MS2690A Signal Analyzer series

MS2690A Signal Analyzer
MS2691A Signal Analyzer
MS2692A Signal Analyzer

Product Introduction

MS2690A: 50 Hz to 6 GHz
MS2691A: 50 Hz to 13.5 GHz
MS2692A: 50 Hz to 26.5 GHz

Version 18.00

ANRITSU CORPORATION

For the latest information on MS2690A/MS2691A/MS2692A series, please refer to the brochure.

Key Features: Multi-functions

Spectrum Analyzer (SPA) Function

World class dynamic range
- Avg. noise level: –155 dBm/Hz (2 GHz)
- TOI: ≥+22 dBm
- W-CDMA ACLR: –78 dBc @ 5 MHz

Superior absolute amplitude accuracy up to 6 GHz
- ±0.3 dB (50 Hz to 6 GHz) typ.

Signal Analyzer (VSA) Function

Wideband FFT analysis of 31.25 MHz
- Option upgrade to 125 MHz*1

*1: When bandwidth setting > 31.25 MHz
Frequency setting range: 100 MHz to 6 GHz

Digitize waveforms capture function
- Multi-domain waveform analysis
- Save captured waveforms as IQ data

Preselector Bypass (MS2692A option)
- Bypassing preselector improves RF frequency characteristics and in-band frequency characteristics.
- Supports 125 MHz*2 Wideband Measurements up to 26.5 GHz

*2: Require Opt.077+078

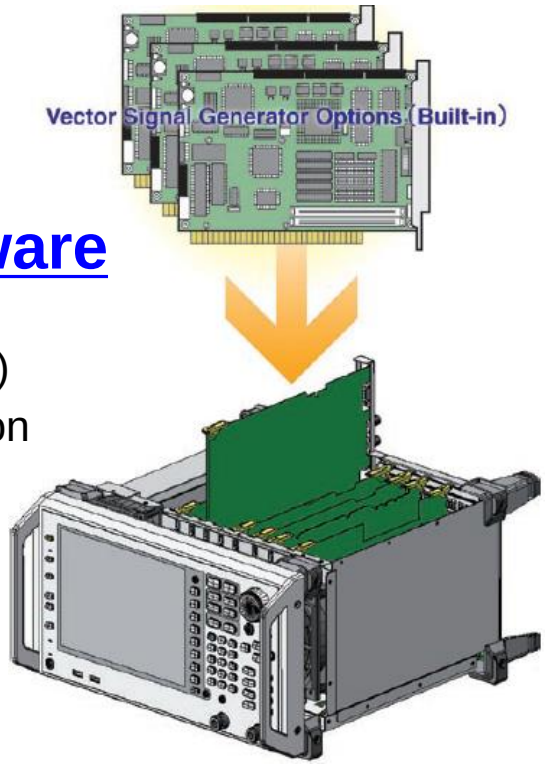
Vector Signal Generator (SG)(option)
- Frequency range: 125 MHz to 6 GHz
- RF Modulation bandwidth: 120 MHz
- Built in BER measurement function
- Built-in AWGN addition function

Key Features: Expandability and Versatility

Modular platform supports options for a variety of applications.Installing measurement software options supports modulation analysis for each communications technology

Main Unit

MS2690A (50 Hz to 6 GHz)
MS2691A (50 Hz to 13.5 GHz)
MS2692A (50 Hz to 26.5 GHz)



Options

Vector Signal Generator (125 MHz to 6 GHz)

Analysis Bandwidth Extension (62.5/125 MHz)

6 GHz Preamp (100 kHz to 6 GHz)

Preselector Bypass (For MS2692A)

Rubidium Reference Oscillator

:

Measurement Software

5G

LTE/LTE-Advanced (FDD/TDD)

W-CDMA/HSPA/HSPA Evolution

GSM/EDGE/EDGE Evolution

TD-SCDMA

ETC/DSRC

WLAN

:

Key Features: Compact and Light Design

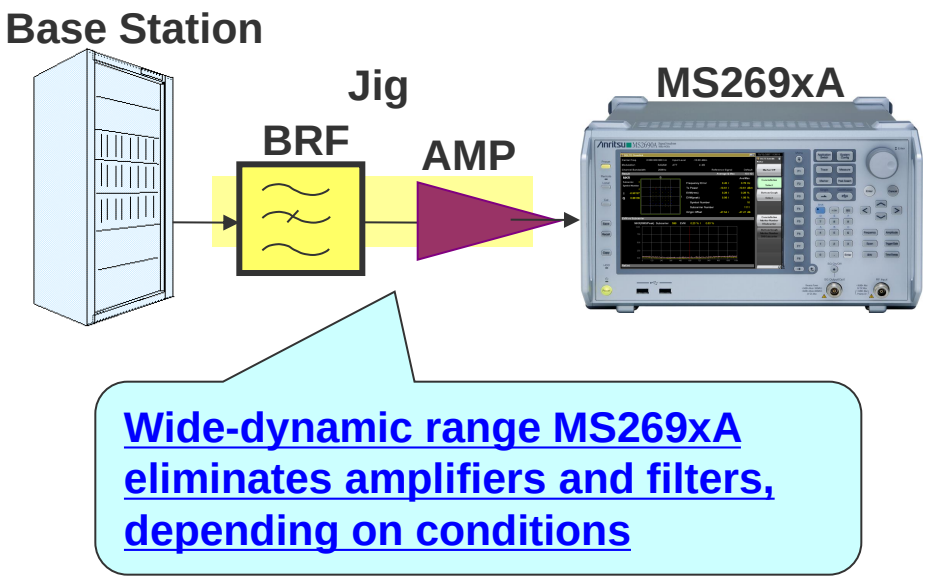
All-in-one platform supporting spectrum analyzer, signal analyzer, and vector signal generator functions with small footprint for production lines and easy portability.

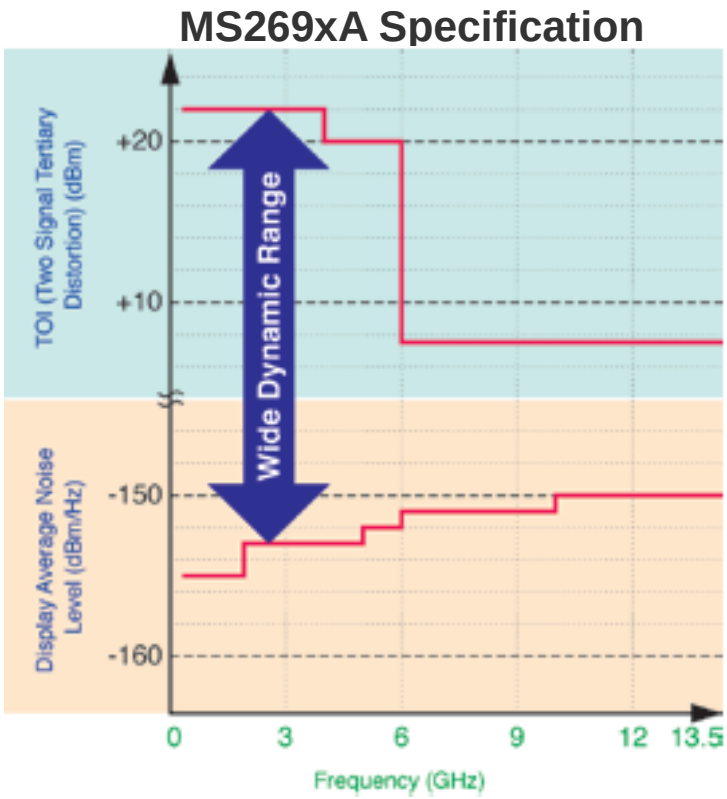
Comparison with Earlier MS8609A

	MS269xA	MS8609A
Size:	**200(H), 340(W), 350(D) mm**	**177(H), 320(W), 410(D) mm**
Screen Size:	**8.4 inch**	**6.5 inch**
Weight:	**12.5 kg (MS2690A)** **13.5 kg (MS2691A/MS2692A)**	**16 kg**

Basic Performance: High-Level Dynamic Range (1/2)

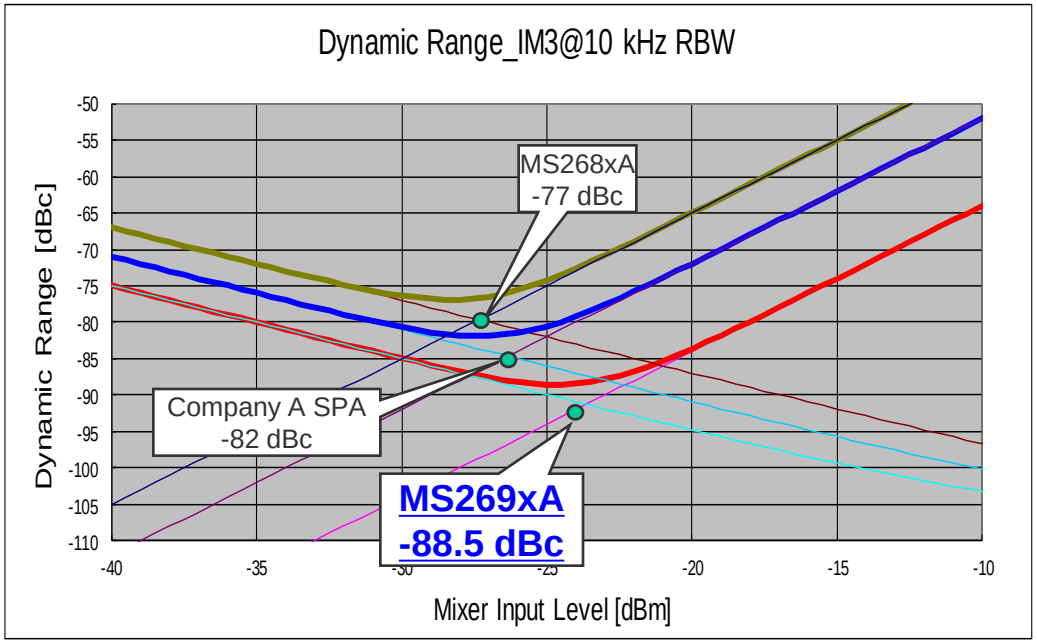
The world-class dynamic range (displayed avg. noise level -155 dBm/Hz @ 2 GHz, TOI +22 dBm @ 2 GHz) reduces amplifiers and filters for spurious test systems, supporting simple, low-cost testing.





Basic Performance: High-Level Dynamic Range (2/2)

Dynamic Range Comparison (Catalog Specifications)



Narrow Dynamic Range…

⇒ **Only narrow RBW can be used not to hide weak signal in noise floor.**

⇒ **Slow measurement speed**

	TOI @ 2GHz	Noise Floor @ 2 GHz	Max. Dynamic Range @ 10 kHz RBW
MS269xA(SPA)	**+22 dBm**	**-155 dBm**	**88.5 dBc**
MS2683A	+12.5 dBm	-147 dBm	77 dBc
Company-A SPA	+16 dBm	-151 dBm	82 dBc

***MS269xA SPA mode specification**

MS269xA

Wide Dynamic Range

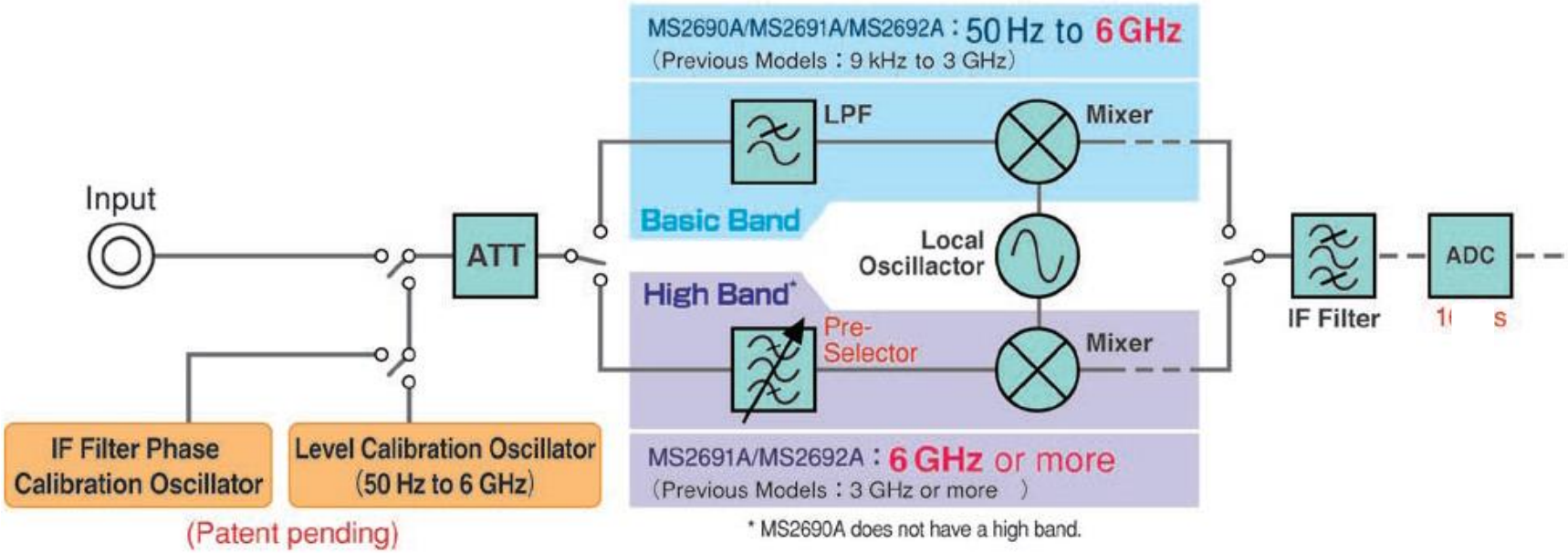
⇒ **Larger RBW can be used because weak signal rarely hides in noise floor.**

⇒ **Fast measurement speed**

***When RBW width is 10 times different, the sweep time is 100 times different.**

Basic Performance: Excellent Accuracy up to 6-GHz (1/2)

The MS269xA offers superior total level accuracy (±0.3 dB typ.) and modulation accuracy over a wide frequency range of 50 Hz to 6 GHz using a basic band up to 6 GHz and two calibration oscillators. It also supports superior analysis performance for applications of 5G, 4G and W-LAN at 3 GHz or higher.



Pre-Selector

At high band, standard spectrum analyzers use a pre-selector to clean images. It is extremely difficult to stabilize the amplitude and frequency characteristics of the pre-selector, which is a notorious cause of degraded level accuracy and modulation precision in measurement devices. The throughput range of frequencies for the pre-selector also limits analytical bandwidths.

Basic Performance: Excellent Accuracy up to 6-GHz (1/2)

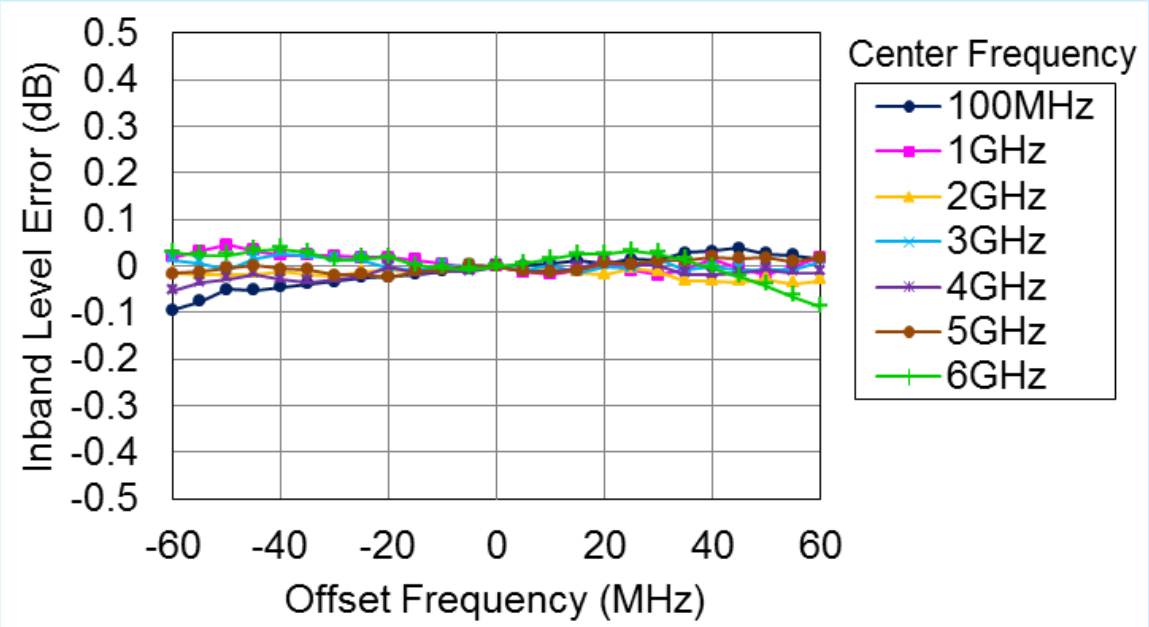
Excellent Frequency Characteristics In Analysis Bandwidth

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.

Frequency range of Extra Band Cal function:

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

Example of frequency characteristics in analysis bandwidth after Extra Band Cal



(With Opt.078,
Reference Level: –10 dBm,
Input attenuator: 10 dB,
Preamp: Off,
Span: 125 MHz)

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

Basic Performance: Supports 125 MHz Wideband Measurements up to 26.5 GHz (1/2)

Wide bandwidth FFT Analysis

Not only can it capture wideband signals but FFT technology supports multifunction signal analyses in both the time and frequency domains.

	Bandwidth	Sampling rate	ADC resolution
Standard	31.25 MHz max.	50 MHz max.	16 bits
Analysis Bandwidth Extension to 62.5 MHz option (Opt.077*1)	62.5 MHz max.	100 MHz max.	14 bits
Analysis Bandwidth Extension to 125 MHz option (Opt.078*1,*2)	125 MHz max.	200 MHz max.	14 bits

*1: The MS269xA-177/178 cannot be retrofitted to the MS269xA already fitted with the MS269xA-004/104 Wideband Analysis Hardware option (discontinued).
*2: MS269xA-078 requires MS269xA-077.

Frequency setting range	Bandwidth setting ≤ 31.25 MHz	Bandwidth setting > 31.25 MHz
MS2690A/91A/92A (Standard)	Main-frame upper limit frequency	
+MS269xA-077/078	Main-frame upper limit frequency	100 MHz to 6 GHz
MS2692A+MS2692A-077/078 +MS2692A-067*3	Main-frame upper limit frequency	**100 MHz to 26.5 GHz**

*3: Microwave Preselecter Bypass. Can be installed in MS2692A. Cannot install simultaneously with MS2692A-003/008.

Basic Performance: Supports 125 MHz Wideband Measurements up to 26.5 GHz (2/2)

MS2692A-067*1 Microwave Preselector Bypass (For MS2692A)

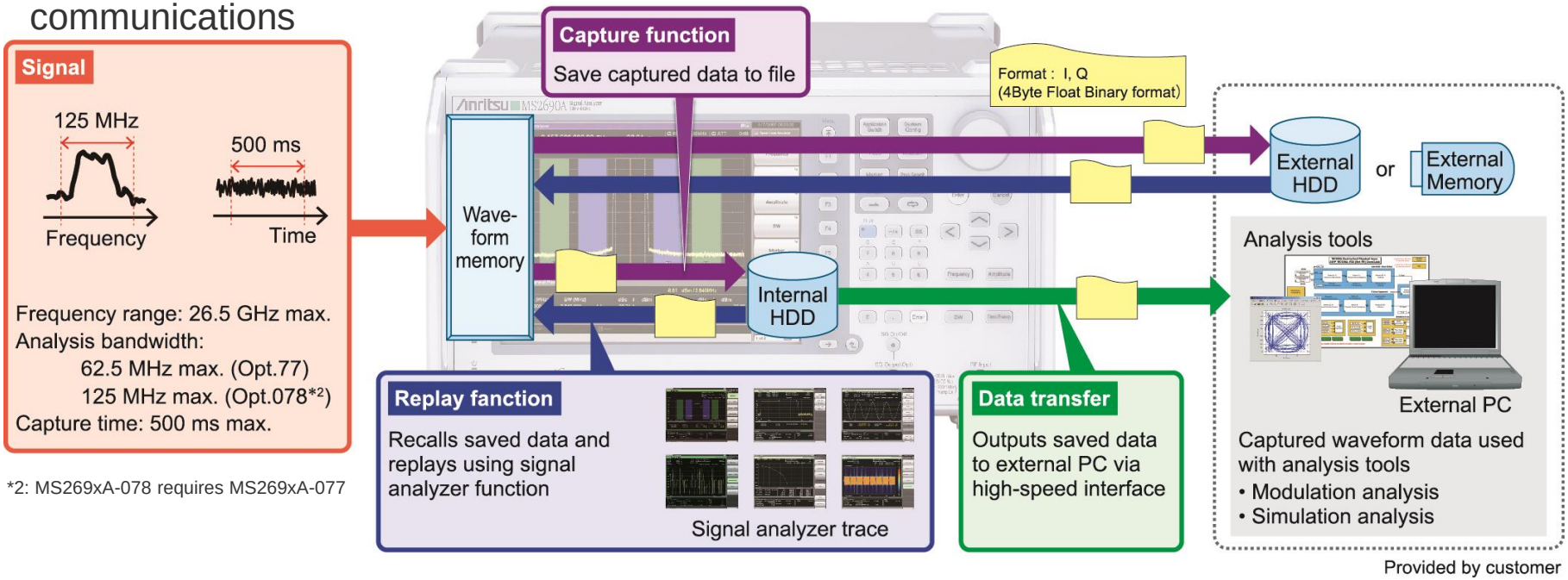
Bypassing the preselector used for the microwave band improves RF frequency characteristics and in-band frequency characteristics.

Preselector bypass Frequency Range: **6 GHz to 26.5 GHz**

(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.)

*1: Can be installed in MS2692A. Cannot install simultaneously with MS2692A-003/008.

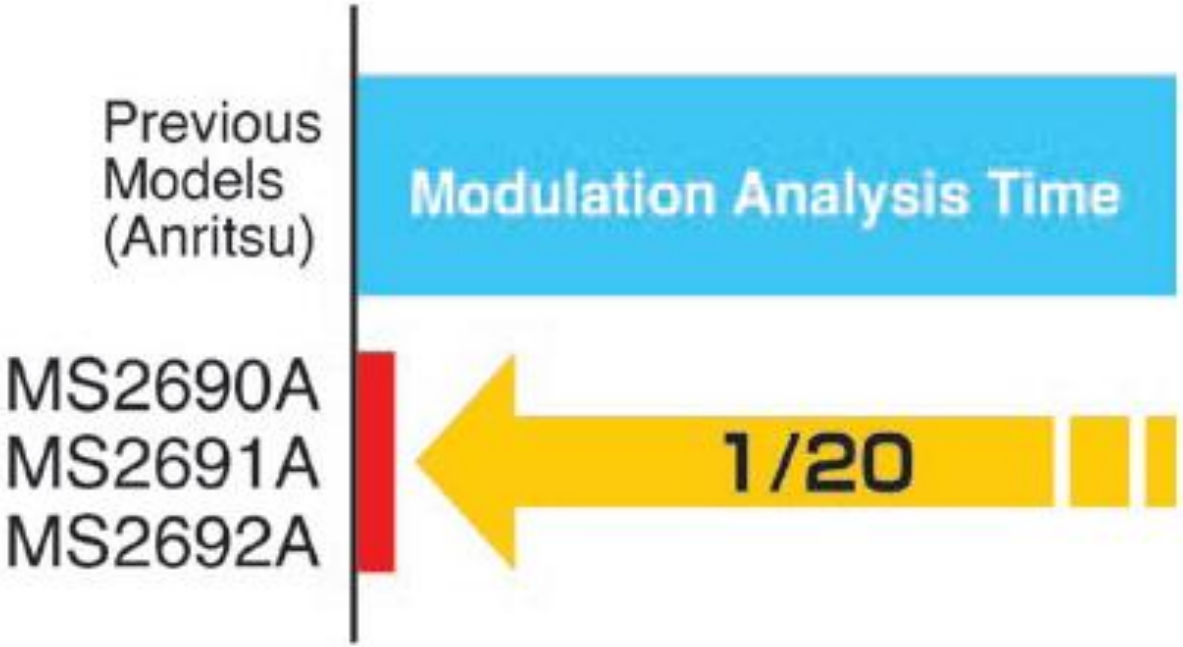
MS2692A with the microwave preselector bypass supports signal analyzer measurement functions up to 26.5 GHz. Supports wideband analysis with high frequencies for satellite communications



*2: MS269xA-078 requires MS269xA-077

High-Speed Modulation Analysis

The MS269xA with improved DSP technology and high-speed CPU offers about 20 times faster modulation analyses, such as CDMA and OFDM, than conventional Anritsu products. It shortens tact times on production lines and supports efficient analysis of next-generation systems.

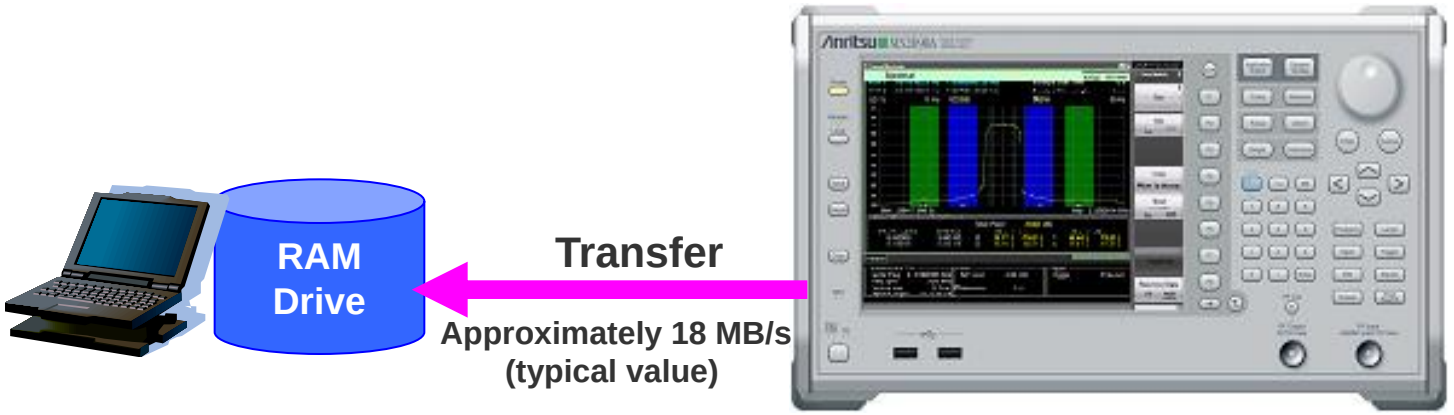


Basic Performance: External Interfaces

Versatile External Interfaces as Standard

The MS269xA includes Gigabit Ethernet, USB2.0 and GPIB as standard interfaces for remote control.

Moreover, it can transfer large amounts of VSA digitized data at high speed over Gigabit Ethernet to an external PC.



Transferring 785 MB of data
Gigabit Ethernet ⇒ 44 s

*The file size of waveform data captured by VSA at the longest time setting is 785 MB.

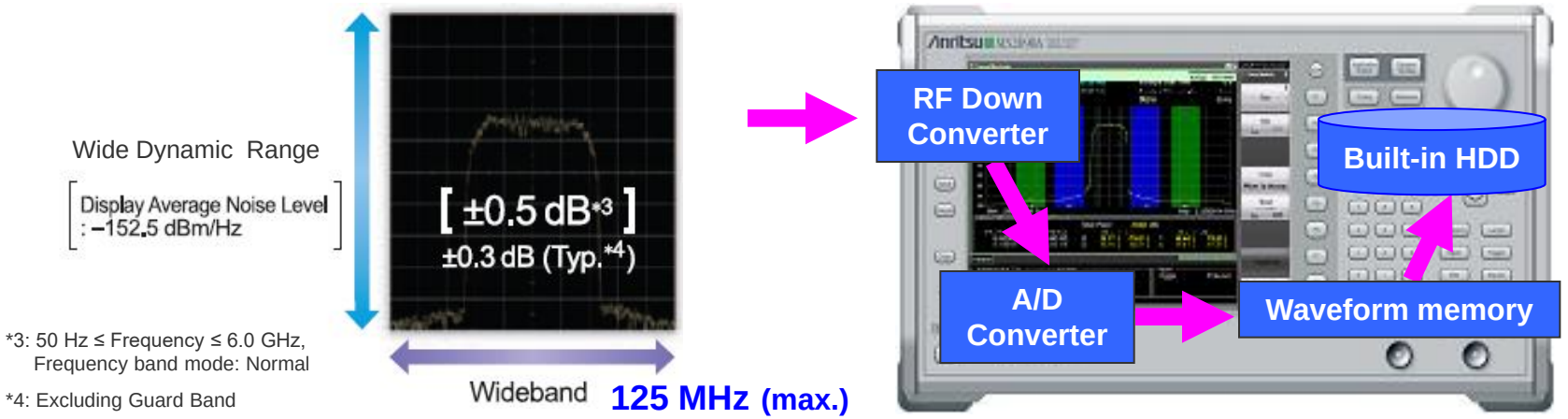
Digitize: Wideband and High Accuracy Waveform Capture (1/2)

Captures wideband waveforms up to 125 MHz with accuracy of ±0.3 dB typ.

The MS269xA Digitize function with opt.077/078 support sampling with maximum resolution of 200 Msps/14 bit (standard: resolution of 50 Msps/16 bit). 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 (typ.).

	Bandwidth	Sampling rate	ADC resolution
Standard	31.25 MHz max.	50 MHz max. (20 ns)	16 bits
Opt.077*1	62.5 MHz max.	100 MHz max. (10 ns)	14 bits
Opt.077*1+078*1,*2	125 MHz max.	200 MHz max. (5 ns)	14 bits

*1: The MS269xA-177/178 cannot be retrofitted to the MS269xA already fitted with the MS269xA-004/104 Wideband Analysis Hardware option (discontinued).
*2: MS269xA-078 requires MS269xA-077.



*3: 50 Hz ≤ Frequency ≤ 6.0 GHz, Frequency band mode: Normal

*4: Excluding Guard Band

Digitize: Wideband and High Accuracy Waveform Capture (2/2)

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.

- **Frequency Span**
  - 1 kHz to 31.25 MHz
  - 1 kHz to 62.5 MHz (Opt-077)
  - 1 kHz to 125 MHz (Opt-077+078)
- **Sampling Rate**
  - 2 kHz to 50 MHz
  - 2 kHz to 100 MHz (Opt-077)
  - 2 kHz to 200 MHz (Opt-077+078)
  - (Automatic frequency span setting)
- **Attenuator:** 0 to 60 dB
- **Trigger:** Video / Wide IF Video / External / SG Marker

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

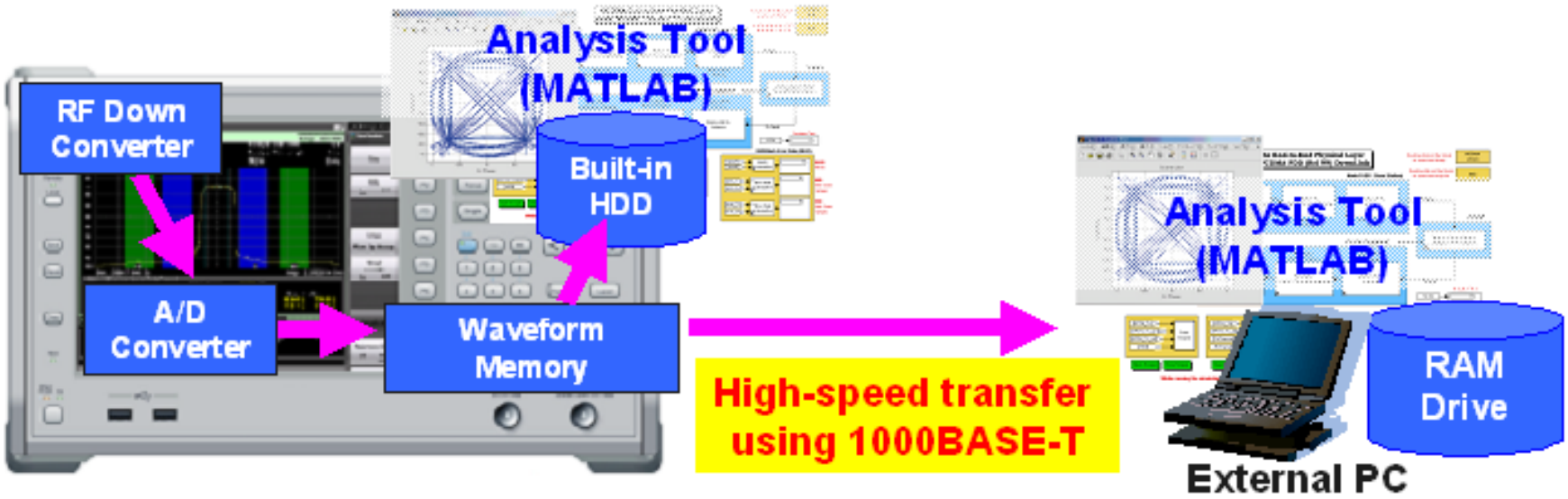
Digitize: Calibration-Free Waveform Capture

No need for calibration block at analysis tool side

Normally, error calibration is required at signal analysis due to amplitude/phase errors generated by passage of the RF signal through the down converter.

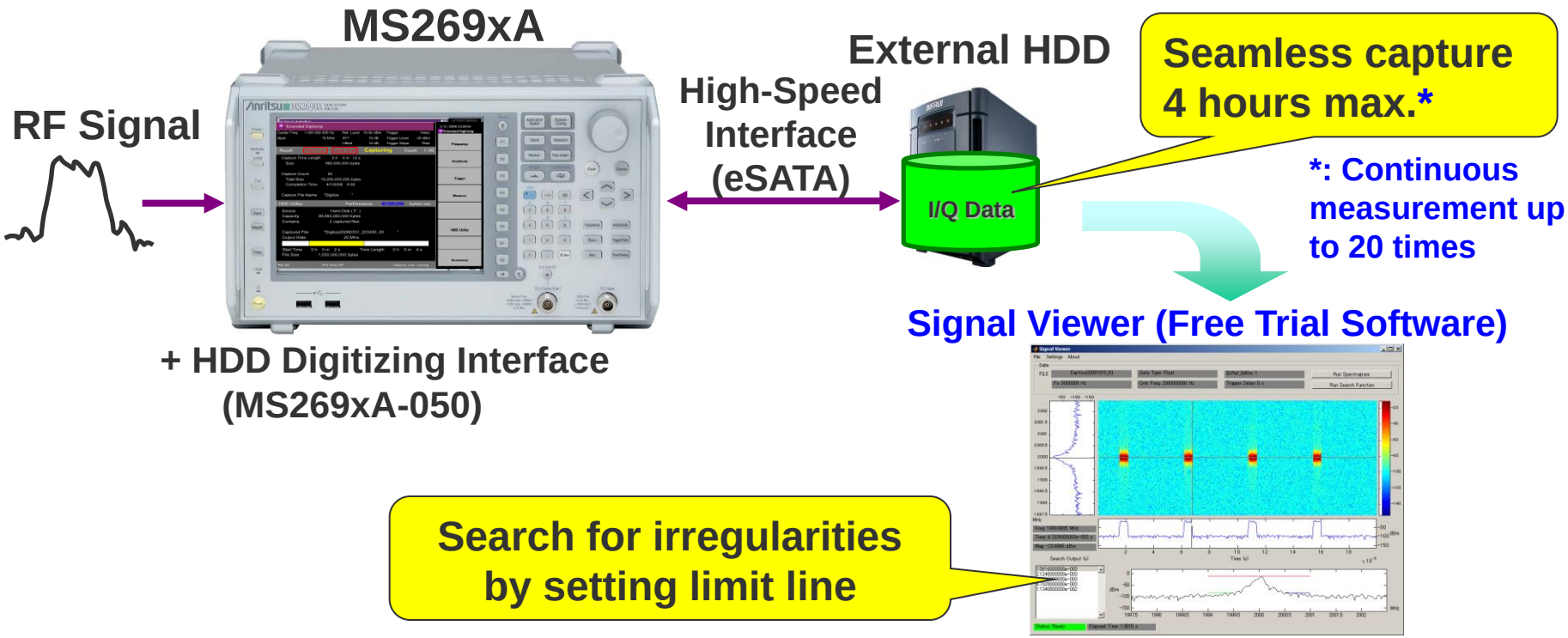
The MS269xA has built-in amplitude/phase calibration circuits to automatically calibrate internal error.

Captured waveform data are saved to the built-in hard disk and can also be output to an external PC via 1000BASE-T.



Digitize: Expansion Digitize Function

The MS269xA can seamlessly capture up to 4 hours of signals in the 20 MHz band max. to monitor every instantaneous fault and signal fluctuation. It is useful for observing long-term DUT performance in a changing environment (temperature, humidity, external vibration, etc.) and troubleshooting faults by monitoring the radio-wave environment of base stations with poor performance.

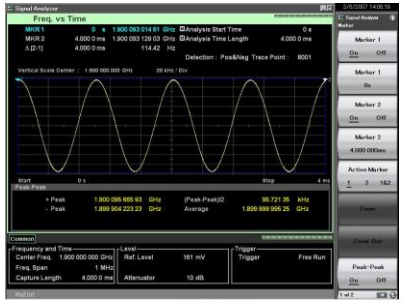


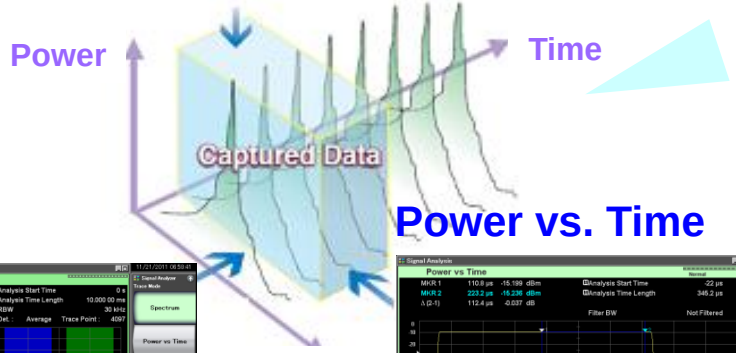
VSA Function: Multi-domain Analysis of Captured Signals

Display captured waveforms in various domains

Frequency vs. Time

Measures FSK and GMSK modulation wave frequency variation, and VCO frequency switching time

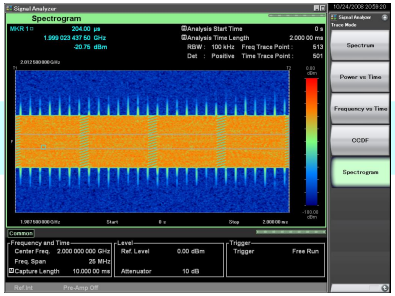




Phase vs. Time

Monitors time fluctuations of phase to check sudden phase shift

Spectrogram

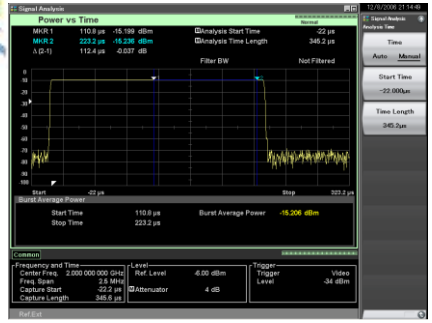


Displays spectrum variations with time; useful for understanding waveform transients because supports visual monitoring of frequency and level time variations

Spectrum

Displays waveform of wideband SPAN up to 125 MHz without interruption

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.

CCDF/APD

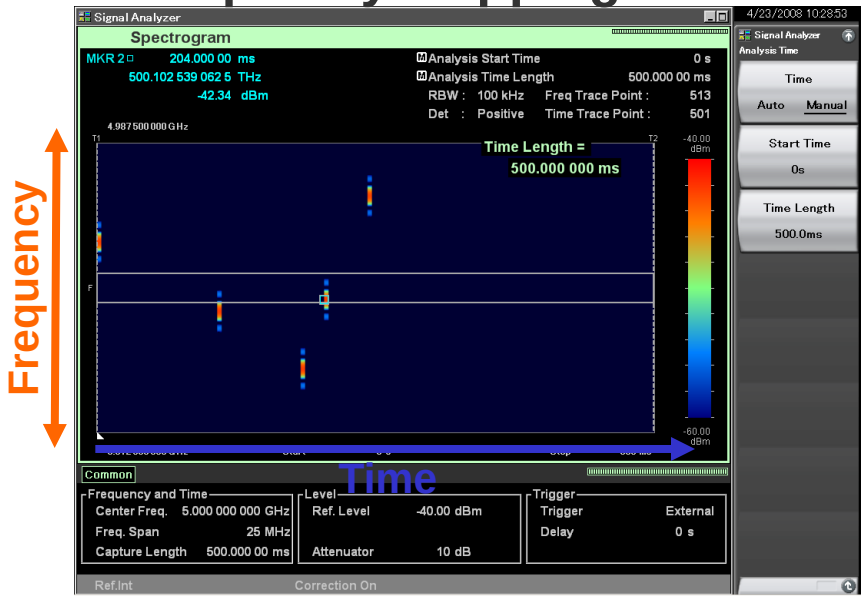
Supports wideband CCDF analysis up to 125 MHz and ideal for evaluating power amps for wideband communication systems

VSA Function: Continuous monitoring of spectrum changes

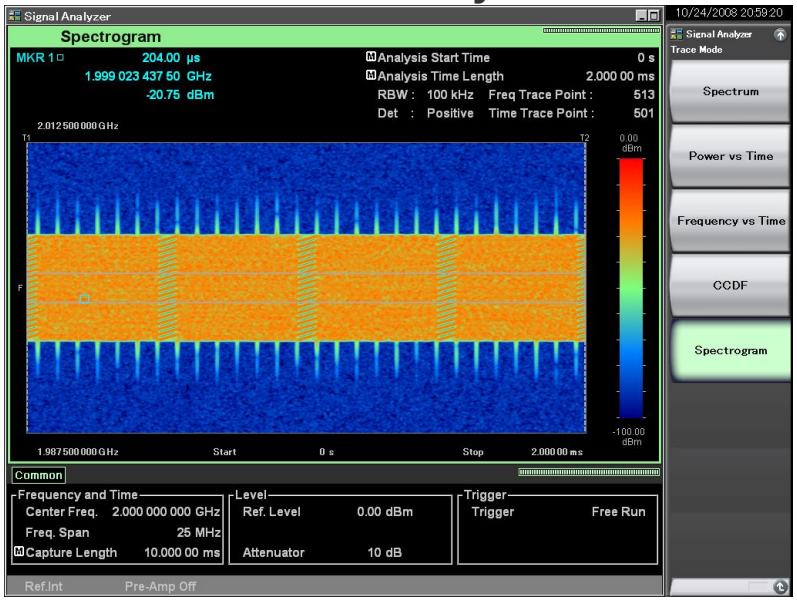
♦Spectrogram

This function supports continuous monitoring of spectrum changes with a SPAN up to 125 MHz. It is useful for checking the stability of burst signals and occasional interference signals due to intuitive recognition of changes in frequency and level with time.

Frequency Hopping Radar

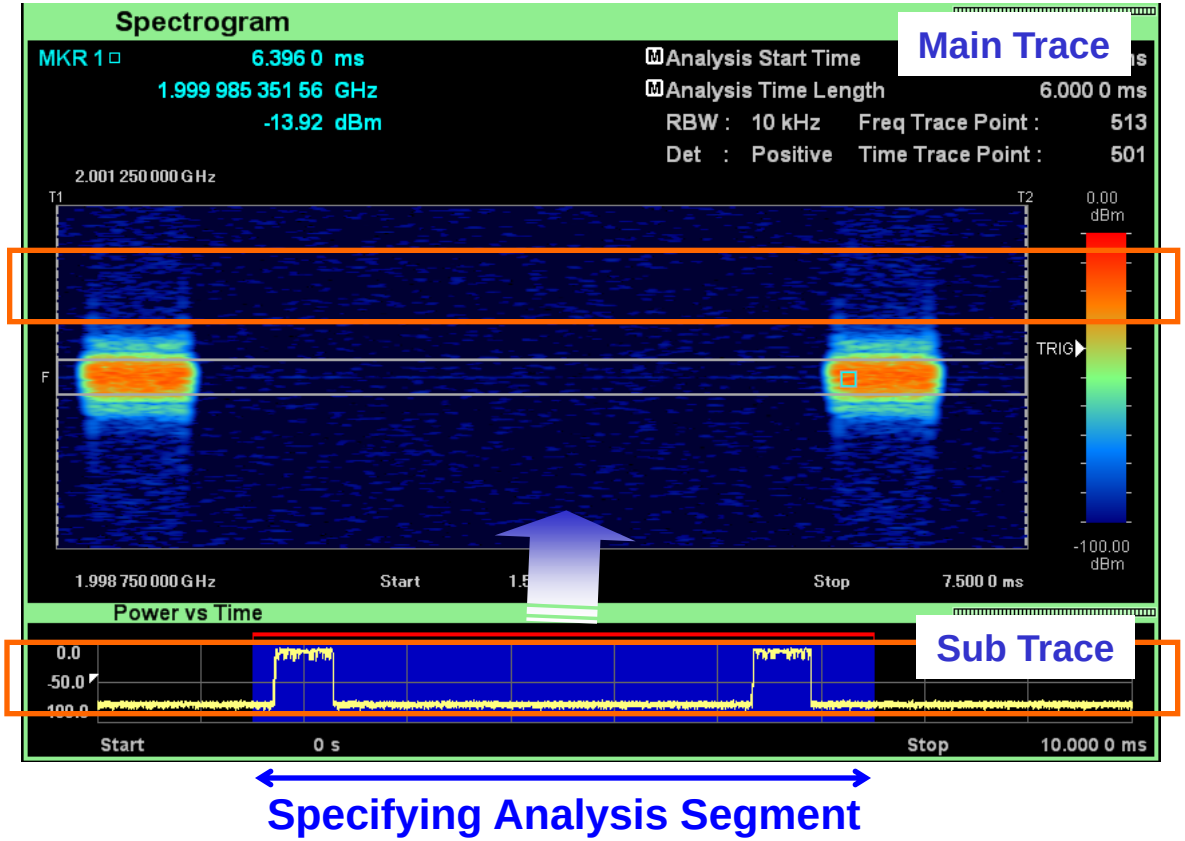


LTE Signal causing Distortion due to Interference between Symbols



VSA Function: Intuitive Split-Screen Display

Various VSA analyses can be performed on the main trace by specifying analysis segments on the sub-trace. Intuitive analysis focusing on signal-on/rising/falling, etc., parts is made easy by observing signal distributions on the sub-trace.



Main Trace

- Spectrum
- Power vs. Time
- Frequency vs. Time
- Phase vs. Time
- CCDF
- Spectrogram

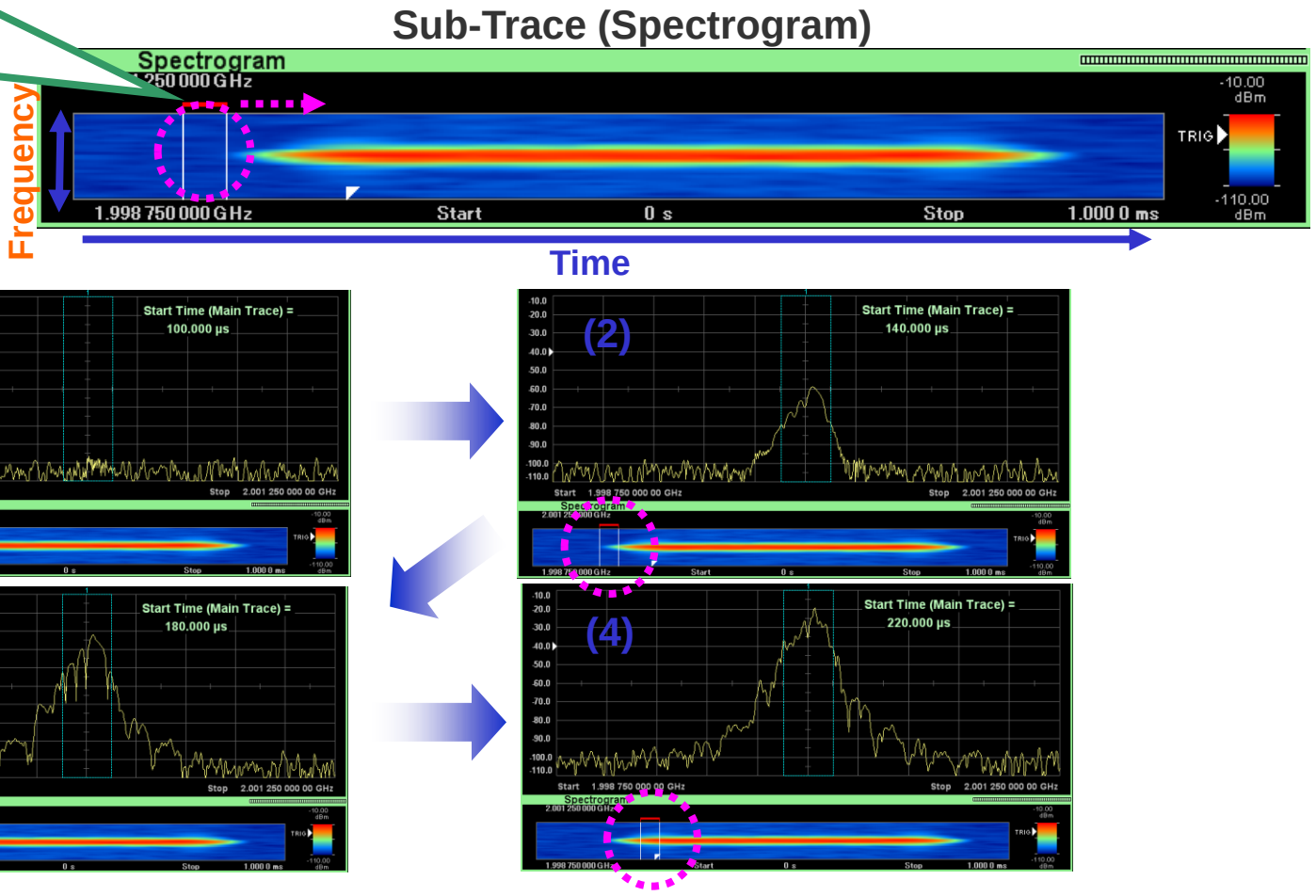
Sub Trace

- Power vs. Time
- Spectrogram

VSA Function: One-Step Observation of Rising/Falling Signals

This function supports troubleshooting by frame-by-frame replay of transient burst responses and generation of unwanted spurious in captured RF signals.

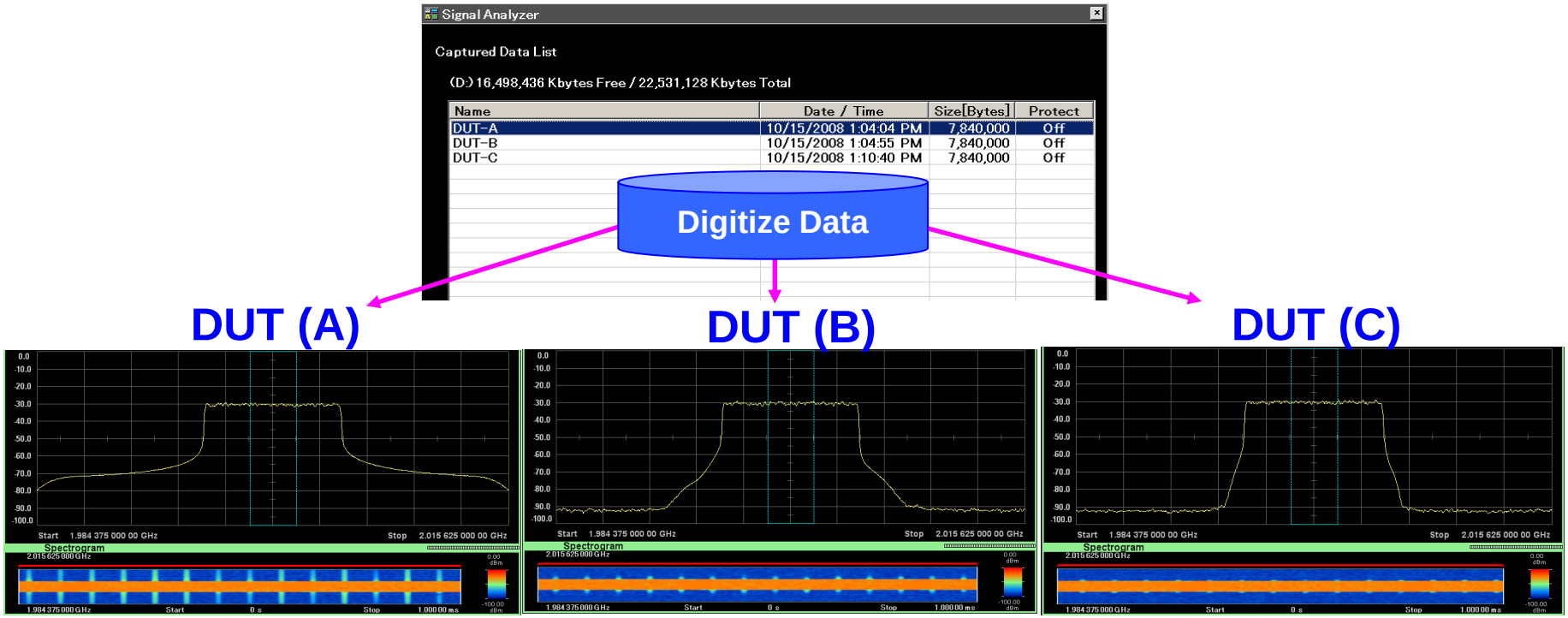
Frame-by-frame replay of changes in captured spectrum



VSA Function: Useful Replay Function for Comparative Verification

Captured waveforms can be replayed again by using the VSA function to read saved digitize data. This is convenient for comparing performance of each DUT test version using digitized data as well as for troubleshooting post-shipment product faults.

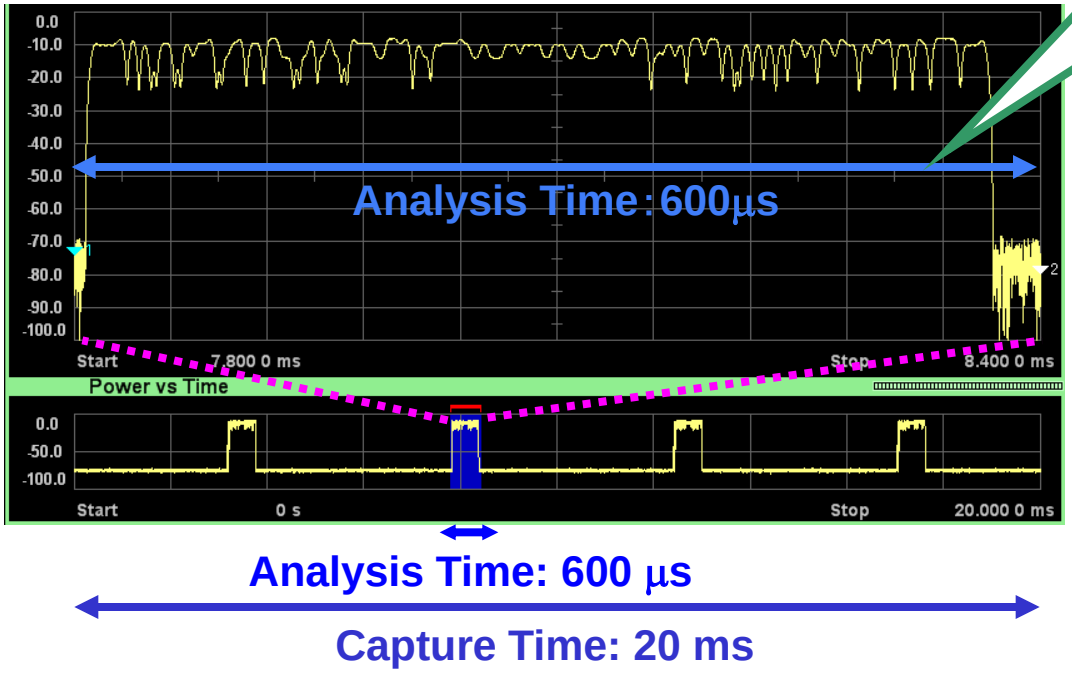
Digitize Data File Selection Screen



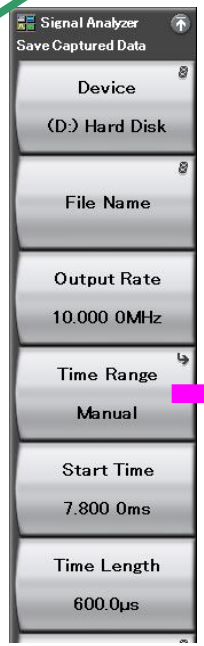
VSA Function: Flexible File Save Function

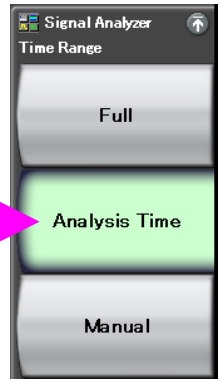
Captured data can be saved to a file by specifying the Analysis Time range (display range of main trace) or any time. The amount of saved data and later workload are cut because only required segments are captured and saved to a file.

Example: Capture 20 ms and save only one burst (600 µs) of GSM signal to file.



Save required segment to file.





Save total capture time.

Save data specified by Analysis Time.

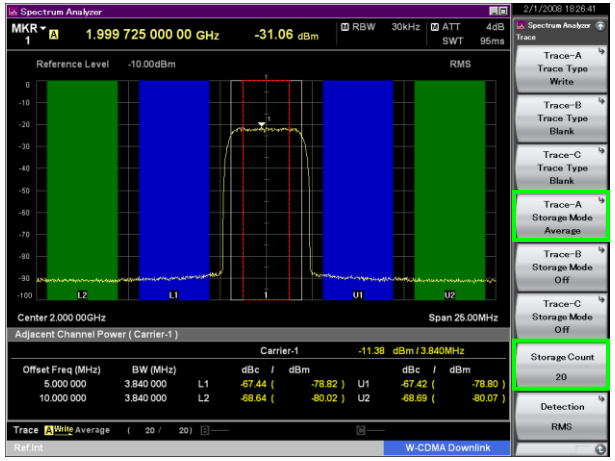
Save specified time segment.

VSA Function: FFT Analysis Advantages Ultra High Speed

The MS269xA measures many times faster than a sweep spectrum analyzer by using the signal analyzer mode, which performs FFT analysis for the standard 31.25 MHz bandwidth.

Spectrum Analyzer

SPAN 25 MHz
RBW 30 kHz
SWT 95 ms



20 Averagings

Measurement Time **2.6 sec**

Signal Analyzer

SPAN 25 MHz
RBW 30 kHz
Analysis Length 95 µs

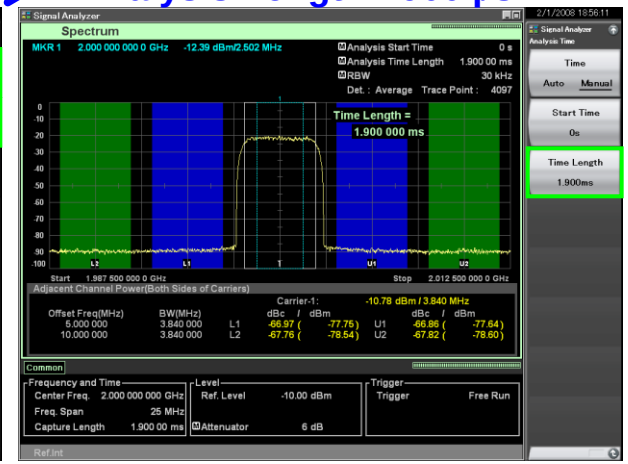
20 Averagings

Measurement Time **0.3 sec**

8 Times Faster

Signal Analyzer

SPAN 25 MHz
RBW 30 kHz
Analysis Length 1900 µs



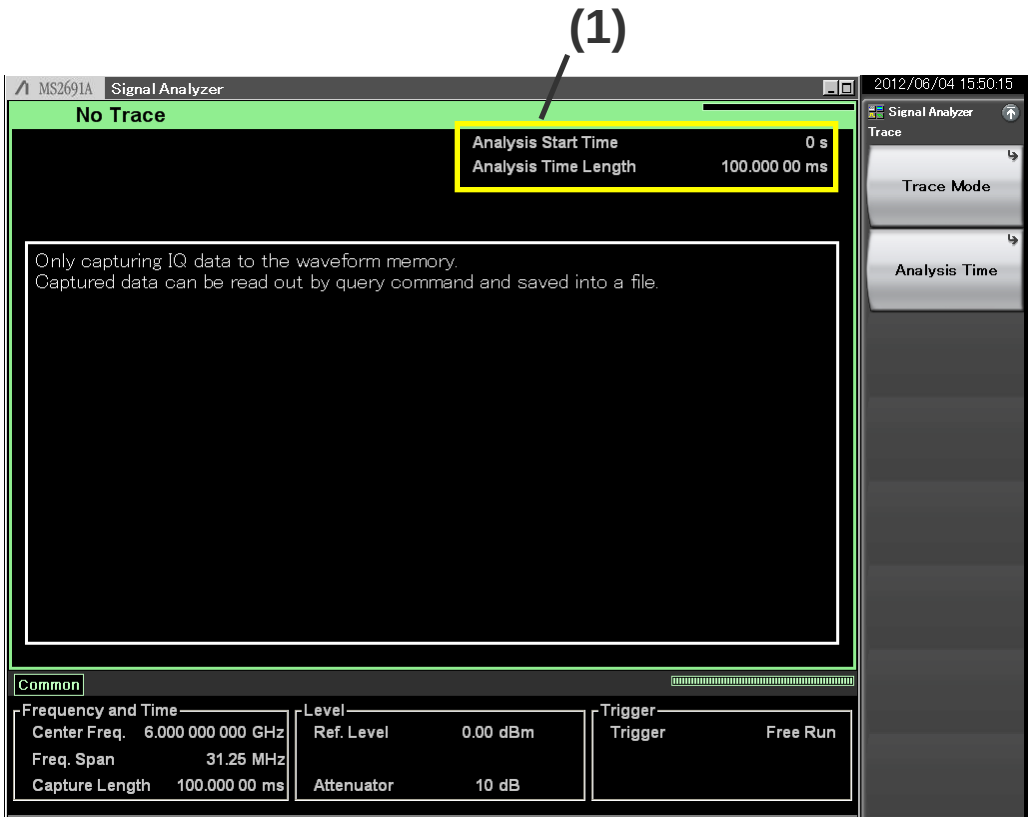
Batch Capture 20 Times

Measurement Time **0.04 sec**

65 Times Ultra Fast

VSA Function: No Trace Mode

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.



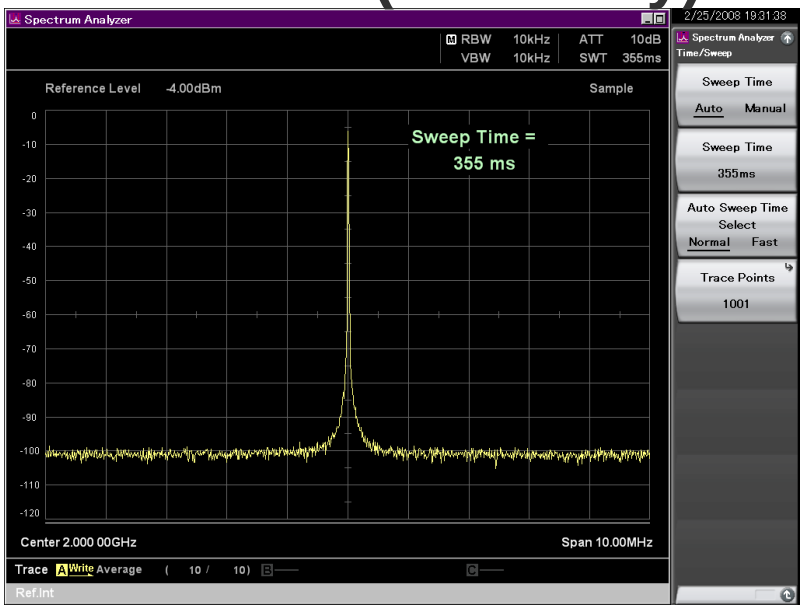
(1)	Analysis Start Time Analysis Time Length
	Displays “Analysis Start Time” and “Analysis Time Length”.

*As analysis is not executed, Save Waveform function for saving waveform data cannot be used.

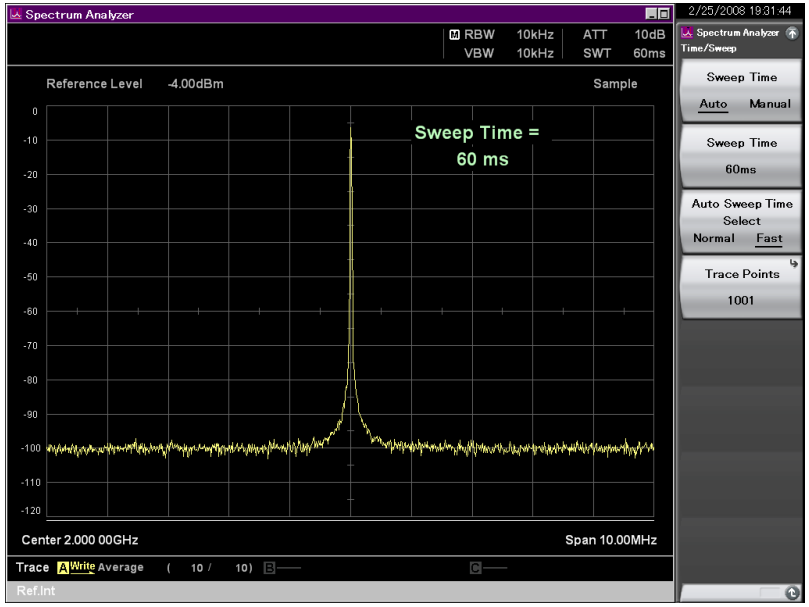
SPA Function: Six Times (max.) Faster Sweep

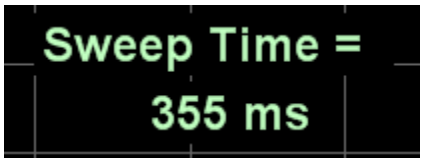
Fast mode with 6 times faster sweeping minimizes spurious measurement times, etc.

Normal (Accuracy)

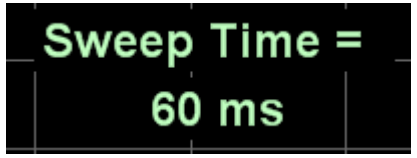


Fast





About 6 Times Faster



Fast mode: Achieves high-speed measurement with accuracy by using internal calibration

Measurement Software: Various Communications Systems

Measurement Software

Modulation analysis of various communication systems from cellular system, such as 5G, LTE and WCDMA analysis software is all supported.

Communications Systems	Model	Name
5G	MX269051A	5G Standard Measurement Software (Base License)
	MX269051A-011	NR TDD sub-6 GHz Downlink (Requires MX269051A)
	MX269051A-061	NR TDD sub-6 GHz Uplink (Requires MX269051A)
	MX269051A-031	NR FDD sub-6 GHz Downlink (Requires MX269051A)
	MX269051A-081	NR FDD sub-6 GHz Uplink (Requires MX269051A)
LTE / LTE-Advanced（FDD）	MX269020A	LTE Downlink Measurement Software
	MX269020A-001	LTE-Advanced FDD Downlink Measurement Software
	MX269021A	LTE Uplink Measurement Software
	MX269021A-001	LTE-Advanced FDD Uplink Measurement Software
LTE / LTE-Advanced (TDD)	MX269022A	LTE TDD Downlink Measurement Software
	MX269022A-001	LTE-Advanced TDD Downlink Measurement Software
	MX269023A	LTE TDD Uplink Measurement Software
	MX269023A-001	LTE-Advanced TDD Uplink Measurement Software

Communications Systems	Model	Name
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
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
TD-SCDMA	MX269015A	TD-SCDMA Measurement Software
ETC/DSRC	MX269014A	ETC/DSRC Measurement Software
Multi-TDMA systems	MX269017A	Vector Modulation Analysis Software
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)

See each software catalog for more details.

*: 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.

Useful Measurement Functions for Evaluating Tx Characteristics (1/21)

The MS269xA has all the versatile built-in measurement functions needed for evaluating Tx characteristics. Using functions matching measurements supports simple tests according to specifications.

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	Opt. 017 *4	

*1: SPA (Spectrum Analyzer)

*2: VSA (Vector Signal Analyzer)

*3: Use USB Power Sensors

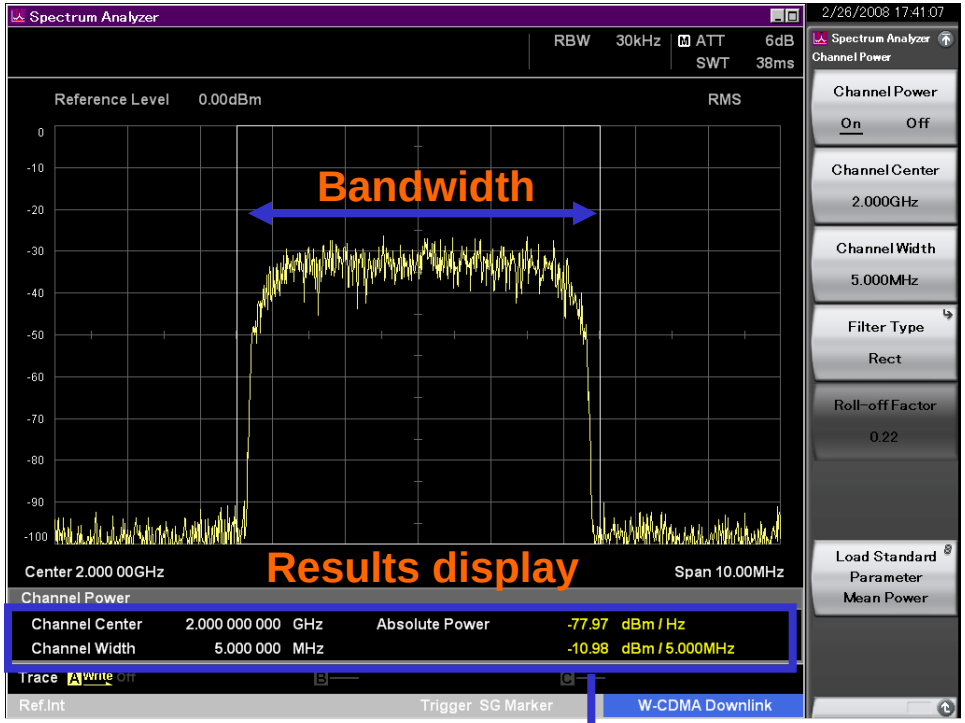
*4: Use Noise Sources (Noisecom, NC346 series)

Channel Power

SPA VSA

Channel power measurement using three types of filter (Rectangular, Nyquist, Root Nyquist) is supported.

Channel Power Measurement



Measurement function ON/OFF

Channel center frequency

Channel bandwidth

Filter:
Rectangular, Nyquist, Root Nyquist

Channel Center: Set value for channel center frequency

Channel Width: Set value for channel bandwidth

Absolute Power: Power per Hz (Density)

In-zone power (Integration)

Occupied Bandwidth

SPA VSA

Occupied bandwidth is measured in two modes—N% and X dB.

Occupied Bandwidth Measurement

Measurement function ON/OFF

Measurement mode selection: (See below)

% setting for <N%> mode

Power setting for <X dB> mode

N% mode:
Bandwidth containing N% power with total power in display as 100%

X dB mode:
Bandwidth X dB down from peak value

OBW: Occupied bandwidth

OBW Lower: Occupied bandwidth left-side frequency

OBW Center: Center frequency of occupied bandwidth

OBW Upper: Occupied bandwidth right-side frequency

Adjacent Channel Leakage Power (ACLR)

SPA VSA

This function measures adjacent channel leakage power.

Adjacent Channel Leakage Power Measurement

Relative power for Offset 1 to 3 [dBc] vs. reference power selected with ACP Reference

( ) indicates absolute power [dBm].

Measurement function ON/OFF

Reference Power setting: (See below)

In-band setting

Offset Channel setting

Result display switching
Carrier: In-band, Ofs: Offset Channel,
All: Both In-band and Offset Channel

Noise cancellation function ON/OFF
(subtracts main-frame noise from measurement result)

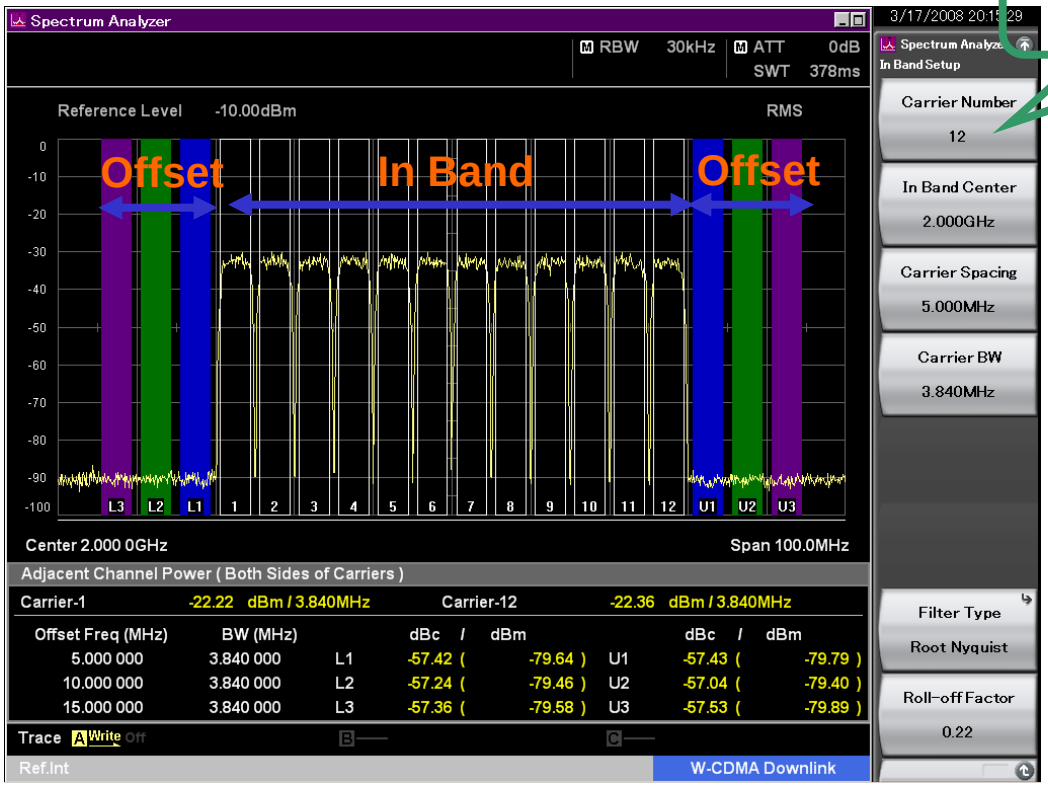
Reference power setting:
- SPAN TOTAL: Integral power for overall display
- Carrier Total: Total of all carrier power
- Both Sides of Carriers: Out-of-band carrier power
- Carrier Select: Specified carrier power

Adjacent Channel Leakage Power (ACLR)

SPA VSA

In Band can be set from 1 to 12 carriers and switched instantaneously on the screen. Moreover, true ACLR performance is measured using the noise cancellation function to subtract main-frame noise from the measurement result.

ACLR Measurement (12 carriers)



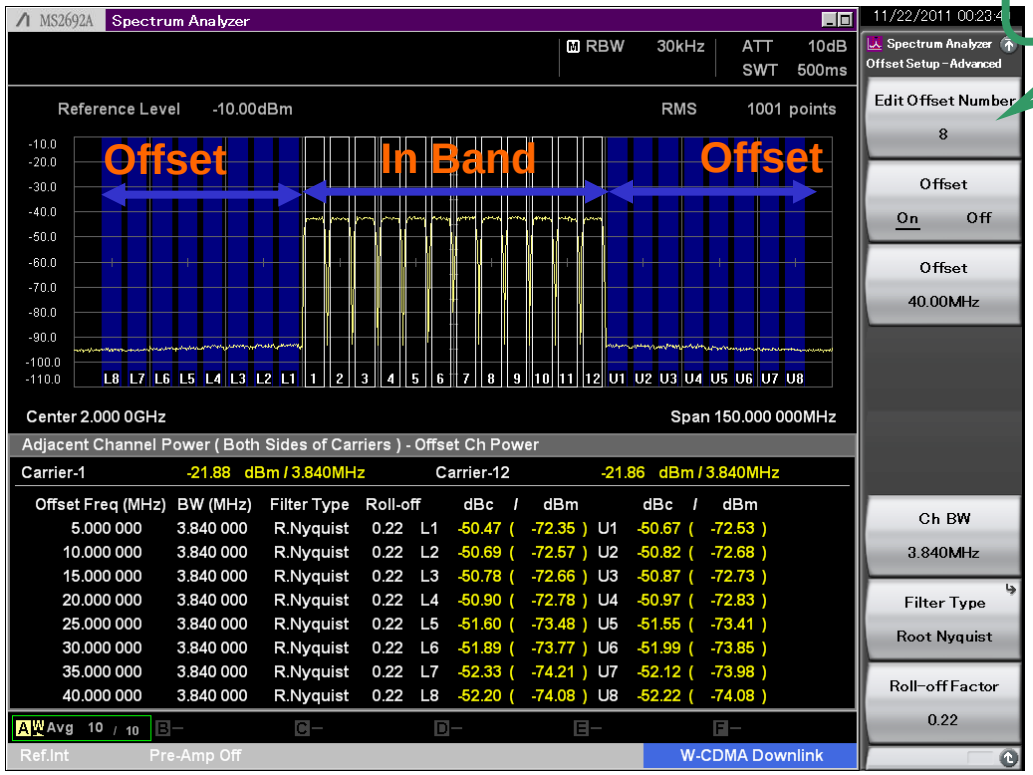
Carrier number switched instantaneously!

Adjacent Channel Leakage Power (ACLR)

SPA

Offset channel can be set from 1 to 8 and switched instantaneously on the screen.

ACLR Measurement (12 carriers / 8 offsets)



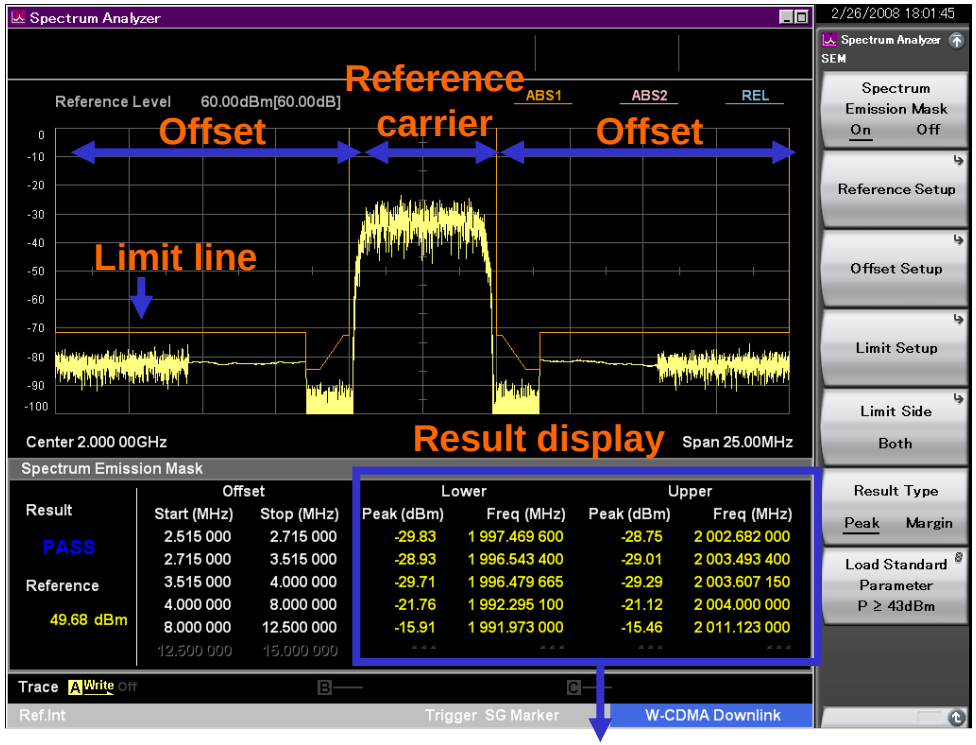
Offset number switched instantaneously!

Spectrum Emission Mask (SEM)

SPA

Offset limit lines can be set for up to 12 segments. The peak frequency and level in each segment are displayed and parts exceeding the limit line are indicated in red. Also, when a limit line is exceeded at just one part, Fail is displayed in red at the Result displays at the bottom left of the screen.

Spectrum Emission Mask Measurement



Level (Peak/Margin) and frequency of point closest to limit line per offset.

Measurement function ON/OFF

Reference carrier bandwidth and sweeping method setting

Offset position and sweeping method setting

Limit line setting (orange line)

Measurement target setting: (See below)

Result display switching

- Peak: Absolute power
- Margin: Margin for limit line

Measurement Target Setting

- Both: Measures both Lower and Upper
- Lower: Measures Lower
- Upper: Measures Upper

Useful Measurement Functions for Evaluating Tx Characteristics (8/21)

♦Limit Lines

SPA

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.

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.

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

(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

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. (Save on Event Function)

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.

Average In-burst Power Measurement

SPA VSA

The average power of specified burst segments is displayed in the time domain. Measurement only requires setting the measurement start and end positions on the screen.

Average In-burst Power Measurement

Measurement function ON/OFF

Measurement start position

Measurement stop position

Noise cancellation function ON/OFF
(Subtracts main-frame noise from measurement result)

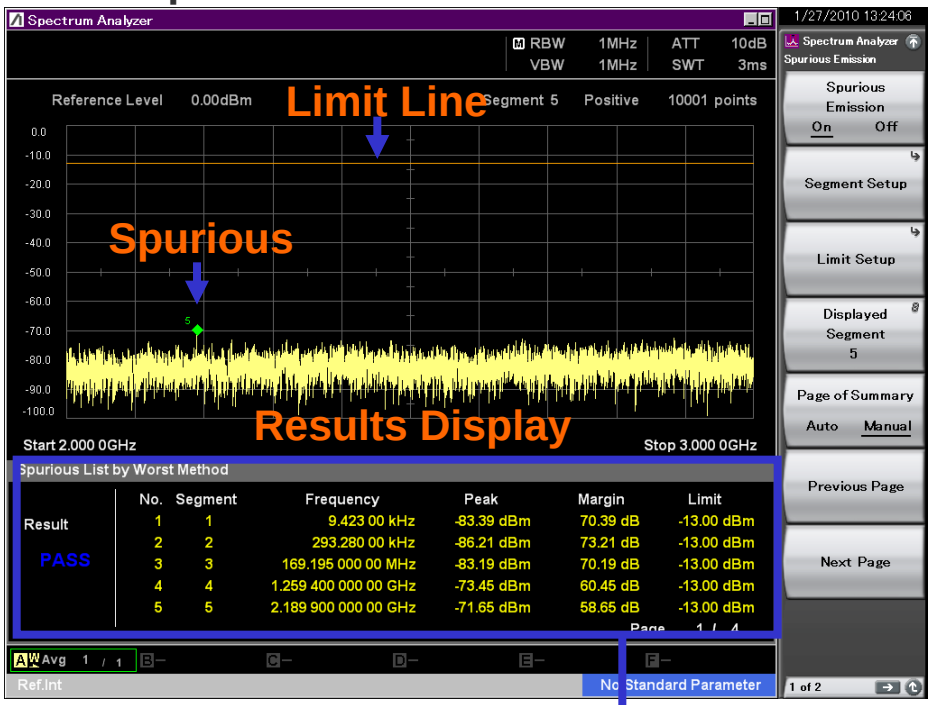
Displays average power between Start Time and Stop Time

Spurious Emission

SPA

The peak frequency and level in each segment and the standard margin are displayed; parts exceeding the limit line are indicated in red. Also, Fail is displayed in red at the bottom left of the Results display even when the limit line is exceeded at only one part. A maximum of 20 segments can be set.

Spurious Emission Measurement



Time Domain Measurement:

Spurious can be swept (detected) for up to 20 segments using the Zero Span measurement function.

Different parameters (RBW/VBW) from segment sweeping can be set.

Time domain measurements can switched ON/OFF.

Detected spurious: Segment number, frequency, level (Peak/Margin), limit line

Useful Measurement Functions for Evaluating Tx Characteristics (11/21)

AM: Power vs. Time

VSA

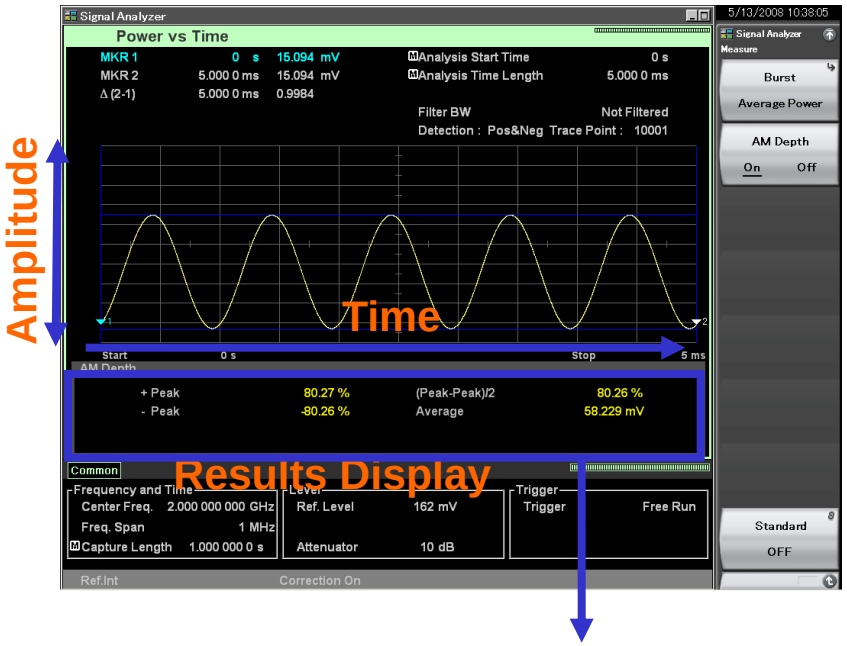
This function measures the amplitude modulation.

FM Shift Measurement Function: Frequency vs. Time

VSA

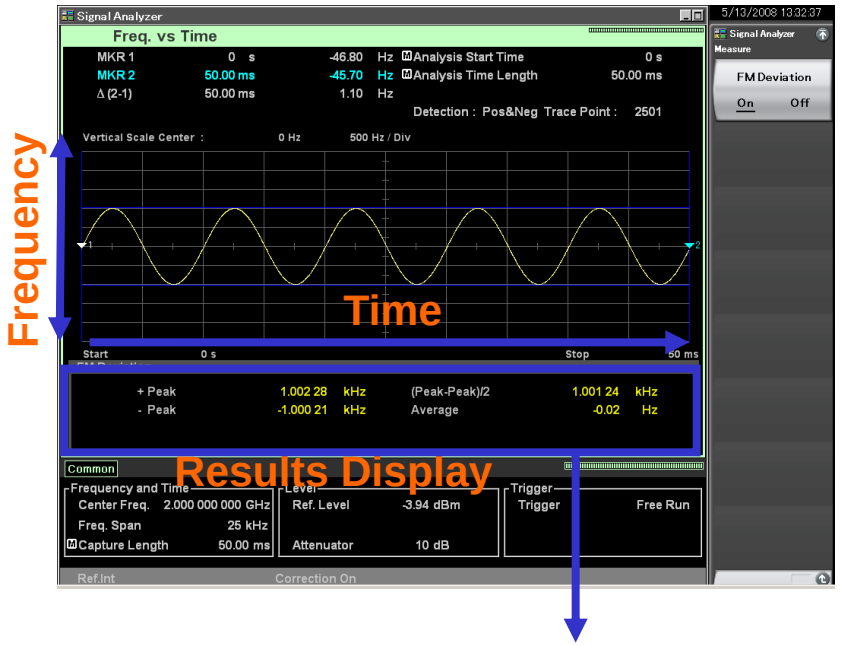
This function measures frequency shift.

AM Measurement



+Peak, -Peak, (Peak-Peak) /2, average voltage between marker 1 and 2

FM Shift Measurement



+Peak, -Peak, (Peak-Peak) /2, average frequency between marker 1 and 2

Phase Fluctuation Display Function: Phase vs. Time

VSA

This function displays phase time fluctuations.

Phase Fluctuation Display

Phase Fluctuation:

Phenomena that are hard to spot using a spectrum analyzer, such as phase drift due to switching and transients, can be evaluated.

Zone Marker Function

SPA VSA

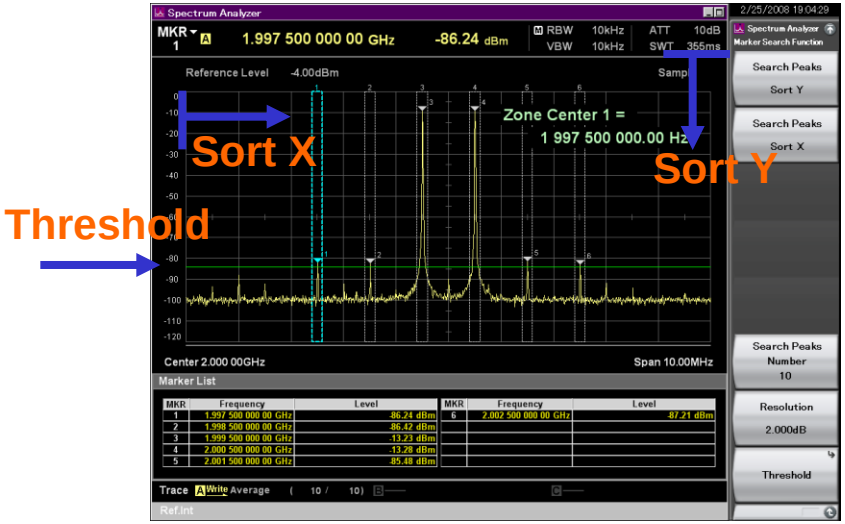
This displays the Peak value within the specified range. It is useful for measuring unstable signals with fluctuating frequency and noise.

Multi-Marker/Highest 10 Function

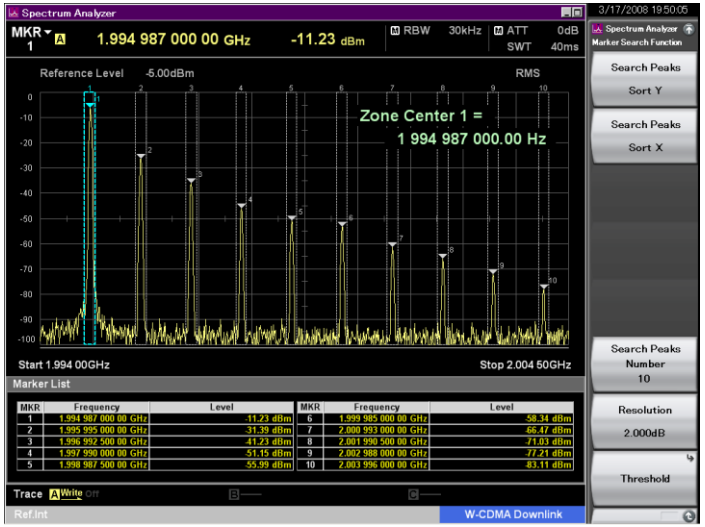
SPA VSA

This automatically searches for the ten highest peaks sorted from highest level (Sort Y) or lowest frequency (Sort X). In addition, setting a threshold eliminates unnecessary searching. This can be used for IM and harmonic, etc., measurements.

IM Measurement



Harmonic Measurement



Useful Measurement Functions for Evaluating Tx Characteristics (14/21)

Gate Sweeping

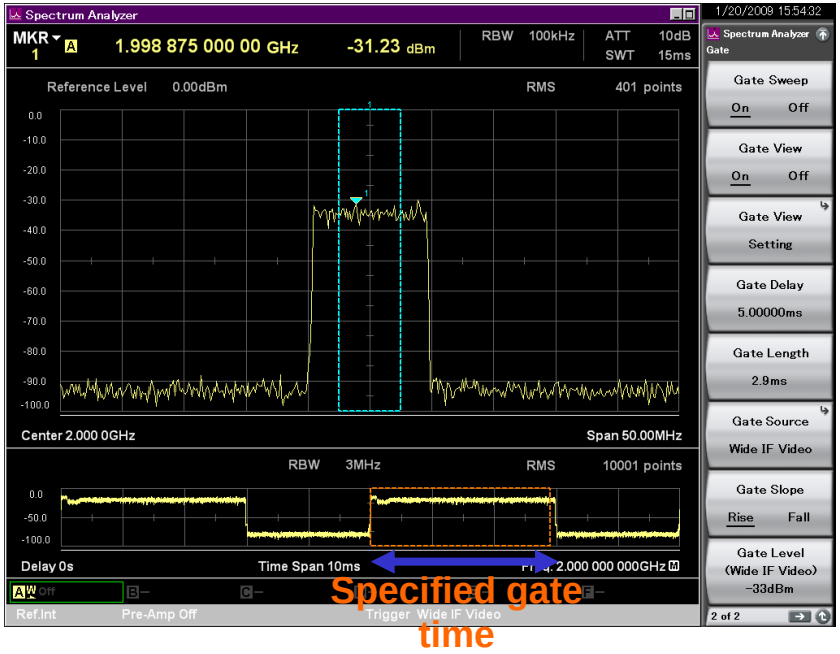
SPA

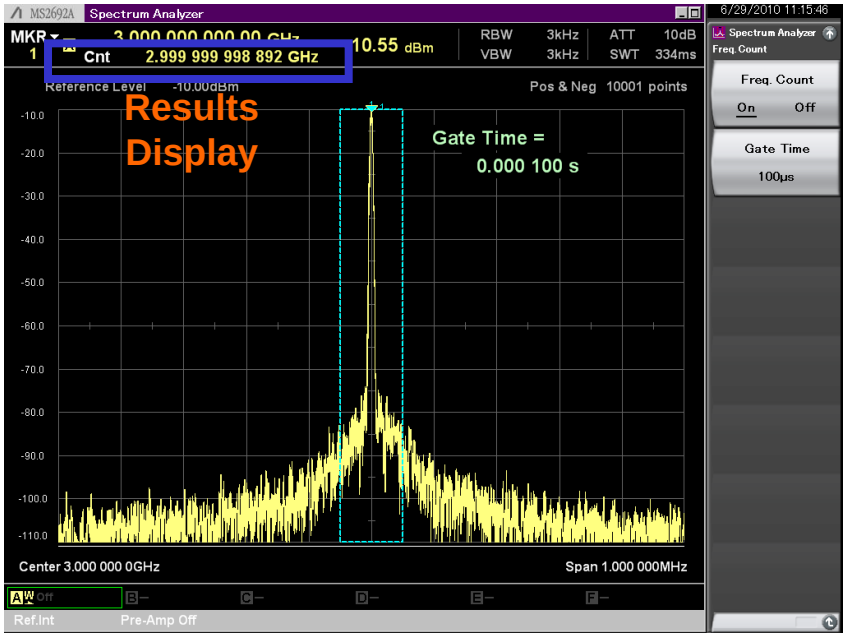
This function performs sweeping at the specified gate timing. The spectrum of the burst-on signal is easily displayed, etc., because sub-screens can be displayed simultaneously in the time domain.

Frequency Counter

SPA

Set [Freq. Count] to ON to use the frequency counter function. [Gate Time] sets the frequency counter measurement time.



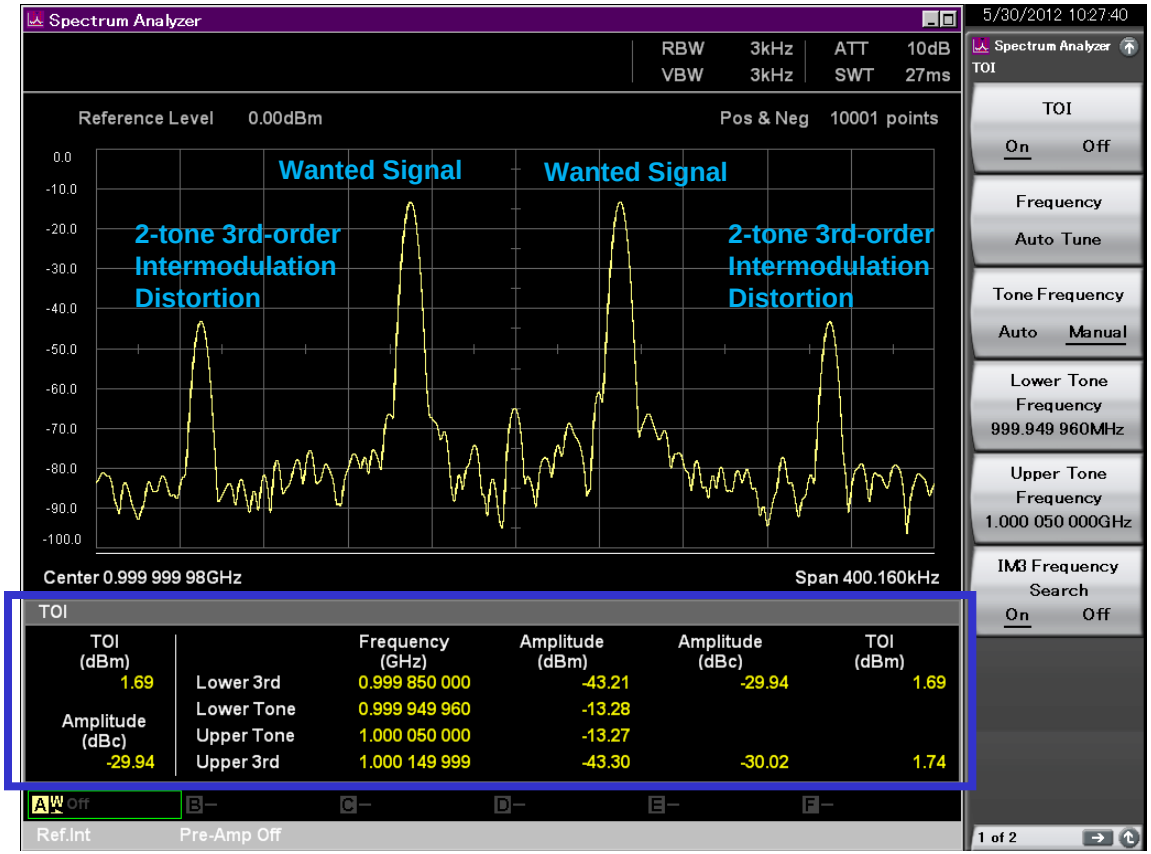


Gate Time:
Sets frequency counter measurement time

2-tone 3rd-order Intermodulation Distortion

SPA

Input two CW signals (wanted signals) with different frequencies and calculate the TOI (Third Order Intercept) from the 2-tone 3rd-order Intermodulation Distortion generated near the wanted signals by the DUT non-linear characteristics.



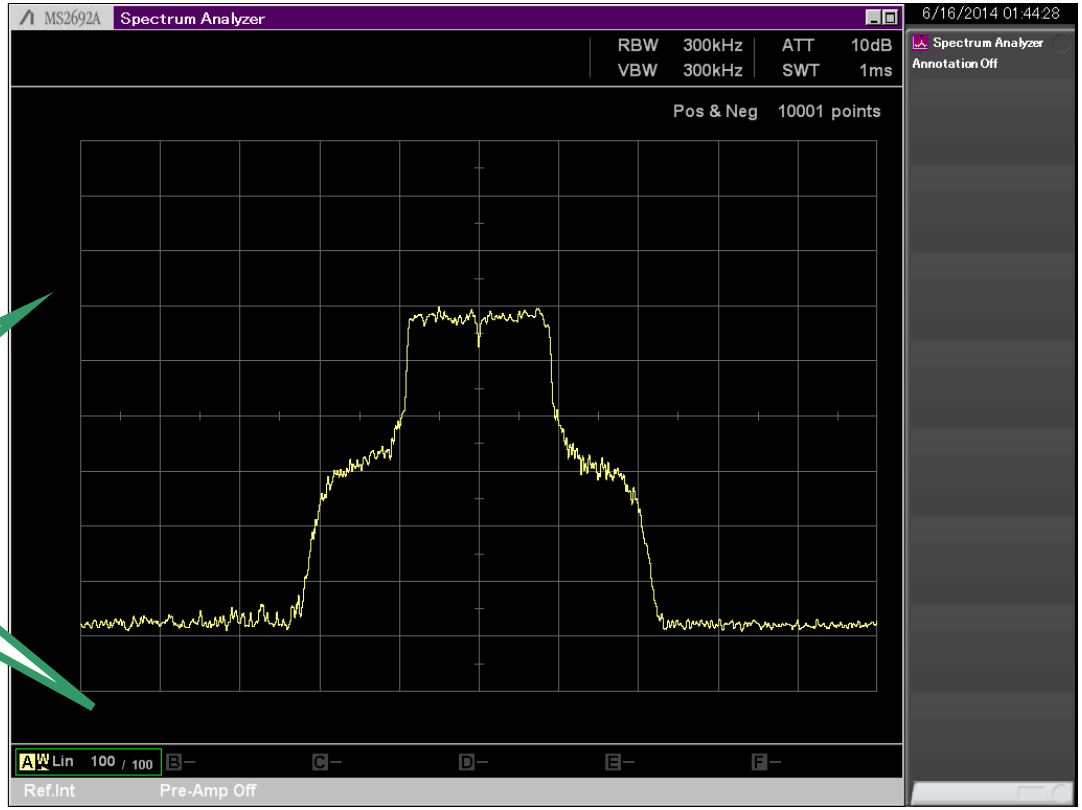
Results Display

TOI (dBm)	Displays calculated TOI. Displays worst value (Lower) of two calculated values (Lower, Upper).
Amplitude (dBc)	Displays level ratio of 2-tone 3rd-order intermodulation distortion to wanted signal. Displays worst value (smaller value) of two calculated values (Lower, Upper).
Lower 3rd	2-tone 3rd-order intermodulation distortion generated at Lower frequency of wanted waveform. Displays frequency, signal level, level ratio compared to wanted signal, and calculated TOI.
Lower Tone	Wanted signal with lower frequency components. Displays frequency and signal level.
Upper Tone	Wanted signal with upper frequency components. Displays frequency and signal level.
Upper 3rd	2-tone 3rd-order intermodulation distortion generated at Upper frequency of wanted waveform. Displays frequency, signal level, level ratio compared to wanted signal, and calculated TOI.

Annotation Display (On/Off)

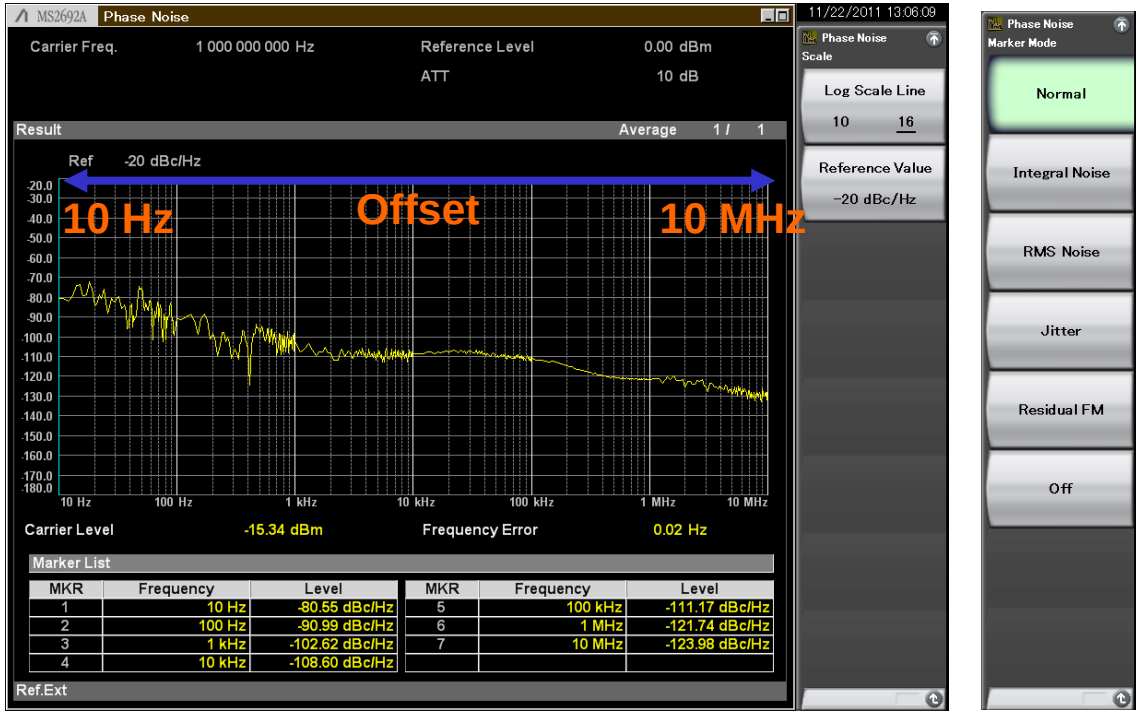
SPA

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



Phase Noise Measurement Function

This function measures the phase noise over a frequency offset range of 10 Hz to 10 MHz.



Normal:
Normal marker. Displays phase noise level at specified frequency offset.

Integral Noise:
Calculates Integral Noise for specified integrated bandwidth

RMS Noise:
Calculates RMS Noise for specified integrated bandwidth

Jitter:
Calculates Jitter for specified integrated bandwidth

Residual FM:
Calculates Residual FM for specified integrated bandwidth

Carrier Frequency:
10 MHz to main frame upper limit

Start Offset (lower limit frequency): 10 Hz to 1 kHz

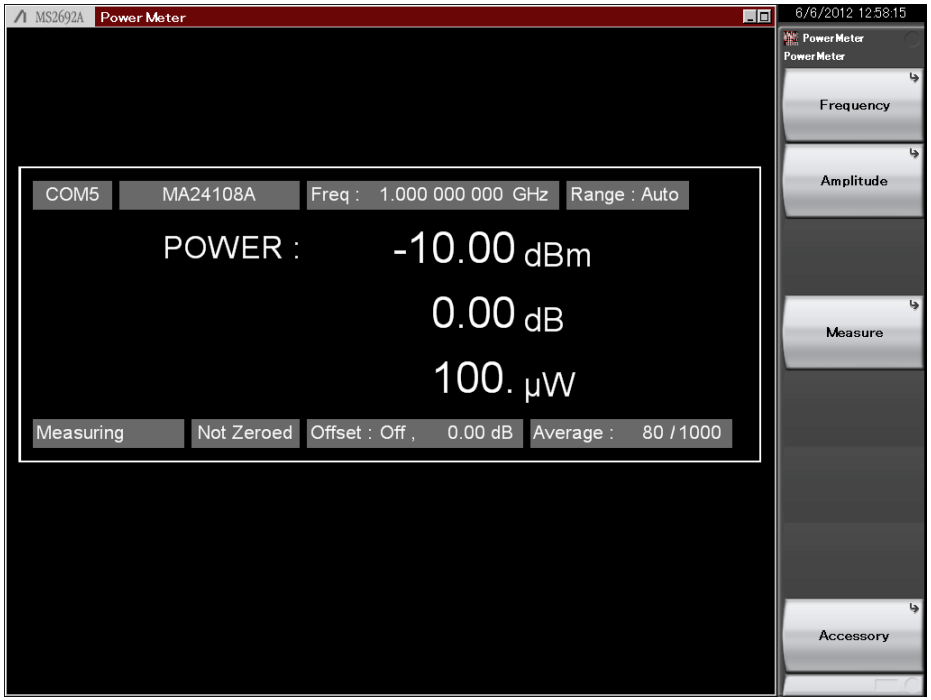
Stop Offset (upper limit frequency): 100 kHz to 10 MHz

Log Scale Line(10/16):
Sets number of Log scale lines to 10 or 16

Reference Value: Sets upper limit of vertical axis
–140 to –50 dBc/Hz (Log Scale Line: 10)
–170 to –20 dBc/Hz (Log Scale Line: 16)

Power Meter Function

Power meter function can connect a USB power sensor to the MS269xA and read the measurement values.



Compatible USB power sensors.

Model	Frequency	Resolution	Dynamic Range
MA24104A*	600 MHz to 4 GHz	1 kHz	+3 to +51.76 dBm
MA24105A	350 MHz to 4GHz	100 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.

Useful Measurement Functions for Evaluating Tx Characteristics (19/21)

Noise Figure Measurement Function [Opt.017]

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

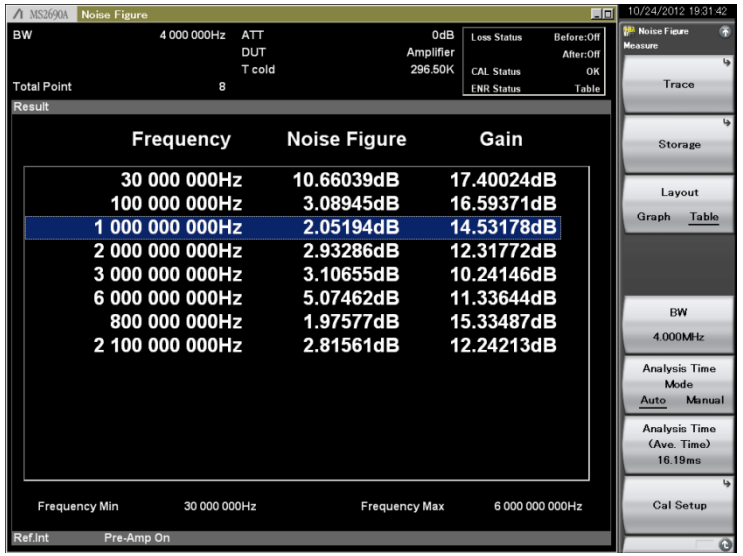
Frequency Mode: Fixed/List/Sweep
DUT Mode: Amplifier
Screen Layout: Graph/Table
Measurement Results Display

■ **Graph/List/Spot**

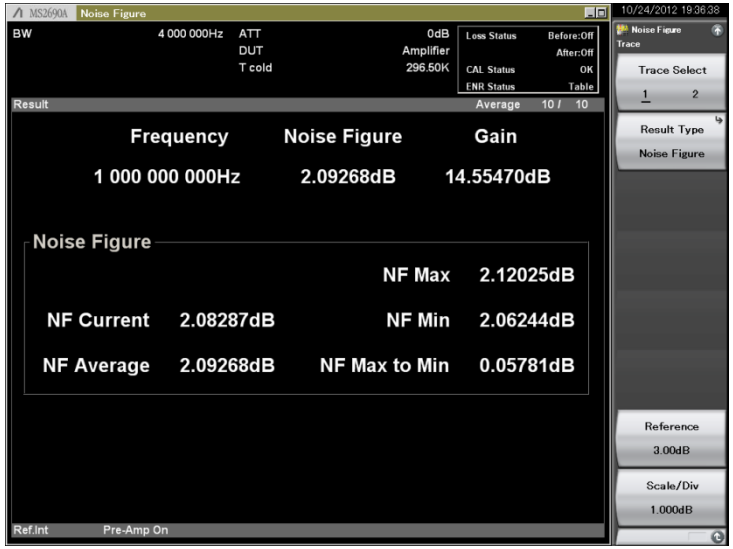
Displays measurement results for each trace (Trace1/Trace2).

- **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)

Useful Measurement Functions for Evaluating Tx Characteristics (20/21)

Noise Figure Measurement Function [Opt.017]

Noise Source

Supports noise sources from Noisecom NC346 series. NC346 series models and summary specifications are listed below.
See the NC346 series catalog and datasheet for detailed specifications.

NC346 series summary specifications

Model	RF Connector	Frequency [GHz]	Output ENR [dB]	VSWR (maximum @ on/off) [GHz]				DC Offset	DC Block
				0.01 to 5	5 to 18	18 to 26.5	26.5 to 40		
NC346A	SMA (M)	0.01 to 18.0	5 to 7	1.15:1	1.25:1	—	—	No	Not required
NC346A Precision	APC3.5 (M)	0.01 to 18.0	5 to 7	1.15:1	1.25:1	—	—	No	Not required
NC346A Option 1	N (M)	0.01 to 18.0	5 to 7	1.15:1	1.25:1	—	—	No	Not required
NC346A Option 2	APC7	0.01 to 18.0	5 to 7	1.15:1	1.25:1	—	—	No	Not required
NC346A Option 4	N (F)	0.01 to 18.0	5 to 7	1.15:1	1.25:1	—	—	No	Not required
NC346B	SMA (M)	0.01 to 18.0	14 to 16	1.15:1	1.25:1	—	—	No	Not required
NC346B Precision	APC3.5 (M)	0.01 to 18.0	14 to 16	1.15:1	1.25:1	—	—	No	Not required
NC346B Option 1	N (M)	0.01 to 18.0	14 to 16	1.15:1	1.35:1	—	—	No	Not required
NC346B Option 2	APC7	0.01 to 18.0	14 to 16	1.15:1	1.25:1	—	—	No	Not required
NC346B Option 4	N (F)	0.01 to 18.0	14 to 16	1.15:1	1.35:1	—	—	No	Not required
NC346D	SMA (M)	0.01 to 18.0	19 to 25*1	1.50:1	1.50:1	—	—	No	Not required
NC346D Precision	APC3.5 (M)	0.01 to 18.0	19 to 25*1	1.50:1	1.50:1	—	—	No	Not required
NC346D Option 1	N (M)	0.01 to 18.0	19 to 25*1	1.50:1	1.75:1	—	—	No	Not required
NC346D Option 2	APC7	0.01 to 18.0	19 to 25*1	1.50:1	1.50:1	—	—	No	Not required
NC346D Option 3	N (F)	0.01 to 18.0	19 to 25*1	1.50:1	1.75:1	—	—	No	Not required
NC346C	APC3.5 (M)	0.01 to 26.5	13 to 17	1.15:1	1.25:1	1.35:1	—	Yes*3	**Required***3
NC346E	APC3.5 (M)	0.01 to 26.5	19 to 25*1	1.50:1	1.50:1	1.50:1	—	Yes*3	**Required***3
NC346Ka	K (M)*2	0.10 to 40.0	10 to 17	1.25:1	1.30:1	1.40:1	1.50:1	Yes*3	**Required***3

*1: Flatness better than ±2 dB

*2: Compatible with SMA and APC3.5

***3: When using noise sources output by DC, always use in combination with a DC block.**

Useful Measurement Functions for Evaluating Tx Characteristics (21/21)

Noise Figure Measurement Function [Opt.017]

Specifications Outlines of Recommended DC Blocks and Adapters

	Ordering		RF Connector	Frequency Range
	Model	Name		
DC Block	J0805	DC Block, N type (MODEL 7003)	N (M)-N (F)	10 kHz to 18 GHz
	J1555A	DC Block, SMA type (MODEL 7006-1)	SMA (M)-SMA (F)	9 kHz to 20 GHz
	K261	DC Block	K (M)-K (F)	10 kHz to 40 GHz
Adapter	J0004	Coaxial Adapter	N (M)-SMA (F)	DC to 12.4 GHz
	J1398A	N-SMA Adapter	N (M)-SMA (F)	DC to 26.5 GHz

Recommended DC blocks / Adaptor combinations for MS269xA/MS2830A series signal analyzer

	Model	Frequency Range	RF connector	Recommended DC Block Order Name	Recommended Adapter Order Name
MS269xA series	MS2690A	50 Hz to 6 GHz	N (F)	J1555A (from 9 kHz)	J0004
	MS2691A	50 Hz to 13.5 GHz	N (F)	J1555A (from 9 kHz)	J1398A
	MS2692A	50 Hz to 26.5 GHz	N (F)	J1555A (9 kHz to 20 GHz)	J1398A
MS2830A series	MS2830A-040	9 kHz to 3.6 GHz	N (F)	Not required	Not required
	MS2830A-041	9 kHz to 6 GHz	N (F)	Not required	Not required
	MS2830A-043	9 kHz to 13.5 GHz	N (F)	Not required	Not required
	MS2830A-044	9 kHz to 26.5 GHz	N (F)	J1555A (9 kHz to 20 GHz)	J1398A
	MS2830A-045	9 kHz to 43 GHz	K (F)	K261	Not required

SG Feature: Vector Signal Generator

The MS269xA incorporates a Vector Signal Generator with frequency range from 125 MHz to 6.0 GHz, 120 MHz vector modulation bandwidth, and 256 Msample (1 GB) waveform memory.
Due to the excellent level accuracy and ACLR performance, it is ideal for use with the spectrum analyzer and signal generator functions for measuring amplifiers, filters and antennas.

Features

- **Frequency: 125 MHz to 6.0 GHz**
- **Vector modulation band: 120 MHz**
- **Waveform memory: 256 Msample**
- **High level accuracy**
  - **Absolute Level Accuracy: ±0.5 dB**
  - **Linearity: ±0.2 dB (typ.)**
- **Excellent ACLR performance**
  - **≤–64 dBc –68 dBc (typ.) @ 5 MHz offset**
  - **≤–67 dBc –70 dBc (typ.) @10 MHz offset**
- **BER Measurement function**
- **AWGN Addition function**

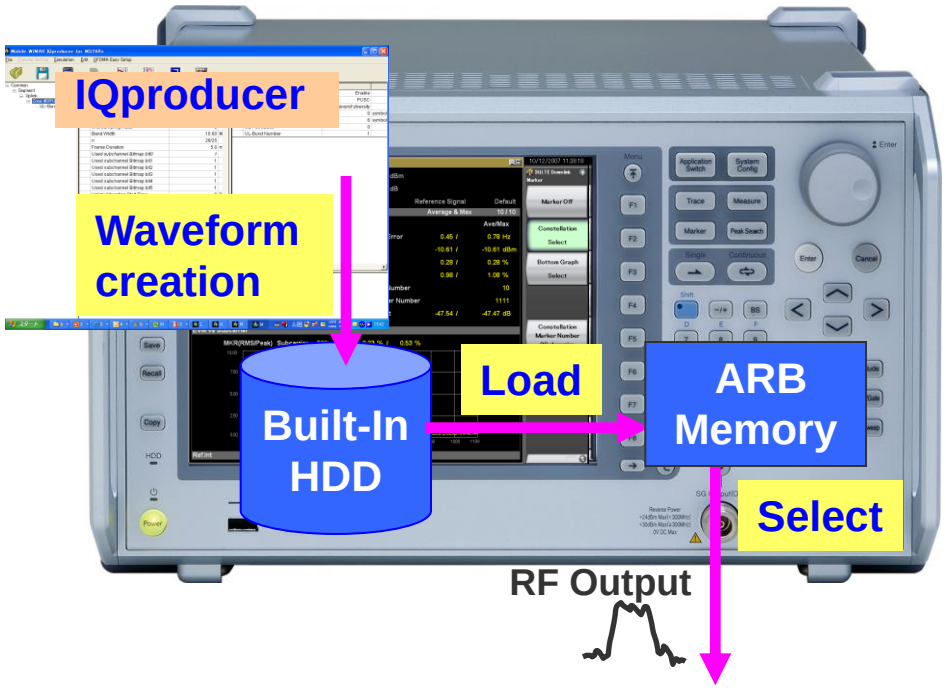
Wanted signal + AWGN signal output from one unit

[Signal Generator Option]
MS269xA-020 Vector Signal Generator (125MHz to 6GHz)

SG Feature: Communication System Line Up

The pre-installed standard waveform pattern is bundled free-of-charge. Moreover, optional PC software (IQproducer) generates waveform patterns with any parameter settings.

In addition, any waveform pattern can be created using IQ data output from simulation tools.



♦Versatile communication system

Built-in waveform patterns

- W-CDMA - HSDPA - CDMA2000
- CDMA2000 1xEV-DO - GSM/EDGE
- Digital Broadcast (ISDB-T/BS/CS/CATV)
- WLAN (IEEE802.11a/11b/11g) - *Bluetooth*®
- AWGN

IQproducer (waveform creation software)

-5G (FDD, Sub-6 GHz)*
-5G (TDD, Sub-6 GHz)*
-LTE (FDD)* / LTE-Advanced (FDD)*
-LTE (TDD)* / LTE-Advanced (TDD)*
-HSDPA/HSUPA*
-W-CDMA
-TDMA (PDC, PHS, Various ARIB standards)*
-Multi-carrier*
-WLAN (11a/b/g/n/j/p)* / WLAN 11ac*
-TD-SCDMA*

* option

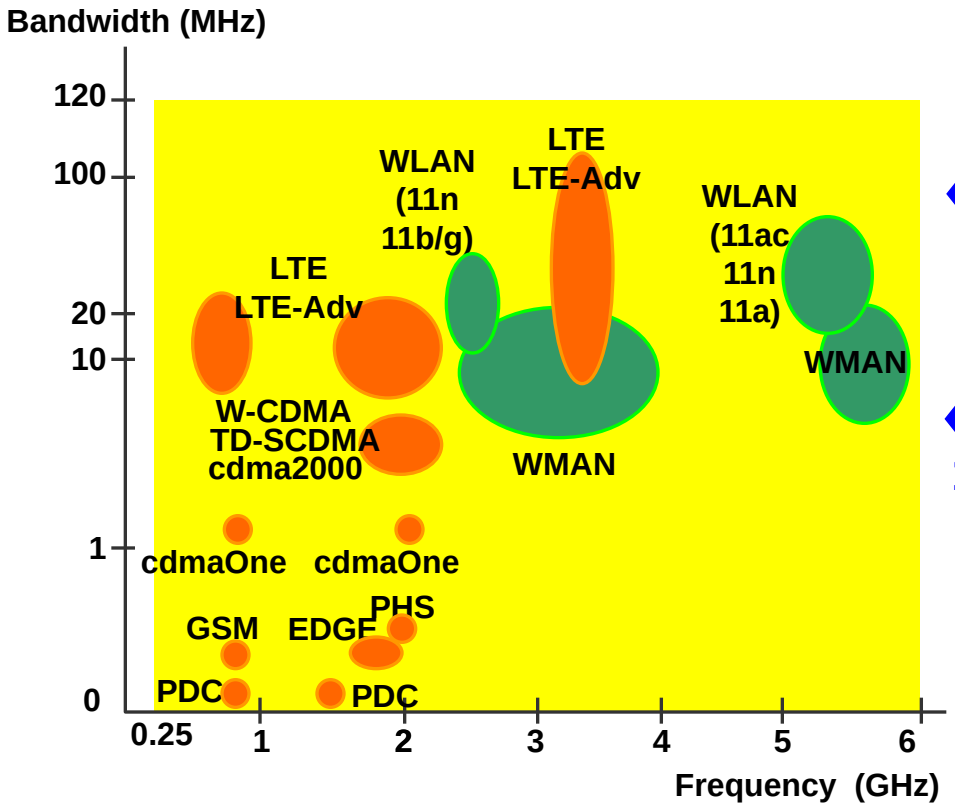
Arbitrary waveform creation

Outputs ASCII IQ data from EDA tool converted to waveform pattern for MS269xA-020

See each IQproducer brochure for more details.

SG Function: Frequency Range and Modulation Band

This all-in-one hardware SG has the performance (frequency 6 GHz, modulation band 120 MHz) to output signals for main communication systems.



♦**Frequency range: 125 MHz to 6 GHz**

The frequency range covers 5 GHz band wireless LAN, 5G and 4G.

♦**Vector modulation band: 120 MHz (built in baseband generator)**

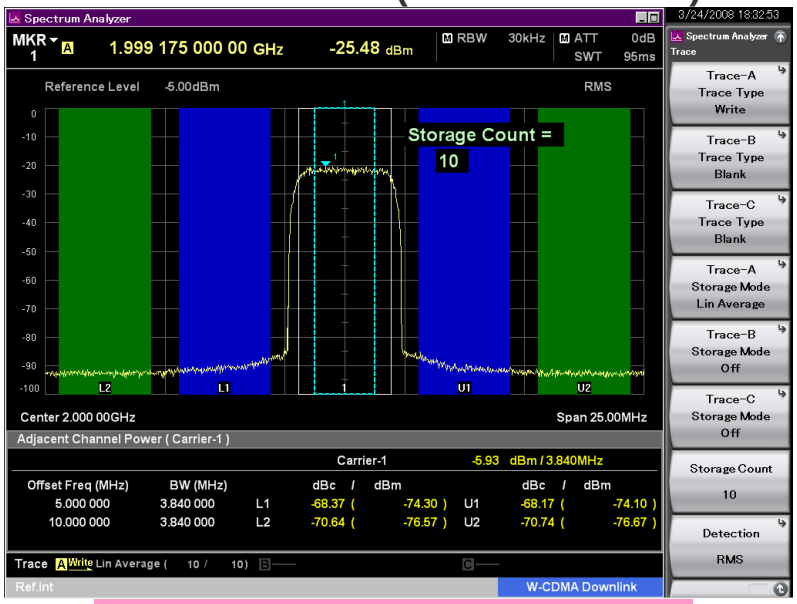
The wideband 120 MHz vector modulation bandwidth is achieved using a built-in baseband signal generator.

SG Performance: ACLR Performance

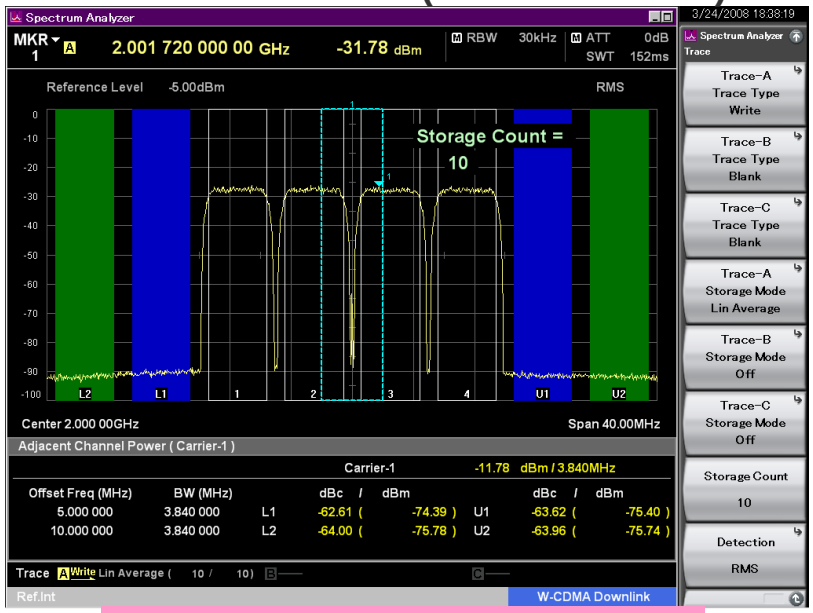
♦Superior ACLR Performance

The superior ACLR performance is useful for device Tx tests of amplifiers, etc. The MX269904A Multi-Carrier IQproducer software generates multiple carrier waveform patterns.

1 Carrier ACLR (measured value)



4 Carrier ACLR (measured value)



5 MHz –68.37 dBc*
10 MHz –70.64 dBc*

5 MHz –62.61 dBc*
10 MHz –64.00 dBc*

(W-CDMA, TestModel1 64DPCH, 2 GHz, SG output -5 dBm)

*:The value is only example data selected at random, and is not the guaranteed performance.

SG Function: AWGN

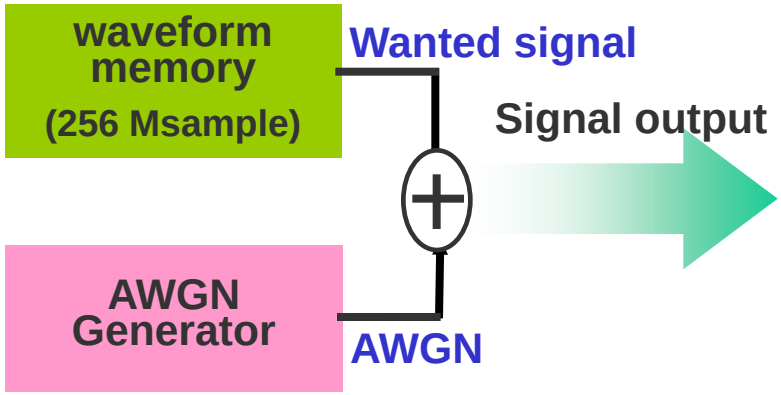
♦Built-in AWGN Generator for Dynamic Range Tests

This can add AWGN (Additive White Gaussian Noise) to the wanted wave in arbitrary waveform memory. It is useful for Tx dynamic range tests.

AWGN band set automatically to sampling clock of wanted signal
Example: Wanted signal conditions:
- WCDMA
- Bandwidth = 3.84 MHz
- Oversampling = 4 times

AWGN bandwidth
= 3.84 MHz × 4
= 15.36 MHz

MS269xA-020
Vector Signal Generator

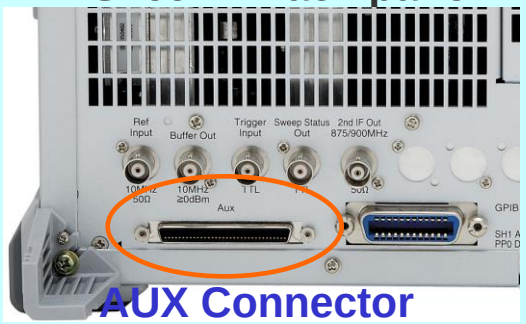


SG Function: Built-in BER Measuring Instrument (option)

♦Built-in BER Measurement for Rx Characteristic Evaluation

Adding the MS269xA-020 Vector Signal Generator option includes a built-in BER measuring instrument 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.

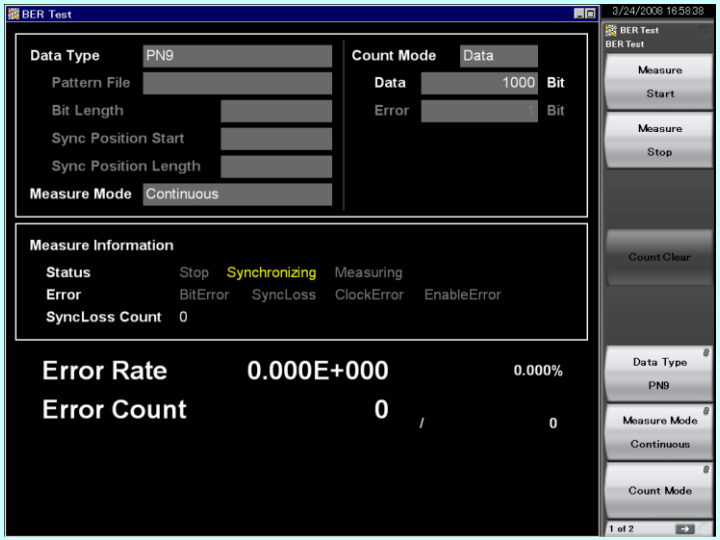
MS269xA Back panel



AUX Connector

J1373A AUX Adapter (AUX ⇒ BNC)

BER Measurement Screen



MS269xA

Data
Clock
Enable

Error Rate Measurement

Input Bit Rate
(1 kbps to 10 Mbps)

DUT

Waveform output

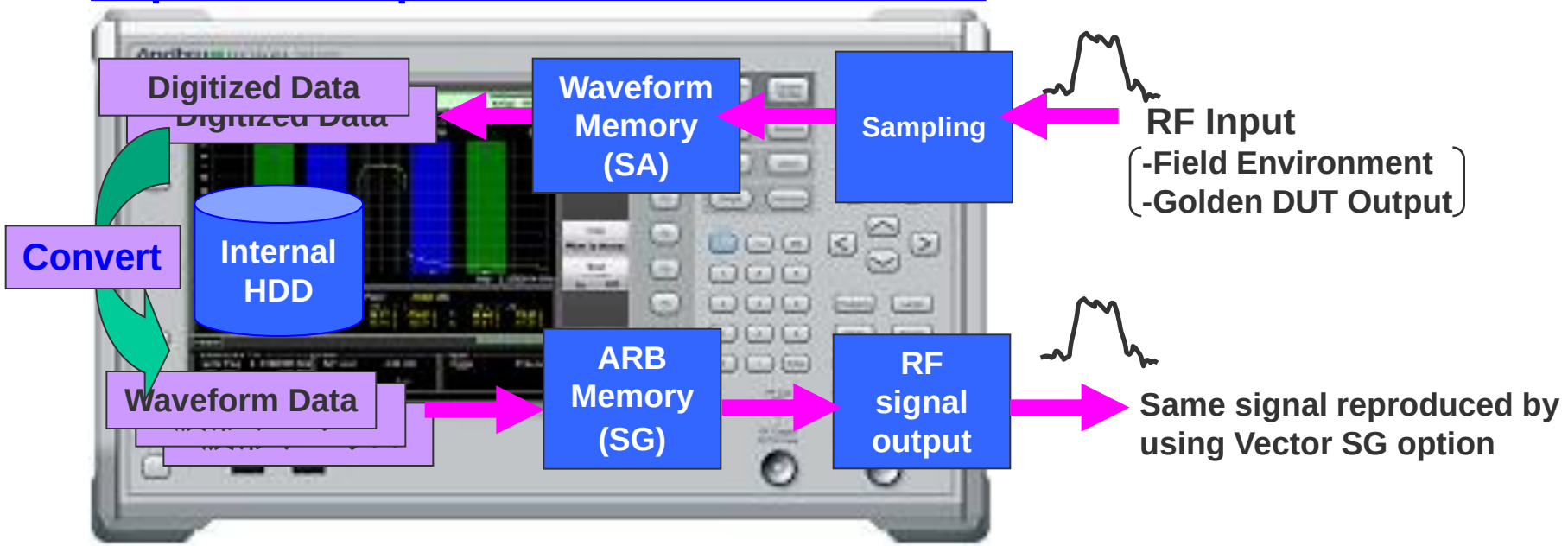
Merits of All-in-One SA+SG (1/3) Easy reproduction of field environment

Digitizer Function + Vector SG Option

Captured waveforms are converted to Vector SG waveform patterns using the built-in PC software. These patterns are read by the vector signal generator to replay the signal.

The field environment is easily reproduced at the bench top to use captured device signals with a stable golden DUT for debugging and higher reliability testing.

Reproduce captured waveforms from SG

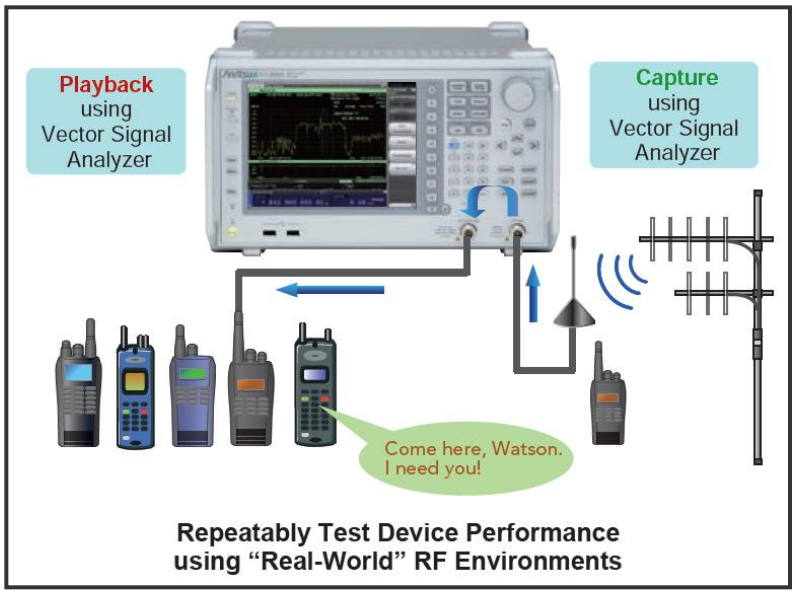


Merits of All-in-One SA+SG (2/3) Easy reproduction of field environment

Digitizer Function + Vector SG Option

Capture & Playback Function

The MS269xA provides *Capture & Playback* functionality that enables laboratory-grade testing of transceiver systems using real world signals. Using the optional integrated Vector Signal Analyzer and Vector Signal Generator of the MS269xA, *Capture & Playback* allows users to conveniently capture up to 100 MHz of spectrum and play it back at any designated frequency and amplitude, making it easy to determine device performance margins.



Repeatably Test Device Performance
using "Real-World" RF Environments

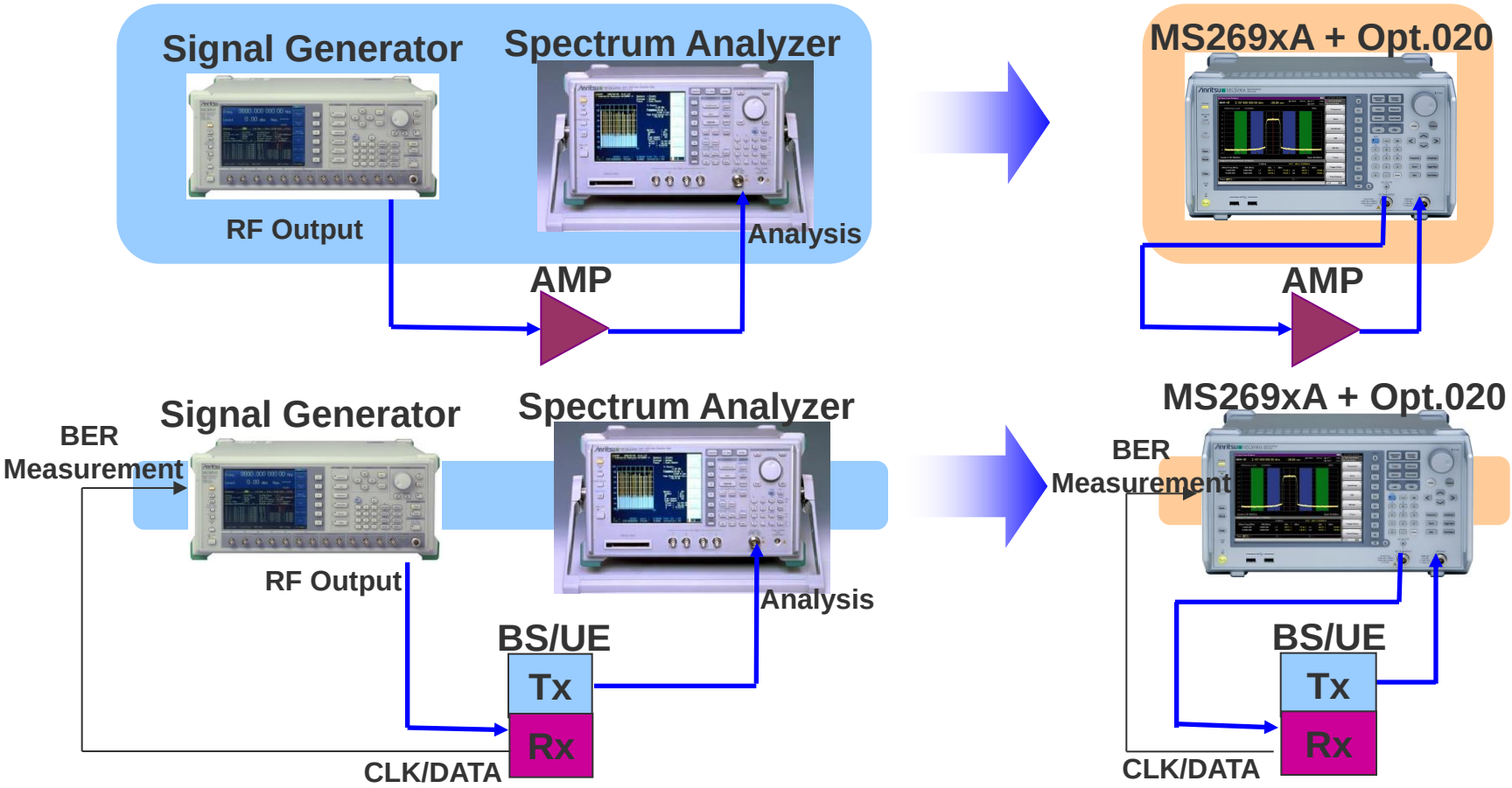
- Bandwidth and Time Limits
  Minimum 10 kHz Bandwidth (2000 s maximum duration)*
  Maximum 100 MHz Bandwidth (500 ms maximum duration)*
  *: Maximum bandwidth depends upon vector signal analyzer options installed (Standard analysis bandwidth or Opt. 077/078).

- Captured signal may be freely tuned to any output frequency and amplitude supported by the vector signal generator.

- Any section of the captured waveform record may be selected and played back.
  - ✓ Enables user to isolate and reproduce specific signal bursts
  - ✓ Enables user to change duty cycle of pulsed waveforms

Merits of All-in-One SA+SG (3/3) Reduced Equipment Investment

The spectrum analyzer and signal generator in one main frame support easy configuration of measurement systems and save bench space, initial equipment investment, and running costs (calibration, management, and power consumption).



Software Download Service

Software download service

This service, which provides updated versions of firmware and software for downloading by product customers, is available on Anritsu's website.

Download software list

Firmware / Software	Contents	Available version
MS269xA Software Installer	**MX269000A Standard Software** This software is installed as standard when shipping the main frame. Spectrum Analyzer function, Signal Analyzer function, etc. **MX2690xxA series Measurement Software** Measurement software for various communication systems.	The latest version is available on the website.
MX370100A IQproducer Installer	**MX2699xxA series IQproducer** PC application software used for generating waveform pattern for various communication systems	The latest version is available on the website.
Standard waveform patterns	**MX269099A Standard waveform pattern** This waveform pattern is installed as standard when shipping the MS269xA-020. The latest version is installed when shipping.	Only the updated waveform pattern is available on the website.

User registration is required for using the software download service.

User registration can be performed on the Anritsu website:

https://my.anritsu.com/home

Anritsu

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