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Product Brochure



Signal Analyzer MS2690A/MS2691A/MS2692A Signal Analyzer MS2850A/MS2840A/MS2830A

MX2690xxA series MX2830xxA series MX2840xxA series MX2850xxA series

Measurement Software



Signal Analyzers MS269xA, MS2830A, MS2840A and MS2850A

The Signal Analyzer MS269xA is the high-end model supporting best-of-class high-accuracy, a wide dynamic range and 125 MHz wideband analysis. The MS2850A, MS2840A and MS2830A are the mid-range model with excellent cost performance supporting superior RF performance, best-of-class speed, and low power consumption.

Model	Feature	Frequency Range	Analysis Bandwidth
MS269xA (High-end model)	 High level accuracy up to 6 GHz expandable to 5G, and 125 MHz wideband 177 dB dynamic range without external filter for spurious measurements 	50 Hz to 6 GHz 50 Hz to 13.5 GHz 50 Hz to 26.5 GHz	31 .25 MHz (Standard) 62 .5 MHz (Option: MS269xA-077) 125 MHz (Option: MS269xA-078)
MS2850A (Middle-range model)	 Analysis bandwidth: 1 GHz max. For R&D and manufacturing cost reduction of 5G and wideband systems including microwave/millimeter wave communications systems, such as satellite broadcasting 	9 kHz to 32 GHz 9 kHz to 44.5 GHz	255 MHz (Standard) 510 MHz (Option: MS2850A-033) 1 GHz (Option: MS2850A-034)
MS2840A (Middle-range model)	 Highest level phase noise performance among middle-range models High cost-performance ratio as replacement for aging high-end models 	9 kHz to 3.6 GHz 9 kHz to 6 GHz 9 kHz to 26.5 GHz 9 kHz to 44.5 GHz	31 .25 MHz (Standard) 62 .5 MHz (Option: MS2840A-077)* 125 MHz (Option: MS2840A-078)*
MS2830A (Middle-range model)	 High-speed, low-cost, low power consumption cuts manufacturing costs Environment-friendly energy saving design Multiple versatile measurement options 	9 kHz to 3.6 GHz 9 kHz to 6 GHz 9 kHz to 13.5 GHz 9 kHz to 26.5 GHz 9 kHz to 43 GHz	None (Standard) 10 MHz (Option: MS2830A-006) 31 .25 MHz (Option: MS2830A-005/009) 62 .5 MHz (Option: MS2830A-077)* 125 MHz (Option: MS2830A-078)*

*: 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 MS2840A/MS2830A analysis bandwidth (125 MHz max.).

The Signal Analyzer MS2690A/91A/92A series is recommended for other measurement purposes.

Main Frame Measurement Functions

The MS269xA, MS2850A, MS2840A and MS2830A series of signal analyzers has the following built-in spectrum analyzer and signal analyzer functions used in combination with measurement software.

- Spectrum
- Channel PowerBurst Average Power
- Spectrum Emission Mask
 FM Deviation
 Multi-marker & Marker List
- FM DeviationFrequency Counter
- 2-tone 3rd-order Intermodulation Distortion
- Frequency vs. Time Phase vs. Time

- Occupied Bandwidth
 Spurious Emission
- Highest 10 Markers
- Annotation Display
- CCDF/APD*
- AM Depth

• Adjacent Channel Leakage Power

- Limit Line
- Power vs. Time
- Spectrogram

*: CCDF: Complementary Cumulative Distribution Function, APD: Amplitude Probability Density

Hardware Option (Measurement Functions)

The following measurement functions can be added as hardware options to the MS269xA, MS2850A, MS2840A and MS2830A series of signal analyzers (depending on the model). For details refer to the relevant main-frame catalog. Phase Noise Measurement Function, Noise Figure Measurement Function, Precompliance EMI Function, etc.

Signal Analyzers MS269xA, MS2830A, MS2840A and MS2850A

The MX2690xxA/MX2830xxA/MX2840xxA/MX2850xxA series of measurement software can be used by the MS269xA, MS2850A, MS2840A and MS2830A.

■ Required Analysis Bandwidth Options for Each Model

		width Options for Each Model Name Model Page MS269xA Option MS269xA Option MS2830A MS2830A MS2830A MS2830A MS2840A Option MS2840A Option MS2840A Option MS2840A Option MS2840A MS2840A MS2850A MS28												
Communications							MS2830A Option		tion				MS2850	A Optior
Systems	Name	Model	Page	MS269xA	<u> </u>	MS2830A				MS2840A	<u> </u>	MS2850A		
W-CDMA/HSPA/	W-CDMA/HSPA Downlink Measurement Software	MX269011A	5	~	011/010	~	R	003/009	011/018		011/010	~	055	034
	W-CDMA/HSPA Uplink Measurement Software	MX269012A	7	~		~	R					~		
GSM/EDGE	GSM/EDGE Measurement Software	MX269013A	9	✓		~	R					✓		
	EDGE Evolution					~								[
EDGE Evolution	Measurement Software	MX269013A-001*8	9	✓		~	R					×		
ETC/DSRC	ETC/DSRC Measurement Software	MX269014A	11	~										
TD-SCDMA	TD-SCDMA Measurement Software	MX269015A	13	~		~	R					~		
5	Vector Modulation Analysis Software	MX269017A	15	✓	U	✓	R	U	U	✓	U	✓		
	APSK Analysis	MX269017A-001*17	15							✓	U	✓		
	Higher-Order QAM Analysis	MX269017A-011*17	15							~	U	 ✓ 		
5	Analog Measurement Software	MX269018A*9	25			~				~				
Pulse Radar	Pulse Radar Measurement Function	MX284059A*19	34							~				
Systems V W-CDMA/HSPA/ N HSPA Evolution N GSM/EDGE G EDGE Evolution N ETC/DSRC E TD-SCDMA T World Digital V Wireless A Standards H Analog H (FM/øM/AM) A Pulse Radar P LTE/ L LTE/ L LTE-Advanced L (FDD) L L N CDMA2000 N A S 1xEV-DO N S S 5G N	LTE Downlink Measurement Software	MX269020A	36	✓		✓	R	R				√		
LTE/ LTE-Advanced (FDD) LTE-Advanced LTE/ LTE-Advanced LT	LTE-Advanced FDD Downlink Measurement Software	MX269020A-001*10	36	~	U	~	R	R	U			~		
	LTE Uplink Measurement Software	MX269021A	42	✓		~	R	R				✓		
	LTE-Advanced FDD Uplink Measurement Software	MX269021A-001*13	42	~	U	~	R	R	U			~		
	LTE TDD Downlink Measurement Software	MX269022A	36	~		~	R	R				~		
	LTE-Advanced TDD Downlink Measurement Software	MX269022A-001*11	36	~	U	~	R	R	U			~		
	LTE TDD Uplink Measurement Software	MX269023A	42	~		~	R	R				~		
	LTE-Advanced TDD Uplink Measurement Software	MX269023A-001*14	42	~	U	~	R	R	U			~		
	CDMA2000 Forward Link Measurement Software	MX269024A	48	~		~	R							
0011112000	All Measure Function	MX269024A-001	48	~		√	R							
1vev-do	EV-DO Forward Link Measurement Software	MX269026A	48	~		~	R							
IXEV DO	All Measure Function	MX269026A-001	48	~		✓	R							
	5G Standard Measurement Software (Base License)	MX285051A	63									~		
	Pre-Standard CP-OFDM Downlink	MX285051A-001*16	63										U	U
	Pre-Standard CP-OFDM Uplink	MX285051A-051*16	63									✓ ×	U	
	NR TDD sub-6 GHz Downlink	MX285051A-011*16	65									·√		
	NR TDD sub-6 GHz Uplink	MX285051A-061*16	65									<i>√</i>		
	NR FDD sub-6 GHz Downlink	MX285051A-031*16	65									~		
	NR FDD sub-6 GHz Uplink	MX285051A-081*16	65									√		
5G	NR TDD mmWave Downlink	MX285051A-021*16	65									√	U	U
	NR TDD mmWave Uplink	MX285051A-071*16	65									✓	U	U
	5G Standard Measurement Software (Base License)	MX269051A	72	~										
	NR TDD sub-6 GHz Downlink	MX296051A-011*18	72	~	U									
	NR TDD sub-6 GHz Uplink	MX269051A-061*18	72	~	U									
	NR FDD sub-6 GHz Downlink	MX296051A-031*18	72	√	U									
	NR FDD sub-6 GHz Uplink	MX269051A-081*18	72	✓	U									
	WLAN (802.11) Measurement Software (Supports	MX269028A	51	~		~	R	R						
	IEEE 802.11a/11b/11g/11j/11n/11p)			<u> </u>										350A Option 3 034 034 034 034 034 034 034 034
W-CDMA/HSPA/ HSPA Evolution GSM/EDGE EDGE Evolution ETC/DSRC TD-SCDMA World Digital Wireless Standards Analog (FM/øM/AM) Pulse Radar ILTE/ LTE-Advanced (FDD) CDMA2000 1xEV-DO 1xEV-DO SG SG WLAN	802.11ac (80 MHz) Measurement Software	MX269028A-001*12	51			~	R	R	R					
	802.11ac (160 MHz) Measurement Software	MX269028A-002*12	51	~	R									
W-CDMA/HSPA	W-CDMA BS Measurement Software	MX269030A	61	✓		~	R							

Signal Analyzers MS269xA, MS2830A, MS2840A and MS2850A

Note, the MS269xA, MS2830A, MS2840A and MS2850A require the following options:

[MS269xA Options] Analysis Bandwidth Extension to 62.5 MHz Analysis Bandwidth Extension to 125 MHz	MS269xA-077 MS269xA-078*1
[MS2850A Options] Analysis Bandwidth Extension 510 MHz Analysis Bandwidth Extension 1 GHz	MS2850A-033 MS2850A-034* ¹⁷
[MS2840A Options] Analysis Bandwidth Extension to 62.5 MHz Analysis Bandwidth Extension to 125 MHz	MS2840A-077 MS2840A-078* ²
[MS2830A Options] Analysis Bandwidth Extension to 31.25 MHz Analysis Bandwidth 10 MHz Bandwidth Extension to 31.25 MHz for Millimeter-wave Analysis Bandwidth Extension to 62.5 MHz Analysis Bandwidth Extension to 125 MHz	MS2830A-005*3 MS2830A-006 MS2830A-009*4 MS2830A-077*5, *7 MS2830A-078*6, *7

*1: MS269xA-077 is necessary.

*2: MS2840A-077 is necessary.

*3: Available only when MS2830A-040/041/043/044 is installed. Requires MS2830A-006.

- *4: Available only when MS2830A-045 is installed. Requires MS2830A-006.
- *5: Requires MS2830A-006 and MS2830A-005 (for MS2830A-040/041/043/044).
- Requires MS2830A-006 and MS2830A-009 (for MS2830A-045). *6: Requires MS2830A-006, MS2830A-005, and MS2830A-077 (for MS2830A-040/041/043/044). Requires MS2830A-006, MS2830A-009, and MS2830A-077 (for MS2830A-045).
- *7: 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 MS2690A/91A/92A series is recommended for other measurement purposes.

*8: Requires MX269013A

- *9: MS2830A-066 and A0086C required by MS2830A; A0086C required by MS2840A.
- *10: Requires MX269020A
- *11: Requires MX269022A
- *12: Requires MX269028A
- *13: Requires MX269021A
- *14: Requires MX269023A
- *15: Requires MS2850A-033
- *16: Requires MX285051A
- *17: Requires MX269017A
- *18: Requires MX269051A

*19: For MS2840A-044/046. MS2840A-046 requires MS2840A-019. Unavailable when MS2840A-069/068/067 is simultaneously installed.

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MX2690xxA/MX2830xxA/MX2840xxA/MX2850xxA series Measurement Software

W-CDMA/HSPA Downlink Measurement Software MX269011A

The W-CDMA/HSPA Downlink Measurement Software MX269011A supports measurement of the RF Tx characteristics of W-CDMA/HSDPA/HSUPA/ HSPA Evolution base stations.

Installing it in the MS269xA/MS2850A/MS2830A supports fast, high-accuracy measurements ideal for efficient R&D and early rollout of base stations and base-station components.

Versatile Functions for W-CDMA/HSPA/HSPA Evolution Development

Modulation analysis, Tx Power measurements, etc., required for development of W-CDMA/HSPA/HSPA Evolution base stations and device components are performed at high speed with superior accuracy.

Modulation Analysis

- Frequency Error
- Mean Power
- Vector Error/Amplitude Error/Phase Error
- Origin Offset
- Peak Code Domain Error
- Constellation
- Vector Error/Amplitude Error/Phase Error vs. Chip

Code Domain

Mean Power

- P-CPICH/P-SCH/S-SCH
- Vector Error/Amplitude Error/Phase Error
- Code Power
- Code Domain/Code Domain Error
- Constellation
- Vector Error/Amplitude Error/Phase Error/Code Power vs. Symbol

Specifications

The specification is the value after 30-minute warm-up at a constant ambient temperature. The specifications are defined under the following condition unless otherwise specified. Attenuator mode: Mechanical Attenuator Only (MS2830A only)

Signal Analyzer		MS269xA	MS2830A					
Signal Analyzer		WIS209XA	MS2850A					
Target Signals		W-CDMA, HSPA, HSPA Evolution Downlink Supports QPSK, 16QAM, and 64QAM HS-PDSCH modular	tion methods (excludes MIMO Tx signals)					
Measurement F	requency Range	400 MHz to 3 GHz						
	Measurement Level Range	–15 to +30 dBm (Preamp Off, or Preamp not installed) –30 to +10 dBm (Preamp On)						
	Carrier Frequency Measurement	At 18°C to 28°C, after calibration, EVM = 1% signal						
	Accuracy	± (Accuracy of reference frequency × Carrier frequency + 5) Hz	± (Accuracy of reference frequency × Carrier frequency + 6) Hz					
weasurement	Modulation Accuracy	At 18°C to 28°C, After calibration, When input signal within measurement level range and less than input level						
		Residual Vector Error: ≤1.0% (rms)	Residual Vector Error: ≤1.3% (rms)					
	Waveform Display	EVM vs. Chip, Amplitude Error vs. Chip, Phase error vs. Ch	ip, IQ Constellation					
	Measurement Level Range	 -15 to +30 dBm (Preamp Off, or Preamp not installed) -30 to +10 dBm (Preamp On) 	-15 to +30 dBm (Preamp Off, or Preamp not installed)					
Amplitude Measurement	Average Power Measurement Accuracy (Found from root sum of	At 18°C to 28°C, After calibration, Input attenuator ≥10 dB When input signal within measurement level range and less than input level						
	squares (RSS) of absolute amplitude accuracy and in-band frequency characteristics of main frame)	±0.6 dB (Preamp Off, or Preamp not installed) ±1.1 dB (Preamp On)	±0.6 dB (Preamp Off, or Preamp not installed)					
	Measurement Level Range	-15 to +30 dBm (Preamp Off or Preamp not installed) -30 to +10 dBm (Preamp On)						
		At 18°C to 28°C, After calibration, When input signal withi	n measurement level range and less than input level					
Code Domain	Code Domain Power	Relative Accuracy: ± 0.02 dB (Code Power ≥10 dBc) ± 0.05 dB (Code Power ≥20 dBc) ± 0.10 dB (Code Power ≥30 dBc)	Relative Accuracy: ±0.02 dB (Code Power ≥10 dBc) ±0.10 dB (Code Power ≥20 dBc) ±0.15 dB (Code Power ≥30 dBc)					
Measurement		At 18°C to 28°C, After calibration, When input signal withi	n measurement level range and less than input level					
	Code Domain Error	Residual Error: ≤–46 dB	Residual Error: ≤–42 dB					
		Accuracy: ±0.3 dB (Code Domain Error ≥-30 dBc) ±1.0 dB (Code Domain Error ≥-40 dBc)						
	Waveform Display	EVM vs. Symbol, Amplitude Error vs. Symbol, Phase Error Code Domain Power, Code Domain Error	vs. Symbol, Symbol Constellation,					
Spectrum Measurement	Measurement Functions	Adjacent Channel Leakage Power, Channel Power, Occup	ied Bandwidth, Spectrum Emission Mask					

Code vs. Time

- Mean Power
- P-CPICH/P-SCH/S-SCH
 Vector Error/Amplitude Error/Phase Error

MS269xA MS2850A

- Code Power
- Code vs. Time
- Code Domain/Code Domain Error

Spectrum

- Adjacent Channel Leakage Power
- Channel Power
- Occupied Bandwidth
- Spectrum Emission Mask

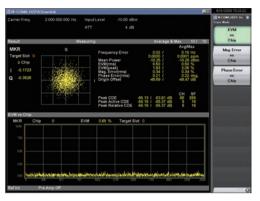
W-CDMA/HSPA Downlink Measurement Software MX269011A (Continued)

MS269xA MS2850A MS2830A

Measurement Functions

• Frequency Error/Modulation Accuracy

This function supports modulation analysis of W-CDMA/HSDPA/ HSUPA/HSPA Evolution downlink signals with simultaneous display of max and mean values of frequency and vector error, etc., for up to 15 slots to evaluate DUT dispersion characteristics.



Modulation Analysis Screen

Code vs. Time

This function is convenient for monitoring time variations in Mean Power for all codes and Code Power for up to 300 slots. It is useful when performing tests specified by 3GPP TS 25.141, 6.4.1 Inner Loop Power Control and 6.4.2 Power Control Steps.



Code vs. Time

Code Domain

This function displays results for each code as a constellation and numeric table, making it easy to discover transient code-dependent signal degradation.

In addition, graphs can be displayed with any of Vector Error, Amplitude Error, and Phase Error on the vertical axis to discover transient timedependent (symbol units) signal degradation for a specific code.



Code Domain (Constellation)

		2 000 000 000 Hz	Input L ATT		-10.00 d8m 4 d8			Code Domain
								Trace
esut	main Powe							Power Error
_	nde 128		16 M	odulation	640AM	Target Slot 14		
INT CO	FOR FAIR 1		17 dB	Error	-57.97 dB	Mean Power	10.26 dBm	
-						P-CPICH	-11.03 dB	
L	1.1.1	-				P-SCH	-14.16 dB	
	10101		1000	nnr A		S-SCH	-14.16 dB	
- 00						EVM(rms)	0.53 %	
						EVM(peak)	1,44 %	Constellation
					n	Mag. Error	0.37 %	
					<u> </u>	Phase Error	0.22 deg.	EVM
= =	Symbol	12			3			EVM vs Symbol
COO E	Symbol Symbol	4	EVM	0.57 %	Target Slot 14	Phase Error Code Power	0.22 deg.	vs Symbol
CO .			EVM	0.57 %	Target Slot 14	Phase Error Code Power	0.22 deg.	vs Symbol Mag Error vs
COO E			EVM	0.57 %	Target Siot 14	Phase Error Code Power	0.22 deg.	vs Symbol Mag Error
MKR 125			evn	0.57 %	Tanget Slot 14	Phase Error Code Power	0.22 deg.	vs Symbol Mag Error vs
MKR 150			EVM	0.57 %	Target Slot 14	Phase Error Code Power	0.22 deg.	vs Symbol Mag Error vs Symbol Phase Error vs
MKR 125	Symbol	4				Phase Error Code Power	0.22 deg. -12.17 dB	vi Symbol Mag Error vis Symbol Phase Error vis Symbol
MKR 530 275 250	Symbol					Phase Error Code Power	0.22 deg. -12.17 dB	vs Symbol Mag Error vs Symbol Phase Error vs

Code Domain (Vector Error vs. Symbol)

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MX2690xxA/MX2830xxA/MX2840xxA/MX2850xxA series Measurement Software

W-CDMA/HSPA Uplink Measurement Software MX269012A

The W-CDMA/HSPA Uplink Measurement Software MX269012A supports measurement of the RF Tx characteristics of W-CDMA/HSDPA/HSUPA/ HSPA Evolution mobile terminals.

Installing it in the MS269xA/MS2850A/MS2830A supports fast, high-accuracy measurements ideal for efficient R&D and early rollout of mobile terminals and mobile-terminal components.

Versatile Functions for W-CDMA/HSPA/HSPA Evolution Development

Modulation analysis, Tx Power measurements, etc., required for development of W-CDMA/HSPA/HSPA Evolution mobile terminals and device components are performed at high speed with superior accuracy.

Modulation Analysis

- Frequency Error
- Mean Power
- Vector Error/Amplitude Error/Phase Error
- Origin Offset
- Peak Code Domain Error
- Constellation
- Vector Error/Amplitude Error/Phase Error vs. Chip

Code Domain

- Mean Power
- Vector Error/Amplitude Error
- Code Power
- Code Domain/Code Domain Error
- Constellation
- Vector Error/Amplitude Error/Code Power vs. Symbol

Spectrum

- · Adjacent Channel Leakage Power
- Channel Power
- Occupied Bandwidth
- Spectrum Emission Mask

Specifications

The specification is the value after 30-minute warm-up at a constant ambient temperature. The specifications are defined under the following condition unless otherwise specified. Attenuator mode: Mechanical Attenuator Only (MS2830A only)

Cinnal Analyzan		MS269xA	MS2830A				
Signal Analyzer		MISZO9XA	MS2850A				
Target Signal		W-CDMA/HSPA/HSPA Evolution Uplink					
Measurement F	requency Range	400 MHz to 3 GHz					
	Measurement Level Range	-15 to +30 dBm (Preamp Off, or Preamp not installed) -30 to +10 dBm (Preamp On)					
		At 18°C to 28°C, After calibration, EVM = 1% signal					
Modulation/ Frequency	Carrier Frequency Measurement Accuracy	± (Accuracy of reference frequency × Carrier frequency + 5) Hz	± (Accuracy of reference frequency × Carrier frequency + 6) Hz				
Measurement		At 18°C to 28°C, After calibration, When input signal withi	in measurement level range and less than input level				
_	Modulation Accuracy	Residual Vector Error: ≤1.0% (rms)	Residual Vector Error: ≤1.2 % (rms)				
	Waveform Display	EVM vs. Chip, Amplitude Error vs. Chip, Phase Error vs. Ch	nip, IQ Constellation				
Amplitude A Measurement A	Measurement Level Range	-15 to +30 dBm (Preamp Off, or Preamp not installed) -30 to +10 dBm (Preamp On)	-15 to +30 dBm (Preamp Off, or Preamp not installed)				
	Average Power Measurement Accuracy (Found from root sum of	At 18°C to 28°C, After calibration, Input attenuator \geq 10 dB, When input signal within measurement level range and less than input level					
	squares (RSS) of absolute amplitude accuracy and in-band frequency characteristics of main frame)	±0.6 dB (Preamp Off, or Preamp not installed) ±1.1 dB (Preamp On)	±0.6 dB (Preamp Off, or Preamp not installed)				
	Measurement Level Range	-15 to +30 dBm (Preamp Off, or Preamp not installed) -30 to +10 dBm (Preamp On)					
		At 18°C to 28°C, After calibration, When input signal withi	in measurement level range and less than input level				
Code Domain	Code Domain Power	Relative Accuracy: ±0.02 dB (Code Power ≥-10 dBc) ±0.05 dB (Code Power ≥-20 dBc) ±0.10 dB (Code Power ≥-30 dBc)	Relative Accuracy: $\pm 0.02 \text{ dB}$ (Code Power ≥-10 dBc) $\pm 0.10 \text{ dB}$ (Code Power ≥-20 dBc) $\pm 0.15 \text{ dB}$ (Code Power ≥-30 dBc)				
Measurement		At 18°C to 28°C, After calibration, When input signal withi	in measurement level range and less than input level				
	Code Domain Error	Residual Error: ≤–46 dB	Residual Error: ≤–42 dB				
		Accuracy: ±0.3 dB (Code Domain Error ≥-30 dBc) ±1.0 dB (Code Domain Error ≥-40 dBc)					
	Waveform Display	EVM vs. Symbol, Amplitude Error vs. Symbol, Vector Erro Code Domain Error, Code Domain Power	r vs. Symbol, Symbol Constellation,				
Spectrum Measurement	Measurement Functions	Adjacent Channel Leakage Power, Channel Power, Occup	ied Bandwidth, Spectrum Emission Mask				

MS269xA MS2850A

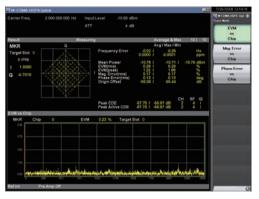
W-CDMA/HSPA Uplink Measurement Software MX269012A (Continued)

MS269xA MS2850A MS2830A

Measurement Functions

• Frequency Error/Mean Power/Modulation Accuracy

The Frequency Error, Mean Power, and Modulation Accuracy are displayed simultaneously as a constellation and graphs showing changes in Vector Error/Amplitude Error/Phase Error over time (Chip units). Instantaneous characteristics can be measured due to the excellent residual EVM characteristics of the MS269xA.



Constellation and Vector Error vs. Chip

🖥 wi CDMA, HSPA Carrier Fred.	2 000 000 000 Hz	Input Level -10.0	0 d8m		7/29/2008 131511
Result		ATT	4 cl) Average I		EVM vs Chip
MKR Target Slot 0 0 chip	•	Frequency Em	0.0000 / -0.00		Mag Error vs Chip
Q 0.3190		EVM(ms) EVM(peak) EVM(peak) Mag.Error(ms Phase Error(ms Origin Offset		29 % 66 % 17 %	Phase Error VS Chip
Phase Error vs C		Peak CDE Peak Active CD		CH 5F 10 2 4 0 2 4 0	
MKR Chip	O Phase	Error -0.12 deg. Ter	getSlot 0		
250					
			****	-	
-210	25. 171 2	1021 125	100 100 200	2001 2004	

Constellation and Phase Error vs. Chip

Code Domain

Code Power and Code Errors can be displayed simultaneously as a specified code constellation and as graphs showing changes in Vector Error/Amplitude Error/Code Power over time (Symbol units). These time domain graphs allow the designer to find demodulation errors between RF and baseband.



Code Domain Power and Constellation

W-CDMA HSP	A Uplink				10	7/29/2008 13:22:50
arrier Freq.	2 000 000 000 Hz	Input Level ATT	-10.00 dBm 4 dB			Code Domain Mo
esu?						Power Error
esus ode Domain Po	wer	_				
I Code 1 Power	28 CH/SF 4.61 dB Error	2 / 4 59.05 dB	Modulation 4PAM	Brench I Target Slot 0		
				Mean Power EVM(rms)	-10.74 dBm	
Power	28 CH / SF 4.78 dB Error	2 4 -58.47 dB	Modulation 4PAM	EVM(peak) Mag. Error Code Power	0.58 %	
ode Power vs 3	C Symbol	12	10 20	Cool Power	4.01 08	Constellation
MKR Symbo	ol 0 Code P	ower -2.16	dB Target Slot 0			EVM vs Symbol
-100	M ATATA MA	11.11.1		WARA U	Nie Pa	Mag Error Vs Symbol
						Code Power vs Symbol
et let	Pre-Amp Off					

Code Domain Power and Code Power vs. Symbol

GSM/EDGE Measurement Software MX269013A EDGE Evolution Measurement Software MX269013A-001

The GSM/EDGE Measurement Software MX269013A and EDGE Evolution Measurement Software MX269013A-001 support measurement of the RF Tx characteristics of GSM/EDGE (EGPRS) and EDGE Evolution (EGPRS2) signals.

Installation in the MS269xA/MS2850A/MS2830A supports fast, high-accuracy measurements ideal for efficient R&D and early rollout of GSM/EDGE/ EDGE Evolution base stations, mobile terminals, and terminal components.

Versatile Functions for GSM/EDGE/EDGE Evolution R&D

Supports the fast, high-accuracy modulation analysis and mean power measurements required for development of GSM/EDGE/EDGE Evolution base stations, mobile terminals, and components.

Modulation Analysis (GMSK)

- Frequency Error
 Phase Error (Peak/rms)
- Constellation · Phase Error vs. Symbol
- Modulation Analysis (QPSK, 8PSK, 16QAM, 32QAM)
- Frequency Error
- Vector Error (EVM) [Peak/rms]
- Magnitude Error/Phase Error (rms)
- Origin Offset
- 95th percentile
- Droop
- Constellation
- EVM/Magnitude Error/Phase Error vs. Symbol

Specifications

The specification is the value after 30-minute warm-up at a constant ambient temperature. Unless otherwise noted, same specifications for MX269013A and MX269013A-001. The specifications are defined under the following condition unless otherwise specified. Attenuator mode: Mechanical Attenuator Only (MS2830A only)

Signal Analyzer		MS269xA	MS2830A
Signal Analyzer			MS2850A
Supported Signa	als	MX269013A: GSM/EDGE Downlink and Uplink MX269013A-001: EDGE Evolution Downlink and Uplink	
Modulation Met	dulation Method asured Frequency Range Measured Level Range Carrier Frequency Measurement Accuracy dulation/ quency asurement Modulation Accuracy Waveform Display Measured Level Range Average Power Measurement Accuracy (Found from root sum- squares (RSS) of absolute amplitud	MX269013A: GMSK, 8PSK, AQPSK (Normal Burst, Continuo	,
		MX269013A-001: QPSK, 16QAM, 32QAM (Normal Burst, Hi	gher Symbol Rate Burst, Continuous)
Measured Frequ	iency Range	400 MHz to 2 GHz	
	Measured Level Range	-15 to +30 dBm (Preamp Off, or Preamp not installed) -30 to +10 dBm (Preamp On)	
	Carrier Frequency	At 18°C to 28°C, After calibration, with EVM = 1% signal	
		± (Accuracy of reference frequency ×	± (Accuracy of reference frequency ×
	Measurement Accuracy	Carrier frequency + 5) Hz	Carrier frequency + 8) Hz
		At 18°C to 28°C, After calibration, With input signal in measure	surement level range and less than Input level
Modulation/		MX269013A	MX269013A
		Residual Vector Error (8PSK/AQPSK): ≤0.6% (rms)	Residual Vector Error (8PSK/AQPSK): ≤1.0% (rms)
Measurement	Modulation Accuracy	MX269013A-001	MX269013A-001
		Residual Vector Error: ≤0.6% (rms)	Residual Vector Error: ≤1.0% (rms)
		MX269013A	MX269013A
		Residual Phase Error (GMSK): ≤0.5 degrees (rms)	Residual Phase Error (GMSK): ≤0.7 degrees (rms)
	Waveform Display	MX269013A Constellation, EVM vs. Symbol (8PSK/AQPSK), Magnitude MX269013A-001 Constellation, EVM vs. Symbol, Magnitude Error vs. Symb	
	Measured Level Range	–15 to +30 dBm (Preamp Off, or Preamp not installed) –30 to +10 dBm (Preamp On)	-15 to +30 dBm (Preamp Off, or Preamp not installed)
Amplitude	Accuracy (Found from root sum of	At 18°C to 28°C, After calibration, With input attenuator ≥1 less than input level	0 dB and input signal in measurement level range and
Measurement	squares (RSS) of absolute amplitude accuracy and in-band frequency characteristics of main frame)	±0.6 dB (Preamp Off, or Preamp not installed) ±1.1 dB (Preamp On)	$\pm 0.6 \text{ dB}$ (Preamp Off, or Preamp not installed)
	Waveform Display	Rise, Fall, Slot, Frame	
		At 18°C to 28°C, After calibration, With input attenuator ≥ 1 no Preamp installed), Carrier frequency of 400 MHz to 2000	
		Measurement Points: ±100, ±200, ±250, ±400, ±600, ±800,	
Output RF Spectrum Measurement	Modulation Part Measurement	Measurement Range: <-41 dB (100 kHz detuning), <-66 dB (200 kHz detuning), <-74 dB (250 kHz detuning), <-79 dB (400 kHz detuning), <-80 dB (<1200 kHz detuning), <-83 dB (<1800 kHz detuning), <-80 dB (≥1800 kHz detuning)	
		Measurement Points: ±400, ±600, ±1200, ±1800 kHz	•
	Switching Transients Measurement	Measurement Range: <-71 dB (400 kHz detuning), <-72 dB (600 kHz detuning), <-75 dB (1200 kHz detuning), <-75 dB (1800 kHz detuning)	_

Output Spectrum Measurement

MS269xA MS2850A

- Spectrum due to Modulation
- Spectrum due to Switching Transients
- Power vs. Time
- Slot Power Slot Status
- Symbol Power Graph
- Time Offset

GSM/EDGE Measurement Software MX269013A EDGE Evolution Measurement Software MX269013A-001 (Continued)

MS269xA MS2850A MS2830A

Measurement Functions

• Frequency Error/Modulation Accuracy

As well as displaying frequency error, modulation accuracy and numeric average and maximum values, the constellation and temporal changes in vector, amplitude and phase errors can are displayed simultaneously as graphs (symbol units) to monitor symbol-dependent changes in modulation accuracy.

			-10.00 dBm			Trace Mode
Sand	DL/PCS 1900		4 dB			EVM
Fignal	NB132QAM					**
Result				Average &	Max 107 10	Symbol
MKR 40 Symbol			Frequency Error	0.34 / 0.000 /	Avg / Max 0.90 Hz 0.000 ppm	Mag Error vs Symbol
0 1 1158			EVM(rms)		0.22 %	Phase Error
		· ·	EVM(peak)			
			Mag. Error(rms)			Symbol
			Phase Error(ms)	0.09 /	0.11 deg.	
	• • •		Origin Offset	62.80 /	-69.13 dB	
			95th percentile Droop	0.37	% 3.65 neperals	
		5.04	1.74 M			
MKR Symbol MKR Sym Loo	nbol 3	EVM (0.29 %			
MKR Sym	nbol 3	EVM	0.29 %			
MKR Syn	nbol 3	EVM (0.29 %			
MKR Syn	nbol 3	EVM (0.29 %			
	nbol 3	EVM	0.29 %			
MKR Syn 500 3.75	nbol 3	EVM	0.28 %			
MKR Sym 5.00 2.35 2.50						
MKR Sym 5.00 2.35 2.50						

Output Spectrum Measurements

The power spectrum is measured from the center frequency to a specified offset frequency. Modulation measures the spectrum due to modulation near the burst center; Switching Transients measures the spectrum due to the burst wave rise/fall.



Modulation Part



Switching Transients Part

• Power vs. Time

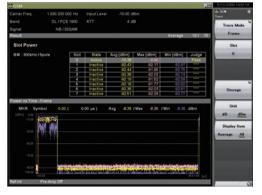
Variations in power with time are monitored at rise/fall, slot and frame displays to support Pass/Fail evaluation. The burst characteristics are easily understood from the single average, max. and min. display.



Rise/Fall (Average)



Slot (Average)



Frame (Average/Max./Min.)

ETC/DSRC Measurement Software MX269014A

The ETC/DSRC Measurement Software MX269014A supports measurement of the RF Tx characteristics of ARIB STD T75 narrow-band wireless devices. Installing it in the MS269xA supports fast, high-accuracy measurements ideal for efficient R&D, early rollout, and evaluation of DSRC wireless devices.

High-accuracy and High-speed Measurements Support Higher Manufacturing Efficiency

The MS269xA series supports modulation analysis and spectrum measurement for manufacturing and servicing DSRC wireless equipment. High-accuracy measurements are supported by extending the baseband upper frequency limit to 6 GHz. The \pm 0.6 dB accuracy for Tx power measurement in the 5.8-GHz band using ETC/DSRC improves yield, while manufacturing and inspection times are cut to 110 ms* and 190 ms*, respectively, for analyzing π /4DQPSK and ASK modulation signals to improve production throughout.

*: Average with graph display OFF (reference value); approximately 120 ms (π/4DQPSK) and 350 ms (ASK) with graph display ON.

Modulation Analysis (π/4DQPSK)

- Frequency Error
- Tx Power
- Vector Error (EVM) [Peak/rms]
- Origin Offset
- Droop Factor
- Constellation

Modulation Analyzer (ASK)

- Frequency Error
- Tx Power
- Peak Power
- Modulation Index
- Eye Opening
- Eye Diagram

Spectrum

- Adjacent Channel Leakage Power
- Occupied Bandwidth

Specifications

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

Signal Analyzer		MS269xA
_	Modulation Method	π/4DQPSK, ASK
Common Specifications	Target Signals	Downlink, Uplink
Specifications	Target Channel	MDC
	Measurement Frequency Range	5700 MHz to 5900 MHz
Modulation/	Measurement Level Range	-15 to +30 dBm (Preamp Off, or Preamp not installed) -30 to +10 dBm (Preamp On)
Frequency Measurement	Carrier Frequency Measurement Accuracy	At 18°C to 28°C, after calibration, with EVM = 1% signal ± (Accuracy of reference frequency × Carrier frequency + 20) Hz
	Residual Vector Error	At 18°C to 28°C, after calibration, when modulation is π/4DQPSK <1.0% (rms)
Amplitude Measurement	Tx Power Measurement Accuracy (This is found from root sum of squares (RSS) of absolute amplitude accuracy and in-band frequency characteristics of main frame.)	At 18°C to 28°C, after calibration, with input attenuator ≥10 dB and input signal in measurement level range and less than Input level ±0.6 dB (Preamp Off, or Preamp not installed) ±1.1 dB (Preamp On)
	Modulation/Frequency	Constellation (π/4DQPSK), Eye Diagram (ASK)
Waveform Display	Spectrum	Adjacent Channel Leakage Power, Occupied Bandwidth

MS269xA

ETC/DSRC Measurement Software MX269014A (Continued)

MS269xA

Measurement Functions

Modulation Analysis (π/4DQPSK)

This analysis displays the π /4DQPSK modulation signal results along with a constellation graph. The dispersion of RF characteristics is measured easily using simultaneous display of maximum and average values.

	5 795 0	00 000 Hz	Ing		00 68m				Common Setting	
									Modulation	•
lesult						A	erage & Max 10 /	10	#/4 DOPSK	
	q						Max			
				Frequency Error						
				Tx Power			-11,44 dBm			
				EVM(ms)						
				EVM(peak)						
				Origin Offset	-64.82		-60.99 dB			
				Droop Factor	0.0000		0.0000 dB/symbo			
MKR 90 1 40,70 Q 40,70										
ef Ext	Pre-Amp O	e								

Modulation Analysis (ASK)

This analysis displays the ASK modulation signal results along with an eye diagram.



TD-SCDMA Measurement Software MX269015A

The TD-SCDMA Measurement Software MX269015A supports measurement of the TRx characteristics of TD-SCDMA 3G digital mobile devices. Installing it in the MS269xA/MS2850A/MS2830A supports fast, high-accuracy measurements ideal for R&D and early rollout of base stations, repeaters, mobile terminals, and components.

Supports Various Functions for R&D and Manufacturing of TD-SCDMA Wireless Equipment and Devices

Modulation analysis and spectrum measurement results can be displayed as both numeric values and graphs. The efficiency of base station and repeater tests is increased by using the Multi Carrier and Multi Slot Power measurement functions as well as the Multi Carrier Adjacent Channel Leakage Power measurement function.

Modulation Analysis

- Frequency Error
- Tx Power
- Vector Error (EVM) [Peak/rms]
- Origin Offset
- Peak Code Domain Error
- Constellation
- Code Domain Graph
- Multi-Carrier Power
- Multi-Slot Power

Spectrum

• Adjacent Channel Leakage Power (ACLR)

MS269xA MS2850A MS2830A

- Occupied Bandwidth (OBW)
- Spectrum Emission Mask (SEM)

Power vs. Time

- Time Mask
- Off Power
- On Power
- TSi Power Power vs. Time Graph

Specifications

The specification is the value after 30-minute warm-up at a constant ambient temperature. The specifications are defined under the following condition unless otherwise specified. Attenuator mode: Mechanical Attenuator Only (MS2830A only)

Signal Analyzer		MS269xA	MS2830A			
Signal Analyzer		WI5209XA	MS2850A			
Channel Bandwi	dth	1.6 MHz				
Measurement Fr	requency Range	1850 MHz to 2620 MHz				
	Measurement Level Range	 -15 to +30 dBm (Preamp Off, or Preamp not installed) -30 to +10 dBm (Preamp On) 				
Modulation/ Frequency	Carrier Frequency Measurement Accuracy	At 18°C to 28°C, After calibration, with EVM = 1% signal ± (Accuracy of reference frequency × Carrier frequency +	20) Hz			
Measurement		At 18°C to 28°C, After calibration, With input signal in measurement level range and less than input level				
	Modulation Accuracy	Residual Vector Error: ≤1.0% (rms)	Residual Vector Error: ≤1.2% (rms)			
	Measurement Level Range	-15 to +30 dBm (Preamp Off, or Preamp not installed) -30 to +10 dBm (Preamp On)	-15 to +30 dBm (Preamp Off, or Preamp not installed)			
Amplitude Measurement	Average Power Measurement Accuracy (Found from root sum of	At 18°C to 28°C, After calibration, With input attenuator ≥10 dB and input signal in measurement level range and less than input level				
	squares (RSS) of absolute amplitude accuracy and in-band frequency characteristics of main frame)	$\pm 0.6 \text{ dB}$ (Preamp Off, or Preamp not installed) $\pm 1.1 \text{ dB}$ (Preamp On)	±0.6 dB (Preamp Off, or Preamp not installed)			
		At 18°C to 28°C, After calibration, With input signal in me	asurement level range and less than input level			
	Code Domain Power	Relative Accuracy: ±0.18 dB (Code Power ≥-10 dBc) ±0.32 dB (Code Power ≥-30 dBc)				
Code Domain Measurement		At 18°C to 28°C, After calibration, With input signal in me	asurement level range and less than input level			
Measurement	Code Domain Error	Residual Error: ≤–40 dB Accuracy: ±1.0 dB (Code Domain Error ≥–40 dBc)				
	Waveform Displays	Code Domain Power, Code Domain Error, IQ Constellation				
Spectrum Measurement Measurement Functions Adjacent Channel Leakage Power, Occupied Bandwidth, Spectrum Emission Mask, Power vs. Time						

TD-SCDMA Measurement Software MX269015A (Continued)

MS269xA MS2850A MS2830A

Measurement Functions

Frequency Error/Tx Power/Modulation Accuracy

The Frequency Error, Tx Power, and Modulation Accuracy for the specified carrier slot are displayed simultaneously as constellation and code domain power graphs. Instantaneous characteristics can be measured due to the excellent residual EVM characteristics of the MS269xA.



Constellation and Code Domain Power



Code Number

Code Domain Power vs. Code Number

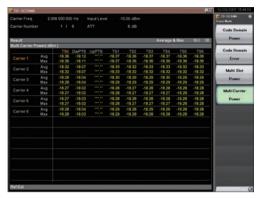


Code Number

Code Domain Error vs. Code Number

• Multi Carrier/Multi Slot Power Measurements

The Multi Carrier measurement function simultaneously displays the Tx Power for all carriers and slots of the multi carrier signal, while the Multi Slot Power measurement function simultaneously displays the mean and partial Tx Powers for all slots.



Multi Carrier Power

	10 000 00		Input Level		10.00 cBm					These Mode
Carrier Number										Code Domain
Result			_				Average	& Max	107 10	Power
Multi Slot Powe									_	Code Domais
Subframe	-10,49									Error
	-10.49									
		DwPTS								Multi Slot
	-10.49			-10,49	-10.49	-10.49	-10.49	-10,49	-10.49	
Mean	-10.49	-10.53		-10.49	-10.49	10.49	-10.49	10.49	-10.49	MultiCarrie
										Power
Oata1	-10,48			-10.49	-10,49	-10.48	-10.49	-10.49	-10.48	
	-10.48			-10.49	-10,49	-10.48	-10.49	-10.49	-10.48	
Midamble	-10.49			-10.50	-10.49	-10.49	-10.49		-10.49	
MICENCE	-10.49			-10.49	-10.48	-10.48			-10.47	
Data2	-10,49				-10,49		-10.49	-10.49	-10.60	
Owner?	-10.49			-10.49	-10.49	-10,49	-10.49	-10.49	-10.49	
RefExt										

Multi Slot Power

• Power vs. Time Measurements

Provides measurements for Transmitter OFF Power and Time Mask. This function can be used only in MS269xA series.



Power vs. Time

ООО "Техэнком" Контрольно-измерительные приборы и оборудование www.tehencom.com

MX2690xxA/MX2830xxA/MX2840xxA/MX2850xxA series Measurement Software

Vector Modulation Analysis Software MX269017A APSK Analysis MX269017A-001 Higher-Order QAM Analysis MX269017A-011

MS269xA MS2850A MS2840A

The Vector Modulation Analysis software MX269017A supports various digital wireless modulation analyses. Installing it in the MS269xA/MS2850A/MS2840A/MS2830A supports fast, high-accuracy measurements ideal for R&D and early rollout of digital radio equipment and components serving a wide range of applications, ranging from public safety (PMR/LMR)*1 to aerospace and satellite communications.

*1: Can measure TETRA, DMR, dPMR, APCO-P25 Phase1/Phase2, NXDN, ARIB STD-T98, T102, etc.

Versatile Functions for Digital Wireless Communication Development

Fast and high-accuracy modulation analysis for R&D into digital radio equipment and components for public, aerospace, and satellite applications.

Numeric result display

BPSK. QPSK, O-QPSK, π/4DQPSK, 8PSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 512QAM, 1024QAM, 2048QAM, MSK, 16APSK, 32APSK

- Tx Power
- Filtered Power
- Frequency Error (Hz, ppm)
- Vector Error (EVM) [Peak/rms]
- Offset Vector Error (EVM) [Peak/rms] (O-QPSK)
- Phase Error (Peak/rms)
- Magnitude Error (Peak/rms)
- Symbol Rate Error
- BER (only BER = On) Specific Word (Hex)
- Origin Offset
- Droop Factor (BPSK, π/4DQPSK, 8PSK, MSK)
- IO Gain Imbalance (QPSK, O-QPSK, π/4DQPSK, 8PSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, MSK)
- Ouadrature Error (QPSK, O-QPSK, π/4DQPSK, 8PSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, MSK)
- MER (Peak/rms)
- Offset EVM [Peak/rms] (O-QPSK)
- Timing Offset

2FSK, 4FSK, H-CPM*

- Tx Power
- Filtered Power
- Frequency Error (Hz, ppm)
- Magnitude Error (Peak/rms)
- FSK Error (Peak/rms)
- BER (only BER = On)
- Modulation Fidelity (Peak/rms)
- Symbol Rate Error
- Specific Word (Hex)
- Jitter (P-P Min., P-P Max.)
- Deviation (Average, +Peak, -Peak, (Peak-Peak)/2)
- Deviation rms [%] (2FSK) • Deviation at Ts/2
- [Average, +Max, Peak, +Min, Peak, -Max, Peak, -Min, Peak, (Peak-Peak)/2, +Max, Peak%, -Min. Peak%] (2FSK, 4FSK)
- Timing Offset
- *: Used at APCO-P25 Phase2 Inbound measurement

2ASK

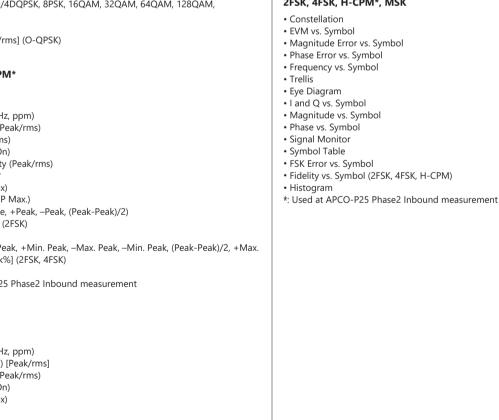
- Tx Power
- Filtered Power
- Frequency Error (Hz, ppm) Vector Error (EVM) [Peak/rms]
- Magnitude Error (Peak/rms)
- BER (only BER = On)
- Specific Word (Hex)
- Droop Factor
- MER (Peak/rms)
- Symbol Rate Error • Modulation Index (rms)
- Eye Opening (X-Time)
- Eye Opening (Y-Amplitude)
- Timing Offset

Graph display

BPSK, QPSK, O-QPSK, π /4DQPSK, 8PSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 512QAM, 1024QAM, 2048QAM, 2ASK, 4ASK, 16APSK, 32APSK

- Constellation
- EVM vs. Symbol
- Magnitude Error vs. Symbol
- Phase Error vs. Symbol
- Trellis
- Eye Diagram
- · I and Q vs. Symbol Magnitude vs. Symbol
- Phase vs. Symbol
- Signal Monitor
- Symbol Table
- Equalizer Amplitude
- Equalizer Phase
- Equalizer Group Delay
- Equalizer Impulse Response

2FSK, 4FSK, H-CPM*, MSK



Vector Modulation Analysis Software MX269017A APSK Analysis MX269017A-001 Higher-Order QAM Analysis MX269017A-011 (Continued)

MS269xA MS2850A MS2840A MS2830A

Specifications

The specification is the value after 30-minute warm-up at a constant ambient temperature. The specifications are defined under the following condition unless otherwise specified. Attenuator mode: Mechanical Attenuator Only (MS2840A/MS2830A)

Common Specifications

Signal Analyze	r	MS269xA	MS2850A	MS2840A	MS2830A		
Measurement Symbol Rate Range	BPSK, QPSK, π/4DQPSK, 8PSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 2ASK, 4ASK, MSK	0.1 ksps to 12.5 Msps	0.1 ksps to 12.5 Msps	0.1 ksps to 12.5 Msps (MS2840A-006/009 installed)	0.1 ksps to 12.5 Msps (MS2830A-005/009, 006 installed) 0.1 ksps to 5 Msps (MS2830A-006 installed)		
	2FSK, 4FSK	0.1 ksps to 6.25 Msps	0.1 ksps to 6.25 Msps	0.1 ksps to 6.25 Msps (MS2840A-006/009 installed)	0.1 ksps to 6.25 Msps (MS2830A-005/009, 006 installed) 0.1 ksps to 2.5 Msps (MS2830A-006 installed)		
Modulation	Standard	BPSK, DBPSK, π/2DBPSK, QPSK, O-QPSK, DQPSK, π/4 DQPSK, 8PSK, D8PSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 2FSK, 4FSK, H-CPM, 2ASK, 4ASK, MSK					
Method	Option	_	16APSK, 32APSK (MX26901 512QAM, 1024QAM, 2048C		—		

Frequency Setting Range

MS269xA						
	Conc	- Frequency Setting Range				
Option	Modulation Type	ation Type Measuring Object Symbol Rate				
	BPSK, QPSK, π/4DQPSK,	Frame Format	>12.5 Msps	100 MHz to the upper limit of the main unit		
With MS269xA-067/167	8PSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM,	Non-Formatted (Span Up = On)	>12.5 Msps	100 MHz to the upper limit of the main unit		
	2ASK, 4ASK, MSK	Non-Formatted (Span Up = Off)	>35 Msps	100 MHz to the upper limit of the main unit		
	2FSK, 4FSK	—	>6.25 Msps	100 MHz to the upper limit of the main unit		
	O-QPSK	_	>3.125 Msps	100 MHz to the upper limit of the main unit		
	BPSK, QPSK, π/4DQPSK,	Frame Format	>12.5 Msps	100 MHz to 6 GHz		
Without	8PSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM,	Non-Formatted (Span Up = On)	>12.5 Msps	100 MHz to 6 GHz		
MS269xA-067/167	2ASK, 4ASK, MSK	Non-Formatted (Span Up = Off)	>35 Msps	100 MHz to 6 GHz		
	2FSK, 4FSK	—	>6.25 Msps	100 MHz to 6 GHz		
	O-QPSK	—	>3.125 Msps	100 MHz to 6 GHz		
Other than above				100 kHz to the upper limit of the main unit		

MS2850A						
	Conc	Frequency Setting Range				
Modulation Type		Measuring Object Symbol Rate				
MS2850A-067	BPSK, QPSK, π/4DQPSK, 8PSK, 16QAM, 32QAM 64QAM, 128QAM, 256QAM, 2ASK, 4ASK, MSK	Frame Format	>12.5 Msps	300 MHz to the upper limit of the main unit		
		Non-Formatted (Capture OSR = 4)	>12.5 Msps	300 MHz to the upper limit of the main unit		
(standard)		Non-Formatted (Capture OSR = 4)	>35 Msps	300 MHz to the upper limit of the main unit		
	2FSK, 4FSK		>6.25 Msps	300 MHz to the upper limit of the main unit		
	O-QPSK	—	>3.125 Msps	300 MHz to the upper limit of the main unit		
Other than above		·		100 kHz to the upper limit of the main unit		

Other than above

		MS284	40A	
		MS283	30A	
Condition				- Frequency Setting Range
Option	Modulation Type	Measuring Object	Symbol Rate	
	BPSK, QPSK, π/4DQPSK,	Frame Format	>12.5 Msps	300 MHz to the upper limit of the main unit
With	8PSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM,	Non-Formatted (Span Up = On)	>12.5 Msps	300 MHz to the upper limit of the main unit
MS2840A-067/167,	2ASK, 4ASK, MSK	Non-Formatted (Span Up = Off)	>35 Msps	300 MHz to the upper limit of the main unit
MS2830A-067/167	2FSK, 4FSK			300 MHz to the upper limit of the main unit
	O-QPSK	—	>3.125 Msps	300 MHz to the upper limit of the main unit
	BPSK, QPSK, π/4DQPSK,	Frame Format	>12.5 Msps	300 MHz to 6 GHz or the upper limit of the main unit, whichever is lower.
14.0°-1	8PSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 2ASK, 4ASK, MSK	Non-Formatted (Span Up = On)	>12.5 Msps	300 MHz to 6 GHz or the upper limit of the main unit, whichever is lower.
Without MS2840A-067/167, MS2830A-067/167		Non-Formatted (Span Up = Off)	>35 Msps	300 MHz to 6 GHz or the upper limit of the main unit, whichever is lower.
1012030A-001/101	2FSK, 4FSK	_	>6.25 Msps	300 MHz to 6 GHz or the upper limit of the main unit, whichever is lower.
	O-QPSK	_	>3.125 Msps	300 MHz to 6 GHz or the upper limit of the main unit, whichever is lower.
Other than above				100 kHz to the upper limit of the main unit

Vector Modulation Analysis Software MX269017A APSK Analysis MX269017A-001 Higher-Order QAM Analysis MX269017A-011 (Continued)

MS269xA MS2850A MS2840A MS2830A

Symbol Rate Setting Range

Firmware package version 12.00.00 and later:

Model	Option					
MS2830A	With 006/106 With 0		005/105/007/009	With 077		With 078
MS2840A	With 006/106	With (005/105/009/109	With 077/17	7	With 078/178
MS269xA		Except a	s described on right	With 077/17	7	With 004/078/178
Maximum Sampling Rate (SP)	20 MHz		50 MHz	100 MHz		200 MHz
Maximum Analysis Bandwidth (SPAN)	10 MHz		31.25 MHz	62.5 MHz		125 MHz
"Capture OSR"	Maxi	mum settin	g symbol rate [symbo	l/s] (Min.: 0.1k Max.: S	P/Capture	OSR)
"32"	0.625 M		1.5625 M	3.125 M		6.25 M
"16"	1.25 M		3.125 M	6.25 M		12.5 M
"8"	2.5 M		6.25 M	25 M 12.5 M		25 M
"4"	5 M		12.5 M	25 M		50 M
"2"	10 M		25 M	50 M		100 M
"1"	20 M		50 M	100 M		200 M
Model			Opt	tion		
MS2850A	With 032		With	h 033		With 034
Maximum Sampling Rate (SP)	325 MHz		650	650 MHz		1300 MHz
Maximum Analysis Bandwidth (SPAN)	255 MHz		510	510 MHz		1000 MHz
"Capture OSR"	Maxi	mum settir	g symbol rate [symbo	l/s] (Min.: 0.1k Max.: S	P/Capture	OSR)
"32"	10.15625 M		20.31	25 M	40.625 M	
"16"	20.3125 M		40.62	25 M	81.25 M	
"8"	40.625 M		81.2	25 M		162.5 M
"4"	81.25 M		162.	.5 M		325 M
"2"	162.5 M		325	δM	650 M	
"1"	325 M		650) M		1300 M

Modulation/Frequency Measurement

Signal Analyzer		MS269xA	MS2850A	MS2840A	MS2830A		
Measurement Level Range		–15 to +30 dBm (Preamp Off, or Preamp not installed) –25 to +10 dBm (Preamp On)					
BPSK, QPSK, 8PSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 2FSK, 4FSK,				o 28°C, after calibration, with EVM = 1% signal ± (Accuracy of reference frequency × Carrier frequency + 10) Hz (Center Frequency: 30 MHz to 3.5 GHz)			
Carrier Frequency Measurement Accuracy	MSK	with Frequency Band Mode set to Spurious.)	(Center Frequency: 800 MHz to 3.5 GHz, symbol rate: 5 Msps to 50 Msps)				
	П/4DQPSK, 2ASK, 4ASK	For firmware package version 12.00.(± (Accuracy of reference frequency × Carrier Frequency + 10) Hz (Center Frequency: 30 MHz to 6.0 GHz) (Note that a range of 3 GHz or above is not available when MS269xA-003 is installed and with Frequency Band Mode set to Spurious.)	00 and later, Capture OSR = 4 ± (Accuracy of reference frequency × Carrier frequency: 30 MHz to 3.5 GHz, symbol rate: 4 ksps to 5 Msps) ± (Accuracy of reference frequency × Carrier frequency + 10) Hz (Center Frequency: 800 MHz to 3.5 GHz, symbol rate: 5 Msps to 50 Msps)	 ± (Accuracy of reference frequency × Carrier frequency + 10) Hz (Center Frequency: 30 MHz to 3.5 GHz) ± (Accuracy of reference frequency × Carrier frequency + 10) Hz (Center Frequency: 5.7 GHz to 5.9 GHz, nom.) 			
	512QAM 1024QAM 2048QAM	With MS2840A-002, At 18°C to 28°C, For firmware package version 12.00.0	after calibration, with EVM = 1% sign 00 and later, Capture OSR = 4 With MX269017-011 ± (Accuracy of reference frequency × Carrier frequency +10) Hz (Center frequency: 30 MHz to 3.5 GHz, symbol rate: 500 ksps to 5 Msps) With MX269017A-011 ± (Accuracy of reference frequency × Carrier frequency +10) Hz (Center frequency: 800 MHz to 3.5 GHz, symbol rate: 5 Msps to 50 Msps, Equalizer = On)	with MX269017A-011 ± (Accuracy of reference frequency × Carrier frequency +10) Hz (Center Frequency: 30 MHz to 3.5 GHz)			

Vector Modulation Analysis Software MX269017A APSK Analysis MX269017A-001 Higher-Order QAM Analysis MX269017A-011 (Continued)

MS269xA MS2850A MS2840A MS2830A

Signal Analyze	r	MS269xA	MS2850A	MS2840A	MS2830A			
			after calibration, with EVM = 1% sign	al				
		For firmware package version 12.00.0						
			With MX269017A-001	With MX269017A-001				
			± (Accuracy of reference frequency × Carrier frequency +10) Hz	± (Accuracy of reference frequency × Carrier				
Carrier			(Center Frequency: 30 MHz to	frequency +10) Hz				
Frequency	16APSK		3.5 GHz, symbol rate: 500 Ksps	(Center Frequency:				
Measurement	32APSK		to 5 Msps)	30 MHz to 3.5 GHz)				
Accuracy		—	With MX269017A-001					
			± (Accuracy of reference frequency					
			× Carrier frequency + 10) Hz					
			(Center frequency: 800 MHz to	_				
			3.5 GHz, symbol rate 5 Msps to					
			50 Msps, Equalizer = On)					
		Without MS269xA-001, With MS2840			ant lovel veneral and lose then			
		input level, 20-times averaging	er type: Root Nyquist or Nyquist, whe	in input signal within measureme	ent level range and less than			
		For firmware package version 12.00.0	Ω and later. Capture $OSR = 4$					
		<0.5% (rms)	<0.5 % (rms)	<1.0% (rms)				
		Symbol rate: 4 ksps to 500 ksps	Symbol rate: 4 ksps to 500 ksps	Symbol rate: 4 ksps to 500 ks	ns			
	BPSK, QPSK,	Measurement time length:	Measurement time length:	Measurement time length: ≤				
	8PSK, 16QAM,	≤50 ms	≤50 ms	Carrier Frequency: 50 MHz to				
	32QAM,	Carrier Frequency:	Carrier frequency:	<1.5% (rms)				
	64QAM,	50 MHz to 500 MHz	50 MHz to 500 MHz	Symbol rate: 500 ksps to 5 M				
	128QAM,	<1.0% (rms)	<1.0 % (rms)	Carrier Frequency: 50 MHz to	3.5 GHz			
	256QAM	Symbol rate: 500 ksps to 5 Msps	Symbol rate: 500 ksps to 5 Msps					
		Carrier Frequency:	Carrier frequency:					
		50 MHz to 6 GHz	50 MHz to 3.5 GHz					
		(Note that a range of 3 GHz or above is not available when MS269xA-003	<1.0 % (rms) Symbol rate: 5 Msps to 50 Msps					
		is installed and with Frequency	Carrier frequency:					
		Band Mode set to Spurious.)	800 MHz to 3.5 GHz					
		Without MS269xA-001, With MS2840		1				
			er type: Root Nyquist or Nyquist, whe	n input signal within measureme	ent level range and less than			
		input level, 20-time averaging						
		For firmware package version 12.00.0		1				
		<0.5% (rms)	<0.5 % (rms)	<1.0% (rms)				
		Symbol rate: 4 ksps to 500 ksps	Symbol rate: 4 ksps to 500 ksps	Symbol rate: 4 ksps to 500 ks				
		Measurement time length:	Measurement time length:	Measurement time length: ≤!				
Residual		≤50 ms Carrier Frequency:	≤50 ms Carrier frequency:	Carrier Frequency: 50 MHz to <1.5% (rms)	500 MHZ			
Vector Error	П/4DQPSK	50 MHz to 500 MHz	50 MHz to 500 MHz	Symbol rate: 500 ksps to 5 M	sps			
		<1.0% (rms)	<1.0 % (rms)	Carrier Frequency: 50 MHz to				
		Symbol rate: 500 ksps to 5 Msps	Symbol rate: 500 ksps to 5 Msps	<1.5% (rms) (nom.)				
		Carrier Frequency:	Carrier frequency:	Symbol rate: 500 ksps to 5 M	sps			
		50 MHz to 6 GHz	50 MHz to 3 .5 GHz	Carrier Frequency: 5.7 GHz to	5.9 GHz			
		(Note that a range of 3 GHz or above	<1.0 % (rms)					
		is not available when MS269xA-003	Symbol rate: 5 Msps to 50 Msps					
		is installed and with Frequency	Carrier frequency:					
		Band Mode set to Spurious.) Without MS269xA-001, With MS2840	800 MHz to 3 .5 GHz					
			pa-002, with MS2830A-002 asurement Filter: None, Reference Filt	ter: Gaussian BT 0.5 when input o	signal within measurement			
		level range and less than input level,			and and an and an and an and an and			
		For firmware package version 12.00.0	5 5					
		<0.5% (rms)	<0.5 % (rms)	<1.0% (rms)				
		Symbol rate: 4 ksps to 500 ksps	Symbol rate: 4 ksps to 500 ksps	Symbol rate: 4 ksps to 500 ks	ps			
				Measurement time length: ≤!	50 ms			
		Measurement time length:	Measurement time length:					
		≤50 ms	≤50 ms	Carrier Frequency: 50 MHz to	500 MHz			
	MSK	≤50 ms Carrier Frequency:	≤50 ms Carrier frequency:	Carrier Frequency: 50 MHz to <1.5% (rms)				
	MSK	≤50 ms Carrier Frequency: 50 MHz to 500 MHz	≤50 ms Carrier frequency: 50 MHz to 500 MHz	Carrier Frequency: 50 MHz to <1.5% (rms) Symbol rate: 500 ksps to 5 M	sps			
	MSK	≤50 ms Carrier Frequency: 50 MHz to 500 MHz <1.0% (rms)	≤50 ms Carrier frequency: 50 MHz to 500 MHz <1.0 % (rms)	Carrier Frequency: 50 MHz to <1.5% (rms)	sps			
	MSK	≤50 ms Carrier Frequency: 50 MHz to 500 MHz <1.0% (rms) Symbol rate: 500 ksps to 5 Msps	≤50 ms Carrier frequency: 50 MHz to 500 MHz <1.0 % (rms) Symbol rate: 500 ksps to 5 Msps	Carrier Frequency: 50 MHz to <1.5% (rms) Symbol rate: 500 ksps to 5 M	sps			
	MSK	≤50 ms Carrier Frequency: 50 MHz to 500 MHz <1.0% (rms) Symbol rate: 500 ksps to 5 Msps Carrier Frequency:	≤50 ms Carrier frequency: 50 MHz to 500 MHz <1.0 % (rms) Symbol rate: 500 ksps to 5 Msps Carrier frequency:	Carrier Frequency: 50 MHz to <1.5% (rms) Symbol rate: 500 ksps to 5 M	sps			
	MSK	≤50 ms Carrier Frequency: 50 MHz to 500 MHz <1.0% (rms) Symbol rate: 500 ksps to 5 Msps Carrier Frequency: 50 MHz to 6 GHz	≤50 ms Carrier frequency: 50 MHz to 500 MHz <1.0 % (rms) Symbol rate: 500 ksps to 5 Msps Carrier frequency: 50 MHz to 3 .5 GHz	Carrier Frequency: 50 MHz to <1.5% (rms) Symbol rate: 500 ksps to 5 M	sps			
	MSK	≤50 ms Carrier Frequency: 50 MHz to 500 MHz <1.0% (rms) Symbol rate: 500 ksps to 5 Msps Carrier Frequency:	≤50 ms Carrier frequency: 50 MHz to 500 MHz <1.0 % (rms) Symbol rate: 500 ksps to 5 Msps Carrier frequency:	Carrier Frequency: 50 MHz to <1.5% (rms) Symbol rate: 500 ksps to 5 M	sps			
	MSK	≤50 ms Carrier Frequency: 50 MHz to 500 MHz <1.0% (rms) Symbol rate: 500 ksps to 5 Msps Carrier Frequency: 50 MHz to 6 GHz (Note that a range of 3 GHz or above	≤50 ms Carrier frequency: 50 MHz to 500 MHz <1.0 % (rms) Symbol rate: 500 ksps to 5 Msps Carrier frequency: 50 MHz to 3 .5 GHz <1.0 % (rms)	Carrier Frequency: 50 MHz to <1.5% (rms) Symbol rate: 500 ksps to 5 M	sps			

Vector Modulation Analysis Software MX269017A APSK Analysis MX269017A-001 Higher-Order QAM Analysis MX269017A-011 (Continued)

MS269xA MS2850A MS2840A MS2830A

Signal Analyzer		MS269xA	MS2850A	MS2840A	MS2830A			
		With MS2840A-002 At 18°C to 28°C, after calibration, Measurement Filter: Root Nyquist, Reference Filter: Nyquist, when input signal within measurement level range and less than input level, 20-time averaging For firmware package version 12.00.00 and later, Capture OSR = 4						
Residual Vector Error –	512QAM 1024QAM 2048QAM	_	With MX269017A-011 <1.0 % (rms) Symbol rate: 500 ksps to 5 Msps Carrier frequency: 50 MHz to 3.5 GHz <1.0 % (rms) Symbol rate: 5 Msps to 50 Msps Carrier frequency: 800 MHz to 3.5 GHz (Note that Equalizer = On)	With MX269017A-011 <1.0 % (rms) Symbol rate: 500 ksps to 5 Msps Carrier frequency: 50 MHz to 3.5 GHz	_			
	16APSK 32APSK	With MS2840A-002 At 18°C to 28°C, after calibration, Measurement Filter: Root Nyquist, Reference Filter: Nyquist, when input signal within measurement level range and less than input level, 20-time averaging For firmware package version 12.00.00 and later, Capture OSR = 4						
		_	With MX269017A-001 <1.0 % (rms) Symbol rate: 500 ksps to 5 Msps Carrier frequency: 50 MHz to 3.5 GHz <1.5 % (rms) Symbol rate: 5 Msps to 50 Msps Carrier frequency: 800 MHz to 3.5 GHz	With MX269017A-001 <1.0 % (rms) Symbol rate: 500 ksps to 5 Msps Carrier frequency: 50 MHz to 3.5 GHz	_			
Symbol Rate Error		After CAL execution at 18°C to 28°C, according to the 10 MHz common reference*, when: Modulation Type: 2FSK, Filter Type: Gaussian, BT = 0.5, Symbol Rate 100 ksps, slot length 160 symbol, The signal measured is within the measurement level range and less than or equal to Input Level, and Average = 10 times For firmware package version 12.00.00 and later, Capture OSR = 4						
		Without MS269xA-001, 30 MHz to 6 GHz <±1.0 ppm (Note that a range of 3 GHz or above is not available when MS269xA-003 is installed and with Frequency Band Mode set to Spurious.)	30 MHz to 3.5 GHz <±1.0 ppm	With MS2840A/MS2830A-002, <±1.0 ppm	30 MHz to 3.5 GHz			

*: Connect 10 MHz Reference between signal source and signal analyzer

Amplitude Measurement

Signal Analyzer	MS269xA	MS2850A	MS2840A	MS2830A		
Measurement Level Range	-15 to +30 dBm (Preamp Off, or Preamp not installed) -25 to +10 dBm (Preamp On)	-15 to +30 dBm (Preamp Off, or Preamp not installed)				
Tx Power Measurement	At 18°C to 28°C, after calibration, with input attenuator \geq 10 dB, SPAN \leq 31.25 MHz and input signal in measurement level range and less than Input level					
Accuracy (This is found from root sum of squares (RSS) of absolute amplitude accuracy and in-band frequency characteristics of main frame.)	30 MHz to 6 GHz ±0.6 dB (at Pre-Amp Off, or Pre-Amp not installed.) ±1.1 dB (at Pre-Amp On) (Note that a range of 3 GHz or above is not available when MS269xA-003 is installed and with Frequency Band Mode set to Spurious.)	30 MHz to 3.5 GHz ±0.6 dB (at Pre-Amp Off, or Pre-Amp	o not installed.)			

Vector Modulation Analysis Software MX269017A APSK Analysis MX269017A-001 Higher-Order QAM Analysis MX269017A-011 (Continued)

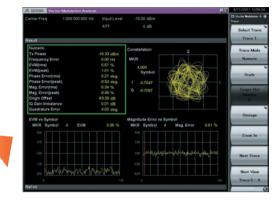
Measurement Functions (Trace Mode)

(1) Modulation Analysis

A maximum of eight traces can be measured using the results for four traces displayed in four panes on one screen. Instantaneous toggling between two screens supports at-a-glance monitoring of eight traces.

Measurement Functions

	1	Modulation Type	e
Trace Mode	BPSK QPSK O-QPSK π/4DQPSK 8PSK 2ASK 4ASK	16QAM 32QAM 64QAM 128QAM 256QAM 512QAM 1024QAM 2048QAM 16APSK 32APSK	2FSK 4FSK H-CPM*1 MSK
Constellation	✓	√	✓
EVM vs. Symbol	✓	~	✓
Magnitude Error vs. Symbol	✓	~	✓
Phase Error vs. Symbol	✓	~	✓
Frequency vs. Symbol	—	—	✓
Trellis	✓	~	~
Eye Diagram	✓	~	~
Numeric	✓	~	~
I and Q vs. Symbol	✓	~	✓
Magnitude vs. Symbol	✓	~	~
Phase vs. Symbol	✓	\checkmark	~
Signal Monitor	✓	✓	~
Symbol Table	✓	✓	~
Equalizer Amplitude	✓	✓	
Equalizer Phase	✓	✓	—
Equalizer Group Delay	✓	✓	
Equalizer Impulse Response	✓	✓	
FSK Error vs. Symbol	-		~
Fidelity vs. Symbol			√*2
Histogram	—	—	~
Custom Numeric	✓	~	✓



MS269xA

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4-pane Screen (Traces 1-4)



4-pane Screen (Traces 5-8)

✓: Displays measured results.

-: Does not display measured results.

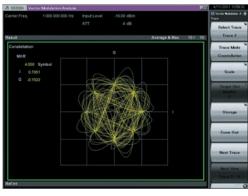
*1: Used at APCO-P25 Phase2 Inbound measurement

*2: Available when Modulation Type is set to 2FSK, 4FSK, H-CPM.

Double-clicking the screen toggles between the four-pane and zoom screens to raise design verification efficiency through optimized operability.



4-pane Screen



Zoom Screen

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MS269xA MS2850A MS2840A MS2830A

• Numeric Display

The results of Frequency Error and EVM, etc., can be listed numerically. Selecting Avg/Max displays the average and worst value simultaneously, helping clarify signal dispersion at a glance.

A Motion Participation Participatio

Modulation method: $\pi/4DQPSK$ example

	1 000 000 000 Hi		-10.00 dBm		Victor Makintee (
					Salart Trace
					A
esuit					Trace 1
Numeric			Symbol Rate Error	outres of ppm	Trace Made
Tx Power	-11.39 dBm		Jitter P-P Min	34.27 %	Trace Mode
	72.55 µW		Jitter P-P Max	31.31 %	Numeric
Filtered Power	-11,39 dBm		Deviation		
	72.56 µW		Average	941.1 Hz	
Frequency Error	-0.01 Hz		+Peak	1.399 kHz	Scale
	0 00000663 pp=		Peak	-1.645 kHz	DCare
Mag. Error(rms)	0.43 %		(Peak-Peak)/2	1.522 kHz	
Mag. Error(peak)		at symbol 165			Target Slot
FSK Error(ms)	0.37 %				- Hardereed
FSK Error(peak)	1.02 %	at symbol 46			
Deviation at Ts/2					0
+3 Average			-3 Average	-941.1 Hz	
+3 + Max Peak	960.8 Hz		-J + Max Peak	-950.2 Hz	
+3 + Min Peak			-3 + Min Peak	-941.3 Hz	Storage
+3 - Max Peak	941.0 Hz		3 - Max Peak	-940.8 Hz	
+3 - Min Peak	935.0 Hz		-3 - Min Peak	-934.3 Hz	
+3 (Peak-Peak)/2			J (Peak-Peak)/2	-942.2 Hz	20631325045
+3 + Max Peak%			-3 + Max Peak%	-100.96 %	Zoom Out
+3 - Min Peak%	99.35 %		J - Min Peak%	-99.27 %	
+1 Average	313.6 Hz		-1 Average	-314.1 Hz	
+1 + Max Peak	319.8 Hz		-1 + Max Peak -1 + Min Peak	-321.8 Hz	and the second second second
+1 + Min Peak	313.6 Hz			-314.1 Hz	Next Trace
+1 - Max Peak	313.4 Hz		-1 - Max Peak	-314.0 Hz	
+1 - Min Peak	308.3 Hz		-1 - Min Peak	-308.7 Hz	
+1 (Peak-Peak)/2 +1 + Max Peak%			-1 (Peak-Peak)/2 -1 + Max Peak%	-315.2 Hz	Next View
+1 + Max Peak% +1 - Min Peak%	33.98 % 32.76 %		-1 + Max Peak% -1 - Min Peak%	34.19 %	the second s
+1 - Min Peak%	32 76 %		-1 - Min Peak%	-32.90 %	Trace 5 - 8

Modulation method: 4FSK example

Carrier Freq.	1 000 000 000 Hz	Input Level	-10.00 dBm		Victor Mediatory A
		ATT	4 05		
					Select Trace
Result		_			Trace 1
Numeric					Trace Mode
	Tx Power		-11.46 dBm		Nemeric
			71.51 uW		- monte
	Filtered Power		-11.46 dBm		
			71.52 µW		Scala
	Frequency Error		0.11 Hz		Control to
			0.00011129 ppm		
	EVM(rms)		0.28 %		Target Slot
	EVM(peak)		0.53 %	at symbol 686.0	Number
	OffsetEVM(rms)		0.35 %		
	OffsetEVM(peak)		0.54 %	at symbol 136.0	
	Phase Error(tms)		0.10 deg.		Storage
	Phase Error(peak)		0.33 deg.	at symbol 309.0	
	Mag. Error(ms)		0.25 %		
1	Mag. Error(peak)		40.47 %	at symbol 136.5	Zoom Out
	Origin Offset		46.97 dB		Zoom Out
			0.45 %		
	IQ Gain Imbalance		0.01 dB		and the second second
	Quadrature Error		4.03 deg.		Next Trace
	MER(ma)		48.09 dB		
	MER(peak)		68.61 dB	at symbol 512.0	And a local division of the local division o
	Symbol Rate Error		ppm		Next View
					Trace 5 - 8

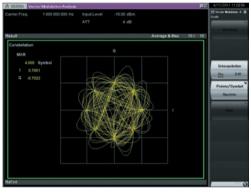
Modulation method: O-QPSK example

Constellation

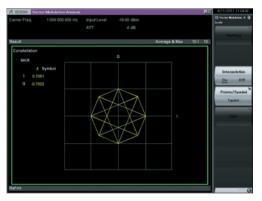
This displays the constellation for each modulation method. Interpolation On displays the state transition.



Interpolation: Off



Interpolation: On, Points/Symbol: 8points



Interpolation: On, Points/Symbol: 1 point

Vector Modulation Analysis Software MX269017A APSK Analysis MX269017A-001 Higher-Order QAM Analysis MX269017A-011 (Continued)

.

• vs. Symbol

This displays the temporal Symbol variation for each of nine characteristics.

- EVM vs. Symbol
- Magnitude Error vs. Symbol
- Phase Error vs. Symbol
- Frequency vs. Symbol
- I and Q vs. Symbol
- Magnitude vs. Symbol
- Phase vs. Symbol
- FSK Error vs. Symbol
- Fidelity vs. Symbol



EVM vs. Symbol



Phase Error vs. Symbol



I and Q vs. Symbol

Symbol Table

This displays the symbol decoding result. The display can be switched between binary and hexadecimal. When a synchronized word is detected, it is reverse-displayed.

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Binary example



Hexadecimal example

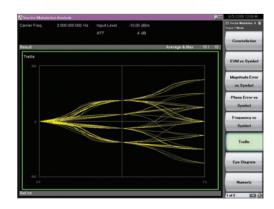
• Eye Diagram

Signal quality can be evaluated visually from the openness of the eye for each symbol at the Eye Diagram screen.

Vector Modula					10	9/5/2009 13:08:40
Carrier Freq.	2 000 000 000 Hz	input Level	-10.00 dBm			C Vector Makdelan A () Trace 7 Mode
Result	_	_	_	Average & Max	10/ 10	Constellation
Eye Diagram					_	EVM vs Symbol
V						Magnitude Error wa Symbol
- V			\geq			Phase Error vs Symbol
					$- \parallel$	Frequency vs Symbol
•				All All		Trailie
						Eye Diagram
					20	Numeric

• Trellis

The Trellis screen is used to examine phase transitions of different symbols.

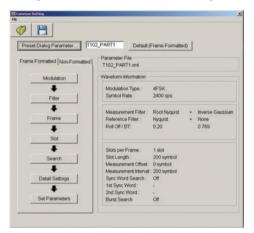


Vector Modulation Analysis Software MX269017A APSK Analysis MX269017A-001 Higher-Order QAM Analysis MX269017A-011 (Continued)

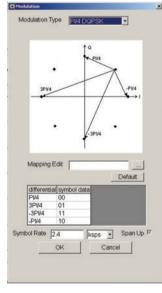
MS269xA MS2850A MS2840A MS2830A

• Graphical Setting Display

Setting is easy using the simple GUI, and the setting parameter Save/ Recall function lightens the burden of complex settings.



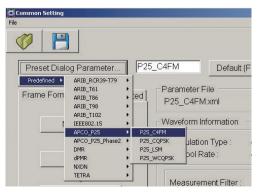
Common Setting



Modulation

Simple Parameter Setting Function

Simply selecting the standard name at [Preset Dialog Parameter...] Measurement parameters can be set easily for APCO-P25 Phase1/ Phase2, NXDN, TETRA, DMR, dPMR, IEEE 802.15.4/4d , RCR STD-28, 39, and ARIB STD-T61, T79, T86, T98, T102.



(2) Power vs. Time

The measured-signal Rise and Fall, Slot, and Frame status can be confirmed using the time-axis graph, and a Mask can be drawn on the graph.

The numeric results indicate the On Slot average power, Off Slot average power, difference in each average power, and the Rise Time and Fall Time. In addition, the power for each Slot can be displayed as a list, while setting a Mask supports On Slot pass/fail evaluation. Moreover, the Marker function can be used to display the Max., Min., and Average power at the calcated marker position as well as to display

and Average power at the selected marker position as well as to display the average power between markers.

The marker start position for the analyzed section can be set in 0.125 symbol units as standard.



Frame Results Display

Vector Modulation Analysis Software MX269017A APSK Analysis MX269017A-001 Higher-Order QAM Analysis MX269017A-011 (Continued)

• Wide Dynamic Range Function*

This function is used mainly for measurements, such as Power Ramp Time and Off Slot Power specified by the LMR/PMR standards. This measurement finds the power of the On Slot and Off Slot as well as the power difference when the radio is transmitting.

For example, when measuring a power of 47 dBm (50 W) during the On Slot and –50 dBm or less during the Off Slot, a spectrum analyzer (signal analyzer) requires a wide dynamic range of at least 100 dB, taking the measurement margin into account. This is a severe requirement, but since the purpose of this function is to widen the measurement dynamic range, it is possible to measure the On Slot and Off Slot power once each by changing the setting of the signal analyzer built-in RF attenuator. In addition, the time-axis graph can display the combined results for the two measurements.

Furthermore, measurement by selecting the standard name using the previously described Simple Parameter Setting Function (Preset Dialog Parameter) enables confirmation that the input-signal On Slot and Off Slot satisfy the standard (Mask). The supported standards are as follows.

• Mask and Filter Standards Set Automatically at Preset Dialog Parameter

RCR STD-28, RCR STD-39, ARIB STD-T61, ARIB STD-T79, ARIB STD-T85, ARIB STD-T86

Other standards can also be measured by setting any Mask, filter, etc.



Measurement Results Example (WDR is displayed on the screen when this function is in use.)

*: The Wide Dynamic Range Function is not supported by some units of the MS2830A 3.6 GHz/6 GHz models (MS2830A-040/041) shipped before November 2011 that do not have either the [M] or [M2] sticker attached to the back panel.

(3) Others

Power Meter Measurement Function

The power meter measurement can performed by calling the mainframe. Power meter function can connect a USB power sensor to the main-frame and read the measurement values. Settings of Carrier Frequency, Offset, and Offset Value are automatically reflected on the corresponding parameters.

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MS2830A



Compatible USB Power Sensors

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

*: MA24104A has been discontinued.

Analog Measurement Software MX269018A

MS2840A MS2830A

The Analog Measurement Software MX269018A supports measurement of TRx characteristics of analog mobile radio. Installing this software in the MS2840A and MS2830A supports fast and accurate measurement, offering an ideal and efficient evaluation platform for development, production, and maintenance of analog wireless equipment.

The various functions for development, production and maintenance of analog mobile radio are supported

All the TRx performance tests (FM/ΦM/AM) required by analog mobile radio are supported.

Supported Signal Analyzer MS2830A Functions

Both RF and AF signal TRx functions can be implemented simultaneously by combining the MS2830A with the analog signal generator and audio analyzer options, supporting all-in-one tests of key analog mobile radio TRx characteristics. All the high-pass, low-pass, and band-pass (weighting) filters as well as de-mphasis functions required for measuring AF signals for each type of analog mobile radio are provided for monitoring demodulated audio signals. The Audio Analyzer option with PTT (Push To Talk) connector controls the analog mobile radio PTT On/Off function.

Table 1. Functions of Analog Measurement Software and Required Configuration (MS2830A)

	Analog Measurement Software Function*1			ation Me Irget Sig		Required Options (Refer to details of each item in Table 2.)
			FM	ΦМ	AM	
		Carrier Frequency and Carrier Frequency Error RF Frequency	~	~	~	
	RF Measurements	Transmit Power <i>RF Power</i>	~	~	~	
	Kr Weasurements	Modulation Measurement Deviation (FM), Radian (ФМ), Depth (AM)	~	~	~	1, 2, 3, 4 are mandatory
		Result of Analyzed DCS Code DCS Code	~	_	_	1. Signal Analyzer (MS2830A-040/041/043*) 2. Low Phase Noise Performance (MS2830A-066)
		Demodulation Frequency AF Frequency	~	~	~	 Analog Measurement Software (MX269018A) USB Audio (A0086C) Commercial loudspeaker
		Effective Level Value at Demodulation Frequency Level	~	~	~	*: As shown above, the analog signal generator 7
Tx Tests	AF Measurements (Demodulation)	Distortion Ratio of Demodulation Frequency Distortion Distortion, SINAD, THD	~	~	~	cannot be installed in the MS2830A-043 because the MS2830A-066 is required.
		Time vs. Level, Frequency vs. Level Graph Result	~	~	~	
		Demodulates input RF signals from analog mobile radio and outputs sound from USB Audio connector* ²	√*3	~	~	
		Demodulates input RF signals from analog mobile radio and outputs sound from internal speaker, headphone jack and demodulation output connector	✓*3	_	_	
	AF Output (Audio Generator Function)	AF Tone, DCS, White Noise (ITU-T Recommendation G.227), DTMF	~	~	~	1 + 2 + 3 + 4 +6 Audio Analyzer (MS2830A-018)
	PTT (Push To Talk)	Control	~	~	~	
		Modulation Signal Output (FM, ΦΜ, AM)	~	~	~	1 + 2 + 3 + 4
	RF Output	Internal Modulation Signal Source (AF Tone)	✓	~	~	+7 Analog Signal Generator
		Internal Modulation Signal Source (DCS)	✓			(Refer to Table 3.)
		Frequency AF Frequency	~	~	~	
Rx Tests	AF Measurements (Audio Analyzer	Effective Level Value Level	~	~	~	1 + 2 + 3 + 4
	Function)	Distortion Ratio SINAD, THD, THD+N	~	~	~	+6 Audio Analyzer (MS2830A-018) +7 Analog Signal Generator (Refer to Table 3.)
		Graph (Time vs. Level, Frequency vs. Level) Graph Result	~	~	~	
	PTT (Push To Talk)	Control	~	~	~	

*1: Spurious can also be measured using the standard spectrum analyzer measurement function.

*2: Voice can be monitored by connecting a commercial loudspeaker using the A0086A, A0086B or A0086C USB Audio option.

*3: The Wide Band FM measurement mode is not supported.

Analog Measurement Software MX269018A (Continued)

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Table 2. Ordering Information for Analog Measurement Software (MS2830A)

	Name	Model		Note	
	Name	New	Retrofit	Note	
	3.6 GHz Signal Analyzer	MS2830A-040	—	9 kHz to 3.6 GHz This option cannot be retrofitted.	
Mandatory	6 GHz Signal Analyzer	MS2830A-041	_	9 kHz to 6 GHz This option cannot be retrofitted.	
Mandatory	13.5 GHz Signal Analyzer	MS2830A-043	_	9 kHz to 13.5 GHz This option cannot be retrofitted. The MS2830A-066 and signal generator options cannot be installed simultaneously.	
Mandatory	Low Phase Noise Performance	MS2830A-066	_	This option cannot be retrofitted. It improves phase noise performance.	
Mandatory	Analog Measurement Software	MX269018A		Retrofit it is supported.	
Mandatory	USB Audio	A0086C		Required for output of demodulated audio	
	3.6 GHz Analog Signal Generator	MS2830A-088	MS2830A-188	Frequency setting range: 100 kHz to 3 GHz Required for Rx tests Refer to the selection conditions in Table 3.	
	Audio Analyzer	MS2830A-018	MS2830A-118		
	Vector Function Extension for Analog Signal Generator	_	MS2830A-189	Add vector function to MS2830A-088/188	
Recommended	3.6 GHz Vector Signal Generator	MS2830A-020	MS2830A-120	250 kHz to 3.6 GHz	
Recommended	6 GHz Vector Signal Generator	MS2830A-021	MS2830A-121	250 kHz to 6 GHz	
	Low Power Extension for Vector Signal Generator	MS2830A-022	MS2830A-122	Extends lower output level limit Mandatory for MS2830A-029	
	Analog Function Extension for Vector Signal Generator	MS2830A-029	*	Adds analog function to MS2830A-020/021 (Requires MX269018A) Required for Rx tests Refer to the selection conditions in Table 3.	

*: Please contact our sales representative

Table 3. Optional Combination Necessary for Mounting Analog Signal Generator (MS2830A)

Option model are decided by the MS2830A which required Analog Signal Generator (SG).

Please note that there is a case where an analog SG function cannot be installed for a part of MS2830A composition.

MS2830A with Installed Analog SG		New MS2830A	When Retrofitting Analog SG in MS2830A		
MS2830A Free	quency Option	Ļ	MS2830A	-040/041	MS2830A-043
Installed	Vector SG	Ļ	Not installed	MS2830A-020/021	Ļ
	Analog SG	MS2830A-088	MS2830A-188	*1	
Supported SG addition	Analog SG + Vector SG	MS2830A-020 or MS2830A-021 + MS2830A-022 + MS2830A-029	MS2830A-188* ² + MS2830A-189* ²	_	Cannot be installed

*1: Please contact our sales representative

*2: Can select only 3.6 GHz Vector SG/Analog SG

Analog Measurement Software MX269018A (Continued)

Supported Signal Analyzer MS2840A Functions

Combining the MS2840A with the analog signal generator option provides all-in-one support for tests of TRx characteristics of analog mobile radio. As well as RF measurements including Tx frequency, Tx power, FM deviation, etc., Tx tests can also be used to the demodulation frequency, distortion, etc., of demodulated AF signals. High-pass filters, low-pass filters, band-pass filters (weighting filters), and de-emphasis functions support measurement of demodulated signals for each wireless type. Additionally, at Rx tests, a modulation signal can be output from the analog signal generator and AF tones and DCS codes can also be output using the built-in modulation output function. However, the audio analyzer option and analog wireless automatic measurement software are not supported.

Table 4. Supported Signal Analyzer MS2840A Frequency Options

			• . Supported, — . Not supported
	Frequency Option	MS2840A-040 (3.6 GHz)	MS2840A-044 (26.5 GHz)
Option		MS2840A-041 (6 GHz)	MS2840A-046 (44.5 GHz)
Analog Measurement Software (MX269018A)		\checkmark	\checkmark
Analog Signal Generator (MS2840A-088, 029)		✓	—
Audio Analyzer		—	—

Table 5. Functions of Analog Measurement Software and Required Configuration (MS2840A)

	Ana	log Measurement Software Function*1	Modulation Method of Target Signal			Required Options
	Carrier Frequency and Carrier Frequency Frequency			ФМ	AM	(Refer to details of each item in Table 6.)
		Carrier Frequency and Carrier Frequency Error RF Frequency	~	~	~	
		Transmit Power <i>RF Power</i>	~	~	~	
	RF Measurements	Modulation Measurement Deviation (FM), Radian (ΦM), Depth (AM)	~	~	~	
		Result of Analyzed DCS Code DCS Code	~	_	_	1, 2, and 3 are mandatory
		Demodulation Frequency AF Frequency	~	~	~	1. Signal Analyzer (MS2840A-040/041/044/046 2. Analog Measurement Software (MX269018A)
		Effective Level Value at Demodulation Frequency Level	~	~	~	3. USB Audio (A0086C) 4. Commercial loudspeaker
x Tests	AF Measurements	Distortion Ratio of Demodulation Frequency Distortion Distortion, SINAD, THD	~	~	~	
	(Demodulation)	Time vs. Level, Frequency vs. Level Graph Result	~	~	~	
		Demodulates input RF signals from analog mobile radio and outputs sound from USB Audio connector* ²	√*3	~	~	
		Demodulates input RF signals from analog mobile radio and outputs sound from internal speaker ^{*3} , headphone jack ^{*3} and demodulation output connector ^{*3}	_	_	_	
	AF Output (Audio Generator Function)	AF Tone, DCS, White Noise (ITU-T Recommendation G.227), DTMF	_	_	_	Not supported by MS2840A
	PTT (Push To Talk)	Control	-	_	_	
		Modulation Signal Output (FM, ΦΜ, ΑΜ)	✓	~	~	Not supported by MS2840A-044/046
	RF Output	Internal Modulation Signal Source (AF Tone)	✓	~	~	1 + 2 + 3
		Internal Modulation Signal Source (DCS)	✓	_	-	+ 5 Analog Signal Generator (Refer to Table 7.
		Frequency AF Frequency	_	_	_	
x Tests	AF Measurements (Audio Analyzer	Effective Level Value Level	_	_	_	Not supported by MS2840A
	Function)	Distortion Ratio SINAD, THD, THD+N	_	_	_	Not supported by MS2040A
		Graph (Time vs. Level, Frequency vs. Level) Graph Result	_	_	_	

*1: Spurious can also be measured using the standard spectrum analyzer measurement function.

*2: Voice can be monitored by connecting a commercial loudspeaker using the A0086A, A0086B or A0086C USB Audio option.

*3: The Wide Band FM measurement mode is not supported.

MS2830A

· Not supported

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. Cupported

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Table 6. Ordering Information for Analog Measurement Software (MS2840A)

This software cannot be installed in the MS2830A 26.5 GHz/43 GHz models, but can be installed in the MS2840A 26.5 GHz/44.5 GHz models. And the MS2830A requires the Low Phase Noise Performance MS2830A-066 but the MS2840A does not require the Low Phase Noise Performance MS2840A-066.

With 3.6 GHz Signal Analyzer (MS2840A-040) or 6 GHz Signal Analyzer (MS2840A-041)

\sim	Name	Model		Note
	Name	New	Retrofit	- Note
Mandatory	3.6 GHz Signal Analyzer	MS2840A-040	_	9 kHz to 3.6 GHz This option cannot be retrofitted.
	6 GHz Signal Analyzer	MS2840A-041	—	9 kHz to 6 GHz This option cannot be retrofitted.
Mandatory	Analog Measurement Software	MX269018A		Frequency range (Tx Tests): 100 kHz to 2.7 GHz (At Wide Band FM measurement: 10 MHz to 2.7 GHz) Retrofit is supported.
Mandatory	USB Audio	A00	186C	Required for output of demodulated audio
	Low Phase Noise Performance	MS2840A-066	MS2840A-166	Improves phase noise performance. This option greatly improves SSB phase noise performance.
	3.6 GHz Analog Signal Generator	MS2840A-088	MS2840A-188	100 kHz to 3 GHz Required for Rx tests Refer to the selection conditions in Table 7.
	Vector Function Extension for Analog Signal Generator	— MS2840A-189		Add vector function to MS2840A-088/188
Recommended	3.6 GHz Vector Signal Generator	MS2840A-020	MS2840A-120	250 kHz to 3.6 GHz
	6 GHz Vector Signal Generator	MS2840A-021	MS2840A-121	250 kHz to 6 GHz
	Low Power Extension for Vector Signal Generator	MS2840A-022 MS2840A-122		Extends lower output level limit Mandatory for MS2840A-029
	Analog Function Extension for Vector Signal Generator	MS2840A-029 MS2840A-129		Adds analog function to MS2840A-020/021 (Requires MX269018A) Required for Rx tests Refer to the selection conditions in Table 7.

With 26.5 GHz Signal Analyzer (MS2840A-044) or 44.5 GHz Signal Analyzer (MS2840A-046)

\square	Name	Model		Note	
	Name	New	Retrofit	Note	
	26.5 GHz Signal Analyzer MS2840A-044 —			9 kHz to 22.5 GHz	
Mandatory		WI32040A-044	_	This option cannot be retrofitted.	
Wandatory	44.5 GHz Signal Analyzer	M52940A 046	MS2840A-046	_	9 kHz to 44.5 GHz
	44.5 GHZ Sigilal Analyzei	WI32040A-040		This option cannot be retrofitted.	
				Frequency range (Tx Tests): 100 kHz to 2.7 GHz	
Mandatory	Analog Measurement Software	MX26	9018A	(At Wide Band FM measurement: 10 MHz to 2.7 GHz)	
				Retrofit is supported.	
Mandatory	USB Audio	A0086C		Required for output of demodulated audio	

Table 7. Optional Combination Necessary for Mounting Analog Signal Generator (MS2840A)

Option model are decided by the MS2840A which required Analog Signal Generator (SG).

MS2840A with Installed Analog SG		New MS2840A	When Retrofitting Analog SG in MS2840A	
MS2840A Frequency Option		Ļ	MS2840A-040/041	
Installed Vector SG		Ļ	Not installed	MS2840A-020/021
	Analog SG	MS2840A-088	MS2840A-188	MS2840A-129 + MS2840A-122*2
Supported SG addition	Analog SG + Vector SG	MS2840A-020 or 021 + MS2840A-022 + MS2840A-029	MS2840A-188*1 + MS2840A-189*1	—

*1: Can select only 3.6 GHz Vector SG/Analog SG

*2: Unnecessary when MS2840A-022 already installed

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Specifications

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

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

Attenuator mode: Mechanical Attenuator Only, The correct level is set for the input signal.

The Tx measurement specifications apply to the MS2840A, and the MS2830A with built-in MS2830A-062/066 Low Phase Noise Performance Option.

gnal Analyzer		MS2840A	N	1S2830A		
Measurements		No Audio Analyzer option	Without MS2830A-018/118 Audio Analyzer Option	With MS2830A-018/118 Audio Analyzer Option		
	Target Signal	FM, ΦM, AM signal				
Common	Frequency Range	100 kHz to 2700 MHz At Wide Band FM measurement: 10 MHz to 2700 MHz				
Common Specification	Level Range	–15 to +30 dBm (Preamp Off, or Preamp not installed) –25 to +10 dBm (Preamp On)				
	Carrier Frequency Accuracy	At 18°C to 28°C, after calibra ± (Accuracy of reference free	tion Juency × Carrier frequency + 1) Hz			
	Frequency Deviation		\leq 20 kHz, 20 kHz < Frequency Deviation y Deviation \leq 20 kHz, 20 kHz < Frequency			
	Demodulation Frequency Range	20 Hz to 20 kHz				
FM	Frequency Deviation Accuracy	1% of indicated value ± Resid	dual FM			
Measurement	Residual FM	3.35 Hz rms, S/N: >50 dB (1.5	kHz Deviation, Demodulation Band: 0.3	kHz to 3 kHz)		
	Demodulation Distortion	0.3% (Demodulation Frequency: 1	kHz, Frequency Deviation: 5 kHz, Demod	lulation Band: 0.3 kHz to 3 kHz)		
	DCS Measurement Function	Digital Code Squelch demod	ulated result display			
	ΦM Deviation	0 to (20 kHz/Demodulation F	requency [Hz]) rad			
ФМ	Demodulation Frequency Range	20 Hz to 20 kHz				
Measurement	ΦM Deviation Accuracy	1% of indicated value ± Resid	dual ΦM			
	Residual ΦM	0.01 rad rms (Demodulation	Band: 0.3 kHz to 3 kHz)			
	Demodulation Distortion	1% (Demodulation Band: 0.3 kHz to 3 kHz)				
	AM	0 to 98%				
AM	Demodulation Frequency Range	20 Hz to 20 kHz				
Measurement	AM Accuracy	1% of indicated value ± Resid	dual AM			
	Residual AM	0.3% (Demodulation Band: 0.	3 kHz to 3 kHz)			
	Demodulation Distortion	0.3% (Demodulation Band: 0.	3 kHz to 3 kHz)			
	Low Pass	300 Hz, 3, 15, 20 kHz				
Filter	High Pass	< 1*, < 20*, 50, 300, 400 Hz,	30 kHz *: FM only			
Filter	Band Pass (Weighting filter)	CCITT, C-Message, CCIR 468,	CCIR-ARM, A-Weighting			
	De-emphasis	25, 50, 75, 500, 750 μs				
Amplitude Measurement	Transmit Power Accuracy	Input level, Preamp Off, or Pr ±0.5 dB		al in measurement level range and less tha ame Absolute Amplitude Accuracy		
Audio Monitor	(Demodulation Output)		to USB Audio equipment connected to ninal (Wide Band FM measurement not	 FM/ΦM/AM: Output demodulated signal to USB audio equipment connected to MS2830A USB terminal (Wide Band F measurements not supported) FM: Internal speaker, headphone jack of demodulation output connector (Wide Band FM measurements not supported) 		

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MS2840A MS2830A

Signal Analyzer		MS2840A	MS2	2830A		
		No Audio Analyzer option	Without MS2830A-018/118 Audio Analyzer Option	With MS2830A-018/118 Audio Analyzer Option		
Rx Measurements		This function is enabled either when the MS2830A/MS2840A-088 3.6 GHz Analog Signal Generator is installed, or when the MS2830A/MS2840A-020/021 Vector Signal Generator and MS2830A/MS2840A-022 Low Power Extension for Vector Signal Generator and MS2830A/MS2840A-029 Analog Function Extension for Vector Signal Generator are installed				
RF Signal Out	put	The performance specifications	s are for the MS2830A-088 or MS2830A-020/0	021 when the MS2830A-029 is installed		
	Frequency Setting Range	100 kHz to 3000 MHz				
	Frequency Setting Resolution	1 Hz				
	Output Setting Level	–136 to +15 dBm (Rx frequen –136 to –3 dBm (Rx frequenc				
	Frequency Deviation Setting Range	0 to 100 kHz				
	Frequency Deviation Setting Resolution	0.1 Hz				
	Frequency Deviation Accuracy	±1% of set value (excludes Re	esidual FM)			
FM	Internal Modulation Signal Source	AF Tone Source × 2 Digital Code Squelch Signal G	Generator	AF Tone Source × 3 Digital Code Squelch Signal Generator		
	Internal Modulation Frequency Range	Tone Frequency: 20 Hz to 40 kHz				
	Internal Modulation Frequency Resolution	0.1 Hz, Setting value ±3 Hz on use of Digital Code Squelch signal				
	DCS Code Setting Range	DCS Code: 000 to 777 (octal,	3-digit)			
	Phase Deviation Setting Range	Settable with the range of 0 to	50.0 rad. (internal modulation frequency \times	phase deviation) < 100 kHz		
	Phase Deviation Setting Resolution	0.01 rad.				
	Phase Deviation Accuracy	±1% of set value (excludes Re	esidual ΦM)			
ФМ	Internal Modulation Signal Source	AF Tone Source × 2		AF Tone Source × 3		
	Internal Modulation Frequency Range	Tone Frequency: 20 Hz to 40 kHz				
	Internal Modulation Frequency Resolution	0.1 Hz				
	Modulation Setting Range	0 to 100%				
	Modulation Setting Resolution	1%				
	Modulation Accuracy	±1% of set value (excludes Re	esidual AM)			
AM	Internal Modulation Signal Source	AF Tone Source × 2		AF Tone Source × 3		
	Internal Modulation Frequency Range	Tone Frequency: 20 Hz to 40 kHz				
	Internal Modulation Frequency Resolution	0.1 Hz				

Analog Signal Generator Option	MS2840A-029/129/088/188	MS2830A-029/088/188			
Max. Reverse Input	0 Vdc (max.) +18 dBm (<20 MHz), +30 dBm (≥20 MHz)				
Function/Performance	The following specifications (see MS2840A catalog) are added to the specifications when the MS2840A-020/02 and MS2840A-022 are installed	The following specifications (see MS2830A catalog) are added to the specifications when the MS2830A-020/021 and MS2830A-022 are installed			
Frequency Setting Range	100 kHz to 3000 MHz	100 kHz to 3000 MHz			
Frequency Setting Resolution	1 Hz				
Output Setting Level	-136 to +15 dBm (Rx frequency > 25 MHz) -136 to -3 dBm (Rx frequency ≤ 25 MHz)				
	MS2830A-029/088/188 MS2840A-029/129/088/188				
		Output level [p] (dBm)			
	±3.0 dB (typ., 100 kHz ≤ f < 250 kHz)	-110 ≤ p ≤ -3			
Output Level Accuracy	±1.0 dB (typ., 250 kHz ≤ f ≤ 25 MHz)	$-110 \le p \le -3$			
	±1.0 dB (typ., 25 MHz < f < 100 MHz)	$-110 \le p \le +4$			
	±0.5 dB (typ., 100 MHz ≤ f < 375 GHz)	$-110 \le p \le +4$			
	±0.5 dB (375 MHz ≤ f ≤ 3 GHz)	$-110 \le p \le +4$			
	±1.0 dB (100 MHz ≤ f ≤ 3 GHz)	-120 ≤ p < -110			
	$\pm 1.0 \text{ dB}$ (typ., 100 MHz $\leq f \leq 3 \text{ GHz}$)	-127 ≤ p < -120			
Arbitrary Signal Generator	Available when the MS2830A-020, 021 or 189 (Vector S	Available when the MS2830A-020, 021 or 189 (Vector Signal Generator) is installed			

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Audio Analyzer Opt	tion			MS2830A-018/118		
Audio Analyzer Fun	nction	The specifications for s	ingle tone me	asurement are listed below		
Measurement F	unction	Amplitude, Frequency, THD, THD+N, SINAD				
Connection Type		Balanced: 1/4-inch phone jack (3-pole, Φ6.3 mm) Unbalanced: BNC-J				
Impedance		Balanced: 200 kΩ (AC o Unbalanced: 100 kΩ (A				
Frequency Mea	surement Range	20 Hz to 50 kHz				
Level Measuren	nent Range	1 mV rms to 25 V rms ((30 V rms, max	ζ.)		
Input Range Set	tting	50 mV peak, 500 mV p	eak, 5 V peak,	50 V peak		
Level Accuracy		18°C to 28°C ±0.4 dB (20 Hz ≤ f ≤ ±3.0 dB (25 kHz < f ≤	≤50 kHz)			
THD + N (Total	Harmonic Distortion + Noise)	<-60 dB <-80 dB (nom.)		0 kHz, Range: 5 Vp-p, 18°C to 28°C		
	Low-pass	Off, 3, 15, 20, 30, 50 kH				
Audio Filter	High-pass	Off, 20, 50, 100, 300, 40				
	Bandpass (Weighting filter)	Off, CCITT, C-Message,				
udio Generator Fu	unction			measurements except White Noise (through ITU-T G.227 filter)		
Connection Typ	e	Balanced: 1/4-inch pho	one jack (3-pol	e, Φ6.3 mm)		
		Unbalanced: BNC-J Balanced: 100 Ω/600 Ω	AC coupled	nom		
Interface		Unbalanced: 50 Ω/600	Ω (AC coupled	d, nom.)		
Output Wavefo	rm		: Tone × 3, DC	CS, White noise (ITU-T G.227), DTMF		
Guaranteed Fre	quency Range	20 Hz to 25 kHz				
Frequency Setti	<u> </u>	10 Hz to 50 kHz				
Frequency Reso	olution	0.01 Hz				
			Using Sub Supply/Audio Revision 2*1			
		Single tone				
		Open circuit voltage	Balanced	Off, 1 mV rms to 12.4 V rms		
		(≥100k Ω termination)	Unbalanced	Off, 1 mV rms to 6.2 V rms		
			Balanced	Off, -63 dBm (equivalent to 0.5 mV rms) to +18 dBm (equivalent to 6.2 V rms)		
		600Ω termination*	Unbalanced	Off, -63 dBm (equivalent to 0.5 mV rms) to +12 dBm (equivalent to 3.1 V rms)		
		White noise (through I				
Output Level Ra	ange		1			
		Open circuit voltage	Balanced	Off, 1.545 mV rms to 3.083 V rms (nom.)		
		(≥100kΩ termination)	Unbalanced	Off, 1.545 mV rms to 1.545 V rms (nom.)		
		600Ω termination*	Balanced	Off, –60 dBm (equivalent to 0.774 mV rms) to +6 dBm (equivalent to 1.545 V rms) (nom.)		
			Unbalanced	Off, –60 dBm (equivalent to 0.774 mV rms) to 0 dBm (equivalent to 0.774 V rms) (nom.)		
		*: Output Impedance =	<u>= 600 Ω, </u> and C	Dutput Impedance Reference = 600 Ω		
Output Level Re	esolution	10 µV (Ou	5 mV rms < Ou tput Level ≤ 3!	trput Level ≤ 350 mV rms) 5 mV rms)		
		White noise (through I				
Level Accuracy		Single tone: ±0.3 dB (1 White noise (through I		ermination, 18°C to 28°C) er): +3 dB (nom)		
Maximum Outp		100 mA (nominal, no sl		בון. בס עט (ווטווו.)		
inaxinani outp				5 kHz. 100 kQ termination. 18°C to 28°C		
THD + N (Total	THD + N (Total Harmonic Distortion + Noise)		At 1 kHz, 0.7 V rms, Band: 20 Hz to 25 kHz, 100 kΩ termination, 18°C to 28°C <–60 dB <–80 dB (nom.)			
Other Function						
Demodulation	Connector Type	BNC-J				
Output	Demodulation Output Level	-10 dBm ±2 dB (Freque	ency deviation	: 3.5 kHz, 600 Ω)		
(FM only)*2	Demodulation Output Impedance	600 Ω				
. ,,	Sound Monitor	Internal speaker or 3.5				
Crosstalk		Crosstalk from Audio G >80 dB	Senerator to A	udio Analyzer		
PTT (Push To Ta	alk) Control	>80 αB Banana jack (Φ4.0 mm, 30 V, 500 mA max.)				
		Connector: D-Sub 15 pin (jack)				
	Dutput (Audio Function)	Function: Open Collect	or × 1 (5 V, 10	0 mA max.), TTL Output × 2, TTL Input × 2		

*1: Sub Supply/Audio Revision is the MS2830A-018/118 printed-circuit board version.

<Sub Supply/Audio Revision Confirmation Method>

(1) MS2830A units with Sub Supply/Audio Revision 2 have a sticker marked 'A1' next to the main-frame serial number.

(2) The MS2830A Sub Supply/Audio Revision can be confirmed as follows: Press [System Config] → [F5] System Information → [F4] Board Revision View to list the Board Revisions; check the displayed Sub Supply/Audio Revision number. (It may be either 1 or 2.)

*2: For Tx test of analog mobile radio. Wide Band FM measurements not supported.

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Tx Tests

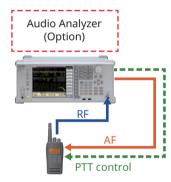
Inputting AF Signal to analog mobile radio and Measuring Characteristics of RF Signal Output from Radio

Combining the MS2830A with the audio analyzer option supports tuning of the AF signal output (AF signal input to the analog mobile radio) and testing of the radio RF transmission characteristics by monitoring at one screen.

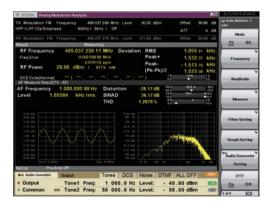
As well as outputting the AF signal simultaneously as up to three tones, tone + DCS, white noise (ITU-T G.227) and DTMF signals can be output too. At the analog mobile radio RF Tx characteristics test, the FM/ Φ M/ AM frequency, power, modulation degree, demodulated AF signal frequency, level, distortion, as well as time vs. level, and frequency vs. level graphs are displayed simultaneously. At FM modulation, the DCS (Digital Code Squelch) Code analysis is displayed as well. Moreover, frequency deviation measurement can be extended up to 1 MHz in the Wide FM measurement mode (usually up to 40 kHz in the normal FM measurement mode).

Various AF filters can be set according to the analog mobile radio when analyzing demodulated AF signals. As well as the common high-pass and low-pass filter settings, there are five CCITT, C-Message, CCIR 468, CCIR-ARM, and A-Weighting bandpass filters (weighting filters) plus five types of De-emphasis setting (25, 50, 75, 500, and 750 μ s). Other application software such as a spectrum analyzer can be used simultaneously at AF signal output. For example, in addition to outputting white noise (ITU-T G.227), both spurious and occupied bandwidth (OBW) measurements can be made using the spectrum analyzer display.

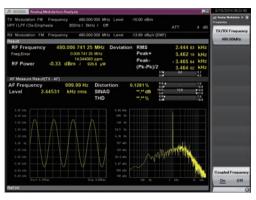
The Audio Analyzer option has a PTT (Push To Talk) connector for On/ Off control of the analog mobile radio PTT.



Tx Characteristics Test Setup



Example of AF Signal Output and FM Modulation Signal Measurement Screen (with Audio Analyzer Option)



Example of FM Modulation Signal Measurement Screen (without Audio Analyzer Option)

Rx Tests

• Outputting FM/ФM/AM Signal to analog mobile radio and Measuring AF Signal Demodulated by Measuring Instrument

Combining the MS2830A with the analog signal generator and audio analyzer options supports tuning of the RF signal output (RF signal input to the analog mobile radio) and testing of the AF signal characteristics output from the radio by monitoring on one screen.

The RF signal output from the analog signal generator supports FM/ Φ M/ AM modulations, and in addition to outputting up to three AF tones from the internal modulation signal source simultaneously, can also output signals created as DCS (FM only) and Wave audio format files. At measurement of AF signals using the Audio Analyzer option, not only the frequency, level, and distortion (SINAD measurement, etc.), but also graphs of the time vs. level and frequency vs. level can be displayed simultaneously. The distortion display can either be as a numeric display or as a graph for easy SINAD tuning at the Rx sensitivity test. As well as high-pass and low-pass filter settings for AF filters, up to five types of CCITT, C-Message, CCIR 468, CCIR-ARM, and A-Weighting bandpass filters (weighting filters) can be set.

<About Internal Modulation Signal Source>

Up to three*1 AF tone signal sources and one DCS signal source are provided.

For example, the analog mobile radio operation confirmation test can use any of the following combinations:

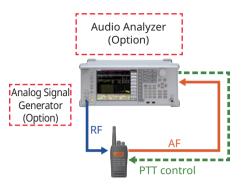
- AF + AF + AF
- (1 kHz audio signal + Tone squelch signal + Audio signal of any frequency)
- AF + AF + DCS
 - (1 kHz audio signal + Audio signal of any frequency + DCS signal)
- AF (Wave audio format)*2
- *1: Two when Audio Analyzer option not installed
- *2: Output of a Wave audio format signal can also be set with the internal modulation signal source. An RF signal, such as DTMF (Dual Tone Multiple Frequency), can be output. The following limitations apply:

Linear PCM file

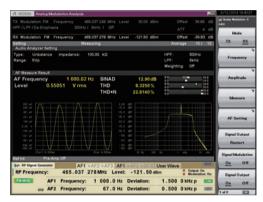
- (It is not possible to support ADPCM and the compressed format for enhanced PCM.)
- The reproduction is monaural or stereo.
- (Multi-channel is not supported and the L-Channel is used to reproduce stereo.) • The sampling quantization bit rate is 8 or 16 bits (full-scale at modulation
- and modulation depth set)
- Data replay of 10 s or less
 The sampling frequency is either 44.1, 48, or 96 kHz.
- Note: Sometimes, the Wave audio format file may not be loaded even if it meets the above specifications.

Analog Measurement Software MX269018A (Continued)

MS2840A MS2830A



Rx Sensitivity Test Setup



Example of RF Signal Output and AF Signal Measurement Screen (with Analog Signal Generator and Audio Analyzer Options)

A MISSING Anal	log Modulation Ana	Aysia			R .2		
TX Modulation HPF/LPF/De-E	FM Frequency mphasis	1 000.000 000 MH Off / Off / Of		10 dBm	ATT 4 dB	gi Anata Ni AMA	dalarian Ma
OK Modulation	FM Frequency	1 000.000 000 MH	iz Level -13	9 dByV (EMF)		-	Sec.
Setting						TX	FOX
RX Setting			SG OFF				14
RF Frequer	ncy	1 000.000 00	00 MHz			Free	uency
RF Level		-13.9	99 dBµV (EM	•)			4
		19	9.5 aW			Ann	litude
Modulation		F	м			-	-
Deviation		0.000	0 kHz				
						AF S	utting
AF Setting						-	Output
Signal	None(CW)					and shares where the	lart
						Her	Mart
				DCS Code		Signal M	Indulation
						On	011
						Signal	Output
						On	011
Ref.int Unlock	Pre-Amp Off					1.42	878

Example of RF Output Measurement Screen (with Analog Signal Generator)

Using Meter Displays

 Useful Meter Displays for Rx Sensitivity Test and Frequency Deviation Measurements

Results can be displayed both as numeric and convenient meter values for confirming and tuning SINAD, THD, Distortion, and frequency deviation measurements.

Meters are split into upper and lower sections; setting a narrow range at the upper meter and a wider range at the lower meter makes it possible to clearly understand the range for tuning at the lower meter, as well as perform fine adjustments in a narrow range at the upper meter when approaching the required value.

Using these meters offers a more intuitive adjustment method than directly reading numeric values that fluctuate when adjusting SINAD at Rx sensitivity tests and frequency deviation at Tx tests (FM only).

SINAD	13.39 dE		8.0 0.0	16.0 24.0	
	SINAD	Met	er		
Deviation	Peak+ Peak- (Pk-Pk)/2	1.4	1.018 23 1.478 73 - 1.451 15 1.464 94	kHz kHz	

Frequency Deviation Meter (FM only)

• Pass/Fail Displays

Pass/Fail evaluations are displayed at all meters by setting the values for the pass range and number of measurement times.

SINAD	11.15 dB	8.0 16.0 0.0 24.0	→ Pass
SINAD	7.96 dB	8.0, 12.0 16.0 0.0 24.0	→ Fail
		🔶 Pass Ra	nge

Demodulated Voice Output

Demodulating RF Signal from analog mobile radio to Output Audio Signal

The RF signal from the analog mobile radio is demodulated and the audio signal is output from the USB connector. The audio signal output from the USB Audio option can be monitored using a commercial loudspeaker.

Additionally, when the Audio Analyzer option is installed, the audio signal can be monitored either at the internal speaker, the headphone jack or the demodulation output connector.*

*: Only supports FM and Wide FM measurement mode not supported.

ООО "Техэнком" Контрольно-измерительные приборы и оборудование www.tehencom.com

MX2690xxA/MX2830xxA/MX2840xxA/MX2850xxA series Measurement Software

Pulse Radar Measurement Function MX284059A

Pulse Radar Measurement Function MX284059A, when combined with the signal analyzer MS2840A, automatically measures Tx characteristics of equipment that use pulse modulation and chirp signals, such as weather radar and marine radar. In addition, it automatically saves numerical results and measurement screen.

Features

- Specializing in Tx test of pulse radar equipment such as calculating 40 dB bandwidth and Out of band mask. (Selectable from 20 dB, 30 dB, 40 dB/decade)
- Supporting short pulse/long pulse/multi-pulse conditions used in modern solid state radar techniques
- Installing inside MS2840A or controlling from an external PC

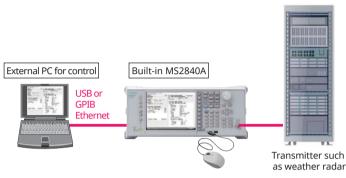
Main Measurement items

Connection Example

• Tx frequency

• Tx power

- Pulse time (pulse width, Rise time, Fall time, pulse repetition frequency)
- Frequency deviation (For FM chirp)40 dB bandwidth
- 40 GB ballowidth
- Spurious (Out of band mask , Spurious)
 Occupied bandwidth
- Graph display
 - Out of band mask & 40 dB bandwidth & Limmit Spurious & Limmit Occupied bandwidth



MS2840A

Specification

Signal Analyzer		MS2840A		
Carrier	Frequency Range	MS2840A-044: 300 MHz to 26,500 MHz MS2840A-046 300 MHz to 36,000 MHz		
	Amplitude Range	-5 to +30 dBm		
Spurious	Frequency Range	MS2840A-044: 30 MHz to 26,500 MHz MS2840A-046: 30 MHz to 44,500 MHz		
Measurement Frequency	Accuracy (standard)	$\pm 2.2 \times 10^{-8}$ (18°C to 28°C, 1 hour after power on)		
	Pulse Types	2 types (Pulse A, Pulse B)		
	Modulation Type	Non-FM Pulse Radar/FM Pulse Radar		
Supported Signal Conditions	Pulse Width	0.5 μs to 500 μs		
	Pulse Repetition Interval	0.05 ms to 5 ms (PRF = 200 Hz to 20,000 kHz)		
	Frequency Deviation	0 to 31 MHz		

Screen Image of Pulse Radar Measurement Function MX284059A (Settings, Numeric Results)

	Puise Radar Measurement Function -	- 🗆 X	
Measurement target	Select Device U3B0::0x0B5B::0x0006::6201591 Connect	Disconnected	View results
settings Sets frequency and Tx power used as the measurement reference. Three types of pulses are available: A only, B only, and A & B.	DUT Settings TX Frequency: 5250 MHz Modulation type Freq. Offset PulseA: Auto 1.25 Autena power: 100000 W Meas. point power: 100000 W Comment1: This is Comment1. Comment2.	PulseA PulseA PulseA Clear Result	The measured numerical results are displayed on the right side of the screen. Clicks [Save] to save numerical
Correction settings Compensates for level offset and path loss at the monitor terminal.	Correction Settings Correction: Correction	X IX Frequency 5,2201985012 GHz, X IX Frequency 7,2201985012 GHz, -54,556 pcm X Domer (Average) 2,256 ml / 4,024 GHm X The Power (Pask) 2,248 ml / 4,000 X K Of McGusary 29,231 MHz (K=6,2) X Freq deviation 12,249 MHz X Puise width 12,249 MHz X Puise length 12,249 MHz X Puise length 12,247 us X Puise width 12,247 us X Puise length 12,247 us X Puise time 309,356 ns	results and measurement screens. When controlling from an external PC, transfer numerical results and measurement screens to the external PC.
Measurement item selection for each pulse Select each of the three types of measurement items	Out of Band Mask(1) Betting Out of Band Mask(2) Setting Survivus Setting Occupied Band Width(1) Setting Occupied Band Width(2) Betting	Fail time 235,515 ns Out of Band Mask(1)> Parss 1, init time 2047/decade Lover Freezency 5,400290 GHz Lover Freezency 5,101850 GHz	,
A/B/A & B.	Check All Clear All Start	Clear Result Print Save	J

Pulse Radar Measurement Function MX284059A

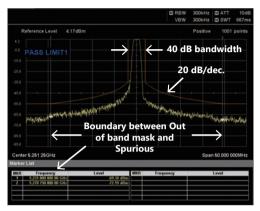
MS2840A

Measurement screen Image of MS2840A

MX284059A controls the signal analyzer MS2840A to perform automatic measurement. When saving the measurement results as an screen image, it is possible to save the image including mask limits and numerical results.

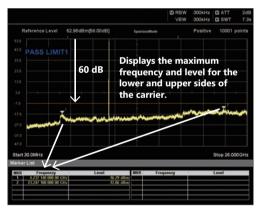
• 40 dB Bandwidth, Out of Band Mask

40 dB bandwidth and 20 dB/dec. mask is calculated and drawn automatically. Furthermore, the spurious area and out-of-band area are automatically judged and Pass/Fail judgment is performed.



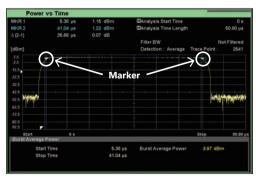
Spurious

MS2840A can measure 60 dBc as defined by Japanese Radio Law without a band rejection filter.



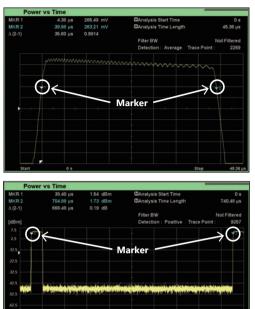
• Average Power

Automatically identifies the pulse duration and measures the average power.



Pulse Time (Pulse Width, Pulse Repetition Interval)

Automatically identifies the pulse On section and measures the pulse duration and pulse period.



Frequency Deviation

The frequency deviation is measured using the standard function (FMCW function) of MS2840A.



Operating Environment

Using MX284059A installed in MS2840A Firmware Version: 14.00.00 or newer

- Using MX284059A installed in external PC
 - OS: Windows 10 English/Japanese 32 bit/64 bit Software: NI-VISA™ 17.5

The installer is stored on the DVD-ROM attached to MS2840A. It is also available on the National Instruments[™] Web site.

Precaution

MX284059A is dedicated for MS2840A-044/046. MS2840A-046 requires a option below.

MX2840A-019: 2 dB Step Attenuator for Millimeter-wave (For MS2840A-046)

Floor noise (DANL) and 2nd harmonic distortion is increase when the following options are installed. The following options are simultaneously unavailable to install with MX284059A.

MS2840A-067: Microwave Preselector Bypass MS2840A-068: Microwave Preamplifier (For MS2840A-046) MS2840A-069: 26.5 GHz Microwave Preamplifier (For MS2840A-044)

MS269xA MS2850A

MX2690xxA/MX2830xxA/MX2840xxA/MX2850xxA series Measurement Software

LTE Downlink Measurement Software MX269020A LTE-Advanced FDD Downlink Measurement Software MX269020A-001 LTE TDD Downlink Measurement Software MX269022A LTE-Advanced TDD Downlink Measurement Software MX269022A-001

The LTE Downlink Measurement Software MX269020A and LTE TDD Downlink Measurement Software MX269022A support measurement of RF characteristics of 3GPP Release 8 LTE (Long Term Evolution) downlink signals.

The LTE-Advanced FDD Downlink Measurement Software MX269020A-001*1 and LTE-Advanced TDD Downlink Measurement Software

MX269022A-001*² support measurement of RF characteristics of 3GPP Release 10 LTE-Advanced downlink signals.

*1: Requires MX269020A

*2: Requires MX269022A

The MS269020A and the MS269020A-001 support FDD (Frequency Division Duplex) measurement systems while the MX269022A and the MX269022A-001 support TDD (Time Division Duplex) systems.

Installing these software applications in the MS269xA/MS2850A/MS2830A signal analyzers offers fast and accurate measurements for improving the quality and efficiency of 3GPP LTE base station and device component development and manufacturing.

Features

Support Testing of 3GPP TS 36.141 Release 8 and Release 10 Downlink RF Characteristics

Easy Setting of Measurement Conditions

• At prototype signal measurement, measurement is performed simply by specifying the parameter test model.

• Synchronization to the input signal is performed automatically using a Synchronization Signal or Reference Signal.

Versatile Analysis Results Formats and Graphs

- Full Output Power, Frequency Error, and EVM
- Power and EVM for each Physical channel
- Both sub-carrier and symbol EVM and I/Q constellation displays
- \bullet Power, EVM and I/Q constellation displays for each RB
- Display of EVM and PHY channel type for each resource element
- Spectrum flatness/graph: Amplitude, Phase and Group Delay frequency characteristics

MIMO Summary Function: Measures Timing Difference between up to 4 MIMO Tx Signal Antennas

- Batch Measurement Function: Batch measures and lists displays multiple items such as modulation accuracy and power spectrum
- Replay Function for Troubleshooting Faults

Supports LTE-Advanced Carrier Aggregation Signal Measurements (requires installed LTE-Advanced measurement option)

• Multi-band and multi-carrier measurements

- In-band continuous carrier batch measurement
- Inter-band discontinuous carrier measurement as one sequence
- Adjacent channel leakage power, spurious and continuous carrier occupied bandwidth measurements for each band

The LTE-Advanced Carrier Aggregation measurement range varies as follows, depending on the Analysis Bandwidth Extension option configuration.

Main frame	Analysis Bandwidth Extension Option	Maximum Analysis Bandwidth (In-band carrier aggregation range)	Maximum Number of Band	Maximum Number of Component Carrier
	MS269xA-078 installed	125 MHz	3	5
MS269xA	MS269xA-077 installed	31.25 MHz	3	5
	Standard	31.25 MHz	3	5
MS2850A	Standard	125 MHz	3	5
	MS2830A-078 installed	125 MHz	1	5
MS2830A	MS2830A-077 installed	31.25 MHz	3	5
	MS2830A-005/009 installed	31.25 MHz	3	5

Measurement Items

- Frequency Error
- Output Power
- RSTP (RS TX power)
- OSTP (OFDM Symbol TX power)
- EVM (Peak/RMS)
- EVM of each Physical Channel: RS/P-SS/S-SS/PBCH/PCFICH/PHICH/PDSCH
- Origin Offset
- Timing Offset (External Trigger)
- MIMO Summary: Frequency Error, Power, Timing Offset, EVM based on RS of each antenna

Graphical Display

- Constellation
- EVM vs. Subcarrier
- EVM vs. Symbol
- Spectral Flatness
- Power vs. Resource Block
- EVM vs. Resource Block
- Resource Element (RE) Map
- Power vs. Time (only MX269022A)

LTE Downlink Measurement Software MX269020A LTE-Advanced FDD Downlink Measurement Software MX269020A-001 LTE TDD Downlink Measurement Software MX269022A LTE-Advanced TDD Downlink Measurement Software MX269022A-001 (Continued)

Measurement Functions

• Easy Measurement of Test Model Signals

Test model signals defined in 3GPP TS 36.141 as test patterns for BTS Tx tests are easily measured by selecting the test model name.



Frequency Error/Transmit Power/EVM

This displays the frequency error, transmit power and EVM of all subcarriers in a specified measurement segment as a constellation. When averaging is performed, the maximum and mean values are displayed simultaneously.

In addition, the "Auto mode" automatically evaluates the modulation scheme of the input signal to support measurement of DL signals including different modulation schemes for each release block.

Result			Average & Max	
MKR	0			Avg/Max
Subcarrier 0		Frequency Error	0.15 /	0.38 Hz
Symbol Number		Output Power	-15.77 /	-15.77 dBm
		Mean Power	-15.77 /	-15.77 dBm
0.46327		EVM(rms)	0.26 /	0.27 %
	 	EVM(peak)	0.87 /	0.97 %
Q -0.76673		Symbol Number		5
		Subcarrier Number		629
		Origin Offset	-63.63 /	-63.02 dB

• EVM vs. Subcarrier

This displays a graph of the vector errors for each subcarrier for a specified symbol or for all symbols in a specified segment. Simultaneous display of mean (rms) and peak values.

	RMS/Pea	k) Sut	carrier	227	EVM	0.20 %	1 0.	49 %	
5.00									
375					+				
2.50					-				
1.25									

• EVM vs. Symbol

This displays a graph of the vector errors for each symbol for a specified subcarrier or for all subcarriers. Simultaneous display of mean (rms) and peak values.

nuitaneous display of mean (ms) and peak values.

MKR(RMS/Peak) Symbol	0 EVM	0.23 % /	0.75 %
\$.00			
3.75			
250			
125			
mmmm	mm	nn	mm

• Spectral Flatness

This displays a graph of amplitude, amplitude difference, phase, and group delay for each subcarrier for all symbols in a specified measurement segment.

MKR	Subcarrier	1 Amplitude	0.00 dB
1.00			
0.50			
0.00			
-0.50			
-1.00			

• Summary Display

This displays a list of various information, such as EVM for each channel (PDSCH, PUSCH, PDCCH, RS, SS, PBCH) and the power of each slot.

nmary	
PDSCH ALL EVM	Page No. 2 / 10
PDSCH ALL EVM (rms)	0.23 %
PDSCH ALL EVM (peak)	1.01 %
Symbol Number	83
Subcarrier Number	878
PDSCH ALL EVM High	
PDSCH ALL EVM (rms)	0.23 %
PDSCH ALL EVM (peak)	1.01 %
Symbol Number	83
Subcarrier Number	878
PDSCH ALL EVM Low	
PDSCH ALL EVM (rms)	0.23 %
PDSCH ALL EVM (peak)	1.01 %
Symbol Number	83
Subcarrier Number	878

PDSCH EVM Display

RS Power	-41.28	dBm		Page No.	10 / 1
Power vs Slot					
Slot No.0	-10.66	dBm	Slot No.10	-10.69	dBm
Slot No.1	-10,61	dBm	Slot No.11	-10.59	dBm
Slot No.2	-10.67	dBm	Slot No.12	-10.69	dBm
Slot No.3	-10.60	dBm	Slot No.13	-10.60	dBm
Slot No.4	-10.69	dBm	Slot No.14	-10.68	dBm
Slot No.5	-10.60	dBm	Slot No.15	-10.59	dBm
Slot No.6	-10.68	dBm	Slot No.16	-10.68	dBm
Slot No.7	-10.59	dBm	Slot No.17	-10.59	dBm
Slot No.8	-10.69	dBm	Slot No.18	-10.68	dBm
Slot No.9	-10.60	dBm	Slot No.19	-10.58	dBm

Power vs. Slot

LTE Downlink Measurement Software MX269020A MS269xA LTE-Advanced FDD Downlink Measurement Software MX269020A-001 LTE TDD Downlink Measurement Software MX269022A LTE-Advanced TDD Downlink Measurement Software MX269022A-001 (Continued)

• Power vs. Resource Block

This displays the power of each resource block in a specified subframe or specified subframe segment. Power boosting over each resource block can be checked easily by visual monitoring of the power distribution.

Moreover, simultaneous display of the constellation for a specified resource block makes troubleshooting easy.

MKR(RMS/Pea	ak)		Subframe	3	Resource Block	6
Modulation	16QAM					
Power	5.00 dB					
EVM	0.30 % /	0.77 %				
				5		

Specified Subframe

MKR(RMS/Pe	ak)	Subframe	Resource Block	
Modulation	16QAM			
Power	5.00 dB			
EVM	0.32 % /	0.75 %		
100000000000000000000000000000000000000				
0.0				
				11111111
The second se				

Power Display for Each Resource Block

DOLTE Downline							10	7/22/2008 12 10 41
Carrier Freq.		000 000 00	10 Hz	Input Le	vel -10.00 dBm			Power on Fill View
Modulation					4 d8			
Channel Bandwi	din .	20	N942			Reference Signal	Auto	Each Subframe
Result								
MKR .								
Resource Element Number					Frequency Error Output Power		0.48 Hz -10.84 dBm	Overall
Subcarrier 72 Symbol 43					Mean Power EVM(rms)		-10.75 dBm 0.34 %	-
Subhama					EVM(peak)		2.35 %	
Number 3 Resource Block Number 6					Symbol Number Subcarrier Num		95 895	
1.68966 0 -1.68569					Origin Offset		-49.64 dB	
Power vs RB								
MKR(F Moduli	stion	160	MAG		lubframe 3 /	Resource Block		
Power EVM		6.00 d 0.32 1		0.75 %				
4							** alle	Graph View
								RMS RMS&Pe
Reflet	Pre-A	ma Off	_					IOMS IOMSE

Constellation for Specified Resource Block

• EVM vs. Resource Block

This displays a graph of the EVM distribution for each resource block in a specified subframe segment, making it easy to check resource-block dependent EVM deterioration.

MKR			Subframe	Resource Block	20
Modulation	64QAM				
Power	0.00 dB				
EVM	0.22 % /	0.51 %			
2.00					1
1.50					_
1.00					_
050	man	m	A		
000					-

• Test Model Summary Display

This displays the analysis results for the signal types set at Test Model.

MS2850A

- RS boosting for each subframe
- EPRE for each channel for each subframe
- PDSCH EPRE for each modulation method for each subframe



Model Sun	may				Pa	ge No. 2 /	3	Scale
Subframe	P.55	16-65	EPRCH	Ene (db) PCFICH	PHCHgroup	BACCUBEC	- 1	
)	0.003	0.002	0.003	4.005	-0.002	1.067		Storage
	in	- militar	mim	0.000	0.004	1,065	_ 1	
	min		mim	4.003	0,005	1.070		
	min		min	-0.010	0.007	1.063		
1	mim		mim	0.002	0.012	1.074		
	0.000	0.004	mim	-0.010	0.003	1.564	_ 1	
		- min	min	0.006	-0.004	1.065	_ 1	
	im			0.006	0.010	1.068		
		- minu	mim	0.002	-0.003	1.065		
				0.004	0.007	1.066	- 1	Page Number
							- 1	2
1	Pre-Amp 01							

Test Model Summary

• MIMO Summary Display

The results for each antenna port are displayed when measuring MIMO. The results are displayed for the number of antenna signals specified at Number of Antenna Ports.

Carrier Freq.	2 110 000 000 Hz	nput Level -10.00	dBm		ACCESSION OF THE OWNER OW
Modulation			dB.		Analysia
Channel Bandwidth	10MHz		Reference Sig	nai Auto	and the second second
Result			Average I	L Max 10/10	Time
r	Tx0/Rx	Tat/Ra	Tx2/Rx	Tx3/Rx	
	0.00 48		dB	dB	
RS Power RS EVM (rms)	0.22 %	du	du tu	- da	Channel Bandwidt
RS Timing Offset				na	10MHz
RS Freg	0.00 Hz	man Mg	Harris Ha	and in Ma	
					DetailSettings

LTE Downlink Measurement Software MX269020A MS269xA MS2850A LTE-Advanced FDD Downlink Measurement Software MX269020A-001 LTE TDD Downlink Measurement Software MX269022A LTE-Advanced TDD Downlink Measurement Software MX269022A-001 (Continued)

Power vs. Time Function (MX269022A and MS269xA)

Following numeric result is displayed in the upper part of the screen and displays time variation of signal in 1 Frame section in the lower part of screen.

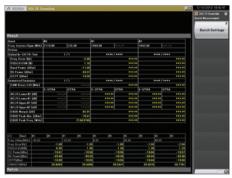
- Off Power
- On Power Transient Period Power at Mask Edge
- Mask Judge



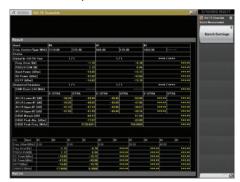
Batch Measurement Function

This function supports batch measurement and list display of the modulation accuracy and Tx power spectrum to shorten the measurement time and comprehensively check the measurement results. When the MS269020A-001 and MX269022A-001 are installed, multiple bands and multiple carriers can be measured at the batchmeasurement function screen*.

*: If the LTE-Advanced option is not installed, measurement is limited to only one carrier.



Batch Measurement Screen (Measurement example for in-band 5 continuous carriers)

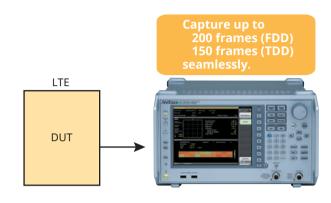


Batch Measurement Screen (Measurement example for carriers in 2 bands)

• Replay Function for Troubleshooting Faults

Up to 200 frames of LTE signals can be captured as a file for replay by the LTE measurement software to perform analyses such as EVM measurement.*

*: Batch measurement is not supported when the MX269020A-001 is installed.





Example of R&D use

Save data for comparing each DUT test version

→ Supports comparison of retrofitting improvement effects

Example of production line use

Save delivery inspection data

→ Supports rechecking of performance data for troubleshooting postdelivery faults

LTE Downlink Measurement Software MX269020A LTE-Advanced FDD Downlink Measurement Software MX269020A-001 LTE TDD Downlink Measurement Software MX269022A LTE-Advanced TDD Downlink Measurement Software MX269022A-001 (Continued)

Specifications

The specification is the value after 30-minute warm-up at a constant ambient temperature. The specifications are defined under the following condition unless otherwise specified. Attenuator mode: Mechanical Attenuator Only (MS2830A only)

LTE Downlink Measurement Software MX269020A, LTE-Advanced FDD Downlink Measurement Software MX269020A-001

	Signal Analyzer	MS269xA	MS2830A MS2850A					
	Channel Bandwidth	1.4, 3, 5, 10, 15, 20 MHz	(HISEOSON)					
Common	Target Signals	Downlink						
Specifications	Capture Time	Auto: 1 Frame Manual: 1 to 200 Frame						
	Measurement Frequency Range	600 MHz to 4 GHz	MS2830A-041/043/044/045: 600 MHz to 4 GHz MS2830A-040: 600 MHz to 3.6 GHz MS2850A: 600 MHz to 4 GHz					
	Measurement Level Range	-15 to +30 dBm (Preamp Off, or Preamp not installed) -15 to +10 dBm (Preamp On)						
		After CAL execution at 18°C to 28°C For a signal of EVM = 1% For Measurement Interval = 10 Subframe						
Modulation/ Frequency Measurement	Carrier Frequency Accuracy	± (Accuracy of reference frequency ×	MS2830A (MS2830A-078 not installed), MS2850A: ± (Accuracy of reference frequency × carrier frequency + 3.5) Hz (center frequency: 600 MHz to 2700 MHz) ± (Accuracy of reference frequency × carrier frequency + 8.0) Hz (center frequency: 2700 MHz to 4000 MHz)					
		Carrier frequency + 3) Hz (Excluding the Batch Measurement when MS269xA-004 is installed)	MS2830A (At CC of center frequency when MS2830A-078 installed. At input level of –4 dBm MS2830A-045 installed) ± (Accuracy of reference frequency × carrier frequency + 4.0) Hz (center frequency: 600 MHz to 2700 MHz) ± (Accuracy of reference frequency × carrier frequency + 8.0) Hz (center frequency: 2700 MHz to 4000 MHz)					
	Residual Vector Error	After CAL execution at 18°C to 28°C At measurement Interval = 10 subframe <1.0% (rms) (Excluding the Batch Measurement when MS269xA-078 is not installed or MS269xA-004 is installed) <1.3% (rms) (In the CC of the center frequency when MS269xA-078	<1.3% (rms) (At the input level of –4 dBm when MS2830A-045 is installed)					
		is installed) After CAL execution, input attenuator ≥10 dB, at 18°C to the input signal is within the measurement level range						
Amplitude Measurement	Tx Power Measurement Accuracy (This is found from root sum of squares (RSS) of absolute amplitude accuracy and in-band frequency characteristics of main frame.)	Excluding the Batch Measurement when the MS269xA-004 is installed. ±0.6 dB (at Preamp Off, or Preamp not installed.) ±1.1 dB (at Preamp On)	MS2830A: ±0.6 dB (at Preamp Off or Preamp not installed) MS2850A: ±0.6 dB (at Preamp Off or Preamp not installed) ±1.1 dB (at Preamp On)					
Waveform Display		Provides functions for displaying waveforms below. Constellation, EVM vs. Subcarrier, EVM vs. Symbol, Power vs. Resource Block, EVM vs. Resource Block, Spectral Flatness						
Adjacent Channel Leakage Power Measurement	Measurement Method	Executes the adjacent channel power measurement fun	ction of the Spectrum Analyzer or Signal Analyzer.					
Occupied Bandwidth Measurement	Measurement Method	Executes the occupied bandwidth measurement functio	n of the Spectrum Analyzer or Signal Analyzer.					
Channel Power Measurement	Measurement Method	Executes the channel power measurement function of the	he Spectrum Analyzer or Signal Analyzer.					
Spectrum Emission Mask Measurement	Measurement Method	Executes the spectrum emission mask measurement fur	nction of the Spectrum Analyzer.					
	Function Overview	Capable of outputting captured waveform data to inter	nal or external storage device.					
Digitize Function	Waveform Data	Format: I, Q (32 bit floating point binary format) Level: Assumes as $\sqrt{(l^2 + Q^2)} = 1$ for 0 dBm input Level accuracy: Same as the absolute amplitude accuracy a	and in-band frequency characteristics of the signal analyzer					
Replay Function	Function Overview	Analyzes traces of saved waveform data Format: I, Q (32 bit floating point binary format) Sampling rate: 50 MHz						

LTE Downlink Measurement Software MX269020A LTE-Advanced FDD Downlink Measurement Software MX269020A-001 LTE TDD Downlink Measurement Software MX269022A LTE-Advanced TDD Downlink Measurement Software MX269022A-001 (Continued)

LTE TDD Downlink Measurement Software MX269022A. LTE-Advanced TDD Downlink Measurement Software MX269022A-001

Sig	gnal Analyzer	MS269xA	MS2830A MS2850A					
	Channel Bandwidth	1.4, 3, 5, 10, 15, 20 MHz						
Common	Target Signals	LTE TDD Downlink						
Specifications	Capture Time	Auto: 5 frame						
		Manual: 5 to 150 frame						
	Measurement Frequency Range	600 MHz to 4 GHz	MS2830A-041/043/044/045: 600 MHz to 4 GHz MS2830A-040: 600 MHz to 3.6 GHz MS2850A: 600 MHz to 4 GHz					
	Measurement Level Range	15 to +30 dBm (Preamp Off, or Preamp not installed) 30 to +10 dBm (Preamp On)						
Modulation/ Frequency Measurement		After CAL execution at 18°C to 28°C For a signal of EVM = 1% When Downlink 10 Subframe is the measurement target	MS2830A (MS2830A-078 not installed) ± (Accuracy of reference frequency × carrier frequency + 3.5) Hz					
	Carrier Frequency Accuracy	± (Accuracy of reference frequency × Carrier frequency + 3) Hz (Excluding the Batch Measurement when MS269xA-004 is installed)	 (center frequency: 600 MHz to 2700 MHz) ± (Acccuracy of reference frequency × carrier frequency + 8.0) Hz (center frequency: 2700 MHz to 4000 MHz) MS2830A (At CC of center frequency when MS2830A-078 installed. At input level of -4 dBm when MS2830A-045 installed.), MS2850A: ± (Acccuracy of reference frequency × carrier frequency: 4.0) Hz (center frequency: 600 MHz to 2700 MHz) ± (Acccuracy of reference frequency × carrier frequency: 8.0) Hz (center frequency + 8.0) Hz (center frequency + 8.0) Hz (center frequency: 2700 MHz to 4000 MHz) 					
		After CAL execution at 18°C to 28°C						
	Residual Vector Error	When Downlink 10 Subframe is the measurement target <1.0% (rms) (Excluding the Batch Measurement when MS269xA-078 is not installed or MS269xA-004 is installed) <1.3% (rms) (In the CC of the center frequency when MS269xA-078 is installed)	MS2830A: < 1.3% (rms) (With MS2830A-078 not installed, At input level of -4 dBm when MS2830A-045 installed) <1.3% rms) (At CC of center frequency when MS2830A-078 installed, At input level of -4 dBm when MS2830A-045 installed)					
			MS2850A: <1.3% (rms) MS2830A: -15 to +30 dBm (Preamp Off or Preamp not installe					
	Measurement Level Range	-15 to +30 dBm (Preamp Off or Preamp not installed) -30 to +10 dBm (Preamp On)	MS2850A: -15 to +30 dBm (Preamp Off or Preamp not installer -30 to +10 dBm (Preamp Off or Preamp not installer -30 to +10 dBm (Preamp On)					
Amplitude Measurement	Tx Power Measurement Accuracy (Found from	At 18°C to 28°C, After calibration, Input attenuator \geq 10 dB, W value set at Input Level	,					
vieasurement	root sum of squares (RSS) of absolute amplitude accuracy and in-band frequency characteristics of main frame)	Excluding batch measurement when MS269xA-004 installed ± 0.6 dB (at Preamp Off or Preamp not installed) ± 1.1 dB (at Preamp On)	MS2830A: ±0.6 dB (at Preamp Off or Preamp not installed) MS2850A: ±0.6 dB (at Preamp Off or Preamp not installed) ±1.1 dB (at Preamp On)					
Waveform Displa	у	Provides functions for displaying waveforms below. Constellation, EVM vs. Subcarrier, EVM vs. Symbol, Power vs. Resource Block, EVM vs. Resource Block, Spectral Flatne						
Adjacent Channel Leakage Power Measurement	Measurement Method	Executes the adjacent channel power measurement function	of the Spectrum Analyzer or Signal Analyzer.					
Occupied Bandwidth Measurement	Measurement Method	Executes the occupied bandwidth measurement function of t	he Spectrum Analyzer or Signal Analyzer.					
Channel Power Measurement	Measurement Method	Executes the channel power measurement function of the Sp	ectrum Analyzer or Signal Analyzer.					
Spectrum Emission Mask Measurement	Measurement Method	Executes the spectrum emission mask measurement function	of the Spectrum Analyzer.					
	Function Overview	Capable of outputting captured waveform data to internal or	r external storage device.					
Digitize Function	Waveform Data	Format: I,Q (32 bit floating point binary format) Level: Assumes as $\sqrt{(l^2 + Q^2)} = 1$ for 0 dBm input Level accuracy: Same as the absolute amplitude accuracy and	l in-band frequency characteristics of the signal analyzer.					
Replay Function	Function Overview	Analyzes traces of saved waveform data Format: I, Q (32 bit floating point binary format) Sampling rate: 50 MHz						
Power vs. Time	Function Overview	Provides measurements for Transmitter OFF Power, Time Ma This function can be used only in the MS269xA series.	sk, and Transmitter Transient Period.					
	Dynamic Range	121.4 dB (nom.)* ^{1, *2}						

10log₁₀(Channel bandwidth/5.0 MHz) dB *2: Wide Dynamic Range = On, Noise Correction = On

MS269xA MS2850A MS2830A

LTE Uplink Measurement Software MX269021A
LTE-Advanced FDD Uplink Measurement Software MX269021A-001
LTE TDD Uplink Measurement Software MX269023A
LTE-Advanced TDD Uplink Measurement Software MX269023A-001

MS269xA MS2850A MS2830A

LTE Uplink Measurement Software MS269021A is for testing RF characteristics of 3GPP LTE FDD Uplink signal. LTE-Advanced FDD Uplink Measurement Software MX269021A-001 expands the Carrier Aggregation measurement function to MX269021A.

LTE Uplink Measurement Software MS269023A is for testing RF characteristics of 3GPP LTE TDD Uplink signal. LTE-Advanced TDD Uplink Measurement Software MX269023A-001 expands the Carrier Aggregation measurement function to MX269023A.

These applications improve the quality and efficiency of 3GPP LTE terminal and device component development and manufacturing.

Features

Support Testing of 3GPP TS 36.521-1 V10.5.0 (2013-03) Uplink RF Characteristics

■ Versatile Analysis Results Formats and Graphs

- Full Output Power, Frequency Error, and EVM
- Power and EVM for each Physical channel
- Both sub-carrier and symbol EVM and I/Q constellation displays
- Spectrum flatness/graph: Amplitude, Phase and Group Delay frequency characteristics
- Time Based EVM
- EVM vs. Demod-Symbol
- In-Band EmissionPower vs. Time

Replay Function for Troubleshooting Faults

Measurement Items

[Text Display]

- Frequency Error
- Output Power
- EVM (rms)/(peak)
- Origin Offset
- Timing Offset (External Trigger)

[Graphical Display]

- Constellation
- EVM vs. Subcarrier
- EVM vs. Symbol
- Spectral Flatness
- Time Based EVM
- EVM vs. Demod-Symbol
- In-Band Emission

[Summary Display]

- PUSCH EVM (rms)/(peak)
- DMRS EVM (rms)/(peak)
- Frequency Error
- Output Power, Mean Power
- EVM (rms)/(peak)
- Origin Offset
- Time Offset
- Total EVM (Time Based)
- PUSCH QPSK/16QAM/64QAM EVM (Time Based)
- Total EVM (Frequency Based)
- PUSCH ALL/QPSK/16QAM/64QAM EVM
- DMRS EVM
- Frequency Error vs. Slot
- Origin Offset vs. Slot
- In-Band Emission
- Inside/Outside Flatness
- EVM Equalizer Spectrum Flatness

LTE Uplink Measurement Software MX269021A LTE-Advanced FDD Uplink Measurement Software MX269021A-001 LTE TDD Uplink Measurement Software MX269023A LTE-Advanced TDD Uplink Measurement Software MX269023A-001 (Continued)

Measurement Functions

Constellation/Numerical Results

The Constellation/Numerical value results are displayed.

- Frequency Error
- Output Power (Mean power in 31.25 MHz bandwidth)
- Mean Power (Mean power in channel bandwidth)
- EVM [Peak/rms]
- Origin Offset
- Time Offset (time offset between the trigger input and head of the frame)

Reault	 Messu	ring	
MKR	0		
Salesester 0		Frequency Error	-0.01 Hz
Symbol Number			0,000 ppm
		Output Power	-13.06 dBm
0.80138		Mean Power	-13.05 dBm
		EVM(rms)	0.27 %
Q 0.8002#		EVM(peak)	1.02 %
		Symbol Number	
		Subcarrier Number	88
		Frame Number	
		Origin Offset Time Offset	-47.93 dB -37.0 ms

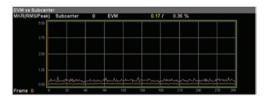
• EVM vs. Subcarrier

This displays the EVM vs. Subcarrier graph (horizontal axis = Subcarrier, vertical axis = EVM) at the bottom of the screen.

The following EVM can be selected by switching EVM vs. Subcarrier View.

Averaged over all Symbols: Mean value of all analysis symbols Each Symbol: Value of symbol selected by marker

It is useful for checking in-band interference signals.



• EVM vs. Symbol

This displays the EVM vs. Symbol graph (horizontal axis = Symbol, vertical axis = EVM) at the bottom of the screen.

It is useful for checking characteristics in the time direction and faults at a specific symbol.

VM vs Symbol		28 EVM	0.21/	0.48 %	
KR(RMS/Peak)	Symbol	28 EVM	0.217	0.48 %	
5.00					
375					
250					
125					
0.00				Anna Maria	
ame 0 0		- Michael Constanting			23

Spectral Flatness

Four kinds of graphs are switched.

- 1. Amplitude vs. Subcarrier
 - Relative power of each subcarrier to average power of all subcarriers

MS269xA MS2850A

- 2. Difference Amplitude vs. Subcarrier Power difference between adjoined subcarriers
- 3. Phase vs. Subcarrier
 - Phase error of each subcarrier
- 4. Group Delay

Group delay between adjoined subcarriers

It is useful for checking frequency response (Amplitude and Group Delay).

vg/Peak)	s(Amplitude vs Subcarrier	0	-0.05 /	-0.05 /	-0.05 dB	
1000						
5.00					_	
000			_	_	_	
-500					_	
-1000						

• Time Base EVM

This displays a graph of each measured symbol in the time domain (horizontal axis) vs. EVM (vertical axis) at the bottom of the screen. The results are displayed for symbols that have a PUSCH.

It is useful for checking characteristics in the time direction and faults at a specific symbol.

te Based EVM				
ne Based EVM (R(RMS/Peak)	Symbol	28 EVM	0,197	0.45 %
500				
375				
250				
125				
0.00				********
me 0 🔍				

• EVM vs. Demodulation Symbol

This displays a graph of the EVM vs. Demodulation Symbol (horizontal axis = Demodulation Symbol, vertical axis = EVM) at the bottom of the screen.

It is useful for checking characteristics in the time direction and faults at a specific symbol.

500				
375				
250 -				
. 125				

LTE Uplink Measurement Software MX269021A LTE-Advanced FDD Uplink Measurement Software MX269021A-001 LTE TDD Uplink Measurement Software MX269023A LTE-Advanced TDD Uplink Measurement Software MX269023A-001 (Continued)

In-Band Emission

The following two types of graph can be selected and displayed at the bottom of the screen by switching In-Band Emission View.

- Averaged over all Slots: Average of In-Band Emission for measured slots
- Each Slot: In-Band Emission value for each slot specified by Graph Slot Number

It is useful for checking in-band emission at a specific subcarrier and resource block.



Summary Display Function

This function batch-displays the power and EVM for each channel.

التلم						D Uplink	A MEDSON LTE-TO
			-10.00 dBm	Input Lev			
							fodulation
PUSCH		Terget Ch			5MHz		Channel Bandwidth
							Result
70 70 70	-0.26 Hz 0.000 ppm -10.88 dBm		utput Power		6	*** ** 9	PUSCH EVM (/ms) QPSK 16QAM 64QAM
10	0.21 % 0.75 % 219	Vumber	/M(rms) /M(peak) Demod-Symbol I	43 / 0	6 219 /	0.75 9	QPSK 16QAM
10	43 0 45.57 dB		Frame Number	Frame	1Symbol#	0.24 1 Subcarrier	64GAM DMRS EVM (rms) DMRS EVM (peak) / !
10	ige No. 1 /	Pa					Summary
	/ Symbol / Fran	nod-Symbol					
			0.75 % 0.21 % 0.75 %	peak peak	EVM Hig		(time based)
	0 1 10	219 / 4	0.21 %	w rms peak	EVMLO		
-	3 / 0	219 / 4	0.21 % 0.75 % 0.21 % 0.75 % 0.21 % 0.75 %	peak maak	EVM Hig	EVM	PUSCH QPSK (time based)
_	a i o	219 / 4	0.75 %		EVMLo	Amp Off	Refint Pre-
	PUSCH 10 10 10 10 10	PUSCH 0.25 kt / 100 0.25 kt / 0.25	Target Cit PL/SCH - 20 40 5 form 0.000 ppm - 0.000 ppm 0.000 ppm - 0.000 ppm-losit publicit firming 0.000 ppm - 0.000 ppm-losit publicit publicit 0.000 ppm - 0.000 ppm-losit publicit 0.000 ppm - 0.000 ppm-losit publicit 0.000 ppm - 0.000 ppm-losit 0.000 ppm - 0.000 ppm 0.000 ppm	4 -0.00 e8m 4 -0.00 e8m Target Ch Preparing Union	Input Lives -1000 dblt AT A db AT A db Target Ch Put Ch Oxford Rover -0.00 gpm Oxford Rover -0.00 gpm Wate Rover -0.00 gpm Oxford Rover	D00 Hz InputLivel -1.500 dBin AUTO ALTO ALTO ALTO AUTO ALTO ALTO PutCh Mole: Target Ch. PutCh ALTO ALTO ALTO ALTO ALTO ALTO	1000000000000000000000000000000000000

Page 1: List of EVM and Power for Each Channel Uplink (PUSCH) (MX269023A)

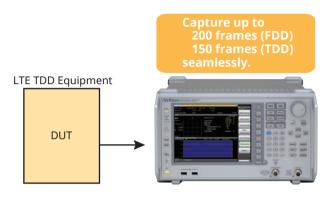
Replay Function for Troubleshooting Faults

Up to 150 frames of LTE TDD signals can be captured as a file for replay by the LTE TDD Measurement Software to perform EVM measurement analyses, etc.*

MS269xA

MS2850A

*: Batch measurement is not supported when the MX269022A-001 is installed.





Example of R&D use

Save data for comparing each DUT test version

→ Supports comparison of retrofitting improvement effects

Example of production line use

Save delivery inspection data

→ Supports rechecking of performance data for troubleshooting postdelivery faults

LTE Uplink Measurement Software MX269021A LTE-Advanced FDD Uplink Measurement Software MX269021A-001 LTE TDD Uplink Measurement Software MX269023A LTE-Advanced TDD Uplink Measurement Software MX269023A-001 (Continued)

Specifications

The specification is the value after 30-minute warm-up at a constant ambient temperature. The specifications are defined under the following condition unless otherwise specified. Attenuator mode: Mechanical Attenuator Only (MS2830A only)

LTE Uplink Measurement Software MX269021A , LTE-Advanced FDD Uplink Measurement Software MX269021A-001

	Signal Analyzer	MS269xA	MS2830A				
			MS2850A				
	Channel Bandwidth	1.4, 3, 5, 10, 15, 20 MHz Uplink					
Common	Target Signals	MS269xA, MS2830A LTE-Advanced can be selected when MX269021A-001 installed When LTE selected: Span = 31.25 MHz fixed When LTE-Advanced selected and Option 077/177/078/178 not installed: Span = 31.25 MHz When LTE-Advanced selected and Option 077/177 installed: Span = 62.5 MHz When LTE-Advanced selected and Option 078/178 installed: Span = 125 MHz MS2850A When LTE selected: Span = 31.25 MHz					
Specifications	Capture Time	The condition "When Span = 62.5 MHz and 125 MHz" is applied when MX269021A-001 is installed. • When Span = 31.25 MHz Capture Time = Auto: 1 Frame Capture Time = Manual: 1 to 200 Frame • When Span = 62.5 MHz Capture Time = Auto: 1 Frame Capture Time = Manual: 1 to 100 Frame • When Span = 125 MHz Capture Time = Auto: 1 Frame Capture Time = Manual: 1 to 50 Frame					
	Measurement Frequency Range	400 MHz to 5 GHz	MS2830A-040: 400 MHz to 3.6 GHz MS2830A-041/043/044/045: 400 MHz to 5 GHz MS2850A: 400 MHz to 5 GHz				
	Measurement Level Range	–15 to +30 dBm (Preamp Off, or Preamp not installed.) –15 to +10 dBm (Preamp On)	MS2830A: -15 to +30 dBm (Preamp Off or Preamp not installed) MS2850A: -15 to +30 dBm (Preamp Off or Preamp not installed) -15 to +10 dBm (Preamp On)				
		After CAL execution at 18°C to 28°C. For a signal of EVM = 1%. For Measurement Interval = 10 Subframe					
Modulation/ Frequency Measurement	Carrier Frequency Accuracy	± (Accuracy of reference frequency × Carrier frequency + 8) Hz	± (Accuracy of reference frequency × Carrier frequency + 8) Hz (At the input level is –4 dBm when MS2830A-045 is installed)				
		After CAL execution at 18°C to 28°C. For Measurement Interval = 10 Subframe. The condition "When Span = 62.5 MHz or 125 MHz" is applied when MX269021A-001 is installed.					
	Residual Vector Error	<1.0% (rms) (When Span = 31.25 MHz) <1.3% (rms) (When Span = 62.5 MHz or 125 MHz)	MS2830A: <1.2% (rms) (When Span = 31.25 MHz) <1.3% (rms) (When Span = 62.5 MHz or 125 MHz) (At input level of -4 dBm when MS2830A-045 installed) MS2850A:				
			<pre></pre>				
Amplitude Measurement	Tx Power Measurement Accuracy	Transmitter power accuracy is calculated from the RSS (root sum of squares) error of the absolute amplitud accuracy and the in-band frequency characteristics of the MS2690A/MS2691A/MS2692A or MS2830A. At 18°C to 28°C after calibration when the input attenuator = ≥ 10 dB, the measured input signal is within the measurement level range and below the value set at Input Level when Span = 31.25 MHz. MS2830A: ±0.6 dB (Preamp Off or Preamp not installed)					
		±0.6 dB (Preamp Off, or Preamp not installed.) ±1.1 dB (Preamp On)	MS2850A: ±0.6 dB (Preamp Off or Preamp not installed) ±1.1 dB (Preamp On)				
Measurement Target Channel Signal		LTE Selected: • PUSCH • PUCCH • SRS • PRACH LTE-Advanced Selected: • PUSCH • PUCCH Measures and displays the result per channel. The channel	el setting is mutually exclusive.				

MS269xA MS2850A MS2830A

MX2690xxA/MX2830xxA/MX2840xxA/MX2850xxA series Measurement Software

LTE Uplink Measurement Software MX269021A LTE-Advanced FDD Uplink Measurement Software MX269021A-001 LTE TDD Uplink Measurement Software MX269023A

LTE-Advanced TDD Uplink Measurement Software MX269023A-001 (Continued)

	Signal Analyzer	MS269xA	MS2830A MS2850A			
Waveform Display		Provides functions for displaying waveforms below. Constellation, EVM vs. Subcarrier, EVM vs. Symbol, Time Based EVM, EVM vs. Demod-Symbol, Spectral Flatness, In-Band Emission, Power vs. Time				
Adjacent Channel Leakage Power Measurement	Measurement Method	Executes the adjacent channel power measurement function of the Spectrum Analyzer or Signal Analyzer.				
Occupied Bandwidth Measurement	Measurement Method	Executes the occupied bandwidth measurement function of the Spectrum Analyzer or Signal Analyzer.				
Channel Power Measurement	Measurement Method	Executes the channel power measurement function of the Spectrum Analyzer or Signal Analyzer.				
Spectrum Emission Mask Measurement	Measurement Method	Executes the spectrum emission mask measurement function of the Spectrum Analyzer.				
	Function Overview	Capable of outputting captured waveform data to internal or external storage device.				
Digitize Function Waveform Data		Format: I, Q (32 bit floating point binary format) Level: Assumes as $\sqrt{(l^2 + Q^2)} = 1$ for 0 dBm input Level accuracy: Same as the absolute amplitude accuracy and in-band frequency characteristics of the signal analyzer.				
Replay Function		Analyzes traces of saved waveform data Format: I, Q (32 bit floating point binary format) Sampling rate: The condition "When Span = 62.5 MHz and 125 MHz" is applied when MX269021A-001 is installed. 50 MHz (when Span = 31.25 MHz) 100 MHz (when Span = 62.5 MHz) 200 MHz (when Span = 125 MHz)				
Component Carrier	Maximum Number of CCs	2				
(CC) Allocated	Channel Bandwidth of Each CC	1.4, 3, 5, 10, 15, 20 MHz				
Condition (Using MX269021A-001)	Frequency Offset Range of Each CC	(Span – Channel bandwidth of each CC)/2 to (Span – Channel bandwidth of each CC)/2				

LTE TDD Uplink Measurement Software MX269023A, LTE-Advanced TDD Uplink Measurement Software MX269023A-001

	Signal Analyzer	MS269xA	MS2830A				
		WI3209XA	MS2850A				
	Channel Bandwidth	1.4, 3, 5, 10, 15, 20 MHz					
	Target Signals	Uplink					
Common	Span Setting	MS269xA, MS2830A LTE-Advanced can be selected when the MX269023A-001 is installed. When LTE selected: Span = 31.25 MHz fixed When LTE-Advanced selected and Option 077/177/078/178 not installed: Span = 31.25 MHz When LTE-Advanced selected and Option 077/177 installed: Span = 62.5 MHz When LTE-Advanced selected and Option 078/178 installed: Span = 125 MHz MS2850A					
Specifications	Capture Time	When LTE selected: Span = 31.25 MHz The condition "When Span = 62.5 MHz and 125 MHz" is applied when MX269023A-001 is installed. • When Span = 31.25 MHz Capture Time = Auto: 5 Frame Capture Time = Manual: 5 to 150 Frame • When Span = 62.5 MHz Capture Time = Auto: 5 Frame Capture Time = Auto: 5 Frame Capture Time = Auto: 5 Frame Capture Time = Manual: 5 to 100 Frame • When Span = 125 MHz Capture Time = Auto: 5 Frame Capture Time = Manual: 5 to 50 Frame					
	Measurement Frequency Range	400 MHz to 5 GHz	MS2830A-040: 400 MHz to 3.6 GHz MS2830A-041/043/044/045: 400 MHz to 5 GHz MS2850A: 400 MHz to 5 GHz				
Modulation/ Frequency Measurement	Measurement Level Range	–15 to +30 dBm (Preamp Off, or Preamp not installed.) –15 to +10 dBm (Preamp On)	MS2830A: -15 to +30 dBm (Preamp Off or Preamp not installed) MS2850A: -15 to +30 dBm (Preamp Off or Preamp not installed) -15 to +10 dBm (Preamp On)				

LTE Uplink Measurement Software MX269021A

LTE-Advanced FDD Uplink Measurement Software MX269021A-001

LTE TDD Uplink Measurement Software MX269023A

LTE-Advanced TDD Uplink Measurement Software MX269023A-001 (Continued)

	Signal Analyzer	MS269xA	MS2830A	
			MS2850A	
		After CAL execution at 18°C to 28°C. For a PUSCH signal For Measurement Interval = 10 Subframe	of EVM = 1% and Full RB.	
Modulation/ Frequency	Carrier Frequency Accuracy	± (Accuracy of reference frequency × Carrier frequency + 8) Hz	MS2830A: ± (Accuracy of reference frequency × Carrier frequency + 8) Hz (At input level of -4 dBm when MS2830A-045 installed) MS2850A: ± (Accuracy of reference frequency × Carrier frequency + 8) Hz (Span = 31.25 MHz)	
Measurement		After CAL execution at 18°C to 28°C. For Measurement Ir		
	Residual Vector Error	The condition "When Span = 62.5 MHz or 125 MHz" is a <1.0% (rms) (When Span = 31.25 MHz) <1.3% (rms) (When Span = 62.5 MHz or 125 MHz)	MS2830A: <1.2% (rms) (When Span = 31.25 MHz) <1.3% (rms) (When Span = 62.5 MHz or 125 MHz) (At input level of -4 dBm when MS2830A-045 installed)	
			MS2850A: <1.3% (rms) (When Span = 31.25 MHz)	
Amplitude Measurement	Tx Power Measurement Accuracy	Transmitter power accuracy is calculated from the RSS (root sum of squares) error of the absolut accuracy and the in-band frequency characteristics of the MS2690A/MS2691A/MS2692A or MS2 At 18°C to 28°C after calibration when input attenuator = \geq 10 dB, the measured input signal is v measurement level range and below the value set at Input Level when Span = 31.25 MHz.		
			±0.6 dB (Preamp Off or Preamp not installed) ±1.1 dB (Preamp On)	
Measurement Target Channel Signal		LTE Selected: • PUSCH • PUCCH • PRACH LTE-Advanced Selected: • PUSCH • PUCCH Measures and displays the result per channel. The chann	el setting is mutually exclusive.	
Waveform Display		Provides functions for displaying waveforms below. Constellation, EVM vs. Subcarrier, EVM vs. Symbol, Time Based EVM, EVM vs. Demod-Symbol, Spectral Flatness, In-Band Emission, Power vs. Time		
Adjacent Channel Leakage Power Measurement	Measurement Method	Executes the adjacent channel power measurement function of the Spectrum Analyzer or Signal Analyzer.		
Occupied Bandwidth Measurement	Measurement Method	Executes the occupied bandwidth measurement function	of the Spectrum Analyzer or Signal Analyzer.	
Channel Power Measurement	Measurement Method	Executes the channel power measurement function of th	e Spectrum Analyzer or Signal Analyzer.	
Spectrum Emission Mask Measurement	Measurement Method	Executes the spectrum emission mask measurement func	tion of the Spectrum Analyzer.	
	Function Overview	Capable of outputting captured waveform data to internal or external storage device.		
Digitize Function	Waveform Data	Format: I, Q (32 bit floating point binary format) Level: Assumes as $\sqrt{(l^2 + Q^2)} = 1$ for 0 dBm input Level accuracy: Same as the absolute amplitude accuracy and in-band frequency characteristics of the signal analyzer.		
Replay Function		Analyzes traces of saved waveform data Format: I, Q (32 bit floating point binary format) Sampling rate: The condition "When Span = 62.5 MHz and 125 MHz" is applied when MX269021A-001 is installed. 50 MHz (when Span = 31.25 MHz) 100 MHz (when Span = 62.5 MHz) 200 MHz (when Span = 125 MHz)		
Component Carrier	Maximum Number of CCs	2		
(CC) Allocated Condition (Using	Channel Bandwidth of Each CC	1.4, 3, 5, 10, 15, 20 MHz		
Condition (Using MX269021A-001) Frequency Offset Range of Each CC – (Span – Channel bandwidth of each CC)/2 to (Span – Channel bandwidth of each CC)/2				

MS269xA MS2850A MS2830A

CDMA2000 Forward Link Measurement Software MX269024A All Measure Function MX269024A-001 EV-DO Forward Link Measurement Software MX269026A All Measure Function MX269026A-001

The CDMA2000 Forward Link Measurement Software MX269024A supports measurement of RF characteristics of 3GPP2 C.S0002/C.S0010 CDMA2000 Forward Link signals. The EV-DO Forward Link Measurement Software MX269026A supports measurement of RF characteristics of 3GPP2 C.S0024/C.S0032 EV-DO Forward Link signals.

Installing the All Measure Function MX269024A-001 in a unit in which the MX269024A has been installed supports single-capture batch-measurement of multiple CDMA2000 Tx characteristics, such as modulation analysis accuracy, power spectrum, etc.

Similarly, installing the All Measure Function MX269026A-001 in a unit in which the MX269026A has been installed supports single-capture batchmeasurement of multiple EV-DO Tx characteristics such as modulation accuracy, power spectrum, etc.

Features

Support Testing of 3GPP2 CDMA2000/EV-DO Revision 0, Revision A Forward Link RF Characteristics

- Easy Setting of Measurement Conditions
- Signal analyzer automatically synchronized to input signal
- CDMA2000 Rev. 0 (Subtype0/1) and Rev. A (Subtype2) switching: CDMA2000
- Data Tx and Idle state switching: EV-DO

Versatile Analysis Results Formats and Graphs

- Text displays for Frequency Error, Output Power, Waveform Quality, ρ, Timing Error, etc.
- Code Domain Power Graph
- Conducted Spurious Emissions
- Occupied Bandwidth
- Power vs. Time (only EV-DO)

All Measurement Function

Batch-measures and list displays multiple items, such as modulation accuracy and power spectrum (requires installation of All Measure Function option)

MX269024A CDMA2000 Forward Link

Code Domain Graph

The code domain analysis result (graph and numerical value) is displayed at the top of the screen. This is the result for the slot set as Target Slot Number.

The numeric modulation analysis result is displayed at the bottom of the screen as an average for the number of slots set as Measurement Interval.

In addition, the measurement result is averaged when Average is On.



Code Domain Screen: CDMA2000 Forward Link

All Measure Screen

Installing the MX269024A-001 All Measure Function supports highspeed batch-measurement of CDMA2000 Forward Link multiple Tx characteristics, such as modulation accuracy, power spectrum, etc.

MS269xA



All Measure Screen: CDMA2000 Forward Link

CDMA2000 Forward Link Measurement Software MX269024A All Measure Function MX269024A-001 EV-DO Forward Link Measurement Software MX269026A All Measure Function MX269026A-001 (Continued)

MX269026A EV-DO Forward Link

Code Domain Graph

The code domain analysis result (graph and numerical value) is displayed at the top of the screen. "MAC" or "Data" is switched at the code domain screen.

The numeric modulation analysis result is displayed at the bottom of the screen.

A MERSENA EVEC	0 Fiirward I	.ink				Lin .	5/18/201	3 15 30 32
Carrier Freq.	870 000	000 Hz	Input Level	-10.00 dBm 8 dB			Code Domain	medle (8
Result Code Domain Por I Code	er(MAC)	0			Branch I		Bra	nch
141	Power	-72.87 eB	٩	0.00000		-9.59 dBm	L	0
-103 -103 -150 -250					Total Pilot Power Total MAC Power Total Data Power I Avg. Active CH	4.57 dBm -11.50 dB -11.41 dB		de ber 1
Q Code (#1) 100 100 -100 -1500 -1500 -1500	e CH Power	0 41.50 #8	•	0,0000	Max, Addive CH Min, Addive CH Max, Inactive CH Q Avg, Active CH Q Max, Active CH Q Max, Active CH Q Max, Inactive CH Q Max, Inactive CH	1244 1141438 1141438		de ter Q
-2000 Modulation Analy	13	_		0				
Frequency Error p site p tea p tea p sendit EVM(ms) Origin Offset Data Modulation		-0.0 0.99 0.99 0.99 0.99	998 998 998 998 998 0.45 % 7.79 dB	Max. MAC Inactive C Power Power Power Power Power Power Power Power Power	-81.50 d 0.00000	B (Q+ 13)		
Ref.int	_	_	_	_	_		1.02	

Code Domain Power Screen: EV-DO Forward Link

All Measure Screen

Installing the MX269026A-001 All Measure Function supports highspeed batch-measurement of EV-DO Forward Link multiple Tx characteristics, such as modulation accuracy, power spectrum, etc.

A MERGER EVEC			ولد	5/18/2013 16:28:48
Carrier Freq.	870 000 000 Hs	Input Leve	-10.00 dBm	All Measure
			8 d3	Modulation Analysis Setting
Result				Setting
Modulation Analys	is & Power		Average & Max 513 / 513	
Power vs Time	AvpMaxMin			Occupied Bandwidt
Template Judge	Pass			000120
OnPower	-10.40 / -10.24	1 -10.58 dBm		Spectrum Emission Mask Setting
Modulation Analy	enin :			
		AvgMax	AvgMax	
Channel Power	10.49 /	-10.37 dBm		
Frequency Error	-0.60 1 -0.0007 1	-1.56 Hz -0.0018 ppm		
p min	0.99998 /	0.99997	Power -66.57 dB (1 - 22)/ -58.76 dB (Q - 28)	
p mac	0.99998 /	0.99997	p 0.00000 / 0.00000 Max. Data Active CH	
p tere	0.99998 /	0.99998	Max. Data Active CH Power -14.95 dB (Q- 01/ -14.06 dB (1- 4)	
p Overall?	0.99998 /	0.99998	p 0.03199 / 0.02507	
p Overall2	0.99998 /	0.99997	Min. Data Active CH	
EVM(rms)	0.45 /	0.48 %	Power -15.11 dB (1 - 0)/ -15.89 dB (Q - 2)	
Origin Offset Data Modulation	47.93 I Scheme	-66.06 dB 16QAM	p 0.03081 / 0.02679	
OBW			SFM	
OBW 1	274 414 MHz		Result Pass	SEM Result
				Detail
Reline				9

All Measure Screen: EV-DO Forward Link

• Power vs. Time Graph

The Time Domain Graph (Avg./Max./Min. level) is displayed at the top of the screen. The three screens are switched as follows:

<u>MS269x</u>A

Halfslot

Displays half slot time.

- 1st Half slot: Displays first half2nd Half slot: Displays second half
- Full slot: Displays second half
 Full slot: Displays mean of first and second half

A MERSENA						الله ا	5/18/2013	16:19:40
Carrier Freq.	870 000 000 H		el .	-10.00 dBm			Pomer vs Time	
				8 d0			Sele	et '
Result	_	_	_	_	Average & Max	513/ 513	Referen	ceLine
Power vs Time(H	CONTRACTOR OF TAXABLE						Referen	ce Line
	400.00 PNChips (325.52 µm)	Avg.	0,19		dB	Le	
1411 1000				****			0.004	(Ber
							Select	Mask
-31.00							Standard	User
-40.0								10000000
							Mark	Setur
-1000								
							Un	
							and the second second	dla
Result							<u>d0</u>	40.00
		AvgMaxMin					Display	Item
Template Judg							Average	All
ReferencePow								
MeanPower OnPower		10.25 / -10.56					Smoo File	
UTIP OWER	HUAT I	10.201 10.00	ugin				On	Off
							Filter	· · ·
							Flat	
Ref.Int							-	
No. 19			_	_			1 #2	100

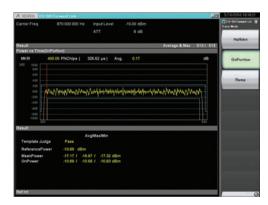
Power vs. Time Screen (Data Tx state): EV-DO Forward Link

A ME3690A	EV-DO Forward Link				10	5/18/2013 16:16:16
Carrier Freq		Input Level ATT	-10.00 dBm 8 dB			Trace Hode
Result		_	_	Average & Max	513/ 513	
Power vs Ti	me(Haffslot)		-		-	and the second second second
MKR	400.00 PNChips (325.52 µs) Av	0.17		dB	OnPortion
(#E) 1000 0.00		1				
-1000		-				
						Ramp
						-
-53.00		1				
-70.00		and the second second				
Result			_			
		AvgMaxMin				
Template	Judge Pass					
Reference	ePower -10.69 dBm					
MeanPow	ver -17.17 / -1	6.97 / -17.32 dBr				
OnPower	-10.69 / -1	0.58 / -10.83 dBr				
Refine						0

Power vs. Time Screen (Idle state): EV-DO Forward Link

OnPortion

Displays Pilot/MAC.



Power vs. Time Screen - OnPortion- (Idle state): EV-DO Forward Link

MS269xA MS2830A

MX2690xxA/MX2830xxA/MX2840xxA/MX2850xxA series Measurement Software

CDMA2000 Forward Link Measurement Software MX269024A All Measure Function MX269024A-001 EV-DO Forward Link Measurement Software MX269026A All Measure Function MX269026A-001 (Continued)

Ramp

Displays Ramp Part of Pilot/MAC.



Power vs. Time Screen - Ramp - (Idle state): EV-DO Forward Link

Specifications

The specification is the value after 30-minute warm-up at a constant ambient temperature. The specifications are defined under the following condition unless otherwise specified. Attenuator mode: Mechanical Attenuator Only (MS2830A only)

Signal Analyzer		MS269xA	MS2830A		
	Frequency Range	400 MHz to 2700 MHz	1		
	Measurement Level Range	–15 to +30 dBm (Preamp Off, or Preamp not installed) –15 to +10 dBm (Preamp On)	-15 to +30 dBm (Preamp Off, or Preamp not installed)		
Modulation/ Frequency	Carrier Frequency Measurement	At 18°C to 28°C, after calibration, EVM = 1% signal			
Measurement	Accuracy	± (Accuracy of reference frequency × Carrier frequency	+ 10) Hz		
	Residual Vector Error	At 18°C to 28°C, after calibration	I		
		<1.0% (rms)	<1.5% (rms)		
	Waveform Quality (ρ)	>0.99990	>0.99978		
Amplitude	Tx Power Measurement Accuracy (This is found from root sum of squares (RSS) of absolute amplitude	At 18°C to 28°C, after calibration, with input attenuator less than Input level ±0.6 dB (Preamp Off, or Preamp not installed)	≥10 dB and input signal in measurement level range and ±0.6 dB (Preamp Off, or Preamp not installed)		
Measurement	accuracy and in-band frequency characteristics of main frame.)	±1.1 dB (Preamp On)			
Code Domain Measurement	Power Accuracy	At 18°C to 28°C, after calibration, input signal in measurement level range and less than Input level, MAC region is average ≥ 16 ± 0.02 dB (Code Power ≥ -10 dBc) ± 0.05 dB (Code Power ≥ -20 dBc) ± 0.10 dB (Code Power ≥ -30 dBc)			
	MX269024A	Modulation Analysis • Frequency Error • RF Level • p • Vector Error (Peak/rms) • Origin Offset • TIM (Difference between "Set position of PN Offset of RF input" and "Trigger input") Code Domain Graph Target Slot, Total Active CH, Output Power, Pilot Power, Active CH Power, Inactive CH Power Advicent Chernel Lealence Devent Operating Readwidth Chernel Devent Sectors Mach			
Measurement Items	MX269026A	Adjacent Channel Leakage Power, Occupied Bandwidth, Channel Power, Spectrum Emission Mask Modulation Analysis • Frequency Error • p (pilot/MAC/Data/Overall) • Vector Error (Peak/rms) • Origin Offset • Data Modulation Scheme • Timing Error (Difference between "Set position of PN Offset of RF input" and "Trigger input") • MAC Inactive CH • Data Active CH • Data Active CH Code Domain Graph I Code/CH/Power/p, Q code/CH/Power/p, Total Pilot Power, Total MAC Power, Total Data Power, I Active CH, I Inactive CH, Q Active CH, Q Inactive CH Power vs. Time Graph Average, Maximum, Minimum Adjacent Channel Leakage Power, Occupied Bandwidth, Channel Power, Spectrum Emission Mask			

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MX2690xxA/MX2830xxA/MX2840xxA/MX2850xxA series Measurement Software

WLAN (802.11) Measurement Software MX269028A 802.11ac (80 MHz) Measurement Software MX269028A-001 802.11ac (160 MHz) Measurement Software MX269028A-002

Installing the WLAN (802.11) Measurement Software MX269028A in the MS269xA/MS2830A main frame supports modulation analysis of IEEE 802.11a/b/g/j/n/p signals with display of numerical and graphical results. The 802.11ac (80 MHz) Measurement Software MX269028A-001*1, and 802.11ac (160 MHz) Measurement Software MX269028A-002*² are MX269028A software options for modulation analysis of IEEE 802.11ac signals. Moreover, Tx tests of RF signals are supported when used in combination with MS269xA/MS2830A functions, such as adjacent channel leakage power, occupied bandwidth, spectrum emission mask, spurious, etc.

*1: Only For MS2830A. Requires MX269028A.

*2: Only For MS269xA. Requires MX269028A.

Features

- One software package supporting IEEE 802.11a/b/g/j/n/p signal (MX269028A)
- Adding optional software supports modulation analysis of IEEE 802.11ac signal (MX269028A-001/002). MX269028A-001: Supports up to 80-MHz bandwidth. (Only for MS2830A)
- MX269028A-002: Supports up to 160-MHz bandwidth. (Only for MS269xA)
- Displays numerical results and analysis graphs (for R&D, quality assurance and manufacturing)
- Catch and replay function*3 (saves*4 signals for later modulation analysis troubleshooting)
- *3: This function is not supported when the MX269028A-002 (only for MS269xA) is installed and the channel bandwidth is set to 160 MHz. *4: Data for 1 burst signal

Evaluation of Tx Characteristics for WLAN Modulation Accuracy (EVM)

The MX269028A supports WLAN modulation analysis and has an easy-to-use graph function for verification at Tx tests of WLAN equipment and parts.

Measurement Signals MX269028A

- IEEE 802.11a
- IEEE 802.11b
- IEEE 802.11g ERP-DSSS/CCK
- IEEE 802.11g ERP-OFDM
- IEEE 803.11g DSSS-OFDM
- IEEE 802.11j
- IEEE 802.11n (HT-Mixed, HT-Greenfield, Non-HT)
- IEEE 802.11p

Measures both continuous and burst signals.

MX269028A-001/002

• IEEE 802.11ac (VHT)

Measures burst signals only.

■ Supports IEEE 802.11ac signals up to 160-MHz bandwidth

The IEEE 802.11ac measurement range varies as follows, depending on the Analysis Bandwidth Extension option configuration.

Table 1. Supported measurement range for IEEE 802.11ac signals

	Model			Bandwidth of IEEE 802.11ac Signal			
Main frame	Measurement software	Analysis Bandwidth Extension Option Configuration	20 MHz	40 MHz	80 MHz	160 MHz	80 MHz + 80 MHz
		MS269xA-078*1 installed	✓	~	~	~	∕*6
MS269xA	MX269028A-002	MS269xA-077/004*2 installed	~	~			
		Standard	~	~			
		MS2830A-078* ³ installed	✓	~	✓*7		
MS2830A MX269028A-001	MS2830A-077*4 installed	~	~				
		MS2830A-005/009*5 installed	~	~			

*1: MS269xA-078 Analysis Bandwidth Extension to 125 MHz

*2: MS269xA-077 Analysis Bandwidth Extension to 62.5 MHz

MS269xA-004 Analysis Bandwidth Extension to 125 MHz

*3: MS2830A-078 Analysis Bandwidth Extension to 125 MHz

*4: MS2830A-077 Analysis Bandwidth Extension to 62.5 MHz

*5: MS2830A-005 Analysis Bandwidth Extension to 31.25 MHz

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

*6: Measurement is required for each carrier signal (80-MHz bandwidth)

*7: Measurement is only possible when the carrier signal (80-MHz bandwidth) is input due to the effect of the image response.

■ Capture & Replay Function*5

When faults are detected, this function captures*6 on-site signals to internal/external hard disk for later troubleshooting using analysis functions.

- *5: This function is not supported when the MX269028A-002 (only for MS269xA) is installed and the channel bandwidth is set to 160 MHz.
- *6: Data for 1 burst signal

MS269xA/MS2830A Main Frame Functions

The following measurements are performed by calling the main-frame spectrum analyzer functions. These functions prepare each measurement standard templates.

- Adjacent Channel Leakage Power
- Occupied Bandwidth
- Spectrum Emission Mask
- Spurious Emission

MS269xA

WLAN (802.11) Measurement Software MX269028A 802.11ac (80 MHz) Measurement Software MX269028A-001 802.11ac (160 MHz) Measurement Software MX269028A-002 (Continued)

MS269xA MS2830A

Analysis Function (Numerical Results and Graph display)

	ltem	11a/j/n/p 11g (ERP-OFDM) 11g (DSSS-OFDM)	11b 11g (ERP-DSSS/CCK)	11ac
	Numerica	l Result Display		1
	Frequency Error	✓	✓	✓
	Symbol Clock Error/Chip Clock Error	✓	✓	~
	Transmit Power	✓	✓	~
	Time Offset	√	✓	√
	EVM [rms]	✓	✓	×
	Data EVM, Pilot EVM	✓		✓
	SIG EVM (rms)	√*1		_
	L-SIG EVM (rms)	√*2		✓
	HT-SIG EVM (rms)	√*3		
	VHT-SIG-A EVM (rms), VHT-SIG-B EVM (rms)			✓ <i>✓</i>
	EVM [Peak]	✓	✓	✓
	Symbol Number, Subcarrier Number/Chip Number	√	✓	✓
	Quadrature Error	√		√*6
	IQ Gain Imbalance	√		√*6
	Center Frequency Leakage	✓		✓
odulation Analysis	Spectral Flatness (Amplitude/Phase/Group Delay)	√		✓ ✓
nction	Outside Subcarrier Amplitude Max and Min Value	√		✓ ✓
	Inside Subcarrier Amplitude Max and Min Value	√		✓ ✓
	Phase Error		✓	
	Magnitude Error		✓ <i>✓</i>	
	IQ Origin Offset		√	
	Detect Parameter	√	√	✓
	Data Rate, Modulation Method, Symbol Length/Chip Length	√*4	✓	
	Preamble	v v *5	✓ ✓	
	MCS, Stream ID, Symbol Length, Guard Interval	✓*2	• • • • • • • • • • • • • • • • • • •	 ✓
		bh Display		•
	Constellation		✓	√
	EVM vs. Subcarrier	¥	•	↓ ↓
		✓ ✓		✓ ✓
	EVM vs. Symbol/EVM vs. Chip	✓ ✓	•	✓ ✓
	Spectral Flatness (Amplitude/Phase/Group Delay)			
	Phase Error vs. Chip		✓ ✓	
	Eye diagram		•	
		l Result Display		
	Transmit Power	✓	✓ ✓	
	Power Flatness Max	✓ ✓		
	Carrier Off Power On/Off Ratio		✓ ✓	
wer vs. Time action		✓ 	✓	
iction	Peak Power Spectrum Density (PSD)	✓	✓	
	Transient time (power-on ramp, power-off ramp)		✓	
		oh Display		
	Burst	✓	✓	
	Transient	✓	✓	

*1: IEEE 802.11a

*2: IEEE 802.11n

*3: IEEE 802.11n (HT-Mixed, HT-Greenfield)

*4: Exclude IEEE 802.11n

*5: IEEE 802.11g DSSS-OFDM

*6: Exclude Channel Bandwidth 160 MHz setting

WLAN (802.11) Measurement Software MX269028A 802.11ac (80 MHz) Measurement Software MX269028A-001 802.11ac (160 MHz) Measurement Software MX269028A-002 (Continued)

MS269xA MS2830A

Common Setup Parameter

	MX269028A: IEEE 802.11a, IEEE 802.11b, IEEE 802.11g ERP-DSSS/CCK, IEEE 802.11g ERP-OFDM,
Standard	IEEE 802.11g DSSS-OFDM, IEEE 802.11j, IEEE 802.11n, IEEE 802.11p,
	MX269028A-001 or MX269028A-002: IEEE 802.11ac
Measuring Object	Burst Signal, Continuous Signals: IEEE 802.11a/b/g/j/n/p
Measuring Object	Burst Signal: IEEE 802.11ac
	MX269028A
	IEEE 802.11n: 20 MHz, 40 MHz, 40 MHz (Upper), 40 MHz (Lower)
	IEEE 802.11j/p: 5, 10, 20 MHz
Channel Bandwidth	MX269028A-001
	IEEE 802.11ac: 20, 40, 80 MHz*
	MX269028A-002
	IEEE 802.11ac: 20, 40, 80, 160 MHz*
	MX269028A
PPDU Format	IEEE 802.11n: Non-HT, HT-Mixed, HT-Greenfield
	MX269028A-001
	IEEE 802.11ac: VHT

*: Refer to [Table1: Supported measurement range for IEEE 802.11ac signals]

Specifications

The specification is the value after 30-minute warm-up at a constant ambient temperature. Typical values are for reference only and are not guaranteed. Values are guaranteed after executing CAL at 18°C to 28°C, and the measured signal is within the measurement level range and is less than or equal to Input Level.

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

Attenuator mode: Mechanical Attenuator Only (MS2830A only)

WLAN (802.11) Measurement software MX269028A

Signal Analyzer			MS269xA	MS2830A	
Standard			IEEE 802.11n HT Mixed, HT Greenfield, Non-HT, (Direct Mapping supported), MCS = 0 to 76 supported		
	Frequency Range		2.4 GHz band: 2412 MHz to 2472 MHz (channel No. 1 to 13) 2484 MHz (channel No. 14) 5 GHz band: 5180 MHz to 5320 MHz (channel No. 36 to 64) 5500 MHz to 5700 MHz (channel No. 100 to 140) 5745 MHz to 5825 MHz (channel No. 149 to 165)		
Measurement Level Range Modulation/ Frequency Measurements Carrier Frequency 20 MHz channel		Range	 2.4 GHz band: -15 to +30 dBm (MS269xA Preamp Off, or Preamp not installed) -15 to +30 dBm (MS2830A Preamp Off, or Preamp not installed, MS2830A-045 not installed) -9 to +30 dBm (MS2830A Preamp Off, or Preamp not installed, MS2830A-045 installed) -30 to +10 dBm (Preamp On) 5 GHz band: -15 to +30 dBm (MS269xA Preamp Off, or Preamp not installed) -12 to +30 dBm (MS2830A Preamp Off, or Preamp not installed) -12 to +30 dBm (MS2830A Preamp Off, or Preamp not installed) -6 to +30 dBm (MS2830A Preamp Off, or Preamp not installed, MS2830A-045 installed) -30 to +10 dBm (Preamp On) 		
			Burst length \geq 250 µs ± (Accuracy of reference frequency × Carrier frequency + 13) Hz (2.4 GHz band) ± (Accuracy of reference frequency × Carrier frequency + 16) Hz (5 GHz band)		
	Accuracy		Burst length >250 μs ± (Accuracy of reference frequency × Carrier frequency + 62) Hz (2.4 GHz band) ± (Accuracy of reference frequency × Carrier frequency + 102) Hz (5 GHz band)		
		20 MHz Channel Estimation: SEQ, Phase Tracking: On, Amplitude Tracking: Off, Burst signal			
	Residual Vector	channel	≤1.2% (rms) (2.4 GHz band) ≤1.6% (rms) (5 GHz band)	≤1.2% (rms) (2.4 GHz band) (Preamp Off) ≤1.6% (rms) (5 GHz band) (Preamp Off)	
	Error	40 1411-	Channel Estimation: SEQ, Phase Tracking: On, Amplit	ude Tracking: Off, Burst signal	
		40 MHz channel	≤1.5% (rms) (2.4 GHz band) ≤1.9% (rms) (5 GHz band)	≤1.6% (rms) (2.4 GHz band) (Preamp Off) ≤2.0% (rms) (5 GHz band) (Preamp Off)	
	Center Frequency Le	akage Floor	≤-50 dBc (nom.)		
			Input attenuator ≥10 dB		
Amplitude Measurement Amplitude Measurement Amplitude Measurement Amplitude	(This is found from root sum of squares (RSS) of absolute	20 MHz channel	2.4 GHz band: ±0.6 dB (Preamp Off, or Preamp not installed) ±1.1 dB (Preamp On) 5 GHz band: ±0.6 dB (Preamp Off, or Preamp not installed) ±1.1 dB (Preamp On)	 2.4 GHz band: ±0.6 dB (Preamp Off, or Preamp not installed) 5 GHz band: ±1.9 dB (Preamp Off, or Preamp not installed) 	
		Input attenuator ≥10 dB			
	frequency characteristics of	40 MHz channel	2.4 GHz band: ±0.7 dB (Preamp Off, or Preamp not installed) ±1.1 dB (Preamp On) 5 GHz band:	2.4 GHz band: ±0.8 dB (Preamp Off, or Preamp not installed) 5 GHz band:	
			±0.7 dB (Preamp Off, or Preamp not installed) ±1.1 dB (Preamp On)	±2.0 dB (Preamp Off, or Preamp not installed)	

WLAN (802.11) Measurement Software MX269028A 802.11ac (80 MHz) Measurement Software MX269028A-001 802.11ac (160 MHz) Measurement Software MX269028A-002 (Continued)

MS269xA MS2830A

Signal Analyzer		MS269xA	MS2830A	
Standard		IEEE 802.11p		
	Frequency Range	5835 MHz to 5925 MHz (channel No. 167 to 185) 300 MHz to 862 MHz		
Modulation/ Frequency Measurements	Measurement Level Range	5835 MHz to 5925 MHz (Channel No. 167 to 185): -15 to +30 dBm (MS269xA Preamp Off, or Preamp no -12 to +30 dBm (MS2830A Preamp Off, or Preamp no -6 to +30 dBm (MS2830A Preamp Off, or Preamp no -30 to +10 dBm (Preamp On) 300 MHz to 862 MHz: -15 to +30 dBm (MS269xA Preamp Off, or Preamp no -15 to +30 dBm (MS2830A Preamp Off, or Preamp no -9 to +30 dBm (MS2830A Preamp Off, or Preamp no -9 to +10 dBm (Preamp On)	ot installed, MS2830A-045 not installed) installed, MS2830A-045 installed) ot installed) ot installed, MS2830A-045 not installed)	
	Carrier Frequency Accuracy	5 MHz channel: Burst length \geq 1 ms, 10 MHz channel: Bu 20 MHz channel: Burst length \geq 250 µs \pm (Accuracy of reference frequency × Carrier frequency		
Modulation/ Frequency Measurements	Residual Vector Error	Channel Estimation: SEQ, Phase Tracking: On, Amplitude 5835 MHz to 5925 MHz (channel No. 167 to 185): ≤1.5% (rms) 300 MHz to 862 MHz: ≤0.5% (rms)		
	Center Frequency Leakage Floor	≤–50 dBc (nom.)		
Amplitude Measurement	Tx Power Accuracy (This is found from root sum of squares (RSS) of absolute amplitude accuracy and in-band frequency characteristics of main frame.)	Input attenuator $\ge 10 \text{ dB}$ ±0.6 dB (Preamp Off, or Preamp not installed) ±1.1 dB (Preamp On)	5835 MHz to 5925 MHz (Channel No.: 167 to 185) ± 1.9 dB (at Preamp Off, or Preamp not installed.) 300 MHz to 862 MHz ±0.7 dB (Preamp Off, or Preamp not installed)	
Standard		IEEE 802.11a		
	Frequency Range	5180 MHz to 5320 MHz (channel No. 36 to 64) 5500 MHz to 5700 MHz (channel No. 100 to 140) 5745 MHz to 5825 MHz (channel No. 149 to 165)		
Modulation/ Frequency	Measurement Level Range	 -15 th +30 dBm (MS269xA Preamp Off, or Preamp not installed) -12 to +30 dBm (MS2830A Preamp Off, or Preamp not installed, MS2830A-045 not installed) -6 to +30 dBm (MS2830A Preamp Off, or Preamp not installed, MS2830A-045 installed) -30 to +10 dBm (Preamp On) 		
Measurements	Carrier Frequency Accuracy	Burst length \geq 250 µs \pm (Accuracy of reference frequency × Carrier frequency		
	Residual Vector Error	Channel Estimation: SEQ, Phase Tracking: On, Amplitude ≤1.5% (rms)	e Tracking: Off, Burst signal ≤1.6% (rms) (Preamp Off)	
	Center Frequency Leakage Floor	≤–50 dBc (nom.)		
Amplitude Measurement	Tx Power Accuracy (This is found from root sum of squares (RSS) of absolute amplitude accuracy and in-band frequency characteristics of main frame.)	Input attenuator \geq 10 dB ±0.6 dB (Preamp Off, or Preamp not installed) ±1.1 dB (Preamp On)	±1.9 dB (Preamp Off, or Preamp not installed)	
Standard	endracteristics of main name.)	IEEE 802.11b, IEEE 802.11g ERP-DSSS/CCK		
	Frequency Range	2412 MHz to 2472 MHz (channel No.1 to 13) 2484 MHz (channel No.14)		
Modulation/ Frequency	Measurement Level Range	 -15 to +30 dBm (MS269xA Preamp Off, or Preamp not i -15 to +30 dBm (MS2830A Preamp Off, or Preamp not i -9 to +30 dBm (MS2830A Preamp Off, or Preamp not in -30 dBm to +10 dBm (at Preamp On) 	installed, MS2830A-045 not installed)	
Measurements	Carrier Frequency Accuracy	Burst length \geq 400 µs ± (Accuracy of reference frequency × Carrier frequency		
	Residual Vector Error	Specify filter with same characteristics as used for measu ≤1.2% (rms)	urement signal, Burst signal ≤1.9% (rms) (Preamp Off)	
	Center Frequency Leakage Floor	≤–50 dBc (nom.)		
Amplitude Measurement	Tx Power Accuracy (This is found from root sum of squares (RSS) of absolute amplitude accuracy and in-band frequency characteristics of main frame.)	Input attenuator \geq 10 dB ±0.6 dB (Preamp Off, or Preamp not installed) ±1.1 dB (Preamp On)	±0.6 dB (Preamp Off, or Preamp not installed)	
Standard		IEEE 802.11g ERP-OFDM	1	
	Frequency Range	2412 MHz to 2472 MHz (channel No.1 to 13) 2484 MHz (channel No.14)		
Modulation/ Frequency	Measurement Level Range	 -15 to +30 dBm (MS269xA Preamp Off, or Preamp not i -15 to +30 dBm (MS2830A Preamp Off, or Preamp not i -9 to +30 dBm (MS2830A Preamp Off, or Preamp not in -30 to +10 dBm (Preamp On) 	installed, MS2830A-045 not installed)	
Measurements	Carrier Frequency Accuracy	Burst length \geq 250 µs ± (Accuracy of reference frequency × Carrier frequency		
	Residual Vector Error	Channel Estimation: SEQ, Phase Tracking: On, Amplitude ≤1.2% (rms)	e Tracking: Off, Burst signals ≤1.2% (rms) (Preamp Off)	
	Center Frequency Leakage Floor	≤–50 dBc (nom.)		
Amplitude Measurement	Tx Power Accuracy (This is found from root sum of squares (RSS) of absolute amplitude accuracy and in-band frequency characteristics of main frame.)	Input attenuator $\geq 10 \text{ dB}$ ±0.6 dB (Preamp Off, or Preamp not installed) ±1.1 dB (Preamp On)	±0.6 dB (Preamp Off, or Preamp not installed)	

WLAN (802.11) Measurement Software MX269028A 802.11ac (80 MHz) Measurement Software MX269028A-001 802.11ac (160 MHz) Measurement Software MX269028A-002 (Continued)

MS269xA MS2830A

Signal Analyzer		MS269xA	MS2830A	
Standard		IEEE 802.11j		
	Frequency Range	4920 MHz to 4980 MHz		
Modulation/ Measurement Level Range		 -15 to +30 dBm (MS269xA Preamp Off, or Preamp not installed) -12 to +30 dBm (MS2830A Preamp Off, or Preamp not installed, MS2830A-045 not installed) -6 to +30 dBm (MS2830A Preamp Off, or Preamp not installed, MS2830A-045 installed) -30 to +10 dBm (Preamp On) 		
Measurements Carrier Frequency Accuracy		Burst length ≥1 ms (Channel Bandwidth: 5 MHz), or Burst length ≥500 μ s (Channel Bandwidth: 10 MHz), Burst length ≥250 μ s (Channel Bandwidth: 20 MHz) ± (Accuracy of reference frequency × Carrier frequency + 16) Hz		
Modulation/	Desident Masters France	Channel Estimation: SEQ, Phase Tracking: On, Amplitude Tracking: Off, Burst signal		
Frequency	Residual Vector Error	≤1.5% (rms)	≤1.6% (rms) (Preamp Off)	
Measurements	Center Frequency Leakage Floor	≤–50 dBc (nom.)		
	Tx Power Accuracy	Input attenuator ≥10 dB		
Amplitude Measurement	(This is found from root sum of squares (RSS) of absolute amplitude accuracy and in-band frequency characteristics of main frame.)	±0.6 dB (Preamp Off, or Preamp not installed) ±1.1 dB (Preamp On)	±1.9 dB (Preamp Off, or Preamp not installed)	

802.11ac (80 MHz) Measurement software MX269028A-001 (MS2830A Option) 802.11ac (160 MHz) Measurement software MX269028A-002 (MS269xA Option)

Signal Analyzer			MS269xA	MS2830A		
Standard			IEEE 802.11ac			
	Frequency Measuren	nents	20 MHz Channel/40 MHz Channel 5180 MHz to 5320 MHz (channel No. 36 to 64) 5500 MHz to 5700 MHz (channel No. 100 to 140) 5745 MHz to 5825 MHz (channel No. 149 to 165) 80 MHz Channel/160 MHz Channel 5180 MHz to 5825 MHz (channel No. 36 to 165)			
	Measurement Level Range		20 MHz Channel/40 MHz Channel -15 to +30 dBm (MS269xA Preamp Off, or Preamp not -15 to +30 dBm (MS2830A Preamp Off, or Preamp not -9 to +30 dBm (MS2830A Preamp Off, or Preamp not -30 to +10 dBm (Preamp On) 80 MHz Channel/160 MHz Channel -10 to +30 dBm (MS269xA Preamp Off, or Preamp not -10 to +30 dBm (MS2830A Preamp Off, or Preamp not -4 to +30 dBm (MS2830A Preamp Off, or Preamp not -20 to +10 dBm (Preamp On)	t installed, MS2830A-045 not installed) installed, MS2830A-045 installed t installed) t installed, MS2830A-045 not installed)		
		20 MHz channel	Burst length \geq 250 µs ± (Accuracy of reference frequency × Carrier frequency + 16) Hz			
Modulation/	Carrier Frequency	40 MHz channel	Burst length \geq 250 µs ± (Accuracy of reference frequency × Carrier frequency	+ 102) Hz		
Frequency Measurements	, i i	Accuracy	80 MHz channel	Burst length $\ge 250 \ \mu s$ ± (Accuracy of reference frequency × Carrier frequency	+ 102) Hz	
	160 MHz channel	Burst length \geq 250 µs ± (Accuracy of reference frequency × Carrier frequency + 102) Hz	_			
			Channel Estimation: SEQ, Phase Tracking: On, Amplitude	Tracking: Off, Burst signal		
		20 MHz channel	\leq 0.7% (rms) (Preamp Off) \leq 0.9% (rms) (Preamp On)	≤0.9% (rms) (Preamp Off)		
			Channel Estimation: SEQ, Phase Tracking: On, Amplitude	Tracking: Off, Burst signal		
		40 MHz channel	≤0.8% (rms) (Preamp Off) ≤1.0% (rms) (Preamp On)	≤1.0% (rms) (Preamp Off)		
	Residual Vector Error		Channel Estimation: SEQ, Phase Tracking: On, Amplitude	Tracking: Off, Burst signal		
		80 MHz channel	≤0.9% (rms) (Preamp Off) ≤1.1% (rms) (Preamp On)	≤1.1% (rms) (Preamp Off)		
		160 MHz channel	Channel Estimation: SEQ, Phase Tracking: On, Amplitude Tracking: Off, Burst signal ≤1.5% (rms) (Preamp Off) ≤1.7% (rms) (Preamp On)	_		
	Center Frequency Lea	akage Floor	≤–50 dBc (nom.)			
		20 MHz	Input attenuator ≥10 dB	······		
	Tx Power Accuracy	channel	±0.6 dB (Preamp Off, or Preamp not installed) ±1.1 dB (Preamp On)	±1.9 dB (Preamp Off, or Preamp not installed)		
	(This is found from root sum of squares	40 MHz	Input attenuator ≥10 dB			
Amplitude	(RSS) of absolute amplitude accuracy	channel	±0.7 dB (Preamp Off, or Preamp not installed) ±1.1 dB (Preamp On)	±2.0 dB (Preamp Off, or Preamp not installed)		
Measurement	and in-band	80 MHz	Input attenuator ≥10 dB			
	frequency characteristics of	channel	±1.2 dB (Preamp Off, or Preamp not installed) ±1.6 dB (Preamp On)	±3.2 dB (Preamp Off, or Preamp not installed)		
	main frame.)	160 MHz channel	Input attenuator ≥10 dB ±1.3 dB (Preamp Off, or Preamp not installed) ±1.7 dB (Preamp On)	_		

WLAN (802.11) Measurement Software MX269028A 802.11ac (80 MHz) Measurement Software MX269028A-001 802.11ac (160 MHz) Measurement Software MX269028A-002 (Continued)

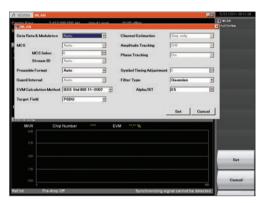
MS269xA MS2830A

Measurement Functions

Parameter Setting

Standard-compliant parameters as well as frequency/level are set at the following screen.

Parameters other than numerical values are set easily by selecting pulldown menus.



Modulation Analysis Function

• Summary

This displays detected parameters as well as numerical results. The dispersion of RF characteristics is measured easily using simultaneous display of maximum and average values.

MX269028A (IEEE 802.11a, 11b, 11g, 11j, 11n, 11p)

MS2830A WLA							Lin		
rrier Freq.	2 412 000 000		put Level		00 dBm			Trace Made	
andard	IEEE802								
indwidth.	205	1Hz				Measurement Mode	Single	EVM vs Subcarrie	
HUR						Average & Max	10/10		
			Av	Max					
Frequency	Error	0.49 /		88 Hz				EVM vs Symbol	
		0.000 /		01 ppm				L'in is officer	
Symbol Clo	k Error	-0.008 /		61 ppm					
Transmit Po	wer	-10.74 /		71 dBm				an and	
								SpectralFlateer	
many	_					_	_		
EVM(rms)		0,4		4 55	Dete	ct Parameter		Summary	
Data EV	M	0.5		5 %		MCS Index		_	
Pilot EV	M	0.4	0.5	\$ %		Stream ID			
EVM(Peak)		2.3	41 2.9	¢ %		Length			
Symbol	Number			4			Long		
Subcarr	ier Number								
Quadrature	Entor	0.0	01 0.2	0 deg.					
iQ Gain Imb	alance	0.0	0.0 1.0	0 48					
Center Fre	quency Leakage	-67.5	1/ -57.0	17 dB					

- Frequency Error
- Symbol Clock Error/Chip Clock Error
- Transmit Power
- EVM [rms]
- (Data EVM, Pilot EVM, SIG EVM (rms), L-SIG EVM (rms), HT-SIG EVM (rms))
- EVM [Peak]
- (Symbol Number, Subcarrier Number/Chip Number)
- Quadrature Error
- IQ Gain Imbalance
- Center Frequency Leakage
 Phase Error
- Pliase Ell'Ol
- Magnitude Error
- IQ Origin Offset
- Detect Parameter

(Data Rate, Modulation Method, Symbol Length/Chip Length, Preamble, MCS Index, Stream ID, Symbol Length, GI)

MX269028A-001/002 (IEEE 802.11ac)



- Frequency Error
- Symbol Clock Error
- Transmit Power
- EVM [rms] (Data EVM, Pilot EVM, L-SIG EVM (rms), VHT-SIG-A EVM (rms), VHT-SIG-B EVM (rms))
- EVM [Peak] (Symbol Number, Subcarrier Number)
- Quadrature Error*
- IQ Gain Imbalance*
- Center Frequency Leakage
- Detect Parameter
- (MCS Index, Stream ID, Symbol Length, GI)
- *: Exclude Channel Bandwidth 160 MHz setting

Constellation/Numerical Result

The Constellation/numerical value results are displayed at the top of the screen. The Constellation screen displays IQ coordinates and subcarrier information for the position selected by the marker. The dispersion of characteristics is measured easily using simultaneous display of maximum and average values.

MX269028A (IEEE 802.11a, 11b, 11g, 11j, 11n, 11p)



Measurement signal:

- IEEE 802.11a, 11g (ERP-OFDM, DSSS-OFDM), 11j, 11n, 11p
- Frequency Error
- Symbol Clock Error
- Transmit Power
- EVM [rms/peak]
- Center Frequency Leakage

WLAN (802.11) Measurement Software MX269028A 802.11ac (80 MHz) Measurement Software MX269028A-001 802.11ac (160 MHz) Measurement Software MX269028A-002 (Continued)

MS269xA	MS2830A
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Measurement signal: IEEE 802.11b, 11g (ERP-DSSS/CCK)

- Frequency Error
- Chip Clock Error
- Transmit Power
- EVM [rms/peak]
- IQ Origin Offset

MX269028A-001/002 (IEEE 802.11ac)



Measurement Signal: IEEE 802.11ac

- Frequency Error
- Symbol Clock Error
- Transmit Power
- EVM (rms/Peak)
- Center Frequency Leakage

• EVM vs. Subcarrier

This displays the EVM vs. Subcarrier graphs (horizontal axis: Subcarrier, vertical axis: EVM) at the bottom of the screen. The EVM calculation method can be selected from:

Averaged: Mean value of all analysis symbols Each: Symbol value selected by the marker

It is useful for checking in-band interference signals.

EVM 1	vs Subcar	rrier						
		e /Max) Subcarrier	17	(5.3126MHz) EVM	0.90 % /	2.49 %	Symbol Number	100
	125							
	0.00							

• EVM vs. Symbol

This displays the EVM vs. Symbol graphs (horizontal axis: Symbol, vertical axis: EVM) at the bottom of the screen.

It is useful for checking characteristics in the time direction and faults at a specific symbol.

vs Symbol				
MKR(AveJMax) Symbol		EVM	0.70 % /	1.34 %
125	A a-			
DOD			25-V.M	Krunnan

• EVM vs. Chip

This displays the EVM vs. Chip graphs (horizontal axis: Chip, vertical axis: EVM) at the bottom of the screen.

It is useful for checking characteristics in the time direction and faults at a specific chip.

MKR(AveJMax) Chip Number	6168	EVM	1.13 % /	3.69 %	
	RETRA	Una lski	iili, b.	in ar	White Int
15 March Back line	1.1.1.1.1.1	1.11			THE LEAD

• Phase Error vs. Chip

This displays the Phase Error vs. Chip graphs (horizontal axis: Chip, vertical axis: Phase Error) at the bottom of the screen.

It is useful for checking a phase change in time direction.

MKR	Chip Number	3698	Phase Error		4
10.00	Chip Number	3098	Phase Error	1.02	aeg.
				-	۲.۵۰۰٬۰۰۰٬۰۰۰٬۰۰۰٬۰۰۰٬۰۰۰٬۰۰۰٬۰۰۰

WLAN (802.11) Measurement Software MX269028A 802.11ac (80 MHz) Measurement Software MX269028A-001 802.11ac (160 MHz) Measurement Software MX269028A-002 (Continued)

Spectral Flatness

A graph of Amplitude vs. Subcarrier (horizontal axis: Subcarrier, vertical axis: Amplitude), Phase vs. Subcarrier (horizontal axis: Subcarrier, vertical axis: Phase) and Group Delay vs. Subcarrier (horizontal axis: Subcarrier, vertical axis: Group Delay) can be selected.

It is useful for checking frequency response (Amplitude, Phase, Group Delay).

KR	Subcarrier		(-6.87	5MHz)	Amplitude	0.04 d	в	
latne	ess(Outside)	Max:	0.04 dB	(Sub -22)	Min	-0.05 dB	(Sub:26)
	ess(inside)	Max:	0.02 dB	(Sub:-7)		Min	-0.03 dB	(Sub:-12)
0.50								
000								
0.50								
-	asse Phase a	us Subo	arrieri			_	_	
_	ness(Phase Subcarrie			5MHz)	Phase	-0.12	ea	-
KR	ness(Phase Subcarrier			5MHz)	Phase	-0.12	ieg.	_
KR				5MHz)	Phase	-0.12 c	leg.	
Flatr KR 0.00				5MHz)	Phase	-0.12	ieg.	

MKR	Subcarrier	-23	(-7.1875MHz)Group Delay	0,38	ns

• Eye Diagram

This displays the I/Q vs. Chip graphs (horizontal axis: Chip, vertical axis: I/Q) at the bottom of the screen.



Power vs. Time Function*

Numerical Results

*: Supports IEEE 802.11a/b/g/j/n/p

MS269xA

The numerical results are displayed at the top of the screen.

- Transmit PowerPower Flatness Max
- Convious Off Document
- Carrier Off Power • On/Off Ratio
- On/Off Ra
- Peak PSD
- Transient Time Power-on Ramp
 - Power-off Ramp

The dispersion of characteristics is measured easily using simultaneous display of maximum and average values.

A MERINA WEAR	1 C				1.10	5/01/2011 08:36:34
Carrier Freq.	2 412 000 000 Hz	Input Level	-10.00 dBm			El WLAN (B
Standard	IEEE002.11b					
				Measurement Mode	Single	Analysis Time
Result				Average & Max	10/10	
					wg/Max	Standard
Transmit Power		-11.63 dBm	Transient Time			IEEEB02 11b
Power Flatness	Max -10.04 /	-10.02 dBm	Power-on Ra	mp 0.93 /	1.00 µs	11111002-110
Carrier Off Pow	er -64.95 /	-64.66 dBm	Power-down	Ramp 0.85 /	0.90 µs	Measuring Object
On/Off Ratio		53.90 dB				Burst Cost
Peak PSD	-20.32 /	-20.32 dBm/MH				
						Channel Bandwidth
Power vs Time - B						20844
MKR	0.0 µs	-13.22 di	3.00			
						PPOU Format
-11.64						HT-Mont
-77.64						Signal Setup
						- and the second second
					-	
	ve Amp Off	_	_			102 830

• Burst

This displays the Power vs. Time graph (horizontal axis: Time, vertical axis: Power) for one burst waveform at the bottom of the screen.

MKR	0.0 µs	-13.22 dBm	
-1164			
-31.64			
-\$1.64			
-71.64			
-91.64			959.3

Transient

This zoom-displays the rising and falling edges of a burst waveform (horizontal axis: Time, vertical axis: Power) at the bottom of the screen. Displayed time scale is adjustable.

It is useful for checking power-on ramp and power-down ramp of burst signal.

MKR	-4.0 µs	-61.67 dBm	
-01.64			

WLAN (802.11) Measurement Software MX269028A 802.11ac (80 MHz) Measurement Software MX269028A-001 802.11ac (160 MHz) Measurement Software MX269028A-002 (Continued)

MS269xA MS2830A

Powerful Capture & Replay Function for Fault Analysis*1

When faults are detected on-site, this function captures^{*2} and saves^{*2} signals to a file for later replay by the WLAN Measurement Software to troubleshoot items, such as EVM measurements.

*1: This function is not supported when the MX269028A-002 (only for MS269xA) is installed and the channel bandwidth is set to 160 MHz.

*2: Data for 1 burst signal



Example of R&D use

- Save data for comparing each DUT test version
- \rightarrow Supports comparison of retrofitting improvement effects

Example of production line use

- Save delivery inspection data
- → Supports rechecking of performance data for troubleshooting postdelivery faults

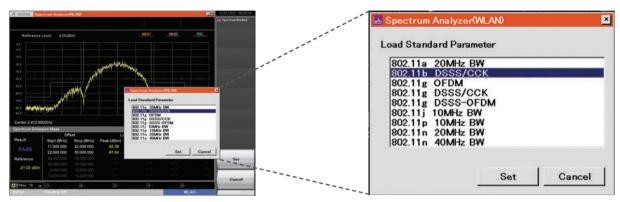
WLAN (802.11) Measurement Software MX269028A 802.11ac (80 MHz) Measurement Software MX269028A-001 802.11ac (160 MHz) Measurement Software MX269028A-002 (Continued)

MS269xA/MS2830A Main Frame Measurement Functions

The following measurements are performed by calling the main-frame spectrum analyzer functions. These functions prepare each measurement standard templates.

• Adjacent Channel Leakage Power (ACP)

- Occupied Bandwidth (OBW)
- Spectrum Emission Mask (SEM)
- Spurious Emission



ex.) Template of Spectrum Emission Mask (SEM)

Each Measurement Standard Templates

Standard	Bandwidth		Supported	l Template	
Standard	Bandwidth	ACP	OBW	SEM	Spurious
IEEE 802.11n	20 MHz	✓ TELEC T403	✓ TELEC T403 ✓ ETSI	✓ IEEE ✓ ETSI	 ✓ TELEC T403 ✓ ETSI ✓ FCC
IEEE OUZ. I III	40 MHz	✓ TELEC T403	✓ TELEC T403 ✓ ETSI	✓ IEEE ✓ ETSI	 ✓ TELEC T403 ✓ ETSI ✓ FCC
	5 MHz	_	✓ ETSI	✓ ETSI	 ✓ TELEC T405 ✓ ETSI ✓ FCC
IEEE 802.11p	10 MHz	_	✓ ETSI	✓ ETSI	 ✓ TELEC T405 ✓ ETSI ✓ FCC
2	20 MHz	✓ TELEC T403	✓ TELEC T403 ✓ ETSI	✓ ETSI	 ✓ TELEC T403 ✓ ETSI ✓ FCC
IEEE 802.11a	_	✓ TELEC T403	✓ TELEC T403 ✓ ETSI	✓ IEEE ✓ ETSI	 ✓ TELEC T403 ✓ ETSI ✓ FCC
IEEE 802.11b	-	_	✓ TELEC T401	✓ IEEE	✓ TELEC T401 ✓ ETSI
IEEE 802.11g ERP-DSSS/CCK	_	—	✓ TELEC T401	✓ IEEE	✓ TELEC T401 ✓ ETSI
IEEE 802.11g ERP-OFDM	_	—	✓ TELEC T401✓ ETSI	✓ IEEE ✓ ETSI	✓ TELEC T401 ✓ ETSI
IEEE 802.11g DSSS-OFDM	_	_	✓ TELEC T401✓ ETSI	✓ IEEE ✓ ETSI	✓ TELEC T401 ✓ ETSI
	5 MHz	_	✓ ETSI	✓ ETSI	✓ TELEC T405
IEEE 802.11j	10 MHz	_	✓ ETSI	✓ IEEE ✓ ETSI	✓ TELEC T405
-	20 MHz	✓ TELEC T403	✓ TELEC T403✓ ETSI	✓ IEEE ✓ ETSI	✓ TELEC T403
	20 MHz	_	✓ ETSI	✓ IEEE ✓ ETSI	-
IEEE 802.11ac	40 MHz	—	✓ ETSI	✓ IEEE ✓ ETSI	-
	80 MHz	—	✓ ETSI	✓ IEEE	—
	160 MHz	_	✓ ETSI	✓ IEEE	_

W-CDMA BS Measurement Software MX269030A

The W-CDMA BS Measurement Software MX269030A is targeted at manufacturing of W-CDMA/HSPA base stations, repeaters, and power amplifiers. It supports measurement of the RF Tx characteristics of high-speed W-CDMA/HSPA downlink signals. Installation in the MS269xA or MS2830A supports fast, high-accuracy measurements to cut tact times.

Functions Supporting Manufacturing of W-CDMA/HSPA Base Stations

Supports fast, high-accuracy modulation analyses and spectrum measurements for manufacturing W-CDMA/HSPA base stations, repeaters, and power amplifiers.

Modulation Analysis

- Mean Power
- CPICH Power
- Carrier Frequency Error
- Vector Error (EVM) [Peak/rms]
- Peak Code Domain Error (PCDE)
- IQ Origin Offset
- Relative Code Domain Error (RCDE)
- Scrambling Code
- PCDE CH/SF/Slot
- Constellation (all codes)
- Code Domain Graph

Specifications

The specification is the value after 30-minute warm-up at a constant ambient temperature. The specifications are defined under the following condition unless otherwise specified. Attenuator mode: Mechanical Attenuator Only (MS2830A only)

Signal Analyzer		MS269xA	MS2830A			
	Target Signal	W-CDMA/HSPA Downlink				
Common Specifications	Frequency Range	400 MHz to 3 GHz				
specifications	Input Level Setting Range	–24 to +30 dBm (Preamp Off, or Preamp not installed)				
Carrier Frequency Measurement		Input level range: Input Level to Input Level –10 dB (Inpu EVM = 1%	tt Level ≥–4 dBm), for 1 wave multiplexed signals with			
	Accuracy	± (Accuracy of reference frequency × Carrier frequency + 4) Hz	± (Accuracy of reference frequency × Carrier frequency + 6) Hz			
	Residual Vector Error	Input level range: Input Level to Input Level –10 dB (Input conforming to 3GPP TS 25.141 TestModel1	It Level ≥–4 dBm), for 64DPCH multiplexed signals			
		≤1.0% (rms)	≤1.3% (rms)			
Modulation/ Frequency	Code Domain Power Relative	Input level range: Input Level to Input Level –10 dB (Input Level \geq –4 dBm), for signals conforming to 3GPP TS 25.141 TestModel2				
Measurement Value Accuracy	± 0.02 dB (Code Domain Power ≥-10 dBc) ± 0.10 dB (Code Domain Power ≥-30 dBc)	± 0.02 dB (Code Domain Power ≥–10 dBc) ± 0.15 dB (Code Domain Power ≥–30 dBc)				
	Residual Code Domain Error	Input level range: Input Level to Input Level –10 dB (Input Level ≥–4 dBm), for signals conforming to 3GPP TS 25.141 TestModel3				
		≤–50 dB	≤–47 dB			
	Code Domain Error Accuracy	Input level range: Input Level to Input Level –10 dB (Input Level \geq –4 dBm), for signals conforming to 3GPP TS 25.141 TestModel3, with code domain error of –40 dBc				
		±0.75 dB	±0.79 dB			
Amplitude Measurement	Tx Power Measurement Accuracy (This is found from root sum of squares (RSS) of absolute amplitude accuracy and in-band frequency characteristics of main frame.)	At 18°C to 28°C, after calibration, for signals with the inp (Input Level \geq -4 dBm) ±0.6 dB	ut level range of Input Level to Input Level –10 dB			
	Occupied Bandwidth Measurement	Attained with 99% method on spectrum waveforms atta	ined by FFT calculation.			
	Adjacent Channel Leakage Power	Performs RRC filter processing ($\alpha = 0.22$) on spectrum w 18°C to 28°C, for single carrier, Input Level ≥ -4 dBm	aveforms attained by FFT calculation.			
Spectrum Measurement	Measurement	–65 dB (5 MHz offset) –66 dB (10 MHz offset)	–64 dB (5 MHz offset, nom.) –65 dB (10 MHz offset, nom.)			
	Spectrum Emission Mask	18°C to 28°C, for single carrier, Input Level ≥–4 dBm				
	Measurement	–78 dB/30 kHz (≥2.515 MHz offset)	–77 dB/30 kHz (≥2.515 MHz offset, nom.)			

Spectrum

- Occupied Bandwidth (OBW)
- Adjacent Channel Leakage Power (ACLR)

MS269xA

Spectrum Emission Mask (SEM)

W-CDMA BS Measurement Software MX269030A (Continued)

Measurement Functions

Batch Modulation Analysis and Spectrum Measurements

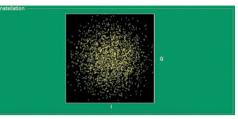
Measures all modulation analysis items (Mean Power, Carrier Frequency Error/EVM/PCDE, etc.), and spectrum measurements (ACLR/OBW/SEM) in about 100 ms to cut tact times.



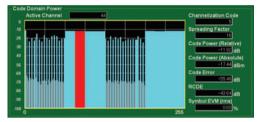
	15 Measuremen				ain.	7/13/2012 23 49:40
easure End	_	_			98	W-COMAIE: Means Meanure
Spectrum Emission	n Mask				-	Modulation Analysis
Measure Count		Pass				Result
-12.500MHzt	o & 000MHz	-7834	-72.88			
-8.000MHz t	o -4.000MHz	-1115	-71.10			
4.000MHz t	o 3 515MHz	-07.82	-82.36			
3.515MHz1	0-2.715MHz	-9028	-84.82			
2.715MHz1	o 2.515MHz	-15.84	-9038			
2.515MHz	to 2.715MHz	-0.54	-81.08			Occupied Bandwidt
2,715564	to 3.515MHz	-89.11	-8165			Result
3.515MHz	to 4.000MHz	-67.22	-81.95			-
4.000MHz	to E.000MHz	-75.23	-7027			Spectrum Emission
B.000MHz to	12.500MHz	-2642	-7036			Mask Result
Adjacent Channel L	eskade nower	Ratio				Adjacent Channel
Measure Count		Average	Minimum	Maximum		Ratio Result
	-10MHz	-0.02	-07.72	-0.0	8	- national and a
	6MHz 📃	-01.09	-94.09	-0100	8	
	SMHz 💻	-0.10	-65.10		a	
	10MHz	-0.55	-14.55	-0152	8	

• Convenient Graph Display

Supports convenient graph function for checking signals to troubleshoot unexpected problems on production lines, etc., as quickly as possible.



Constellation (all codes)



Code Domain Display

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

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

Single Carrier Measurement

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

Multicarrier Measurement

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

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

Numeric Results

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

Graph Displays

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

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

MS2850A

	Signal Analyzer	MS2850A				
Option		Pre-Standard CP-OFDM Downlink MX285051A-001	Pre-Standard CP-OFDM Uplink MX285051A-051			
	Target Signals	TS V5G.211 compliant downlink signal	TS V5G.211 compliant uplink signal			
Electrical Characteristics	Channel Bandwidth	MS2850A-032 installed: Max. 100 MHz × 2 carriers MS2850A-033 installed: Max. 100 MHz × 5 carriers MS2850A-034 installed: Max. 100 MHz × 8 carriers				
Characteristics	Capture Time	1 Frame				
	Frequency Setting Range	MS2850A-047: 800 MHz to 32 GHz MS2850A-046: 800 MHz to 44.5 GHz				
	Measurement Level Range	-15 to +30 dBm (Preamp Off, or Preamp not installed) -30 to +10 dBm (Preamp On)				
Modulation/ Frequency Measurement	Carrier Frequency Measurement Accuracy	At 18°C to 28°C, After calibration, EVM = 2% signal 50 subframes at downlink signal Only 1 carrier of 100 MHz width at center frequency \pm (Accuracy of reference frequency × carrier frequency + 10) Hz (nom.)	At 18°C to 28°C, After calibration, EVM = 2% signal 50 subframes at uplink signal Only 1 carrier of 100 MHz width at center frequency \pm (Accuracy of reference frequency × carrier frequency + 10) Hz (nom.)			
	Residual Vector Error	At 18°C to 28°C, After calibration 50 subframes at downlink signal Only 1 carrier of 100 MHz width at center frequency <2.0% (nom.)	At 18°C to 28°C, After calibration 50 subframes at uplink signal Only 1 carrier of 100 MHz width at center frequency <2.0% (nom.)			
	Measurement Level Range	-15 to +30 dBm (Preamp Off, or Preamp not installed) -30 to +10 dBm (Preamp On)				
Amplitude Measurement	Tx Power Measurement Accuracy (This is found from root sum of squares (RSS) of absolute amplitude accuracy and in-band frequency characteristics of main frame.)	At 18°C to 28°C, After calibration, Input attenuator ≥10 Input signal within measurement level range and below Only 1 carrier of 100 MHz width at center frequency ±2.54 dB (nom.) (Preamp Off, or Preamp not installed ±3.74 dB (nom.) (Preamp On)	value set at Input Level			
Waveform Display		Constellation, EVM vs. Subcarrier, EVM vs. Symbol, Spectral Flatness, Power vs. RB, EVM vs. RB				
	Function Overview	Supports output of captured waveform data to internal	storage or external storage			
	Waveform Data	Format: I, Q (32 bit floating point binary format) Level: Assumes as $\sqrt{(l^2 + Q^2)} = 1$ for 0 dBm input Level accuracy: Same as absolute amplitude accuracy an	d in-band frequency characteristics of the signal analyzer			
Digitize Function	Replay Function	Analyzes traces of saved waveform data Format: I, Q (32 bit floating point binary format) Sampling rate: 325 MHz 650 MHz (with MS2850A-033 installed) 1300 MHz (with MS2850A-034 installed) Under the following conditions, Capture two times with Center frequency <4.2 GHz				

5G Standard Measurement Software (Base License)) MX285051A			MS2850A
NR TDD sub-6 GHz Downlink	MX285051A-011	NR TDD sub-6 GHz Uplink	MX285051A-061	
NR FDD sub-6 GHz Downlink	MX285051A-031	NR FDD sub-6 GHz Uplink	MX285051A-081	
NR TDD mmWave Downlink	MX285051A-021	NR TDD mmWave Uplink	MX285051A-071	

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

Features

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

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

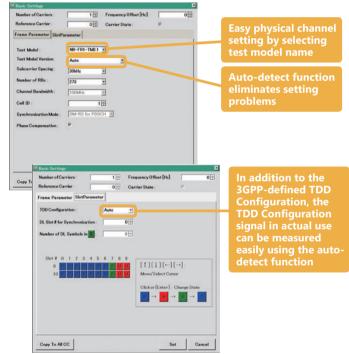
Setting Frequency Ranges: 100 MHz to 32 GHz (with MS2850A-047 installed), 100 MHz to 44.5 GHz (with MS2850A-046 installed)

Supported Measurement Functions

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

Easy Operability for Higher Measurement/Test Efficiency

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



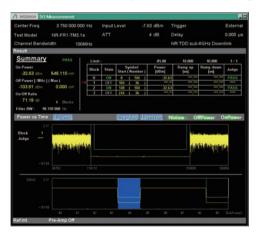
 This function makes it easy to measure Channel Power, OBW, ACLR and SEM.

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



• Power vs. Time measurements are supported.

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



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

A MELENSA SOM	leasurement .				- 1
Center Freq.	28 000 000 000 Hz	Input Level	-3.75 dBm		
			4 dB		
Channel Bandwi	dth 100MHz			R TDO mmWave Downlink	
Result					
MKR		Fr	eq Error	2.32 Hz	
Subcarrier 0 Symbol 3		Те	ansmit Power tal EVM (rms)	0.000 ppm -10.12 dBm 0.87 %	
Physical Channel PDSCH		Te	tal EVM (peak) Symbol Number Subcarrier Number	3.81 % 497 396	
I -0.696 Q -0.630					
MKR Sub		(7620 kHz) EVN	A (rms / peak) 0.1	80 % / 1.94 %	
EMI LI					
200 44	a Hadestern and his large	hanning have	ويعلم المجافل ووالجره لم	inderstand appression of	ŧ٨
128					-
		10 14	DIS 11	60 60 10	

5G Standard Measurement Software (Base License) MX285051A		MS2850A
NR TDD sub-6 GHz Downlink	MX285051A-011	NR TDD sub-6 GHz Uplink MX285051A-061	
NR FDD sub-6 GHz Downlink	MX285051A-031	NR FDD sub-6 GHz Uplink MX285051A-081	
NR TDD mmWave Downlink	MX285051A-021	NR TDD mmWave Uplink MX285051A-071 (Continued)

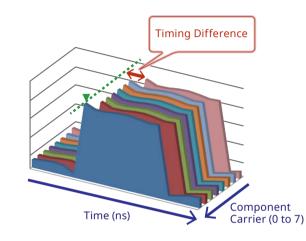
• All-at-Once Measurement and Analysis of 8 CCs max in 1-GHz Analysis Bandwidth

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

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

Tx Total Powe Tx Power Flat					
	Frequency Error	Transmit Power	EVM (rms)	EVM (peak)	Timing Difference
CC0 (Ref.)	23.24 Hz	-19.98 dBm	1.24 %	5.47 %	0.0 ns
CC1	24.13 Hz	-20.02 dBm	1.15 %	5.24 %	0.0 ns
CC2	25.02 Hz	-20.29 dBm	1.13 %	4.88 %	0.0 ns
CC3	25.92 Hz	-20.54 dBm	1.18 %	4.99 %	0.0 ns
CC4	26.95 Hz	-20.25 dBm	1.35 %	6.19 %	0.0 ns
CC5	27.82 Hz	-20.06 dBm	1.03 %	4.53 %	-1.5 ns
CC6	28.69 Hz	-20.14 dBm	1.00 %	4.30 %	0.0 ns
CC7	29.57 Hz	-20.25 dBm	1.01 %	4.80 %	0.0 ns

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



All-at-One Multi-carrier Measurement Software

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

5G Standard Measurement Software (Base License)) MX285051A		MS2850A
NR TDD sub-6 GHz Downlink	MX285051A-011	NR TDD sub-6 GHz Uplink MX285051A-061	
NR FDD sub-6 GHz Downlink	MX285051A-031	NR FDD sub-6 GHz Uplink MX285051A-081	
NR TDD mmWave Downlink	MX285051A-021	NR TDD mmWave Uplink MX285051A-071 (Continued)

Numeric Results

Name	Unit	Modulation Analysis	Carrier Aggregation Analysis	Power vs. Time	Remarks	
Common	·					
Frequency Error	Hz, ppm	~	✓		Displays frequency error	
Transmit Power	dBm	✓			Displays Tx power	
Total EVM (rms/peak)	%, dB	✓	✓		Displays EVM rms/peak values	
Origin Offset	dB	~			Displays Origin Offset value	
Time Offset (External Trigger)	ns	~			Displays time offset between Frame header and trigger in ns units Displays Trigger Switch = On only when using external trigger	
Timing Difference	ns		✓		Displays timing difference between reference carrier and each carrier	
Symbol Clock Error	ppm	~			Displays Symbol Clock Error	
IQ Skew	ns	~			Displays IQ Skew	
IQ Imbalance	dB	~			Displays IQ Imbalance in dB units	
IQ Quad Error	deg.	~			Displays IQ Quadrature Error	
Downlink			·			
P-SS		~				
S-SS		~				
РВСН		✓				
DM-RS (PBCH)	0/ dB dBm	~			Displays average EVM (rms) and maximum EVM (peak) as well as	
PDSCH	— %, dB, dBm	~			S-SS \cdot average power (dBm) for each PHY channel	
DM-RS (PDSCH)		~				
PDCCH		~				
DM-RS (PDCCH)		~				
Cell ID	_	~			Displays Cell ID	
OFDM Symbol Tx Power	_	~			Displays OSTP	
On Power	dBm, W			✓	Displays average On power	
Off Power	dBm, W			✓	Displays average Off power	
On/Off Ratio	dB			✓	Display On/Off power ratio	
Power	dBm			✓	Displays Block Tx power	
Ramp up	μs			✓	Displays signal rise time (only On sections)	
Ramp down	μs			✓	Displays signal fall time (only On sections)	
Uplink						
PUSCH	0/ dD dD	~			Displays average EVM (rms) and maximum EVM (peak) as well as	
DM-RS (PUSCH)	— %, dB, dBm	~			S-SS · average power (dBm) for each PHY channel	

Graph Displays

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

5G Standard Measurement Software (Base License)) MX285051A		MS2850A
NR TDD sub-6 GHz Downlink	MX285051A-011	NR TDD sub-6 GHz Uplink MX285051A-061	
NR FDD sub-6 GHz Downlink	MX285051A-031	NR FDD sub-6 GHz Uplink MX285051A-081	
NR TDD mmWave Downlink	MX285051A-021	NR TDD mmWave Uplink MX285051A-071 (Continued)

Standard		3GPP TS 38.211 (201	3GPP TS 38.211 (2019-06)					
Model/Name		Downlink Downlink		NR TDD mmW Downlink MX285051A-021	NR TDD sub-6 GHz NR FDD sub-6 GHz Uplink Uplink MX285051A-061 MX285051A-081		NR TDD mmW Uplink MX285051A-071	
Measurement	t Frequency Range	800 MHz to 5 GHz	400 MHz to 6 GHz	28 GHz	800 MHz to 5 GHz	400 MHz to 6 GHz	28 GHz	
Frequency Ra	nge	100 MHz to 32 GHz 100 MHz to 44.5 GH:			I			
Test Model		NR-FR1-TM1.1, NR-FR1-TM1.2, NR-FR1-TM2, NR-FR1-TM2a, NR-FR1-TM3.1, NR-FR1-TM3.1a, NR-FR1-TM3.2, NR-FR1-TM3.3		NR-FR2-TM1.1, NR-FR2-TM2, NR-FR2-TM3.1	IR-FR2-TM2, —			
Subcarrier Spa	acing (SCS)	15 kHz, 30 kHz, 60 kl	Hz	60 kHz, 120 kHz	15 kHz, 30 kHz, 60 kHz		60 kHz, 120 kHz	
Channel Band	lwidth	5, 10, 15, 20, 25, 30, 4 100 MHz	40, 50, 60, 70, 80, 90,	50, 100, 200, 400 MHz	5, 10, 15, 20, 25, 30, 100 MHz	5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 50, 100, 200, 100 MHz 400 MHz		
Modulation		CP-OFDM QPSK, 16QAM, 64QA	AM, 256QAM, Auto	<u>.</u>	CP-OFDM/DFT-S-OFDM PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM, Auto			
Measurement Channel		SS-Block, PDSCH, PD	OCCH, PT-RS for PDSC	Н	PUSCH, PT-RS for PL	JSCH		
Commonset	Maximum Number of CCs	2 2		8	1	1	1	
Component Carrier	Channel Bandwidth of each CC	to 100 MHz	to 100 MHz	50, 100 MHz	to 100 MHz	to 100 MHz	to 400 MHz	

RB Number Table

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

			NR TDD/FDD sub-6 GHz DL/UL Channel Bandwidth [MHz] (1CC)											
		5	5 10 15 30 20 25 40 50 60 70 80 90 100					100						
	15	25	52	79	160	106	133	216	270	N.A	N.A	N.A	N.A	N.A
SCS [kHz]	30	11	11 24 38 78 51 65 106 133 162 189 217 245 275							273				
	60	N.A	11	18	24	31	38	51	65	79	93	107	121	135

		N	NR TDD mmWave DL/UL						
		Chan	Channel Bandwidth [MHz] (1CC)						
		50	100	200	400				
60		66	132	264	N.A				
SCS [KH2]	SCS [kHz] 120		66	132	264				

Channel Bandwidth

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

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

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

MS2850A

	Signal Analyzer			MS2	850A			
Option		NR TDD sub-6 GHz I MX285051A-011	Downlink		NR TDD sub-6 0 MX285051A-06			
	Target Signals	TS 38.211 Sub-6 GHz	38.211 Sub-6 GHz compliant downlink signal TS 38.211 Sub 6-GHz compliant uplink signal					
		Subcarrier Spacing	15 kHz 5 MHz (RB: 25), 10 MHz (RB: 52), 15 MHz (RB: 79), 20 MHz (RB: 106), 25 MHz (RE 30 MHz (RB: 160), 40 MHz (RB: 216), 50 MHz (RB: 270)					
Electrical	Channel Bandwidth	30 kHz	30 kHz 5 MHz (RB: 11), 10 MHz (RB: 24), 15 MHz (RB: 38), 20 MHz (RB: 51), 25 MHz (RB 30 kHz 30 MHz (RB: 78), 40 MHz (RB: 106), 50 MHz (RB: 133), 60 MHz (RB: 162), 70 MHz (RB: 189), 80 MHz (RB: 217), 90 MHz (RB: 245), 100 MHz (RB: 273)					
Characteristics		60 kHz	40 MHz (RB: 51		60 MHz (RB: 79)	, 25 MHz (RB: 31), 30 MHz (RB: 38), , 70 MHz (RB: 93), 80 MHz (RB: 107),		
	Capture Time	1 to 2 Frame						
	Frequency Setting Range	MS2850A-047: 100 MHz to 32 GHz MS2850A-046: 100 MHz to 44.5 GHz						
	Measurement Frequency Range	800 MHz to 5 GHz						
	Measurement Level Range	-10 to +30 dBm (Pre -30 to +10 dBm (Pre		mp not installed)				
Modulation/ Frequency Measurement	Carrier Frequency Measurement Accuracy	At 18°C to 28°C, After signal 1 Frame at do Only 1 carrier of 100 30 kHz) or 50 MHz w at center frequency ± (Accuracy of refe frequency + 10) Hz	, After calibration, EVM = 1% (rms) at uplink signal f 100 MHz width (Subcarrier Spacing: 1Hz width (Subcarrier Spacing: 15 kHz ency of reference frequency × carrier 10) Hz					
	Residual Vector Error	At 18°C to 28°C, After calibration 1 Frame at downlink signal Only 1 carrier of 100 MHz width (Subcarrier Spacing: 30 kHz) or 50 MHz width (Subcarrier Spacing: 15 kHz) at center frequency ≤1.0%			At 18°C to 28°C, After calibration 1 Frame at uplink signal Only 1 carrier of 100 MHz width (Subcarrier Spacing: 30 kHz) or 50 MHz width (Subcarrier Spacing: 15 kHz) at center frequency ≤1.0%			
	Measurement Level Range	-10 to +30 dBm (Pre -30 to +10 dBm (Pre		mp not installed)	·			
Amplitude	Tx Power Measurement Accuracy (This is found from root sum of	At 18°C to 28°C, Afte Input signal within m Only 1 carrier at cent	neasurement leve			it Level		
Measurement	squares (RSS) of absolute amplitude accuracy and in-band	Frequency	/ Range	Preamp	· ·	Preamp On		
	frequency characteristics of main	800 MHz ≤ Frequ	-	or without ±0.74 dB		±1.27 dB (nom.)		
	frame.)	4 GHz ≤ Frequence	,	±1.48 dB	, ,	±2.11 dB (nom.)		
		4.2 GHz ≤ Freque	ncy ≤ 5 GHz	±1.45 dB	(nom.)	±1.94 dB (nom.)		
Waveform Display		Constellation, EVM v EVM vs. RB, Power vs						
	Function Overview	Supports output of c	aptured wavefor	m data to internal	storage or extern	nal storage		
	Waveform Data	Format: I, Q (32 bit fl Level: Assumes as √ Level accuracy: Same	$\frac{1}{(l^2 + Q^2)} = 1$ for (dBm input	d in-band freque	ncy characteristics of the signal analyze		
Digitize Function	Replay Function	Analyzes traces of sa Format: I, Q (32 bit fl Sampling Rate:	oating point bina	ry format)				
		Channel Ba		Without MS2		With MS2850A-033 162.5 MHz		
Power vs. Time Measurement	Displayed Average Noise	≤100 MHz 162.5 M This is calculated up to 5 GHz from the Display Average Noise Level for the signal analyzer with MS2850A-033/034 option installed at no signal input and an ambient temperature range of 18°C to 28°C when Wide Dynamic Range = On, Noise Correction = On, Pre-AMP = On.						

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

MS2850A

	Signal Analyzer			MS2	850A		
Option		NR FDD sub-6 GHz Do MX285051A-031	ownlink		NR FDD sub-6 MX285051A-0		
	Target Signals	TS 38.211 Sub-6 GHz o	compliant down	link signal	TS 38.211 Sub	6-GHz compliant uplink signal	
		15 kHz	5 MHz (BB: 25) 10 MHz (BB: 52) 15 MHz (BB: 79) 20 MHz (BB: 106) 25 MHz (BB: 1				
Channel Bandv	Channel Bandwidth	30 kHz	5 MHz (RB: 11) 30 MHz (RB: 78 70 MHz (RB: 18	, 10 MHz (RB: 24), 1 8), 40 MHz (RB: 106 89), 80 MHz (RB: 21	15 MHz (RB: 38),), 50 MHz (RB: 1 7), 90 MHz (RB:	20 MHz (RB: 51), 25 MHz (RB: 65), 33), 60 MHz (RB: 162), 245), 100 MHz (RB: 273)	
Characteristics		60 kHz	40 MHz (RB: 51), 15 MHz (RB: 18),), 50 MHz (RB: 65), 21), 100 MHz (RB: 1	60 MHz (RB: 79), 25 MHz (RB: 31), 30 MHz (RB: 38),), 70 MHz (RB: 93), 80 MHz (RB: 107),	
	Capture Time	1 to 2 Frame					
	Frequency Setting Range	MS2850A-047: 100 MHz to 32 GHz MS2850A-046: 100 MHz to 44.5 GHz					
	Measurement Frequency Range	400 MHz to 6 GHz					
	Measurement Level Range	-10 to +30 dBm (Prea -30 to +10 dBm (Prea		mp not installed)			
Modulation/ Frequency Measurement	Carrier Frequency Measurement Accuracy	At 18°C to 28°C, After calibration, EVM = 1% (rms) signal 1 Frame at downlink signal Only 1 carrier of 100 MHz (Subcarrier Spacing: 30 kHz)			width or 50 MHz (Subcarrier Spacing: 15 kHz) width center frequency		
	Residual Vector Error	At 18°C to 28°C, After signal 1 Frame at dow Only 1 carrier of 100 N width or 50 MHz (Sub center frequency However, Only 1 carrie 15 kHz, 30 kHz, 60 kH < 800 MHz \$1.0%	nlink signal MHz (Subcarrier carrier Spacing er of 25 MHz (S	Spacing: 30 kHz) 15 kHz) width at ubcarrier Spacing:	At 18° \leq to 28°C, After calibration, EVM = 1% (rms) signal 1 Frame at uplink signal Only 1 carrier of 100 MHz (Subcarrier Spacing: 30 kH width or 50 MHz (Subcarrier Spacing: 15 kHz) width center frequency However, Only 1 carrier of 25 MHz (Subcarrier Spaci 15 kHz, 30 kHz, 60 kHz) width at 400 MHz \leq frequer < 800 MHz \leq 1.0%		
	Measurement Level Range	-10 to +30 dBm (Prea -30 to +10 dBm (Prea		mp not installed)			
A 19 1	Tx Power Measurement Accuracy	At 18°C to 28°C, After Input signal within me Only 1 carrier at cente	asurement leve			ut Level	
Amplitude Measurement	(This is found from root sum of squares (RSS) of absolute amplitude accuracy and in-band	Frequency		Preamp or without	Preamp	Preamp On	
	frequency characteristics of main	400 MHz ≤ Frequer		±0.72 dB	, ,	±1.14 dB (nom.)	
	frame.)	$\frac{800 \text{ MHz} \leq \text{Frequen}}{4 \text{ GHz} \leq \text{Frequency}}$		±0.74 dB ±1.45 dB		±1.27 dB (nom.) ±2.11 dB (nom.)	
		4.2 GHz ≤ Frequency		±1.45 dB		±1.94 dB (nom.)	
Waveform Display		Constellation, EVM vs. EVM vs. RB, Power vs.	,		,		
	Function Overview	Supports output of ca					
	Waveform Data		ating point bin $\frac{2^2}{2} + Q^2$ = 1 for (ary format)) dBm input		ncy characteristics of the signal analyzer	
Digitize Function	Replay Function	Analyzes traces of sav Format: I, Q (32 bit flo Sampling Rate:					
		Channel Ban ≤100 M		Without MS2 162.5 N		With MS2850A-033 162.5 MHz	

5G Standard Measurement Software (Base License) MX285051A NR TDD mmWave Downlink MX285051A-021 NR TDD mmWave Uplink MX285051A-071

MS2850A

	Signal Analyzer			MS2	2850A	
Option		NR TDD mmWave Do MX285051A-021	ownlink		NR TDD mmW MX285051A-07	
	Target Signals	TS 38.211 mmWave co	ompliant downli	nk signal	TS 38.211 mm\	Vave compliant uplink signal
		Subcarrier Spacing	Channel Band	width		
	Channel Bandwidth	60 kHz	50 MHz (RB: 6	6), 100 MHz (RB: 1	32), 200 MHz (RE	3: 264)
Electrical Characteristics		120 kHz	50 MHz (RB: 3	2), 100 MHz (RB: 6	6), 200 MHz (RB:	132), 400 MHz (RB: 264)
	Capture Time	1 to 2 Frame				
	Frequency Setting Range	MS2850A-047: 100 MHz to 32 GHz MS2850A-046: 100 MHz to 44.5 GHz				
	Measurement Level Range	-15 to +30 dBm (Prea -30 to +10 dBm (Prea	•	mp not installed)		
Modulation/ Frequency Measurement	Carrier Frequency Measurement Accuracy	At 18°C to 28°C, After calibration, EVM = 2% (rms) At 18°C to 28°C, After calibration, EVM signal 1 Frame at downlink signal signal 1 Frame at uplink signal Only 1 carrier of 100 MHz width at center frequency Only 1 carrier of 100 MHz width at center frequency setting of 28 GHz setting of 28 GHz ± (Accuracy of reference frequency × carrier ± (Accuracy of reference frequency × carrier frequency + 10) Hz frequency + 10) Hz				at uplink signal if 100 MHz width at center frequency Hz of reference frequency × carrier
	Residual Vector Error	At 18°C to 28°C, After calibrationAt 18°C to 28°C,1 Frame at downlink signal1 Frame at uplir			of 100 MHz width at center frequency	
	Measurement Level Range	-15 to +30 dBm (Prea -30 to +10 dBm (Prea		mp not installed)		
Amplitude Measurement	Tx Power Measurement Accuracy (This is found from root sum of squares (RSS) of absolute	At 18°C to 28°C, After calibration, Input attenuator ≥10 dB Input signal within measurement level range and below value set at Input Level Only 1 carrier of 100 MHz width at center frequency				
	amplitude accuracy and in-band frequency characteristics of main	Frequency	Range	Preamp or without		Preamp On
	frame.)	26.5 GHz < Freque	ncy ≤ 40 GHz	±2.54 dB	(nom.)	±3.74 dB (nom.)
Waveform Display	1	Constellation, EVM vs. Subcarrier, EVM vs. Symbol, Spectral Flatness, Power vs. RB, EVM vs. RB, Power vs. Time (NR TDD mmW Downlink MX285051A-021)				
	Function Overview	Supports output of ca	aptured wavefor	m data to internal	storage or extern	nal storage
	Waveform Data	Format: I, Q (32 bit flo Level: Assumes as √(Level accuracy: Same	$\frac{1}{1^2 + Q^2} = 1$ for () dBm input	d in-band frequer	ncy characteristics of the signal analyze
Digitize Function		Analyzes traces of sav Format: I, Q (32 bit flo Sampling Rate:				
	Replay Function	Channel Bar	ndwidth	Without MS2	2850A-033	With MS2850A-033
		≤100 N	1Hz	162.5 I	MHz	162.5 MHz
		>100 N	1Hz	325 N	1Hz	650 MHz
Power vs. Time Measurement	Displayed Average Noise	This is calculated up t Average Noise Level 1 MS2850A-033/034 op and an ambient temp when Wide Dynamic On, Pre-AMP = On. -86.2 dBm/MHz (no	for the signal an otion installed at perature range o Range = On, No	alyzer with t no signal input f 18°C to 28°C		_

5G Standard Measurement Software (Base License) MX269051A							
NR TDD sub-6 GHz Downlink	MX269051A-011	NR TDD sub-6 GHz Uplink	MX269051A-061				
NR FDD sub-6 GHz Downlink	MX269051A-031	NR FDD sub-6 GHz Uplink	MX269051A-081				

The 5G measurement Software MX269051A are are installed in the MS269xA main unit to support development and production of 5G wireless communication device. The software support signal analysis and RF characteristics by supporting GPP-compliant sub-6 GHz uplink signal and downlink signal and specifying combinations from multiple component carriers and subcarrier spacing.

Features

• Supports Both Downlink and Uplink Signal Measurement in sub-6 GHz

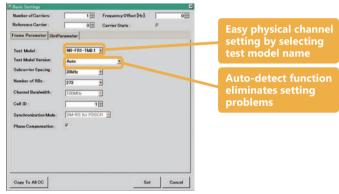
The 5G measurement Software MX269051A are are installed to support both Downlink and Uplink signal in 5G NR sub-6 GHz. Combining with MS269xA-x077/078 can analyze a carrier with up to 100 MHz bandwidth.

Supported Measurement Functions

Supported Software	Modulation Analysis	Power vs. Time		
NR TDD sub-6 GHz Downlink MX269051A-011	✓	✓		
NR FDD sub-6 GHz Downlink MX269051A-031	✓	—		
NR TDD sub-6 GHz Uplink MX269051A-061	✓	—		
NR FDD sub-6 GHz Uplink MX269051A-081	✓	_		

Easy Operability for Higher Measurement/Test Efficiency

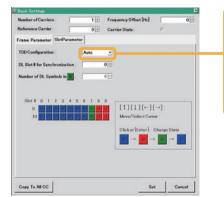
• The Phy channel can be measured simply by specifying the measured test model.



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

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





In addition to the 3GPP-defined TDD Configuration, the TDD Configuration signal in actual use can be measured easily using the autodetect function

• Power vs. Time measurements are supported.

Off power and Transient period measurements that are required for 3GPP TS 38.141-1/2 specified Transient On/Off Power are supported. Measurement results are displayed along with Power vs. Time graphs.

A M52850A 50	Measurement										
Center Freq.	3 750 000 000		Input	evel		-7.83	3 dBm	Trigger			External
Test Model	NR-FR1-TM3.1a					4		Delay			0.000 µs
Channel Bandwidth 100MHz								NR TOD	sub	-6GHz Down	link
Result											
Summary		Limit					-85.00	10.0	900	10.000	
On Power -32.63 dlim	546.110 mm	Block	State		mbol Numb	**)	Pewer [d8m]	Ramp [us]	up	Ramp down [un]	Judge
Off Power [/MHz]		0	0.0	0	104		-32.6		***		PASS
-103.81 dBm	0.000 mV	2 1	OFF	104	(36	-	-32.0				PASS
On/Off Ratio		1	110	244		+					
	4 Blocks 310 000 Hz										
Power vs Time	ESVICE)		1	Pres	âmpi	Lin	ited I	Noise	0	IPower (nPower
Jodge	a fina unpe	114312								ileit oli	1
Ref.Int	Pre-Amp Off										

5G Standard Measurement Software (Base License)	MX269051A		MS269xA
NR TDD sub-6 GHz Downlink	MX269051A-011	NR TDD sub-6 GHz Uplink MX269051A-061	
NR FDD sub-6 GHz Downlink	MX269051A-031	NR FDD sub-6 GHz Uplink MX269051A-081	(Continued)

Numeric Results

Name	Unit	Modulation Analysis	Power vs. Time	Remarks
Common				
Frequency Error	Hz, ppm	✓		Displays frequency error
Transmit Power	dBm	✓		Displays Tx power
Total EVM (rms/peak)	%, dB	✓		Displays EVM rms/peak values
Origin Offset	dB	✓		Displays Origin Offset value
Time Offset (External Trigger)	ns	~		Displays time offset between Frame header and trigger in ns units Displays Trigger Switch = On only when using external trigger
Symbol Clock Error	ppm	✓		Displays Symbol Clock Error
IQ Skew	ns	✓		Displays IQ Skew
IQ Imbalance	dB	✓		Displays IQ Imbalance in dB units
IQ Quad Error	deg.	✓		Displays IQ Quadrature Error
Downlink				
P-SS		✓		
S-SS		✓		
РВСН		✓		
DM-RS (PBCH)		✓		Displays average EVM (rms) and maximum EVM (peak) as well as S-SS · average
PDSCH	— %, dB, dBm	✓		power (dBm) for each PHY channel
DM-RS (PDSCH)		✓		
PDCCH		✓		
DM-RS (PDCCH)		✓		
Cell ID	—	✓		Displays Cell ID
OFDM Symbol Tx Power	_	✓		Displays OSTP
On Power	dBm, W		✓	Displays average On power
Off Power	dBm, W		✓	Displays average Off power
On/Off Ratio	dB		✓	Display On/Off power ratio
Power	dBm		✓	Displays Block Tx power
Ramp up	μs		✓	Displays signal rise time (only On sections)
Ramp down	μs		✓	Displays signal fall time (only On sections)
Uplink				
PUSCH	0/ dD dD	✓		
DM-RS (PUSCH)	— %, dB, dBm	~		

Graph Displays

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

5G Standard Measurement Software (Base License)	MX269051A		MS269xA
NR TDD sub-6 GHz Downlink	MX269051A-011	NR TDD sub-6 GHz Uplink MX269051A-061	
NR FDD sub-6 GHz Downlink	MX269051A-031	NR FDD sub-6 GHz Uplink MX269051A-081 (C	Continued)

Standard	3GPP TS 38.211 ((2019-06)								
	NR TDD sub-6 G	Hz								
Model/Name	NR TDD sub-6 G Downlink MX269051A-011		NR FDD sub-6 GHz Downlink MX269051A-031		NR TDD sub-6 GHz Uplink MX269051A-061	:	NR FDD sub-6 GHz Uplink MX269051A-081			
Measurement Frequency Range	800 MHz to 5 GH	łz	400 MHz to 6 GHz		800 MHz to 5 GHz		400 MHz to 6 GHz			
Frequency Setting Range	MS2690A MS2691A MS2692A	≤31.25 M ≤62.5 M ≤125 M ≤62.5 M ≤62.5 M ≤125 M ≤31.25 M ≤62.5 M ≤125 M ≤62.5 M	ysis Bandwidth Hz (Standard) Hz (MS269xA-077) Hz (MS269xA-078) Hz (Standard) Hz (MS269xA-077) Hz (MS269xA-078) Hz (Standard) Hz (MS269xA-077) Hz (MS269xA-078) Hz (MS269xA-077)	Witho	IS269xA-067 — — — — ut MS269xA-067/ lector Bypass on	100 N 100 N 100 N 100 N 100 N 100 N	Auency Range AHz to 6 GHz AHz to 6 GHz AHz to 13.5 GHz AHz to 6 GHz AHz to 26.5 GHz AHz to 6 GHz AHz to 26.5 GHz			
est Model	NR-FR1-TM1.1, NR-FR1-TM1.2, NR-FR1-TM2, NR-FR1-TM2a, NR-FR1-TM3.1, NR-FR1-TM3.1a, NR-FR1-TM3.2, NR-FR1-TM3.3		Hz (MS269xA-078)	<u> </u>						
Subcarrier Spacing (SCS)	15 kHz, 30 kHz, 6	60 kHz			15 kHz, 30 kHz, 60) kHz, 60 kHz				
Channel Bandwidth	5, 10, 15, 20, 25,	30, 40, 50, 60), 70, 80, 90, 100 MHz	z 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 MHz						
Nodulation	CP-OFDM QPSK, 16QAM, 6	4QAM, 256C	AM, Auto		CP-OFDM/DFT-S-C PI/2 BPSK, QPSK, 10		QAM, 256QAM, Auto			
Measurement Channel	SS-Block, PDSCH	, PDCCH, PT	-RS for PUSCH		PUSCH, PT-RS for F	PUSCH				

RB Number Table

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

							-		GHz DL/UL MHz] (1CC)								
		5	5 10 15 30 20 25 40 50 60 70 80 90 100 55 52 70 160 106 132 216 270 NA NA NA NA														
	15	25	52	79	160	106	133	216	270	N.A	N.A	N.A	N.A	N.A			
SCS [kHz]	30	11	24	38	78	51	65	106	133	162	189	217	245	273			
	60	N.A	11	18	24	31	38	51	65	79	93	107	121	135			

Channel Bandwidth

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

		Maximum Analysis Bandwidth
	Standard	31.25 MHz
MS269xA	MS269xA-077	62.5 MHz
	MS269xA-078	125 MHz

5G Standard Measurement Software (Base License) MX269051A NR TDD sub-6 GHz Downlink MX269051A-011 NR TDD sub-6 GHz Uplink MX269051A-061

MS269xA

Specifications

	Signal Analyzer				MS269xA							
Option		NR TDD sub-6 GF MX269051A-011	Iz Downlink		NR TDD sub-6 MX269051A-00		< c					
	Target Signals	TS 38.211 Sub-6 0	GHz compliant	t downlink signal	TS 38.211 Sub	6-GHz com	pliant uplink signal					
		Subcarrier Spacin	ng Channel I	Bandwidth								
		15 kHz	30 MHz (RB: 160), 40 MHz (R	B: 216), 50 MHz (RB:	270)	B: 106), 25 MHz (RB: 133),					
	Channel Bandwidth	30 kHz	30 MHz (70 MHz (RB: 78), 40 MHz (RE RB: 189), 80 MHz (R	: 106), 50 MHz (RB: 1 B: 217), 90 MHz (RB:	33), 60 MH 245), 100 M	1Hz (RB: 273)					
		60 kHz	40 MHz (: 65), 60 MHz (RB: 79		RB: 31), 30 MHz (RB: 38), RB: 93), 80 MHz (RB: 107),					
	Capture Time	1 to 2 Frame										
Electrical			Analysi	is Bandwidth	MS269xA-067	7	Frequency Range					
Characteristics			≤31.25 MHz		_		100 MHz to 6 GHz					
		MS2690A		z (MS269xA-077) z (MS269xA-078)	_		100 MHz to 6 GHz					
			≤31.25 MHz	z (Standard)	—		100 MHz to 13.5 GHz					
	Frequency Setting Range	MS2691A		z (MS269xA-077) z (MS269xA-078)	—		100 MHz to 6 GHz					
			≤31.25 MHz		_		100 MHz to 26.5 GHz					
		MS2692A		z (MS269xA-077) z (MS269xA-078)	Without MS269xA Preselector Bypas		100 MHz to 6 GHz					
				z (MS269xA-077) z (MS269xA-078)	Preselector Bypas	is on	100 MHz to 26.5 GHz					
	Measurement Frequency Range	600 MHz to 5 GH	Z									
	Measurement Level Range	-10 to +30 dBm (-25 to +10 dBm (r Preamp not instal	led)							
	Carrier Frequency Measurement Accuracy	1 Frame at downl Only 1 carrier of 1 30 kHz) or 50 MH at center frequence ± (Accuracy of r	ink signal 100 MHz width Iz width (Subca cy reference frequ	n (Subcarrier Spacin arrier Spacing: 15 kl	1 Frame at upli g: Only 1 carrier of Hz) 30 kHz) or 50 M at center frequ ± (Accuracy of	 At 18°C to 28°C, After calibration, EVM = 1% (rms) si 1 Frame at uplink signal Only 1 carrier of 100 MHz width (Subcarrier Spacing 30 kHz) or 50 MHz width (Subcarrier Spacing: 15 kH at center frequency ± (Accuracy of reference frequency × carrier frequency + 10) Hz 						
measurement	Residual Vector Error		After calibratio ink signal 100 MHz width z width (Subca	on 1 (Subcarrier Spacin arrier Spacing: 15 kl	At 18°C to 28°C 1 Frame at upli g: Only 1 carrier of	C, After cali ink signal of 100 MHz MHz width	bration width (Subcarrier Spacing: (Subcarrier Spacing: 15 kH;					
	Measurement Level Range	-10 to +30 dBm (-25 to +10 dBm (r Preamp not instal	led)							
Amplitude Measurement	Tx Power Measurement Accuracy (This is found from root sum of squares (RSS) of absolute amplitude		n measuremer		≥10 dB elow value set at Inpu	ut Level						
	accuracy and in-band frequency characteristics of MS269xA main	· · · ·	ncy Range		or without Preamp		Preamp On					
	frame.)	600 MHz ≤ Fre	equency < 5 G	Hz ±1.9	1 dB (nom.)	±	2.20 dB (nom.)					
Waveform Display		Constellation, EV	M vs. Subcarrie	er, EVM vs. Symbol,	Spectral Flatness, Pov	wer vs. RB,	EVM vs. RB					
	Function Overview	Supports output of	of captured wa	aveform data to inte	ernal storage or exter	nal storage	1					
	Waveform Data	Format: I, Q (32 bit floating point binary format) Level: Assumes as $\sqrt{(l^2 + Q^2)} = 1$ for 0 dBm input Level accuracy: Same as absolute amplitude accuracy and in-band frequency characteristics of the signal analyz										
Digitize Function	Dealer Function	Analyzes traces of Format: I, Q (32 b Sampling Rate:										
	Replay Function	Channel Ban	dwidth	Vithout MS269xA-0 Vithout MS269xA-0			With MS269xA-077 With MS269xA-078					
		≤100 M	Hz	50 MHz	100 MH	łz	200 MHz					
Power vs. Time Measurement	Displayed Average Noise	and an ambient te	vel for the sign 8 option insta emperature ra mic Range = C			—						

5G Standard Measurement Software (Base License) MX269051A NR FDD sub-6 GHz Downlink MX269051A-031 NR FDD sub-6 GHz Uplink MX269051A-081

MS269xA

Specifications

	Signal Analyzer					MS269							
Option	1	NR FDD sub-6GH MX269051A-031				M	IR FDD sub-6GH 1X269051A-081						
	Target Signals	TS 38.211 Sub-6 0	GHz compli	ant downl	ink signal	TS	S 38.211 Sub 6-0	GHz com	pliant uplink signal				
		Subcarrier Spacir		el Bandwi									
		15 kHz	30 MH	Iz (RB: 160), 40 MHz (RE	B: 216),	50 MHz (RB: 27	0)	B: 106), 25 MHz (RB: 133),				
	Channel Bandwidth	30 kHz	30 MH	Iz (RB: 78),	, 40 MHz (RB:	: 106), 5	MHz (RB: 38), 20 0 MHz (RB: 133) 90 MHz (RB: 24), 60 MH					
		60 kHz	40 MH	Iz (RB: 51),		: 65), 60	MHz (RB: 79), 7		RB: 31), 30 MHz (RB: 38), RB: 93), 80 MHz (RB: 107),				
	Capture Time	1 to 2 Frame											
Electrical			Ana	lysis Band	width		MS269xA-067		Frequency Range				
Characteristics				/Hz (Stand					100 MHz to 6 GHz				
		MS2690A	≤62.5 N	/Hz (MS26 /Hz (MS26	59xA-077)		_		100 MHz to 6 GHz				
				/Hz (Stand					100 MHz to 13.5 GHz				
	Frequency Setting Range	MS2691A	≤62.5 N	/Hz (MS26 /Hz (MS26	59xA-077)		_		100 MHz to 6 GHz				
				/Hz (Stand					100 MHz to 26.5 GHz				
		MS2692A	≤62.5 N	/Hz (MS26 /Hz (MS26	59xA-077)		out MS269xA-06 elector Bypass o		100 MHz to 6 GHz				
		WI32092A	≤62.5 N	/Hz (MS26 /Hz (MS26 /Hz (MS26	59xA-077)		elector Bypass o		100 MHz to 26.5 GHz				
	Maaguramant Eraguangy Banga	400 MHz to 6 CH			JJAR-010)								
	Measurement Frequency Range	400 MHz to 6 GHz -10 to +30 dBm (f. or Pream	np not installe	ed)							
	Measurement Level Range	-25 to +10 dBm (At 18°C to 28°C, A	Preamp On	1)			+ 10°C += 20°C	After cal	bration, EVM = 1% (rms)				
c	Carrier Frequency Measurement Accuracy	Signal 1 Frame at Only 1 carrier of 1 width or 50 MHz (center frequency However, Only 1 c 15 kHz, 30 kHz, 60 < 800 MHz ± (Accuracy of r frequency + 10)	downlink si 00 MHz (Su (Subcarrier carrier of 25 0 kHz) widtl reference fro	ignal ubcarrier S Spacing: 5 MHz (Su h at 400 N	Spacing: 30 kH 15 kHz) width bcarrier Spaci 1Hz ≤ frequer	Hz) O n at w ce ing: H ncy 1!	gnal 1 Frame at nly 1 carrier of idth or 50 MHz enter frequency owever, Only 1 5 kHz, 30 kHz, 6 800 MHz						
	Residual Vector Error	At 18°C to 28°C, A signal 1 Frame at Only 1 carrier of 1 width or 50 MHz (center frequency However, Only 1 c 15 kHz, 30 kHz, 60 < 800 MHz \leq 1.0%	After calibra downlink si 00 MHz (Su (Subcarrier carrier of 25	ignal ubcarrier S Spacing: 5 5 MHz (Su	Spacing: 30 kł 15 kHz) width bcarrier Spaci	A si Hz) O n at w ce ing: H ncy 1!	At 18° ≤ to 28°C, After calibration, EVM = 1% (rms) signal 1 Frame at uplink signal Only 1 carrier of 100 MHz (Subcarrier Spacing: 30 width or 50 MHz (Subcarrier Spacing: 15 kHz) widt center frequency However, Only 1 carrier of 25 MHz (Subcarrier Spa 15 kHz, 30 kHz, 60 kHz) width at 400 MHz ≤ freque < 800 MHz ≤ 1.0%						
	Measurement Level Range	-10 to +30 dBm (-25 to +10 dBm (np not installe	ed)							
Amplitude Measurement	Tx Power Measurement Accuracy (This is found from root sum of squares (RSS) of absolute amplitude accuracy and in-band frequency	At 18°C to 28°C, A Input signal withir Only 1 carrier at c	n measuren enter frequ	lue set at Input I	Level								
	characteristics of MS269xA main	· · · ·	ncy Range		Preamp Off, o				Preamp On				
	frame.)	400 MHz ≤ Fre	quency < 6	GHz	±1.91	1 dB (nc	om.)	±	2.20 dB (nom.)				
Waveform Display		Constellation, EVM vs. Subcarrier, EVM vs. Symbol, Spectral Flatness, Power vs. RB, EVM vs. RB											
	Function Overview	Supports output of captured waveform data to internal storage or external storage Format: I, Q (32 bit floating point binary format)											
	Waveform Data	Level: Assumes as	$\sqrt{(l^2 + Q^2)}$	= 1 for 0 d	dBm input	y and ir	n-band frequenc	y charac	teristics of the signal analyz				
Digitize Function		Analyzes traces of saved waveform data Format: I, Q (32 bit floating point binary format) Sampling Rate:											
	Replay Function	Channel Ban			MS269xA-07 MS269xA-07		With MS269xA-077With MS269xA-077Vihtout MS269xA-078With MS269xA-078						
		≤100 M	Hz	5	50 MHz		100 MHz	MHz 200 MHz					

MS2850A/MS2840A/MS2830A Configuration

Options Configuration

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

MS2830A Hardware Configuration

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

																	✓ =	Can	be i	insta	alled	No	= C	ann	ot b	e ins	stalle	ed, R	= R	equi	re, L	J = L	Jpgrad	e
		ofit	Add	ition	to M	ain fra	ame								C	omb	oinati	ion v	vith	"Op	tion'	(Re	fer t	o th	e let	ft lin	e)							
Opt.	Name	Retrofit	040	041	043	044	045	001	002	005	006	600	077	078	008	010	011	016	017	018	020	021	022	026	052	027	028	029	066	067	068	088	189 180	!
001	Rubidium Reference Oscillator		1	✓	\checkmark	✓	✓	\bowtie	*9																									
002	High Stability Reference Oscillator		✓	\checkmark	\checkmark	No	No	*9	\times																									
005	Analysis Bandwidth Extension to 31.25 MHz		✓	~	~	~	No			\ge	R	No																						
006	Analysis Bandwidth 10 MHz		1	~	\checkmark	~	\checkmark			U	\times	U	U	U																				
009	Bandwidth Extension to 31.25 MHz for Millimeter-wave		No	No	No	No	~		No	No	R	\boxtimes								No	No	No	No			No	No	No	No			No	No	٦
077	Analysis Bandwidth Extension to 62.5 MHz	No	1	✓	✓	~	~			*5	R	*5	\boxtimes]																				1
078	Analysis Bandwidth Extension to 125 MHz	No	1	~	~	~	~			*5	R	*5	R	\triangleright	1																			1
008	Preamplifier		1	~	~	*1	*1								\boxtimes	1															*1			
010	Phase Noise Measurement Function		1	~	~	~	~									\boxtimes																		1
011	2ndary HDD		1	~	~	~	~										\boxtimes																	
016	Precompliance EMI Function		1	~	~	~	~											imes																
017	Noise Figure Measurement Function		1	~	~	~	~								U				imes												U			
018	Audio Analyzer*4		1	~	*7	No	No					No								\times									R	No	No			7
020	3.6 GHz Vector Signal Generator		√	~	*2	No	No					No									imes	No			*11				*2	No	No	No	No	
021	6 GHz Vector Signal Generator		1	~	*2	No	No					No									No	\times			*11				*2	No	No	No	No	٦
022	Low Power Extension for Vector Signal Generator		√	~	~	No	No					No									F		imes							No	No	No	No	
026	BER Measurement Function		1	~	~	~	~																	\times										٦
052	Internal Signal Generator Control Function	*12	1	~	*2	No	No														*1	1			\boxtimes				*2			*11		
027	ARB Memory Upgrade 256 MSa for Vector Signal Generator		1	~	~	No	No					No									F					\boxtimes				No	No	*3	*3	٦
028	AWGN		1	~	\checkmark	No	No					No									F						\bowtie			No	No	*3	*3	
029	Analog Function Extension for Vector Signal Generator*4	*8	V	✓	No	No	No					No									F		R					\boxtimes	R	No	No	No	No	٦
066	Low Phase Noise Performance	No	1	~	*2	No	No					No									*	:			*2				\times	No	No			
067	Microwave Preselector Bypass		No	No	No	~	<		No											No	No	No	No					No		imes		No	No	
068	Microwave Preamplifier		No	No	No	*1	*1		No						*1					No	No	No	No					No	No		\ge	No	No	
088	3.6 GHz Analog Signal Generator*4		✓	~	No	No	No					No									No	No	No		*11	*3	*3	No	R	No	No	\ge	U	
189	Vector Function Extension for Analog Signal Generator Retrofit		✓	~	No	No	No					No									No	No	No			*3	*3	No	R	No	No	R	\times	
180	CPU/Windows 7 64 bit Upgrade Retrofit	*10	✓	~	\checkmark	\checkmark	\checkmark																										$ \ge$	3

*1: Cannot be installed simultaneously MS2830A-008 and MS2830A-068/168. When MS2830A-168 is added to Signal Analyzer with MS2830A-008, only MS2830A-168 becomes effective.

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

*3: MS2830A-027 and MS2830A-028 are not used in analog signal generator (MS2830A-088/188).

After vector function (MS2830A-189) was added, the vector signal generator function can add MS2830A-027 and MS2830A-028.

*4: Require MX269018A.

*5: MS2830A-040/041/043/044 require MS2830A-005.

MS2830A-045 requires MS2830A-009.

*6: An image response is received when setting the bandwidth to more than 31.25 MHz. This can be used when not inputting a signal frequency outside the MS2830A analysis bandwidth (125 MHz max.).

The Signal Analyzer series MS2690A/91A/92A is recommended for other measurement purposes.

*7: The MS2830A-018 can be installed with MS2830A-043 but cannot be installed simultaneously with a signal generator (MS2830A-088/020/021/029) because MS2830A-066 is required. Consequently, analog wireless Rx tests cannot be performed using the same main frame when the MS2830A-018 and MS2830A-043 are combined.

*8: Please contact our sales representative when requesting retrofitting.

*9: The Rubidium Reference Oscillator can be retrofitted to MS2830A-040/041/043 with installed High Stability Reference Oscillator.

In this case, the Rubidium Reference Oscillator is functional.

*10: Replace current CPU board of MS2830A which Windows Embedded Standard 2009 (Windows XP) is installed (it was ordered until August 2016 approximately) and upgrade the operating system to Windows Embedded Standard 7 (Windows 7).

A seal labeled "C1" is affixed near the serial number label of MS2830A which is installed Windows 7.

*11: Installing the MS2830A-052 requires any of the MS2830A-020/120, 021/121, or 088/188 options.

*12: When retrofitting signal generator-linked functions (MS2830A-352), the license is delivered on an accessory DVD which is used to install the license in the MS2830A. It is not necessary to return the MS2830A to Anritsu for upgrading.

MS2850A/MS2840A/MS2830A Configuration (Continued)

MS2840A Hardware Configuration

Frequency range (MS2840A-040/041/044/046) not upgradable.

							_						~	= C	an b	e ins	tallec	l, Nc) = 0	ann	ot be	e inst	allec	l, R =	= Re	quir	e, U :	= Up	pgrade
			Ado	dition to	Main fra	me							Co	ombi	natio	on w	ith "C	pt."	(Ref	er to	o the	left	line)						
Opt.	Name	Retrofit	040 (3.6 GHz)	041 (6 GHz)	044 (26.5 GHz)	046 (44.5 GHz)	001	002	005 (standard install)	000 (standard install)		078	008	690	068	019	010	016	017	026	051	066	020	021	189	022	027	028	088 029
001	Rubidium Reference Oscillator	Yes	✓	✓	~	✓	\boxtimes	*4																					
002	High Stability Reference Oscillator	Yes	~	~	Equiv function	/alent installed	*4	Х		N	0			No	No							N	0						
005	Analysis Bandwidth Extension to 31.25 MHz	-	Standard install	Standard install	Standard install	No			$\langle \rangle$	(n	0				No														
006	Analysis Bandwidth 10 MHz	-	Standard install	Standard install	Standard install	Standard install			$\langle \rangle$	\bigcirc																			
009	Bandwidth Extension to 31.25 MHz for Millimeter-wave	-	No	No	No	Standard install		No	No	\bigcirc											Ν	١o	No	No	No	No	No	No	No No
077	Analysis Bandwidth Extension to 62.5 MHz*1	Yes	✓	~	~	~			\land	\diamond	$\langle \times \rangle$	1																	
078	Analysis Bandwidth Extension to 125 MHz*1	Yes	✓	~	√	~			$\overline{\mathbf{A}}$	\bigtriangledown	R	\boxtimes																	
008	Preamplifier	Yes	~	~	✓	~							\boxtimes	*5	*5														
069	26.5 GHz Microwave Preamplifier	Yes	No	No	~	No		No		N	0		*5	\boxtimes	No						Ν	١o	No	No	No	No	No	1 oV	No No
068	Microwave Preamplifier	Yes	No	No	No	~		No	N	0			*5	No	\times						٩	١o	No	No	No	No	No	No I	No No
019	2 dB Step Attenuator for Millimeter-wave	Yes	No	No	No	~		No	N	0				No		X					٩	١o	No	No	No	No	No	1 oV	No No
010	Preamplifier	Yes	✓	~	✓	~											\langle												
011	2ndary SSD	Yes	~	~	✓	~										Í		1											
016	Precompliance EMI Function	Yes	~	~	✓	~												\mathbb{X}											
017	Noise Figure Measurement Function	Yes	~	~	~	~							U	U	U			Ē	\boxtimes										
026	BER Measurement Function	Yes	~	~	✓	~														\times									
051	Noise Floor Reduction	Yes	✓	~	~	~														Ì	X								
066	Low Phase Noise Performance	Yes	✓	~	No	No				N	0			No	No							×и	0						
067	Microwave Preselector Bypass	Yes	No	No	√	~		No													١	10)	Nc	No	No	No	No	No I	No No
020	3.6 GHz Vector Signal Generator	Yes	~	~	No	No				N	0			No	No							N	٥X	No	No			1	No
021	6 GHz Vector Signal Generator	Yes	✓	~	No	No				N	0			No	No							N	o No	\sim	No			1	No
189	Vector Function Extension for Analog Signal Generator Retrofit	Yes	~	~	No	No				N	0			No	No							N	o No	No	X	No			R No
022	Low Power Extension for Vector Signal Generator	Yes	~	~	No	No				N	0			No	No							N	0	R	No	\times		١	No
027	ARB Memory Upgrade 256 Msa for Vector Signal Generator* ²	Yes	~	~	No	No				N	0			No	No							N	0	R			X		
028	AWGN*2	Yes	~	~	No	No				N	0			No	No							N	0	R				X	
088	3.6 GHz Analog Signal Generator*3	Yes	✓	✓	No	No				N	0			No	No							N	o No	No		No	ľ		Nc
029	Analog Function Extension for Vector Signal Generator ^{*3}	Yes	~	~	No	No				N	0			No	No							N	0	R	No	R		1	No

*1: 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 MS2840A analysis bandwidth (125 MHz max.). The Signal Analyzer series MS2690A/91A/92A is recommended for other measurement purposes.

*2: The ARB Memory Upgrade 256 Msa for Vector Signal Generator (MS2840A-027) and AWGN (MS2840A-028) are non-functional in the Analog Signal Generator (MS2840A-029/088).

*3: Requires Analog Measurement Software (MX269018A).

*4: The Rubidium Reference Oscillator can be retrofitted to the MS2840A-040/041 with installed High Stability Reference Oscillator.

In this case, the Rubidium Reference Oscillator is functional.

*5: The 26.5 GHz Microwave Preamplifier or Microwave Preamplifier can be retrofitted to the MS2840A-044/046 with installed Preamplifier.

In this case, the 26.5 GHz Microwave Preamplifier or Microwave Preamplifier are functional.

MS2850A/MS2840A/MS2830A Configuration (Continued)

MS2850A Hardware Configuration

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

inequency rung						✓ =	Can b	oe insta	alled, N	lo = Ca	annot	be inst	alled, I	R = Re	quire,	U = Up	grade
				ion to frame			Co	ombina	ation w	vith "O	otion"	(Refer	to the	left lin	e)		
Option	Name	Retrofit	MS2850A-046 (44.5 GHz model)	MS2850A-047 (32 GHz model)	MS2850A-032 (standard install)	MS2850A-033	MS2850A-034	MS2850A-010	MS2850A-017	MS2850A-067 (standard install)	MS2850A-068	MS2850A-072	MS2850A-076	MS2850A-051	MS2850A-011	MS2850A-053	MS2850A-054
MS2850A-032	Analysis Bandwidth 255 MHz	_	Standard install	Standard install	\boxtimes												
MS2850A-033	Analysis Bandwidth Extension to 510 MHz	Yes	✓	✓	\square	\ge											
MS2850A-034	Analysis Bandwidth Extension to 1 GHz	Yes	✓	✓		R	\ge										
MS2850A-010	Phase Noise Measurement Function	Yes	✓	✓				\succ									
MS2850A-017	Noise Figure Measurement Function	Yes	√	~					\ge		U						
MS2850A-067	Microwave Preselector Bypass	_	Standard install	Standard install						\boxtimes							
MS2850A-068	Microwave Preamplifier	Yes	✓	~							\ge						
MS2850A-072	Extended Specifications	Yes	✓	✓								\ge					
MS2850A-076	Low Second Harmonic Distortion	Yes	✓	✓									\succ				
MS2850A-051	Noise Floor Reduction	Yes	✓	✓										\geq			
MS2850A-011	Secondary Storage Device	Yes	✓	✓											\geq		
MS2850A-053	External Interface for High Speed Data Transfer PCIe	Yes	~	~												\ge	
MS2850A-054	External Interface for High Speed Data Transfer USB3.0	Yes	~	~													\ge

MS2850A/MS2840A/MS2830A Configuration (Continued)

MS2830A Software Configuration

												\checkmark = Can be installed, No = Cannot be installed, R = Require, U = Upgrade	
		Addition to Main frame					Analysis Bandwidth				:h		
Model	Name	040	041	043	044	045	005	900	600	077	078	Note	
MX269011A	W-CDMA/HSPA Downlink Measurement Software	~	~	~	~	✓		R					
MX269012A	W-CDMA/HSPA Uplink Measurement Software	✓	~	~	~	✓		R					
MX269013A	GSM/EDGE Measurement Software	~	~	~	~	~		R					
MX269013A-001	EDGE Evolution Measurement Software	~	✓	✓	~	✓		R				Require MX269013A	
MX269015A	TD-SCDMA Measurement Software	~	~	~	~	✓		R					
MX269017A	Vector Modulation Analysis Software	~	~	~	√*3	√ *3	U	R	U*1	U	U	U: Upgrade of the phase noise performance (MS2830A-066) (Measured signal: Frequency <3.6 GHz, Bandwidth <1 MHz)	
MX269018A	Analog Measurement Software	~	~	√*2	No	No			No			Require MS2830A-066 and A0086C (See MX2690xxA series Measurement Software catalog for detail) Note) MS2830A-043 cannot implement a signal generator for Rx test (Because MS2830A-066 is required)	
MX269020A	LTE Downlink Measurement Software	~	~	~	~	~	R	R	R *1				
MX269020A-001	LTE-Advanced FDD Downlink Measurement Software	✓	✓	✓	~	✓	R	R	R *1	U	U	Require MX269020A	
MX269021A	LTE Uplink Measurement Software	~	~	~	~	~	R	R	R *1				
MX269021A-001	LTE-Advanced FDD Uplink Measurement Software	~	~	~	~	✓	R	R	R *1	U	U	Require MX269021A	
MX269022A	LTE TDD Downlink Measurement Software	\checkmark	~	~	~	~	R	R	R *1				
MX269022A-001	LTE-Advanced TDD Downlink Measurement Software	~	~	~	~	✓	R	R	R *1	U	U	Require MX269022A	
MX269023A	LTE TDD Uplink Measurement Software	\checkmark	~	✓	~	✓	R	R	R *1				
MX269023A-001	LTE-Advanced TDD Uplink Measurement Software	~	~	~	~	✓	R	R	R *1	U	U	Require MX269023A	
MX269024A	CDMA2000 Forward Link Measurement Software	~	~	~	~	✓		R					
MX269024A-001	All Measure Function	~	~	✓	~	✓		R				Require MX269024A	
MX269026A	EV-DO Forward Link Measurement Software	~	~	✓	~	~		R					
MX269026A-001	All Measure Function	~	~	~	~	~		R				Require MX269026A	
MX269028A	WLAN (802.11) Measurement Software	~	~	~	~	~	R	R	R *1				
MX269028A-001	802.11ac (80 MHz) Measurement Software	~	~	~	~	~	R	R	R *1	R	R	Only for MS2830A. Require MX269028A	
MX269030A	W-CDMA BS Measurement Software	~	~	~	~	✓		R					

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

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

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

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

MS2840A Software Configuration

Model	Name		Addition to	Analysis Bandwidth				
		040 (3.6 GHz)	041 (6 GHz)	044 (26.5 GHz)	046 (44.5 GHz)	077 (62.5 MHz)	078 (125 MHz)	
MX269017A	Vector Modulation Analysis Software	~	~	~	~	~	✓	
MX269017A-001	APSK Analysis	~	~	✓	~	~	✓	
MX269017A-011	Higher-Order QAM Analysis	✓	~	~	~	~	✓	
MX269018A	Analog Measurement Software*	✓	✓	✓	✓			
MX284059A	Pulse Radar Measurement Function	No	No	~	~			

*: Requires USB Audio A0086C

 \checkmark = Can be installed, No = Cannot be installed, R = Require, U = Upgrade

MS2850A/MS2840A/MS2830A Configuration (Continued)

MS2850A Software Configuration

Option	Name		Main frame be installed		dwidth option pgrade	Note	
Option		MS2850A-046 (44.5 GHz model)	MS2850A-047 (32 GHz model)	MS2850A-033 (510 MHz)	MS2850A-034 (1 GHz)		
MX285051A	5G Standard Measurement Software (Base License)	~	~	U	U	This license can't be used alone. Require MX285051A-001/011/021/031/ 051/061/071/081	
MX285051A-001	Pre-Standard CP-OFDM Downlink	√	√	U	U	Require MX285051A	
MX285051A-051	Pre-Standard CP-OFDM Uplink	√	✓	U	U	Require MX285051A	
MX285051A-011	NR TDD sub-6 GHz Downlink	√	✓			Require MX285051A	
MX285051A-061	NR TDD sub-6 GHz Uplink	√	√			Require MX285051A	
MX285051A-031	NR FDD sub-6 GHz Downlink	√	\checkmark			Require MX285051A	
MX285051A-081	NR FDD sub-6 GHz Uplink	√	✓			Require MX285051A	
MX285051A-021	NR TDD mmWave Downlink	·····√	✓	U	U	Require MX285051A	
MX285051A-071	NR TDD mmWave Uplink	√	✓	U	U	Require MX285051A	
MX269011A	W-CDMA/HSPA Downlink Measurement Software	~	~				
MX269012A	W-CDMA/HSPA Uplink Measurement Software	~	~				
MX269013A	GSM/EDGE Measurement Software	✓	✓				
MX269013A-001	EDGE Evolution Measurement Software	~	~			Require MX269013A	
MX269015A	TD-SCDMA Measurement Software	√	✓				
MX269020A	LTE Downlink Measurement Software	√	✓				
MX269020A-001	LTE-Advanced FDD Downlink Measurement Software	√	~			Require MX269020A	
MX269021A	LTE Uplink Measurement Software	✓	✓				
MX269021A-001	LTE-Advanced FDD Uplink Measurement Software	√	~			Require MX269021A	
MX269022A	LTE TDD Downlink Measurement Software	~	~				
MX269022A-001	LTE-Advanced TDD Downlink Measurement Software	√	~			Require MX269022A	
MX269023A	LTE TDD Uplink Measurement Software	~	~				
MX269023A-001	LTE-Advanced TDD Uplink Measurement Software	~	~			Require MX269023A	
MX269017A	Vector Modulation Analysis Software	√	 ✓ 				
MX269017A-001	APSK Analysis	√	~			Require MX269017A	
MX269017A-011	Higher-Order QAM Analysis	√	√			Require MX269017A	

Ordering Information

Please specify the model/order number, name and quantity when ordering. The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No	Name	Model/Order No	Name
	Main Frame	MX285051A-031	NR FDD sub-6 GHz Downlink
MS2690A	Signal Analyzer (50 Hz to 6 GHz)		(MS2850A only, Requires MX285051A)
MS2691A	Signal Analyzer (50 Hz to 13.5 GHz)	MX285051A-081	NR FDD sub-6 GHz Uplink (MS2850A only, Requires MX285051A
MS2692A	Signal Analyzer (50 Hz to 26.5 GHz)	MX285051A-021	NR TDD mmWave Downlink
MS2850A-047	Signal Analyzer (9 kHz to 32 GHz)		(MS2850A only, Requires MX285051A)
MS2850A-046	Signal Analyzer (9 kHz to 44.5 GHz)	MX285051A-071	NR TDD mmWave Uplink (MS2850A only, Requires MX285051A)
MS2840A-040	Signal Analyzer (9 kHz to 3.6 GHz)	MX269051A	5G Standard Measurement Software (Base License)
MS2840A-041	Signal Analyzer (9 kHz to 6 GHz)	NAV2600511 011	(MS269xA only, Requires MX269051A-011/031/061/081)
MS2840A-044	Signal Analyzer (9 kHz to 26.5 GHz)	MX269051A-011	NR TDD sub-6 GHz Downlink
MS2840A-046	Signal Analyzer (9 kHz to 44.5 GHz)	MX269051A-061	(MS269xA only, Requires MX269051A) NR TDD sub-6 GHz Uplink (MS269xA only, Requires MX269051A
MS2830A-040	Signal Analyzer (9 kHz to 3.6 GHz)		NR TDD sub-6 GHz Opink (MS2699XA Only, Requires MX2690514 NR FDD sub-6 GHz Downlink
MS2830A-041	Signal Analyzer (9 kHz to 6 GHz)	MX269051A-031	
MS2830A-043	Signal Analyzer (9 kHz to 13.5 GHz)	MX269051A-081	(MS269xA only, Requires MX269051A) NR FDD sub-6 GHz Uplink (MS269xA only, Requires MX269051A
MS2830A-044	Signal Analyzer (9 kHz to 26.5 GHz)	101/203031A-001	
MS2830A-045	Signal Analyzer (9 kHz to 43 GHz)	W3098AE	Application Parts MX269011A Operation Manual (Operation)
	Software Options	W3099AE	
	CD-ROM with license and operation manuals	W3099AE W3060AE	MX269011A Operation Manual (Remote Control) MX269012A Operation Manual (Operation)
MX269011A	W-CDMA/HSPA Downlink Measurement Software	W3061AE	MX269012A Operation Manual (Operation) MX269012A Operation Manual (Remote Control)
MX269012A	W-CDMA/HSPA Uplink Measurement Software	W3100AE	MX269013A Operation Manual (Operation)
MX269013A	GSM/EDGE Measurement Software	W3101AE	MX269013A Operation Manual (Remote Control)
MX269013A-001	EDGE Evolution Measurement Software	W3031AE	MX269014A Operation Manual (Operation)
MX269014A	(Requires MX269013A)	W3032AE	MX269014A Operation Manual (Remote Control)
MX269014A MX269015A	ETC/DSRC Measurement Software (MS269xA only) TD-SCDMA Measurement Software	W3044AE	MX269015A Operation Manual (Operation)
MX269017A	Vector Modulation Analysis Software	W3045AE	MX269015A Operation Manual (Remote Control)
MX269017A-001	APSK Analysis (Requires MX269017A)	W3305AE	MX269017A Operation Manual (Operation)
MX269017A-001	Higher-Order QAM Analysis (Requires MX269017A)	W3306AE	MX269017A Operation Manual (Remote Control)
MX269018A	Analog Measurement Software (For MS2840A and MS2830A.	W3555AE	MX269018A Operation Manual (Operation)
111/203010/1	MS2830A-066 and A0086C are required for MS2830A.	W3556AE	MX269018A Operation Manual (Remote Control)
	A0086C is required for MS2840A.)	W3014AE	MX269020A Operation Manual (Operation)
MX269020A	LTE Downlink Measurement Software	W3064AE	MX269020A Operation Manual (Remote Control)
MX269020A-001	LTE-Advanced FDD Downlink Measurement Software	W3015AE	MX269021A Operation Manual (Operation)
	(Requires MX269020A)	W3065AE	MX269021A Operation Manual (Remote Control)
MX269021A	LTE Uplink Measurement Software	W3209AE	MX269022A Operation Manual (Operation)
MX269021A-001	LTE-Advanced FDD Uplink Measurement Software	W3210AE	MX269022A Operation Manual (Remote Control)
	(Requires MX269021A)	W3521AE	MX269023A Operation Manual (Operation)
MX269022A	LTE TDD Downlink Measurement Software	W3522AE	MX269023A Operation Manual (Remote Control)
MX269022A-001	LTE-Advanced TDD Downlink Measurement Software	W3201AE	MX269024A Operation Manual (Operation)
	(Requires MX269022A)	W3202AE	MX269024A Operation Manual (Remote Control)
MX269023A	LTE TDD Uplink Measurement Software	W3203AE	MX269026A Operation Manual (Operation)
MX269023A-001	LTE-Advanced TDD Uplink Measurement Software	W3204AE	MX269026A Operation Manual (Remote Control)
	(Requires MX269023A)	W3528AE	MX269028A Operation Manual (Operation)
MX269024A	CDMA2000 Forward Link Measurement Software	W3529AE	MX269028A Operation Manual (Remote Control)
MX269024A-001	All Measure Function (Requires MX269024A)	W2860AE	MX269030A Operation Manual (Operation)
MX269026A	EV-DO Forward Link Measurement Software	W2861AE W4029AE	MX269030A Operation Manual (Remote Control) MS2840A Signal Analyzer Operation Manual
MX269026A-001	All Measure Function (Requires MX269026A)	W4029AE	
MX269028A	WLAN (802.11) Measurement Software	W3922AE	(Pulse Radar Measurement Function) MX285051A/MX269051A Operation Manual (Operation)
MX269028A-001	802.11ac (80 MHz) Measurement Software	W3922AE W3924AE	MX285051A-001/MX285051A-051 Operation Manual (Operation)
	(MS2830A only, Requires MX269028A)	VVJJZ4AL	(Operation)
MX269028A-002	802.11ac (160 MHz) Measurement Software	W3925AE	MX285051A-001/MX285051A-051 Operation Manual (Remote
	(MS269xA only, Requires MX269028A)	WUJJEJAL	Control)
MX269030A	W-CDMA BS Measurement Software	W3963AE	MX285051A-011/MX269051A-011/MX285051A-021/
MX284059A	Pulse Radar Measurement Function (MS2840A-044/046 only)	1100000/1E	MX285051A-061/MX269051A-061/MX285051A-071
MX285051A	5G Standard Measurement Software (Base License)		Operation Manual (Operation)
	(MS2850A only, Requires MX285051A-001/011/021/031/051/	W3964AE	MX285051A-011/MX269051A-011/MX285051A-021/
	061/071/081) Dra Standard CR OEDM Downlink		MX285051A-061/MX269051A-061/MX285051A-071
MX285051A-001	Pre-Standard CP-OFDM Downlink		Operation Manual (Remote Control)
	(MS2850A only, Requires MX285051A)	W4035AE	MX285051A-031/MX269051A-031/MX285051A-081/
MX285051A-051	Pre-Standard CP-OFDM Uplink		MX269051A-081 Operation Manual (Operation)
MY285051A 011	(MS2850A only, Requires MX285051A)	W4036AE	MX285051A-031/MX269051A-031/MX285051A-081/
MX285051A-011	NR TDD sub-6 GHz Downlink		MX269051A-081 Operation Manual (Remote Control)
	(MS2850A only, Requires MX285051A)		

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