Product Brochure



MS2690A/MS2691A/MS2692A Signal Analyzer MS2830A Signal Analyzer

MX2690xxA series

Measurement Software





MS269xA and MS2830A Signal Analyzers

The MS269xA Signal Analyzer is the high-end model supporting best-of-class high-accuracy, a wide dynamic range and 125 MHz wideband analysis.

The MS2830A is the mid-range model with excellent cost performance supporting superior RF performance, best-of-class speed, and low power consumption.

		MS269xA (High-end model)	MS2830A (Middle-range model)
Feature		 High level accuracy up to 6 GHz expandable to 4G, and 125 MHz wideband 177dB dynamic range without external filter for spurious measurements 	 High-speed, low-cost, low power-consumption cuts manufacturing costs Environment-friendly energy saving design
Measurement	Frequency range	50 Hz to 6 GHz 50 Hz to 13.5 GHz 50 Hz to 26.5 GHz	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
range	Analysis bandwidth	31.25 MHz 62.5 MHz (Opt.) 125 MHz (Opt.)	None 10 MHz (Opt.) 31.25 MHz (Opt.) 62.5 MHz (Opt.)*1 125 MHz (Opt.)*1
	Displayed average noise level TOI	-155 dBm/Hz (30 MHz to 2.4 GHz) -151 dBm/Hz (6 GHz to 10 GHz) +22 dBm (700 MHz to 4 GHz)	-153 dBm/Hz (30 MHz to 1 GHz) -142 dBm/Hz (6 GHz to 13.5 GHz) +15 dBm (300 MHz to 3.5 GHz)
RF	Total level accuracy	±0.3 dB (typ., 50 Hz to 6 GHz)	±0.3 dB (typ., 300 kHz to 4 GHz)
performance	Residual vector error*2	W-CDMA/HSPA Downlink: ≤1.0% (rms) W-CDMA/HSPA Uplink: ≤1.0% (rms) LTE Downlink: <1.0% (rms) LTE Uplink: <1.0% (rms)	W-CDMA/HSPA Downlink: ≤1.3% (rms) W-CDMA/HSPA Uplink: ≤1.2% (rms) LTE Downlink: <1.3% (rms) LTE Uplink: <1.2% (rms)

*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 MS2830A analysis bandwidth (125 MHz max.).

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

*2: Note that the residual vector error performance of the MS269xA and MS2830A is different due to the difference in basic performance. Refer to the specifications page for the specifications for other residual vector error software.

Built-in Standard Spectrum Measurement Function

Both the MS269xA and MS2830A support the following spectrum measurements as standard functions that can be used in combination with measurement software.

Spurious Emission

Burst Average Power

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



Spectrum Emission Mask

• 2-tone 3rd-order Intermodulation Distortion

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Spurious Emission



MX2690xxA series Measurement Software

The MX2690xxA series of measurement software can be used by both the MS269xA and MS2830A. Installing this software adds modulation analysis for each communication system to the MS269xA and MS2830A. The platforms supported by the MX2690xxA are shown below.

Communications systems	Name	Model Pa		MS269xA	MS269xA Option	MS2830A	MS2830A Option		
					Opt. 077/078		Opt. 006	Opt. 005/009	Opt. 077/078
Mobile WiMAX	Mobile WiMAX Measurement Software	MX269010A	5	√		√	√	√	
W-CDMA/HSPA/	W-CDMA/HSPA Downlink Measurement Software	MX269011A	7	√		√	√		
HSPA Evolution	W-CDMA/HSPA Uplink Measurement Software	MX269012A	9	√		√	√		
GSM/EDGE	GSM/EDGE Measurement Software	MX269013A	11	√		√	√		
EDGE Evolution	EDGE Evolution Measurement Software	MX269013A-001*7	11	√		√	√		
ETC/DSRC	ETC/DSRC Measurement Software	MX269014A	13	√					
TD-SCDMA	TD-SCDMA Measurement Software	MX269015A	15	√		√	√		
Next-generation PHS (XGP)	XG-PHS Measurement Software	MX269016A	17	√					
World Digital Wireless Standards	Vector Modulation Analysis Software	MX269017A	19	√	√*14	√	√	√ *14	√*14
Analog Wireless	Analog Measurement Software	MX269018A*8	26			√			
	LTE Downlink Measurement Software	MX269020A	29	√		√	√	✓	
3GPP LTE (FDD)	LTE-Advanced FDD Downlink Measurement Software	MX269020A-001*9	29	√	√*15	√	√	√ *15	√*15
	LTE Uplink Measurement Software	MX269021A	35	√		√	√	√	
	LTE TDD Downlink Measurement Software	MX269022A	29	√		√	√	√	
3GPP LTE (TDD)	LTE-Advanced TDD Downlink Measurement Software	MX269022A-001*10	29	√	√ *15	√	√	√ *15	√ *15
	LTE TDD Uplink Measurement Software	MX269023A	35	√		√	√	√	
CDM42000	CDMA2000 Forward Link Measurement Software	MX269024A	40	√		√	√		
CDMA2000	All Measure Function	MX269024A-001	40	√		√	√		
1xEV-DO	EV-DO Forward Link Measurement Software	MX269026A	40	√		√	√		
IXEV-DO	All Measure Function	MX269026A-001	40	√		√	√		
	WLAN (802.11) Measurement Software (Supports IEEE802.11n/11p/11a/11b/11g/11j)	MX269028A	43	~		~	~	~	
WLAN	802.11ac (80 MHz) Measurement Software	MX269028A-001*11	43			√	√	√ *16	√*16
	802.11ac (160 MHz) Measurement Software	MX269028A-002*11	43	√	√*16				
W-CDMA/HSPA	W-CDMA BS Measurement Software	MX269030A	53	√		√	√		
Media FLO	Measurement Software for MediaFLO	MX269036A	55	√					
	Wireless Network Device Test Software	MX283027A	60			√			
WLAN	WLAN Test Software (Supports IEEE802.11n/11a/11b/11g)	MX283027A-001*12, *13	60			√	√	√	
Bluetooth	Bluetooth Test Software	MX283027A-002*12	60			√	√		

Note, the MS269xA and MS2830A require the following options:

[MS269xA Option]

MS269xA-077 Analysis Bandwidth Extension to 62.5 MHz
 MS269xA-078 Analysis Bandwidth Extension to 125 MHz^{*1}

[MS2830A Option] MHz • MS2830A-005 Ana

MS2830A-005 Analysis Bandwidth Extension to 31.25 MHz^{*2}

MS2830A-006 Analysis Bandwidth 10 MHz

MS2830A-009 Bandwidth Extension to 31.25 MHz for Millimeter-wave*3

- MS2830A-077 Analysis Bandwidth Extension to 62.5 MHz^{*4, *6}
- MS2830A-078 Analysis Bandwidth Extension to 125 MHz^{*5, *6}

*1: MS269xA-077 is necessary.

- *2: Available only when MS2830A-040/041/043/044 is installed. Requires Opt.006.
- *3: Available only when MS2830A-045 is installed. Requires Opt.006.
- *4: Requires MS2830A-006 and MS2830A-005 (for MS2830A-040/041/043/044).
- Requires MS2830A-006 and MS2830A-009 (for MS2830A-045).
- *5: 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).
- *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 MS2690A/91A/92A Signal Analyzer series is recommended for other measurement purposes.

*7: Requires MX269013A

- *8: Requires MS2830A-066 and A0086A USB Audio
- *9: Requires MX269020A
- *10: Requires MX269022A
- *11: Requires MX269028A
- *12: Requires MX283027A

*13: MX283027A-001 includes MX269911A WLAN IQproducer (Cannot order MX283027A-001 and MX269911A at same time).



*14: The Symbol Rate setting range varies as follows, depending on the option configuration.

	Model	Modulation Method				
MS269xA	MS2830A	O-QPSK	FSK	Except FSK		
MS209XA	MS269XA MS283UA U-QPSK		FOR	Frame Formatted	Non-Formatted	
Opt. 078, Opt. 077 installed	Opt. 078, Opt. 077, Opt. 005/009, Opt. 006 installed	0.1 ksps to 12.5 Msps	0.1 ksps to 25 Msps	0.1 ksps to 50 Msps	0.1 ksps to 140 Msps	
Opt. 077 installed	Opt. 077, Opt. 005/009, Opt. 006 installed	0.1 ksps to 6.25 Msps	0.1 ksps to 12.5 Msps	0.1 ksps to 25 Msps	0.1 ksps to 70 Msps	
Standard	Opt. 005/009, Opt. 006 installed	0.1 ksps to 3.125 Msps	0.1 ksps to 6.25 Msps	0.1 ksps to 12.5 Msps	0.1 ksps to 35 Msps	
_	Opt. 006 installed	0.1 ksps to 1.25 Msps	0.1 ksps to 2.5 Msps	0.1 ksps to 5 Msps	0.1 ksps to 5 Msps	

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

	00 0		,	
Main frame	Analysis Bandwidth	Maximum Analysis Bandwidth	Maximum Number of Band	Maximum Number of
Iviairi Iraine	Extension Option	(In-band carrier aggregation range)	Maximum Number of Band	Component Carrier
	Opt. 078 installed	125 MHz	3	5
MS269xA	Opt. 077 installed	31.25 MHz	3	5
	Standard	31.25 MHz	3	5
	Opt. 078 installed	125 MHz	1	5
MS2830A	Opt. 077 installed	31.25 MHz	3	5
	Opt. 005/009 installed	31.25 MHz	3	5

*16: The IEEE802.11ac measurement range varies as follows, depending on the Analysis Bandwidth Extension option configuration.

	Model			Bandwidth of IEEE802.11ac signal			
Main frame	Measurement software	Analysis Bandwidth Extension Option Configuration	20 MHz	40 MHz	80 MHz	160 MHz	80 MHz + 80 MHz
		Opt. 078 installed	~	~	✓	~	√*17
MS269xA	MX269028A-002	Opt. 077 installed	~	~			
		Standard	✓	✓			
		Opt. 078 installed	~	~	√*18		
MS2830A	MX269028A-001	Opt. 077 installed	~	~			
		Opt. 005/009 installed	~	~			

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

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



Measurement Software for Smart Meter

This software is for PC. This software supports automatic measurement of the PHY layer and protocol analysis of the PHY/MAC layer of smart utility network wireless communications (Wi-SUN).

- MX705010A Wi-SUN PHY Measurement Software^{*1}
- MX705110A Wi-SUN Protocol Monitor*2

The MX705010A^{*1} supports automatic measurement of Wi-SUN Alliance PHY Conformance test cases. The MS269xA/ MS2830A is controlled by remote commands from this software.

*1: - Only Wi-SUN Alliance members can purchase this software.

- Cannot be installed in MS269xA/MS2830A.
- Requires the latest firmware of MS269xA/MS2830A.

This service, which provides updated versions of firmware and software for downloading by product customers, is available on Anritsu's website. https://www1.anritsu.co.jp/Download/MService/Login.asp

Main frame	Options configuration examples	
MS269xA	MX269017A, MS269xA-020, MX269902A	
MS2830A	MS2830A-041, MS2830A-002, MS2830A-006, MX269017A, MS2830A-020, MS2830A-022, MS2830A-027, MX269902A	

MX705110A*² supports Wi-SUN protocol analysis. The wireless signals*³ between communicating devices are captured as I/Q data using the MS269xA digitize function and data analysis is performed by this software. Data analysis displays the PHY/MAC frame format, Tx timing, etc.

- *2: Cannot be installed in MS269xA/MS2830A.
- Requires the latest firmware of MS269xA/MS2830A.
 MS2830A-006 is necessary for MS2830A.

*3: - IEEE 802.15.4g/e (GFSK)

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- CDMA2000® is a registered trademark of the Telecommunications Industry Association (TIA-USA).
- Media FLO[™] is a registered trademark of Qualcomm Inc.
- Wi-SUN® is a registered trademark of Wi-SUN Alliance.

000 "Техэнком" Контрольно-измерительные приборы и оборудование www.tehencom.com MX269010A Mobile WIMAX Measurement Software



MS2830A

The MX269010A Mobile WiMAX Measurement Software supports measurement of IEEE802.16e RF Tx characteristics. Installing it in the MS269xA and MS2830A supports fast, high-accuracy measurements ideal for efficient R&D and early rollout of Mobile WiMAX base stations, mobile terminals, and components.

Versatile Functions for Mobile WiMAX Development

Mobile WiMAX Measurement Software supports modulation analysis and transmit power measurement required for development of Mobile WiMAX base stations, mobile terminals, and device components.

Downlink Measurement Functions

- Frequency Offset
- Vector Error (EVM) [Peak/rms]
- CINR
- Preamble Power
- Downlink Average Power
- Timing Error
- Constellation
- Power spectrum vs. Subcarrier
- Power vs. Time
- I/Q data vs. Subcarrier
- Map Information
- EVM vs. Subcarrier
- EVM vs. Symbol
- Spectral Flatness

Uplink Measurement Functions

- Frequency Offset
- Vector Error (EVM) [Peak/rms]
- Channel Power
- Unmodulated subcarrier error
- Pilot subcarrier power
- Data subcarrier power
- Null subcarrier power
- Constellation
- Power spectrum vs. Subcarrier
- Power vs. Time
- EVM vs. Subcarrier
- EVM vs. Symbol
- Spectral Flatness

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 Analysis Length 5ms, Cyclic Prefix: 1/4, 1/8, 1/16, 1/32 20, 10, 8.75, 7, 5, 3.5 MHz Bandwidth 64QAM, 16QAM, QPSK Modulation Method Measurement Frequency 2.3 GHz to 3.8 GHz Range Modulation/ -15 to +30 dBm -15 to +30 dBm Frequency Measurement Level Range (Preamp Off, or Preamp not installed) (Preamp Off, or Preamp not installed) Measurement -30 to +20 dBm (Preamp On) Carrier Frequency At 18° to 28°C, after calibration ± (Accuracy of reference frequency × Carrier frequency + 20 Hz) Measurement Accuracy At 18° to 28°C, after calibration Residual Vector Error <0.6% (rms) (Under 10 MHz BW) <1.6% (rms) (Under 10 MHz BW) <0.8% (rms) (20 MHz BW) <1.8% (rms) (20 MHz BW) Spectral Flatness Accuracy ±0.3 dB Tx Power Measurement Accuracy At 18° to 28°C, after calibration (This is found from root sum of ±0.6 dB (Preamp Off, or Preamp not installed) ±0.6 dB (Preamp Off, or Preamp not installed) Amplitude squares (RSS) of absolute ±1.1 dB (Preamp On) Measurement amplitude accuracy and in-band frequency characteristics of main frame.)

Modulation

This function displays the constellation and subcarrier spectrum for a specified symbol along with frequency error, EVM, power, etc., results as text. It is useful for finding symbol-dependent faults.

Adulation		2.000000000 GHz ATTEN: 10 dB	Photodetere(0.)
			Symbol
/Q Constellation	Information Freq Offset :	0.01 Hz	[19/20]
	Timing Error :		Subcarrier
	Total EVM (mms) : Preamble Excluded	0.17 % -55.22 dB 0.25 % -52.04 dB	14
	Total EVM (peak) :	1.03 % -39.70 dB at SubCarr -288, Symbol 22	Input Type
	Preamble EVM : Symbol EVM :	0.10 % -60.31 dB 0.25 % -52.06 dB	JOHT/OPSK/ BIGAM/GHDAM
	SWIDOLEVM : CINR :	0.25 % -52.06 db 50.11 dB	Graph
	Preamble Power : DL Average Power :	-10.71 dBm -14.51 dBm	Dubcarrier Spectrum
Power Spectrum	DC AND AGE FOWER :	-1451.00m	Marker
1277 45.56			10+7-04
2020 (100) (where the state of the state	- Inderstandig and	
THE WORLD			-

Modulation

Map Information

The distribution (map) of the DL burst is displayed with logical subchannel on the vertical axis and symbol on the horizontal axis. The burst information and modulation accuracy are displayed for the specified burst.



Map Information

EVM vs. Subcarrier

The EVM distribution of each subcarrier at the specified symbol is displayed. This can be used to find instantaneous subcarrier-dependent EVM degradation.

Error Vector Spectrum		2.000000000 GHz	ATTEN: 10 dB	
Subcarrier Index		R. [PT] H4.]	31	Symbol
	Information Freq Offset : Traing (Fror : Total EVAt (rms) : Prearble Excluded Total EVAt (sock) : Prearble EVAt : Symbol EVAt : CINR : Prearble Power : DL Average Power :	0.01 Hz us 0.17 % - 35.30 db 0.25 % - 35.92 dB 1.14 % - 38.85 dB at SubCarr -415, 92 0.09 % - 51.03 dB 50.30 dB -11.34 dBm -11.34 dBm	mbol 1	(13/28) Suburier (21) Basit Type (21) Basit Type Jacoby Segue Hater (24) Off
Imor Vector Spectrum			DVM : 0.20 %	

EVM vs. Subcarrier

EVM vs. Symbol

The EVM distribution for each symbol is displayed. This can be used to find instantaneous symbol-dependent EVM degradation.



EVM vs. Symbol

Spectral Flatness

The Absolute Flatness Display indicates the difference between the average power and power of each subcarrier; the Differential Flatness Display indicates the power difference between adjacent subcarriers.



Spectral Flatness

MIMO Signal Measurement

The modulation accuracy, frequency error, Tx power, spectral flatness, etc., for both ANT 0 and ANT 1 MIMO signals are measured by switching between ANT 0 and ANT 1.



Map Information (ANT 1)

ооо "Техэнком" Контрольно-измерительные приборы и оборудование www.tehencom.com MX269011A W-CDMA/HSPA Downlink Measurement Software



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

Installing it in the MS269xA and 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

- Code vs. Time
- Mean Power
- P-CPICH/P-SCH/S-SCH
- Vector Error/Amplitude Error/Phase Error
- Code Power
- Code vs. Time
- Code Domain/Code Domain Error
- 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)

Signal Analyzer		MS269xA	MS2830A		
Common Specifications	Target Signals	W-CDMA/HSPA/HSPA Evolution Downlink			
	Measurement Frequency Range	400 MHz to 3 GHz			
Modulation/	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) 		
Frequency Measurement	Carrier Frequency Measurement Accuracy	At 18° to 28°C, after calibration, EVM = 1% signal ± (Accuracy of reference frequency × Carrier frequency + 5 Hz)	± (Accuracy of reference frequency × Carrier frequency + 6 Hz)		
	Residual Vector Error	At 18° to 28°C, after calibration, When input signal wit ≤1.0% (rms)	hin measurement level range and less than input level ≤1.3% (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° to 28°C, after calibration, Input attenuator ≥10 When input signal within measurement level range at ±0.6 dB (Preamp Off, or Preamp not installed) ±1.1 dB (Preamp On)	nd less than input level ±0.6 dB (Preamp Off, or Preamp not installed)		
		At 18° to 28°C, after calibration, When input signal wit	hin 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	Code Domain Error	Relative Accuracy: <=-46 dB Relative Accuracy: <=-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 Code Domain Power, Code Domain Error	Error vs. Symbol, Symbol Constellation,		
Spectrum Measurement	Measurement Functions	Adjacent Channel Leakage Power, Channel Power, C	Occupied Bandwidth, Spectrum Emission Mask		

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 TS25.141, 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 time-dependent (symbol units) signal degradation for a specific code.



Code Domain (Constellation)



Code Domain (Vector Error vs. Symbol)

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

Installing it in the MS269xA and 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

Attenuator mode: Mechanical Attenuator Only (MS2830A only)

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.

Signal Analyzer		MS269xA	MS2830A			
Common Specifications	Target Signal	W-CDMA/HSPA/HSPA Evolution Uplink				
	Measurement Frequency Range	400 MHz to 3 GHz				
Modulation/	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)			
Frequency Measurement	Carrier Frequency	At 18° to 28°C, after calibration, EVM = 1% signal				
Weasurement	Measurement Accuracy	± (Accuracy of reference frequency × Carrier frequency + 5 Hz)	± (Accuracy of reference frequency × Carrier frequency + 6 Hz)			
	Residual Vector Error	At 18° to 28°C, after calibration, When input signal wit	thin measurement level range and less than input level			
	Residual vector Error	≤1.0% (rms)	≤1.2 % (rms)			
	Tx Power Measurement Accuracy (This is found from root sum of	At 18° to 28°C, after calibration, Input attenuator ≥10 dB, When input signal within measurement level range and less than input level				
Amplitude 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)	±0.6 dB (Preamp Off, or Preamp not installed)			
		At 18° to 28°C, after calibration, When input signal within 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	Code Domain Error	Residual Error: ≤-46 dB Accuracy: ±0.3 dB (Code Domain Error ≥-30 dBc) ±1.0 dB (Code Domain Error ≥-40 dBc)	Residual Error: ≤–42 dB			
	Waveform Display	EVM vs. Symbol, Amplitude Error vs. Symbol, Vector Code Domain Error, Code Domain Power	r Error vs. Symbol, Symbol Constellation,			
Spectrum Measurement	Measurement Functions	Adjacent Channel Leakage Power, Channel Power,	Occupied Bandwidth, Spectrum Emission Mask			

Spectrum

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

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

Carrier Freq.	2 000 000 000 Hz	Input Level	-10.00 dBm			Tours Made
Result	M	ATT	4 cti	Average & Ma		EVM vs Chip
MKR TargetSlot 0 0 chip		Frequen Mean Po	0.00		Hz ppm	Mag Error va Chip
Q 0.3190		EVM/ms EVMpea I Mag.Em Phase El Origin Of	() 0, k) 1, pr(ma) 0, recima) 0,	20 / 0.29 25 / 1.65 17 / 0.17 13 / 0.13 76 / 55.44	88 × × × 8	Phase Error V8 Chip
Phase Error vs C	NIP	Peak CD Peak Act	E .57.62 Ive CDE .57.62	1 5664 48	CH 5F 10 2 4 0 2 4	
MKR Chi	p O Phase	Error -0.12 deg	TargetSlot 0			
250						
600				, and the second second		
-150						

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 HEP	A Uplick					7/29/2008	
	2 000 000 000 Hz	Input Level ATT	-10.00 dBm 4 dB			Code Does	
etu!		_				Permar	Error
ode Domain P	OWNER						
Power	4.61 dB Error	2 / 4 -59.05 dB	Modulation 4PAM	Branch I Target Slot 0			
4100 4100 4100 4100		â		Mean Power	-10.74 dBm		
	0	10	101 225	EVM(rms)	0.19 %		
	478 dB Error	21 4 58.47 dB	Modulation 4PAM	EVM(peak)	0.58 %		
Power	4.78 CB Error	-58.41 05	Modulation 4PAM	Mag. Error			
-217				Code Power	-4.61 dB		
11		1				100000	102
ode Power va	0	822	10 25			Conste	lation
MKR Symb		wer -2.16	dB Target Slot 0				
						EM	
						Sym	
0.0000	ומני געירע איז	U DUCT KUNA TIMO U	מרוענו ומנותים היו ונ	תינים שמשוושניים	COLUMN 1	Mag	
-1000	IN LECTION AND	Y I D Y KU	ALL FULLY MADE IN		TODATM	- VS	
						5ym	bol
						Code P	ower
					\$75 639	Sym	had

Code Domain Power and Code Power vs. Symbol

OOO "Техэнком" Контрольно-измерительные приборы и оборудование www.tehencom.com MX269013A GSM/EDGE Measurement Software MX269013A-001 EDGE Evolution Measurement Software

MS269xA

MS2830A

The MX269013A GSM/EDGE Measurement Software and MX269013A-001 EDGE Evolution Measurement Software support measurement of the RF Tx characteristics of GSM/EDGE (EGPRS) and EDGE Evolution (EGPRS2) signals. Installation in the MS269xA and 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. The specifications are defined under the following condition unless otherwise specified.

Attenuator mode: Mechanical Attenuator Only (MS2830A only) Signal Analyzer MS269xA MS2830A GSM/EDGE Downlink and uplink (MX269013A) Supported Signals EDGE Evolution Downlink and Uplink (MX269013A-001) Shared Specifications GMSK, 8PSK (Normal Burst, Continous) (MX269013A) Modulation Method QPSK, 16QAM, 32QAM (Normal Burst, Higher Symbol Rate Burst, Continous) (MX269013A-001) Measured Frequency Range 400 MHz to 2 GHz -15 to +30 dBm -15 to +30 dBm (Preamp Off, or Preamp not installed) (Preamp Off, or Preamp not installed) Measured Level Range -30 to +10 dBm (Preamp On) At 18° to 28°C, after calibration, with EVM = 1% signal Carrier Frequency Measurement Accuracy ± (Accuracy of reference frequency × Carrier frequency + 5 Hz) ± (Accuracy of reference frequency × Carrier frequency + 8 Hz) Modulation/ Residual Vector Error At 18° to 28°C, after calibration, with input signal in measurement level range and less than Input level Frequency (QPSK, 8PSK, 16QAM, 32QAM) ≤0.6% (rms) ≤1.0% (rms) Measurement Residual Phase Error At 18° to 28°C, after calibration, with input signal in measurement level range and less than Input level (GMSK) ≤0.5 deg (rms) ≤0.7 deg (rms) Waveform Display Constellation, Phase Error vs. Symbol, EVM vs. Symbol (at 8PSK only), Magnitude Error vs. Symbol (at 8PSK only) (MX269013A) Waveform Display Constellation, Phase Error vs. Symbol, EVM vs. Symbol, Magnitude Error vs. Symbol (MX269013A-001) Tx Power Measurement Accuracy At 18° to 28°C, after calibration, with input attenuator ≥10 dB and input signal in measurement level range (This is found from root sum of and less than Input level squares (RSS) of absolute ±0.6 dB (Preamp Off, or Preamp not installed) ±0.6 dB (Preamp Off, or Preamp not installed) Amplitude amplitude accuracy and in-band ±1.1 dB (Preamp On) Measurement frequency characteristics of main frame.) Waveform Display Rise, Fall, Slot, Frame At 18° to 28°C, after calibration, with input attenuator ≥10 dB input signal 0 to +30 dBm (at preamp Off, or no preamp installed), carrier frequency of 400 MHz to 2000 MHz, 5-pole filter Modulation Part Measurement Points ±100, ±200, ±250, ±400, ±600, ±800, ±1000, ±1200, ±1400, ±1600, ±1800, ±3000, ±6000 kHz <-41 dB (100 kHz detuning), <-66 dB (200 kHz detuning), Output RF Modulation Part <-74 dB (250 kHz detuning), <-79 dB (400 kHz detuning), Spectrum Measurement Range <-80 dB (<1200 kHz detuning), <-83 dB (<1800 kHz detuning), Measurement <-80 dB (≥1800 kHz detuning) Switching Transients part ±400, ±600, ±1200, ±1800 kHz Measurement Points Switching Transients part <-71 dB (400 kHz detuning), <-72 dB (600 kHz detuning), <-75 dB (1200 kHz detuning), <-75 dB (1800 kHz detuning) Measurement Range

Output Spectrum Measurement

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

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.

0.5M	Mary Conversion of				10	
			-10.00 dBm			Call H
Band						EVM
Signal	NB132QAM					**
Result				Average &		Symbol
MKR	0				Avg / Max	Mag Error
40 Symbol			Frequency Error	0.34 /	0.90 Hz 0.000 ppm	**
-0.2276				0.000 1	0.000 ppm	Symbol
			EVM(rms)		0.22 %	Phase Error
Q 1.1158			EVM(peak)			~
			Mag. Error(rms)			Symbol
			Phase Error(ms)		0.11 deg.	
			Origin Offset	-62.80 /	69.13 dB	
			95th percentile			
		-	Droop		3.65 nepera/s	
EVM ve Symbol		_		_		
	nbol 3	EVM (129 %			
	mm	ma				

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.)

000 "Техэнком" Контрольно-измерительные приборы и оборудование www.tehencom.com MX269014A ETC/DSRC Measurement Software



The MX269014A ETC/DSRC Measurement Software 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 ±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 PI/4DQPSK and ASK modulation signals to improve production throughout.

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

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



Modulation Analysis (PI/4DQPSK)

This analysis displays the PI/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.

larrier Freg. fodulation		100 000 14 DQP1	ATT		d8		Common Sutter	
Result						 erage & Max 10 /	 x/4 DOPSK	
	a				Avg	Max	-	1
	-			equency Error				
				(Power		-11.44 dBm		
				VM(rms)				
				VM(peak)				
				rigin Offset	-64.82	-60.99 dB		
				roop Factor	0.0000	0.0000 dB/symbol		
MKR 9/ 1 -0.70 Q -0.70								

Modulation Analysis (ASK)

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



000 "Техэнком" Контрольно-измерительные приборы и оборудование www.tehencom.com MX269015A TD-SCDMA Measurement Software



The MX269015A TD-SCDMA Measurement Software supports measurement of the TRx characteristics of TD-SCDMA 3G digital mobile devices.

Installing it in the MS269xA and 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)
- 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
Common	Channel Bandwidth	1.6 MHz	
Specifications	Target Signal	Downlink, Uplink	
	Measurement Frequency Range	1850 MHz to 2620 MHz	
		-15 to +30 dBm	-15 to +30 dBm
Modulation/	Measurement Level Range	(Preamp Off, or Preamp not installed)	(Preamp Off, or Preamp not installed)
Frequency		-30 to +10 dBm (Preamp On)	
Measurement	Carrier Frequency	At 18° to 28°C, after calibration, with EVM = 1% sign	al
	Measurement Accuracy	± (Accuracy of reference frequency × Carrier frequen	ncy + 20 Hz)
	Modulation Accuracy	At 18° to 28°C, after calibration, input signal in measure	urement level range and less than Input level
	Modulation Accuracy	Residual EVM: ≤1.0% (rms)	Residual EVM: ≤1.2% (rms)
	Tx Power Measurement Accuracy	At 18° to 28°C, after calibration, with input attenuator	· ≥10 dB and input signal in measurement level range
	(This is found from root sum of	and less than Input level	
Amplitude	squares (RSS) of absolute	±0.6 dB (Preamp Off, or Preamp not installed)	±0.6 dB (Preamp Off, or Preamp not installed)
Measurement	amplitude accuracy and in-band	±1.1 dB (Preamp On)	
	frequency characteristics of		
	main frame.)		
		At 18° to 28°C, after calibration, input signal in measure	urement level range and less than Input level
		Relative Accuracy:	
Code Domain	Code Domain Power	±0.18 dB (Code Power ≥–10 dBc)	
Measurement		±0.32 dB (Code Power ≥–30 dBc)	
mododromon	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 Conste	ellation
Spectrum Measurement	Measurement Functions	Adjacent Channel Leakage Power, Occupied Bandw	idth, Spectrum Emission Mask, Power vs. Time

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.

Carrier Freq.	201	10 000 0	00 Hz	Input	Len	el -10.00 dBm				Target Time Sot
arrier Number						8 dB				Time Slot
kesuž							Averag	e & Mari	10/ 10	0
MKR						Target Time Slot T			AvpMax	Time Slot
0 chip						Frequency Error				1
-0.0012						Mean Power	-18.36		-18.36 dBm	Time Slot
Q -0.0037						EVM(rms)	0.80		0.84 %	2
						EVM(peak)	9.02		10.21 %	
						Origin Offset	-65.42		-61.87 dB	Time Slot
						PCDE	-62.62		-51.88 dB	-
Code Dornain Po	WE! VE	Code N	umber							Time Slot
MKR	Chi Pov	annel / S		1 /		Error	-60.79 d			4
(40)										Time Slot
										5
										Time Slot
										6
		-		532				- 37	Care -	Burst

Constellation and Code Domain Power

	Channel / SF Power	1 / 16 -10.01 dB	Error	-69.38 dB	
Code Domain Power					

Code Number

Code Domain Power vs. 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

		010 000 00		Input Leve		10.00 dBm					TO-DODMA Trace Mode
Carrier Numbe											Code Domain
Result Multi Sict Pow						_		Average	& Max	101 10	Power
Subframe	Avg	-10,49									Code Domain
											Unor
			DwPTS								Multi Slot
Mean		-10.49	-10.53		-10.49	-10.49	-10.49	-10.49	-10,49	-10.49	
14:04:01	Max	-10.49	-10.53	-10.52	-10,49	-10.49	-10,49	-10.49	-10.49	-10,49	MultiCarrier Power
Data1		-10.48			-10.49	-10,49	-10.48	-10.49	-10,49	-10.48	
Uacan		-10,48			-10.49	-10,49	-10.48	-10,49	-10,49	-10.48	
Midamble		-10,49				-10.49	-10.49	-10.49		-10.49	
MIGERIOIE		-10.49			-10.49	-10.48	-10.48			-10.47	
Data2		-10,49				-10,49		-10.49	-10,49		
Comm2		-10,49			-10.49	-10,49	-10,49	-10.49	-10.49	-10.49	

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

000 "Техэнком" Контрольно-измерительные приборы и оборудование www.tehencom.com MX269016A XG-PHS Measurement Software



The MX269016A XG-PHS Measurement Software supports measurement of the RF Tx characteristics of next-generation PHS (XGP: eXtended Global Platform) equipment.

Installing it in the MS269xA supports fast, high-accuracy measurements ideal for R&D and early rollout of next-generation PHS base stations, mobile terminals, and devices.

Versatile Functions for Next-generation PHS

Modulation analysis, Tx power measurement, etc., required for development of base stations and device components for nextgeneration PHS are performed at high speed with superior accuracy.

Modulation Analysis

- Frequency Error
- Transmission Power
- Vector Error (EVM) [Peak/rms]
- Origin Offset
- Constellation
- EVM vs. Subcarrier
- EVM vs. Symbol
- Spectral Flatness
- EVM vs. PRU
- Total EVM (Peak/rms)
- ICH All EVM (Peak/rms)
- CCCH EVM (Peak/rms)
- Training EVM (Peak/rms)
- Pilot EVM (Peak/rms)
- Signal EVM (Peak/rms)
- Data All EVM (Peak/rms)
- Data BPSK EVM (Peak/rms)
- Data QPSK EVM (Peak/rms)
- Data 16QAM EVM (Peak/rms)
 Data 64QAM EVM (Peak/rms)
- Data 64QAM EVM (Peak/rms)
 Data 256QAM EVM (Peak/rms)
- Data 250QAM EVM (Pe
 IO Imbalance
- IQ Imbalance
- Quadrature Error

Specifications

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

Signal Analyzer		MS269xA
Common Specifications	ECBW (Effective Channel Bandwidth)	8.1, 9, 16.2, 17.1, 18 MHz
Specifications	Target Signals	Downlink, Uplink (OFDMA Only)
	Measurement Frequency Range	10 MHz to 2700 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	At 18° to 28°C, after calibration, with EVM = 1% signal
wedsurement	Measurement Accuracy	± (Accuracy of reference frequency × Carrier frequency + 10 Hz)
	Residual Vector Error	At 18° to 28°C, after calibration ≤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° 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)
Waveform Display	Modulation/Frequency	Constellation, EVM vs. Subcarrier, EVM vs. Symbol, EVM vs. PRU, Spectral Flatness, Power vs. Time, Summary
	Spectrum	Adjacent Channel Leakage Power, Occupied Bandwidth

- Power vs. Time
- Slot Power
- Slot Status
- Spectrum
- Channel Power
- Occupied Bandwidth
- Spectrum Emission Mask

Modulation Analysis

EVM changes for each subcarrier, symbol and PRU, constellations, spectral flatness, etc., can be checked on graphs. The fluctuations in EVM characteristic can be evaluated using simultaneous display of average (rms) and peak values.



Constellation

Carrier Freq.	2 560 000 00	0 Hz	Input l	evel.	-10.00 dBm			Ka-Peti Touce Bade
Modulation		лто						_
Channel Bandwid	2h 0.1	MHz						EVMvs Subcarrie
Result						Average & Max	10 / 10	A Pro- Children
MKR							AvoMax	
					requency Error	-0.13 /	-0.75 Hz	EVM vi Symbol
					utput Power	-13,00 /	-13.00 dBm	
Subcarrier 1					lean Power	-12.98 /	-12.98 dBm	
Symbol Number					VM(rms) VM(peak)	0.417	0.42 %	SpectralFlatees
				1 5	Symbol Number	1,50 7	1.83 %	operorariation
					Subcarrier Number		207	
				0	rigin Offset	-64,77 /	-63.74 dB	and the second second
0.00191								EVM vs PRU
Q 0.00320								
VM vs Subcarrie	1							
								Eurosy
MKR/R	MS(Peak) Subi	arrier	1 6	VM.				Eummory
		arrier	1 6	WM.				Eunmary
MKR/R		carrier	1 6	VM.				Summary
MKRUR 500		carrier	1 6	evm.				Euromany
MKR/R		carrier	1 6	VM				Summary
500 - 3.75 - 250 -	MSPeak) Sub							Summary
MKR(R) 500 -	MSPeak) Sub					. aulw		Eusmary
MKR(R) 500 -	MSPeak) Sub					why apple		
MKR(R) 500 -	MSPeak) Sub					John Jahn		Summary Comstellation On

EVM vs. Subcarrier

Power vs. Time

Changes in power over time are observed using rising/falling, slot and frame displays. Pass/Fail judgment is supported. Burst characteristics are observed easily by simultaneous display of average, max., and min. power.



Power vs. Time (Rising/Falling)

	the state of a second second					10	
arrier Freq. 256	0 000 000 Hz	Input Level	-10.00	18 m			March Parts
fodulation				:6			
hannel Bandwidth	8.1MHz						Rise and Fall
lesuit					Average	10 / 10	
Slot Power			1		A.C		
	Slot	State	Avg (dBm)	Max (dBm)	Min (dBm)	Judge	Silot
	2	Inactive	073.64	23.62	-73.64		
	3	Inactive	-73.55		73.62	****	
	4	Inactive	.73.64		-73.67	****	Frame
ower vs Time - Frame							and the second
	10.00						
Mulhard .	an-sheithe						
-0.0					-	and in	
-0.20		ng kang tanan Minag taidha na	he di malaya ya Nga malaya ya m na na n	1944 #214	na forma anna a		
-000		a ta a ta da a	n fi nave te seteration	ang di Sudan da	an jes anton	1997 (B) 199 (B) 2016 (B) [21]	

Power vs. Time (Frame Display)

000 "Техэнком" Контрольно-измерительные приборы и оборудование www.tehencom.com MX269017A Vector Modulation Analysis Software



The MX269017A Vector Modulation Analysis software supports various digital wireless modulation analyses. Installing it in the MS269xA and 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 facilities and private industry to aerospace and satellite communications.

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, PI/4DQPSK, 8PSK, 16QAM, 64QAM, 256QAM

- 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
- Origin Offset
- Droop Factor (BPSK, PI/4DQPSK, 8PSK)
- IQ Gain Imbalance
- (QPSK, O-QPSK, PI/4DQPSK, 8PSK, 16QAM, 64QAM, 256QAM)
- Quadrature Error (QPSK, O-QPSK, PI/4DQPSK, 8PSK, 16QAM, 64QAM, 256QAM)
- MER (Peak/rms)
- 2FSK, 4FSK
- Tx Power
- Filtered Power
- Frequency Error (Hz, ppm)
- Magnitude Error (Peak/rms)
- FSK Error (Peak/rms)
- Symbol Rate Error
- Jitter (P-P Min., P-P Max.)
- Deviation (Average, +Peak, -Peak, (Peak-Peak)/2)
- Deviation at Ts/2

Graph display

BPSK, QPSK, O-QPSK, PI/4DQPSK, 8PSK, 16QAM, 64QAM, 256QAM

- 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

- Constellation
- EVM vs. Symbol
- Magnitude Error vs. Symbol
- Phase Error vs. Symbol
- Frequency vs. Symbol
- Trellis
- Eye Diagram
- I and Q vs. Symbol
- Magnitude vs. Symbol
- Phase vs. Symbol
- Signal Monitor
- Symbol Table
- FSK Error vs. Symbol

⁽Average, +Max. Peak, +Min. Peak, –Max. Peak, –Min. Peak, (Peak-Peak)/2, +Max. Peak%, –Min. Peak%)

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	Viecnanical Attenuator Only (N	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	MS269xA				MS2830A			
	Measurement Frequency Range	is not available whe	Note that range at or above 3 en MS269xA-003 is installed nd Mode set to Spurious.)		30 MHz to 3.	.5 GHz				
		100 kHz to the up	per limit of the main unit							
	Frequency Setting Range	12.5 MHz (Fram 16QA 35 MHz (Non- Fo 6.25 MHz (2FSH 3.125 MHz (O-C then the frequency		ted (Sp BPSK, bllows:	an Up=On), ar QPSK, PI/4DQ 300 MHz to (PSK, 8 6 GHz	PSK, 16QAM,6	34QAM, 256QAM 1/045 is installed		
			z (Other than the above)		and MS2830A-067 is not installed.) 300 MHz to the upper limit of the main unit (Other than the above)					
		64QAM, 256QAM	4DQPSK, 8PSK, 16QAM,		0.1 ksps to 12.5 Msps (MS2830A-005/006/009 installed and Modulation method: BPSK, QPSK, PI/4DQPSK, 8PSK, 16QAM, 64QAM, 256QAM)					
Common Specifications	Measurement Symbol Rate		0.1 ksps to 6.25 Msps (MS2830A-005/006/009 installed and Modulation method 2FSK, 4FSK)							
	Range		0.1 ksps to 5 Msps (MS2830A-006 installed and Modulation method: BPSK, QPSK, PI/4DQPSK, 8PSK, 16QAM, 64QAM, 256QAM)							
				0.1 ksps to 2.5 Msps (MS2830A-006 installed and Modulation method: 2FSK, 4FSK)						
		Model			Modulation Method					
		MS269xA	MS2830A	0-Q	PSK FS	SK		pt FSK Non-Formatted		
	Symbol Rate Setting Range	Opt. 078, Opt. 077 installed	Opt. 078, Opt. 077, Opt. 005/009, Opt. 006 installed	0.1 ks 12.5 N	lsps 25 Ms	sps	0.1 ksps to 50 Msps	0.1 ksps to 140 Msps		
		Opt. 077 installed	Opt. 077, Opt. 005/009, Opt. 006 installed	0.1 ks 6.25 N	1sps 12.5 N	/sps	0.1 ksps to 25 Msps	0.1 ksps to 70 Msps		
		Standard	Opt. 005/009, Opt. 006 installed	0.1 ks 3.125	Msps 6.25 N	Asps	0.1 ksps to 12.5 Msps 0.1 ksps to	0.1 ksps to 35 Msps 0.1 ksps to		
		Opt. 006 installed 0.1 ks 1.25 M			Msps 2.5 Msps 5 Msps 5 Msps					
	Modulation method	BPSK, QPSK, O-QPSK, PI/4DQPSK, 8PSK, 16QAM, 64QAM, 256QAM (Non-Formatted only), 2FSK, 4FSK								
	Measurement Level Range	-15 to +30 dBm (F -25 to +10 dBm (F	Preamp Off, or Preamp not i Preamp On)	installed	l)					
	Carrier Frequency Measurement Accuracy		er calibration, with EVM = 1 erence frequency × Carrier f							
			er calibration, Filter type: Ross than input level, 20-time		ng		input signal wit	hin measuremer		
Modulation/ Frequency Measurement	Residual Vector Error	Symbol rate: 4 k Measurement tir Carrier Frequen	<1.0% (rms) Symbol rate: 4 ksps to 500 ksps Measurement time length: ≤50 ms Carrier Frequency: 50 MHz to 500 MHz							
		Carrier Frequen) ksps to 5 Msps cy: 50 MHz to 6 GHz		<1.5% (rms) Symbol rate: 500 ksps to 5 Msps Carrier Frequency: 50 MHz to 3.5 GHz					
	Symbol Rate Error	Filter type: Gaussi		100 ksp	s, Slot length	160 syr	nbols,	ut Level, and		
	Measurement Level Range	-25 to +10 dBm (F	1 /	,		``		eamp not installed		
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.)	and less than Inpu	Off, or Preamp not installed)				nal in measure ff, or Preamp r			

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



-: Does not display measured results.

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.

	Modulation Type				
Trace Mode	BPSK QPSK PI/4DQPSK 8PSK	16QAM 64QAM 256QAM	2FSK 4FSK		
Constellation	√	✓	√		
EVM vs. Symbol	✓	✓	√		
Magnitude Error vs. Symbol	✓	✓	√		
Phase Error vs. Symbol	✓	✓	√		
Frequency vs. Symbol	—	—	√		
Frellis	√	✓	√		
Eye Diagram	✓	✓	√		
Numeric	✓	✓	√		
and Q vs. Symbol	✓	✓	√		
Vagnitude vs. Symbol	√	✓	√		
Phase vs. Symbol	√	✓	√		
Signal Monitor	√	✓	√		
Symbol Table	✓	✓	√		
Equalizer Amplitude	√	✓	_		
Equalizer Phase	√	✓	_		
Equalizer Group Delay	√	✓	_		
Equalizer Impulse Response	√	✓	_		
SK Error vs. Symbol	—		√		



4-pane Screen (Traces 1-4)



4-pane Screen (Traces 5-8)

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



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.

arrier Freq.	for Wodulation Analysis 1 000 000 000 Hz	Input Level	-10.00 dBm		12	E Verbe Makadam A (
						Trace
						Select Trace
Result	Mea	auricig		Average & Max	201 20	Trace 1
Numeric		AvgIN	lax.			Trace Mode
	Tx Power	-10.39 /	-10.38 dBm			Numeric
		91.48 µW I	91.55 µW			and the second
	Filtered Power	-11.62 /	-11.53 dBm			C. C. C. M. M.
		68.81 µW /	70.37 µW			Scale
	Frequency Error	8.53 /	8.55 Hz			10000
		0.00853001 /	0.00855165 ppm			
	EVM(rms)	0.07 /	0.10 %			Target Slot
	EVM(peak)		0.25 %			
	Phase Error(rms)		0.05 deg.			
	Phase Error(peak)		0.14 deg.			united the
	Mag. Error(ms)		0.03 %			Storage
	Mag. Error(peak)		-0.09 %			and a second second
	Origin Offset		-74.42 dB			
			0.02 %			Zoom Out
	Droop Factor	0.0000 /	0.0000 dB/Sym	ibal		200m UUT
	IQ Gain Imbalance		-0.07 dB			-
	Quadrature Error		7.20 deg.			- and a start of the
	MER(ms)	63.20 /	60.39 dB			Next Trace
	MER(peak)	55.14 /	52.09 dB			and the second second
	Symbol Rate Error					Next View
						Paral Vacan
						Trace 5 - 8
ef les	Pre-Amp Off					142 82

Modulation method: PI/4DQPSK example

arrier Freq.	1 000 000 000 Hz	input Level	-10.00 dBm		CO Vector Medidation A
					Select Trace
esu?	_	_			Truce 1
Numeric			Symbol Rate Error	man of pom	Trace Made
Tx Power	-11.39 dBm		Jitter P-P Min	34.27 %	Trace Mode
	72.55 J/W		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 ppm		Peak	-1.645 kHz	OCINE
Mag. Error(rms)	0.43 %		(Peak-Peak)/2	1.522 kHz	
Mag. Error(peak)		at symbol 165			Target Slot
FSK Error(ms)	0.37 %				Rarget Slot
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		-3 + Max Peak	-960.2 Hz	1000
+3 + Min Peak			-3 + Min Peak	-941.3 Hz	Storage
+3 - Max Peak	941.0 Hz		J – Max Peak	-940.8 Hz	the second second second second
+3 - Min Peak	935.0 Hz		-3 - Min Peak	-034.3 Hz	
+3 (Peak-Peak)/2			J (Peak-Peak)/2	-942.2 Hz	ATAI CONTRACTOR
+3 + Max Peak%			-3 + Max Peak%	-100.96 %	Zoom Out
+3 - Min Peak%			3 - Min Peak%	-89.27 %	and the second sec
+1 Average	313.6 Hz		-1 Average	-314.1 Hz	
+1 + Max Peak	319.8 Hz		-1 + Max Peak	-321.8 Hz	
+1 + Min Peak	313.6 Hz		-1 + Min Peak		Next Trace
+1 - Max Peak	313.4 Hz		-1 - Max Peak	-314.0 Hz	and the second second
+1 - Min Peak	308.3 Hz		-1 — Min Peak	-308.7 Hz	
+1 (Peak-Peak)/2			-1 (Peak-Peak)/2	-315.2 Hz	Next View
+1 + Max Peak%			-1 + Max Peak%	-34.19 %	Heat warm
+1 - Min Peak%	32.76 %		-1 - Min Peak%	-32.80 %	Trace 5 - 8

Modulation method: 4FSK example

Carrier Freq.	1 000 000 000 Hz	Input Level	-10.00 dBm		CE Vector Mekkelses A
		ATT	4 dB		VNA
					Select Trace
Result					Trace 1
Numeric					Trace Mode
					and the second second second second
	Tx Power		-11.46 dBm		Numeric
			71.51 µW		
1	Filtered Power		-11.46 dBm		
			71.52 µW		Scale
	Frequency Error				
			0.00011129 ppm		Target Slot
	EVM(rms)		0.28 %		Number
	EVM(peak)		0.53 %	at symbol 686.0	0
1	OffsetEVM(rms)		0.35 %		
	OffsetEVM(peak)		0.54 %	at symbol 136.0	
1	Phase Error(rms)		0.10 deg.		Storage
1	Phase Error(peak)		0.33 deg.	at symbol 309.0	
	Mag. Error(ms)		0.25 %		
	Mag. Error(peak)		40.47 %	at symbol 136.5	Zoom Out
	Origin Offset		46.97 dB		2008 001
1			0.45 %		
1	10 Gain Imbalance		0.01 dB		
	Quadrature Error		-0.03 deg.		Next Trace
	MER(ms)		48.09 dB		Contractor and
	MER(peak)		68,61 dB	at symbol 512.0	
	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: 1point

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vs. Symbol

This displays the temporal Symbol variation for each of seven characteristics: EVM, Magnitude Error, Phase Error, Frequency, I and Q, Magnitude, and Phase.

- · EVM vs. Symbol
- Magnitude Error vs. Symbol
 Phase Error vs. Symbol
- Frequency vs. Symbol
 I and Q vs. Symbol
- Magnitude vs. SymbolPhase 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.



Binary example



Hexadecimal example

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Eye Diagram

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



Trellis

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



Simple Parameter Setting Function

Simply selecting the standard name at [Preset Dialog Parameter...] sets the parameters for IEEE802.15.4/4d.



Graphical Setting Display

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

Preset Dialog Parameter]	PARTI Default (Frame Formatte	a	
Frame Formatted Non-Formatted	Parameter File T102_PART1.xml		_	
Modulation	Waveform Information			
₽ Filter	Modulation Type : Symbol Rate :	4FSK 2400 sps		
Frame	Measurement Filter : Reference Filter :	Root Nyquist	•	Inverse Gaussian
+	Roll Off / BT:	0.20		0.769
Slot	Slots per Frame :	1 slot		
Search	Slot Length Measurement Offset Measurement Interval	200 symbol 0 symbol 200 symbol		
Detail Settings	Sync Word Search : 1st Sync Word :	Off -		
Set Parameters	2nd Sync Word : Burst Search	- 0ff		

Common Setting



Modulation



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.



Compatible USB power sensors

Model	Frequency Range	Resolution	Dynamic Range
MA24104A*	600 MHz to 4 GHz	1 kHz	+3 to +51.76 dBm
MA24106A	50 MHz to 6 GHz	1 kHz	-40 to +23 dBm
MA24108A	10 MHz to 8 GHz	100 kHz	-40 to +20 dBm
MA24118A	10 MHz to 18 GHz	100 kHz	-40 to +20 dBm
MA24126A	10 MHz to 26 GHz	100 kHz	–40 to +20 dBm

*: MA24104A has been discontinued.



The MX269018A Analog Measurement Software supports measurement of TRx characteristics of wireless equipment using analog modulation. Installing it in the MS2830A Signal Analyzer main frame supports ideal fast and high-accuracy measurements for efficient evaluation at R&D and maintenancing/verification of analog wireless equipment.

Multi-support for Analog Wireless R&D and Manufacturing

This software supports output of RF Tx characteristics required for analog wireless R&D. Combination with an optional analog signal generator outputs FM/ΦM/AM RF signals for confirming the operation of wireless equipment and Rx sensitivity tests. In addition, combining it with the USB audio and a commercial speaker supports demodulation of RF signals sent from wireless equipment to monitor demodulated voice signals.

MS2830A-066 low phase noise and USB Audio are necessary for the analog measurement software. Combining it with an optional analog signal generator outputs supports verification of analog wireless equipment.

Table 1 Function of analog measurement software and necessary composition

	Analog measurement software function*1						
		•	FM	ΦM	AM		
		Carrier Frequency and Carrier Frequency Error RF Frequency	~	~	~		
	Tx Measure	Transmit Power RF Power	~	~	~		
	measurement result display	Modulation measurement* ² Deviation (FM), Radian (ΦM), Depth (AM)	~	~	~	1, 2, 3, 4 is mandatory	
		Result of analyzed DCS Code DCS Code	~	-	_	1. Signal Analyzer (MS2830A-040/041/043*) 2. Low Phase Noise Performance (MS2830A-066)	
Tx Test		Demodulation Frequency Frequency	~	~	~	3. Analog Measurement Software (MS2630A-000) 4. USB Audio (A0086A)	
	AF Measure measurement	Effective Value for Level at Demodulation Frequency Level	~	~	~	5. commercial speaker	
	result display	Distortion Ratio of Demodulation Frequency (S/N) Distortion	~	~	~	*: MS2830A-043 cannot be installed MS2830A-066 and 6. Analog Signal Generator simultaneously.	
		Power vs. Time Graph Result	~	~	~		
	Demodulated Voice Output	Demodulate Input RF Signals from wireless equipment and Output Voice from USB connector*3	~	~	~		
Rx Test	Rx Test FM/ФМ/AM Outputs from analog signal generator		~	~	~	1 + 2 + 3 + 4 6. Analog Signal Generator (Refer to Table 3 about 4)	

*1: Spurious measurement is also possible by Spectrum analyzer standard measurement function.

*2: Deviation (FM), Radian (ΦM), Depth (AM)
 *3: The voice can be monitored by connecting a speaker etc. on the market with USB Audio.

Table 2 Ordering Information relationed Analog Measurement Software

	Name	Mo	del	Note
	Name	New	Retrofit	Nole
	3.6 GHz Signal Analyzer	MS2830A-040	—	9 kHz to 3.6 GHz
	6 GHz Signal Analyzer	MS2830A-041	—	9 kHz to 6 GHz
Mandatory	13.5 GHz Signal Analyzer	MS2830A-043	_	9 kHz to 13.5 GHz Cannot be installed MS2830A-066 and signal generator options simultaneously
Mandatory	Low Phase Noise Performance	MS2830A-066	—	Cannot retrofit. Improved phase noise performance
Mandatory	Analog Measurement Software	MX26	9018A	
Mandatory	USB Audio	A00	86A	Necessary for Demodulated Voice Output
	3.6 GHz Vector Signal Generator	MS2830A-020	MS2830A-120	250 kHz to 3.6 GHz
	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	The lower bound value at the output level is enhanced Mandatory to MS2830A-029
Recommend	Analog Function Extension for Vector Signal Generator	MS2830A-029	—	Add analog function to MS2830A-020/021 (Require MX269018A) Necessary for Rx Test. Refer to the selection condition to Table 3
	3.6 GHz Analog Signal Generator	MS2830A-088	MS2830A-188	MS2830A-022 corresponding is included (Require MX269018A) Necessary for Rx Test. Refer to the selection condition to Table 3
	Vector Function Extension for Analog Signal Generator	—	MS2830A-189	Add vector function to MS2830A-088/188

Table 3 Optional combination necessary for mounting analog signal generator

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 insta	MS2830A installed analog SG		MS2830A installed analog SG		The ca	ase that retrofit analog SG to MS	2830A
Frequency opti	Frequency option of MS2830A		MS2830A-040/041		MS2830A-043		
Installed	vector SG	Ļ	Not installed	MS2830A-020/021	Ļ		
SG that can be added	Analog SG	088*1	188* ¹	*2	Cannot be installed		
SG that can be added	Analog SG + Vector SG	020 or 021 + 022 + 029	188 + 189* ³	—	Cannot be installed		

Refer to MS2830A-*** in Table 2 for the three-digit number in table 3.

*1: MS2830A-022 corresponding is included

*2: Please inquire individually

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

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

Target Signal Frequency Range Level Range Analysis Time Carrier Frequency Accuracy Frequency Deviation Demodulation Frequency Range Frequency Deviation Accuracy Residual FM Demodulation Distortion DCS Measurement Function Φ M Deviation Demodulation Frequency Range Φ M Deviation Accuracy Residual Φ M Demodulation Distortion AM Demodulation Frequency Range AM Accuracy Residual AM Demodulation Distortion Low Pass	separately by each item, the following standards are guaranteed FM, ΦM, AM signal 300 kHz to 2700 MHz -15 to +30 dBm (Preamp Off, or Preamp not installed) -25 to +10 dBm (Preamp On) 80 ms, 300 ms (DCS Measurement) At 18° to 28°C, after calibration ± (Accuracy of reference frequency × Carrier frequency + 1) Hz 0 to 20 kHz 20 Hz to 20 kHz 1% of indicated value ± Residual FM 3.35 Hz rms, SN > 50 dB (1.5 kHz deviation, demodulation band: 0.3 kHz to 3 kHz) 0.3% (demodulation frequency: 1 kHz, Frequency Deviation: 5 kHz, demodulation band: 0.3 kHz to 3 kH Demodulated result display of Digital Code Squelch 0 to (20 kHz/demodulation frequency [Hz]) rad 20 Hz to 20 kHz 1% of indicated value ± Residual ΦM 0.01 rad rms (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 0 to 98% 20 Hz to 20 kHz 1% of indicated value ± Residual AM 0.3% (demodulation band: 0.3 kHz to 3 kHz) 0 x% (demodulation band: 0.3 kHz to 3 kHz) 0.3% (demodulation band: 0.3 kHz to 3 kHz)
Frequency Range Level Range Analysis Time Carrier Frequency Accuracy Frequency Deviation Demodulation Frequency Range Frequency Deviation Accuracy Residual FM Demodulation Distortion DCS Measurement Function ФM Deviation Demodulation Frequency Range ΦM Deviation Accuracy Residual ΦM Demodulation Distortion AM Demodulation Frequency Range AM Accuracy Residual AM Demodulation Distortion	300 kHz to 2700 MHz -15 to +30 dBm (Preamp Off, or Preamp not installed) -25 to +10 dBm (Preamp On) 80 ms, 300 ms (DCS Measurement) At 18° to 28°C, after calibration ± (Accuracy of reference frequency × Carrier frequency + 1) Hz 0 to 20 kHz 20 Hz to 20 kHz 1% of indicated value ± Residual FM 3.35 Hz rms, SN > 50 dB (1.5 kHz deviation, demodulation band: 0.3 kHz to 3 kHz) 0.3% (demodulation frequency: 1 kHz, Frequency Deviation: 5 kHz, demodulation band: 0.3 kHz to 3 kH 0 to (20 kHz/demodulation frequency [Hz]) rad 20 Hz to 20 kHz 1% of indicated value ± Residual ΦM 0.01 rad rms (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 1% of indicated value ± Residual AM 0.3% (demodulation band: 0.3 kHz to 3 kHz)
Level Range Analysis Time Carrier Frequency Accuracy Frequency Deviation Demodulation Frequency Range Frequency Deviation Accuracy Residual FM Demodulation Distortion DCS Measurement Function ΦM Deviation Demodulation Frequency Range ΦM Deviation Accuracy Residual ΦM Demodulation Distortion AM Demodulation Frequency Range AM Accuracy Residual AM Demodulation Distortion	-15 to +30 dBm (Preamp Off, or Preamp not installed) -25 to +10 dBm (Preamp On) 80 ms, 300 ms (DCS Measurement) At 18° to 28°C, after calibration ± (Accuracy of reference frequency × Carrier frequency + 1) Hz 0 to 20 kHz 20 Hz to 20 kHz 1% of indicated value ± Residual FM 3.35 Hz rms, SN > 50 dB (1.5 kHz deviation, demodulation band: 0.3 kHz to 3 kHz) 0.3% (demodulation frequency: 1 kHz, Frequency Deviation: 5 kHz, demodulation band: 0.3 kHz to 3 kHz 0 to (20 kHz/demodulation frequency [Hz]) rad 20 Hz to 20 kHz 1% of indicated value ± Residual FM 0.3% (demodulation frequency: 1 kHz, Frequency Deviation: 5 kHz, demodulation band: 0.3 kHz to 3 kHz 0 to (20 kHz/demodulation frequency [Hz]) rad 20 Hz to 20 kHz 1% of indicated value ± Residual ΦM 0.01 rad rms (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 0 to 98% 20 Hz to 20 kHz 1% of indicated value ± Residual AM 0.3% (demodulation band: 0.3 kHz to 3 kHz)
Analysis Time Carrier Frequency Accuracy Frequency Deviation Demodulation Frequency Range Frequency Deviation Accuracy Residual FM Demodulation Distortion DCS Measurement Function ФM Deviation Demodulation Frequency Range ФM Deviation Accuracy Residual ΦM Demodulation Distortion AM Demodulation Frequency Range AM Accuracy Residual AM Demodulation Distortion	 -25 to +10 dBm (Preamp On) 80 ms, 300 ms (DCS Measurement) At 18° to 28°C, after calibration (Accuracy of reference frequency × Carrier frequency + 1) Hz 0 to 20 kHz 20 Hz to 20 kHz 1% of indicated value ± Residual FM 3.35 Hz rms, SN > 50 dB (1.5 kHz deviation, demodulation band: 0.3 kHz to 3 kHz) 0.3% (demodulation frequency: 1 kHz, Frequency Deviation: 5 kHz, demodulation band: 0.3 kHz to 3 kH Demodulated result display of Digital Code Squelch 0 to (20 kHz/demodulation frequency [Hz]) rad 20 Hz to 20 kHz 1% of indicated value ± Residual ΦM 0.01 rad rms (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 0 to 98% 20 Hz to 20 kHz 1% of indicated value ± Residual AM 0.3% (demodulation band: 0.3 kHz to 3 kHz)
Carrier Frequency Accuracy Frequency Deviation Demodulation Frequency Range Frequency Deviation Accuracy Residual FM Demodulation Distortion DCS Measurement Function ΦM Deviation Demodulation Frequency Range ΦM Deviation Accuracy Residual ΦM Demodulation Distortion AM Demodulation Frequency Range AM Accuracy Residual AM Demodulation Distortion	At 18° to 28°C, after calibration ± (Accuracy of reference frequency × Carrier frequency + 1) Hz 0 to 20 kHz 20 Hz to 20 kHz 1% of indicated value ± Residual FM 3.35 Hz rms, SN > 50 dB (1.5 kHz deviation, demodulation band: 0.3 kHz to 3 kHz) 0.3% (demodulation frequency: 1 kHz, Frequency Deviation: 5 kHz, demodulation band: 0.3 kHz to 3 kHz 0 to (20 kHz/demodulation frequency [Hz]) rad 20 Hz to 20 kHz 1% of indicated value ± Residual ΦM 0.01 rad rms (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 1% of indicated value ± Residual ΦM 0.1 rad rms (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 1% of indicated value ± Residual AM 0.3% (demodulation band: 0.3 kHz to 3 kHz)
Frequency Deviation Demodulation Frequency Range Frequency Deviation Accuracy Residual FM Demodulation Distortion DCS Measurement Function Φ M Deviation Demodulation Frequency Range Φ M Deviation Accuracy Residual Φ M Demodulation Distortion AM Demodulation Frequency Range AM Accuracy Residual AM Demodulation Distortion	± (Accuracy of reference frequency × Carrier frequency + 1) Hz 0 to 20 kHz 20 Hz to 20 kHz 1% of indicated value ± Residual FM 3.35 Hz rms, SN > 50 dB (1.5 kHz deviation, demodulation band: 0.3 kHz to 3 kHz) 0.3% (demodulation frequency: 1 kHz, Frequency Deviation: 5 kHz, demodulation band: 0.3 kHz to 3 kHz 0 to (20 kHz/demodulation frequency [Hz]) rad 20 Hz to 20 kHz 1% of indicated value ± Residual ΦM 0.01 rad rms (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 1% of indicated value ± Residual ΦM 0.1 rad rms (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 1% of indicated value ± Residual AM 0.3% (demodulation band: 0.3 kHz to 3 kHz)
Demodulation Frequency Range Frequency Deviation Accuracy Residual FM Demodulation Distortion DCS Measurement Function ФM Deviation Demodulation Frequency Range ФM Deviation Accuracy Residual ΦM Demodulation Distortion AM Demodulation Frequency Range AM Accuracy Residual AM Demodulation Distortion	0 to 20 kHz 20 Hz to 20 kHz 1% of indicated value ± Residual FM 3.35 Hz rms, SN > 50 dB (1.5 kHz deviation, demodulation band: 0.3 kHz to 3 kHz) 0.3% (demodulation frequency: 1 kHz, Frequency Deviation: 5 kHz, demodulation band: 0.3 kHz to 3 kH Demodulated result display of Digital Code Squelch 0 to (20 kHz/demodulation frequency [Hz]) rad 20 Hz to 20 kHz 1% of indicated value ± Residual ΦM 0.01 rad rms (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 0 to 98% 20 Hz to 20 kHz 1% of indicated value ± Residual AM 0.3% (demodulation band: 0.3 kHz to 3 kHz)
Frequency Deviation Accuracy Residual FM Demodulation Distortion DCS Measurement Function ФM Deviation Demodulation Frequency Range ФM Deviation Accuracy Residual ΦM Demodulation Distortion AM Demodulation Frequency Range AM Accuracy Residual AM Demodulation Distortion	1% of indicated value ± Residual FM 3.35 Hz rms, SN > 50 dB (1.5 kHz deviation, demodulation band: 0.3 kHz to 3 kHz) 0.3% (demodulation frequency: 1 kHz, Frequency Deviation: 5 kHz, demodulation band: 0.3 kHz to 3 kH Demodulated result display of Digital Code Squelch 0 to (20 kHz/demodulation frequency [Hz]) rad 20 Hz to 20 kHz 1% of indicated value ± Residual ΦM 0.01 rad rms (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 0 to 98% 20 Hz to 20 kHz 1% of indicated value ± Residual AM 0.3% (demodulation band: 0.3 kHz to 3 kHz)
Residual FM Demodulation Distortion DCS Measurement Function ΦM Deviation Demodulation Frequency Range ΦM Deviation Accuracy Residual ΦM Demodulation Frequency Range ΦM Deviation Accuracy Residual ΦM Demodulation Frequency Range AM Demodulation Frequency Range AM Accuracy Residual AM Demodulation Distortion	3.35 Hz rms, SN > 50 dB (1.5 kHz deviation, demodulation band: 0.3 kHz to 3 kHz) 0.3% (demodulation frequency: 1 kHz, Frequency Deviation: 5 kHz, demodulation band: 0.3 kHz to 3 kH Demodulated result display of Digital Code Squelch 0 to (20 kHz/demodulation frequency [Hz]) rad 20 Hz to 20 kHz 1% of indicated value ± Residual ΦM 0.01 rad rms (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 0 to 98% 20 Hz to 20 kHz 1% of indicated value ± Residual AM 0.3% (demodulation band: 0.3 kHz to 3 kHz)
Demodulation Distortion DCS Measurement Function ФМ Deviation Demodulation Frequency Range ФМ Deviation Accuracy Residual ФМ Demodulation Distortion AM Demodulation Frequency Range AM Accuracy Residual AM Demodulation Distortion	0.3% (demodulation frequency: 1 kHz, Frequency Deviation: 5 kHz, demodulation band: 0.3 kHz to 3 kHz Demodulated result display of Digital Code Squelch 0 to (20 kHz/demodulation frequency [Hz]) rad 20 Hz to 20 kHz 1% of indicated value ± Residual ΦM 0.01 rad rms (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 0 to 98% 20 Hz to 20 kHz 1% of indicated value ± Residual AM 0.3% (demodulation band: 0.3 kHz to 3 kHz)
DCS Measurement Function	Demodulated result display of Digital Code Squelch 0 to (20 kHz/demodulation frequency [Hz]) rad 20 Hz to 20 kHz 1% of indicated value ± Residual ΦM 0.01 rad rms (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 0 to 98% 20 Hz to 20 kHz 1% of indicated value ± Residual AM 0.3% (demodulation band: 0.3 kHz to 3 kHz)
ΦM Deviation Demodulation Frequency Range ΦM Deviation Accuracy Residual ΦM Demodulation Distortion AM Demodulation Frequency Range AM Accuracy Residual AM Demodulation Frequency Range AM Accuracy Residual AM Demodulation Distortion	0 to (20 kHz/demodulation frequency [Hz]) rad 20 Hz to 20 kHz 1% of indicated value ± Residual ΦM 0.01 rad rms (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 0 to 98% 20 Hz to 20 kHz 1% of indicated value ± Residual AM 0.3% (demodulation band: 0.3 kHz to 3 kHz)
Demodulation Frequency Range	20 Hz to 20 kHz 1% of indicated value ± Residual ΦM 0.01 rad rms (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 0 to 98% 20 Hz to 20 kHz 1% of indicated value ± Residual AM 0.3% (demodulation band: 0.3 kHz to 3 kHz)
ΦΜ Deviation Accuracy Residual ΦΜ Demodulation Distortion AM Demodulation Frequency Range AM Accuracy Residual AM Demodulation Distortion	1% of indicated value ± Residual ΦM 0.01 rad rms (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 0 to 98% 20 Hz to 20 kHz 1% of indicated value ± Residual AM 0.3% (demodulation band: 0.3 kHz to 3 kHz)
ΦΜ Deviation Accuracy Residual ΦΜ Demodulation Distortion AM Demodulation Frequency Range AM Accuracy Residual AM Demodulation Distortion	0.01 rad rms (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 0 to 98% 20 Hz to 20 kHz 1% of indicated value ± Residual AM 0.3% (demodulation band: 0.3 kHz to 3 kHz)
Residual ΦM Demodulation Distortion AM Demodulation Frequency Range AM Accuracy Residual AM Demodulation Distortion	0.01 rad rms (demodulation band: 0.3 kHz to 3 kHz) 1% (demodulation band: 0.3 kHz to 3 kHz) 0 to 98% 20 Hz to 20 kHz 1% of indicated value ± Residual AM 0.3% (demodulation band: 0.3 kHz to 3 kHz)
AM Demodulation Frequency Range AM Accuracy Residual AM Demodulation Distortion	0 to 98% 20 Hz to 20 kHz 1% of indicated value ± Residual AM 0.3% (demodulation band: 0.3 kHz to 3 kHz)
Demodulation Frequency Range AM Accuracy Residual AM Demodulation Distortion	20 Hz to 20 kHz 1% of indicated value ± Residual AM 0.3% (demodulation band: 0.3 kHz to 3 kHz)
AM Accuracy Residual AM Demodulation Distortion	1% of indicated value ± Residual AM 0.3% (demodulation band: 0.3 kHz to 3 kHz)
Residual AM Demodulation Distortion	0.3% (demodulation band: 0.3 kHz to 3 kHz)
Demodulation Distortion	
	0.20 (demodulation bands 0.2 kl la to 2 kl la)
Low Pass	
	300 Hz, 3, 15, 20 kHz
High Pass	50, 300, 400 Hz, 30 kHz
Band Pass	CCITT, C-Message
De-emphasis	750, 500, 75, 50, 25 µs
Transmit Power Accuracy	At 18° to 28°C, after calibration, with input attenuator ≥10 dB and input signal in measurement le range and less than Input level ±0.5 dB (Preamp Off, or Preamp not installed) Transmit Power Accuracy based on MS2830A main frame Absolute Amplitude Accuracy
Appitor	Output demodulated signal to USB audio equipment connected to MS2830A USB terminal
nent	The function becomes effective when MS2830A-088 3.6 GHz Analog Signal Generator is installed, or when MS2830A-020/021 Vector Signal Generator and MS2830A-022 Low Power Extension for Vector Signal Generator and MS2830A-029 Analog Function Extension for Vector Signal Generator are instal
ut	The performance applies to MS2830A-088 performance or MS2830A-020/021 performance whe MS2830A-029 is mounted
Frequency Setting Range	100 kHz to 2700 MHz
	Tone Deviation (FM)/Digital Code Squelch Deviation: 0 to 100 kHz
	0.1 Hz
	±1% of set value (excludes Residual FM)
	AF Tone Source × 2 Digital Code Squelch Signal Generator
	Tone Frequency: 20 Hz to 40 kHz
· · · ·	Set value ±3 Hz (When 0.1 Hz Digital Code Squelch signal used)
· · · · ·	DCS Code: 000 to 777 (octal, 3 digit)
0	Tone Radian (ΦM): 0 to 50.0 rad. (internal modulation frequency × phase deviation) <100 kHz setting rar
Phase Deviation Setting Resolution	0.01 rad.
Phase Deviation Accuracy	±1% of set value (excludes Residual ΦM)
Internal Modulation Signal Source	AF Tone source x 2
Internal Modulation Frequency Range	Tone Frequency: 20 Hz to 40 kHz
Internal Modulation Frequency Resolution	0.1 Hz
Modulation Setting Range	Tone Depth (AM): 0 to 100%
Modulation Setting Resolution	1%
Modulation Accuracy	±1% of set value (excludes Residual AM)
Internal Modulation Signal Source	AF Tone source × 2
Internal Modulation Frequency Range	Tone Frequency: 20 Hz to 40 kHz
Internal Modulation Frequency Resolution	0.1 Hz
rator Option	MS2830A-029/088/189
	1020307-023/000/103
	Band Pass De-emphasis Fransmit Power Accuracy onitor ent ent t frequency Setting Range Frequency Deviation Setting Range Frequency Deviation Setting Resolution Frequency Deviation Setting Resolution Frequency Deviation Setting Resolution Frequency Deviation Setting Resolution DCS Code Setting Range Phase Deviation Frequency Resolution DCS Code Setting Range Phase Deviation Setting Range Phase Deviation Setting Range Phase Deviation Setting Range Phase Deviation Setting Resolution Phase Deviation Frequency Resolution Phase Deviation Frequency Range Internal Modulation Frequency Resolution Modulation Setting Range Modulation Setting Range Modulation Setting Range Modulation Setting Resolution Modulation Setting Resolution

Ма	x. reverse input	0 Vdc (max.) +18 dBm (<20 MHz), +30 dBm (≥20 MHz)
Fu	nction/Performance	The following specifications are added to the specifications of the MS2830A-020/-021 and MS2830A-022 installed (See catalog for MS2830A)
	Frequency range	MS2830A-088/189: 100 kHz to 3.6 GHz MS2830A-029: Lower limit frequency: 100 kHz. The upper limit frequency depends on the vector signal generator installed
	Output level accuracy	with MS2830A-029/088, CW, 18° to 28°C Output level p [dBm] –110 ≤ p ≤ –3 ±3.0 dB (typ., 100 kHz ≤ f < 250 kHz)
	Arbitrary signal generator	Available only when the MS2830A-189 is installed (when the MS2830A-088 is installed)

Tx Tests

The RF signal analysis result from the wireless equipment and the AM/ Φ M/AM demodulated result can be displayed

The transmission characteristics of the RF output from the wireless equipment can be examined. This simultaneously displays both the frequency, level, and modulation of RF input signals for FM/ Φ M/ AM, as well as the frequency, level, and distortion of demodulated AF signals as both numerical and graphical results. It also displays the analyzed FM DCS Code.



Setup for test of Tx characteristics



Example of FM signal measurement results

Measurement Items (MX269018A)

	Display Items	Summary
TX	Measure	Analysis results of RF signal
	RF Frequency	Carrier frequency and Carrier frequency error
	RF Power	RF power
	Deviation	Frequency deviation (FM)
	Radian	Phase deviation (ΦM)
	Depth	Modulation (AM)
	DCS Code	DCS code analysis result (FM)
AF	Measure	Analysis results of demodulated signal
	Frequency	Demodulated frequency
	Level	Rms level with demodulated frequency
	Distortion	Distortion with demodulated frequency (S/N)
	Graph result	Power vs. Time with demodulated frequency

- Measurement Items (Spectrum Analyzer)
- Spurious Emission
- Channel Power

Demodulated Voice Output

Demodulate Input RF Signals from the wireless equipment and Output Voice from USB connector

The RF signal from the wireless equipment is demodulated, and the audio signal is output from USB connector. The audio signal output from USB Audio can be monitored by preparing a speaker etc. on the market.



Setup for monitoring demodulated voice

Rx Tests

The FM/ Φ M/AM modulated RF signal can be output from Analog Signal Generator

The FM/ Φ M/AM modulated RF Signal can be output from the analog signal generator option. They included two AF oscillators and DCS (Digital Code Squelch) signal source, and can output the RF signal set them respectively. The wireless equipment can be used for examination confirming the operation by the following combinations.

- 1. AF + AF = 1 kHz audio signal + Tone squelch signal
- 2. AF + DCS = 1 kHz audio signal + DCS signal
- 3. AF (user wave file) *1,*2 = Arbitrary signal
- *1: One of AF oscillators can be used to generate a user-created Wave signal instead of a tone signal. The RF signal such as DTMF (Dual Tone Multiple Frequency) can be output.
- *2: Correspondence format of Wave file
 - It corresponds to the Wave audio format. There is the following limitations.
 - Linear PCM file (It is not possible to correspond to ADPCM and the compressed format of enhancing PCM.)
 - The reproduction method is monaural or it is a stereo. (It doesn't correspond to a multi channel. L-Channel is used to reproduce for the stereo form.)
 - The quantization bit rate for sampling is 8 bit or 16 bit (Full-scale against when modulating and the modulation depth is set).
 - The reproduction time is a size of data within ten seconds.
 - The sampling frequency is either 44.1 kHz, 48 kHz or 96 kHz.
 - Note: Even if the Wave file satisfies the specifications described above, you may be unable to load the file. An error message is displayed when specifying a Wave file that cannot be loaded.

In addition, the reception sensitivity of the wireless equipment can be examined by preparing the SINAD measuring instrument. The wireless equipment is demodulated input RF signal, and outputs the AF signal, and SINAD measuring instrument measures it.



Setup for Rx sensitivity tests



Example of Analog signal parameter setting

- Setting Items of Analog Signal
- Modulation method (FM/ΦM/AM)
- AF1/AF2
 - Tone frequency Tone Deviation (FM) Tone Radian (ΦM) Tone Depth (AM)
- DCS (FM) Code (Octet) Deviation

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

MS269xA

MS2830A

The MX269020A LTE Downlink Measurement Software and MX269022A LTE TDD Downlink Measurement Software support measurement of RF characteristics of 3GPP Release 8 LTE (Long Term Evolution) downlink signals. The MX269020A-001^{*1} LTE-Advanced FDD Downlink Measurement Software and MX269022A-001^{*2} LTE-Advanced TDD Downlink

Measurement Software support measurement of RF characteristics of 3GPP Release 10 LTE-Advanced downlink signals. *1: Requires MX269020A

*2: Requires MX269022A

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

Installing these software applications in the MS269xA or 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
- 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
	Opt. 078 installed	125 MHz	3	5
MS269xA	Opt. 077 installed	31.25 MHz	3	5
	Standard	31.25 MHz	3	5
	Opt. 078 installed	125 MHz	1	5
MS2830A	Opt. 077 installed	31.25 MHz	3	5
	Opt. 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)

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.



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.

5.00	(RMS/Pea)	., ou.	1		0.20 %	9 %	ľ	
			-	-				
	A					 li ene		

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.



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.

atness	(Amplitude v	s Subcar	rier)				
MKR	Subcarrier		1 A	mplitude	0.00 dE		
1.00							
050							
0.00							-
-0.50							
-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.

ummary							
PDSCH ALL EVM	Page No.	2/1	0				
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

				Page No.	10 / 10
RS Power	-41.28	dBm			
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



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/Pe	ak)		Subframe	Resource Block	
Modulation	16QAM				
Power	5.00 dB				
EVM	0.30 % /	0.77 %			
			_		
-30					

Specified Subframe

MKR(RMS/P	eak)		Subframe	Resource Block		
Modulation	16QAM					
Power	5.00 dB					
EVM	0.32 % /	0.75 %				
						-10
					Concession in the	

Power Display for Each Resource Block

DOLTE Downline	-		-					10	7/22/2008 12 104
Carrier Freq.	20	000 000 00	0 Hz	Input L	evel -10.0	00 dBH			Power on Fill View
Adulation						4 dB			
Channel Bandwid	dth	20	WHIZ				Reference Signal	Auto	Each Subframe
Result									
MKR "		9							
Resource Element Number					Frequency			0.48 Hz	Overall
					Output Po Mean Pow			-10.84 dBm	100 Million P
Subcarrier 72 Symbol 40					EVM(rms)			0.34 %	-
Subframe					EVM(peak			2.36 %	
Number 3					Symbo		er.	96	
Resource Block Number					Subcar	rier Ni	mber	895	-
1.68966					Origin Off	set		-49.64 dB	
-1.68569									
									_
Ower vs RB		_				_			
MKR(R					Subframe		Resource Block		
Maduli		160							
Power		5.00 d							
EVM		0.32 %		0.75 %					
								-12.00	
1000									
and the second second								10.000	
			- 11				CONTRACTOR OF THE OWNER		-
								** .alloo	Graph View
									RMS RMSEP
at let	Fre Art	- 04							
		9 MI	_	_	_	_			1

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.



Test Model Summary Display

This displays the analysis results for the signal types set at Test Model. • RS boosting for each subframe

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



					P	ige No. 21	3	
Subframe			EPRE	(Cra (db)			- 1	
	0.003	0.002	6.003	PCFICH 4.005	PHICH group 4002	PDCCH REG		Storage
	0.003	0.002	0.003				- 1	
	- min			0.000	0.004	1.065		
	in	min	- mim	4.003	0.005	1.075		
	mim		mim	0.010	0.007	1.063		
	im	mim	min	4.002	0.012	1,074		
	0.000	0.004	mim	0.010	0.003	1.564		
	min		-mim	0.506	0.004	1.063		
	im		im	0.006	0.010	1.568		
	- minn	mim	- mim	0.002	-0.003	1.965		
				0.004	0.007	1.565		Page Number
								2
	Pre-Jung Cf							

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.



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 LTE-Advanced FDD Downlink Measurement Software and MX269022A-001 LTE-Advanced TDD Downlink Measurement Software are installed, multiple bands and multiple carriers can be measured at the batch-measurement 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 post-delivery faults

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)

MX269020A LTE Downlink Measurement Software

MX269020A-001 LTE-Advanced FDD Downlink Measurement Software

Sign	al Analyzer	MS269xA	MS2830A
	Channel Bandwidth	1.4, 3, 5, 10, 15, 20 MHz	
Common Specifications	Target Signals Capture Time	Downlink Auto: 1 Frame	
	Measurement	Manual: 1 to 200 Frame 600 MHz to 4000 MHz	600 MHz to 4000 MHz (MS2830A-041/043/044/045)
	Frequency Range Measurement Level	-15 to +30 dBm (Preamp Off, or Preamp not installed)	600 MHz to 3600 MHz (MS2830A-040)
	Range	-15 to +10 dBm (Preamp On) After CAL execution at 18° to 28°C For a signal of EVM = 1% For Measurement Interval = 10 Subframe	
Modulation/ Frequency Measurement	Carrier Frequency Measurement Accuracy	± (Accuracy of reference frequency × Carrier frequency + 3 Hz) (Excluding the Batch Measurement when MS269xA-004 is installed)	 ± (Accuracy of reference frequency × Carrier frequency + 3.5 Hz) (When the center frequency is from 600 MHz to 2700 MHz and MS2830A-078 is not installed) ± (Accuracy of reference frequency × Carrier frequence + 8.0 Hz) (When the center frequency is from 2700 MHz to 4000 MHz and MS2830A-078 is not installed) ± (Accuracy of reference frequency × Carrier frequence + 4.0 Hz) (In the CC of the center frequency when the center frequency is from 600 MHz to 2700 MHz and MS2830A-078 is installed) (At the input level of -4 dBm when MS2830A-045 is installed) ± (Accuracy of reference frequency when the center frequency is from 2700 MHz to 4000 MHz and MS2830A-078 is installed) (At the input level of -4 dBm when MS2830A-045 is installed) (In the CC of the center frequency when the center frequency is from 2700 MHz to 4000 MHz and MS2830A-078 is installed) (At the input level of -4 dBm when MS2830A-045 is installed) (At the input level of -4 dBm when MS2830A-045 is installed)
	Residual Vector Error	After CAL execution at 18° to 28°C At measurement Interval = 10 subframe <1.0% (ms) (Excluding the Batch Measurement when MS269xA-078 is not installed or MS269xA-004 is installed) <1.3% (ms) (In the CC of the center frequency when MS269xA-078 is installed)	<1.3% (rms) At the input level of –4 dBm when MS2830A-045 is installed)
	Tx Power Measurement Accuracy	After CAL execution, input attenuator ≥10 dB, at 18° to the input signal is within the measurement level range	
	(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)	±0.6 dB (at Preamp Off, or Preamp not installed.)
	Waveform Display	Provides functions for displaying waveforms below. Constellation, EVM vs. Subcarrier, EVM vs. Symbol, Spectral Flatness	Power vs. Resource Block, EVM vs. Resource Block,
Adjacent Channel Leakage Power Measurement	Measurement Method	Executes the adjacent channel power measurement fu	nction of the Spectrum Analyzer or Signal Analyzer.
Occupied Bandwidth Measurement	Measurement Method	Executes the occupied bandwidth measurement function	on 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 for	unction of the Spectrum Analyzer.
	Function Overview	Capable of outputting captured waveform data to interr	al hard disk or external hard disk.
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 analyzed
Replay Function	Function Overview	Analyzes traces of saved waveform data Format: I, Q (32 bit floating point binary format) Sampling rate: 50 MHz	

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

Sign	al Analyzer	MS269xA	MS2830A		
0	Channel Bandwidth	1.4, 3, 5, 10, 15, 20 MHz			
Common Specifications	Target Signals Capture Time	LTE TDD Downlink Auto: 5 frame			
	Measurement	Manual: 5 to 150 frame 600 MHz to 4000 MHz	600 MHz to 4000 MHz (MS2830A-041/043/044/045)		
	Frequency Range Measurement Level	-15 to +30 dBm (Preamp Off, or Preamp not installed)	600 MHz to 3600 MHz (MS2830A-040)		
	Range	 -15 to +10 dBm (Preamp On) After CAL execution at 18° to 28°C For a signal of EVM = 1% When Downlink 10 Subframe is the measurement target 	et		
Modulation/ Frequency Measurement	Carrier Frequency Measurement Accuracy	± (Accuracy of reference frequency × Carrier frequency + 3 Hz) (Excluding the Batch Measurement when MS269xA-004 is installed) After CAL execution at 18° to 28°C	 ± (Accuracy of reference frequency × Carrier frequency + 3.5 Hz) (When the center frequency is from 600 MHz to 2700 MHz and MS2830A-078 is not installed) ± (Accuracy of reference frequency × Carrier frequency + 8.0 Hz) (When the center frequency is from 2700 MHz to 4000 MHz and MS2830A-078 is not installed) ± (Accuracy of reference frequency × Carrier frequency + 4.0 Hz) (In the CC of the center frequency when the center frequency is from 600 MHz to 2700 MHz and MS2830A-078 is installed) (At the input level of -4 dBm when MS2830A-045 is installed) ± (Accuracy of reference frequency × Carrier frequency + 8.0 Hz) (In the CC of the center frequency × Carrier frequency frequency is from 2700 MHz to 4000 MHz and MS2830A-078 is installed) (At the input level of -4 dBm when MS2830A-045 is installed) (In the CC of the center frequency when the center frequency is from 2700 MHz to 4000 MHz and MS2830A-078 is installed) (At the input level of -4 dBm when MS2830A-045 is installed) 		
Residual Vector Error		When Downlink 10 Subframe is the measurement target <1.0% (rms)			
	Tx Power Measurement Accuracy	After CAL execution, input attenuator ≥10 dB, at 18° to the input signal is within the measurement level range a			
	(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)	±0.6 dB (at Preamp Off, or Preamp not installed.)		
	Waveform Display	Provides functions for displaying waveforms below. Constellation, EVM vs. Subcarrier, EVM vs. Symbol, Spectral Flatness	Power vs. Resource Block, EVM vs. Resource Block,		
Adjacent Channel Leakage Power Measurement	Measurement Method	Executes the adjacent channel power measurement fur	nction of the Spectrum Analyzer or Signal Analyzer.		
Occupied Bandwidth Measurement	Measurement Method	Executes the occupied bandwidth measurement function	on of the Spectrum Analyzer or Signal Analyzer.		
Channel Power Veasurement	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 fu			
	Function Overview	Capable of outputting captured waveform data to interr	al hard disk or external hard disk.		
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 analyze		
Replay Function	Function Overview	Analyzes traces of saved waveform data Format: I, Q (32 bit floating point binary format) Sampling rate: 50 MHz			
	Function Overview	Provides measurements for Transmitter OFF Power, Ti This function can be used only in the MS269xA series.	me Mask, and Transmitter Transient Period.		
Power vs. Time	Dynamic Range	 121.4 dB (nominal)*1.*2 *1: This is the value when Channel bandwidth is 5 MH formula can be used. 10log10(Channel bandwidth/5.0 MHz) dB *2: Wide Dynamic Range = On, Noise Correction = Or 	-		

OOO "Техэнком" Контрольно-измерительные приборы и оборудование www.tehencom.com MX269021A LTE Uplink Measurement Software MX269023A LTE TDD Uplink Measurement Software

MS269xA

MS2830A

The MX269021A LTE Uplink Measurement Software and MX269023A LTE TDD Uplink Measurement Software support measurement of RF characteristics of 3GPP Release 8 LTE (Long Term Evolution) uplink signals.

The MS269021A LTE Uplink Measurement Software supports FDD (Frequency Division Duplex) measurement systems while the MX269023A LTE TDD Uplink Measurement Software supports TDD (Time Division Duplex) systems.

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

Features

■ Support Testing of 3GPP TS 36.521-1 Release 8 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 Emission

Replay Function for Troubleshooting Faults

Measurement Items

[Text Display]

- Frequency Error
- Output Power
- EVM (Peak/rms)
- 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
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		Merri	ring	
MKR	q			
Sakeanler 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 0.80028			EVM(peak)	1.02.%
			Symbol Number	
			Subcarrier Number	
			Frame Number	
			Origin Offset	-47.93 dB
Frame 0			Time Offset	-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 Subcarrie				
MKR(RMS/Peak)	Subcarrier	0	EVM	0.17 / 0.35 %
500				
375				
250 -				
125				
000	Mar mary	Ann	him	and an and a second
Frame 0 0	30	9.]	90 1	120 150 100 210 240 220 256

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.

ol 28 EVM	0.21 / 0.48 %	
		٦
		_
man	mont	

Spectral Flatness

Four kinds of graphs are switched.

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

(Avg/Peak)	Subcarrier	0		-0.05	51 -	0.05 /	-0.05 dE	3	
10.00									
5.00									
000		_	_	_					
-500									
-1000									
ne 0 °									

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.

ne Based EVM (R(RMS/Peak)	Symbol	28	EVM	0.19/	0.45 %	
5.00						
375 —						
250						_
1.25						_
0.00			~~~		*******	
ame 0 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.

M vs Demod-S	lymbol								
R(RMS/Peak)	Demod-Symi	0 100	EVM		0.20	/ 0.4	13 %		
500									
375 -									
250 -									
1.25									
000	under	ren		m		A\	mur	May	May
me 0 0	30	60	90 1	120 1	50 10	0 2	30 2	40 2	20 299

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.



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.*

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





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

 \rightarrow Supports rechecking of performance data for troubleshooting post-delivery faults

Summary Display Function

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



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

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)

MX269021A LTE Uplink Measurement Software

Sign	al Analyzer	MS269xA	MS2830A					
	Channel Bandwidth	1.4, 3, 5, 10, 15, 20 MHz						
Common	Target Signals	Uplink						
Specifications	Capture Time	Auto: 1 Frame						
		Manual: 1 to 200 Frame						
	Measurement Frequency Range	600 MHz to 2700 MHz						
	Measurement Level	–15 to +30 dBm (Preamp Off, or Preamp not installed)						
	Range	-15 to +10 dBm (Preamp On)						
	Carrier Frequency	After CAL execution at 18° to 28°C. For a signal of EVI						
	Measurement Accuracy	± (Accuracy of reference frequency × Carrier frequency	y + 8 Hz)					
	Residual Vector Error	After CAL execution at 18° to 28°C	,					
		<1.0% (rms)	<1.2% (rms)					
	Tx Power Measurement	After CAL execution, input attenuator ≥10 dB, at 18° to	28°C,					
	Accuracy	the input signal is within the measurement level range	and below the value set in Input Level.					
Modulation/ Frequency 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 (at Preamp Off, or Preamp not installed.) ±1.1 dB (at Preamp On)	±0.6 dB (at Preamp Off, or Preamp not installed.)					
	Measurement Target Channel Signal	Measurement target channel • PUSCH • SRS • PUCCH • PRACH Measures and displays the result per channel. The channel 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						
Adjacent Channel Leakage Power Measurement	Measurement Method	Executes the adjacent channel power measurement fu	nction of the Spectrum Analyzer or Signal Analyzer.					
Occupied Bandwidth Measurement	Measurement Method	Executes the occupied bandwidth measurement function	on 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 interr	nal hard disk or external hard disk.					
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: 50 MHz						

	al Analyzer	MS269xA	MS2830A					
	Channel Bandwidth	1.4, 3, 5, 10, 15, 20 MHz						
Common	Target Signals	Uplink						
Specifications	Capture Time	Auto: 5 Frame Vanual: 5 to 150 Frame						
	Measurement Frequency Range	600 MHz to 2700 MHz						
	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						
	Carrier Frequency Measurement Accuracy	After CAL execution at 18° to 28°C. For a PUSCH sign ± (Accuracy of reference frequency × Carrier frequency						
	Residual Vector Error	After CAL execution at 18° to 28°C						
		<1.0% (rms)	<1.2% (rms)					
	Tx Power Measurement	After CAL execution, input attenuator ≥10 dB, at 18° to	28°C,					
Modulation/ Frequency Measurement	Accuracy (This is found from root sum of squares (RSS) of absolute amplitude accuracy and in-band frequency characteristics of main frame.)	the input signal is within the measurement level range ±0.6 dB (at Preamp Off, or Preamp not installed.) ±1.1 dB (at Preamp On)	and below the value set in Input Level. ±0.6 dB (at Preamp Off, or Preamp not installed.)					
	Measurement Target Channel Signal	Measurement target channel • PUSCH • PUCCH • PRACH Measures and displays the result per channel. The channel 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						
Adjacent Channel Leakage Power Measurement	Measurement Method	Executes the adjacent channel power measurement fu	nction of the Spectrum Analyzer or Signal Analyzer.					
Occupied Bandwidth Measurement	Measurement Method	Executes the occupied bandwidth measurement function	on 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 interr	nal hard disk or external hard disk.					
Digitize Function	Waveform Data		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: 50 MHz						

MX269023A LTE TDD Uplink Measurement Software

00	OWTX289024A COMA2000 Forward Link Measurement Softw	Vare v	www.tehencom.com
	MX269024A-001 All Measure Function	4168	
	MX269026A EV-DO Forward Link Measurement Software		
	MX269026A-001 All Measure Function		
		MS269x	A MS2830A

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

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

Similarly, installing the MX269026A-001 All Measure Function in a unit in which the MX269026A EV-DO Forward Link Measurement Software has been installed supports single-capture batch-measurement 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.

A 18139/05 COM				10	
Carrier Freq.	870 000 000 Hz	Input Level	-10.00 dBm		COMATINE Farmeril (#
			4 dB		Modulation Analysis
Result		_			Betting
Modulation Analy					Occupied Dandwidth
Code Domain P Inactive CH Pow					Setting
Total Average	-47.51 dB -67.92 dB				Spectrum Emission
Maximum	-65.33 dB				Mush Setting
Modulation Ana	lysis				
Frequency Error		-0.55 Hz			
		-0.0006 pp 0.99998	Channel Power	-10.59 dBm	
P EVM (rms)		0.999946	Channel Power	-10.59 dBm	
Origin Offset		-58.67 dE	Pilot Power		
			Abs.	-17.55 dBm	
			Rel.	-6.97 dB	
OBW		1	5em		
OBW	1.269 531 MHz		Result Pass		
					SEM Result
					Detail
Retint				la	0

All Measure Screen: CDMA2000 Forward Link

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.



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.



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:

Halfslot

- Displays half slot time.
- 1st Half slot: Displays first half
- 2nd Half slot: Displays second half
- Full slot: Displays mean of first and second half

A 1809/04	F-OO Furnant Link				10	5/18/2013	161940
Carrier Freq.	870 000 000 Ha	Input Level	-10.00 dBm 8 dB			Preserve Time Sele	
Result		_	_	Average & Max	513/ 513	Referen	ceLine
MKR	400.00 PNChips (325.52 µs) A	rg. 0.19		dB	Referen Lev 0.004	rel
-10.00 -20.00 -30.00						Select Standard	COLUMN STATE
-400 -500 -600 -700						Mask I	letup 4
-90.00 -90.00						Un di	a din
Result							
Template Ju ReferenceP	idge Pass	AvgMaxMin				Display	All
MeanPower OnPower		0.25 / -10.59 dB				Emoor Film Om	
						Filter	
Ref.Int						1.42	101 0



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

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

■ Ramp Displays Ramp Part of Pilot/MAC.

A 100901	V-DO Furnant Ltd.				الله ا	5/18/2013 16:16:24
Carrier Freq.	870 000 000 Hz	Input Level ATT	-10.00 dBm 8 dB			Trace Hole
Result Power ve Time	s(Ramp)			Average & Max	513/ 513	
MKR	400.00 PNChips (326.62 µs) Avg	0.17		dB	OnPortion
-108 -200 -200 -400						Ramp
-50.0 -600 -70.0 -000 -90.0				have		
Result	10	415	604		643	
Template Ji ReferenceP MeanPower OnPower	udge Pass Yower -10.69 dBm r -17.17 / -1	AvgMaxiMin 597 / -17.32 dBm 568 / -10.83 dBm				
Ref.Int						

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				
•• • • • • •	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 Measurement	Carrier Frequency Measurement Accuracy	At 18° to 28°C, after calibration, EVM = 1% signal ± (Accuracy of reference frequency × Carrier frequency + 10 Hz)				
weasurement	Residual Vector Error	At 18° to 28°C, after calibration				
		<1.0% (rms)	<1.5% (rms)			
	Waveform Quality (ρ)	>0.99990	>0.99978			
	Tx Power Measurement Accuracy (This is found from root sum of	At 18° to 28°C, after calibration, with input attenuator and less than Input level	>10 dB and input signal in measurement level range			
Amplitude 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)	±0.6 dB (Preamp Off, or Preamp not installed)			
Code Domain Measurement	Power Accuracy	At 18° 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				
		Adjacent Channel Leakage Power, Occupied Bandwi	idth, Channel Power, Spectrum Emission Mask			
Measurement Items	MX269026A	Modulation Analysis • Frequency Error • ρ (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				
		Code Domain Graph I Code/CH/Power/ρ, Q code/CH/Power/ρ, Total Pilo I Active CH, I Inactive CH, Q Active CH, Q Inactive				
		Power vs. Time Graph Average, Maximum, Minimum				
		Adjacent Channel Leakage Power, Occupied Bandw	idth, Channel Power, Spectrum Emission Mask			

OOO "Техэнком" Контрольно-измерительные приборы и оборудование www.tehencom.com MX269028A WLAN (802.11) Measurement Software MX269028A-001 802.11ac (80 MHz) Measurement Software MX269028A-002 802.11ac (160 MHz) Measurement Software

MS269xA

MS2830A

Installing the MX269028A WLAN (802.11) Measurement Software in the MS269xA/MS2830A Signal Analyzer main frame supports modulation analysis of IEEE802.11n/p/a/b/g/j signals with display of numerical and graphical results. The MX269028A-001^{*1} 802.11ac (80 MHz) Measurement Software, and MX269028A-002^{*2} 802.11ac (160 MHz) Measurement Software are MX269028A software options for modulation analysis of IEEE802.11ac 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 IEEE802.11n/p/a/b/g/j signal (MX269028A)
- Adding optional software supports modulation analysis of IEEE802.11ac 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^{*1} (saves^{*2} signals for later modulation analysis troubleshooting)

*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

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

- IEEE802.11n (HT-Mixed, HT-Greenfield, Non-HT)
- IEEE802.11p
- IEEE802.11a
- IEEE802.11b
- IEEE802.11g ERP-DSSS/CCK
- IEEE802.11g ERP-OFDM
- IEEE803.11g DSSS-OFDM
- IEEE802.11j

Measures both continuous and burst signals.

MX269028A-001/002

IEEE802.11ac (VHT)

Measures burst signals only.

Capture & Replay Function^{*1}

When faults are detected, this function captures^{*2} on-site signals to internal/external hard disk for later troubleshooting using analysis functions.

- *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

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

Supports IEEE802.11ac signals up to 160-MHz bandwidth

The IEEE802.11ac measurement range varies as follows, depending on the Analysis Bandwidth Extension option configuration.

Table 1: Supported measurement range for IEEE802.11ac signals

	Model				dth of IEEE802.1	lac signal	
Main frame	Measurement software	Analysis Bandwidth Extension Option Configuration	20 MHz	40 MHz	80 MHz	160 MHz	80 MHz + 80 MHz
		Opt. 078*1 installed	~	✓	~	✓	√*6
MS269xA	MX269028A-002	Opt. 077/004*2 installed	~	~			
		Standard	~	~			
		Opt. 078*3 installed	~	~	√*7		
MS2830A	MX269028A-001	Opt. 077*4 installed	~	~			
		Opt. 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 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.

Analysis Function (Numerical Results and Graph display)

	ltem	11n/p/a/j 11g (ERP-OFDM) 11g (DSSS-OFDM)	11b 11g (ERP-DSSS/CCK)	11ac
	Numerical Result Display			
	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)	_	_	√
	EVM [Peak]	 ✓ 	✓	✓
ion	Symbol Number, Subcarrier Number/Chip Number	\checkmark	✓	
nct	Quadrature Error	· ·		v v*6
ЪЦ	IQ Gain Imbalance	· ·		· √*6
sis.	Center Frequency Leakage	· ·		✓ · ·
aly	Spectral Flatness (Amplitude/Phase/Group Delay)	· ·	_	· •
Modulation Analysis Function	Outside Subcarrier Amplitude Max and Min Value	✓ ✓		✓ V
u	Inside Subcarrier Amplitude Max and Min Value	· ✓		· •
lati	Phase Error	-		-
npo	Magnitude Error	_	• ✓	
M	IQ Origin Offset		• •	
	Detect Parameter		• ✓	
	Data Rate, Modulation Method, Symbol Length/Chip Length	✓ ✓*4	▼ ✓	•
	Preamble	✓*5	▼ ✓	
	MCS, Stream ID, Symbol Length, Guard Interval	✓*2	•	
	Graph Display	• -	_	•
	Constellation	 ✓ 	✓	✓
	EVM vs. Subcarrier	· ·	•	✓ V
	EVM vs. Subcarrier EVM vs. Symbol/EVM vs. Chip	✓ ✓		✓ ✓
	Spectral Flatness (Amplitude/Phase/Group Delay)	▼ ✓	•	✓ ✓
	Phase Error vs. Chip	•		•
	Eye diagram		▼ ✓	
	Numerical Result Display		v	
E	Transmit Power	✓	✓	
ctic	Power Flatness Max	▼ ✓	▼ ✓	
nn -	Carrier Off Power	▼ ✓	▼ ✓	
еF	On/Off Ratio	✓ ✓	✓ ✓	
Lim		▼ ✓	 ✓	
Power vs. Time Function	Peak Power Spectrum Density (PSD)	×	✓ ✓	
Sr v	Transient time (power-on ramp, power-off ramp) Graph Display		v	_
DW6		 ✓ 	✓	
P	Burst	✓ ✓	✓ ✓	
	Transient	v	v	

*1: IEEE802.11a

*2: IEEE802.11n

*3: IEEE802.11n (HT-Mixed, HT-Greenfield)

*4: Exclude IEEE802.11n

*5: IEEE802.11g DSSS-OFDM

*6: Exclude Channel Bandwidth 160 MHz setting

Common Setup Parameter

Standard	MX269028A: IEEE802.11n, IEEE802.11p, IEEE802.11a, IEEE802.11b, IEEE802.11g ERP-DSSS/CCK, IEEE802.11g ERP-OFDM, IEEE802.11g DSSS-OFDM, IEEE802.11j MX269028A-001 or MX269028A-002: IEEE802.11ac
Measuring Object	Burst Signal, Continuous Signals: IEEE802.11n/p/a/b/g/j Burst Signal: IEEE802.11ac
Channel Bandwidth	MX269028A: IEEE802.11n: 20 MHz, 40 MHz, 40 MHz (Upper), 40 MHz (Lower) IEEE802.11j/p: 5, 10, 20 MHz MX269028A-001: IEEE802.11ac: 20, 40, 80 MHz* MX269028A-002: IEEE802.11ac: 20, 40, 80, 160 MHz*
PPDU Format	MX269028A: IEEE802.11n: Non-HT, HT-Mixed, HT-Greenfield MX269028A-001: IEEE802.11ac: VHT

*: Refer to [Table1: Supported measurement range for IEEE802.11ac 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° 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)

MX269028A WLAN (802.11) Measurement software

Signal Analyzer			MS269xA	MS2830A	
Standard			IEEE 802.11n HT Mixed, HT Greenfield, Non-HT, (I	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)		
Modulation/ Frequency Measurements Carrier Frequency Accuracy 20 MHz channel 40 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 (MS2830A Preamp Off, or Preamp not installed) -15 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 not installed) -6 to +10 dBm (Preamp On) 		
		channel 40 MHz	Burst length ≥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) 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)		
	Residual Vector	idual Vector	Channel Estimation: SEQ, Phase Tracking: On, Am ≤1.2% (rms) (2.4 GHz band) ≤1.6% (rms) (5 GHz band)		
	Error	40 MHz channel	Channel Estimation: SEQ, Phase Tracking: On, Am ≤1.5% (rms) (2.4 GHz band) ≤1.9% (rms) (5 GHz band)	plitude Tracking: Off, Burst signal ≤1.6% (rms) (2.4 GHz band) (Preamp Off) ≤2.0% (rms) (5 GHz band) (Preamp Off)	
	Center Frequency Leakage Floor		≤–50 dBc (nominal)		
Amplitude Measurement	Tx Power Accuracy (This is found from root sum of squares (RSS) of absolute amplitude accuracy		Input attenuator ≥10 dB 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) Input attenuator ≥10 dB	 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) 	
	and in-band frequency characteristics of main frame.)	40 MHz channel	 2.4 GHz band: ±0.7 dB (Preamp Off, or Preamp not installed) ±1.1 dB (Preamp On) 5 GHz band: ±0.7 dB (Preamp Off, or Preamp not installed) ±1.1 dB (Preamp On) 	 2.4 GHz band: ±0.8 dB (Preamp Off, or Preamp not installed) 5 GHz band: ±2.0 dB (Preamp Off, or Preamp not installed) 	

Signal Analyzer		MS269xA	MS2830A			
Standard		IEEE 802.11p	1102000/1			
	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 Pream) -12 to +30 dBm (MS2830A Preamp Off, or Pream) -6 to +30 dBm (MS2830A Preamp Off, or Pream) -30 to +10 dBm (Preamp On) 300 MHz to 862 MHz: -15 to +30 dBm (MS269xA Preamp Off, or Pream) -9 to +30 dBm (MS2830A Preamp Off, or Pream) -9 to +30 dBm (MS2830A Preamp Off, or Pream) -30 to +10 dBm (Preamp On)	p not installed, MS2830A-045 not installed) not installed, MS2830A-045 installed) o not installed) p not installed, MS2830A-045 not installed) not installed, MS2830A-045 installed)			
	Carrier Frequency Accuracy	5 MHz channel: Burst length ≥1 ms, 10 MHz channe 20 MHz channel: Burst length ≥250 μs ± (Accuracy of reference frequency × Carrier frequence)	5			
Modulation/ Frequency Measurements	Residual Vector Error	Channel Estimation: SEQ, Phase Tracking: On, Amp 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 (nominal)				
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 ≥10 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) -15 to +30 dBm (MS269xA Preamp Off, or Preamp I	not installed)			
Modulation/ Frequency Measurements	Measurement Level Range	 -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) 				
	Carrier Frequency Accuracy	Burst length ≥250 µs ± (Accuracy of reference frequency × Carrier frequency + 16) Hz				
	Residual Vector Error	Channel Estimation: SEQ, Phase Tracking: On, Amp ≤1.5% (rms)	litude Tracking: Off, Burst signal ≤1.6% (rms) (Preamp Off)			
	Center Frequency Leakage Floor	≤–50 dBc (nominal)				
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 ≥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		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 Measurements	Measurement Level Range	-15 to +30 dBm (MS269xA Preamp Off, or Preamp off, or Preamp off to +30 dBm (MS2830A Preamp Off, or Preamp n-9 to +30 dBm (MS2830A Preamp Off, or Preamp n-30 dBm to +10 dBm (at Preamp On) Burst length ≥400 µs	not installed, MS2830A-045 not installed)			
vieasurements	Carrier Frequency Accuracy	± (Accuracy of reference frequency × Carrier frequence	ncy + 21) Hz			
	Residual Vector Error	Specify filter with same characteristics as used for m ≤1.2% (rms)	leasurement signal, Burst signal ≤1.9% (rms) (Preamp Off)			
Amplitude Measurement	Center Frequency Leakage Floor Tx Power Accuracy (This is found from root sum of squares (RSS) of absolute amplitude accuracy and in-band frequency characteristics of main frame.)	 ≤-50 dBc (nominal) Input attenuator ≥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				
	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 I -15 to +30 dBm (MS2830A Preamp Off, or Preamp -9 to +30 dBm (MS2830A Preamp Off, or Preamp n -30 to +10 dBm (Preamp On)	not installed, MS2830A-045 not installed)			
Measurements	Carrier Frequency Accuracy	Burst length ≥250 µs ± (Accuracy of reference frequency × Carrier frequence)				
	Residual Vector Error	Channel Estimation: SEQ, Phase Tracking: On, Amp ≤1.2% (rms)	litude Tracking: Off, Burst signals ≤1.2% (rms) (Preamp Off)			
	Center Frequency Leakage Floor	≤–50 dBc (nominal)				
Amplitude Measurement	Tx Power Accuracy (This is found from root sum of squares (RSS) of absolute amplitude accuracy and in-band frequency	Input attenuator ≥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)			

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), c Burst length ≥250 µs (Channel Bandwidth: 20 MHz ± (Accuracy of reference frequency × Carrier frequ		
Modulation/	Deside al Mantes 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	S-50 dBc (nominal)		
	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)	

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

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

Signal Analyzer			MS269xA	MS2830A			
Standard			IEEE 802.11ac				
	Frequency Measurements		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)				
			20 MHz Channel/40 MHz Channel -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) 80 MHz Channel/160 MHz Channel -10 to +30 dBm (MS269xA Preamp Off, or Preamp not installed) -10 to +30 dBm (MS2830A Preamp Off, or Preamp not installed) -4 to +30 dBm (MS2830A Preamp Off, or Preamp not installed, MS2830A-045 installed) -20 to +10 dBm (Preamp On)				
		20 MHz	Burst length ≥250 µs				
		channel	± (Accuracy of reference frequency × Carrier frequer	ncy + 16) Hz			
Modulation/		40 MHz channel	Burst length ≥250 µs ± (Accuracy of reference frequency × Carrier frequency + 102) Hz				
Frequency Carrier Frequency Measurements Accuracy	Carrier Frequency	80 MHz	Burst length \geq 250 µs				
	Accuracy	channel	± (Accuracy of reference frequency × Carrier frequer	ncy + 102) Hz			
		160 MHz channel	Burst length ≥250 µs ± (Accuracy of reference frequency × Carrier frequency + 102) Hz	_			
		20 MHz	Channel Estimation: SEQ, Phase Tracking: On, Amp	blitude Tracking: Off, Burst signal			
		channel	≤0.7% (rms) (Preamp Off) ≤0.9% (rms) (Preamp On)	≤0.9% (rms) (Preamp Off)			
		40 MHz	Channel Estimation: SEQ, Phase Tracking: On, Amp	blitude Tracking: Off, Burst signal			
	Residual Vector	channel	≤0.8% (rms) (Preamp Off) ≤1.0% (rms) (Preamp On)	≤1.0% (rms) (Preamp Off)			
	Error	00 MI I-	Channel Estimation: SEQ, Phase Tracking: On, Amplitude Tracking: Off, Burst signal				
		channel	≤0.9% (rms) (Preamp Off) ≤1.1% (rms) (Preamp On)	≤1.1% (rms) (Preamp Off)			
	_		Channel Estimation: SEQ, Phase Tracking: On, Amplitude Tracking: Off, Burst signal ≤1.5% (rms) (Preamp Off) ≤1.7% (rms) (Preamp On)	_			
	Center Frequency Le	eakage Floor	≤–50 dBc (nominal)	·			
		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)			
Amplitude	(This is found from root sum of squares (RSS) of absolute	40 MHz channel	Input attenuator ≥10 dB ±0.7 dB (Preamp Off, or Preamp not installed) ±1.1 dB (Preamp On)	±2.0 dB (Preamp Off, or Preamp not installed)			
Measurement	amplitude accuracy	80 MHz	Input attenuator ≥10 dB				
	and in-band frequency	channel	±1.2 dB (Preamp Off, or Preamp not installed) ±1.6 dB (Preamp On)	±3.2 dB (Preamp Off, or Preamp not installed)			
	characteristics of main frame.)	160 MHz channel	Input attenuator ≥10 dB ±1.3 dB (Preamp Off, or Preamp not installed) ±1.7 dB (Preamp On)	-			

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 pull-down 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 (IEEE802.11n, 11p, 11a, 11b, 11g, 11j)



- 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 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 (IEEE802.11ac)

	5 250 000 000				0 dBm		El within
Standard	EEE802.1				4 dB		
Bandwidth	160%	8142			Measurement Mode	Single	EVM vs Subcarrie
Result					Average & Max	10/10	
				Avg/Max			and an end of the second
Frequency Er		-95.85 /		-115.69 Hz			EVM vs Symbo
				-0.02 ppm			
Symbol Clock				-0.48 ppm			
Transmit Pow	ver	-5.61 /		-5.60 dBm			the matter
							SpectralFlatee
Summary		_	_			9	
EVM(rms)		1,13		1,21 %	Detect Parameter		Summary
Data EVN	(rms)	1,13		1.20 %	MCS Index		
					Stream ID		
Pilot EVM	(rma)			1,10.%			
		1.03		1.10 %	Length		
Pilot EVM L-SIG EV						11 Long	
Pilot EVM L-SIG EVI VHT-SIG	M(rma)	1,15			Length		
Pilot EVM L-SIG EVI VHT-SIG	M(rms) A EVM(rms)	1.15		1.20 %	Length		
Pilot EVM L-SIG EVI VHT-SIG- VHT-SIG-	M(rma) A EVM(rma) B EVM(rma)	1,15 1,07 1,23		1.20 % 1.12 % 1.33 %	Length		
Pilot EVM L-SIG EVI VHT-SIG- VHT-SIG- EVM(Peak) Symbol N	M(rma) A EVM(rma) B EVM(rma)	1,15 1,07 1,23		1.20 % 1.12 % 1.33 % 6.30 %	Length		
Pilot EVM L-SIG EVI VHT-SIG- VHT-SIG- EVM(Peak) Symbol N	M(rms) A EVM(rms) B EVM(rms) Iumber ir Number	1.15 1.07 1.23 4.21		1.20 % 1.12 % 1.33 % 6.30 % 6 376	Length		
Plict EVM L-SIG EVI VHT-SIG- VHT-SIG- EVM(Peak) Symbol N Subcarrie	M(rms) A EVM(rms) B EVM(rms) Iumber Iumber Ir Number Error	1.15 1.07 1.23 4.21		1.20 % 1.12 % 1.33 % 6.30 % 6 376	Length		

- 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 Bandwidth160 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 (IEEE802.11n, 11p, 11a, 11b, 11g, 11j)



Measurement signal:

IEEE802.11n, 11p, 11a, 11g (ERP-OFDM, DSSS-OFDM), 11j

- Frequency Error •
- Symbol Clock Error •
- Transmit Power
- EVM [rms/peak]
- Center Frequency Leakage

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Measurement signal: IEEE802.11b, 11g (ERP-DSSS/CCK)

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

MX269028A-001/002 (IEEE802.11ac)



Measurement Signal: IEEE802.11ac

- 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.

MKR(Ave./Max) Subca	riar 17	(5.3125MHz) EVM	0.90 % /	2.40.%	Symbol Number	100
500		10.0120mm2) E 4m	0.30 /0 /	2.49 /1	oymoor nomoer	10
000						

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.

EVM vs Symbol	The Name		LUL LOUD		
MKR(AveJMax) Symbol		EVM	0.70 % /	1.34 %	
125	1.00				
0.00		Attille			

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.



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	1.02	deg.
				-	

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 Subcarrie		(-6.87	(5MHz) Amplitude	0.04 d	В	
Flatness(Outside) Max:	0.04 dB	(Sub: -22)	Min	-0.05 dB	(Sub:26)
Flatness(Inside)	Max:	0.02 dB	(Sub:-7)	Min	-0.03 dB	(Sub:-12)
650						
1.20						
600						
100					_	
-650						

MKR	Subcarrier	(-7.1875MHz)	Phase	-0.12	deg.

ipectral Flatr	ness(Group De	nlay vs	Subcarrier)	
MKR	Subcarrier	-23	(-7.1876MHz)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*

*: Supports IEEE802.11n/p/a/b/g/j

Numerical Results

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

- Transmit Power
- Power Flatness Max
- Carrier Off Power
- On/Off Ratio
- 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 MEAN					10	
Carrier Freq.	2 412 000 000 Hz	InputLevel	-10.00 dBm			El WLAN American Time
Standard	EEE802.11b					
				Messurement Mode	Single	Analysis Time
Result				Average & Max	10/10	
Transmit Power	-11.54 /	-11.63 dBm	Transient Time	Aw	pMax	Standard
Power Flatness M		-11.63 dBm				IEEEB02.11b
			Power-on Ram		1.00 µs	
Carrier Off Power		-64.66 dBm	Power-down R	amp 0.85 /	0.90 µs	Measuring Object
On/Off Ratio	53.33 /	53.90 dB				Burst Cont.
Peak PSD	-20.32 /	-20.32 dBm/MH				Channel Bandwid
Power vs Time - Bur						
MKR	0.0 µs	-13.22 66	3m			2014.6
						PPDU Format
						HT-Mond
-11.64						
						Signal Setup
						Construction
-2.64						
-71.64						
	Ams Off				1110 [Ju]	-
						142 828

Burst

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

Power vs Time - Burs	ıt		
MKR	0.0 µs	-13.22 dBm	
608 [mBb]			
-11.64			
-21.64			
-51.64			
-71.64			
-91.64 -20.0			969.3 [µs]

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.

tKR	-4.0 µs	-61.67 dBm	



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 post-delivery faults

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 measuremer	it standard i	emplates					
Standard	Bandwidth		Supported	Supported Template			
Stanuaru	Danuwiutin	ACP	OBW	SEM	Spurious		
IEEE802.11n	20 MHz	✓ TELEC T403	✓ TELEC T403✓ ETSI	✓ IEEE ✓ ETSI	 ✓ TELEC T403 ✓ ETSI ✓ FCC 		
ILLEOUZ. I III	40 MHz	✓ TELEC T403	✓ TELEC T403✓ ETSI	✓ IEEE ✓ ETSI	 ✓ TELEC T403 ✓ ETSI ✓ FCC 		
	5 MHz	_	✓ ETSI	✓ ETSI	 ✓ TELEC T405 ✓ ETSI ✓ FCC 		
IEEE802.11p	10 MHz	_	✓ ETSI	✓ ETSI	 ✓ TELEC T405 ✓ ETSI ✓ FCC 		
	20 MHz	✓ TELEC T403	✓ TELEC T403✓ ETSI	✓ ETSI	 ✓ TELEC T403 ✓ ETSI ✓ FCC 		
IEEE802.11a	_	✓ TELEC T403	✓ TELEC T403✓ ETSI	✓ IEEE ✓ ETSI	 ✓ TELEC T403 ✓ ETSI ✓ FCC 		
IEEE802.11b	_	—	✓ TELEC T401	✓ IEEE	✓ TELEC T401✓ ETSI		
IEEE802.11g ERP-DSSS/CCK	_	_	✓ TELEC T401	✓ IEEE	✓ TELEC T401✓ ETSI		
IEEE802.11g ERP-OFDM	_	_	 ✓ TELEC T401 ✓ ETSI 	✓ IEEE ✓ ETSI	✓ TELEC T401✓ ETSI		
IEEE802.11g DSSS-OFDM	_	_	 ✓ TELEC T401 ✓ ETSI 	✓ IEEE ✓ ETSI	✓ TELEC T401✓ ETSI		
	5 MHz	—	✓ ETSI	✓ ETSI	✓ TELEC T405		
IEEE802.11j	10 MHz	—	✓ ETSI	✓ IEEE ✓ ETSI	✓ TELEC T405		
	20 MHz	✓ TELEC T403	 ✓ TELEC T403 ✓ ETSI 	✓ IEEE ✓ ETSI	✓ TELEC T403		
	20 MHz	_	✓ ETSI	✓ IEEE ✓ ETSI	—		
IEEE802.11ac	40 MHz	_	✓ ETSI	✓ IEEE ✓ ETSI	—		
	80 MHz	—	✓ ETSI	✓ IEEE	—		
	160 MHz	_	✓ ETSI	✓ IEEE	_		

Each measurement standard templates

000 "Техэнком" Контрольно-измерительные приборы и оборудование www.tehencom.com MX269030A W-CDMA BS Measurement Software



MS2830A

The MX269030A W-CDMA BS Measurement Software 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

Spectrum

- Occupied Bandwidth (OBW)
- Adjacent Channel Leakage Power (ACLR)
- Spectrum Emission Mask (SEM)

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			
Common	Target Signal	W-CDMA/HSPA Downlink				
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	Input level range: Input Level to Input Level –10 dB (with EVM = 1%	Input Level ≥–4 dBm), for 1 wave multiplexed signals			
	Measurement 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 (signals conforming to 3GPP TS 25.141 TestModel1	Input Level ≥–4 dBm), for 64DPCH multiplexed			
		≤1.0% (rms)	≤1.3% (rms)			
Modulation/ Frequency	Code Domain Power	Input level range: Input Level to Input Level –10 dB (I TS25.141 TestModel2	nput Level ≥–4 dBm), for signals conforming to 3GPF			
Measurement	Relative Value Accuracy	±0.02 dB (Code Domain Power ≥-10 dBc)	±0.02 dB (Code Domain Power ≥–10 dBc)			
		±0.10 dB (Code Domain Power ≥-30 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 3GP TS25.141 TestModel3				
		≤–50 dB	≤–47 dB			
	Code Domain Error Accuracy	Input level range: Input Level to Input Level –10 dB (Input Level ≥–4 dBm), for signals conforming to 3GPI TS25.141 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° to 28°C, after calibration, for signals with the in (Input Level \geq -4 dBm) \pm 0.6 dB	nput level range of Input Level to Input Level –10 dB			
	Occupied Bandwidth Measurement	Attained with 99% method on spectrum waveforms a	ttained by FFT calculation.			
Spectrum	Adjacent Channel Leakage	Performs RRC filter processing (α = 0.22) on spectru 18° to 28°C, for single carrier, Input Level \geq -4 dBm	m waveforms attained by FFT calculation.			
Measurement	Power Measurement	-65 dB (5 MHz offset)	–64 dB (5 MHz offset, Nominal)			
		-66 dB (10 MHz offset)	-65 dB (10 MHz offset, Nominal)			
	Spectrum Emission Mask	18° 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, Nominal)			

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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.



BOREA W-COMAL	Contraction in the local distance	-				7/13/2012 20 49 40
						Henne
Spectrum Emission	Manit				•	Modulation Analysi
Measure Count		Pass				Result
		d8m				
-12.500MHz t	a 41.000MHz	-78.34	-72.88			
8.000MHz t	-4.000MHz	-71.55	-71.10			
-4.000MHz 5	a-3.515MHz	-0.83	-82.36			
-3.515MHz t	0-2.715MHz	-9028	-94.82			
	0-2.515MHz	-65.94	-0.00			
2.615MHz	to 2.715MHz	-91.54	-61.08			Occupied Bandwidt
2.715MHz	to 3.515MHz	-89.11	-10.05			Result
3.515MHz	to 4.000MHz	-17.22	-61.05			
4.000MHz1	to 8.000MHz	-75.73	-7027			Spectrum Emission
B DOOMH2 to	12.500MHz	-71-42	-7010			Mask Result
Adjacent Channel L	eekage powe	Ratio				Adjacent Charme
Measure Count			Minimum	Maximum		Leakage power Ratio Result
	-10MHz	-47.23	-07.73	-47.23	68	
	-6MHz	-64.09	-64.09	-01.09	68	
	6MHz 📃	-45.18	-45.16	-45.18	68	
	10MHz	-0155	-0.50	-01.52	68	

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



The MX269036A Measurement Software for MediaFLO supports measurement of RF Tx characteristics of TIA-1099 and TIA-1099A MediaFLO signals.

Installing it in the MŠ269xA supports modulation analysis of MediaFLO signals with display of numerical and graphical results. In addition, standard functions of the MS269xA support measurement of RF Tx characteristics, such as adjacent channel leakage power, spectrum mask spurious, etc.

For Evaluating Transmitter Stations, Gap Fillers, and MediaFLO Parts

The MX269036A supports MediaFLO modulation analysis and has an easy to use graph function for verification at Tx tests of transmitters and gap fillers.

- Specifications
- Standard •
- **Channel Bandwidth** •
- FFT Size Cyclic Prefix •
- : 5, 6, 7, 8 MHz : 2, 4, 8 K
- Modulation •

: 1/16, 1/8, 3/16, 1/4 : QPSK. 16QAM/Layered (ER = 4),

: TIA-1099, TIA-1099-A

Layered ($\vec{ER} = 6.25$) : 0 to 15

- WID •
 - LID
- : 0 to 15 Slot to Interlace : Pattern1, Pattern2 •
- Wide-Area Data •
- : Arbitrariness PPC/Reserved OFDM Symbol : Arbitrariness •
- Measurement Frequency Range: 200 MHz to 1600 MHz
- Measurement Level Range :-26 to +30 dBm •
 - -38 to +10 dBm (at Preamp On)

Numerical Results Display

- Frequency Error (Hz, ppm) •
- Output Power •
- MER
- DATA (TPC, OIS, Data), TDM1, WIC, LIC, TDM2
- **Transmitter Timing**

- Graph Display
- Constellation •
- MER vs. Subcarrier •
- MER vs. Symbol
- Spectral Flatness (Frequency response) Amplitude vs. Subcarrier Group Delay vs. Subcarrier
- Summary Carrier Suppression, MER Total, MER Data & OIS Channel, MER Pilot
- MS269xA Measurement Functions
- Adjacent Channel Leakage Power
- Channel Power •
- Occupied Bandwidth •
- Spectrum Emission Mask •
- Spurious Emission
- Burst Average Power

Specifications

Signal Analyzer		MS269xA				
	easurement Accuracy	At 18° to 28°C, after calibration, signal ≥33 dB (MER DATA) ± (Accuracy of reference frequency × Carrier frequency) ±0.1 Hz				
Residual MER		At 18° to 28°C, after calibration >49 dB (MER DATA)				
	Frequency range	Measurement range: 200 MHz to 1600 MHz Settable range: 100 MHz to main frame upper frequency				
Standard Parameter Setting	Level range	Measurement range: -26 to +30 dBm (Preamp Off, or no Preamp) -38 to +10 dBm (Preamp On) Settable range: (-80.00 + Offset Value) to (10.00 + Offset Value) dBm (Preamp Off) (-60.00 + Offset Value) to (30.00 + Offset Value) dBm (Preamp On)				
	Channel bandwidth	5, 6, 7, 8 MHz				
	Analysis time length	First symbol to (Frame OIS, Frame1, Frame2, Frame3, Frame4) * Include TDM1, WIC, LIC, TDM2.				
	Tracking Mode	Manual: Modulation is set with the manual. Estimation: Modulation is set by the automatic estimation.				
	Modulation QPSK, 16QAM/Layered (ER = 4), Layered (ER = 6.25) * Can be set when Tracking Mode = Manual.					
	SPC Presence	Present, Absent				
	FFT Size	2, 4, 8K * Can be set when SPC Presence = Present.				
	Cyclic Prefix	1/16, 1/8, 3/16, 1/4 * Can be set when SPC Presence = Present.				
Detail Parameter	Slot to Interlace	Pattern 1, Pattern 2 * Can be set when SPC Presence = Present.				
Setting	PPC Presence	Present, Absent * Can be set when SPC Presence = Present.				
	PPC/RS Number	2, 6, 10, 14 * This set value changes by "SPC Presence" "PPC Presence" "FFT Size"				
	Wide-area Data Symbols	When SPC Presence = Absent: 0 to {(Superframe Symbol Number – 18 – PPC or RS Number)/4–4} When SPC Presence = Presence: 0 to (It conforms to the TIA-1099-A standard.)				
	WID	0 to 15				
	LID	0 to 15				
	Numerical result	Output Power, Transmitter Timing, MER DATA, MER TDM1, MER WIC, MER LIC, MER TDM2				
Display Measurement	Graph display	Constellation, MER vs. Subcarrier, MER vs. Symbol, Spectral Flatness (Amplitude vs. Subcarrier, Group Delay vs. Subcarrier)				
Results	Summary	Frequency Error, Output Power, Transmitter Timing, MER DATA, MER TDM1, MER WIC, MER LIC, MER TDM2, Carrier Suppression, MER Total, MER DATA & OIS Channel, MER Pilot				

Measurement Functions

Parameter Setting

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

Parameters other than numerical values are set easily by selecting pulldown menus. Set triggers and measurement averaging as required.

10/8/2009 19:33	10	1211	1174.00			A MARINELO
Detail Serrege	SG Marker	Trigger	-10.00 dBm	Input Level	107 000 000 Hz	Carrier Freq.
	0.000 µ#	Delay	4 48		6MHz	Channel Bandwidth
				10		Result
						MKR
	-	Extinuation Manual		ing Mode	Track	Symbol Number
		Estimation				TDM1 Subcerrier
		Present		SPC Presence		
		ex.		FFT Size		NOL
		1/8		Cyclic Prefix		
	2	Patternl		Slot to Interla		a
	•	Abuent		PPC Presence		dER vs Symbol
	100	0	er.	PPC/RS Num	Sym	MKR
	88	142	a Symboli	Wide area Dat		
	nit = 142	Max limi			-	
	1	15		WED		
Set	H	15		LID		
-						
Cancel	Cancel	Set				

Constellation/Numerical Results

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.



Frequency Error:

Frequency error of input signals to set frequency **Output Power:** Average power of each bandwidth

MER DATA:

Data Symbol MER (except TDM1, WIC, LIC, TDM2, PPC, RS and SPC)

MER TDM1: TDM Pilot 1 MER

MER WIC: WIC MER

MER LIC: LIC MER

MER TDM2: TDM Pilot 2 MER

Transmitter Timing:

Time difference of first frame position vs trigger (when trigger set)

Summary

The following measurement results as well as numerical results are displayed as a summary.

Carrier Freq.	207 000 000 Hz	Input Level	-10.00 dBm	tie Mediar I 10
Channel Bandy	vidth 6MHz			and the second second
Result		_		MER vs Subcarrie
Frequenc	y Error		0.02 Hz	MER vs Symbol
Output Pr	-		0.000 ppm -7.28 dBm	
				Spectral Flateen
Summery				
			Page No. 1 / 1	Summary
Cerrier Su	ppression		53.06 dB	
MER DA			53.90 dB	
то			62.72 dB	
w			61.23 dB	
LIC			61.11 dB	
TD			56.40 dB	
PP				
SP				
To			53.91 dB	
DA	TA & OIS Channel		53.90 dB	
	ot		53.99 dB	
Reflet	Pre-Amp Off			

Carrier Suppression:

Carrier Suppression from WIC to End Symbol

MER Total:

MER to MER DATA & OIS Channel and MER Pilot

MER to Wide-area OIS, Wide-area DATA, Local-area OIS, and

Local-area DATA ER Pilot:

MER to Pilot Channel

MER DATA & OIS Channel:

Measure True Product Performance – Excellent RF performance (residual MER >49 dB) –

The excellent RF performance of the signal analyzer supports a Residual MER of >49 dB. This reduces the impact of the measuring instrument so true product performance can be measured.



*: These are real uncorrected measurement values; actual measurements may vary with measurement conditions.

MER vs. Subcarrier

MER vs. Symbol

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

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

It is useful for checking in-band interference signals.

Carrier Freq.	207 000 000 Hz		-10.00 dBm		Traut Bols
Channel Bandwidth	6MHz		4 dB		MER vs Subcar
Result	_	_		_	MER VS DUDLAR
MKR	Q				and the second se
Synbol Number		Freq	uency Error		0.02 HZ MER vs Symb
			ut Power		0.000 ppm
WDATA Subcertier		MER			33.90 dB
10			TDM1		12.72 dB Spectral Flats
			WIC		1.23 68
					11.11 dB
0.31725			TDM2		6.40 dB Summary
Q -0.31392					
MER +s Subcerrier	_				
MKR	Subcerrier	113 MER	54.12 dB	Averaged	
150					
					MER on Subcard
					View
					Each Avera

Spectral Flatness

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

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



This displays the MER vs. Symbol graph (horizontal axis = Symbol, vertical axis = MER) for one super-frame at the bottom of the screen. It is useful for checking characteristics in the time direction and faults at a specific symbol.



Frequency Response Difference Calculation

This calculates and displays the difference of the measurement results versus reference signals.

It is useful for checking the frequency responses of various devices.





MER vs. Subcarrier

The noise of each subcarrier (interference wave, etc.) hidden in the channel band can be checked. This is useful for checking noise impacting the circuit as well as signal quality in the field.



The presence of noise in the channel band cannot be checked using a spectrum display.





The presence of noise can be checked using MER vs. Subcarrier, because MER deteriorates at the noise part.

OOO "Техэнком" Контрольно-измерительные приборы и оборудование www.tehencom.com MX283027A Wireless Network Device Software MX283027A-001 WLAN Test Software MX283027A-002 Bluetooth Test Software MX283027A-002 Bluetooth Test Software

The MX283027A Wireless Network Device Software, MX283027A-001 WLAN Test Software, and MX283027A-002 *Bluetooth* Test Software are for measuring the RF characteristics of wireless terminals and devices.

Installing these options in the MS2830A Signal Analyzer with MS2830A-020/021 Vector Signal Generator option supports TRx tests of WLAN and *Bluetooth* devices/modules using one measurement unit.

Shortening test times by eliminating measurement screens helps facilitate high-speed, high-accuracy measurements on production lines.

Features

- One software package supporting IEEE802.11n/a/b/g (MX283027A-001)
- One software package supporting Basic Rate/Enhanced Data Rate/Bluetooth Low Energy (MX283027A-002)
- One hardware unit supporting high-speed TRx measurements (with vector signal generation option (MS2830A-020/021))

Points for High-speed Measurement

- Eliminates measurement screens to cut measurement time
- Batch processing minimizes signal loading and processing of multiple measurements
- · Simplifies batch measurements by remote commands

WLAN High-speed TRx Characteristics Measurements

MX283027A-001 WLAN Test Software*

One unit supports high-speed measurements of TRx characteristics of devices and modules based on WLAN standards. Installing the Vector Signal Generator option (MS2830A-020/021) outputs WLAN signals and measures Rx characteristics. No measurement screen is displayed at the main frame.

Measurement setting and execution, and reading of numerical results are under remote control.

Measurement Signals

- IEEE802.11n (HT-Mixed, HT-Greenfield)
- IEEE802.11a
- IEEE802.11b
- IEEE802.11g ERP-DSSS/CCK
- IEEE802.11g ERP-OFDM

Tx Characteristics Tests

Batch measurements are executed to measure the following items and read the numerical results by remote control.

- Modulation Analysis
- Tx Power Measurements
- Transmit Spectrum Mask Measurements
- Occupied Bandwidth Measurements

Rx Characteristics Tests

Installing the Vector Signal Generator option (MS2830A-020/021) supports the following WLAN signal outputs:

- Preinstalled WLAN Waveform Pattern (IEEE802.11a/b/g)
- WLAN IQproducer Generation Waveform Pattern* (IEEE802.11n/p/a/b/g/j)

Numerical Value
Modulation Analysis
Vector Error (EVM) [rms/Peak]
Vector Error (EVM) [rms/Peak] pass/fail judgement result
Frequency Error
Frequency Error pass/fail judgement result
Center Frequency Leakage Power
Center Frequency Leakage Power pass/fail judgement result
IQ Offset
IQ Offset pass/fail judgement result
Spectrum Flatness pass/fail judgement result
IQ Gain Imbalance
Quadrature Error

Symbol Clock Error
Symbol Clock Error pass/fail judgement result
Chip Clock Error
Chip Clock Error pass/fail judgement result
Count of modulation accuracy measurements
Tx Power Measurement
Tx Power
Tx Power pass/fail judgement result
Peak Power Spectrum Density (PSD)
Peak Power Spectrum Density (PSD) pass/fail judgement result
Burst waveform rise time
Burst waveform fall time
Rise and fall time pass/fail judgement result
Count of transmit power measurements
Transmit Spectrum Mask
Peak PSD of reference channel
Absolute value of spectrum density at frequency where margin from limit line
becomes minimum within offset frequency range [positive/negative side]
Margin from limit line at frequency where margin is minimum for limit line
within offset frequency range [positive/negative side]
Frequency where margin from limit line becomes minimum within offset frequency range [positive/negative side]
Pass/fail judgement result within offset frequency range
Count of Tx spectrum mask measurements
Absolute value of spectrum density at start frequency of offset
[positive/negative side]
Absolute value of spectrum density at end frequency of offset
[positive/negative side]
Occupied Bandwidth Measurement
Occupied Bandwidth
Occupied Bandwidth pass/fail judgement result
Count of Occupied Bandwidth measurements
*: MX283027A-001 includes MX269911A WLAN IQproducer (Cannot order

Numerical Value

*: MX283027A-001 includes MX269911A WLAN IQproducer (Cannot order MX283027A-001 and MX269911A at same time).

Example of WLAN Module TRx Characteristics Measurement System



*1: Direct control measurements

Measure TRx characteristics after setting DUT to Tx or Rx mode using control software provided by chipset maker. Please prepare the Control software for the DUT.

*2: Measurement settings and execution, and reading of numerical results are executed by remote control.

*3: No measurement screen displayed on main frame.

*4: Installing Vector Signal Generator option (MS2830A-020/021) outputs WLAN signals.

*5: Evaluate Rx characteristics with DUT or control PC.

Bluetooth High-speed TRx Characteristics Measurements

MX283027A-002 Bluetooth Test Software

One unit supports measurement of high-speed TRx characteristics of *Bluetooth* devices and modules. Installing the Vector Signal Generator option (MS2830A-020/021) outputs *Bluetooth* signals and measures Rx characteristics. No measurement screen is displayed on the main frame.

Measurement settings and execution, and reading of numerical results are executed by remote control.

Measurement Signals

- Basic Rate
- Enhanced Data Rate
- Bluetooth Low Energy

Tx Characteristics Tests

Batch measurements are executed to measure the following items and read the numerical results by remote control.

- Output Power Measurements
- Modulation Characteristics Measurements
- ICFT Measurements
- Carrier Frequency Drift
- EDR Frequency Stability/Modulation Accuracy Measurements
- EDR Relative Tx Power Measurements
- EDR Differential Phase Decode Measurements
- Demodulation Data Measurements

Rx Characteristics Tests

Installing the Vector Signal Generator option (MS2830A-020/021) supports the following *Bluetooth* signal outputs:

Preinstalled Bluetooth Waveform Pattern

Packet format
DH1, DH3, DH5 [Clean/Dirty/Dirty withFM]
DH3_3SlotOff, DH5_5SlotOff
2-DH1, 2-DH3, 2-DH5 [Clean/Dirty/Dirty withFM]
3-DH1, 3-DH3, 3-DH5 [Clean/Dirty/Dirty withFM]
2-DH3_3SlotOff, 2-DH5_5SlotOff
3-DH3_3SlotOff, 3-DH5_5SlotOff
BLE, BLE_Dirty, BLE_Dirty_withFM, BLE_CRC_corruped
No packet format
GFSK-PN9, GFSK-PN15
PI_4_DQPSK-PN9, PI_4_DQPSK-PN15
8DPSK-PN9, 8DPSK-PN15
GMSK-PN15_BLE

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Tx Characteristics Measurement Numerical Results	
Output Power Measurements	
GFSK average power, peak power	
GFSK average power pass/fail judgement result	
Count of output power measurements	
Modulation Characteristics Measurements	
∠f1 (payload data: 11110000/00001111) Average frequency error	
∠f2 (payload data: 10101010/01010101) Average frequency error	
∠f1 maximum frequency error	
∠f2 maximum frequency error	
∠f2 maximum frequency error > lower limit ratio	
∠f2 average frequency error/∠f1 average frequency error	
∠f1 average frequency error pass/fail judgement result	
∠f2 maximum frequency error > Lower limit ratio pass/fail judgement resu	ılt
∠f2 average frequency error/∠f1 average frequency error pass/fail	
judgement result	
Count of modulation characteristics measurements	
Initial Center Frequency Torelance (ICFT) Measurements	
ICFT	
ICFT pass/fail judgement result	
Count of ICFT measurements	
Carrier Frequency Drift Measurements	
Frequency drift	
Maximum drift rate	
Frequency drift pass/fail judgement result	
Maximum drift rate pass/fail judgement result	
Count of carrier frequency drift measurement	

Tx Characteristics Measurement Numerical Results
EDR Frequency Stability/Modulation Accuracy Measurements
Frequency error
Differential vector error (DEVM) [RMS value/peak value/99% value]
Frequency error pass/fail judgement result
Differential vector error (DEVM) pass/fail judgement result
Count of EDR frequency stability/modulation accuracy measurements
EDR Relative Tx Power Measurements
GFSK average power
DPSK average power
Relative power (difference between GFSK and DPSK average power)
Relative power pass/fail judgement result
Count of EDR relative Tx power measurements
Rx Characteristics Measurement Numerical Results
EDR Differential Phase Encoding Measurements
Bit error rate (BER)
Bit error
Packet error rate (PER)

Packet error rate (PER)
Packet error rate (PER) pass/fail judgement result
Count of EDR differential phase encoding measurements
Demodulation Data Measurements
Packet type
Payload length
Payload

Example of *Bluetooth* Module TRx Characteristics Measurement System



*1: Direct control measurements

Measure TRx characteristics after setting DUT to Tx or Rx mode using control software provided by chipset maker. Please prepare the Control software for the DUT.

- *2: Measurement settings and execution, and reading of numerical results are executed by remote control.
- *3: No measurement screen displayed on main frame.
- *4: Installing Vector Signal Generator option (MS2830A-020/021) outputs Bluetooth signals.
- *5: Evaluate Rx characteristics with DUT or control PC.

Specifications

MX283027A-001 WLAN Test Software

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° 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

Signal Analyzer MS2830A IEEE 802.11a Standard 5180 MHz to 5320 MHz (channel No. 36 to 64) 5500 MHz to 5700 MHz (channel No. 100 to 140) Frequency Range 5745 MHz to 5825 MHz (channel No. 149 to 165) -12 to +30 dBm (MS2830A-045 not installed) Measurement Level Range -6 to +30 dBm (MS2830A-045 installed) Modulation/ Burst length ≥250 µs Frequency Carrier Frequency Accuracy Measurements ± (Accuracy of reference frequency × Carrier frequency + 16) Hz Channel Estimation: SEQ, Phase Tracking: On, Amplitude Tracking: Off Residual Vector Error ≤1.6% (rms) Center Frequency Leakage ≤–50 dBc (nominal) Floor Input attenuator ≥10 dB Tx Power Accuracy (This is found from root sum of ±1.9 dB Amplitude squares (RSS) of absolute amplitude accuracy and in-band Measurement frequency characteristics of main frame.) ≥68 dB (11 MHz Offset from carrier frequency) ≥68 dB (20 MHz Offset from carrier frequency) Spectrum Tx Spectrum Mask Dynamic ≥68 dB (30 MHz Offset from carrier frequency) Measurement Range The dynamic range refers to the transmitted power ratio for specified frequency offset It is applied if RBW = 100 kHz and Mixer Level = -19 to -14 dBm Standard IEEE 802.11b, IEEE 802.11g ERP-DSSS/CCK 2412 MHz to 2472 MHz (channel No.1 to 13) Frequency Range 2484 MHz (channel No.14) -15 to +30 dBm (MS2830A-045 not installed) Measurement Level Range -9 to +30 dBm (MS2830A-045 installed) Modulation/ Burst length ≥400 µs Frequency Carrier Frequency Accuracy ± (Accuracy of reference frequency × Carrier frequency + 21) Hz Measurements Specify filter with same characteristics as used for measured signal Residual Vector Error ≤1.9% (rms) Center Frequency Leakage ≤–50 dBc (nominal) Floor Input attenuator ≥10 dB Tx Power Accuracy (This is found from root sum of +0.6 dB Amplitude squares (RSS) of absolute amplitude accuracy and in-band Measurement frequency characteristics of main frame.) ≥68 dB (11 MHz Offset from carrier frequency) ≥68 dB (22 MHz Offset from carrier frequency) Spectrum Tx Spectrum Mask Dynamic ≥68 dB (33 MHz Offset from carrier frequency) Measurement Range The dynamic range refers to the transmitted power ratio for specified frequency offset It is applied if RBW = 100 kHz and Mixer Level = -19 to -14 dBm Standard IEEE 802.11g ERP-OFDM 2412 MHz to 2472 MHz (channel No.1 to 13) Frequency Range 2484 MHz (channel No.14) -15 to +30 dBm (MS2830A-045 not installed) Measurement Level Range -9 to +30 dBm (MS2830A-045 installed) Modulation/ Burst length ≥250 µs Carrier Frequency Accuracy Frequency ± (Accuracy of reference frequency × Carrier frequency + 13) Hz Measurements Channel Estimation: SEQ, Phase Tracking: On, Amplitude Tracking: Off Residual Vector Error ≤1.2% (rms) Center Frequency Leakage ≤–50 dBc (nominal) Floor Input attenuator ≥10 dB Tx Power Accuracy (This is found from root sum of ±0.6 dB Amplitude squares (RSS) of absolute amplitude accuracy and in-band Measurement frequency characteristics of main frame.)

Signal Analvzer	Signal Analyzer		MS2830A		
Spectrum Measurement			 ≥68 dB (11 MHz Offset from carrier frequency) ≥68 dB (20 MHz Offset from carrier frequency) ≥68 dB (30 MHz Offset from carrier frequency) The dynamic range refers to the transmitted power ratio for the specified frequency offset It is applied if RBW = 100 kHz and Mixer Level = -19 to -4 dBm 		
Standard			IEEE 802.11n HT Mixed, HT Greenfield (STBC, MIMO not supported), MCS = 0 to 7, 32 supported Channel Bandwidth: 20 MHz, 40 MHz		
	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)		
Measuremen		el Range	2.4 GHz band: -15 to +30 dBm (MS2830A-045 not installed) -9 to +30 dBm (MS2830A-045 installed) 5 GHz band: -12 to +30 dBm (MS2830A-045 not installed) -6 to +30 dBm (MS2830A-045 installed)		
Modulation/ Frequency Measurements	Carrier Frequency Accuracy	20 MHz channel 40 MHz channel	Burst length ≥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) 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)		
	Residual Vector Error	20 MHz channel 40 MHz	1 (Accuracy of reference inequency × Carner inequency + 102) Hz (3 GHz band) Channel Estimation: SEQ, Phase Tracking: On, Amplitude Tracking: Off ≤1.6% (rms) (2.4 GHz band) Channel Estimation: SEQ, Phase Tracking: On, Amplitude Tracking: Off ≤1.6% (rms) (2.4 GHz band)		
Center Frequency Le		channel Leakage	≤2.0% (rms) (5 GHz band) ≤–50 dBc (nominal)		
Amplitude Floor Amplitude Accuracy (This is found from root sum of squares (RSS) of absolute amplitude accuracy and in-band frequency characteristics of main frame.)		20 MHz channel	Input attenuator ≥10 dB ±0.6 dB (2.4 GHz band) ±1.9 dB (5 GHz band)		
		40 MHz channel	Input attenuator ≥10 dB ±0.8 dB (2.4 GHz band) ±2.0 dB (5 GHz band)		
Spectrum Measurement	Tx Spectrum	20 MHz channel	2.4 GHz band: ≥68 dB (11 MHz Offset from carrier frequency) ≥68 dB (20 MHz Offset from carrier frequency) ≥68 dB (30 MHz Offset from carrier frequency) 5 GHz band: ≥68 dB (11 MHz Offset from carrier frequency) ≥68 dB (20 MHz Offset from carrier frequency) ≥68 dB (30 MHz Offset from carrier frequency) ≥68 dB (30 MHz Offset from carrier frequency) ≥68 dB (30 MHz Offset from carrier frequency) The dynamic range refers to the transmitted power ratio for the specified frequency offset It is applied if RBW = 100 kHz and Mixer Level = −19 to −14 dBm		
	Mask Dynamic Range 40 MHz channel		2.4 GHz band: ≥60 dB (21 MHz Offset from carrier frequency) ≥69 dB (40 MHz Offset from carrier frequency) ≥69 dB (60 MHz Offset from carrier frequency) 5 GHz band: ≥60 dB (21 MHz Offset from carrier frequency) ≥69 dB (40 MHz Offset from carrier frequency) ≥69 dB (60 MHz Offset from carrier frequency) ≥69 dB (60 MHz Offset from carrier frequency) The dynamic range refers to the transmitted power ratio for the specified frequency offset It is applied if RBW = 100 kHz and Mixer Level = −19 to −14 dBm		

MX283027A-002 Bluetooth Test Software

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° 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

Signal Analyzer		MS2830A		
Standard		Basic Rate, Bluetooth Low Energy		
	Frequency Range	2402 MHz to 2480 MHz (channel No. 0 to 78)		
	Measurement Level Range	-15 to +30 dBm		
		Packet type: DH1, DH3, DH5, BLE Reference Packet		
	Initial Carrier Frequency	Payload data: All		
Modulation/	Tolerance	Measurement range: 0 to ±100 kHz (nominal)		
Frequency		Measurement accuracy: ± (Accuracy of reference frequency × Carrier frequency + 2 kHz)		
Measurements		Packet type: DH1, DH3, DH5, BLE Reference Packet		
modouromonio	Modulation Characteristics	Payload data: 0xF0, 0x0F, 0xAA, 0x55		
		Frequency error measurement accuracy: ±1 kHz (nominal)		
		Packet type: DH1, DH3, DH5, BLE Reference Packet		
	Carrier Frequency Drift	Payload data: 0xAA, 0x55		
		Measurement accuracy: ±2 kHz (nominal)		
	Tx Power Accuracy	Input attenuator ≥10 dB		
Amplitude	(This is found from root sum of squares (RSS) of absolute	±0.6 dB		
Measurement	amplitude accuracy and in-band			
weasurement	frequency characteristics of			
	main frame.)			
Standard		Enhanced Data Rate		
	Frequency Range	2402 MHz to 2480 MHz (channel No. 0 to 78)		
	Measurement Level Range	-15 to +30 dBm		
Modulation/		Packet type: 2-DH1, 2-DH3, 2-DH5, 3-DH1, 3-DH3, 3-DH5		
Frequency	EDR Modulation Accuracy	Payload data: All		
Measurements		DEVM floor ≤1.2% (rms)		
	EDR Carrier Frequency	Packet type: 2-DH1, 2-DH3, 2-DH5, 3-DH1, 3-DH3, 3-DH5		
	Stability	Payload data: All		
	,	Measurement accuracy: ± (Accuracy of reference frequency × Carrier frequency + 2 kHz)		
	Tx Power Accuracy	Input attenuator ≥10 dB		
Amplitude	(This is found from root sum of squares (RSS) of absolute	±0.6 dB		
Measurement	amplitude accuracy and in-band			
modelaremont	frequency characteristics of			
	main frame.)			

Recommended Configuration

For MX283027A-001 WLAN Test Software

						Selected x: Not selected	
	2.4 GHz band				5 GHz band		
Test target	Tx Te	st	Rx Test	Tx Te	st	Rx Test	
	Not for Spurious Test	For Spurious Test	(Signal Generator*1)	Not for Spurious Test	For Spurious Test	(Signal Generator*1)	
Main Frame							
MS2830A-040			√ √	×		×	
MS2830A-041		×	(Opt. 020/021)		×	√ √	
MS2830A-043	$\checkmark\checkmark$		(Opt. 020/021)			(Opt. 21)	
MS2830A-044		$\checkmark\checkmark$		· · ·	1 1		
MS2830A-045			×		~ ~	×	
Hardware Options							
MS2830A-002	✓	√		✓	√		
MS2830A-005/009	11	11			11		
MS2830A-006	**	× •		· · ·	~ ~		
Vector Signal Generator	Options (MS2830A-020/021 ca	annot be installed in MS28	30A-044/045.)				
MS2830A-020						×	
MS2830A-021			$\checkmark\checkmark$				
MS2830A-022			1			1 **	
MS2830A-027			,			· · · · ·	
MS2830A-028			√			1	
Software Options							
MX283027A		11	11		11	11	
MX283027A-001*2	~~	~~	~~	~~	√ √	×	

*1: Installing the Vector Signal Generator option (MS2830A-020/021) outputs WLAN signals. MS2830A-020/021 can use as a reference signal source of the Rx test. MS2830A main functions sets the pattern send count.

*2: MX283027A-001 includes MX269911A WLAN IQproducer (Cannot order MX283027A-001 and MX269911A at same time).

For MX283027A-002 Bluetooth Test Software

		✓✓: Required ✓:	Selected x: Not selected	
	Basic Rate, Enhanced Data Rate, Bluetooth Low Energy			
Test target	Tx Te	Rx Test		
	Not for Spurious Test	For Spurious Test	(Signal Generator*)	
Main Frame				
MS2830A-040		×	$\checkmark\checkmark$	
MS2830A-041		^	(Opt. 020/021)	
MS2830A-043	$\checkmark\checkmark$		(Opt: 020/021)	
MS2830A-044		$\checkmark\checkmark$	×	
MS2830A-045			×	
Hardware Options				
MS2830A-002	✓	√		
MS2830A-005/009	11	~~		
MS2830A-006	••	••		
Vector Signal Generator (Options (MS2830A-020/021 ca	annot be installed in MS28	30A-044/045.)	
MS2830A-020				
MS2830A-021			$\checkmark\checkmark$	
MS2830A-022				
MS2830A-027			<u> </u>	
MS2830A-028			Ť	
Software Options				
MX283027A	11	1 1	VV	
MX283027A-002	•••			

*: Installing the Vector Signal Generator option (MS2830A-020/021) outputs *Bluetooth* signals. MS2830A-020/021 can use as a reference signal source of the Rx test. MS2830A main functions sets the pattern send count.

Ordering Information

Model/Order No	Name	Remarks			
Main Frame					
MS2830A-040	3.6 GHz Signal Analyzer	9 kHz to 3.6 GHz			
MS2830A-041	6 GHz Signal Analyzer	9 kHz to 6 GHz			
MS2830A-043	13.5 GHz Signal Analyzer	9 kHz to 13.5 GHz			
MS2830A-044	26.5 GHz Signal Analyzer	9 kHz to 26.5 GHz			
MS2830A-045	43 GHz Signal Analyzer	9 kHz to 43 GHz			
Hardware Options					
MS2830A-002	High Stability Reference Oscillator	Aging rate: 1×10-8/day			
MS2830A-005	Analysis Bandwidth Extension to 31.25 MHz	Required for MX283027A-001. Option for MS2830A-040/041/043/044.			
MS2830A-006	Analysis Bandwidth 10 MHz	Required for MX283027A-001/002			
MS2830A-009	Bandwidth Extension to 31.25 MHz for Millimeter-wave	Required for MX283027A-001 and MS2830A-005/009. Option for MS2830A-045.			
Vector Signal Generator Options (MS2830A-020/021 cannot be installed in MS2830A-044/045.)					
MS2830A-020	3.6 GHz Vector Signal Generator	250 kHz to 3.6 GHz			
MS2830A-021	6 GHz Vector Signal Generator	250 kHz to 6 GHz			
MS2830A-022	Low Power Extension for Vector Signal Generator	–136 to +15 dBm (>25 MHz), –136 to –3 dBm (≥25 MHz)			
MS2830A-027	ARB Memory Upgrade 256 Msa for Vector Signal Generator	Memory: 256 Msamples (MS2830A-027 installed), 64 Msamples (MS2830A-027 not installed)			
MS2830A-028	AWGN	Absolute CN Ratio: ≤40 dB			
Software Options					
MX283027A	Wireless Network Device Test Software				
MX283027A-001	WLAN Test Software	MX283027A-001 includes MX269911A WLAN IQproducer (Cannot order MX283027A-001 and MX269911A at same time)			
MX283027A-002	Bluetooth Test Software				



The MX283087A TRX Sweep Calibration is TRx power measurement software for the power adjustment function incorporated in femtocell base stations, etc. When the target DUT Tx and Rx powers change in a stepwise manner at each time determined by the frequency and level, this software can adjust the power quickly for each measured/output signal at a predetermined timing without repeatedly changing the measuring instruments settings.

Use of this application software requires a function for stepwise synchronization of the Tx and Rx power measurement with the DUT as well as a measurement system for synchronizing the DUT and measuring instrument.



Features

- Uses signal analyzer function and installed vector signal generator option to perform high-speed TRx adjustment with one MS2830A unit
- Supports two measurement modes: TRx Mode for measuring both Tx and Rx signal simultaneously, and Rx Mode for measuring only Rx signals
- Sets frequency and level for predetermined measurement points using remote commands (program) and auto-switches frequency and level at trigger input (List Mode)

In the TRx measurement mode, the DUT is synchronized as shown in the following diagram using adjustment of the Tx and Rx powers.



Segment Change Sequence

Segment Change Sequence

Adjustment time base position = Tx adjustment signal rising edge

In the Rx measurement mode, the MS2830A vector signal generator outputs a trigger sequence to prepare the DUT to receive the signal and then a preprogrammed signal pattern is output for adjusting the Rx power.



MS2830A Recommended Configuration

Model/Order No.	Name	Remarks	
MS2830A-040			
MS2830A-041	Signal Analyzer	MX283087A cannot be installed in MS2830A-044/045.	
MS2830A-043			
MX283087A	TRX Sweep Calibration		
MS2830A-006	Analysis Bandwidth 10 MHz	Necessary for MX283087A	
MS2830A-005	Analysis Bandwidth Extension to 31.25 MHz	Necessary for MX283087A	
MS2830A-020	3.6 GHz Vector Signal Generator	Necessary for MX283087A	
MS2830A-021	6 GHz Vector Signal Generator	NECESSALY IOI WINZOSUOTA	
MS2830A-022	Low Power Extension for Vector Signal Generator	Necessary for MX283087A	

Measu	re Status	Rea	dy		Measurement Mode	RX	TRADese TRADese
		Tria	ger Wait		Short Burst Segment	1	Start
			suring/Playin		Time Offset Segment Short Burst Level	1 -15.0 dBm	Sequence
Error S	itatus	Non	e				
WEL				_			
Segment							Stop
No	TX		Rx	No	Tx	Rx	Sequence
1	30.0048	-	-15.00dBm	21	-10.00dBm	-85.00dBm	outrance
2		-	-20.00dBm	22	-12.00dBm	85.00dBm	
3	26.00dB	en	-25.00dBm	23	-14.00dBm	45.00dBm	
4	24.00dB		-30.00dBm	24	-16.00dBm	-85.00d8m	
5	22.00dB	-	-35.00dBm	26	-18.00dBm	-85.00dBm	
6	20.0048	m .	-40.00dBm	26	-20.00dBm	45.00dBm	
7	18.004B	-	45.00dBm	27	-22.00dBm	45.00dBm	
8	16.00dB	-	-60.00dBm	28	-24.00dBm	-85.00dBm	
9	14,00dB	-	-65.00dBm	29	-26.00dBm	-85.00dBm	
10	12.0048	-	40.00dBm	30	28.00dBm	45.00dBm	100 C
11	10.00.dB	6	45.00dBm	31	-30.00dBm	45.00dBm	Display List
12	8.00dB		-70.00dBm	32	-30.00dBm	-85.00dBm	FREQ LEVEL
13	6.00dB		-75.00dBm	33	-30.00dBm	-85.00dBm	
14	4.00dB		-80.00dBm	34	30.00dBm	85.00dBm	
15	2.00 dB		-85.00dBm	36	30.00dBm	-85.00dBm	Next Page
16	0.00dB	1110	-85.00dBm	36	30.00dBm	-85.00dBm	contra trada
17	-2.0048		45.00dBm	37	-30.00dBm	45.00dBm	
18	-4.00d8	_	45.00dBm	30	-30.00dBm	45.00dBm	
19	6.00.48		45.00dBm	39	-30.00d8m	85.00dBm	Prev Page
20	48.00.6B	-	-85.00dBm	40	-30.00dBm	45.00dBm	

TRX Sweep Calibration Screen

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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. The specifications are defined under the following condition unless otherwise specified. Attenuator mode: Mechanical Attenuator Only (MS2830A only)

Sig	nal Analyzer	MS2830A								
Function		Performs measurement while switching both the level for each measurement unit (segment) according to the level list and the frequency for each measurement unit group (sequence) according to the frequency list.								
Measurement Mode		TRX mode: Performs transmission measurement and reception measurement at the same time. RX mode: Performs reception measurement only. In the RX mode, a trigger signal, which consists of output On (active) and Off (inactive) intervals, can be output before a measurement signal.								
	Frequency Range	400 MHz to 3500 MHz								
Items Common to Transmission and	Setting Range of Segment Length	10 ms, 20 ms								
Reception	Setting Range of Segment	1 to 80								
	Setting Range of Sequence	1 to 20								
	Analysis Bandwidth	2.5, 5, 10, 25 MHz								
	Measurement Time Range	Symmetric about the center of the segment and 20 to 90% of the specified segment length								
	Trigger	Trigger mode: Free Run (Trig Off), Video (Trig On) Trigger setting range: -30 to -10 dB (compared to the measurement level specified for the first segment)								
	Measured Level Range	-30 to +30 dBm								
Transmitter Power Measurement	Transmitter Power Accuracy	After CAL execution at 18° to 28°C, the input signal level is within the measurement level range, and the input level is as follows: ±0.7 dB The transmitter power accuracy is calculated from an input attenuator switching error, a measured linearity error, and a root sum square (RSS) error of the absolute amplitude accuracy and in-band frequency								
		characteristics.								
	Output Level Range	–120 to –5 dBm								
	Output Level Accuracy	CW, at 18° to 28°C ±0.5 dB (Output level ≥–110 dBm) ±1 dB (Output level <110 dBm)								
		The output level accuracy is based on that of the MS2830A-020/021 Vector Signal Generator Option.								
Reception Power		AWGN signal whose bandwidth is 5 MHz, at 18° to 28°C, with an output frequency of 100 MHz or higher								
Measurement	Level Error From CW during	±0.2 dB								
	Vector Modulation	Based on the level error from CW during vector modulation with MS2830A-020/021 Vector Signal Generator Option.								
	Trigger Signal	Output On interval (short burst) and Off interval (time offset) Short burst interval setting range: 1 to 100 Segment Time offset interval setting range: 1 to 100 Segment								



MX705010A Wi-SUN PHY Measurement Software supports automatic measurement of Smart Utility Network wireless communications "Wi-SUN Alliance" PHY Conformance test cases. The MX705010A also supports automatic ARIB STD T-108 (TELEC-T245) tests. The MS269xA/MS2830A signal analyzer is controlled by remote commands from this software. This is the ideal solution for efficient RF tests of Wi-SUN wireless equipment and improves design work.

Supports Wi-SUN RF Conformance Auto-Test

Supports automatic measurement of RF conformance test required for development and evaluation of Wi-SUN wireless equipment.

- Wi-SUN PHY Transmitter Test: Automatic measurement of Wi-SUN Alliance PHY Conformance test items
- Wi-SUN PHY Receiver Test: Supports Wi-SUN Alliance PHY Conformance test signals and Tx control methods
- ARIB STD T-108/TELEC T245 Test*1: Automatic measurement and result evaluation
- *1: There is restriction by a Wi-SUN standard

Configurations



Measurement Functions

Simple operation screen

One button click starts each test



"Frequency Band ID" selects the frequency band identifier determined by IEEE 802.15.4g 2012.

"Operating Mode" automatically sets the Data Rate, Channel Spacing and Modulation Index for each mode. "Measurement Channel" is a function for automatically computing and selecting the channel corresponding to the selected operating mode.





Wi-SUN Tx Test

Selects measurement items and sets parameter. "MEASURE" button click starts automatic measurement.



Wi-SUN Rx Test

Selects measurement items and sets parameter. "SEND SIGNAL" button click starts RF signal sending.



Displays overall PASS/FAIL evaluation result for measurement item.

Saves measurement results as a .csv file.



After finishing sending of specified number of PPDUs, automatically sets RF output to OFF.

*: This software does not perform packet error rate measurement or evaluation.





MX705110A Wi-SUN Protocol Monitor supports protocol analysis of Smart Utility Network wireless communications "Wi-SUN Alliance" PHY/MAC layer. The wireless signals (IEEE 802.15.4g/e, GFSK) between communicating wireless equipments are captured as I/Q data using the MS269xA/MS2830A digitize function and data analysis is performed by MX705110A. Data analysis displays the PHY/MAC frame format, Tx timing, etc.

MX705110A is a powerful tool for "Troubleshooting communications problems by checking the status of communications between wireless equipments".

Supports Wi-SUN Wireless Communications Troubleshooting

This software analyzes the contents of the communications handled by two communications equipments to perform and confirm communications using the correct protocols.

- IEEE802.15.4g/e (GFSK) signal analysis function
- Display for PHY layer frame data
- Display for MAC layer frame data
- Supports FCS32
- Display for RF analysis (Time vs. Tx power graph, Tx timing, Tx power)
- The analysis results are converted to a file format that can be read by Wireshark^{*1} and saved for later detailed analysis using the Wireshark function.

*1: Wireshark is an open source network protocol analyzer commonly used worldwide.

- Analyzing wireless equipment communications for R&D
- Checking interoperability between multiple wireless equipments



Configurations



Measurement Functions

Simple operation screen



Protocol Monitor Screen

Brings all key data together on one screen.



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

	pt. Name		Addition to Main frame																												
Opt.			040	041	043	044	045	001	002	005	900	600	077	078	008	010	011	016	017	020	021	022	026	027	028	029	066	067	068	088	189
001	Rubidium Reference Oscillator		~	1	~	~	~	\boxtimes	No																						
002	High Stability Reference Oscillator		✓	✓	~	No	No	No	\boxtimes																						
005	Analysis Bandwidth Extension to 31.25 MHz		1	1	~	~	No			\boxtimes	R	No																			
006	Analysis Bandwidth 10 MHz		\checkmark	✓	~	~	~			U	\boxtimes	U	U	U																	
009	Bandwidth Extension to 31.25 MHz for Millimeter-wave		No	No	No	No	✓		No	No	R	imes								No	No	No		No	No	No	No			No	No
077	Analysis Bandwidth Extension to 62.5 MHz	No	\checkmark	1	~	~	~			*5	R	*5	imes																		
078	Analysis Bandwidth Extension to 125 MHz	No	~	1	~	~	~			*5	R	*5	R	imes																	
008	Preamplifier		✓	1	~	*1	*1								imes														*1		
010	Phase Noise Measurement Function		 Image: A set of the set of the	1	~	~	~									\times															
011	2ndary HDD		✓	1	~	~	~										\times														
016	Precompliance EMI Function		1	1	~	~	~											\times													
017	Noise Figure Measurementl Function		✓	1	~	~	~								U				imes										U		
020	3.6 GHz Vector Signal Generator		1	1	*2	No	No					No								imes	No						*2	No	No	No	No
021	6 GHz Vector Signal Generator		✓	1	*2	No	No					No								No	\times						*2	No	No	No	No
022	Low Power Extension for Vector Signal Generator		1	1	~	No	No					No								F	2	imes						No	No	No	No
026	BER Measurement Function		✓	1	~	~	~																\boxtimes								
027	ARB Memory Upgrade 256 MSa for Vector Signal Generator		~	1	~	No	No					No								F	२			imes				No	No	*3	*3
028	AWGN		✓	1	~	No	No					No								F	2				\times			No	No	*3	*3
029	Analog Function Extension for Vector Signal Generator*4	No	1	1	No	No	No					No								F	२	R				\times	R	No	No	No	No
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	No	No	\boxtimes		No	No
068	Microwave Preamplifier		No	No	No	*1	*1		No						*1					No	No	No		No	No	No	No		\boxtimes	No	No
088	3.6 GHz Analog Signal Generator*4		~	1	No	No	No					No								No	No	No		*3	*3	No	R	No	No	\boxtimes	U
189	Vector Function Extension for Analog Signal Generator Retrofit		~	1	No	No	No					No								No	No	No		*3	*3	No	R	No	No	R	\boxtimes

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

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

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

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

*4: Require MX269018A.

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

MS2830A-045 requires Opt. 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 MS2690A/91A/92A Signal Analyzer series is recommended for other measurement purposes.

MS2830A Software Configuration

											~	= Can be installed, No = Cannot be installed, R = Require, U = Upgrade		
Model	Name		lition	to M	ain fr	ame			nalys Indwi			Note		
Model	Hame	040	041	043	044	045	005	900	600	770	078	Note		
MX269010A	Mobile WiMAX Measurement Software	✓	~	✓	 ✓ 	No	R	R	No					
MX269011A	W-CDMA/HSPA Downlink Measurement Software	~	~	×	 ✓ 	~		R						
MX269012A	W-CDMA/HSPA Uplink Measurement Software	✓	~	~	 ✓ 	~		R						
MX269013A	GSM/EDGE Measurement Software	✓	~	✓	\checkmark	✓		R						
MX269013A-001	EDGE Evolution Measurement Software	~	~	1	1	~		R				Require MX269013A		
MX269015A	TD-SCDMA Measurement Software	✓	~	✓	 ✓ 	~		R						
MX269017A	Vector Modulation Analysis Software	~	~	~	*3	*3	U	R	*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 A0086A USB Audio (See MX2690xxA series Measurement Software catalog for detail) Note) MS2830A-043 cannot implement a signal generator for Rx-test (Because Opt. 066 is required)		
MX269020A	LTE Downlink Measurement Software	~	~	 ✓ 	1	~	R	R	*1					
MX269020A-001	LTE-Advanced FDD Downlink Measurement Software	~	~	~	~	~	R	R	*1	U	U	Require MX269020A		
MX269021A	LTE Uplink Measurement Software	~	~	1	~	~	R	R	*1					
MX269022A	LTE TDD Downlink Measurement Software	~	~	1	~	~	R	R	*1					
MX269022A-001	LTE-Advanced TDD Downlink Measurement Software	~	~	~	~	~	R	R	*1	U	U	Require MX269022A		
MX269023A	LTE TDD Uplink Measurement Software	~	~	×	 ✓ 	~	R	R	*1					
MX269024A	CDMA2000 Forward Link Measurement Software	✓	~	✓	~	✓		R						
MX269024A-001	All Measure Function	✓	~	1	1	1		R				Require MX269024A		
MX269026A	EV-DO Forward Link Measurement Software	✓	~	 ✓ 	~	✓		R						
MX269026A-001	All Measure Function	✓	~	 ✓ 	1	~		R				Require MX269026A		
MX269028A	WLAN (802.11) Measurement Software	~	~	~	~	~	R	R	*1					
MX269028A-001	802.11ac (80 MHz) Measurement Software	✓	 ✓ 	 ✓ 	 ✓ 	1	R	R	*1	R	R	Only for MS2830A. Require MX269028A		
MX269030A	W-CDMA BS Measurement Software	~	~	1	~	~		R						
MX283027A	Wireless Network Device Test Software	Ļ	↓	↓	Ļ	Ļ	\downarrow	Ļ	↓					
MX283027A-001	WLAN Test Software	✓	✓	✓	1	✓	R	R	*1			Require MX283027A*4		
MX283027A-002	Bluetooth Test Software	✓	√	✓	✓	✓		R				Require MX283027A		
MX283087A	TRX Sweep Calibration	✓	~	 ✓ 	No	No	R	R				Require MS2830A-020/021 and MS2830A-022		

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

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

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

*3: By the measurement of the narrowband signal, add Opt. 066. (Channel bandwidth: x kHz to 100 kHz)

MS2830A-044/045 cannot be installed Opt. 066.

*4: MX283027A-001 includes MX269911A WLAN IQproducer (Cannot order MX283027A-001 and MX269911A at same time).

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	the chart below are Order Names. The actual name of the item Name	Model/Order No	Name
	Main frame	Wodel/Order No	Application parts
MS2690A	Signal Analyzer (50 Hz to 6 GHz)	W2919AE	MX269010A Operation Manual (Operation)
MS2691A MS2691A	Signal Analyzer (50 Hz to 13.5 GHz)	W2919AE W2954AE	MX269010A Operation Manual (Operation) MX269010A Operation Manual (Remote Control)
		W3098AE	
MS2692A	Signal Analyzer (50 Hz to 26.5 GHz)		MX269011A Operation Manual (Operation)
MS2830A-040	Signal Analyzer (9 kHz to 3.6 GHz)	W3099AE	MX269011A Operation Manual (Remote Control)
MS2830A-041	Signal Analyzer (9 kHz to 6 GHz)	W3060AE	MX269012A Operation Manual (Operation)
MS2830A-043	Signal Analyzer (9 kHz to 13.5 GHz)	W3061AE	MX269012A Operation Manual (Remote Control)
MS2830A-044	Signal Analyzer (9 kHz to 26.5 GHz)	W3100AE	MX269013A Operation Manual (Operation)
MS2830A-045	Signal Analyzer (9 kHz to 43 GHz)	W3101AE	MX269013A Operation Manual (Remote Control)
	Software options	W3031AE	MX269014A Operation Manual (Operation)
	CD-ROM with license and operation manuals	14/202245	(MS269xA only)
MX269010A	Mobile WiMAX Measurement Software	W3032AE	MMX269014A Operation Manual (Remote Control)
MX269011A	W-CDMA/HSPA Downlink Measurement Software		(MS269xA only)
MX269012A	W-CDMA/HSPA Uplink Measurement Software	W3044AE	MX269015A Operation Manual (Operation)
MX269013A	GSM/EDGE Measurement Software	W3045AE	MX269015A Operation Manual (Remote Control)
MX269013A-001	EDGE Evolution Measurement Software	W3157AE	MX269016A Operation Manual (Operation)
	(Requires MX269013A)		(MS269xA only)
MX269014A	ETC/DSRC Measurement Software (MS269xA only)	W3158AE	MX269016A Operation Manual (Remote Control)
MX269015A	TD-SCDMA Measurement Software		(MS269xA only)
MX269016A	XG-PHS Measurement Software (MS269xA only)	W3305AE	MX269017A Operation Manual (Operation)
MX269017A	Vector Modulation Analysis Software	W3306AE	MX269017A Operation Manual (Remote Control)
MX269018A	Analog Measurement Software (MS2830A only,	W3555AE	MX269018A Operation Manual (Operation)
	Requires MS2830A-066 and A0086A USB Audio)		(MS2830A only)
MX269020A	LTE Downlink Measurement Software	W3556AE	MX269018A Operation Manual (Remote Control)
MX269020A-001	LTE-Advanced FDD Downlink Measurement Software		(MS2830A only)
	(Requires MX269020A)	W3014AE	MX269020A Operation Manual (Operation)
MX269021A	LTE Uplink Measurement Software	W3064AE	MX269020A Operation Manual (Remote Control)
MX269022A	LTE TDD Downlink Measurement Software	W3015AE	MX269021A Operation Manual (Operation)
MX269022A-001	LTE-Advanced TDD Downlink Measurement Software	W3065AE	MX269021A Operation Manual (Remote Control)
	(Requires MX269022A)	W3209AE	MX269022A Operation Manual (Operation)
MX269023A	LTE TDD Uplink Measurement Software	W3210AE	MX269022A Operation Manual (Remote Control)
MX269024A	CDMA2000 Forward Link Measurement Software	W3521AE	MX269023A Operation Manual (Operation)
MX269024A-001	All Measure Function (Requires MX269024A)	W3522AE	MX269023A Operation Manual (Remote Control)
MX269026A	EV-DO Forward Link Measurement Software	W3201AE	MX269024A Operation Manual (Operation)
MX269026A-001	All Measure Function (Requires MX269026A)	W3202AE	MX269024A Operation Manual (Remote Control)
MX269028A	WLAN (802.11) Measurement Software	W3203AE	MX269026A Operation Manual (Operation)
MX269028A-001	802.11ac (80 MHz) Measurement Software	W3204AE	MX269026A Operation Manual (Remote Control)
	(MS2830A only. Requires MX269028A)	W3528AE	MX269028A Operation Manual (Operation)
MX269028A-002	802.11ac (160 MHz) Measurement Software	W3529AE	MX269028A Operation Manual (Remote Control)
	(MS269xA only. Requires MX269028A)	W2860AE	MX269030A Operation Manual (Operation)
MX269030A	W-CDMA BS Measurement Software	W2861AE	MX269030A Operation Manual (Remote Control)
MX269036A	Measurement Software for MediaFLO (MS269xA only)	W3313AE	MX269036A Operation Manual (Operation)
MX283027A	Wireless Network Device Test Software		(MS269xA only)
MX283027A-001	WLAN Test Software (Requires MX283027A)	W3314AE	MX269036A Operation Manual (Remote Control)
MX283027A-002	Bluetooth Test Software (Requires MX283027A)		(MS269xA only)
MX283087A	TRX Sweep Calibration	W3471AE	MX283027A Operation Manual (Operation)
	Measurement Software Options	W3473AE	MX283027A-001 Operation Manual (Operation)
	These software are for PC.	W3474AE	MX283027A-001 Operation Manual (Remote Control)
MX705010A*1	Wi-SUN PHY Measurement Software	W3516AE	MX283027A-002 Operation Manual (Operation)
MX705110A	Wi-SUN Protocol Monitor	W3517AE	MX283027A-002 Operation Manual (Remote Control)
	(MS2830A-006 is necessary for MS2830A.)	W3448AW	MX283087A Operation Manual (Operation)
	Alliance members can purchase this software	W3449AW	MX283087A Operation Manual (Remote Control)

*1: - Only Wi-SUN Alliance members can purchase this software.

-	Main frame	Options configuration examples
	MS269xA	MX269017A, MS269xA-020, MX269902A
	MS2830A	MS2830A-041, MS2830A-002, MS2830A-006,
		MX269017A, MS2830A-020, MS2830A-022,
		MS2830A-027, MX269902A



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

Note:

/incitsu

United States

Anritsu Company 1155 East Collins Blvd., Suite 100, Richardson, TX 75081, U.S.A. Toll Free: 1-800-267-4878 Phone: +1-972-644-1777 Fax: +1-972-671-1877

Canada

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

Brazil Anritsu Eletrônica Ltda.

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

Mexico

Anritsu Company, S.A. de C.V. Av. Ejército Nacional No. 579 Piso 9, Col. Granada 11520 México, D.F., México Phone: +52-55-1101-2370 Fax: +52-55-5254-3147

United Kingdom

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

• France

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

Germany

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

Italy Anritsu S.r.l.

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

Sweden Anritsu AB

Kistagången 20B, 164 40 KISTA, Sweden Phone: +46-8-534-707-00 Fax: +46-8-534-707-30

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

 Denmark Anritsu A/S (Service Assurance) Anritsu AB (Test & Measurement) Kay Fiskers Plads 9, 2300 Copenhagen S, Denmark Phone: +45-7211-2200 Fax: +45-7211-2210

Russia

Anritsu EMEA Ltd. **Representation Office in Russia** Tverskaya str. 16/2, bld. 1, 7th floor. Russia, 125009, Moscow

Phone: +7-495-363-1694 Fax: +7-495-935-8962

United Arab Emirates Anritsu EMEA Ltd.

Dubai Liaison Office P O Box 500413 - Dubai Internet City Al Thuraya Building, Tower 1, Suit 701, 7th Floor Dubai, United Arab Emirates Phone: +971-4-3670352 Fax: +971-4-3688460

India

Anritsu India Private Limited

2nd & 3rd Floor, #837/1, Binnamangla 1st Stage, Indiranagar, 100ft Road, Bangalore - 560038, India Phone: +91-80-4058-1300 Fax: +91-80-4058-1301

Specifications are subject to change without notice.

Singapore

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

• P.R. China (Shanghai) Anritsu (China) Co., Ltd.

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

P.R. China (Hong Kong)

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

Japan

Anritsu Corporation 8-5, Tamura-cho, Atsugi-shi, Kanagawa, 243-0016 Japan Phone: +81-46-296-1221 Fax: +81-46-296-1238

Korea

Anritsu Corporation, Ltd. 502, 5FL H-Square N B/D, 681

Sampyeong-dong, Bundang-gu, Seongnam-si, Gyeonggi-do, 463-400 Korea Phone: +82-31-696-7750 Fax: +82-31-696-7751

Australia

Anritsu Pty. Ltd. Unit 21/270 Ferntree Gully Road, Notting Hill, Victoria 3168, Australia Phone: +61-3-9558-8177 Fax: +61-3-9558-8255

• Taiwan

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

