

Specifications

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

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

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

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

Specifications above 26.5 GHz: MS2830A-045 only.

■ Signal Analyzer/Spectrum Analyzer

Frequency

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

Amplitude

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

■ Signal Analyzer/Spectrum Analyzer (Continuation)

Reference level

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

■ Signal Analyzer/Spectrum Analyzer (Continuation)

Spurious responses

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

■ Spectrum Analyzer

Frequency

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

Amplitude

Displayed average noise level (DANL)	<p>18° to 28°C, Detector: Sample, VBW: 1 Hz (Video average), Input attenuator: 0 dB</p> <p>without MS2830A-067/068, Frequency band mode: Normal</p> <ul style="list-style-type: none"> -120 dBm/Hz (9 kHz $\leq f < 100$ kHz, nominal) -134 dBm/Hz (100 kHz) -134 dBm/Hz (100 kHz $< f < 1$ MHz, nominal) -144 dBm/Hz (1 MHz) -144 dBm/Hz (1 MHz $< f < 10$ MHz, nominal) -150 dBm/Hz (10 MHz $\leq f < 30$ MHz, nominal) -153 dBm/Hz (30 MHz $\leq f < 1$ GHz) -150 dBm/Hz (1 GHz $\leq f < 2.4$ GHz) -147 dBm/Hz (2.4 GHz $\leq f \leq 3.5$ GHz) -144 dBm/Hz (3.5 GHz $< f \leq 4$ GHz) -144 dBm/Hz (4 GHz $< f \leq 6$ GHz) -151 dBm/Hz (6 GHz $< f \leq 13.5$ GHz) -149 dBm/Hz (13.5 GHz $< f \leq 18.3$ GHz) -146 dBm/Hz (18.3 GHz $< f \leq 26.5$ GHz) -146 dBm/Hz (26.5 GHz $< f \leq 34$ GHz) [MS2830A-045] -144 dBm/Hz (34 GHz $< f \leq 40$ GHz) [MS2830A-045] -140 dBm/Hz (40 GHz $< f \leq 43$ GHz) [MS2830A-045] <p>without MS2830A-067, with MS2830A-068, Preamp: Off, Frequency band mode: Normal</p> <ul style="list-style-type: none"> -120 dBm/Hz (9 kHz $\leq f < 100$ kHz, nominal) -134 dBm/Hz (100 kHz) -134 dBm/Hz (100 kHz $< f < 1$ MHz, nominal) -144 dBm/Hz (1 MHz) -144 dBm/Hz (1 MHz $< f < 10$ MHz, nominal) -150 dBm/Hz (10 MHz $\leq f < 30$ MHz, nominal) -153 dBm/Hz (30 MHz $\leq f < 1$ GHz) -150 dBm/Hz (1 GHz $\leq f < 2.4$ GHz) -147 dBm/Hz (2.4 GHz $\leq f \leq 3.5$ GHz) -144 dBm/Hz (3.5 GHz $< f \leq 4$ GHz) -144 dBm/Hz (4 GHz $< f \leq 6$ GHz) -147 dBm/Hz (6 GHz $< f \leq 13.5$ GHz) -145 dBm/Hz (13.5 GHz $< f \leq 18.3$ GHz) -141 dBm/Hz (18.3 GHz $< f \leq 26.5$ GHz) -141 dBm/Hz (26.5 GHz $< f \leq 34$ GHz) [MS2830A-045] -135 dBm/Hz (34 GHz $< f \leq 40$ GHz) [MS2830A-045] -132 dBm/Hz (40 GHz $< f \leq 43$ GHz) [MS2830A-045] <p>without MS2830A-067, or Microwave Preselector Bypass: Off with MS2830A-068, Preamp: On, Frequency band mode: Normal</p> <ul style="list-style-type: none"> -147 dBm/Hz (100 kHz, nominal) -156 dBm/Hz (1 MHz) -163 dBm/Hz (30 MHz $\leq f < 1$ GHz) -161 dBm/Hz (1 GHz $\leq f < 2$ GHz) -159 dBm/Hz (2 GHz $\leq f \leq 3.5$ GHz) -155 dBm/Hz (3.5 GHz $< f \leq 4$ GHz) -155 dBm/Hz (4 GHz $< f \leq 6$ GHz) -160 dBm/Hz (6 GHz $< f \leq 13.5$ GHz) -158 dBm/Hz (13.5 GHz $< f \leq 18.3$ GHz) -156 dBm/Hz (18.3 GHz $< f \leq 26.5$ GHz) -156 dBm/Hz (26.5 GHz $< f \leq 34$ GHz) [MS2830A-045] -150 dBm/Hz (34 GHz $< f \leq 40$ GHz) [MS2830A-045] -147 dBm/Hz (40 GHz $< f \leq 43$ GHz) [MS2830A-045] <p>with MS2830A-067: See Microwave Preselector Bypass (Displayed average noise level)</p>
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■ Spectrum Analyzer (Continuation)

Amplitude (Continuation)

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

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

Sweep

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

■ Spectrum Analyzer (Continuation)

Waveform display

Detector	Positive & Negative, Positive peak, Sample, Negative peak, RMS
CISPR Detector	Quasi-Peak, CISPR-AVG, RMS-AVG (with MS2830A-016)
Sweep (trace) point	5001, 10001 (Span: >30 GHz) 1001, 2001, 5001, 10001 (500 MHz < Span ≤ 30 GHz) 101, 201, 251, 401, 501, 1001, 2001, 5001, 10001 (100 MHz < Span ≤ 500 MHz) (300 Hz ≤ Span ≤ 100 MHz, Sweep time: > 10 s) 11, 21, 41, 51, 101, 201, 251, 401, 501, 1001, 2001, 5001, 10001 (300 Hz ≤ Span ≤ 100 MHz, Sweep time: ≤ 10 s) (Span: 0 Hz)
Scale	Log scale: 10 div/12 div, 0.1 to 20 dB/div (1-2-5 sequence) Linear scale: 10 div, 1 to 10%/div (1-2-5 sequence)
Trigger	Free run (Trigger off), Video, Wide IF video, External, Frame
Gate	Off, Wide IF video, External, Frame

Measure function

Adjust channel power (ACP)	Reference: Span total, Carrier total, Both sides of carriers, Carrier select Adjust channel specifications: 3 channels × 2 (Normal Mode), 8 channels × 2 (Advanced Mode)	
Burst average power	Displayed average power of specified interval at time domain	
Channel power	Measurement of absolute values: dBm, dBm/Hz	
Occupied bandwidth (OBW)	N% of power, X-dB down	
Spectrum emission mask (SEM)	Decision to Pass/Fail at Peak/Margin measurement	
Spurious emission	Decision to Pass/Fail at Worst/Peaks measurement	
Frequency counter	Accuracy	Span: ≤1 MHz, RBW: 1 kHz, S/N: ≥50 dB, Gate time: ≥100 ms ± (Marker frequency × Frequency reference accuracy + (0.1 × N / Gate time [s] Hz) N: Mixer harmonic order
	Gate time setting	100 μs to 1 s
2-tone 3rd-order intermodulation distortion	Measures IM3 and TOI from two-tone signal	

■ Signal Analyzer

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

General

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

■ Signal Analyzer (Continuation)

Spectrum displayed function

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

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

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

Power vs. Time displayed function

Function outline	Displayed time changes of power for captured waveform data
Analysis time range	Analysis start time: Sets analysis start time position from beginning of waveform data Analysis time length: Sets analysis time length Setting mode: Auto, Manual
Resolution bandwidth	Filter type: Rect, Gaussian, Nyquist, Root Nyquist, Off, (Default: Off) Roll-off ratio: 0.01 to 1 (Set for Nyquist, Root Nyquist) Filter frequency offset: Set center frequency of filter in wavelength data frequency band
AM Depth (Peak to Peak measurement)	Measures with AM Depth or marker function +Peak, –Peak, (P-P)/2, Average
Burst average power	Measures average power of burst signal

■ Signal Analyzer (Continuation)

Frequency vs. Time displayed function

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

Phase vs. Time displayed function

Function outline	Displayed phase time fluctuation of input signal from captured waveform data
Analysis time range	Analysis start time: Sets analysis start time point from waveform data header Analysis time length: Sets analysis time length Setting mode: Auto, Manual
Phase (Vertical axis)	Display mode: Wrap, Unwrap Displayed phase range: 0.01 deg./div to 200 Gdeg./div Offset: -100 deg. to +100 Mdeg.

CCDF/APD displayed function

Function outline	Displayed CCDF and APD of waveform data within a given length of time
Analysis time range	Analysis start time: Sets analysis start time point from waveform data header Analysis time length: Sets analysis time length Setting mode: Auto, Manual
Display	Displayed CCDF or APD as graphs Histogram resolution: 0.01 dB Value: Average power, Max. power, Crest factor
Resolution bandwidth	Filter type: Rectangle, Off, (Default: Off) Filter frequency offset: Sets filter center frequency in frequency band of waveform data

Spectrogram displayed function

Function outline	Displayed spectrogram for arbitrary time length in captured waveform data
Analysis time range	Analysis start time: Sets analysis start time point from waveform data header Analysis time length: Sets analysis time length Setting mode: Auto, Manual
Frequency	Can be set Center frequency and Span at frequency range in waveform data
Resolution bandwidth (RBW)	Setting range: 1 Hz to 1 MHz (1-3 sequence) Selectivity (-60 dB/-3 dB): 4.5:1 (nominal)

Digitize function

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

■ Signal Analyzer (Continuation)

Replay function

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

■ Connector

Connector

RF input	<p>18° to 28°C, Input attenuator: ≥10 dB</p> <p>with MS2830A-044 Connector: N-J (Front panel), 50Ω (nominal) VSWR : ≤1.2 (nominal, 40 MHz ≤ f ≤ 3 GHz) ≤1.5 (nominal, 3 GHz < f ≤ 6 GHz) ≤1.6 (nominal, 6 GHz < f ≤ 13.5 GHz) ≤1.9 (nominal, 13.5 GHz < f ≤ 26.5 GHz)</p> <p>with MS2830A-045 Connector: K-J (Front panel), 50Ω (nominal) VSWR : ≤1.2 (nominal, 40 MHz ≤ f ≤ 3 GHz) ≤1.3 (nominal, 3 GHz < f ≤ 6 GHz) ≤1.3 (nominal, 6 GHz < f ≤ 13.5 GHz) ≤1.4 (nominal, 13.5 GHz < f ≤ 26.5 GHz) ≤1.6 (nominal, 26.5 GHz < f ≤ 40 GHz) ≤1.6 (Reference data, 40 GHz < f ≤ 43 GHz, V-K converter mounted and included)</p>																																				
External reference input	Connector: BNC-J (Rear panel), 50Ω (nominal) Frequency: 5, 10, 13 MHz Operating range: ±1 ppm Input level: -15 to +20 dBm, 50Ω (AC coupling)																																				
Reference signal output	Connector: BNC-J (Rear panel), 50Ω (nominal) Frequency: 10 MHz Output level: ≥0 dBm (AC coupling)																																				
Sweep status output	Connector: BNC-J (Rear panel) Output level: TTL level (High level at sweeping or waveform capture)																																				
SA trigger input	Connector: BNC-J (Rear panel) Output level: TTL level																																				
Noise source drive	This is available when the MS2830A-017/117 is installed. Supply (+28 V) of the Noise Source Drive. Rear Panel, BNC-J Output Voltage: 28 ±0.5 V, Pulsed																																				
External controller	Control from external controller (excluding power-on/off)																																				
Ethernet (10/100/1000BASE-T)	Connector: RJ-45 (Rear panel)																																				
GPIB	IEEE488 bus connector (IEEE488.2, Rear panel) Interface function: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0, E2																																				
USB (B)	USB-B connector (USB2.0, Rear panel)																																				
USB	USB-A connector (USB2.0, Front panel: 2 ports, Rear panel: 2 ports)																																				
Monitor output	Mini D-Sub 15 pin (Compatible with VGA, Rear panel)																																				
Aux	50 pin (Correspond to DX10A-50S, Rear panel), Using extended input/output																																				
IF output*	Connector: SMA-J (Rear panel), 50Ω (nominal) Frequency: 1875 MHz Gain: -10 dB (nominal, Input attenuator: 0 dB, Input frequency: 10 GHz)																																				
1st local output*	Connector: SMA-J (Front panel), 50Ω (nominal) Frequency: 5 GHz to 10 GHz (Local signal output), 1875 MHz (IF signal frequency) Gain: -10 dB (nominal, Input attenuator: 0 dB, Input frequency: 10 GHz)																																				
Display	XGA-color LCD (Resolution: 1024 × 768), 8.4 inches (Diagonal: 213 mm)																																				
External mixer*	Frequency Frequency range: 26.5 GHz to 325 GHz Frequency bands: <table border="1" data-bbox="411 1453 1010 1766"> <thead> <tr> <th>Band</th> <th>Frequency range</th> <th>Mixer harmonics order (N)</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>26.5 GHz to 40 GHz</td> <td>4+</td> </tr> <tr> <td>Q</td> <td>33 GHz to 50 GHz</td> <td>5+</td> </tr> <tr> <td>U</td> <td>40 GHz to 60 GHz</td> <td>6+</td> </tr> <tr> <td>V</td> <td>50 GHz to 75 GHz</td> <td>8+</td> </tr> <tr> <td>E</td> <td>60 GHz to 90 GHz</td> <td>9+</td> </tr> <tr> <td>W</td> <td>75 GHz to 110 GHz</td> <td>11+</td> </tr> <tr> <td>F</td> <td>90 GHz to 140 GHz</td> <td>14+</td> </tr> <tr> <td>D</td> <td>110 GHz to 170 GHz</td> <td>17+</td> </tr> <tr> <td>G</td> <td>140 GHz to 220 GHz</td> <td>22+</td> </tr> <tr> <td>Y</td> <td>170 GHz to 260 GHz</td> <td>26+</td> </tr> <tr> <td>J</td> <td>220 GHz to 325 GHz</td> <td>33+</td> </tr> </tbody> </table> Amplitude Mixer conversion loss Setting range: 0 to 99.9 dB Maximum input level, Average noise level, Frequency response: Depends on External mixer Input/Output Applicable mixer: 2-port mixer only Local frequency: 5 GHz to 10 GHz IF Frequency: 1875 MHz	Band	Frequency range	Mixer harmonics order (N)	A	26.5 GHz to 40 GHz	4+	Q	33 GHz to 50 GHz	5+	U	40 GHz to 60 GHz	6+	V	50 GHz to 75 GHz	8+	E	60 GHz to 90 GHz	9+	W	75 GHz to 110 GHz	11+	F	90 GHz to 140 GHz	14+	D	110 GHz to 170 GHz	17+	G	140 GHz to 220 GHz	22+	Y	170 GHz to 260 GHz	26+	J	220 GHz to 325 GHz	33+
Band	Frequency range	Mixer harmonics order (N)																																			
A	26.5 GHz to 40 GHz	4+																																			
Q	33 GHz to 50 GHz	5+																																			
U	40 GHz to 60 GHz	6+																																			
V	50 GHz to 75 GHz	8+																																			
E	60 GHz to 90 GHz	9+																																			
W	75 GHz to 110 GHz	11+																																			
F	90 GHz to 140 GHz	14+																																			
D	110 GHz to 170 GHz	17+																																			
G	140 GHz to 220 GHz	22+																																			
Y	170 GHz to 260 GHz	26+																																			
J	220 GHz to 325 GHz	33+																																			

*: With MS2830A-044/045 only

■ General

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

■ MS2830A-001 Rubidium Reference Oscillator

Generates 10 MHz reference signal with higher frequency stability.

Frequency

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

This option adds a function to analyze 10 MHz bandwidth.

■ MS2830A-005 Analysis Bandwidth Extension to 31.25 MHz

This option adds a function to analyze 31.25 MHz bandwidth. (Require MS2830A-006)
MS2830A-005 is not available when MS2830A-045 is installed.

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

This option adds a function to analyze 31.25 MHz bandwidth (Require MS2830A-006).
MS2830A-009 is available when MS2830A-045 is installed.
Cannot be set the RBW to more than 10 MHz in spectrum analyzer function.

■ MS2830A-008 Preamplicifier

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

Frequency

Frequency range	100 kHz to 6 GHz
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Amplitude

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

■ MS2830A-010 Phase Noise Measurement Function

Displays the phase noise characteristics on a logarithmic scale

Frequency

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

■ MS2830A-011 2ndary HDD

This option adds a removable HDD for storing user data.

■ MS2830A-016 Precompliance EMI Function

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

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

■ MS2830A-017 Noise Figure Measurement Function*

Frequency

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

NF measurement

Measurement range	Within the frequency range (Attenuator = 0 dB, Pre-Amp = On) – 20 to +40 dB
Instrument uncertainty	Within the measurement range ENR: 4 to 7 dB ±0.02 dB ENR: 12 to 17 dB ±0.025 dB ENR: 20 to 22 dB ±0.03 dB

GAIN measurement

Measurement range	Within the frequency range –20 to +40 dB
Instrument uncertainty	Within the measurement range ≤0.07

Resolution bandwidth

Setting range	100 kHz to 8 MHz
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Connector

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

■ MS2830A-026 BER Measurement Function

Connector	AUX connector(Rear panel)* *: Can convert to BNC by connecting AUX Conversion Adapter (J1556A).
Input Level	TTL Level
Input Signal	Data, Clock, Enable
Input Bit Rate	100 bps to 10 Mbps
Measured Patterns	PN9, PN11, PN15, PN20, PN23, ALL0, ALL1, Alternate (0101 ...) PN9Fix, PN11Fix, PN15Fix, PN20Fix, PN23Fix, User Define (4096 bits Max.)
Synchronization Establishing Condition	PN Signal: PN stage × 2 bit error free At PNFix Signal: PN stage × 2 bit error free, PN signal and sync establishment, establish sync with PNFix signal at PN stage error free from PNFix signal header bit ALL0, ALL1, Alternate (0101 ...): 10 bit error free UserDefine: 8 to 1024 bits (variable) error free Select header bit used at sync detection
Re-synchronization Judgment Condition	x/y (Resynchronization at detection of x-bit error in y bits) y ... Measured bit count: Select from 500 bits, 5000 bits, 50000 bits x ... Number of error bits in y bits: Setting range 1 to y/2
Measured Bit Count	$\leq 2^{32} - 1$ bits
Measured Error Bit Count	$\leq 2^{31} - 1$ bits
Measurement End Conditions	Measured bit count, Measured error bit count
Auto Re-synchronization Function	Can be toggled on and off
Operation at Resync.	Select from Count Clear, and Count Keep
Measurement Mode	Single, Endless, Continuous
Display	Status, Error, Error Rate, Error Count, SyncLoss Count, Measured bit count
Polarity Inversion Function	Supports polarity reversal for Data, Clock, Enable
Clear Measurement Function	At BER measurement, hold sync status, clears measured value and measures from 0

■ MS2830A-068 Microwave Preamplicifier

This option amplifies signal prior to mixer to enhance sensitivity.

Cannot install simultaneously with MS2830A-008.

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

Frequency

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

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

■ MS2830A-067 Microwave Preselector Bypass

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

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

When the preselector option is set to On, the image response elimination filter is bypassed.

Therefore, this function is not appropriate for spurious measurement to receive the image response.

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

Frequency

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

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

■ MS2830A-313 Removable HDD

The MS2830A-313 Removable HDD is useful when a user takes the instrument to an outside company for calibration but wants to protect the security of data in the instrument, such as measurement results, data and main frame settings. In this case, the user removes the regular MS2830A hard disk and replaces it with this product.

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

■ MS2830A-077 Analysis Bandwidth Extension to 62.5 MHz

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

■ MS2830A-078 Analysis Bandwidth Extension to 125 MHz

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

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

General

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

Frequency

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

Amplitude

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

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

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

Nominal: Values not warranted. Included to facilitate application of product.

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