

**Anritsu** envision : ensure

# Signal Analyzer

## MS2850A

MS2850A-047: 9 kHz to 32 GHz

MS2850A-046: 9 kHz to 44.5 GHz



<b>Definitions.....</b>	<b>5</b>
<b>Conditions of Specifications .....</b>	<b>5</b>
<b>Signal Analyzer/Spectrum Analyzer.....</b>	<b>6</b>
Frequency .....	6
Performance guarantee frequency range.....	6
Frequency bands .....	6
Pre-selector range .....	6
Internal reference oscillator .....	6
Single side band noise (SSB phase noise).....	7
Spurious caused by the local signal.....	7
Amplitude.....	7
Level measurement range .....	7
Maximum input level.....	7
Input attenuator range .....	8
Input attenuator switching uncertainty.....	8
Reference level.....	8
Linearity error .....	8
RF frequency characteristics .....	9
Second harmonic distortion .....	10
Residual responses .....	11
<b>Spectrum Analyzer .....</b>	<b>12</b>
Frequency .....	12
Performance guarantee frequency range.....	12
Frequency setting range.....	12
SPAN.....	12
Display frequency accuracy.....	12
Resolution bandwidth (RBW).....	12
Video bandwidth (VBW).....	12
Amplitude.....	13
Display average noise level (DANL) .....	13
Total level accuracy .....	16
1 dB gain compression .....	16
Spurious responses.....	17
2-tone 3rd-order intermodulation distortion.....	17
Image Response .....	18
Sweep.....	18
Sweep mode .....	18
Sweep time.....	18
Waveform display.....	18
Detector .....	18
Trace points .....	18
Scale .....	18
Trigger function .....	18
Gate function.....	18
Measure function.....	19
Adjust channel power (ACP) .....	19
Burst average.....	19
Channel power.....	19
Occupied bandwidth (OBW).....	19
Spectrum emission mask (SEM) .....	19
Spurious emission.....	19
Frequency counter.....	19
Two-tone third-order intermodulation distortion.....	19

<b>Signal Analyzer .....</b>	<b>20</b>
Model/Name .....	20
Performance guarantee frequency range .....	20
Function .....	20
Trace mode .....	20
SPAN .....	20
Capture function .....	20
Trigger .....	20
ADC resolution .....	21
Spectrum displayed function .....	21
Analysis time length .....	21
Frequency .....	21
Resolution bandwidth (RBW) .....	21
Amplitude .....	21
In-band frequency characteristics .....	22
In-band phase linearity .....	23
Image response .....	23
RF frequency characteristics .....	23
Linearity error .....	23
Spurious free dynamic range due to ADC (SFDR) .....	23
ADC clipping level .....	23
IF output .....	24
Display average noise level (DANL) .....	24
Measure function .....	26
Power vs. Time .....	27
Analysis time range .....	27
Resolution bandwidth .....	27
Measure function .....	27
Frequency vs. Time .....	27
Analysis time range .....	27
Operating level range .....	27
Frequency (vertical axis) .....	27
Displayed frequency accuracy .....	27
Measure function .....	27
Phase vs. Time .....	27
Analysis time range .....	27
Phase (vertical axis) .....	27
CCDF .....	28
Analysis time range .....	28
Display .....	28
Resolution bandwidth .....	28
Spectrogram .....	28
Analysis time range .....	28
Frequency .....	28
Resolution bandwidth (RBW) .....	28
Replay function .....	28
<b>Connector .....</b>	<b>29</b>
RF input .....	29
External reference input .....	31
Reference signal output .....	31
Sweep status output .....	31
SA trigger input .....	31
SA trigger output .....	31
External controls .....	32
Ethernet (10/100/1000Base-T) .....	32
GPIB .....	32
USB (B) .....	32
USB (A) .....	32

# Contents

---

Monitor output.....	32
AUX (for future extension) .....	32
IF output .....	32
1st local output .....	32
Noise source.....	33
USB (B).....	34
PCIe.....	34
CAL port (for future extension).....	34
<b>Display .....</b>	<b>34</b>
<b>External Mixer .....</b>	<b>35</b>
Frequency.....	35
Frequency bands .....	35
Amplitude.....	35
Input/Output.....	35
High Performance Waveguide Mixer MA2806A/MA2808A .....	36
Electrical Characteristics .....	36
Interface.....	36
General.....	36
External Mixer MA2740C/MA2750C Series .....	36
<b>General .....</b>	<b>37</b>
Dimensions and mass.....	37
Power supply.....	37
Temperature .....	37
Environment performance.....	37
OS.....	37
<b>Options .....</b>	<b>37</b>
Phase Noise Measurement Function MS2850A-010.....	37
Frequency.....	37
Secondary Storage Device MS2850A-011 .....	37
Noise Figure Measurement Function MS2850A-017 .....	38
Frequency.....	38
NF measurement.....	38
Gain measurement .....	38
Resolution bandwidth.....	38
Analysis Bandwidth 255 MHz MS2850A-032 (Standard).....	38
Analysis Bandwidth Extension 510 MHz MS2850A-033.....	38
Analysis Bandwidth Extension 1 GHz MS2850A-034.....	38
Functions .....	38
Frequency.....	38
Amplitude.....	39
Noise Floor Reduction MS2850A-051.....	39
Noise Floor Reduction.....	39
External Interface for High Speed Data Transfer PCIe MS2850A-053.....	40
External Interface for High Speed Data Transfer USB3.0 MS2850A-054 .....	40
Microwave Preselector Bypass MS2850A-067 (Standard).....	40
Frequency.....	40
Amplitude.....	40
Microwave Preamplifier MS2850A-068 .....	41
Frequency.....	41
Amplitude.....	41
Extended Specifications MS2850A-072.....	41
Frequency response in a certain 100 MHz range within bandwidth .....	41
Phase linearity in a certain 100 MHz range within bandwidth.....	41
RF input.....	42
Low Second Harmonic Distortion MS2850A-076 .....	42
Frequency.....	42
Amplitude.....	42

## Definitions

---

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 by randomly selected measuring instruments.

## Conditions of Specifications

---

The conditions are as follows unless specified otherwise.

After 30-minute warm-up (at constant ambient temperature)

Auto Sweep Time Select: Normal

Auto Swp Type Rules: Swept Only

Switching Speed mode: Normal

Attenuator Mode: Mechanical Atten Only

After CAL operation

The conditions of Signal Analyzer mode are specified at center frequency unless otherwise noted.

95th percentile values indicate the breadth of the population (approx.  $2\sigma$ ) of performance tolerances expected to be met in

95 percent of the cases with a 95 percent confidence at shipment, for a certain temperature in the range of 18° to 28°C.

These values do not include measurement uncertainty, are not guaranteed, and are updated occasionally if a change in the statistical values is observed.

## Frequency

### Performance guarantee frequency range

Spectrum Analyzer mode, Signal Analyzer mode (Bandwidth  $\leq 31.25$  MHz)

MS2850A-047: 9 kHz to 32 GHz

MS2850A-046: 9 kHz to 44.5 GHz

Signal Analyzer mode (Bandwidth  $> 31.25$  MHz)

MS2850A-047: 800 MHz to 32 GHz

MS2850A-046: 800 MHz to 44.5 GHz

### Frequency bands

Spectrum Analyzer mode, Signal Analyzer mode (Bandwidth  $\leq 31.25$  MHz)

MS2850A-047/046

Frequency Range	Band	Mixer harmonics order (N)
9 kHz to 4000 MHz	0	1
3500 MHz to 4400 MHz	1	1/2
4300 MHz to 6000 MHz	2	1
3900 MHz to 8000 MHz	3	1
7900 MHz to 10575 MHz	4	1
10475 MHz to 12200 MHz	5	2
12100 MHz to 18400 MHz	6	2
18300 MHz to 26600 MHz	7	4
26500 MHz to 42100 MHz	8	4
42000 MHz to 44500 MHz	9	8

Signal Analyzer mode (Bandwidth  $> 31.25$  MHz)

MS2850A-047/046

Frequency Range	Band	Mixer harmonics order (N)
100 MHz to 4200 MHz	0	1
4200 MHz to 8000 MHz	2	1
8000 MHz to 10575 MHz	4	1
10575 MHz to 12200 MHz	5	2
12200 MHz to 18500 MHz	6	2
18500 MHz to 26400 MHz	7	4
26400 MHz to 42100 MHz	8	4
42100 MHz to 44500 MHz	9	8

### Pre-selector range

Model	Frequency Band Mode	
	Normal	Spurious
MS2850A-047/046	$> 4$ GHz	$\geq 3.5$ GHz

### Internal reference oscillator

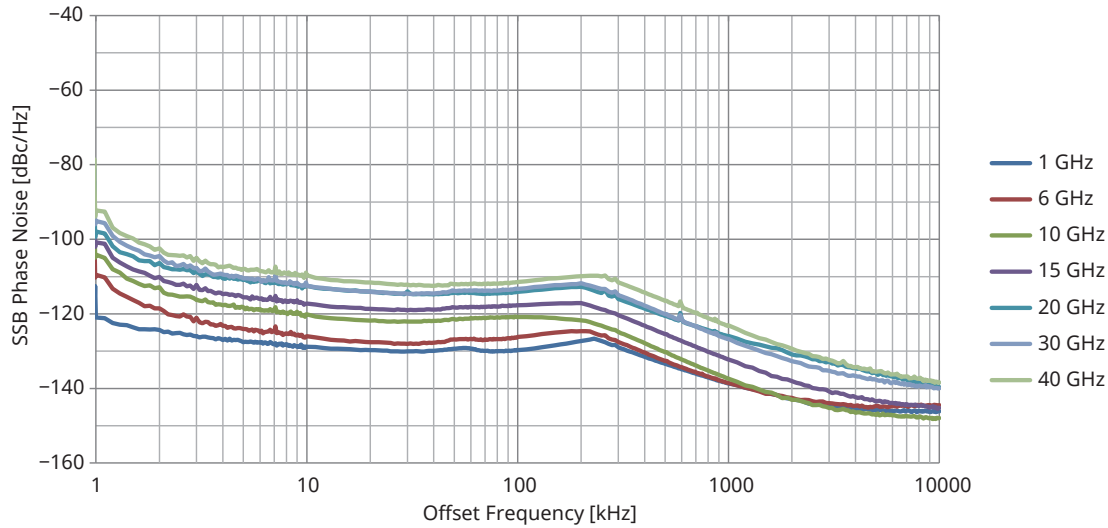
Accuracy	$\pm$ [(Time from the previous calibration $\times$ Aging rate) + Temperature characteristics + The initial calibration before shipment]
Activation characteristics	Based on frequency 24 hours after power application, at 23°C $\pm 5 \times 10^{-7}$ (2 minutes after power application) $\pm 5 \times 10^{-8}$ (5 minutes after power application)
Aging rate	$\pm 1 \times 10^{-7}$ /year
Temperature characteristics	$\pm 2 \times 10^{-8}$ (0°C to +45°C)
Frequency accuracy at the initial calibration	$\pm 2.2 \times 10^{-8}$ (18°C to 28°C, 1 hour after power application)

## Single side band noise (SSB phase noise)

At 18° to 28°C, Center frequency: 1 GHz, Spectrum Analyzer mode

Offset	Specification	95th percentile
10 Hz	-80 dBc/Hz (nom.)	—
100 Hz	-92 dBc/Hz (nom.)	—
1 kHz	-117 dBc/Hz (nom.)	—
10 kHz	-123 dBc/Hz	-127 dBc/Hz
100 kHz	-123 dBc/Hz	-126 dBc/Hz
1 MHz	-135 dBc/Hz	-136 dBc/Hz
10 MHz	-148 dBc/Hz (nom.)	—

### SSB Phase Noise (meas.)



## Spurious caused by the local signal

10 MHz < frequency ≤ 1 GHz

3 kHz ≤ offset frequency < 100 kHz	-70 dBc (nom.)
100 kHz ≤ offset frequency < 10 MHz	-75 dBc (nom.)

Frequency > 1 GHz

3 kHz ≤ offset frequency < 100 kHz	$-70 + 20 \times \log(f)$ dBc (nom.)
100 kHz ≤ offset frequency < 10 MHz	$-75 + 20 \times \log(N)$ dBc (nom.)

f: Receiving frequency [GHz] N: Mixing order

## Amplitude

### Level measurement range

Without MS2850A-068 or Preamp Off	DANL to +30 dBm
With MS2850A-068 and Preamp On	DANL to +10 dBm

### Maximum input level

	Average total power	DC voltage
Without MS2850A-068 or Preamp Off	+30 dBm (Input attenuator: ≥10 dB) +20 dBm (Input attenuator: 0 dB)	±0 Vdc
With MS2850A-068 and Preamp On	+10 dBm (Input attenuator: 0 dB)	±0 Vdc

## Input attenuator range

0 to 60 dB, 2 dB Steps

E-ATT Combined Mode is available on following conditions.

Spectrum Analyzer mode, Signal Analyzer mode (Bandwidth  $\leq 31.25$  MHz)

Frequency Band: Normal:  $0 \text{ Hz} \leq \text{frequency} \leq 6 \text{ GHz}$

Frequency Band: Spurious:  $0 \text{ Hz} \leq \text{frequency} \leq 4 \text{ GHz}$

Signal Analyzer mode (Bandwidth  $> 31.25$  MHz)

$100 \text{ MHz} \leq \text{frequency} < 4.2 \text{ GHz}$

## Input attenuator switching uncertainty

At  $18^\circ\text{C}$  to  $28^\circ\text{C}$ , Referenced to 10 dB, without MS2850A-068 or Preamp Off, 10 to 60 dB

Frequency Range	Spectrum Analyzer mode Signal Analyzer mode (Bandwidth $\leq 31.25$ MHz)	Signal Analyzer mode (Bandwidth $> 31.25$ MHz)
$300 \text{ kHz} \leq \text{frequency} < 4 \text{ GHz}$ , Frequency Band Mode: Normal $300 \text{ kHz} \leq \text{frequency} < 3.5 \text{ GHz}$ , Frequency Band Mode: Spurious	$\pm 0.20 \text{ dB}$	$\pm 0.30 \text{ dB}$
$4 \text{ GHz} \leq \text{frequency} \leq 13.8 \text{ GHz}$ , Frequency Band Mode: Normal $3.5 \text{ GHz} \leq \text{frequency} \leq 13.8 \text{ GHz}$ , Frequency Band Mode: Spurious	$\pm 0.75 \text{ dB}$	
$13.8 \text{ GHz} < \text{frequency} \leq 26.5 \text{ GHz}$	$\pm 0.80 \text{ dB}$	
$26.5 \text{ GHz} < \text{frequency} \leq 40 \text{ GHz}$	$\pm 1.0 \text{ dB}$	
$40 \text{ GHz} < \text{frequency} \leq 44.5 \text{ GHz}$	$\pm 1.0 \text{ dB (typ.)}$	

## Reference level

Setting range

Log scale:  $-120$  to  $+50 \text{ dBm}$ , or Equivalent level

Linear scale:  $22.4 \mu\text{V}$  to  $70.7 \text{ V}$ , or Equivalent level

Setting resolution:  $0.01 \text{ dB}$ , or Equivalent level

Scale units

Log scale:  $\text{dBm}$ ,  $\text{dB}\mu\text{V}$ ,  $\text{dBmV}$ ,  $\text{dB}\mu\text{V (emf)}$ ,  $\text{dB}\mu\text{V/m}$ ,  $\text{V}$ ,  $\text{W}$

Linear scale:  $\text{V}$

## Linearity error

Spectrum Analyzer mode, Signal Analyzer mode, without MS2850A-051/151 or Noise Floor Reduction: Off (Bandwidth  $\leq 31.25$  MHz), Excluding the noise floor effect

Without MS2850A-068 or Preamp Off	Mixer input level: $\leq -20 \text{ dBm}$	$\pm 0.07 \text{ dB}$
	Mixer input level: $\leq -10 \text{ dBm}$	$\pm 0.10 \text{ dB}$
With MS2850A-068 and Preamp On	Preamplifier input level: $\leq -40 \text{ dBm}$	$\pm 0.07 \text{ dB}$
	Preamplifier input level: $\leq -30 \text{ dBm}$	$\pm 0.10 \text{ dB}$
Attenuator Mode: E-ATT Combined, Without MS2850A-068 or Preamp Off	Mixer input level: $\leq -20 \text{ dBm}$ , RF input level: $\leq -10 \text{ dBm}$	$\pm 0.07 \text{ dB}$
	Mixer input level: $\leq -10 \text{ dBm}$ , RF input level: $\leq -10 \text{ dBm}$	$\pm 0.10 \text{ dB}$
	Mixer input level: $\leq -20 \text{ dBm}$ , $9 \text{ kHz} \leq \text{frequency} \leq 300 \text{ MHz}$ , RF input level: $\leq +5 \text{ dBm}$	$\pm 0.07 \text{ dB (nom.)}$
	Mixer input level: $\leq -20 \text{ dBm}$ , $300 \text{ MHz} < \text{frequency} \leq 6 \text{ GHz}$ , RF input level: $\leq +20 \text{ dBm}$	
	Mixer input level: $\leq -10 \text{ dBm}$ , $9 \text{ kHz} \leq \text{frequency} \leq 300 \text{ MHz}$ , RF input level: $\leq +5 \text{ dBm}$	$\pm 0.10 \text{ dB (nom.)}$
	Mixer input level: $\leq -10 \text{ dBm}$ , $300 \text{ MHz} < \text{frequency} \leq 6 \text{ GHz}$ , RF input level: $\leq +20 \text{ dBm}$	

Signal Analyzer mode (Bandwidth  $> 31.25$  MHz), Excluding the noise floor effect

Without MS2850A-068 or Preamp Off	Mixer input level: $\leq -10 \text{ dBm}$	$\pm 0.20 \text{ dB (typ.)}$
With MS2850A-068 and Preamp On	Preamplifier input level: $\leq -30 \text{ dBm}$	$\pm 0.20 \text{ dB (typ.)}$



## RF frequency characteristics

Microwave Preselector Bypass: Off

	Without MS2850A-068 or Preamp Off 18°C to 28°C, Input attenuator: 10 dB, Preselector Auto Tune is done	
	Spectrum Analyzer mode Signal Analyzer mode (Bandwidth ≤31.25 MHz)	Signal Analyzer mode (Bandwidth >31.25 MHz)
9 kHz ≤ frequency < 300 kHz	±1.00 dB	—
300 kHz ≤ frequency < 50 MHz	±0.35 dB	—
50 MHz ≤ frequency < 4 GHz, Frequency Band Mode: Normal	±0.35 dB	±0.45 dB
50 MHz ≤ frequency < 3.5 GHz, Frequency Band Mode: Spurious		
4 GHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal	±1.50 dB	
3.5 GHz ≤ frequency ≤ 4 GHz, Frequency Band Mode: Spurious		
6 GHz < frequency ≤ 13.8 GHz, Frequency Band Mode: Normal	±1.50 dB	
4 GHz < frequency ≤ 13.8 GHz, Frequency Band Mode: Spurious		
13.8 GHz < frequency ≤ 26.5 GHz	±2.50 dB	
26.5 GHz < frequency ≤ 40 GHz	±2.50 dB	
40 GHz < frequency ≤ 44.5 GHz	±2.50 dB (typ.)	

Microwave Preselector Bypass: Off

	With MS2850A-068 and Preamp On, 18°C to 28°C, Input attenuator: 10 dB, Preselector Auto Tune is done	
	Spectrum Analyzer mode Signal Analyzer mode (Bandwidth ≤31.25 MHz)	Signal Analyzer mode (Bandwidth >31.25 MHz)
100 kHz ≤ frequency < 300 kHz	±1.00 dB	—
300 kHz ≤ frequency < 4 GHz, Frequency Band Mode: Normal	±0.65 dB	±0.75 dB
300 kHz ≤ frequency < 3.5 GHz, Frequency Band Mode: Spurious		
4 GHz ≤ frequency ≤ 13.8 GHz, Frequency Band Mode: Normal	±1.80 dB	
3.5 GHz ≤ frequency ≤ 13.8 GHz, Frequency Band Mode: Spurious		
13.8 GHz < frequency ≤ 26.5 GHz	±2.50 dB	
26.5 GHz < frequency ≤ 40 GHz	±3.50 dB	
40 GHz < frequency ≤ 44.5 GHz	±3.50 dB (nom.)	

Microwave Preselector Bypass: On

	Without MS2850A-068 or Preamp Off, 18°C to 28°C, Input attenuator: 10 dB	
	Spectrum Analyzer mode	Signal Analyzer mode
6 GHz < frequency ≤ 13.8 GHz, Frequency Band Mode: Normal	±1.0 dB	
4 GHz < frequency ≤ 13.8 GHz, Frequency Band Mode: Spurious		
4 GHz ≤ frequency ≤ 13.8 GHz, Signal Analyzer mode (Bandwidth >31.25 MHz)		
13.8 GHz < frequency ≤ 26.5 GHz	±1.5 dB	
26.5 GHz < frequency ≤ 40 GHz	±2.0 dB	
40 GHz < frequency ≤ 44.5 GHz	±2.0 dB (typ.)	

Microwave Preselector Bypass: On

	With MS2850A-068 and Preamp On, 18°C to 28°C, Input attenuator: 10 dB
	Spectrum Analyzer mode Signal Analyzer mode
6 GHz < frequency ≤ 13.8 GHz, Frequency Band Mode: Normal	±1.8 dB
4 GHz < frequency ≤ 13.8 GHz, Frequency Band Mode: Spurious	
4 GHz ≤ frequency ≤ 13.8 GHz, Signal Analyzer mode (Bandwidth >31.25 MHz)	
13.8 GHz < frequency ≤ 26.5 GHz	±2.5 dB
26.5 GHz < frequency ≤ 40 GHz	±3.0 dB
40 GHz < frequency ≤ 44.5 GHz	±3.0 dB (nom.)

## Second harmonic distortion

Without MS2850A-076,  
Without MS2850A-068 or Preamp Off,  
Microwave Preselector Bypass: Off,  
Spectrum Analyzer mode or Signal Analyzer mode (Bandwidth ≤31.25 MHz)

At mixer input level: -30 dBm

Frequency Range	Harmonics	SHI
10 MHz ≤ Input frequency ≤ 300 MHz	≤ -60 dBc	≥ +30 dBm
300 MHz < Input frequency ≤ 1 GHz	≤ -65 dBc	≥ +35 dBm
1 GHz < Input frequency ≤ 2 GHz, Frequency Band Mode: Normal	≤ -65 dBc	≥ +35 dBm
1 GHz < Input frequency < 1.75 GHz, Frequency Band Mode: Spurious	≤ -65 dBc	≥ +35 dBm

At mixer input level: -20 dBm

Frequency Range	Harmonics	SHI
2 GHz < Input frequency ≤ 3 GHz, Frequency Band Mode: Normal	≤ -80 dBc	≥ +60 dBm
1.75 GHz ≤ Input frequency ≤ 2 GHz, Frequency Band Mode: Spurious	≤ -80 dBc	≥ +60 dBm

At mixer input level: -10 dBm

Frequency Range	Harmonics	SHI
2 GHz < Input frequency ≤ 3 GHz, Frequency Band Mode: Spurious	≤ -70 dBc	≥ +60 dBm
3 GHz < Input frequency ≤ 13.25 GHz	≤ -70 dBc	≥ +60 dBm
13.25 GHz < Input frequency ≤ 22.25 GHz	≤ -70 dBc (nom.)	≥ +60 dBm (nom.)

With MS2850A-076, Without MS2850A-068 or Preamp Off,  
Microwave Preselector Bypass: Off,  
Spectrum Analyzer mode or Signal Analyzer mode (Bandwidth ≤31.25 MHz)

At mixer input level: -30 dBm

Frequency Range	Harmonics	SHI
10 MHz ≤ Input frequency ≤ 300 MHz	≤ -60 dBc	≥ +30 dBm
300 MHz < Input frequency ≤ 1 GHz	≤ -65 dBc	≥ +35 dBm
1 GHz < Input frequency ≤ 2 GHz, Frequency Band Mode: Normal	≤ -65 dBc	≥ +35 dBm
1 GHz < Input frequency < 1.75 GHz, Frequency Band Mode: Spurious	≤ -65 dBc	≥ +35 dBm

At mixer input level: -20 dBm

Frequency Range	Harmonics	SHI
2 GHz < Input frequency ≤ 3 GHz, Frequency Band Mode: Normal	≤ -80 dBc	≥ +60 dBm
1.75 GHz ≤ Input frequency ≤ 2 GHz, Frequency Band Mode: Spurious	≤ -80 dBc	≥ +60 dBm

At mixer input level: -10 dBm

Frequency Range	Harmonics	SHI
2 GHz < Input frequency ≤ 3 GHz, Frequency Band Mode: Spurious	≤ -80 dBc	≥ +70 dBm
3 GHz < Input frequency ≤ 13.25 GHz	≤ -90 dBc	≥ +80 dBm
13.25 GHz < Input frequency ≤ 22.25 GHz	≤ -90 dBc (nom.)	≥ +80 dBm (nom.)

With MS2850A-068 and Preamp On,  
Microwave Preselector Bypass: Off

At preamplifier input level: -45 dBm

Frequency Range	Harmonics	SHI
10 MHz ≤ Input frequency ≤ 300 MHz	≤ -50 dBc (nom.)	≥ +5 dBm (nom.)
300 MHz < Input frequency ≤ 2 GHz	≤ -55 dBc (nom.)	≥ +10 dBm (nom.)
2 GHz < Input frequency ≤ 13.25 GHz	≤ -45 dBc (nom.)	≥ 0 dBm (nom.)
13.25 GHz < Input frequency ≤ 22.25 GHz	≤ -40 dBc (nom.)	≥ -5 dBm (nom.)

Attenuator Mode : E-ATT Combined  
Without MS2850A-068 or Preamp Off

At mixer input level: -30 dBm

Frequency Range	RF input level	Harmonics	SHI
10 MHz ≤ Input frequency ≤ 300 MHz	≤ -5 dBm	≤ -60 dBc	≥ +30 dBm
300 MHz < Input frequency ≤ 1 GHz	≤ -5 dBm	≤ -65 dBc	≥ +35 dBm
1 GHz < Input frequency ≤ 2 GHz, Frequency Band Mode: Normal 1 GHz < Input frequency < 1.75 GHz, Frequency Band Mode: Spurious	≤ +5 dBm	≤ -65 dBc	≥ +35 dBm

At mixer input level: -20 dBm

Frequency Range	RF input level	Harmonics	SHI
2 GHz < Input frequency ≤ 3 GHz, Frequency Band Mode: Normal 1.75 GHz ≤ Input frequency ≤ 3 GHz, Frequency Band Mode: Spurious	≤ +5 dBm	≤ -80 dBc	≥ +60 dBm

At mixer input level: -30 dBm

Frequency Range	RF input level	Harmonics	SHI
10 MHz ≤ Input frequency ≤ 300 MHz	≤ 0 dBm	≤ -60 dBc (nom.)	≥ +30 dBm (nom.)
300 MHz < Input frequency ≤ 1 GHz	≤ +15 dBm	≤ -65 dBc (nom.)	≥ +35 dBm (nom.)
1 GHz < Input frequency ≤ 2 GHz, Frequency Band Mode: Normal 1 GHz < Input frequency < 1.75 GHz, Frequency Band Mode: Spurious	≤ +15 dBm	≤ -65 dBc (nom.)	≥ +35 dBm (nom.)

At mixer input level: -20 dBm

Frequency Range	RF input level	Harmonics	SHI
2 GHz < Input frequency ≤ 3 GHz, Frequency Band Mode: Normal 1.75 GHz ≤ Input frequency ≤ 2 GHz, Frequency Band Mode: Spurious	-5 dBm < RF input level ≤ +15 dBm	≤ -80 dBc (nom.)	≥ +60 dBm (nom.)

## Residual responses

Frequency ≥ 1 MHz, Input attenuator 0 dB, 50Ω terminated,  
Spectrum Analyzer mode or Signal Analyzer mode (Bandwidth ≤ 31.25 MHz)

1 MHz ≤ frequency ≤ 1 GHz	≤ -100 dBm
1 GHz < frequency ≤ 6 GHz	≤ -90 dBm (typ.)
6 GHz < frequency ≤ 13.6 GHz	≤ -90 dBm (nom.)
13.6 GHz < frequency ≤ 26.5 GHz	≤ -90 dBm (nom.)
26.5 GHz < frequency ≤ 44.5 GHz	≤ -80 dBm (nom.)

## Frequency

### Performance guarantee frequency range

Model	Frequency Range
MS2850A-047	9 kHz to 32 GHz
MS2850A-046	9 kHz to 44.5 GHz

### Frequency setting range

Model	Setting Range	Setting resolution
MS2850A-047	-100 MHz to 32.5 GHz	1 Hz
MS2850A-046	-100 MHz to 45 GHz	1 Hz

### SPAN

Model	Setting Range	Setting resolution
MS2850A-047	0 Hz, 300 Hz to 32 GHz	2 Hz
MS2850A-046	0 Hz, 300 Hz to 44.5 GHz	2 Hz

SPAN accuracy:  $\pm 0.2\%$  (Trace Point 10,001)

### Display frequency accuracy

$\pm (\text{Display frequency} \times \text{Frequency reference accuracy} + \text{SPAN frequency} \times \text{SPAN accuracy} + \text{RBW} \times 0.05 + 2 \times N + \text{SPAN frequency}/(\text{Trace points} - 1)) \text{ Hz}$

N: Mixer harmonic order

### Resolution bandwidth (RBW)

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
Selectivity	(-60 dB/-3 dB) 4.5: 1 (1 Hz to 10 MHz, nom.)

### Video bandwidth (VBW)

Setting range	1 Hz to 3 kHz (1-3 sequence), 5 kHz, 10 kHz to 10 MHz (1-3 sequence), Off
Selectivity	(-60 dB/-3 dB) 4.5: 1 (1 Hz to 10 MHz, nom.)
VBW Mode	Video Average/Power Average

## Amplitude

### Display average noise level (DANL)

At 18°C to 28°C, Detector: Sample, VBW: 1 Hz (Video Average), Input attenuator: 0 dB

Without MS2850A-068, Without MS2850A-076,  
Microwave Preselector Bypass: On/Off Common,  
Frequency Band Mode: Normal  
or

Without MS2850A-068, With MS2850A-076,  
Microwave Preselector Bypass: On,  
Frequency Band Mode: Normal

Frequency Range	DANL
9 kHz ≤ frequency < 100 kHz	-120 dBm/Hz
100 kHz ≤ frequency < 1 MHz	-134 dBm/Hz
1 MHz ≤ frequency < 10 MHz	-144 dBm/Hz
10 MHz ≤ frequency < 30 MHz	-150 dBm/Hz
30 MHz ≤ frequency < 1 GHz	-153 dBm/Hz
1 GHz ≤ frequency < 2.4 GHz	-150 dBm/Hz
2.4 GHz ≤ frequency ≤ 3.5 GHz	-147 dBm/Hz
3.5 GHz < frequency ≤ 4 GHz	-144 dBm/Hz
4 GHz < frequency ≤ 6 GHz	-144 dBm/Hz
6 GHz < frequency ≤ 13 GHz	-146 dBm/Hz
13 GHz < frequency ≤ 18.3 GHz	-144 dBm/Hz
18.3 GHz < frequency ≤ 26.5 GHz	-140 dBm/Hz
26.5 GHz < frequency ≤ 34 GHz	-140 dBm/Hz
34 GHz < frequency ≤ 40 GHz	-136 dBm/Hz
40 GHz < frequency ≤ 44.5 GHz	-130 dBm/Hz (nom.)

With MS2850A-068 and Preamp: Off, Without MS2850A-076,  
Microwave Preselector Bypass: On/Off Common,  
Frequency Band Mode: Normal

Frequency Range	DANL	95th percentile
9 kHz ≤ frequency < 100 kHz	-120 dBm/Hz	-137 dBm/Hz
100 kHz ≤ frequency < 1 MHz	-134 dBm/Hz	-143 dBm/Hz
1 MHz ≤ frequency < 10 MHz	-144 dBm/Hz	-148 dBm/Hz
10 MHz ≤ frequency < 30 MHz	-150 dBm/Hz	-152 dBm/Hz
30 MHz ≤ frequency < 1 GHz	-153 dBm/Hz	-153 dBm/Hz
1 GHz ≤ frequency < 2.4 GHz	-150 dBm/Hz	-152 dBm/Hz
2.4 GHz ≤ frequency ≤ 3.5 GHz	-147 dBm/Hz	-148 dBm/Hz
3.5 GHz < frequency ≤ 4 GHz	-144 dBm/Hz	-148 dBm/Hz
4 GHz < frequency ≤ 6 GHz	-144 dBm/Hz	-148 dBm/Hz
6 GHz < frequency ≤ 13 GHz	-142 dBm/Hz	-145 dBm/Hz
13 GHz < frequency ≤ 18.3 GHz	-140 dBm/Hz	-141 dBm/Hz
18.3 GHz < frequency ≤ 26.5 GHz	-136 dBm/Hz	-137 dBm/Hz
26.5 GHz < frequency ≤ 34 GHz	-135 dBm/Hz	-139 dBm/Hz
34 GHz < frequency ≤ 40 GHz	-131 dBm/Hz	-134 dBm/Hz
40 GHz < frequency ≤ 44.5 GHz	-125 dBm/Hz (nom.)	—

With MS2850A-068 and Preamp: Off, With MS2850A-076  
Microwave Preselector Bypass: On,  
Frequency Band Mode: Normal

Frequency Range	DANL
9 kHz ≤ frequency < 100 kHz	-120 dBm/Hz
100 kHz ≤ frequency < 1 MHz	-134 dBm/Hz
1 MHz ≤ frequency < 10 MHz	-144 dBm/Hz
10 MHz ≤ frequency < 30 MHz	-150 dBm/Hz
30 MHz ≤ frequency < 1 GHz	-153 dBm/Hz
1 GHz ≤ frequency < 2.4 GHz	-150 dBm/Hz
2.4 GHz ≤ frequency ≤ 3.5 GHz	-147 dBm/Hz
3.5 GHz < frequency ≤ 4 GHz	-144 dBm/Hz
4 GHz < frequency ≤ 6 GHz	-144 dBm/Hz
6 GHz < frequency ≤ 13 GHz	-142 dBm/Hz
13 GHz < frequency ≤ 18.3 GHz	-140 dBm/Hz
18.3 GHz < frequency ≤ 26.5 GHz	-136 dBm/Hz
26.5 GHz < frequency ≤ 34 GHz	-135 dBm/Hz
34 GHz < frequency ≤ 40 GHz	-131 dBm/Hz
40 GHz < frequency ≤ 44.5 GHz	-125 dBm/Hz (nom.)

With MS2850A-068 and Preamp: On, Without MS2850A-076,  
Microwave Preselector Bypass: On,  
Frequency Band Mode: Normal

Frequency Range	DANL	95th percentile
100 kHz	-147 dBm/Hz (nom.)	—
1 MHz	-156 dBm/Hz	-163 dBm/Hz
30 MHz ≤ frequency < 1 GHz	-166 dBm/Hz	-168 dBm/Hz
1 GHz ≤ frequency < 2 GHz	-164 dBm/Hz	-167 dBm/Hz
2 GHz ≤ frequency ≤ 3.5 GHz	-163 dBm/Hz	-165 dBm/Hz
3.5 GHz < frequency ≤ 4 GHz	-160 dBm/Hz	-164 dBm/Hz
4 GHz < frequency ≤ 6 GHz	-160 dBm/Hz	-162 dBm/Hz
6 GHz < frequency ≤ 13 GHz	-160 dBm/Hz	-162 dBm/Hz
13 GHz < frequency ≤ 18.3 GHz	-159 dBm/Hz	-161 dBm/Hz
18.3 GHz < frequency ≤ 26.5 GHz	-155 dBm/Hz	-157 dBm/Hz
26.5 GHz < frequency ≤ 34 GHz	-152 dBm/Hz	-156 dBm/Hz
34 GHz < frequency ≤ 40 GHz	-149 dBm/Hz	-151 dBm/Hz
40 GHz < frequency ≤ 44.5 GHz	-142 dBm/Hz (nom.)	—

With MS2850A-068 and Preamp: On, With MS2850A-076,  
Microwave Preselector Bypass: On,  
Frequency Band Mode: Normal

Frequency Range	DANL
100 kHz	-147 dBm/Hz (nom.)
1 MHz	-156 dBm/Hz
30 MHz ≤ frequency < 1 GHz	-166 dBm/Hz
1 GHz ≤ frequency < 2 GHz	-164 dBm/Hz
2 GHz ≤ frequency ≤ 3.5 GHz	-163 dBm/Hz
3.5 GHz < frequency ≤ 4 GHz	-160 dBm/Hz
4 GHz < frequency ≤ 6 GHz	-160 dBm/Hz
6 GHz < frequency ≤ 13 GHz	-160 dBm/Hz
13 GHz < frequency ≤ 18.3 GHz	-159 dBm/Hz
18.3 GHz < frequency ≤ 26.5 GHz	-155 dBm/Hz
26.5 GHz < frequency ≤ 34 GHz	-152 dBm/Hz
34 GHz < frequency ≤ 40 GHz	-149 dBm/Hz
40 GHz < frequency ≤ 44.5 GHz	-142 dBm/Hz (nom.)

With MS2850A-068 and Preamp: On, Without MS2850A-076,  
 Microwave Preselector Bypass: Off,  
 Frequency Band Mode: Normal

Frequency Range	DANL	95th percentile
100 kHz	-147 dBm/Hz (nom.)	—
1 MHz	-156 dBm/Hz	-163 dBm/Hz
30 MHz ≤ frequency < 1 GHz	-166 dBm/Hz	-168 dBm/Hz
1 GHz ≤ frequency < 2 GHz	-164 dBm/Hz	-166 dBm/Hz
2 GHz ≤ frequency ≤ 3.5 GHz	-163 dBm/Hz	-165 dBm/Hz
3.5 GHz < frequency ≤ 4 GHz	-160 dBm/Hz	-164 dBm/Hz
4 GHz < frequency ≤ 6 GHz	-160 dBm/Hz	-162 dBm/Hz
6 GHz < frequency ≤ 13 GHz	-163 dBm/Hz	-165 dBm/Hz
13 GHz < frequency ≤ 18.3 GHz	-162 dBm/Hz	-164 dBm/Hz
18.3 GHz < frequency ≤ 26.5 GHz	-159 dBm/Hz	-161 dBm/Hz
26.5 GHz < frequency ≤ 34 GHz	-156 dBm/Hz	-159 dBm/Hz
34 GHz < frequency ≤ 40 GHz	-153 dBm/Hz	-156 dBm/Hz
40 GHz < frequency ≤ 44.5 GHz	-145 dBm/Hz (nom.)	—

With MS2850A-068 and Preamp: On, With MS2850A-076,  
 Microwave Preselector Bypass: Off,  
 Frequency Band Mode: Normal

Frequency Range	DANL
100 kHz	-147 dBm/Hz (nom.)
1 MHz	-156 dBm/Hz
30 MHz ≤ frequency < 1 GHz	-166 dBm/Hz
1 GHz ≤ frequency < 2 GHz	-164 dBm/Hz
2 GHz ≤ frequency ≤ 3.5 GHz	-163 dBm/Hz
3.5 GHz < frequency ≤ 4 GHz	-160 dBm/Hz
4 GHz < frequency ≤ 6 GHz	-160 dBm/Hz
6 GHz < frequency ≤ 13 GHz	-163 dBm/Hz
13 GHz < frequency ≤ 18.3 GHz	-162 dBm/Hz
18.3 GHz < frequency ≤ 26.5 GHz	-159 dBm/Hz
26.5 GHz < frequency ≤ 34 GHz	-156 dBm/Hz
34 GHz < frequency ≤ 40 GHz	-153 dBm/Hz
40 GHz < frequency ≤ 44.5 GHz	-145 dBm/Hz (nom.)

Without MS2850A-068 or With MS2850A-068 and Preamp: Off,  
 With MS2850A-076,  
 Microwave Preselector Bypass: Off,  
 Frequency Band Mode: Normal

Frequency Range	DANL
9 kHz ≤ frequency < 100 kHz	-120 dBm/Hz
100 kHz ≤ frequency < 1 MHz	-134 dBm/Hz
1 MHz ≤ frequency < 10 MHz	-144 dBm/Hz
10 MHz ≤ frequency < 30 MHz	-150 dBm/Hz
30 MHz ≤ frequency < 1 GHz	-153 dBm/Hz
1 GHz ≤ frequency < 2.4 GHz	-150 dBm/Hz
2.4 GHz ≤ frequency ≤ 3.5 GHz	-147 dBm/Hz
3.5 GHz < frequency ≤ 4 GHz	-144 dBm/Hz
4 GHz < frequency ≤ 6 GHz	-144 dBm/Hz
6 GHz < frequency ≤ 13 GHz	-147 dBm/Hz
13 GHz < frequency ≤ 18.3 GHz	-145 dBm/Hz
18.3 GHz < frequency ≤ 26.5 GHz	-141 dBm/Hz
26.5 GHz < frequency ≤ 34 GHz	-141 dBm/Hz
34 GHz < frequency ≤ 40 GHz	-139 dBm/Hz
40 GHz < frequency ≤ 44.5 GHz	-134 dBm/Hz (nom.)

## Total level accuracy

At 18°C to 28°C, without MS2850A-051/151 or Noise Floor Reduction: Off, Auto Sweep Time Select: Normal, 30 Hz ≤ RBW ≤ 1 MHz,

Detection: Positive, CW, Excluding the noise floor effect and FFT runtime,

Preamp Off: Input Attenuator ≥ 10 dB, Mixer input level ≤ -10 dBm,

Preamp On: Input Attenuator = 10 dB, Preamplifier input level ≤ -30 dBm

The total level accuracy is calculated from an RSS (root summed square) error of the RF frequency characteristics, linearity error and input attenuator switching error.

Frequency Range	Frequency Band Mode	Microwave Preselector Bypass: Off		
		Without MS2850A-068 or With MS2850A-068 and Preamp: Off		With MS2850A-068 and Preamp: On
		Specification	95th percentile	Specification
300 kHz ≤ frequency < 100 MHz	—	±0.5 dB	—	±1.0 dB
100 MHz ≤ frequency < 3.5 GHz	—	±0.5 dB	±0.24 dB	±1.0 dB
3.5 GHz ≤ frequency < 4 GHz	Normal	±0.5 dB	±0.24 dB	±1.0 dB
	Spurious	±1.8 dB	±0.25 dB	±1.8 dB
4 GHz ≤ frequency ≤ 6 GHz	Normal	±1.8 dB	±0.35 dB	±1.8 dB
	Spurious		±0.53 dB	±2.0 dB
6 GHz < frequency ≤ 13.8 GHz	Normal	±1.8 dB	±0.31 dB	±2.0 dB
	Spurious		±0.53 dB	
13.8 GHz < frequency ≤ 26.5 GHz	—	±3.0 dB	±0.45 dB	±3.0 dB
26.5 GHz < frequency ≤ 40 GHz	—	±3.0 dB	±0.94 dB	±4.0 dB
40 GHz < frequency ≤ 44.5 GHz	—	±3.5 dB (nom.)	—	±4.0 dB (nom.)

Frequency Range	Microwave Preselector Bypass: On	
	Without MS2850A-068 or With MS2850A-068 and Preamp: Off	With MS2850A-068 and Preamp: On
6 GHz < frequency ≤ 13.8 GHz, Frequency Band Mode: Normal 4 GHz < frequency ≤ 13.8 GHz, Frequency Band Mode: Spurious	±1.4 dB	±1.9 dB
13.8 GHz < frequency ≤ 26.5 GHz	±2.0 dB	±2.7 dB
26.5 GHz < frequency ≤ 40 GHz	±2.5 dB	±3.7 dB
40 GHz < frequency ≤ 44.5 GHz	±2.5 dB (nom.)	±3.7 dB (nom.)

## 1 dB gain compression

Without MS2850A-068 or Preamp Off, Without MS2850A-076

At mixer input level

Frequency Range	Frequency Band Mode	Two-tone third-order intermodulation distortion	
		Specification	95th percentile
300 MHz ≤ frequency < 3.5 GHz	—	≥ +3 dBm	≥ +5 dBm
3.5 GHz ≤ frequency ≤ 4 GHz	Normal	≥ +3 dBm	≥ +5 dBm
	Spurious		≥ +8 dBm
4 GHz < frequency ≤ 13.5 GHz	—	≥ 0 dBm	≥ +8 dBm
13.5 GHz < frequency ≤ 26.5 GHz	—	≥ -1 dBm	≥ +10 dBm
26.5 GHz < frequency ≤ 40 GHz	—	≥ -1 dBm (nom.)	—

Without MS2850A-068 or Preamp Off, With MS2850A-076

At mixer input level

300 MHz ≤ frequency ≤ 4 GHz Frequency Band Mode: Normal 300 MHz ≤ frequency < 3.5 GHz Frequency Band Mode: Spurious	≥ +3 dBm
3.5 GHz ≤ frequency ≤ 4 GHz Frequency Band Mode: Spurious	≥ +3 dBm
4 GHz < frequency ≤ 13.5 GHz	≥ 0 dBm
13.5 GHz < frequency ≤ 26.5 GHz	≥ -1 dBm
26.5 GHz < frequency ≤ 40 GHz	≥ -1 dBm (nom.)

With MS2850A-068 and Preamp On,

At preamp input level

300 MHz ≤ frequency ≤ 4 GHz	≥ -15 dBm (nom.)
4 GHz < frequency ≤ 13.5 GHz	≥ -21 dBm (nom.)
13.5 GHz < frequency ≤ 26.5 GHz	≥ -21 dBm (nom.)
26.5 GHz < frequency ≤ 40 GHz	≥ -21 dBm (nom.)



## Spurious responses

### 2-tone 3rd-order intermodulation distortion

Without MS2850A-068 or Preamp Off, Without MS2850A-076

At 18°C to 28°C, with mixer input level: -15 dBm (per wave) and using ≥300 kHz separation, at RBW ≤30 kHz

Frequency Range	Frequency Band Mode	Two-tone third-order intermodulation distortion		TOI	
		Specification	95th percentile	Specification	95th percentile
30 MHz ≤ frequency < 300 MHz	—	≤ -54 dBc	≤ -65 dBc	+12 dBm	+17 dBm
300 MHz ≤ frequency < 3.5 GHz	—	≤ -62 dBc	≤ -63 dBc	+16 dBm	+16.5 dBm
3.5 GHz ≤ frequency < 4 GHz	Normal	≤ -62 dBc	≤ -63 dBc	+16 dBm	+16.5 dBm
	Spurious	≤ -56 dBc	—	+13 dBm	—
4 GHz ≤ frequency ≤ 6 GHz	Normal	≤ -60 dBc	≤ -65 dBc	+15 dBm	+17 dBm
	Spurious	≤ -56 dBc	—	+13 dBm	—
6 GHz < frequency ≤ 13.5 GHz	—	≤ -56 dBc	≤ -65 dBc	+13 dBm	+17 dBm
13.5 GHz < frequency ≤ 26.5 GHz	—	≤ -56 dBc	≤ -68 dBc	+13 dBm	+19 dBm
26.5 GHz < frequency ≤ 40 GHz	—	≤ -56 dBc (nom.)	—	+13 dBm (nom.)	—

Without MS2850A-068 or Preamp Off, With MS2850A-076

At 18°C to 28°C, with mixer input level: -15 dBm (per wave) and using ≥300 kHz separation, at RBW ≤30 kHz

Frequency Range	Frequency Band Mode	Two-tone third-order intermodulation distortion	TOI
30 MHz ≤ frequency < 300 MHz	—	≤ -54 dBc	+12 dBm
300 MHz ≤ frequency < 3.5 GHz	—	≤ -62 dBc	+16 dBm
3.5 GHz ≤ frequency < 4 GHz	Normal	≤ -62 dBc	+16 dBm
	Spurious	≤ -56 dBc	+13 dBm
4 GHz ≤ frequency ≤ 6 GHz	Normal	≤ -60 dBc	+15 dBm
	Spurious	≤ -56 dBc	+13 dBm
6 GHz < frequency ≤ 13.5 GHz	—	≤ -56 dBc	+13 dBm
13.5 GHz < frequency ≤ 26.5 GHz	—	≤ -56 dBc	+13 dBm
26.5 GHz < frequency ≤ 40 GHz	—	≤ -56 dBc (nom.)	+13 dBm (nom.)

With MS2850A-068, Preamp On,

At 18°C to 28°C, with Preamplifier input level: -45 dBm (per wave) and using ≥300 kHz separation, at RBW ≤30 kHz

Frequency Range	Two-tone third-order intermodulation distortion	TOI
30 MHz ≤ frequency < 300 MHz	≤ -73 dBc (nom.)	-8.5 dBm (nom.)
300 MHz ≤ frequency ≤ 700 MHz	≤ -78 dBc (nom.)	-6 dBm (nom.)
700 MHz < frequency < 4 GHz, Frequency Band Mode: Normal 700 MHz < frequency < 3.5 GHz, Frequency Band Mode: Spurious	≤ -81 dBc (nom.)	-4.5 dBm (nom.)
4 GHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal 3.5 GHz ≤ frequency ≤ 4 GHz, Frequency Band Mode: Spurious	≤ -78 dBc (nom.)	-6 dBm (nom.)
6 GHz < frequency ≤ 13.5 GHz, Frequency Band Mode: Normal 4 GHz < frequency ≤ 13.5 GHz, Frequency Band Mode: Spurious	≤ -70 dBc (nom.)	-10 dBm (nom.)
13.5 GHz < frequency ≤ 26.5 GHz	≤ -70 dBc (nom.)	-10 dBm (nom.)
26.5 GHz < frequency ≤ 40 GHz	≤ -70 dBc (nom.)	-10 dBm (nom.)

Attenuator Mode: E-ATT Combined

Without MS2850A-068 or Preamp Off,

At 18°C to 28°C, with mixer input level: -15 dBm (per wave) and using ≥300 kHz separation, at RBW ≤30 kHz

Frequency Range	RF input level	Two-tone third-order intermodulation distortion	TOI
30 MHz ≤ frequency < 300 MHz	≤ -5 dBm	≤ -54 dBc	+12 dBm
300 MHz ≤ frequency ≤ 1 GHz	≤ -5 dBm	≤ -62 dBc	+16 dBm
1 GHz < frequency < 4 GHz, Frequency Band Mode: Normal 1 GHz < frequency < 3.5 GHz, Frequency Band Mode: Spurious	≤ +5 dBm	≤ -62 dBc	+16 dBm
4 GHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal	≤ +5 dBm	≤ -60 dBc	+15 dBm
3.5 GHz ≤ frequency ≤ 4 GHz, Frequency Band Mode: Spurious	≤ +5 dBm	≤ -56 dBc	+13 dBm
30 MHz ≤ frequency < 300 MHz	-5 dBm < RF input level ≤ 0 dBm	≤ -54 dBc (nom.)	+12 dBm (nom.)
300 MHz ≤ frequency < 4 GHz, Frequency Band Mode: Normal 300 MHz ≤ frequency < 3.5 GHz, Frequency Band Mode: Spurious	-5 dBm < RF input level ≤ +15 dBm	≤ -62 dBc (nom.)	+16 dBm (nom.)
4 GHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal	-5 dBm < RF input level ≤ +15 dBm	≤ -60 dBc (nom.)	+15 dBm (nom.)
3.5 GHz ≤ frequency ≤ 4 GHz, Frequency Band Mode: Spurious	-5 dBm < RF input level ≤ +15 dBm	≤ -56 dBc (nom.)	+13 dBm (nom.)

---

## Image Response

Frequency Band Mode: Normal, Microwave Preselector Bypass: OFF

10 MHz $\leq$ frequency < 4 GHz	$\leq -70$ dBc
4 GHz $\leq$ frequency $\leq$ 6 GHz	$\leq -55$ dBc
6 GHz < frequency $\leq$ 13.5 GHz	$\leq -70$ dBc
13.5 GHz < frequency $\leq$ 26.5 GHz	$\leq -70$ dBc
26.5 GHz < frequency $\leq$ 44.5 GHz	$\leq -70$ dBc (nom.)

---

## Sweep

### Sweep mode

Continuous, Single

### Sweep time

SPAN	Range
$\geq 300$ Hz	1 ms to 1000 s
0 Hz	1 $\mu$ s to 1000 s

---

## Waveform display

### Detector

Pos&Neg, Positive Peak, Sample, Negative Peak, RMS

### Trace points

SPAN	Trace points
SPAN > 30 GHz	5001, 10001, 30001
500 MHz < SPAN $\leq$ 30 GHz	1001, 2001, 5001, 10001, 30001
100 MHz < SPAN $\leq$ 500 MHz	101, 201, 251, 401, 501, 1001, 2001, 5001, 10001, 30001
300 Hz $\leq$ SPAN $\leq$ 100 MHz and Sweep Time > 10 s	101, 201, 251, 401, 501, 1001, 2001, 5001, 10001, 30001
300 Hz $\leq$ SPAN $\leq$ 100 MHz and Sweep Time $\leq$ 10 s	11, 21, 41, 51, 101, 201, 251, 401, 501, 1001, 2001, 5001, 10001, 30001
SPAN = 0 Hz	11, 21, 41, 51, 101, 201, 251, 401, 501, 1001, 2001, 5001, 10001, 30001

---

## Scale

Log scale

10 div/12 div: 0.1 to 20 dB/div, 1-2-5 sequence

Lin scale

10 div: 1 to 10%/div, 1-2-5 sequence

---

## Trigger function

Trigger Mode: Free Run (Trig Off), Video, Wide IF Video, External, Frame

---

## Gate function

Gate Mode: Off, Wide IF Video, External, Frame

## Measure function

---

### Adjust channel power (ACP)

Reference: SPAN Total, Carrier Total, Both Sides of Carriers or Carrier Select

Adjust channel specifications: 3 channels × 2 (Normal Mode), 8 channels × 2 (Advanced Mode)

---

### Burst average

Indicates average power of specified time in the time domain mode.

---

### Channel power

Absolute value measurement: dBm, dBm/Hz

---

### Occupied bandwidth (OBW)

N% of Power, X dB Down

---

### Spectrum emission mask (SEM)

Peak/Margin measurement: Pass/fail judgment is performed by Peak/Margin measurement.

---

### Spurious emission

Worst/Peaks measurement: Pass/fail judgment is performed by Worst/Peaks measurement

---

### Frequency counter

Counter accuracy

SPAN ≤ 1 MHz, RBW = 1 kHz, S/N ≥ 50 dB, Gate Time ≥ 100 ms

± (marker frequency × reference frequency accuracy + (0.1 × N/Gate Time [s] )) Hz

N: Mixer harmonic order

---

### Two-tone third-order intermodulation distortion

Measures IM3 and TOI from two-tone signal.

## Model/Name

Model	Name	Note
MS2850A-032	Analysis Bandwidth 255 MHz	Standard function
MS2850A-033	Analysis Bandwidth Extension 510 MHz	Option
MS2850A-034	Analysis Bandwidth Extension 1 GHz	Option

## Performance guarantee frequency range

Bandwidth  $\leq 31.25$  MHz

Model	Frequency Range
MS2850A-047	9 kHz to 32 GHz
MS2850A-046	9 kHz to 44.5 GHz

Bandwidth  $> 31.25$  MHz

Model	Frequency Range
MS2850A-047	800 MHz to 32 GHz
MS2850A-046	800 MHz to 44.5 GHz

## Function

### Trace mode

Spectrum, Power vs. Time, Frequency vs. Time, CCDF, Spectrogram, Phase vs. Time, No Trace

### SPAN

Conditions for measurable waveform data: I, Q (Binary)

SPAN	Sampling Rate	Maximum Capture Time	Options
1 kHz	2 kHz	2000 s	MS2850A-032/033/034
2.5 kHz	5 kHz	2000 s	MS2850A-032/033/034
5 kHz	10 kHz	2000 s	MS2850A-032/033/034
10 kHz	25 kHz	2000 s	MS2850A-032/033/034
25 kHz	50 kHz	2000 s	MS2850A-032/033/034
50 kHz	100 kHz	1000 s	MS2850A-032/033/034
100 kHz	200 kHz	500 s	MS2850A-032/033/034
250 kHz	500 kHz	200 s	MS2850A-032/033/034
500 kHz	1 MHz	100 s	MS2850A-032/033/034
1 MHz	2 MHz	50 s	MS2850A-032/033/034
2.5 MHz	5 MHz	20 s	MS2850A-032/033/034
5 MHz	10 MHz	10 s	MS2850A-032/033/034
10 MHz	20 MHz	5 s	MS2850A-032/033/034
25 MHz	50 MHz	2 s	MS2850A-032/033/034
31.25 MHz	50 MHz	2 s	MS2850A-032/033/034
50 MHz	81.25 MHz	48 s	MS2850A-032/033/034
62.5 MHz	81.25 MHz	48 s	MS2850A-032/033/034
100 MHz	162.5 MHz	24 s	MS2850A-032/033/034
125 MHz	162.5 MHz	24 s	MS2850A-032/033/034
255 MHz	325 MHz	12 s	MS2850A-032/033/034
510 MHz	650 MHz	6 s	MS2850A-033/034
1000 MHz	1300 MHz	3 s	MS2850A-034

### Capture function

Capture Time Length: Sets the capture time length

Setting mode: Auto, Manual

### Trigger

Trigger mode: Free Run (Trig Off), Video, Wide IF Video, Frame, External (TTL)

## ADC resolution

Bandwidth	ADC resolution
≤31.25 MHz	16 bits
>31.25 MHz	12 bits

## Spectrum displayed function

Displays the spectrum for arbitrary time length and frequency range in the acquired waveform data.

## Analysis time length

Analysis Start Time	Sets analysis start time point from waveform data header
Analysis Time Length	Sets analysis time length
Setting mode	Auto, Manual

## Frequency

Center frequency and SPAN can be set within the frequency range in waveform data.

Frequency setting

	Bandwidth ≤31.25 MHz	31.25 MHz < Bandwidth ≤ 510 MHz	Bandwidth = 1 GHz
MS2850A-047	0 MHz to 32 GHz	100 MHz to 32 GHz	4.2 GHz to 32 GHz
MS2850A-046	0 MHz to 44.5 GHz	100 MHz to 44.5 GHz	4.2 GHz to 44.5 GHz

Display frequency accuracy

$\pm (\text{Indicator frequency} \times \text{reference frequency accuracy} + \text{SPAN frequency} \times \text{reference frequency accuracy} + \text{RBW} \times 0.05 + 2 \times N + \text{SPAN frequency}/(\text{Trace points} - 1)) \text{ Hz}$

N: Mixer harmonic order

## Resolution bandwidth (RBW)

	Bandwidth ≤31.25 MHz	50 MHz ≤ Bandwidth ≤ 62.5 MHz	Bandwidth ≥100 MHz
Setting range	1 Hz to 1 MHz (1-3 sequence)	3 kHz to 3 MHz (1-3 sequence)	10 kHz to 10 MHz (1-3 sequence)
Selectivity	(-60 dB/-3 dB) 4.5: 1 (nom.)	(-60 dB/-3 dB) 4.5: 1 (nom.)	(-60 dB/-3 dB) 4.5: 1 (nom.)

## Amplitude

Total level accuracy

At 18°C to 28°C, RBW: Auto, Time Detection: Average, Marker Result: Integration or Peak (Accuracy), Center frequency, CW, Excluding the noise floor effect,

Preamp Off: Input attenuator ≥10 dB, Mixer Input Level ≤ -10 dBm,

Preamp On: Input attenuator = 10 dB, Preamp Input Level ≤ -30 dBm,

The total level accuracy is calculated from an RSS (root summed square) error of the RF frequency characteristics, linear error and input attenuator switching error.

Frequency Range	Microwave Preselector Bypass: Off		
	Without MS2850A-068 or With MS2850A-068 and Preamp: Off		With MS2850A-068 and Preamp: On
	Bandwidth ≤31.25 MHz	Bandwidth >31.25 MHz	
300 kHz ≤ frequency < 4 GHz, Frequency Band Mode: Normal 300 kHz ≤ frequency < 3.5 GHz, Frequency Band Mode: Spurious	±0.5 dB	±0.6 dB	±1.0 dB
4 GHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal 3.5 GHz ≤ frequency ≤ 4 GHz, Frequency Band Mode: Spurious	±1.8 dB		±1.8 dB
6 GHz < frequency ≤ 13.8 GHz, Frequency Band Mode: Normal 4 GHz < frequency ≤ 13.8 GHz, Frequency Band Mode: Spurious	±1.8 dB		±2.0 dB
13.8 GHz < frequency ≤ 26.5 GHz	±3.0 dB		±3.0 dB
26.5 GHz < frequency ≤ 40 GHz	±3.0 dB		±4.0 dB
40 GHz < frequency ≤ 44.5 GHz	±3.5 dB (nom.)		±4.0 dB (nom.)

Bandwidth  $\leq$  31.25 MHz, Signal Analyzer mode

Frequency Range	Frequency Band Mode	Microwave Preselector Bypass: On		
		Without MS2850A-068 or With MS2850A-068 and Preamp: Off		With MS2850A-068, Preamp: On
		Specification	95th percentile	Specification
4 GHz < frequency $\leq$ 6 GHz	Spurious	$\pm 1.4$ dB	$\pm 0.28$ dB	$\pm 1.9$ dB
6 GHz < frequency $\leq$ 13.8 GHz	Normal	$\pm 1.4$ dB	$\pm 0.26$ dB	$\pm 1.9$ dB
	Spurious		$\pm 0.28$ dB	
13.8 GHz < frequency $\leq$ 26.5 GHz	—	$\pm 2.0$ dB	$\pm 0.41$ dB	$\pm 2.7$ dB
26.5 GHz < frequency $\leq$ 40 GHz	—	$\pm 2.5$ dB	$\pm 0.75$ dB	$\pm 3.7$ dB
40 GHz < frequency $\leq$ 44.5 GHz	—	$\pm 2.5$ dB (nom.)	—	$\pm 3.7$ dB (nom.)

Bandwidth > 31.25 MHz, Signal Analyzer mode

Frequency Range	Microwave Preselector Bypass: On		
	Without MS2850A-068 or With MS2850A-068 and Preamp: Off		With MS2850A-068 and Preamp: On
	Specification	95th percentile	Specification
4 GHz $\leq$ frequency $\leq$ 13.8 GHz	$\pm 1.4$ dB	$\pm 0.40$ dB	$\pm 1.9$ dB
13.8 GHz < frequency $\leq$ 26.5 GHz	$\pm 2.0$ dB	$\pm 0.46$ dB	$\pm 2.7$ dB
26.5 GHz < frequency $\leq$ 40 GHz	$\pm 2.5$ dB	$\pm 0.86$ dB	$\pm 3.7$ dB
40 GHz < frequency $\leq$ 44.5 GHz	$\pm 2.5$ dB (nom.)	—	$\pm 3.7$ dB (nom.)

### In-band frequency characteristics

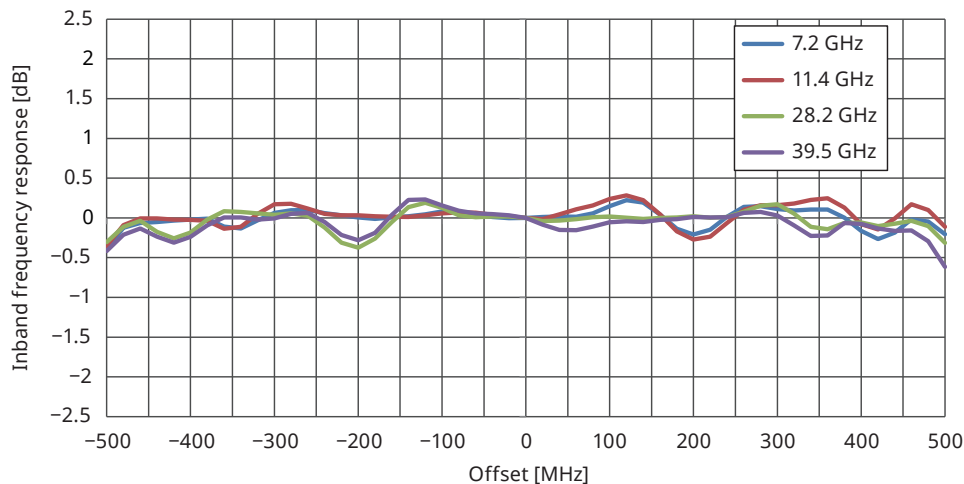
Bandwidth  $\leq$  31.25 MHz, On the basis of a level of the center frequency, at 18°C to 28°C

Center frequency	Frequency offset	In-band frequency characteristics
30 MHz $\leq$ frequency $\leq$ 4 GHz, Frequency Band Mode: Normal 30 MHz $\leq$ frequency < 3.5 GHz, Frequency Band Mode: Spurious	Center frequency $\pm 10$ MHz	$\pm 0.31$ dB

Bandwidth > 31.25 MHz, On the basis of a level of the center frequency

Center frequency	Frequency offset	In-band frequency characteristics
4.2 GHz $\leq$ frequency < 5 GHz	Center frequency $\pm 50$ MHz	$\pm 0.3$ dB (nom.)
	Center frequency $\pm 255$ MHz	$\pm 0.7$ dB (nom.)
5 GHz $\leq$ frequency $\leq$ 18.5 GHz	Center frequency $\pm 50$ MHz	$\pm 0.3$ dB (nom.)
	Center frequency $\pm 500$ MHz	$\pm 0.7$ dB (nom.)
18.5 GHz < frequency $\leq$ 26.5 GHz	Center frequency $\pm 50$ MHz	$\pm 0.3$ dB (nom.)
	Center frequency $\pm 500$ MHz	$\pm 1.0$ dB (nom.)
26.5 GHz < frequency $\leq$ 32 GHz	Center frequency $\pm 50$ MHz	$\pm 0.3$ dB (nom.)
	Center frequency $\pm 500$ MHz	$\pm 1.2$ dB (nom.)
32 GHz < frequency $\leq$ 44.5 GHz	Center frequency $\pm 50$ MHz	$\pm 0.3$ dB (nom.)
	Center frequency $\pm 500$ MHz	$\pm 1.25$ dB (nom.)

### Inband frequency response without MS2850A-068 (meas.)



## In-band phase linearity

Deviation from linear phase characteristics

Bandwidth >31.25 MHz, Attenuator :10 dB, Offset frequency  $\leq$  Center frequency  $\pm$ 500 MHz

Preamp Off, Reference Level  $\leq$ 0 dBm

4.2 GHz $\leq$ Center frequency $\leq$ 5.14 GHz	5°p-p (nom.)
5.14 GHz < Center frequency $\leq$ 42.1 GHz	5°p-p (nom.)
42.1 GHz < Center frequency $\leq$ 44.5 GHz	6°p-p (nom.)

Preamp: On, Reference Level  $\leq$ -20 dBm

4.2 GHz $\leq$ Center frequency $\leq$ 5.14 GHz	7°p-p (nom.)
5.14 GHz < Center frequency $\leq$ 42.1 GHz	6°p-p (nom.)
42.1 GHz < Center frequency $\leq$ 44.5 GHz	6°p-p (nom.)

## Image response

Bandwidth >31.25 MHz

800 MHz $\leq$ frequency $\leq$ 4.2 GHz	-60 dBc*1
4.2 GHz < frequency $\leq$ 44.5 GHz	0 dBc (nom.)*2
4.2 GHz < frequency $\leq$ 44.5 GHz	-60 dBc*1

\*1: To be generated at a frequency that is  $(650 \text{ MHz} \pm \text{BW}/2) \times 2$  MHz away.

\*2: To be generated at a frequency that is  $(1950 \text{ MHz} \pm \text{BW}/2) \times 2$  MHz away.

BW: Input signal bandwidth

## RF frequency characteristics

Refer to "RF frequency characteristics" of Signal Analyzer/Spectrum Analyzer.

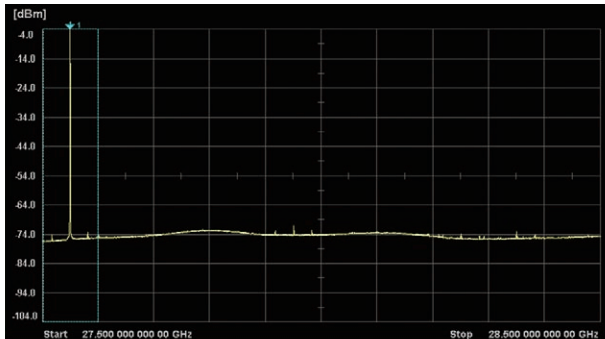
## Linearity error

Refer to "Linearity error" of Signal Analyzer/Spectrum Analyzer.

## Spurious free dynamic range due to ADC (SFDR)

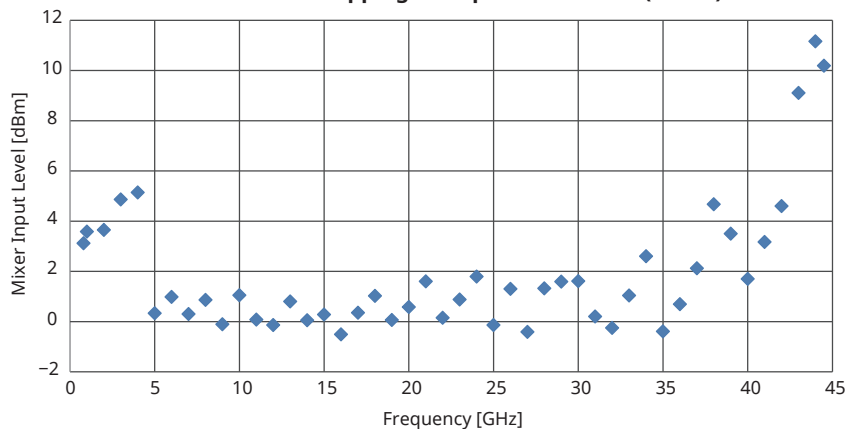
Input level: ADC full scale - 14 dB at center frequency, Bandwidth >31.25 MHz, within measurement bandwidth

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



## ADC clipping level

Nominal ADC Clipping vs. Input Mixer Level (meas.)



## IF output

Refer to "IF output" of Connector.

### Display average noise level (DANL)

■ Bandwidth  $\leq 31.25$  MHz

At 18°C to 28°C, Time Detection : Average, Input attenuator: 0 dB, Center frequency, Excluding the residual response effect

Without MS2850A-068, Without MS2850A-076,

Microwave Preselector Bypass: On/Off Common, Frequency Band Mode: Normal  
or

Without MS2850A-068, With MS2850A-076,

Microwave Preselector Bypass: On, Frequency Band Mode: Normal

Frequency Range	DANL (Bandwidth $\leq 31.25$ MHz)
100 kHz	-131.5 dBm/Hz
1 MHz	-141.5 dBm/Hz
30 MHz $\leq$ frequency < 1 GHz	-150.5 dBm/Hz
1 GHz $\leq$ frequency < 2.4 GHz	-147.5 dBm/Hz
2.4 GHz $\leq$ frequency $\leq$ 3.5 GHz	-144.5 dBm/Hz
3.5 GHz < frequency $\leq$ 4 GHz	-141.5 dBm/Hz
4 GHz < frequency $\leq$ 6 GHz	-141.5 dBm/Hz
6 GHz < frequency $\leq$ 13 GHz	-143.5 dBm/Hz
13 GHz < frequency $\leq$ 18.3 GHz	-141.5 dBm/Hz
18.3 GHz < frequency $\leq$ 26.5 GHz	-137.5 dBm/Hz
26.5 GHz < frequency $\leq$ 34 GHz	-137.5 dBm/Hz
34 GHz < frequency $\leq$ 40 GHz	-133.5 dBm/Hz
40 GHz < frequency $\leq$ 44.5 GHz	-127.5 dBm/Hz (nom.)

With MS2850A-068 and Preamp: Off, Without MS2850A-076,

Microwave Preselector Bypass: On/Off Common, Frequency Band Mode: Normal  
or

With MS2850A-068 and Preamp: Off, With MS2850A-076

Microwave Preselector Bypass: On, Frequency Band Mode: Normal

Frequency Range	DANL (Bandwidth $\leq 31.25$ MHz)
100 kHz	-131.5 dBm/Hz
1 MHz	-141.5 dBm/Hz
30 MHz $\leq$ frequency < 1 GHz	-150.5 dBm/Hz
1 GHz $\leq$ frequency < 2.4 GHz	-147.5 dBm/Hz
2.4 GHz $\leq$ frequency $\leq$ 3.5 GHz	-144.5 dBm/Hz
3.5 GHz < frequency $\leq$ 4 GHz	-141.5 dBm/Hz
4 GHz < frequency $\leq$ 6 GHz	-141.5 dBm/Hz
6 GHz < frequency $\leq$ 13 GHz	-139.5 dBm/Hz
13 GHz < frequency $\leq$ 18.3 GHz	-137.5 dBm/Hz
18.3 GHz < frequency $\leq$ 26.5 GHz	-133.5 dBm/Hz
26.5 GHz < frequency $\leq$ 34 GHz	-132.5 dBm/Hz
34 GHz < frequency $\leq$ 40 GHz	-128.5 dBm/Hz
40 GHz < frequency $\leq$ 44.5 GHz	-122.5 dBm/Hz (nom.)



Frequency Range	DANL (Bandwidth $\leq 31.25$ MHz)	
	With MS2850A-068, Preamp: On Frequency Band Mode: Normal	
	Microwave Preselector Bypass: Off	Microwave Preselector Bypass: On
100 kHz	-147 dBm/Hz (nom.)	-147 dBm/Hz (nom.)
1 MHz	-153.5 dBm/Hz	-153.5 dBm/Hz
30 MHz $\leq$ frequency < 1 GHz	-163.5 dBm/Hz	-163.5 dBm/Hz
1 GHz $\leq$ frequency < 2 GHz	-161.5 dBm/Hz	-161.5 dBm/Hz
2 GHz $\leq$ frequency $\leq$ 3.5 GHz	-160.5 dBm/Hz	-160.5 dBm/Hz
3.5 GHz < frequency $\leq$ 4 GHz	-157.5 dBm/Hz	-157.5 dBm/Hz
4 GHz < frequency $\leq$ 6 GHz	-157.5 dBm/Hz	-157.5 dBm/Hz
6 GHz < frequency $\leq$ 13 GHz	-160.5 dBm/Hz	-157.5 dBm/Hz
13 GHz < frequency $\leq$ 18.3 GHz	-159.5 dBm/Hz	-156.5 dBm/Hz
18.3 GHz < frequency $\leq$ 26.5 GHz	-156.5 dBm/Hz	-152.5 dBm/Hz
26.5 GHz < frequency $\leq$ 34 GHz	-153.5 dBm/Hz	-149.5 dBm/Hz
34 GHz < frequency $\leq$ 40 GHz	-150.5 dBm/Hz	-146.5 dBm/Hz
40 GHz < frequency $\leq$ 44.5 GHz	-142.5 dBm/Hz (nom.)	-139.5 dBm/Hz (nom.)

Without MS2850A-068 or With MS2850A-068 and Preamp: Off, With MS2850A-076,  
Microwave Preselector Bypass: Off, Frequency Band Mode: Normal

Frequency Range	DANL (Bandwidth $\leq 31.25$ MHz)
100 kHz	-131.5 dBm/Hz
1 MHz	-141.5 dBm/Hz
30 MHz $\leq$ frequency < 1 GHz	-150.5 dBm/Hz
1 GHz $\leq$ frequency < 2.4 GHz	-147.5 dBm/Hz
2.4 GHz $\leq$ frequency $\leq$ 3.5 GHz	-144.5 dBm/Hz
3.5 GHz < frequency $\leq$ 4 GHz	-141.5 dBm/Hz
4 GHz < frequency $\leq$ 6 GHz	-141.5 dBm/Hz
6 GHz < frequency $\leq$ 13 GHz	-147.5 dBm/Hz
13 GHz < frequency $\leq$ 18.3 GHz	-142.5 dBm/Hz
18.3 GHz < frequency $\leq$ 26.5 GHz	-138.5 dBm/Hz
26.5 GHz < frequency $\leq$ 34 GHz	-138.5 dBm/Hz
34 GHz < frequency $\leq$ 40 GHz	-136.5 dBm/Hz
40 GHz < frequency $\leq$ 44.5 GHz	-131.5 dBm/Hz (nom.)

■ Bandwidth >31.25 MHz

At 18°C to 28°C, Time Detection : Average, Input attenuator: 0 dB, Center frequency, Excluding the residual response effect  
Microwave Preselector Bypass is set as On automatically when Bandwidth is set greater than 31.25 MHz.

Frequency Range	DANL (Bandwidth >31.25 MHz)	
	Without MS2850A-068 Frequency Band Mode: Normal	
	Without MS2850A-076	With MS2850A-076
800 MHz $\leq$ frequency < 1 GHz	-142 dBm/Hz	-142 dBm/Hz
1 GHz $\leq$ frequency < 2.4 GHz	-141 dBm/Hz	-141 dBm/Hz
2.4 GHz $\leq$ frequency $\leq$ 3.5 GHz	-140 dBm/Hz	-140 dBm/Hz
3.5 GHz < frequency < 4.2 GHz	-138 dBm/Hz	-138 dBm/Hz
4.2 GHz $\leq$ frequency $\leq$ 4.6 GHz	-138 dBm/Hz	-137 dBm/Hz
4.6 GHz < frequency $\leq$ 6 GHz	-142 dBm/Hz	-141 dBm/Hz
6 GHz < frequency $\leq$ 13 GHz	-141 dBm/Hz	-140 dBm/Hz
13 GHz < frequency $\leq$ 17 GHz	-141 dBm/Hz	-140 dBm/Hz
17 GHz < frequency $\leq$ 18.5 GHz	-139 dBm/Hz	-137 dBm/Hz
18.5 GHz < frequency $\leq$ 26.5 GHz	-139 dBm/Hz	-137 dBm/Hz
26.5 GHz < frequency $\leq$ 34 GHz	-138 dBm/Hz	-136 dBm/Hz
34 GHz < frequency $\leq$ 40 GHz	-137 dBm/Hz	-135 dBm/Hz
40 GHz < frequency $\leq$ 44.5 GHz	-130 dBm/Hz (nom.)	-130 dBm/Hz (nom.)

Frequency Range	DANL (Bandwidth >31.25 MHz)			
	With MS2850A-068, Without MS2850A-076			
	Frequency Band Mode: Normal			
	Preamp: Off		Preamp: On	
	Specification	95th percentile	Specification	95th percentile
800 MHz ≤ frequency < 1 GHz	-142 dBm/Hz	-142 dBm/Hz	-161 dBm/Hz	-161 dBm/Hz
1 GHz ≤ frequency < 2.4 GHz	-141 dBm/Hz	-141 dBm/Hz	-160 dBm/Hz	-160 dBm/Hz
2.4 GHz ≤ frequency ≤ 3.5 GHz	-140 dBm/Hz	-140 dBm/Hz	-159 dBm/Hz	-159 dBm/Hz
3.5 GHz < frequency < 4.2 GHz	-138 dBm/Hz	-139 dBm/Hz	-157 dBm/Hz	-158 dBm/Hz
4.2 GHz ≤ frequency ≤ 4.6 GHz	-138 dBm/Hz	-139 dBm/Hz	-155 dBm/Hz	-156 dBm/Hz
4.6 GHz < frequency ≤ 6 GHz	-141 dBm/Hz	-142 dBm/Hz	-155 dBm/Hz	-158 dBm/Hz
6 GHz < frequency ≤ 13 GHz	-140 dBm/Hz	-141 dBm/Hz	-155 dBm/Hz	-158 dBm/Hz
13 GHz < frequency ≤ 17 GHz	-140 dBm/Hz	-140 dBm/Hz	-155 dBm/Hz	-157 dBm/Hz
17 GHz < frequency ≤ 18.5 GHz	-135 dBm/Hz	-140 dBm/Hz	-152 dBm/Hz	-157 dBm/Hz
18.5 GHz < frequency ≤ 26.5 GHz	-135 dBm/Hz	-137 dBm/Hz	-152 dBm/Hz	-154 dBm/Hz
26.5 GHz < frequency ≤ 34 GHz	-135 dBm/Hz	-138 dBm/Hz	-150 dBm/Hz	-153 dBm/Hz
34 GHz < frequency ≤ 40 GHz	-132 dBm/Hz	-134 dBm/Hz	-146 dBm/Hz	-149 dBm/Hz
40 GHz < frequency ≤ 44.5 GHz	-125 dBm/Hz (nom.)	—	-138 dBm/Hz (nom.)	—

Frequency Range	DANL (Bandwidth >31.25 MHz)	
	With MS2850A-068, With MS2850A-076	
	Frequency Band Mode: Normal	
	Preamp: Off	Preamp: On
800 MHz ≤ frequency < 1 GHz	-142 dBm/Hz	-161 dBm/Hz
1 GHz ≤ frequency < 2.4 GHz	-141 dBm/Hz	-160 dBm/Hz
2.4 GHz ≤ frequency ≤ 3.5 GHz	-140 dBm/Hz	-159 dBm/Hz
3.5 GHz < frequency < 4.2 GHz	-138 dBm/Hz	-157 dBm/Hz
4.2 GHz ≤ frequency ≤ 4.6 GHz	-138 dBm/Hz	-155 dBm/Hz
4.6 GHz < frequency ≤ 6 GHz	-141 dBm/Hz	-155 dBm/Hz
6 GHz < frequency ≤ 13 GHz	-140 dBm/Hz	-155 dBm/Hz
13 GHz < frequency ≤ 17 GHz	-140 dBm/Hz	-155 dBm/Hz
17 GHz < frequency ≤ 18.5 GHz	-135 dBm/Hz	-152 dBm/Hz
18.5 GHz < frequency ≤ 26.5 GHz	-135 dBm/Hz	-152 dBm/Hz
26.5 GHz < frequency ≤ 34 GHz	-135 dBm/Hz	-150 dBm/Hz
34 GHz < frequency ≤ 40 GHz	-132 dBm/Hz	-146 dBm/Hz
40 GHz < frequency ≤ 44.5 GHz	-125 dBm/Hz (nom.)	-138 dBm/Hz (nom.)

## Measure function

Adjacent channel power (ACP)

Reference: SPAN Total, Carrier Total, Both Sides of Carriers, or Carrier Select

Adjacent channel specification: 3 channels × 2

Channel power

Absolute value measurement: dBm, dBm/Hz

Occupied Bandwidth (OBW)

N% of Power, X dB Down

## Power vs. Time

Indicates time changes of power for captured waveform data.

---

### Analysis time range

Analysis start time	Sets analysis start time position from beginning of waveform data
Analysis time length	Sets analysis time length
Setting mode	Auto, Manual

---

### Resolution bandwidth

Filter type	Rect, Gaussian, Nyquist, Root Nyquist, Off (default Off)
Roll-off ratio	0.01 to 1 (set for Nyquist, Root Nyquist)
Filter frequency offset	Set center frequency of filter in wavelength data frequency band

---

### Measure function

Peak to Peak measurement  
with AM Depth or marker function  
+Peak, -Peak, (P-P)/2, Average  
Burst Average Power  
Measures average power of burst signal.

## Frequency vs. Time

Displays frequency time fluctuations of input signal from captured waveform data.

---

### Analysis time range

Analysis start time	Sets analysis start time point from waveform data header
Analysis time length	Sets analysis time length
Setting mode	Auto, Manual

---

### Operating level range

-17 to +30 dBm (Input attenuator  $\geq 10$  dB)

---

### Frequency (vertical axis)

Center frequency and SPAN can be set within the frequency range in waveform data  
Display frequency range: Selectable from 1/25, 1/10, 1/5 and 1/2 of analysis bandwidth

---

### Displayed frequency accuracy

$\text{SPAN} \leq 31.25 \text{ MHz}$ , Scale =  $\text{SPAN}/25$ , CW  
 $\pm (\text{reference oscillator accuracy} \times \text{center frequency} + \text{indicator frequency range} \times 0.01) \text{ Hz}$

---

### Measure function

Peak to Peak measurement  
Measured using FM Deviation or marker function.  
+Peak, -Peak, (P-P)/2, Average

## Phase vs. Time

Displays frequency time fluctuations of input signal from captured waveform data.

---

### Analysis time range

Analysis start time	Sets analysis start time point from waveform data header
Analysis time length	Sets analysis time length
Setting mode	Auto, Manual

---

### Phase (vertical axis)

Display mode	Wrap, Unwrap
Displayed phase range	0.01 deg./div to 200 G deg./div
Offset	-100 to +100 Mdeg.

## CCDF

Displays CCDF and APD of waveform data captured at specific time.

### Analysis time range

Analysis start time	Sets analysis start time point from waveform data header
Analysis time length	Sets analysis time length
Setting mode	Auto, Manual

### Display

Graphically displays CCDF and APD.

Histogram resolution: 0.01 dB

Numerical value: Average Power, Max Power, Crest Factor

### Resolution bandwidth

Filter type: Rectangle, Off (Default Off)

Filter frequency offset: Sets filter center frequency in frequency band of waveform data

## Spectrogram

Displayed spectrogram for arbitrary time length in captured waveform data.

### Analysis time range

Analysis start time	Sets analysis start time point from waveform data header
Analysis time length	Sets analysis time length
Setting mode	Auto, Manual

### Frequency

Center frequency and SPAN can be set within the frequency range in waveform data.

### Resolution bandwidth (RBW)

Setting range	1 Hz to 10 MHz (1-3 sequence)
Selectivity	(-60 dB/-3 dB) 4.5: 1 (nom.)

## Replay function

Analyzes traces of saved waveform data

Conditions for measurable waveform data: I, Q (Binary)

SPAN	Sampling rate	Minimum capture sample (time)	Options
1 kHz	2 kHz	74000 (37 s)	MS2850A-032/033/034
2.5 kHz	5 kHz	160000 (32 s)	MS2850A-032/033/034
5 kHz	10 kHz	310000 (31 s)	MS2850A-032/033/034
10 kHz	25 kHz	610000 (30.5 s)	MS2850A-032/033/034
25 kHz	50 kHz	730000 (14.6 s)	MS2850A-032/033/034
50 kHz	100 kHz	730000 (7.3 s)	MS2850A-032/033/034
100 kHz	200 kHz	730000 (3.65 s)	MS2850A-032/033/034
250 kHz	500 kHz	730000 (1.46 s)	MS2850A-032/033/034
500 kHz	1 MHz	730000 (730 ms)	MS2850A-032/033/034
1 MHz	2 MHz	730000 (365 ms)	MS2850A-032/033/034
2.5 MHz	5 MHz	730000 (146 ms)	MS2850A-032/033/034
5 MHz	10 MHz	730000 (73 ms)	MS2850A-032/033/034
10 MHz	20 MHz	730000 (36.5 ms)	MS2850A-032/033/034
25 MHz	50 MHz	730000 (14.6 ms)	MS2850A-032/033/034
31.25 MHz	50 MHz	730000 (14.6 ms)	MS2850A-032/033/034
50 MHz	81.25 MHz	730000 (8.99 ms)	MS2850A-032/033/034
62.5 MHz	81.25 MHz	730000 (8.99 ms)	MS2850A-032/033/034
100 MHz	162.5 MHz	730000 (4.5 ms)	MS2850A-032/033/034
125 MHz	162.5 MHz	730000 (4.5 ms)	MS2850A-032/033/034
255 MHz	325 MHz	730000 (2.25 ms)	MS2850A-032/033/034
510 MHz	650 MHz	730000 (1.13 ms)	MS2850A-033/034
1000 MHz	1300 MHz	730000 (562 μs)	MS2850A-034

## RF input

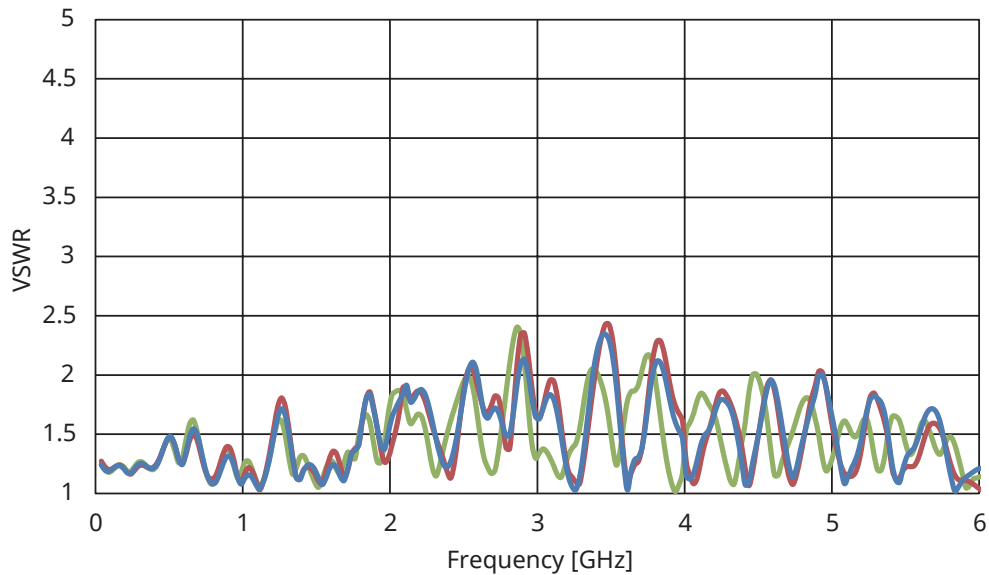
Front panel, K-J, 50Ω

VSWR: Input attenuator ≥ 10 dB, at 18° to 28°C

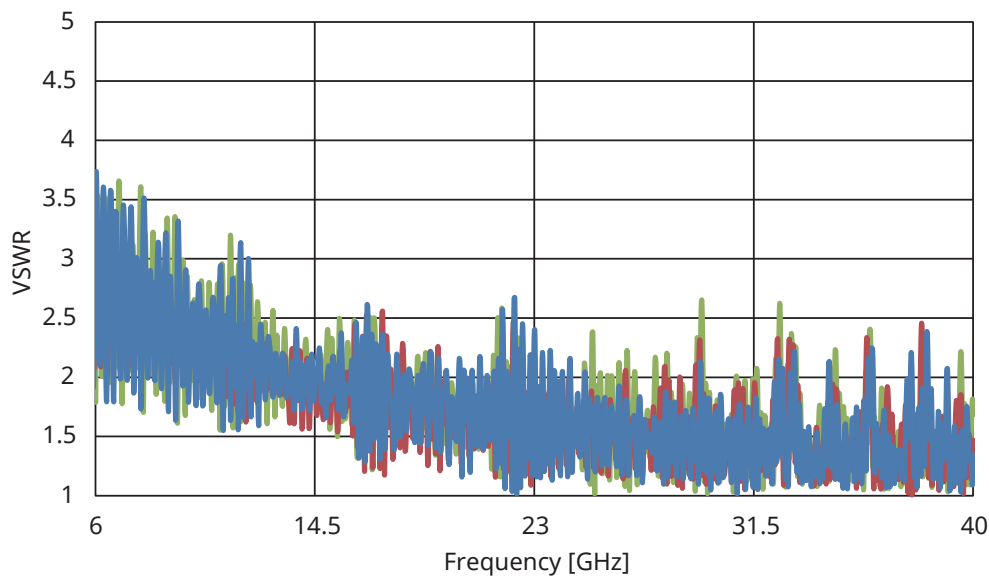
40 MHz ≤ frequency ≤ 3 GHz	≤ 1.2 (nom.)
3 GHz < frequency ≤ 6 GHz	≤ 1.3 (nom.)
6 GHz < frequency ≤ 13.6 GHz	≤ 1.3 (nom.)
13.6 GHz < frequency ≤ 26.5 GHz	≤ 1.4 (nom.)
26.5 GHz < frequency ≤ 40 GHz	≤ 1.6 (nom.)
40 GHz < frequency ≤ 44.5 GHz	≤ 1.6 (reference data)*

\*: Including effect of V-K conversion adaptor which is attached RF input connector.

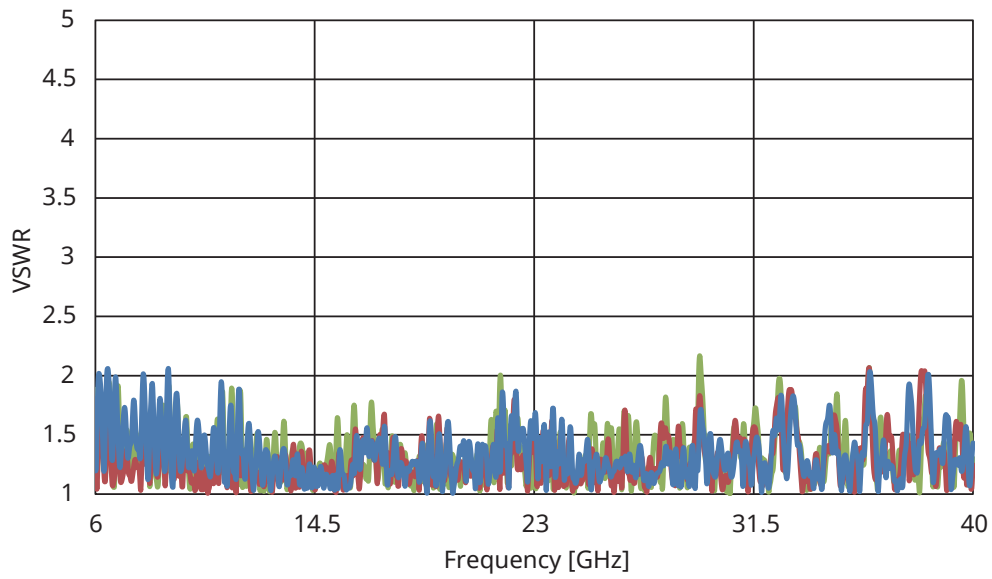
### VSWR (meas.) (ATT: 0 dB, Preamp: Off, ≤ 6 GHz, 3 Units)



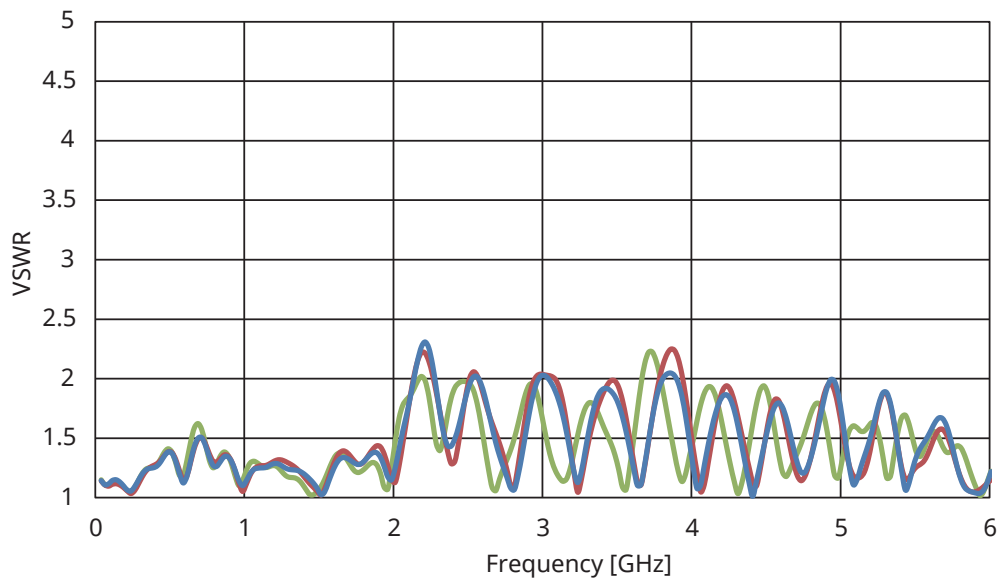
### VSWR (meas.) (ATT: 0 dB, Preamp: Off, > 6 GHz, Microwave Preselector Bypass: Off, 3 Units)



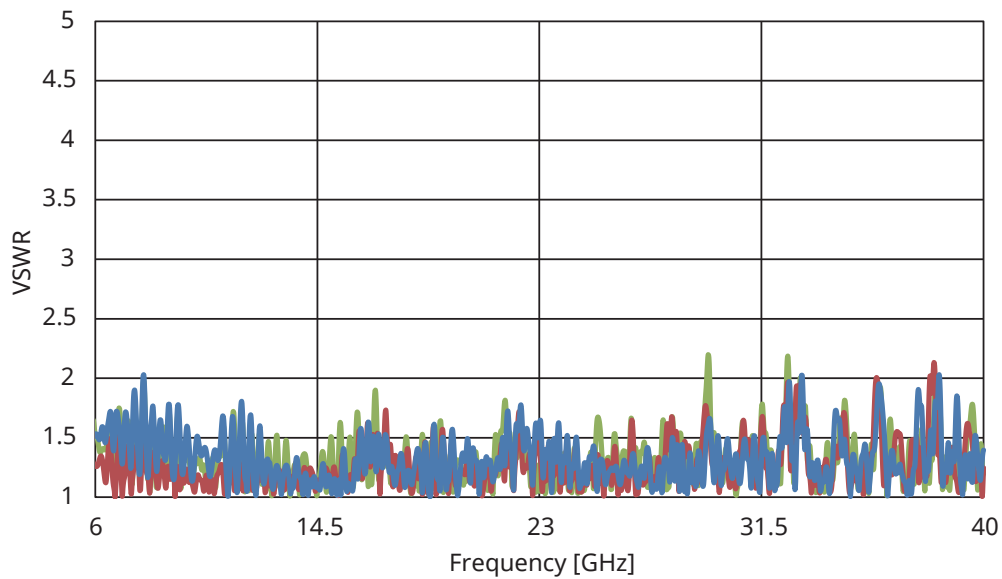
**VSWR (meas.) (ATT: 0 dB, Preamp: Off, > 6 GHz, Microwave Preselector Bypass: On, 3 Units)**



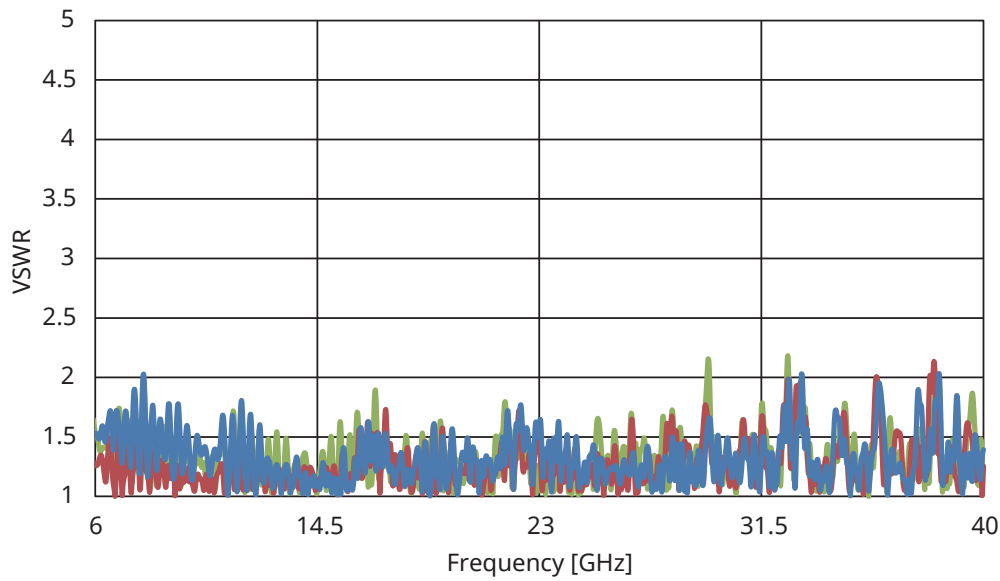
**VSWR (meas.) (ATT: 0 dB, Preamp: On, ≤ 6 GHz, 3 Units)**



**VSWR (meas.) (ATT: 0 dB, Preamp: On, > 6 GHz, Microwave Preselector Bypass: Off, 3 Units)**



**VSWR (meas.) (ATT: 0 dB, Preamp: On, > 6 GHz, Microwave Preselector Bypass: On, 3 Units)**



**External reference input**

Connector	Rear panel, BNC-J, 50Ω (nom.)
Frequency	5 MHz/10 MHz/13 MHz
Operating range	±1 ppm
Input level	-15 dBm ≤ level ≤ +20 dBm, 50Ω (AC coupling)

**Reference signal output**

Connector	Rear panel, BNC-J, 50Ω (nom.)
Frequency	10 MHz
Output level	≥0 dBm (AC coupling)

**Sweep status output**

Connector	Rear panel, BNC-J
Output level	TTL level (High level at sweep or capture)

**SA trigger input**

Rear Panel: 2 ports, BNC-J

Connector	Name	Trigger Level
Trigger1	SA Trigger Input	TTL Level
Trigger2	Trigger Input 2	LVC MOS

**SA trigger output**

Connector	BNC-J (rear panel 2 port)
Output level	LVC MOS

## External controls

---

### Ethernet (10/100/1000Base-T)

Connector: Rear Panel, RJ-45

---

### GPIO

IEEE488.2 compatible

Connector	Rear panel, IEEE488 bus
Interface function	SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0, E2

---

### USB (B)

USB2.0

Connector: USB-B Connector (rear panel 1 port)

---

### USB (A)

USB2.0 compatible

Enables waveform hard copy to USB compatible external device and saving mainframe setting parameters

Connector: USB-A Connector (front panel 2 port, rear panel 2 port)

---

## Monitor output

Connector: Rear panel, VGA compatible, mini D-SUB 15 pin

## AUX (for future extension)

Not available at present.

Used for the input/output of an auxiliary device.

Connector: Rear panel, 50 pin (Correspond to DX10A-50S)

## IF output

Connector for the 1st IF output, Outputs the signal before band filtering.

Connector	Rear panel, SMA-J, 50Ω (nom.)
Output frequency	1875 MHz: Spectrum Analyzer mode, Signal Analyzer mode (Bandwidth ≤31.25 MHz) 1950 MHz: Signal Analyzer mode (Bandwidth >31.25 MHz)
Max Bandwidth (6 dB)	2.5 GHz (nom.)
Gain	-10 dB (nom.) (ATT 0 dB, at input frequency 10 GHz)

## 1st local output

Connector for External Mixer

Connector	Front panel, SMA-J, 50Ω (nom.)
Frequency	Local signal frequency: 5 GHz to 10 GHz IF signal: frequency: 1875 MHz
Level	Local signal level ≥10 dBm (typ.)
Bias current	Setting range: 0.0 to 20.0 mA Resolution: 0.1 mA



## Noise source

Connector for external noise source.

This is available when the MS2850A-017 is installed.

Connector	Rear panel, BNC-J
Output voltage range	+28 V $\pm$ 0.5 V, Pulsed

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

### NC346 series summary specifications

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

\*1: Flatness better than  $\pm 2$  dB

\*2: Compatible with SMA and APC3.5

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

### Specifications outlines of recommended DC Blocks and Adapters

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

Recommended DC blocks/Adaptor combinations for MS2850A/MS2840A/MS2830A/MS269xA series signal analyzer

	Model	Frequency Range	RF connector	Recommended DC Block Order Name	Recommended Adapter Order Name
MS2850A series	MS2850A-047	9 kHz to 32 GHz	K (F)	K261	Not required
	MS2850A-046	9 kHz to 44.5 GHz	K (F)	K261	Not required
MS2840A series	MS2840A-040	9 kHz to 3.6 GHz	N (F)	Not required	Not required
	MS2840A-041	9 kHz to 6 GHz	N (F)	Not required	Not required
	MS2840A-044	9 kHz to 26.5 GHz	N (F)	J1554A	J1398A
	MS2840A-046	9 kHz to 44.5 GHz	K (F)	K261	Not required
MS2830A series	MS2830A-040	9 kHz to 3.6 GHz	N (F)	Not required	Not required
	MS2830A-041	9 kHz to 6 GHz	N (F)	Not required	Not required
	MS2830A-043	9 kHz to 13.5 GHz	N (F)	Not required	Not required
	MS2830A-044	9 kHz to 26.5 GHz	N (F)	J1554A	J1398A
	MS2830A-045	9 kHz to 43 GHz	K (F)	K261	Not required
MS269xA series	MS2690A	50 Hz to 6 GHz	N (F)	J1555A	J0004
	MS2691A	50 Hz to 13.5 GHz	N (F)	J1555A	J1398A
	MS2692A	50 Hz to 26.5 GHz	N (F)	J1554A	J1398A

## USB (B)

USB3.0 compatible

Connector: USB-B Connector (rear panel 1 port)

## PCIe

PCIe Gen2 x8 compatible

Connector: PCIe Connector (rear panel 1 port)

## CAL port (for future extension)

Not available at present.

Connector: BNC-J (rear panel)

## Display

---

XGA color LCD (Resolution: 1024 × 768)

Size: 8.4" (213 mm diagonal)

## External Mixer

This is available when MS2850A-046/047 is installed.

### Frequency

Frequency range: 26.5 GHz to 325 GHz

### Frequency bands

Band	Frequency range	Mixer harmonics order (N)
Band VHP	50.0 GHz to 75.0 GHz	8+
Band EHP	60.0 GHz to 90.0 GHz	12-
Band A	26.5 GHz to 40.0 GHz	4+
Band Q	33.0 GHz to 50.0 GHz	5+
Band U	40.0 GHz to 60.0 GHz	6+
Band V	50.0 GHz to 75.0 GHz	8+
Band E	60.0 GHz to 90.0 GHz	9+
Band W	75.0 GHz to 110.0 GHz	11+
Band F	90.0 GHz to 140.0 GHz	14+
Band D	110.0 GHz to 170.0 GHz	17+
Band G	140.0 GHz to 220.0 GHz	22+
Band Y	170.0 GHz to 260.0 GHz	26+
Band J	220.0 GHz to 325.0 GHz	33+

### Amplitude

Mixer conversion loss	0 to 99.9 dB
Maximum input level	Depends on external mixer
Average noise level	Depends on external mixer
Frequency response	Depends on external mixer

### Input/Output

Applicable mixer	2-port mixer only
Local frequency	5 GHz to 10 GHz
IF frequency	1.875 GHz

# High Performance Waveguide Mixer MA2806A/MA2808A

## Electrical Characteristics

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

\*: At assured performance temperature range

## Interface

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

## General

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



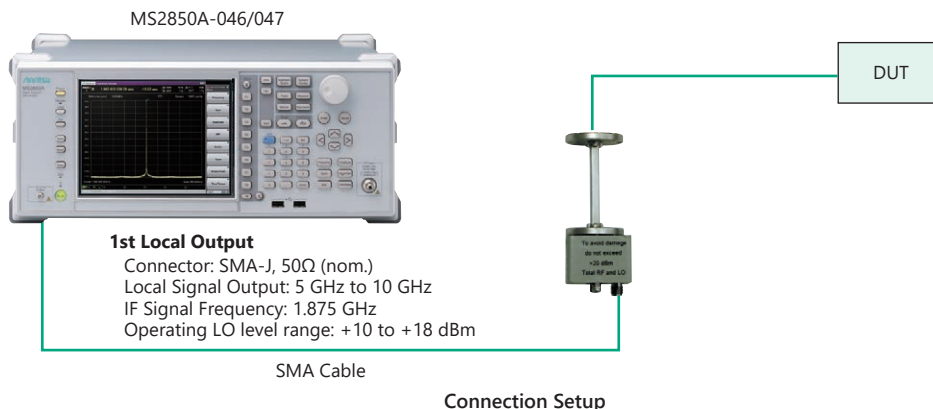
MA2808A

## External Mixer MA2740C/MA2750C Series

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

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

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



## General

---

### Dimensions and mass

Dimensions	426 (W) × 177 (H) × 390 (D)mm (excluding projections)
Mass	≤21 kg (With MS2850A-047 or 046, including all options)

### Power supply

Power voltage	100 V(ac) to 120 V(ac) or 200 V(ac) to 240 V(ac)
Frequency	50 Hz to 60 Hz
Power consumption	≤500 VA (including all options) 340 VA (nom.) (With MS2850A-047 or 046, MS2850A-067/068/032/033/034 installed, excluding other options)

### Temperature

Operating temperature	0°C to +45°C
Storage temperature	-20°C to +60°C

### Environment performance

Conducted emission	Conforms to EN61326-1
Radiated emission	Conforms to EN61326-1
Harmonic current emission	Conforms to EN61000-3-2
Electrostatic discharge	Conforms to EN61326-1
Electromagnetic field immunity	Conforms to EN61326-1
Fast transient/burst	Conforms to EN61326-1
Surge	Conforms to EN61326-1
Conducted RF	Conforms to EN61326-1
Power frequency magnetic field	Conforms to EN61326-1
Voltage dips/short interruption	Conforms to EN61326-1

### OS

Orders from September 2020  
Windows 10 (64 bits)

Orders before August 2020  
Windows 7 (64 bits)

## Options

---

### Phase Noise Measurement Function MS2850A-010

Displays the phase noise characteristics on a logarithmic scale

#### Frequency

Range	10 MHz to Upper frequency limit
Offset Frequency Range	10 Hz to 10 MHz
Marker Mode	Normal, Integral Noise, RMS Noise, Jitter, Residual FM, Off

### Secondary Storage Device MS2850A-011

This is removable SSD (Solid State Drive) for user data storage.  
This can be installed to Secondary SSD slot on rear panel.

## Noise Figure Measurement Function MS2850A-017

### Frequency

Frequency setting range

MS2850A-047	10 MHz to 32 GHz
MS2850A-046	10 MHz to 44.5 GHz

Frequency range

MS2850A-047	30 MHz to 32 GHz
MS2850A-046	30 MHz to 40 GHz

### NF measurement

Attenuator: 0 dB\*

Range	-20 to +40 dB
-------	---------------

\*: Recommend to use Pre Amp

ENR	Instrument Uncertainty
4 to 7 dB	±0.02 dB
12 to 17 dB	±0.025 dB
20 to 22 dB	±0.03 dB

### Gain measurement

Range	-20 to +40 dB
Instrument Uncertainty	≤0.07 dB

### Resolution bandwidth

Setting range: 100 kHz to 8 MHz

### Analysis Bandwidth 255 MHz MS2850A-032 (Standard)

### Analysis Bandwidth Extension 510 MHz MS2850A-033

### Analysis Bandwidth Extension 1 GHz MS2850A-034

Extends the analysis bandwidth to 255 MHz/510 MHz/1 GHz in single analyzer mode by bypassing a preselector and performing fast sampling.

Analysis Bandwidth 255 MHz option is installed by default.

Because an image response is received over 4.2 GHz, it demands an attention for measuring spurious or out-of-analysis-band signals and analyzing signals.

### Functions

Model/ Name	MS2850A-032: Analysis Bandwidth 255 MHz
	MS2850A-033: Analysis Bandwidth Extension 510 MHz
	MS2850A-034: Analysis Bandwidth Extension 1 GHz
Bandwidth	Refer to "Bandwidth" of Signal Analyzer.
Sampling rate	Refer to "Sampling rate" of Signal Analyzer.
Capture time (Maximum Capture Time)	Refer to "Maximum Capture time" of Signal Analyzer.
Resolution bandwidth	Refer to "Resolution bandwidth" of Signal Analyzer.
ADC resolution	Refer to "ADC resolution" of Signal Analyzer.

### Frequency

Frequency range	Refer to "Performance guarantee frequency range" of Signal Analyzer.
Frequency settings	Refer to "Frequency settings" of Signal Analyzer.

Frequency bands

Frequency bands	Refer to "Frequency bands" of Signal Analyzer /Spectrum Analyzer.
-----------------	---

## Amplitude

Display average noise level (DANL)

Refer to "Display average noise level (DANL)" of Signal Analyzer.

In-band frequency characteristics

Refer to "In-band frequency characteristics" of Signal Analyzer.

In-band Phase Linearity

Refer to "In-band Phase Linearity" of Signal Analyzer.

Image Response

Refer to "Image Response" of Signal Analyzer.

RF frequency characteristics

Refer to "RF frequency characteristics" of Signal Analyzer/Spectrum Analyzer.

Linearity error

Refer to "Linearity error" of Signal Analyzer/Spectrum Analyzer.

## Noise Floor Reduction MS2850A-051

When measuring signals using the MS2850A or by connecting an external mixer to the MS2850A, this option estimates the impact of the noise floor of these measuring instruments to reduce the estimated impact on the measurement results. The functions of this option can be used only by the spectrum analyzer option.

### Noise Floor Reduction

The noise floor reduction amount is specified as the difference between the measured values when the Noise Floor Reduction setting is Off and On.

Moreover, the following conditions are assumed unless otherwise specified.

After performing Noise Floor analysis in the spectrum analyzer mode at a temperature of 18°C to 28°C with Detector = Sample, RBW = 1 MHz, VBW = 1 Hz (Power Average), Input Attenuator = 0 dB, termination = 50Ω, and Preselector Manual Tune = 0 Hz, the in-band power per Hz is measured at each frequency band with Center Frequency = (Center frequency of each frequency band +  $\pi$  × 1,000,000) Hz, Span = Bandwidth of each frequency band/10, External Mixer = Off when either the MS2850A-068/168 is installed and Preamplifier = Off, or the MS2850A-068/168 is not installed and Microwave Preselector Bypass = Off.

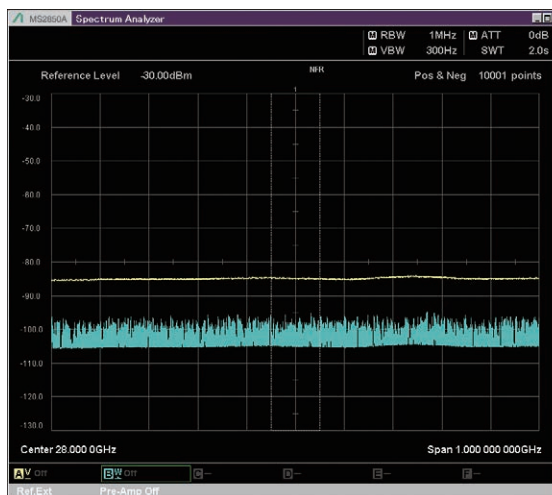
Frequency Range	Noise Floor Reduction
9 kHz to 4000 MHz	11 dB (nom.)
3500 MHz to 4400 MHz	11 dB (nom.)
4300 MHz to 6000 MHz	11 dB (nom.)
3900 MHz to 8000 MHz	7 dB (nom.)
7900 MHz to 10575 MHz	7 dB (nom.)

Frequency Range	Noise Floor Reduction
10475 MHz to 12200 MHz	7 dB (nom.)
12100 MHz to 18400 MHz	7 dB (nom.)
18300 MHz to 26600 MHz	7 dB (nom.)
26500 MHz to 42100 MHz	7 dB (nom.)
42000 MHz to 44500 MHz	7 dB (nom.)

When using external mixer

After executing Analyze External Mixer Noise Floor and setting Span as each frequency bandwidth/100 with external mixer, Noise Floor Reduction: 11 dB (nom.)

However, the Noise Floor attenuation depends on the external mixer being used.



← Noise Floor Reduction: Off

← Noise Floor Reduction: On

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

This interface is connected to an external PC using a standard PCIe cable. With support for a PCIe Gen2 x8 Link, it has a maximum data rate of 4 GB/s between the external controller and PCIe backplane.

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

This interface is connected to an external PC using a standard USB3.0 cable. It has a maximum data rate of 500 MB/s between the external controller and USB3.0 backplane.

## Microwave Preselector Bypass MS2850A-067 (Standard)

By bypassing the preselector (image response elimination filter), the RF frequency characteristics and the in-band frequency characteristics are improved, and level accuracy improvement can be achieved.

Because an image response is received due to bypassing the image response elimination filter, this is not adequate for measuring spurious. Low Second Harmonic Distortion MS2850A-076 is recommended if measuring spurious on MS2850A.

Notes on default values:

To improve the in-band frequency characteristics, the default value is set to On for the Signal Analyzer function, and is always set to On for all other applications.

To avoid measuring the image signals generated internally, the default value is set to Off for the Spectrum Analyzer function.

---

### Frequency

Frequency range

Spectrum analyzer, Signal Analyzer (Bandwidth  $\leq 31.25$  MHz)

MS2850A-047	4 GHz to 32 GHz
MS2850A-046	4 GHz to 44.5 GHz

Signal Analyzer (Bandwidth  $> 31.25$  MHz)

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

---

### Amplitude

Total level accuracy

Refer to "Total level accuracy" of Spectrum Analyzer
Refer to "Total level accuracy" of Signal Analyzer

RF frequency characteristics

Refer to "RF frequency characteristics" of Signal Analyzer/Spectrum Analyzer.
---

Display average noise level (DANL)

Refer to "Display average noise level (DANL)" of Spectrum Analyzer
Refer to "Display average noise level (DANL)" of Signal Analyzer

Image Response

With MS2850A-067, Microwave Preselector Bypass: On

To be generated frequency of 1875 MHz  $\times 2$  away

6 GHz < frequency $\leq 13.5$ GHz	0 dBc (nom.)
13.5 GHz < frequency $\leq 26.5$ GHz	0 dBc (nom.)



## Microwave Preamplifier MS2850A-068

This option amplifies signal prior to 1st mixer to enhance sensitivity.

### Frequency

Frequency range

MS2850A-047	100 kHz to 32 GHz
MS2850A-046	100 kHz to 44.5 GHz

### Amplitude

Measurement range	Refer to "Level measurement range" of Signal Analyzer/Spectrum Analyzer
Maximum input level	Refer to "Maximum input level" of Signal Analyzer/Spectrum Analyzer
Displayed average noise level (Signal Analyzer)	Refer to "Displayed average noise level (DANL)" of Signal Analyzer
Displayed average noise level (Spectrum analyzer)	Refer to "Display average noise level (DANL)" of Spectrum Analyzer
RF frequency characteristics	Refer to "RF Frequency Characteristics" of Signal Analyzer/Spectrum Analyzer
Input attenuator switching error	Refer to "Input attenuator switching uncertainty" of Signal Analyzer/Spectrum Analyzer
Linearity error	Refer to "Linearity error" of Signal Analyzer/Spectrum Analyzer
Secondary harmonic wave distortion	Refer to "Second harmonic distortion" of Signal Analyzer/Spectrum Analyzer
1 dB gain compression	Refer to "1 dB gain compression" of Signal Analyzer/Spectrum Analyzer
Two-tone third-order intermodulation distortion	Refer to "2-tone 3rd-order intermodulation distortion" of Spectrum Analyzer

## Extended Specifications MS2850A-072

This option specifies the following items.

- Frequency response in a certain 100 MHz range within bandwidth
- Phase linearity in a certain 100 MHz range within bandwidth
- RF input VSWR

### Frequency response in a certain 100 MHz range within bandwidth

Conditions: 18°C to 28°C,  $\geq 100$  MHz bandwidth, Preamplifier turned off, input attenuator = 10 dB, Reference Level  $\leq 0$  dBm, Signal Analyzer mode after the completion of calibration.

In the range of  $\pm 50$  MHz,

on the basis of the level of a certain frequency [Hz] within  $[-(\text{bandwidth} - 100 \text{ MHz})/2, +(\text{bandwidth} - 100 \text{ MHz})/2]$

Frequency Range	Frequency response in a certain 100 MHz range within bandwidth
$420 \text{ MHz} \leq \text{Center Frequency} < 4.2 \text{ GHz}$	$\pm 1.6 \text{ dB}$
$4.2 \text{ GHz} \leq \text{Center Frequency} \leq 13.6 \text{ GHz}$	$\pm 1.2 \text{ dB}$
$13.6 \text{ GHz} < \text{Center Frequency} \leq 26.5 \text{ GHz}$	$\pm 1.4 \text{ dB}$
$26.5 \text{ GHz} < \text{Center Frequency} \leq 30 \text{ GHz}$	$\pm 1.6 \text{ dB}$
$30 \text{ GHz} < \text{Center Frequency} \leq 39.5 \text{ GHz}$	$\pm 1.9 \text{ dB}$

### Phase linearity in a certain 100 MHz range within bandwidth

Conditions:  $\geq 100$  MHz bandwidth, Preamplifier turned off, input attenuator = 10 dB, Reference Level  $\leq 0$  dBm, Signal Analyzer mode after the completion of calibration.

As a deviation from phase linearity in the range of  $\pm 50$  MHz,

comparing to a certain frequency [Hz] within  $[-(\text{bandwidth} - 100 \text{ MHz})/2, +(\text{bandwidth} - 100 \text{ MHz})/2]$

Frequency Range	Phase linearity in a certain 100 MHz range within bandwidth
$420 \text{ MHz} \leq \text{Center Frequency} \leq 1.24 \text{ GHz}$	$\pm 3.1 \text{ degrees}^*$
$1.24 \text{ GHz} < \text{Center Frequency} < 4.2 \text{ GHz}$	$\pm 3.1 \text{ degrees}^*$
$4.2 \text{ GHz} \leq \text{Center Frequency} \leq 5.14 \text{ GHz}$	$\pm 3.5 \text{ degrees}^*$
$5.14 \text{ GHz} < \text{Center Frequency} \leq 26.4 \text{ GHz}$	$\pm 2.7 \text{ degrees}^*$
$26.4 \text{ GHz} < \text{Center Frequency} \leq 35 \text{ GHz}$	$\pm 2.4 \text{ degrees}^*$
$35 \text{ GHz} < \text{Center Frequency} \leq 42.1 \text{ GHz}$	$\pm 2.6 \text{ degrees}^*$
$42.1 \text{ GHz} < \text{Center Frequency} \leq 44.5 \text{ GHz}$	$\pm 3.4 \text{ degrees}^*$

\*: Release acceptance criteria:

The criteria at the time of factory shipment. Determined with a certain degree within 18°C to 28°C by excluding measurement uncertainty.

---

## RF input

Front panel, K-J, 50Ω

VSWR: Input attenuator  $\geq 10$  dB, 18°C to 28°C

40 MHz $\leq$ frequency $\leq$ 3 GHz	$\leq 1.3$
3 GHz < frequency $\leq$ 6 GHz	$\leq 1.4$
6 GHz < frequency $\leq$ 13.6 GHz	$\leq 1.6$
13.6 GHz < frequency $\leq$ 26.5 GHz	$\leq 1.9$
26.5 GHz < frequency $\leq$ 40 GHz	$\leq 2.0$

## Low Second Harmonic Distortion MS2850A-076

This option improves DANL and second harmonic distortion over 4 GHz when Preamp is Off and Microwave Preselector Bypass is Off.

---

## Frequency

Frequency range

Spectrum analyzer, Signal Analyzer (Bandwidth  $\leq 31.25$  MHz)

MS2850A-047	4 GHz to 32 GHz
MS2850A-046	4 GHz to 44.5 GHz

Signal Analyzer (Bandwidth > 31.25 MHz)

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

---

## Amplitude

Level measurement range	Refer to "Level measurement range" of Signal Analyzer/Spectrum Analyzer
Maximum input level	Refer to "Maximum input level" of Signal Analyzer/Spectrum Analyzer
Displayed average noise level (Signal Analyzer)	Refer to "Displayed average noise level (DANL)" of Signal Analyzer
Displayed average noise level (Spectrum analyzer)	Refer to "Display average noise level (DANL)" of Spectrum Analyzer
RF frequency characteristics	Refer to "RF Frequency Characteristics" of Signal Analyzer/Spectrum Analyzer
Input attenuator switching error	Refer to "Input attenuator switching uncertainty" of Signal Analyzer/Spectrum Analyzer
Linearity error	Refer to "Linearity error" of Signal Analyzer/Spectrum Analyzer
Secondary harmonic wave distortion	Refer to "Second harmonic distortion" of Signal Analyzer/Spectrum Analyzer
1 dB gain compression	Refer to "1 dB gain compression" of Signal Analyzer/Spectrum Analyzer
Two-tone third-order intermodulation distortion	Refer to "2-tone 3rd-order intermodulation distortion" of Spectrum Analyzer

**Note:**

---

- **United States**

**Anritsu Americas Sales Company**

450 Century Parkway, Suite 190, Allen, TX 75013 U.S.A.  
Phone: +1-800-Anritsu (1-800-267-4878)

- **Canada**

**Anritsu Electronics Ltd.**

700 Silver Seven Road, Suite 120, Kanata,  
Ontario K2V 1C3, Canada  
Phone: +1-613-591-2003  
Fax: +1-613-591-1006

- **Brazil**

**Anritsu Elettronica Ltda.**

Praça Amadeu Amaral, 27 - 1 Andar  
01327-010 - Bela Vista - Sao Paulo - SP, Brazil  
Phone: +55-11-3283-2511  
Fax: +55-11-3288-6940

- **Mexico**

**Anritsu Company, S.A. de C.V.**

Bldv Miguel de Cervantes Saavedra #169 Piso 1, Col. Granada  
Mexico, Ciudad de Mexico, 11520, MEXICO  
Phone: +52-55-4169-7104

- **United Kingdom**

**Anritsu EMEA Ltd.**

200 Capability Green, Luton, Bedfordshire, LU1 3LU, U.K.  
Phone: +44-1582-433200  
Fax: +44-1582-731303

- **France**

**Anritsu S.A.**

12 avenue du Québec, Bâtiment Iris 1- Silic 612,  
91140 VILLEBON SUR YVETTE, France  
Phone: +33-1-60-92-15-50  
Fax: +33-1-64-46-10-65

- **Germany**

**Anritsu GmbH**

Nemetschek Haus, Konrad-Zuse-Platz 1,  
81829 München, Germany  
Phone: +49-89-442308-0  
Fax: +49-89-442308-55

- **Italy**

**Anritsu S.r.l.**

Via Elio Vittorini 129, 00144 Roma, Italy  
Phone: +39-6-509-9711  
Fax: +39-6-502-2425

- **Sweden**

**Anritsu AB**

Isafjordsgatan 32C, 164 40 KISTA, Sweden  
Phone: +46-8-534-707-00

- **Finland**

**Anritsu AB**

Teknobulevardi 3-5, FI-01530 VANTAA, Finland  
Phone: +358-20-741-8100  
Fax: +358-20-741-8111

- **Denmark**

**Anritsu A/S**

c/o Regus Winghouse, Ørestads Boulevard 73, 4th floor,  
2300 Copenhagen S, Denmark  
Phone: +45-7211-2200

- **Russia**

**Anritsu EMEA Ltd.**

**Representation Office in Russia**

Tverskaya str. 16/2, bld. 1, 7th floor.  
Moscow, 125009, Russia  
Phone: +7-495-363-1694  
Fax: +7-495-935-8962

- **Spain**

**Anritsu EMEA Ltd.**

**Representation Office in Spain**

Paseo de la Castellana, 141. Planta 5, Edificio Cuzco IV  
28046, Madrid, Spain  
Phone: +34-91-572-6761

- **United Arab Emirates**

**Anritsu EMEA Ltd.**

**Dubai Liaison Office**

902, Aurora Tower, P O Box: 500311- Dubai Internet City  
Dubai, United Arab Emirates  
Phone: +971-4-3758479  
Fax: +971-4-4249036

- **India**

**Anritsu India Private Limited**

6th Floor, Indiqube ETA, No.38/4, Adjacent to EMC2,  
Doddanekundi, Outer Ring Road, Bengaluru – 560048, India  
Phone: +91-80-6728-1300  
Fax: +91-80-6728-1301

- **Singapore**

**Anritsu Pte. Ltd.**

11 Chang Charn Road, #04-01, Shriro House, Singapore 159640  
Phone: +65-6282-2400  
Fax: +65-6282-2533

- **Vietnam**

**Anritsu Company Limited**

Room No. 1635, 16th Floor, ICON 4 Tower, 243A De La Thanh Street,  
Lang Thuong Ward, Dong Da District, Hanoi, Vietnam  
Phone: +84-24-3760-6216  
Fax: +84-24-6266-2608

- **P.R. China (Shanghai)**

**Anritsu (China) Co., Ltd.**

Room 2701-2705, Tower A, New Caohejing International  
Business Center No. 391 Gui Ping Road Shanghai, 200233, P.R. China  
Phone: +86-21-6237-0898  
Fax: +86-21-6237-0899

- **P.R. China (Hong Kong)**

**Anritsu Company Ltd.**

Unit 1006-7, 10/F., Greenfield Tower, Concordia Plaza,  
No. 1 Science Museum Road, Tsim Sha Tsui East,  
Kowloon, Hong Kong, P.R. China  
Phone: +852-2301-4980  
Fax: +852-2301-3545

- **Japan**

**Anritsu Corporation**

8-5, Tamura-cho, Atsugi-shi, Kanagawa, 243-0016 Japan  
Phone: +81-46-296-6509  
Fax: +81-46-225-8352

- **Korea**

**Anritsu Corporation, Ltd.**

5FL, 235 Pangyoeyeok-ro, Bundang-gu, Seongnam-si,  
Gyeonggi-do, 13494 Korea  
Phone: +82-31-696-7750  
Fax: +82-31-696-7751

- **Australia**

**Anritsu Pty. Ltd.**

Unit 20, 21-35 Ricketts Road, Mount Waverley, Victoria 3149, Australia  
Phone: +61-3-9558-8177  
Fax: +61-3-9558-8255

- **Taiwan**

**Anritsu Company Inc.**

7F, No. 316, Sec. 1, NeiHu Rd., Taipei 114, Taiwan  
Phone: +886-2-8751-1816  
Fax: +886-2-8751-1817