

# MS2830A

## Signal Analyzer

MS2830A-040: 9 kHz to 3.6 GHz\*

MS2830A-041: 9 kHz to 6 GHz\*

MS2830A-043: 9 kHz to 13.5 GHz\*

MS2830A-044: 9 kHz to 26.5 GHz

MS2830A-045: 9 kHz to 43 GHz



\*: See MS2830A-040/041/043 catalog

The MS2830A-044/045 Signal Analyzer includes a spectrum analyzer function for measuring up to 110 GHz using an external mixer based on the 26.5 GHz/43 GHz upper frequency limit. It supports measurements of Tx characteristics, including adjacent channel leakage power, spectrum mask, and frequency counter, as well as spurious measurements requiring a wide dynamic range. Installing the bandwidth analysis option up to 125 MHz adds signal analyzer functions for checking phenomena that are hard to check using a spectrum analyzer, such as frequency vs. time, phase vs. time, spectrogram, and CCDF. In addition, optional measurement software supports modulation analysis. Moreover, installing a preselector bypass option enables use of the signal analyzer and modulation analysis functions up to 26.5 GHz/43 GHz (MS2830A-044/045). Finally, it can be customized to support a range of application-specific measurements.

- Installing a microwave-band preamp supports measurement of weaker signals.
- Using the 1st local signal output as an external mixer supports measurement of high-frequency signals up to 110 GHz.
- Using the 1st IF signal output as a down converter supports analysis in combination with external equipment.

Frequency option	MS2830A-040*1	MS2830A-041*1	MS2830A-043*1	MS2830A-044	MS2830A-045
Frequency range	9 kHz to 3.6 GHz	9 kHz to 6 GHz	9 kHz to 13.5 GHz	9 kHz to 26.5 GHz	9 kHz to 43 GHz
Aging rate	$\pm 1 \times 10^{-7}$ /day (Standard) $\pm 1 \times 10^{-8}$ /day (Opt. 002) $\pm 1 \times 10^{-10}$ /month (Opt. 001)			$\pm 1 \times 10^{-8}$ /day (Standard) $\pm 1 \times 10^{-10}$ /month (Opt. 001)	
Start time/Characteristics	5 minutes, $\pm 5 \times 10^{-7}$ (Standard) 5 minutes, $\pm 5 \times 10^{-8}$ (Opt. 002) 7 minutes, $\pm 1 \times 10^{-9}$ (Opt. 001)			5 minutes, $\pm 5 \times 10^{-8}$ (Standard) 7 minutes, $\pm 1 \times 10^{-9}$ (Opt. 001)	
Phase noise	Frequency: 500 MHz, Spectrum Analyzer mode				
1 kHz offset	-109 dBc/Hz (Opt. 066)			—	
10 kHz offset	-118 dBc/Hz (Opt. 066)			—	
100 kHz offset	-115 dBc/Hz (Standard)			-115 dBc/Hz (Standard)	
1 MHz offset	-133 dBc/Hz (Standard)			-133 dBc/Hz (Standard)	
	-148 dBc/Hz (Opt. 066), nominal				
Displayed average noise level (DANL)	Spectrum Analyzer mode without options				
Frequency: 500 MHz	—			-153 dBm/Hz	
Frequency: 2 GHz	-151 dBm/Hz			-150 dBm/Hz	
Frequency: 5 GHz	-146 dBm/Hz			-144 dBm/Hz	
Frequency: 12 GHz	-142 dBm/Hz			-151 dBm/Hz	
Frequency: 25 GHz	—			-146 dBm/Hz	
Frequency: 40 GHz	—			-144 dBm/Hz	
Attenuator range/step	0 to 60 dB/2 dB step				0 to 60 dB/10 dB step
Total absolute amplitude accuracy	Unlike normal Total Level Accuracy, this includes frequency characteristics, attenuator switching error and linearity error. Since it gives an instinctive impression of measurement instrument error, it lowers the risk of measurement errors.				
Frequency: 500 MHz, 2 GHz	±0.5 dB				
Frequency: 5 GHz, 12 GHz	±1.8 dB				
Frequency: 25 GHz	—				±3.0 dB
Frequency: 40 GHz	—				±3.0 dB
Resolution bandwidth	1 Hz to 3 MHz (1-3 sequence), 5, 10, 20*8, 31.25 MHz*8, 50 kHz [Spectrum Analyzer mode]				
Analysis bandwidth	10 MHz (Opt. 006) 31.25 MHz (Opt. 005) 62.5 MHz (Opt. 077)*9 125 MHz (Opt. 078)*9			10 MHz (Opt. 006) 31.25 MHz (Opt. 009) 62.5 MHz (Opt. 077)*9 125 MHz (Opt. 078)*9	
Additional functions					
Vector signal generator	✓ (Opt. 020/021)			—	
Low phase noise performance*2	✓ (Opt. 066)			—	
Phase noise measurement function	—			✓ (Opt. 010)	
Noise figure measurement function	—			✓ (Opt. 017)	
BER measurement function	—			✓ (Opt. 026)	
Preamplifier*3	—			✓ (Opt. 008)	
Microwave preamplifier*4	—			✓ (Opt. 068)	
Microwave preselector bypass*5	—			✓ (Opt. 067)	
External mixer 1st local signal output*6	—			✓ (Standard)	
1st IF signal output*7	—			✓ (Standard)	

\*1: See catalog for MS2830A-040/041/043.

\*2: Phase noise improved for <3.6 GHz.

\*3: Frequency range: 100 kHz to 3.6 GHz (MS2830A-040)  
100 kHz to 6 GHz (excluding MS2830A-040)

\*4: Frequency range: 100 kHz to 26.5 GHz (MS2830A-044),  
100 kHz to 43 GHz (MS2830A-045)

\*5: Frequency range: 4 GHz to 26.5 GHz (MS2830A-044),  
4 GHz to 43 GHz (MS2830A-045)

\*6: Connector: SMA-J, 50Ω, Local signal: 5 GHz to 10 GHz

\*7: Connector: SMA-J, 50Ω, Frequency: 1875 MHz

\*8: Can be set when with MS2830A-005. Can not be set when with MS2830A-009.

\*9: Signal Analyzer Mode Frequency Setting Range

With Opt. 077/078, With Opt. 067, >31.25 MHz bandwidth

300 MHz to 26.5 GHz [MS2830A-044]

300 MHz to 43 GHz [MS2830A-045]

With Opt. 077/078, Without Opt. 067, >31.25 MHz bandwidth

300 MHz to 3.6 GHz [MS2830A-040]

300 MHz to 6 GHz [MS2830A-041]

300 MHz to 13.5 GHz [MS2830A-043]

300 MHz to 6 GHz [MS2830A-044]

300 MHz to 6 GHz [MS2830A-045]

### Eco-friendly

Anritsu uses two eco product marks indicating environment-friendly products as follows:

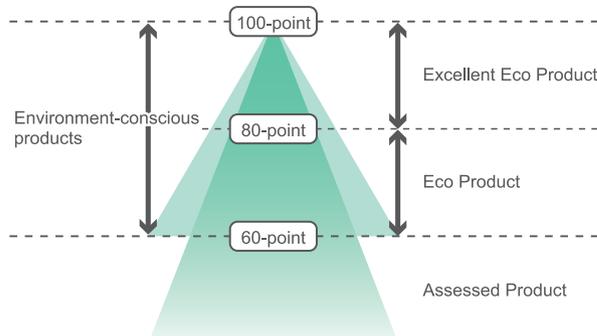
Excellent eco product:

80+ score and satisfies excellent eco product requirements

Eco product:

60+ score and satisfies eco product requirements

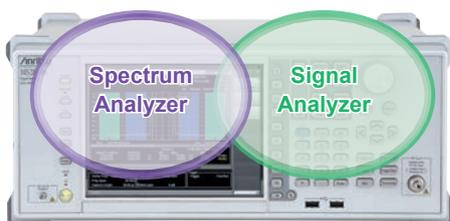
Resource saving/reduction of manufacturing load  
Reduction of toxins  
Reduction of logistics load  
Reduction of usage load  
Reduction of disposal load



# Key Features

## Basic Performance/Functions

- **Frequency Range**  
MS2830A-044: 9 kHz to 26.5 GHz  
MS2830A-045: 9 kHz to 43 GHz
- **Measures up to 110 GHz using External Mixer**  
Frequency Range: 26.5 GHz to 110 GHz  
Built-in connector to connect external mixer (MS2830A-044/045)
  - Connector: SMA-J, 50  $\Omega$
  - Local Signal Output: 5 GHz to 10 GHz
  - IF Signal Frequency: 1875 MHz
- **Excellent Dynamic Range\*1:**  
159 dB (at 25 GHz)  
TOI\*2:  $\geq +13$  dBm  
DANL\*3:  $-146$  dBm/Hz  
157 dB (nominal, at 40 GHz)  
TOI:  $\geq +13$  dBm nominal  
DANL:  $-144$  dBm/Hz
- **Preamp up to 43 GHz**  
→ Opt. 068/168: Microwave Preamplifier  
DANL\*3:  $-156$  dBm/Hz (at 25 GHz)\*4  
DANL\*3:  $-150$  dBm/Hz (at 40 GHz)\*4
- **Total Level Accuracy:**  
 $\pm 0.5$  dB ( $300 \text{ kHz} \leq f < 4 \text{ GHz}$ )  
 $\pm 3.0$  dB ( $13.8 \text{ GHz} < f \leq 40 \text{ GHz}$ )
- **Used as Wideband Down Converter**  
Built-in IF Output Function (MS2830A-044/045)
  - Connector: SMA-J, 50  $\Omega$
  - IF Output Frequency: 1875 MHz
  - IF Output Bandwidth: 1 GHz (3 dB Bandwidth, nominal)\*5
  - Gain:  $-10$  dB (nominal)
- **Improved Level Linearity**
- **Reference Oscillator**  
Pre-installed Reference Oscillator  
Aging Rate:  $\pm 1 \times 10^{-7}$ /year,  $\pm 1 \times 10^{-8}$ /day  
Start-up Characteristics:  $\pm 5 \times 10^{-8}$  (5 minutes after power-on)  
Rubidium Reference Oscillator (Opt. 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**
  - Channel Power
  - Occupied Bandwidth
  - Adjacent Channel Leakage Power
  - Spectrum Emission Mask\*4
  - Spurious Emission\*4
  - Burst Average Power
  - Frequency Counter\*4
  - AM Depth\*6
  - FM Deviation\*6
  - Multi-marker & Marker List
  - Highest 10 Markers
  - Limit Line\*4
  - 2-tone 3rd-order Intermodulation Distortion\*4
  - Power Meter\*7
  - Phase Noise\*8
  - Noise Figure\*9
- **Low-power Consumption**  
MS2830A-044/045: 190 VA (nominal)



## Signal Analyzer Functions

- **Analysis Bandwidth**  
Opt. 006: 10 MHz max.  
(20 MHz max. sampling rate = 50 ns resolution, ADC resolution 16 bits)  
Opt. 005\*10, Opt. 009\*11: 31.25 MHz max.  
(50 MHz max. sampling rate = 20 ns resolution, ADC resolution 16 bits)  
Opt. 077\*12: 62.5 MHz max.  
(100 MHz max. sampling rate = 10 ns resolution, ADC resolution 14 bits)  
Opt. 078\*13: 125 MHz max.  
(200 MHz max. sampling rate = 5 ns resolution, ADC resolution 14 bits)  
Note: An image response is received when setting the bandwidth to more than 31.25 MHz. This can be used when not inputting a signal frequency outside the MS2830A analysis bandwidth (125 MHz max.). The MS2690A/91A/92A Signal Analyzer series is recommended for other measurement purposes.
- **Capture Function**  
Saves analysis Span  $\times$  Time signal to internal memory and writes to hard disk. Up to 100 Msamples per measurement saved to internal memory.  
Example: Span 1 MHz: Max. capture time 50 s  
Span 10 MHz: Max. capture time 5 s  
Span 100 MHz: Max. capture time 0.5 s
- **Replay Function**  
Reads saved data and replays using signal analyzer function.  
Example:
  1. Data sharing between R&D and manufacturing
  2. Later laboratory bench-top analysis of on-site signals
- **Measurement with Sub-trace Display**  
Split screen displaying 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 43 GHz**  
→ Opt. 067: Microwave Preselector Bypass  
→ Opt. 078\*13: Analysis Bandwidth Extension to 125 MHz  
Bypassing preselector improves RF frequency characteristics and in-band frequency characteristics. Supports modulation analysis and signal analyzer measurements for signals up to 43 GHz.

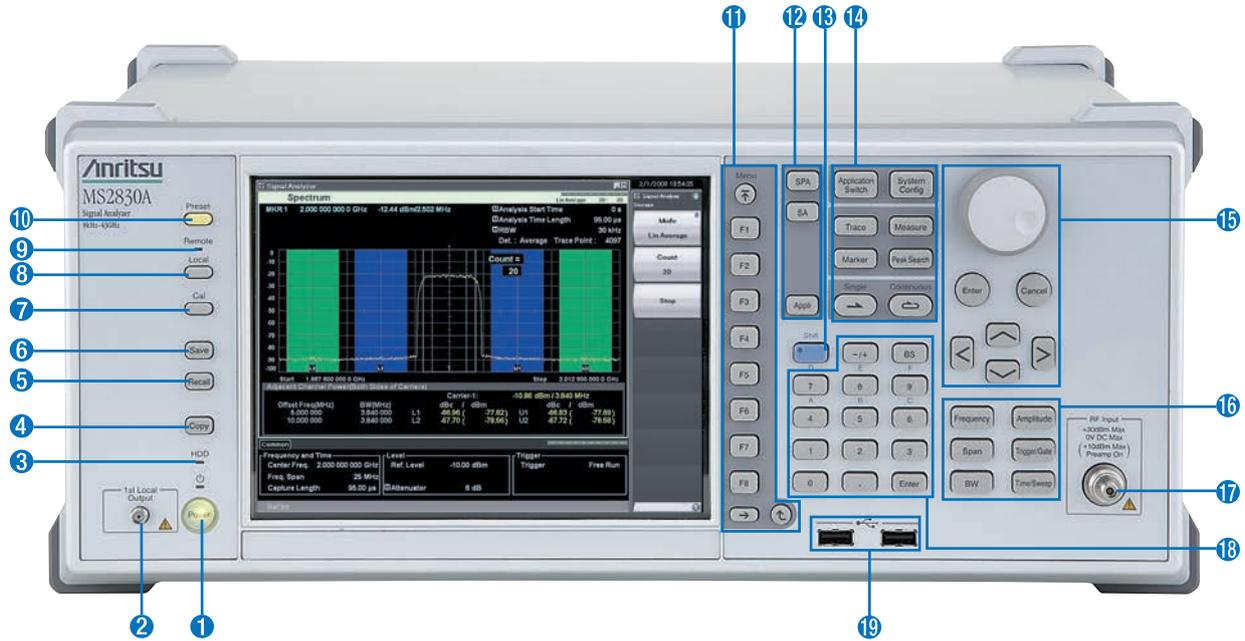
## BER Measurement Function (Opt. 026)

This option measures BER using Data/Clock/Enable demodulated at the DUT.

Input Bit Rate: 100 bps to 10 Mbps  
Input Level: TTL Level

- \*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: When using external mixer bands, or using internal micro frequency bands (Band; 3 to 9) with Microwave Preselector Bypass option: On
- \*6: Signal Analyzer functions (requires Opt. 005/006/009/077/078)
- \*7: Power Meter Function (use USB power sensors)
- \*8: Phase Noise Measurement Function (requires Opt. 010)
- \*9: Noise Figure Measurement Function (Requires Opt. 017)  
[Use Noise Sources (Noisecom, NC346 series)]
- \*10: Opt. 005 can be installed in MS2830A-044. Requires Opt. 006.
- \*11: Opt. 009 can be installed in MS2830A-045. Requires Opt. 006.  
Cannot be set the RBW to more than 10 MHz in spectrum analyzer function.
- \*12: Requires Opt. 006 and Opt. 005 (for MS2830A-044).  
Requires Opt. 006 and Opt. 009 (for MS2830A-045).
- \*13: Requires Opt. 006, Opt. 005 and Opt. 077 (for MS2830A-044).  
Requires Opt. 006, Opt. 009 and Opt. 077 (for MS2830A-045).

# Panel Layout



## 1 Power switch

Press to switch between the standby state in which AC power is supplied and the Power On state in which the MS2830A is under operation. The Power lamp  lights up orange in the standby state, and lights up green in the Power On state. Press the power switch for a reasonably long duration (for about two seconds).

## 2 1st Local Output connector

Installed in main frame with MS2830A-044/045 and supplies local signal and bias current to external mixer, and receives frequency-converted IF signals

## 3 HDD lamp

Lights up when the MS2830A internal hard disk is being accessed.

## 4 Copy key

Press to capture a screen image from the display and save it to a file.

## 5 Recall key

Press to recall a parameter file.

## 6 Save key

Press to save a parameter file.

## 7 Cal key

Press to display the calibration execution menu.

## 8 Local key

Press to return to local operation from remote control operation through GPIB, Ethernet or USB (B), and enable panel settings.

## 9 Remote lamp

Lights up when the MS2830A is in a remote control state.

## 10 Preset key

Resets parameters to their initial settings.

## 11 Function keys

Used for selecting or executing function menu displayed on the right of the screen. The function menu contents are provided in multiple pages and layers.

## 12 Application key

Press to switch between applications.

## 13 Shift key

Used to operate any keys with functions described in blue characters on the panel. First press the Shift key, then press the target key when the Shift key lamp lights up green.

## 14 Main function keys 2

Used to set or execute main functions of the MS2830A. Executable functions vary depending on the application currently selected.

## 15 Rotary knob/Cursor keys/Enter key/Cancel key

The rotary knob and cursor keys are used to select display items or change settings.

## 16 Main function keys 1

Used to set or execute main functions of the MS2830A. Executable functions vary depending on the application currently selected.

## 17 RF Input connector

Inputs an RF signal.

N-J, 50  $\Omega$  (MS2830A-044)

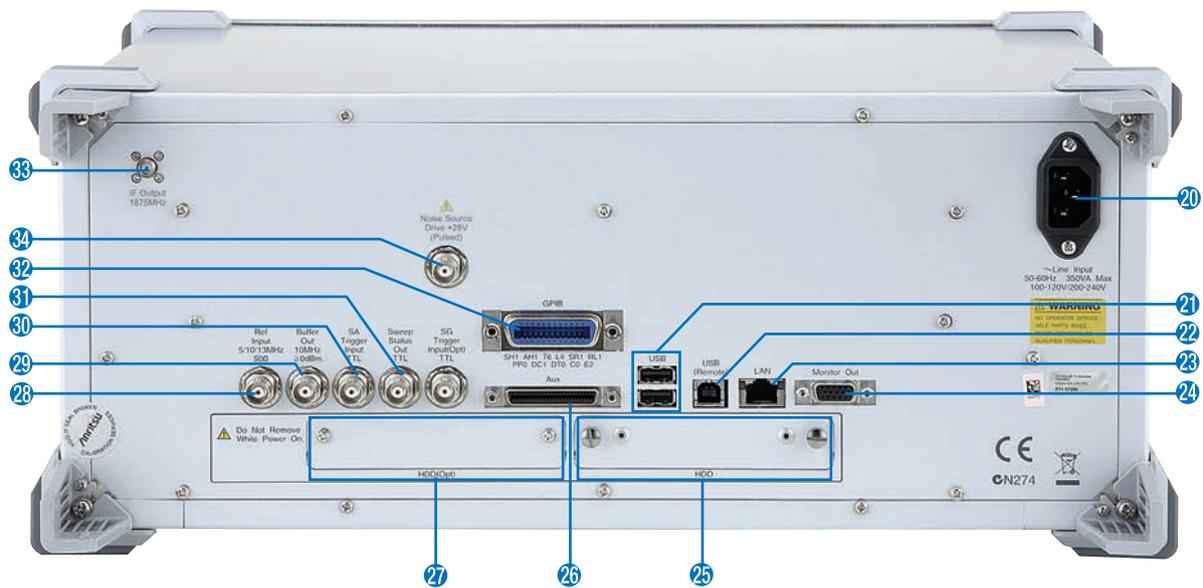
K-J, 50  $\Omega$  (MS2830A-045)

## 18 Numeric keypad

Used to enter numbers on parameter setup screens.

## 19 USB connector (type A)

Used to connect a USB keyboard or mouse or the USB memory supplied with the MS2830A.



- 20 AC inlet**  
Used for supplying power.
- 21 USB connectors (type A)**  
Used to connect a USB keyboard or mouse or the USB memory supplied with the MS2830A.
- 22 USB connector (type B)**  
Used when controlling the MS2830A externally via USB.
- 23 LAN (Ethernet) connector**  
Used for connecting to a personal computer or for Ethernet connection.
- 24 Monitor Out connector**  
Used for connection with an external display.
- 25 HDD slot**  
This is a hard disk slot.
- 26 Aux connector (For MS2830A-026)**  
Composite connector for BER measurement function options with BER measurement Clock, Data, and Enable inputs. Converted to BNC using AUX Conversion Adaptor\*.  
\*: The J1556A Aux Conversion Adapter is a standard accessory supplied with the Opt. 026 BER Measurement Function.
- 27 HDD slot for options**  
This is a hard disk slot for the options.
- 28 Ref Input connector (reference frequency signal input connector)**  
Inputs an external reference frequency signal (5/10/13 MHz). It is used for inputting reference frequency signals with accuracy higher than that of those inside the MS2830A, or for synchronizing the frequency of the MS2830A to that of other device.
- 29 Buffer Out connector (reference frequency signal output connector)**  
Outputs the reference frequency signal (10 MHz) generated inside the MS2830A. It is used for synchronizing the frequencies between other devices and the MS2830A based on the reference frequency signal output from this connector.
- 30 SA Trigger Input connector**  
This is a BNC connector used to input the external trigger signal (TTL) for the Spectrum Analyzer or Signal Analyzer application.
- 31 Sweep Status Out connector**  
Outputs a signal that is enabled when an internal measurement is performed or measurement data is obtained.
- 32 GPIB connector**  
Used when controlling the MS2830A externally via GPIB.
- 33 IF Output connector**  
Installed in main frame with MS2830A-044/045 to monitor output of internal IF signal  
Connector: SMA-J, 50 Ω  
IF Output Frequency: 1875 MHz
- 34 Noise Source Drive connector**  
This is available when the Option 017/117 is installed. Supply (+28 V) of the Noise Source Drive.

# Basic Performance

## Dynamic Range

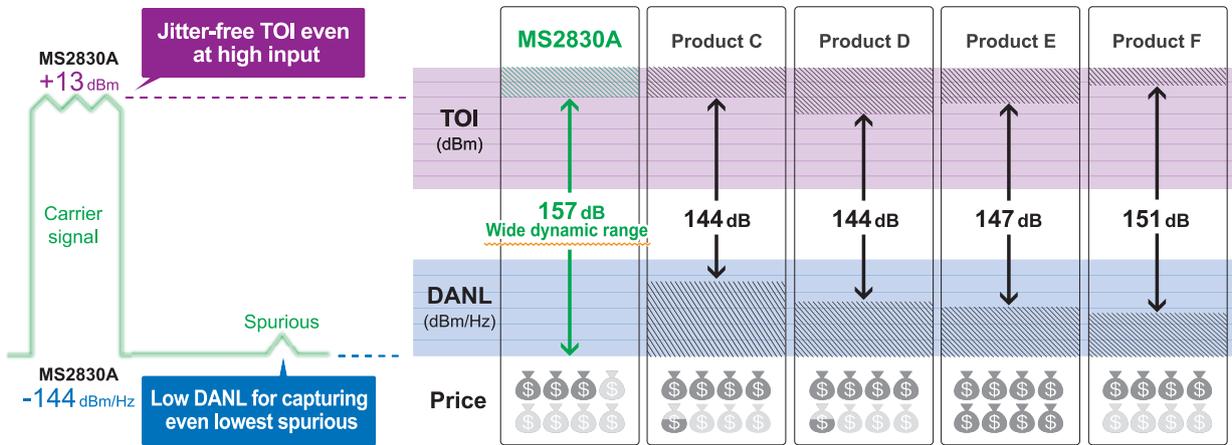
Dynamic Range\*<sup>1</sup>: 159 dB (at 25 GHz)  
 TOI\*<sup>2</sup>:  $\geq +13$  dBm (6 GHz < f  $\leq$  26.5 GHz)  
 DANL\*<sup>3</sup>:  $-146$  dBm/Hz (18.3 GHz < f  $\leq$  34 GHz)  
 Dynamic Range: 157 dB (nominal, at 40 GHz)  
 TOI:  $\geq +13$  dBm (nominal, 26.5 GHz < f  $\leq$  40 GHz)  
 DANL:  $-144$  dBm/Hz (34 GHz < f  $\leq$  40 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.

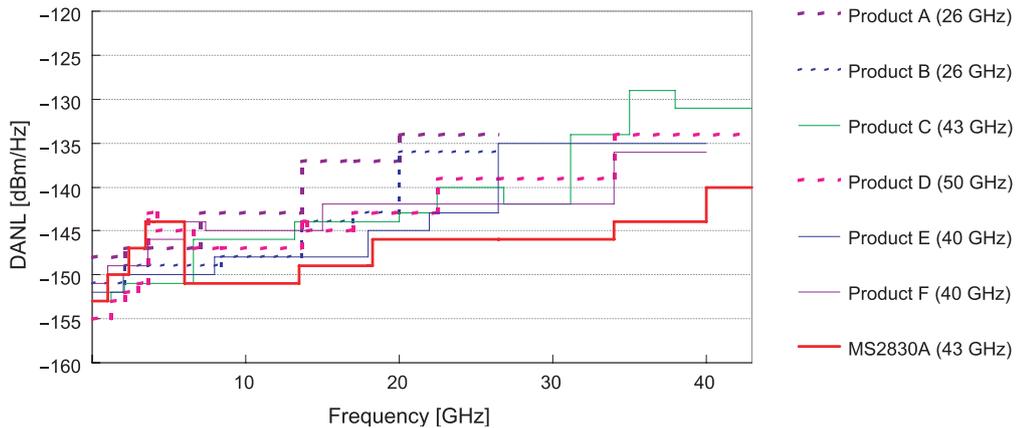
The MS2830A has an excellent dynamic range supporting true performance measurements of devices, such as base stations, requiring wideband measuring instruments.

Dynamic Range Comparison Image (at 40 GHz)



DANL Comparison

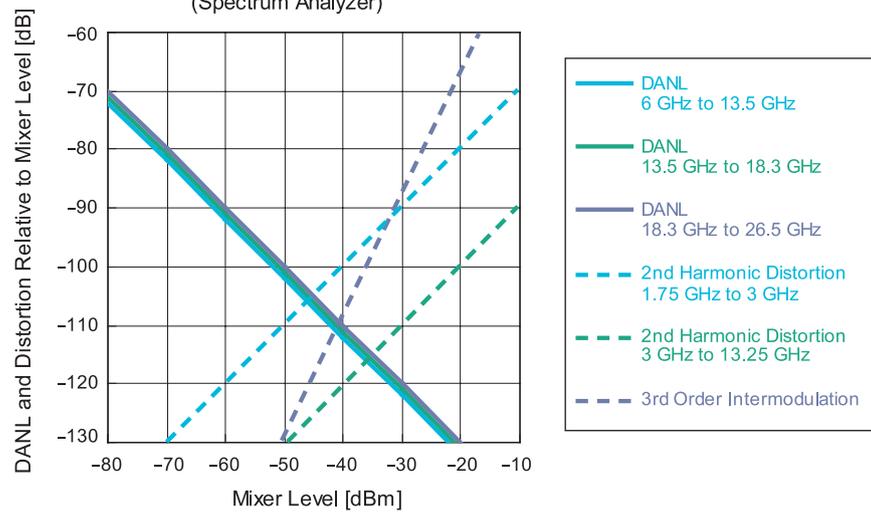
With Preamp, without Preselector bypass



# Basic Performance

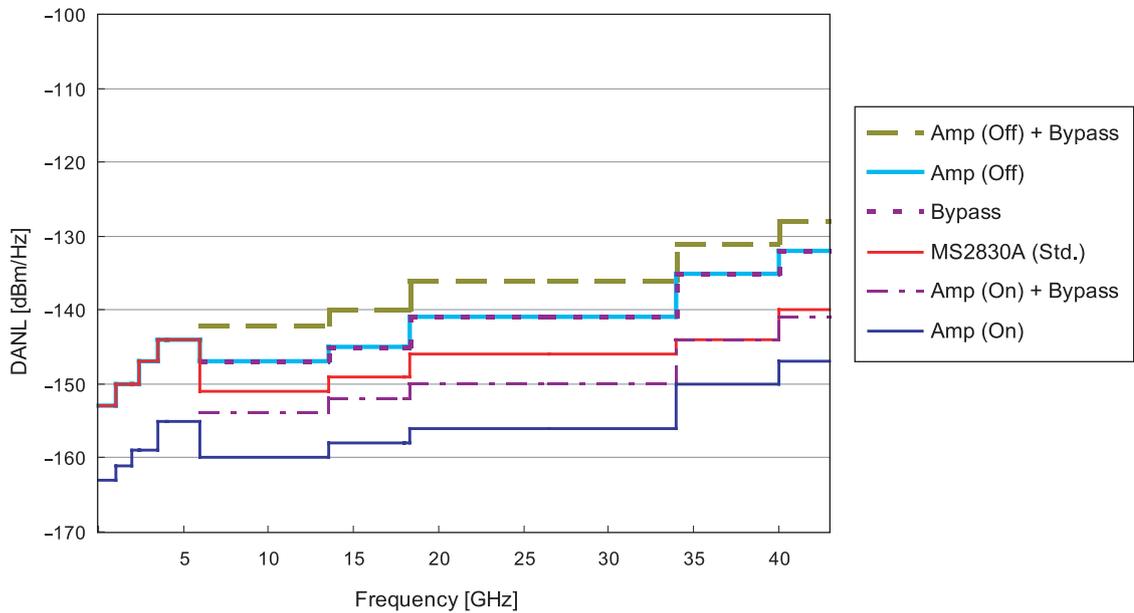
## Distortion Characteristics (Spectrum Analyzer)

Distortion Characteristics at Microwave band  
MS2830A-044  
(Spectrum Analyzer)



## DANL (MS2830A-045)

Amp (Preamplifier: Opt. 068), Bypass (Preselector Bypass: Opt. 067/009)



# Basic Performance

## Total Level Accuracy

$\pm 0.5$  dB ( $300 \text{ kHz} \leq f < 4 \text{ GHz}$ )

$\pm 1.8$  dB ( $4 \text{ GHz} \leq f \leq 13.8 \text{ GHz}$ )

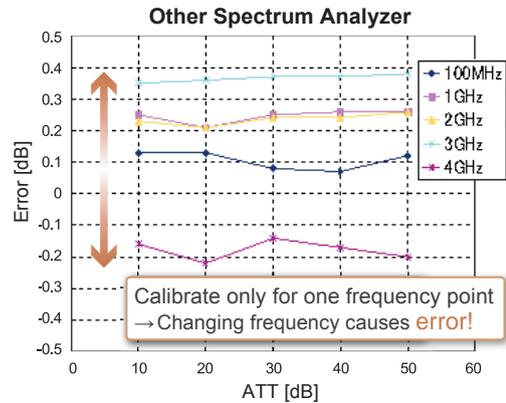
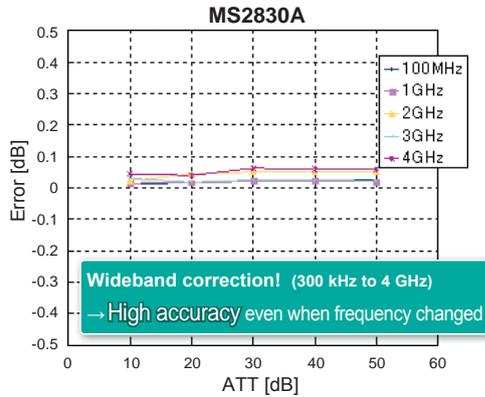
$\pm 3.0$  dB ( $13.8 \text{ GHz} < f \leq 40 \text{ GHz}$ )

The absolute level accuracy in most spectrum analyzer catalogs does not include frequency characteristics, linearity, and attenuator switching error.

However, the MS2830A Total Level Accuracy in the catalog includes the above three errors.

Even when changing the frequency and attenuator, stable measurement is assured in the specified error range.

### Example: Level Error Comparison with Different Level Calibration Method



The MS2830A total level accuracy includes:

- Frequency characteristics
- Linearity
- Attenuator switching error

The absolute amplitude accuracy specifications of other spectrum analyzers excludes:

- Frequency characteristics
- Linearity
- Attenuator switching error

# Basic Performance

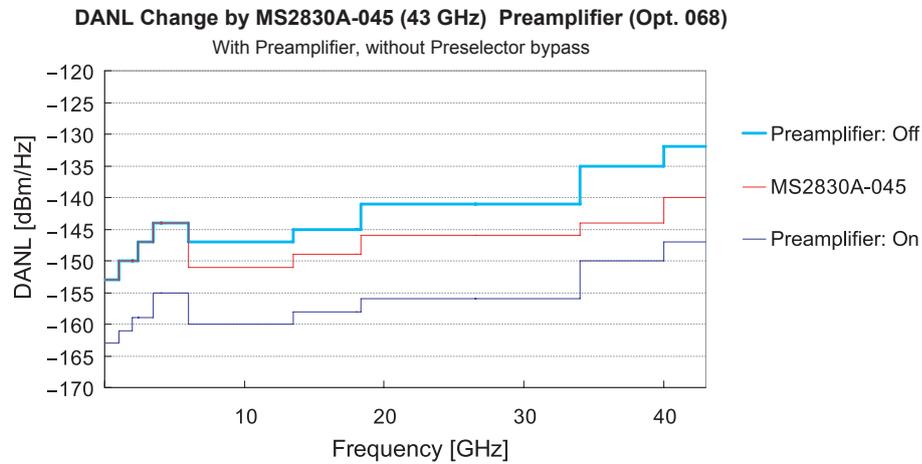
## Preamp up to 43 GHz: Opt. 068 Microwave Preamplifier

**DANL: -156 dBm/Hz (at 25 GHz)**  
**-150 dBm/Hz (at 40 GHz)**

Installing the Microwave Preamp (Opt. 068) amplifies signals before the mixer to improve the spectrum analyzer and signal analyzer sensitivity. This is recommended when measuring low-level signals, such as noise and interference signals.

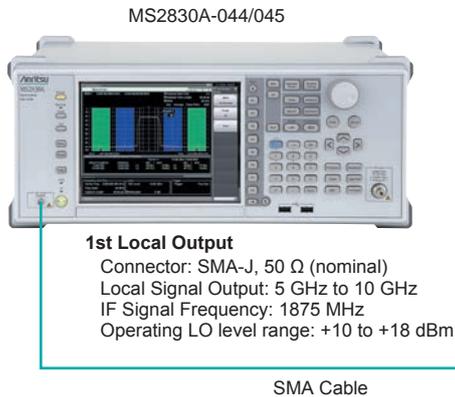
Frequency range: 100 kHz to 26.5 GHz (MS2830A-044)  
 100 kHz to 43 GHz (MS2830A-045)

\*: Simultaneous installation with Opt. 008 not supported



## Measures up to 110 GHz using External Mixer

The MA2740A series of external mixers supports spectrum measurements up to 110 GHz with high-sensitivity and less Lo-order harmonics because output of local signals from 5 GHz to 10 GHz is supported.



### External mixer (MA2740A Series)

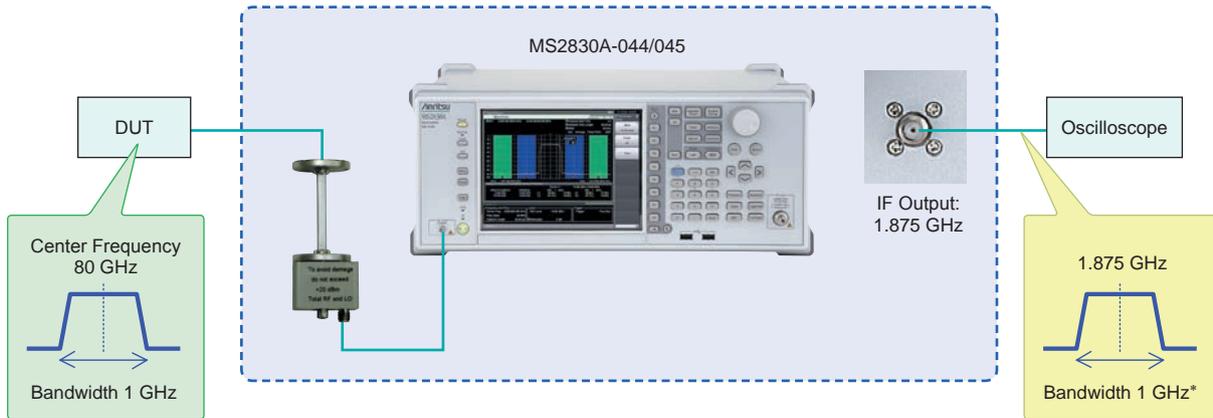
Model Name	Frequency Range	LO Order Harmonics
MA2740A	18 GHz to 26.5 GHz	3
MA2741A	26.5 GHz to 40 GHz	4
MA2742A	33 GHz to 50 GHz	5
MA2743A	40 GHz to 60 GHz	6
MA2744A	50 GHz to 75 GHz	8
MA2745A	60 GHz to 90 GHz	9
MA2746A	75 GHz to 110 GHz	11

# Basic Performance

## Used as Wideband Down Converter: IF Output Frequency 1.875 GHz

Since IF Out supports a high frequency of 1.875 GHz, 1 GHz\* wideband signals can be down converted. This can be used for down converting when performing modulation analysis by digitizing with an oscilloscope, etc.

Measurement image: Down convert signals with 80 GHz center frequency and 1 GHz\* bandwidth to 1.875 GHz



\*: When using external mixer bands, or using internal micro frequency bands (Band; 3 to 9) with Microwave Preselector Bypass option: On

## Supports 125 MHz Wideband Measurements up to 43 GHz

### Opt. 067 Microwave Preselector Bypass + Opt. 078\* Analysis Bandwidth Extension to 125 MHz

\*: Requires Opt. 006, Opt. 005 and Opt. 077 (for MS2830A-044).  
Requires Opt. 006, Opt. 009 and Opt. 077 (for MS2830A-045).

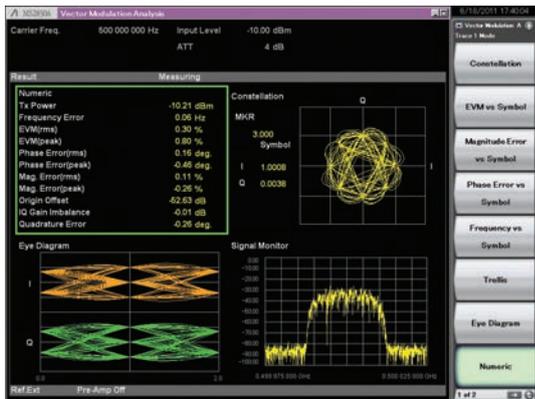
Supports wideband analysis with high frequencies

Frequency range: 4 GHz to 26.5 GHz (MS2830A-044, Frequency band mode: Normal)  
4 GHz to 43 GHz (MS2830A-045, Frequency band mode: Normal)

Installing the Microwave Preselector Bypass supports signal analyzer measurement functions in the above frequency range.

Adding the measurement software permits modulation analysis and is very useful for designing and inspecting high-frequency devices.

### Example: MX269017A Vector Modulation Analysis Software



#### • Modulation method

BPSK, QPSK, O-QPSK,  $\pi/4$  DQPSK, 8PSK, 16QAM, 64QAM, 2FSK, 4FSK, 256QAM\*1

#### • Filter

Nyquist, Root Nyquist, None, Gaussian, ARIB STD-T98, Inverse Rect, Inverse Gaussian, Half-sine, User Defined

#### • Symbol rate (Upper limit depends on analysis bandwidth 10/31.25/62.5/125 MHz)

0.1 k to 2.5 M/6.25 M/12.5 M/25 M symbol/s\*2

0.1 k to 5 M/12.5 M/25 M/50 M symbol/s\*3

0.1 k to 5 M/35 M/70 M/140 M symbol/s\*4

0.1 k to 1.25 M/3.125 M/6.25 M/12.5 M symbol/s\*5

\*1: 256QAM available with Non-Format

\*2: When 2FSK and 4FSK

\*3: When Frame Formatted and xxPSK, xxQAM

\*4: When Non-Formatted and xxPSK, xxQAM

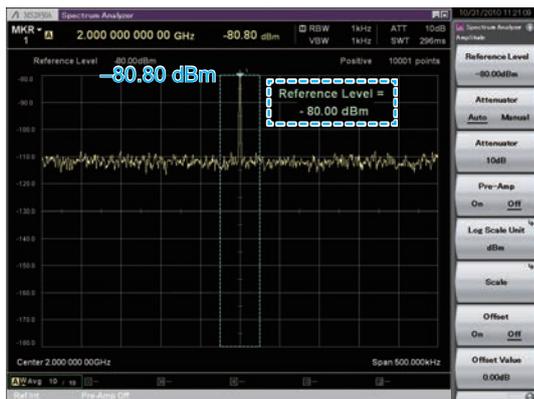
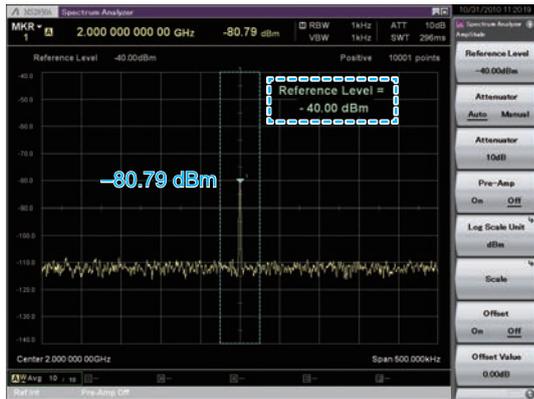
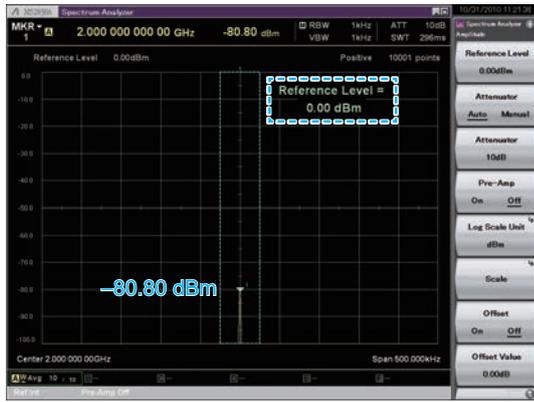
\*5: When O-QPSK

# Basic Performance

## 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 MS2830A uses a digital IF instead of a log amp, which supports measurements with excellent accuracy at any point.

### Example: Level Stability by Switching Reference Level



### Level Linearity

The MS2830A total level accuracy is better than that of conventional spectrum analyzers but sometimes a power meter is used when wanting to measure with even higher accuracy. However, use of a power meter narrows the dynamic range and errors may also occur easily when switching the power range. Since a power meter has no frequency selection, the total power of the input signal is measured. In other words, the power of the target frequency components cannot be separated out. Measurement can be performed with a wide dynamic range after checking the MS2830A level measurement reference value with a power meter.

The MS2830A total level accuracy includes:

- Frequency characteristics
- Linearity
- Attenuator switching error

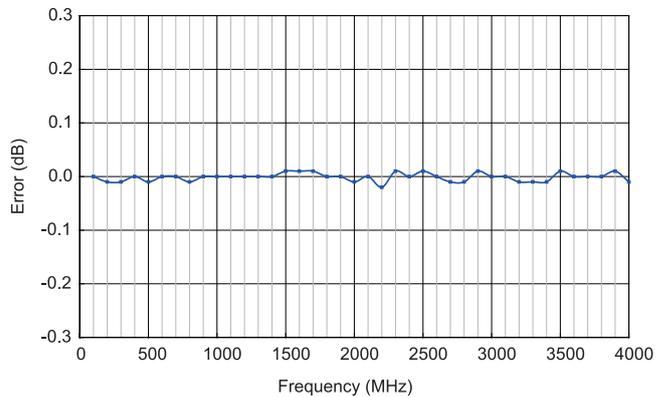
And supports excellent:

- Log scale stability

## Dual Sweep Speed: Normal/Fast

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

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



# Basic Performance

## Low Consumption Power, Excellent Eco Product

The MS2830A meets Anritsu "Excellent eco products" standard for environment-friendly products. It cuts consumed power by 50% compared to conventional models.

### Power Consumption:

- ≤350 VA (including all options)
- 190 VA (nominal, MS2830A-044 only, 26.5 GHz\*1)
- 190 VA (nominal, MS2830A-045 only, 43 GHz\*1)

\*1: Excluding other options

## Resolution Bandwidth (RBW)

### Setting Range

#### Spectrum Analyzer:

- 1 Hz to 3 MHz (1-3 sequence),
- 50 kHz, 5 MHz, 10 MHz, 20 MHz\*2, 31.25 MHz\*2,\*3,
- 200 Hz (6 dB)\*4, 9 kHz (6 dB)\*4, 120 kHz (6 dB)\*4,
- 1 MHz (Impulse)\*4

#### Spectrum trace in signal analyzer mode:

- 1 Hz to 1 MHz (1-3 sequence)\*5
- 1 Hz to 3 MHz (1-3 sequence)\*6
- 1 Hz to 10 MHz (1-3 sequence)\*7

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, set the RBW to 31.25 MHz.

\*2: Can be set when with Opt. 005. Can not be set when with Opt. 009.

\*3: Instead of Gaussian filter, 31.25 MHz RBW uses filter with flat top characteristics above 31.25 MHz.

\*4: When Opt. 016 installed.

\*5: Without Opt. 077/078, or Bandwidth: ≤31.25 MHz

\*6: With Opt. 077, Bandwidth: >31.25 MHz

\*7: With Opt. 078, Bandwidth: >31.25 MHz

## 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
  - Frame trigger
- Setting range and resolution for gate delay
  - Setting range: 0 to 1 s
  - Resolution: 20 ns
- Setting range and resolution for gate length
  - Setting range: 50 μs to 1 s
  - Resolution: 20 ns

## Trigger Function

Trigger sweep executes sweeping using the specified trigger condition as the start point.

- 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 5 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.
- Frame trigger:  
An equipment-internal trigger signal is used to generate a trigger and start the sweep. The generation period (Period) and offset time (Offset) for the trigger signal can be set. It is also possible to resynchronize the trigger signal with either the Wide IF Video signal or an external trigger.

## 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

### Analysis Bandwidth

**Opt. 006: 10 MHz max.**

(20 MHz max. sampling rate = 50 ns resolution, ADC resolution 16 bits)

**Opt. 005\*1, Opt. 009\*2: 31.25 MHz max.**

(50 MHz max. sampling rate = 20 ns resolution, ADC resolution 16 bits)

**Opt. 077\*3: 62.5 MHz max.**

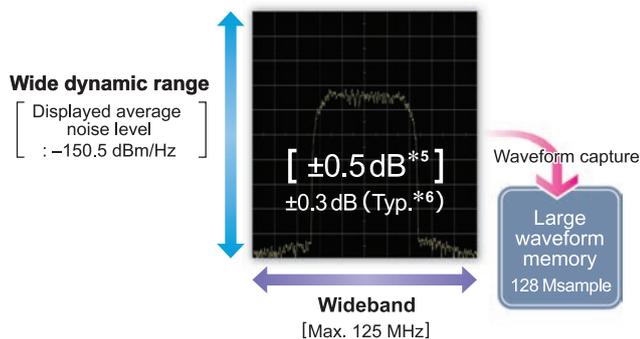
(100 MHz max. sampling rate = 10 ns resolution, ADC resolution 14 bits)

**Opt. 078\*4: 125 MHz max.**

(200 MHz max. sampling rate = 5 ns resolution, ADC resolution 14 bits)

Note: An image response is received when setting the bandwidth to more than 31.25 MHz. This can be used when not inputting a signal frequency outside the MS2830A analysis bandwidth (125 MHz max.). The MS2690A/91A/92A Signal Analyzer series is recommended for other measurement purposes.

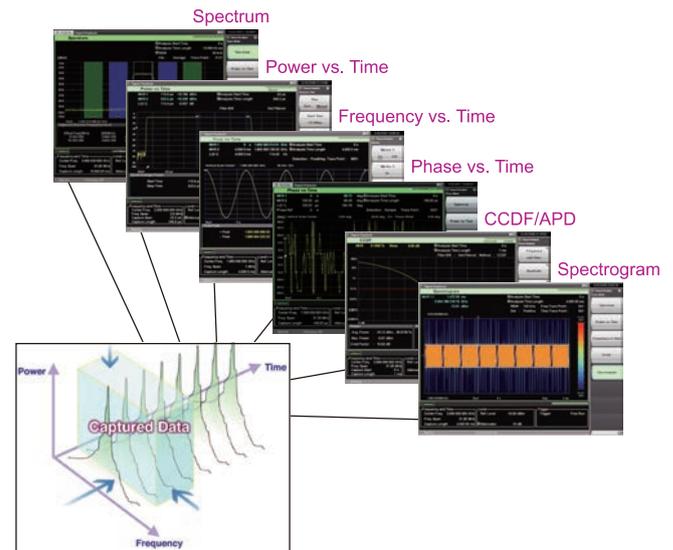
Based on the excellent level accuracy and wide dynamic range of the MS2830A, a signal with an FFT analysis bandwidth of up to 125 MHz can be captured with a level accuracy of  $\pm 0.3$  dB.



- \*1: Opt. 005 can be installed in MS2830A-044. Requires Opt. 006.
- \*2: Opt. 009 can be installed in MS2830A-045. Requires Opt. 006.
- \*3: Requires Opt. 006 and Opt. 005 (for MS2830A-044). Requires Opt. 006 and Opt. 009 (for MS2830A-045).
- \*4: Requires Opt. 006, Opt. 005 and Opt. 077 (for MS2830A-044). Requires Opt. 006, Opt. 009 and Opt. 077 (for MS2830A-045).
- \*5:  $300 \text{ kHz} \leq f < 4 \text{ GHz}$ , Frequency band mode Normal.
- \*6: Excluding Guard Band

## Vector Signal Analysis (VSA) Function

Seamless signal capture and VSA analysis in multiple domains make it easy to evaluate burst-signal responses and capture degraded spectrum transients, etc., which cannot be checked by conventional sweep spectrum analyzers. This greatly improves design verification and troubleshooting efficiency.



# Signal Analyzer: Basic Performance/Functions

## 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 Opt. 006: 1 kHz to 10 MHz  
 With Opt. 005/006 (for MS2830A-044) or  
 Opt. 006/009 (for MS2830A-045): 1 kHz to 31.25 MHz  
 With Opt. 005/006/077 (for MS2830A-044) or  
 Opt. 006/009/077 (for MS2830A-045): 1 kHz to 62.5 MHz  
 With Opt. 005/006/077/078 (for MS2830A-044) or  
 Opt. 006/009/077/078 (for MS2830A-045): 1 kHz to 125 MHz

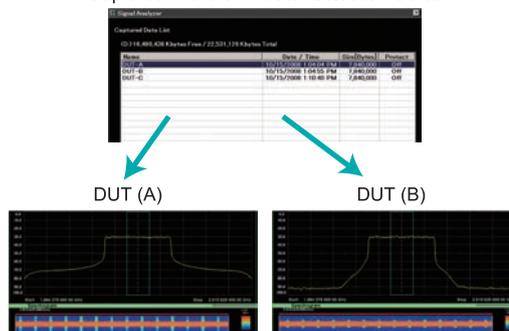
## Replay Function for Comparison Evaluation

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

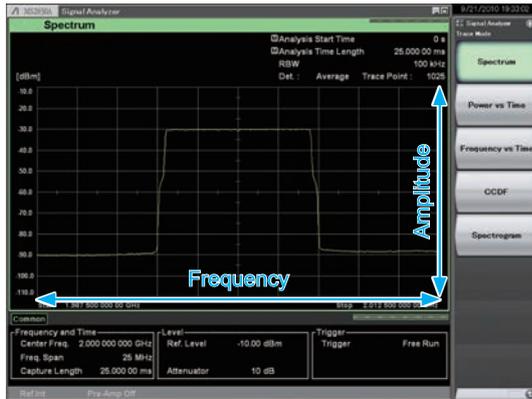
Captured Waveform Data: Selection Screen



# Signal Analyzer: Trace

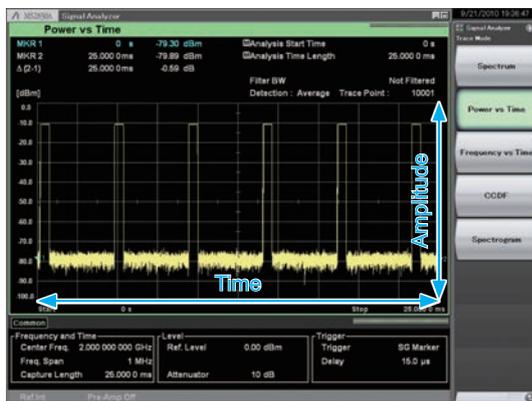
## Spectrum

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 to display as a spectrum.



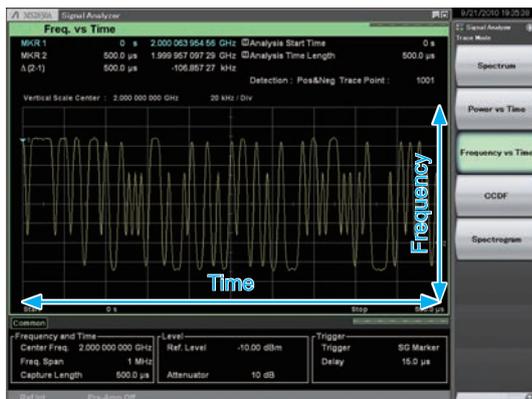
## Power vs. Time

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.



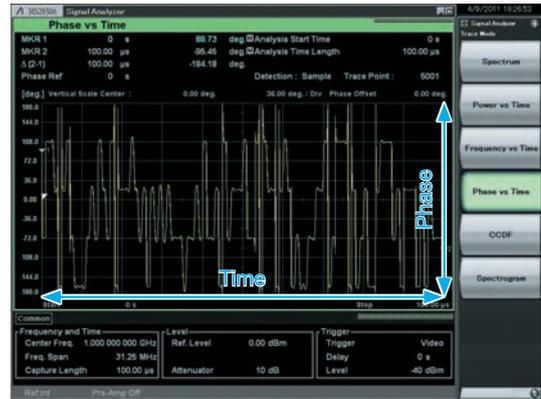
## Frequency vs. Time

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 x-axis to confirm the CCDF and APD of measured signals.

- \*1: CCDF (Complementary Cumulative Distribution Function)
- \*2: APD (Amplitude Probability Density)



## Measurement Results

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

# Signal Analyzer: Trace

## Spectrogram

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

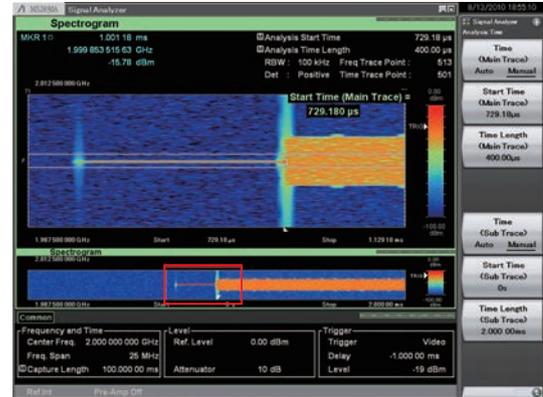


## Measurement with Sub-trace Display

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

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

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



## No Trace

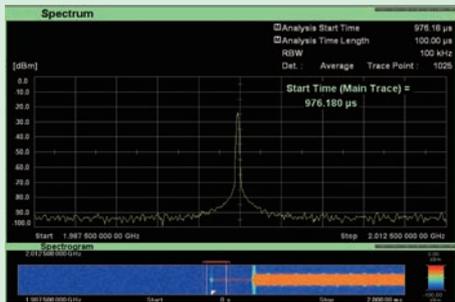
No Trace mode does not execute signal analysis. Therefore, "IQ data output" and "IQ data readout using remote commands" can be executed quickly without the need to wait for completion of analysis.



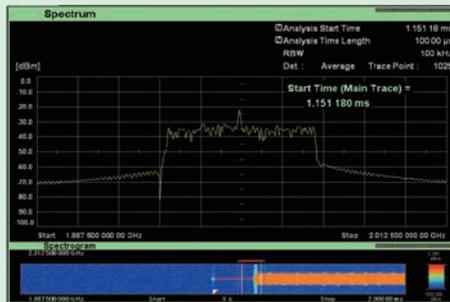
# Signal Analyzer: Trace

## Example: Sub-trace Display

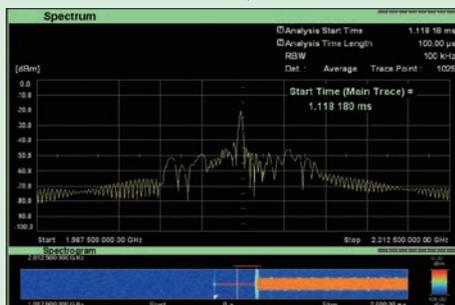
Confirm analysis range in sub-trace, and target signal status on main trace.



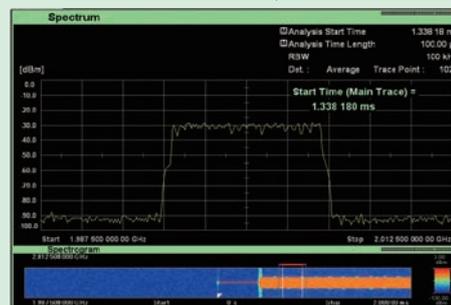
↑ Analysis range



↑ Analysis range



↑ Analysis range



↑ Analysis range

# Versatile Built-in Functions

## Useful for Tx Characteristics Evaluation

The MS2830A 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.

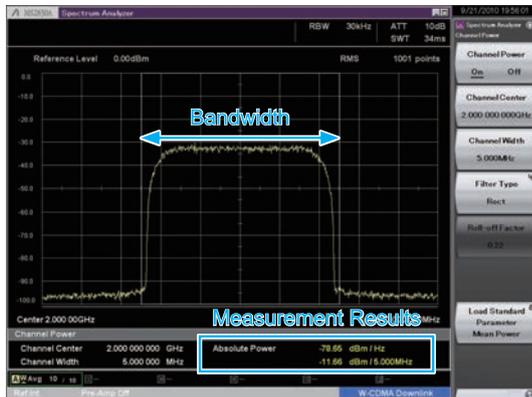
Measure Function	SPA*1	VSA*2
Channel Power	✓	✓
Occupied Bandwidth	✓	✓
Adjacent Channel Leakage Power	✓	✓
Spectrum Emission Mask	✓	
Burst Average Power	✓	✓
Spurious Emission	✓	
AM Depth		✓
FM Deviation		✓
Multi-marker & Marker List	✓	✓
Highest 10 Markers	✓	✓
Limit Line	✓	
Frequency Counter	✓	
2-tone 3rd-order Intermodulation Distortion	✓	
Power Meter	Independent function*3	
Phase Noise	Opt. 010	
Noise Figure	Opt. 017*4	

- \*1: SPA (Spectrum Analyzer)
- \*2: VSA (Vector Signal Analyzer), requires Opt. 005/006/009/077/078
- \*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

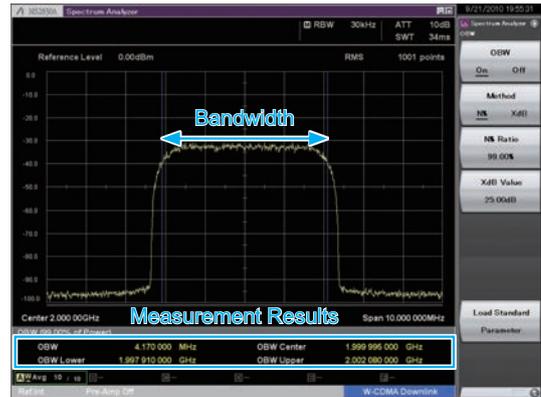
- Absolute power per Hz in channel band
- Total power in channel band

## 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

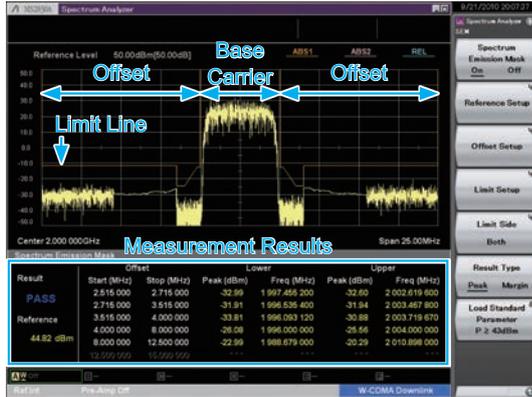
- Absolute power of Offset channel
- Relative values in relation to reference power selected in ACP reference

# Versatile Built-in Functions

## 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.



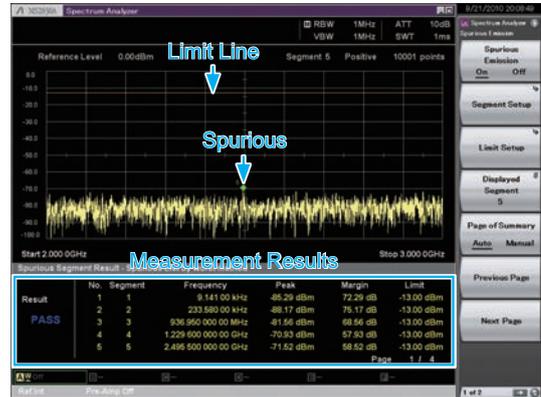
### Measurement Results

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

## 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.



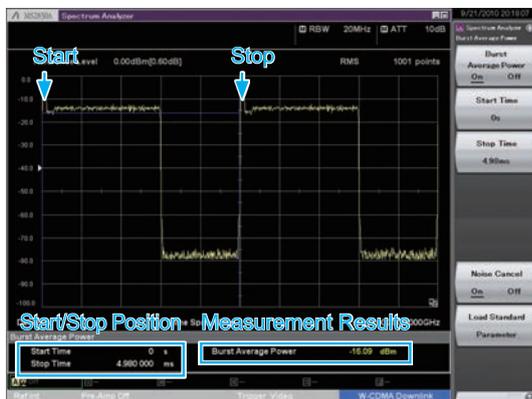
### Measurement Results

- Each segment peak power and margin
- Each peak frequency

## 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

### Example: Spurious Emission

The Japanese Radio Law governing measurement of spurious specifies searching for the peak level in the swept frequency segment using different parameter settings and then performing zero-span measurement of the found peak point. The MS2830A spurious measurement function not only performs the sweep search but also performs the zero-span measurement automatically as well, and displays the results of both. Using zero-span measurement, the search screen is displayed as is while zero-span measurement runs in the background and the result markers are plotted on the search screen. Time wasted by screen switching is reduced and the correlation with the search results can be seen at a glance.

### Measurement Example



Search only



Search + Measurement

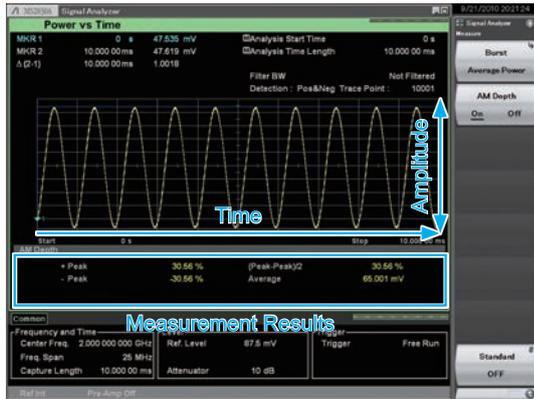
# Versatile Built-in Functions

## AM Depth

VSA

The Power vs. Time trace measurement function is used to confirm AM depth.

It measures the measured signal AM based on trace data at the displayed marker. When marker is Off, the whole range is measured.



### Measurement Results

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

## FM Deviation

VSA

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



### Measurement Results

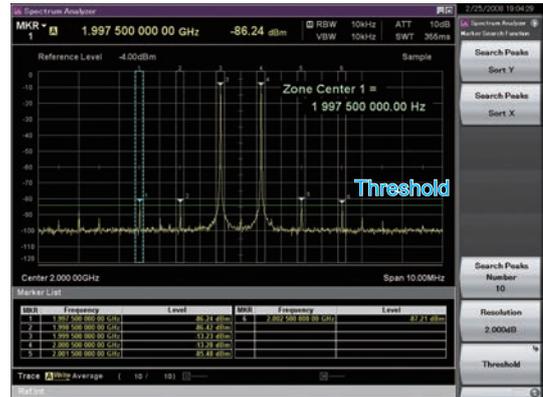
- +Peak, -Peak, (Peak-Peak)/2, Average

## Multi-marker & Marker List

SPA

VSA

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



### Measurement Results

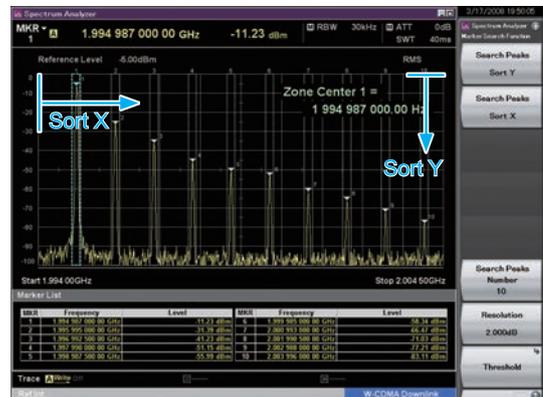
- Marker point frequency
- Marker point power
- Absolute power per Hz in marker bandwidth
- Total power in marker bandwidth
- Difference between any markers

## Highest 10 Markers

SPA

VSA

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



### Measurement Results

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

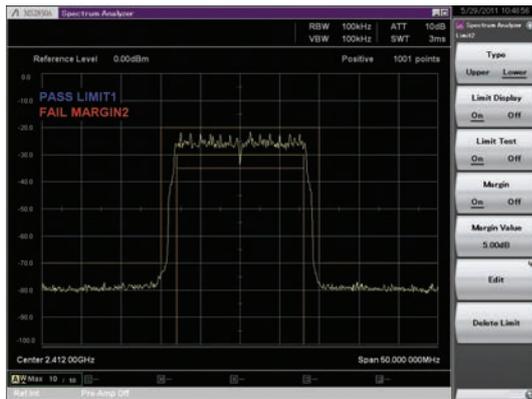
# Versatile Built-in Functions

## Limit Line

SPA

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

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



### Measurement Results

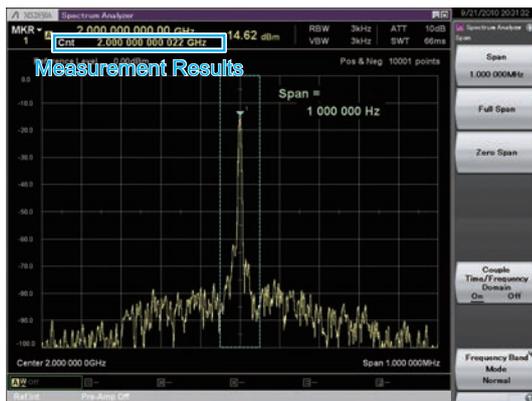
- Evaluation: PASS, FAIL

## Frequency Counter

SPA

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

Gate Time sets the measurement target time.



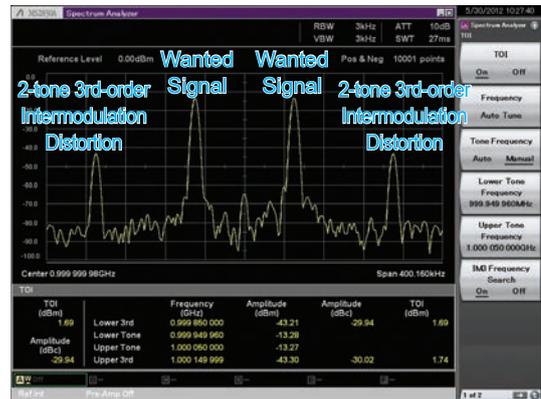
### Measurement Results

- Marker point frequency

## 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.

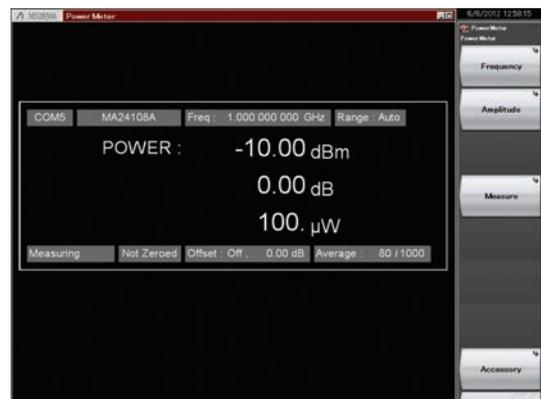


### Measurement Results

- TOI: [dBm]
- Amplitude: [dBc]

## 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

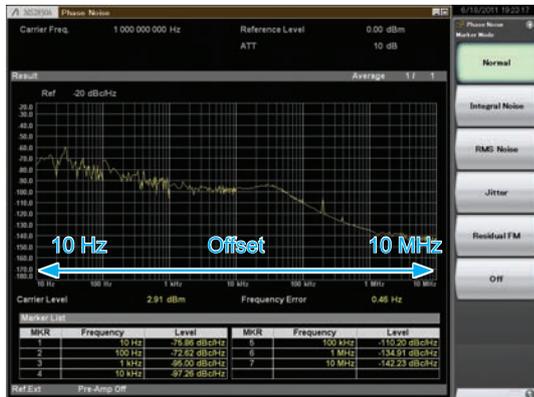
Model	Frequency Range	Resolution	Dynamic Range
MA24104A*	600 MHz to 4 GHz	1 kHz	+3 to +51.76 dBm
MA24106A	50 MHz to 6 GHz	1 kHz	-40 to +23 dBm
MA24108A	10 MHz to 8 GHz	100 kHz	-40 to +20 dBm
MA24118A	10 MHz to 18 GHz	100 kHz	-40 to +20 dBm
MA24126A	10 MHz to 26 GHz	100 kHz	-40 to +20 dBm

\*: MA24104A has been discontinued.

# Versatile Built-in Functions

## Phase Noise (Opt. 010)

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

## Noise Figure Measurement (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

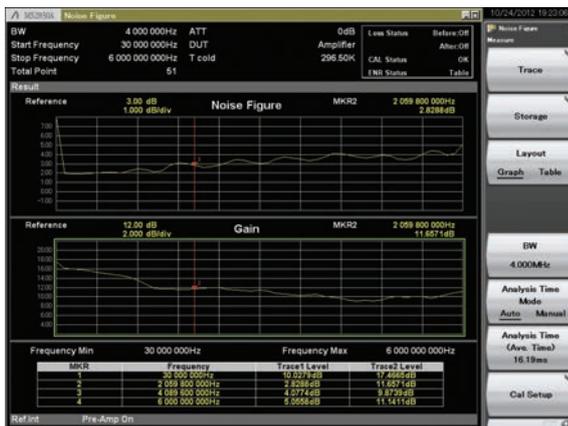
- Graph/List/Spot

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

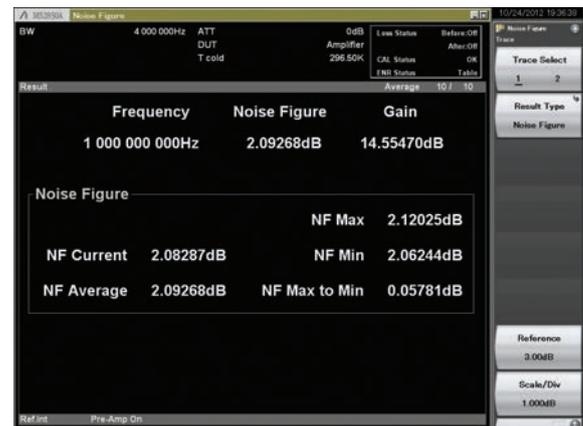
- Noise Figure (NF) [dB]
- Noise Factor (F) [Linear]
- Gain
- Y-Factor: Power ratio when Noise Source is turned ON/OFF
- T effective: Effective noise temperature
- P Hot: Power measured when Noise Source is On.
- P Cold: Power measured when Noise Source is Off.



Measurement Result: Example of List display (Frequency Mode: List, Screen Layout: List)



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



Measurement Result: Example of Spot display (Frequency Mode: Fixed)

# Versatile Built-in Functions

## 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

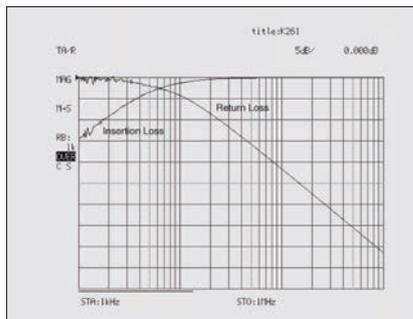
\*1: Flatness better than ±2 dB

\*2: Compatible with SMA and APC3.5

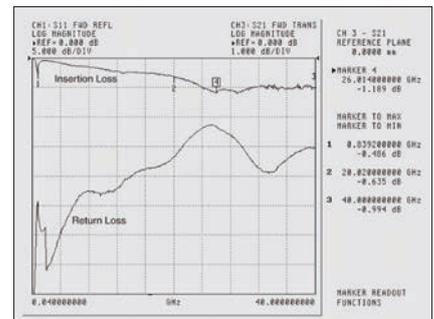
\*3: When using noise sources output by DC, always use in combination with a DC block.

### Specifications outlines of recommended DC Blocks and Adapters

	Ordering		RF Connector	Frequency Range	VSWR
	Model	Name			
DC Block	J0805	DC Block, N type (MODEL 7003)	N (M)-N (F)	10 kHz to 18 GHz	1.35 (max.)
	J1555A	DC Block, SMA type (MODEL 7006-1)	SMA (M)-SMA (F)	9 kHz to 20 GHz	1.50 (9 kHz to 10 kHz) 1.50 (11 kHz to 20 kHz) 1.30 (20 kHz to 20 GHz)
	J1554A	DC Block, SMA type (MODEL 7006)	SMA (M)-SMA (F)	9 kHz to 26.5 GHz	1.50 (9 kHz to 20 kHz) 1.35 (20 kHz to 20 GHz) 1.70 (20 GHz to 26.5 GHz)
	K261	DC Block	K (M)-K (F)	10 kHz to 40 GHz	See figure (return loss) below
Adapter	J0004	Coaxial Adapter	N (M)-SMA (F)	DC to 12.4 GHz	≤1.08 (DC to 3 GHz) ≤1.11 (3 GHz to 6 GHz) ≤1.18 (6 GHz to 12.4 GHz)
	J1398A	N-SMA Adapter	N (M)-SMA (F)	DC to 26.5 GHz	≤1.05 (DC to 3 GHz) ≤1.07 (3 GHz to 6 GHz) ≤1.2 (6 GHz to 13.5 GHz) ≤1.3 (13.5 GHz to 20 GHz) ≤1.45 (20 GHz to 26.5 GHz)



Typical Low Frequency Insertion Loss measured on K261 over the range of 1 kHz to 1 MHz.



Insertion Loss and Return Loss measured on K261 over the range of 40 MHz to 40 GHz.

### K261 DC Block Return Loss

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

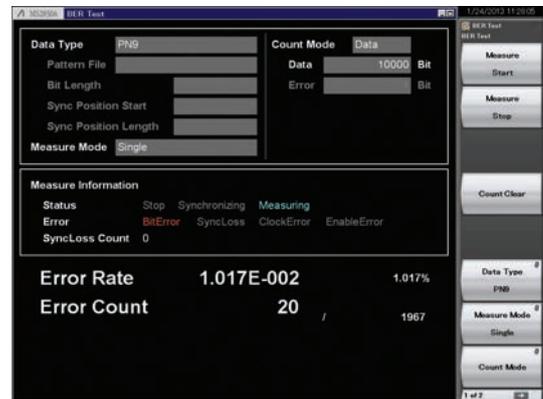
	Model	Frequency Range	RF connector	Recommended DC Block Order Name	Recommended Adapter Order Name
MS269xA series	MS2690A	50 Hz to 6 GHz	N (F)	J1555A	J0004
	MS2691A	50 Hz to 13.5 GHz	N (F)	J1555A	J1398A
	MS2692A	50 Hz to 26.5 GHz	N (F)	J1554A	J1398A
MS2830A series	MS2830A-040	9 kHz to 3.6 GHz	N (F)	Not 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)	J1554A	J1398A
	MS2830A-045	9 kHz to 43 GHz	K (F)	K261	Not required

# BER Measurement Function (Opt. 026): Basic Performance

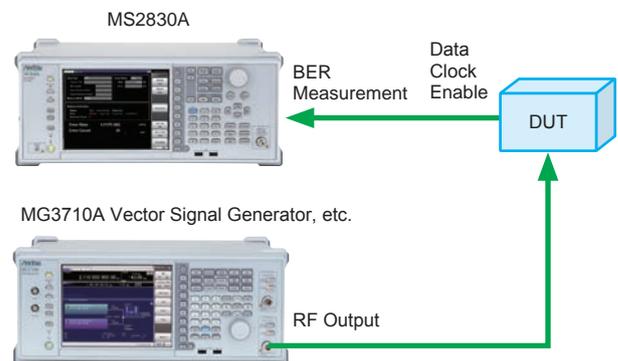
## Convenient Built-in BER Measurement Function for Rx Evaluations

The MS2830A with the Opt. 026 BER Measurement Function supports measurement up to 10 Mbps. It supports Rx sensitivity tests by inputting the receiver-demodulated Data/Clock/Enable to the back of the MS2830A.

- Input Signal: Data, Clock, Enable (Polarity reversal supported)
- Input Bit Rate: 100 bps to 10 Mbps
- Input Level: TTL 3.3 V
- Connector: Rear panel, AUX connector\*
  - \*: Can convert to BNC by connecting AUX conversion adapter (J1556A).
- Measured Patterns:
  - PN9, PN11, PN15, PN20, PN23, ALL0, ALL1, Alternate (0101...),
  - PN9Fix, PN11Fix, PN15Fix, PN20Fix, PN23Fix,
  - UserDefine (4096 bits Max.)
- Measurable Bit Count: 1000 to 4294967295 bits ( $2^{32} - 1$  bits)
- Measurable Error Bit Count: 1 to 2147483647 bits ( $2^{31} - 1$  bits)
- Count Mode
  - Data: Measures until specified Data count
  - Error: Measures until specified Error count
- Measurement Mode
  - Single: Measures specified measurement bit count once
  - Continuous: Repeats Single measurement
  - Endless: Continues measurement to upper limit of measurement bits



BER Measurement Function Main Screen



BER Measurement Setup Example  
(using external vector signal generator)

# Excellent Expandability Platform (Hardware)

The versatility of the MS2830A series is tailored easily to the application by installing modules in expansion slots.

## Basic Performance and Function Improvement

### MS2830A-001 Rubidium Reference Oscillator

#### MS2830A-101 Rubidium Reference Oscillator Retrofit

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)

### MS2830A-008 Preamplifier

#### MS2830A-108 Preamplifier Retrofit

This option is used to measure low-level signals, such as noise and interference signals.

Frequency Range: 100 kHz to 6 GHz

\*: Cannot be installed simultaneously with Opt. 068/168

### MS2830A-011 2ndary HDD

#### MS2830A-111 2ndary HDD Retrofit

Removable HDD for saving user data

### MS2830A-016 Precompliance EMI Function

#### MS2830A-116 Precompliance EMI Function Retrofit

This option adds an EMI measurement detection mode and RBW to the spectrum analyzer function. Both the detection mode used for CISPR standards (Quasi-Peak, CISPR-AVG, RMS-AVG) and RBW (200 Hz (6 dB), 9 kHz (6 dB), 120 kHz (6 dB), 1 MHz (Imp)) as well as conventional settings can be selected.

### MS2830A-067 Microwave Preselector Bypass

#### MS2830A-167 Microwave Preselector Bypass Retrofit

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

\*: Add MS2830A-067 when using the signal analyzer measurement functions at bandwidth: >31.25 MHz and frequency: >6 GHz.

### MS2830A-068 Microwave Preamplifier

#### MS2830A-168 Microwave Preamplifier Retrofit

This option is used to measure low-level signals, such as noise and interference signals.

Frequency Range: 100 kHz to 26.5 GHz (MS2830A-044)  
100 kHz to 43 GHz (MS2830A-045)

\*: Cannot be installed simultaneously with Opt. 008/108

## Signal Analyzer Function and Performance Improvement

### MS2830A-005 Analysis Bandwidth Extension to 31.25 MHz

#### MS2830A-105 Analysis Bandwidth Extension to 31.25 MHz Retrofit

This option extends the analysis bandwidth to 31.25 MHz.

\*: Requires Opt. 006/106

Not supported by MS2830A-045 (43 GHz Signal Analyzer) — use Opt. 009

### MS2830A-006 Analysis Bandwidth 10 MHz

#### MS2830A-106 Analysis Bandwidth 10 MHz Retrofit

This option supports the VSA and digitize functions.

### MS2830A-009 Bandwidth Extension to 31.25 MHz for Millimeter-wave

#### MS2830A-109 Bandwidth Extension to 31.25 MHz for Millimeter-wave Retrofit

This option extends the MS2830A-045 (43 GHz Signal Analyzer) analysis bandwidth to 31.25 MHz.

\*: Requires Opt. 006/106

Dedicated option for MS2830A-045 (43 GHz Signal Analyzer)

Cannot be set the RBW to more than 10 MHz in spectrum analyzer function.

### MS2830A-077 Analysis Bandwidth Extension to 62.5 MHz

This option extends the analysis bandwidth to 62.5 MHz.

\*: Retrofit not supported.

Requires Opt. 006 and Opt. 005 (for MS2830A-044).

Requires Opt. 006 and Opt. 009 (for MS2830A-045).

### MS2830A-078 Analysis Bandwidth Extension to 125 MHz

This option extends the analysis bandwidth to 125 MHz.

\*: Retrofit not supported.

Requires Opt. 006, Opt. 005 and Opt. 077 (for MS2830A-044).

Requires Opt. 006, Opt. 009 and Opt. 077 (for MS2830A-045).

Note: An image response is received when setting the bandwidth to more than 31.25 MHz. This can be used when not inputting a signal frequency outside the MS2830A analysis bandwidth (125 MHz max.). The MS2690A/91A/92A Signal Analyzer series is recommended for other measurement purposes.

## Expansion Functions

### MS2830A-010 Phase Noise Measurement Function

#### MS2830A-110 Phase Noise Measurement Function Retrofit

Phase Noise Measurements

Frequency Range: 10 MHz to main-frame upper limit frequency

Offset Frequency Range: 10 Hz to 10 MHz

### MS2830A-017 Noise Figure Measurement Function

#### MS2830A-117 Noise Figure Measurement Function Retrofit

Adds noise figure measurement function.

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

### MS2830A-026 BER Measurement Function

#### MS2830A-126 BER Measurement Function Retrofit

Adds BER measurement function.

It supports Rx sensitivity tests by inputting the receiver-demodulated Data/Clock/Enable to the back of the MS2830A.

Input Bit Rate: 100 bps to 10 Mbps

### MS2830A-313 Removable HDD

The MS2830A-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 MS2830A hard disk and replaces it with this product.

# Future-proof Platform (Software\*)

\*: See each software catalog for more details.

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	Addition to Main frame (✓: Can be installed, No: Cannot be installed)		Analysis Bandwidth Extension Option (✓: Required, ✓+: Function expansion, Space (no symbol): No specification)			
			Opt. 040/041/043	Opt. 044/045	Opt. 006	Opt. 005/009	Opt. 077	Opt. 078
			LTE (FDD)	MX269020A	LTE Downlink Measurement Software	✓	✓	✓
	MX269020A-001	LTE-Advanced FDD Downlink Measurement Software	✓	✓	✓	✓	✓	✓+*1
	MX269021A	LTE Uplink Measurement Software	✓	✓	✓	✓		
LTE (TDD)	MX269022A	LTE TDD Downlink Measurement Software	✓	✓	✓	✓		
	MX269022A-001	LTE-Advanced TDD Downlink Measurement Software	✓	✓	✓	✓	✓	✓+*1
	MX269023A	LTE TDD Uplink Measurement Software	✓	✓	✓	✓		
W-CDMA/HSPA/ HSPA Evolution	MX269011A	W-CDMA/HSPA Downlink Measurement Software	✓	✓	✓			
	MX269012A	W-CDMA/HSPA Uplink Measurement Software	✓	✓	✓			
W-CDMA/HSPA (Downlink)	MX269030A	W-CDMA BS Measurement Software	✓	✓	✓			
TD-SCDMA	MX269015A	TD-SCDMA 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	✓	✓	✓			
GSM/EDGE	MX269013A	GSM/EDGE Measurement Software	✓	✓	✓			
EDGE Evolution	MX269013A-001	EDGE Evolution Measurement Software	✓	✓	✓			
Multi-TDMA systems	MX269017A	Vector Modulation Analysis Software	✓	✓*2	✓	✓+*3	✓+*3	✓+*3
Analog Wireless	MX269018A	Analog Measurement Software	✓*4	No				
WLAN IEEE802.11a/b/g/n/j/p	MX269028A	WLAN (802.11) Measurement Software (Supports IEEE802.11n/11a/11b/11g/11j/11p)	✓	✓	✓	✓		
WLAN IEEE802.11ac (80 MHz)	MX269028A-001*5	802.11ac (80 MHz) Measurement Software	✓	✓	✓	✓	✓	✓
WLAN IEEE802.11a/b/g/n	MX283027A	Wireless Network Device Test Software	✓	✓				
WLAN	MX283027A-001	WLAN Test Software	✓	✓	✓	✓		
Bluetooth	MX283027A-002	Bluetooth Test Software	✓	✓	✓			
Mobile WiMAX	MX269010A	Mobile WiMAX Measurement Software	✓	✓	✓	✓		

\*1: The LTE-Advanced Carrier Aggregation measurement range varies as follows, depending on the Analysis Bandwidth Extension option configuration.

Main frame	Analysis Bandwidth Extension Option Configuration	Maximum Analysis Bandwidth (In-band carrier aggregation range)	Maximum Number of Bands	Maximum Number of Component Carriers
MS269xA	Opt. 078 installed	125 MHz	3	5
	Opt. 077 installed	31.25 MHz	3	5
	Standard	31.25 MHz	3	5
MS2830A	Opt. 078 installed	125 MHz	1	5
	Opt. 077 installed	31.25 MHz	3	5
	Opt. 005/009 installed	31.25 MHz	3	5

\*2: By the measurement of the narrowband signal, add Opt. 066. (Channel bandwidth: x kHz to 100 kHz)  
MS2830A-044/045 cannot be installed Opt. 066.

\*3: The Symbol Rate setting range varies as follows, depending on the option configuration.

	O-QPSK	FSK	Except FSK	
			Frame Formatted	Non-Formatted
Opt. 078, Opt. 077, Opt. 005, Opt. 006 installed	0.1 kpsps to 12.5 Msps	0.1 kpsps to 25 Msps	0.1 kpsps to 50 Msps	0.1 kpsps to 140 Msps
Opt. 077, Opt. 005, Opt. 006 installed	0.1 kpsps to 6.25 Msps	0.1 kpsps to 12.5 Msps	0.1 kpsps to 25 Msps	0.1 kpsps to 70 Msps
Opt. 005, Opt. 006 installed	0.1 kpsps to 3.125 Msps	0.1 kpsps to 6.25 Msps	0.1 kpsps to 12.5 Msps	0.1 kpsps to 35 Msps
Opt. 006 installed	0.1 kpsps to 1.25 Msps	0.1 kpsps to 2.5 Msps	0.1 kpsps to 5 Msps	0.1 kpsps to 5 Msps

\*4: MS2830A-043 can implement only either Opt. 020/021 or Opt. 066.

By the system that Opt. 066 is necessary, Opt. 020/021 is not added to MS2830A-043.

\*5: Requires MX269028A. The IEEE802.11ac measurement range varies as follows, depending on the Analysis Bandwidth Extension option configuration.

Main frame	Measurement software	Model	Analysis Bandwidth Extension Option Configuration	Bandwidth of IEEE802.11ac signal				
				20 MHz	40 MHz	80 MHz	160 MHz	80 MHz + 80 MHz
MS269xA	MX269028A-002 (Only for MS269xA)		Opt. 078 installed	✓	✓	✓	✓	✓*5-1
			Opt. 077 installed	✓	✓			
			Standard	✓	✓			
MS2830A	MX269028A-001 (Only for MS2830A)		Opt. 078 installed	✓	✓	✓*5-2		
			Opt. 077 installed	✓	✓			
			Opt. 005/009 installed	✓	✓			

\*5-1: Measurement required for each carrier signal (80-MHz bandwidth)

\*5-2: Measurement is only possible when the carrier signal (80-MHz bandwidth) is input due to the effect of the image response.

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# Specifications

The specification is the value after 30-minute warm-up at a constant ambient temperature.

The specifications are defined under the following conditions unless otherwise specified.

Auto sweep time select: Normal, Auto sweep type rules: Sweep only, Switching speed mode: Best phase noise mode

Nominal values indicate expected performance or describe product performance. That is not covered by the product warranty.

Specifications above 26.5 GHz: MS2830A-045 only.

## ■ Signal Analyzer/Spectrum Analyzer

### Frequency

Frequency range	9 kHz to 26.5 GHz [MS2830A-044], 9 kHz to 43 GHz [MS2830A-045]		
Frequency bands	Frequency range	Band	Mixer harmonics order (N)
	9 kHz to 4 GHz	0	1
	3.5 GHz to 4.4 GHz	1	1/2
	4.3 GHz to 6 GHz	1	1
	3.9 GHz to 8 GHz	3	1
	7.9 GHz to 10.575 GHz	4	1
	10.475 GHz to 12.2 GHz	5	2
	12.1 GHz to 18.4 GHz	6	2
	18.3 GHz to 26.6 GHz	7	4
	26.5 GHz to 41.9 GHz	8	4
	41.8 GHz to 43 GHz	9	8
Frequency setting range	-100 MHz to 26.6 GHz [MS2830A-044] -100 MHz to 43.1 GHz [MS2830A-045] Setting resolution: 1 Hz		
Pre-selector range	MS2830A-044	MS2830A-045	(Frequency band mode: Normal) (Frequency band mode: Spurious)
	4 GHz to 26.5 GHz	4 GHz to 43 GHz	
	3.5 GHz to 26.5 GHz	3.5 GHz to 43 GHz	
Internal reference oscillator	with MS2830A-044/045 23°C, Referenced to frequency at 24-hour after power-on Start-up characteristics: $\pm 5 \times 10^{-7}$ (2 minutes after power-on), $\pm 5 \times 10^{-8}$ (5 minutes after power-on) Aging rate: $\pm 1 \times 10^{-7}$ /year Temperature stability: $\pm 2 \times 10^{-8}$ (5° to 45°C)		
	with MS2830A-001 23°C, Referenced to frequency at 24-hour after power-on Start-up characteristics: $\pm 1 \times 10^{-9}$ (7 minutes after power-on) Aging rate: $\pm 1 \times 10^{-10}$ /month Temperature stability: $\pm 1 \times 10^{-9}$ (5° to 45°C)		
SSB phase noise	18° to 28°C, 500 MHz, Spectrum Analyzer mode, Switching Speed mode: Normal -115 dBc/Hz (100 kHz offset) -133 dBc/Hz (1 MHz offset)		

### Amplitude

Level measurement range	without MS2830A-008/068, or Preamp: Off DANL to +30 dBm with MS2830A-008/068, Preamp: On DANL to +10 dBm
Maximum input level	without MS2830A-008/068, or Preamp: Off Average total power: +30 dBm (Input attenuator: $\geq 10$ dB) DC voltage: $\pm 0$ Vdc with MS2830A-008/068, Preamp: On Average total power: +10 dBm (Input attenuator: 0 dB) DC voltage: $\pm 0$ Vdc
Input attenuator range	with MS2830A-044 0 to 60 dB, 2 dB steps with MS2830A-045 0 to 60 dB, 10 dB steps (ATT mode: Mechanical Atten Only, or E-ATT Combined Mode, Stop Frequency: $\geq 6$ GHz) 0 to 10 dB, 10 dB steps/10 to 40 dB, 2 dB steps/40 to 60 dB, 10 dB steps (Attenuator mode: E-ATT Combined Mode, Stop Frequency: $< 6$ GHz)
Input attenuator switching uncertainty	18° to 28°C, Referenced to 10 dB, ATT mode: Mechanical Atten Only without MS2830A-008/068, or Preamp: Off $\pm 0.2$ dB (10 to 60 dB) (300 kHz $\leq f < 4$ GHz, Frequency band mode: Normal) $\pm 0.2$ dB (10 to 60 dB) (300 kHz $\leq f < 3.5$ GHz, Frequency band mode: Spurious) $\pm 0.75$ dB (10 to 60 dB) (4 GHz $\leq f \leq 13.8$ GHz, Frequency band mode: Normal) $\pm 0.75$ dB (10 to 60 dB) (3.5 GHz $\leq f \leq 13.8$ GHz, Frequency band mode: Spurious) $\pm 0.8$ dB (10 to 60 dB) (13.8 GHz $< f \leq 26.5$ GHz) $\pm 1.0$ dB (10 to 60 dB) (26.5 GHz $< f \leq 40$ GHz) $\pm 1.0$ dB (10 to 60 dB) (typ., 40 GHz $< f \leq 43$ GHz)

## ■ Signal Analyzer/Spectrum Analyzer (Continuation)

### Reference level

Setting range	Log scale: -120 to +50 dBm, or Equivalent level Linear scale: 22.4 $\mu$ V to 70.7 V, or Equivalent level Setting resolution: 0.01 dB, or Equivalent level
Scale units	Log scale: dBm, dB $\mu$ V, dBmV, dB $\mu$ V (emf), dB $\mu$ V/m, V, W Linear scale: V
Linearity error	Excluding the noise floor effect, Input level: $\leq$ -10 dB (f: <30 MHz) $\pm$ 0.07 dB (Mixer input level: $\leq$ -20 dBm) $\pm$ 0.10 dB (Mixer input level: $\leq$ -10 dBm)
RF frequency characteristics	18° to 28°C, after CAL, Input attenuator: 10 dB without MS2830A-008/068, or Preamp: Off without MS2830A-067, or Microwave Preselector Bypass: Off, after Preselector Auto Tune $\pm$ 1.0 dB (9 kHz $\leq$ f < 300 kHz) $\pm$ 0.35 dB (300 kHz $\leq$ f < 4 GHz, Frequency band mode: Normal) (300 kHz $\leq$ f < 3.5 GHz, Frequency band mode: Spurious) $\pm$ 1.5 dB (4 GHz $\leq$ f $\leq$ 6 GHz, Frequency band mode: Normal) (3.5 GHz $\leq$ f $\leq$ 6 GHz, Frequency band mode: Spurious) $\pm$ 1.5 dB (6 GHz < f $\leq$ 13.8 GHz) $\pm$ 2.5 dB (13.8 GHz < f $\leq$ 26.5 GHz) $\pm$ 2.5 dB (26.5 GHz < f $\leq$ 40 GHz) $\pm$ 2.5 dB (typ., 40 GHz < f $\leq$ 43 GHz) with MS2830A-008, Preamp: On $\pm$ 0.65 dB (300 kHz $\leq$ f < 4 GHz, Frequency band mode: Normal) (300 kHz $\leq$ f < 3.5 GHz, Frequency band mode: Spurious) $\pm$ 1.8 dB (4 GHz $\leq$ f $\leq$ 6 GHz, Frequency band mode: Normal) (3.5 GHz $\leq$ f $\leq$ 4 GHz, Frequency band mode: Spurious) with MS2830A-068, or Preamp: On without MS2830A-067, or Microwave Preselector Bypass: Off, after Preselector Auto Tune $\pm$ 0.65 dB (300 kHz $\leq$ f < 4 GHz, Frequency band mode: Normal) (300 kHz $\leq$ f < 3.5 GHz, Frequency band mode: Spurious) $\pm$ 1.8 dB (4 GHz $\leq$ f $\leq$ 13.8 GHz, Frequency band mode: Normal) (3.5 GHz $\leq$ f $\leq$ 13.8 GHz, Frequency band mode: Spurious) $\pm$ 2.5 dB (13.8 GHz < f $\leq$ 26.5 GHz) $\pm$ 3.5 dB (26.5 GHz < f $\leq$ 40 GHz) $\pm$ 3.5 dB (nominal, 40 GHz < f $\leq$ 43 GHz)
1 dB gain compression	without MS2830A-008/068, or Preamp: Off, at Mixer input level $\geq$ +3 dBm (300 MHz $\leq$ f $\leq$ 4 GHz) $\geq$ -1 dBm (4 GHz < f $\leq$ 13.5 GHz) $\geq$ -1 dBm (13.5 GHz < f $\leq$ 26.5 GHz) $\geq$ -1 dBm (nominal, 26.5 GHz < f $\leq$ 40 GHz) with MS2830A-068, Preamp: On, at Preamp input level $\geq$ -15 dBm (300 MHz $\leq$ f $\leq$ 4 GHz) $\geq$ -21 dBm (4 GHz < f $\leq$ 13.5 GHz) $\geq$ -21 dBm (13.5 GHz < f $\leq$ 26.5 GHz) $\geq$ -21 dBm (nominal, 26.5 GHz < f $\leq$ 40 GHz)

## ■ Signal Analyzer/Spectrum Analyzer (Continuation)

### Spurious responses

Second harmonic distortion	without MS2830A-008/068, without MS2830A-067		
	Mixer input level: -30 dBm		
	Harmonic distortion	SHI	
	≤-60 dBc	≥+30 dBm	(10 MHz ≤ f ≤ 300 MHz)
	≤-65 dBc	≥+35 dBm	(300 MHz < f ≤ 1 GHz)
	≤-65 dBc	≥+35 dBm	(1 GHz < f ≤ 2 GHz, Frequency band mode: Normal)
	≤-65 dBc	≥+35 dBm	(1 GHz < f < 1.75 GHz, Frequency band mode: Spurious)
	Mixer input level: -10 dBm		
	Harmonic distortion	SHI	
	≤-70 dBc	≥+60 dBm	(2 GHz < f ≤ 3 GHz, Frequency band mode: Normal)
	≤-70 dBc	≥+60 dBm	(1.75 GHz ≤ f ≤ 3 GHz, Frequency band mode: Spurious)
	≤-90 dBc	≥+80 dBm	(3 GHz < f ≤ 13.25 GHz)
≤-90 dBc	≥+80 dBm	(13.25 GHz < f ≤ 21.5 GHz, nominal)	
with MS2830A-068, Preamp: Off, or with MS2830A-067, Microwave Preselector Bypass: Off			
Mixer input level: -30 dBm			
Harmonic distortion	SHI		
≤-60 dBc	≥+30 dBm	(10 MHz ≤ f ≤ 300 MHz)	
≤-65 dBc	≥+35 dBm	(300 MHz < f ≤ 1 GHz)	
≤-65 dBc	≥+35 dBm	(1 GHz < f ≤ 2 GHz, Frequency band mode: Normal)	
≤-65 dBc	≥+35 dBm	(1 GHz < f < 1.75 GHz, Frequency band mode: Spurious)	
Mixer input level: -10 dBm			
Harmonic distortion	SHI		
≤-70 dBc	≥+60 dBm	(2 GHz < f ≤ 3 GHz, Frequency band mode: Normal)	
≤-70 dBc	≥+60 dBm	(1.75 GHz ≤ f ≤ 3 GHz, Frequency band mode: Spurious)	
≤-70 dBc	≥+60 dBm	(2 GHz < f ≤ 3 GHz, Frequency band mode: Spurious)	
≤-70 dBc	≥+60 dBm	(3 GHz < f ≤ 13.25 GHz)	
≤-70 dBc	≥+60 dBm	(13.25 GHz < f ≤ 21.5 GHz, nominal)	
with MS2830A-008/068, Preamp: On, with MS2830A-067, Microwave Preselector Bypass: Off			
Preamp input level: -45 dBm			
Harmonic distortion	SHI		
≤-50 dBc	≥+5 dBm	(10 MHz ≤ f ≤ 300 MHz)	
≤-55 dBc	≥+10 dBm	(300 MHz < f ≤ 2 GHz)	
≤-45 dBc	≥0 dBm	(2 GHz < f ≤ 13.25 GHz)	
≤-40 dBc	≥-5 dBm	(13.25 GHz < f < 21.5 GHz, nominal)	
SHI: Second Harmonic Intercept			
Residual responses	Frequency: ≥1 MHz, Input attenuator: 0 dB, 50Ω terminated		
	with MS2830A-077/078, except bandwidth setting: >31.25 GHz		
	≤-100 dBm (up to 1 GHz)		
	≤-90 dBm (typ., 1 GHz to 6 GHz)		
	≤-90 dBm (nominal, 6 GHz to 13.5 GHz)		
	≤-90 dBm (nominal, 13.25 GHz to 26.5 GHz)		
≤-80 dBm (nominal, 26.5 GHz to 40 GHz)			

## ■ Spectrum Analyzer

### Frequency

Span	Range: 0 Hz, 300 Hz to 26.5 GHz [MS2830A-044] 0 Hz, 300 Hz to 43 GHz [MS2830A-045] Resolution: 2 Hz Accuracy: $\pm 0.2\%$ (Sweep points: 10001)
Frequency readout accuracy	$\pm (\text{Display frequency} \times \text{Frequency reference accuracy} + \text{Span frequency} \times \text{Span accuracy} + \text{RBW} \times 0.05 + 2 \times N + \text{Span frequency}/(\text{Sweep points}-1)) \text{ Hz}$ N: Mixer harmonic order
Resolution bandwidth (RBW)	Setting range: 1 Hz to 3 MHz (1-3 sequence), 50 kHz, 5 MHz, 10 MHz, 20 MHz, 31.25 MHz 1 Hz to 10 Hz: Can not be set when Span: 0 Hz 31.25 MHz: Can be set when Span: 0 Hz only 20 MHz, 31.25 MHz: Can be set when with MS2830A-005, Can not be set when with MS2830A-009 Selectivity ( $-60 \text{ dB}/-3 \text{ dB}$ ): 4.5:1 (nominal, 1 Hz to 10 MHz)
Resolution bandwidth (CISPR RBW)	with MS2830A-016 Setting range: 200 Hz (6 dB), 9 kHz (6 dB), 120 kHz (6 dB), 1 MHz (Impulse)
Video bandwidth (VBW)	1 Hz to 3 kHz (1-3 sequence), 5 kHz, 10 kHz to 10 MHz (1-3 sequence), Off VBW mode: Video average, Power average

### Amplitude

Displayed average noise level (DANL)	<p>18° to 28°C, Detector: Sample, VBW: 1 Hz (Video average), Input attenuator: 0 dB</p> <p>without MS2830A-067/068, Frequency band mode: Normal</p> <ul style="list-style-type: none"> <li>-134 dBm/Hz (100 kHz)</li> <li>-144 dBm/Hz (1 MHz)</li> <li>-153 dBm/Hz (30 MHz <math>\leq f &lt; 1</math> GHz)</li> <li>-150 dBm/Hz (1 GHz <math>\leq f &lt; 2.4</math> GHz)</li> <li>-147 dBm/Hz (2.4 GHz <math>\leq f \leq 3.5</math> GHz)</li> <li>-144 dBm/Hz (3.5 GHz <math>&lt; f \leq 4</math> GHz)</li> <li>-144 dBm/Hz (4 GHz <math>&lt; f \leq 6</math> GHz)</li> <li>-151 dBm/Hz (6 GHz <math>&lt; f \leq 13.5</math> GHz)</li> <li>-149 dBm/Hz (13.5 GHz <math>&lt; f \leq 18.3</math> GHz)</li> <li>-146 dBm/Hz (18.3 GHz <math>&lt; f \leq 26.5</math> GHz)</li> <li>-146 dBm/Hz (26.5 GHz <math>&lt; f \leq 34</math> GHz)</li> <li>-144 dBm/Hz (34 GHz <math>&lt; f \leq 40</math> GHz)</li> <li>-140 dBm/Hz (40 GHz <math>&lt; f \leq 43</math> GHz)</li> </ul> <p>without MS2830A-067, with MS2830A-068, Preamp: Off, Frequency band mode: Normal</p> <ul style="list-style-type: none"> <li>-134 dBm/Hz (100 kHz)</li> <li>-144 dBm/Hz (1 MHz)</li> <li>-153 dBm/Hz (30 MHz <math>\leq f &lt; 1</math> GHz)</li> <li>-150 dBm/Hz (1 GHz <math>\leq f &lt; 2.4</math> GHz)</li> <li>-147 dBm/Hz (2.4 GHz <math>\leq f \leq 3.5</math> GHz)</li> <li>-144 dBm/Hz (3.5 GHz <math>&lt; f \leq 4</math> GHz)</li> <li>-144 dBm/Hz (4 GHz <math>&lt; f \leq 6</math> GHz)</li> <li>-147 dBm/Hz (6 GHz <math>&lt; f \leq 13.5</math> GHz)</li> <li>-145 dBm/Hz (13.5 GHz <math>&lt; f \leq 18.3</math> GHz)</li> <li>-141 dBm/Hz (18.3 GHz <math>&lt; f \leq 26.5</math> GHz)</li> <li>-141 dBm/Hz (26.5 GHz <math>&lt; f \leq 34</math> GHz)</li> <li>-135 dBm/Hz (34 GHz <math>&lt; f \leq 40</math> GHz)</li> <li>-132 dBm/Hz (40 GHz <math>&lt; f \leq 43</math> GHz)</li> </ul> <p>without MS2830A-067, or Microwave Preselector Bypass: Off with MS2830A-068, Preamp: On, Frequency band mode: Normal</p> <ul style="list-style-type: none"> <li>-147 dBm/Hz (nominal, 100 kHz)</li> <li>-156 dBm/Hz (1 MHz)</li> <li>-163 dBm/Hz (30 MHz <math>\leq f &lt; 1</math> GHz)</li> <li>-161 dBm/Hz (1 GHz <math>\leq f &lt; 2</math> GHz)</li> <li>-159 dBm/Hz (2 GHz <math>\leq f \leq 3.5</math> GHz)</li> <li>-155 dBm/Hz (3.5 GHz <math>&lt; f \leq 4</math> GHz)</li> <li>-155 dBm/Hz (4 GHz <math>&lt; f \leq 6</math> GHz)</li> <li>-160 dBm/Hz (6 GHz <math>&lt; f \leq 13.5</math> GHz)</li> <li>-158 dBm/Hz (13.5 GHz <math>&lt; f \leq 18.3</math> GHz)</li> <li>-156 dBm/Hz (18.3 GHz <math>&lt; f \leq 26.5</math> GHz)</li> <li>-156 dBm/Hz (26.5 GHz <math>&lt; f \leq 34</math> GHz)</li> <li>-150 dBm/Hz (34 GHz <math>&lt; f \leq 40</math> GHz)</li> <li>-147 dBm/Hz (40 GHz <math>&lt; f \leq 43</math> GHz)</li> </ul> <p>with MS2830A-067: See Microwave Preselector Bypass (Displayed average noise level)</p>
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## ■ Spectrum Analyzer (Continuation)

### Amplitude (Continuation)

<p>Total absolute amplitude accuracy*</p> <p>*: Total absolute amplitude accuracy is found from root sum of squares (RSS) of RF frequency characteristics, Linearity error, and Input attenuator switching uncertainty.</p>	<p>18° to 28°C, after CAL, Auto sweep time select: Normal, 30 Hz ≤ RBW ≤ 1 MHz, Detector: Positive, CW Excluding the noise floor effect, and FFT runtime (Display: On)</p> <p>without MS2830A-068, or Preamp: Off Input attenuator: ≥10 dB, Input level: ≤-10 dBm (f: &lt;30 MHz), Mixer input level: ≤-10 dBm (f: ≥30 MHz)</p> <p>±0.5 dB (300 kHz ≤ f &lt; 4 GHz, Frequency band mode: Normal) (300 kHz ≤ f &lt; 3.5 GHz, Frequency band mode: Spurious)</p> <p>±1.8 dB (4 GHz ≤ f ≤ 6 GHz, Frequency band mode: Normal) (3.5 GHz ≤ f ≤ 4 GHz, Frequency band mode: Spurious)</p> <p>±1.8 dB (6 GHz &lt; f ≤ 13.8 GHz, Frequency band mode: Normal) (4 GHz &lt; f ≤ 13.8 GHz, Frequency band mode: Spurious)</p> <p>±3.0 dB (13.8 GHz &lt; f ≤ 26.5 GHz) ±3.0 dB (26.5 GHz &lt; f ≤ 40 GHz) ±3.5 dB (nominal, 40 GHz &lt; f ≤ 43 GHz)</p> <p>with MS2830A-068, Preamp: On Input attenuator: 10 dB, Preamp Input level: ≤-30 dBm</p> <p>±1.0 dB (300 kHz ≤ f &lt; 4 GHz, Frequency band mode: Normal) (300 kHz ≤ f &lt; 3.5 GHz, Frequency band mode: Spurious)</p> <p>±1.8 dB (4 GHz ≤ f ≤ 6 GHz, Frequency band mode: Normal) (3.5 GHz ≤ f ≤ 4 GHz, Frequency band mode: Spurious)</p> <p>±2.0 dB (6 GHz &lt; f ≤ 13.8 GHz, Frequency band mode: Normal) (4 GHz &lt; f ≤ 13.8 GHz, Frequency band mode: Spurious)</p> <p>±3.0 dB (13.8 GHz &lt; f ≤ 26.5 GHz) ±4.0 dB (26.5 GHz &lt; f ≤ 40 GHz) ±4.0 dB (nominal, 40 GHz &lt; f ≤ 43 GHz)</p>
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### Spurious responses

<p>2-tone 3rd-order intermodulation distortion</p>	<p>18° to 28°C, ≥300 kHz separation</p> <p>without MS2830A-068, or Preamp: Off, Mixer input level: -15 dBm (1wave)</p> <p>≤-54 dBc, TOI = +12 dBm (30 MHz ≤ f &lt; 300 MHz) ≤-60 dBc, TOI = +15 dBm (300 MHz ≤ f &lt; 3.5 GHz) ≤-58 dBc, TOI = +14 dBm (3.5 GHz ≤ f ≤ 6 GHz, Frequency band mode: Normal) ≤-56 dBc, TOI = +13 dBm (6 GHz &lt; f ≤ 13.5 GHz) ≤-56 dBc, TOI = +13 dBm (13.5 GHz &lt; f ≤ 26.5 GHz) ≤-56 dBc, TOI = +13 dBm (nominal, 26.5 GHz &lt; f ≤ 40 GHz)</p> <p>with MS2830A-068, Preamp: On without MS2830A-067, Microwave Preselector Bypass: Off, Preamp input level: -45 dBm (1wave)</p> <p>≤-73 dBc, TOI = -8.5 dBm (30 MHz ≤ f &lt; 300 MHz) ≤-78 dBc, TOI = -6 dBm (300 MHz ≤ f ≤ 700 MHz) ≤-81 dBc, TOI = -4.5 dBm (700 MHz &lt; f &lt; 4 GHz, Frequency band mode: Normal) (700 MHz &lt; f &lt; 3.5 GHz, Frequency band mode: Spurious)</p> <p>≤-78 dBc, TOI = -6 dBm (4 GHz ≤ f ≤ 6 GHz, Frequency band mode: Normal) (3.5 GHz ≤ f ≤ 4 GHz, Frequency band mode: Spurious)</p> <p>≤-70 dBc, TOI = -10 dBm (6 GHz &lt; f ≤ 13.5 GHz, Frequency band mode: Normal) (4 GHz &lt; f ≤ 13.5 GHz, Frequency band mode: Spurious)</p> <p>≤-70 dBc, TOI = -10 dBm (13.5 GHz &lt; f ≤ 26.5 GHz) ≤-70 dBc, TOI = -10 dBm (nominal, 26.5 GHz &lt; f ≤ 40 GHz)</p> <p>TOI: Third-order intermodulation distortion</p>
<p>Image responses</p>	<p>ATT mode: M-ATT only mode, Frequency band mode: Normal</p> <p>without MS2830A-067</p> <p>≤-70 dBc (10 MHz ≤ f &lt; 4 GHz) ≤-55 dBc (4 GHz ≤ f ≤ 6 GHz) ≤-70 dBc (6 GHz &lt; f ≤ 13.5 GHz) ≤-70 dBc (13.5 GHz &lt; f ≤ 26.5 GHz)</p> <p>with MS2830A-067: See Microwave Preselector Bypass (Image responses)</p>

### Sweep

<p>Sweep mode</p>	<p>Continuous, Single</p>
<p>Sweep time</p>	<p>Setting range: 1 ms to 1000 s (Span: ≥300 Hz) 1 μs to 1000 s (Span: 0 Hz)</p>

## ■ Spectrum Analyzer (Continuation)

### Waveform display

Detector	Positive & Negative, Positive peak, Sample, Negative peak, RMS
CISPR Detector	Quasi-Peak, CISPR-AVG, RMS-AVG (with MS2830A-016)
Sweep (trace) point	5001, 10001 (Span: >30 GHz) 1001, 2001, 5001, 10001 (500 MHz < Span ≤ 30 GHz) 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)
Scale	Log scale: 10 div/12 div, 0.1 to 20 dB/div (1-2-5 sequence) Linear scale: 10 div, 1 to 10%/div (1-2-5 sequence)
Trigger	Free run (Trigger off), Video, Wide IF video, External, Frame
Gate	Off, Wide IF video, External, Frame

### Measure function

Adjust channel power (ACP)	Reference: Span total, Carrier total, Both sides of carriers, Carrier select Adjust channel specifications: 3 channels × 2 (Normal Mode), 8 channels × 2 (Advanced Mode)
Burst average power	Displayed average power of specified interval at time domain
Channel power	Measurement of absolute values: dBm, dBm/Hz
Occupied bandwidth (OBW)	N% of power, X-dB down
Spectrum emission mask (SEM)	Decision to Pass/Fail at Peak/Margin measurement
Spurious emission	Decision to Pass/Fail 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 + (0.1 × N / Gate time [s] Hz) N: Mixer harmonic order
	Gate time setting 100 μs to 1 s
2-tone 3rd-order intermodulation distortion	Measures IM3 and TOI from two-tone signal

## ■ Signal Analyzer

Display waveform data, such as Spectrum, Power vs. Time captured at specific time

### General

Trace mode	Spectrum, Power vs. Time, Frequency vs. Time, Phase vs. Time, CCDF, Spectrogram, No Trace
Analysis bandwidth	Sets capture analysis bandwidth from center frequency 1 kHz to 10 MHz (1-2.5-5 sequence) (with MS2830A-006) 1 kHz to 25 MHz (1-2.5-5 sequence), 31.25 MHz (with MS2830A-005, or with MS2830A-009) 1 kHz to 25 MHz (1-2.5-5 sequence), 31.25 MHz, 50 MHz, 62.5 MHz (with MS2830A-077) 1 kHz to 25 MHz (1-2.5-5 sequence), 31.25 MHz, 50 MHz, 62.5 MHz, 100 MHz, 125 MHz (with MS2830A-078) *MS2830A-005 is not available when MS2830A-045 is installed.
Sampling rate	Auto setting by conditions of analysis bandwidth 2 kHz to 20 MHz (1-2-5 sequence) (with MS2830A-006) 2 kHz to 50 MHz (1-2-5 sequence) (with MS2830A-005, or with MS2830A-009) 2 kHz to 100 MHz (1-2-5 sequence) (with MS2830A-077) 2 kHz to 200 MHz (1-2-5 sequence) (with MS2830A-078)
Capture time	without MS2830A-077/078, or $\leq 31.25$ MHz bandwidth Setting capture time length Minimum capture time length: 2 $\mu$ s to 50 ms (Determined according to analysis bandwidth) Maximum capture time length: 2 s to 2000 s (Determined according to analysis bandwidth) Setting mode: Auto, Manual with MS2830A-077, $>31.25$ MHz bandwidth Setting capture time length Minimum capture time length: 1 $\mu$ s Maximum capture time length: 500 ms Setting mode: Auto, Manual with MS2830A-078, $>31.25$ MHz bandwidth Setting capture time length Minimum capture time length: 500 ns to 1 $\mu$ s (Determined according to analysis bandwidth) Maximum capture time length: 500 ms Setting mode: Auto, Manual
Trigger	Free run (Trigger off), Video, Wide IF video, Frame, External
ADC resolution	without MS2830A-077/078, or $\leq 31.25$ MHz bandwidth 16 bits

■ Signal Analyzer (Continuation)

Spectrum displayed function

Function outline	Displayed spectrum of any time length and frequency range within captured waveform data
Analysis time length	Analysis start time: Sets analysis start time point from waveform data header Analysis time length: Sets analysis time length Setting mode: Auto, Manual
Frequency	Can be set Center frequency and Span at frequency range in waveform data
Frequency setting	without MS2830A-077/078, or $\leq 31.25$ MHz bandwidth 0 MHz to 26.5 GHz [MS2830A-044] 0 MHz to 43 GHz [MS2830A-045]  with MS2830A-077/078, without MS2830A-067, $> 31.25$ MHz bandwidth 300 MHz to 6 GHz [MS2830A-044] 300 MHz to 6 GHz [MS2830A-045]  with MS2830A-077/078, MS2830A-067, $> 31.25$ MHz bandwidth 300 MHz to 26.5 GHz [MS2830A-044] 300 MHz to 43 GHz [MS2830A-045]
Resolution bandwidth (RBW)	without MS2830A-077/078, or $\leq 31.25$ MHz bandwidth Setting range: 1 Hz to 1 MHz (1-3 sequence) Selectivity ( $-60$ dB/ $-3$ dB): 4.5:1 (nominal)  with MS2830A-077, $> 31.25$ MHz bandwidth Setting range: 1 Hz to 3 MHz (1-3 sequence) Selectivity ( $-60$ dB/ $-3$ dB): 4.5:1 (nominal)  with MS2830A-078, $> 31.25$ MHz bandwidth Setting range: 1 Hz to 10 MHz (1-3 sequence) Selectivity ( $-60$ dB/ $-3$ dB): 4.5:1 (nominal)
Total absolute amplitude accuracy*	18° to 28°C, after CAL, Input attenuator: $\geq 10$ dB, RBW: Auto, Time detection: Average, Marker result: Integration or Peak (Accuracy), Center frequency, CW Excluding the noise floor effect  without MS2830A-068, or Preamp: Off Input attenuator: $\geq 10$ dB, Input level: $\leq -10$ dBm (f: $< 30$ MHz), Mixer input level: $\leq -10$ dBm (f: $\geq 30$ MHz) $\pm 0.5$ dB (300 kHz $\leq f < 4$ GHz, Frequency band mode: Normal) (300 kHz $\leq f < 3.5$ GHz, Frequency band mode: Spurious) $\pm 1.8$ dB (4 GHz $\leq f \leq 6$ GHz, Frequency band mode: Normal) (3.5 GHz $\leq f \leq 4$ GHz, Frequency band mode: Spurious) $\pm 1.8$ dB (6 GHz $< f \leq 13.8$ GHz, Frequency band mode: Normal) (4 GHz $< f \leq 13.8$ GHz, Frequency band mode: Spurious) $\pm 3.0$ dB (13.8 GHz $< f \leq 26.5$ GHz) $\pm 3.0$ dB (26.5 GHz $< f \leq 40$ GHz) $\pm 3.5$ dB (nominal, 40 GHz $< f \leq 43$ GHz)  with MS2830A-068, Preamp: On Input attenuator: 10 dB, Preamp Input level: $\leq -30$ dBm $\pm 1.0$ dB (300 kHz $\leq f < 4$ GHz, Frequency band mode: Normal) (300 kHz $\leq f < 3.5$ GHz, Frequency band mode: Spurious) $\pm 1.8$ dB (4 GHz $\leq f \leq 6$ GHz, Frequency band mode: Normal) (3.5 GHz $\leq f \leq 4$ GHz, Frequency band mode: Spurious) $\pm 2.0$ dB (6 GHz $< f \leq 13.8$ GHz, Frequency band mode: Normal) (4 GHz $< f \leq 13.8$ GHz, Frequency band mode: Spurious) $\pm 3.0$ dB (13.8 GHz $< f \leq 26.5$ GHz) $\pm 4.0$ dB (26.5 GHz $< f \leq 40$ GHz) $\pm 4.0$ dB (nominal, 40 GHz $< f \leq 43$ GHz)
In-band frequency characteristics	18° to 28°C, Referenced to level at center frequency, Center frequency: $\pm 10$ MHz  Without MS2830A-077/078, or $\leq 31.25$ MHz bandwidth $\pm 0.31$ dB (30 MHz $\leq f \leq 4$ GHz, Frequency band mode: Normal) (30 MHz $\leq f < 3.5$ GHz, Frequency band mode: Spurious)

■ **Signal Analyzer (Continuation)**  
**Spectrum displayed function (Continuation)**

Displayed average noise level (DANL)	without MS2830A-067/068, Frequency band mode: Normal –131.5 dBm/Hz (100 kHz) –141.5 dBm/Hz (1 MHz) –150.5 dBm/Hz (30 MHz ≤ f < 1 GHz) –147.5 dBm/Hz (1 GHz ≤ f < 2.4 GHz) –144.5 dBm/Hz (2.4 GHz ≤ f ≤ 3.5 GHz) –141.5 dBm/Hz (3.5 GHz < f ≤ 4 GHz) –141.5 dBm/Hz (4 GHz < f ≤ 6 GHz) –148.5 dBm/Hz (6 GHz ≤ f ≤ 13.5 GHz) –146.5 dBm/Hz (13.5 GHz < f ≤ 18.3 GHz) –143.5 dBm/Hz (18.3 GHz < f ≤ 26.5 GHz) –143.5 dBm/Hz (26.5 GHz < f ≤ 34 GHz) –141.5 dBm/Hz (34 GHz < f ≤ 40 GHz) –137.5 dBm/Hz (40 GHz < f ≤ 43 GHz)
	without MS2830A-067, with MS2830A-068, Preamp: Off, Frequency band mode: Normal –131.5 dBm/Hz (100 kHz) –141.5 dBm/Hz (1 MHz) –150.5 dBm/Hz (30 MHz ≤ f < 1 GHz) –147.5 dBm/Hz (1 GHz ≤ f < 2.4 GHz) –144.5 dBm/Hz (2.4 GHz ≤ f ≤ 3.5 GHz) –141.5 dBm/Hz (3.5 GHz < f ≤ 4 GHz) –141.5 dBm/Hz (4 GHz < f ≤ 6 GHz) –144.5 dBm/Hz (6 GHz < f ≤ 13.5 GHz) –142.5 dBm/Hz (13.5 GHz < f ≤ 18.3 GHz) –138.5 dBm/Hz (18.3 GHz < f ≤ 26.5 GHz) –138.5 dBm/Hz (26.5 GHz < f ≤ 34 GHz) –132.5 dBm/Hz (34 GHz < f ≤ 40 GHz) –129.5 dBm/Hz (40 GHz < f ≤ 43 GHz)
	without MS2830A-067, with MS2830A-068, Preamp: On, Frequency band mode: Normal –144.5 dBm/Hz (nominal, 100 kHz) –153.5 dBm/Hz (1 MHz) –160.5 dBm/Hz (30 MHz ≤ f < 1 GHz) –158.5 dBm/Hz (1 GHz ≤ f < 2 GHz) –156.5 dBm/Hz (2 GHz ≤ f ≤ 3.5 GHz) –152.5 dBm/Hz (3.5 GHz < f ≤ 4 GHz) –152.5 dBm/Hz (4 GHz < f ≤ 6 GHz) –157.5 dBm/Hz (6 GHz < f ≤ 13.5 GHz) –155.5 dBm/Hz (13.5 GHz < f ≤ 18.3 GHz) –153.5 dBm/Hz (18.3 GHz < f ≤ 26.5 GHz) –153.5 dBm/Hz (26.5 GHz < f ≤ 34 GHz) –147.5 dBm/Hz (34 GHz < f ≤ 40 GHz) –144.5 dBm/Hz (40 GHz < f ≤ 43 GHz)
	with MS2830A-067: See Microwave Preselector Bypass (Displayed average noise level)
Adjacent channel power (ACP)	Reference: Span total, Carrier total, Both sides of carriers, Carrier select Adjacent channel specifications: 3 channels × 2
Channel power	Measurement of absolute values: dBm, dBm/Hz
Occupied bandwidth (OBW)	N% of Power, X-dB Down

**Power vs. Time displayed function**

Function outline	Displayed time changes of power for captured waveform data
Analysis time range	Analysis start time: Sets analysis start time position from beginning of waveform data 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

## ■ Signal Analyzer (Continuation)

### Frequency vs. Time displayed function

Function outline	Displayed frequency time fluctuations 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
Operating level range	-17 to +30 dBm (Input attenuator: ≥10 dB)
Frequency (Vertical axis)	Can be set Center frequency and Span at frequency range in waveform data Displayed frequency range: Selectable 1/25, 1/10, 1/5, 1/2 of analysis bandwidth Input frequency range: 10 MHz to 6 GHz
Frequency readout accuracy	Input level: -17 to +30 dBm, Span: ≤31.25 MHz, Scale: Span/25, CW input ± (Reference oscillator accuracy × Center frequency + Displayed frequency range × 0.01) Hz
FM Deviation (Peak to Peak measurement)	Measures FM Deviation or marker function +Peak, -Peak, (P-P)/2, Average

### Phase vs. Time displayed function

Function outline	Displayed 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 Displayed phase range: 0.01 deg./div to 200 Gdeg./div Offset: -100 deg. to +100 Mdeg.

### CCDF/APD displayed function

Function outline	Displayed CCDF and APD of waveform data within a given length of 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	Displayed CCDF or APD as graphs Histogram resolution: 0.01 dB Value: Average power, Max. power, Crest factor
Resolution bandwidth	Filter type: Rectangle, Off, (Default: Off) Filter frequency offset: Sets filter center frequency in frequency band of waveform data

### Spectrogram displayed function

Function outline	Displayed spectrogram for arbitrary time length in 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
Frequency	Can be set Center frequency and Span at frequency range in waveform data
Resolution bandwidth (RBW)	Setting range: 1 Hz to 1 MHz (1-3 sequence) Selectivity (-60 dB/-3 dB): 4.5:1 (nominal)

### Digitize function

Function outline	Captured waveform data saved to internal HDD or output to external devices
Waveform data	Format: I, Q (each 32 bit, Float binary type) Level: 0 dBm input is $\sqrt{I^2 + Q^2} = 1$ Level accuracy: Same as signal analyzer absolute amplitude accuracy
External output	Can be output to external PC via Ethernet

■ Signal Analyzer (Continuation)

**Replay function**

Function outline	Captured waveforms can be replayed again by using the VSA function to read saved digitize data		
Conditions for measurable waveform data	Format: I, Q (binary format)		
	Combination of Span, Sampling rate, and Minimum capture sample		
	Span	Sampling rate	Minimum capture sample
	1 kHz	2 kHz	74000 (37 s)
	2.5 kHz	5 kHz	160000 (32 s)
	5 kHz	10 kHz	310000 (31 s)
	10 kHz	25 kHz	610000 (30.5 s)
	25 kHz	50 kHz	730000 (14.6 s)
	50 kHz	100 kHz	730000 (7.3 s)
	100 kHz	200 kHz	730000 (3.65 s)
	250 kHz	500 kHz	730000 (1.46 s)
	500 kHz	1 MHz	730000 (730 ms)
	1 MHz	2 MHz	730000 (365 ms)
	2.5 MHz	5 MHz	730000 (146 ms)
	5 MHz	10 MHz	730000 (73 ms)
	10 MHz	20 MHz	730000 (36.5 ms)
	18.6 MHz	20 MHz	730000 (36.5 ms)
	20 MHz	25 MHz	730000 (29.2 ms)
	25 MHz	50 MHz	730000 (14.6 ms)
	31.25 MHz	50 MHz	730000 (14.6 ms)
50 MHz	100 MHz	730000 (7.3 ms)	
62.5 MHz	100 MHz	730000 (7.3 ms)	
100 MHz	200 MHz	730000 (3.65 ms)	
125 MHz	200 MHz	730000 (3.65 ms)	

## ■ Connector

### Connector

RF input	<p>18° to 28°C, Input attenuator: ≥10 dB</p> <p>with MS2830A-044  Connector: N-J (Front panel), 50Ω (nominal)  VSWR : ≤1.2 (nominal, 40 MHz ≤ f ≤ 3 GHz)  ≤1.5 (nominal, 3 GHz &lt; f ≤ 6 GHz)  ≤1.6 (nominal, 6 GHz &lt; f ≤ 13.5 GHz)  ≤1.9 (nominal, 13.5 GHz &lt; f ≤ 26.5 GHz)</p> <p>with MS2830A-045  Connector: K-J (Front panel), 50Ω (nominal)  VSWR : ≤1.2 (nominal, 40 MHz ≤ f ≤ 3 GHz)  ≤1.3 (nominal, 3 GHz &lt; f ≤ 6 GHz)  ≤1.3 (nominal, 6 GHz &lt; f ≤ 13.5 GHz)  ≤1.4 (nominal, 13.5 GHz &lt; f ≤ 26.5 GHz)  ≤1.6 (nominal, 26.5 GHz &lt; f ≤ 40 GHz)  ≤1.6 (Reference data, 40 GHz &lt; f ≤ 43 GHz, V-K converter mounted and included)</p>																																				
External reference input	Connector: BNC-J (Rear panel), 50Ω (nominal) Frequency: 5, 10, 13 MHz Operating range: ±1 ppm Input level: -15 to +20 dBm, 50Ω (AC coupling)																																				
Reference signal output	Connector: BNC-J (Rear panel), 50Ω (nominal) Frequency: 10 MHz Output level: ≥0 dBm (AC coupling)																																				
Sweep status output	Connector: BNC-J (Rear panel) Output level: TTL level (High level at sweeping or waveform capture)																																				
SA trigger input	Connector: BNC-J (Rear panel) Output 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 controller	Control from external controller (excluding power-on/off)																																				
Ethernet (10/100/1000BASE-T)	Connector: RJ-45 (Rear panel)																																				
GPIB	IEEE488 bus connector (IEEE488.2, Rear panel) Interface function: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0, E2																																				
USB (B)	USB-B connector (USB2.0, Rear panel)																																				
USB	USB-A connector (USB2.0, Front panel: 2 ports, Rear panel: 2 ports)																																				
Monitor output	Mini D-Sub 15 pin (Compatible with VGA, Rear panel)																																				
Aux	50 pin (Correspond to DX10A-50S, Rear panel), Using extended input/output																																				
IF output*	Connector: SMA-J (Rear panel), 50Ω (nominal) Frequency: 1875 MHz Gain: -10 dB (nominal, Input attenuator: 0 dB, Input frequency: 10 GHz)																																				
1st local output*	Connector: SMA-J (Front panel), 50Ω (nominal) Frequency: 5 GHz to 10 GHz (Local signal output), 1875 MHz (IF signal frequency) Gain: -10 dB (nominal, Input attenuator: 0 dB, Input frequency: 10 GHz)																																				
Display	XGA-color LCD (Resolution: 1024 × 768), 8.4 inches (Diagonal: 213 mm)																																				
External mixer*	Frequency Frequency range: 26.5 GHz to 110 GHz Frequency bands: <table border="1" data-bbox="411 1451 1010 1766"> <thead> <tr> <th>Band</th> <th>Frequency range</th> <th>Mixer harmonics order (N)</th> </tr> </thead> <tbody> <tr><td>A</td><td>26.5 GHz to 40 GHz</td><td>4+</td></tr> <tr><td>Q</td><td>33 GHz to 50 GHz</td><td>5+</td></tr> <tr><td>U</td><td>40 GHz to 60 GHz</td><td>6+</td></tr> <tr><td>V</td><td>50 GHz to 75 GHz</td><td>8+</td></tr> <tr><td>E</td><td>60 GHz to 90 GHz</td><td>9+</td></tr> <tr><td>W</td><td>75 GHz to 110 GHz</td><td>11+</td></tr> <tr><td>F</td><td>90 GHz to 140 GHz</td><td>14+</td></tr> <tr><td>D</td><td>110 GHz to 170 GHz</td><td>17+</td></tr> <tr><td>G</td><td>140 GHz to 220 GHz</td><td>22+</td></tr> <tr><td>Y</td><td>170 GHz to 260 GHz</td><td>26+</td></tr> <tr><td>J</td><td>220 GHz to 325 GHz</td><td>33+</td></tr> </tbody> </table> Amplitude Mixer conversion loss Setting range: 0 to 99.9 dB Maximum input level, Average noise level, Frequency response: Depends on External mixer Input/Output Applicable mixer: 2-port mixer only Local frequency: 5 GHz to 10 GHz IF Frequency: 1875 MHz	Band	Frequency range	Mixer harmonics order (N)	A	26.5 GHz to 40 GHz	4+	Q	33 GHz to 50 GHz	5+	U	40 GHz to 60 GHz	6+	V	50 GHz to 75 GHz	8+	E	60 GHz to 90 GHz	9+	W	75 GHz to 110 GHz	11+	F	90 GHz to 140 GHz	14+	D	110 GHz to 170 GHz	17+	G	140 GHz to 220 GHz	22+	Y	170 GHz to 260 GHz	26+	J	220 GHz to 325 GHz	33+
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Q	33 GHz to 50 GHz	5+																																			
U	40 GHz to 60 GHz	6+																																			
V	50 GHz to 75 GHz	8+																																			
E	60 GHz to 90 GHz	9+																																			
W	75 GHz to 110 GHz	11+																																			
F	90 GHz to 140 GHz	14+																																			
D	110 GHz to 170 GHz	17+																																			
G	140 GHz to 220 GHz	22+																																			
Y	170 GHz to 260 GHz	26+																																			
J	220 GHz to 325 GHz	33+																																			

\*: With MS2830A-044/045 only

## ■ General

Dimensions and Mass	426 (W) × 177 (H) × 390 (D) mm (Exclusive of surface projection) ≤15 kg (excluding other options)
Power supply	Power voltage: 100 V(ac) to 120 V(ac) / 200 V(ac) to 240 V(ac) Frequency: 50 Hz/60 Hz Power consumption: 190 VA (nominal, excluding other options)
Temperature range	Operating: +5° to +45°C, Storage: -20° to +60°C
EMC	EN61326-1, EN61000-3-2

## ■ MS2830A-001 Rubidium Reference Oscillator

Generates 10 MHz reference signal with higher frequency stability.

### Frequency

Internal reference oscillator	See Signal Analyzer/Spectrum Analyzer (Internal reference oscillator)
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## ■ MS2830A-006 Analysis Bandwidth 10 MHz

This option adds a function to analyze 10 MHz bandwidth.

## ■ MS2830A-005 Analysis Bandwidth Extension to 31.25 MHz

This option adds a function to analyze 31.25 MHz bandwidth. (Require Opt. 006)

MS2830A-005 is not available when MS2830A-045 is installed.

## ■ MS2830A-009 Bandwidth Extension to 31.25 MHz for Millimeter-wave

This option adds a function to analyze 31.25 MHz bandwidth (Require Opt. 006).

MS2830A-009 is available when MS2830A-045 is installed.

Cannot be set the RBW to more than 10 MHz in spectrum analyzer function.

## ■ MS2830A-008 Preamplicifier

This option amplifies signal prior to mixer to enhance sensitivity.

Cannot install simultaneously with MS2830A-068.

### Frequency

Frequency range	100 kHz to 6 GHz
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### Amplitude

Level measurement range	See Signal Analyzer/Spectrum Analyzer (Level measurement range)
Maximum input level	See Signal Analyzer/Spectrum Analyzer (Maximum input level)
Displayed average noise level (DANL)	See Spectrum Analyzer, Signal Analyzer (Displayed average noise level (DANL))
RF frequency characteristics	See Signal Analyzer/Spectrum Analyzer (RF frequency characteristics)
Input attenuator switching uncertainty	See Signal Analyzer/Spectrum Analyzer (Input attenuator switching uncertainty)
Linearity error	See Signal Analyzer/Spectrum Analyzer (Linearity error)
Second harmonic distortion	See Signal Analyzer/Spectrum Analyzer (Second harmonic distortion)
1 dB gain compression	See Signal Analyzer/Spectrum Analyzer (1 dB gain compression)
2-tone 3rd-order intermodulation distortion	See Spectrum Analyzer (2-tone 3rd-order intermodulation distortion)

## ■ MS2830A-010 Phase Noise Measurement Function

Displays the phase noise characteristics on a logarithmic scale

### Frequency

Frequency range	10 MHz to Upper frequency limit
Offset frequency range	10 Hz to 10 MHz
Marker mode	Normal, Integral Noise, RMS Noise, Jitter, Residual FM

## ■ MS2830A-011 2ndary HDD

This option adds a removable HDD for storing user data.

## ■ MS2830A-016 Precompliance EMI Function

Adds the Detection mode and the Resolution bandwidth for EMI measurement to the Spectrum Analyzer function.

Resolution bandwidth (RBW)	Setting range: 200 Hz (6 dB), 9 kHz (6 dB), 120 kHz (6 dB), 1 MHz (Impulse)
Detector	Quasi-Peak, CISPR-AVG, RMS-AVG

## ■ MS2830A-017 Noise Figure Measurement Function\*

### Frequency

Frequency range	MS2830A-044 (MS2830A-068/168 is not installed): 30 MHz to 6 GHz MS2830A-044 (MS2830A-068/168 is installed): 30 MHz to 26.5 GHz MS2830A-045 (MS2830A-068/168 is not installed): 30 MHz to 6 GHz MS2830A-045 (MS2830A-068/168 is installed): 30 MHz to 40 GHz
Frequency setting range	MS2830A-044: 10 MHz to 26.5 GHz MS2830A-045: 10 MHz to 43 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
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### Connector

Noise source	Connector: Rear Panel, BNC-J Output Voltage: 28 ±0.5 V, Pulsed
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\*: Recommending the NC346 Series noise sources by Noisecom company

## ■ MS2830A-026 BER Measurement Function

Connector	AUX connector(Rear panel)* *: Can convert to BNC by connecting AUX Conversion Adapter (J1556A).
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, Alternate (0101 ...) PN9Fix, PN11Fix, PN15Fix, PN20Fix, PN23Fix, User Define (4096 bits Max.)
Synchronization Establishing Condition	PN Signal: PN stage × 2 bit error free At PNFix Signal: 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, Alternate (0101 ...): 10 bit error free UserDefine: 8 to 1024 bits (variable) error free Select header bit used at sync detection
Re-synchronization Judgment Condition	x/y (Resynchronization at detection of x-bit error in y bits) y ... Measured bit count: Select from 500 bits, 5000 bits, 50000 bits x ... Number of error bits in y bits: Setting range 1 to y/2
Measured Bit Count	$\leq 2^{32} - 1$ bits
Measured Error Bit Count	$\leq 2^{31} - 1$ bits
Measurement End Conditions	Measured bit count, Measured error bit count
Auto Re-synchronization Function	Can be toggled on and off
Operation at Resync.	Select from Count Clear, and Count Keep
Measurement Mode	Single, Endless, Continuous
Display	Status, Error, Error Rate, Error Count, SyncLoss Count, Measured bit count
Polarity Inversion Function	Supports polarity reversal for Data, Clock, Enable
Clear Measurement Function	At BER measurement, hold sync status, clears measured value and measures from 0

## ■ MS2830A-068 Microwave Preamplicifier

This option amplifies signal prior to mixer to enhance sensitivity.

Cannot install simultaneously with MS2830A-008.

When Opt. 168 is added to MS2830A (with Opt. 008), only Opt. 168 becomes available.

### Frequency

Frequency range	100 kHz to 26.5 GHz [MS2830A-044] 100 kHz to 43 GHz [MS2830A-045]
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### Amplitude

Level measurement range	See Signal Analyzer/Spectrum Analyzer (Level measurement range)
Maximum input level	See Signal Analyzer/Spectrum Analyzer (Maximum input level)
Displayed average noise level (DANL)	See Spectrum Analyzer, Signal Analyzer (Displayed average noise level (DANL))
RF frequency characteristics	See Signal Analyzer/Spectrum Analyzer (RF frequency characteristics)
Input attenuator switching uncertainty	See Signal Analyzer/Spectrum Analyzer (Input attenuator switching uncertainty)
Linearity error	See Signal Analyzer/Spectrum Analyzer (Linearity error)
Second harmonic distortion	See Signal Analyzer/Spectrum Analyzer (Second harmonic distortion)
1 dB gain compression	See Signal Analyzer/Spectrum Analyzer (1 dB gain compression)
2-tone 3rd-order intermodulation distortion	See Spectrum Analyzer (2-tone 3rd-order intermodulation distortion)

## ■ MS2830A-067 Microwave Preselector Bypass

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

Add MS2830A-067 when using the signal analyzer measurement functions at bandwidth: >31.25 MHz and frequency: >6 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.

Microwave Preselector Bypass: On (with MS2830A-067), Microwave Preselector Bypass: Off (with special directions)

### Frequency

Frequency range	4 GHz to 26.5 GHz [MS2830A-044] 4 GHz to 43 GHz [MS2830A-045]
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### Amplitude

Frequency characteristics	<p>18° to 28°C, after CAL, Input attenuator: 10 dB, Microwave Preselector Bypass: On</p> <p>without MS2830A-068, Preamp: Off</p> <ul style="list-style-type: none"> <li>±1.0 dB (6 GHz ≤ f ≤ 13.8 GHz, Frequency band mode: Normal)</li> <li>(4 GHz ≤ f ≤ 13.8 GHz, Frequency band mode: Spurious)</li> <li>±1.5 dB (13.8 GHz &lt; f ≤ 26.5 GHz)</li> <li>±2.0 dB (26.5 GHz &lt; f ≤ 40 GHz)</li> <li>±2.0 dB (typ., 40 GHz &lt; f ≤ 43 GHz)</li> </ul> <p>with MS2830A-068, Preamp: On</p> <ul style="list-style-type: none"> <li>±1.8 dB (6 GHz ≤ f ≤ 13.8 GHz, Frequency band mode: Normal)</li> <li>(4 GHz ≤ f ≤ 13.8 GHz, Frequency band mode: Spurious)</li> <li>±2.5 dB (13.8 GHz &lt; f ≤ 26.5 GHz)</li> <li>±3.0 dB (26.5 GHz &lt; f ≤ 40 GHz)</li> <li>±3.0 dB (nominal, 40 GHz &lt; f ≤ 43 GHz)</li> </ul> <p>*with MS2830A-067, Microwave Preselector Bypass: Off, see Signal Analyzer/Spectrum Analyzer (RF frequency characteristics)</p>
Displayed average noise level (DANL)	<p>18° to 28°C, Detector: Sample, VBW: 1 Hz (Video average), Input attenuator: 0 dB</p> <p>without MS2830A-068, Microwave Preselector Bypass: On, Off</p> <ul style="list-style-type: none"> <li>-147 dBm/Hz (6 GHz &lt; f ≤ 13.5 GHz)</li> <li>-145 dBm/Hz (13.5 GHz &lt; f ≤ 18.3 GHz)</li> <li>-141 dBm/Hz (18.3 GHz &lt; f ≤ 26.5 GHz)</li> <li>-141 dBm/Hz (26.5 GHz &lt; f ≤ 34 GHz)</li> <li>-135 dBm/Hz (34 GHz &lt; f ≤ 40 GHz)</li> <li>-132 dBm/Hz (40 GHz &lt; f ≤ 43 GHz)</li> </ul> <p>with MS2830A-068, Preamp: Off, Microwave Preselector Bypass: On, Off</p> <ul style="list-style-type: none"> <li>-142 dBm/Hz (6 GHz &lt; f ≤ 13.5 GHz)</li> <li>-140 dBm/Hz (13.5 GHz &lt; f ≤ 18.3 GHz)</li> <li>-136 dBm/Hz (18.3 GHz &lt; f ≤ 26.5 GHz)</li> <li>-136 dBm/Hz (26.5 GHz &lt; f ≤ 34 GHz)</li> <li>-131 dBm/Hz (34 GHz &lt; f ≤ 40 GHz)</li> <li>-128 dBm/Hz (40 GHz &lt; f ≤ 43 GHz)</li> </ul> <p>with MS2830A-068, Preamp: On, Microwave Preselector Bypass: On</p> <ul style="list-style-type: none"> <li>-154 dBm/Hz (6 GHz &lt; f ≤ 13.5 GHz)</li> <li>-152 dBm/Hz (13.5 GHz &lt; f ≤ 18.3 GHz)</li> <li>-150 dBm/Hz (18.3 GHz &lt; f ≤ 26.5 GHz)</li> <li>-150 dBm/Hz (26.5 GHz &lt; f ≤ 34 GHz)</li> <li>-144 dBm/Hz (34 GHz &lt; f ≤ 40 GHz)</li> <li>-141 dBm/Hz (40 GHz &lt; f ≤ 43 GHz)</li> </ul>
Image responses	<p>with MS2830A-067, Microwave Preselector Bypass: Off</p> <ul style="list-style-type: none"> <li>≤ -60 dBc (6 GHz &lt; f ≤ 13.5 GHz)</li> <li>≤ -60 dBc (13.5 GHz &lt; f ≤ 26.5 GHz)</li> </ul> <p>with MS2830A-067, Microwave Preselector Bypass: On</p> <p>Generated at the frequency at the distance of 1875 MHz × 2</p> <ul style="list-style-type: none"> <li>0 dBc (nominal, 4 GHz ≤ f ≤ 26.5 GHz)</li> <li>0 dBc (nominal, 26.5 GHz &lt; f ≤ 43 GHz)</li> </ul>

## ■ MS2830A-313 Removable HDD

The MS2830A-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 MS2830A hard disk and replaces it with this product.

Insert into the HDD slot on the rear panel to use.

## ■ MS2830A-077 Analysis Bandwidth Extension to 62.5 MHz

This option adds a function to analyze 62.5 MHz bandwidth.  
 MS2830A-044: Require MS2830A-006 and MS2830A-005.  
 MS2830A-045: Require MS2830A-006 and MS2830A-009.

## ■ MS2830A-078 Analysis Bandwidth Extension to 125 MHz

This option adds a function to analyze 125 MHz bandwidth.  
 MS2830A-044: Require MS2830A-006, MS2830A-005 and MS2830A-077.  
 MS2830A-045: Require MS2830A-006 MS2830A-009 and MS2830A-077

An image response is received when setting the bandwidth to more than 31.25 MHz.  
 This can be used when not inputting a signal frequency outside the MS2830A analysis bandwidth (125 MHz max.).  
 The MS2690A/91A/92A Signal Analyzer series is recommended for other measurement purposes.

### General

Analysis bandwidth	See Signal Analyzer (Analysis bandwidth)
Sampling rate	See Signal Analyzer (Sampling rate)
Capture time	See Signal Analyzer (Capture time)
ADC resolution	with MS2830A-077/078, >31.25 MHz bandwidth 14 bits

### Frequency

Frequency setting	See Signal Analyzer/Spectrum display function (Frequency setting)
Resolution bandwidth (RBW)	See Signal Analyzer/Spectrum display function(Resolution bandwidth (RBW))

### Amplitude

Displayed average noise level (DANL)	<p>18° to 28°C, Input attenuator: 0 dB          with MS2830A-077 or 078, &gt;31.25 MHz bandwidth          without MS2830A-008/068, or with MS2830A-008/068, Preamp: Off</p> <ul style="list-style-type: none"> <li>-146.5 dBm/Hz (300 MHz ≤ f &lt; 1 GHz)</li> <li>-143.5 dBm/Hz (1 GHz ≤ f &lt; 2.4 GHz)</li> <li>-140.5 dBm/Hz (2.4 GHz ≤ f ≤ 3.5 GHz)</li> <li>-137.5 dBm/Hz (3.5 GHz &lt; f ≤ 4 GHz)</li> <li>-137.5 dBm/Hz (4 GHz &lt; f ≤ 6 GHz)</li> </ul> <p>with MS2830A-008/068, Preamp: ON</p> <ul style="list-style-type: none"> <li>-156.5 dBm/Hz (300 MHz ≤ f &lt; 1 GHz)</li> <li>-154.5 dBm/Hz (1 GHz ≤ f &lt; 2 GHz)</li> <li>-152.5 dBm/Hz (2 GHz ≤ f ≤ 3.5 GHz)</li> <li>-148.5 dBm/Hz (3.5 GHz &lt; f ≤ 4 GHz)</li> <li>-148.5 dBm/Hz (4 GHz &lt; f ≤ 6 GHz)</li> </ul> <p>18° to 28°C, Input attenuator: 0 dB          with MS2830A-077 or 078, with MS2830A-067, &gt;31.25 MHz bandwidth          without MS2830A-068</p> <ul style="list-style-type: none"> <li>-137.5 dBm/Hz (6 GHz &lt; f ≤ 13.5 GHz)</li> <li>-135.5 dBm/Hz (13.5 GHz &lt; f ≤ 18.3 GHz)</li> <li>-131.5 dBm/Hz (18.3 GHz &lt; f ≤ 26.5 GHz)</li> <li>-131.5 dBm/Hz (26.5 GHz &lt; f ≤ 34 GHz) [MS2830A-045]</li> <li>-125.5 dBm/Hz (34 GHz &lt; f ≤ 40 GHz) [MS2830A-045]</li> <li>-122.5 dBm/Hz (40 GHz &lt; f ≤ 43 GHz) [MS2830A-045]</li> </ul> <p>with MS2830A-068, Preamp: Off</p> <ul style="list-style-type: none"> <li>-132.5 dBm/Hz (6 GHz &lt; f ≤ 13.5 GHz)</li> <li>-130.5 dBm/Hz (13.5 GHz &lt; f ≤ 18.3 GHz)</li> <li>-126.5 dBm/Hz (18.3 GHz &lt; f ≤ 26.5 GHz)</li> <li>-126.5 dBm/Hz (26.5 GHz &lt; f ≤ 34 GHz) [MS2830A-045]</li> <li>-121.5 dBm/Hz (34 GHz &lt; f ≤ 40 GHz) [MS2830A-045]</li> <li>-118.5 dBm/Hz (40 GHz &lt; f ≤ 43 GHz) [MS2830A-045]</li> </ul> <p>with MS2830A-068, Preamp: On</p> <ul style="list-style-type: none"> <li>-147.5 dBm/Hz (6 GHz &lt; f ≤ 13.5 GHz)</li> <li>-145.5 dBm/Hz (13.5 GHz &lt; f ≤ 18.3 GHz)</li> <li>-143.5 dBm/Hz (18.3 GHz &lt; f ≤ 26.5 GHz)</li> <li>-143.5 dBm/Hz (26.5 GHz &lt; f ≤ 34 GHz) [MS2830A-045]</li> <li>-137.5 dBm/Hz (34 GHz &lt; f ≤ 40 GHz) [MS2830A-045]</li> <li>-134.5 dBm/Hz (40 GHz &lt; f ≤ 43 GHz) [MS2830A-045]</li> </ul>
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■ **MS2830A-077 Analysis Bandwidth Extension to 62.5 MHz**  
**MS2830A-078 Analysis Bandwidth Extension to 125 MHz (Continuation)**

**Amplitude (Continuation)**

Image Response	<p>with MS2830A-077/078, &gt;31.25 MHz bandwidth  Image Response (Occurs at frequency 200 MHz away): 0 dBc (nominal, 300 MHz &lt; f ≤ 43 GHz)</p> <p>with MS2830A-077/078, MS2830A-067, &gt;31.25 MHz bandwidth  Image Response (Occurs at frequency 1875 MHz × 2 away): 0 dBc (nominal, 6 GHz &lt; f ≤ 43 GHz)</p>
RF frequency characteristics	<p>18° to 28°C, after CAL, Input attenuator: 10 dB, Frequency band mode: Normal, &gt;31.25 MHz bandwidth</p> <p>without MS2830A-008/068, or Preamp: Off  ±0.35 dB (300 MHz ≤ f &lt; 4 GHz)  ±1.5 dB (4 GHz ≤ f ≤ 6 GHz)</p> <p>with MS2830A-008, Preamp: On  ±0.65 dB (300 MHz ≤ f &lt; 4 GHz)  ±1.8 dB (4 GHz ≤ f ≤ 6 GHz)</p> <p>without MS2830A-068, or Preamp: Off  with MS2830A-067, Microwave Preselector Bypass: On  ±1.0 dB (6 GHz ≤ f ≤ 13.8 GHz)  ±1.5 dB (13.8 GHz &lt; f ≤ 26.5 GHz)  ±2.0 dB (26.5 GHz &lt; f ≤ 40 GHz)  ±2.0 dB (typ., 40 GHz &lt; f ≤ 43 GHz)</p> <p>with MS2830A-068, or Preamp: On  with MS2830A-067, Microwave Preselector Bypass: On  ±1.8 dB (6 GHz ≤ f ≤ 13.8 GHz)  ±2.5 dB (13.8 GHz &lt; f ≤ 26.5 GHz)  ±3.0 dB (26.5 GHz &lt; f ≤ 40 GHz)  ±3.0 dB (Nominal, 40 GHz &lt; f ≤ 43 GHz)</p>
Linearity error	See Signal Analyzer/Spectrum Analyzer (Linearity error)

**Typical (typ.):** Performance not warranted. Most 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.



## Software

✓ = Can be installed, No = Cannot be installed, R = Require, U = Upgrade

Model	Name	Addition to Main frame					Analysis Bandwidth					Note
		040	041	043	044	045	005	006	009	077	078	
MX269010A	Mobile WiMAX Measurement Software	✓	✓	✓	✓	No	R	R	No			
MX269011A	W-CDMA/HSPA Downlink Measurement Software	✓	✓	✓	✓	✓		R				
MX269012A	W-CDMA/HSPA Uplink Measurement Software	✓	✓	✓	✓	✓		R				
MX269013A	GSM/EDGE Measurement Software	✓	✓	✓	✓	✓		R				
MX269013A-001	EDGE Evolution Measurement Software	✓	✓	✓	✓	✓		R				Require MX269013A
MX269015A	TD-SCDMA Measurement Software	✓	✓	✓	✓	✓		R				
MX269017A	Vector Modulation Analysis Software	✓	✓	✓	*3	*3	U	R	*1	U	U	U: Upgrade of the phase noise performance (MS2830A-066) (Measured signal: Frequency <3.6 GHz, Bandwidth <1 MHz)
MX269018A	Analog Measurement Software	✓	✓	*2	No	No			No			Require MS2830A-066 and A0086A USB Audio (See MX2690xxA series Measurement Software catalog for detail) Note) MS2830A-043 cannot implement a signal generator for Rx-test (Because Opt. 066 is required)
MX269020A	LTE Downlink Measurement Software	✓	✓	✓	✓	✓	R	R	*1			
MX269020A-001	LTE-Advanced FDD Downlink Measurement Software	✓	✓	✓	✓	✓	R	R	*1	U	U	Require MX269020A
MX269021A	LTE Uplink Measurement Software	✓	✓	✓	✓	✓	R	R	*1			
MX269022A	LTE TDD Downlink Measurement Software	✓	✓	✓	✓	✓	R	R	*1			
MX269022A-001	LTE-Advanced TDD Downlink Measurement Software	✓	✓	✓	✓	✓	R	R	*1	U	U	Require MX269022A
MX269023A	LTE TDD Uplink Measurement Software	✓	✓	✓	✓	✓	R	R	*1			
MX269024A	CDMA2000 Forward Link Measurement Software	✓	✓	✓	✓	✓		R				
MX269024A-001	All Measure Function	✓	✓	✓	✓	✓		R				Require MX269024A
MX269026A	EV-DO Forward Link Measurement Software	✓	✓	✓	✓	✓		R				
MX269026A-001	All Measure Function	✓	✓	✓	✓	✓		R				Require MX269026A
MX269028A	WLAN (802.11) Measurement Software	✓	✓	✓	✓	✓	R	R	*1			
MX269028A-001	802.11ac (80 MHz) Measurement Software	✓	✓	✓	✓	✓	R	R	*1	R	R	Only for MS2830A. Require MX269028A
MX269030A	W-CDMA BS Measurement Software	✓	✓	✓	✓	✓		R				
MX283027A	Wireless Network Device Test Software	↓	↓	↓	↓	↓	↓	↓	↓			
MX283027A-001	WLAN Test Software	✓	✓	✓	✓	✓	R	R	*1			Require MX283027A*4
MX283027A-002	Bluetooth Test Software	✓	✓	✓	✓	✓		R				Require MX283027A
MX283087A	TRX Sweep Calibration	✓	✓	✓	No	No	R	R				Only for MS2830A. Require MS2830A-020/021 and MS2830A-022

\*1: MS2830A-045 cannot be installed Opt. 005. Add Opt. 009 in substitution for Opt. 005.

\*2: MS2830A-043 can implement only either Opt. 020/021 or Opt. 066.

By the system that Opt. 066 is necessary, Opt. 020/021 is not added to MS2830A-043.

\*3: By the measurement of the narrowband signal, add Opt. 066. (Channel bandwidth: x kHz to 100 kHz)

MS2830A-044/045 cannot be installed Opt. 066.

\*4: MX283027A-001 includes MX269911A WLAN IQproducer (Cannot order MX283027A-001 and MX269911A at same time).

# 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
MS2830A	<b>– Main frame –</b> Signal Analyzer
	<b>– Standard accessories –</b>
P0031A	Power Cord: 1 pc
Z0541A	USB Memory (≥256 MB, USB2.0 Flash Driver): 1 pc
	USB Mouse: 1 pc
	Install CD-ROM (Application software, instruction manual CD-ROM): 1 pc
MS2830A-044	<b>– Options –</b> 26.5 GHz Signal Analyzer
MS2830A-045	43 GHz Signal Analyzer
MS2830A-001	Rubidium Reference Oscillator
MS2830A-005*1	Analysis Bandwidth Extension to 31.25 MHz
MS2830A-006	Analysis Bandwidth 10 MHz
MS2830A-008	Preamplifier
MS2830A-009*2	Bandwidth Extension to 31.25 MHz for Millimeter-wave
MS2830A-010	Phase Noise Measurement Function
MS2830A-011	2ndary HDD
MS2830A-016	Precompliance EMI Function
MS2830A-017	Nose Figure Measurement
MS2830A-026*3	BER Measurement Function (J1556A AUX Conversion Adapter as standard accessory)
MS2830A-067	Microwave Preselector Bypass
MS2830A-068	Microwave Preamplifier
MS2830A-077*4	Analysis Bandwidth Extension to 62.5 MHz
MS2830A-078*5	Analysis Bandwidth Extension to 125 MHz
MS2830A-313	Removable HDD
	<b>– Retrofit options –</b>
MS2830A-101	Rubidium Reference Oscillator Retrofit
MS2830A-105*1	Analysis Bandwidth Extension to 31.25 MHz Retrofit
MS2830A-106	Analysis Bandwidth 10 MHz Retrofit
MS2830A-108	Preamplifier Retrofit
MS2830A-109*2	Bandwidth Extension to 31.25 MHz for Millimeter-wave Retrofit
MS2830A-110	Phase Noise Measurement Function Retrofit
MS2830A-111	2ndary HDD Retrofit
MS2830A-116	Precompliance EMI Function Retrofit
MS2830A-117	Nose Figure Measurement Retrofit
MS2830A-126*3	BER Measurement Function Retrofit (J1556A AUX Conversion Adapter as standard accessory)
MS2830A-167	Microwave Preselector Bypass Retrofit
MS2830A-168	Microwave Preamplifier Retrofit
	<b>– Software options –</b>
MX269010A*6	CD-ROM with License and Operation manuals
MX269011A	Mobile WiMAX Measurement Software
MX269012A	W-CDMA/HSPA Downlink Measurement Software
MX269013A	W-CDMA/HSPA Uplink Measurement Software
MX269013A-001	GSM/EDGE Measurement Software
	EDGE Evolution Measurement Software (Requires MX269013A)
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-001	802.11ac (80 MHz) Measurement Software (For MS2830A. Requires MX269028A.)
MX269030A	W-CDMA BS Measurement Software
MX283027A	Wireless Network Device Test Software
MX283027A-001	WLAN Test Software (Requires MX283027A)
MX283027A-002	Bluetooth Test Software (Requires MX283027A)
	<b>– Warranty service –</b>
MS2830A-ES210	2 years Extended Warranty Service
MS2830A-ES310	3 years Extended Warranty Service
MS2830A-ES510	5 years Extended Warranty Service

Model/Order No	Name
	<b>– Application parts –</b>
	Following operation manuals provided as hard copy
W3334AE	MS2830A Operation Manual (Mainframe Operation)
W2851AE	MS2690A/MS2691A/MS2692A and MS2830A Operation Manual (Mainframe Remote Control)
W3335AE	MS2830A Operation Manual (Signal Analyzer Function Operation)
W2853AE	MS2690A/MS2691A/MS2692A and MS2830A Operation Manual (Signal Analyzer Function Remote Control)
W3336AE	MS2830A Operation Manual (Spectrum Analyzer Function Operation)
W2855AE	MS2690A/MS2691A/MS2692A and MS2830A Operation Manual (Spectrum Analyzer Function Remote Control)
W3117AE	MS2690A/MS2691A/MS2692A and MS2830A Operation Manual (Phase Noise Measurement Function Operation)
W3118AE	MS2690A/MS2691A/MS2692A and MS2830A Operation Manual (Phase Noise Measurement Function 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)
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)
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)
W3471AE	MX283027A Operation Manual (Operation)
W3473AE	MX283027A-001 Operation Manual (Operation)
W3474AE	MX283027A-001 Operation Manual (Remote Control)
W3516AE	MX283027A-002 Operation Manual (Operation)
W3517AE	MX283027A-002 Operation Manual (Remote Control)

- \*1: Opt. 005/105 is available when MS2830A-044 is installed. Requires Opt. 006/106.
- \*2: Opt. 009/109 is available when MS2830A-045 is installed. Requires Opt. 006/106
- \*3: The J1556A Aux Conversion Adapter is a standard accessory supplied with MS2830A-026/126.
- \*4: Retrofit not supported. Requires Opt. 006 and Opt. 005 (for MS2830A-044). Requires Opt. 006 and Opt. 009 (for MS2830A-045).
- \*5: Retrofit not supported. Requires Opt. 006, Opt. 005 and Opt. 077 (for MS2830A-044). Requires Opt. 006, Opt. 009 and Opt. 077 (for MS2830A-045).
- \*6: Can not be installed in MS2830A-045.

Model/Order No	Name
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)
J1359A	Coaxial Adaptor (K-P · K-J, SMA)
J0576B	Coaxial Cord, 1 m (N-P · 5D-2W · N-P)
J0576D	Coaxial Cord, 2 m (N-P · 5D-2W · N-P)
J0127A	Coaxial Cord, 1 m (BNC-P · RG58A/U · BNC-P)
J0127B	Coaxial Cord, 2 m (BNC-P · RG58A/U · BNC-P)
J0127C	Coaxial Cord, 0.5 m (BNC-P · RG58A/U · BNC-P)
J0322A	Coaxial Cord, 0.5 m (DC to 18 GHz), (SMA-P · 50Ω SUCOFLEX104 · SMA-P)
J0322B	Coaxial Cord, 1 m (DC to 18 GHz), (SMA-P · 50Ω SUCOFLEX104 · SMA-P)
J0322C	Coaxial Cord, 1.5 m (DC to 18 GHz), (SMA-P · 50Ω SUCOFLEX104 · SMA-P)
J0322D	Coaxial Cord, 2 m (DC to 18 GHz), (SMA-P · 50Ω SUCOFLEX104 · SMA-P)
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 Adaptor (DC to 26.5 GHz, 50Ω, N-P · SMA-J)
34AKNF50	Ruggedized K-to-Type N Adapter (DC to 20 GHz, 50Ω, Ruggedized K-M · N-F, SWR: 1.5 (max.), Insertion Loss: 0.4 dB (max.))
J0911	Coaxial Cable, 1.0 m for 40 GHz (DC to 40 GHz, approx. 1 m, SF102A, 11K254/K254/1.0M)
J0912	Coaxial Cable, 0.5 m for 40 GHz (DC to 40 GHz, approx. 0.5 m, SF102A, 11K254/K254/0.5M)
41KC-3	Fixed Attenuator (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	GPIO Cable, 2.0 m
J1556A*1	AUX Conversion Adapter (AUX → BNC, for vector signal generator option and BER measurement function option)
B0635A	Rack Mount Kit (EIA)
B0657A	Rack Mount Kit (JIS)
B0636C*2	Carrying Case (Hard type, with casters)
B0645A	Soft Carrying Case
B0671A*2	Front Cover for 1MW4U
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)
Z0975A	Keyboard (USB)
Z1345A	Installation Kit (required when retrofitting options or installing software)

\*1: The J1556A AUX Conversion Adapter is not a standard accessory for the MS2830A-020/120/021/121 Vector Signal Generator Option.

The J1556A AUX Conversion Adapter is a standard accessory supplied with MS2830A-026/126 BER Measurement Function.

\*2: The B0636C Carrying Case includes a Front Panel Protective Cover (B0671A).



**J1556A** AUX Conversion Adapter



**MA24106A** USB Power Sensor



**B0636C** Carrying Case  
(Hard type, with casters)



**B0645A** Soft Carrying Case



MS2830A with Front Cover

**B0671A** Front Cover for 1MW4U

**Note:**

**Note:**

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