

**Anritsu** envision : ensure

# Signal Analyzer

## MS2830A Microwave

MS2830A-044: 9 kHz to 26.5 GHz

MS2830A-045: 9 kHz to 43 GHz

« MS2830A-040: 9 kHz to 3.6 GHz\* »

« MS2830A-041: 9 kHz to 6 GHz\* »

« MS2830A-043: 9 kHz to 13.5 GHz\* »



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

The Signal Analyzer MS2830A-044/045 includes a spectrum analyzer function with upper frequency limits of 26.5 GHz and 43 GHz. Combining it with the High Performance Waveguide Mixer or the External Mixer MA2740C/MA2750C series supports measurements up to 325 GHz. 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 325 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                               | ±1 × 10 <sup>-7</sup> /day (Standard)<br>±1 × 10 <sup>-9</sup> /day (MS2830A-002)<br>±1 × 10 <sup>-10</sup> /month (MS2830A-001)   |                |                   | ±1 × 10 <sup>-9</sup> /day (Standard)<br>±1 × 10 <sup>-10</sup> /month (MS2830A-001)                   |                       |
| Start time/Characteristics               | 5 minutes, ±5 × 10 <sup>-7</sup> (Standard)<br>5 minutes, ±5 × 10 <sup>-8</sup> (MS2830A-002)<br>7 minutes, ±1 × 10 <sup>-9</sup> (MS2830A-001)  |                |                   | 5 minutes, ±5 × 10 <sup>-8</sup> (Standard)<br>7 minutes, ±1 × 10 <sup>-9</sup> (MS2830A-001)          |                       |
| Phase noise                              | Frequency: 500 MHz, Spectrum Analyzer mode   |                |                   |  |                       |
| 1 kHz offset                             | -109 dBc/Hz (MS2830A-066)  |                |                   | —  |                       |
| 10 kHz offset                            | -118 dBc/Hz (MS2830A-066)  |                |                   | —  |                       |
| 100 kHz offset                           | -115 dBc/Hz (Standard)<br>-133 dBc/Hz (MS2830A-066)  |                |                   | -115 dBc/Hz (Standard)   |                       |
| 1 MHz offset                             | -133 dBc/Hz (Standard)<br>-148 dBc/Hz (MS2830A-066) (nom.)   |                |                   | -133 dBc/Hz (Standard)   |                       |
| 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 (MS2830A-006)<br>31.25 MHz (MS2830A-005)<br>62.5 MHz (MS2830A-077)*9<br>125 MHz (MS2830A-078)*9   |                |                   | 10 MHz (MS2830A-006)<br>31.25 MHz (MS2830A-009)<br>62.5 MHz (MS2830A-077)*9<br>125 MHz (MS2830A-078)*9 |                       |
| Additional functions                     |  |                |                   |  |                       |
| Vector signal generator                  | ✓ (MS2830A-020/021)  |                |                   | —  |                       |
| Low phase noise performance*2            | ✓ (MS2830A-066)  |                |                   | —  |                       |
| Phase noise measurement function         | —  |                |                   | ✓ (MS2830A-010)  |                       |
| Noise figure measurement function        | —  |                |                   | ✓ (MS2830A-017)  |                       |
| BER measurement function                 | —  |                |                   | ✓ (MS2830A-026)  |                       |
| Preamplifier*3                           | —  |                |                   | ✓ (MS2830A-008)  |                       |
| Microwave preamplifier*4                 | —  |                |                   | ✓ (MS2830A-068)  |                       |
| Microwave preselector bypass*5           | —  |                |                   | ✓ (MS2830A-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: 1.875 GHz

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

\*9: Signal Analyzer Mode Frequency Setting Range

With MS2830A-077/078, With MS2830A-067, >31.25 MHz bandwidth  
300 MHz to 26.5 GHz [MS2830A-044]  
300 MHz to 43 GHz [MS2830A-045]

With MS2830A-077/078, Without MS2830A-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:

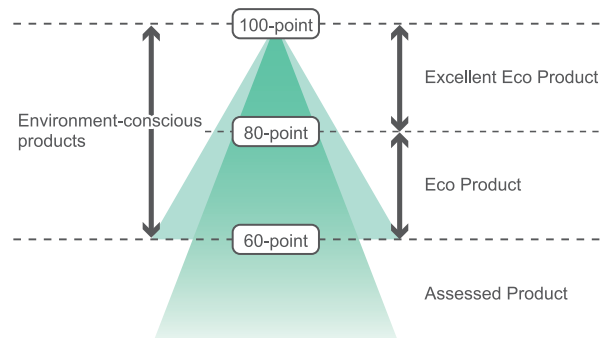
Excellent eco product:

80+ score and satisfies excellent eco product requirements

Eco product:

60+ score and satisfies eco product requirements

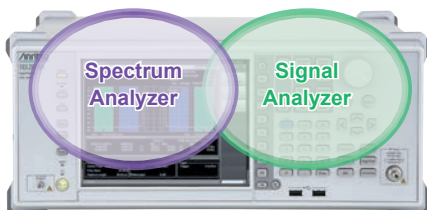
Resource saving/reduction of manufacturing load  
Reduction of toxins  
Reduction of logistics load  
Reduction of usage load  
Reduction of disposal load



# 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 325 GHz using High Performance Waveguide Mixer and External Mixer**  
Frequency Range:  
26.5 GHz to 325 GHz (External Mixer)  
50 GHz to 90 GHz (High Performance Waveguide Mixer)  
Built-in connector to connect High Performance Waveguide Mixer and External Mixer (MS2830A-044/045)
  - Connector: SMA-J, 50  $\Omega$
  - Local Signal Output: 5 GHz to 10 GHz
  - IF Signal Frequency: 1.875 GHz
- **Excellent Dynamic Range\*1:**  
159 dB (at 25 GHz)  
TOI\*2:  $\geq +13$  dBm  
DANL\*3:  $-146$  dBm/Hz  
157 dB (at 40 GHz)  
TOI:  $\geq +13$  dBm (nom.)  
DANL:  $-144$  dBm/Hz
- **Preamp up to 43 GHz**  
→ MS2830A-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: 1.875 GHz
  - IF Output Bandwidth: 1 GHz (3 dB Bandwidth, nom.)\*5
  - Gain:  $-10$  dB (nom.)
- **Improved Level Linearity**
- **Reference Oscillator**  
Pre-installed Reference Oscillator  
Aging Rate:  $\pm 1 \times 10^{-7}$ /year,  $\pm 1 \times 10^{-9}$ /day  
Start-up Characteristics:  $\pm 5 \times 10^{-8}$  (5 minutes after power-on)  
Rubidium Reference Oscillator (MS2830A-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
  - Annotation Display (On/Off)
  - Power Meter\*7
  - Phase Noise\*8
  - Noise Figure\*9
- **Low-power Consumption**  
MS2830A-044/045: 190 VA (nom.)



## Signal Analyzer Functions

- **Analysis Bandwidth**  
MS2830A-006: 10 MHz max.  
(20 MHz max. sampling rate = 50 ns resolution, ADC resolution 16 bits)  
MS2830A-005\*10, MS2830A-009\*11: 31.25 MHz max.  
(50 MHz max. sampling rate = 20 ns resolution, ADC resolution 16 bits)  
MS2830A-077\*12: 62.5 MHz max.  
(100 MHz max. sampling rate = 10 ns resolution, ADC resolution 14 bits)  
MS2830A-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 Signal Analyzer series MS2690A/91A/92A 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**  
→ MS2830A-067: Microwave Preselector Bypass  
→ MS2830A-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.

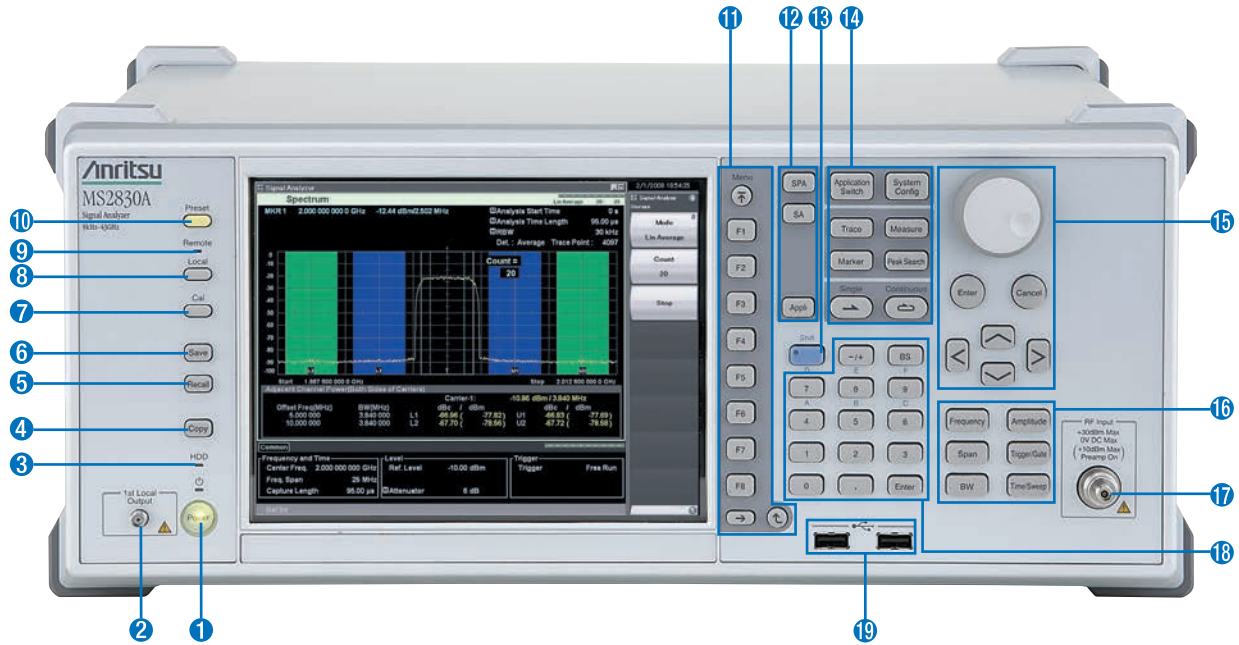
## BER Measurement Function (MS2830A-026)

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 MS2830A-005/006/009/077/078)
- \*7: Power Meter Function (use USB power sensors)
- \*8: Phase Noise Measurement Function (requires MS2830A-010)
- \*9: Noise Figure Measurement Function (Requires MS2830A-017)  
[Use Noise Sources (Noisecom, NC346 series)]
- \*10: MS2830A-005 can be installed in MS2830A-044.  
Requires MS2830A-006.
- \*11: MS2830A-009 can be installed in MS2830A-045.  
Requires MS2830A-006.  
Cannot be set the RBW to more than 10 MHz in spectrum analyzer function.
- \*12: Requires MS2830A-006 and MS2830A-005 (for MS2830A-044).  
Requires MS2830A-006 and MS2830A-009 (for MS2830A-045).
- \*13: Requires MS2830A-006, MS2830A-005 and MS2830A-077 (for MS2830A-044).  
Requires MS2830A-006, MS2830A-009 and MS2830A-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 High Performance Waveguide 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)

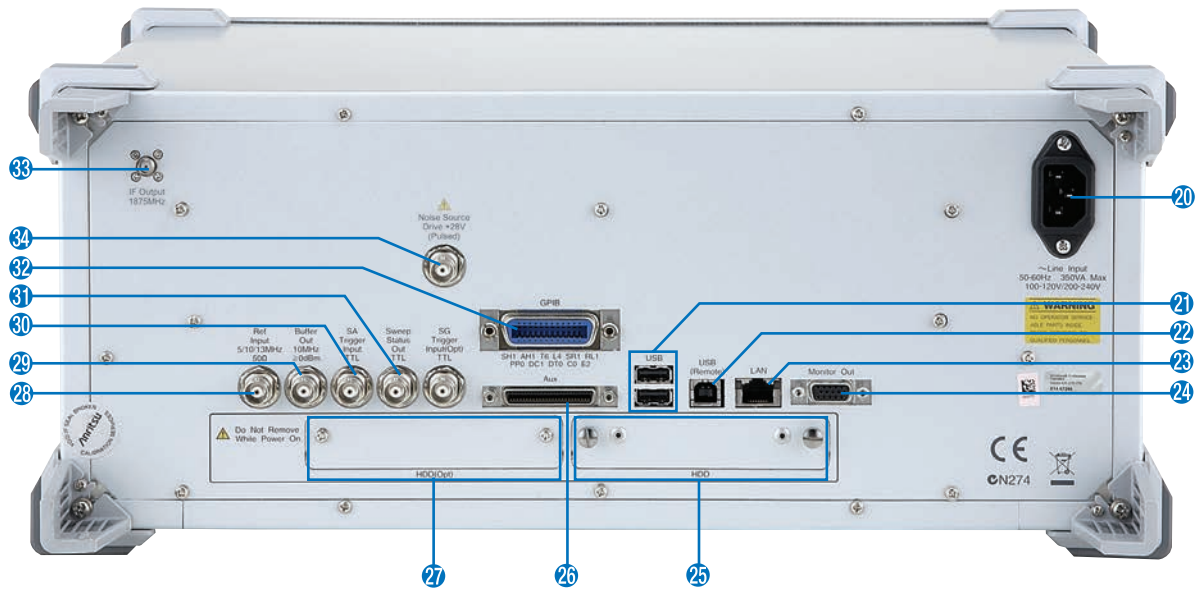
K-J, 50  $\Omega$  (MS2830A-045)

## 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 MS2830A-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: 1.875 GHz
- 34 Noise Source Drive connector**  
This is available when the MS2830A-017/117 is installed. Supply (+28 V) of the Noise Source Drive.

# Basic Performance

## Dynamic Range

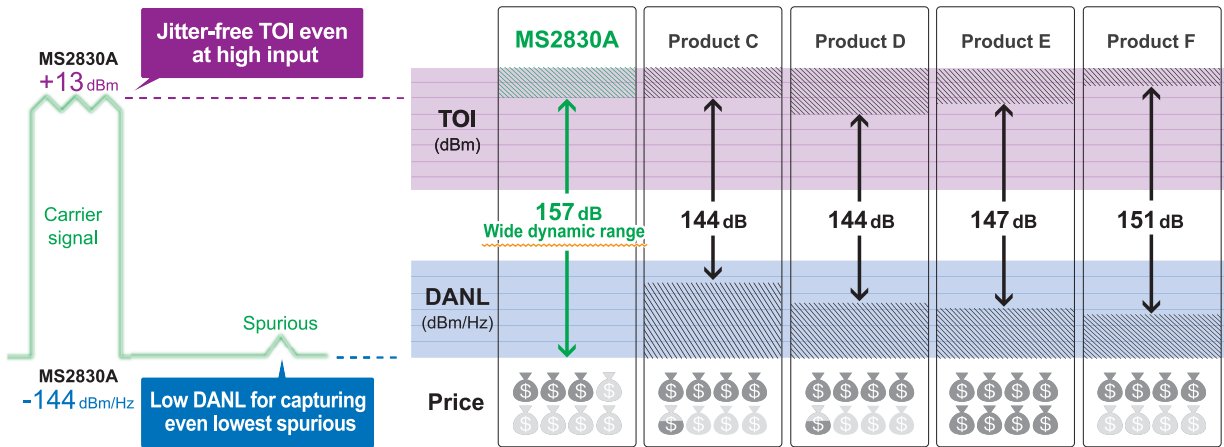
Dynamic Range\*<sup>1</sup>: 159 dB (at 25 GHz)  
 TOI\*<sup>2</sup>:  $\geq +13$  dBm (6 GHz < f  $\leq$  26.5 GHz)  
 DANL\*<sup>3</sup>:  $-146$  dBm/Hz (18.3 GHz < f  $\leq$  34 GHz)  
 Dynamic Range: 157 dB (at 40 GHz)  
 TOI:  $\geq +13$  dBm (nom., 26.5 GHz < f  $\leq$  40 GHz)  
 DANL:  $-144$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

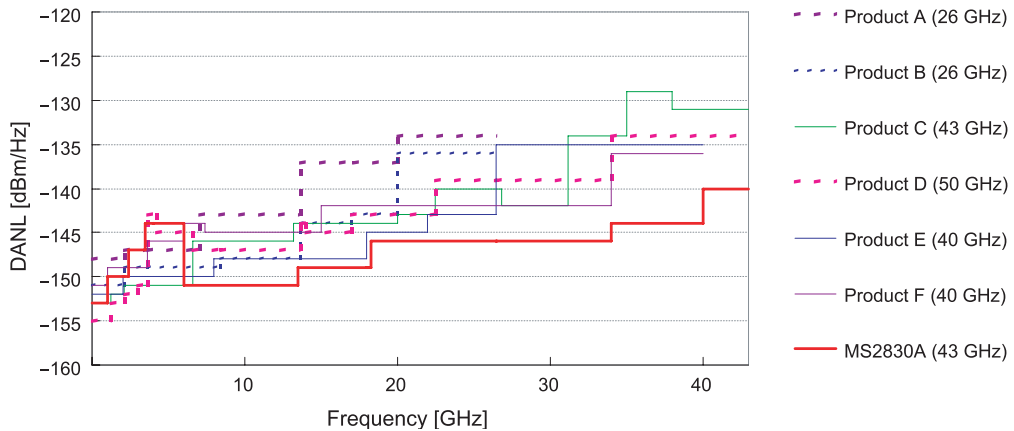
The MS2830A has an excellent dynamic range supporting true performance measurements of devices, such as base stations, requiring wideband measuring instruments.

Dynamic Range Comparison Image (at 40 GHz)



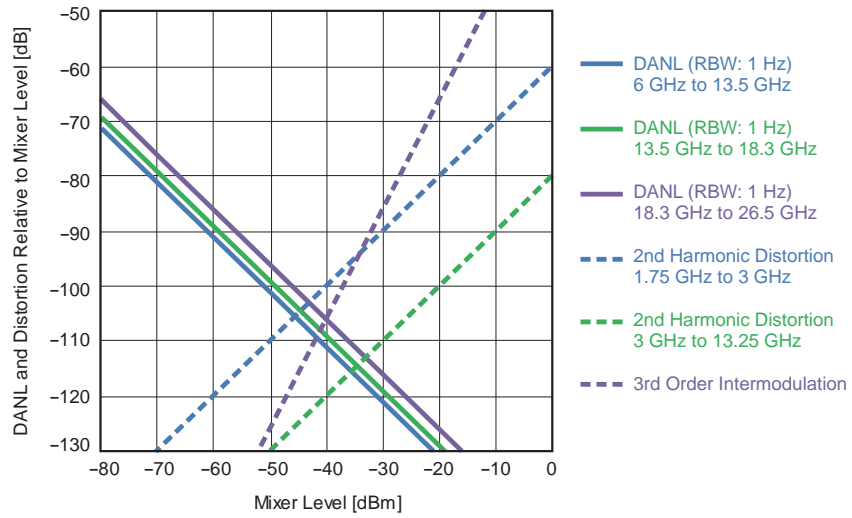
DANL Comparison

With Preamp, without Preselector bypass

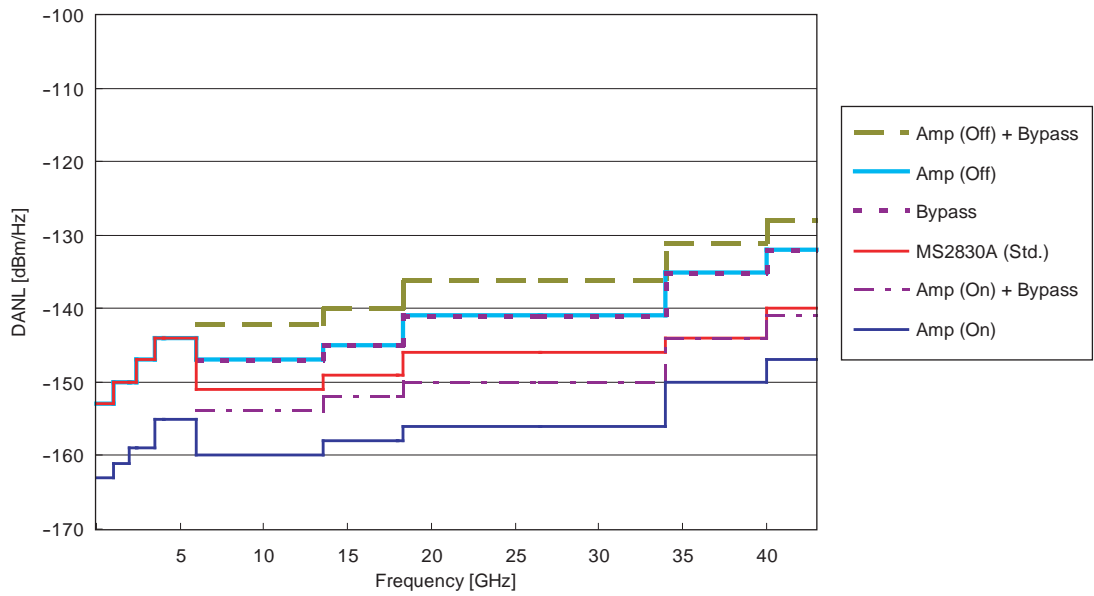


# Basic Performance

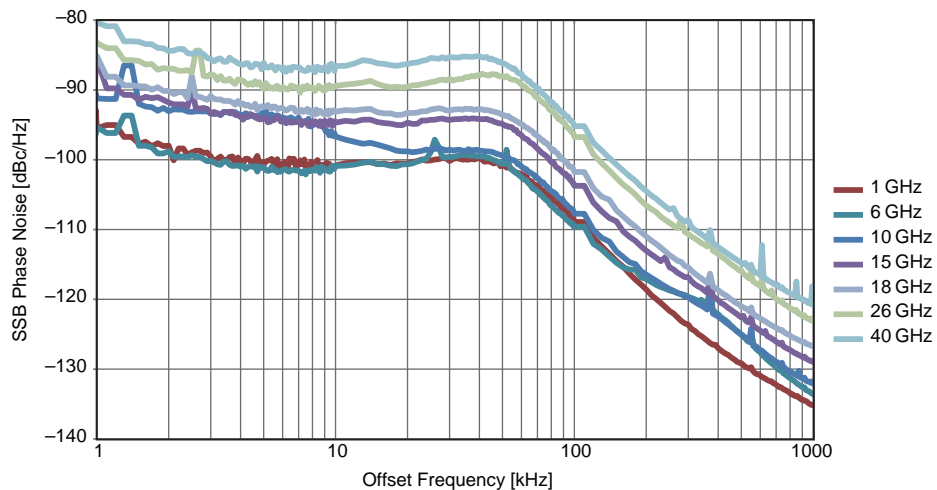
**Distortion Characteristics (Spectrum Analyzer)**



**DANL (MS2830A-045)**  
**Amp (Preamplifier: MS2830A-068), Bypass (Preselector Bypass: MS2830A-067/009)**



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



# Basic Performance

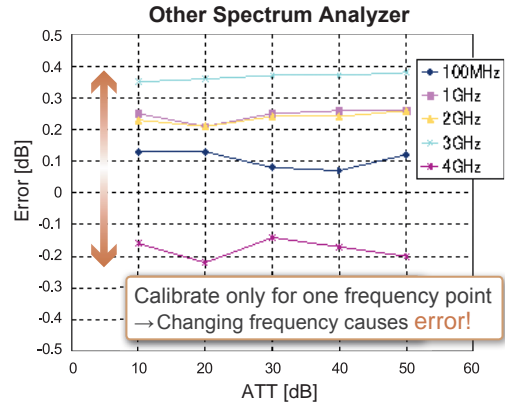
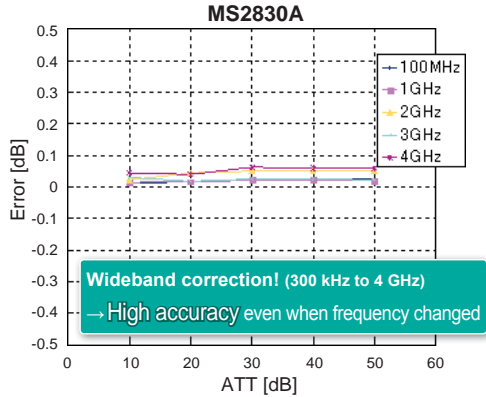
## Total Level Accuracy

- ±0.5 dB (300 kHz ≤ f < 4 GHz)
- ±1.8 dB (4 GHz ≤ f ≤ 13.8 GHz)
- ±3.0 dB (13.8 GHz < f ≤ 40 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:

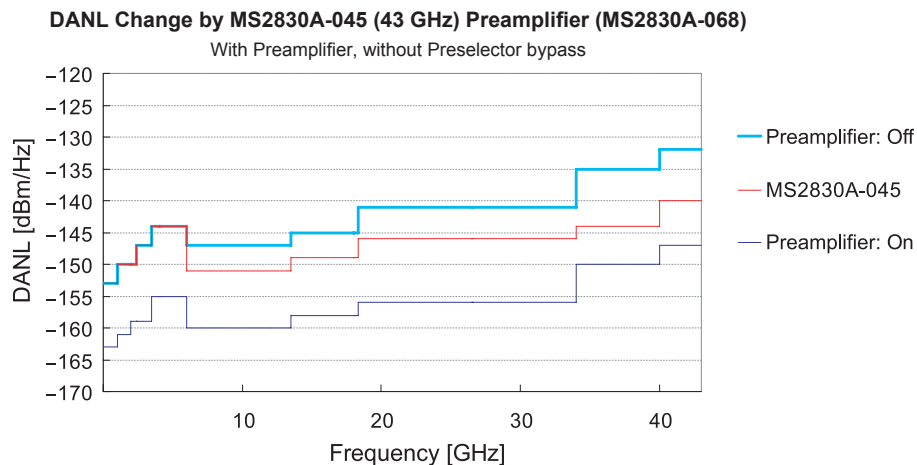
- Frequency characteristics
- Linearity
- Attenuator switching error

## Preamp up to 43 GHz: MS2830A-068 Microwave Preamplifier

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

Installing the Microwave Preamp (MS2830A-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 MS2830A-008 not supported





# Basic Performance

## Measure Up To 325 GHz using High Performance Waveguide Mixer and External Mixer

### High Performance Waveguide Mixer MA2806A and MA2808A Targeting Spectrum Analysis for Wider-Band Millimeter-Wave Wireless Transmitters

The High Performance Waveguide Mixer MA2806A and MA2808A are new mixers for connection to the Signal Analyzer MS2830A with frequency option 044 or option 045. It has the good features of both a harmonic mixer and a down converter and is ideal for spectrum analysis of millimeter-wave (50 GHz to 90 GHz-band) wireless transmitters now being used for future wider-band applications, such as wireless backhaul, automotive radar, etc.

#### High Performance Waveguide Mixer (MA2806A and MA2808A)

| Model   | Name  | Frequency Band | Frequency Range  | Waveguide Flange | Waveguide Size |
|---------|---|----------------|------------------|------------------|----------------|
| MA2806A | High Performance Waveguide Mixer (50 to 75 GHz) | V band         | 50 GHz to 75 GHz | UG-385/U         | WR15           |
| MA2808A | High Performance Waveguide Mixer (60 to 90 GHz) | E band         | 60 GHz to 90 GHz | UG-387/U         | WR12           |

Specifications in back of this catalog

#### Features

- Wide dynamic range based on excellent minimum sensitivity and P1dB performance
- Image-response-free measurement of wideband signals plus high IF frequency and PS function\*1



MA2808A

The MA2806A and MA2808A have a dedicated multiplier, amplifier, bandpass filter, etc., supporting an excellent conversion loss of at least 10 dB better than conventional harmonic mixers, as well as P1dB performance exceeding 0 dBm. When used in combination with the MS2830A, the display average noise performance level is excellent at  $-150 \text{ dBm/Hz}$  (meas)<sup>\*2</sup> at 75 GHz. Due to this wide dynamic range, the MA2806A and MA2808A support evaluation of the true spurious performance of wider-band, millimeter-wave wireless transmitters as well as various types of millimeter-wave equipment, such as automotive radar, wireless backhaul and gigabit wireless LAN (IEEE 802.11ad/WiGig) etc., that cannot be evaluated accurately using conventional harmonic-mixer and down-converter methods.

Moreover, by using the high IF frequency (1.875 GHz) of the MS2830A, spectrum mask measurements can be made over a wide measurement span with no impact from image-response effects. Spectrum mask measurements require measurement over a wider measurement span than the bandwidth of the signal to be measured. For example, when using the MA2806A and MA2808A to measure a signal with a bandwidth of 1 GHz, no image response occurs in a wide measurement span covering 6.5 GHz. Moreover, no image response occurs in a measurement span of 5.5 GHz for a signal with a bandwidth of 2 GHz. Additionally, use of the newly developed PS function\*1 supports image-response-free measurements over a measurement span of up to 7.5 GHz, irrespective of the measured signal bandwidth.

Connection to the MS2830A is as easy as simply connecting a cable to the IF port. Conversion loss data saved in a USB memory stick is loaded into the MS2830A for reflection in the measured values.

\*1: Patent pending as of October 2015

\*2: Value measured at design but not guaranteed specification.

#### Performance Comparison of Measurement Method

| Measurement Method          | Product Selection Points |                       |                 |                    |                                   |
|-----------------------------|--------------------------|-----------------------|-----------------|--------------------|-----------------------------------|
|                             | Min. Sensitivity         | Image Response        | P 1 dB          | System Config      | Mixer Conversion Loss Calibration |
| <b>Anritsu Solution</b><br> | <br><b>Good</b>          | <br><b>Far</b>        | <br><b>High</b> | <br><b>Simple</b>  | <br><b>No Need</b>                |
| <b>Harmonic Mixer</b><br>   | <br><b>Bad</b>           | <br><b>Very Close</b> | <br><b>High</b> | <br><b>Simple</b>  | <br><b>No Need</b>                |
| <b>Down Converter</b><br>   | <br><b>Good</b>          | <br><b>Very Far</b>   | <br><b>Low</b>  | <br><b>Complex</b> | <br><b>Need</b>                   |

\*1: High noise floor level and narrow dynamic range due to high mixer conversion order

\*2: Low IF frequency depending on spectrum analyzer causes occurrence of image response generated in measurement range

\*3: Narrow dynamic range due to mixer P1dB performance of only  $-10$  to  $-5 \text{ dBm}$

\*4: Different calibration procedure depending on spectrum analyzer used

\*5: Requires mixer conversion loss data for measurement range because any IF frequency can be set

# Basic Performance

## Ordering Information

| Model No.                  | Name   | Notes  |
|----------------------------|--|--|
| MA2806A<br>MA2808A         | – Main frame –<br>High Performance Waveguide Mixer (50 to 75 GHz)<br>High Performance Waveguide Mixer (60 to 90 GHz)     | Waveguide (WR15, UG-385/U)<br>Waveguide (WR12, UG-387/U)   |
| Z1922A<br>Z1923A<br>Z1625A | – Standard accessories –<br>MA2806A USB Memory: 1 pc<br>MA2808A USB Memory: 1 pc<br>AC Adapter: 1 pc<br>Power Cord: 1 pc | Saved conversion loss data (For MA2806A)<br>Saved conversion loss data (For MA2808A)<br>100 V(ac) to 120 V(ac)/200 V(ac) to 240 V(ac), 50 Hz/60 Hz |
| J1692B                     | Coaxial Cord, 1 m: 1 pc  | SMA-P · SUCOFLEX104PE · SMA-P, DC to 18 GHz, 50Ω   |

## Minimum Recommended Configuration

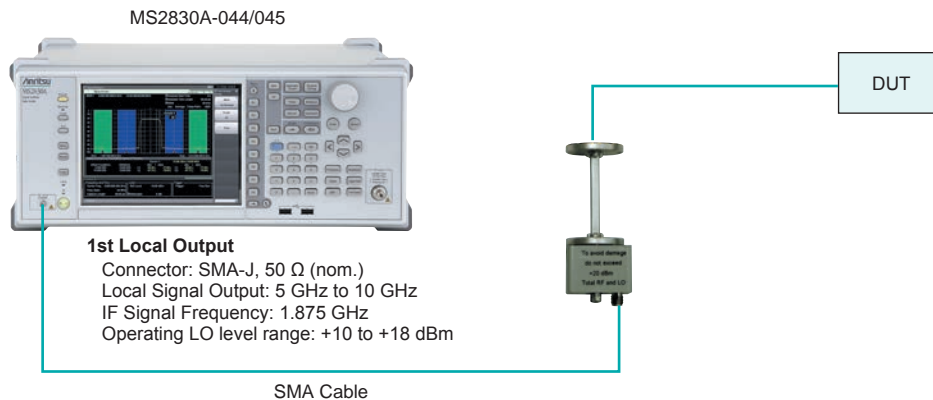
| Model No.   | Name  | Notes  |
|-------------|---|--|
| MS2830A     | Signal Analyzer                                 | Main unit  |
| MS2830A-044 | 26.5 GHz Signal Analyzer                        | Select upper frequency                           |
| MS2830A-045 | 43 GHz Signal Analyzer                          | Select one of MS2830A-044 or MS2830A-045 options |
| MA2806A     | High Performance Waveguide Mixer (50 to 75 GHz) | Select mixer model                               |
| MA2808A     | High Performance Waveguide Mixer (60 to 90 GHz) | Select one of MA2806A or MA2808A                 |

## External Mixers (MA2740C/MA2750C Series)

The MA2740C/MA2750C series of External Mixers (Harmonic Mixers) supports spectrum measurements up to 325 GHz with high sensitivity and fewer LO harmonic order because these mixers output 1st local signals from 5 GHz to 10 GHz.

| Model   | Name           | Frequency Band | Frequency Range    | LO Harmonic Order | Mixing Mode | Conversion Loss* (dB) | Waveguide Flange     | Wave Guide Size |
|---------|----------------|----------------|--------------------|-------------------|-------------|-----------------------|----------------------|-----------------|
| MA2741C | External Mixer | A Band         | 26.5 GHz to 40 GHz | 4                 | +           | 23                    | MIL-DTL-3922/54-003  | WR28            |
| MA2742C | External Mixer | Q Band         | 33 GHz to 50 GHz   | 5                 | +           | 26                    | MIL-DTL-3922/67D-006 | WR22            |
| MA2743C | External Mixer | U Band         | 40 GHz to 60 GHz   | 6                 | +           | 28                    | MIL-DTL-3922/67D-007 | WR19            |
| MA2744C | External Mixer | V Band         | 50 GHz to 75 GHz   | 8                 | +           | 32                    | MIL-DTL-3922/67D-008 | WR15            |
| MA2745C | External Mixer | E Band         | 60 GHz to 90 GHz   | 9                 | +           | 36                    | MIL-DTL-3922/67D-009 | WR12            |
| MA2746C | External Mixer | W Band         | 75 GHz to 110 GHz  | 11                | +           | 39                    | MIL-DTL-3922/67D-010 | WR10            |
| MA2747C | External Mixer | F Band         | 90 GHz to 140 GHz  | 14                | +           | 40                    | MIL-DTL-3922/67D-M08 | WR08            |
| MA2748C | External Mixer | D Band         | 110 GHz to 170 GHz | 17                | +           | 45                    | MIL-DTL-3922/67D-M06 | WR06            |
| MA2749C | External Mixer | G Band         | 140 GHz to 220 GHz | 22                | +           | 50                    | MIL-DTL-3922/67D-M05 | WR05            |
| MA2750C | External Mixer | Y Band         | 170 GHz to 260 GHz | 26                | +           | 65                    | MIL-DTL-3922/67D-M04 | WR04            |
| MA2751C | External Mixer | J Band         | 220 GHz to 325 GHz | 33                | +           | 70                    | MIL-DTL-3922/67D-M03 | WR03            |

\*: The Conversion loss is a typical value near the center frequency of each band but is not a guaranteed specification.



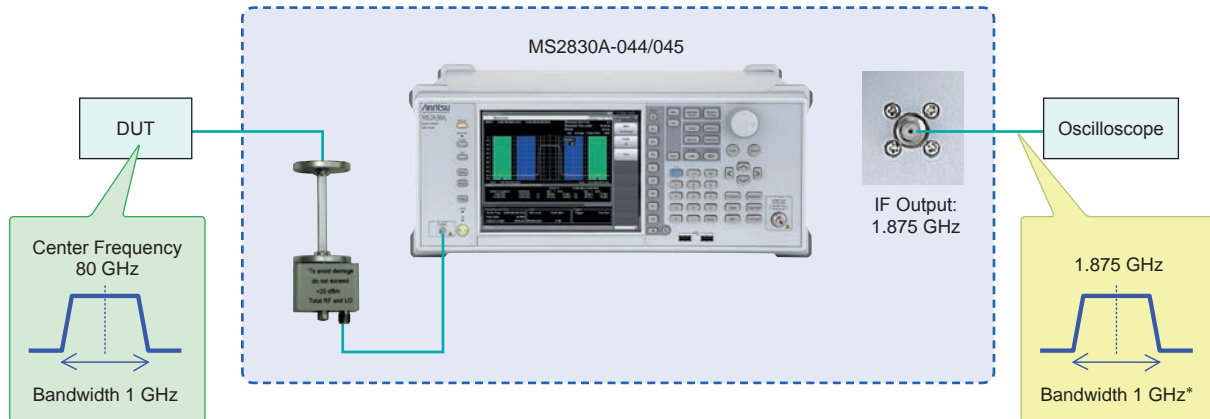
**Connection Setup**

# 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 (MA2740C/MA2750C Series), 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

### MS2830A-067 Microwave Preselector Bypass + MS2830A-078\* Analysis Bandwidth Extension to 125 MHz

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

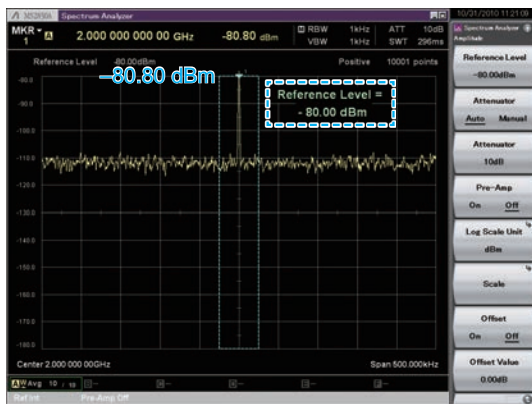
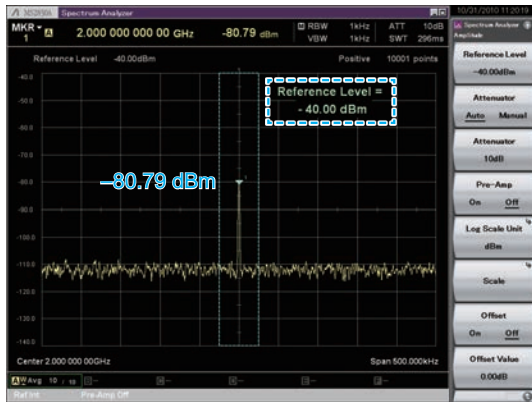
\*5: When O-QPSK

# 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.

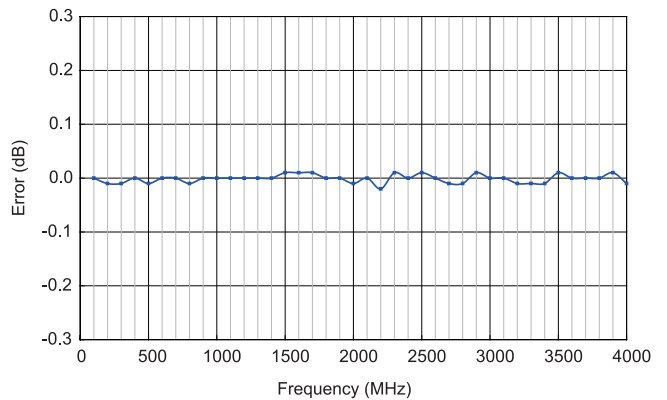
The MS2830A total level accuracy includes:

- 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 (nom., MS2830A-044 only, 26.5 GHz\*1)
- 190 VA (nom., 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 MS2830A-005. Can not be set when with MS2830A-009.

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

\*4: When MS2830A-016 installed.

\*5: Without MS2830A-077/078, or Bandwidth: ≤31.25 MHz

\*6: With MS2830A-077, Bandwidth: >31.25 MHz

\*7: With MS2830A-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

**MS2830A-006: 10 MHz max.**

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

**MS2830A-005\*<sup>1</sup>, MS2830A-009\*<sup>2</sup>: 31.25 MHz max.**

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

**MS2830A-077\*<sup>3</sup>: 62.5 MHz max.**

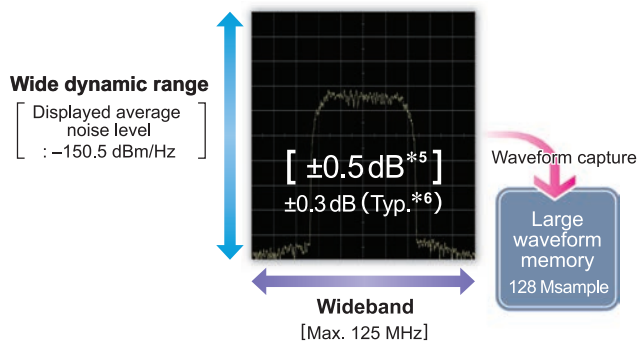
(100 MHz max. sampling rate = 10 ns resolution, ADC resolution 14 bits)

**MS2830A-078\*<sup>4</sup>: 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 Signal Analyzer series MS2690A/91A/92A is recommended for other measurement purposes.

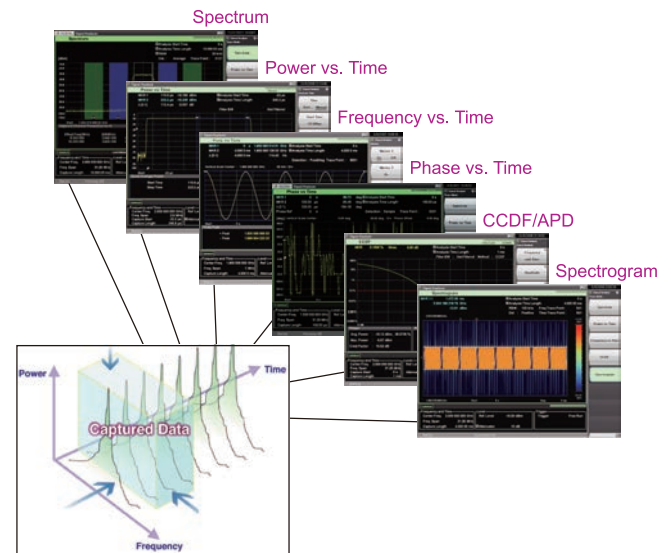
Based on the excellent level accuracy and wide dynamic range of the MS2830A, a signal with an FFT analysis bandwidth of up to 125 MHz can be captured with a level accuracy of  $\pm 0.3$  dB.



- \*1: MS2830A-005 can be installed in MS2830A-044. Requires MS2830A-006.
- \*2: MS2830A-009 can be installed in MS2830A-045. Requires MS2830A-006.
- \*3: Requires MS2830A-006 and MS2830A-005 (for MS2830A-044). Requires MS2830A-006 and MS2830A-009 (for MS2830A-045).
- \*4: Requires MS2830A-006, MS2830A-005 and MS2830A-077 (for MS2830A-044). Requires MS2830A-006, MS2830A-009 and MS2830A-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 MS2830A-006: 1 kHz to 10 MHz  
 With MS2830A-005/006 (for MS2830A-044) or  
 MS2830A-006/009 (for MS2830A-045): 1 kHz to 31.25 MHz  
 With MS2830A-005/006/077 (for MS2830A-044) or  
 MS2830A-006/009/077 (for MS2830A-045): 1 kHz to 62.5 MHz  
 With MS2830A-005/006/077/078 (for MS2830A-044) or  
 MS2830A-006/009/077/078 (for MS2830A-045): 1 kHz to 125 MHz

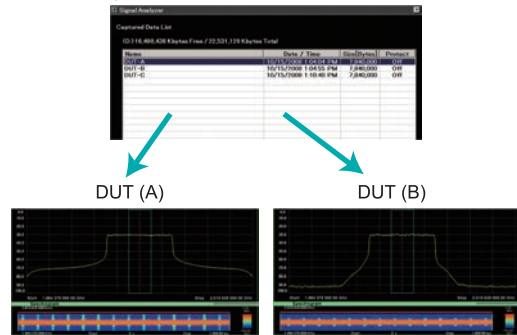
## Replay Function for Comparison Evaluation

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

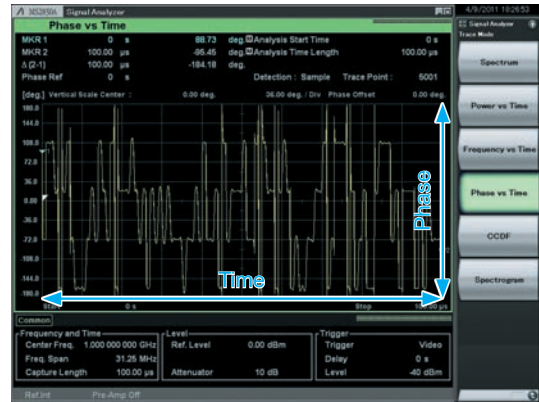
## Spectrum

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 for display as a spectrum.



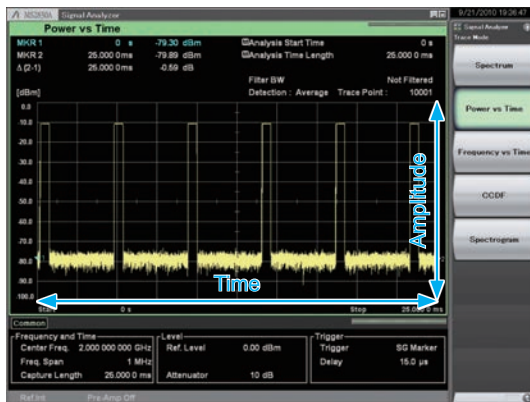
## Phase vs. Time

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.



## Power vs. Time

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



## CCDF\*1/APD\*2

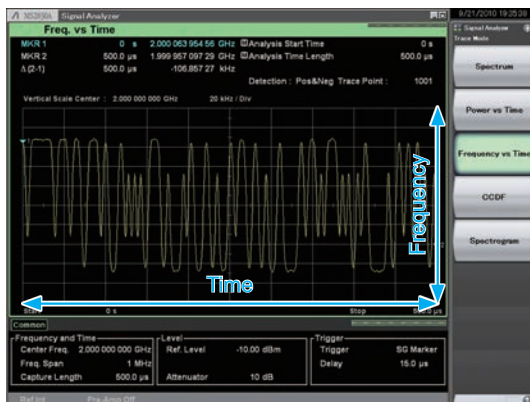
The CCDF trace displays the power variation probability on the y-axis and power variation on the x-axis to confirm the CCDF and APD of measured signals.

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



## 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.



## Measurement Results

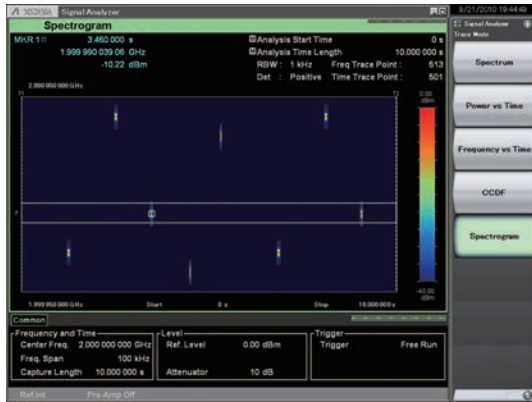
- CCDF: The CCDF display indicates the cumulative distribution of transient power variations compared to average power.
- APD: The APD display indicates the probability distribution of transient power fluctuations compared to average power.



# 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.

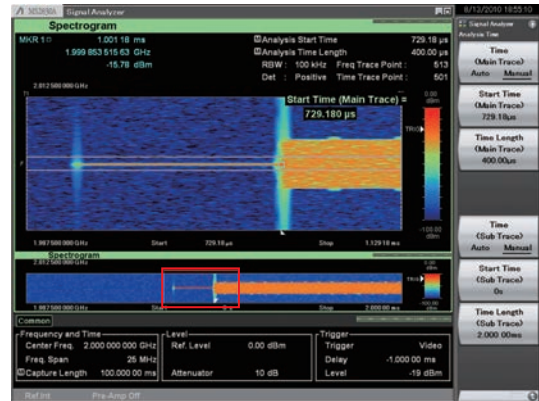


## Measurement with Sub-trace Display

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

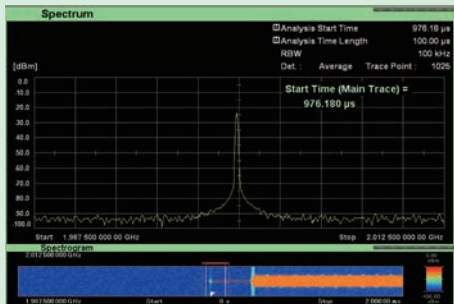
No Trace mode does not execute signal analysis. Therefore, "IQ data output" and "IQ data readout using remote commands" can be executed quickly without the need to wait for completion of analysis.



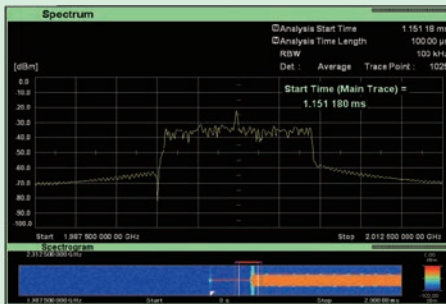
# Signal Analyzer: Trace

## Example: Sub-trace Display

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



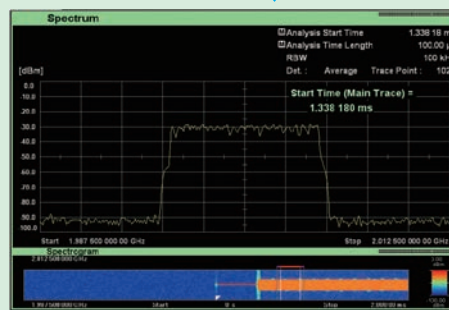
↑ Analysis range



↑ 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 | ✓                      |       |
| Annotation Display (On/Off)                 | ✓                      |       |
| Power Meter                                 | Independent function*3 |       |
| Phase Noise                                 | MS2830A-010            |       |
| Noise Figure                                | MS2830A-017*4          |       |

\*1: SPA (Spectrum Analyzer)

\*2: VSA (Vector Signal Analyzer), requires MS2830A-005/006/009/077/078

\*3: Use USB Power Sensors

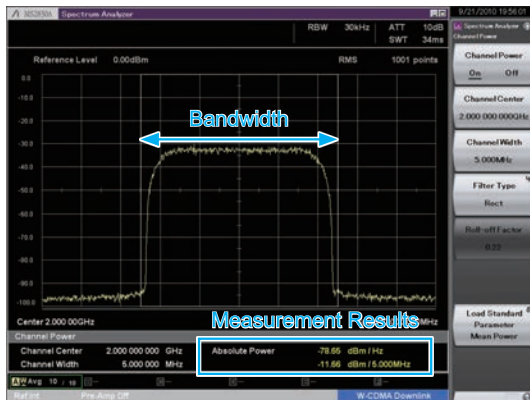
\*4: Use Noise Sources (Noisecom, NC346 series)

## 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

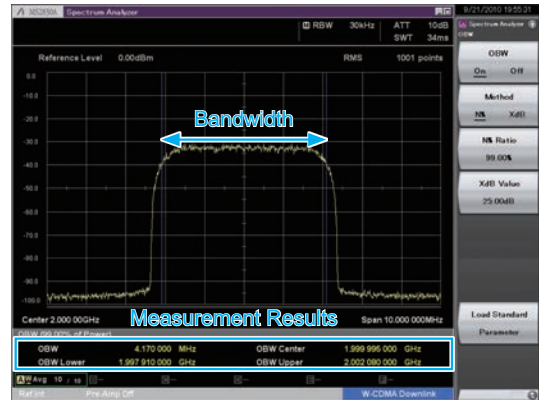
- Absolute power per Hz in channel band
- Total power in channel band

## 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

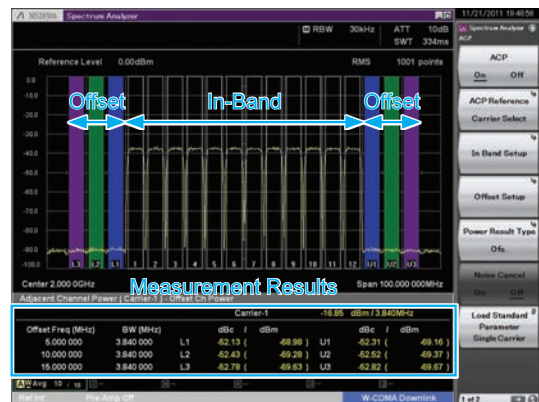
SPA VSA

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

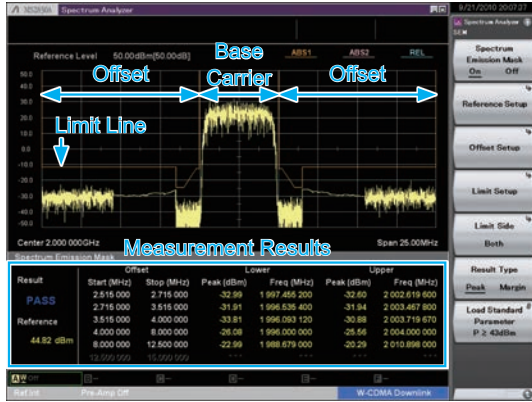
- Absolute power of Offset channel
- Relative values in relation to reference power selected in ACP reference

# 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.



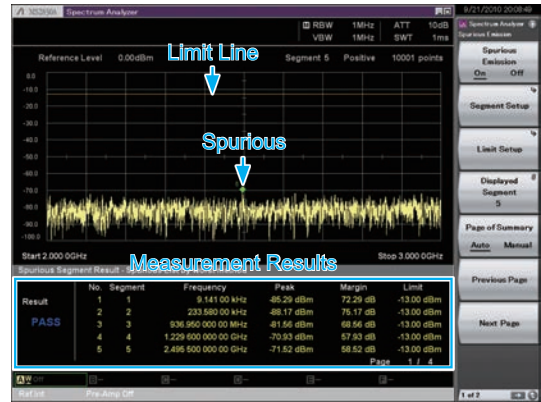
### Measurement Results

- 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.



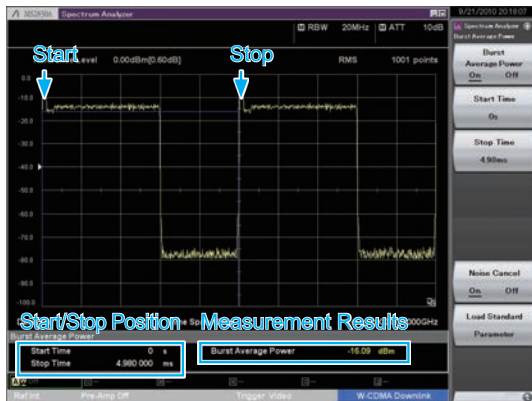
### Measurement Results

- 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.



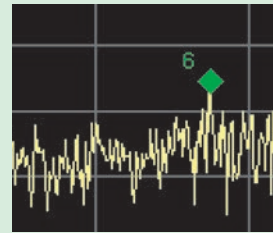
### Measurement Results

- Average power of specified range

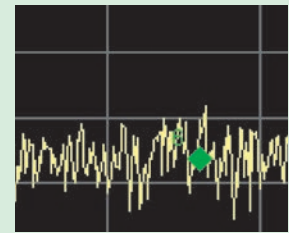
### Example: Spurious Emission

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

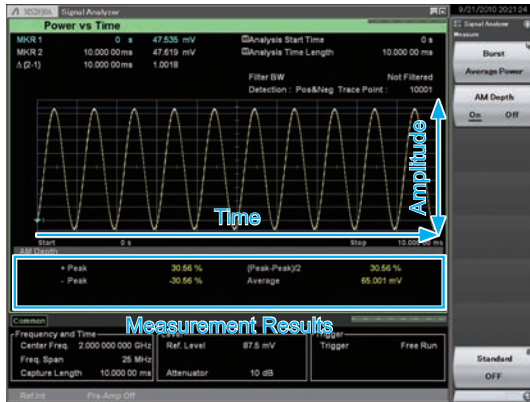
# Versatile Built-in Functions

## 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.



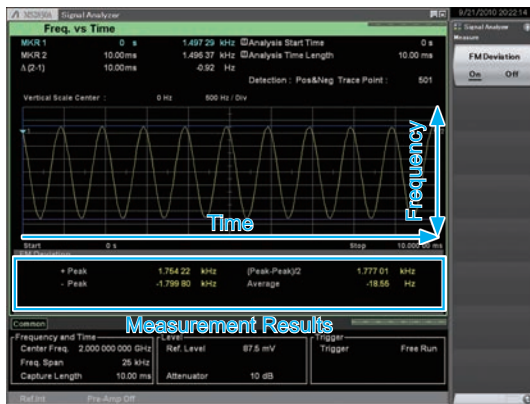
### Measurement Results

- +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

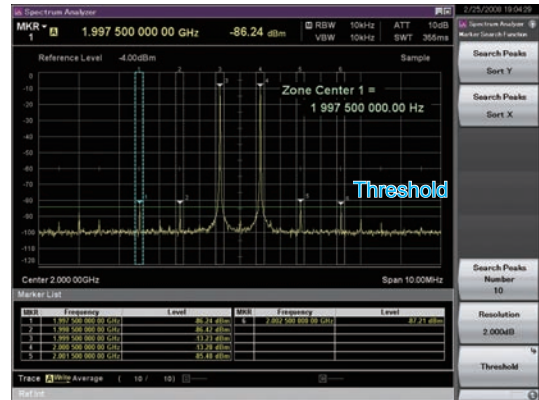
- +Peak, -Peak, (Peak-Peak)/2, Average

## 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

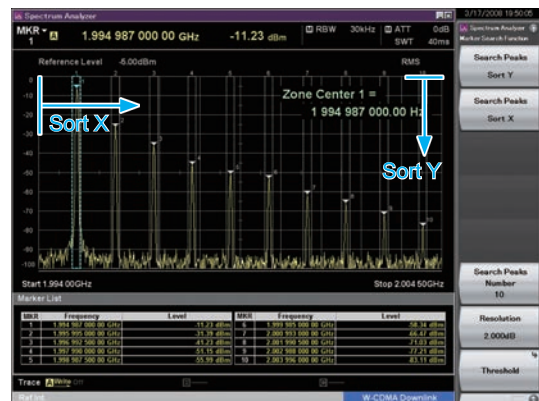
- Marker point frequency
- Marker point power
- Absolute power per Hz in marker bandwidth
- Total power in marker bandwidth
- Difference between any markers

## 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 Lines

SPA

### Setting Limit Lines

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

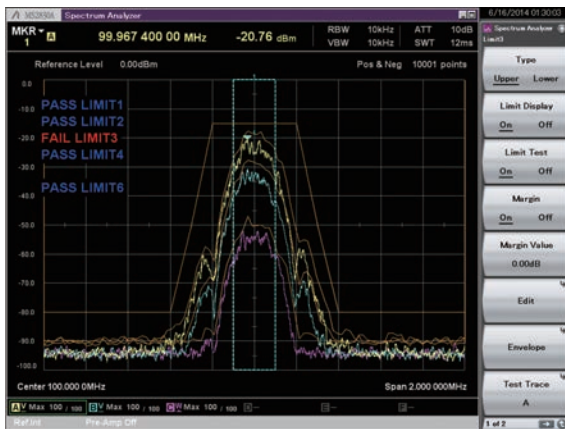
### Evaluating using Limit Line Setting (Limit Test Function)

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

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

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

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



#### Example:

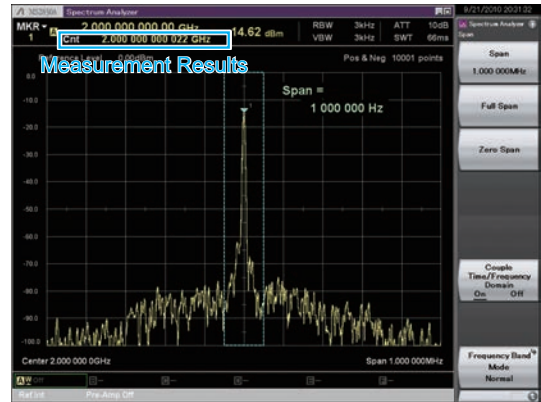
PASS/FAIL evaluation is performed by changing the input signal level. The evaluation results for the five line types can be displayed simultaneously on one screen.

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

## Frequency Counter

SPA

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



**Measurement Results**  
 ■ Marker point frequency

## 2-tone 3rd-order Intermodulation Distortion

SPA

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



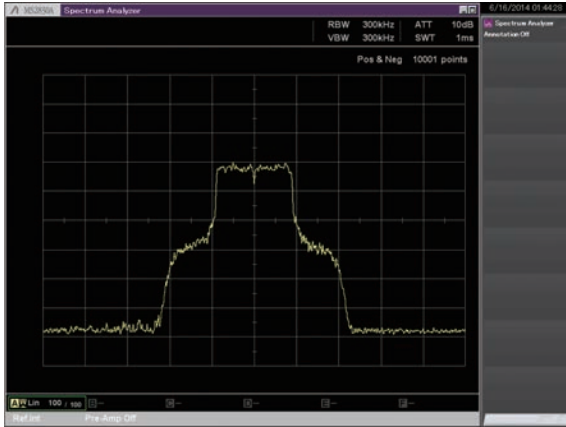
**Measurement Results**  
 ■ TOI: [dBm]  
 ■ Amplitude: [dBc]

# Versatile Built-in Functions

## Annotation Display

SPA

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



## Phase Noise (MS2830A-010)

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

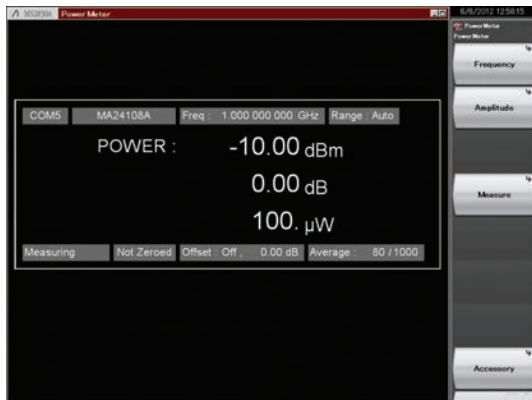


### Measurement Results

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

## 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 |
| MA24105A  | 350 MHz to 4 GHz | 100 kHz    | +3 to +51.76 dBm |
| MA24106A  | 50 MHz to 6 GHz  | 1 kHz      | -40 to +23 dBm   |
| MA24108A  | 10 MHz to 8 GHz  | 100 kHz    | -40 to +20 dBm   |
| MA24118A  | 10 MHz to 18 GHz | 100 kHz    | -40 to +20 dBm   |
| MA24126A  | 10 MHz to 26 GHz | 100 kHz    | -40 to +20 dBm   |

\*: MA24104A has been discontinued.

## Installing the PowerXpert™

Installing the PowerXpert™ PC application software for the Anritsu USB Power Sensor in the MS2830A supports various measurement functions offered by PowerXpert™, as well as use of other USB power sensors by the MS2830A.

PowerXpert™ for the MS2830A can be downloaded from the MS2830A and MS2830A Microwave product pages at the Anritsu website. When using the PowerXpert™ software with a PC, download the latest version from the USB Power Sensor product page at the Anritsu website.

# Versatile Built-in Functions

## Noise Figure Measurement (MS2830A-017)

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

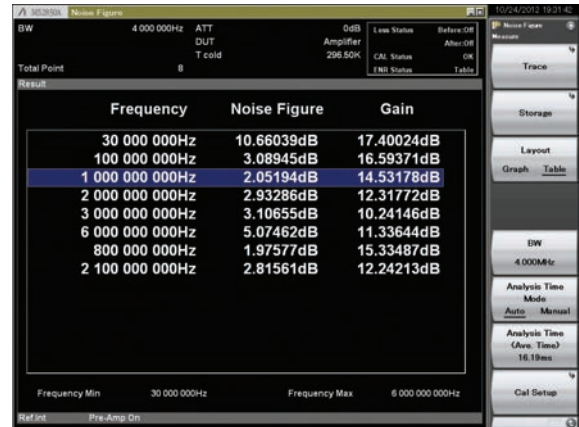
Frequency Mode: Fixed, List, Sweep  
 DUT Mode: Amplifier, Down Converter, Up Converter  
 Screen Layout: Graph, Table

### Measurement Results Display

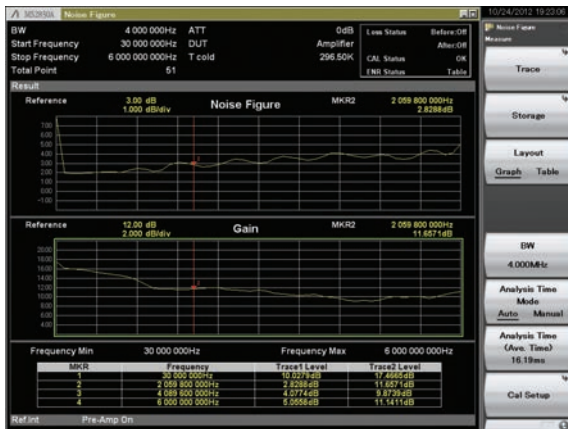
#### ■ Graph/List/Spot

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

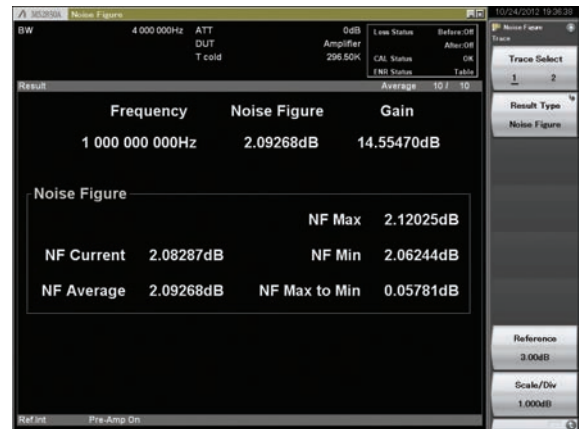
- Noise Figure (NF) [dB]
- Noise Factor (F) [Linear]
- Gain
- Y-Factor: Power ratio when Noise Source is turned ON/OFF
- T effective: Effective noise temperature
- P Hot: Power measured when Noise Source is On.
- P Cold: Power measured when Noise Source is Off.



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   |

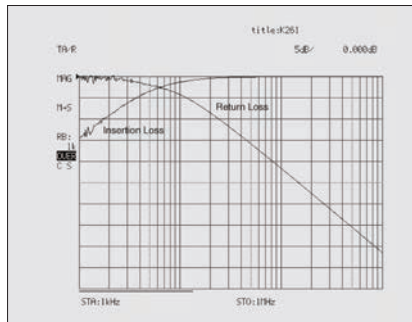
\*1: Flatness better than ±2 dB

\*2: Compatible with SMA and APC3.5

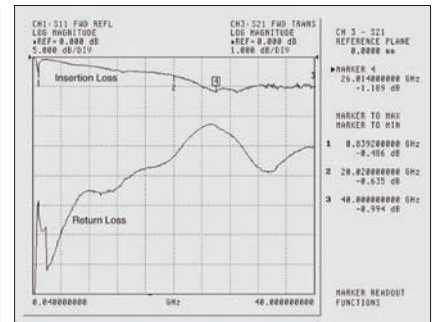
\*3: When using noise sources output by DC, always use in combination with a DC block.

### 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)<br>1.50 (11 kHz to 20 kHz)<br>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)<br>1.35 (20 kHz to 20 GHz)<br>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)<br>≤1.11 (3 GHz to 6 GHz)<br>≤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)<br>≤1.07 (3 GHz to 6 GHz)<br>≤1.2 (6 GHz to 13.5 GHz)<br>≤1.3 (13.5 GHz to 20 GHz)<br>≤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 MS2830A/MS269xA series signal analyzer

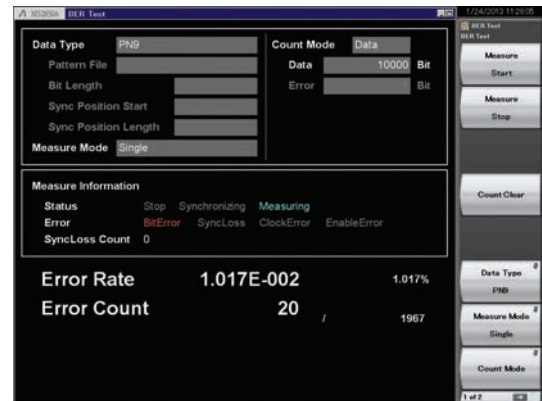
|                | Model       | Frequency Range   | RF connector | Recommended DC Block Order Name | Recommended Adapter Order Name |
|----------------|-------------|-------------------|--------------|---------------------------------|--------------------------------|
| MS2830A series | MS2830A-040 | 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                   |
| 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                         |

# BER Measurement Function (MS2830A-026): Basic Performance

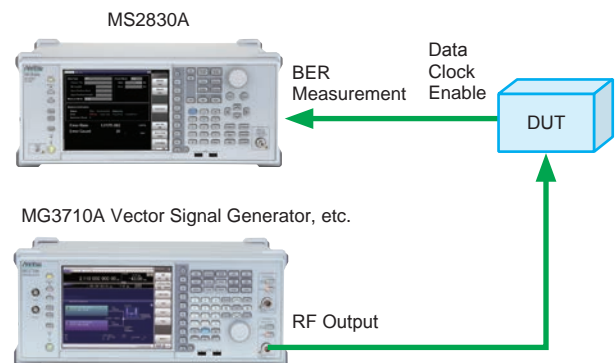
## Convenient Built-in BER Measurement Function for Rx Evaluations

The MS2830A with the MS2830A-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-001/101 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-008/108 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 MS2830A-068/168

### MS2830A-016/116 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-067/167 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-068/168 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 MS2830A-008/108

## Signal Analyzer Function and Performance Improvement

### MS2830A-005/105

#### Analysis Bandwidth Extension to 31.25 MHz/Retrofit

This option extends the analysis bandwidth to 31.25 MHz.

\*: Requires MS2830A-006/106

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

### MS2830A-006/106 Analysis Bandwidth 10 MHz/Retrofit

This option supports the VSA and digitize functions.

### MS2830A-009/109

#### 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 MS2830A-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 MS2830A-006 and MS2830A-005 (for MS2830A-044).

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

Requires MS2830A-006, MS2830A-009 and MS2830A-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 Signal Analyzer series MS2690A/91A/92A is recommended for other measurement purposes.

## Expansion Functions

### MS2830A-010/110 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-011/111 2ndary HDD/Retrofit

This removable 2ndary HDD is installed in the HDD Option Slot of the MS2830A main frame to expand the user data storage space. It does not have the Windows OS installed. The MS2830A ships with it installed. Only one expansion HDD can be installed in the MS2830A.

It is useful when taking the instrument for calibration but the security of saved user data, such as measurement results, must be protected.

### MS2830A-311 2ndary HDD Retrofit

This removable 2ndary HDD is installed in the HDD Option Slot of the MS2830A main frame to expand the user data storage space. It does not have the Windows OS installed.

It is useful when taking the instrument for calibration but the security of saved user data, such as measurement results, must be protected.

### MS2830A-017/117 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-026/126 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

# 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<br>(✓: Can be installed, No: Cannot be installed) |              | Analysis Bandwidth Extension Option<br>(✓: 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/LTE-Advanced (FDD)     | MX269020A       | LTE Downlink Measurement Software   | ✓  | ✓            | ✓   | ✓            |          |          |
|                            | MX269020A-001   | LTE-Advanced FDD Downlink Measurement Software                                | ✓  | ✓            | ✓   | ✓            | ✓+*1     | ✓+*1     |
|                            | MX269021A       | LTE Uplink Measurement Software   | ✓  | ✓            | ✓   | ✓            |          |          |
| LTE/LTE-Advanced (TDD)     | MX269021A-001   | LTE-Advanced FDD Uplink Measurement Software                                  | ✓  | ✓            | ✓   | ✓            | ✓+       | ✓+       |
|                            | MX269022A       | LTE TDD Downlink Measurement Software   | ✓  | ✓            | ✓   | ✓            |          |          |
|                            | MX269022A-001   | LTE-Advanced TDD Downlink Measurement Software                                | ✓  | ✓            | ✓   | ✓            | ✓+*1     | ✓+*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 Bluetooth             | MX283027A-001   | WLAN Test Software  | ✓  | ✓            | ✓   | ✓            |          |          |
|                            | 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 |
|------------|---|--|-------------------------|--------------------------------------|
| MS2830A    | MS2830A-078 installed                             | 125 MHz  | 1                       | 5                                    |
|            | MS2830A-077 installed                             | 31.25 MHz  | 3                       | 5                                    |
|            | MS2830A-005/009 installed                         | 31.25 MHz  | 3                       | 5                                    |
| MS269xA    | MS269xA-078 installed                             | 125 MHz  | 3                       | 5                                    |
|            | MS269xA-077 installed                             | 31.25 MHz  | 3                       | 5                                    |
|            | Standard  | 31.25 MHz  | 3                       | 5                                    |

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

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

|                                      | O-QPSK                   | FSK                     | Except FSK              |                        |
|--------------------------------------|--------------------------|-------------------------|-------------------------|------------------------|
|                                      |                          |                         | Frame Formatted         | Non-Formatted          |
| MS2830A-078, 077, 005, 006 installed | 0.1 kspss to 12.5 Mspss  | 0.1 kspss to 25 Mspss   | 0.1 kspss to 50 Mspss   | 0.1 kspss to 140 Mspss |
| MS2830A-077, 005, 006 installed      | 0.1 kspss to 6.25 Mspss  | 0.1 kspss to 12.5 Mspss | 0.1 kspss to 25 Mspss   | 0.1 kspss to 70 Mspss  |
| MS2830A-005, 006 installed           | 0.1 kspss to 3.125 Mspss | 0.1 kspss to 6.25 Mspss | 0.1 kspss to 12.5 Mspss | 0.1 kspss to 35 Mspss  |
| MS2830A-006 installed                | 0.1 kspss to 1.25 Mspss  | 0.1 kspss to 2.5 Mspss  | 0.1 kspss to 5 Mspss    | 0.1 kspss to 5 Mspss   |

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

By the system that MS2830A-066 is necessary, MS2830A-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 |
| MS2830A    | MX269028A-001 (Only for MS2830A) |       | MS2830A-078 installed                             | ✓                                | ✓      | ✓*5-2  |         |                 |
|            |                                  |       | MS2830A-077 installed                             | ✓                                | ✓      |        |         |                 |
|            |                                  |       | MS2830A-005/009 installed                         | ✓                                | ✓      |        |         |                 |
| MS269xA    | MX269028A-002 (Only for MS269xA) |       | MS269xA-078 installed                             | ✓                                | ✓      | ✓      | ✓       | ✓*5-1           |
|            |                                  |       | MS269xA-077 installed                             | ✓                                | ✓      |        |         |                 |
|            |                                  |       | Standard  | ✓                                | ✓      |        |         |                 |

\*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]<br>-100 MHz to 43.1 GHz [MS2830A-045]<br>Setting resolution: 1 Hz  |                   |  |
| Pre-selector Range            | MS2830A-044   | MS2830A-045       | (Frequency band mode: Normal)<br>(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<br>23°C, Referenced to frequency at 24-hour after power-on<br>Start-up characteristics: $\pm 5 \times 10^{-7}$ (2 minutes after power-on), $\pm 5 \times 10^{-8}$ (5 minutes after power-on)<br>Aging rate: $\pm 1 \times 10^{-7}$ /year<br>Temperature stability: $\pm 2 \times 10^{-8}$ (5° to 45°C)<br><br>With MS2830A-001<br>23°C, Referenced to frequency at 24-hour after power-on<br>Start-up characteristics: $\pm 1 \times 10^{-9}$ (7 minutes after power-on)<br>Aging rate: $\pm 1 \times 10^{-10}$ /month<br>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<br>-115 dBc/Hz (100 kHz offset)<br>-133 dBc/Hz (1 MHz offset)  |                   |  |

### Amplitude

|  |   |
|--|---|
| Level Measurement Range                | Without MS2830A-008/068, or Preamp: Off<br>DANL to +30 dBm<br><br>With MS2830A-008/068, Preamp: On<br>DANL to +10 dBm   |
| Maximum Input Level                    | Without MS2830A-008/068, or Preamp: Off<br>Average total power: +30 dBm (Input attenuator: $\geq 10$ dB)<br>DC voltage: $\pm 0$ Vdc<br><br>With MS2830A-008/068, Preamp: On<br>Average total power: +10 dBm (Input attenuator: 0 dB)<br>DC voltage: $\pm 0$ Vdc   |
| Input Attenuator Range                 | With MS2830A-044<br>0 to 60 dB, 2 dB steps<br><br>With MS2830A-045<br>0 to 60 dB, 10 dB steps (ATT mode: Mechanical ATT only, or E-ATT combined mode, Stop frequency: $\geq 6$ GHz)<br>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 ATT only<br><br>Without MS2830A-008/068, or Preamp: Off<br>$\pm 0.2$ dB (10 to 60 dB) (300 kHz $\leq f < 4$ GHz, Frequency band mode: Normal)<br>$\pm 0.2$ dB (10 to 60 dB) (300 kHz $\leq f < 3.5$ GHz, Frequency band mode: Spurious)<br>$\pm 0.75$ dB (10 to 60 dB) (4 GHz $\leq f \leq 13.8$ GHz, Frequency band mode: Normal)<br>$\pm 0.75$ dB (10 to 60 dB) (3.5 GHz $\leq f \leq 13.8$ GHz, Frequency band mode: Spurious)<br>$\pm 0.8$ dB (10 to 60 dB) (13.8 GHz $< f \leq 26.5$ GHz)<br>$\pm 1.0$ dB (10 to 60 dB) (26.5 GHz $< f \leq 40$ GHz)<br>$\pm 1.0$ dB (10 to 60 dB) (typ., 40 GHz $< f \leq 43$ GHz) |

■ Signal Analyzer/Spectrum Analyzer (continued)

Reference Level

|                              |   |
|------------------------------|---|
| Setting Range                | Log scale: -120 to +50 dBm, or Equivalent level<br>Linear scale: 22.4 $\mu$ V to 70.7 V, or Equivalent level<br>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<br>Linear scale: V   |
| Linearity Error              | Excluding the noise floor effect, Input level: $\leq$ -10 dB (f: <30 MHz)<br>$\pm$ 0.07 dB (Mixer input level: $\leq$ -20 dBm)<br>$\pm$ 0.10 dB (Mixer input level: $\leq$ -10 dBm)   |
| RF Frequency Characteristics | 18° to 28°C, After Cal, Input attenuator: 10 dB<br>Without MS2830A-008/068, or Preamp: Off<br>Without MS2830A-067, or Microwave Preselector Bypass: Off, After preselector auto tune<br>$\pm$ 1.0 dB (9 kHz $\leq$ f < 300 kHz)<br>$\pm$ 0.35 dB (300 kHz $\leq$ f < 4 GHz, Frequency band mode: Normal)<br>(300 kHz $\leq$ f < 3.5 GHz, Frequency band mode: Spurious)<br>$\pm$ 1.5 dB (4 GHz $\leq$ f $\leq$ 6 GHz, Frequency band mode: Normal)<br>(3.5 GHz $\leq$ f $\leq$ 6 GHz, Frequency band mode: Spurious)<br>$\pm$ 1.5 dB (6 GHz < f $\leq$ 13.8 GHz)<br>$\pm$ 2.5 dB (13.8 GHz < f $\leq$ 26.5 GHz)<br>$\pm$ 2.5 dB (26.5 GHz < f $\leq$ 40 GHz)<br>$\pm$ 2.5 dB (typ., 40 GHz < f $\leq$ 43 GHz)<br>With MS2830A-008, Preamp: On<br>$\pm$ 0.65 dB (300 kHz $\leq$ f < 4 GHz, Frequency band mode: Normal)<br>(300 kHz $\leq$ f < 3.5 GHz, Frequency band mode: Spurious)<br>$\pm$ 1.8 dB (4 GHz $\leq$ f $\leq$ 6 GHz, Frequency band mode: Normal)<br>(3.5 GHz $\leq$ f $\leq$ 4 GHz, Frequency band mode: Spurious)<br>With MS2830A-068, or Preamp: On<br>Without MS2830A-067, or Microwave Preselector Bypass: Off, After preselector auto tune<br>$\pm$ 0.65 dB (300 kHz $\leq$ f < 4 GHz, Frequency band mode: Normal)<br>(300 kHz $\leq$ f < 3.5 GHz, Frequency band mode: Spurious)<br>$\pm$ 1.8 dB (4 GHz $\leq$ f $\leq$ 13.8 GHz, Frequency band mode: Normal)<br>(3.5 GHz $\leq$ f $\leq$ 13.8 GHz, Frequency band mode: Spurious)<br>$\pm$ 2.5 dB (13.8 GHz < f $\leq$ 26.5 GHz)<br>$\pm$ 3.5 dB (26.5 GHz < f $\leq$ 40 GHz)<br>$\pm$ 3.5 dB (nom., 40 GHz < f $\leq$ 43 GHz) |
| 1 dB Gain Compression        | Without MS2830A-008/068, or Preamp: Off, At mixer input level<br>$\geq$ +3 dBm (300 MHz $\leq$ f $\leq$ 4 GHz)<br>$\geq$ -1 dBm (4 GHz < f $\leq$ 13.5 GHz)<br>$\geq$ -1 dBm (13.5 GHz < f $\leq$ 26.5 GHz)<br>$\geq$ -1 dBm (nom., 26.5 GHz < f $\leq$ 40 GHz)<br>With MS2830A-068, Preamp: On, At preamp input level<br>$\geq$ -15 dBm (300 MHz $\leq$ f $\leq$ 4 GHz)<br>$\geq$ -21 dBm (4 GHz < f $\leq$ 13.5 GHz)<br>$\geq$ -21 dBm (13.5 GHz < f $\leq$ 26.5 GHz)<br>$\geq$ -21 dBm (nom., 26.5 GHz < f $\leq$ 40 GHz)  |

■ Signal Analyzer/Spectrum Analyzer (continued)

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, nom.)                      |   |
| 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, nom.)                      |   |
| 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, nom.)                      |   |
| 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 (nom., 6 GHz to 13.5 GHz)                         |   |   |
|   | ≤-90 dBm (nom., 13.25 GHz to 26.5 GHz)                     |   |   |
| ≤-80 dBm (nom., 26.5 GHz to 40 GHz)   |  |   |   |

## ■ Spectrum Analyzer

### Frequency

|                                  |   |
|----------------------------------|---|
| Span                             | Range: 0 Hz, 300 Hz to 26.5 GHz [MS2830A-044]<br>0 Hz, 300 Hz to 43 GHz [MS2830A-045]<br>Resolution: 2 Hz<br>Accuracy: $\pm 0.2\%$ (Sweep points: 10001)  |
| Frequency Readout Accuracy       | $\pm$ (Display frequency $\times$ Frequency reference accuracy + Span frequency $\times$ Span accuracy + RBW $\times$ 0.05 + 2 $\times$ N + Span frequency / (Sweep points - 1)) Hz<br>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<br>1 Hz to 10 Hz: Can not be set when span: 0 Hz<br>31.25 MHz: Can be set when span: 0 Hz only<br>20 MHz, 31.25 MHz: Can be set when with MS2830A-005, Can not be set when with MS2830A-009<br>Selectivity ( $-60$ dB/ $-3$ dB): 4.5:1 (nom., 1 Hz to 10 MHz) |
| Resolution Bandwidth (CISPR RBW) | With MS2830A-016<br>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<br>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>-120 dBm/Hz (9 kHz <math>\leq f &lt; 100</math> kHz, nom.)</li> <li>-134 dBm/Hz (100 kHz)</li> <li>-134 dBm/Hz (100 kHz <math>&lt; f &lt; 1</math> MHz, nom.)</li> <li>-144 dBm/Hz (1 MHz)</li> <li>-144 dBm/Hz (1 MHz <math>&lt; f &lt; 10</math> MHz, nom.)</li> <li>-150 dBm/Hz (10 MHz <math>\leq f &lt; 30</math> MHz, nom.)</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) [MS2830A-045]</li> <li>-144 dBm/Hz (34 GHz <math>&lt; f \leq 40</math> GHz) [MS2830A-045]</li> <li>-140 dBm/Hz (40 GHz <math>&lt; f \leq 43</math> GHz) [MS2830A-045]</li> </ul> <p>Without MS2830A-067, with MS2830A-068, Preamp: Off, Frequency band mode: Normal</p> <ul style="list-style-type: none"> <li>-120 dBm/Hz (9 kHz <math>\leq f &lt; 100</math> kHz, nom.)</li> <li>-134 dBm/Hz (100 kHz)</li> <li>-134 dBm/Hz (100 kHz <math>&lt; f &lt; 1</math> MHz, nom.)</li> <li>-144 dBm/Hz (1 MHz)</li> <li>-144 dBm/Hz (1 MHz <math>&lt; f &lt; 10</math> MHz, nom.)</li> <li>-150 dBm/Hz (10 MHz <math>\leq f &lt; 30</math> MHz, nom.)</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) [MS2830A-045]</li> <li>-135 dBm/Hz (34 GHz <math>&lt; f \leq 40</math> GHz) [MS2830A-045]</li> <li>-132 dBm/Hz (40 GHz <math>&lt; f \leq 43</math> GHz) [MS2830A-045]</li> </ul> <p>Without MS2830A-067, or Microwave Preselector Bypass: Off<br/>With MS2830A-068, Preamp: On, Frequency band mode: Normal</p> <ul style="list-style-type: none"> <li>-147 dBm/Hz (100 kHz, nom.)</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) [MS2830A-045]</li> <li>-150 dBm/Hz (34 GHz <math>&lt; f \leq 40</math> GHz) [MS2830A-045]</li> <li>-147 dBm/Hz (40 GHz <math>&lt; f \leq 43</math> GHz) [MS2830A-045]</li> </ul> <p>With MS2830A-067: See Microwave Preselector Bypass (Displayed average noise level)</p> |
|--------------------------------------|--|



## ■ Spectrum Analyzer (continued)

### Amplitude (continued)

|   |  |
|---|--|
| <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</p> <p>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)<br/>(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)<br/>(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)<br/>(4 GHz &lt; f ≤ 13.8 GHz, Frequency band mode: Spurious)</p> <p>±3.0 dB (13.8 GHz &lt; f ≤ 26.5 GHz)</p> <p>±3.0 dB (26.5 GHz &lt; f ≤ 40 GHz)</p> <p>±3.5 dB (nom., 40 GHz &lt; f ≤ 43 GHz)</p> <p>With MS2830A-068, Preamp: On</p> <p>Input attenuator: 10 dB, Preamp input level: ≤-30 dBm</p> <p>±1.0 dB (300 kHz ≤ f &lt; 4 GHz, Frequency band mode: Normal)<br/>(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)<br/>(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)<br/>(4 GHz &lt; f ≤ 13.8 GHz, Frequency band mode: Spurious)</p> <p>±3.0 dB (13.8 GHz &lt; f ≤ 26.5 GHz)</p> <p>±4.0 dB (26.5 GHz &lt; f ≤ 40 GHz)</p> <p>±4.0 dB (nom., 40 GHz &lt; f ≤ 43 GHz)</p> |
|---|--|

### 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)</p> <p>≤-60 dBc, TOI = +15 dBm (300 MHz ≤ f &lt; 3.5 GHz)</p> <p>≤-58 dBc, TOI = +14 dBm (3.5 GHz ≤ f ≤ 6 GHz, Frequency band mode: Normal)</p> <p>≤-56 dBc, TOI = +13 dBm (6 GHz &lt; f ≤ 13.5 GHz)</p> <p>≤-56 dBc, TOI = +13 dBm (13.5 GHz &lt; f ≤ 26.5 GHz)</p> <p>≤-56 dBc, TOI = +13 dBm (nom., 26.5 GHz &lt; f ≤ 40 GHz)</p> <p>With MS2830A-068, Preamp: On</p> <p>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)</p> <p>≤-78 dBc, TOI = -6 dBm (300 MHz ≤ f ≤ 700 MHz)</p> <p>≤-81 dBc, TOI = -4.5 dBm (700 MHz &lt; f &lt; 4 GHz, Frequency band mode: Normal)<br/>(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)<br/>(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)<br/>(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)</p> <p>≤-70 dBc, TOI = -10 dBm (nom., 26.5 GHz &lt; f ≤ 40 GHz)</p> <p>TOI: Third-order intermodulation distortion</p> |
| <p>Image Responses</p>                             | <p>ATT mode: Mechanical ATT only, Frequency band mode: Normal</p> <p>Without MS2830A-067</p> <p>≤-70 dBc (10 MHz ≤ f &lt; 4 GHz)</p> <p>≤-55 dBc (4 GHz ≤ f ≤ 6 GHz)</p> <p>≤-70 dBc (6 GHz &lt; f ≤ 13.5 GHz)</p> <p>≤-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)<br/>1 μs to 1000 s (Span: 0 Hz)</p> |

■ **Spectrum Analyzer** (continued)

**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)<br>1001, 2001, 5001, 10001 (500 MHz < span ≤ 30 GHz)<br>101, 201, 251, 401, 501, 1001, 2001, 5001, 10001 (100 MHz < span ≤ 500 MHz)<br>(300 Hz ≤ span ≤ 100 MHz, Sweep time: > 10 s)<br>11, 21, 41, 51, 101, 201, 251, 401, 501, 1001, 2001, 5001, 10001 (300 Hz ≤ span ≤ 100 MHz, Sweep time: ≤ 10 s)<br>(span: 0 Hz) |
| Scale               | Log scale: 10 div/12 div, 0.1 to 20 dB/div (1-2-5 sequence)<br>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<br>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<br>Span: ≤1 MHz, RBW: 1 kHz, S/N: ≥50 dB, Gate time: ≥100 ms<br>± (Marker frequency × Frequency reference accuracy + (0.1 × N / Gate time [s] Hz)<br>N: Mixer harmonic order |
|   | Gate Time Setting<br>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 | <p>Sets capture analysis bandwidth from center frequency</p> <p>1 kHz to 10 MHz (1-2.5-5 sequence) (with MS2830A-006)</p> <p>1 kHz to 25 MHz (1-2.5-5 sequence), 31.25 MHz (with MS2830A-005, or with MS2830A-009)</p> <p>1 kHz to 25 MHz (1-2.5-5 sequence), 31.25 MHz, 50 MHz, 62.5 MHz (with MS2830A-077)</p> <p>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)</p> <p>*MS2830A-005 is not available when MS2830A-045 is installed.</p>  |
| Sampling Rate      | <p>Auto setting by conditions of analysis bandwidth</p> <p>2 kHz to 20 MHz (1-2-5 sequence) (with MS2830A-006)</p> <p>2 kHz to 50 MHz (1-2-5 sequence) (with MS2830A-005, or with MS2830A-009)</p> <p>2 kHz to 100 MHz (1-2-5 sequence) (with MS2830A-077)</p> <p>2 kHz to 200 MHz (1-2-5 sequence) (with MS2830A-078)</p>  |
| Capture Time       | <p>Without MS2830A-077/078, or <math>\leq 31.25</math> MHz bandwidth</p> <p>Setting capture time length</p> <p>Minimum capture time length: 2 <math>\mu</math>s to 50 ms (Determined according to analysis bandwidth)</p> <p>Maximum capture time length: 2 s to 2000 s (Determined according to analysis bandwidth)</p> <p>Setting mode: Auto, Manual</p> <p>With MS2830A-077, <math>&gt; 31.25</math> MHz bandwidth</p> <p>Setting capture time length</p> <p>Minimum capture time length: 1 <math>\mu</math>s</p> <p>Maximum capture time length: 500 ms</p> <p>Setting mode: Auto, Manual</p> <p>With MS2830A-078, <math>&gt; 31.25</math> MHz bandwidth</p> <p>Setting capture time length</p> <p>Minimum capture time length: 500 ns to 1 <math>\mu</math>s (Determined according to analysis bandwidth)</p> <p>Maximum capture time length: 500 ms</p> <p>Setting mode: Auto, Manual</p> |
| Trigger            | Free run (Trigger off), Video, Wide IF video, Frame, External   |
| ADC Resolution     | Without MS2830A-077/078, or $\leq 31.25$ MHz bandwidth<br>16 bits   |

■ Signal Analyzer (continued)

**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<br>Analysis time length: Sets analysis time length<br>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<br>0 MHz to 26.5 GHz [MS2830A-044]<br>0 MHz to 43 GHz [MS2830A-045]<br>With MS2830A-077/078, without MS2830A-067, $>31.25$ MHz bandwidth<br>300 MHz to 6 GHz [MS2830A-044]<br>300 MHz to 6 GHz [MS2830A-045]<br>With MS2830A-077/078, MS2830A-067, $>31.25$ MHz bandwidth<br>300 MHz to 26.5 GHz [MS2830A-044]<br>300 MHz to 43 GHz [MS2830A-045]  |
| Resolution Bandwidth (RBW)         | Without MS2830A-077/078, or $\leq 31.25$ MHz bandwidth<br>Setting range: 1 Hz to 1 MHz (1-3 sequence)<br>Selectivity ( $-60$ dB/ $-3$ dB): 4.5:1 (nom.)<br>With MS2830A-077, $>31.25$ MHz bandwidth<br>Setting range: 1 Hz to 3 MHz (1-3 sequence)<br>Selectivity ( $-60$ dB/ $-3$ dB): 4.5:1 (nom.)<br>With MS2830A-078, $>31.25$ MHz bandwidth<br>Setting range: 1 Hz to 10 MHz (1-3 sequence)<br>Selectivity ( $-60$ dB/ $-3$ dB): 4.5:1 (nom.)  |
| Total Absolute Amplitude Accuracy* | 18° to 28°C, After Cal, Input attenuator: $\geq 10$ dB, RBW: Auto,<br>Time detection: Average, Marker result: Integration or Peak (Accuracy), Center frequency, CW,<br>Excluding the noise floor effect<br>Without MS2830A-068, or Preamp: Off<br>Input attenuator: $\geq 10$ dB, Input level: $\leq -10$ dBm (f: $<30$ MHz), Mixer input level: $\leq -10$ dBm (f: $\geq 30$ MHz)<br>$\pm 0.5$ dB (300 kHz $\leq f < 4$ GHz, Frequency band mode: Normal)<br>(300 kHz $\leq f < 3.5$ GHz, Frequency band mode: Spurious)<br>$\pm 1.8$ dB (4 GHz $\leq f \leq 6$ GHz, Frequency band mode: Normal)<br>(3.5 GHz $\leq f \leq 4$ GHz, Frequency band mode: Spurious)<br>$\pm 1.8$ dB (6 GHz $< f \leq 13.8$ GHz, Frequency band mode: Normal)<br>(4 GHz $< f \leq 13.8$ GHz, Frequency band mode: Spurious)<br>$\pm 3.0$ dB (13.8 GHz $< f \leq 26.5$ GHz)<br>$\pm 3.0$ dB (26.5 GHz $< f \leq 40$ GHz)<br>$\pm 3.5$ dB (nom., 40 GHz $< f \leq 43$ GHz)<br>With MS2830A-068, Preamp: On<br>Input attenuator: 10 dB, Preamp Input level: $\leq -30$ dBm<br>$\pm 1.0$ dB (300 kHz $\leq f < 4$ GHz, Frequency band mode: Normal)<br>(300 kHz $\leq f < 3.5$ GHz, Frequency band mode: Spurious)<br>$\pm 1.8$ dB (4 GHz $\leq f \leq 6$ GHz, Frequency band mode: Normal)<br>(3.5 GHz $\leq f \leq 4$ GHz, Frequency band mode: Spurious)<br>$\pm 2.0$ dB (6 GHz $< f \leq 13.8$ GHz, Frequency band mode: Normal)<br>(4 GHz $< f \leq 13.8$ GHz, Frequency band mode: Spurious)<br>$\pm 3.0$ dB (13.8 GHz $< f \leq 26.5$ GHz)<br>$\pm 4.0$ dB (26.5 GHz $< f \leq 40$ GHz)<br>$\pm 4.0$ dB (nom., 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<br>Without MS2830A-077/078, or $\leq 31.25$ MHz bandwidth<br>$\pm 0.31$ dB (30 MHz $\leq f \leq 4$ GHz, Frequency band mode: Normal)<br>(30 MHz $\leq f < 3.5$ GHz, Frequency band mode: Spurious)   |

■ **Signal Analyzer** (continued)

**Spectrum Displayed Function** (continued)

|                                      |   |
|--------------------------------------|---|
| Displayed Average Noise Level (DANL) | Without MS2830A-067/068, Frequency band mode: Normal<br>–131.5 dBm/Hz (100 kHz)<br>–141.5 dBm/Hz (1 MHz)<br>–150.5 dBm/Hz (30 MHz ≤ f < 1 GHz)<br>–147.5 dBm/Hz (1 GHz ≤ f < 2.4 GHz)<br>–144.5 dBm/Hz (2.4 GHz ≤ f ≤ 3.5 GHz)<br>–141.5 dBm/Hz (3.5 GHz < f ≤ 4 GHz)<br>–141.5 dBm/Hz (4 GHz < f ≤ 6 GHz)<br>–148.5 dBm/Hz (6 GHz ≤ f ≤ 13.5 GHz)<br>–146.5 dBm/Hz (13.5 GHz < f ≤ 18.3 GHz)<br>–143.5 dBm/Hz (18.3 GHz < f ≤ 26.5 GHz)<br>–143.5 dBm/Hz (26.5 GHz < f ≤ 34 GHz)<br>–141.5 dBm/Hz (34 GHz < f ≤ 40 GHz)<br>–137.5 dBm/Hz (40 GHz < f ≤ 43 GHz)                             |
|                                      | Without MS2830A-067, with MS2830A-068, Preamp: Off, Frequency band mode: Normal<br>–131.5 dBm/Hz (100 kHz)<br>–141.5 dBm/Hz (1 MHz)<br>–150.5 dBm/Hz (30 MHz ≤ f < 1 GHz)<br>–147.5 dBm/Hz (1 GHz ≤ f < 2.4 GHz)<br>–144.5 dBm/Hz (2.4 GHz ≤ f ≤ 3.5 GHz)<br>–141.5 dBm/Hz (3.5 GHz < f ≤ 4 GHz)<br>–141.5 dBm/Hz (4 GHz < f ≤ 6 GHz)<br>–144.5 dBm/Hz (6 GHz < f ≤ 13.5 GHz)<br>–142.5 dBm/Hz (13.5 GHz < f ≤ 18.3 GHz)<br>–138.5 dBm/Hz (18.3 GHz < f ≤ 26.5 GHz)<br>–138.5 dBm/Hz (26.5 GHz < f ≤ 34 GHz)<br>–132.5 dBm/Hz (34 GHz < f ≤ 40 GHz)<br>–129.5 dBm/Hz (40 GHz < f ≤ 43 GHz)  |
|                                      | Without MS2830A-067, with MS2830A-068, Preamp: On, Frequency band mode: Normal<br>–144.5 dBm/Hz (nom., 100 kHz)<br>–153.5 dBm/Hz (1 MHz)<br>–160.5 dBm/Hz (30 MHz ≤ f < 1 GHz)<br>–158.5 dBm/Hz (1 GHz ≤ f < 2 GHz)<br>–156.5 dBm/Hz (2 GHz ≤ f ≤ 3.5 GHz)<br>–152.5 dBm/Hz (3.5 GHz < f ≤ 4 GHz)<br>–152.5 dBm/Hz (4 GHz < f ≤ 6 GHz)<br>–157.5 dBm/Hz (6 GHz < f ≤ 13.5 GHz)<br>–155.5 dBm/Hz (13.5 GHz < f ≤ 18.3 GHz)<br>–153.5 dBm/Hz (18.3 GHz < f ≤ 26.5 GHz)<br>–153.5 dBm/Hz (26.5 GHz < f ≤ 34 GHz)<br>–147.5 dBm/Hz (34 GHz < f ≤ 40 GHz)<br>–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<br>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<br>Analysis time length: Sets analysis time length<br>Setting mode: Auto, Manual   |
| Resolution Bandwidth                | Filter type: Rect, Gaussian, Nyquist, Root nyquist, Off, (Default: Off)<br>Roll-off ratio: 0.01 to 1 (Set for Nyquist, Root nyquist)<br>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<br>+Peak, –Peak, (P-P)/2, Average   |
| Burst Average Power                 | Measures average power of burst signal  |

## ■ Signal Analyzer (continued)

### 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<br>Analysis time length: Sets analysis time length<br>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<br>Displayed frequency range: Selectable 1/25, 1/10, 1/5, 1/2 of analysis bandwidth<br>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<br>± (Reference oscillator accuracy × Center frequency + Displayed frequency range × 0.01) Hz                                  |
| FM Deviation<br>(Peak to Peak Measurement) | Measures FM deviation or marker function<br>+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<br>Analysis time length: Sets analysis time length<br>Setting mode: Auto, Manual |
| Phase (Vertical Axis) | Display mode: Wrap, Unwrap<br>Displayed phase range: 0.01 deg./div to 200 Gdeg./div<br>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<br>Analysis time length: Sets analysis time length<br>Setting mode: Auto, Manual |
| Display              | Displayed CCDF or APD as graphs<br>Histogram resolution: 0.01 dB<br>Value: Average power, Max. power, Crest factor   |
| Resolution Bandwidth | Filter type: Rectangle, Off, (Default: Off)<br>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<br>Analysis time length: Sets analysis time length<br>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)<br>Selectivity (-60 dB/-3 dB): 4.5:1 (nom.)  |

### 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)<br>Level: 0 dBm input is $\sqrt{I^2 + Q^2} = 1$<br>Level accuracy: Same as signal analyzer absolute amplitude accuracy |
| External Output  | Can be output to external PC via Ethernet  |

## ■ Signal Analyzer (continued)

### 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   | 20 kHz           | 610000 (30.5 s)        |
|   | 25 kHz   | 50 kHz           | 730000 (14.6 s)        |
|   | 50 kHz   | 100 kHz          | 730000 (7.3 s)         |
|   | 100 kHz  | 200 kHz          | 730000 (3.65 s)        |
|   | 250 kHz  | 500 kHz          | 730000 (1.46 s)        |
|   | 500 kHz  | 1 MHz            | 730000 (730 ms)        |
|   | 1 MHz  | 2 MHz            | 730000 (365 ms)        |
|   | 2.5 MHz  | 5 MHz            | 730000 (146 ms)        |
|   | 5 MHz  | 10 MHz           | 730000 (73 ms)         |
|   | 10 MHz   | 20 MHz           | 730000 (36.5 ms)       |
|   | 18.6 MHz   | 20 MHz           | 730000 (36.5 ms)       |
|   | 20 MHz   | 25 MHz           | 730000 (29.2 ms)       |
|   | 25 MHz   | 50 MHz           | 730000 (14.6 ms)       |
|   | 31.25 MHz  | 50 MHz           | 730000 (14.6 ms)       |
| 50 MHz                                  | 100 MHz  | 730000 (7.3 ms)  |                        |
| 62.5 MHz                                | 100 MHz  | 730000 (7.3 ms)  |                        |
| 100 MHz                                 | 200 MHz  | 730000 (3.65 ms) |                        |
| 125 MHz                                 | 200 MHz  | 730000 (3.65 ms) |                        |

## ■ Connector

|                              |  |
|------------------------------|--|
| RF Input                     | <p>18° to 28°C, Input attenuator: ≥10 dB</p> <p>With MS2830A-044<br/>           Connector: N-J (Front panel), 50Ω (nom.)<br/>           VSWR : ≤1.2 (nom., 40 MHz ≤ f ≤ 3 GHz)<br/>                     ≤1.5 (nom., 3 GHz &lt; f ≤ 6 GHz)<br/>                     ≤1.6 (nom., 6 GHz &lt; f ≤ 13.5 GHz)<br/>                     ≤1.9 (nom., 13.5 GHz &lt; f ≤ 26.5 GHz)</p> <p>With MS2830A-045<br/>           Connector: K-J (Front panel), 50Ω (nom.)<br/>           VSWR : ≤1.2 (nom., 40 MHz ≤ f ≤ 3 GHz)<br/>                     ≤1.3 (nom., 3 GHz &lt; f ≤ 6 GHz)<br/>                     ≤1.3 (nom., 6 GHz &lt; f ≤ 13.5 GHz)<br/>                     ≤1.4 (nom., 13.5 GHz &lt; f ≤ 26.5 GHz)<br/>                     ≤1.6 (nom., 26.5 GHz &lt; f ≤ 40 GHz)<br/>                     ≤1.6 (Reference data, 40 GHz &lt; f ≤ 43 GHz, V-K converter mounted and included)</p> |
| External Reference Input     | <p>Connector: BNC-J (Rear panel), 50Ω (nom.)<br/>           Frequency: 5, 10, 13 MHz<br/>           Operating range: ±1 ppm<br/>           Input level: -15 to +20 dBm, 50Ω (AC coupling)</p>  |
| Reference Signal Output      | <p>Connector: BNC-J (Rear panel), 50Ω (nom.)<br/>           Frequency: 10 MHz<br/>           Output level: ≥0 dBm (AC coupling)</p>  |
| Sweep Status Output          | <p>Connector: BNC-J (Rear panel)<br/>           Output level: TTL level (High level at sweeping or waveform capture)</p>   |
| SA Trigger Input             | <p>Connector: BNC-J (Rear panel)<br/>           Output level: TTL level</p>  |
| Noise Source Drive           | <p>This is available when the MS2830A-017/117 is installed.<br/>           Supply (+28 V) of the noise source drive.<br/>           Rear panel, BNC-J<br/>           Output voltage: 28 ±0.5 V, Pulsed</p>   |
| 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)<br>Interface function: SH1, AH1, T6, L4, SR1, RL1, PPO, 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*                   | <p>Connector: SMA-J (Rear panel), 50Ω (nom.)<br/>           Frequency: 1.875 GHz<br/>           Gain: -10 dB (nom., Input attenuator: 0 dB, Input frequency: 10 GHz)</p>   |
| 1st Local Output*            | <p>Connector: SMA-J (Front panel), 50Ω (nom.)<br/>           Frequency: 5 GHz to 10 GHz (Local signal output), 1.875 GHz (IF frequency)<br/>           Gain: -10 dB (nom., Input attenuator: 0 dB, Input frequency: 10 GHz)</p>  |

\*: With MS2830A-044/045 only

## ■ Display

|         |   |
|---------|---|
| Display | XGA-color LCD (Resolution: 1024 × 768), 8.4 inches (Diagonal: 213 mm) |
|---------|---|

## ■ General

|                     |   |
|---------------------|---|
| Dimensions and Mass | 426 (W) × 177 (H) × 390 (D) mm (excluding projections)<br>≤15 kg (excluding other options)  |
| Power Supply        | Power voltage: 100 V(ac) to 120 V(ac)/200 V(ac) to 240 V(ac)<br>Frequency: 50 Hz/60 Hz<br>Power consumption: 190 VA (nom., excluding other options) |
| Temperature Range   | Operating: +5° to +45°C, Storage: -20° to +60°C   |
| EMC                 | EN61326-1, EN61000-3-2  |

## ■ External Mixer Function (26.5 GHz to 325 GHz)

|                 |              |   |                    |                    |                           |
|-----------------|--------------|---|--------------------|--------------------|---------------------------|
| External Mixer* | Frequency    | Frequency range: 26.5 GHz to 325 GHz<br>Frequency bands:  |                    |                    |                           |
|                 |              | Model   | Band               | Frequency range    | Mixer harmonics order (N) |
|                 |              | MA2741C   | A                  | 26.5 GHz to 40 GHz | 4+                        |
|                 |              | MA2742C   | Q                  | 33 GHz to 50 GHz   | 5+                        |
|                 |              | MA2743C   | U                  | 40 GHz to 60 GHz   | 6+                        |
|                 |              | MA2744C   | V                  | 50 GHz to 75 GHz   | 8+                        |
|                 |              | MA2745C   | E                  | 60 GHz to 90 GHz   | 9+                        |
|                 |              | MA2746C   | W                  | 75 GHz to 110 GHz  | 11+                       |
|                 |              | MA2747C   | F                  | 90 GHz to 140 GHz  | 14+                       |
|                 |              | MA2748C   | D                  | 110 GHz to 170 GHz | 17+                       |
|                 | MA2749C      | G   | 140 GHz to 220 GHz | 22+                |                           |
|                 | MA2750C      | Y   | 170 GHz to 260 GHz | 26+                |                           |
|                 | MA2751C      | J   | 220 GHz to 325 GHz | 33+                |                           |
|                 | Amplitude    | Mixer conversion loss<br>Setting range: 0 to 99.9 dB<br>Maximum input level, Average noise level, Frequency response: Depends on external mixer |                    |                    |                           |
|                 | Input/Output | Applicable mixer: 2-port mixer only<br>Local frequency: 5 GHz to 10 GHz<br>IF frequency: 1.875 GHz  |                    |                    |                           |

\*: With MS2830A-044/045 only

## ■ 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) |
|-------------------------------|---|

## ■ 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. (Requires MS2830A-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 (Requires MS2830A-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 Preamplifier

This option amplifies signal prior to mixer to enhance sensitivity.  
Cannot install simultaneously with MS2830A-068.

#### Frequency

|                 |                  |
|-----------------|------------------|
| Frequency Range | 100 kHz to 6 GHz |
|-----------------|------------------|

#### 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 (without MS2830A-068/168): 30 MHz to 6 GHz<br>MS2830A-044 (with MS2830A-068/168): 30 MHz to 26.5 GHz<br>MS2830A-045 (without MS2830A-068/168): 30 MHz to 6 GHz<br>MS2830A-045 (with MS2830A-068/168): 30 MHz to 40 GHz |
| Frequency Setting Range | MS2830A-044: 10 MHz to 26.5 GHz<br>MS2830A-045: 10 MHz to 43 GHz   |

#### NF Measurement

|                        |  |
|------------------------|--|
| Measurement Range      | Within the frequency range<br>(Attenuator: 0 dB, Preamp: On)<br>– 20 to +40 dB                                     |
| Instrument Uncertainty | Within the measurement range<br>ENR: 4 to 7 dB ±0.02 dB<br>ENR: 12 to 17 dB ±0.025 dB<br>ENR: 20 to 22 dB ±0.03 dB |

#### Gain Measurement

|                        |   |
|------------------------|---|
| Measurement Range      | Within the frequency range<br>–20 to +40 dB |
| Instrument Uncertainty | Within the measurement range<br>≤0.07       |

#### Resolution Bandwidth

|               |                  |
|---------------|------------------|
| Setting Range | 100 kHz to 8 MHz |
|---------------|------------------|

#### Connector

|              |   |
|--------------|---|
| Noise Source | Connector: Rear panel, BNC-J<br>Output voltage: 28 ±0.5 V, Pulsed |
|--------------|---|

\*: Recommending the NC346 Series noise sources by Noisecom company

## ■ MS2830A-026 BER Measurement Function

|   |  |
|---|--|
| Connector                                 | AUX connector(Rear panel)*<br>*: 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 ...)<br>PN9Fix, PN11Fix, PN15Fix, PN20Fix, PN23Fix, User define (4096 bits max.)  |
| Synchronization<br>Establishing Condition | PN signal: PN stage × 2 bit error free<br>At PNFix signal: PN stage × 2 bit error free, PN signal and sync establishment, establish sync with PNFix signal at PN stage<br>error free from PNFix signal header bit<br>ALL0, ALL1, Alternate (0101 ...): 10 bit error free<br>UserDefine: 8 to 1024 bits (variable) error free<br>Select header bit used at sync detection |
| Re-synchronization<br>Judgment Condition  | x/y (Resynchronization at detection of x-bit error in y bits)<br>y ... Measured bit count: Select from 500 bits, 5000 bits, 50000 bits<br>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<br>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 MS2830A-168 is added to MS2830A (with MS2830A-008), only MS2830A-168 becomes available.

### Frequency

|                 |  |
|-----------------|--|
| Frequency Range | 100 kHz to 26.5 GHz [MS2830A-044]<br>100 kHz to 43 GHz [MS2830A-045] |
|-----------------|--|

### 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<br>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<br>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<br>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]<br>4 GHz to 43 GHz [MS2830A-045] |
|-----------------|--|

### 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 (nom., 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 1.875 GHz × 2</p> <ul style="list-style-type: none"> <li>0 dBc (nom., 4 GHz ≤ f ≤ 26.5 GHz)</li> <li>0 dBc (nom., 26.5 GHz &lt; f ≤ 43 GHz)</li> </ul>  |

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

This option adds a function to analyze 62.5 MHz bandwidth.  
 MS2830A-044: Requires MS2830A-006 and MS2830A-005.  
 MS2830A-045: Requires 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: Requires MS2830A-006, MS2830A-005 and MS2830A-077.  
 MS2830A-045: Requires 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 Signal Analyzer series MS2690A/91A/92A 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<br>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<br/>                     With MS2830A-077 or 078, &gt;31.25 MHz bandwidth<br/>                     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<br/>                     With MS2830A-077 or 078, with MS2830A-067, &gt;31.25 MHz bandwidth</p> <p>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> |
|--------------------------------------|--|

■ **MS2830A-077 Analysis Bandwidth Extension to 62.5 MHz**  
**MS2830A-078 Analysis Bandwidth Extension to 125 MHz** (continued)

**Amplitude** (continued)

|                              |   |
|------------------------------|---|
| Image Response               | With MS2830A-077/078, >31.25 MHz bandwidth<br>Image response (occurs at frequency 200 MHz away): 0 dBc (nom., 300 MHz < f ≤ 43 GHz)<br>With MS2830A-077/078, MS2830A-067, >31.25 MHz bandwidth<br>Image response (occurs at frequency 1.875 GHz × 2 away): 0 dBc (nom., 6 GHz < f ≤ 43 GHz)   |
| RF Frequency Characteristics | 18° to 28°C, After Cal, Input attenuator: 10 dB, Frequency band mode: Normal, >31.25 MHz bandwidth<br>Without MS2830A-008/068, or Preamp: Off<br>±0.35 dB (300 MHz ≤ f < 4 GHz)<br>±1.5 dB (4 GHz ≤ f ≤ 6 GHz)<br>With MS2830A-008, Preamp: On<br>±0.65 dB (300 MHz ≤ f < 4 GHz)<br>±1.8 dB (4 GHz ≤ f ≤ 6 GHz)<br>Without MS2830A-068, or Preamp: Off<br>With MS2830A-067, Microwave Preselector Bypass: On<br>±1.0 dB (6 GHz ≤ f ≤ 13.8 GHz)<br>±1.5 dB (13.8 GHz < f ≤ 26.5 GHz)<br>±2.0 dB (26.5 GHz < f ≤ 40 GHz)<br>±2.0 dB (typ., 40 GHz < f ≤ 43 GHz)<br>With MS2830A-068, or Preamp: On<br>With MS2830A-067, Microwave Preselector Bypass: On<br>±1.8 dB (6 GHz ≤ f ≤ 13.8 GHz)<br>±2.5 dB (13.8 GHz < f ≤ 26.5 GHz)<br>±3.0 dB (26.5 GHz < f ≤ 40 GHz)<br>±3.0 dB (nom., 40 GHz < f ≤ 43 GHz) |
| Linearity Error              | See Signal Analyzer/Spectrum Analyzer (Linearity error)   |

■ **MA2806A High Performance Waveguide Mixer (50 to 75 GHz)**  
**MA2808A High Performance Waveguide Mixer (60 to 90 GHz)**

**Electrical Characteristics**

| Model No.                     | MA2806A              |             | MA2808A          |
|-------------------------------|----------------------|-------------|------------------|
| Frequency Range               | 50 GHz to 75 GHz     |             | 60 GHz to 90 GHz |
| LO Amplitude Range            | >+10 dBm             |             |                  |
| Multiplier                    | 8                    |             | 12               |
| Conversion Loss*              | <15 dB (typ.)        |             |                  |
| 1 dB Gain Compression (P1dB)* | >0 dBm (typ.)        |             |                  |
| LO Leakage                    | <-30 dBm (nom.)      |             |                  |
| RF Input VSWR                 | ≤1.5 (nom.)          |             |                  |
| IF/LO Port VSWR               | 1.875 GHz (IF)       | ≤2.0 (nom.) |                  |
|                               | 5 GHz to 10 GHz (LO) | ≤2.4 (nom.) | ≤2.0 (nom.)      |
| Maximum Input Level (CW)      | +10 dBm              |             |                  |

\*: At assured performance temperature range

**Interface**

| Model No. | MA2806A                    |  | MA2808A                    |
|-----------|----------------------------|--|----------------------------|
| RF        | Waveguide (WR15, UG-385/U) |  | Waveguide (WR12, UG-387/U) |
| IF/LO     | SMA-J                      |  |                            |

**General**

|                     |   |
|---------------------|---|
| Power Supply        | 100 V(ac) to 120 V(ac)/200 V(ac) to 240 V(ac), 50 Hz/60 Hz, 40 VA   |
| Dimensions and Mass | 134 (W) × 51 (H) × 229 (D) mm (excluding projections), <2 kg  |
| Temperature Range   | Assured performance range: +18° to +28°C<br>Operating: +5° to +45°C (no condensation)<br>Storage: -20° to +60°C (no condensation) |
| EMC                 | EN61326-1, EN61000-3-2  |

**Typical (typ.):** Performance not warranted. Must products meet typical performance.

**Nominal (nom.):** Values not warranted. Included to facilitate application of product.

**Example:** Performance not warranted. Data actually measured by randomly selected measuring instruments.

# Options Configuration Guide

## Options Configuration

Refer two table shown below about the hardware / software which each frequency model of MS2830A can implement.

### Hardware

Frequency range (MS2830A-040/041/043/044/045) not upgradable.

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

| Opt. | Name   | Retrofit | Addition to Main frame |     |     |     |     | Combination with "Opt." (Refer to the left line) |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
|------|--|----------|------------------------|-----|-----|-----|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|
|      |  |          | 040                    | 041 | 043 | 044 | 045 | 001  | 002 | 005 | 006 | 009 | 077 | 078 | 008 | 010 | 011 | 311 | 016 | 017 | 018 | 020 | 021 | 022 | 026 | 027 | 028 | 029 | 066 | 067 | 068 | 088 | 189 | 180 |  |  |
| 001  | Rubidium Reference Oscillator                                  |          | ✓                      | ✓   | ✓   | ✓   | ✓   |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 002  | High Stability Reference Oscillator                            |          | ✓                      | ✓   | ✓   | No  | No  | *9   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 005  | Analysis Bandwidth Extension to 31.25 MHz                      |          | ✓                      | ✓   | ✓   | ✓   | No  |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 006  | Analysis Bandwidth 10 MHz                                      |          | ✓                      | ✓   | ✓   | ✓   | ✓   |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 009  | Bandwidth Extension to 31.25 MHz for Millimeter-wave           |          | No                     | No  | No  | No  | No  |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 077  | Analysis Bandwidth Extension to 62.5 MHz                       | No       | ✓                      | ✓   | ✓   | ✓   | ✓   |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 078  | Analysis Bandwidth Extension to 125 MHz                        | No       | ✓                      | ✓   | ✓   | ✓   | ✓   |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 008  | Preamplifier   |          | ✓                      | ✓   | ✓   | *1  | *1  |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 010  | Phase Noise Measurement Function                               |          | ✓                      | ✓   | ✓   | ✓   | ✓   |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 011  | 2ndary HDD   |          | ✓                      | ✓   | ✓   | ✓   | ✓   |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 311  | 2ndary HDD Retrofit  |          | ✓                      | ✓   | ✓   | ✓   | ✓   |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 016  | Precompliance EMI Function                                     |          | ✓                      | ✓   | ✓   | ✓   | ✓   |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 017  | Noise Figure Measurement Function                              |          | ✓                      | ✓   | ✓   | ✓   | ✓   |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 018  | Audio Analyzer*4   |          | ✓                      | ✓   | *7  | No  | No  |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 020  | 3.6 GHz Vector Signal Generator                                |          | ✓                      | ✓   | *2  | No  | No  |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 021  | 6 GHz Vector Signal Generator                                  |          | ✓                      | ✓   | *2  | No  | No  |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 022  | Low Power Extension for Vector Signal Generator                |          | ✓                      | ✓   | ✓   | No  | No  |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 026  | BER Measurement Function                                       |          | ✓                      | ✓   | ✓   | ✓   | ✓   |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 027  | ARB Memory Upgrade 256 MSa for Vector Signal Generator         |          | ✓                      | ✓   | ✓   | No  | No  |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 028  | AWGN   |          | ✓                      | ✓   | ✓   | No  | No  |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 029  | Analog Function Extension for Vector Signal Generator*4        | *8       | ✓                      | ✓   | No  | No  | No  |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 066  | Low Phase Noise Performance                                    | No       | ✓                      | ✓   | *2  | No  | No  |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 067  | Microwave Preselector Bypass                                   |          | No                     | No  | No  | ✓   | ✓   |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 068  | Microwave Preamplifier   |          | No                     | No  | No  | *1  | *1  |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 088  | 3.6 GHz Analog Signal Generator*4                              |          | ✓                      | ✓   | No  | No  | No  |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 189  | Vector Function Extension for Analog Signal Generator Retrofit |          | ✓                      | ✓   | No  | No  | No  |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| 180  | CPU/Windows 7 64 bit Upgrade Retrofit                          | *10      | ✓                      | ✓   | ✓   | ✓   | ✓   |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |

- \*1: Cannot be installed simultaneously MS2830A-008 and MS2830A-068/168. When MS2830A-168 is added to Signal Analyzer with MS2830A-008, only MS2830A-168 becomes effective.
- \*2: MS2830A-043 can implement only either MS2830A-020/021 or MS2830A-066.
- \*3: MS2830A-027 and MS2830A-028 are not used in analog signal generator (MS2830A-088/188). After vector function (MS2830A-189) was added, the vector signal generator function can add MS2830A-027 and MS2830A-028.
- \*4: Require MX269018A.
- \*5: MS2830A-040/041/043/044 require MS2830A-005. MS2830A-045 requires MS2830A-009.
- \*6: 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 Signal Analyzer series MS2690A/91A/92A is recommended for other measurement purposes.
- \*7: The MS2830A-018 can be installed with MS2830A-043 but cannot be installed simultaneously with a signal generator (MS2830A-088/020/021/029) because MS2830A-066 is required. Consequently, analog wireless Rx tests cannot be performed using the same main frame when the MS2830A-018 and MS2830A-043 are combined.
- \*8: Please contact our sales representative when requesting retrofitting.
- \*9: The Rubidium Reference Oscillator can be retrofitted to MS2830A-040/041/043 with installed High Stability Reference Oscillator. In this case, the Rubidium Reference Oscillator is functional.
- \*10: Replace current CPU board of MS2830A which Windows Embedded Standard 2009 (Windows XP) is installed (it was ordered until August 2016 approximately) and upgrade the operating system to Windows Embedded Standard 7 (Windows 7). A seal labeled "C1" is affixed near the serial number label of MS2830A which is installed Windows 7.

## 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)<br>(Measured signal: Frequency <3.6 GHz, Bandwidth <1 MHz)   |
| MX269018A     | Analog Measurement Software                    | ✓                      | ✓   | *2  | No  | No  |                    |     | No  |     |     | Require MS2830A-066 and A0086B<br>(See MX2690xxA series Measurement Software catalog for detail)<br>Note) MS2830A-043 cannot implement a signal generator for Rx test<br>(Because MS2830A-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  |     |     |  |
| MX269021A-001 | LTE-Advanced FDD Uplink Measurement Software   | ✓                      | ✓   | ✓   | ✓   | ✓   | R                  | R   | *1  | U   | U   | Require MX269021A  |
| 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  |     |     |  |
| MX269023A-001 | LTE-Advanced TDD Uplink Measurement Software   | ✓                      | ✓   | ✓   | ✓   | ✓   | R                  | R   | *1  | U   | U   | Require MX269023A  |
| 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**  |
| MX283027A-002 | Bluetooth Test Software                        | ✓                      | ✓   | ✓   | ✓   | ✓   | R                  | R   |     |     |     | Require MX283027A  |
| MX283087A     | TRX Sweep Calibration                          | ✓                      | ✓   | ✓   | No  | No  | R                  | R   |     |     |     | Require MS2830A-020/021 and MS2830A-022  |

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

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

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

\*3: By the measurement of the narrowband signal, add MS2830A-066. (Channel bandwidth: x kHz to 100 kHz)

MS2830A-044/045 cannot be installed MS2830A-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><br>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<br>(Application software, instruction manual CD-ROM): 1 pc               |
| MS2830A-044    | <b>– Options –</b><br>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    | Noise 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-311    | 2ndary HDD Retrofit   |
|                | <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    | Noise 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   |
| MS2830A-180*6  | CPU/Windows 7 64 bit Upgrade Retrofit   |
|                | <b>– Software options –</b>   |
|                | CD-ROM with License and Operation manuals   |
| MX269010A*7    | Mobile WiMAX Measurement Software   |
| MX269011A      | W-CDMA/HSPA Downlink Measurement Software   |
| MX269012A      | W-CDMA/HSPA Uplink Measurement Software   |
| MX269013A      | GSM/EDGE Measurement Software   |
| MX269013A-001  | EDGE Evolution Measurement Software (Requires MX269013A)                                |
| 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   |
| MX269021A-001  | LTE-Advanced FDD Uplink Measurement Software (Requires MX269021A)                       |
| MX269022A      | LTE TDD Downlink Measurement Software   |
| MX269022A-001  | LTE-Advanced TDD Downlink Measurement Software (Requires MX269022A)                     |
| MX269023A      | LTE TDD Uplink Measurement Software   |
| MX269023A-001  | LTE-Advanced TDD Uplink Measurement Software (Requires MX269023A)                       |
| 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)  |

| Model/Order No | Name  |
|----------------|---|
| MS2830A-ES210  | <b>– Warranty service –</b><br>2 years Extended Warranty Service  |
| MS2830A-ES310  | 3 years Extended Warranty Service   |
| MS2830A-ES510  | 5 years Extended Warranty Service   |
|                | <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: MS2830A-005/105 is available when MS2830A-044 is installed. Requires MS2830A-006/106.
- \*2: MS2830A-009/109 is available when MS2830A-045 is installed. Requires MS2830A-006/106
- \*3: The J1556A Aux Conversion Adapter is a standard accessory supplied with MS2830A-026/126.
- \*4: Retrofit not supported. Requires MS2830A-006 and MS2830A-005 (for MS2830A-044). Requires MS2830A-006 and MS2830A-009 (for MS2830A-045).
- \*5: Retrofit not supported. Requires MS2830A-006, MS2830A-005 and MS2830A-077 (for MS2830A-044). Requires MS2830A-006, MS2830A-009 and MS2830A-077 (for MS2830A-045).
- \*6: Replace the CPU board and upgrade the OS to Windows 7. For more information, please refer to "Hardware" chapter on "Options Configuration Guide".
- \*7: Can not be installed in MS2830A-045.



| Model/Order No  | Name   |
|---|--|
| MA2806A<br>MA2808A  | <b>– High Performance Waveguide Mixer –</b><br>High Performance Waveguide Mixer (50 to 75 GHz)<br>High Performance Waveguide Mixer (60 to 90 GHz)  |
| Z1922A  | <b>– Standard accessories –</b><br>MA2806A USB Memory<br>(Saved conversion loss data, for MA2806A): 1 pc   |
| Z1923A  | MA2808A USB Memory<br>(Saved conversion loss data, for MA2808A): 1 pc  |
| Z1625A  | AC Adapter: 1 pc<br>Power Cord: 1 pc   |
| J1692B  | Coaxial Cord, 1 m<br>(SMA-P · SUCOFLEX104PE · SMA-P,<br>DC to 18 GHz, 50Ω): 1 pc   |
| MA2741C<br>MA2742C<br>MA2743C<br>MA2744C<br>MA2745C<br>MA2746C<br>MA2747C<br>MA2748C<br>MA2749C<br>MA2750C<br>MA2751C | <b>– External Mixer –</b><br>External Mixer (26.5 GHz to 40 GHz)<br>External Mixer (33 GHz to 50 GHz)<br>External Mixer (40 GHz to 60 GHz)<br>External Mixer (50 GHz to 75 GHz)<br>External Mixer (60 GHz to 90 GHz)<br>External Mixer (75 GHz to 110 GHz)<br>External Mixer (90 GHz to 140 GHz)<br>External Mixer (110 GHz to 170 GHz)<br>External Mixer (140 GHz to 220 GHz)<br>External Mixer (170 GHz to 260 GHz)<br>External Mixer (220 GHz to 325 GHz) |

| Model/Order No | Name   |
|----------------|--|
| K240B          | Power Divider<br>(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),<br>(SMA-P · 50Ω SUCOFLEX104 · SMA-P)   |
| J0322B         | Coaxial Cord, 1 m (DC to 18 GHz),<br>(SMA-P · 50Ω SUCOFLEX104 · SMA-P)   |
| J0322C         | Coaxial Cord, 1.5 m (DC to 18 GHz),<br>(SMA-P · 50Ω SUCOFLEX104 · SMA-P)   |
| J0322D         | Coaxial Cord, 2 m (DC to 18 GHz),<br>(SMA-P · 50Ω SUCOFLEX104 · SMA-P)   |
| J0805          | DC Block, N type (MODEL 7003)<br>(10 kHz to 18 GHz, N-P · N-J)   |
| J1554A         | DC Block, SMA type (MODEL 7006)<br>(9 kHz to 26.5 GHz, SMA-P · SMA-J)  |
| J1555A         | DC Block, SMA type (MODEL 7006-1)<br>(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<br>(DC to 20 GHz, 50Ω, Ruggedized K-M · N-F,<br>SWR: 1.5 (max.), Insertion Loss: 0.4 dB (max.)) |
| J0911          | Coaxial Cable, 1.0 m for 40 GHz<br>(DC to 40 GHz, approx. 1 m, SF102A, 11K254/K254/1.0M)                                       |
| J0912          | Coaxial Cable, 0.5 m for 40 GHz<br>(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<br>(AUX → BNC, for vector signal generator option and<br>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  |
| MA24105A       | Inline Peak Power Sensor<br>(350 MHz to 4 GHz, with USB A to mini B cable)   |
| MA24106A       | USB Power Sensor<br>(50 MHz to 6 GHz, with USB A to mini B Cable)  |
| MA24108A       | Microwave USB Power Sensor<br>(10 MHz to 8 GHz, with USB A to Micro-B Cable)   |
| MA24118A       | Microwave USB Power Sensor<br>(10 MHz to 18 GHz, with USB A to Micro-B Cable)  |
| MA24126A       | Microwave USB Power Sensor<br>(10 MHz to 26 GHz, with USB A to Micro-B Cable)  |
| Z0975A         | Keyboard (USB)   |
| Z1345A         | Installation Kit<br>(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.

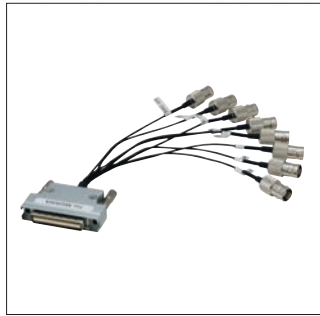
The J1556A AUX Conversion Adapter is a standard accessory supplied with MS2830A-026/126 BER Measurement Function.

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



MA2808A

**MA2806A/MA2808A**  
High Performance  
Waveguide Mixer



**J1556A**  
AUX Conversion Adapter



**MA24106A**  
USB Power Sensor



MS2830A with Front Cover

**B0671A**  
Front Cover for 1MW4U



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



**B0645A**  
Soft Carrying Case

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