

**Anritsu** envision : ensure

# Signal Analyzer

## MS2850A

MS2850A-047: 9 kHz to 32 GHz

MS2850A-046: 9 kHz to 44.5 GHz



**Analysis  
Bandwidth**

**1** GHz

**EVM  
Performance**

**< 1** %

# A Signal Analyzer for Building the Future

## Analysis Bandwidth

1 GHz

### Cut R&D Costs 1 GHz Analysis Bandwidth Signal Analyzer

The 1 GHz analysis bandwidth supports wider-band microwave and millimeter-wave communications while high flatness performance facilitates multicarrier signal analysis.

With lower costs and higher measurement accuracy, the MS2850A is ideal for R&D and manufacturing of wideband next-generation communications systems, such as 5G mobile and broadcast satellites.

## EVM Performance

< 1%

### Wide Dynamic Range for Higher Wideband Signal Measurement Accuracy

The measurement dynamic range is better than 140 dB\*1 at a 1 GHz analysis bandwidth. This performance is equivalent to <1% EVM performance which is considered Peak-to-Peak of modulation waveform at measurement of a single 5G carrier (100 MHz wide)\*2.

With its wide dynamic range, the MS2850A increases the reliability of next-generation, wideband communications systems.

\*1: Difference between ADC Clipping level and DANL

\*2: At 100 MHz, single carrier, 28 GHz (meas.)





# MS2850A

For Developing Broadband Communications,  
including 5G Mobile and Broadcast Satellite Communications

- 5G (Base Stations, Small Cells, Mobiles, Wireless Backhaul, etc.)
- Aerospace (High-throughput Broadcast Satellites, Terrestrial Monitoring Equipment, Wideband Transponders, etc.)
- Other Microwave and Millimeter-wave Wideband Communications Systems
- Academic Research



# Signal Analyzer MS2850A Features

## Main Frame Functions/Performance

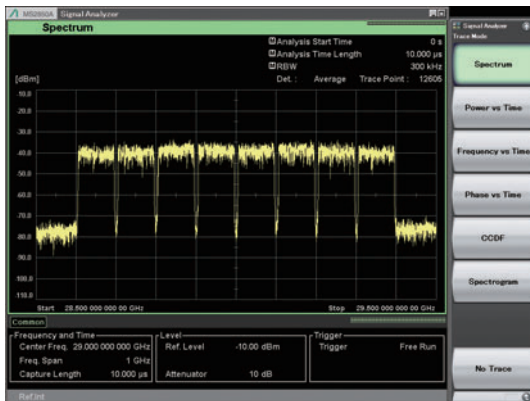
The Signal Analyzer MS2850A is a spectrum analyzer/signal analyzer with a maximum analysis bandwidth of 1 GHz and a frequency range of 9 kHz to either 32 GHz or 44.5 GHz. Its high cost-performance helps cut rising R&D and manufacturing CAPEX costs in future deployments of microwave and millimeter-wave wideband communications systems.

### 1 GHz Analysis Bandwidth

**The 1 GHz analysis bandwidth supports wider bands for microwave and millimeter-wave communications systems, such as 5G mobile and broadcast satellites.**

The signal analyzer function using FFT (Fast Fourier transform) analysis supports spectrum displays, spectrogram displays, and applications where frequency and phase change with elapsed time. In addition, frequency bands required for 5G measurements are covered and all-in-one evaluation of multicarrier signals is supported by the 5G measurement software.

Analysis Bandwidth: 255 MHz (standard)  
510 MHz (option), 1 GHz (option)



Spectrum of eight 100 MHz bandwidth carriers at 29 GHz center frequency

### Excellent Flatness Performance

The amplitude and phase flatness performance<sup>\*1</sup> over a wide analysis bandwidth of 1 GHz exceed that of other signal analyzers<sup>\*2</sup>. With this performance, the MS2850A supports high-accuracy amplitude and phase measurements for each carrier in wideband communications systems, such as 5G mobile, to play a key role in improving the quality of radio communications equipment.

Center Frequency: 28 GHz, at Center Frequency  $\pm 500$  MHz  
In-band Frequency Characteristics:  $\pm 1.2$  dB (nom.)  
In-band Phase Linearity: 5 deg. p-p (nom.)

\*1: Stipulated as In-band Frequency Characteristics and In-band Phase Linearity in Anritsu specifications  
\*2: Anritsu test at May 2017

### Wide Dynamic Range

#### High ADC<sup>\*3</sup> Clipping Level

#### Wide Measurement Dynamic Range at Difference from DANL<sup>\*4</sup>

The MS2850A has a high ADC clipping level over an analysis bandwidth of 1 GHz. This performance can be used to obtain a wider difference from the DANL, which rises when inputting the actual signal input level and inputting a wideband signal when using an attenuator.

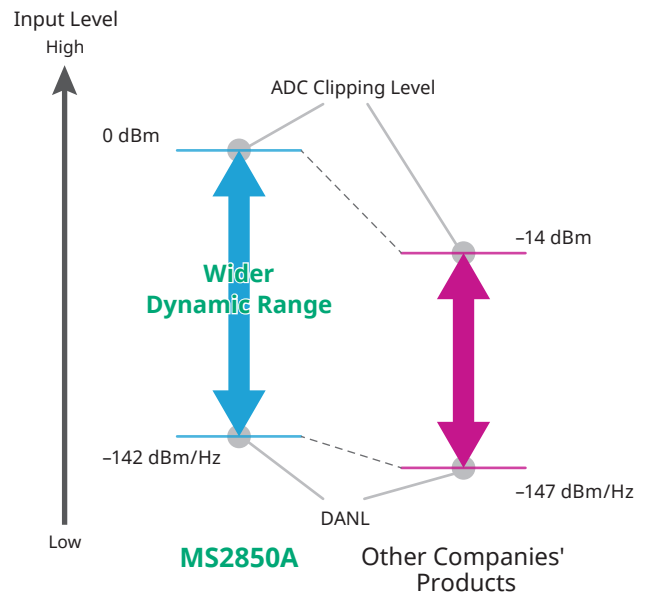
This wide dynamic range performance helps obtain more accurate EVM values at measurement of 5G signals. For example, in the 28 GHz band, the measured dynamic range at the difference between the ADC clipping level and DANL is better than 140 dB (ref.).

Center Frequency: 28 GHz  
ADC Clipping Level: 0 dBm<sup>\*5</sup> (CW)  
DANL:  $-142$  dBm/Hz<sup>\*5</sup>  
Dynamic Range: 142 dB (ref.)

\*3: Analog to Digital Converter

\*4: Displayed Average Noise Level

\*5: meas. means value measured as design stage but not guaranteed specification



The measurement dynamic range widens if the ADC clipping level is high even when the DANL is quite high.

### High SFDR (Spurious Free Dynamic Range)

#### -70 dBc at 1 GHz Analysis Bandwidth

The MS2850A suppresses spurious generation due to ADC over the 1 GHz analysis bandwidth, assuring a wide measurement dynamic range at wideband signal analysis.

SFDR

800 MHz  $\leq$  Frequency < 4.2 GHz:  $-60$  dBc (nom.)  
4.2 GHz  $\leq$  Frequency  $\leq$  44.5 GHz:  $-70$  dBc (nom.)

# Signal Analyzer MS2850A Features

## 5G Measurement Software

Dedicated software for 5G measurements can be installed in the Signal Analyzer MS2850A, and detailed and accurate measurements are backed by the high-performance 1 GHz (max.) analysis bandwidth and high measurement dynamic range.

| Standard               |           | Model/Name   | Channel Bandwidth (1CC) | Multi Carrier Measurement        |
|------------------------|-----------|--|-------------------------|----------------------------------|
| V5G (Verizon 5GTF)     |           | Pre-Standard CP-OFDM Downlink MX285051A-001<br>Pre-Standard CP-OFDM Uplink MX285051A-051   | Up to 100 MHz           | Support                          |
| 5G NR (3GPP TS 38.211) | sub-6 GHz | NR TDD sub-6 GHz Downlink MX285051A-011<br>NR TDD sub-6 GHz Uplink MX285051A-061<br>NR FDD sub-6 GHz Downlink MX285051A-031<br>NR FDD sub-6 GHz Uplink MX285051A-081 | Up to 100 MHz           | Downlink only (Up to 2 carriers) |
|                        | mmWave    | NR TDD mmWave Downlink MX285051A-021<br>NR TDD mmWave Uplink MX285051A-071   | Up to 400 MHz           | Downlink only (Up to 8 carriers) |

### All-in-One V5G/5G NR (sub-6 GHz/mmWave) Coverage

Adding the MS2850A software option provides support for both V5G and 5G NR (sub-6 GHz/mmWave). The MX285051A software measures the RF characteristics of both downlink and uplink signals proposed for applications ranging from 5G demonstration tests to actual 5G NR use.

Frequency Setting Range:

- 100 MHz to 32 GHz (with MS2850A-047 installed)
- 100 MHz to 44.5 GHz (with MS2850A-046 installed)

### Excellent EVM Performance for Applications Ranging from R&D to Manufacturing

The residual EVM performance in combination with the MS2850A is better than 1%\*1, helping minimize the measuring instrument effect and improving the quality of 5G wireless systems at lower equipment cost

### Easy Operability Improves Measurement and Test Efficiency

The one-button Auto Range function optimizes the complex built-in attenuator settings required for more accurate EVM measurement.



Basic Screen (EVM vs. Subcarrier)

### More Efficient R&D and Manufacturing

Evaluation and manufacturing are more efficient thanks to fast collection of measurement results. Measurement speeds are about 10% faster (at 10 averaging) than the V5G software.

### Multicarrier Analysis and Batch Measurement at 1 GHz\*2

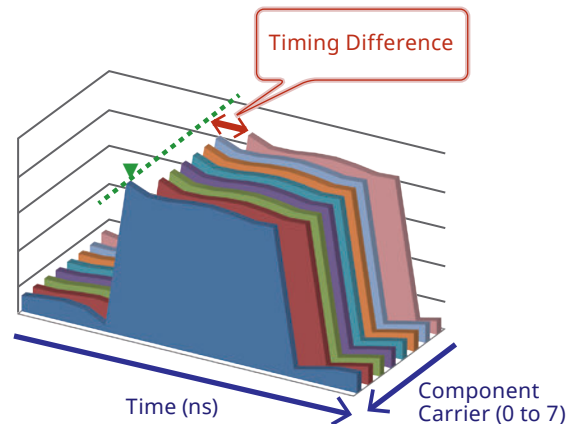
The 5G measurement software uses the 1 GHz analysis bandwidth of the MS2850A to support batch (all-at-once) measurement of all 5G signal carriers (8 carriers × 100 MHz wide). The characteristics of each single carrier can be evaluated quickly at the same time without needing to measure each single carrier separately.

| Result            |                 |                |           |            |                   |
|-------------------|-----------------|----------------|-----------|------------|-------------------|
| Tx Total Power    |                 | -11.16 dBm     |           |            |                   |
| Tx Power Flatness |                 | 0.56 dB        |           |            |                   |
|                   | Frequency Error | Transmit Power | EVM (rms) | EVM (peak) | Timing Difference |
| CC0 (Ref)         | 23.24 Hz        | -19.96 dBm     | 1.24 %    | 5.47 %     | 0.0 ns            |
| CC1               | 24.13 Hz        | -20.02 dBm     | 1.15 %    | 5.24 %     | 0.0 ns            |
| CC2               | 25.02 Hz        | -20.29 dBm     | 1.13 %    | 4.89 %     | 0.0 ns            |
| CC3               | 25.92 Hz        | -20.54 dBm     | 1.18 %    | 4.99 %     | 0.0 ns            |
| CC4               | 26.86 Hz        | -20.25 dBm     | 1.35 %    | 6.19 %     | 0.0 ns            |
| CC5               | 27.82 Hz        | -20.06 dBm     | 1.03 %    | 4.53 %     | -1.5 ns           |
| CC6               | 28.69 Hz        | -20.14 dBm     | 1.00 %    | 4.30 %     | 0.0 ns            |
| CC7               | 29.57 Hz        | -20.25 dBm     | 1.01 %    | 4.80 %     | 0.0 ns            |

Batch (All-at-Once) Carrier Measurements (Numeric Results)

### Timing Difference Measurement\*3

Batch (all-at-once) measurement of all carriers not only supports EVM and frequency error measurements for each carrier, but also supports timing difference measurements for each carrier.



\*1: At 100 MHz, single carrier, 28 GHz (meas.)

\*2: Supported using MX285051A-001/021/051

\*3: Supported using MX285051A-001/011/021/031/051

# Signal Analyzer MS2850A Functions



## Signal Analyzer MS2850A

The Signal Analyzer MS2850A has the analysis bandwidth and excellent flatness performance required for R&D and manufacturing of next-generation wideband communications systems. In addition to versatile basic functions for more convenient testing, it also has useful troubleshooting functions, such as Capture&Replay and sub-trace displays.

### Standard Functions

Signal Analyzer (Analysis Bandwidth: 255 MHz)  
Spectrum Analyzer

### Option Functions

Signal Analyzer (Analysis Bandwidth: 510 MHz, 1 GHz)  
Built-in Preamp  
Low Second Harmonic Distortion  
Phase Noise Measurement  
Noise Figure (NF) Measurement  
Modulation Analysis (5G, LTE, W-CDMA, etc.)

### Application Parts

High Performance Waveguide Mixer (50 GHz to 90 GHz)  
External Mixer (Harmonic, 26.5 GHz to 325 GHz)  
USB Power Sensor

### Typical Measurement Items and Functions

✓: Supported

| Measurement Function/Item   | Signal Analyzer | Spectrum Analyzer | Option/Application Part |
|---|-----------------|-------------------|-------------------------|
| Spectrum Display  | ✓               | ✓                 |                         |
| Power/Frequency/Phase vs. Time Display  | ✓               |                   |                         |
| Capture & Replay  | ✓               |                   |                         |
| CCDF/APD Display  | ✓               |                   |                         |
| Spectrogram Display   | ✓               |                   |                         |
| Sub-trace Display   | ✓               |                   |                         |
| Gate View (at Gate Sweep)   |                 | ✓                 |                         |
| Channel Power   | ✓               | ✓                 |                         |
| Occupied Bandwidth  | ✓               | ✓                 |                         |
| Adjacent Channel Leakage Power  | ✓               | ✓                 |                         |
| Burst Average Power   | ✓               | ✓                 |                         |
| Multi-marker & List Display   | ✓               | ✓                 |                         |
| Highest 10 Markers  | ✓               | ✓                 |                         |
| Spectrum Emission Mask  |                 | ✓                 |                         |
| Limit Line  |                 | ✓                 |                         |
| Frequency Counter   |                 | ✓                 |                         |
| Two-Signal Tertiary Distortion (TOI)  |                 | ✓                 |                         |
| Power Meter*  |                 |                   | ✓                       |
| Modulation Analysis (5G, LTE, etc.)   |                 |                   | ✓                       |
| Phase Noise Measurement   |                 |                   | ✓                       |
| Noise Figure (NF) Measurement   |                 |                   | ✓                       |
| mmWave-band Spectrum Measurement<br>using External Mixer Connection (sold separately) | ✓               | ✓                 | ✓                       |

\*: Connected to USB power sensor sold separately

# Signal Analyzer MS2850A Functions

## Signal Analyzer Functions (Standard)

### Analysis Bandwidth

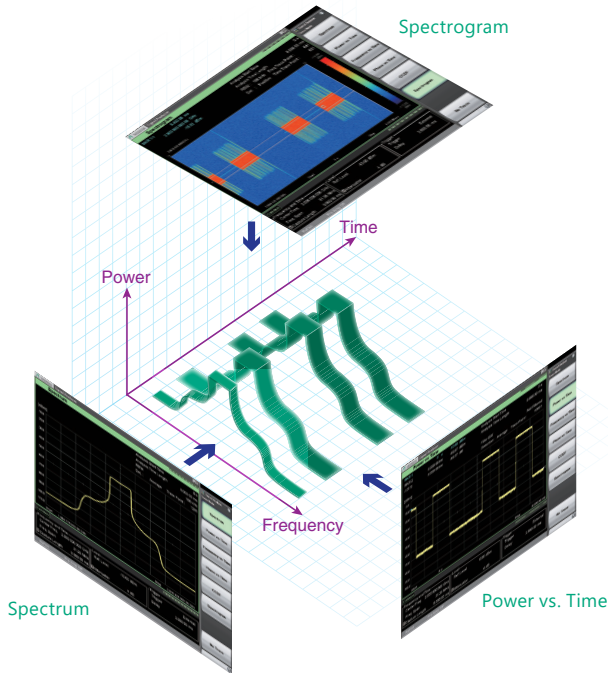
| Analysis Bandwidth | Frequency Measurement Range |
|--------------------|-----------------------------|
| 255 MHz (standard) | 100 MHz to 32 GHz/44.5 GHz  |
| 510 MHz (option)   | 100 MHz to 32 GHz/44.5 GHz  |
| 1 GHz (option)     | 4.2 GHz to 32 GHz/44.5 GHz  |

### Multiple Display Modes at FFT Analysis

The MS2850A has a built-in 255 MHz analysis bandwidth FFT analysis function. The measured signal is captured for display in various domains. Troubleshooting efficiency is greatly improved because phenomena such as spectrum transients that cannot be monitored by sweep-type spectrum analyzers can be observed. The analysis bandwidth can be extended optionally to 510 MHz and 1 GHz.

#### Display Mode

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



### High Dynamic Range Performance

Analysis of wideband signals of 1 GHz does not simply require a signal analyzer with a wide analysis bandwidth. Accurate signal capture and analysis requires securing good dynamic range performance. With a high ADC clipping level\*1 and low DANL, the MS2850A achieves a dynamic range of better than 140 dB\*2 at a center frequency of 28 GHz. Additionally, the SFDR (Spurious Free Dynamic Range) performance is an excellent -70 dBc at an analysis bandwidth of 1 GHz. As a result, the MS2850A is ideal for accurately capturing and analyzing the true performance next-generation wideband communications systems.

Dynamic Range: 142 dB (Center Frequency 28 GHz, CW, ref.)

|                      |               |
|----------------------|---------------|
| ADC Clipping Level*1 | 0 dBm*2       |
| DANL                 | -142 dBm/Hz*2 |

SFDR:

|                     |                |
|---------------------|----------------|
| 800 MHz to 4.2 GHz  | -60 dBc (nom.) |
| 4.2 GHz to 44.5 GHz | -70 dBc (nom.) |

\*1: Mixer level (CW) for using ADC at full scale

\*2: meas. means value measured as design stage but not guaranteed specification

### Capture & Replay Function

Waveform data can be saved (captured) in the internal memory for later display and replay. The causes of problems can be resolved quickly and easily because the display mode can be switched during replay.

#### Maximum Capture Times for Each Frequency Span

| Span     | Sampling Rate | Max. Capture Time |
|----------|---------------|-------------------|
| 50 MHz   | 81.25 MHz     | 48 s              |
| 100 MHz  | 162.5 MHz     | 24 s              |
| 255 MHz  | 325 MHz       | 12 s              |
| 510 MHz  | 650 MHz       | 6 s               |
| 1000 MHz | 1300 MHz      | 3 s               |

Refer to the MS2850A data sheet for details.

### Excellent Phase and Amplitude Flatness Performance

The phase-array antenna performs electronic scanning to control the phase of the parallel antenna elements because the mean width of the antenna directivity will become wider than expected if the phase of each antenna element is not the same. Consequently, the signal analyzer must be able to measure phase with high accuracy. Additionally, excellent amplitude characteristics are required at evaluation of communications using wideband signals, such as 5G mobile. The MS2850A has excellent phase and amplitude flatness over a wide analysis bandwidth of 1 GHz.

Center Frequency 28 GHz, at Center Frequency  $\pm 500$  MHz

|   |                     |
|---|---------------------|
| In-band Frequency Characteristics<br>(Amplitude Flatness) | $\pm 1.2$ dB (nom.) |
| In-band Phase Linearity<br>(Phase Flatness)               | 5°p-p (nom.)        |



# Signal Analyzer MS2850A Functions

## Signal Analyzer Functions (Standard)

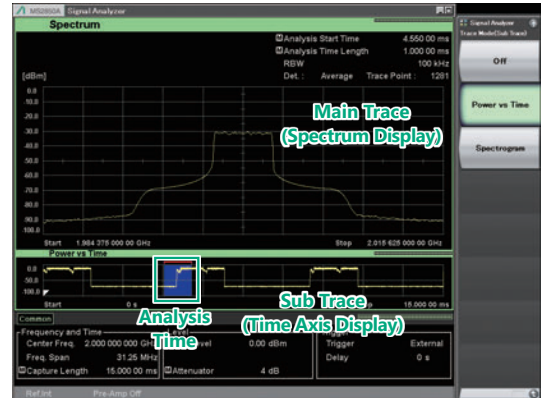
### Spectrum Display

This function graphically displays the amplitude on the y-axis and the frequency on the x-axis. The captured IQ data are FFT-processed, and the time-domain data are converted to the frequency domain to display the spectrum. This is useful for confirming spectrum transients that cannot be monitored using spectrum analyzer functions.



### Sub-trace Display

This function is useful for checking the spectrum while changing the analysis time period arbitrarily (blue display) such as when confirming burst signal rise and fall times. Simultaneous display of the time axis (sub-trace) and frequency axis (main trace) is useful for visually confirming when spectrum waveform distortion components (adjacent channel components, etc.) occur in the time domain.



### Power vs. Time

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



### CCDF/APD

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.

#### CCDF (Complementary Cumulative Distribution Function):

The CCDF display indicates the cumulative distribution of transient power variations compared to average power.

#### APD (Amplitude Probability Density):

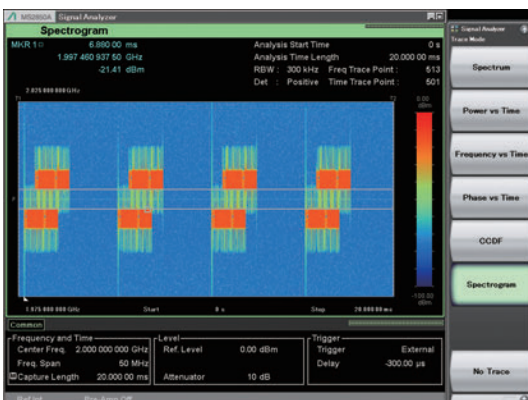
The APD display indicates the probability distribution of transient power



### Spectrogram

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

It is useful for monitoring frequency hopping and transient signals.



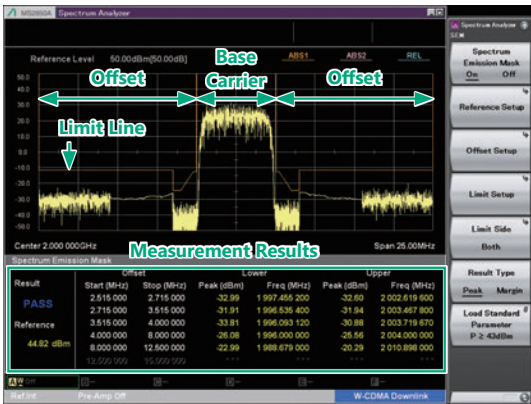


# Signal Analyzer MS2850A Functions

## Versatile Built-in Functions

### Spectrum Emission Mask

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.

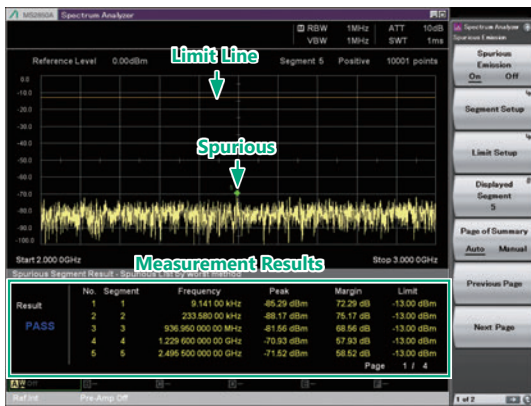


#### Measurement Results

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

### Spurious Emission

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.



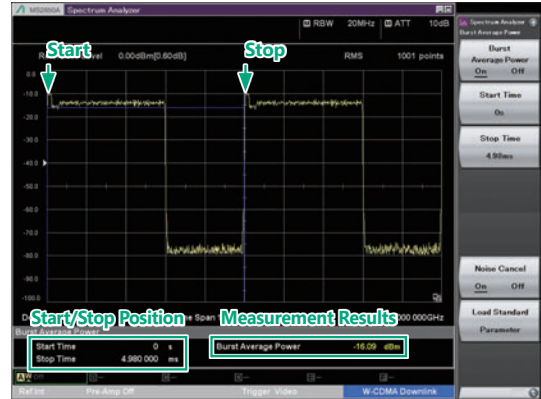
### Multi-marker & Marker List

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.



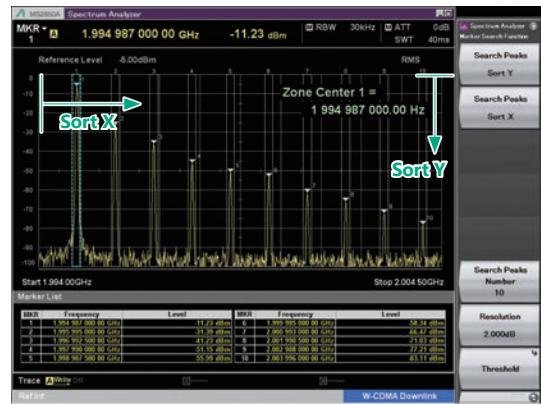
### Burst Average Power

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.



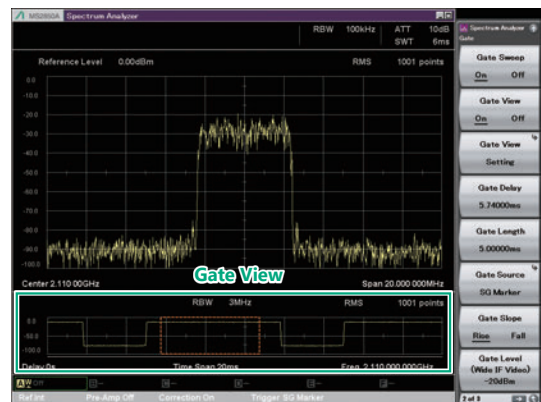
### Highest 10 Markers

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



### Gate View

For efficient gate sweeping when sweeping only the burst-signal on period, the spectrum analyzer functions include an auxiliary screen (Gate View) to display the gate sweep section.



# Signal Analyzer MS2850A Functions

## Hardware Standard Functions/Options/Application Parts

### Microwave Preselector Bypass (Standard Function)

Passing the input signal through a preselector removes generated spurious at microwave and mmWave band measurements. However, in this case, the signal passband width is restricted and the flatness of the in-band frequency characteristics is degraded, both of which can adversely affect FFT analysis and modulation analysis times. As a result, adding a preselector bypass improves the in-band frequency characteristics and supports analysis up to wide bandwidths of 44.5 GHz.

### 2 dB Step Attenuator (Standard Function)

The built-in attenuator can be set with a resolution of 2 dB and the level of the input signal to the mixer can be adjusted with high resolution to make best use of the MS2850A dynamic range.

### Phase Noise Measurement Function (MS2850A-010)

Phase noise can be measured over a frequency offset of 10 Hz to 10 MHz. The local and remote phase noise vs. the carrier signal can each be measured by automatically switching to the best filter.



Measurement Screen

### Secondary Storage Device (MS2850A-011)

This removable SSD extends the main unit internal storage capacity to save even more large digitized data files from wideband signals. Removability makes data transfer and exchange easy. The OS is not installed on this SSD and the MS2850A is shipped with the secondary SSD installed in the secondary SSD slot.

### Noise Figure Measurement Function (MS2850A-017)

This option measures the noise figure according to the Y-Factor rule using a noise source. The Noisecom Inc. NC346 series of noise sources\* is supported.

\*: Refer to the MS2850A data sheet for details.

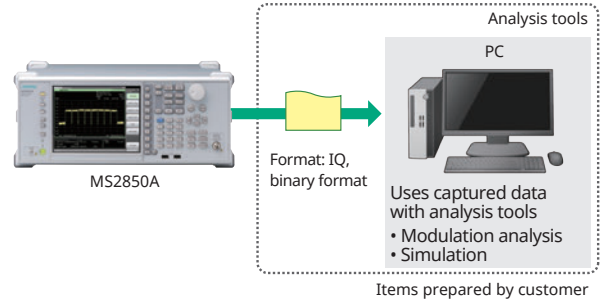


Measurement Result: Example of Graph display (Frequency Mode: Sweep, Screen Layout: Graph)

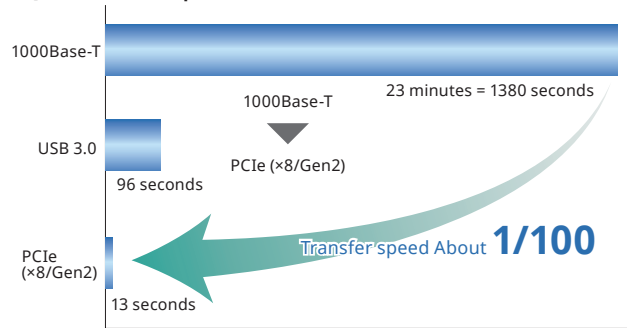
### External Interface for High Speed Data Transfer PCIe (MS2850A-053)

### External Interface for High Speed Data Transfer USB3.0 (MS2850A-054)

The digitized data captured by the main unit is transferred at high speed to the PC, helping improve development efficiency and lower production costs.



### IQ Data Transfer Speed (Reference Value)



Time required to transfer 32 GB\* of IQ data  
 \*: MS2850A maximum IQ data transfer size  
 Equivalent to about 3 seconds of digitized data at Span: 1 GHz

### Noise Floor Reduction (MS2850A-051)

The Noise Floor Reduction (NFR) function increases the measurement accuracy for low-level signals. It subtracts the internal noise components (11 dB max. nominal) of the measuring instrument itself from the displayed measurement result.

### Microwave Preamplifier (MS2850A-068)

With a 20 dB gain, this option improves DANL. It is useful for measuring low-level signals such as noise and interference as well as for measurements via antennas with large path losses.

Frequency Range: 100 kHz to 32 GHz (with MS2850A-047)  
 100 kHz to 44.5 GHz (with MS2850A-046)

### Low Second Harmonic Distortion (MS2850A-076)

Installation of this option is recommended when measuring secondary harmonics at an input frequency range of 2 GHz to 22.25 GHz. Installing this option upgrades the MS2850A secondary harmonic distortion performance.

| Input Frequency    | Harmonic Upper: when installed<br>(Lower: when not installed) | SHI* Upper: when installed<br>(Lower: when not installed) |
|--------------------|---|---|
| 2 GHz to 3 GHz     | -80 dBc<br>(-70 dBc)  | +70 dBm<br>(+60 dBm)                                      |
| 3 GHz to 22.25 GHz | -90 dBc<br>(-70 dBc)  | +80 dBm<br>(+60 dBm)                                      |

\* SHI: Second Harmonic Intercept

### USB Power Sensor (Sold Separately)

Connecting this sensor to the MS2850A supports power and absolute power measurements.

| Model     | Frequency Range  | Dynamic Range    |
|-----------|------------------|------------------|
| MA24104A* | 600 MHz to 4 GHz | +3 to +51.76 dBm |
| MA24105A  | 350 MHz to 4 GHz | +3 to +51.76 dBm |
| MA24106A  | 50 MHz to 6 GHz  | -40 to +23 dBm   |
| MA24108A  | 10 MHz to 8 GHz  | -40 to +20 dBm   |
| MA24118A  | 10 MHz to 18 GHz | -40 to +20 dBm   |
| MA24126A  | 10 MHz to 26 GHz | -40 to +20 dBm   |

\*:MA24104A has been discontinued.

# Signal Analyzer MS2850A Functions

## High Performance Waveguide Mixer/External Mixers (Harmonic Mixers)

Two types of mixer can be connected to the MS2850A series (32 GHz/44.5 GHz models) for millimeter-wave-band measurements; spectrum measurements up to 325 GHz are supported using either a High-Performance Waveguide Mixer or an external harmonic mixer. In particular, High Performance Waveguide Mixer are ideal for analyzing the true spectrum of millimeter-wave-band transmitters due to its excellent wide dynamic range.

### High Performance Waveguide Mixer MA2806A/MA2808A

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

The widest analysis bandwidth of MS2850A is 510 MHz when connecting MS2850A to MA2806A/MA280808A.

#### 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



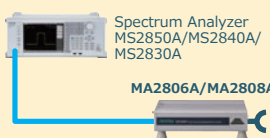





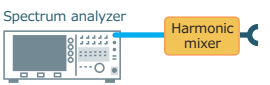





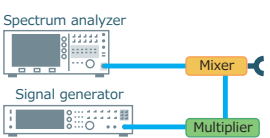





The MA2806A and MA2808A have a dedicated multiplier, amplifier, bandpass filter, etc., supporting an excellent conversion loss of at least 10 dB better than conventional harmonic mixers, as well as P1dB performance exceeding 0 dBm. When used in combination with the MS2850A series (32 GHz/44.5 GHz models) the display average noise performance level is excellent at  $-150$  dBm/Hz (meas.)\* at 75 GHz.

Due to this wide dynamic range, the MA2806A and MA2808A support evaluation of the true spurious performance of wider-band, millimeterwave wireless transmitters as well as various types of millimeter-wave equipment that cannot be evaluated accurately using conventional harmonic-mixer and down-converter methods.

Connection to the MS2850A series (32 GHz/44.5 GHz models) 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 MS2850A series for reflection in the measured values.

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

### Measurement Method Performance Comparison

| 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>   | <sup>*1</sup><br><br><b>Bad</b> | <sup>*2</sup><br><br><b>Very Close</b> | <br><b>High</b>                | <br><b>Simple</b>  | <sup>*4</sup><br><br><b>No Need</b> |
| <b>Down Converter</b><br>   | <br><b>Good</b>                 | <br><b>Very Far</b>                    | <sup>*3</sup><br><br><b>Low</b> | <br><b>Complex</b> | <sup>*5</sup><br><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  $-5$  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



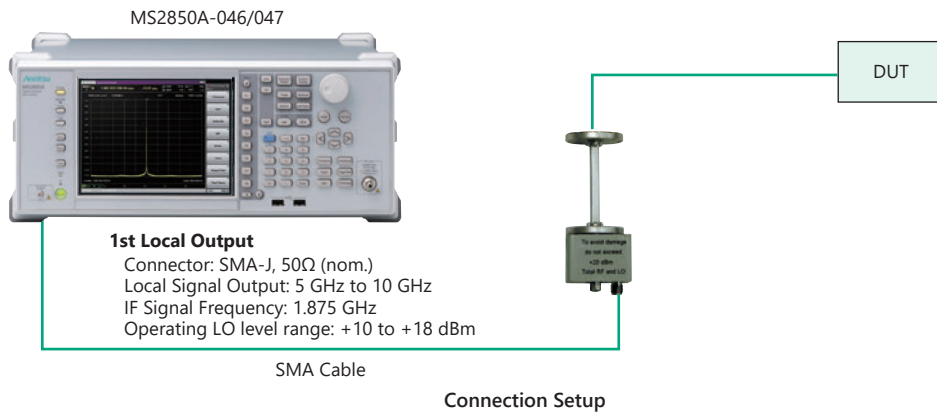
# Signal Analyzer MS2850A Functions

## High Performance Waveguide Mixer/External Mixers (Harmonic Mixers)

### External Mixers (Harmonic Mixers)

Connecting the MS2850A to the MA2740C/MA2750C series of External Mixers (Harmonic Mixers) supports spectrum measurements up to 325 GHz with low costs.

| Model   | Name           | Frequency Band | Frequency Range    | Waveguide | Flange               |
|---------|----------------|----------------|--------------------|-----------|----------------------|
| MA2741C | External Mixer | A Band         | 26.5 GHz to 40 GHz | WR28      | MIL-DTL-3922/54-003  |
| MA2742C | External Mixer | Q Band         | 33 GHz to 50 GHz   | WR22      | MIL-DTL-3922/67D-006 |
| MA2743C | External Mixer | U Band         | 40 GHz to 60 GHz   | WR19      | MIL-DTL-3922/67D-007 |
| MA2744C | External Mixer | V Band         | 50 GHz to 75 GHz   | WR15      | MIL-DTL-3922/67D-008 |
| MA2745C | External Mixer | E Band         | 60 GHz to 90 GHz   | WR12      | MIL-DTL-3922/67D-009 |
| MA2746C | External Mixer | W Band         | 75 GHz to 110 GHz  | WR10      | MIL-DTL-3922/67D-010 |
| MA2747C | External Mixer | F Band         | 90 GHz to 140 GHz  | WR08      | MIL-DTL-3922/67D-M08 |
| MA2748C | External Mixer | D Band         | 110 GHz to 170 GHz | WR06      | MIL-DTL-3922/67D-M06 |
| MA2749C | External Mixer | G Band         | 140 GHz to 220 GHz | WR05      | MIL-DTL-3922/67D-M05 |
| MA2750C | External Mixer | Y Band         | 170 GHz to 260 GHz | WR04      | MIL-DTL-3922/67D-M04 |
| MA2751C | External Mixer | J Band         | 220 GHz to 325 GHz | WR03      | MIL-DTL-3922/67D-M03 |



## FFT Analysis in Millimeter Wave Band

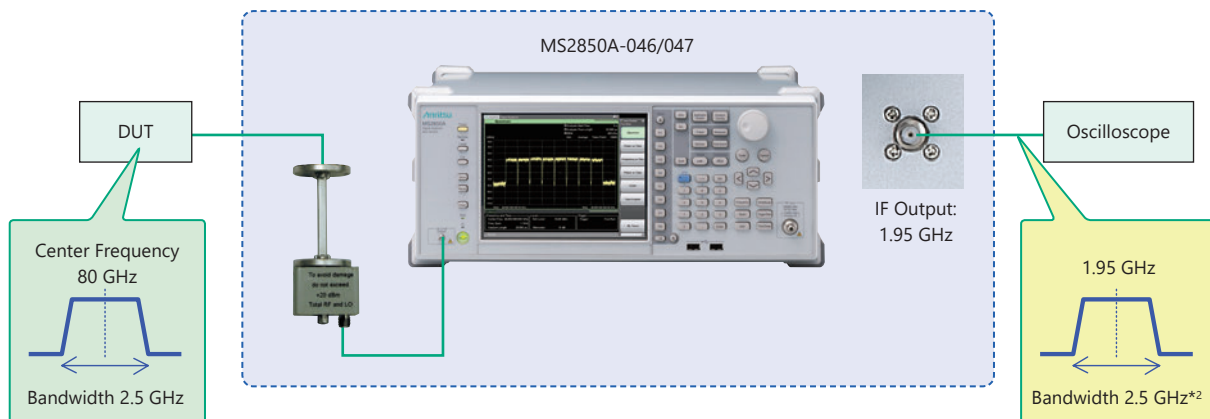
The signal-analyzer functions can be used by connecting either the High-Performance Waveguide mixer or an external mixer. This helps improve troubleshooting efficiency when confirming transient phenomena, such as a degraded spectrum that cannot be captured using a sweep-type spectrum analyzer.

Additionally, MS2850A supports down converting signals up to a maximum bandwidth of 2.5 GHz through IF out port. This can be used as down converter when performing modulation analysis by digitizing with an oscilloscope, etc.

|  | Maximum Bandwidth set by MS2850A | Maximum Bandwidth as Down Converter |
|--|----------------------------------|-------------------------------------|
| High Performance Waveguide Mixer MA2806A/MA2808A | 510 MHz*1                        | 510 MHz*1                           |
| External Mixer MA2740C/MA2750C Series            | 1 GHz                            | 2.5 GHz                             |

\*1: The widest analysis bandwidth of MS2850A is 510 MHz.

Measurement image: Down convert signals with 80 GHz center frequency and 2.5 GHz\*2 bandwidth to 1.95 GHz



\*2: When using external mixer bands (MA2740C/MA2750C Series), or using internal micro frequency bands (Band; 3 to 9) with Microwave Preselector Bypass MS2850A-067: On

# Signal Analyzer MS2850A Functions

## Software Options

Measurement software options are provided with modulation analysis functions supporting various communications methods. For details refer to the MX2690xxA Series, MX2830xxA Series, MX2850xxA Series Measurement Software brochure.

### **W-CDMA/HSPA Downlink Measurement Software (MX269011A)**

This software is for measuring the RF Tx characteristics of W-CDMA/HSDPA/HSPA Evolution base stations.

### **W-CDMA/HSPA Uplink Measurement Software (MX269012A)**

This software is for measuring the RF Tx characteristics of W-CDMA/HSUPA/HSPA Evolution terminals.

### **GSM/EDGE Measurement Software (MX269013A)**

#### **EDGE Evolution Measurement Software (MX269013A-001)**

This software is for measuring the RF Tx characteristics of GSM/EDGE (EGPRS) and EDGE Evolution (EGPRS2) base stations and terminals.

### **TD-SCDMA Measurement Software (MX269015A)**

This software is for measuring the RF Tx characteristics of TD-SCDMA base stations and terminals. It supports multiple modulation methods, including ASK, FSK, QPSK, QAM, etc.

### **LTE Downlink Measurement Software (MX269020A)**

#### **LTE-Advanced FDD Downlink Measurement Software (MX269020A-001)**

#### **LTE TDD Downlink Measurement Software (MX269022A)**

#### **LTE-Advanced TDD Downlink Measurement Software (MX269022A-001)**

This software is for measuring the RF Tx characteristics of LTE/LTE-Advanced base stations.

### **LTE Uplink Measurement Software (MX269021A)**

#### **LTE-Advanced FDD Uplink Measurement Software (MX269021A-001)**

#### **LTE TDD Uplink Measurement Software (MX269023A)**

#### **LTE-Advanced TDD Uplink Measurement Software (MX269023A-001)**

This software is for measuring the RF Tx characteristics of LTE/LTE-Advanced terminals.

### **5G Standard Measurement Software (Base License) (MX285051A)**

#### **Pre-Standard CP-OFDM Downlink (MX285051A-001)**

#### **Pre-Standard CP-OFDM Uplink (MX285051A-051)**

#### **NR TDD sub-6 GHz Downlink (MX285051A-011)**

#### **NR TDD sub-6 GHz Uplink (MX285051A-061)**

#### **NR FDD sub-6 GHz Downlink (MX285051A-031)**

#### **NR FDD sub-6 GHz Uplink (MX285051A-081)**

#### **NR TDD mmWave Downlink (MX285051A-021)**

#### **NR TDD mmWave Uplink (MX285051A-071)**

This software is for measuring the RF Tx characteristics of 5G base stations and terminals.

### **Vector Signal Analysis Software (MX269017A)**

#### **APSK Analysis (MX269017A-001)**

#### **Higher-Order QAM Analysis (MX269017A-011)**

This software is for measuring the RF Tx characteristics of base stations and terminals using various digital wireless methods.

Supported Modulation Technologies

BPSK, QPSK, O-QPSK,  $\pi/4$  DQPSK, 8PSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 2FSK, 4FSK, 2ASK, 4ASK, H-CPM, MSK

The software options as below are required.

| Option        | Modulation               |
|---------------|--------------------------|
| MX269017A-001 | 16APSK, 32APSK           |
| MX269017A-011 | 512QAM, 1024QAM, 2048QAM |

# Signal Analyzer MS2850A Functions

## Software Options

|  |                      |
|--|----------------------|
| <b>5G Standard Measurement Software (Base License)</b> | <b>MX285051A</b>     |
| <b>Pre-Standard CP-OFDM Downlink</b>                   | <b>MX285051A-001</b> |
| <b>Pre-Standard CP-OFDM Uplink</b>                     | <b>MX285051A-051</b> |

The MX285051A-001 and MX285051A-051 software packages are for measuring the RF characteristics of CP-OFDM modulation downlink and uplink signals expected to be used for 5G demonstration tests and test operations.

### Single Carrier Measurement

This function analyzes a 100 MHz band carrier to display the constellation, frequency error, Tx power, modulation accuracy (EVM), etc.

### Multicarrier Measurement

Combination with the Analysis Bandwidth Extension to 1 GHz MS2850A-034 option supports batch (all-at-once) analysis of up to eight 100 MHz band carriers to display the frequency error for each carrier, Tx power, EVM, timing difference, etc.

| Analysis Bandwidth | Batch Analysis Carrier Count |
|--------------------|------------------------------|
| 255 MHz (standard) | 2                            |
| 510 MHz (option)   | 5                            |
| 1 GHz (option)     | 8                            |

### Numeric Results

| Name                  | Unit       | Single Carrier Measurement | Multicarrier Measurement | Remarks  |
|-----------------------|------------|----------------------------|--------------------------|--|
| <b>Common</b>         |            |                            |                          |  |
| Frequency Error       | Hz, ppm    | ✓                          | ✓                        | Displays frequency error   |
| Transmit Power        | dBm        | ✓                          | ✓                        | Displays Tx power  |
| Total EVM (rms/peak)  | %, dB      | ✓                          | ✓                        | Displays EVM rms/peak values   |
| Origin Offset         | dB         | ✓                          |                          | Displays Origin Offset value   |
| Time Offset           | ns         | ✓                          |                          | Displays time offset between Frame header and trigger in ns units<br>Displays Trigger Switch = On only when using external trigger |
| Timing Difference     | ns         |                            | ✓                        | Displays timing difference between reference carrier and each carrier  |
| Symbol Clock Error    | ppm        | ✓                          |                          | Displays Symbol Clock Error  |
| IQ Skew               | ns         | ✓                          |                          | Displays IQ Skew   |
| IQ Imbalance          | dB         | ✓                          |                          | Displays IQ Imbalance in dB units  |
| IQ Quadrature Error   | deg.       | ✓                          |                          | Displays IQ Quadrature Error   |
| Tx Total Power        | dBm        |                            | ✓                        | Displays total power of all carriers   |
| Tx Power Flatness     | dB         |                            | ✓                        | Displays maximum power difference between carriers   |
| <b>Downlink</b>       |            |                            |                          |  |
| xPDSCH EVM (rms/peak) | %, dB      | ✓                          |                          | Displays EVM rms/peak values for QPSK/16QAM/64QAM  |
| P-SS                  | %, dB, dBm | ✓                          |                          | Displays average EVM (rms) and maximum EVM (peak) as well as average power (dBm) for each PHY channel                              |
| S-SS                  |            | ✓                          |                          |  |
| E-SS                  |            | ✓                          |                          |  |
| BRS                   |            | ✓                          |                          |  |
| xPBCH                 |            | ✓                          |                          |  |
| xPDSCH                |            | ✓                          |                          |  |
| xPDCCH                |            | ✓                          |                          |  |
| UE-RS (xPDSCH)        |            | ✓                          |                          |  |
| UE-RS (xPDSCH)        |            | ✓                          |                          |  |
| <b>Uplink</b>         |            |                            |                          |  |
| xPUSCH EVM (rms/peak) | %, dB      | ✓                          |                          | Displays EVM rms/peak value for QPSK/16QAM/64QAM   |
| xPUSCH                | %, dB, dBm | ✓                          |                          | Displays average EVM (rms) and maximum EVM (peak) as well as average power (dBm) for each PHY channel                              |
| DM-RS (xPUSCH)        |            | ✓                          |                          |  |

### Graph Displays

| Name                                | Single Carrier Measurement | Multicarrier Measurement |
|-------------------------------------|----------------------------|--------------------------|
| Constellation                       | ✓                          |                          |
| EVM vs. Subcarrier                  | ✓                          |                          |
| EVM vs. Symbol                      | ✓                          |                          |
| Spectral Flatness (Amplitude/Phase) | ✓                          |                          |
| Power vs. RB                        | ✓                          | ✓                        |
| EVM vs. RB                          | ✓                          | ✓                        |
| Summary                             | ✓                          | ✓                        |



# Signal Analyzer MS2850A Functions

## Software Options

|  |                      |                                |                      |
|--|----------------------|--------------------------------|----------------------|
| <b>5G Standard Measurement Software (Base License)</b> | <b>MX285051A</b>     | <b>NR TDD sub-6 GHz Uplink</b> | <b>MX285051A-061</b> |
| <b>NR TDD sub-6 GHz Downlink</b>                       | <b>MX285051A-011</b> | <b>NR FDD sub-6 GHz Uplink</b> | <b>MX285051A-081</b> |
| <b>NR FDD sub-6 GHz Downlink</b>                       | <b>MX285051A-031</b> | <b>NR TDD mmWave Uplink</b>    | <b>MX285051A-071</b> |
| <b>NR TDD mmWave Downlink</b>                          | <b>MX285051A-021</b> |                                |                      |

The 5G measurement software are installed in the MS2850A for developing and manufacturing 5G radio equipment. They support analyses of both uplink and downlink signals used by the sub-6 GHz and mmWave bands in the 5G NR standards by specifying combinations of multiple component carriers (up to 400 MHz) and subcarrier spacing.

### Features

- All-in-one sub-6 GHz and mmWave Coverage**

Both 5G NR sub-6 GHz and mmWave are covered by installing the MX285051A options.

Setting Frequency Ranges: 100 MHz to 32 GHz (with MS2850A-047 installed), 100 MHz to 44.5 GHz (with MS2850A-046 installed)

### Supported Measurement Functions

| Supported Software                      | Modulation Analysis | Carrier Aggregation Analysis | Power vs. Time |
|---|---------------------|------------------------------|----------------|
| NR TDD sub-6 GHz Downlink MX285051A-011 | ✓                   | ✓                            | ✓              |
| NR FDD sub-6 GHz Downlink MX285051A-031 | ✓                   | ✓                            | —              |
| NR FDD mmW Downlink MX285051A-021       | ✓                   | ✓                            | ✓              |
| NR TDD sub-6 GHz Uplink MX285051A-061   | ✓                   | —                            | —              |
| NR FDD sub-6 GHz Uplink MX285051A-081   | ✓                   | —                            | —              |
| NR FDD mmW Uplink MX285051A-071         | ✓                   | —                            | —              |

- Easy operability for higher measurement/test efficiency**

The Phy channel can be measured simply by specifying the measured test model.

- This function makes it easy to measure Channel Power, OBW, ACLR and SEM.

The measurement software calls Signal Analyzer function and the measurement performed according to the handed over parameter settings.



- Power vs. Time measurements are supported. Off power and Transient period measurements are supported in both sub-6 GHz and mmWave that are required for 3GPP TS 38.141-1/2 specified Transient On/Off Power. The measurement results are displayed with Power vs. Time graph.

- The one-button Auto Range function optimizes the complex built-in attenuator settings, required for more accurate EVM measurement.



# Signal Analyzer MS2850A Functions

## Software Options

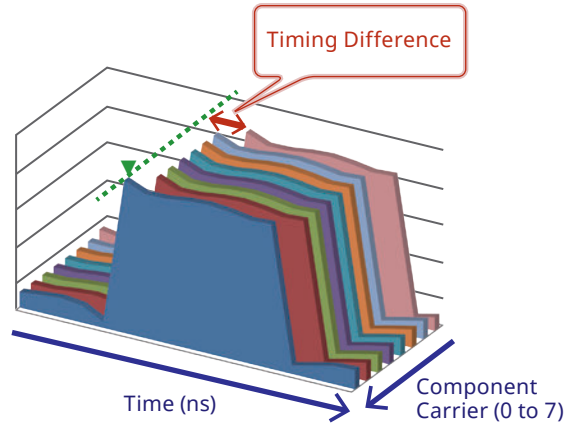
- All-at-Once Measurement and Analysis of 8 CCs max in 1-GHz Analysis Bandwidth**

Combined use with the Analysis Bandwidth Extension to 1 GHz option (MS2850A-034) supports all-at-once measurement of up to 8 CCs (8 carriers × 100 MHz). Since this eliminates individual measurement of multiple component carriers, the characteristics of single carriers can be evaluated in shorter times.

Additionally, all-at-once measurement of all carriers not only supports EVM and frequency error measurements for each carrier but also enables time difference measurements for each carrier.

| Result            |                 |                |           |            |                   |
|-------------------|-----------------|----------------|-----------|------------|-------------------|
| Tx Total Power    |                 | -11.16 dBm     |           |            |                   |
| Tx Power Flatness |                 | 0.66 dB        |           |            |                   |
| CC0 (Ref.)        | Frequency Error | Transmit Power | EVM (rms) | EVM (peak) | Timing Difference |
| CC0               | 23.24 Hz        | -19.96 dBm     | 1.24 %    | 5.47 %     | 0.0 ns            |
| CC1               | 24.13 Hz        | -20.02 dBm     | 1.16 %    | 5.24 %     | 0.0 ns            |
| CC2               | 25.02 Hz        | -20.29 dBm     | 1.13 %    | 4.88 %     | 0.0 ns            |
| CC3               | 26.32 Hz        | -20.64 dBm     | 1.18 %    | 4.99 %     | 0.0 ns            |
| CC4               | 26.96 Hz        | -20.25 dBm     | 1.36 %    | 6.19 %     | 0.0 ns            |
| CC5               | 27.82 Hz        | -20.05 dBm     | 1.03 %    | 4.53 %     | -1.5 ns           |
| CC6               | 28.69 Hz        | -20.14 dBm     | 1.00 %    | 4.30 %     | 0.0 ns            |
| CC7               | 29.57 Hz        | -20.26 dBm     | 1.01 %    | 4.80 %     | 0.0 ns            |

Batch (All-at-Once) Carrier Measurements (Numeric Results)



### All-at-One Multi-carrier Measurement Software

| Supported Software   | Analysis Bandwidth Extension Option                 | Channel Bandwidth   | Max. Component Carrier Count |
|--|---|---|------------------------------|
| NR TDD sub-6 GHz Downlink MX285051A-011<br>NR FDD sub-6 GHz Downlink MX285051A-031 | Not installed<br>(Max. Analysis Bandwidth: 255 MHz) | 5, 10, 15, 20, 25, 30, 40, 50, 60,<br>70, 80, 90, 100 MHz | 2                            |
|  | MS2850A-033<br>(Max. Analysis Bandwidth: 510 MHz)   |   |                              |
| NR TDD mmW Downlink MX285051A-021  | Not installed<br>(Max. Analysis Bandwidth: 255 MHz) | 50 MHz  | 5                            |
|  |   | 100 MHz   | 2                            |
|  |   | 200 MHz   | 1                            |
|  | MS2850A-033<br>(Max. Analysis Bandwidth: 510 MHz)   | 50 MHz  | 8                            |
|  |   | 100 MHz   | 5                            |
|  |   | 200 MHz   | 2                            |
|  | MS2850A-034<br>(Max. Analysis Bandwidth: 1 GHz)     | 400 MHz   | 1                            |
|  |   | 50 MHz  | 8                            |
|  |   | 100 MHz   | 8                            |
|  |   | 200 MHz   | 4                            |
|  |   | 400 MHz   | 2                            |

# Signal Analyzer MS2850A Functions

## Software Options

### Numeric Results

| Name                           | Unit       | Modulation Analysis | Carrier Aggregation Analysis | Power vs. Time | Remarks  |
|--------------------------------|------------|---------------------|------------------------------|----------------|--|
| Common                         |            |                     |                              |                |  |
| Frequency Error                | Hz, ppm    | ✓                   | ✓                            |                | Displays frequency error   |
| Transmit Power                 | dBm        | ✓                   |                              |                | Displays Tx power  |
| Total EVM (rms/peak)           | %, dB      | ✓                   | ✓                            |                | Displays EVM rms/peak values   |
| Origin Offset                  | dB         | ✓                   |                              |                | Displays Origin Offset value   |
| Time Offset (External Trigger) | ns         | ✓                   |                              |                | Displays time offset between Frame header and trigger in ns units<br>Displays Trigger Switch = On only when using external trigger |
| Timing Difference              | ns         |                     | ✓                            |                | Displays timing difference between reference carrier and each carrier  |
| Symbol Clock Error             | ppm        | ✓                   |                              |                | Displays Symbol Clock Error  |
| IQ Skew                        | ns         | ✓                   |                              |                | Displays IQ Skew   |
| IQ Imbalance                   | dB         | ✓                   |                              |                | Displays IQ Imbalance in dB units  |
| IQ Quad Error                  | deg.       | ✓                   |                              |                | Displays IQ Quadrature Error   |
| Downlink                       |            |                     |                              |                |  |
| P-SS                           | %, dB, dBm | ✓                   |                              |                | Displays average EVM (rms) and maximum EVM (peak) as well as S-SS · average power (dBm) for each PHY channel                       |
| S-SS                           |            | ✓                   |                              |                |  |
| PBCH                           |            | ✓                   |                              |                |  |
| DM-RS (PBCH)                   |            | ✓                   |                              |                |  |
| PDSCH                          |            | ✓                   |                              |                |  |
| DM-RS (PDSCH)                  |            | ✓                   |                              |                |  |
| PDCCH                          |            | ✓                   |                              |                |  |
| DM-RS (PDCCH)                  |            | ✓                   |                              |                |  |
| Cell ID                        | —          | ✓                   |                              |                | Displays Cell ID   |
| OFDM Symbol Tx Power           | —          | ✓                   |                              |                | Displays OSTP  |
| On Power                       | dBm, W     |                     |                              | ✓              | Displays average On power  |
| Off Power                      | dBm, W     |                     |                              | ✓              | Displays average Off power   |
| On/Off Ratio                   | dB         |                     |                              | ✓              | Display On/Off power ratio   |
| Power                          | dBm        |                     |                              | ✓              | Displays Block Tx power  |
| Ramp up                        | µs         |                     |                              | ✓              | Displays signal rise time (only On sections)   |
| Ramp down                      | µs         |                     |                              | ✓              | Displays signal fall time (only On sections)   |
| Uplink                         |            |                     |                              |                |  |
| PUSCH                          | %, dB, dBm | ✓                   |                              |                | Displays average EVM (rms) and maximum EVM (peak) as well as S-SS · average power (dBm) for each PHY channel                       |
| DM-RS (PUSCH)                  |            | ✓                   |                              |                |  |

### Graph Displays

| Name                                | Modulation Analysis | Carrier Aggregation Analysis | Power vs. Time |
|-------------------------------------|---------------------|------------------------------|----------------|
| Constellation                       | ✓                   |                              |                |
| EVM vs. Subcarrier                  | ✓                   |                              |                |
| EVM vs. Symbol                      | ✓                   |                              |                |
| Spectral Flatness (Amplitude/Phase) | ✓                   |                              |                |
| Power vs. RB                        | ✓                   | ✓                            |                |
| EVM vs. RB                          | ✓                   | ✓                            |                |
| Summary                             | ✓                   | ✓                            |                |
| Power vs. Time                      |                     |                              | ✓              |



# Signal Analyzer MS2850A Functions

## Software Options

|                             |   |  |  |   |  |                                    |            |
|-----------------------------|---|--|--|---|--|------------------------------------|------------|
| Standard                    | 3GPP TS 38.211 (2019-06)  |  |  |   |  |                                    |            |
| Model/Name                  | NR TDD sub-6 GHz Downlink<br>MX285051A-011  | NR FDD sub-6 GHz Downlink<br>MX285051A-031 | NR TDD mmW Downlink<br>MX285051A-021         | NR TDD sub-6 GHz Uplink<br>MX285051A-061                          | NR FDD sub-6 GHz Uplink<br>MX285051A-081 | NR TDD mmW Uplink<br>MX285051A-071 |            |
| Measurement Frequency Range | 800 MHz to 5 GHz  | 400 MHz to 6 GHz                           | 28 GHz                                       | 800 MHz to 5 GHz  | 400 MHz to 6 GHz                         | 28 GHz                             |            |
| Frequency Range             | 100 MHz to 32 GHz (MS2850A-047)<br>100 MHz to 44.5 GHz (MS2850A-046)  |  |  |   |  |                                    |            |
| Test Model                  | NR-FR1-TM1.1,<br>NR-FR1-TM1.2,<br>NR-FR1-TM2,<br>NR-FR1-TM2a,<br>NR-FR1-TM3.1,<br>NR-FR1-TM3.1a,<br>NR-FR1-TM3.2,<br>NR-FR1-TM3.3 |  | NR-FR2-TM1.1,<br>NR-FR2-TM2,<br>NR-FR2-TM3.1 | —   |  |                                    |            |
| Subcarrier Spacing (SCS)    | 15 kHz, 30 kHz, 60 kHz  |  | 60 kHz, 120 kHz                              | 15 kHz, 30 kHz, 60 kHz  |  | 60 kHz, 120 kHz                    |            |
| Channel Bandwidth           | 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 MHz  |  | 50, 100, 200, 400 MHz                        | 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 MHz            |  | 50, 100, 200, 400 MHz              |            |
| Modulation                  | CP-OFDM<br>QPSK, 16QAM, 64QAM, 256QAM, Auto   |  |  | CP-OFDM/DFT-S-OFDM<br>PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM, Auto |  |                                    |            |
| Measurement Channel         | SS-Block, PDSCH, PDCCH, PT-RS for PDSCH   |  |  | PUSCH, PT-RS for PUSCH  |  |                                    |            |
| Component Carrier           | Maximum Number of CCs   | 2  | 2  | 8   | 1  | 1                                  | 1          |
|                             | Channel Bandwidth of each CC  | to 100 MHz                                 | to 100 MHz                                   | 50, 100 MHz   | to 100 MHz                               | to 100 MHz                         | to 400 MHz |

### RB Number Table

The channel bandwidth is defined in accordance with SCS and RB.

|           |    | NR TDD/FDD sub-6 GHz DL/UL<br>Channel Bandwidth [MHz] (1CC) |    |    |     |     |     |     |     |     |     |     |     |     |
|-----------|----|---|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|           |    | 5   | 10 | 15 | 30  | 20  | 25  | 40  | 50  | 60  | 70  | 80  | 90  | 100 |
| SCS [kHz] | 15 | 25  | 52 | 79 | 160 | 106 | 133 | 216 | 270 | N.A | N.A | N.A | N.A | N.A |
|           | 30 | 11  | 24 | 38 | 78  | 51  | 65  | 106 | 133 | 162 | 189 | 217 | 245 | 273 |
|           | 60 | N.A   | 11 | 18 | 24  | 31  | 38  | 51  | 65  | 79  | 93  | 107 | 121 | 135 |

|           |     | NR TDD mmWave DL/UL<br>Channel Bandwidth [MHz] (1CC) |     |     |     |
|-----------|-----|--|-----|-----|-----|
|           |     | 50   | 100 | 200 | 400 |
| SCS [kHz] | 60  | 66   | 132 | 264 | N.A |
|           | 120 | 32   | 66  | 132 | 264 |

### Channel Bandwidth

The maximum channel bandwidth is determined by the Analysis Bandwidth option.

|         |             | Maximum Analysis Bandwidth |
|---------|-------------|----------------------------|
| MS2850A | Standard    | 255 MHz                    |
|         | MS2850A-033 | 510 MHz                    |
|         | MS2850A-034 | 1 GHz                      |

# Signal Analyzer MS2850A Functions

## Software Options

|  |                      |
|--|----------------------|
| <b>5G Standard Measurement Software (Base License)</b> | <b>MX285051A</b>     |
| <b>NR TDD sub-6 GHz Downlink</b>                       | <b>MX285051A-011</b> |
| <b>NR TDD sub-6 GHz Uplink</b>                         | <b>MX285051A-061</b> |

## Specifications

| Signal Analyzer                         |   | MS2850A   |  |                  |
|---|---|---|--|------------------|
| Option                                  |   | NR TDD sub-6 GHz Downlink<br>MX285051A-011  | NR TDD sub-6 GHz Uplink<br>MX285051A-061   |                  |
| Electrical Characteristics              | Target Signals  | TS 38.211 Sub-6 GHz compliant downlink signal   | TS 38.211 Sub-6-GHz compliant uplink signal  |                  |
|   | Channel Bandwidth   | Subcarrier Spacing   Channel Bandwidth  |  |                  |
|   |   | 15 kHz  | 5 MHz (RB: 25), 10 MHz (RB: 52), 15 MHz (RB: 79), 20 MHz (RB: 106), 25 MHz (RB: 133), 30 MHz (RB: 160), 40 MHz (RB: 216), 50 MHz (RB: 270)   |                  |
|   |   | 30 kHz  | 5 MHz (RB: 11), 10 MHz (RB: 24), 15 MHz (RB: 38), 20 MHz (RB: 51), 25 MHz (RB: 65), 30 MHz (RB: 78), 40 MHz (RB: 106), 50 MHz (RB: 133), 60 MHz (RB: 162), 70 MHz (RB: 189), 80 MHz (RB: 217), 90 MHz (RB: 245), 100 MHz (RB: 273)   |                  |
|   | 60 kHz  | 10 MHz (RB: 11), 15 MHz (RB: 18), 20 MHz (RB: 24), 25 MHz (RB: 31), 30 MHz (RB: 38), 40 MHz (RB: 51), 50 MHz (RB: 65), 60 MHz (RB: 79), 70 MHz (RB: 93), 80 MHz (RB: 107), 90 MHz (RB: 121), 100 MHz (RB: 135)  |  |                  |
|   | Capture Time  | 1 to 2 Frame  |  |                  |
| Frequency Setting Range                 | MS2850A-047: 100 MHz to 32 GHz<br>MS2850A-046: 100 MHz to 44.5 GHz  |   |  |                  |
| Measurement Frequency Range             | 800 MHz to 5 GHz  |   |  |                  |
| Modulation/<br>Frequency<br>Measurement | Measurement Level Range   | -10 to +30 dBm (Preamp Off, or Preamp not installed)<br>-30 to +10 dBm (Preamp On)  |  |                  |
|   | Carrier Frequency<br>Measurement Accuracy   | At 18°C to 28°C, After calibration, EVM = 1% (rms) signal 1 Frame at downlink signal<br>Only 1 carrier of 100 MHz width (Subcarrier Spacing: 30 kHz) or 50 MHz width (Subcarrier Spacing: 15 kHz) at center frequency<br>± (Accuracy of reference frequency × carrier frequency + 10) Hz          | At 18°C to 28°C, After calibration, EVM = 1% (rms) signal 1 Frame at uplink signal<br>Only 1 carrier of 100 MHz width (Subcarrier Spacing: 30 kHz) or 50 MHz width (Subcarrier Spacing: 15 kHz) at center frequency<br>± (Accuracy of reference frequency × carrier frequency + 10) Hz |                  |
|   | Residual Vector Error   | At 18°C to 28°C, After calibration<br>1 Frame at downlink signal<br>Only 1 carrier of 100 MHz width (Subcarrier Spacing: 30 kHz) or 50 MHz width (Subcarrier Spacing: 15 kHz) at center frequency<br>≤1.0%  | At 18°C to 28°C, After calibration<br>1 Frame at uplink signal<br>Only 1 carrier of 100 MHz width (Subcarrier Spacing: 30 kHz) or 50 MHz width (Subcarrier Spacing: 15 kHz) at center frequency<br>≤1.0%   |                  |
| Amplitude<br>Measurement                | Measurement Level Range   | -10 to +30 dBm (Preamp Off, or Preamp not installed)<br>-30 to +10 dBm (Preamp On)  |  |                  |
|   | Tx Power Measurement Accuracy<br>(This is found from root sum of squares (RSS) of absolute amplitude accuracy and in-band frequency characteristics of main frame.) | At 18°C to 28°C, After calibration, Input attenuator ≥10 dB<br>Input signal within measurement level range and below value set at Input Level<br>Only 1 carrier at center frequency   |  |                  |
|   |   | Frequency Range   | Preamp Off,<br>or without Preamp   | Preamp On        |
|   |   | 800 MHz ≤ Frequency < 4 GHz   | ±0.74 dB (nom.)  | ±1.27 dB (nom.)  |
|   |   | 4 GHz ≤ Frequency < 4.2 GHz   | ±1.48 dB (nom.)  | ±2.11 dB (nom.)  |
|   |   | 4.2 GHz ≤ Frequency ≤ 5 GHz   | ±1.45 dB (nom.)  | ±1.94 dB (nom.)  |
| Waveform Display                        |   | Constellation, EVM vs. Subcarrier, EVM vs. Symbol, Spectral Flatness, Power vs. RB, EVM vs. RB, Power vs. Time (NR TDD sub-6 GHz Downlink MX285051A-011)  |  |                  |
| Digitize Function                       | Function Overview   | Supports output of captured waveform data to internal storage or external storage   |  |                  |
|   | Waveform Data   | Format: I, Q (32 bit floating point binary format)<br>Level: Assumes as $\sqrt{I^2 + Q^2} = 1$ for 0 dBm input<br>Level accuracy: Same as absolute amplitude accuracy and in-band frequency characteristics of the signal analyzer  |  |                  |
|   | Replay Function   | Analyzes traces of saved waveform data<br>Format: I, Q (32 bit floating point binary format)<br>Sampling Rate:  |  |                  |
|   |   | Channel Bandwidth   | Without MS2850A-033  | With MS2850A-033 |
|   |   | ≤100 MHz  | 162.5 MHz  | 162.5 MHz        |
| Power vs. Time<br>Measurement           | Displayed Average Noise   | This is calculated up to 5 GHz from the Display Average Noise Level for the signal analyzer with MS2850A-033/034 option installed at no signal input and an ambient temperature range of 18°C to 28°C when Wide Dynamic Range = On, Noise Correction = On, Pre-AMP = On.<br>-95 dBm/MHz (nominal) | —  |                  |

# Signal Analyzer MS2850A Functions

## Software Options

|  |                      |
|--|----------------------|
| <b>5G Standard Measurement Software (Base License)</b> | <b>MX285051A</b>     |
| <b>NR FDD sub-6 GHz Downlink</b>                       | <b>MX285051A-031</b> |
| <b>NR FDD sub-6 GHz Uplink</b>                         | <b>MX285051A-081</b> |

## Specifications

| Signal Analyzer                      |  | MS2850A   |   |                  |
|--------------------------------------|--|---|---|------------------|
| Option                               |  | NR FDD sub-6 GHz Downlink<br>MX285051A-031  | NR FDD sub-6 GHz Uplink<br>MX285051A-081  |                  |
| Electrical Characteristics           | Target Signals   | TS 38.211 Sub-6 GHz compliant downlink signal   | TS 38.211 Sub-6 GHz compliant uplink signal   |                  |
|                                      | Channel Bandwidth  | Subcarrier Spacing   Channel Bandwidth  |   |                  |
|                                      |  | 15 kHz  | 5 MHz (RB: 25), 10 MHz (RB: 52), 15 MHz (RB: 79), 20 MHz (RB: 106), 25 MHz (RB: 133), 30 MHz (RB: 160), 40 MHz (RB: 216), 50 MHz (RB: 270)  |                  |
|                                      |  | 30 kHz  | 5 MHz (RB: 11), 10 MHz (RB: 24), 15 MHz (RB: 38), 20 MHz (RB: 51), 25 MHz (RB: 65), 30 MHz (RB: 78), 40 MHz (RB: 106), 50 MHz (RB: 133), 60 MHz (RB: 162), 70 MHz (RB: 189), 80 MHz (RB: 217), 90 MHz (RB: 245), 100 MHz (RB: 273)  |                  |
|                                      | 60 kHz   | 10 MHz (RB: 11), 15 MHz (RB: 18), 20 MHz (RB: 24), 25 MHz (RB: 31), 30 MHz (RB: 38), 40 MHz (RB: 51), 50 MHz (RB: 65), 60 MHz (RB: 79), 70 MHz (RB: 93), 80 MHz (RB: 107), 90 MHz (RB: 121), 100 MHz (RB: 135)  |   |                  |
|                                      | Capture Time   | 1 to 2 Frame  |   |                  |
| Frequency Setting Range              | MS2850A-047: 100 MHz to 32 GHz<br>MS2850A-046: 100 MHz to 44.5 GHz   |   |   |                  |
| Measurement Frequency Range          | 400 MHz to 6 GHz   |   |   |                  |
| Modulation/<br>Frequency Measurement | Measurement Level Range  | -10 to +30 dBm (Preamp Off, or Preamp not installed)<br>-30 to +10 dBm (Preamp On)  |   |                  |
|                                      | Carrier Frequency Measurement Accuracy   | At 18°C to 28°C, After calibration, EVM = 1% (rms) signal 1 Frame at downlink signal<br>Only 1 carrier of 100 MHz (Subcarrier Spacing: 30 kHz) width or 50 MHz (Subcarrier Spacing: 15 kHz) width at center frequency<br>However, Only 1 carrier of 25 MHz (Subcarrier Spacing: 15 kHz, 30 kHz, 60 kHz) width at 400 MHz ≤ frequency < 800 MHz<br>± (Accuracy of reference frequency × carrier frequency + 10) Hz | At 18°C to 28°C, After calibration, EVM = 1% (rms) signal 1 Frame at uplink signal<br>Only 1 carrier of 100 MHz (Subcarrier Spacing: 30 kHz) width or 50 MHz (Subcarrier Spacing: 15 kHz) width at center frequency<br>However, Only 1 carrier of 25 MHz (Subcarrier Spacing: 15 kHz, 30 kHz, 60 kHz) width at 400 MHz ≤ frequency < 800 MHz<br>± (Accuracy of reference frequency × carrier frequency + 10) Hz |                  |
|                                      | Residual Vector Error  | At 18°C to 28°C, After calibration, EVM = 1% (rms) signal 1 Frame at downlink signal<br>Only 1 carrier of 100 MHz (Subcarrier Spacing: 30 kHz) width or 50 MHz (Subcarrier Spacing: 15 kHz) width at center frequency<br>However, Only 1 carrier of 25 MHz (Subcarrier Spacing: 15 kHz, 30 kHz, 60 kHz) width at 400 MHz ≤ frequency < 800 MHz<br>≤ 1.0%  | At 18°C to 28°C, After calibration, EVM = 1% (rms) signal 1 Frame at uplink signal<br>Only 1 carrier of 100 MHz (Subcarrier Spacing: 30 kHz) width or 50 MHz (Subcarrier Spacing: 15 kHz) width at center frequency<br>However, Only 1 carrier of 25 MHz (Subcarrier Spacing: 15 kHz, 30 kHz, 60 kHz) width at 400 MHz ≤ frequency < 800 MHz<br>≤ 1.0%  |                  |
| Amplitude Measurement                | Measurement Level Range  | -10 to +30 dBm (Preamp Off, or Preamp not installed)<br>-30 to +10 dBm (Preamp On)  |   |                  |
|                                      | Tx Power Measurement Accuracy (This is found from root sum of squares (RSS) of absolute amplitude accuracy and in-band frequency characteristics of main frame.) | At 18°C to 28°C, After calibration, Input attenuator ≥ 10 dB<br>Input signal within measurement level range and below value set at Input Level<br>Only 1 carrier at center frequency  |   |                  |
|                                      |  | Frequency Range   | Preamp Off, or without Preamp   | Preamp On        |
|                                      |  | 400 MHz ≤ Frequency < 800 MHz   | ±0.72 dB (nom.)   | ±1.14 dB (nom.)  |
|                                      |  | 800 MHz ≤ Frequency < 4 GHz   | ±0.74 dB (nom.)   | ±1.27 dB (nom.)  |
|                                      |  | 4 GHz ≤ Frequency < 4.2 GHz   | ±1.45 dB (nom.)   | ±2.11 dB (nom.)  |
|                                      |  | 4.2 GHz ≤ Frequency ≤ 6 GHz   | ±1.45 dB (nom.)   | ±1.94 dB (nom.)  |
| Waveform Display                     |  | Constellation, EVM vs. Subcarrier, EVM vs. Symbol, Spectral Flatness, Power vs. RB, EVM vs. RB, Power vs. Time (NR TDD sub-6 GHz Downlink MX285051A-011)  |   |                  |
| Digitize Function                    | Function Overview  | Supports output of captured waveform data to internal storage or external storage   |   |                  |
|                                      | Waveform Data  | Format: I, Q (32 bit floating point binary format)<br>Level: Assumes as $\sqrt{I^2 + Q^2} = 1$ for 0 dBm input<br>Level accuracy: Same as absolute amplitude accuracy and in-band frequency characteristics of the signal analyzer  |   |                  |
|                                      | Replay Function  | Analyzes traces of saved waveform data<br>Format: I, Q (32 bit floating point binary format)<br>Sampling Rate:  |   |                  |
|                                      |  | Channel Bandwidth   | Without MS2850A-033   | With MS2850A-033 |
|                                      |  | ≤ 100 MHz   | 162.5 MHz   | 162.5 MHz        |



# Signal Analyzer MS2850A Functions

## Software Options

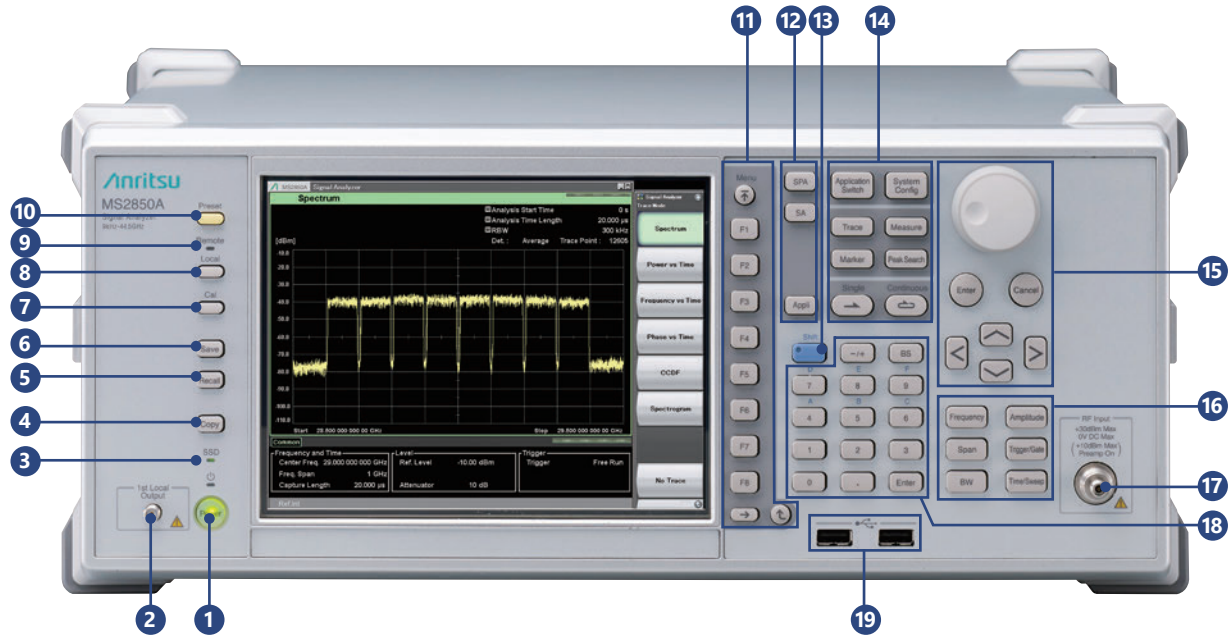
|  |                      |
|--|----------------------|
| <b>5G Standard Measurement Software (Base License)</b> | <b>MX285051A</b>     |
| <b>NR TDD mmWave Downlink</b>                          | <b>MX285051A-021</b> |
| <b>NR TDD mmWave Uplink</b>                            | <b>MX285051A-071</b> |

## Specifications

| Signal Analyzer                         |   | MS2850A  |   |                                  |                  |                               |                 |                 |          |         |         |  |
|---|---|--|---|----------------------------------|------------------|-------------------------------|-----------------|-----------------|----------|---------|---------|--|
| Option                                  |   | NR TDD mmWave Downlink<br>MX285051A-021  | NR TDD mmWave Uplink<br>MX285051A-071   |                                  |                  |                               |                 |                 |          |         |         |  |
| Electrical Characteristics              | Target Signals  | TS 38.211 mmWave compliant downlink signal   | TS 38.211 mmWave compliant uplink signal  |                                  |                  |                               |                 |                 |          |         |         |  |
|   | Channel Bandwidth   | Subcarrier Spacing      Channel Bandwidth  |   |                                  |                  |                               |                 |                 |          |         |         |  |
|   |   | 60 kHz   | 50 MHz (RB: 66), 100 MHz (RB: 132), 200 MHz (RB: 264)   |                                  |                  |                               |                 |                 |          |         |         |  |
|   |   | 120 kHz  | 50 MHz (RB: 32), 100 MHz (RB: 66), 200 MHz (RB: 132), 400 MHz (RB: 264)   |                                  |                  |                               |                 |                 |          |         |         |  |
| Capture Time                            | 1 to 2 Frame  |  |   |                                  |                  |                               |                 |                 |          |         |         |  |
| Frequency Setting Range                 | MS2850A-047: 100 MHz to 32 GHz<br>MS2850A-046: 100 MHz to 44.5 GHz  |  |   |                                  |                  |                               |                 |                 |          |         |         |  |
| Modulation/<br>Frequency<br>Measurement | Measurement Level Range   | -15 to +30 dBm (Preamp Off, or Preamp not installed)<br>-30 to +10 dBm (Preamp On)   |   |                                  |                  |                               |                 |                 |          |         |         |  |
|   | Carrier Frequency<br>Measurement Accuracy   | At 18°C to 28°C, After calibration, EVM = 2% (rms)<br>signal 1 Frame at downlink signal<br>Only 1 carrier of 100 MHz width at center frequency<br>setting of 28 GHz<br>± (Accuracy of reference frequency × carrier<br>frequency + 10) Hz  | At 18°C to 28°C, After calibration, EVM = 2% (rms)<br>signal 1 Frame at uplink signal<br>Only 1 carrier of 100 MHz width at center frequency<br>setting of 28 GHz<br>± (Accuracy of reference frequency × carrier<br>frequency + 10) Hz |                                  |                  |                               |                 |                 |          |         |         |  |
|   | Residual Vector Error   | At 18°C to 28°C, After calibration<br>1 Frame at downlink signal<br>Only 1 carrier of 100 MHz width at center frequency<br>setting of 28 GHz<br>≤2.0%  | At 18°C to 28°C, After calibration<br>1 Frame at uplink signal<br>Only 1 carrier of 100 MHz width at center frequency<br>setting of 28 GHz<br>≤2.0%   |                                  |                  |                               |                 |                 |          |         |         |  |
| Amplitude<br>Measurement                | Measurement Level Range   | -15 to +30 dBm (Preamp Off, or Preamp not installed)<br>-30 to +10 dBm (Preamp On)   |   |                                  |                  |                               |                 |                 |          |         |         |  |
|   | Tx Power Measurement Accuracy<br>(This is found from root sum of<br>squares (RSS) of absolute<br>amplitude accuracy and in-band<br>frequency characteristics of main<br>frame.) | At 18°C to 28°C, After calibration, Input attenuator ≥10 dB<br>Input signal within measurement level range and below value set at Input Level<br>Only 1 carrier of 100 MHz width at center frequency   |   |                                  |                  |                               |                 |                 |          |         |         |  |
|   |   | <table border="1"> <thead> <tr> <th>Frequency Range</th> <th>Preamp Off,<br/>or without Preamp</th> <th>Preamp On</th> </tr> </thead> <tbody> <tr> <td>26.5 GHz &lt; Frequency ≤ 40 GHz</td> <td>±2.54 dB (nom.)</td> <td>±3.74 dB (nom.)</td> </tr> </tbody> </table>   | Frequency Range   | Preamp Off,<br>or without Preamp | Preamp On        | 26.5 GHz < Frequency ≤ 40 GHz | ±2.54 dB (nom.) | ±3.74 dB (nom.) |          |         |         |  |
| Frequency Range                         | Preamp Off,<br>or without Preamp  | Preamp On  |   |                                  |                  |                               |                 |                 |          |         |         |  |
| 26.5 GHz < Frequency ≤ 40 GHz           | ±2.54 dB (nom.)   | ±3.74 dB (nom.)  |   |                                  |                  |                               |                 |                 |          |         |         |  |
| Waveform Display                        |   | Constellation, EVM vs. Subcarrier, EVM vs. Symbol, Spectral Flatness, Power vs. RB, EVM vs. RB,<br>Power vs. Time (NR TDD mmW Downlink MX285051A-021)  |   |                                  |                  |                               |                 |                 |          |         |         |  |
| Digitize Function                       | Function Overview   | Supports output of captured waveform data to internal storage or external storage  |   |                                  |                  |                               |                 |                 |          |         |         |  |
|   | Waveform Data   | Format: I, Q (32 bit floating point binary format)<br>Level: Assumes as $\sqrt{I^2 + Q^2} = 1$ for 0 dBm input<br>Level accuracy: Same as absolute amplitude accuracy and in-band frequency characteristics of the signal analyzer   |   |                                  |                  |                               |                 |                 |          |         |         |  |
|   | Replay Function   | Analyzes traces of saved waveform data<br>Format: I, Q (32 bit floating point binary format)<br>Sampling Rate:   |   |                                  |                  |                               |                 |                 |          |         |         |  |
|   |   | <table border="1"> <thead> <tr> <th>Channel Bandwidth</th> <th>Without MS2850A-033</th> <th>With MS2850A-033</th> </tr> </thead> <tbody> <tr> <td>≤100 MHz</td> <td>162.5 MHz</td> <td>162.5 MHz</td> </tr> <tr> <td>&gt;100 MHz</td> <td>325 MHz</td> <td>650 MHz</td> </tr> </tbody> </table>                    | Channel Bandwidth   | Without MS2850A-033              | With MS2850A-033 | ≤100 MHz                      | 162.5 MHz       | 162.5 MHz       | >100 MHz | 325 MHz | 650 MHz |  |
| Channel Bandwidth                       | Without MS2850A-033   | With MS2850A-033   |   |                                  |                  |                               |                 |                 |          |         |         |  |
| ≤100 MHz                                | 162.5 MHz   | 162.5 MHz  |   |                                  |                  |                               |                 |                 |          |         |         |  |
| >100 MHz                                | 325 MHz   | 650 MHz  |   |                                  |                  |                               |                 |                 |          |         |         |  |
| Power vs. Time<br>Measurement           | Displayed Average Noise   | This is calculated up to 5 GHz from the Display<br>Average Noise Level for the signal analyzer with<br>MS2850A-033/034 option installed at no signal input<br>and an ambient temperature range of 18°C to 28°C<br>when Wide Dynamic Range = On, Noise Correction =<br>On, Pre-AMP = On.<br>-86.2 dBm/MHz (nominal) | —   |                                  |                  |                               |                 |                 |          |         |         |  |

# Signal Analyzer MS2850A Key Layout

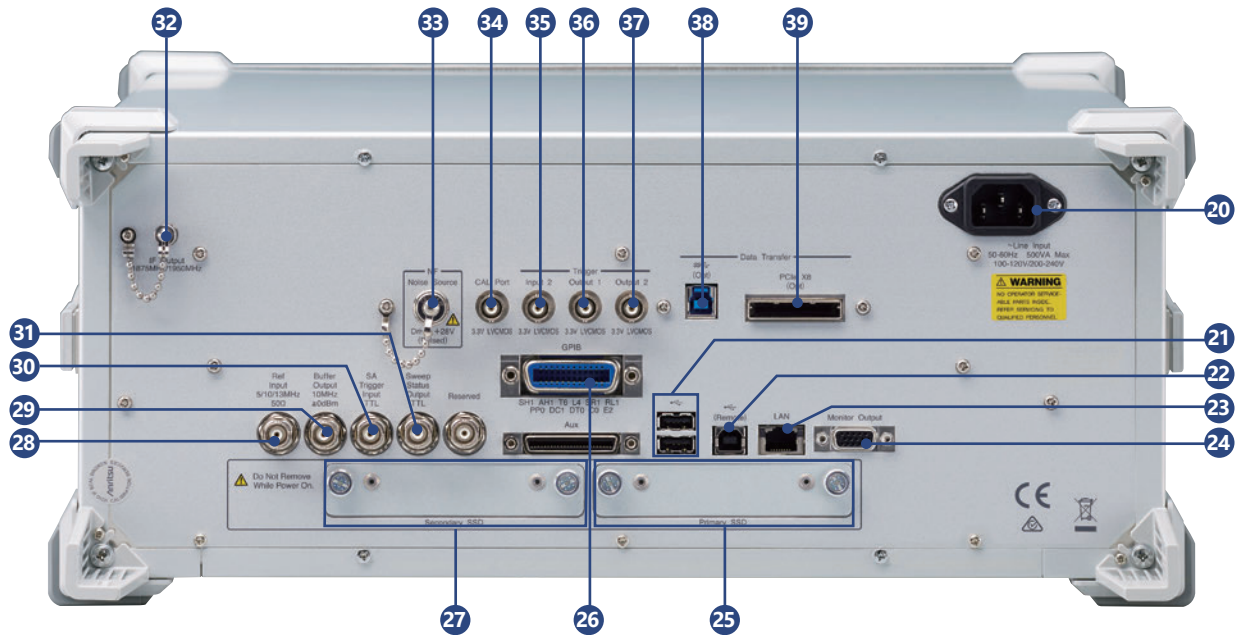
## Front Panel



- 1 Power switch**  
Press to switch between the standby state in which AC power is supplied and the Power On state in which the MS2850A 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**  
Reserved for future function expansion
- 3 SSD lamp**  
Lights when the MS2850A internal solid state drive 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 MS2850A 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 MS2850A. 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 MS2850A. Executable functions vary depending on the application currently selected.
- 17 RF Input connector**  
Used for inputting RF signal.  
K-J, 50Ω  
Maximum input level:  
+30 dBm (Continuous wave average power,  
Input attenuator: ≥10 dB, Preamp: Off)
- 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.

# Signal Analyzer MS2850A Key Layout

## Rear Panel



- 20 AC inlet**  
Used for supplying power.
- 21 USB connectors (type A)**  
Used to connect a USB keyboard or mouse or USB memory.
- 22 USB connector (type B)**  
Used when controlling the MS2850A externally via USB.
- 23 LAN (Ethernet) connector**  
Used for connecting to personal computer to implement external control over LAN or for Ethernet connection.
- 24 Monitor Out connector**  
Used for connection with an external display.
- 25 Primary SSD slot**  
This is a solid state drive slot.
- 26 GPIB connector**  
Used when controlling the MS2850A externally via GPIB.
- 27 Secondary SSD slot**  
This is a solid state drive slot for 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 MS2850A, or for synchronizing the frequency of the MS2850A to that of other device.
- 29 Buffer Out connector (reference frequency signal output connector)**  
Outputs the reference frequency signal (10 MHz) generated inside the MS2850A. It is used for synchronizing the frequencies between other devices and the MS2850A 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 IF Output connector**  
Monitor output of internal IF signal  
Connector: SMA-J, 50Ω  
IF Output Frequency: 1875 MHz, 1950 MHz
- 33 Noise Source Drive connector**  
Supply (+28 V) of the Noise Source Drive.  
Requires installation of MS2850A-017/117.
- 34 CAL Port Connector**  
Reserved for Future Use
- 35 Trigger Input 2 Connector**  
BNC connector for input of external trigger signal (3.3 V LVCMOS) for spectrum analyzer and signal analyzer applications
- 36 Trigger Output 1 Connector**  
BNC Connector for output of trigger signal (3.3 V LVCMOS)
- 37 Trigger Output 2 Connector**  
BNC connector for output of trigger signal (3.3 V LVCMOS)
- 38 USB 3.0 Connector**  
USB3.0 Type-B connector for data transfer.  
Used when MS2850A-054 option equipped.
- 39 PCIe X8 Connector**  
PCIe (X8/Gen2) connector for data transfer.  
Used when MS2850A-053 option equipped.

# Signal Analyzer MS2850A Configurations

## Hardware Configuration

Frequency range (MS2850A-046/047) not upgradable.

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

| Option      | Name   | Retrofit | Addition to Main frame          |                               | Combination with "Option" (Refer to the left line) |             |             |             |             |                                   |             |             |             |             |             |             |             |             |  |
|-------------|--|----------|---------------------------------|-------------------------------|--|-------------|-------------|-------------|-------------|-----------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--|
|             |  |          | MS2850A-046<br>(44.5 GHz model) | MS2850A-047<br>(32 GHz model) | MS2850A-032<br>(standard install)                  | MS2850A-033 | MS2850A-034 | MS2850A-010 | MS2850A-017 | MS2850A-067<br>(standard install) | MS2850A-068 | MS2850A-072 | MS2850A-076 | MS2850A-051 | MS2850A-011 | MS2850A-053 | MS2850A-054 | MS2850A-182 |  |
| MS2850A-032 | Analysis Bandwidth 255 MHz                             | —        | Standard install                | Standard install              | X  |             |             |             |             |                                   |             |             |             |             |             |             |             |             |  |
| MS2850A-033 | Analysis Bandwidth Extension to 510 MHz                | Yes      | ✓                               | ✓                             | X  | X           |             |             |             |                                   |             |             |             |             |             |             |             |             |  |
| MS2850A-034 | Analysis Bandwidth Extension to 1 GHz                  | Yes      | ✓                               | ✓                             | X  | R           | X           |             |             |                                   |             |             |             |             |             |             |             |             |  |
| MS2850A-010 | Phase Noise Measurement Function                       | Yes      | ✓                               | ✓                             |  |             |             | X           |             |                                   |             |             |             |             |             |             |             |             |  |
| MS2850A-017 | Noise Figure Measurement Function                      | Yes      | ✓                               | ✓                             |  |             |             |             | X           |                                   |             |             |             |             |             |             |             |             |  |
| MS2850A-067 | Microwave Preselector Bypass                           | —        | Standard install                | Standard install              |  |             |             |             |             | X                                 |             |             |             |             |             |             |             |             |  |
| MS2850A-068 | Microwave Preamplifier                                 | Yes      | ✓                               | ✓                             |  |             |             |             |             |                                   | X           |             |             |             |             |             |             |             |  |
| MS2850A-072 | Extended Specifications                                | Yes      | ✓                               | ✓                             |  |             |             |             |             |                                   |             | X           |             |             |             |             |             |             |  |
| MS2850A-076 | Low Second Harmonic Distortion                         | Yes      | ✓                               | ✓                             |  |             |             |             |             |                                   |             |             | X           |             |             |             |             |             |  |
| MS2850A-051 | Noise Floor Reduction                                  | Yes      | ✓                               | ✓                             |  |             |             |             |             |                                   |             |             |             | X           |             |             |             |             |  |
| MS2850A-011 | Secondary Storage Device                               | Yes      | ✓                               | ✓                             |  |             |             |             |             |                                   |             |             |             |             | X           |             |             |             |  |
| MS2850A-053 | External Interface for High Speed Data Transfer PCIe   | Yes      | ✓                               | ✓                             |  |             |             |             |             |                                   |             |             |             |             |             | X           |             |             |  |
| MS2850A-054 | External Interface for High Speed Data Transfer USB3.0 | Yes      | ✓                               | ✓                             |  |             |             |             |             |                                   |             |             |             |             |             |             | X           |             |  |
| MS2850A-182 | CPU/Windows10 Upgrade Retrofit*                        | Yes      | ✓                               | ✓                             |  |             |             |             |             |                                   |             |             |             |             |             |             |             | X           |  |

\*: Replace the MS2850A CPU board with Windows Embedded Standard 7 (Windows 7) and upgrade the operating system to Windows 10 IoT Enterprise LTSC2019.  
 Windows 7 is installed in MS2850A units ordered until August 2020.  
 Windows 10 is installed in MS2850A units ordered from September 2020 and has a label indicating C2 attached near the serial number.

## Software Configuration

| Option        | Name  | Addition to Main frame<br>✓ = Can be installed |                               | Analysis Bandwidth option<br>U = Upgrade |                        | Note  |
|---------------|---|--|-------------------------------|--|------------------------|---|
|               |   | MS2850A-046<br>(44.5 GHz model)                | MS2850A-047<br>(32 GHz model) | MS2850A-033<br>(510 MHz)                 | MS2850A-034<br>(1 GHz) |   |
| MX285051A     | 5G Standard Measurement Software (Base License) | ✓  | ✓                             | U  | U                      | This license can't be used alone. Require MX285051A-001/011/021/031 051/061/071/081 |
| MX285051A-001 | Pre-Standard CP-OFDM Downlink                   | ✓  | ✓                             | U  | U                      | Require MX285051A   |
| MX285051A-051 | Pre-Standard CP-OFDM Uplink                     | ✓  | ✓                             | U  | U                      | Require MX285051A   |
| MX285051A-011 | NR TDD sub-6 GHz Downlink                       | ✓  | ✓                             |  |                        | Require MX285051A   |
| MX285051A-061 | NR TDD sub-6 GHz Uplink                         | ✓  | ✓                             |  |                        | Require MX285051A   |
| MX285051A-031 | NR FDD sub-6 GHz Downlink                       | ✓  | ✓                             |  |                        | Require MX285051A   |
| MX285051A-081 | NR FDD sub-6 GHz Uplink                         | ✓  | ✓                             |  |                        | Require MX285051A   |
| MX285051A-021 | NR TDD mmWave Downlink                          | ✓  | ✓                             | U  | U                      | Require MX285051A   |
| MX285051A-071 | NR TDD mmWave Uplink                            | ✓  | ✓                             | U  | U                      | Require MX285051A   |
| 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             | ✓  | ✓                             |  |                        | Require MX269013A   |
| MX269015A     | TD-SCDMA Measurement Software                   | ✓  | ✓                             |  |                        |   |
| MX269020A     | LTE Downlink Measurement Software               | ✓  | ✓                             |  |                        |   |
| MX269020A-001 | LTE-Advanced FDD Downlink Measurement Software  | ✓  | ✓                             |  |                        | Require MX269020A   |
| MX269021A     | LTE Uplink Measurement Software                 | ✓  | ✓                             |  |                        |   |
| MX269021A-001 | LTE-Advanced FDD Uplink Measurement Software    | ✓  | ✓                             |  |                        | Require MX269021A   |
| MX269022A     | LTE TDD Downlink Measurement Software           | ✓  | ✓                             |  |                        |   |
| MX269022A-001 | LTE-Advanced TDD Downlink Measurement Software  | ✓  | ✓                             |  |                        | Require MX269022A   |
| MX269023A     | LTE TDD Uplink Measurement Software             | ✓  | ✓                             |  |                        |   |
| MX269023A-001 | LTE-Advanced TDD Uplink Measurement Software    | ✓  | ✓                             |  |                        | Require MX269023A   |
| MX269017A     | Vector Modulation Analysis Software             | ✓  | ✓                             |  |                        |   |
| MX269017A-001 | APSK Analysis                                   | ✓  | ✓                             |  |                        | Require MX269017A   |
| MX269017A-011 | Higher-Order QAM Analysis                       | ✓  | ✓                             |  |                        | Require MX269017A   |



# Signal Analyzer MS2850A Specifications

## Common Signal Analyzer and Spectrum Analyzer Specifications

Refer to the MS2850A Data Sheet for detailed specifications.

### Frequency Range

9 kHz to 32 GHz (MS2850A-047)  
 9 kHz to 44.5 GHz (MS2850A-046)

Signal Analyzer Functions (at >31.25 MHz Analysis Bandwidth)

800 MHz to 32 GHz (MS2850A-047)  
 800 MHz to 44.5 GHz (MS2850A-046)

### Frequency Setting Range

Spectrum Analyzer Function

-100 MHz to 32.5 GHz (MS2850A-047)  
 -100 MHz to 45 GHz (MS2850A-046)

Signal Analyzer Function

Analysis Bandwidth ≤31.25 MHz

0 MHz to 32 GHz (MS2850A-047)  
 0 MHz to 44.5 GHz (MS2850A-046)

31.25 < Analysis Bandwidth ≤ 510 MHz

100 MHz to 32 GHz (MS2850A-047)  
 100 MHz to 44.5 GHz (MS2850A-046)

Analysis Bandwidth = 1 GHz

4.2 GHz to 32 GHz (MS2850A-047)  
 4.2 GHz to 44.5 GHz (MS2850A-046)

### RF Input Connector (Front Panel)

K-J, 50Ω (nom.)

### Aging Rate

$\pm 1 \times 10^{-7}$ /year

### Max. Input Level

CW Average Power: +30 dBm  
 (Input Attenuator: ≥10 dB, Preamp: Off)

### Attenuator

0 to 60 dB, 2 dB steps

### Phase Noise

Spectrum Analyzer Function

| Input Frequency | Frequency Offset | SSB Noise          |
|-----------------|------------------|--------------------|
| 1 GHz           | 10 Hz            | -80 dBc/Hz (nom.)  |
|                 | 100 Hz           | -92 dBc/Hz (nom.)  |
|                 | 1 kHz            | -117 dBc/Hz (nom.) |
|                 | 10 kHz           | -123 dBc/Hz        |
|                 | 100 kHz          | -123 dBc/Hz        |
|                 | 1 MHz            | -135 dBc/Hz        |
|                 | 10 MHz           | -148 dBc/Hz (nom.) |

### Total Level Accuracy

Preamp: None, Microwave Preselector Bypass: Off  
 ±0.5 dB (300 kHz ≤ Frequency < 4 GHz)  
 ±1.8 dB (4 GHz ≤ Frequency ≤ 13.8 GHz)  
 ±3.0 dB (13.8 GHz < Frequency ≤ 40 GHz)  
 ±3.5 dB (40 GHz < Frequency < 44.5 GHz, nom.)

### Secondary Harmonic Distortion

Spectrum Analyzer Function

Signal Analyzer Function (Analysis Bandwidth: ≤31.25 MHz)

Preamp: None

Low Second Harmonic Distortion: Yes

Microwave Preselector Bypass: Off

Frequency Band Mode: Spurious

| Input Frequency | Harmonic        | SHI             | Mixer Input Level |
|-----------------|-----------------|-----------------|-------------------|
| 1 GHz           | ≤-65 dBc        | ≥+35 dBm        | -30 dBm           |
| 4 GHz, 13 GHz   | ≤-90 dBc        | ≥+80 dBm        | -10 dBm           |
| 20 GHz          | ≤-90 dBc (nom.) | ≥+80 dBm (nom.) | -10 dBm           |

# Signal Analyzer MS2850A Specifications

## Spectrum Analyzer Function

### RBW (Resolution Bandwidth)

Setting Range:

- 1 Hz to 3 MHz (1-3 sequence), 500 Hz, 50 kHz, 2 MHz, 5 MHz, 10 MHz, 20 MHz, 31.25 MHz
- (1 Hz to 10 Hz: Can not be set when Span 0 Hz)
- 31.25 MHz: Can be set when Span 0 Hz only)

### VBW (Video Bandwidth)

Setting Range:

- 1 Hz to 3 kHz (1-3 sequence), 5 kHz, 10 kHz to 10 MHz (1-3 sequence), Off

VBW Mode: Video Average, Power Average

### DANL (Display Average Noise Level)

Preamp: None

Low Second Harmonic Distortion: Yes

Microwave Preselector Bypass: On

| Frequency | DANL               |
|-----------|--------------------|
| 1 GHz     | -150 dBm/Hz        |
| 4 GHz     | -144 dBm/Hz        |
| 13 GHz    | -146 dBm/Hz        |
| 20 GHz    | -140 dBm/Hz        |
| 28 GHz    | -140 dBm/Hz        |
| 39 GHz    | -136 dBm/Hz        |
| 44 GHz    | -130 dBm/Hz (nom.) |

### Two-Signal Tertiary Distortion

Preamp: None

| Frequency      | Two-Signal Tertiary Distortion        |
|----------------|---------------------------------------|
| 1 GHz          | $\leq -62$ dBc (TOI = +16 dBm)        |
| 4 GHz          | $\leq -60$ dBc (TOI = +15 dBm)        |
| 13 GHz, 20 GHz | $\leq -56$ dBc (TOI = +13 dBm)        |
| 28 GHz, 39 GHz | $\leq -56$ dBc (TOI = +13 dBm) (nom.) |

## Signal Analyzer Function

### Analysis Bandwidth

255 MHz (standard)

510 MHz (option)

1 GHz (option)

### Display Functions (Trace Mode)

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

### ADC Resolution

Analysis Bandwidth  $\leq 31.25$  MHz: 16 bits

Analysis Bandwidth  $> 31.25$  MHz: 12 bits

### SFDR (Spurious Free Dynamic Range)

Analysis Bandwidth  $> 31.25$  MHz

| Frequency Range   | SFDR           |
|---|----------------|
| $800 \text{ MHz} \leq \text{Frequency} < 4.2 \text{ GHz}$     | -60 dBc (nom.) |
| $4.2 \text{ GHz} \leq \text{Frequency} \leq 44.5 \text{ GHz}$ | -70 dBc (nom.) |

### RBW (Resolution Bandwidth)

Spectrum Display

Setting Range:

Analysis Bandwidth  $\leq 31.25$  MHz: 1 Hz to 1 MHz (1-3 sequence)

50 MHz  $\leq$  Analysis Bandwidth  $\leq 62.5$  MHz:

3 kHz to 3 MHz (1-3 sequence)

Analysis Bandwidth  $\geq 100$  MHz: 10 kHz to 10 MHz (1-3 sequence)

### DANL (Display Average Noise Level)

Analysis Bandwidth  $> 31.25$  MHz

| Frequency | Preamp: None       | Preamp: On         |
|-----------|--------------------|--------------------|
| 1 GHz     | -141 dBm/Hz        | -160 dBm/Hz        |
| 4 GHz     | -138 dBm/Hz        | -157 dBm/Hz        |
| 13 GHz    | -140 dBm/Hz        | -155 dBm/Hz        |
| 20 GHz    | -135 dBm/Hz        | -152 dBm/Hz        |
| 28 GHz    | -135 dBm/Hz        | -150 dBm/Hz        |
| 39 GHz    | -132 dBm/Hz        | -146 dBm/Hz        |
| 44 GHz    | -125 dBm/Hz (nom.) | -138 dBm/Hz (nom.) |

### In-band Frequency Characteristics (Amplitude Flatness)

Analysis Bandwidth  $> 31.25$  MHz

| Frequency      | Frequency Offset | In-band Frequency Characteristic |
|----------------|------------------|----------------------------------|
| 13 GHz         | CF $\pm 500$ MHz | $\pm 0.7$ dB (nom.)              |
| 20 GHz         |                  | $\pm 1.0$ dB (nom.)              |
| 28 GHz         |                  | $\pm 1.2$ dB (nom.)              |
| 39 GHz, 44 GHz |                  | $\pm 1.25$ dB (nom.)             |

### In-band Phase Linearity (Phase Flatness)

Analysis Bandwidth  $> 31.25$  MHz

Preamp: None

Offset Frequency  $\leq$  Center Frequency  $\pm 500$  MHz

| Center Frequency               | In-band Phase Linearity |
|--------------------------------|-------------------------|
| 13 GHz, 20 GHz, 28 GHz, 39 GHz | 5°p-p (nom.)            |
| 44 GHz                         | 6°p-p (nom.)            |

# Signal Analyzer MS2850A Specifications

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## General Specifications

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### Dimensions and Mass

426 (W) × 177 (H) × 390 (D) mm (excluding protrusions)  
≤21 kg (with MS2850A-046 or 047 and other options installed)

### Power

Power voltage: 100 V(ac) to 120 V(ac)/200 V(ac) to 240 V(ac)  
Frequency: 50 Hz/60 Hz  
Power Consumption:  
≤500 VA (with all options installed)  
320 VA (nom.) (with MS2850A-047 or 046 and MS2850A-067/068/  
032/033/034 installed, but excluding other options)

### EU Standards (CE Marking)

EMC: 2014/30/EU, EN61326-1, EN61000-3-2  
LVD: 2014/35/EU, EN61010-1  
RoHS: 2011/65/EU, EN50581

### OS

Windows 10 (64 bits)

Windows® is a registered trademark of Microsoft Corporation in the USA and other countries.

All other product names, models, services trademarks are trademarks or registered trademarks of their respective owners.

## 5G Measurement Software

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Refer to the MX2690xxA Series, MX2830xxA Series, MX2850xxA Series Measurement Software brochure for the specification details.

Typical (typ.):

Performance not warranted. Most products meet typical performance.

Nominal (nom.):

Values not warranted. Included to facilitate application of product.

Measured (meas.):

Performance not warranted. Data actually measured from randomly selected measuring instruments.

# Signal Analyzer MS2850A 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   |
|-----------------|--|
| MS2850A         | <b>Main Frame</b><br>Signal Analyzer   |
|                 | <b>Standard Accessories</b>  |
| P0031A          | Power Cord: 1 pc   |
| Z0541A          | USB Memory (≥ 1 GB): 1 pc  |
|                 | USB Mouse: 1 pc  |
|                 | Install DVD-ROM (Application software, instruction manual DVD-ROM): 1 pc   |
| MS2850A-047     | <b>Options</b><br>32 GHz Signal Analyzer   |
| MS2850A-046     | 44.5 GHz Signal Analyzer   |
| MS2850A-033     | Analysis Bandwidth Extension 510 MHz   |
| MS2850A-034     | Analysis Bandwidth Extension 1 GHz   |
| MS2850A-010     | Phase Noise Measurement Function   |
| MS2850A-017     | Noise Figure Measurement Function  |
| MS2850A-068     | Microwave Preampifier  |
| MS2850A-072     | Extended Specifications  |
| MS2850A-076     | Low Second Harmonic Distortion   |
| MS2850A-051     | Noise Floor Reduction  |
| MS2850A-011     | Secondary Storage Device   |
| MS2850A-053     | External Interface for High Speed Data Transfer PCIe   |
| MS2850A-054     | External Interface for High Speed Data Transfer USB3.0   |
|                 | <b>Retrofit Options</b>  |
| MS2850A-133     | Analysis Bandwidth Extension 510 MHz Retrofit  |
| MS2850A-134     | Analysis Bandwidth Extension 1 GHz Retrofit  |
| MS2850A-110     | Phase Noise Measurement Function Retrofit  |
| MS2850A-117     | Noise Figure Measurement Function Retrofit   |
| MS2850A-168     | Microwave Preampifier Retrofit   |
| MS2850A-172     | Extended Specifications Retrofit   |
| MS2850A-176     | Low Second Harmonic Distortion Retrofit  |
| MS2850A-151     | Noise Floor Reduction Retrofit   |
| MS2850A-111     | Secondary Storage Device Retrofit  |
| MS2850A-153     | External Interface for High Speed Data Transfer PCIe Retrofit  |
| MS2850A-154     | External Interface for High Speed Data Transfer USB3.0 Retrofit  |
| MS2850A-182     | CPU/Windows10 Upgrade Retrofit   |
| MS2850A-282     | CPU/Windows10 Upgrade Retrofit   |
|                 | <b>Software Options</b>  |
| MX285051A       | DVD-ROM with License and Operation manuals<br>5G Standard Measurement Software (Base License)<br>(Requires MX285051A-001 and/or 011/021/031/051/061/071/081) |
| MX285051A-001   | Pre-Standard CP-OFDM Downlink (Requires MX285051A)   |
| MX285051A-051   | Pre-Standard CP-OFDM Uplink (Requires MX285051A)   |
| MX285051A-011   | NR TDD sub-6 GHz Downlink (Requires MX285051A)   |
| MX285051A-061   | NR TDD sub-6 GHz Uplink (Requires MX285051A)   |
| MX285051A-031   | NR FDD sub-6 GHz Downlink (Requires MX285051A)   |
| MX285051A-081   | NR FDD sub-6 GHz Uplink (Requires MX285051A)   |
| MX285051A-021   | NR TDD mmWave Downlink (Requires MX285051A)  |
| MX285051A-071   | NR TDD mmWave Uplink (Requires MX285051A)  |
| 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  |
| MX269017A-001   | APSK Analysis (Requires MX269017A)   |
| MX269017A-011   | Higher-Order QAM Analysis (Requires MX269017A)   |
| MX269020A       | LTE Downlink Measurement Software  |
| MX269020A-001   | LTE-Advanced FDD Downlink Measurement Software<br>(Requires MX269020A)   |
| MX269021A       | LTE Uplink Measurement Software  |
| MX269021A-001   | LTE-Advanced FDD Uplink Measurement Software<br>(Requires MX269021A)   |
| MX269022A       | LTE TDD Downlink Measurement Software  |
| MX269022A-001   | LTE-Advanced TDD Downlink Measurement Software<br>(Requires MX269022A)   |
| MX269023A       | LTE TDD Uplink Measurement Software  |
| MX269023A-001   | LTE-Advanced TDD Uplink Measurement Software<br>(Requires MX269023A)   |
|                 | <b>Warranty Service</b>  |
| MS2850A-ES210   | 2 years Extended Warranty Service  |
| MS2850A-ES310   | 3 years Extended Warranty Service  |
| MS2850A-ES510   | 5 years Extended Warranty Service  |

| Model/Order No. | Name  |
|-----------------|---|
|                 | <b>Manuals</b>  |
|                 | Following operation manuals provided as hard copy and written in English.   |
| W3920AE         | MS2850A Operation Manual (Mainframe Operation)  |
| W2851AE         | MS2690A/MS2691A/MS2692A/MS2830A/MS2840A and MS2850A Operation Manual (Mainframe Remote Control)                         |
| W3335AE         | MS2830A/MS2840A/MS2850A Operation Manual (Signal Analyzer Function Operation)   |
| W2853AE         | MS2690A/MS2691A/MS2692A/MS2830A/MS2840A and MS2850A Operation Manual (Signal Analyzer Function Remote Control)          |
| W3336AE         | MS2830A/MS2840A/MS2850A Operation Manual (Spectrum Analyzer Function Operation)   |
| W2855AE         | MS2690A/MS2691A/MS2692A/MS2830A/MS2840A and MS2850A Operation Manual (Spectrum Analyzer Function Remote Control)        |
| W3117AE         | MS2690A/MS2691A/MS2692A/MS2830A/MS2840A and MS2850A Operation Manual (Phase Noise Measurement Function Operation)       |
| W3118AE         | MS2690A/MS2691A/MS2692A/MS2830A/MS2840A and MS2850A Operation Manual (Phase Noise Measurement Function Remote Control)  |
| W3655AE         | MS2690A/MS2691A/MS2692A/MS2830A/MS2840A and MS2850A Operation Manual (Noise Figure Measurement Function Operation)      |
| W3656AE         | MS2690A/MS2691A/MS2692A/MS2830A/MS2840A and MS2850A Operation Manual (Noise Figure Measurement Function Remote Control) |
| W3950AE         | MS2850A-053/MS2850A-054 Operation Manual (External Interface for High Speed Data Transfer)                              |
| W3922AE         | MX285051A/MX269051A Operation Manual  |
| W3924AE         | MX285051A-011/MX269051A-011/MX285051A-021/MX285051A-061/MX269051A-061/MX285051A-071 Operation Manual (Operation)        |
| W3925AE         | MX285051A-011/MX269051A-011/MX285051A-021/MX285051A-061/MX269051A-061/MX285051A-071 Operation Manual (Remote Control)   |
| W4035AE         | MX285051A-031/MX285051A-081 Operation Manual (Operation)  |
| W4036AE         | MX285051A-031/MX285051A-081 Operation Manual (Remote Control)   |
| W3098AE         | MX269011A Operation Manual (Operation)  |
| W3099AE         | MX269011A Operation Manual (Remote Control)   |
| W3060AE         | MX269012A Operation Manual (Operation)  |
| W3061AE         | MX269012A Operation Manual (Remote Control)   |
| W3100AE         | MX269013A Operation Manual (Operation)  |
| W3101AE         | MX269013A Operation Manual (Remote Control)   |
| 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)   |

The following options are installed as standard and do not require separate orders when ordering the MS2850A-046/047.

|                              |             |
|------------------------------|-------------|
| Standard Software            | MX269000A   |
| Analysis Bandwidth 255 MHz   | MS2850A-032 |
| Microwave Preselector Bypass | MS2850A-067 |

Requires Installation Kit Z1957A when retrofitting options or installing software.  
The instruction manuals are published on our website except some.



# Signal Analyzer MS2850A Ordering Information

| 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 (Harmonic 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) |



**Ruggedized K-to-Type N Adapter  
34AKNF50**

This adapter converts the MS2850A-046 RF Input connector (K-J) to N-J. It is used by attachment to the MS2850A main unit.



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



**Front Cover for 1MW4U B0671A**

| Model/Order No. | Name   |
|-----------------|--|
| 34AKNF50        | <b>Application Parts</b><br>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.)) |
| 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)   |
| 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)   |
| 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 Adaptor (DC to 12.4 GHz, 50Ω, N-P · SMA-J)   |
| J1398A          | N-SMA Adaptor (DC to 26.5 GHz, 50Ω, N-P · SMA-J)   |
| J0911           | Coaxial Cable, 1.0 m for 40 GHz (DC to 40 GHz, approx. 1 m,<br>SF102A, 11K254/K254/1.0M)   |
| J0912           | Coaxial Cable, 0.5 m for 40 GHz (DC to 40 GHz, approx. 0.5 m,<br>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           | GPIB Cable, 2.0 m  |
| B0635A          | Rack Mount Kit (EIA)   |
| B0657A          | Rack Mount Kit (JIS)   |
| B0636C*         | Carrying Case (Hard type, with casters)  |
| B0671A*         | 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)   |
| Z1957A          | Installation Kit<br>(required when retrofitting options or installing software)  |
| U0088A          | <b>External Interface for High Speed Data Transfer</b><br>PCIe Host Adapter  |
| J1749A          | PCIe x8 Cable (2 m)  |
| J1749B          | PCIe x8 Cable (5 m)  |

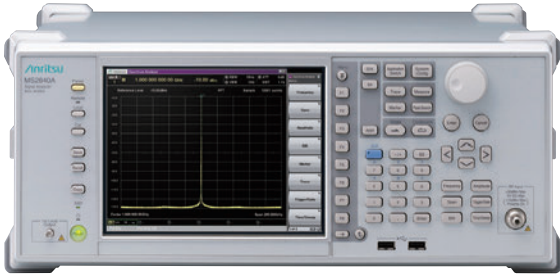
\*: The Carrying Case B0636C includes the Front Panel Protective Cover (B0671A).

## Signal Analyzer MS2850A Related Products

### Signal Analyzer MS2840A

9 kHz to 3.6 GHz/6 GHz/26.5 GHz/44.5 GHz/325 GHz (with external mixer)  
Analysis bandwidth: 31.25 MHz (Standard), Max. 125 MHz (Option)

The MS2840A is a mid-range spectrum analyzer/signal analyzer with excellent multi-functions and narrowband performance.



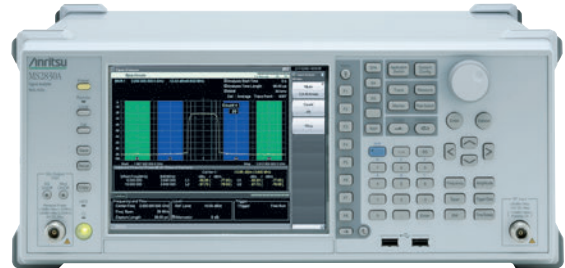
#### Features

- Dedicated low-phase-noise option for same phase noise performance as high-end instruments (3.6 GHz/6 GHz models).
- Monitor actual spectrum of mmWave transmitters and excellent phase noise performance and DANL using high-performance waveguide mixer (50 GHz to 90 GHz) (26.5 GHz/44.5 GHz models).
- Versatile measurement options including phase noise measurement function, vector modulation analysis, analog modulation (FM,  $\Phi$ M, AM) analysis, built-in signal generator, noise figure (NF) measurement, Noise Floor Reduction.
- High cost-performance substitute for aging high-end models.

### Signal Analyzer MS2830A

9 kHz to 3.6 GHz/6 GHz/13.5 GHz/26.5 GHz/43 GHz/325 GHz (with external mixer)  
Analysis bandwidth: 31.25 MHz (Standard), Max. 125 MHz (Option)

The MS2830A is a mid-range signal analyzer/spectrum analyzer with excellent versatility and cost-performance.



#### Features

- Both vector and analog signal generators can be built-in. All-in-one TRx evaluations of digital and analog radios are supported in combination with the BER measurement function, and built-in audio analyzer, etc. BER.
- Versatile measurement options include digital modulation analysis for LTE/LTE-Advanced, WLAN, etc., vector modulation analysis, analog modulation analysis (FM,  $\Phi$ M, AM), NF measurements, internal signal generator tracking and more.
- The Capture&Playback function using the vector signal generator can replay the onsite radio-wave environment.

### Signal Analyzer MS2690A/MS2691A/MS2692A

50 Hz to 6 GHz/13.5 GHz/26.5 GHz  
Analysis bandwidth: 31.25 MHz (Standard), Max. 125 MHz (Option)

With excellent phase noise performance, dynamic range, and measurement level accuracy, this is a high-standard signal analyzer/spectrum analyzer.



#### Features

- The baseband can be extended to 6 GHz and the built-in calibration oscillator supports excellent measurement level accuracy and modulation accuracy from 50 Hz to 6 GHz.
- A vector signal generator can be installed. All-in-one TRx evaluations of digital radio are supported in combination with the BER measurement function, etc.
- Versatile measurement options include digital modulation analysis for LTE/LTE-Advanced, WLAN, etc., vector modulation analysis, NF measurements, and more.
- The Capture&Playback function using the vector signal generator can replay the onsite radio-wave environment.
- The compact design cuts the benchtop footprint.



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