SIGNAL ANALYZER

MS2690A, MS2691A, MS2692A

50 Hz to 6.0 GHz   50 Hz to 13.5 GHz   50 Hz to 26.5 GHz

Signal Analyzer Solving Next-Generation Wireless Communications Issues

Excellent Eco Product

CE

The Signal Analyzer MS2690A/MS2691A/MS2692A (MS269xA) 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 preselector 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.
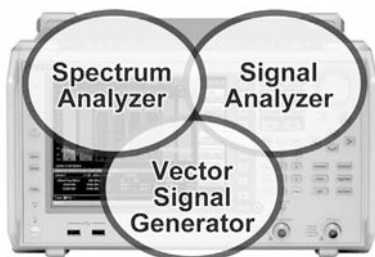
Key Features

• **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.)**

  • **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: $\pm 1 \times 10^{-8}$/day
      Start-up Characteristics: $\pm 5 \times 10^{-8}$ (5 minutes after power-on)
    Rubidium Reference Oscillator (Option 001)
      Aging Rate: $\pm 1 \times 10^{-10}$/month
      Start-up Characteristics: $\pm 1 \times 10^{-9}$ (7 minutes after power-on)

  • **Versatile Built-in Functions**
    [Standard]

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]
2-tone 3rd-order Intermodulation Distortion[4]	
Phase Noise	Power Meter[6]

   [Option]
    Noise Figure[7]

[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]: Use USB Power Sensors
[7]: Noise Figure Measurement Function (Requires Option 017)
    [Use Noise Sources (Noisecom, NC346 series)]

- Signal Analyzer Functions

  • Analysis Bandwidth
    Standard: 31.25 MHz max.
      (50 MHz max. sampling rate = 20 ns resolution, ADC resolution 16 bits)
    Option 077: 62.5 MHz max.
      (100 MHz max. sampling rate = 10 ns resolution, ADC resolution 14 bits)
    Option 078*8, *9: 125 MHz max.
      (200 MHz max. sampling rate = 5 ns resolution, ADC resolution 14 bits)

  • 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.

  • Replay Function
    Reads saved data and replays using signal analyzer function.

  • 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
    Option 067 Microwave Preselector Bypass*10
    Option 078 Analysis Bandwidth Extension to 125 MHz*8

    Bypassing preselector improves RF frequency characteristics and
    in-band frequency characteristics. Supports modulation analysis
    and signal analyzer measurements for signals up to 26.5 GHz.

  *8: Requires MS269xA-077
  *9: Combining with MX269028A-002 wireless LAN IEEE802.11ac (160 MHz)
       measurement software (only for MS269xA) supports modulation analysis
       up to 160-MHz bandwidth signals of the IEEE802.11ac.
       See measurement software catalog for more details.
  *10: Option 067 can be installed in MS2692A

- Vector Signal Generator (Option 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

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 preselector at the 3-GHz basic
band, which causes lowered measurement accuracy. The MS269xA
basic band of 6 GHz eliminates the degraded noise floor and
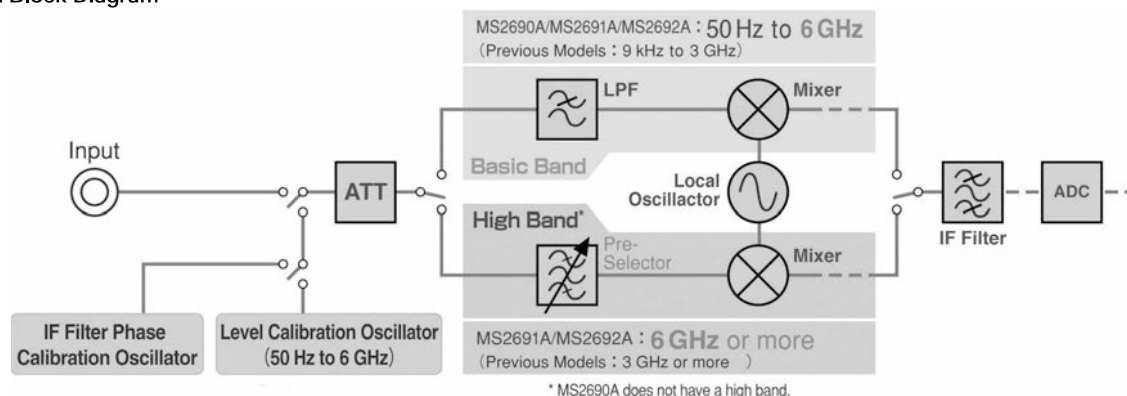improves measurement accuracy.

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 kHz to 6 GHz, minimizing
measurement errors in this frequency range.

The MS269xA total level accuracy includes:
  • Frequency characteristics
  • Linearity
  • Attenuator switching error
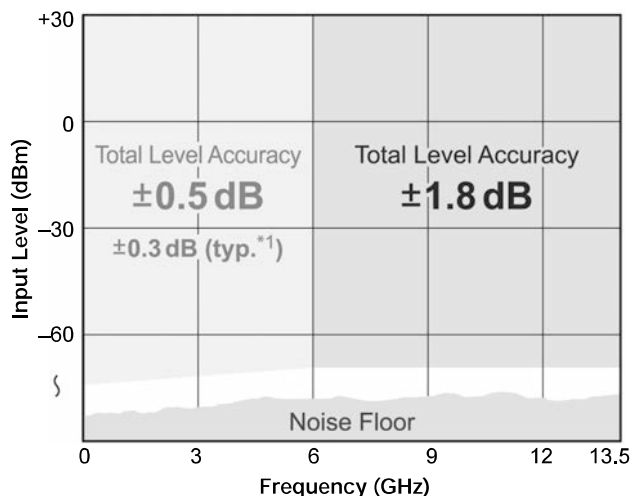
Note: Eliminates effect of noise floor
      Used only when Uncal does not occur

*1: Excluding Guard Band

MS269xA Block Diagram

MS2690A/MS2691A/MS2692A : 50 Hz to 6 GHz
(Previous Models : 9 kHz to 3 GHz)

Input

ATT

LPF

Mixer

Basic Band

Local Oscillator

High Band*

Pre-Selector

Mixer

IF Filter

ADC

IF Filter Phase Calibration Oscillator

Level Calibration Oscillator (50 Hz to 6 GHz)

MS2691A/MS2692A : 6 GHz or more
(Previous Models : 3 GHz or more)

* MS2690A does not have a high band.

Preselector

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

Microwave Preselector Bypass MS2692A-067*

Bypasses the preselector to improve the RF frequency characteristics and the in-band frequency characteristics.
When the preselector 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.

*: Option 067 can be installed in MS2692A.

• 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)
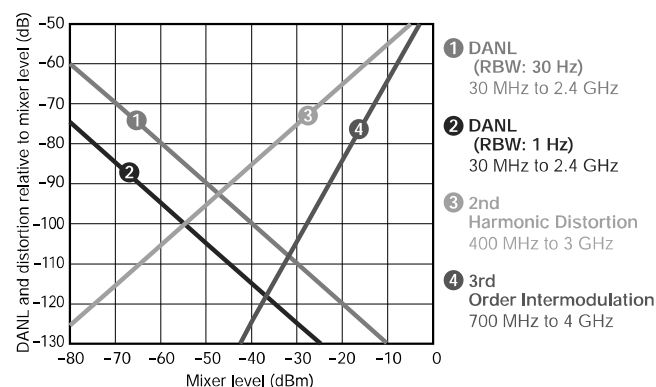[3]: DANL (Displayed Average Noise Level)

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.
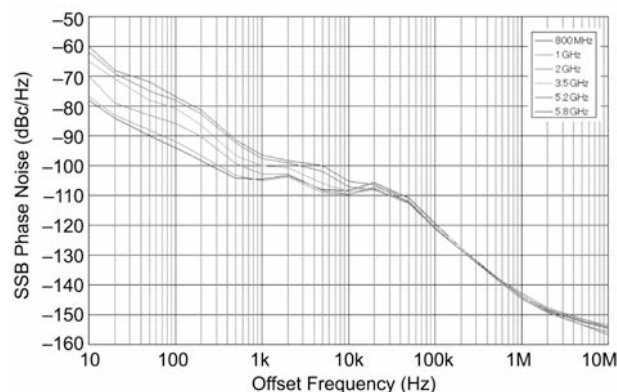
The MS269xA has an excellent dynamic range supporting true performance measurements of devices, such as base stations, requiring wideband measuring instruments.
For example, the 3GPP category-B spurious measurement specification requires a measuring instrument with severe dynamic range specifications. 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)

❶ DANL
 (RBW: 30 Hz)
 30 MHz to 2.4 GHz

❷ DANL
 (RBW: 1 Hz)
 30 MHz to 2.4 GHz

❸ 2nd
 Harmonic Distortion
 400 MHz to 3 GHz

❹ 3rd
 Order Intermodulation
 700 MHz to 4 GHz

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

800MHz
1GHz
2GHz
3.5GHz
5.2GHz
5.8GHz

- **Supports 125 MHz Wideband Measurements up to 26.5 GHz**

Microwave Preselector Bypass MS2692A-067*[1] + Analysis Bandwidth Extension to 125 MHz MS2692A-078*[2]
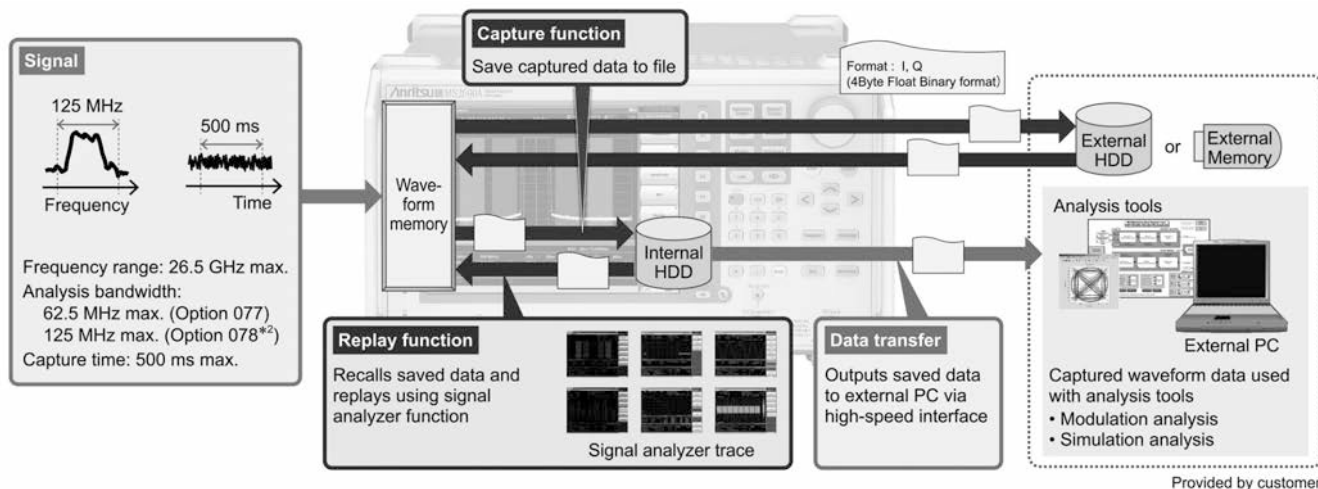
*1: Can be installed in MS2692A.
*2: Require MS2692A-077.

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.
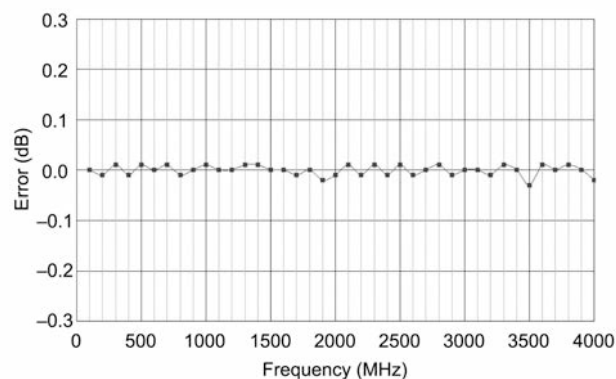
Example: Level Stability by Switching Reference Level
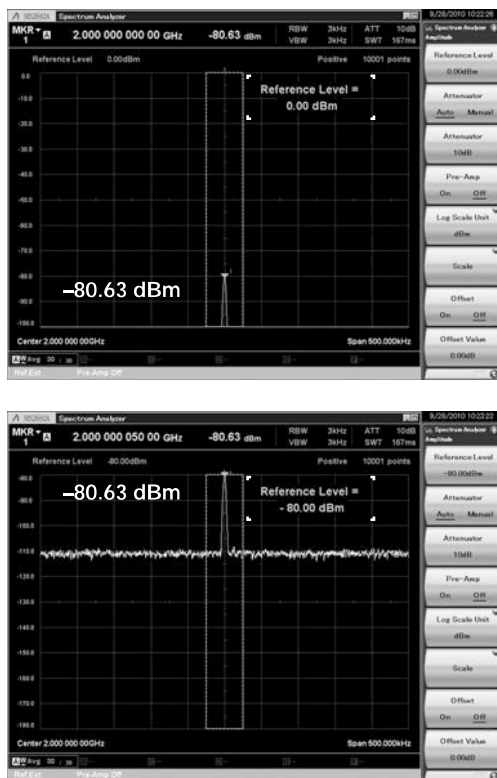
- **Dual Sweep Speed: Normal/Fast**

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 Option 077 installed and bandwidth setting ≥50 MHz
*3: With Option 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 Option 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 Option 020):**
    Sweeping starts in synchronization with the rise or fall of the marker signal output of Option 020. This function supports measurement in synchronization with the output signal of Option 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 Option 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 us 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, ADC resolution 16 bits)
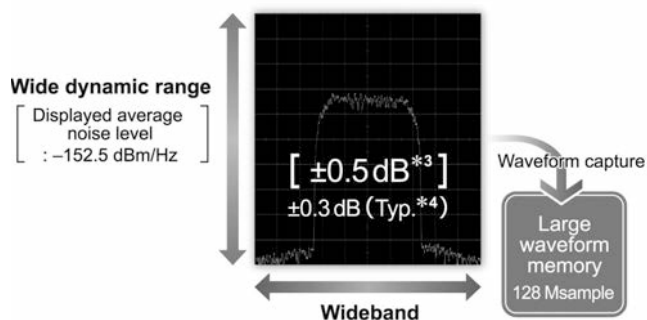
  Option 077: 62.5 MHz max.
  (Sampling rate 100 MHz max = Resolution 10 ns, ADC resolution 14 bits)

  Option 078*1, *2: 125 MHz max.
  (Sampling rate 200 MHz max = Resolution 5 ns, ADC resolution 14 bits)

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.

Wide dynamic range
Displayed average noise level : –152.5 dBm/Hz

[±0.5 dB*3]
±0.3 dB (Typ.*4)

Wideband

Waveform capture

Large waveform memory
128 Msample

*1: Requires Option 077
*2: Combining with MX269028A-002 wireless LAN IEEE802.11ac (160 MHz) measurement software (only for MS269xA) supports modulation analysis up to 160-MHz bandwidth signals of the IEEE802.11ac.
See measurement software catalog for more details.
*3: 50 Hz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal
*4: Excluding Guard Band

• **Excellent Frequency Characteristics in Analysis Bandwidth**

The Signal Analyzer Extra Band Cal function using the built-in oscillator for calibration supports analysis bandwidth calibration at the set frequency.

The excellent in-band frequency characteristics support wideband modulation analysis with less error.

Extra Band Cal Frequency Range

Span ≤ 31.25 MHz (Standard): 30 MHz to 6 GHz
Span > 31.25 MHz (Option 077/078): 100 MHz to 6 GHz

∗:Setting center frequency after Extra Band Cal, requires re-execution of Extra Band Cal.

Example of frequency characteristics in analysis bandwidth after Extra Band Cal
(With Option 078, Reference Level: −10 dBm,
Input attenuator: 10 dB, Preamp: Off, Span: 125 MHz)
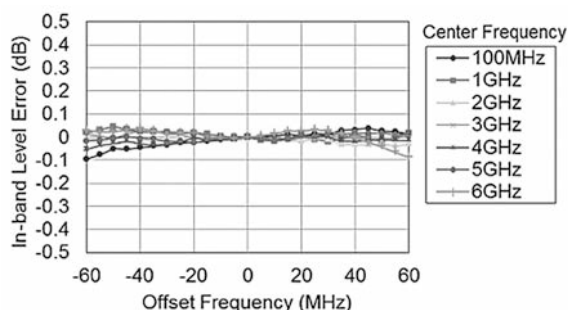
• **Save Signals in Internal Memory**

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

• **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

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.
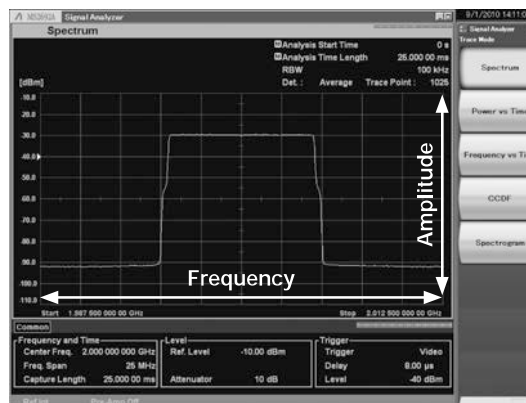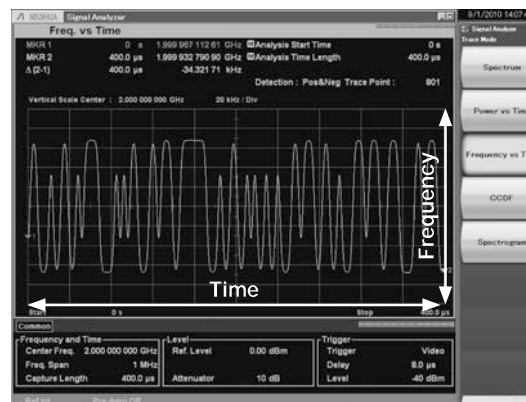

• **Power vs. Time**
The Power vs. Time trace displays a graph with amplitude on the y-axis and time on the x-axis to confirm changes in power with time of measured signals.
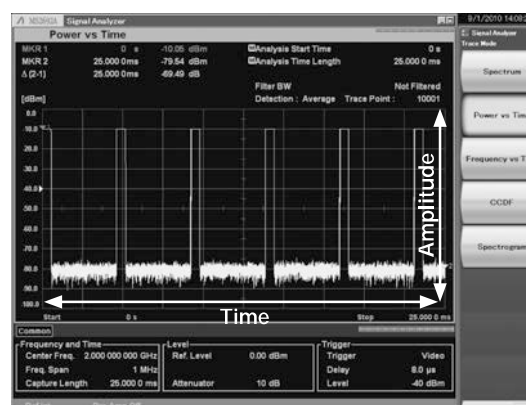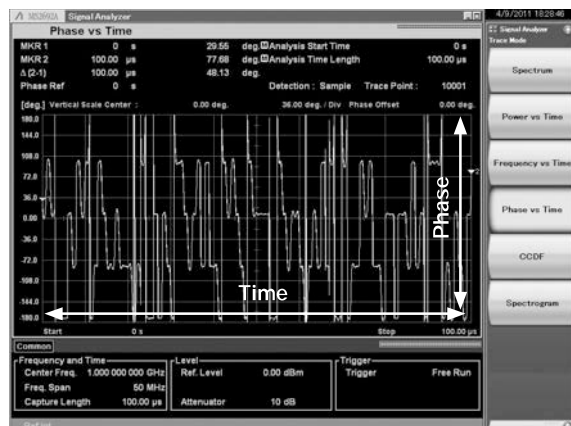

• **Frequency vs. Time**
The Frequency vs. Time trace displays a graph with frequency on the y-axis and time on the x-axis to confirm time variation of the measured signal frequency.

• 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.

• 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.

• No Trace

No Trace mode does not execute signal analysis. Therefore, "IQ data output" and "IQ data readout using remote commands" can be executed quickly without the need to wait for completion of analysis.
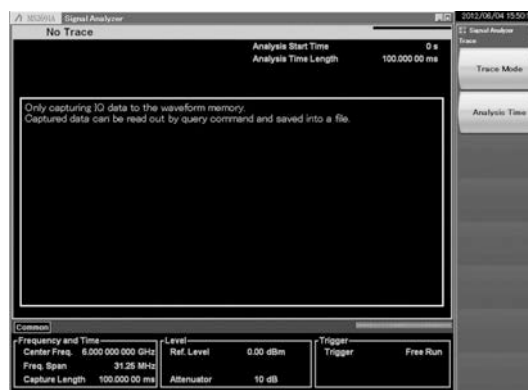
• Measurement with Sub-trace Display

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 on the sub-trace to display the problem part only on the 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.
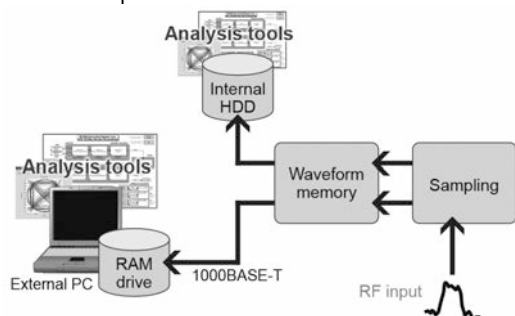
• Playback of Captured Waveform from Built-in Vector Signal Generator

Combined use with the MS269xA-020 Vector Signal Generator (option) supports playback of RF signals captured by the signal analyzer.

Playback can be used for the following applications:

- Playback of signals from radio equipment for use as a reference signal source with a quality close to that of actual operation signals.
- Playback of constant noise occurring under specific conditions for stable reproduction of fault-occurrence conditions.
- Playback of unspecified field noise for use as interference wave at in-house evaluations.

There are two playback output methods:

1. Conversion of the captured RF signal using built-in PC software to a waveform pattern for output from the vector signal generator.
2. Simple use of the Capture & Playback function.

• One-button Playback of Captured Waveform (Capture & Playback Function)

Previously, at playback from the built-in vector signal generator, after capturing the RF signal with the signal analyzer, it was necessary to perform several time-wasting procedures to save the signal as a file, convert it to waveform data for use by the signal generator, and set the output conditions.

The built-in, easy-to-use, one-button Capture & Playback function eliminates this wasted time*.

*: Requires MS269xA-020 Vector Signal Generator option.
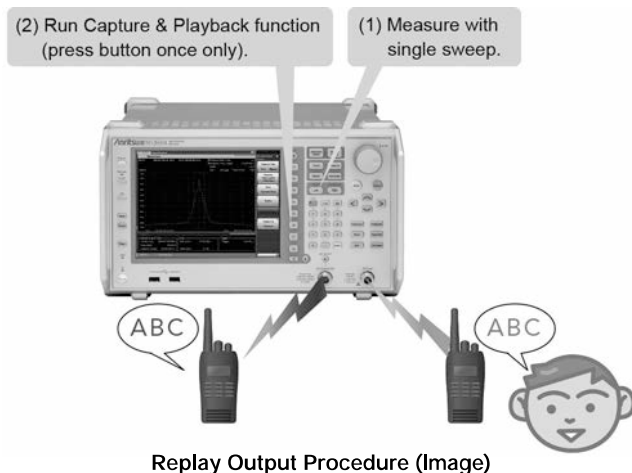
Replay Output Procedure (Image)

- Freely convertible output frequency and level
- Bandwidth and time playback
  Min. 1 kHz (2000 s), Max. 100 MHz (500 ms)*
- Playback signals captured previously by equipment

*: Requires Option 077 or 078, depending on bandwidth

In addition, any captured playback range (time) can be set. The captured waveform is displayed on the signal analyzer time axis and only the specified required range (time) is played back.
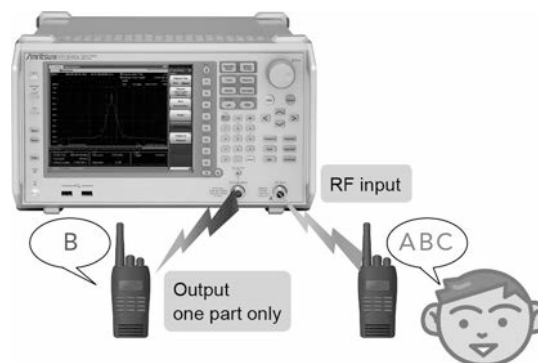

For example, parts of burst signals with periodic On/Off cycles can be played back as shown in the diagram below by specifying one or several Off to On cycles.

When using a signal generator as a reference signal source, the signal quality is often much better than that in the actual usage environment, which can cause evaluation problems. Playback of an actual captured radio signal supports evaluation of signal quality mimicking the real signal environment.
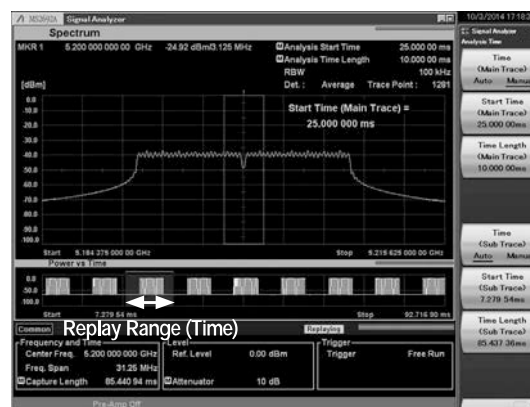
Specifying Playback Range (Time)
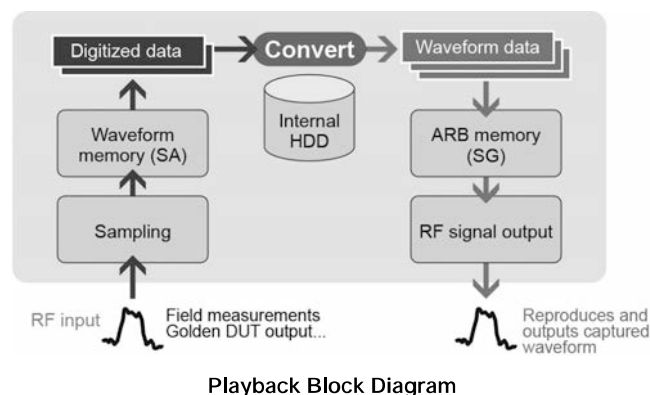
Playback Block Diagram

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	✓	
2-tone 3rd-order Intermodulation Distortion	✓	
Annotation Display (On/Off)	✓	
Phase Noise	Independent function	
Power Meter	Independent function*3	
Noise Figure	Option 017*4	

*1: SPA (Spectrum Analyzer)
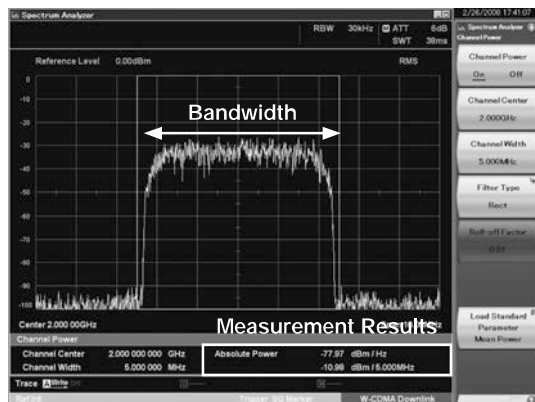*2: VSA (Vector Signal Analyzer)
*3: Use USB Power Sensors
*4: Use Noise Sources (Noisecom, NC346 series)

• Channel Power (SPA) (VSA)

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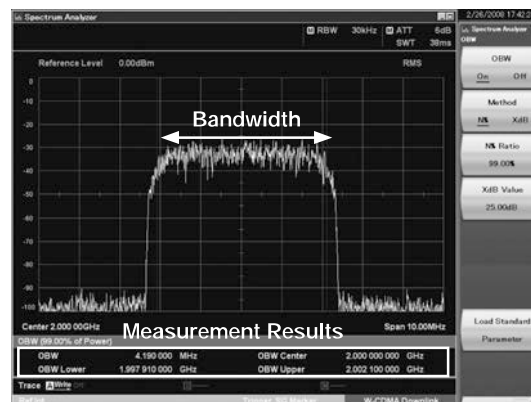Pre-installed templates for each standard support easy parameter setting.

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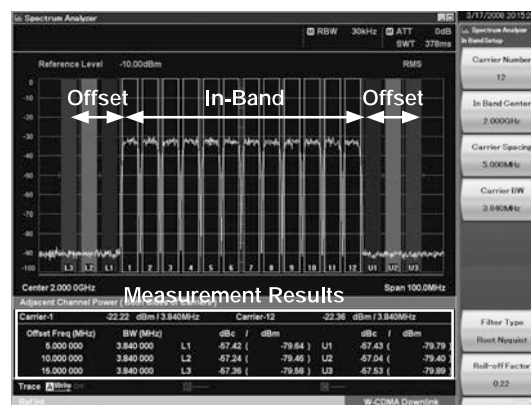
Measurement Results
■ Absolute power of Offset channel
■ Relative values in relation to reference power
  selected in ACP reference

• Spectrum Emission Mask (SPA)

This function splits the offset part into up to 12 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.
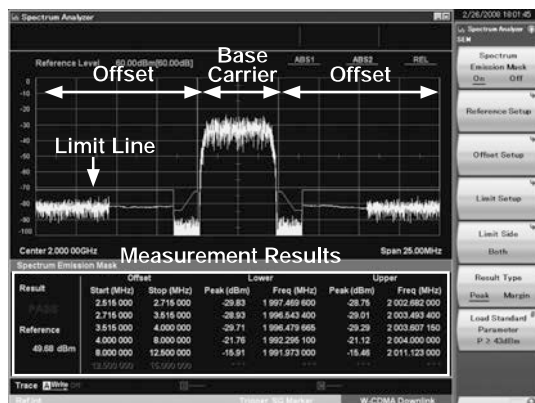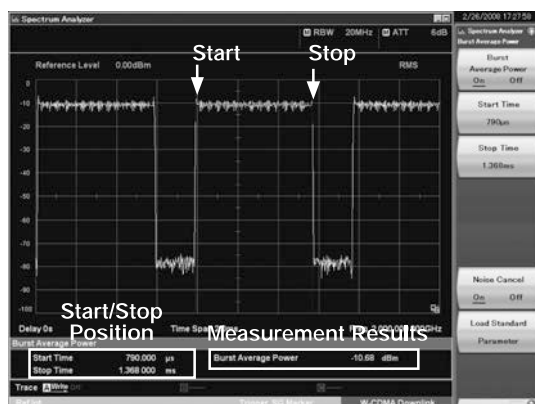

Measurement Results
- Average power of specified range

• 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.
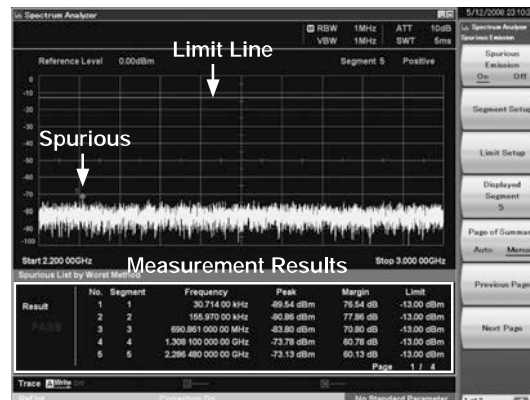
Measurement Results
- Each segment peak power and margin
- Each peak frequency

• 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)

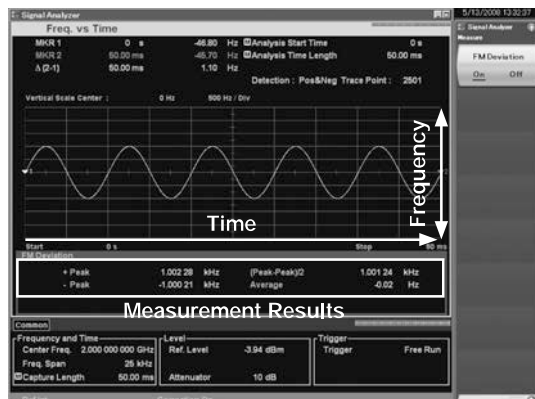The Frequency vs. Time trace measurement is used to confirm the FM deviation. It measures the maximum and minimum frequencies from trace data in the marker range. When marker is Off, the whole range is measured.

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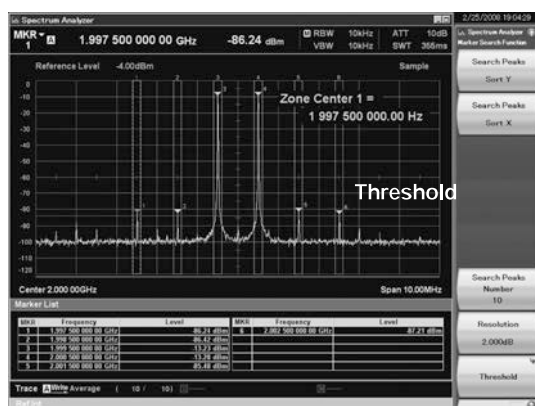
Measurement Results
- Marker point frequency
- Marker point power
- Absolute power per Hz in marker bandwidth
- Total power in marker bandwidth
- Difference between any markers

• Highest 10 Markers (SPA) (VSA)

This function sets the threshold level and auto-detects peaks in the X (frequency) and Y (level/time) directions.
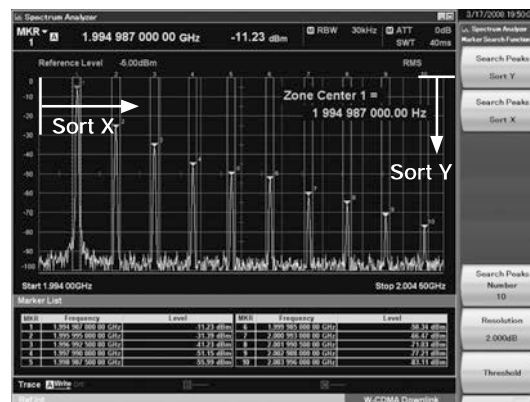
Measurement Results
- Peak Search Y:
  Sets up to 10 markers in order of peak level
- Peak Search X:
  Sets up to 10 markers in order of frequency (time) level

• Limit Line (SPA)

• Setting Limit Lines

Up to six types of Limit line can be set on the spectrum display (frequency domain).

In addition to setting the frequency and level of crossover points manually in sequence from the low frequency, after creating the right half of a line, the left half can be created by reversing and copying the right half, to set a symmetric limit line. Additionally, a Limit line that traces the measured waveform can be created using the Limit Envelope function. A margin can be set on the Limit line in the amplitude direction.

• Evaluating using Limit Line Setting (Limit Test Function)

When the waveform is above or below the Limit line, it is evaluated automatically as PASS or FAIL. Evaluation is also possible with an added margin. The target evaluation line can be chosen from any of six types.

**• Auto-saving Waveform Data using Limit Line Setting (Save on Event Function)**

When the waveform matches the evaluation conditions (Event), it can be saved automaticaly as a csv format file. Any one of the following five Event types can be selected.

(1) Limit Fail: Saves waveform file when evaluation result is Fail
(2) Limit Pass: Saves waveform file when evaluation result is Pass
(3) Margin Fail: Saves waveform file when evaluation result including margin is Fail
(4) Margin Pass: Saves waveform file when evaluation result including margin is Pass
(5) Sweep Complete: Saves waveform file at every measurement regardless of evaluation result
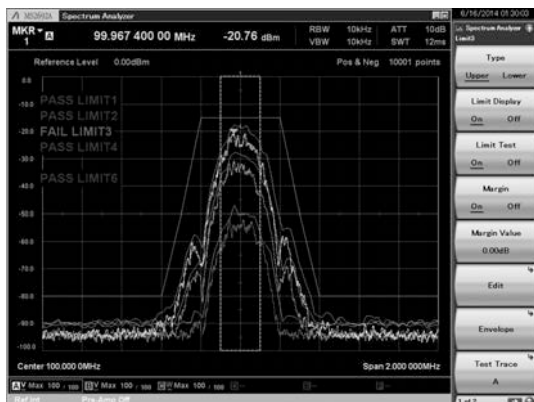
Example:

PASS/FAIL evaluation is performed by changing the input signal level.

The evaluation results for the five line types can be displayed simultaneously on one screen.

Line: Limit 1, Limit 2, Limit 3, Limit 4, Limit 5, Limit 6
Evaluation Type: Upper Limit, Lower Limit
Crossover (Point): 1 to 100
Margin: Set Margin line for each Limit 1, 2, 3, 4, 5, 6
Evaluation Result: PASS, FAIL
Result Save: Auto-save as csv format file

• Frequency Counter (SPA)

This function of the marker functions is used to measure CW frequencies.

Gate Time sets the measurement target time.
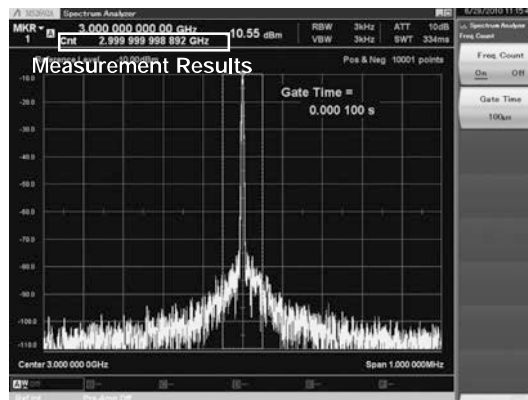
Measurement Results

■ Marker point frequency

• 2-tone 3rd-order Intermodulation Distortion (SPA)

By inputting two different frequency CW signals (desired waves), two-tone third-order intermodulation distortion is generated close to the desired waves according to non-linear characteristics of Device Under Test (DUT). Then, Third Order Intercept (TOI) is calculated from the two-tone third-order intermodulation distortion.

Measurement Results

■ TOI: [dBm]
■ Amplitude: [dBc]

• Annotation Display (SPA)

Screen annotations can be set to On or Off. Annotations about frequency, level, etc., are not displayed at the Off setting.

• 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

• Power Meter

Power meter function can connect a USB power sensor to the MS2830A and read the measurement values.

Measurement Results
■ Power: [dBm], [W]
■ Relative power: [dB]

Compatible USB power sensors.

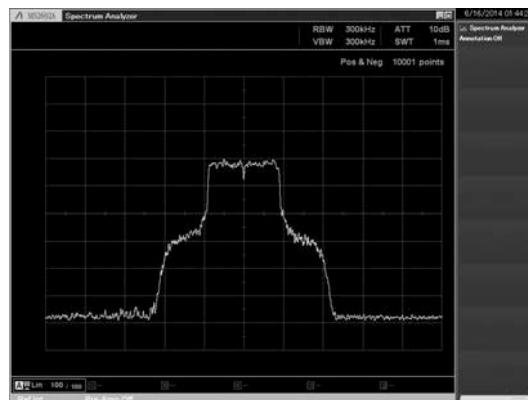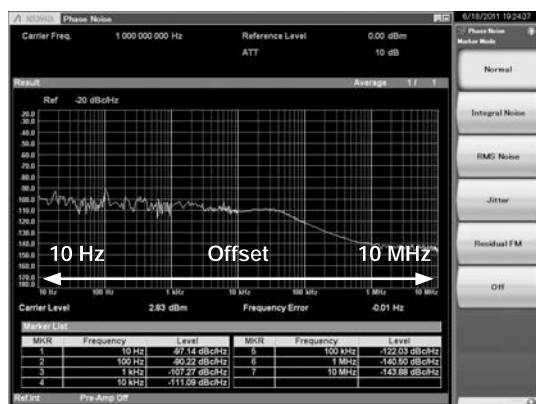| Model	Frequency Range	Resolution	Dynamic Range
MA24104A*	600 MHz to 4 GHz	1 kHz	+3 to +51.76 dBm
MA24106A	50 MHz to 6 GHz	1 kHz	−40 to +23 dBm
MA24108A	10 MHz to 8 GHz	100 kHz	−40 to +20 dBm
MA24118A	10 MHz to 18 GHz	100 kHz	−40 to +20 dBm
MA24126A	10 MHz to 26 GHz	100 kHz	−40 to +20 dBm

∗: MA24104A has been discontinued.

• Noise Figure Measurement (Option 017)

Noise Figure is measured with the measurement method of Y-factor method which uses a Noise Source*.

Frequency Mode: Fixed, List, Sweep
DUT Mode: Amplifier, Down Converter, Up Converter
Screen Layout: Graph, Table

∗: Supports noise sources from Noisecom NC346 series.
  See the MS2690A/MS2691A/MS2692A catalog for more details.

Measurement Results Display

■ Graph/List/Spot

Displays measurement results for each trace (Trace1/Trace2).
• Noise Figure (NF) [dB]
• Noise Factor (F) [Linear]
• Gain
• Y-Factor: Power ratio when Noise Source is turned ON/OFF
• T effective: Effective noise temperature
• P Hot: Power measured when Noise Source is On.
• P Cold: Power measured when Noise Source is Off.

Measurement Result: Example of Graph display
(Frequency Mode: Sweep, Screen Layout: Graph)
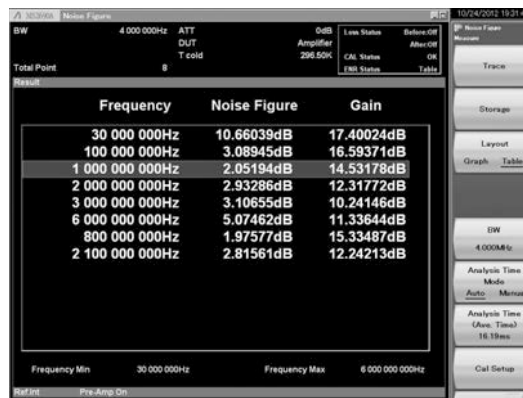
Measurement Result: Example of List display
(Frequency Mode: List, Screen Layout: List)
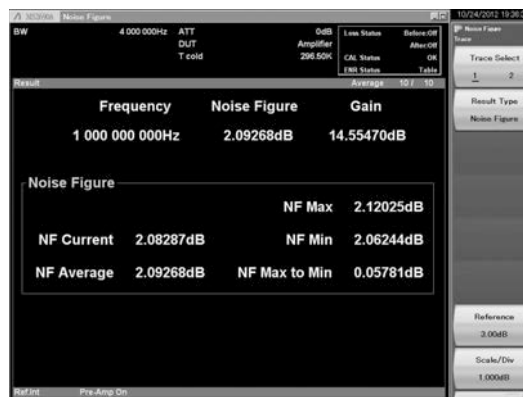
Measurement Result: Example of Spot display
(Frequency Mode: Fixed)

Vector Signal Generator (Option 020)
Basic Performance

The Vector Signal Generator MS269xA-020 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 (Option 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 Option 020 baseband signal generator.
The sampling clock supports up to 160 MHz.

Example: Vector Modulation Bandwidth
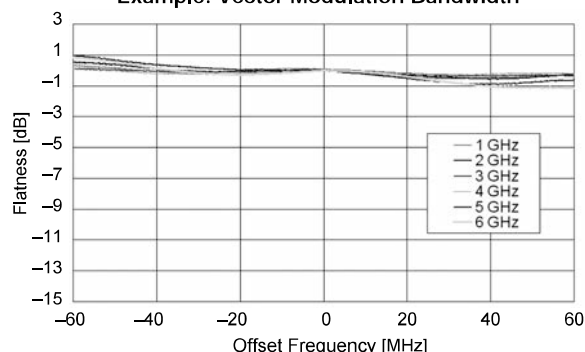
- Level Accuracy ±0.5 dB

  - 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)
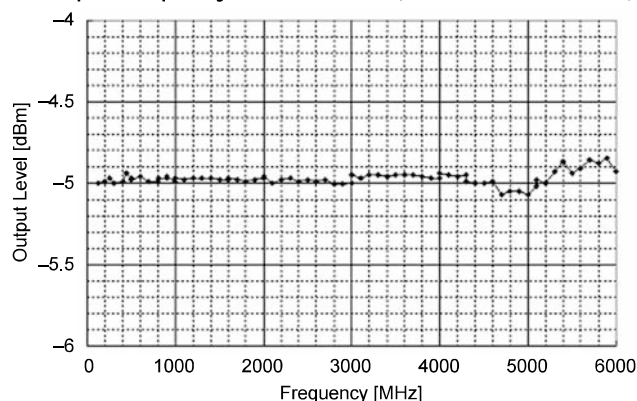
Example: Linearity (Referenced to –5 dBm)
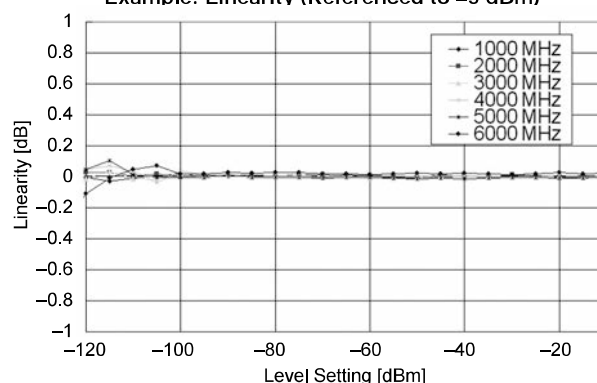
Example: SSB Phase Noise
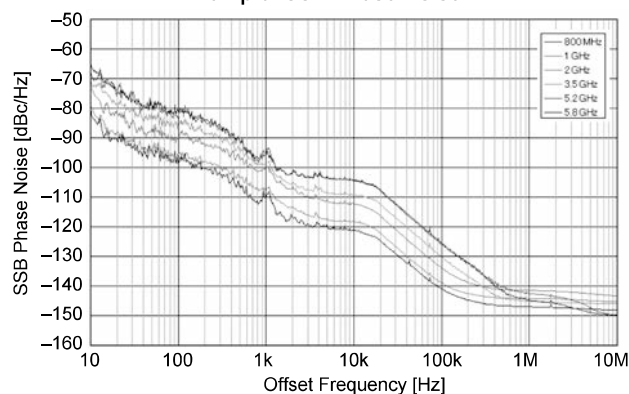
• **Large-capacity Memory**

1 GB = 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

• **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*

Adding the MS269xA-020 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.

∗: Requires AUX Conversion Adapter J1373A (sold separately)

• **Versatile Multiple Waveform Generation**

Any type of waveform can be generated using the MS269xA-020.
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
• LTE TDD IQproducer
• WLAN IQproducer
• TD-SCDMA 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.
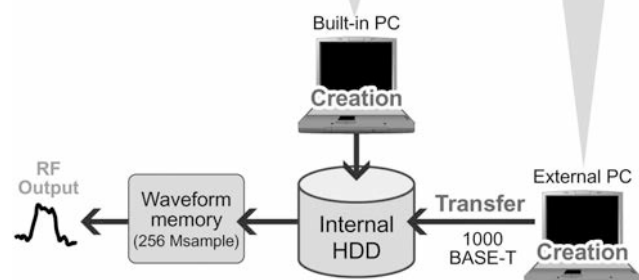
• **Useful IQproducer Waveform Generation Software**
IQproducer is application software for a PC for editing, creating and
transferring waveform patterns using the MS269xA-020 arbitrary
waveform generation option.
It has the following three main functions.

• **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

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**

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

Aging Rate: $\pm 1 \times 10^{-10}$/month
Start-up Characteristics: $\pm 1 \times 10^{-9}$ (7 minutes after power-on)

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

• **6 GHz Preamplifier MS2690A/MS2691A/MS2692A-008**
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)

• **Microwave Preselector Bypass MS2692A-067**
Bypassing the preselector used for the microwave band
improves RF frequency characteristics and in-band frequency
characteristics.

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

• **Signal Analyzer Function and Performance Upgrade**

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

• **Analysis Bandwidth Extension to 125 MHz**
MS2690A/MS2691A/MS2692A-078*1, *2
This option expands the analysis bandwidth to 125 MHz.

∗1: Requires Option 077
∗2: Combining with MX269028A-002 wireless LAN IEEE802.11ac (160 MHz)
    measurement software (only for MS269xA) supports modulation
    analysis up to 160-MHz bandwidth signals of the IEEE802.11ac.
    See measurement software catalog for more details

Usage Example: Record Noise and Replay

When the Vector Signal Generator (Option 020) generates a signal based on the data captured by the signal analyzer, a signal that mimics the captured signal can be output[*1]. The Capture & Playback function can also be used for capture and replay using a simple procedure.

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

• Noise Figure Measurement Function
MS2690A/MS2691A/MS2692A-017

Adds noise figure measurement function.
Noise Figure is measured with the measurement method of Y-factor method which uses a Noise Source.

• Vector Signal Generator
MS2690A/MS2691A/MS2692A-020

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.

• Baseband Interface Unit
MS2690A/MS2691A/MS2692A-040

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 DigRF 2.5G/3G Digital I/F Control Software.

*: See each catalog for details.

• HDD Digitizing Interface
MS2690A/MS2691A/MS2692A-050

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.
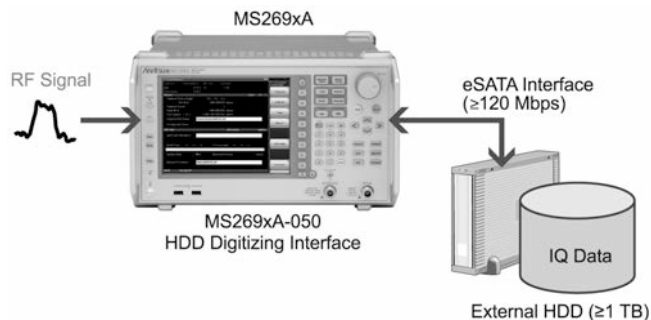
• Removable HDD
MS2690A/MS2691A/MS2692A-313

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	Model	Name
Mobile WiMAX	MX269010A	Mobile WiMAX Measurement Software
W-CDMA/ HSPA/HSPA Evolution	MX269011A	W-CDMA/HSPA Downlink Measurement Software
	MX269012A	W-CDMA/HSPA Uplink Measurement Software
W-CDMA/HSPA	MX269030A	W-CDMA BS Measurement Software
GSM/EDGE	MX269013A	GSM/EDGE Measurement Software
EDGE Evolution	MX269013A-001	EDGE Evolution Measurement Software
ETC/DSRC	MX269014A	ETC/DSRC Measurement Software
TD-SCDMA	MX269015A	TD-SCDMA Measurement Software
Multi-TDMA systems	MX269017A	Vector Modulation Analysis Software
3GPP LTE (FDD)	MX269020A	LTE Downlink Measurement Software
	MX269020A-001	LTE-Advanced FDD Downlink Measurement Software
	MX269021A	LTE Uplink Measurement Software
3GPP LTE (TDD)	MX269022A	LTE TDD Downlink Measurement Software
	MX269022A-001	LTE-Advanced TDD Downlink Measurement Software
	MX269023A	LTE TDD Uplink Measurement Software
CDMA2000	MX269024A	CDMA2000 Forward Link Measurement Software
	MX269024A-001	All Measure Function
1xEV-DO	MX269026A	EV-DO Forward Link Measurement Software
	MX269026A-001	All Measure Function
WLAN	MX269028A	WLAN (802.11) Measurement Software (Supports IEEE802.11n/11a/11b/ 11g/11j/11p)
	MX269028A-002*	802.11ac (160 MHz) Measurement Software (for MS269xA)
MediaFLO	MX269036A	Measurement Software for MediaFLO

*: Only for MS269xA.
　Combining with the MS269xA-078 Analysis Bandwidth Extension to 125 MHz supports modulation analysis up to 160-MHz bandwidth signals of the IEEE802.11ac.

*: See each measurement software catalog for more details.

• Measurement Software for Smart Meter

This software is for PC. This software supports automatic measurement of the PHY layer and protocol analysis of the PHY/MAC layer of smart utility network wireless communications (Wi-SUN).

• i-SUN PHY Measurement Software MX705010A[*1]
• Wi-SUN Protocol Monitor MX705110A[*2]

The MX705010A[*1] supports automatic measurement of Wi-SUN Alliance PHY Conformance test cases. The MS269xA is controlled by remote commands from this software.

[*1]: Cannot be installed in MS269xA.
　Requires the latest firmware of MS269xA.
　Requires MX269017A, MS269xA-020 and MX269902A.

MX705110A[*2] is possible to check the details of a Wi-SUN protocol. The wireless signals*3 between communicating wireless equipments are captured as I/Q data using the MS269xA digitize function and data analysis is performed by this software. Data analysis displays the PHY/MAC frame format, Tx timing, etc.

[*2]: Cannot be installed in MS269xA.
　Requires the latest firmware of MS269xA.
[*3]: IEEE 802.15.4g/e (GFSK)

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.

- HSDPA/HSUPA IQproducer   MX269901A
- TDMA IQproducer   MX269902A
- Multi-Carrier IQproducer   MX269904A
- Mobile WiMAX IQproducer   MX269905A
- LTE IQproducer   MX269908A
- LTE-Advanced FDD Option   MX269908A-001*[1]
- LTE TDD IQproducer   MX269910A
- LTE-Advanced TDD Option   MX269910A-001*[2]
- WLAN IQproducer   MX269911A
- 802.11ac (80 MHz) Option   MX269911A-001*[3]
- TD-SCDMA IQproducer   MX269912A

*1: Requires MX269908A.
*2: Requires MX269910A.
*3: Requires MX269911A.

• 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*

Option Patterns
- 1xEV-DO Reverse Receiver Test Waveform Pattern MX269970A

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)

Preselector 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): $\pm 5 \times 10^{-7}$ (2 minutes after power-on), $\pm 5 \times 10^{-8}$ (5 minutes after power-on) Aging rate: $\pm 1 \times 10^{-7}$/year, $\pm 1 \times 10^{-8}$/day Temperature characteristics: $\pm 2 \times 10^{-8}$ (5° to 45°C) with MS269xA-001 Rubidium Reference Oscillator Start-up characteristics (23°C, referenced to frequency at 24 h after power-on): $\pm 1 \times 10^{-9}$ (7 minutes after power-on) Aging rate: $\pm 1 \times 10^{-10}$/month Temperature characteristics: $\pm 1 \times 10^{-9}$ (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)

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

Connector

RF Input	Front panel, N-J, 50Ω (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, 50Ω (nominal)
	Frequency: 875 MHz (Signal Analyzer, without MS269xA-077/078, or Bandwidth: ≤31.25 MHz)
	     900 MHz (Signal Analyzer, with MS269xA-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, 50Ω (nominal) Frequency: 10 MHz,13 MHz Operation range: ±1 ppm Input level: –15 dBm ≤ Level ≤ +20 dBm, 50Ω (AC coupling)
Reference Signal Output	Rear panel, BNC-J, 50Ω (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
Noise Source Drive	This is available when the Option 017/117 is installed. Supply(+28 V) of the Noise Source Drive. Rear Panel, BNC-J Output Voltage: 28 ±0.5 V, Pulsed
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

Displayed 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 {TABLE1} with MS269xA-008, Preamp: On {TABLE2} with MS269xA-008, Preamp: Off {TABLE3}
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 Preselector 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)

Table 1 (without MS269xA-008):

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

Table 2 (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

Table 3 (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

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 Preselector 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
2-tone 3rd-order Intermodulation Distortion	Measures IM3 and TOI from two-tone signal.	

• Vector Signal Analysis Function

Common

Trace Mode	Spectrum, Power vs. Time, Frequency vs. Time, Phase vs. Time, CCDF, Spectrogram, No Trace

Bandwidth	without MS269xA-077/078
	   Specified analysis bandwidth from center frequency
	   1 kHz to 25 MHz (1-2.5-5 sequence), 31.25 MHz
	
	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-077/078, or Bandwidth: ≤31.25 MHz 2 kHz to 50 MHz (1-2-5 sequence)
	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-077/078, 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-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)
ADC Resolution	16 bits

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-077/078, 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-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

Resolution Bandwidth (RBW)	without MS269xA-077/078, 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-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-077/078, 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 Preselector 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-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 Preselector 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-077/078, 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-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)

Displayed Average Noise Level (DANL)	18˚ to 28˚C, Input attenuator: 0 dB

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

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

• Rubidium Reference Oscillator MS2690A/MS2691A/MS2692A-001

Function Outline	Generates 10 MHz reference signal with higher frequency stability

• Extension of Preselector Lower Limit to 3 GHz MS2691A/MS2692A-003
Cannot be installed simultaneously MS2692A-003 and MS2692A-067.

Function Outline	Extends lower limit of preselector to 3 GHz

• 6 GHz Preamplifier MS2690A/MS2691A/MS2692A-008
Cannot be installed simultaneously MS2692A-008 and MS2692A-067.

Frequency

Range	100 kHz to 6 GHz

Amplitude

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

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 Hz ≤ 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

• Noise Figure Measurement Function MS2690A/MS2691A/MS2692A-017*

Frequency

Frequency range	MS2690A: 30 MHz to 6 GHz MS2691A: 30 MHz to 6 GHz MS2692A: 30 MHz to 6 GHz
Frequency setting range	MS2690A: 10 MHz to 6 GHz MS2691A: 10 MHz to 13.5 GHz MS2692A: 10 MHz to 26.5 GHz

NF Measurement

Measurement range	Within the frequency range (Attenuator = 0 dB, Pre-Amp = On) − 20 to +40 dB
Instrument Uncertainty	Within the measurement range ENR: 4 to 7 dB ±0.02 dB ENR: 12 to 17 dB ±0.025 dB ENR: 20 to 22 dB ±0.03 dB

GAIN Measurement

Measurement range	Within the frequency range −20 to +40 dB
Instrument Uncertainty	Within the measurement range ≤0.07

Resolution Bandwidth

Setting Range	100 kHz to 8 MHz

Connector

Noise Source	Connector: Rear Panel, BNC-J Output Voltage: 28 ±0.5 V, Pulsed

∗: Recommending the NC346 Series noise sources by Noisecom company

• Vector Signal Generator MS2690A/MS2691A/MS2692A-020

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, 50Ω [Front panel, SG Output (Option)]

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), 600Ω, 0 to 5 V, Threshold value: approx. 1 V

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/50Ω), 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
Synchronization Establishing Condition	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
Re-synchronization Judgment Condition	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	≤2^{32} – 1 bits
Measured Error Bit Count	≤2^{31} – 1 bits
Measurement End Conditions	Measured bit count, Measured error bit count
Auto Re-synchronization 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

• HDD Digitizing Interface MS2690A/MS2691A/MS2692A-050

	Bandwidth	Sampling Rate	Recorded Data Format
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	
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.)		

• Microwave Preselector Bypass MS2692A-067
Bypasses the preselector to improve the RF frequency characteristics and the in-band frequency characteristics.
When the preselector 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 Preselector Bypass: On (with MS2692A-067), Microwave Preselector Bypass: Off (with special directions)

Cannot install simultaneously with MS2692A-003, 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 Preselector 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 Preselector 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 Preselector Bypass: On or Off −146 dBm/Hz (6.0 GHz ≤ Frequency < 10.0 GHz) −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 Preselector Bypass: Off ≤−60 dBc (6.0 GHz ≤ Frequency ≤ 26.5 GHz)

• Analysis Bandwidth Extension to 62.5 MHz MS2690A/MS2691A/MS2692A-077
  Analysis Bandwidth Extension to 125 MHz MS2690A/MS2691A/MS2692A-078 (Requires Option 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	with MS269xA-077/078, Bandwidth: >31.25 MHz 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

Amplitude

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

Frequency	Max.
100 MHz ≤ Frequency < 2.2 GHz	−147.0 [dBm/Hz]
2.2 GHz ≤ Frequency < 4.0 GHz	−145.0 [dBm/Hz]
4.0 GHz ≤ Frequency ≤ 6.0 GHz	−143.0 [dBm/Hz]

with MS269xA-008, Preamp: On, Frequency band mode: Normal

Frequency	Max.
100 MHz ≤ Frequency < 2.2 GHz	−160.0 [dBm/Hz]
2.2 GHz ≤ Frequency < 4.0 GHz	−158.0 [dBm/Hz]
4.0 GHz ≤ Frequency ≤ 6.0 GHz	−154.0 [dBm/Hz]

with MS2692A-067, Microwave Preselector Bypass: On

Frequency	Max.
6.0 GHz < Frequency < 10.0 GHz	−140.0 [dBm/Hz]
10.0 GHz ≤ Frequency ≤ 13.5 GHz	−136.0 [dBm/Hz]
13.5 GHz < Frequency ≤ 20.0 GHz	−133.0 [dBm/Hz]
20.0 GHz < Frequency ≤ 26.5 GHz	−129.0 [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 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 Preselector 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)
Linearity Error	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 Preselector Bypass: On ±0.60 dB (Mixer input level: ≤0 dBm, Frequency: > 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 (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 Preselector Bypass: On ±1.0 dB (6.0 GHz < Frequency ≤ 13.5 GHz) ±1.5 dB (13.5 GHz < Frequency ≤ 26.5 GHz)

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-008	6 GHz Preamplifier (100 kHz to 6 GHz)	
MS2690A-017	Noise Figure Measurement Function	
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*2	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 preselector to 3 GHz)	
MS2691A-008	6 GHz Preamplifier (100 kHz to 6 GHz)	
MS2691A-017	Noise Figure Measurement Function	
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*2	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 preselector to 3 GHz)	
MS2692A-008	6 GHz Preamplifier (100 kHz to 6 GHz)	
MS2692A-017	Noise Figure Measurement Function	
MS2692A-020	Vector Signal Generator (125 MHz to 6 GHz)	
MS2692A-040	Baseband Interface Unit	
MS2692A-050	HDD Digitizing Interface	
MS2692A-067*3	Microwave Preselector Bypass	
MS2692A-077	Analysis Bandwidth Extension to 62.5 MHz	
MS2692A-078*2	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-108	6 GHz Preamplifier Retrofit (100 kHz to 6 GHz)	
MS2690A-117	Noise Figure Measurement Function Retrofit	
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*1	Analysis Bandwidth Extension to 62.5 MHz Retrofit	
MS2690A-178*1,*2	Analysis Bandwidth Extension to 125 MHz Retrofit	
	(Requires MS2690A-077/177)	
MS2690A-180*4	CPU/Windows7 Upgrade Retrofit	
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-108	6 GHz Preamplifier Retrofit (100 kHz to 6 GHz)	
MS2691A-117	Noise Figure Measurement Function Retrofit	
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*1	Analysis Bandwidth Extension to 62.5 MHz Retrofit	
MS2691A-178*1,*2	Analysis Bandwidth Extension to 125 MHz Retrofit	
	(Requires MS2691A-077/177)	
MS2691A-180*4	CPU/Windows7 Upgrade Retrofit	

Model/Order No.	Name	
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-108	6 GHz Preamplifier Retrofit (100 kHz to 6 GHz)	
MS2692A-117	Noise Figure Measurement Function Retrofit	
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*3	Microwave Preselector Bypass Retrofit	
MS2692A-177*1	Analysis Bandwidth Extension to 62.5 MHz Retrofit	
MS2692A-178*1,*2	Analysis Bandwidth Extension to 125 MHz Retrofit	
	(Requires MS2692A-077/177)	
MS2692A-180*4	CPU/Windows7 Upgrade Retrofit	
	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	
MX269017A	Vector Modulation Analysis Software	
MX269020A	LTE Downlink Measurement Software	
MX269020A-001	LTE-Advanced FDD Downlink Measurement Software	
	(Requires MX269020A)	
MX269021A	LTE Uplink Measurement Software	
MX269022A	LTE TDD Downlink Measurement Software	
MX269022A-001	LTE-Advanced TDD Downlink Measurement Software	
	(Requires MX269022A)	
MX269023A	LTE TDD Uplink Measurement Software	
MX269024A	CDMA2000 Forward Link Measurement Software	
MX269024A-001	All Measure Function (Requires MX269024A)	
MX269026A	EV-DO Forward Link Measurement Software	
MX269026A-001	All Measure Function (Requires MX269026A)	
MX269028A	WLAN (802.11) Measurement Software	
MX269028A-002*2	802.11ac (160 MHz) Measurement Software	
	(For MS269xA. Requires MX269028A)	
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	
MX269908A-001	LTE-Advanced FDD Option (Requires MX269908A)	
MX269910A	LTE TDD IQproducer	
MX269910A-001	LTE-Advanced TDD Option (Requires MX269910A)	
MX269911A	WLAN IQproducer	
MX269911A-001	802.11ac (80 MHz) Option (Requires MX269911A)	
MX269912A	TD-SCDMA IQproducer	
MX269970A	1xEV-DO Reverse Receiver Test Waveform Pattern	
	Other software options	
	These software are for PC.	
MX705010A	Wi-SUN PHY Measurement Software	
MX705110A	Wi-SUN Protocol Monitor	
	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	

*1: The MS269xA-177/178 cannot be retrofitted to the MS269xA already fitted with the MS269xA-004/104 option (discontinued).
*2: Combining the MS269xA-078 Analysis Bandwidth Extension to 125 MHz and MX269028A-002 wireless LAN IEEE802.11ac (160 MHz) measurement
software (only for MS269xA) supports modulation analysis up to 160-MHz bandwidth signals of the IEEE802.11ac.
See measurement software catalog for more details.
*3: Cannot be installed simultaneously with MS2692A-003/103/008/108 and MS2692A-004/104 option (discontinued).
*4: Contact our sales representative for more details.

http://www.anritsu.com

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)
W3655AE	MS2690A/MS2691A/MS2692A and MS2830A Operation Manual (Noise Figure Measurement Function Operation)
W3656AE	MS2690A/MS2691A/MS2692A and MS2830A Operation Manual (Noise Figure Measurement Function 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)
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)
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)

Model/Order No.	Name
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
W3221AE	MX269910A Operation Manual
W3488AE	MX269911A Operation Manual
W3582AE	MX269912A Operation Manual
W3675AE	MX269970A Operation Manual
K240B	Power Divider (K connector, DC to 26.5 GHz, 50Ω, K-J, 1 W max)
MA1612A	Four-Port Junction Pad (5 MHz to 3 GHz, N-J)
MP752A	Termination (DC to 12.4 GHz, 50Ω, 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 · 50Ω SUCOFLEX104 · SMA-P), 0.5 m (DC to 18 GHz)
J0322B	Coaxial Cord (SMA-P · 50Ω SUCOFLEX104 · SMA-P), 1 m (DC to 18 GHz)
J0322C	Coaxial Cord (SMA-P · 50Ω SUCOFLEX104 · SMA-P), 1.5 m (DC to 18 GHz)
J0322D	Coaxial Cord (SMA-P · 50Ω SUCOFLEX104 · SMA-P), 2 m (DC to 18 GHz)
J0805	DC Block, N type (MODEL 7003) (10 kHz to 18 GHz, N-P · N-J)
J1554A	DC Block, SMA type (MODEL 7006) (9 kHz to 26.5 GHz, SMA-P · SMA-J)
J1555A	DC Block, SMA type (MODEL 7006-1) (9 kHz to 20 GHz, SMA-P · SMA-J)
K261	DC Block (10 kHz to 40 GHz, K-P · K-J)
J0004	Coaxial Adapter (DC to 12.4 GHz, 50Ω, N-P · SMA-J)
J1398A	N-SMA Adapter (DC to 26.5 GHz, 50Ω, 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)
MA24108A	Microwave USB Power Sensor (10 MHz to 8 GHz, with USB A to Micro-B Cable)
MA24118A	Microwave USB Power Sensor (10 MHz to 18 GHz, with USB A to Micro-B Cable)
MA24126A	Microwave USB Power Sensor (10 MHz to 26 GHz, with USB A to Micro-B Cable)
Z1037A	Installation Kit (required when retrofitting options or installing software)

∗: The J1373A AUX Conversion Adapter is not a standard accessory for the MS269xA-020/120 Vector Signal Generator Option.
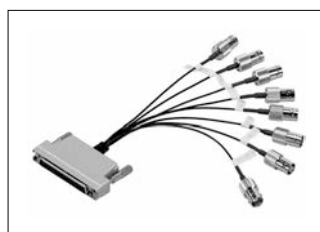
J1373A
AUX Conversion Adapter

MA24106A
USB Power Sensor

B0589A
Carrying Case (Hard type)

B0633A
Carrying Case (Soft type)