

**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 bandwidth 64QAM xPDSCH







# 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\*1 over a wide analysis bandwidth of 1 GHz exceed that of other signal analyzers\*2. 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\*3 Clipping Level

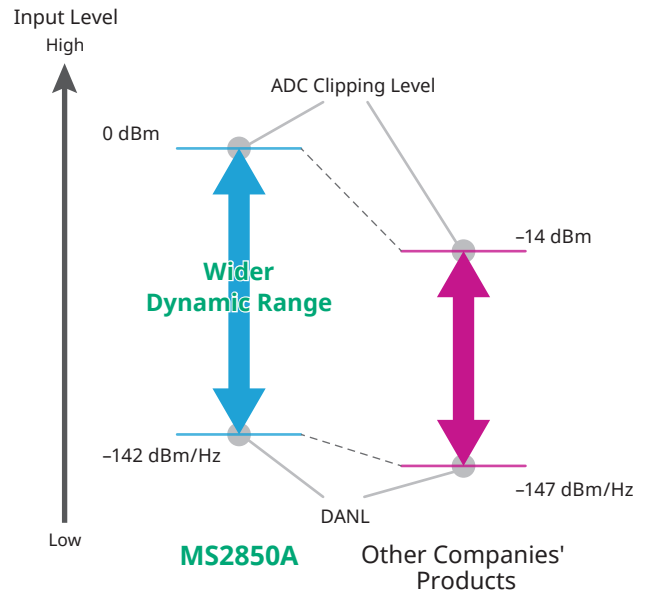
#### Wide Measurement Dynamic Range at Difference from DANL\*4

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\*5 (CW)  
DANL: -142 dBm/Hz\*5  
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.

### Name/Model

5G Standard Measurement Software (Base License) MX285051A  
 Pre-Standard CP-OFDM Downlink MX285051A-001  
 Pre-Standard CP-OFDM Uplink MX285051A-051

### Measurement Items

#### Numeric Results

- Frequency Error
- Tx Power
- EVM
- Origin Offset
- Timing Difference

#### Graph Results

- Constellation
- EVM vs. Subcarrier
- Spectral Flatness (Amplitude)
- Spectral Flatness (Phase)
- EVM vs. RB



Basic Screen (EVM vs. Subcarrier)

### High EVM Performance due to MS2850A Wide Dynamic Range (EVM: <1%)

Combining the 5G analysis software with the MS2850A offers an EVM performance of <1% at measurement of a 5G single carrier (100 MHz wide, 28 GHz)\*1.

And even wider dynamic range performance is achieved over the difference between the MS2850A high ADC clipping level (0 dBm\*2) and DANL.

Pressing [Auto Range] performs measurement at the optimum level setting.

Result			
xPDSCH EVM (rms)		Frequency Error	-0.65 Hz
QPSK	---		0.000 ppm
16QAM	---	Transmit Power	-5.29 dBm
64QAM	0.84 %	Total EVM (rms)	0.84 %
		Total EVM (peak)	4.05 %
xPDSCH EVM (peak) / Subcarrier / Symbol		Symbol Number	462
QPSK	---		303
16QAM	---	Subcarrier Number	303
64QAM	3.50 % / 796 / 667	Origin Offset	-72.97 dB

Single Carrier EVM Measurement Example (Numeric Results)

### Multicarrier Analysis and Batch Measurement at 1 GHz

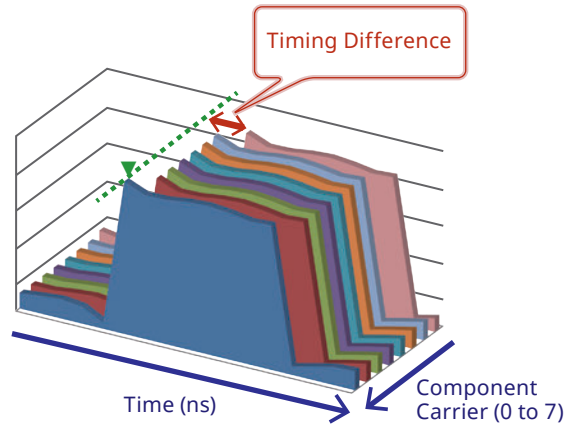
The 5G measurement software uses the 1 GHz analysis bandwidth of the MS2850A to support batch (all-at-once) measurement of all 5G signal carriers (8 carriers × 100 MHz wide). The characteristics of each single carrier can be evaluated quickly at the same time without needing to measure each single carrier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

Result					
Tx Total Power		-11.16 dBm			
Tx Power Flatness		0.56 dB			
CC0 (Ref)	Frequency Error	Transmit Power	EVM (rms)	EVM (peak)	Timing Difference
CC1	23.24 Hz	-19.98 dBm	1.24 %	5.47 %	0.0 ns
CC2	24.13 Hz	-20.02 dBm	1.15 %	5.24 %	0.0 ns
CC3	26.02 Hz	-20.29 dBm	1.13 %	4.89 %	0.0 ns
CC4	26.92 Hz	-20.54 dBm	1.16 %	4.99 %	0.0 ns
CC5	28.86 Hz	-20.25 dBm	1.35 %	6.19 %	0.0 ns
CC6	27.82 Hz	-20.06 dBm	1.03 %	4.53 %	-1.5 ns
CC7	29.69 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

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.



### High-Accuracy Measurement due to MS2850A Amplitude and Phase Flatness

The amplitude and phase flatness performance of the MS2850A over the wide analysis bandwidth of 1 GHz (max.) exceed that of other signal analyzers. For example, suppressing the measuring instrument error enables phase adjustment of each path in an antenna array.

### MS2850A Specifications

- Offset Frequency: At Center Frequency ±500 MHz
- In-band frequency characteristics (Amplitude flatness): ±1.2 dB (nom.)
- In-band phase linearity (Phase flatness): 5° p-p (nom.)

\*1: at 100 MHz bandwidth 64QAM xPDSCH

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

# 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 using External Mixer Connection (sold separately)	✓	✓	✓

\*: Connected to USB power sensor sold separately

# Signal Analyzer MS2850A Functions

## Signal Analyzer Functions (Standard)

### Analysis Bandwidth

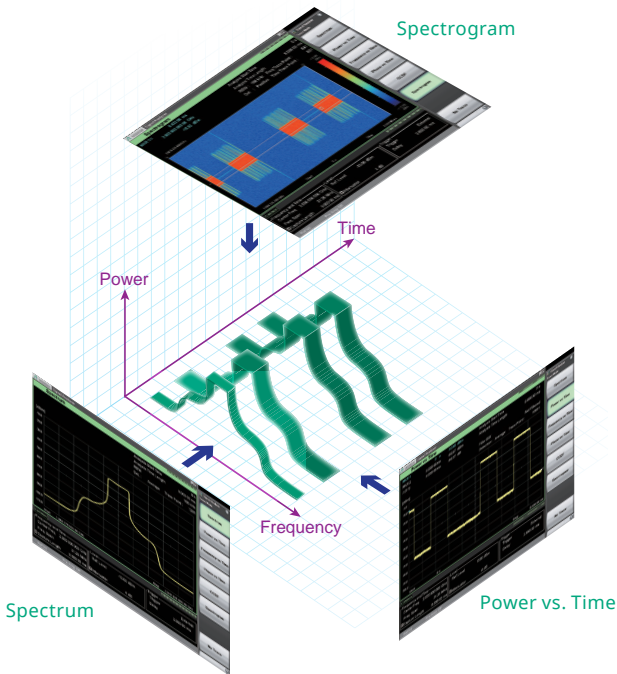
Analysis Bandwidth	Frequency Measurement Range
255 MHz (standard)	100 MHz to 32 GHz/44.5 GHz
510 MHz (option)	100 MHz to 32 GHz/44.5 GHz
1 GHz (option)	4.2 GHz to 32 GHz/44.5 GHz

### 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 (Amplitude Flatness)	$\pm 1.2$ dB (nom.)
In-band Phase Linearity (Phase Flatness)	$5^\circ$ p-p (nom.)

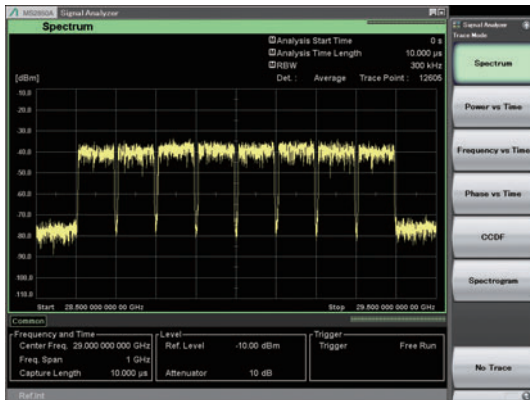


# Signal Analyzer MS2850A Functions

## Signal Analyzer Functions (Standard)

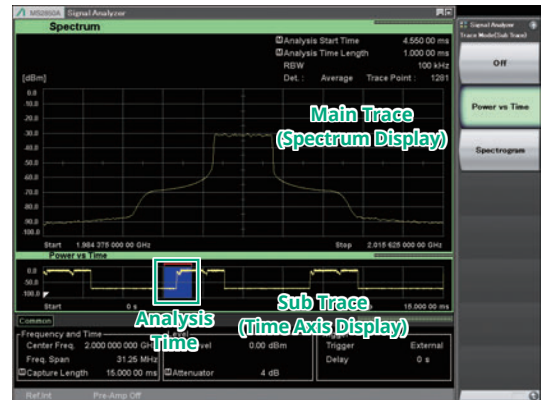
### Spectrum Display

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.

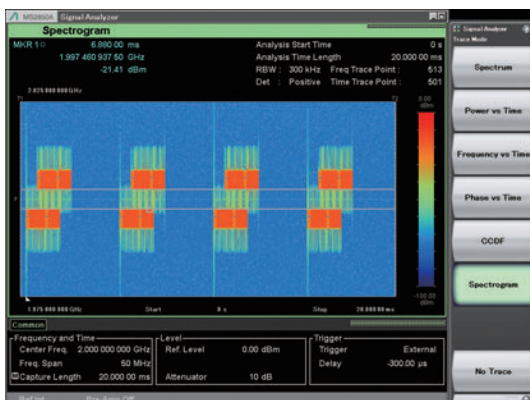
#### APD (Amplitude Probability Density):

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.



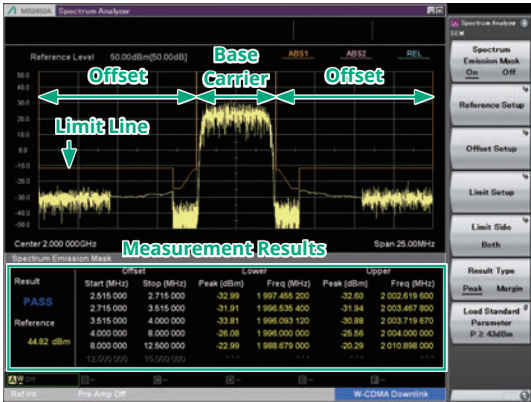


# Signal Analyzer MS2850A Functions

## 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.

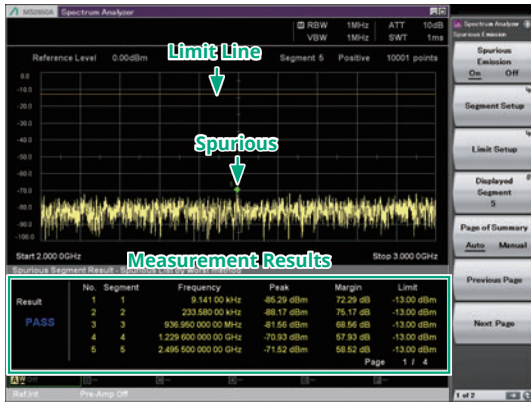


#### Measurement Results

- 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.



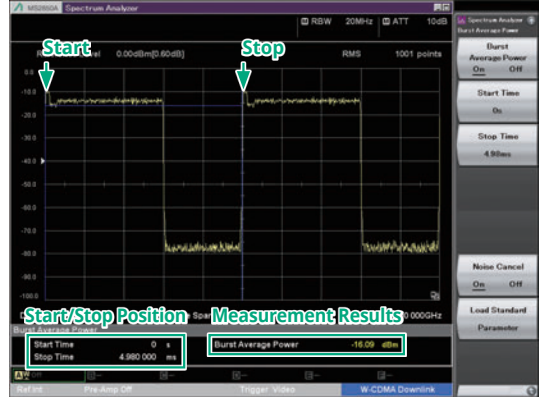
### Multi-marker & Marker List

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.



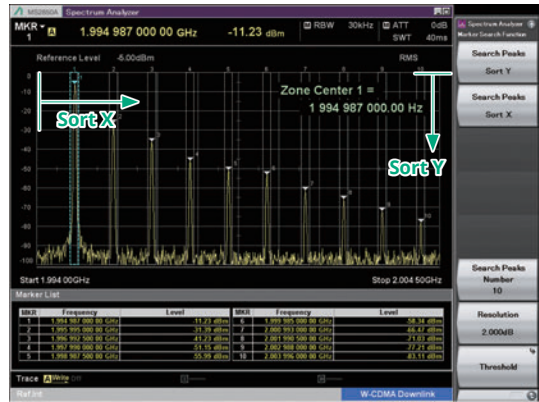
### Burst Average Power

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.



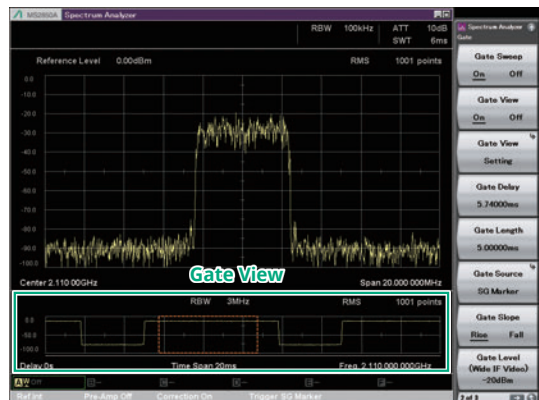
### Highest 10 Markers

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

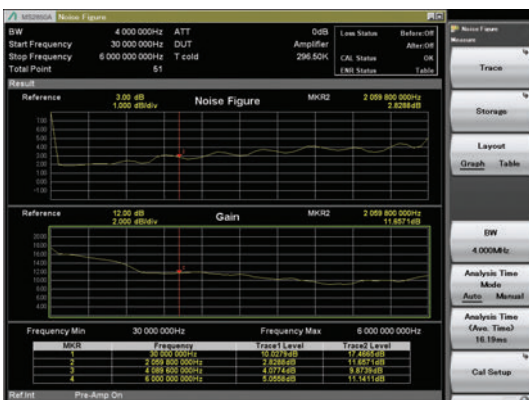
### Secondary Storage Device (MS2850A-011)

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.

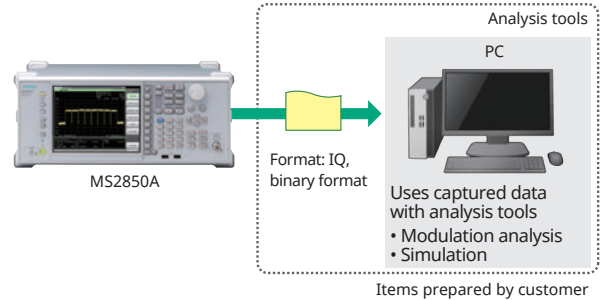


Measurement Result: Example of Graph display (Frequency Mode: Sweep, Screen Layout: Graph)

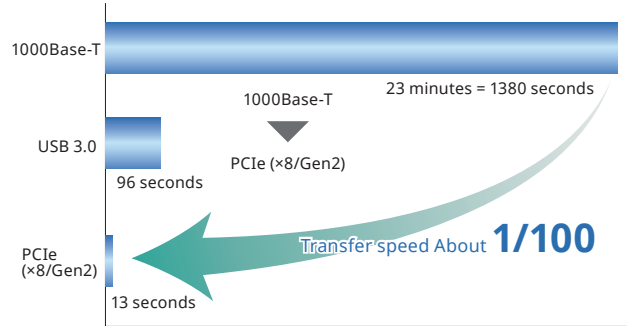
### External Interface for High Speed Data Transfer PCIe (MS2850A-053)

### 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 (Lower: when not installed)	SHI* Upper: when installed (Lower: when not installed)
2 GHz to 3 GHz	-80 dBc (-70 dBc)	+70 dBm (+60 dBm)
3 GHz to 22.25 GHz	-90 dBc (-70 dBc)	+80 dBm (+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/MA2808A.

#### Features

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









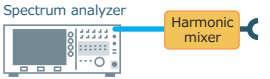





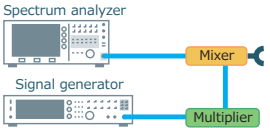





The MA2806A and MA2808A have a dedicated multiplier, amplifier, bandpass filter, etc., supporting an excellent conversion loss of at least 10 dB better than conventional harmonic mixers, as well as P1dB performance exceeding 0 dBm. When used in combination with the MS2850A series (32 GHz/44.5 GHz models) the display average noise performance level is excellent at -150 dBm/Hz (meas.)\*2 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.

\*1: Patent pending

\*2: 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> 	 <b>Good</b>	 <b>Far</b>	 <b>High</b>	 <b>Simple</b>	 <b>No Need</b>
<b>Harmonic Mixer</b> 	 <b>Bad</b>	 <b>Very Close</b>	 <b>High</b>	 <b>Simple</b>	 <b>No Need</b>
<b>Down Converter</b> 	 <b>Good</b>	 <b>Very Far</b>	 <b>Low</b>	 <b>Complex</b>	 <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



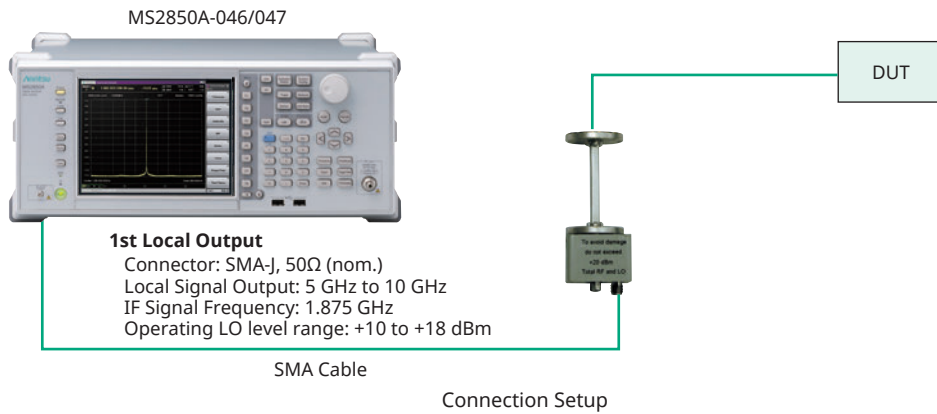
# Signal Analyzer MS2850A Functions

## 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

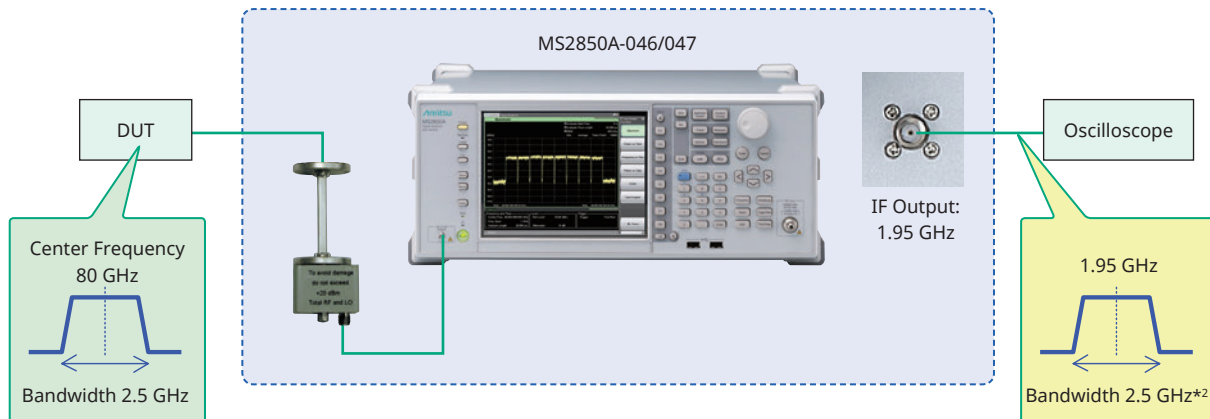
The signal-analyzer functions can be used by connecting either the High-Performance Waveguide mixer or an external mixer. This helps improve troubleshooting efficiency when confirming transient phenomena, such as a degraded spectrum that cannot be captured using a sweep-type spectrum analyzer.

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)**

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 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

## Single Carrier Measurement

### Constellation

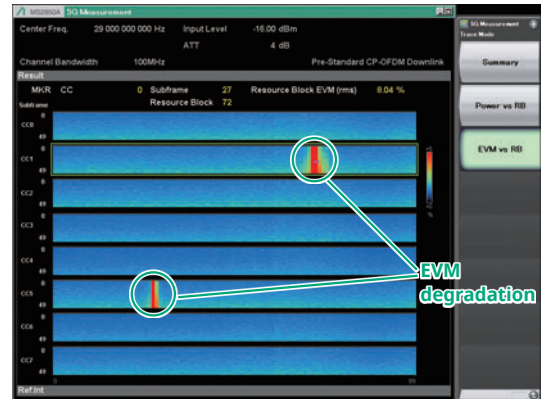
The frequency error for all sub-carriers, Tx power, EVM, etc., are displayed together on a constellation graph. Since peak values can be displayed simultaneously with mean values, the randomness of characteristics can be evaluated by comparing both values. Characteristics can be confirmed easily using the many intuitive graph displays.



## Multi Carrier Measurement

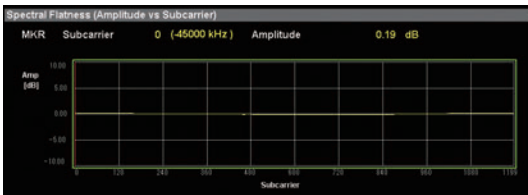
### EVM vs. RB Power vs. RB

Up to eight carriers can be analyzed at once as a batch to display the EVM and power for each resource block in the sub-frame section as a gradation. Since the power boosting applied to each resource block and the location of the degraded EVM caused by in-band interference can be monitored and compared visually for each carrier, this function plays a key role at R&D troubleshooting.



### Spectral Flatness

Graphs of the amplitude and phase for each sub-carrier are displayed for all symbols in a specified measurement region.



### Summary

Various data, such as the frequency error, Tx power, EVM, etc., can be analyzed at once as a batch for each carrier, which is useful for measuring the timing difference with other carriers based on a specified carrier.

Carrier	Frequency Error	Transmit Power	EVM (rms)	EVM (peak)	Timing Difference
CC0 (Ref)	23.24 Hz	-19.98 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 %	4.88 %	0.0 ns
CC3	25.92 Hz	-20.54 dBm	1.18 %	4.99 %	0.0 ns
CC4	26.95 Hz	-20.26 dBm	1.36 %	6.19 %	0.0 ns
CC5	27.82 Hz	-20.06 dBm	1.03 %	4.53 %	-1.5 ns
CC6	28.89 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

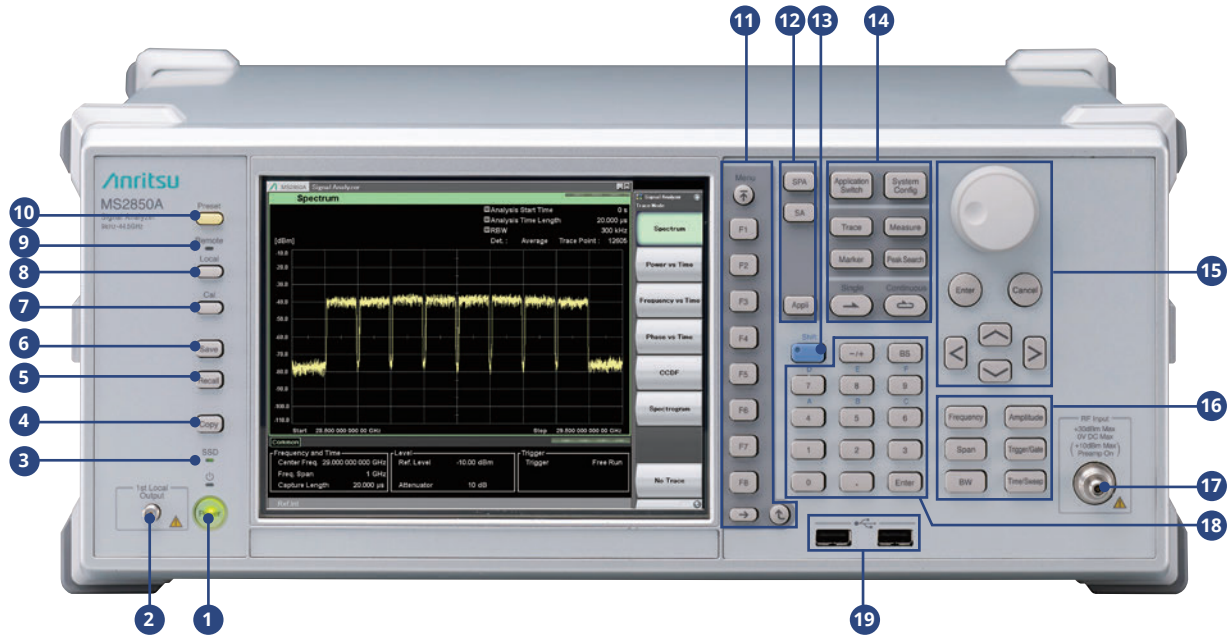
### Summary

Various data, such as the EVM and power for each channel (SS, xPDSCH, xPUSCH, xPDCCH), are tabulated.

Channel	Avg EVM (rms)	Max EVM (peak)	Avg Power	Symbol Clock Error
P-SS	0.96 %	2.87 %	612 0	IQ Skew 0.000 ppm
S-SS	0.95 %	1.90 %	547 0	IQ Imbalance 0.015 ns
E-SS	0.90 %	2.08 %	521 360	IQ Quad Error 0.000 dB
BRS	0.87 %	2.98 %	1183 4	IQ Quad Error 0.067 deg
xPBCH	0.86 %	2.83 %	326 12	Cell ID 0
xPDSCH	0.84 %	3.50 %	795 567	
UE-RS(xPDSCH)	0.62 %	1.70 %	32 30	
xPDCCH	0.87 %	2.80 %	364 238	
UE-RS(xPDCCH)	1.10 %	4.06 %	303 462	

# 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

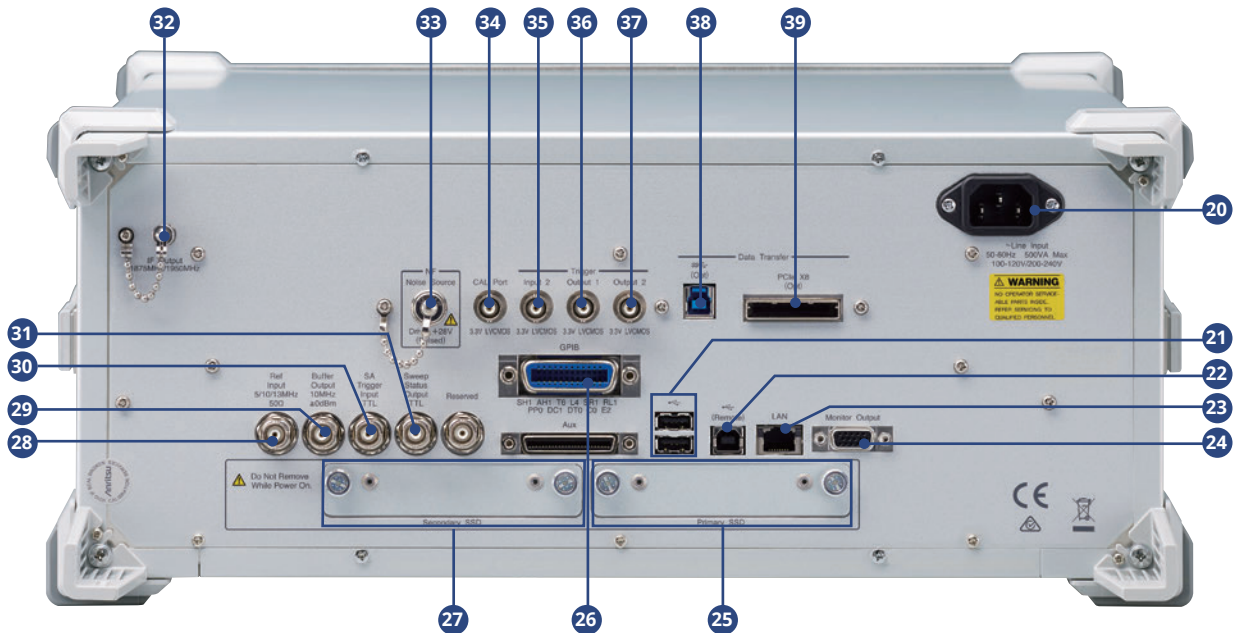
Used to enter numbers on parameter setup screens.

### 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 (44.5 GHz model)	MS2850A-047 (32 GHz model)	MS2850A-032 (standard install)	MS2850A-033	MS2850A-034	MS2850A-010	MS2850A-017	MS2850A-067 (standard install)	MS2850A-068	MS2850A-076	MS2850A-051	MS2850A-011	MS2850A-053	MS2850A-054		
MS2850A-032	Analysis Bandwidth 255 MHz	—	Standard install	Standard install														
MS2850A-033	Analysis Bandwidth Extension to 510 MHz	Yes	✓	✓														
MS2850A-034	Analysis Bandwidth Extension to 1 GHz	Yes	✓	✓		R												
MS2850A-010	Phase Noise Measurement Function	Yes	✓	✓														
MS2850A-017	Noise Figure Measurement Function	Yes	✓	✓														
MS2850A-067	Microwave Preselector Bypass	—	Standard install	Standard install														
MS2850A-068	Microwave Preamplifier	Yes	✓	✓														
MS2850A-076	Low Second Harmonic Distortion	Yes	✓	✓														
MS2850A-051	Noise Floor Reduction	Yes	✓	✓														
MS2850A-011	Secondary Storage Device	Yes	✓	✓														
MS2850A-053	External Interface for High Speed Data Transfer PCIe	Yes	✓	✓														
MS2850A-054	External Interface for High Speed Data Transfer USB3.0	Yes	✓	✓														

## Software Configuration

Option	Name	Addition to Main frame ✓ = Can be installed		Analysis Bandwidth option U = Upgrade		Note
		MS2850A-046 (44.5 GHz model)	MS2850A-047 (32 GHz model)	MS2850A-033 (510 MHz)	MS2850A-034 (1 GHz)	
MX285051A	5G Standard Measurement Software (Base License)	✓	✓	U	U	This license can't be used alone. Require MX285051A-001/051
MX285051A-001	Pre-Standard CP-OFDM Downlink	✓	✓	U	U	Require MX285051A
MX285051A-051	Pre-Standard CP-OFDM 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  $\leq 31.25$  MHz

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

31.25 < Analysis Bandwidth  $\leq 510$  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, 50 $\Omega$  (nom.)

### Aging Rate

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

### Max. Input Level

CW Average Power: +30 dBm  
 (Input Attenuator:  $\geq 10$  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  
 $\pm 0.5$  dB (300 kHz  $\leq$  Frequency < 4 GHz)  
 $\pm 1.8$  dB (4 GHz  $\leq$  Frequency  $\leq$  13.8 GHz)  
 $\pm 3.0$  dB (13.8 GHz < Frequency  $\leq$  40 GHz)  
 $\pm 3.5$  dB (40 GHz < Frequency < 44.5 GHz, nom.)

### Secondary Harmonic Distortion

Spectrum Analyzer Function  
 Signal Analyzer Function (Analysis Bandwidth:  $\leq 31.25$  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	$\leq -65$ dBc	$\geq +35$ dBm	-30 dBm
4 GHz, 13 GHz	$\leq -90$ dBc	$\geq +80$ dBm	-10 dBm
20 GHz	$\leq -90$ dBc (nom.)	$\geq +80$ 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  
(1 Hz to 10 Hz: Can not be set when Span 0 Hz)

### 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: EN61326-1, EN61000-3-2  
LVD: EN61010-1  
RoHS: EN50581

### OS

Windows 7 (64 bit)

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> Signal Analyzer
P0031A Z0541A	<b>Standard accessories</b> Power Cord: 1 pc USB Memory (≥1 GB): 1 pc USB Mouse: 1 pc Install DVD-ROM (Application software, instruction manual DVD-ROM): 1 pc
MS2850A-047 MS2850A-046	<b>Options</b> 32 GHz Signal Analyzer 44.5 GHz Signal Analyzer
MS2850A-033 MS2850A-034	Analysis Bandwidth Extension 510 MHz Analysis Bandwidth Extension 1 GHz
MS2850A-010 MS2850A-017 MS2850A-068 MS2850A-076 MS2850A-051	Phase Noise Measurement Function Noise Figure Measurement Function Microwave Preamplifier Low Second Harmonic Distortion Noise Floor Reduction
MS2850A-011 MS2850A-053 MS2850A-054	Secondary Storage Device External Interface for High Speed Data Transfer PCIe External Interface for High Speed Data Transfer USB3.0
MS2850A-133 MS2850A-134	<b>Retrofit options</b> Analysis Bandwidth Extension 510 MHz Retrofit Analysis Bandwidth Extension 1 GHz Retrofit
MS2850A-110 MS2850A-117 MS2850A-168 MS2850A-176 MS2850A-151	Phase Noise Measurement Function Retrofit Noise Figure Measurement Function Retrofit Microwave Preamplifier Retrofit Low Second Harmonic Distortion Retrofit Noise Floor Reduction Retrofit
MS2850A-111 MS2850A-153	Secondary Storage Device Retrofit External Interface for High Speed Data Transfer PCIe Retrofit
MS2850A-154	External Interface for High Speed Data Transfer USB3.0 Retrofit
MX285051A MX285051A-001 MX285051A-051 MX269011A MX269012A MX269013A MX269013A-001 MX269015A MX269017A MX269017A-001 MX269017A-011 MX269020A MX269020A-001 MX269021A MX269021A-001 MX269022A MX269022A-001 MX269023A MX269023A-001	<b>Software options</b> DVD-ROM with License and Operation manuals 5G Standard Measurement Software (Base License) (Requires MX285051A-001 and/or 051) Pre-Standard CP-OFDM Downlink (Requires MX285051A) Pre-Standard CP-OFDM Uplink (Requires MX285051A) W-CDMA/HSPA Downlink Measurement Software W-CDMA/HSPA Uplink Measurement Software GSM/EDGE Measurement Software EDGE Evolution Measurement Software (Requires MX269013A) TD-SCDMA Measurement Software Vector Modulation Analysis Software APSK Analysis (Requires MX269017A) Higher-Order QAM Analysis (Requires MX269017A) LTE Downlink Measurement Software LTE-Advanced FDD Downlink Measurement Software (Requires MX269020A) LTE Uplink Measurement Software LTE-Advanced FDD Uplink Measurement Software (Requires MX269021A) LTE TDD Downlink Measurement Software LTE-Advanced TDD Downlink Measurement Software (Requires MX269022A) LTE TDD Uplink Measurement Software LTE-Advanced TDD Uplink Measurement Software (Requires MX269023A)

Model/Order No.	Name
MS2850A-ES210 MS2850A-ES310 MS2850A-ES510	<b>Warranty service</b> 2 years Extended Warranty Service 3 years Extended Warranty Service 5 years Extended Warranty Service
W3920AE W2851AE W3335AE W2853AE W3336AE W2855AE W3117AE W3118AE W3655AE W3656AE W3450AE W3922AE W3924AE W3925AE W3098AE W3099AE W3060AE W3061AE W3100AE W3101AE W3044AE W3045AE W3305AE W3306AE W3014AE W3064AE W3015AE W3065AE W3209AE W3210AE W3521AE W3522AE	<b>Manuals</b> Following operation manuals provided as hard copy and written in English. MS2850A Operation Manual (Mainframe Operation) MS2690A/MS2691A/MS2692A/MS2830A/MS2840A and MS2850A Operation Manual (Mainframe Remote Control) MS2830A/MS2840A/MS2850A Operation Manual (Signal Analyzer Function Operation) MS2690A/MS2691A/MS2692A/MS2830A/MS2840A and MS2850A Operation Manual (Signal Analyzer Function Remote Control) MS2830A/MS2840A/MS2850A Operation Manual (Spectrum Analyzer Function Operation) MS2690A/MS2691A/MS2692A/MS2830A/MS2840A and MS2850A Operation Manual (Spectrum Analyzer Function Remote Control) MS2690A/MS2691A/MS2692A/MS2830A/MS2840A and MS2850A Operation Manual (Phase Noise Measurement Function Operation) MS2690A/MS2691A/MS2692A/MS2830A/MS2840A and MS2850A Operation Manual (Phase Noise Measurement Function Remote Control) MS2690A/MS2691A/MS2692A/MS2830A/MS2840A and MS2850A Operation Manual (Noise Figure Measurement Function Operation) MS2690A/MS2691A/MS2692A/MS2830A/MS2840A and MS2850A Operation Manual (Noise Figure Measurement Function Remote control) MS2850A-053/MS2850A-054 Operation Manual (External Interface for High Speed Data Transfer) MX285051A Operation Manual (Operation) MX285051A-001/MX285051A-051 Operation Manual (Operation) MX285051A-001/MX285051A-051 Operation Manual (Remote Control) MX269011A Operation Manual (Operation) MX269011A Operation Manual (Remote Control) MX269012A Operation Manual (Operation) MX269012A Operation Manual (Remote Control) MX269013A Operation Manual (Operation) MX269013A Operation Manual (Remote Control) MX269015A Operation Manual (Operation) MX269015A Operation Manual (Remote Control) MX269017A Operation Manual (Operation) MX269017A Operation Manual (Remote Control) MX269020A Operation Manual (Operation) MX269020A Operation Manual (Remote Control) MX269021A Operation Manual (Operation) MX269021A Operation Manual (Remote Control) MX269022A Operation Manual (Operation) MX269022A Operation Manual (Remote Control) MX269023A Operation Manual (Operation) 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 MA2808A	<b>High Performance Waveguide Mixer</b> High Performance Waveguide Mixer (50 to 75 GHz) High Performance Waveguide Mixer (60 to 90 GHz)
Z1922A	<b>Standard accessories</b> MA2806A USB Memory (Saved conversion loss data, for MA2806A): 1 pc
Z1923A	MA2808A USB Memory (Saved conversion loss data, for MA2808A): 1 pc
Z1625A	AC Adapter: 1 pc Power Cord: 1 pc
J1692B	Coaxial Cord, 1 m (SMA-P · SUCOFLEX104PE · SMA-P, DC to 18 GHz, 50Ω): 1 pc
MA2741C MA2742C MA2743C MA2744C MA2745C MA2746C MA2747C MA2748C MA2749C MA2750C MA2751C	<b>External Mixer (Harmonic Mixer)</b> External Mixer (26.5 GHz to 40 GHz) External Mixer (33 GHz to 50 GHz) External Mixer (40 GHz to 60 GHz) External Mixer (50 GHz to 75 GHz) External Mixer (60 GHz to 90 GHz) External Mixer (75 GHz to 110 GHz) External Mixer (90 GHz to 140 GHz) External Mixer (110 GHz to 170 GHz) External Mixer (140 GHz to 220 GHz) External Mixer (170 GHz to 260 GHz) 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> Ruggedized K-to-Type N Adapter (DC to 20 GHz, 50Ω, Ruggedized K-M · N-F, SWR: 1.5 (max.), Insertion Loss: 0.4 dB (max.))
K240B	Power Divider (K connector, DC to 26.5 GHz, 50Ω, K-J, 1 W max.)
MA1612A	Four-port Junction Pad (5 MHz to 3 GHz, N-J)
J1359A	Coaxial Adaptor (K-P · K-J, SMA)
J0576B	Coaxial Cord, 1 m (N-P · 5D-2W · N-P)
J0576D	Coaxial Cord, 2 m (N-P · 5D-2W · N-P)
J0127A	Coaxial Cord, 1 m (BNC-P · RG58A/U · BNC-P)
J0127B	Coaxial Cord, 2 m (BNC-P · RG58A/U · BNC-P)
J0127C	Coaxial Cord, 0.5 m (BNC-P · RG58A/U · BNC-P)
J0322A	Coaxial Cord, 0.5 m (DC to 18 GHz), (SMA-P · 50Ω SUCOFLEX104 · SMA-P)
J0322B	Coaxial Cord, 1 m (DC to 18 GHz), (SMA-P · 50Ω SUCOFLEX104 · SMA-P)
J0322C	Coaxial Cord, 1.5 m (DC to 18 GHz), (SMA-P · 50Ω SUCOFLEX104 · SMA-P)
J0322D	Coaxial Cord, 2 m (DC to 18 GHz), (SMA-P · 50Ω SUCOFLEX104 · SMA-P)
J0805	DC Block, N type (MODEL 7003) (10 kHz to 18 GHz, N-P · N-J)
J1554A	DC Block, SMA type (MODEL 7006) (9 kHz to 26.5 GHz, SMA-P · SMA-J)
J1555A	DC Block, SMA type (MODEL 7006-1) (9 kHz to 20 GHz, SMA-P · SMA-J)
K261	DC Block (10 kHz to 40 GHz, K-P · K-J)
J0004	Coaxial Adapter (DC to 12.4 GHz, 50Ω, N-P · SMA-J)
J1398A	N-SMA Adaptor (DC to 26.5 GHz, 50Ω, N-P · SMA-J)
J0911	Coaxial Cable, 1.0 m for 40 GHz (DC to 40 GHz, approx. 1 m, SF102A, 11K254/K254/1.0M)
J0912	Coaxial Cable, 0.5 m for 40 GHz (DC to 40 GHz, approx. 0.5 m, SF102A, 11K254/K254/0.5M)
41KC-3	Fixed Attenuator (DC to 40 GHz, 3 dB)
J1261A	Ethernet Cable (Shield type, Straight, 1 m)
J1261B	Ethernet Cable (Shield type, Straight, 3 m)
J1261C	Ethernet Cable (Shield type, Cross, 1 m)
J1261D	Ethernet Cable (Shield type, Cross, 3 m)
J0008	GPIO Cable, 2.0 m
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 (350 MHz to 4 GHz, with USB A to mini B cable)
MA24106A	USB Power Sensor (50 MHz to 6 GHz, with USB A to mini B cable)
MA24108A	Microwave USB Power Sensor (10 MHz to 8 GHz, with USB A to Micro-B cable)
MA24118A	Microwave USB Power Sensor (10 MHz to 18 GHz, with USB A to Micro-B cable)
MA24126A	Microwave USB Power Sensor (10 MHz to 26 GHz, with USB A to Micro-B cable)
Z0975A	Keyboard (USB)
Z1957A	Installation Kit (required when retrofitting options or installing software)
U0088A	<b>External Interface for High Speed Data Transfer</b> PCIe Host Adapter
J1749A	PCIe x8 Cable (2 m)

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

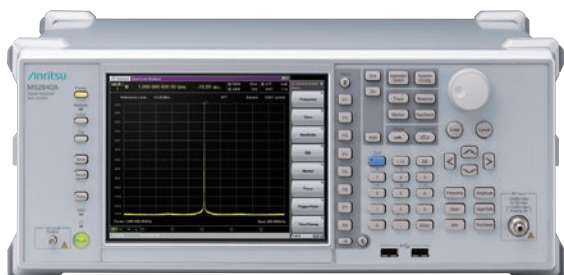


## Signal Analyzer MS2850A Related Products

### 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.



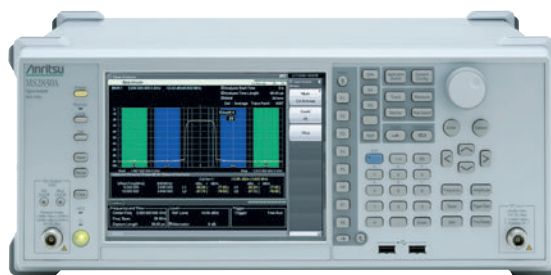
#### Features

- 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.

**Note:**

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**Note:**

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**Note:**

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