results

- Peak power (or margin) at offset
- Each peak frequency

Burst Average Power

SPA VSA

The average power for the range specified by two markers is displayed in the time domain. Measurement only requires setting the measurement start and stop positions on the screen. True performance is measured using the noise cancellation function to subtract main-frame noise from the measurement result. Pre-installed templates for each standard support easy parameter setting.



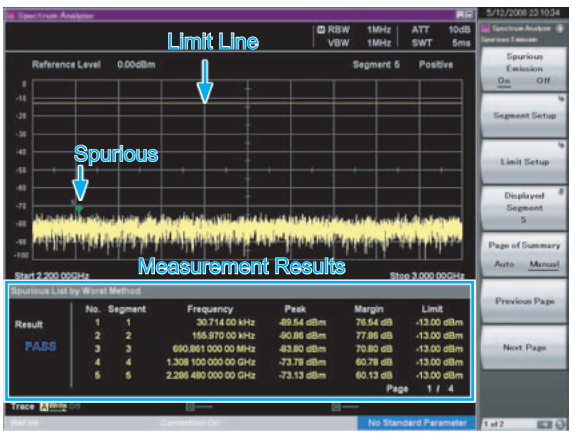
Measurement Results

- Average power of specified range

Spurious Emission

SPA

This function splits the frequency range into up to 20 segments for sweeping; the measurement parameters and limit lines can be specified to measure the peak power and margin for each segment. The results are tabulated below the trace and marked PASS/FAIL. In particular, all tests can be completed up to the final stage without an external PC because the zero-span capture function described in the technology compliance test is built-in.



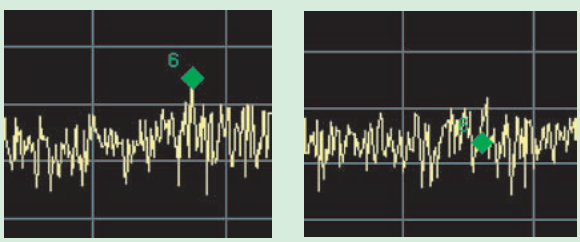
Measurement Results

- Each segment peak power and margin
- Each peak frequency

Example: Spurious Emission

The Japanese Radio Law governing measurement of spurious specifies searching for the peak level in the swept frequency segment using different parameter settings and then performing zero-span measurement of the found peak point. The MS269xA spurious measurement function not only performs the sweep search but also performs the zero-span measurement automatically as well, and displays the results of both. Using zero-span measurement, the search screen is displayed as is while zero-span measurement runs in the background and the result markers are plotted on the search screen. Time wasted by screen switching is reduced and the correlation with the search results can be seen at a glance.

Measurement Example



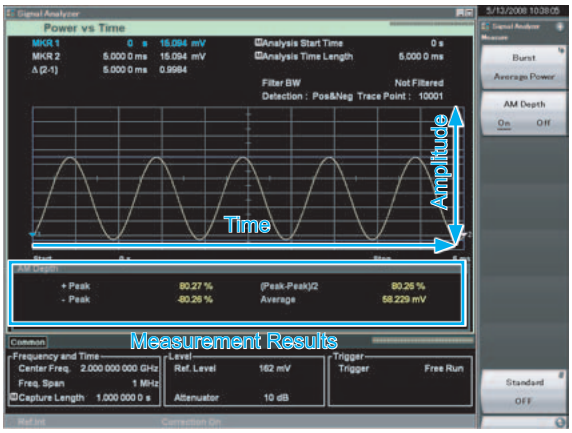
Search only | Search + Measurement

Versatile Built-in Functions

AM Depth

VSA

The Power vs. Time trace measurement function is used to confirm AM depth.
It measures the measured signal AM based on trace data at the displayed marker. When marker is Off, the whole range is measured.



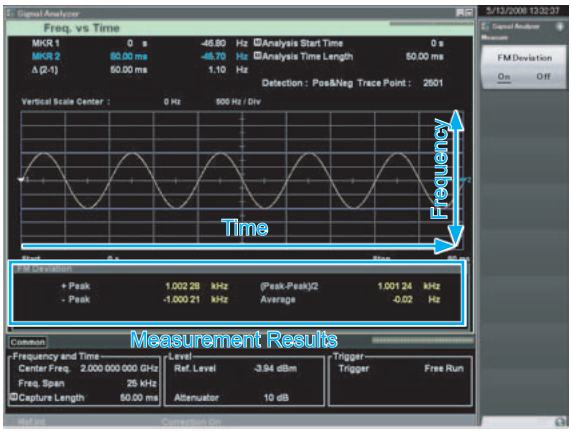
Measurement Results

- +Peak, –Peak, (Peak-Peak)/2, Average

FM Deviation

VSA

The Frequency vs. Time trace measurement is used to confirm the FM deviation. It measures the maximum and minimum frequencies from trace data in the marker range. When marker is Off, the whole range is measured.



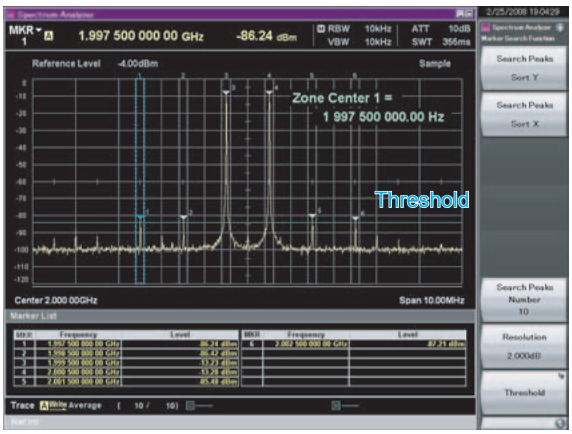
Measurement Results

- +Peak, –Peak, (Peak-Peak)/2, Average

Multi-marker & Marker List

SPA VSA

Up to 10 markers can be set for this function. Markers may be either a spot or a zone. Using a zone marker, the peak of a signal with an unstable variable frequency can be tracked and measured. Not only can the 10 markers be listed below the trace but the differences between markers can be calculated and displayed using the delta setting.



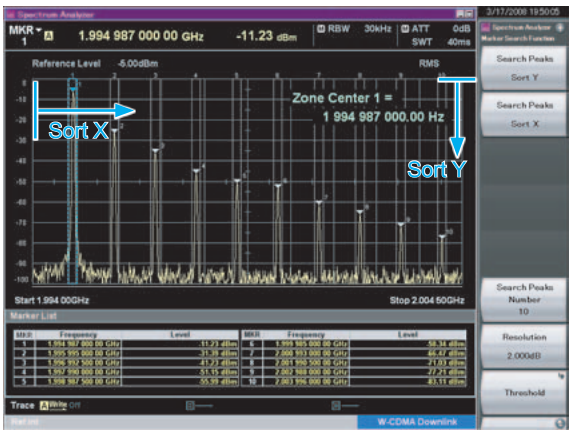
Measurement Results

- Marker point frequency
- Marker point power
- Absolute power per Hz in marker bandwidth
- Total power in marker bandwidth
- Difference between any markers

Highest 10 Markers

SPA VSA

This function sets the threshold level and auto-detects peaks in the X (frequency) and Y (level/time) directions.



Measurement Results

- Peak Search Y:
  Sets up to 10 markers in order of peak level
- Peak Search X:
  Sets up to 10 markers in order of frequency (time) level

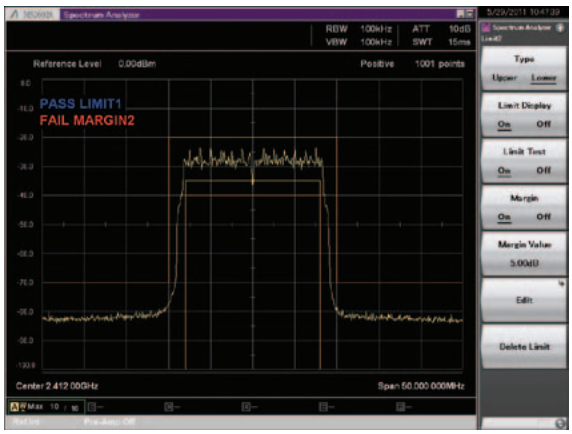
Versatile Built-in Functions

Limit Line

SPA

At the spectrum display (frequency domain), two limit lines are set and evaluation is performed based on these set lines. Either Upper Limit or Lower Limit can be selected. The line settings set the frequency/level of the crossover point sequentially from the lowest frequency. Up to 100 crossover points can be set. (In the diagram below, Limit1 is 6 points and Limit2 is 4 points.) In addition, when a margin is set at each of Limit1/2, evaluation can be performed using the lines, taking into account the margins. Once Limit1/2 has been set, the level direction can be fine-adjusted by the margin setting.

Line: Limit1, Limit2
Judgment type: Upper Limit, Lower Limit
Crossover (point): 1 to 100
Margin: Limit1, 2 + Display margin line



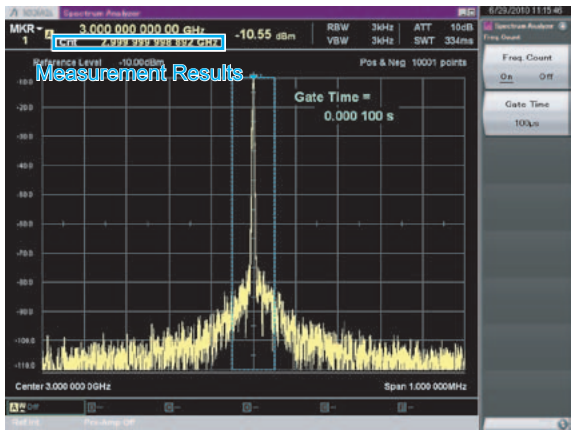
Measurement Results

- Evaluation: PASS, FAIL

Frequency Counter

SPA

This function of the marker functions is used to measure CW frequencies.
Gate Time sets the measurement target time.

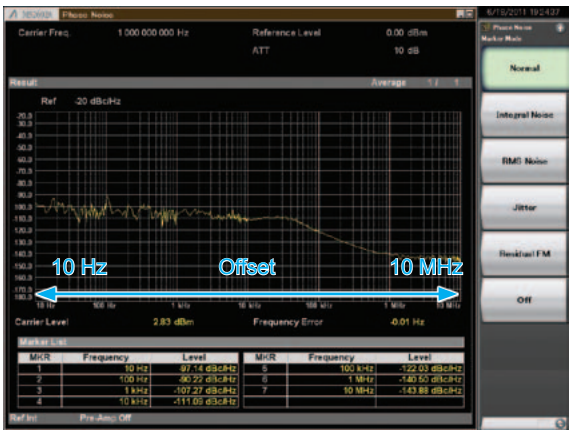


Measurement Results

- Marker point frequency

Phase Noise

This function measures phase noise in the 10 Hz to 10 MHz frequency offset range.



Measurement Results

- Carrier level
- Error between set frequency and carrier frequency
- Marker point phase noise level

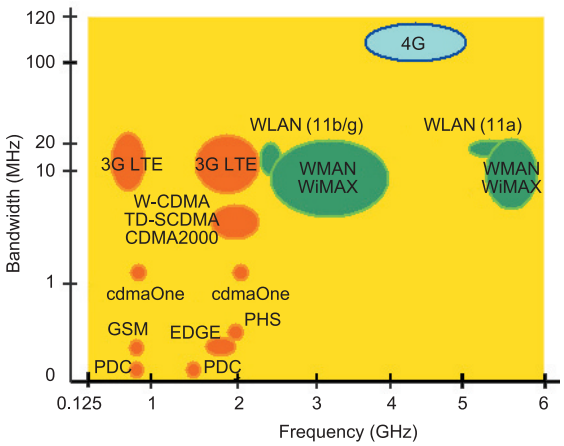
Vector Signal Generator (Opt.020): Basic Performance

The MS269xA-020 Vector Signal Generator option covers the frequency range from 125 MHz to 6 GHz; it has a wide vector modulation bandwidth of 120 MHz as well as a large built-in memory for storing 256 Msamples. Its level accuracy is at least as good as a dedicated signal generator and the ACLR performance is ideal for Tx tests of devices such as amplifiers and Rx tests of base stations. The all-in-one analyzer and signal generator supports simple configuration of space-saving measurement systems as well as easy signal analysis matching the output timing from the signal generator option.

Frequency Range

Frequency Range: 125 MHz to 6 GHz
Resolution: 0.01 Hz step

The Vector Signal Generator (Opt.020) frequency range is 125 MHz to 6 GHz, covering the key wireless communication range.

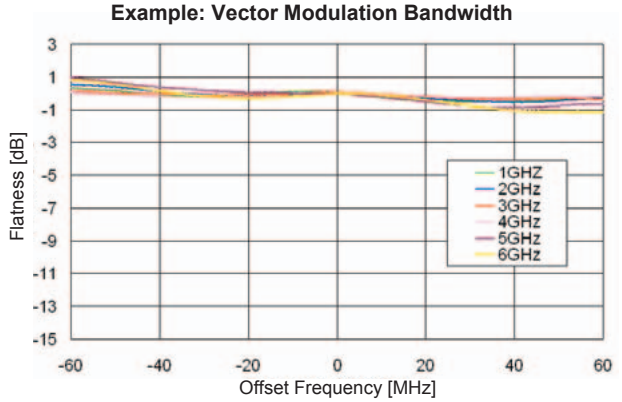


Internal Baseband Generator

Vector Modulation Bandwidth: 120 MHz
Sampling Clock: 20 kHz to 160 MHz

The wideband 120-MHz vector modulation bandwidth is achieved using the Opt.020 baseband signal generator.
The sampling clock supports up to 160 MHz.

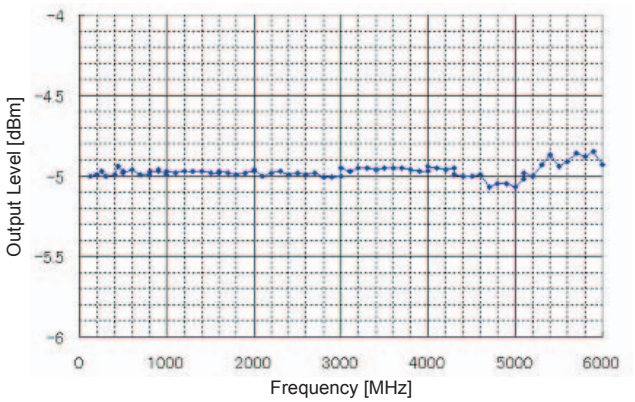
Example: Vector Modulation Bandwidth



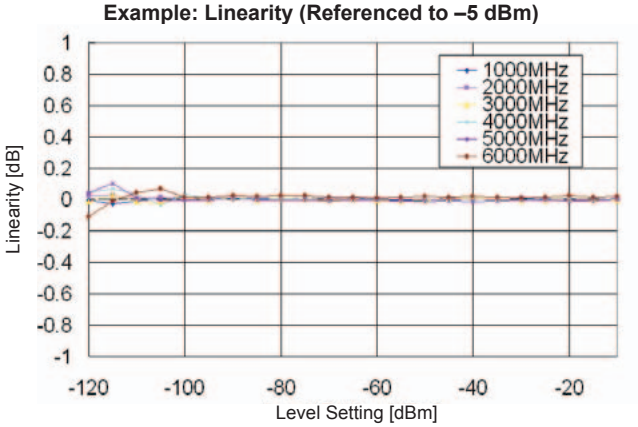
Level Accuracy ±0.5 dB

Output Level Accuracy (CW):
±0.5 dB (–120 dBm ≤ Level ≤ +5 dBm, Frequency ≤3 GHz)
±0.8 dB (–110 dBm ≤ Level ≤ +5 dBm, Frequency >3 GHz)

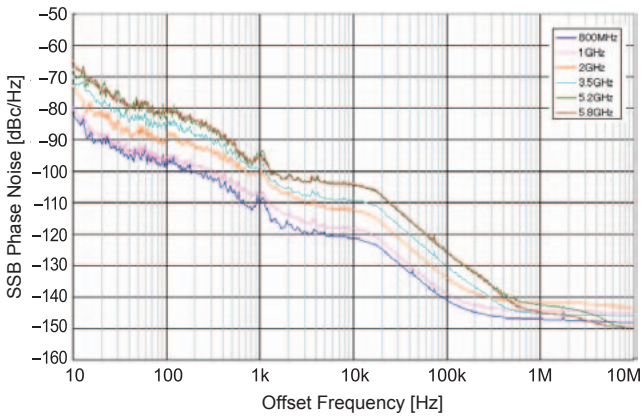
Example: Frequency Characteristics (Referenced to –5 dBm)



Example: Linearity (Referenced to –5 dBm)



Example: SSB Phase Noise



Vector Signal Generator (Opt.020): Basic Performance

Large-capacity Memory

1GB = 256 Msamples/channel

The MS269xA-020 arbitrary waveform memory can save 256 Msamples/channel as well as multiple waveform patterns at the same time. Waveform patterns in memory can be output instantaneously by switching without need to recall from hard disk.

Internal AWGN Generator

Absolute CN Ratio: ≤40 dB

This functions adds AWGN (Additive White Gaussian Noise) to the wanted waveform in memory. It is ideal for Tx dynamic range tests.

AWGN band set automatically to sampling clock of wanted signal.

Example: When wanted signal conditions are:

- W-CDMA
- Bandwidth = 3.84 MHz
- Over sampling = × 4

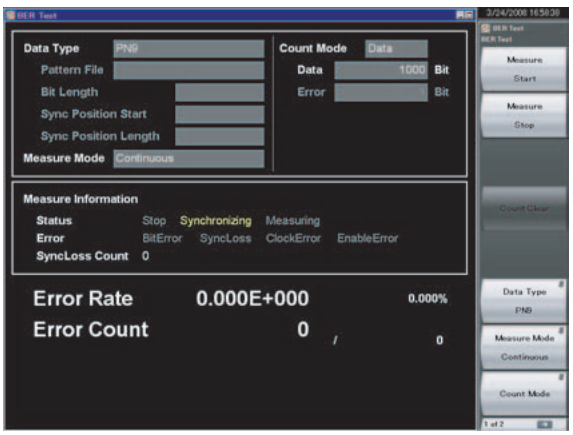
Wanted Signal + AWGN Signal output from one unit

Internal BER Measurement Function

Input Bit Rate: 100 bps to 10 Mbps
Input Level: TTL Level
Input Signal: Data, Clock, Enable
Connector: Rear panel, Aux connector*

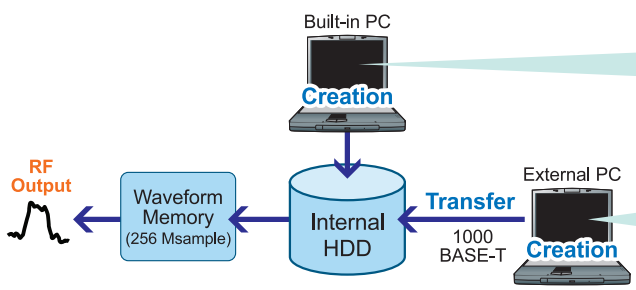
*: Requires J1373A AUX Conversion Adapter (sold separately)

Adding the MS269xA-020 Vector Signal Generator option includes a built-in BER tester for measurements up to 10 Mbps. It supports Rx sensitivity tests by inputting the receiver-demodulated Data/Clock/Enable to the back of the MS269xA.



Versatile Multiple Waveform Generation

Any type of waveform can be generated using the MS269xA-020 Signal Generator option. In addition to using C and simulation tools, Anritsu's IQproducer can be run on a PC to edit waveform parameters and output waveforms.



Creating Waveform Using IQproducer

IQproducer is PC software that is used to edit parameters and create any waveform pattern. It can be installed either on an external PC or in the MS269xA main frame.

- HSDPA/HSUPA IQproducer
- TDMA IQproducer
- Multi-carrier IQproducer
- Mobile WiMAX IQproducer
- LTE IQproducer
- XG-PHS IQproducer
- LTE TDD IQproducer
- WLAN IQproducer

Creating Any Waveform

IQ Data created using the MS269xA digitize function or by simulation tools or in C can be converted to a waveform pattern using the SG option and output.

Vector Signal Generator (Opt.020): Basic Performance

Useful IQproducer Waveform Generation Software

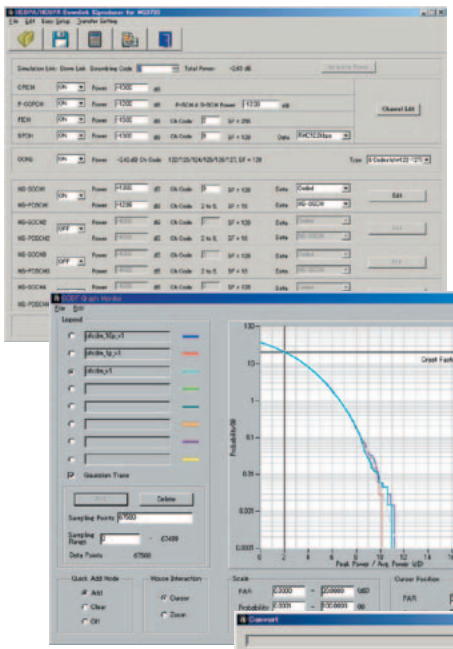
IQproducer is application software for a PC for editing, creating and transferring waveform patterns using the MS269xA-020 arbitrary waveform generation option.
It has the following three main functions.

Parameter Editing:
Function for easily editing parameters matching each communication method

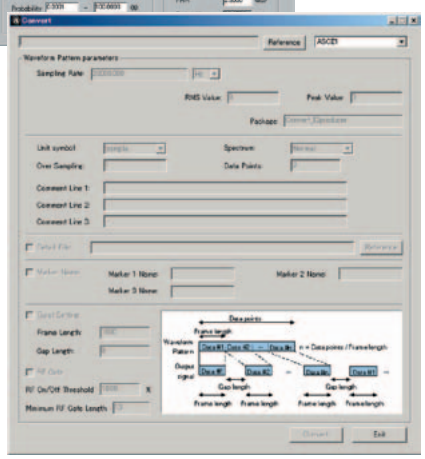
Simulation:
Function for checking generated waveform pattern before transfer to CCDF and FFT graphs

Conversion:
Function for converting ASCII format waveform patterns created by simulation software, files captured using digitizing function, and MG3700A waveform patterns, into files that can be used by MS269xA-020

Parameter Setting Screen (HSDPA/HSUPA IQproducer)



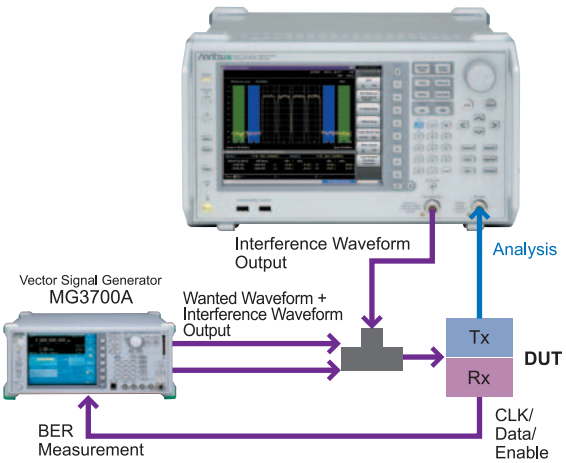
Simulation Screen (CCDF)



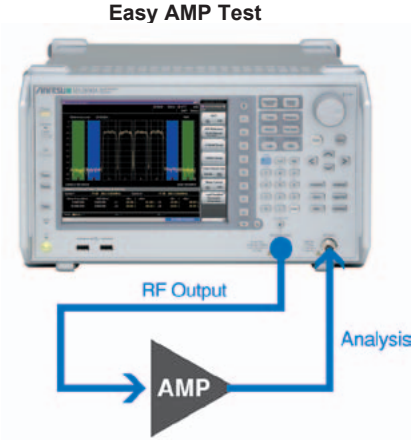
Convert Screen

Application

Simplified Tx/Rx Test Setup



Easy AMP Test



Excellent Expandability Platform (Hardware)

The versatility of the MS269xA series is tailored easily to the application by installing modules in expansion slots.

Basic Function and Performance Upgrades

MS2690A/MS2691A/MS2692A-001
Rubidium Reference Oscillator
This option is a 10 MHz reference crystal oscillator with excellent frequency stability startup characteristics of ±1 × 10^{-9} at 7 minutes after power-on.

Aging Rate: ±1 × 10^{-10}/month
Start-up Characteristics: ±1 × 10^{-9} (7 minutes after power-on)

MS2691A/MS2692A-003
Pre-selector Extended Lower Limit (3 GHz)
This option extends the lower limit of the pre-selector from 5.9 GHz to 3 GHz. It can only be installed in the MS2691A/MS2692A.

MS2690A/MS2691A/MS2692A-008
6 GHz Preamplifier
This option increases the sensitivity of the spectrum/signal analyzer functions and is used for examining low-level signals such as interference waveforms.

Frequency Range: 100 kHz to 6 GHz
Gain: 14 dB (≤3 GHz)
13 dB (3 GHz < Frequency ≤ 4 GHz)
11 dB (4 GHz < Frequency ≤ 5 GHz)
10 dB (5 GHz < Frequency ≤ 6 GHz)

MS2692A-067 Microwave Preselector Bypass
Bypassing the pre-selector used for the microwave band improves RF frequency characteristics and in-band frequency characteristics.

∗: Cannot be installed simultaneously with MS2692A-003/004/008

Signal Analyzer Function and Performance Upgrade

MS2690A/MS2691A/MS2692A-004
Wideband Analysis Hardware
This option expands the maximum analysis bandwidth to 125 MHz.

MS2690A/MS2691A/MS2692A-077
Analysis Bandwidth Extension to 62.5 MHz
This option expands the maximum analysis bandwidth to 62.5 MHz.

MS2690A/MS2691A/MS2692A-078
Analysis Bandwidth Extension to 125 MHz
This option expands the maximum analysis bandwidth to 125 MHz.

∗: Requires Opt. 077

Usage Example: Record Noise and Replay
When the Vector Signal Generator (Opt.020) generates a signal based on the data captured by the signal analyzer, a signal that mimics the captured signal can be output[*1].
For example, a variety of noise sources can be captured and edited using one MS269xA to evaluate the noise tolerance of a product. In some cases, it is not possible to capture minute level fluctuations with a resolution of 20 ns[*2], depending on the noise components. In these circumstances, a signal very close to the actual noise can be captured and replayed by setting the resolution to 5 ns[*3].
(At signal generation, the setting range of the pattern sampling rate must be within the 160 MHz upper limit of the vector signal generator sampling rate.)

∗1: Capture time depends on memory capacity.
∗2: Sampling rate of 50 MHz at 31.25 MHz FFT band
∗3: Sampling rate of 200 MHz at 125 MHz FFT band

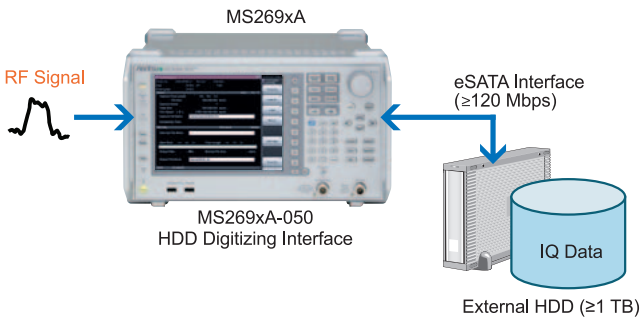
Expansion Functions

MS2690A/MS2691A/MS2692A-020
Vector Signal Generator
This option is a high-performance waveform generator covering a frequency range of 125 MHz to 6 GHz with a 120 MHz wideband vector modulation band and built-in 256 Msample waveform memory.

MS2690A/MS2691A/MS2692A-040
Baseband Interface Unit
The MS269xA is an all-in-one solution supporting DigRF 3G RFIC Tx/Rx measurements using a combination of the MS269xA-020 Vector Signal Generator, MX269040A RF UMTS Measurement Software, and MX269041A DigRF2.5G/3G Digital I/F Control Software.

∗: See each catalog for details.

MS2690A/MS2691A/MS2692A-050
HDD Digitizing Interface
Installing the MS269xA-050 HDD Digitizing Interface option captures up to 4 hours of 20 MHz wideband RF signals. It is convenient for troubleshooting uncommon faults.



MS2690A/MS2691A/MS2692A-313
Removable HDD
The MS269xA-313 Removable HDD is useful when a user takes the instrument to an outside company for calibration but wants to protect the security of data in the instrument, such as measurement results, data and main frame settings. In this case, the user removes the regular MS269xA hard disk and replaces it with this product.

Future-proof Platform (Software)

Adding measurement software options to the signal analyzer assures that the modulation analysis and other functions will support all common current and future communications systems.

Measurement Software

Communications Systems	Name	Model
Mobile WiMAX	Mobile WiMAX Measurement Software	MX269010A
W-CDMA/HSPA/ HSPA Evolution	W-CDMA/HSPA Downlink Measurement Software	MX269011A
	W-CDMA/HSPA Uplink Measurement Software	MX269012A
W-CDMA/HSPA	W-CDMA BS Measurement Software	MX269030A
GSM/EDGE	GSM/EDGE Measurement Software	MX269013A
EDGE Evolution	EDGE Evolution Measurement Software	MX269013A-001
ETC/DSRC	ETC/DSRC Measurement Software	MX269014A
TD-SCDMA	TD-SCDMA Measurement Software	MX269015A
Next-generation PHS (XGP)	XG-PHS Measurement Software	MX269016A
Multi-TDMA systems	Vector Modulation Analysis Software	MX269017A
3GPP LTE (FDD)	LTE Downlink Measurement Software	MX269020A
	LTE Uplink Measurement Software	MX269021A
3GPP LTE (TDD)	LTE TDD Downlink Measurement Software	MX269022A
	LTE TDD Uplink Measurement Software	MX269023A
CDMA2000	CDMA2000 Forward Link Measurement Software	MX269024A
1xEV-DO	EV-DO Forward Link Measurement Software	MX269026A
WLAN	WLAN (802.11) Measurement Software	MX269028A
MediaFLO	Measurement Software for MediaFLO	MX269036A

∗: See each measurement software catalog for more details.

Adding a license for the IQproducer waveform generation software to the vector signal generator option supports easy generation of test patterns for all common communications systems worldwide.

IQproducer License for MS269xA-020 VSG

Waveforms generated by IQproducer can be downloaded to the MS269xA main frame in which the MS269xA-020 Vector Signal Generator is installed, but the following licenses (option) are required to output the signal.

- MX269901A HSDPA/HSUPA IQproducer
- MX269902A TDMA IQproducer
- MX269904A Multi-Carrier IQproducer
- MX269905A Mobile WiMAX IQproducer
- MX269908A LTE IQproducer
- MX269909A XG-PHS IQproducer
- MX269910A LTE TDD IQproducer
- MX269911A WLAN IQproducer

Waveform Patterns for MS269xA-020 VSG

Various waveforms with preset parameters matching each communication method are provided. The MS269xA-020 Vector Signal Generator option outputs RF signals.
Pre-installed reference waveforms are saved on the MS269xA hard disk for free use.

- **Pre-installed Patterns**
  - W-CDMA
  - HSDPA (Test Model5)
  - CDMA2000 1xEV-DO
  - CDMA2000
  - GSM/EDGE
  - Digital Broadcasting (ISDB-T/CS/BS/CATV)
  - WLAN (IEEE802.11a/b/g)
  - *Bluetooth*

Specifications

The specification is the value after a 30-minute warm-up at a constant ambient temperature.
Typical values are only for reference and are not guaranteed specifications.

■ Vector Signal Analysis Function/Spectrum Analyzer Function Common

Frequency

Frequency Range	50 Hz to 6.0 GHz (MS2690A) 50 Hz to 13.5 GHz (MS2691A) 50 Hz to 26.5 GHz (MS2692A)
Frequency Bands	Frequency / Band / Mixer harmonic order (N) 50 Hz ≤ Frequency ≤ 6.0 GHz / 0 / 1 3.0 GHz ≤ Frequency ≤ 6.0 GHz / 1 – L / 1 (with MS2691A-003/MS2692A-003, MS2691A/MS2692A) 5.9 GHz ≤ Frequency ≤ 8.0 GHz / 1– / 1 (MS2691A/MS2692A) 7.9 GHz ≤ Frequency ≤ 13.5 GHz / 1+ / 1 (MS2691A/MS2692A) 13.4 GHz ≤ Frequency ≤ 20.0 GHz / 2– / 2 (MS2692A) 19.9 GHz ≤ Frequency ≤ 26.5 GHz / 2+ / 2 (MS2692A)
Pre-Selector Range	5.9 GHz to 13.5 GHz (Frequency band mode: Normal) (MS2691A) 5.9 GHz to 26.5 GHz (Frequency band mode: Normal) (MS2692A) 3.0 GHz to 13.5 GHz (Frequency band mode: Spurious) (MS2691A) 3.0 GHz to 26.5 GHz (Frequency band mode: Spurious) (MS2692A)
Frequency Setting Range	0 Hz to 6.0 GHz (MS2690A) 0 Hz to 13.5 GHz (MS2691A) 0 Hz to 26.5 GHz (MS2692A) Setting resolution: 1 Hz
Internal Reference Oscillator	Start-up characteristics (23˚C, referenced to frequency at 24 h after power-on): ±5 × 10^{-7} (2 minutes after power-on), ±5 × 10^{-8} (5 minutes after power-on) Aging rate: ±1 × 10^{-7}/year, ±1 × 10^{-9}/day Temperature characteristics: ±2 × 10^{-8} (5˚ to 45˚C) with MS269xA-001 Rubidium Reference Oscillator Start-up characteristics (23˚C, referenced to frequency at 24 h after power-on): ±1 × 10^{-9} (7 minutes after power-on) Aging rate: ±1 × 10^{-10}/month Temperature characteristics: ±1 × 10^{-9} (5˚ to 45˚C)
SSB Phase Noise	18˚ to 28˚C, 2 GHz Frequency Offset / Max. 100 kHz / –116 dBc/Hz 1 MHz / –137 dBc/Hz

Amplitude

Measurement Range	without MS269xA-008, or Preamp: Off DANL to +30 dBm with MS269xA-008, Preamp: On DANL to +10 dBm
Max. Input Level	without MS269xA-008, or Preamp: Off CW Average power: +30 dBm (Input attenuator: ≥10 dB) DC Voltage: 0 Vdc with MS269xA-008, Preamp: On CW Average power: +10 dBm (Input attenuator: 0 dB) DC Voltage: 0 Vdc
Input Attenuator	0 to 60 dB, 2 dB steps
Input Attenuator Switching Error	Referenced to 10 dB input attenuator without MS269xA-008, or Preamp: Off Frequency band mode: Normal ±0.2 dB (≤6.0 GHz, 10 to 60 dB) ±0.75 dB (>6.0 GHz, 10 to 60 dB) Frequency band mode: Spurious ±0.2 dB (<3.0 GHz, 10 to 60 dB) ±0.75 dB (≥3.0 GHz, 10 to 60 dB) with MS269xA-008, Preamp: On Frequency band mode: Normal ±0.65 dB (≤6.0 GHz, 10 to 60 dB)

■ Vector Signal Analysis Function/Spectrum Analyzer Function Common (Continuation)

Reference Level

Setting Range	Log scale: –120 to +50 dBm, or Equivalent level Linear scale: 22.4 µV to 70.7 V, or Equivalent level Setting resolution: 0.01 dB, or Equivalent level
Units	Log scale: dBm, dBµV, dBmV, dBµV (emf), dBµV/m, V, W Linear scale: V
Linearity Error	Excluding the noise floor effect without MS269xA-008, or Preamp: Off ±0.07 dB (Mixer input level: ≤–20 dBm) ±0.10 dB (Mixer input level: ≤–10 dBm) Frequency band mode: Normal, Mixer input level: ≤0 dBm ±0.15 dB (≤6.0 GHz) ±0.50 dB (>6.0 GHz) (MS2691A) ±0.60 dB (>6.0 GHz) (MS2692A) Frequency band mode: Spurious, Mixer input level: ≤0 dBm ±0.15 dB (<3.0 GHz) ±0.50 dB (≥3.0 GHz) (MS2691A) ±0.60 dB (≥3.0 GHz) (MS2692A) with MS269xA-008, Preamp: On ±0.07 dB (Preamp input level: ≤–40 dBm) ±0.10 dB (Preamp input level: ≤–30 dBm) Frequency band mode: Normal ±0.50 dB (Preamp input level: ≤–20 dBm, ≤6.0 GHz)
RF Frequency Characteristics	18° to 28°C, after CAL, Input attenuator: 10 dB without MS269xA-008, or Preamp: Off ±0.35 dB (9 kHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal) (9 kHz ≤ Frequency < 3.0 GHz, Frequency band mode: Spurious) without MS2692A-067, or Microwave Pre-selector Bypass: Off, after Pre-selector tuning ±1.50 dB (6.0 GHz < Frequency ≤ 13.5 GHz, Frequency band mode: Normal) (3.0 GHz ≤ Frequency ≤ 13.5 GHz, Frequency band mode: Spurious) ±2.50 dB (13.5 GHz < Frequency ≤ 26.5 GHz) with MS269xA-008, Preamp: On ±0.65 dB (100 kHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal) (100 kHz ≤ Frequency < 3.0 GHz, Frequency band mode: Spurious)
1 dB Gain Compression	without MS269xA-008, or Preamp: Off, Mixer input level ≥+3 dBm (100 MHz ≤ Frequency < 400 MHz) ≥+7 dBm (400 MHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal) (400 MHz ≤ Frequency < 3.0 GHz, Frequency band mode: Spurious) ≥+3 dBm (3.0 GHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Spurious) (MS2691A) (6.0 GHz < Frequency ≤ 13.5 GHz) (MS2691A) ≥0 dBm (3.0 GHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Spurious) (MS2692A) (6.0 GHz < Frequency ≤ 26.5 GHz) (MS2692A) with MS269xA-008, Preamp: On, Preamp input level ≥–20 dBm (100 MHz ≤ Frequency < 400 MHz) ≥–15 dBm (400 MHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal) (400 MHz ≤ Frequency < 3.0 GHz, Frequency band mode: Spurious)

Spurious Response

2nd Harmonic Distortion	without MS269xA-008, or Preamp: Off, Mixer input level: –30 dBm Harmonic (dBc) / SHI (dBm) ≤–60 / ≥+30 (10 MHz ≤ Frequency ≤ 400 MHz) ≤–75 / ≥+45 (400 MHz < Frequency ≤ 3.0 GHz) without MS2692A-067, Mixer input level: –10 dBm Harmonic (dBc) / SHI (dBm) ≤–90 / ≥+80 (>3.0 GHz, Frequency band mode: Normal) ≤–90 / ≥+80 (≥1.5 GHz, Frequency band mode: Spurious) with MS2692A-067, Microwave Pre-selector Bypass: Off, Mixer input level: –10 dBm Harmonic (dBc) / SHI (dBm) ≤–70 / ≥+60 (3 GHz < Frequency ≤ 13.25 GHz) with MS269xA-008, Preamp: On, Preamp input level: –45 dBm Harmonic (dBc) / SHI (dBm) ≤–50 / ≥+5 (10 Hz ≤ Frequency ≤ 400 MHz) ≤–55 / ≥+10 (400 MHz < Frequency ≤ 3.0 GHz)
Residual Response	Frequency: ≥1 MHz, Input attenuator: 0 dB, 50 Ω terminated Signal Analyzer: with MS269xA-004 or 077/078, Except bandwidth setting: >31.25 MHz ≤–100 dBm

■ Vector Signal Analysis Function/Spectrum Analyzer Function Common (Continuation)

Connector

RF Input	Front panel, N-J, 50 Ω (nominal) 18˚ to 28˚C, Input attenuator: ≥10 dB VSWR: ≤1.2 (nominal, 40 MHz ≤ Frequency ≤ 3.0 GHz) ≤1.5 (nominal, 3.0 GHz < Frequency ≤ 6.0 GHz) ≤2.0 (nominal, 6.0 GHz < Frequency ≤ 26.5 GHz)
IF Output	Rear panel, BNC-J, 50 Ω (nominal) Frequency: 875 MHz (Signal Analyzer, without MS269xA-004/077/078, or Bandwidth: ≤31.25 MHz) 900 MHz (Signal Analyzer, with MS269xA-004 or 077/078, Bandwidth: >31.25 MHz) 874.988 MHz (Spectrum Analyzer) Gain: 0 dB (nominal) (Referenced to RF input level, RF frequency: 1 GHz, Input attenuator: 0 dB) IF Bandwidth: 120 MHz (nominal)
External Reference Input	Rear panel, BNC-J, 50 Ω (nominal) Frequency: 10 MHz,13 MHz Operation range: ±1 ppm Input level: –15 dBm ≤ Level ≤ +20 dBm, 50 Ω (AC coupling)
Reference Signal Output	Rear panel, BNC-J, 50 Ω (nominal) Frequency: 10 MHz Output level: ≥0 dBm (AC coupling)
Sweep Status Output	Rear panel, BNC-J Output level: TTL Level (High level at sweeping or waveform capture)
Trigger Input	Rear panel, BNC-J Input level: TTL Level
External Reference	Control from external controller (Excluding power-on) Ethernet 10/100/1000BASE-T, Rear panel, RJ-45 GPIB: IEEE488.2, Rear panel, IEEE488 bus connector Interface functions: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0, E2 USB (B): USB2.0, Rear panel, USB-B connector
USB	USB2.0 Supporting waveform hard copy to external device, and saving main frame settings USB-A connector (Front panel: 2 ports, Rear panel: 2 ports)
Monitor Output	Rear panel, VGA compatible, mini D-Sub 15 pin
Aux	When using MS269xA-020 trigger input/output Rear panel, 68 pins (DX10BM-68S equivalent)
Display	XGA-color LCD (1024 × 768 resolution), 8.4 inch (213 mm)

General Specifications

Dimensions and Mass	340 (W) × 200 (H) × 350 (D) mm (Excluding projections), ≤13.5 kg (Excluding options)
Power Supply	100 V(ac) to 120 V(ac), 200 V(ac) to 240 V(ac) (–15/+10%, 250 V max.), 50 Hz/60 Hz (±5%) ≤260 VA (Excluding options), ≤440 VA (Including all options, max.)
Temperature Range	Operating: +5˚ to +45˚C, Storage: –20˚ to +60˚C
EMC	EN61326-1, EN61000-3-2
LVD	EN61010-1

■ Spectrum Analyzer Function

Frequency

Span	Range: 0 Hz, 300 Hz to 6.0 GHz (MS2690A) 0 Hz, 300 Hz to 13.5 GHz (MS2691A) 0 Hz, 300 Hz to 26.5 GHz (MS2692A) Resolution: 2 Hz Accuracy: ±0.2% (Number of Trace points: 10001)
Display Frequency Accuracy	± [Display frequency × Reference oscillator accuracy + Span frequency × Span accuracy + RBW × 0.05 + 2 × N + Span frequency/(Number of trace points – 1)] Hz N: Mixer harmonic order
Resolution Bandwidth (RBW)	Setting range: 30 Hz to 3 MHz (1-3 sequence), 50 kHz, 5, 10, 20, 31.25 MHz ∗31.25 MHz: Can be set when Span: 0 Hz only Selectivity (–60 dB/–3 dB): 4.5:1 (Nominal, 30 Hz to 10 MHz)
Video Bandwidth (VBW)	Setting range: 1 Hz to 10 MHz (1-3 sequence), 5 kHz, Off VBW mode: Video Average, Power Average

Amplitude

Display Average Noise Level (DANL)

18° to 28°C, Detector: Sample, VBW: 1 Hz (Video Average), Input attenuator: 0 dB

without MS269xA-008, 6.0 GHz ≤ Frequency ≤ 26.5 GHz: without MS2692A-067

Frequency	Max.	Frequency band mode
100 kHz	–135.0 [dBm/Hz]	
1 MHz	–145.0 [dBm/Hz]	
30 MHz ≤ Frequency < 2.4 GHz	–155.0 [dBm/Hz]	
2.4 GHz ≤ Frequency < 3.0 GHz	–153.0 [dBm/Hz]	
3.0 GHz ≤ Frequency < 4.0 GHz	–153.0 [dBm/Hz]	Normal
4.0 GHz ≤ Frequency < 6.0 GHz	–152.0 [dBm/Hz]	Normal
6.0 GHz ≤ Frequency < 10.0 GHz	–151.0 [dBm/Hz]	Normal
10.0 GHz ≤ Frequency ≤ 13.5 GHz	–150.0 [dBm/Hz]	Normal
13.5 GHz < Frequency ≤ 20.0 GHz	–147.0 [dBm/Hz]	Normal
20.0 GHz < Frequency ≤ 26.5 GHz	–143.0 [dBm/Hz]	Normal

with MS269xA-008, Preamp: On

Frequency	Max.	Frequency band mode
100 kHz	–150.0 [dBm/Hz]	
1 MHz	–159.0 [dBm/Hz]	
30 MHz ≤ Frequency < 2.4 GHz	–166.0 [dBm/Hz]	
2.4 GHz ≤ Frequency < 3.0 GHz	–165.0 [dBm/Hz]	
3.0 GHz ≤ Frequency < 4.0 GHz	–164.0 [dBm/Hz]	Normal
4.0 GHz ≤ Frequency < 5.0 GHz	–161.0 [dBm/Hz]	Normal
5.0 GHz ≤ Frequency ≤ 6.0 GHz	–159.0 [dBm/Hz]	Normal

with MS269xA-008, Preamp: Off

Frequency	Max.	Frequency band mode
100 kHz	–135.0 [dBm/Hz]	
1 MHz	–145.0 [dBm/Hz]	
30 MHz ≤ Frequency < 2.4 GHz	–153.0 [dBm/Hz]	
2.4 GHz ≤ Frequency < 3.0 GHz	–152.0 [dBm/Hz]	
3.0 GHz ≤ Frequency < 4.0 GHz	–151.0 [dBm/Hz]	Normal
4.0 GHz ≤ Frequency < 5.0 GHz	–150.0 [dBm/Hz]	Normal
5.0 GHz ≤ Frequency < 6.0 GHz	–149.0 [dBm/Hz]	Normal

Total Level Accuracy*

∗: The Total level accuracy is found from root sum of squares (RSS) of RF characteristics, linearity error, and input attenuator switching error.

18° to 28°C, after CAL, Input attenuator: ≥10 dB, Auto Sweep Time Select: Normal, RBW: ≤1 MHz,
Detection: Positive, CW, Excluding the noise floor effect

without MS269xA-008, Preamp: Off
Mixer input level: ≤0 dBm,
±0.5 dB (50 Hz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal)
(50 Hz ≤ Frequency < 3.0 GHz, Frequency band mode: Spurious)
after Pre-selector tuning
±1.8 dB (6.0 GHz < Frequency ≤ 13.5 GHz, Frequency band mode: Normal)
(3.0 GHz ≤ Frequency ≤ 13.5 GHz, Frequency band mode: Spurious)
±3.0 dB (13.5 GHz < Frequency ≤ 26.5 GHz)

with MS269xA-008, Preamp: On
Preamp input level: ≤–20 dBm
±1.0 dB (100 kHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal)
(100 kHz ≤ Frequency < 3.0 GHz, Frequency band mode: Spurious)

■ Spectrum Analyzer Function (Continuation)

Spurious Response

2-tone 3rd-order Intermodulation Distortion	18˚ to 28˚C, ≥300 kHz separation without MS269xA-008, or Preamp: Off with MS2692A-067, Microwave Pre-selector Bypass: Off Mixer input level: –15 dBm (per waveform) ≤–60 dBc (TOI: +15 dBm) (30 MHz ≤ Frequency < 400 MHz) ≤–66 dBc (TOI: +18 dBm) (400 MHz ≤ Frequency < 700 MHz) ≤–74 dBc (TOI: +22 dBm) (700 MHz ≤ Frequency < 4.0 GHz, Frequency band mode: Normal) (700 MHz ≤ Frequency < 3.0 GHz, Frequency band mode: Spurious) ≤–66 dBc (TOI: +18 dBm) (4.0 GHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal) ≤–45 dBc (TOI: +7.5 dBm) (6.0 GHz < Frequency ≤ 26.5 GHz, Frequency band mode: Normal) (3.0 GHz ≤ Frequency ≤ 26.5 GHz, Frequency band mode: Spurious) with MS269xA-008, Preamp: On Preamp input level: –45 dBm (per waveform) ≤–73 dBc (TOI: –8.5 dBm) (30 MHz ≤ Frequency < 400 MHz) ≤–78 dBc (TOI: –6 dBm) (400 MHz ≤ Frequency < 700 MHz) ≤–81 dBc (TOI: –4.5 dBm) (700 MHz ≤ Frequency < 4.0 GHz, Frequency band mode: Normal) (700 MHz ≤ Frequency < 3.0 GHz, Frequency band mode: Spurious) ≤–78 dBc (TOI: –6 dBm) (4.0 GHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal)
Image Response	without MS2692A-067 ≤–70 dBc (Frequency ≤ 13.5 GHz) ≤–65 dBc (13.5 GHz < Frequency ≤ 26.5 GHz)

Sweep

Sweep Mode	Single, Continuous
Sweep Time	Setting range: 2 ms to 1000 s (Span: ≥300 Hz), 1 µs to 1000 s (Span: 0 Hz)

Waveform Display

Detector	Pos&Neg, Positive Peak, Sample, Negative Peak, RMS
Number of Trace Points	1001, 2001, 5001, 10001 (Span: >500 MHz) 101, 201, 251, 401, 501, 1001, 2001, 5001, 10001 (100 MHz < Span ≤ 500 MHz) (300 Hz ≤ Span ≤ 100 MHz, Sweep time: >10 s) 11, 21, 41, 51, 101, 201, 251, 401, 501, 1001, 2001, 5001, 10001 (300 Hz ≤ Span ≤ 100 MHz, Sweep time: ≤10 s) (Span: 0 Hz, Sweep time: ≤10 s) 101, 201, 251, 401, 501, 1001, 2001, 5001, 10001 (Span: 0 Hz, Sweep time: >10 s)
Scale	Log display: 10 div/12 div, 0.1 to 20 dB/div (1-2-5 sequence) Lin display: 10 div, 1 to 10%/div (1-2-5 sequence)
Trigger Function	Trigger mode: Free Run (Trig Off), Video, Wide IF, External (TTL) SG Marker (with MS269xA-020), BBIF (with MS269xA-040)
Gate Function	Gate mode: Off, Wide IF, External SG Marker (with MS269xA-020), BBIF (with MS269xA-040)

Measurement Functions

Adjacent Channel Leakage Power (ACP)		Reference: Span Total, Carrier Total, Both side of Carrier, Carrier Select Adjacent channel specification: 3 channels × 2 (Normal Mode), 8 channels × 2 (Advanced Mode)
Burst Average Power		In time domain, displays average power in specified time
Channel Power		Absolute value measurement: dBm, dBm/Hz
Occupied Bandwidth (OBW)		N% of Power, X-dB Down
Spectrum Emission Mask		Pass/Fail evaluation at Peak/Margin measurement
Spurious Emission		Pass/Fail evaluation at Worst/Peaks measurement
Frequency Counter	Accuracy	Span: ≤1 MHz, RBW: 1 kHz, S/N: ≥50 dB, Gate time: ≥100 ms, ± (Marker frequency × Frequency reference accuracy + (0.01 × N/Gate Time[s]) Hz) N: Mixer harmonic order
	Gate Time Range	100 µs to 1 s

■ Vector Signal Analysis Function

Common

Trace Mode	Spectrum, Power vs. Time, Frequency vs. Time, Phase vs. Time, CCDF, Spectrogram
Bandwidth	without MS269xA-004 Specified analysis bandwidth from center frequency 1 kHz to 25 MHz (1-2.5-5 sequence), 31.25 MHz with MS269xA-004 Adds the 50, 100, and 125 MHz bandwidths to the standard analysis bandwidths. with MS269xA-077 Adds the 50 MHz, 62.5 MHz bandwidths to the standard analysis bandwidths. with MS269xA-077/078 Adds the 50, 62.5, 100, and 125 MHz bandwidths to the standard analysis bandwidths.
Sampling Rate	Auto-setting depending on RBW without MS269xA-004, or Bandwidth: ≤31.25 MHz 2 kHz to 50 MHz (1-2-5 sequence) with MS269xA-004, Bandwidth: >31.25 MHz 100 MHz, 200 MHz with MS269xA-077, Bandwidth: >31.25 MHz 100 MHz with MS269xA-077/078, Bandwidth: >31.25 MHz 100 MHz, 200 MHz
Capture Time	Set length of capture time without MS269xA-004, or Bandwidth: ≤31.25 MHz Min. capture time length: 2 µs to 50 ms (determined depending on analysis bandwidth) Max. capture time length: 2 to 2000 s (determined depending on analysis bandwidth) Setting mode: Auto, Manual with MS269xA-004, Bandwidth: >31.25 MHz Min. capture time length: 500 ns to 1 µs (determined depending on analysis bandwidth) Max. capture time length: 500 ms with MS269xA-077, Bandwidth: >31.25 MHz Min. capture time length: 1 µs (determined depending on analysis bandwidth) Max. capture time length: 500 ms with MS269xA-077/078, Bandwidth: >31.25 MHz Min. capture time length: 500 ns to 1 µs (determined depending on analysis bandwidth) Max. capture time length: 500 ms
Trigger	Trigger mode: Free Run (Trig Off), Video, Wide IF Video, External (TTL) SG Marker (with MS269xA-020), BBIF (with MS269xA-040)

Spectrum Display Function

Function Outline	Displays any time length in captured waveform data and spectrum in frequency range
Analysis Time Range	Analysis start time: Set analysis start time point from waveform data header Analysis time length: Set analysis time length Setting mode: Auto, Manual
Frequency	Set center frequency and Span in frequency range of waveform data
Frequency Setting Range	without MS269xA-004, or Bandwidth: ≤31.25 MHz 0 Hz to 6.0 GHz (MS2690A), 0 Hz to 13.5 GHz (MS2691A), 0 Hz to 26.5 GHz (MS2692A) with MS269xA-004, Bandwidth: >31.25 MHz 100 MHz to 6.0 GHz with MS269xA-077, or with MS269xA-077/078, without MS2692A-067, Bandwidth: >31.25 MHz 100 MHz to 6.0 GHz with MS269xA-077, or with MS269xA-077/078, with MS2692A-067, Bandwidth: >31.25 MHz 100 MHz to 26.5 GHz

■ Vector Signal Analysis Function (Continuation)

Spectrum Display Function (Continuation)

Resolution Bandwidth (RBW)	without MS269xA-004, or Bandwidth: ≤31.25 MHz Setting range: 1 Hz to 1 MHz (1-3 sequence) Selectivity (–60 dB/–3 dB): 4.5:1 (nominal) with MS269xA-004, Bandwidth: >31.25 MHz Setting range: 3 kHz to 10 MHz (1-3 sequence) Selectivity (–60 dB/–3 dB): 4.5:1 (nominal) with MS269xA-077, Bandwidth: >31.25 MHz Setting range: 3 kHz to 3 MHz (1-3 sequence) Selectivity (–60 dB/–3 dB): 4.5:1 (nominal) with MS269xA-077/078, Bandwidth: >31.25 MHz Setting range: 3 kHz to 10 MHz (1-3 sequence) Selectivity (–60 dB/–3 dB): 4.5:1 (nominal)
Total Level Accuracy* *: The Total level accuracy is found from root sum of squares (RSS) of RF characteristics, linearity error, and input attenuator switching error.	18˚ to 28˚C, after CAL, Input attenuator: ≥10 dB, Center frequency, CW, RBW: Auto, Time Detection: Average, Marker Result: Integration or Peak (Accuracy), Excluding the noise floor effect Mixer input level: ≤0 dBm without MS269xA-004, or Bandwidth: ≤31.25 MHz without MS269xA-008, or Preamp: Off ±0.5 dB (50 Hz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal) (50 Hz ≤ Frequency < 3.0 GHz, Frequency band mode: Spurious) after Pre-selector tuning ±1.8 dB (6.0 GHz < Frequency ≤ 13.5 GHz, Frequency band mode: Normal) (3.0 GHz ≤ Frequency ≤ 13.5 GHz, Frequency band mode: Spurious) ±3.0 dB (13.5 GHz ≤ Frequency ≤ 26.5 GHz) with MS269xA-004, Bandwidth: >31.25 MHz without MS269xA-008, or Preamp: Off ±0.5 dB (100 MHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal) with MS269xA-077, or with MS269xA-077/078, Bandwidth: >31.25 MHz without MS269xA-008, or Preamp: Off ±0.5 dB (100 MHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal) with MS269xA-077, or with MS269xA-077/078 with MS2692A-067, Microwave Pre-selector Bypass: On, Bandwidth: >31.25 MHz ±1.8 dB (6.0 GHz ≤ Frequency ≤ 13.5 GHz, Frequency band mode: Normal) ±3.0 dB (13.5 GHz ≤ Frequency ≤ 26.5 GHz) Preamp input level: ≤–20 dBm without MS269xA-004, or Bandwidth: ≤31.25 MHz with MS269xA-008, Preamp: On ±1.0 dB (100 kHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal) (100 kHz ≤ Frequency < 3.0 GHz, Frequency band mode: Spurious) with MS269xA-004, Bandwidth: >31.25 MHz with MS269xA-008, Preamp: On ±1.0 dB (100 MHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal) with MS269xA-077, or with MS269xA-077/078, Bandwidth: >31.25 MHz with MS269xA-008, Preamp: On ±1.0 dB (100 MHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal)

■ Vector Signal Analysis Function (Continuation)

Spectrum Display Function (Continuation)

Display Average Noise Level (DANL)

18˚ to 28˚C, Input attenuator: 0 dB

without MS269xA-008, 6.0 GHz ≤ Frequency ≤ 26.5 GHz: without MS2692A-067

Frequency	Max.	Frequency band mode
100 kHz	–132.5 [dBm/Hz]	
1 MHz	–142.5 [dBm/Hz]	
30 MHz ≤ Frequency < 2.4 GHz	–152.5 [dBm/Hz]	
2.4 GHz ≤ Frequency < 3.0 GHz	–150.5 [dBm/Hz]	
3.0 GHz ≤ Frequency < 4.0 GHz	–150.5 [dBm/Hz]	Normal
4.0 GHz ≤ Frequency < 6.0 GHz	–149.5 [dBm/Hz]	Normal
6.0 GHz ≤ Frequency < 10.0 GHz	–148.5 [dBm/Hz]	Normal
10.0 GHz ≤ Frequency ≤ 13.5 GHz	–147.5 [dBm/Hz]	Normal
13.5 GHz < Frequency ≤ 20.0 GHz	–144.5 [dBm/Hz]	Normal
20.0 GHz < Frequency ≤ 26.5 GHz	–140.5 [dBm/Hz]	Normal

with MS269xA-008, Preamp: On

Frequency	Max.	Frequency band mode
100 kHz	–147.5 [dBm/Hz]	
1 MHz	–156.5 [dBm/Hz]	
30 MHz ≤ Frequency < 2.4 GHz	–163.5 [dBm/Hz]	
2.4 GHz ≤ Frequency < 3.0 GHz	–162.5 [dBm/Hz]	
3.0 GHz ≤ Frequency < 4.0 GHz	–161.5 [dBm/Hz]	Normal
4.0 GHz ≤ Frequency < 5.0 GHz	–158.5 [dBm/Hz]	Normal
5.0 GHz ≤ Frequency ≤ 6.0 GHz	–156.5 [dBm/Hz]	Normal

with MS269xA-008, Preamp: Off

Frequency	Max.	Frequency band mode
100 kHz	–132.5 [dBm/Hz]	
1 MHz	–142.5 [dBm/Hz]	
30 MHz ≤ Frequency < 2.4 GHz	–150.5 [dBm/Hz]	
2.4 GHz ≤ Frequency < 3.0 GHz	–149.5 [dBm/Hz]	
3.0 GHz ≤ Frequency < 4.0 GHz	–148.5 [dBm/Hz]	Normal
4.0 GHz ≤ Frequency < 5.0 GHz	–147.5 [dBm/Hz]	Normal
5.0 GHz ≤ Frequency < 6.0 GHz	–146.5 [dBm/Hz]	Normal

Adjacent Channel Leakage Power Measurement (ACP)	Reference: Span Total, Carrier Total, Both Sides of Carriers, Carrier Select Adjacent channel specification: 3 channels × 2
Channel Power	Absolute value measurement: dBm, dBm/Hz
Occupied Bandwidth (OBW)	N% of Power, × dB Down

Power vs. Time Display Function

Function Outline	Displays variation in power of captured waveform with time
Analysis Time Range	Analysis start time: Sets analysis start time point from waveform data header Analysis time length: Sets analysis time length Setting mode: Auto, Manual
Resolution Bandwidth	Filter type: Rect, Gaussian, Nyquist, Root Nyquist, Off, (Default: Off) Roll-off ratio: 0.01 to 1 (Set for Nyquist, Root Nyquist) Filter frequency offset: Set center frequency of filter in wavelength data frequency band
AM Depth (Peak to Peak Measurement)	Measures with AM depth or marker function +Peak, –Peak, (P-P)/2, Average
Burst Average Power	Measures average power of burst signal

Frequency vs. Time Display Function

Function Outline	Displays variation in frequency of input signal with time from captured waveform data
Analysis Time Range	Analysis start time: Sets analysis start time point from waveform data header Analysis time length: Sets analysis time length Setting mode: Auto, Manual
Operation Level Range	–17 to +30 dBm (Input attenuator: ≥10 dB)
Frequency (Vertical axis)	Sets center frequency and Span in waveform data frequency range Display frequency range: 1/25, 1/10, 1/5, 1/2 of RBW Input frequency range: 10 MHz to 6 GHz
Display Frequency Accuracy	Input level: –17 to +30 dBm (Span: ≤31.25 MHz, Scale: Span/25) CW input: ± (Reference oscillator accuracy × Center frequency + Display frequency range × 0.01) Hz
FM Deviation (Peak to Peak Measurement)	Measures with FM deviation or marker function +Peak, –Peak, (P-P)/2, Average

■ Vector Signal Analysis Function (Continuation)

Phase vs. Time Display Function

Function Outline	Displays phase time fluctuation of input signal from captured waveform data
Analysis Time Range	Analysis start time: Sets analysis start time point from waveform data header Analysis time length: Sets analysis time length Setting mode: Auto, Manual
Phase (Vertical axis)	Display mode: Wrap, Unwrap Display phase range: 0.01 deg./div to 200 Gdeg./div Offset: –100 deg. to +100 Mdeg.

CCDF/APD Display Function

Function Outline	Displays CCDF and APD of waveform data captures for fixed time
Analysis Time Range	Analysis start time: Sets analysis start time point from waveform data header Analysis time length: Sets analysis time length Setting mode: Auto, Manual
Display	Displays CCDF or APD as graph Histogram resolution: 0.01 dB Numeric display: Average Power, Max Power, Crest Factor
Resolution Bandwidth (RBW)	Filter type: Rectangle, Off, (Default: Off) Filter frequency offset: Sets filter center frequency in waveform data frequency band

Spectrogram Display Function

Function Outline	Displays spectrogram for time period in captured waveform data
Analysis Time Range	Analysis start time: Sets position of analysis start after waveform data header Analysis time length: Sets analysis time length Setting mode: Auto, Manual
Frequency	Settable as center frequency and span frequency of waveform data
Resolution Bandwidth (RBW)	Setting range: 1 Hz to 1 MHz (1-3 sequence) Selection (–60/–3 dB): 4.5: 1 (nominal)

Digitize Function

Function Outline	Outputs captured waveform data to internal hard disk or external device
Waveform Data	Format: I, Q (32 bit Float Binary format) Level: Sets 0 dBm input to $\sqrt{(I^2 + Q^2)} = 1$ Level accuracy: Same as Total level accuracy of Signal Analyzer
External Output	Output to external PC via Ethernet

Replay Function

Function Outline	Captured waveforms can be replayed again by using the VSA function to read saved digitize data
Measurable Waveform Data Condition	Format: I, Q (Binary format) Combination of Span, Sampling rate, and Minimum Capture Sample:

Span	Sampling Rate	Minimum Capture Sample
1 kHz	2 kHz	74000 (37 s)
2.5 kHz	5 kHz	160000 (32 s)
5 kHz	10 kHz	310000 (31 s)
10 kHz	20 kHz	610000 (30.5 s)
25 kHz	50 kHz	730000 (14.6 s)
50 kHz	100 kHz	730000 (7.3 s)
100 kHz	200 kHz	730000 (3.65 s)
250 kHz	500 kHz	730000 (1.46 s)
500 kHz	1 MHz	730000 (730 ms)
1 MHz	2 MHz	730000 (365 ms)
2.5 MHz	5 MHz	730000 (146 ms)
5 MHz	10 MHz	730000 (73 ms)
10 MHz	20 MHz	730000 (36.5 ms)
18.6 MHz	20 MHz	730000 (36.5 ms)
20 MHz	25 MHz	730000 (29.2 ms)
25 MHz	50 MHz	730000 (14.6 ms)
31.25 MHz	50 MHz	730000 (14.6 ms)
50 MHz	100 MHz	730000 (7.3 ms)
62.5 MHz	100 MHz	730000 (7.3 ms)
100 MHz	200 MHz	730000 (3.65 ms)
125 MHz	200 MHz	730000 (3.65 ms)

■ Hardware Option

MS2690A/MS2691A/MS2692A-001 Rubidium Reference Oscillator

Function Outline	Generates 10 MHz reference signal with higher frequency stability

MS2691A/MS2692A-003 Pre-selector Extended Lower Limit (3 GHz)

Cannot be installed simultaneously MS2692A-003 and MS2692A-067.

Function Outline	Extends lower limit of pre-selector to 3 GHz

MS2690A/MS2691A/MS2692A-004 Wideband Analysis Hardware

Cannot be installed simultaneously MS2692A-004 and MS2692A-067.

Common

Bandwidth	This option adds the 50, 100, and 125 MHz bandwidths to the standard analysis bandwidths (1 kHz to 25 MHz (1-2.5-5 sequence), 31.25 MHz).
Sampling Rate	Bandwidth: >31.25 MHz Auto-setting depending on RBW 100 MHz, 200 MHz
Capture Time	Bandwidth: >31.25 MHz Capture Time Length: Set length of capture time Max. Capture Time Length: 500 ns to 1 µs (determined depending on analysis bandwidth) Min. Capture Time Length: 500 ms
Resolution Bandwidth (RBW)	Bandwidth: >31.25 MHz Setting Range: 3 kHz to 10 MHz (1-3 sequence) Selectivity (–60 dB/–30 dB): 4.5:1 (nominal)
Frequency	Setting Range: 100 MHz to 6.0 GHz (Bandwidth: >31.25 MHz)

Amplitude

Display Average Noise Level (DANL)	18˚ to 28˚C, Input attenuator: 0 dB, Frequency band mode: Normal without MS269xA-008, or Preamp: Off

Frequency	Max.
100 MHz ≤ Frequency < 2.4 GHz	–143.0 [dBm/Hz]
2.4 GHz ≤ Frequency < 4.0 GHz	–141.0 [dBm/Hz]
4.0 GHz ≤ Frequency ≤ 6.0 GHz	–139.0 [dBm/Hz]

with MS269xA-008, Preamp: On

Frequency	Max.
100 MHz ≤ Frequency < 2.4 GHz	–156.0 [dBm/Hz]
2.4 GHz ≤ Frequency < 4.0 GHz	–154.0 [dBm/Hz]
4.0 GHz ≤ Frequency ≤ 6.0 GHz	–150.0 [dBm/Hz]

Total Level Accuracy* *: The Total level accuracy is found from root sum of squares (RSS) of RF characteristics, linearity error, and input attenuator switching error.	18˚ to 28˚C, After CAL, Input attenuator: ≥10 dB, Center frequency, CW, RBW: Auto, Time Detection: Average, Marker Result: Integration or Peak (Accuracy), Excluding the noise floor effect, Bandwidth: >31.25 MHz without MS269xA-008, or Preamp: Off, Mixer input level: ≤0 dBm ±0.5 dB (100 MHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal) with MS269xA-008, Preamp: On, Preamp input level: ≤–20 dBm ±1.0 dB (100 MHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal)
Linearity Error	Frequency band mode: Normal, Excluding the noise floor effect without MS269xA-008, or Preamp: Off ±0.07 dB (Mixer input level: ≤–20 dBm) ±0.10 dB (Mixer input level: ≤–10 dBm) ±0.30 dB (Mixer input level: ≤0 dBm) with MS269xA-008, Preamp: On ±0.07 dB (Mixer input level: ≤–40 dBm) ±0.10 dB (Mixer input level: ≤–30 dBm) ±0.50 dB (Mixer input level: ≤–20 dBm)
RF Frequency Characteristics	18˚ to 28˚C, After CAL, Input attenuator: ≥10 dB without MS269xA-008, or Preamp: Off ±0.35 dB (100 MHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal) with MS269xA-008, Preamp: On ±0.65 dB (100 MHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal)

Note: There is a chance of a sampling error of 0.084 ppm or less when setting the 50 MHz/100 MHz/125 MHz bandwidth for Wideband Analysis Hardware operation. Very occasionally, you may observe a noise spike for about 10 ns when measuring with the Power vs. Time screen of the Vector Signal Analyzer.

■ Hardware Option (Continuation)

MS2690A/MS2691A/MS2692A-008 6 GHz Preamplifier

Cannot be installed simultaneously MS2692A-008 and MS2692A-067.

Frequency

Range	100 kHz to 6 GHz

Amplitude

Measurement Range	Display average noise level to +10 dBm
Max. Input Level	CW Average power: +10 dBm (Input attenuator: 0 dB) DC Voltage: 0 Vdc
Gain	14 dB (Frequency ≤ 3.0 GHz), 13 dB (3.0 GHz < Frequency ≤ 4.0 GHz), 11 dB (4.0 GHz < Frequency ≤ 5.0 GHz), 10 dB (5.0 GHz < Frequency ≤ 6.0 GHz)
Noise Factor	7.0 dB (Frequency ≤ 3.0 GHz), 8.5 dB (3.0 GHz < Frequency ≤ 4.0 GHz), 9.5 dB (4.0 GHz < Frequency ≤ 6.0 GHz)
Display Average Noise Level (DANL)	Spectrum analyzer function: 18˚ to 28˚C, Input attenuator: 0 dB, Detector: sample, VBW: 1 Hz (Video average) Vector signal analysis function: 18˚ to 28˚C, Input attenuator: 0 dB Preamp: On

Frequency	Max. (Spectrum analyzer function)	Max. (Vector signal analysis function)	Frequency band mode
100 kHz	–150.0 [dBm/Hz]	–147.5 [dBm/Hz]	
1 MHz	–159.0 [dBm/Hz]	–156.5 [dBm/Hz]	
30 MHz ≤ Frequency < 2.4 GHz	–166.0 [dBm/Hz]	–163.5 [dBm/Hz]	
2.4 GHz ≤ Frequency < 3.0 GHz	–165.0 [dBm/Hz]	–162.5 [dBm/Hz]	
3.0 GHz ≤ Frequency < 4.0 GHz	–164.0 [dBm/Hz]	–161.5 [dBm/Hz]	Normal
4.0 GHz ≤ Frequency < 5.0 GHz	–161.0 [dBm/Hz]	–158.5 [dBm/Hz]	Normal
5.0 GHz ≤ Frequency ≤ 6.0 GHz	–159.0 [dBm/Hz]	–156.5 [dBm/Hz]	Normal

Preamp: Off

Frequency	Max. (Spectrum analyzer function)	Max. (Vector signal analysis function)	Frequency band mode
100 kHz	–135.0 [dBm/Hz]	–132.5 [dBm/Hz]	
1 MHz	–145.0 [dBm/Hz]	–142.5 [dBm/Hz]	
30 MHz ≤ Frequency < 2.4 GHz	–153.0 [dBm/Hz]	–150.5 [dBm/Hz]	
2.4 GHz ≤ Frequency < 3.0 GHz	–152.0 [dBm/Hz]	–149.5 [dBm/Hz]	
3.0 GHz ≤ Frequency < 4.0 GHz	–151.0 [dBm/Hz]	–148.5 [dBm/Hz]	Normal
4.0 GHz ≤ Frequency < 5.0 GHz	–150.0 [dBm/Hz]	–147.5 [dBm/Hz]	Normal
5.0 GHz ≤ Frequency < 6.0 GHz	–149.0 [dBm/Hz]	–146.5 [dBm/Hz]	Normal

Input Attenuator Switching Error	Frequency band mode: Normal ±0.65 dB (≤6.0 GHz, 10 to 60 dB)

Reference Level

RF Frequency Characteristics	18˚ to 28˚C, After CAL, Input attenuator: 10 dB ±0.65 dB (100 kHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal) (100 kHz ≤ Frequency < 3.0 GHz, Frequency band mode: Spurious)
Linearity Error	Excluding the noise floor effect ±0.07 dB (Preamp input level*: ≤–40 dBm) ±0.10 dB (Preamp input level*: ≤–30 dBm) Frequency band mode: Normal ±0.5 dB (Preamp input level*: ≤–20 dBm, frequency: ≤6.0 GHz)
1 dB Gain Compression	Preamp input level* ≥–20 dBm (100 MHz ≤ Frequency < 400 MHz) ≥–15 dBm (400 MHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal) (400 MHz ≤ Frequency < 3.0 GHz, Frequency band mode: Spurious)

Spurious Response

2nd Harmonic Distortion	Preamp input level*: –45 dBm Harmonic SHI ≤–50 dBc ≤+5 dBm (10 MHz ≤ Frequency ≤ 400 MHz) ≤–55 dBc ≤+10 dBm (400 MHz < Frequency ≤ 3.0 GHz)
2-tone 3rd-order Intermodulation Distortion	18˚ to 28˚C, Preamp input level*: –45 dBm (per waveform), ≥300 kHz separation ≤–73 dBc (TOI: –8.5 dBm) (30 MHz ≤ Frequency < 400 MHz) ≤–78 dBc (TOI: –6 dBm) (400 MHz ≤ Frequency < 700 MHz) ≤–81 dBc (TOI: –4.5 dBm) (700 MHz ≤ Frequency < 4.0 GHz, Frequency band mode: Normal) (700 MHz ≤ Frequency < 3.0 GHz, Frequency band mode: Spurious) ≤–78 dBc (TOI: –6 dBm) (4.0 GHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal)

*: Preamp input level = RF input level – Input attenuator setting value

■ Hardware Option (Continuation)

MS2690A/MS2691A/MS2692A-020 Vector Signal Generator

Frequency

Range	125 MHz to 6 GHz
Resolution	0.01 Hz steps

Output Level

Setting range	–140 to +10 dBm (CW), –140 to 0 dBm (Modulation)
Units	dBm, dBμV (Terminated, Open)
Resolution	0.01 dB
Level Accuracy	18˚ to 28˚C, CW Output level: p –120 ≤ p ≤ +5 dBm ±0.5 dB (≤3.0 GHz) –110 ≤ p ≤ +5 dBm ±0.8 dB (>3.0 GHz) –127 ≤ p < –120 dBm ±0.7 dB (≤3.0 GHz) –127 ≤ p ≤ –110 dBm ±2.5 dB (typ.) (>3.0 GHz) –136 ≤ p < –127 dBm ±1.5 dB (typ.) (≤3.0 GHz)
Linearity	18˚ to 28˚C, CW, Referenced to –5 dBm output Output level: p –120 ≤ p ≤ –5 dBm ±0.2 dB (typ.) (≤3.0 GHz) –110 ≤ p ≤ –5 dBm ±0.3 dB (typ.) (>3.0 GHz)
Connector	N-J connector, 50 Ω [Front panel, SG Output (Opt.)]
VSWR	CW: ≤–5 dBm, Modulation: ≤–15 dBm 1.3 (≤3.0 GHz) 1.9 (>3.0 GHz)
Max. Reverse Input	1 W peak (≥300 MHz), 0.25 W peak (<300 MHz)

Signal Purity

Harmonic Spurious	Output level: ≤+5 dBm, CW, Output frequency: ≥300 MHz ≤–30 dBc
Non-harmonic Spurious	Output level: ≤+5 dBm, CW, Offset: ≥15 kHz (from Output frequency) <–68 dBc (125 MHz ≤ Frequency ≤ 500 MHz) <–62 dBc (500 MHz < Frequency ≤ 1.0 GHz) <–56 dBc (1.0 GHz < Frequency ≤ 2.0 GHz) <–50 dBc (2.0 GHz < Frequency ≤ 6.0 GHz)

Vector Modulation

18˚ to 28˚C, SG Level Auto CAL: On

Vector Accuracy	W-CDMA (DL1code) Output level: ≤–5 dBm, Output frequency: 800 MHz to 2700 MHz ≤2% (rms)
Carrier Leak	Output frequency: ≥300 MHz ≤–40 dBc
Image Rejection	Output frequency: ≥300 MHz, Using 10 MHz max. sine wave ≤–40 dBc
ACLR	Output level: ≤–5 dBm, Using W-CDMA (Test Model 1 64DPCH) signal, 300 MHz ≤ Output frequency ≤ 2.4 GHz ≤–64 dBc/3.84 MHz (5 MHz offset), ≤–67 dBc/3.84 MHz (10 MHz offset)
CW and Level Error at Vector Modulation	AWGN signal with bandwidth of 5 MHz, Output frequency: ≥300 MHz ±0.2 dB (Output level: ≤–15 dBm) ±0.4 dB (typ., –15 dBm < Output level: ≤–5 dBm)
Spectrum Inversion	Supported

Pulse Modulation

On/Off ratio	≥60 dB
Rising/Falling Edge Time	≤90 ns (10 to 90%)
Pulse Repetition Frequency	DC to 1 MHz (Duty 50%)
External Panel Modulation Signal Input	AUX connector (Rear panel), 600 Ω, 0 to 5 V, Threshold value: approx. 1 V

■ Hardware Option (Continuation)

Arbitrary Waveform Generator

Waveform Resolution	14 bits
Marker Output	Three signals (three signals in waveform pattern, or real-time three signals generation), TTL, polarity inversion function
Internal Baseband Reference Clock	Range: 20 kHz to 160 MHz Resolution: 0.001 Hz
External Baseband Reference Clock	Range: 20 kHz to 40 MHz Division, Multiplier function: 1, 2, 4, 8, 16, 1/2, 1/4, 1/8, 1/16 of input signal Input connector: AUX connector (Rear panel), 0.7 Vp-p min. (AC/50 Ω), or TTL
Waveform Memory	Memory: 256 Msamples
AWGN Addition Function	CN Ratio absolute value: ≤40 dB

BER Measurement

Connector	AUX connector (Rear panel)
Input Level	TTL Level
Input Signal	Data, Clock, Enable
Input Bit Rate	100 bps to 10 Mbps
Measured Patterns	PN9, PN11, PN15, PN20, PN23, ALL0, ALL1, 01 Repeat PN9Fix, PN11Fix, PN15Fix, PN20Fix, PN23Fix, User Define
Sync. Establishment Conditions	PN Signal: PN stage × 2 bit error free At PNFix Signal: 0 PN stage × 2 bit error free, PN signal and sync establishment, establish sync with PNFix signal at PN stage error free from PNFix signal header bit ALL0, ALL1, 01 Repeat: 10 bit error free User Define: 8 to 1024 bits (variable) error free, Select header bit used at sync detection
Resync. Evaluation Conditions	x/y y = Measured bit count: Select from 500, 5000, 50000 x = y bit error bit count: Setting range 1 to y/2
Measured Bit Count	$\leq 2^{32} - 1$ bits
Measured Error Bit Count	$\leq 2^{31} - 1$ bits
Measurement End Conditions	Measured bit count, Measured error bit count
Auto-resync. Function	On/Off
Operation at Resync.	Select from Count Clear, and Count Keep
Measurement Mode	Single, Endless, Continuous
Display	Status, Error, Error Rate, Error Count, Sync Loss Count, Measured bit count
Polarity Inversion Function	Data, Clock, Enable polarity inversion
Clear Measurement Function	Clear measured value saved at sync during BER measurement, and select measurement from 0

MS2690A/MS2691A/MS2692A-050 HDD Digitizing Interface

Bandwidth, Sampling Rate, Recorded Data Format	See table below
Recording Time	5 seconds to 4 hours
Number of Recorded File	1000 files max.
Resample Function	Convert by resampling at data retrieval, Setting range: Sampling rate/2 to Sampling rate
Trigger Function	Video, Wide IF Video, External, SG Marker
Count Mode	Capturing times: 1 to 20 times
Interface	Connector: External Serial ATA Connector Data rate: 1.5 Gbps Hot Plug: Not supported (The main frame and external HDD must be off when connecting/disconnecting connectors.)

Bandwidth	Sampling Rate	Recorded Data Format
100, 250, 500 kHz, 1, 2.5, 5 MHz	200, 500 kHz, 1, 2, 5, 10 MHz	Floating Decimal Format
10 MHz, 18.6 MHz	20 MHz	Fixed Decimal Format (16 bits)
20 MHz	25 MHz	

■ Hardware Option (Continuation)

MS2692A-067 Microwave Preselector Bypass

Bypasses the pre-selector to improve the RF frequency characteristics and the in-band frequency characteristics.
When the pre-selector option is set to On, the image response elimination filter is bypassed.
Therefore, this function is not appropriate for spurious measurement to receive the image response.
Microwave Pre-selector Bypass: On (with MS2692A-067), Microwave Pre-selector Bypass: Off (with special directions)

Cannot install simultaneously with MS2692A-003, MS2692A-004, or MS2692A-008.

Frequency

Frequency Range	6.0 GHz to 26.5 GHz

Amplitude

RF Frequency Characteristics	18° to 28°C, after CAL, Input attenuator: 10 dB, Microwave Pre-selector Bypass: On ±1.0 dB (6.0 GHz ≤ Frequency ≤ 13.5 GHz) ±1.5 dB (13.5 GHz < Frequency ≤ 26.5 GHz) ∗ with MS2692A-067, Microwave Pre-selector Bypass: Off, see Signal Analyzer/Spectrum Analyzer (RF Frequency Characteristics)
Displayed Average Noise Level (DANL)	18° to 28°C, Detector: Sample, VBW: 1 Hz (Video average), Input attenuator: 0 dB Microwave Pre-selector Bypass: On or Off –146 dBm/Hz (6.0 GHz ≤ Frequency < 10.0GHz) –145 dBm/Hz (10.0 GHz ≤ Frequency ≤ 13.5 GHz) –142 dBm/Hz (13.5 GHz < Frequency ≤ 20.0 GHz) –138 dBm/Hz (20.0 GHz < Frequency ≤ 26.5 GHz)
Image Responses	Microwave Pre-selector Bypass: Off ≤–60 dBc (6.0 GHz ≤ Frequency ≤ 26.5 GHz)

MS2690A/MS2691A/MS2692A-077 Analysis Bandwidth Extension to 62.5 MHz
MS2690A/MS2691A/MS2692A-078 Analysis Bandwidth Extension to 125 MHz (Requires Opt. 077)

Common

Bandwidth	with MS269xA-077 Adds the 50 MHz, 62.5 MHz bandwidths to the standard analysis bandwidths. with MS269xA-077/078 Adds the 50, 62.5, 100, and 125 MHz bandwidths to the standard analysis bandwidths.
Sampling Rate	Auto-setting depending on RBW with MS269xA-077, Bandwidth: >31.25 MHz 100 MHz with MS269xA-077/078, Bandwidth: >31.25 MHz 100 MHz, 200 MHz
Capture Time	Set length of capture time with MS269xA-077, Bandwidth: >31.25 MHz Min. capture time length: 1 µs (determined depending on analysis bandwidth) Max. capture time length: 500 ms with MS269xA-077/078, Bandwidth: >31.25 MHz Min. capture time length: 500 ns to 1 µs (determined depending on analysis bandwidth) Max. capture time length: 500 ms
Resolution Bandwidth (RBW)	with MS269xA-077, Bandwidth: >31.25 MHz Setting range: 3 kHz to 3 MHz (1-3 sequence) Selectivity (–60 dB/–3 dB): 4.5:1 (nominal) with MS269xA-077/078, Bandwidth: >31.25 MHz Setting range: 3 kHz to 10 MHz (1-3 sequence) Selectivity (–60 dB/–3 dB): 4.5:1 (nominal)
ADC Resolution	14 bits
Frequency	without MS2692A-067, Bandwidth: >31.25 MHz 100 MHz to 6.0 GHz with MS2692A-067, Bandwidth: >31.25 MHz 100 MHz to 26.5 GHz

■ Hardware Option (Continuation)

Amplitude

<table>
<tr><td>Display Average Noise Level (DANL)</td><td>
18˚ to 28˚C, Input attenuator: 0 dB
without MS269xA-008, or Preamp: Off, Frequency band mode: Normal
<table>
<tr><th>Frequency</th><th>Max.</th></tr>
<tr><td>100 MHz ≤ Frequency < 2.2 GHz</td><td>–147.0 [dBm/Hz]</td></tr>
<tr><td>2.2 GHz ≤ Frequency < 4.0 GHz</td><td>–145.0 [dBm/Hz]</td></tr>
<tr><td>4.0 GHz ≤ Frequency ≤ 6.0 GHz</td><td>–143.0 [dBm/Hz]</td></tr>
</table>
with MS269xA-008, Preamp: On, Frequency band mode: Normal
<table>
<tr><th>Frequency</th><th>Max.</th></tr>
<tr><td>100 MHz ≤ Frequency < 2.2 GHz</td><td>–160.0 [dBm/Hz]</td></tr>
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<tr><td>4.0 GHz ≤ Frequency ≤ 6.0 GHz</td><td>–154.0 [dBm/Hz]</td></tr>
</table>
with MS2692A-067, Microwave Pre-selector Bypass: On
<table>
<tr><th>Frequency</th><th>Max.</th></tr>
<tr><td>6.0 GHz < Frequency < 10.0 GHz</td><td>–140.0 [dBm/Hz]</td></tr>
<tr><td>10.0 GHz ≤ Frequency ≤ 13.5 GHz</td><td>–136.0 [dBm/Hz]</td></tr>
<tr><td>13.5 GHz < Frequency ≤ 20.0 GHz</td><td>–133.0 [dBm/Hz]</td></tr>
<tr><td>20.0 GHz < Frequency ≤ 26.5 GHz</td><td>–129.0 [dBm/Hz]</td></tr>
</table>
</td></tr>
<tr><td>Total Level Accuracy*
*: The Total level accuracy is found from root sum of squares (RSS) of RF characteristics, linearity error, and input attenuator switching error.</td><td>
18˚ to 28˚C, after CAL, Input attenuator: ≥10 dB, Center frequency, CW, RBW: Auto, Time Detection: Average, Marker Result: Integration or Peak (Accuracy), Excluding the noise floor effect
without MS269xA-008, or Preamp: Off, Mixer input level: ≤0 dBm, Bandwidth: >31.25 MHz
±0.5 dB (100 MHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal)
with MS269xA-008, Preamp: On, Preamp input level: ≤–20 dBm, Bandwidth: >31.25 MHz
±1.0 dB (100 MHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal)
with MS269xA-077, or MS269xA-077/078, Bandwidth: >31.25 MHz
with MS2692A-067, Microwave Pre-selector Bypass: On
±1.8 dB (6.0 GHz ≤ Frequency ≤ 13.5 GHz, Frequency band mode: Normal)
±3.0 dB (13.5 GHz ≤ Frequency ≤ 26.5 GHz)
</td></tr>
<tr><td>Linearity Error</td><td>
Excluding the noise floor effect
without MS269xA-008, or Preamp: Off, Frequency band mode: Normal
±0.07 dB (Mixer input level: ≤–20 dBm)
±0.10 dB (Mixer input level: ≤–10 dBm)
±0.30 dB (Mixer input level: ≤0 dBm, Frequency: ≤6.0 GHz)
with MS269xA-008, Preamp: On, Frequency band mode: Normal
±0.07 dB (Mixer input level: ≤–40 dBm)
±0.10 dB (Mixer input level: ≤–30 dBm)
±0.50 dB (Mixer input level: ≤–20 dBm)
with MS2692A-067, Microwave Pre-selector Bypass: On
±0.60 dB (Mixer input level: ≤0 dBm, Frequency: > 6.0 GHz)
</td></tr>
<tr><td>RF Frequency Characteristics</td><td>
18˚ to 28˚C, After CAL, Input attenuator: 10 dB
without MS269xA-008, or Preamp: Off
±0.35 dB (100 MHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal)
with MS269xA-008, Preamp: On
±0.65 dB (100 MHz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal)
with MS2692A-067, Microwave Pre-selector Bypass: On
±1.0 dB (6.0 GHz < Frequency ≤ 13.5 GHz)
±1.5 dB (13.5 GHz < Frequency ≤ 26.5 GHz)
</td></tr>
</table>

Note: Amplitude errors may occur in digitized IQ data at a probability of 0.0001 ppm or less. (AD converter maker nominal specifications) when the Analysis Bandwidth Extension 62.5 MHz/125 MHz option operates at the 50 MHz/62.5 MHz/100 MHz/125 MHz bandwidth setting.

Typical (typ):
Performance not warranted. Must products meet typical performance.
Nominal:
Values not warranted. Included to facilitate application of product.
Example:
Performance not warranted. Data actually measured by randomly selected measuring instruments.

Ordering Information

Please specify the model/order number, name and quantity when ordering.
The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

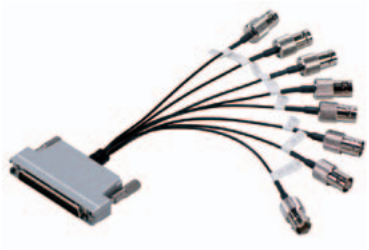
Model/Order No.	Name
	- Main Frame -
MS2690A	Signal Analyzer (50 Hz to 6.0 GHz)
MS2691A	Signal Analyzer (50 Hz to 13.5 GHz)
MS2692A	Signal Analyzer (50 Hz to 26.5 GHz)
	- Standard Accessories -
	Power Cord :1 pc
P0031A	USB Memory (>1 GB USB2.0 Flash Driver) :1 pc
Z0541A	USB Mouse :1 pc
	Install CD-ROM
	(Application software, instruction manual CD-ROM) :1 pc
	- Options -
MS2690A-001	Rubidium Reference Oscillator (Aging rate ±1 × 10^{-10}/month)
MS2690A-004	Wideband Analysis Hardware
	(Extends the Analysis Bandwidth to 125 MHz)
MS2690A-008	6 GHz Preamplifier (100 kHz to 6 GHz)
MS2690A-020	Vector Signal Generator (125 MHz to 6 GHz)
MS2690A-040	Baseband Interface Unit
MS2690A-050	HDD Digitizing Interface
MS2690A-077	Analysis Bandwidth Extension to 62.5 MHz
MS2690A-078	Analysis Bandwidth Extension to 125 MHz
	(Requires MS2690A-077)
MS2690A-313	Removable HDD
MS2691A-001	Rubidium Reference Oscillator (Aging rate ±1 × 10^{-10}/month)
MS2691A-003	Extension of Preselector Lower Limit to 3 GHz
	(Extends lower limit of pre-selector to 3 GHz)
MS2691A-004	Wideband Analysis Hardware
	(Extends the Analysis Bandwidth to 125 MHz)
MS2691A-008	6 GHz Preamplifier (100 kHz to 6 GHz)
MS2691A-020	Vector Signal Generator (125 MHz to 6 GHz)
MS2691A-040	Baseband Interface Unit
MS2691A-050	HDD Digitizing Interface
MS2691A-077	Analysis Bandwidth Extension to 62.5 MHz
MS2691A-078	Analysis Bandwidth Extension to 125 MHz
	(Requires MS2691A-077)
MS2691A-313	Removable HDD
MS2692A-001	Rubidium Reference Oscillator (Aging rate ±1 × 10^{-10}/month)
MS2692A-003	Extension of Preselector Lower Limit to 3 GHz
	(Extends lower limit of pre-selector to 3 GHz)
MS2692A-004	Wideband Analysis Hardware
	(Extends the Analysis Bandwidth to 125 MHz)
MS2692A-008	6 GHz Preamplifier (100 kHz to 6 GHz)
MS2692A-020	Vector Signal Generator (125 MHz to 6 GHz)
MS2692A-040	Baseband Interface Unit
MS2692A-050	HDD Digitizing Interface
MS2692A-067*	Microwave Preselector Bypass
MS2692A-077	Analysis Bandwidth Extension to 62.5 MHz
MS2692A-078	Analysis Bandwidth Extension to 125 MHz
	(Requires MS2692A-077)
MS2692A-313	Removable HDD
	- Retrofit Options -
MS2690A-101	Rubidium Reference Oscillator Retrofit (Aging rate ±1 × 10^{-10}/month)
MS2690A-104	Wideband Analysis Hardware Retrofit
	(Extends the Analysis Bandwidth to 125 MHz)
MS2690A-108	6 GHz Preamplifier Retrofit (100 kHz to 6 GHz)
MS2690A-120	Vector Signal Generator Retrofit (125 MHz to 6 GHz)
MS2690A-140	Baseband Interface Unit Retrofit
MS2690A-150	HDD Digitizing Interface Retrofit
MS2690A-177	Analysis Bandwidth Extension to 62.5 MHz Retrofit
MS2690A-178	Analysis Bandwidth Extension to 125 MHz Retrofit
	(Requires MS2690A-077/177)

Model/Order No.	Name
MS2691A-101	Rubidium Reference Oscillator Retrofit (Aging rate ±1 × 10^{-10}/month)
MS2691A-103	Extension of Preselector Lower Limit to 3 GHz Retrofit
	(Extends lower limit of pre-selector to 3 GHz)
MS2691A-104	Wideband Analysis Hardware Retrofit
	(Extends the Analysis Bandwidth to 125 MHz)
MS2691A-108	6 GHz Preamplifier Retrofit (100 kHz to 6 GHz)
MS2691A-120	Vector Signal Generator Retrofit (125 MHz to 6 GHz)
MS2691A-140	Baseband Interface Unit Retrofit
MS2691A-150	HDD Digitizing Interface Retrofit
MS2691A-177	Analysis Bandwidth Extension to 62.5 MHz Retrofit
MS2691A-178	Analysis Bandwidth Extension to 125 MHz Retrofit
	(Requires MS2691A-077/177)
MS2692A-101	Rubidium Reference Oscillator Retrofit (Aging rate ±1 × 10^{-10}/month)
MS2692A-103	Extension of Preselector Lower Limit to 3 GHz Retrofit
	(Extends lower limit of pre-selector to 3 GHz)
MS2692A-104	Wideband Analysis Hardware Retrofit
	(Extends the Analysis Bandwidth to 125 MHz)
MS2692A-108	6 GHz Preamplifier Retrofit (100 kHz to 6 GHz)
MS2692A-120	Vector Signal Generator Retrofit (125 MHz to 6 GHz)
MS2692A-140	Baseband Interface Unit Retrofit
MS2692A-150	HDD Digitizing Interface Retrofit
MS2692A-167*	Microwave Preselector Bypass Retrofit
MS2692A-177	Analysis Bandwidth Extension to 62.5 MHz Retrofit
MS2692A-178	Analysis Bandwidth Extension to 125 MHz Retrofit
	(Requires MS2692A-077/177)
	- Software Options -
	CD-ROM with License and Operation manuals
MX269010A	Mobile WiMAX Measurement Software
MX269011A	W-CDMA/HSPA Downlink Measurement Software
MX269012A	W-CDMA/HSPA Uplink Measurement Software
MX269013A	GSM/EDGE Measurement Software
MX269013A-001	EDGE Evolution Measurement Software
	(Requires MX269013A)
MX269014A	ETC/DSRC Measurement Software
MX269015A	TD-SCDMA Measurement Software
MX269016A	XG-PHS Measurement Software
MX269017A	Vector Modulation Analysis Software
MX269020A	LTE Downlink Measurement Software
MX269021A	LTE Uplink Measurement Software
MX269022A	LTE TDD Downlink Measurement Software
MX269023A	LTE TDD Uplink Measurement Software
MX269024A	CDMA2000 Forward Link Measurement Software
MX269026A	EV-DO Forward Link Measurement Software
MX269028A	WLAN (802.11) Measurement Software
MX269030A	W-CDMA BS Measurement Software
MX269036A	Measurement Software for MediaFLO
MX269040A	UMTS Measurement Software for RF Device Test
MX269041A	Digital I/F Control Software for DigRF2.5G/3G
MX269901A	HSDPA/HSUPA IQproducer
MX269902A	TDMA IQproducer
MX269904A	Multi-Carrier IQproducer
MX269905A	Mobile WiMAX IQproducer
MX269908A	LTE IQproducer
MX269909A	XG-PHS IQproducer
MX269910A	LTE TDD IQproducer
MX269911A	WLAN IQproducer
	- Warranty Service -
MS2690A-ES210	2 Years Extended Warranty Service
MS2690A-ES310	3 Years Extended Warranty Service
MS2690A-ES510	5 Years Extended Warranty Service
MS2691A-ES210	2 Years Extended Warranty Service
MS2691A-ES310	3 Years Extended Warranty Service
MS2691A-ES510	5 Years Extended Warranty Service
MS2692A-ES210	2 Years Extended Warranty Service
MS2692A-ES310	3 Years Extended Warranty Service
MS2692A-ES510	5 Years Extended Warranty Service

*: Cannot be installed simultaneously with MS2692A-003/103/004/104/008/108

Model/Order No.	Name
	- Application Parts -
	Following operation manuals provided as hard copy
W2850AE	MS2690A/MS2691A/MS2692A Operation Manual (Main frame Operation)
W2851AE	MS2690A/MS2691A/MS2692A Operation Manual (Main frame Remote Control)
W2852AE	MS2690A/MS2691A/MS2692A Operation Manual (Signal Analyzer Function Operation)
W2853AE	MS2690A/MS2691A/MS2692A Operation Manual (Signal Analyzer Function Remote Control)
W2854AE	MS2690A/MS2691A/MS2692A Operation Manual (Spectrum Analyzer Function Operation)
W2855AE	MS2690A/MS2691A/MS2692A Operation Manual (Spectrum Analyzer Function Remote Control)
W2856AE	MS2690A/MS2691A/MS2692A-020 Operation Manual (Operation)
W2857AE	MS2690A/MS2691A/MS2692A-020 Operation Manual (Remote Control)
W2914AE	MS2690A/MS2691A/MS2692A-020 Operation Manual (IQproducer)
W2929AE	MS2690A/MS2691A/MS2692A-020 Operation Manual (Standard Waveform Pattern)
W3130AE	MS2690A/MS2691A/MS2692A-040 Operation Manual (Operation)
W3117AE	Phase Noise Measurement Function Operation Manual (Operation)
W3118AE	Phase Noise Measurement Function Operation Manual (Remote control)
W2919AE	MX269010A Operation Manual (Operation)
W2954AE	MX269010A Operation Manual (Remote Control)
W3098AE	MX269011A Operation Manual (Operation)
W3099AE	MX269011A Operation Manual (Remote control)
W3060AE	MX269012A Operation Manual (Operation)
W3061AE	MX269012A Operation Manual (Remote control)
W3100AE	MX269013A Operation Manual (Operation)
W3101AE	MX269013A Operation Manual (Remote control)
W3031AE	MX269014A Operation Manual (Operation)
W3032AE	MX269014A Operation Manual (Remote control)
W3044AE	MX269015A Operation Manual (Operation)
W3045AE	MX269015A Operation Manual (Remote control)
W3157AE	MX269016A Operation Manual (Operation)
W3158AE	MX269016A Operation Manual (Remote control)
W3305AE	MX269017A Operation Manual (Operation)
W3306AE	MX269017A Operation Manual (Remote control)
W3014AE	MX269020A Operation Manual (Operation)
W3064AE	MX269020A Operation Manual (Remote control)
W3015AE	MX269021A Operation Manual (Operation)
W3065AE	MX269021A Operation Manual (Remote control)
W3209AE	MX269022A Operation Manual (Operation)
W3210AE	MX269022A Operation Manual (Remote control)
W3521AE	MX269023A Operation Manual (Operation)
W3522AE	MX269023A Operation Manual (Remote Control)
W3201AE	MX269024A Operation Manual (Operation)
W3202AE	MX269024A Operation Manual (Remote control)
W3203AE	MX269026A Operation Manual (Operation)
W3204AE	MX269026A Operation Manual (Remote control)
W3528AE	MX269028A Operation Manual (Operation)
W3529AE	MX269028A Operation Manual (Remote Control)
W2860AE	MX269030A Operation Manual (Operation)
W2861AE	MX269030A Operation Manual (Remote control)

Model/Order No.	Name
W3313AE	MX269036A Operation Manual (Operation)
W3314AE	MX269036A Operation Manual (Remote control)
W3003AE	MX269040A Operation Manual (W-CDMA Operation)
W3004AE	MX269040A Operation Manual (GSM/EDGE Operation)
W3005AE	MX269040A Operation Manual (Remote control)
W3006AE	MX269041A Operation Manual (BBIF Operation)
W3007AE	MX269041A Operation Manual (BBIF Remote control)
W3008AE	MX269041A Operation Manual (IQ Pattern/DUT Control Producer)
W3016AE	MX269041A Operation Manual (RF device test integrated software)
W3108AE	MX269050A Operation Manual (Operation)
W3109AE	MX269050A Operation Manual (Remote control)
W2915AE	MX269901A Operation Manual
W2916AE	MX269902A Operation Manual
W2917AE	MX269904A Operation Manual
W2918AE	MX269905A Operation Manual
W3023AE	MX269908A Operation Manual
W3153AE	MX269909A Operation Manual
W3221AE	MX269910A Operation Manual
W3488AE	MX269911A Operation Manual
K240B	Power Divider (K connector, DC to 26.5 GHz, 50 Ω, K-J, 1 W max)
MA1612A	Four-Port Junction Pad (5 MHz to 3 GHz, N-J)
MP752A	Termination (DC to 12.4 GHz, 50 Ω, N-P)
MA2512A	Band Pass Filter (for W-CDMA, 1.92 to 2.17 GHz)
J0576B	Coaxial Cord (N-P · 5D-2W · N-P), 1 m
J0576D	Coaxial Cord (N-P · 5D-2W · N-P), 2 m
J0127A	Coaxial Cord (BNC-P · RG58A/U · BNC-P), 1 m
J0127B	Coaxial Cord (BNC-P · RG58A/U · BNC-P), 2 m
J0127C	Coaxial Cord (BNC-P · RG58A/U · BNC-P), 0.5 m
J0322A	Coaxial Cord (SMA-P · 50 Ω SUCOFLEX104 · SMA-P), 0.5 m (DC to 18 GHz)
J0322B	Coaxial Cord (SMA-P · 50 Ω SUCOFLEX104 · SMA-P), 1 m (DC to 18 GHz)
J0322C	Coaxial Cord (SMA-P · 50 Ω SUCOFLEX104 · SMA-P), 1.5 m (DC to 18 GHz)
J0322D	Coaxial Cord (SMA-P · 50 Ω SUCOFLEX104 · SMA-P), 2 m (DC to 18 GHz)
J1264	SMA-N Conversion Adapter (DC to 18 GHz, 50 Ω, N-P · SMA-J)
J1398A	N-SMA Adapter (DC to 26.5 GHz, 50 Ω, N-P · SMA-J)
J0911	Coaxial Cord, 1.0 M (for 40 GHz) (DC to 40 GHz, approx. 1 m) (SF102A, 11K254/K254/1.0M)
J0912	Coaxial Cord, 0.5 M (for 40 GHz) (DC to 40 GHz, approx. 0.5 m) (SF102A, 11K254/K254/0.5M)
41KC-3	Fixed Attenuator, 3 dB (DC to 40 GHz, 3 dB)
J1261A	Ethernet Cable (Shield type, straight), 1 m
J1261B	Ethernet Cable (Shield type, straight), 3 m
J1261C	Ethernet Cable (Shield type, cross), 1 m
J1261D	Ethernet Cable (Shield type, cross), 3 m
J0008	GPIB Connection Cable, 2.0 m
J1373A	AUX Conversion Adapter (AUX → BNC, for vector signal generator option)
B0597A	Rack Mount Kit (EIA)
B0589A	Carrying Case (Hard type, with casters)
B0633A	Carrying Case (Soft type)
Z1082A	10/13 MHz Reference Signal Input
MA24106A	USB Power Sensor (50 MHz to 6 GHz, with USB A to mini B Cable)
Z1037A	Installation Kit (required when retrofitting options or installing software)



J1373A AUX Conversion Adapter

MA24106A USB Power Sensor

B0589A Carrying Case (Hard type)

B0633A Carrying Case (Soft type)

Note:

Anritsu

Specifications are subject to change without notice.

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