Discover What's Possible™

# MX268X Series Measurement Software (For MS2681A/MS2683A/MS2687B Spectrum Analyzer)



For evaluation of the digital mobile communications system in the world

The MS2681A/MS2683A/MS2687B Spectrum Analyzer has been designed to provide the optimum performance required for evaluation of the advanced radio communication devices. They have a wide dynamic range, wide resolution bandwidth (20 MHz), and high-speed sweep (refresh rate: 20 times/s).

When measurement software is stalled in the mainframe, the analysis function of spectrum analyzer to each communication system will be extended. In this case, more advanced analysis can be performed.

#### Selection guide

| Communication system   | Measurement software  |
|--|---|
| W-CDMA   | MX268101B/MX268301B/MX268701B W-CDMA Measurement software                       |
| GSM<br>EDGE  | MX268102A/MX268302A/MX268702A GSM Measurement software                          |
| cdmaOne<br>CDMA2000 1X   | MX268103A/MX268303A/MX268703A cdma Measurement software                         |
| CDMA2000 1xEV-DO   | MX268104A/MX268304A/MX268704A 1xEV-DO Measurement software                      |
| π/4DQPSK<br>PDC<br>PHS<br>NADC (IS-136)<br>STD-39/T79<br>STD-T61 | MX268105A/MX268305A/MX268705A $\pi$ /4DQPSK Measurement software                |
| WLAN<br>IEEE802.11a/b/g<br>HiSWANa<br>HiperLAN2                  | MX268130A/MX268330A/MX268730A Wireless LAN Measurement software                 |
| WLAN<br>IEEE802.11a/b/g<br>HiSWANa<br>HiperLAN2                  | MX268132A/MX268332A/MX268732A Wireless LAN Measurement software Limited Version |



- Measurement software is installed in main frame using a memory card.
- The signal of various kinds is analyzable with the function of the measurement software installed in main frame. The notebook PC for analyzing a signal is unnecessary.
- Measurement software is installable in one set of a spectrum analyzer to three.



## W-CDMA Measurement Software MX268101B/MX268301B/MX268701B

## Evaluation of W-CDMA transmission system with single unit –

MX268101B/MX268301B/MX268701B W-CDMA Measurement Software is the application software used in the MS2681A/MS2683A/MS2687B Spectrum Analyzer. The installation in Spectrum Analyzer main frame enables to measure functions and performance of W-CDMA digital mobile equipment simply.

#### • Measured items

#### Modulation analysis:

Carrier frequency, Vector error, Phase error, Magnitude error, Code domain analysis (Code domain power, Code domain error), Code vs. time

Amplitude measurement: Transmission power measurement

Occupied bandwidth measurement

Adjacent channel power

Spurious measurement

Demodulation data monitoring

Spectrum emission mask

CCDF measurement

IQ level measurement

## **Parameter Setup**

A setup screen is provided for the entry of required parameters for modulation accuracy and code domain power measurements in W-CDMA analysis. Measurement can be performed after parameter setup.



## **Demodulation data monitoring**

After de-spreading, up to 10 frames of demodulation data can be evaluated.



## **Modulation Accuracy Measurement**

Frequency error, modulation accuracy and code domain analysis are performed and then results are displayed on the screen. The measurement accuracy is 1% (typical value) of residual vector error (rms).

| > Measure        | : Single   | Hodu Lation<br>Analysis  |
|------------------|--|--|
| Storage<br>Trace | : Normal<br>: Non  | #  |
|                  |  | Trace  |
| : 1              | 919.999 999 6 MHz  | Format   |
| :                | -0.4 Hz  |  |
|                  | 0.000 ppm  | *  |
|                  |  | Ctanaga  |
| :                | 0.99943  | Mode   |
|                  |  | ж  |
|                  | 1 00 11 ( )  |  |
| :                | 1.63 % (rms)   | Scale  |
| :                | 4.69 %   | llode  |
| :                | 0.67 deg. (Phs)  | *  |
|                  | I.IJ % (FMS)   |  |
| :                | -35.26 dB  | Analysis   |
|                  |  | noue   |
| :                | -17.80 dBn   |  |
| :                | -9.88 dB   | I  |
| :                | -12.89 dB  | Adjust   |
| :                | -12.89 dB  | Range  |
| :                | 00000  | →<br>→   |
|                  | P== 4  | Back   |
|                  | THE TAXABLE PARTY  |  |
| 09 00-1B         | Berron Col . Off   | Screen   |
|                  | Measure<br>Storage<br>Trace<br>: 1<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>: | <ul> <li>Measure : Single<br/>Storage : Koraal<br/>Trace : Kon</li> <li>: 1919.999 999 6 MHz</li> <li>: -0.4 Hz</li> <li>0.000 ppa</li> <li>: 0.99943</li> <li>: 1.63 % (ras)</li> <li>: 4.69 %</li> <li>: 0.67 deg. (ras)</li> <li>: 1.13 % (ras)</li> <li>: -95.26 dB</li> <li>: -17.80 dBa</li> <li>: -12.89 dB</li> <li>: -12.89 dB</li> <li>: -12.89 dB</li> <li>: -12.89 dB</li> </ul> |

## **BTS Code Domain Analysis**

Perform code domain analysis of forward link signals in approx. 2 seconds. Code domains of IQ phase are displayed on the screen.



#### **CCDF Measurement**

It enables distribution display or cumulative distribution display of the power difference between instantaneous power and average power.

Max. 20 MHz of filter bandwidth is able to perform multi-carrier measurement.



## Code vs. time

This function is for measuring code power of specified code channel for each slot in the continuous slot range. It enables to check some functions, such as power control of code channel and compressed mode of down link (Spreading Factor Reduction), efficiently.



## **Spurious Close to the Carrier Measurement**

Spurious close to the carrier is measured using the spectrum analyzer function. The PASS/FAIL result of a template judgement is displayed on the screen.



# **Specifications**

Following specifications are guaranteed after optimized internal level (Range of internal receiver is automatically adjusted by pushing Adjust Range key).

The "pre-amp on" of MS2681A and MS2683A can be set up when MS2681A-08/MS2683A-08 of an option are carried.

|                          |  | · · · · · · · · · · · · · · · · · · ·  |  |   |  |
|--------------------------|--|--|--|---|--|
|                          | Model  | MX268101B  | MX268301B  | MX268701B   |  |
|                          | Measurement<br>frequency range                       | 50 MHz to 3 GHz<br>50 MHz to 2.3 GHz (with MS2681A-08/I  | MS2683A-08)  | 50 MHz to 3 GHz   |  |
|                          | Measurement level<br>range                           | -60 to +30 dBm (average power, pre-an<br>-80 to +10 dBm (average power, pre-an   | np off)<br>np on)  | -50 to +30 dBm (average power)  |  |
|                          | Carrier frequency accuracy                           | Input level : ≥–30 dBm (pre-amp off), ≥–<br>± (reference frequency accuracy + 10 H   | 40 dBm (pre-amp on), at 1 code channel z)  | Input level: ≥–30 dBm, at 1 code channel<br>± (reference frequency accuracy + 10 Hz)                          |  |
| Modulation/<br>frequency | Modulation accuracy<br>(residual vector error)       | Input level: ≥–30 dBm (pre-amp off), ≥–40 dBm (pre-amp on), at 1 code channel <2.0% (rms)  |  | Input level: ≥–30 dBm, at 1 code channel <2.0% (rms)  |  |
| measurement              | Origin offset<br>accuracy                            | Input level: ≥–30 dBm (pre-amp off), ≥–40 dBm (pre-amp on), at 1 code channel,<br>relative to signal with origin offset of –30 dBc<br>±0.50 dB   |  | Input level: ≥–30 dBm, at 1 code<br>channel, relative to signal with origin<br>offset of –30 dBc<br>±0.50 dB  |  |
|                          | Waveform display                                     | Displays the following items for 1 CH to<br>Constellation display, Eye pattern displ<br>Amplitude error vs. Chip no. display   | multi-CH input signal.<br>lay, Vector error vs. Chip no. display, Phas   | se error vs. Chip no. display,  |  |
|                          | Frequency range                                      | 50 MHz to 3 GHz, 50 MHz to 2.3 GHz (   | with MS2681A-08/MS2683A-08)  | 50 MHz to 3 GHz   |  |
|                          | Measurement level<br>range                           | <ul> <li>-60 to +30 dBm (average power, pre-an</li> <li>-80 to +10 dBm (average power, pre-an</li> </ul>   | np off)<br>np on)  | -50 to +30 dBm (average power)  |  |
|                          | Code domain power accuracy                           | Input level: $\geq$ -10 dBm (pre-amp off), $\geq$ -2<br>±0.1 dB (code power $\geq$ -10 dB)<br>±0.3 dB (code power $\geq$ -25 dB)   | 20 dBm (pre-amp on)  | Input level: $\geq$ -10 dBm<br>±0.1 dB (code power $\geq$ -10 dBc)<br>±0.3 dB (code power $\geq$ -25 dBc)     |  |
| Code domain<br>analysis  | Code domain error                                    | Input level: ≥–10 dBm (pre-amp off), ≥–3<br>Spread factor: 512 (down-link)/256 (up-l<br>Residual error: <–50 dB, the input signa<br>Measurement accuracy:<br>±0.5 dB (at error of –30 dBc), the input          | Input level: ≥–10 dBm<br>Spread factor: 512 (down-link)/256 (up-link)<br>Residual error: <–50 dB, the input signal<br>does not have the origin offset<br>Measurement accuracy:<br>±0.5 dB (at error of –30 dBc), the input<br>signal does not have the origin offset |   |  |
|                          | Display function                                     | Code domain power, code domain error<br>Spread factor: 4 to 256 (up-link)/4 to 51:<br>IQ separately displayed at up-link<br>Automatic spreading factor detection fur<br>SCH level measuring function available | 2 (down-link)<br>nction available  |   |  |
|                          | Code vs. slot<br>measurement                         | Measures code domain power for each down link)   | slot of specified code channel up to 150 s   | lots (applicable to compressed mode of  |  |
|                          | Frequency range                                      | 50 MHz to 3 GHz, 50 MHz to 2.3 GHz (   | with MS2681A-08/MS2683A-08)  | 50 MHz to 3 GHz   |  |
|                          | Measurement level<br>range                           | -60 to +30 dBm (average power): pre-a<br>-80 to +10 dBm (average power): pre-a   | mp off<br>mp on  | -50 to +30 dBm (average power)  |  |
|                          | Tx power<br>measurement range                        | -20 to +30 dBm (average power): pre-a<br>-20 to +10 dBm (average power): pre-a   | mp off<br>mp on  | -20 to +30 dBm (average power)  |  |
|                          | Tx power measure-<br>ment accuracy                   | ±2.0 dB (Typical)  |  | ±2.0 dB (Typical)   |  |
| Amplitude<br>measurement | Power<br>measurement<br>linearity                    | Input level: ≥–10 dBm (pre-amp off), ≥–2<br>unchanged reference level s<br>±0.20 dB (0 to –40 dB)  | 20 dBm (pre-amp on),<br>setup after range adjustment   | Input level: ≥–10 dBm,<br>unchanged reference level setup<br>after range adjustment<br>±0.20 dB (0 to -30 dB) |  |
|                          | Filter selection<br>function                         | Enables the measurement of the value   | of the power passed through the RRC ( $\alpha$ =   | = 0.22)   |  |
|                          | Transmitter power<br>control measurement<br>function | Displays relative power for each slot of   | Displays relative power for each slot of maximum 150 slots. Pass/Fail judgment funct   |   |  |
|                          | RACH measuring<br>function                           | Measures the time difference between p   | preamble RACH signal and message RAC   | H signal  |  |
|                          | Frequency range                                      | 50 MHz to 3 GHz  |  |   |  |
| Occupied                 | Measurement level                                    | -60 to +30 dBm (average power): pre-a  | mp off   | -50 to +30 dBm (average power)  |  |
| measurement              | Measurement  | Sweep method: After measuring the signal   | al with the sweep type spectrum analyzer, pe<br>with EET, performs calculation and display   | erforms calculation and displays the result.  |  |
|                          | Frequency range                                      | 50 MHz to 3 GHz, 50 MHz to 2 3 GHz (   | with MS2681A-08/MS2683A-08)  | 50 MHz to 3 GHz   |  |
|                          | Input level range                                    | -10 to +30 dBm (average power). pre-a  | mp off   | -10 to +30 dBm (average power)  |  |
| Adjacent                 | F 2  | Sweep method (all): After measuring the the result.  | e signal with the sweep type spectrum ana  | lyzer, performs calculation and displays  |  |
| channel<br>power         | Measurement<br>method                                | Sweep method (separate): After measur<br>type spectru<br>Filter method: Measures power at adjac<br>built-in receive filter (RRC  | ring adjacent channel and the channel nex<br>m analyzer, performs calculation and displ<br>ent channel and at the channel next to the<br>$C \alpha = 0.22$ ) and displays the value.   | tt to the adjacent channel with the sweep<br>ays the result.<br>e adjacent channel after it passes the        |  |

|                              | Vodel   | MX268101B   | MX268301B  | MX268701B  |  |  |
|------------------------------|---|---|--|--|--|--|
| Adjacent<br>channel<br>power | Measurement<br>range  | Input level: ≥0 dBm, filter method, in broa<br>At code channel 1CH<br>5 MHz offset: ≥55 dBc, 10 MHz offset:<br>At multiple code channel 16CH (only with<br>5 MHz offset: ≥50 dBc, 10 MHz offset:<br>Input level: ≥–10 dBm, filter method, in b<br>At code channel 1CH<br>5 MHz offset: 55 dBc Typical, 10 MHz of<br>At multiple code channel 16CH<br>5 MHz offset: 50 dBc Typical, 10 MHz offset: | ad dynamic range mode<br>≥62 dBc<br>h Option 08)<br>≥60 dBc<br>oroad dynamic range mode<br>offset: 62 dBc Typical<br>offset: 60 dBc Typical  | Input level: 0 dBm, filter method, in<br>broad dynamic range mode<br>At code channel 1CH<br>5 MHz offset: ≥55 dBc,<br>10 MHz offset: ≥62 dBc<br>At multiple code channel 16CH<br>5 MHz offset: ≥55 dBc,<br>10 MHz offset: ≥60 dBc<br>Input level: ≥–10 dBm, filter method, in<br>broad dynamic range mode<br>At code channel 1CH<br>5 MHz offset: 55 dBc Typical,<br>10 MHz offset: 50 dBc Typical<br>At multiple code channel 16CH<br>5 MHz offset: 50 dBc Typical,<br>10 MHz offset: 60 dBc Typical, |  |  |
|                              | Measurement<br>frequency range                              | 9 kHz to 3.0 GHz (except within ±50 MHz of carrier frequency)   | 9 kHz to 7.8 GHz (except within ±50 MHz of carrier frequency)  | 9 kHz to 12.75 GHz (except within ±50 MHz of carrier frequency   |  |  |
|                              | Input level range<br>(Tx power)                             | 0 to +30 dBm (average power): pre-amp   | off  | 0 to +30 dBm (average power)   |  |  |
| Spurious<br>measurement      | Measurement<br>method                                       | Sweep method:<br>After sweeping the designated frequence<br>Calculates the ratio with the transmitted<br>AVERAGE.<br>Spot method:<br>After measuring the designated frequence<br>Calculates the ratio with the transmitted<br>AVERAGE.<br>Search method:<br>After sweeping the designated frequency<br>frequency in time domain, and displays<br>the power ratio, and displays it. Detecti        | cy range with the spectrum analyzer, deter<br>d power value, which is the power ratio, ar<br>ncy in time domain of the spectrum analyz<br>d power value, which is the power ratio, ar<br>cy range with the spectrum analyzer and o<br>the average value. Calculates the ratio w<br>on mode should be AVERAGE.  | cts the peak value and displays it.<br>Ind displays it. Detection mode should be<br>er, displays the average value.<br>Ind displays it. Detection mode should be<br>detecting the peak value, measures the<br>ith the transmitted power value, which is  |  |  |
|                              |   | Carrier frequency: 1800 to 2200 MHz<br>When carrier frequency is in a 2030.354 to 2200 MHz range, spurious will be generated at the frequency below.<br>f (spurious) = f (in) – 2030.345 MHz  |  |  |  |  |
|                              | Measurement<br>range (typical)                              | <ul> <li>≥79 dB (RBW: 1 kHz, 9 kHz to 150 kHz)</li> <li>≥79 dB (RBW: 10 kHz, 150 kHz to 30 MHz)</li> <li>≥79 dB (RBW: 100 kHz, 30 MHz to 1 GHz)</li> <li>≥76 - f [GHz] dB (RBW: 1 MHz, 1 GHz to 3.0 GHz)</li> </ul>   | <ul> <li>≥79 dB (RBW: 1 kHz, 9 kHz to 150 kHz, band 0)</li> <li>≥79 dB (RBW: 10 kHz, 150 kHz to 30 MHz, band 0)</li> <li>≥79 dB (RBW: 100 kHz, 30 MHz to 1 GHz, band 0)</li> <li>≥76 - f [GHz] dB (RBW: 1 MHz, 1 GHz to 3.15 GHz, band 0)</li> <li>≥76 dB (RBW: 1 MHz, 3.15 GHz to 7.8 GHz, band 1)</li> </ul> | <ul> <li>≥79 dB (RBW: 1 kHz, 9 kHz to 150 kHz)</li> <li>≥79 dB (RBW: 10 kHz, 150 kHz to 30 MHz)</li> <li>≥79 dB (RBW: 100 kHz, 30 MHz to 1 GHz)</li> <li>≥76 - f [GHz] dB</li> <li>(RBW: 1 MHz, 1 GHz to 3.15 GHz)</li> <li>≥76 dB (RBW: 1 MHz, 3.15 GHz to 7.9 GHz)</li> <li>at MS2687A</li> <li>≥68 dB (RBW: 1 MHz, 7.9 to 12.75 GHz)</li> <li>at MS2687B</li> <li>≥74 dB (RBW: 1 MHz, 7.9 to 12.75 GHz)</li> </ul>  |  |  |
| Spectrum emis<br>measurement | sion mask   | After measuring the signal with the swee  | ep type spectrum analyzer, performs judgn  | nent with template and displays it.  |  |  |
| Demodulation                 | measurement   | Maximum ten frames data of the designation  | ated code channel After De-Spreading is c  | outputted.   |  |  |
|                              | Frequency range   | 50 MHz to 3 GHz, 50 MHz to 2.3 GHz (v   | with MS2681A-08/MS2683A-08)  | 50 MHz to 3 GHz  |  |  |
| CODE                         | Measurement level<br>range                                  | <ul> <li>-60 to +30 dBm (average power): pre-ar</li> <li>-80 to +10 dBm (average power): pre-ar</li> </ul>  | mp off<br>mp on  | -50 to +30 dBm (average power)   |  |  |
| measurement                  | Measurement<br>method                                       | CCDF: Displays the cumulative distributi<br>APD: Displays the distribution of the pow   | on of the power difference between instan  | taneous power and average power.<br>er and average power.  |  |  |
|                              | Filter selection  | 20 MHz, 10 MHz, 5 MHz, 3 MHz, RRC:  | α = 0.22, RC: α = 0.22   |  |  |  |
|                              | Input impedance   | 1 MΩ (parallel capacitance: <100 pF), 50  | ΩΩ   |  |  |  |
|                              | Balance input   | With MS2681A-17/MS2683-17A<br>Differential voltage: 0.1 to 1 Vp-p (input t<br>In-phase voltage: ±2.5 V(input terminals)   | terminals)   | -  |  |  |
| Electric                     | Unbalance Input   | With MS2681A-18/MS2683A-18/MS2687<br>0.1 to 1 Vp-p (input terminals)<br>DC/AC coupling: Changeable  | /B-18  |  |  |  |
| performance                  | Measurement items   | Modulation accuracy, code domain powe   | er, amplitude, occupied bandwidth (FFT me  | ethod), IQ level   |  |  |
| (IQ input)                   | Modulation accuracy<br>measurement<br>residual vector error | Input level: ≥0.1 V (rms)<br><2%(rms), DC coupling, the input signal  | does not have the origin offset  |  |  |  |
|                              | IQ rever measurement  | when the CW signal is inputted to Lond  | P)<br>O input terminals, measures and displays   | the phase difference between Labore  |  |  |
|                              | measurement   | and Q-phase signals.  | a input terminais, measures and displays   | the phase difference between i-pliase  |  |  |

#### Evaluation of GSM transmission system with single unit –

MX268102A/MX268302A/MX268702A GSM measurement software is the application software used in the MS2681A/ MS2683A/MS2687B Spectrum Analyzer. The installation in Spectrum Analyzer main frame enables to measure functions and performance of GSM digital mobile equipment simply.

#### • Measured items

Modulation analysis, Frequency: [Numerical result] EVM Phase error Magnitude error Origin offset 95:th Percentile [Waveform display] Constellation display Trellis display (at GMSK modulation) Eve pattern display EVM vs. bit number display (at 8PSK modulation) Phase error vs. bit number display Magnitude error vs. bit number display IQ diagram display Amplitude measurement: Transmitted power Output RF spectrum Spurious measurement

## **Parameter Setup**

This screen is used to set common parameters such as input terminal, frequency, signal modulation, and training sequence and so on before starting an analysis. Setting these parameters simplifies measurement operations.



## Modulation analysis (Numerical result)

Displays numeric results, including the frequency, phase error, magnitude error, origin offset, and modulation accuracy (EVM).

| (Modulation Analysis (GSM) >> | Measure   | · Single                          | Nodulation<br>Analysis |
|-------------------------------|-----------|-----------------------------------|------------------------|
|                               | Storage   | : Normal<br>: Non                 | #                      |
| Frequency                     |           |                                   | Trace                  |
| Carrier Frequency             | :         | 890.199 996 4 MHz                 | Format                 |
| Carrier Frequency Error       | :         | -0.003 6 kHz<br>0.00 ppm          | *                      |
| <b>v</b> • • • • •            |           |                                   | Storage<br>Mode        |
| Degulation<br>DWC Dhase Ennon |           | 0.07 dog (pec)                    | v                      |
| Peak Phase Frror              | :         | 1 73 deg                          |                        |
| Magnitude Error               | -         | 0.97 % (rms)                      | Scale<br>Mode          |
|                               |           |                                   |                        |
|                               |           |                                   |                        |
|                               |           |                                   | Adjust<br>Range        |
|                               |           |                                   | -                      |
| Ch · ICH Level ·              | -18 00dBa | Pre Ampl : Off<br>Power Cal : Off | Back<br>Screen         |
| Freq: 890.200000MHz Offset:   | 0.00dB    | Correction : Off                  | 1 2                    |

## Modulation analysis (Waveform display)

The waveform (constellation, trellis, etc.) for modulation analysis can be displayed.



Constellation display



Trellis display

## **RF** Power

The numerical results (Tx power, Carrier Off power, Power flatness) are displayed. Moreover, it is possible to display the waveform of a "slot", "ON-portion", "leading", and "trail-



ing."







#### RF power leading display

| < Out          | nut RF Spectr  | 11m (65M) >>         | Measu                | re · Single             |                        | Output<br>RF Spectrum |
|----------------|----------------|----------------------|----------------------|-------------------------|------------------------|-----------------------|
| ( vas          | pue in Specier |                      | Stora                | ge : Normal             |                        |                       |
|                |                |                      | Metho                | d : High Sp             | eed                    |                       |
|                | Offset Freq.   | Modula               | tion S               | witching Tran           | sients                 |                       |
|                | 0.000MHz       | -13.3                | 6dBn                 | -6.29dB                 | m                      |                       |
|                |                | Lower                | Upper                | Lower                   | Upper                  | Stopago               |
| f 1 =          | 0.100MHz       | -4.11dB              | -6.66dB              | -11.43dBn               | -11.66dBm              | Mode                  |
| t 2 =<br>f 9 - | 0.200MH2       | -33.59dB             | -35.34dB             | -38.38dBm<br>-44 E0.00m | -37.36dBm<br>-44.76dBm |                       |
| f 4 =          | 0.400MHz       | -71.39dB             | -68.07dB             | -71.86dBn               | -69.81dBn              |                       |
| f 5 =          | 0.600MHz       | -72.78dB             | -72.71dB             | -77.39dBn               | -78.62dBm              | Unit                  |
| f 6 =          | 0.800MHz       | -75.58dB             | -75.62dB             | -80.75dBn               | -80.32dBm              |                       |
| 17=<br>f9-     | 1.000MHz       | -75.26dB<br>-77.71dB | -72.63dB<br>-90.56dB | -82.36dBm<br>-82.11dBm  | -81.30dBm<br>-79.94dBm |                       |
| f 9 =          | 1.400MHz       | -77.00dB             | -78.58dB             | -82.29dBn               | -83.52dBn              | h. 111 111            |
| f10 =          | 1.600MHz       | -77.75dB             | -77.10dB             | -82.86dBn               | -82.73dBm              | Calibratic            |
| f11 =          | 1.800MHz       | -74.73dB             | -73.78dB             | -83.98dBn               | -84.55dBn              |                       |
|                |                |                      |                      |                         |                        |                       |
|                |                |                      |                      |                         |                        | Adjust                |
|                |                |                      |                      |                         |                        | Range                 |
|                |                |                      |                      |                         |                        |                       |
|                |                |                      |                      |                         |                        | Back                  |
| 0L             |                |                      | . 19 00-1            | Pre Ampi<br>Barron Col  | : 0ff                  | Screen                |
| Fren           | . 890 20000    | 1011 Level           | t 0.00d              | B Correctio             | n · 0ff                | 1                     |

#### **RF** Power spectrum

#### **Spurious emission**

Three kinds of measurement modes (spot, search, and sweep) are used, and "frequency of spurious" and a "level of spurious" are measured. Simultaneously, "RBW", "VBW" and



"SWT" are displayed.



**Measurement result** 

# **Specifications**

Following specifications are guaranteed after optimized internal level (Range of internal receiver is automatically adjusted by pushing Adjust Range key).

The "pre-amp on" of MS2681A and MS2683A can be set up when MS2681A-08/MS2683A-08 of an option is carried.

| Model                                   |  | MX268102A   | MX268302A   | MX268702A  |  |  |  |
|---|--|---|---|--|--|--|--|
| Measurement<br>frequency range          |  | 50 MHz to 2.7 GHz   |   |  |  |  |  |
|   | Measurement<br>level range   | -40 to +30 dBm (average power within burst signal): when pre-amplifier is OFF -40 to +30 dBm (average power within burst signal): when pre-amplifier is ON burst signal)  |   |  |  |  |  |
|   | Carrier frequency accuracy   | Input level (average power within burst<br>>-30 dBm (when pre-amplifier is OFF)<br>± (reference frequency accuracy + 10   | signal):<br>, ≥–40 dBm (when pre-amplifier is ON)<br>Hz)                                      | Input level (average power within burst<br>signal): ≥–30 dBm<br>± (reference frequency accuracy<br>+ 10 Hz)  |  |  |  |
|   | Modulation<br>accuracy   | Input level (average power within burst =<br>>-30 dBm (when pre-amplifier is OFF)   | signal):<br>, ≥–40 dBm (when pre-amplifier is ON)   | Input level (average power within burst signal): ≥–30 dBm  |  |  |  |
| Modulation/<br>frequency<br>measurement | Residual phase<br>error (GMSK<br>modulation)                         | <0.5 degree (rms), <2.0 degree (peak)   |   |  |  |  |  |
|   | Residual vector<br>error (8PSK<br>modulation)                        | <1.0%(rms)  |   |  |  |  |  |
|   | Waveform display   | Constellation<br>Trellis display (at GMSK modulation)<br>Eye pattern display<br>EVM vs. bit number display (at 8PSK modulation)<br>Phase error vs. bit number display<br>Amplitude error vs. bit number display<br>IQ diagram display |   |  |  |  |  |
|   | Frequency range  | 50 MHz to 2.7 GHz   |   |  |  |  |  |
|   | Measurement<br>level range   | <ul> <li>-40 to +30 dBm (average power within</li> <li>-60 to +10 dBm (average power within</li> </ul>  | burst signal): when pre-amplifier is OFF<br>burst signal): when pre-amplifier is ON           | <ul> <li>-40 to +30 dBm (average power within<br/>burst signal)</li> </ul>   |  |  |  |
|   | Tx power measure-<br>ment range                                      | <ul> <li>-10 to +30 dBm (average power within</li> <li>-10 to +10 dBm (average power within</li> </ul>  | burst signal): when pre-amplifier is OFF<br>burst signal): when pre-amplifier is ON           | <ul> <li>-10 to +30 dBm (average power within<br/>burst signal)</li> </ul>   |  |  |  |
|   | Tx power measure-<br>ment accuracy<br>(typical)                      | ±2.0 dB   |   |  |  |  |  |
| Amplitude<br>measurement                | Power measure-<br>ment linearity                                     | Input level (average power within burst s<br>≥–10 dBm (when pre-amplifier is OFF)<br>±0.2 dBm (0 to –30 dB) without changi<br>optimization  | signal):<br>, ≥–20 dBm (when pre-amplifier is ON),<br>ing reference level setting after range | Input level (average power within burst<br>signal): ≥–10 dBm, ±0.2 dBm (0 to<br>–30 dB) without changing reference<br>level setting after range optimization |  |  |  |
|   | Power measure-<br>ment when carrier<br>is OFF                        | Input level (average power within burst s<br>≥–10 dBm (when pre-amplifier is OFF)   | signal):<br>, ≥–20 dBm (when pre-amplifier is ON)   | Input level (average power within burst signal): ≥–10 dBm  |  |  |  |
|   | Normal mode<br>measurement range                                     | ≥60 dB (compared with average power   | within burst signal)  |  |  |  |  |
|   | Broad dynamic<br>range mode<br>measurement range                     | Average power within burst signal: comp<br>≥80 dB<br>Note that the measurement limit is deter   | pared with 10 mV<br>rmined depending on the average noise le                                  | evel: ≤–70 dBm (50 MHz to 2.7 GHz).  |  |  |  |
|   | Rise/fall<br>characteristics   | Waveform is displayed in synchronization<br>Specified line can be displayed (measure  | on with the data of measured signal.<br>red in 1 MHz bandwidth), equipped with pa             | ass/fail judging function  |  |  |  |
|   | Frequency range  | 100 MHz to 2.7 GHz  |   |  |  |  |  |
|   | Input level range  | <ul> <li>-10 to +30 dBm (average power within</li> <li>-20 to +10 dBm (average power within</li> </ul>  | burst signal): when pre-amplifier is OFF<br>burst signal): when pre-amplifier is ON           | <ul> <li>-10 to +30 dBm (average power within<br/>burst signal)</li> </ul>   |  |  |  |
| Output RF<br>spectrum                   | Modulation mea-<br>surement range<br>(spectrum due to<br>modulation) | At CW signal input<br>≥60 dB (≥200 kHz offset)<br>≥68 dB (≥250 kHz offset)<br>(<1.8 MHz offset is RBW: 30 kHz, ≥1.8 l   | MHz offset is RBW: 100 kHz)   |  |  |  |  |
|   | Transient section<br>measurement range<br>(Switching transient)      | At CW signal input<br>≥63 dB (≥400 kHz offset)  |   |  |  |  |  |

| Model                                 |                                       | MX268102A   | MX268302A  | MX268702A   |  |  |
|---------------------------------------|---------------------------------------|---|--|---|--|--|
|                                       | Frequency range                       | 100 kHz to 3.0 GHz, except for the  | 100 kHz to 7.8 GHz, except for the   | 100 kHz to 12.75 GHz, except for the  |  |  |
|                                       |                                       | range within carrier frequency ±50 MHz  | range within carrier frequency ±50 MHz   | range within carrier frequency ±50 MHz  |  |  |
|                                       | (transmitted power)                   | 0 to +30 dBm (average power of burst signal) burst signal)  |  |   |  |  |
| Sourious                              | Measurement<br>method                 | Sweep method:<br>After sweeping the designated frequen<br>Calculates the ratio with the transmitter<br>AVERAGE.<br>Spot method:<br>After measuring the designated frequen<br>Calculates the ratio with the transmitter<br>AVERAGE.<br>Search method:<br>After sweeping the designated frequen<br>frequency in time domain, and displays<br>the power ratio, and displays it. Detect | cy range with the spectrum analyzer, deter<br>d power value, which is the power ratio, ar<br>ncy in time domain of the spectrum analyz<br>d power value, which is the power ratio, ar<br>cy range with the spectrum analyzer and c<br>is the average value. Calculates the ratio w<br>ion mode should be AVERAGE.  | cts the peak value and displays it.<br>Ind displays it. Detection mode should be<br>er, displays the average value.<br>Ind displays it. Detection mode should be<br>detecting the peak value, measures the<br>ith the transmitted power value, which is   |  |  |
| measurement                           |                                       | Carrier frequency. 500 Minz to 1 Griz al  |  | >72 dB (RBW: 10 kHz, 100 kHz to   |  |  |
| measurement                           | Measurement<br>range (typical)        | <ul> <li>≥72 dB (RBW: 10 kHz, 100 kHz to 50 MHz)</li> <li>≥72 dB (RBW: 100 kHz, 50 to 500 MHz)</li> <li>≥66 - f [GHz] dB (RBW: 3 MHz, 500 MHz to 3 GHz, except for harmonic frequency)</li> </ul>   | <ul> <li>≥72 dB (RBW: 10 kHz, 100 kHz to 50 MHz, Band 0)</li> <li>≥72 dB (RBW: 100 kHz, 50 to 500 MHz, Band 0)</li> <li>At normal mode</li> <li>≥66 - f [GHz] dB (RBW: 3 MHz, 500 MHz to 3.15 GHz, Band 0, except for harmonic frequency)</li> <li>≥66 dB (RBW: 3 MHz, 3.15 to 7.8 GHz, Band 1)</li> <li>With MS2683A-03, at spurious mode</li> <li>≥66 dB (RBW: 3 MHz, 1.6 to 7.8 GHz, Band 1)</li> </ul> | ≥72 dB (RBW: 10 kHz, 100 kHz, 100 kHz to<br>50 MHz, Band 0)<br>≥72 dB (RBW: 100 kHz, 50 to 500<br>MHz, Band 0)<br>≥66 – f [GHz] dB (RBW: 3 MHz, 500<br>MHz to 3.15 GHz, Band 0, except for<br>harmonic frequency)<br>≥66 dB (RBW: 3 MHz, 3.15 to 7.9<br>GHz, Band 1)<br>With MS2687B-22<br>≥66 – f [GHz] dB (RBW: 3 MHz, 500<br>MHz to 3.15 GHz, Band 0, except for<br>harmonic frequency)<br>≥66 dB (RBW: 3 MHz, 3.15 to 7.9<br>GHz, Band 1: n = 1)<br>≥65 dB (RBW: 3 MHz, 7.9 to 12.75<br>GHz, Band 1: n = 2) |  |  |
|                                       | Input method                          | With Option 17 and option 18.   | anaad  | With Option 18  |  |  |
|                                       | Input impedance                       | Selectable between 1 MO (parallel capa  | city <100 pF) and 50 Ω   |   |  |  |
|                                       | Input level range balance input       | With Option 17.<br>Differential voltage range: 0.1 to 1 Vp-p<br>In-phase voltage range: ±2.5 V (at input  | (at input terminal)<br>terminal)   | -   |  |  |
| Electric<br>performance<br>(IQ input) | Input level range<br>unbalance Input  | With option 18.<br>0.1 to 1 Vp-p (at input terminal)<br>Changeable between DC connection an   | d AC connection  | With option 18.<br>0.1 to 1 Vp-p (at input terminal)<br>Changeable between DC connection<br>and AC connection   |  |  |
|                                       | Measurement items                     | Modulation accuracy, amplitude, IQ leve   | l  |   |  |  |
|                                       | Modulation<br>accuracy<br>measurement | Input level: ≥0.1 V (rms), at ambient terr<br>Modulation accuracy residual vector erro<br>Residual EVM (at 8PSK modulation) : <   | perature 18° to 28 °C<br>or (at GMSK modulation) : <0.5 degree (rm<br>1.0% (rms), DC connection  | ns), DC connection  |  |  |
|                                       | IQ level<br>measurement               | Measures input voltage (rms value and   | p-p value) of I and Q, and displays them.  |   |  |  |
|                                       | IQ phase difference<br>measurement    | When CW signal is input to each input to phase signal and displays it.  | erminal of I and Q, measures the phase di  | fference between I phase signal and Q   |  |  |

## cdma Measurement Software MX268103A/MX268303A/MX268703A

#### - Evaluation of CDMA2000 1X transmission system with one tester -

MX268103A/MX268303A/MX268703A cdma Measurement Software is the application software used in the MS2681A/ MS2683A/MS2687B Spectrum Analyzer. The installation of MX268103A/MX268303A/MX268703A enables evaluation of base station or mobile transmitters conforming to the cdmaOne and CDMA2000 1X standards.

#### Measured items

Modulation analysis:

Carrier frequency, vector error, phase error, magnitude error

Code domain analysis:

Code domain power, code domain timing offset, code domain phase offset

Amplitude measurement: Transmission power

Spurious close to the carrier measurement

Spurious measurement

Occupied bandwidth measurement

IQ level measurement

## **Parameter Setup**

A setup screen is provided for the entry of required parameters for modulation accuracy and code domain power measurements in cdmaOne or CDMA2000 1X analysis. Measurement can be performed after parameter setup.



## **Modulation Accuracy Measurement**

Frequency error, modulation accuracy and code domain analysis are performed and then results are displayed on the screen. The measurement accuracy is 1% (typical value) of residual vector error (rms).



## **BTS Code Domain Analysis**

Only 2 seconds are required for code domain analysis of CDMA2000 1X signals. RC\*1 through RC5 can be measured. Spreading factor of each code is automatically detected and displayed on the screen.

\*: Radio Configuration



• cdmaOne is a registered trademark of the CDMA Development Group (CDG)

CDMA2000® is a trademark of the Telecommunications Industry Association (TIA-USA).

## **MS Code Domain Analysis**

Perform code domain analysis of CDMA2000 1X signals in RC3 and RC4 in only 2 seconds. Code domains of IQ phase are displayed on the screen.



### **Spurious Close to the Carrier Measurement**

Spurious close to the carrier is measured using the spectrum analyzer function. The PASS/FAIL result of a template judgement is displayed on the screen.



## **Transmission Power Measurement**

When transmission power is measured both the value and signal waveform are displayed on the screen.



### **Spurious Measurement**

A frequency table can be set up in spurious measurement to provide a PASS/FAIL measurement result. Fifteen different frequencies and their limit values can be entered.

| << Spurious Emission •    | (cdma) >>                  |                      | Spurious<br>Enission |
|---------------------------|----------------------------|----------------------|----------------------|
|                           |                            | Spurious : Spot      | *                    |
|                           |                            | Detect : Average     | Spurious<br>Mode     |
| Ref Power                 | : -3.69                    | dBm                  |                      |
| Frequency                 | 7 Level                    | Judgement(Relati     | ve)                  |
| f 1 = 1 775.300 00        | 00 MHz: -45.29             | dBn Pass             |                      |
| f 2 = 2 662.950 00        | 00 MHz: -64.62             | dBa Pass             |                      |
| f 3 = 3 550.600 00        | 00 MHz: -72.39             | dBn Pass             | \$                   |
| f 4 = 4 438.250 00        | )0 MHz: −73.85             | dBn Pass             | View                 |
| f 5 = 5 325.900 00        | 00 MHz: −74.70             | dBm Pass             | Select               |
| f 6 = 6 213.550 00        | 00 MHz: -72.81             | dBn Pass             | Judgement            |
| f 7 = 7 101.200 00        | 00 MHz: -73.93             | dBn Pass             | *                    |
| f 8 = 7 988.850 00        | 00 MHz: -68.26             | dBn Pass             |                      |
| f 9 = 8 876.500 00        | 00 MHz: -66.32             | dBn Pass             | Calibration          |
| f10 = 9.764.150.00        | 00 MHz: -65.09             | dBn Pass             | current a bron       |
| f11 = 10651.80000         | 00 MHz: -66.84             | dBa Pass             |                      |
| $f12 = 11 \ 539.450 \ 00$ | 00 MHz: -65.70             | dBn Pass             |                      |
| $f13 = 12 \ 427.100 \ 00$ | 00 MHz: −65.68             | dBa Pass             |                      |
| $f_{14} =$                | MHz:                       | dBa ————             | Adjust               |
| f1b =                     | MHz:                       | dBa ————             | Range                |
|                           | Total J                    | udgement : Pass      | ÷                    |
| - 01                      | I Lorol -                  | 6 00 dDa Domon Cal . | Back<br>Screen       |
| Fren · 887 650000M        | i Level : -<br>Iz Offset · | 0.00dB Correction :  | 0ff 123              |

# **Specifications**

Following specifications are guaranteed after optimized internal level (Range of internal receiver is automatically adjusted by pushing Adjust Range key).

The "pre-amp On" of MS2681A and MS2683A can be set up when MS2681A-08/MS2683A-08 of an option are carried.

| Model                            |   | MX268103A  | MX268303A  | MX268703A   |  |  |
|----------------------------------|---|--|--|---|--|--|
|                                  | Measurement<br>frequency range                      | 50 MHz to 2.3 GHz  |  | ,   |  |  |
|                                  | Measurement level<br>range                          | -40 to +30 dBm (average power within<br>-60 to +10 dBm (average power within   | burst, pre-amp off)<br>burst, pre-amp on)  | -30 to +30 dBm<br>(average power within burst)  |  |  |
| Modulation/                      | Carrier frequency<br>accuracy <sup>*1</sup>         | ± (reference frequency accuracy + 10 H   | z)   | ,   |  |  |
| frequency<br>measurement         | Modulation<br>accuracy (residual<br>vector error)*1 | <2.0%(rms)   |  |   |  |  |
|                                  | Origin offset<br>accuracy <sup>*1</sup>             | Relative to signal with origin offset of -3  | 0 dBc: ±0.50 dB  |   |  |  |
|                                  | Waveform display                                    | Displays the following items for 1 CH to<br>phase error vs. chip number, amplitude   | multi CH input signals: constellation, eye error vs. chip number   | pattern, vector error vs.chip number,   |  |  |
|                                  | Frequency range                                     | 50 MHz to 2.3 GHz  |  |   |  |  |
|                                  | Measurement level                                   | -40 to +30 dBm (average power within   | burst, pre-amp off)  | -30 to +30 dBm  |  |  |
| Code domain                      | range   | -60 to +10 dBm (average power within   | burst, pre-amp on)   | (average power within burst)  |  |  |
| analysis                         | Code domain power accuracy                          | $\pm 0.1$ dB (code power: $\geq -10$ dBc), $\pm 0.3$ c<br>At Input level: $\geq -10$ dBm (pre-amp off),                      | 0.1 dB (code power: ≥-10 dBc), ±0.3 dB (code power: ≥-25 dBc)       ±0.1 dB (code power: ≥-10 dBc), ±0.3 dB (code power: ≥-25 dBc)         ±0.1 dB (code power: ≥-10 dBm (pre-amp off), ≥-20 dBm (pre-amp on)       ±0.1 dB (code power: ≥-25 dBc) |   |  |  |
|                                  | Display function                                    | Code domain power, code domain timin   | g offset, code domain phase offset   | L   |  |  |
|                                  | Frequency range                                     | 50 MHz to 2.3 GHz  |  |   |  |  |
|                                  | Measurement level range                             | -40 to +30 dBm (average power within<br>-60 to +10 dBm (average power within   | burst, pre-amp off)<br>burst, pre-amp on)  | -30 to +30 dBm<br>(average power within burst)  |  |  |
|                                  | Tx power<br>measurement<br>range                    | <ul> <li>–20 to +30 dBm (average power within</li> <li>–20 to +10 dBm (average power within</li> </ul>                       | burst, pre-amp off)<br>burst, pre-amp on)  | -20 to +30 dBm<br>(average power within burst)  |  |  |
| Amplitude<br>measurement         | Tx power<br>measurement<br>accuracy                 | ±2 dB typical  |  |   |  |  |
|                                  | Power<br>measurement<br>linearity                   | ±0.20 dB (0 to −40 dB)<br>Input level: ≥−10 dBm (average power v<br>≥−20 dBm (average power v<br>unchanged reference level s | within burst, pre-amp off),<br>vithin burst, pre-amp on),<br>setup after range adjustment  | ±0.20 dB (0 to −30 dB)<br>Input level: ≥−10 dBm, unchanged<br>reference level setup after<br>range adjustment |  |  |
|                                  | Burst analysis                                      | Rising/falling characteristics and on/off ratio analysis function  |  |   |  |  |
|                                  | Frequency range                                     | 50 MHz to 2.3 GHz  |  |   |  |  |
| Occupied                         | Measurement level                                   | -40 to +30 dBm (average power within   | burst, pre-amp off)  | -30 to +30 dBm  |  |  |
| bandwidth                        | range   | -60 to +10 dBm (average power within   | burst, pre-amp on)   | (average power within burst)  |  |  |
| measurement                      | Measurement<br>method                               | Sweep method: Sweeps signal using sp<br>FFT Method: Analyzes signal with FFT a   | ectrum analyzer and calculates result<br>and calculates result   |   |  |  |
|                                  | Frequency range                                     | 50 MHz to 2.3 GHz  |  |   |  |  |
|                                  | Input level range                                   | -10 to +30 dBm (average power within   | burst, pre-amp off)  | -10 to +30 dBm<br>(average power within burst)  |  |  |
| Spurious close<br>carrier to the | Measurement<br>method                               | Calculates and displays the ratio of Tx p  | power to the power measured by spectrur  | n analyzer with sweep method  |  |  |
| measurement                      | Tx power<br>measurement                             | Tx power method: Carrier power measured in SPA method: Carrier power measured in   | red in 1.23 MHz bandwidth<br>n RBW: 3 MHz, VBW: 3 kHz, detection m   | ode: sample, frequency span: 0 Hz   |  |  |
|                                  | Measurement   | At RBW: 30 kHz, VBW: 300 kHz, Detec  | tion: Positive   |   |  |  |
|                                  | range*2   | ≥50 dBc (900 kHz offset), ≥60 dBc (1.98  | 3 MHz offset)  |   |  |  |

| Model  |   | MX268103A  | MX268303A   | MX268703A  |  |  |  |
|--|---|--|---|--|--|--|--|
|  | Measurement   | 10 MHz to 3.0 GHz (except within   | 10 MHz to 7.8 GHz (except within  | 10 MHz to 12.75 GHz (except within   |  |  |  |
|  | Inequency range   | ±50 IVIHZ OF CARRIER TREQUENCY)  | ±50 MHz of carrier frequency)   | ±50 MHz of carrier frequency)  |  |  |  |
|  | (Tx power)  | 0 to +30 dBm (average power within but   | rst)  |  |  |  |  |
|  | Measurement<br>method   | Sweep method:<br>Sweeps specified frequency range usin<br>during the sweep. Detection mode is a<br>Spot method:<br>Measures average power of specified i<br>power and measured power of the free<br>Search method:<br>Sweeps specified frequency range usin<br>Measures average power of the detect<br>rier power and the measured power for | ng spectrum analyzer and calculates ratio<br>verage.<br>frequencies in time domain using spectrur<br>quencies. Detection mode is average.<br>ng spectrum analyzer and detects frequen<br>ted frequencies in time domain using spec<br>r the frequencies. Detection mode is Avera  | of carrier power and peak value detected<br>n analyzer and calculates ratio of carrier<br>icy of peak spurious.<br>trum analyzer and calculates ratio of car-<br>age.  |  |  |  |
| Spurious<br>measurement  | Tx power<br>measurement   | Tx power method: Carrier power measu<br>SPA method: Carrier power measured in<br>Span: 0 Hz  | red in 1.23 MHz bandwidth<br>n RBW: 3 MHz, VBW: 3 kHz, detection mc   | ode: sample, frequency   |  |  |  |
|  |   | Carrier frequency: 800 to 1000 MHz/1.8<br>When carrier frequency is in a 2030.354<br>f (spurious) = f (input) – 2030.345 MHz   | Carrier frequency: 800 to 1000 MHz/1.8 to 2.2 GHz, referential value of power ratio in Tx power.<br>When carrier frequency is in a 2030.354 to 2200 MHz range, spurious will be generated at the frequency below.<br>f (spurious) = f (input) – 2030.345 MHz  |  |  |  |  |
|  | Measurement<br>range (typical)  | <ul> <li>≥79 dB (RBW: 10 kHz, 10 to 30 MHz),</li> <li>≥79 dB (RBW: 100 kHz, 30 MHz to 1 GHz)</li> <li>Normal mode:</li> <li>≥76 - f [GHz] dB (RBW: 1 MHz, 1 to 3 GHz)</li> </ul>   | <ul> <li>≥79 dB (RBW: 10 kHz, 10 MHz to 30 MHz), ≥79 dB (RBW: 100 kHz, 30 MHz to 1 GHz)</li> <li>Normal mode:</li> <li>≥76 - f [GHz] dB (RBW: 1 MHz, 1 to 3.15 GHz, band 0), ≥76 dB (RBW: 1 MHz, 3.15 to 7.8 GHz, band 1)</li> <li>Spurious mode (Can be set when MS2683A-03 option is installed in the main frame.):</li> <li>≥76 dB (RBW: 1 MHz, 1.6 to 7.8 GHz, band 2)</li> </ul> | <ul> <li>≥79 dB (RBW: 10 kHz, 10 to 30 MHz),</li> <li>≥79 dB (RBW: 100 kHz, 30 MHz to 1 GHz)</li> <li>≥76 - f [GHz] dB (RBW: 1 MHz, 1 to 3.15 GHz, band 0)</li> <li>≥76 dB (RBW: 1 MHz, 3.15 to 7.9 GHz, band 1)</li> <li>≥74 dB (RBW: 1 MHz, 7.9 to 12.75 GHz, band 2)</li> </ul> |  |  |  |
|  | Input impedance   | 1 M $\Omega$ (parallel capacitance: <100 pF), 5  | 0 Ω   |  |  |  |  |
|  | Balance input   | Differential voltage: 0.1 to 1 Vp-p<br>In-phase voltage: ±2.5 V  |   | -  |  |  |  |
|  | Unbalance Input   | 0.1 to 1 Vp-p<br>DC/AC coupling: Changeable  |   |  |  |  |  |
| Electric   | Measurement items   | Modulation accuracy, code domain powe  | er, amplitude, occupied bandwidth (FFT m  | ethod), IQ level   |  |  |  |
| (IQ input)*3   | Modulation<br>accuracy<br>measurement   | <2% (rms) DC coupling, input level: $\geq 0.7$   | 1 V (rms)   |  |  |  |  |
|  | IQ level<br>measurement   | Measures input level of I and Q (rms, p-   | p)  |  |  |  |  |
|  | IQ phase difference<br>measurement  | When the CW signal is inputted to I and Q-phase signals.   | Q input terminals, measures and displays  | s the phase difference between I- and  |  |  |  |
| *1 [MS2687B] In<br>[MS2681A/M3<br>*2 [MS2687B] In<br>[MS2681A/M3<br>*3 Specifications<br>[MS2681A] M<br>[MS2683A] M<br>[MS2687B] M | measurement       Q-phase signals.         *1 [MS2687B] Input level: >=-30 dBm, at 1 code channel         [MS2681A/MS2683A] Input level >=-30 dBm (pre-amp off), >=-40 dBm (pre-amp on), at 1 code channel         *2 [MS2687B] Input level (average power within burst): >0 dBm         [MS2681A/MS2683A] Input level (average power within burst): >0 dBm (pre-amp off)         *3 Specifications of electric performance are applied when the following option is mounted.         [MS2681A] MS2681A-17, MS2681A-18         [MS2687B] MS2687B-18 |  |   |  |  |  |  |

## CDMA2000 1xEV-DO Measurement Software MX268104A/MX268304A/MX268704A

#### Evaluation of CDMA2000 1X transmission system with single unit –

MX268104A/MX268304A/MX268704A CDMA2000 1xEV-DO Measurement Software is the application software used in the MS2681A/MS2683A/MS2687B Spectrum Analyzer. The installation in MX268104A/MX268304A/MX268704A enables evaluation of base station or mobile transmitters conforming to the 3GPP2C.S0024 standards.

#### • Measured items

Modulation analysis:

Carrier frequency, Vector error, Phase error, Magnitude error

Code domain analysis:

Code domain power, Code domain timing offset, Code domain phase offset

Amplitude measurement:

Transmission power measurement

Spurious close to the carrier measurement

Spurious measurement

Occupied bandwidth measurement

IQ level measurement

CCDF measurement

## **Parameter Setup**

A setup screen is provided for the entry of required parameters for modulation accuracy and code domain power measurements in CDMA2000 1xEV-DO analysis. Measurement can be performed after parameter setup.

| < Setup Common Parameter (1xEV-DC   | )) >>   | Setup<br>Parameter                |
|---|---|-----------------------------------|
| Input<br>Terninal<br>Reference Level & Offset   | : [RF ]<br>: [ -6.00dBm] [ 0.00dB]  |                                   |
| Frequency<br>Channel & Frequency<br>Channel Spacing                                     | : [ 1092CH] = [ 887.650000HHz]<br>: [ 1.250000HHz]                                      | Modulatic<br>Analysis             |
| Signal<br>Filter<br>Measuwing Object<br>Slot Type<br>Modulation Type<br>Preamble Length | : [ <mark>]ilter=}0</mark> ]<br>: [Porward Link]<br>: [Active]<br>: [Auto]<br>: [ Auto] | RF<br>Power                       |
| Synchronization<br>Offset Index (PN Offset)   | : [ 0] * 64 PNchip  | Occupied<br>Bandwidth             |
| Trigger   | : [Free Run ]   | Spurious<br>close to t<br>Carrier |
| Ch : 1092CH Level :<br>Freq : 887.650000MHz Offset :                                    | -6.00dBm Power Cal : Off<br>0.00dB Correction : Off                                     | Spurious<br>Enission              |

## **Modulation Accuracy Measurement**

Frequency error, modulation accuracy and code domain analysis are performed and then results are displayed on the screen. The measurement accuracy is 1% (typical value) of residual vector error (rms).



## **Constellation Display**

Auto setup is available for modulation system and preamble length setup, simplifying operations by automated detection.



• CDMA2000<sup>®</sup> is a registered trademark of the Telecommunications Industry Association (TIA-USA).

## **BTS Code Domain Analysis**

Perform code domain analysis of forward link signals in approx. 2 seconds. Code domains of IQ phase are displayed on the screen.



## **MS Code Domain Analysis**

Perform code domain analysis of reverse link signals in approx. 2 seconds. Code domains of IQ phase are displayed on the screen.



## **Transmission Power Measurement**

When transmission power is measured both the value and signal waveform are displayed on the screen.



## **Spurious Close to the Carrier Measurement**

Spurious close to the carrier is measured using the spectrum analyzer function. The PASS/FAIL result of a template judgement is displayed on the screen.



# **Specifications**

Following specifications are guaranteed after optimized internal level (Range of internal receiver is automatically adjusted by pushing Adjust Range key).

"Pre-amp on" can be set when MS2681A-08/MS2683A-08 option is installed in the main frame.

| Model                    |   | MX268104A  | MX268304A   | MX268704A  |  |  |  |
|--------------------------|---|--|---|--|--|--|--|
|                          | Measurement<br>frequency range                    | 50 MHz to 2.3 GHz  |   |  |  |  |  |
| -                        | Measurement level<br>range                        | <ul><li>-40 to +30 dBm (average power within</li><li>-60 to +10 dBm (average power within</li></ul>  | –30 to +30 dBm<br>(average power within burst)  |  |  |  |  |
|                          | Carrier frequency accuracy                        | Input level: ≥–30 dBm (pre-amp off), ≥–<br>± (reference frequency accuracy + 10 H  | 40 dBm (pre-amp on), at 1 code channel<br>lz)   | Input level:<br>≥–30 dBm, at 1 code channel<br>± (reference frequency accuracy + 10 Hz)                      |  |  |  |
| Modulation/              | Modulation<br>accuracy (residual<br>vector error) | Input level: ≥–30 dBm (pre-amp off), ≥–<br><2.0% (rms)   | 40 dBm (pre-amp on), at 1 code channel  | Input level:<br>≥–30 dBm, at 1 code channel<br><2.0% (rms)   |  |  |  |
| measurement              | Origin offset<br>accuracy                         | Input level: ≥–30 dBm (pre-amp off), ≥–<br>relative to signal with origin o<br>±0.50 dB  | 40 dBm (pre-amp on), at 1 code channel,<br>offset of -30 dBc  | Input level: ≥–30 dBm, at 1 code<br>channel, relative to signal with<br>origin offset of –30 dBc<br>±0.50 dB |  |  |  |
|                          | Waveform display                                  | Forward link<br>Displays the following items for each or entire domain of DATA, MAC and Pilot:<br>Constellation, Eye pattern, Vector error vs. chip number, Phase error vs. chip number, Amplitude error vs. chip number<br>Displays the symbol constellation of DATA domain<br>Reverse link<br>Displays the following items for 1CH to multi CH input signals:<br>Constellation, Eye pattern, Vector error vs.chip number, Phase error vs. chip number, Amplitude error vs. chip number |   |  |  |  |  |
|                          | Frequency range                                   | 50 MHz to 2.3 GHz  |   |  |  |  |  |
|                          | Measurement level                                 | -40 to +30 dBm (average power within   | -30 to +30 dBm  |  |  |  |  |
|                          | range   | -60 to +10 dBm (average power within   | burst, pre-amp on)  | (average power within burst)   |  |  |  |
| Code domain              | Code domain power accuracy                        | Input level: $\geq$ -10 dBm (pre-amp off), $\geq$ -<br>±0.2 dB (code power $\geq$ -10 dB)<br>±0.4 dB (code power $\geq$ -25 dB)  | Input level: ≥–10 dBm<br>±0.2 dB (code power ≥–10 dB)<br>±0.4 dB (code power ≥–25 dB)                       |  |  |  |  |
| analysis                 | Analysis signal                                   | Forward link, Reverse link   |   |  |  |  |  |
|                          | Waveform display                                  | Forward link<br>Displays the code domain power for each DATA and MAC domain:<br>Code domain power for DATA domain, Spread factor: IQ separate display for fixed 16 codes<br>Code domain power for MAC domain, Spread factor: IQ separate display for fixed 64 codes<br>Reverse link: Displays the code domain power for IQ separately. Detects the following channels  |   |  |  |  |  |
|                          | Frequency range                                   | 50 MHz to 2.3 GHz  |   |  |  |  |  |
|                          | Measurement level<br>range                        | <ul><li>-40 to +30 dBm (average power within</li><li>-60 to +10 dBm (average power within</li></ul>  | burst): pre-amp off<br>burst): pre-amp on   | −30 to +30 dBm<br>(average power within burst)   |  |  |  |
|                          | Tx power<br>measurement range                     | <ul><li>-20 to +30 dBm (average power within</li><li>-20 to +10 dBm (average power within</li></ul>  | burst): pre-amp off<br>burst): pre-amp on   | <ul> <li>20 to +30 dBm</li> <li>(average power within burst)</li> </ul>                                      |  |  |  |
| Amplitude<br>measurement | Tx power<br>measurement<br>accuracy               | ±2.0 dB typical  |   |  |  |  |  |
|                          | Power<br>measurement<br>linearity                 | Input level: ≥0 dBm (pre-amp off), ≥–20<br>level setup after range adjus<br>±0.20 dB (0 to –40 dB)   | Input level: ≥0 dBm, unchanged<br>reference level setup after range<br>adjustment<br>±0.20 dB (0 to –40 dB) |  |  |  |  |
|                          | Idle slot analysis                                | Rise/Fall characteristics and On/Off ratio   | o analysis function are equipped.   |  |  |  |  |
|                          | Frequency range                                   | 50 MHz to 2.3 GHz  |   |  |  |  |  |
| Occupied                 | Measurement level                                 | -40 to +30 dBm (average power within   | burst): pre-amp off   | -30 to +30 dBm   |  |  |  |
| bandwidth                | range   | -60 to +10 dBm (average power within   | burst): pre-amp on  | (average power within burst)   |  |  |  |
| measurement              | Measurement method                                | Sweep method: Sweeps signal using sp<br>FFT Method: Analyzes signal with FFT a   | bectrum analyzer and calculates result<br>and calculates result   |  |  |  |  |

| Model                   |                                    | MX268104A  | MX268304A   | MX268704A  |  |  |  |  |  |
|-------------------------|------------------------------------|--|---|--|--|--|--|--|--|
|                         | Frequency range                    | 50 MHz to 2.3 GHz  |   |  |  |  |  |  |  |
| Spurious                | Input level range                  | -10 to +30 dBm (average power within   | burst): pre-amp off   |  |  |  |  |  |  |
|                         | Measurement<br>method              | Calculates and displays the ratio of Tx power to the power measured by spectrum analyzer with sweep method.  |   |  |  |  |  |  |  |
| to the measurement      | Tx power<br>measurement            | Tx power method: Carrier power measured in 1.23 MHz bandwidth.<br>SPA method: Carrier power measured in RBW: 3 MHz, VBW: 3 kHz, detection mode: sample, frequency span: 0 Hz.  |   |  |  |  |  |  |  |
|                         | Measurement range                  | Input level (average power within burst): ≥0 dBm (pre-amp off), RBW: 30 kHz, VBW:3 kHz, detection mode: positive<br>750 kHz offset: ≥45 dBc, (at span 2 MHz)<br>1.98 MHz offset: ≥60 dBc   |   |  |  |  |  |  |  |
|                         | Measurement<br>frequency range     | 10 MHz to 3.0 GHz (except within ±50 MHz of carrier frequency)   | 10 MHz to 7.8 GHz (except within ±50 MHz of carrier frequency)  | 10 MHz to 12.75 GHz (except within ±50 MHz of carrier frequency)   |  |  |  |  |  |
|                         | Input level range<br>(Tx power)    | 0 to +30 dBm (average power within bu  | rst): pre-amp off   | 0 to +30 dBm<br>(average power within burst)   |  |  |  |  |  |
|                         | Measurement<br>method              | Sweep method:<br>Sweeps specified frequency range using spectrum analyzer and calculates ratio of carrier power and peak value detected<br>during the sweep. Detection mode is average.<br>Spot method:<br>Measures average power of specified frequencies in time domain using spectrum. Analyzer and calculates ratio of carrier<br>power and measured power of the frequencies. Detection mode is average.<br>Search method:<br>Sweeps specified frequency range using spectrum analyzer and detects frequency of peak spurious.<br>Measures average power of the detected frequencies in time domain using spectrum analyzer and calculates ratio of<br>average average power of the detected frequencies in time domain using spectrum analyzer and calculates ratio of<br>average average power of the detected frequencies in time domain using spectrum analyzer and calculates ratio of<br>average average power of the detected frequencies in time domain using spectrum analyzer and calculates ratio of<br>average average power of the detected frequencies in time domain using spectrum analyzer and calculates ratio of<br>average average power of the detected frequencies in time domain using spectrum analyzer and calculates ratio of<br>average average power of the detected frequencies in time domain using spectrum analyzer and calculates ratio of<br>average average power of the detected frequencies in time domain using spectrum analyzer and calculates ratio of<br>average average power of the detected frequencies in time domain using spectrum analyzer and calculates ratio of<br>average average power of the measured power for the frequencies in time domain using spectrum analyzer and calculates ratio of<br>average average power of the measured power for the frequencies in time domain using spectrum analyzer and calculates ratio of<br>average average power of the measured power for the frequencies in time domain using spectrum analyzer and calculates average averag |   |  |  |  |  |  |  |
| Spurious<br>measurement | Tx power<br>measurement            | Tx power method: Carrier power measu<br>SPA method: Carrier power measured in  | Tx power method: Carrier power measured in 1.23 MHz bandwidth<br>SPA method: Carrier power measured in RBW: 3 MHz, VBW: 3 kHz, detection mode: sample, frequency, span: 0 Hz  |  |  |  |  |  |  |
|                         |                                    | Carrier frequency: 800 to 1000 MHz/1.8 to 2.2 GHz, reference value of power ratio in Tx power*1.   |   |  |  |  |  |  |  |
|                         | Measurement<br>range (typical)     | <ul> <li>≥79 dB</li> <li>(RBW: 10 kHz, 10 MHz to 30 MHz)</li> <li>≥79 dB</li> <li>(RBW: 100 kHz, 30 MHz to 1 GHz)</li> <li>Normal mode:</li> <li>≥76 - f [GHz] dB</li> <li>(RBW: 1 MHz, 1 GHz to 3.0 GHz)</li> </ul>   | <ul> <li>≥79 dB (RBW: 10 kHz, 10 MHz to<br/>30 MHz, Band 0)</li> <li>≥79 dB (RBW: 100 kHz, 30 MHz to<br/>1 GHz, Band 0)</li> <li>Normal mode:</li> <li>≥76 - f [GHz] dB (RBW: 1 MHz,<br/>1 GHz to 3.15 GHz, Band 0)</li> <li>≥76 dB (RBW: 1 MHz, 3.15 GHz to<br/>7.8 GHz, Band 1)</li> <li>With MS2683A-03 option, at spurious<br/>mode</li> <li>≥76 dB (RBW: 1 MHz, 1.6 GHz to<br/>7.8 GHz, Band 1)</li> </ul> | <ul> <li>≥79 dB (RBW: 10 kHz, 10 MHz to 30<br/>MHz, Band 0)</li> <li>≥79 dB (RBW: 100 kHz, 30 MHz to<br/>1 GHz, Band 0)</li> <li>Normal mode:</li> <li>≥76 - f [GHz] dB (RBW: 1 MHz,<br/>1 GHz to 3.15 GHz, Band 0)</li> <li>≥76 dB (RBW: 1 MHz, 3.15 GHz to<br/>7.9 GHz, Band 1)</li> <li>at MS2687A</li> <li>≥68 dB (RBW: 1 MHz, 7.9 to 12.75 GHz)</li> <li>at MS2687B</li> <li>≥74 dB (RBW: 1 MHz, 7.9 to 12.75 GHz)</li> </ul> |  |  |  |  |  |
|                         | Frequency range                    | 50 MHz to 2.3 GHz  |   | · · · · · · · · · · · · · · · · · · ·  |  |  |  |  |  |
| 0005                    | Measurement level<br>range         | -60 to +30 dBm: pre-amp off<br>-80 to +10 dBm: pre-amp on  |   | -50 to +30 dBm   |  |  |  |  |  |
| measurement             | Measurement<br>method              | CCDF: Displays the cumulative distribut<br>APD: Displays the distribution of the po  | CCDF: Displays the cumulative distribution of the power difference between instantaneous power and average power.<br>APD: Displays the distribution of the power difference between instantaneous power and average power   |  |  |  |  |  |  |
|                         | Filter selection<br>function       | 20 MHz, 10 MHz, 5 MHz, 3 MHz, 1.23 I   | MHz   |  |  |  |  |  |  |
|                         | Input impedance                    | 1 M $\Omega$ (parallel capacitance: <100 pF), 5  | 50 Ω  |  |  |  |  |  |  |
|                         | Balance input                      | With MS2681A-17/MS2683A-17<br>Differential voltage: 0.1 to 1 Vp-p<br>In-phase voltage: ±2.5 V  |   | -  |  |  |  |  |  |
| Electric                | Unbalance Input                    | With MS2681A-18/MS2683A-18/MS268<br>0.1 to 1 Vp-p<br>DC/AC coupling: Changeable  | 37B-18  |  |  |  |  |  |  |
| performance             | Measurement items                  | Modulation accuracy, code domain pow   | er, amplitude, occupied bandwidth (FFT m  | ethod), IQ level   |  |  |  |  |  |
| (i v input)             | Modulation accuracy<br>measurement | Input level: ≥0.1 V (rms)<br><2% (rms), DC coupling  |   |  |  |  |  |  |  |
|                         | IQ level<br>measurement            | Measures input level of I and Q (rms, p  | -р)   |  |  |  |  |  |  |
|                         | IQ phase difference<br>measurement | When the CW signal is inputted to I and and Q-phase signals.   | d Q input terminals, measures and displays  | the phase difference between I-phase   |  |  |  |  |  |

\*1: When carrier frequency is in a 2030.354 to 2200 MHz range, spurious will be generated at the frequency below. f (spurious) = f (input) – 2030.345 MHz

## π/4DQPSK Measurement Software MX268105A/MX268305A/MX268705A

## – Evaluation of $\pi$ /4DQPSK transmission systems with one tester –

The MX268105A/MX268305A/MX268705A application software is used with the MS2681A/MS2683A/MS2687B Spectrum Analyzer to evaluate transmission systems in conformance with the PDC, PHS, NADC (IS-136) standards and general purpose.

#### • Measured items

#### Modulation analysis:

Carrier frequency, vector error, phase error, magnitude error

Amplitude measurement:

Transmitter power, carrier-off leakage power, rise/fall characteristics

Adjacent channel power measurement

Spurious measurement

Occupied bandwidth measurement

IQ level measurement

General purpose measurement

## **Parameter Setting**

Analysis of PDC, PHS and NADC (IS-136) systems requires setting of parameters for important measurement such as modulation accuracy at this screen. Changing the symbol rate also permits analysis of systems other than PDC, PHS and NADC.



## **Modulation Accuracy Measurement**

The constellation display is combined with the modulation accuracy measurement results to monitor the residual vector error (rms) with a high accuracy of 0.5% (PDC).



## **Transmitter Power Measurement**

This screen displays the transmitter power and waveform.



## **Send Timing Measurement**

This screen displays the PHS send timing. In addition, when average measurement is selected, the send jitter is also displayed.

| << RF      | Power        | («/4DOPSK) >>   |  |   | RF Power                     |
|------------|--------------|---|--|---|------------------------------|
|            |              |   | Storage  | : Average ( 10/ 10                        | *                            |
| [dB]       | PS-TCH       | Template  | : Standard   | Tx Power :<br>71.65,% -11.45dB            | Window                       |
| 0<br>-10   | la se        | 1   |  | Mean Power (frame) :<br>16.73 هر -17.76dB | *<br>Storage                 |
| -20        |              |   |  | Carrier Off Power :<br>10.24,₩ -19.90dB   | Mode                         |
| -30<br>-40 |              |   |  | On/Off Ratio :<br>8.45dB                  | Transmit<br>Timing<br>On Off |
| -50        |              |   |  | Rise Time : 11.21<br>Fall Time : 10.34    | Wide Dynamic                 |
| -60<br>-70 | ра<br>dation | et (all tests from the state of t | ennege of Second Second States<br>Second States and American | Timing : 0.000sy                          | On Off                       |
| -80        |              |   |  | Jitter(+) : 0.001sy<br>(-) : 0.000sy      | Adjust<br>Pango              |
| -90        | -38          | On : Pass Off :   | Fail 1002<br>[symbol]  |   |                              |
| 01         |              |   | . 16 00-ID+  | Barron Col . Aff                          | Back<br>Screen               |
| Freq       | : 10         | 0.000000MHz Offse   | et : 0.00dB  | Correction : Off                          | 12                           |

## **Adjacent Channel Power Measurement**

When measurement is performed using a spectrum analyzer, the adjacent channel power is measured after passage through a built-in filter (root Nyquist). A high-speed measurement method can also be selected.



## **Occupied Bandwidth Measurement**

The occupied bandwidth is measured with a spectrum analyzer or by FFT using DSP, and displayed.



## **Spurious Measurement**

There are three methods: spot, sweep and search. Frequency and limit value can be set maximum 15 in the tables. The measurement results are displayed with a limit evaluation.

| (< Spurious Emission (m/       | (4DOPSK) >>     |                     | Spurious<br>Emission |
|--------------------------------|-----------------|---------------------|----------------------|
| -                              | Spuriou         | ıs : Spot           | *                    |
|                                | Detect          | : Average           | Spurious<br>Mode     |
| Tx Power                       | : -0.46 dBm     |                     |                      |
| Frequency                      | Level           | Judgement(Relative) |                      |
| f 1 = 470.012500               | MHz: -89.93 dBm | Pass                |                      |
| f 2 = 1880.050000              | MHz: -47.80 dBm | Pass                |                      |
| f 3 = 2 820.075 000            | MHz: -54.87 dBm | Pass                | \$                   |
| f 4 = 3 760.100 000            | MHz: -77.53 dBm | Pass                | Vie₩                 |
| f 5 = 4 700.125 000            | MHz: -84.13 dBm | Pass                | Select               |
| f 6 = 5 640.150 000            | MHz: -96.15 dBm | Pass                | Judgement            |
| f 7 = 6 580.175 000            | MHz: -96.68 dBm | Pass                | *                    |
| f 8 = 7 520.200 000            | MHz: -94.78 dBm | Pass                |                      |
| f 9 = 8 460.225 000            | MHz: -90.65 dBm | Pass                | Calibration          |
| $f10 = 9\ 400.250\ 000$        | MHz: -87.19 dBm | Pass                | Currenter            |
| f11 = 10 340.275 000           | MHz: -89.83 dBm | Pass                |                      |
| f12 = 11 280.300 000           | MHZ: -87.18 dBm | Pass                |                      |
| f13 = 12 220.325 000           | MHZ: -90.12 dBm | Pass                | 4.1.4                |
| 114 - 13 160.350 000           | MIG80.10 GBM    | Pass                | Bongo                |
| 115                            |                 |                     | паще                 |
|                                | Total Judgener  | nt : Pass           | <b>→</b>             |
|                                |                 |                     | Back<br>Screen       |
| Un : 10H<br>Enor 040.095000MHz | Affect - 0.00dB | Composition . Off   | 123                  |

# **Specifications**

Following specifications are guaranteed after optimized internal level (Range of internal receiver is automatically adjusted by pushing Adjust Range key).

The "pre-amp On" of MS2681A and MS2683A can be set up when MS2681A-08/MS2683A-08 of an option are carried.

| Model                                       |   | MX268105A   | MX268305A  | MX268705A                                      |  |  |  |  |  |
|---|---|---|--|--|--|--|--|--|--|
|   | Measurement<br>frequency range              | 50 MHz to 2.1 GHz   |  |  |  |  |  |  |  |
|   | Measurement level                           | -40 to +30 dBm (average power within  | burst, pre-amp off)  | -30 to +30 dBm                                 |  |  |  |  |  |
|   | range                                       | -60 to +10 dBm (average power within  | -60 to +10 dBm (average power within burst, pre-amp on) (average power within burst) |  |  |  |  |  |  |
| Modulation/                                 | Carrier frequency accuracy <sup>*1</sup>    | ± (reference frequency accuracy + 10 Hz)  |  |  |  |  |  |  |  |
| frequency                                   | Modulation                                  | Averaging: 10 times<br><0.5% (rms) (PDC, NADC), <0.7% (rms) (PHS)   |  |  |  |  |  |  |  |
| measurement                                 | vector error)*1                             |   |  |  |  |  |  |  |  |
|   | Origin offset<br>accuracy*1                 | Relative to signal with origin offset of -30 dBc: ±0.50 dB  |  |  |  |  |  |  |  |
|   | Transmission rate<br>accuracy <sup>*1</sup> | ±1 ppm  | ±1 ppm   |  |  |  |  |  |  |
|   | Waveform display                            | Constellation, eye diagram, EVM vs. sy  | mbol No., phase error vs. symbol No., am   | plitude error vs. symbol No.                   |  |  |  |  |  |
|   | Frequency range                             | 50 MHz to 2.1 GHz   |  |  |  |  |  |  |  |
|   | Measurement level<br>range                  | <ul> <li>-40 to +30 dBm (average power within</li> <li>-60 to +10 dBm (average power within</li> </ul>  | burst, pre-amp off)<br>burst, pre-amp on)  | -30 to +30 dBm<br>(average power within burst) |  |  |  |  |  |
|   | Tx power<br>measurement                     | -10 to +30 dBm (average power within  | burst, pre-amp off)  | -10 to +30 dBm                                 |  |  |  |  |  |
|   | range                                       |   |  |  |  |  |  |  |  |
| Amplitude                                   | Tx power<br>measurement<br>accuracy         | ±2 dB typical   |  |  |  |  |  |  |  |
| measurement                                 | Power<br>measurement<br>linearity           | Unchanged reference level setup after range adjustment $\pm 0.20$ dB (0 to $-30$ dB)  |  |  |  |  |  |  |  |
|   | Carrier-off power measurement*2             | Normal mode measurement range: ≥65 dB (PDC, NADC), ≥60 dB (PHS) (Relative to average power within burst)<br>Wide dynamic range mode measurement range:<br>≥90 dB [measurement limits of average noise level: ≤–80 dBm (50 MHz to 2.1 GHz)] (PDC, NADC)<br>≥80 dB [measurement limits of average noise level: ≤–70 dBm (50 MHz to 2.1 GHz)] (PHS)                                    |  |  |  |  |  |  |  |
|   | Rise/fall characteristics                   | Display rising/falling edges while synchronizing to modulation data of signal data to be measured.<br>Standard line display, NO/GO judgement function   |  |  |  |  |  |  |  |
|   | Frequency range                             | 50 MHz to 2.1 GHz   |  |  |  |  |  |  |  |
| Occupied                                    | Measurement level                           | -40 to +30 dBm (average power within  | -30 to +30 dBm   |  |  |  |  |  |  |
| bandwidth                                   | range                                       | -60 to +10 dBm (average power within  | burst, pre-amp on)   | (average power within burst)                   |  |  |  |  |  |
| measurement                                 | Measurement                                 | Sweep method: Calculates and displays result after signal measured with sweep spectrum analyzer   |  |  |  |  |  |  |  |
|   | Frequency range                             | 100 MHz to 2.1 GHz  |  |  |  |  |  |  |  |
|   | Trequency range                             | -10 to $+30$ dBm (average power within  | burst pre-amp off)   | -10 to +30 dBm                                 |  |  |  |  |  |
|   | Input level range                           | -20 to +10 dBm (average power within  | burst, pre-amp on)   | (average power within burst)                   |  |  |  |  |  |
| Adjacent<br>channel<br>power<br>measurement | Measurement<br>method                       | Sweep method (all):     Calculates and displays after measuring adjacent channel and next adjacent channel signal with sweep spectrum     analyzer     High-speed method:     Calculates and displays after measuring adjacent channel and next adjacent channel power (rms) through internal     reasuring adjacent channel and next adjacent channel power (rms) through internal |  |  |  |  |  |  |  |
|   | Measurement<br>range                        | CW signal input, at high-speed method)<br>PDC: ≥60 dB (50 kHz offset), ≥65 dB (100 kHz offset)<br>PHS: ≥60 dB (600 kHz offset), ≥60 dB (900 kHz offset)<br>NADC: ≥30 dB (30 kHz offset), ≥60 dB (60 kHz offset), ≥65 dB (90 kHz offset)<br>(Adjacent channel power averaging ratio found from average power within burst and during burst on interval)                              |  |  |  |  |  |  |  |

| Model                                   |                                       | MX268105A   | MX268305A  | MX268705A   |  |  |  |  |
|---|---------------------------------------|---|--|---|--|--|--|--|
|   | Measurement<br>frequency range        | 10 MHz to 3.0 GHz (except within<br>carrier frequency ±50 MHz)  | 10 MHz to 7.8 GHz (except within<br>carrier frequency ±50 MHz) | 10 MHz to 12.75 GHz (except within carrier frequency ±50 MHz) |  |  |  |  |
|   | Input level range<br>(Tx power)       | 0 to +30 dBm (average power within bur  | rst)   |   |  |  |  |  |
| Spurious<br>measurement                 | Measurement<br>method                 | Sweep method:<br>Sweeps the specified range of frequency using the spectrum analyzer, and then detects and displays the peak value.<br>Calculates the rate for transmission power value and displays it as power rate. Waveform detection mode: average<br>Spot method:<br>Measures the specified frequency with time domain from the spectrum analyzer and then displays the average value.<br>Calculates the rate for transmission power value and displays it as power rate. Waveform detection mode: average<br>Search method:<br>Sweeps the specified frequency range using the spectrum analyzer to detect the peak value, then measures the frequen-<br>cy using the time domain to display the average value. Calculates the rate for transmission power value and displays it as<br>power rate. Waveform detection mode: average |  |   |  |  |  |  |
|   | Input impedance                       | 1 MΩ (parallel capacitance: <100 pF), 50 Ω  |  |   |  |  |  |  |
| ·                                       | Balance input                         | Differential voltage: 0.1 to 1 Vp-p<br>In-phase voltage: ±2.5 V   |  |   |  |  |  |  |
|   | Unbalance Input                       | 0.1 to 1 Vp-p<br>DC/AC coupling: Changeable   |  |   |  |  |  |  |
| Fleetrie                                | Measurement items                     | Modulation accuracy, amplitude, occupie   | ed bandwidth (FFT method), IQ level                            |   |  |  |  |  |
| Electric<br>performance<br>(IQ input)*3 | Modulation<br>accuracy<br>measurement | Input level: 0.1 V (rms) *Temperature range: +18° to +28°C<br>Residual vector error<br>PDC/NADC: <0.5% (rms) *Typical, DC coupling<br>PHS: <0.7% (rms) *Typical, DC coupling  |  |   |  |  |  |  |
|   | IQ level<br>measurement               | Level measurement: Measurement and  | display each I, Q input voltage (rms, p-p)                     |   |  |  |  |  |
|   | IQ phase difference<br>measurement    | Phase difference between I and Q phase  | e signals when CW signal input to I and Q                      | l input terminals   |  |  |  |  |

\*1 [MS2687B] Input level: ≥-30 dBm
[MS2681A/MS2683A] Input level ≥-30 dBm (pre-amp off), ≥-40 dBm (pre-amp on)
\*2 [MS2687B] Input level: ≥-10 dBm
[MS2681A/MS2683A] Input level: ≥-10 dBm (pre-amp off), ≥-20 dBm (pre-amp on)
\*3 Specifications of electric performance are applied when the following option is mounted.
[MS2681A] MS2681A-17, MS2681A-18
[MS2683A] MS2683A-17, MS2683A-18
[MS2687B] MS2687B-18

## Wireless LAN Measurement Software MX268130A/MX268330A/MX268730A

#### From Development and Production to Construction and Maintenance –

The MX268130A/MX268330A/MX268730A Wireless LAN Measurement Software is application software used by the MS2681A/MS2683A/MS2687B spectrum analyzer. A transmission system conforming to the wireless LAN standards can be evaluated by installing this wireless LAN measurement software into the spectrum analyzer.

#### Features

- Conforms to the IEEE802.11a, IEEE802.11b, IEEE802.11g (ERP-OFDM, DSSS-OFDM, ERP-DSSS/CCK), HiSWANa and HiperLAN2 standards.
- Analyzes OFDM signals that realize high-speed data transfer at 54 Mbps.
- Integrates a high-performance DSP, enabling high-speed and high-accuracy measurement using the fast A/D sampling (at 64 MHz). Modulation accuracy measurement can be completed in 1 sec or less.
- Capable of measuring harmonics up to 5-time waves of the 5-GHz band wireless LAN (IEEE802.11a, HiSWANa, HiperLAN2) in use of MS2687B.
- One-touch operation of tests on transmission characteristics, including modulation analysis and spurious.
- Provides a batch measurement function which automatically measures items that were individually measured before, and displays judgement results for the specified reference value.

#### Measured items

Modulation analysis: [IEEE802.11a, IEEE802.11g (ERP-OFDM, DSSS-OFDM), HiSWANa, HiperLAN2] Frequency (Carrier frequency, Carrier frequency error) Modulation Characteristic (EVM-RMS, EVM-Peak, Phase error-RMS) OFDM-spectrum (Carrier leak, Spectrum flatness)

Display waveform (Constellation, EVM vs Symbol, EVM vs Sub-carrier, Phase error vs Symbol, Spectrum flatness)

[IEEE802.11b, IEEE802.11g (ERP-DSSS/CCK)] Frequency (Carrier frequency, Carrier frequency error) Modulation Characteristic (EVM-RMS, EVM-Peak, Phase error-RMS, Amplitude error-RMS, Origin offset) Display waveform (Constellation, EVM vs Chip, Phase error vs Chip, Eye-diagram)

#### Power

Average power, Maximum Power, Carrier off power, Burst on/off ratio, Burst rising/falling time Occupied bandwidth, Spreading bandwidth Adjacent channel power Spectrum mask Spurious, Out-band leakage power CCDF, APD Macro function (Batch processing) Chip clock tolerance Symbol rate error

## **Setup Common Parameter**

This screen is used to set common parameters such as signaling system, input level, frequency, data rate and target system before starting analysis. Setting these parameters simplifies measurement operations.

| Setup Common Parame                   | ter (WLAN) >> | ,                            |                  | Setup<br>Parameter           |
|---------------------------------------|---------------|------------------------------|------------------|------------------------------|
| Input                                 |               |                              | _                |                              |
| Terminal                              |               | : URF                        | 1                | Batch<br>Measure             |
| Reference Level<br>Offset Level       |               | : [ -6.00dBm<br>: [ 0.00dB]  | ]                | -                            |
| Frequency<br>Carrier Frequency        |               | : [ 5230.0000                | DOMHz ]          | Modulation<br>Analysis       |
| Signal<br>Target Systen               |               | : [IEEE802.11;               | a]               | RF                           |
| Data Rate<br>Modulation               |               | : [54Mbps ]<br>: [0FDH-64QAM | 1                | ·                            |
| Trigger                               |               | : [Free Run]                 |                  | Occupied<br>Bandwidth        |
|                                       |               |                              |                  | Adjacent<br>Channel<br>Power |
|                                       |               |                              |                  | -                            |
| System : IEEE802.11a<br>Bate : 54Mbns | Freq : E      | 5230.000000MHz<br>-6.00dBn   |                  | Spectrum<br>Mask             |
| Mod : OFDM-64QAM                      | Offset :      | 0.00dB                       | Correction : Off | 12                           |

## **Modulation Analysis**

Displays numeric results, including the frequency, execution value and maximum value of the modulation accuracy (EVM) and the execution value of the phase error.

| <pre>K&lt; Modulation Analysis (WLAN)</pre> | · >> | Measure : Single           | Hodu lation<br>Analysis |
|---|------|----------------------------|-------------------------|
| •••••••••••••••••••••••••••••••••••••••     |      | Storage : Normal           | #                       |
|   |      | Trace : No Trace           |                         |
|   |      |                            | Trace                   |
| Frequency                                   |      |                            | Format                  |
| Carrier Frequency                           |      | 5 230,000 005 7 HHz        |                         |
| Carrier Frequency Error                     | :    | 5.7 Hz 0.001 ppm           | *                       |
|   |      |                            |                         |
| Modulation                                  |      |                            | Storage                 |
| EVM (BMS)                                   |      | 1.31 % -37.65 dB           | flode                   |
| EVM (Peak)                                  | - 1  | 5.54 %                     | *                       |
| Phase Error (RMS)                           | -    | 0.75 deg.                  |                         |
|   |      |                            | Signal                  |
| Spectrum                                    |      |                            | Setup                   |
| Carrier Leak                                |      | -31.10 dB                  |                         |
| Flatness (Outside) Max                      |      | 0.18 dB (Subcarrier: 26)   |                         |
| Min   |      | -0.22 dB (Subcarrier: -26) | Flatness                |
| (Inside) Max                                |      | 0 12 dB (Subcarrier: 16)   | Measurement             |
| Hin.  |      | -0.13 dB (Subcarrier: -16) | On Off                  |
|   |      |                            |                         |
|   |      |                            |                         |
|   |      |                            | Adjust                  |
|   |      |                            | Range                   |
|   |      |                            | 10160                   |
|   |      |                            | →                       |
|   |      |                            |                         |
| System · IFFF809 11a From                   |      | 5230 000000000             | Back                    |
| Rate Auto Level                             | - 1  | -6 00dBa                   | Screen                  |
| Mod Auto Offset                             | . :  | 0.00dB Correction · Off    | 12                      |
| ava i nuvo VIISCI                           |      | V.VVII - VII               |                         |

## **Modulation Analysis: Constellation**

Displays the constellation in graph form.

| k   | Mod  | hilation | Ana   | ilvsi | s (I | LAND | >>   |      | Measure   | : Single             | Nodulation<br>Analysis |
|-----|------|----------|-------|-------|------|------|------|------|-----------|----------------------|------------------------|
| l   |      |          |       |       |      |      |      |      | Storage   | : Normal             | #                      |
|     |      |          |       |       |      |      |      |      | Trace     | : Constellation      |                        |
|     | ſ    |          |       |       |      |      |      |      |           | Frogueron .          | Trace                  |
|     |      |          |       |       |      |      |      |      |           | E 920 000 00E 7 MIL  | ronat                  |
|     |      | £        | -     | +     | -    | -    | 1    | 7    | *         | 5 230.000 005 7 IIHZ | *                      |
|     |      |          |       |       |      |      |      |      |           | Frequency Error :    |                        |
|     |      | *        | ۰.    | *     | - 0  |      | 14   | - 4  | Ъ.        | 5.7 112              | Storage                |
|     |      |          |       |       |      |      |      |      |           | 0.001 ppm            | Mode                   |
|     |      | *        | 2     |       |      |      | ٠    | ,    | -         |                      |                        |
|     |      |          |       |       |      |      |      |      |           | EVM (RMS) : 1.31%    | *                      |
|     |      | +        |       |       |      |      |      |      |           | -37.65dB             |                        |
|     | ۵L   |          |       |       |      |      |      |      |           | (Peak): 5.54%        | Signal                 |
|     |      | ٤        |       |       |      |      |      |      |           | Phase Err (Rms):     | Setup                  |
|     |      |          |       |       |      |      |      |      |           | 0.75 deg.            |                        |
|     |      |          |       | ,     |      |      | 2    |      |           | EVM (AII ):          | Flatness               |
|     |      |          |       |       |      |      |      |      |           | 1.31%                | Measurement            |
| 1   |      |          | 5     |       | -    |      |      |      |           | -37.65dB             | On Off                 |
| 1   |      |          |       |       |      |      |      |      |           |                      | ULL ULL                |
|     |      | 2        | \$    | •     | ~    | ~    |      | يو.  | *         |                      |                        |
|     |      |          |       |       |      |      |      |      |           |                      | Adjunct                |
|     |      |          |       |       |      |      |      |      |           |                      | Bongo                  |
|     | L    |          |       |       |      | T    |      |      |           | 1                    | паше                   |
|     |      | 1        | llodu | ılati | on : | OFD  | M-64 | IQAM |           |                      | →                      |
| I., |      |          |       |       |      |      |      |      |           |                      | Back                   |
| Sş  | yste | em : IEE | E802  | 2.11a | Fr   | eđ   |      | 52   | 30.000000 | MHz                  | Screen                 |
| Ra  | ate  | : Aut    | 0     |       | Le   | vel  | :    | -6   | .00dBn    |                      | - Soreen               |
| M   | bd   | : Aut    | 0     |       | 0f   | fset | :    | 0    | .00dB     | Correction : Off     | 1.2                    |
|     |      |          |       |       |      |      |      |      |           |                      |                        |

#### Modulation Analysis: Modulation Accuracy (EVM) vs. Sub-carrier

Displays the modulation accuracy (EVM) for each sub-carrier in graph form if a measured signal is OFDM. Graphs are displayed on the left side, and numeric results on the right



## Modulation Analysis: Phase Error vs. Symbol/Chip

Displays the phase error for each symbol/chip in graph form. Graphs are displayed on the left side, and numeric results on the right side.

#### Modulation Analysis: Modulation Accuracy (EVM) vs. Symbol/Chip

Displays the modulation accuracy (EVM) for each symbol/chip in graph form.



### Modulation Analysis: Spectrum Flatness

Displays the spectrum flatness for each sub-carrier in graph form [IEEE802.11a, IEEE802.11g (ERP-OFDM, DSSS-OFDM), HiSWANa, HiperLAN2].



## **Modulation Analysis: Eye-Diagram**

Displays the eye diagrams [IEEE802.11b, IEEE802.11g (ERP-DSSS/CCK)].



#### **Power: Slot display**

Displays a burst waveform of one slot. Numeric results such as the average power and maximum instantaneous power are also displayed.



#### **Power: Transient display**

Displays an enlarged version of the rising/falling edge of the burst waveform of the slot. The rising/falling time is also displayed in the IEEE802.11b/11g. [IEEE802.11b, IEEE802.11g (ERP-DSSS/CCK)]



## **Occupied Bandwidth**

Displays the occupied bandwidth, which includes 99% of the total emission power, in graph and numeric data forms. Also, the IEEE802.11b/11g displays the numeric data of spreading bandwidth, which includes 90% of the total emission power.



#### **Adjacent Channel Power**

Displays the power to second adjacent channel in widerange graph and numeric data forms. It is also possible to display the power for each channel separately.



#### **Spectrum Mask**

Executes pass/fail judgement using the standard line corresponding to each wireless LAN system. The level difference of the measured value or the measured level value is also displayed with its frequency.



#### CCDF

Displays the cumulative distribution for the difference between the instantaneous value and the average value of the power that is band-limited by a filter.



### APD

Displays the distribution for the difference between the instantaneous value and the average value of the power that is band-limited by a filter.



## **Spurious**

Displays the measured results for the spurious, including frequency, level, judgement result (PASS/FAIL), specifications, RBW and VBW in three sweep modes, on three separate screens. Measured results are automatically judged and the PASS/FAIL is displayed by presetting the Limit.



#### Macro Function (Batch Processing)

By presetting the judgement values, each item listed below is batch measured and judged automatically. Measured results are displayed on four separate screens.

Frequency accuracy, EVM-RMS, EVM-Peak, Phase error-RMS, Amplitude error-RMS, Origin offset, Carrier leak, Spectrum flatness (at burst signal), TX-power, Carrier off power (at burst signal), On/Off ratio (at burst signal), Burst signal rising/falling time (at burst signal), Occupied bandwidth, Adjacent channel power, Spectrum mask,

Spurious (Two tables can be chosen)



## **Specifications**

Specified values are obtained after warming up the equipment for 30 minutes at a constant ambient temperature. Guaranteed specifications after Adjust Range and Level Calibration keys pressed.

Pre-amp On can be set when MS2681A-08 and MS2683A-08 are installed in the main frame.

IQ-input can be set when MS2681A-17/18, MS2683A-17/18 and MS2687B-18 are installed in the main frame.

#### • IEEE802.11a, IEEE802.11g (ERP-OFDM, DSSS-OFDM), HiSWANa<sup>(\*1)</sup>, HiperLAN2<sup>(\*2)</sup> 1/3

|                |  | MYOCOLOOA  | MAX 000000A   | 14/20072004   |  |  |  |  |
|----------------|--|--|---|---|--|--|--|--|
| Modulation tvr |  | MX268730A<br>MX268730A<br>MX268730A<br>MX268730A   |   |   |  |  |  |  |
| Data rate      |  | OFDM-04QAM, OFDM-16QAM, OFDM-QFSK, OFDM-BFSK           [IEEE802.11a, IEEE802.11g (ERP-OFDM, DSSS-OFDM)]:           54, 48, 36, 24, 18, 12, 9, 6 Mbps, Auto (at burst signal only)           [HiSWANa]: 54, 36, 27, 18, 12, 9, 6 Mbps, Auto (at burst signal only)  |   |   |  |  |  |  |
|                | Measurement items                            | Frequency (carrier frequency, carrier frequency error), Modulation Characteristic (EVM-RMS, EVM-Peak, phase error-<br>RMS), OFDM-spectrum (carrier leak, spectrum flatness)  |   |   |  |  |  |  |
|                | Frequency range                              | 100 MHz to 3 GHz   | [IEEE802.11a, HiSWANa, HiperLAN2]:<br>100 MHz to 6 GHz,<br>100 MHz to 3 GHz (pre-amp On)<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]: 100 MHz to 3 GHz  | [IEEE802.11a, HiSWANa, HiperLAN2]:<br>100 MHz to 6 GHz<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]:<br>100 MHz to 3 GHz |  |  |  |  |
|                | Measurement<br>frequency intake<br>range     | [IEEE802.11a, HiSWANa, HiperLAN2]<br>Temperature: +18° to +35 °C,<br>setting frequency: ±120 kHz (3 to 6 GH<br>[IEEE802.11g (ERP-OFDM, DSSS-OFD<br>Temperature: +18° to +35 °C, setting fit  | [IEEE802.11a, HiSWANa, HiperLAN2]<br>Temperature: +18° to +35 °C,<br>setting frequency: ±120 kHz (3 to 6 GHz, MS2681A is object outside.), ±80 kHz (100 MHz to 3 GHz)<br>[IEEE802.11g (ERP-OFDM, DSSS-OFDM)]<br>Temperature: ±18° to ±35 °C, setting frequency: ±80 kHz |   |  |  |  |  |
|                | Measurement<br>level range                   | -26 to +26 dBm, -46 to +26 dBm (pre-a  | amp On)   | -26 to +24 dBm  |  |  |  |  |
|                | Carrier frequency<br>accuracy                | [IEEE802.11a, HiSWANa, HiperLAN2]<br>Frequency: 2 to 2.5 GHz<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]<br>Frequency: 2.4 to 2.5 GHz  | [IEEE802.11a, HiSWANa, HiperLAN2]<br>Frequency: 4.9 to 6 GHz<br>[IEEE802.11g (ERP-OFDM, DSSS-OFE<br>Frequency: 2.4 to 2.5 GHz   | DM)]  |  |  |  |  |
|                |  | Input level: -10 dBm, Averaging 30 times, Temperature: +18 to +35 °C,<br>± (reference frequency accuracy x setting frequency + 500 Hz)   |   |   |  |  |  |  |
|                | Modulation accuracy                          | [IEEE802.11a, HiSWANa, HiperLAN2]<br>Frequency: 2 to 2.5 GHz[IEEE802.11a, HiSWANa, HiperLAN2]<br>Frequency: 4.9 to 6 GHz<br>[IEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]<br>Frequency: 2.4 to 2.5 GHz[IEE802.11a, HiSWANa, HiperLAN2]<br>Frequency: 4.9 to 6 GHz<br>[IEE802.11g (ERP-OFDM, DSSS-OFDM)]<br>Frequency: 2.4 to 2.5 GHz   |   |   |  |  |  |  |
| analysis       |  | 1.5%rms (typ.)   |   |   |  |  |  |  |
|                | Display waveform                             | Constellation, EVM vs symbol number, EVM vs Sub-carrier number<br>Phase error vs symbol number, spectrum flatness  |   |   |  |  |  |  |
|                | Constellation                                | Display format: 1) All, 2) First Symbol, 3) Last Symbol, 4) Pilot Only, 5) One Sub-Carrier, 6) Outside Pair (When "Target<br>system: HiSWANa" and "Data rate: Auto" are set, 2) and 3) are not selectable)<br>Error scale: 5%, 10%, 20%, 35%, OFF ("Error scale" is available when "Data rate" is not set to "Auto" and "Modulation<br>type" is set to "OFDM-BPSK" or "OFDM-QPSK") |   |   |  |  |  |  |
|                | EVM vs symbol                                | Vertical line (full scale): 5%, 10%, 20%,<br>Horizontal line: Symbol number, 1 to 13   | Vertical line (full scale): 5%, 10%, 20%, 50%, 100%<br>Horizontal line: Symbol number, 1 to 1367 symbol   |   |  |  |  |  |
|                | EVM vs sub-carrier                           | Vertical line (full scale): 5%, 10%, 20%,<br>Horizontal line: Sub-carrier number –26   | 50%, 100%<br>to +26   |   |  |  |  |  |
|                | Phase error vs<br>symbol                     | Vertical line (full scale): 5 deg, 10 deg, 2<br>Horizontal line: Symbol number, 1 to 13  | 20 deg, 50 deg, 100 deg<br>67 symbol  |   |  |  |  |  |
|                | Spectrum flatness                            | Vertical line (full scale): 5 dB, 10 dB, 20<br>Horizontal line: Sub-carrier number –26   | dB, 50 dB, 100 dB<br>to +26   |   |  |  |  |  |
|                | Analysis length                              | Setting range: 1 to 1367 OFDM symbol<br>Setting resolution: 1 OFDM symbol<br>Setting method: Manual setting, Auto setting (at burst signal only. When "Data rate" is set to "Auto." HiperLAN2 is not<br>supported.)  |   |   |  |  |  |  |
|                | Analysis Start<br>Position<br>(HiSWANa only) | Setting range: 1 to [1367 – ("Analysis le<br>Setting resolution: 1 OFDM symbol   | ngth" setting value) + 1] OFDM symbol   |   |  |  |  |  |
|                | Storage mode                                 | Normal: Refresh waveform/data for each measurement.<br>Average: Data display averages the result for the designated number of measurements.<br>Averaging count: 2 to 999. Waveform display is same as "Normal" mode.<br>Overwrite: Waveform is overwritten without erasing previous waveform. Data display is same as "Normal" mode.   |   |   |  |  |  |  |

## • IEEE802.11a, IEEE802.11g (ERP-OFDM, DSSS-OFDM), HiSWANa<sup>(\*1)</sup>, HiperLAN2<sup>(\*2)</sup> 2/3

| Model                                   |                                      | MX268130A  | MX268330A   | MX268730A   |  |  |  |  |
|---|--------------------------------------|--|---|---|--|--|--|--|
|   | Measurement<br>frequency range       | 100 MHz to 3 GHz   | [IEEE802.11a, HiSWANa, HiperLAN2]:<br>100 MHz to 6 GHz,<br>100 MHz to 3 GHz (pre-amp On)<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]: 100 MHz to 3 GHz  | [IEEE802.11a, HiSWANa, HiperLAN2]:<br>100 MHz to 6 GHz<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]:<br>100 MHz to 3 GHz   |  |  |  |  |
|   | Measurement level<br>range           | -26 to +26 dBm, -46 to +26 dBm (pre-a  | amp On)   | -26 to +24 dBm  |  |  |  |  |
|   | Measurement items*3                  | Average power, Maximum power, Carrie   | er off power (at burst signal), Burst on/off r  | atio (at burst signal)  |  |  |  |  |
|   | Burst average<br>power accuracy      | [IEEE802.11a, HiSWANa, HiperLAN2]<br>Frequency: 2 to 2.5 GHz<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]<br>Frequency: 2.4 to 2.5 GHz<br>Averaging 30 times<br>≤±1.7 dB (Input level: −18 to 0 dBm)<br>≤±2.0 dB (pre-amp On, Input level:<br>−38 to 0 dBm)   | $\label{eq:constraint} \begin{array}{llllllllllllllllllllllllllllllllllll$  | [IEEE802.11a, HiSWANa, HiperLAN2]<br>Frequency: 4.9 to 6 GHz,<br>Input level: -26 to 0 dBm,<br>Averaging 30 times<br>≤±2.9 dB<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]<br>Frequency: 2.4 to 2.5 GHz,<br>Input level: -26 to 0 dBm,<br>Averaging 30 times<br>≤±1.9 dB |  |  |  |  |
| RF power                                | Burst rising detection method        | Selects from (1) and (2).<br>(1) The rising edge is detected from cha<br>(2) The rising edge is detected from a p  | ange of a signal level.<br>reamble signal. (Preamble Search)  |   |  |  |  |  |
|   | Burst signal length detection method | Selects from (1) and (2).<br>(1) Input data length<br>(2) The falling edge is detected from cha  | ange of a signal level. (Ramp-down Detec  | tion)   |  |  |  |  |
|   | Slot display                         | A time domain waveform is displayed.<br>Vertical line: Unit = dBm, dB, %<br>Horizontal line<br>At burst signal: –20.0 (fixed) to 5680.0 μs (based on burst length)<br>At continuous signal: 0.0 to 5660.0 μs (fixed)   |   |   |  |  |  |  |
|   | Transient display                    | Displays zoom of the rising and falling e<br>Vertical line: Unit = dBm, dB, %<br>Horizontal line: 8.0 to 40.0 µs (setting re   | Uispiays zoom of the rising and falling edges of a slot.<br>Vertical line: Unit = dBm, dB, %<br>Horizontal line: 8.0 to 40.0 μs (setting resolution: 0.1 μs)  |   |  |  |  |  |
|   | Analysis length                      | Setting range: 1 to 1367 OFDM symbol (DSSS-OFDM: 1 to 1300 OFDM symbol)<br>Setting resolution: 1 OFDM symbol<br>Setting method: Manual setting, Auto setting (at burst signal only.)   |   |   |  |  |  |  |
|   | Storage mode                         | Normal: Refresh waveform/data for each measurement.<br>Average: Data display averages the result for the designated number of measurements.<br>Averaging count: 2 to 999. Waveform display is same as "Normal" mode.<br>Overwrite: Waveform is overwritten without erasing previous waveform. Data display is same as "Normal" mode. |   |   |  |  |  |  |
| Occupied                                | Frequency range                      | 100 MHz to 3 GHz   | [IEEE802.11a, HiSWANa, HiperLAN2]:<br>100 MHz to 6 GHz,<br>100 MHz to 3 GHz (pre-amp On)<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]: 100 MHz to 3 GHz  | [IEEE802.11a, HiSWANa, HiperLAN2]:<br>100 MHz to 6 GHz<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]:<br>100 MHz to 3 GHz   |  |  |  |  |
| frequency bandwidth                     | Reference level<br>range             | -26 to +26 dBm, -46 to +26 dBm (pre-a  | amp On)   | -26 to +24 dBm  |  |  |  |  |
|   | Measurement method                   | BW (99%): 99% of the total radiation po  | ower is defined as the contained frequency  | / width.  |  |  |  |  |
|   | Storage mode                         | Normal: Displays the measured result v<br>Average: Data display averages the res<br>Averaging count: 2 to 999. Wa  | alue and waveform after every measurem<br>ult for the designated number of measuren<br>weform display is same as "Normal" mode  | ent.<br>ments.<br>a.  |  |  |  |  |
|   | Target system                        | IEEE802.11a, HiSWANa, HiperLAN2  |   |   |  |  |  |  |
|   | Frequency range                      | 100 MHz to 3 GHz   | 100 MHz to 6 GHz,<br>100 MHz to 3 GHz (pre-amp On)  | 100 MHz to 6 GHz  |  |  |  |  |
|   | Reference level<br>range             | -16 to +26 dBm, -36 to +26 dBm (pre-a  | amp On)   | -16 to +24 dBm  |  |  |  |  |
| Adjacent<br>channel<br>leakage<br>power | Measurement<br>method                | Sweep method (All):<br>After measuring the signal range inclu-<br>analyzer performs calculation of adjac<br>Sweep method (Separate):<br>After measuring adjacent channel and<br>performs calculation and displays the  | ding upper/lower second adjacent channel<br>ent/second adjacent channels and display<br>the channel next to the adjacent channel<br>result.   | Is at a time with the sweep type spectrum<br>s the result.<br>with the sweep type spectrum analyzer   |  |  |  |  |
|   | Storage mode                         | Normal: Refresh waveform/data for eac<br>Average: Displays the measured result<br>Averaging count: 2 to 999. Wa  | performs calculation and displays the result.<br>Normal: Refresh waveform/data for each measurement.<br>Average: Displays the measured result value averaged for the designated numbe<br>Averaging count: 2 to 999. Waveform display is same as "Normal" mode |   |  |  |  |  |

| Model                              |                          | MX268130A  | MX268330A  | MX268730A   |  |  |  |  |
|------------------------------------|--------------------------|--|--|---|--|--|--|--|
|                                    | Frequency range          | 100 MHz to 3 GHz   | [IEEE802.11a, HiSWANa, HiperLAN2]:<br>100 MHz to 6 GHz,<br>100 MHz to 3 GHz (pre-amp On)<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]: 100 MHz to 3 GHz         | [IEEE802.11a, HiSWANa, HiperLAN2]:<br>100 MHz to 6 GHz<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]:<br>100 MHz to 3 GHz |  |  |  |  |
| Spectrum<br>mask                   | Reference level range    | -16 to +26 dBm, -36 to +26 dBm (pre-a  | amp On)  | –16 to +24 dBm  |  |  |  |  |
|                                    | Template                 | Corresponds to the spectrum mask defi<br>Arbitrary spectrum mask is also availabl  | ned in IEEE std 802.11a-1999 17.3.9.2 an<br>le.  | d IEEE std 802.11g-2003 19.5.4/19.7.2.  |  |  |  |  |
|                                    | Storage mode             | Normal: Refresh waveform/data for each measurement.<br>Average: Displays the measured result value averaged for the designated number of measurements.<br>Averaging count: 2 to 999. Waveform display is same as "Normal" mode.  |  |   |  |  |  |  |
|                                    | Frequency range          | 9 kHz to 3 GHz   | 9 kHz to 7.8 GHz   | 9 kHz to 30 GHz   |  |  |  |  |
|                                    | Reference level<br>range | -6 to +26 dBm  | -  | -6 to +24 dBm   |  |  |  |  |
| Spurious                           | Measurement<br>method    | Sweep method:<br>Detects and displays the peak value after sweeping the designated frequency range with the spectrum analyzer.<br>Calculates and displays the ratio to the transmitted power value (power ratio). Detection mode is Positive Peak.<br>Spot method:<br>Displays the average value after measuring the designated frequency in time domain of the spectrum analyzer.<br>Calculates and displays the ratio to the transmitted power value (power ratio). Detection mode is Sample.<br>Search method:<br>Measures the frequency in time domain and displays the average value after sweeping the designated frequency range<br>with the spectrum analyzer and detecting the peak value. Calculates and displays the ratio to the transmitted power value<br>(power ratio). Detection mode is Sample. |  |   |  |  |  |  |
|                                    | Storage mode             | Normal: Refresh waveform/data for each measurement.<br>Average: Displays the measured result value averaged for the designated number of measurements.<br>Averaging count: 2 to 999. Waveform display is same as "Normal" mode.  |  |   |  |  |  |  |
|                                    | Frequency range          | 100 MHz to 3 GHz   | 100 MHz to 6 GHz,<br>100 MHz to 3 GHz (pre-amp On)   | 100 MHz to 6 GHz  |  |  |  |  |
|                                    | Reference level<br>range | -26 to +26 dBm, -46 to +26 dBm (pre-a  | -26 to +24 dBm   |   |  |  |  |  |
|                                    | Measurement<br>method    | CCDF: Displays cumulative distribution of difference between instantaneous power and average power.<br>APD: Displays distribution of difference between instantaneous power and average power.   |  |   |  |  |  |  |
|                                    | Data count               | 10,000 to 2,000,000,000  |  |   |  |  |  |  |
| CCDE                               | Analysis time            | 0.001 to 100 ms  |  |   |  |  |  |  |
| 00001                              | Filter selection         | 22 MHz, 20 MHz, 10 MHz, 5 MHz, 3 MH  | Hz, RRC: $\alpha$ = 0.22, RC: $\alpha$ = 0.22  |   |  |  |  |  |
|                                    | Trigger                  | Free run: Regardless of the state of an input signal, a signal is taken in continuously.<br>Wide IF: A signal is taken in synchronizing with a video signal.<br>Trigger edge: Rise, Fall<br>Trigger delay: -10000 to +10000 μs<br>Trigger level: High, Middle, Low<br>External: A signal is taken in synchronizing with the trigger signal inputted into a "Trig/Gate In" connector on the back.<br>Trigger edge: Rise, Fall<br>Trigger delay: -10000 to +10000 μs   |  |   |  |  |  |  |
| Batch<br>measurement <sup>*4</sup> | Measurement items        | Frequency accuracy, EVM-RMS, EVM-F<br>Carrier off power (at burst signal), On/O<br>power, Spectrum mask, Spurious (Two<br>* "Adjacent channel leakage power" car   | Peak, Phase error-RMS, Carrier leak, Spe<br>ff ratio (at burst signal), Occupied frequen<br>tables can be chosen)<br>n be measured complying with "IEEE802.1 | ctrum flatness (at burst signal), TX-power,<br>cy bandwidth, Adjacent channel leakage<br>I1a, HiSWANa, HiperLAN2."    |  |  |  |  |
|                                    | Judgement                | According to the judgment value set per<br>measurement item.   | r measurement item, PASS or FAIL judgmo  | ent is automatically performed for each   |  |  |  |  |

## • IEEE802.11a, IEEE802.11g (ERP-OFDM, DSSS-OFDM), HiSWANa<sup>(\*1)</sup>, HiperLAN2<sup>(\*2)</sup> 3/3

|                                     | Model                      | MX268130A   | MX268330A MX268730A   |                |  |  |  |
|-------------------------------------|----------------------------|---|---|----------------|--|--|--|
|                                     | Target System              | IEEE802.11a, IEEE802.11g(ERP-OFDM   | I, DSSS-OFDM)   |                |  |  |  |
|                                     | Frequency range            | 100 MHz to 3 GHz  | 100 MHz to 6 GHz  |                |  |  |  |
| Symbol rate<br>error<br>measurement | Measurement level<br>range | -26 to +26 dBm  |   | -26 to +24 dBm |  |  |  |
|                                     | Analysis length            | 250 to 1000 OFDM symbol (Setting res  | 250 to 1000 OFDM symbol (Setting resolution : 1 OFDM symbol)  |                |  |  |  |
|                                     | Measurement range          | 0.0 to 50.0 ppm   |   |                |  |  |  |
|                                     | Measurement<br>resolution  | 0.1 ppm   |   |                |  |  |  |
|                                     | Measurement<br>accuracy    | [IEEE802.11a]<br>Frequency: 2 to 2.5 GHz<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]<br>Frequency: 2.4 to 2.5 GHz   | [IEEE802.11a]<br>Frequency: 4.9 to 6 GHz<br>[IEEE802.11g (ERP-OFDM, DSSS-OFD<br>Frequency: 2.4 to 2.5 GHz | M)]            |  |  |  |
|                                     |                            | $\pm$ (reference frequency x 10 <sup>6</sup> + 1.0) ppm<br>per OFDM symbol rate (250 kHz [ = (4 µs) <sup>-1</sup> ]).   |   |                |  |  |  |
|                                     | Storage mode               | Normal: Refresh waveform/data for each measurement.<br>Average: Displays the measured result value averaged for the designated number of measurements.<br>Averaging count: 2 to 999. Waveform display is same as "Normal" mode. |   |                |  |  |  |

\*1: HiSWANa measurement function cannot carry out the following measurement.

1) Measurement for every MAC frame

2) Measurement of a signal whose cyclic prefix duration is not 800 ns

3) Measurement of a continuous signal whose by the prefix duration is not control in a signal whose modulation type is not constant.
\*2: HiperLAN2 measurement function cannot carry out the following measurement.
1) The same measurement as '\*1'.

Measurement of a burst signal whose modulation type on payload is not constant.
 Measurement of power time mask.

\*3: When burst interval is 20 µs or less, the Wireless LAN software cannot measure the following item rightly:
1) Carrier off power, 2) On/Off ratio
\*4: "Batch measurement" function cannot carry out when "Target system: HiSWANa" and "Data rate: Auto" are set.

| • IEEE802 11b | IFFF802 11a | (FRP-DSSS/CCK) | 1/3 |
|---------------|-------------|----------------|-----|
|               | ILLLUUZ.IIG |                | 1/5 |

| Model           |  | MX268130A  | MX268330A   | MX268730A                 |  |  |  |
|-----------------|--|--|---|---------------------------|--|--|--|
| Modulation type |  | CCK, DQPSK, DBPSK  |   |                           |  |  |  |
| Data rate       |  | 11, 5.5, 2, 1 Mbps, Auto (automatic recognition at burst signal only)  |   |                           |  |  |  |
| Filter          |  | No Filter<br>Gaussian BT = 0.3 to 1.0 (setting resolution: 0.1)<br>Rectangular<br>Root Raised Cosine, $\alpha = 0.30$ to 1.00 (setting resolution: 0.01)   |   |                           |  |  |  |
|                 | Measurement items                        | Frequency (Carrier frequency, Carrier frequency, Ca | equency error), Modulation Characteristic offset)                 | (EVM-RMS, EVM-Peak, Phase |  |  |  |
|                 | Frequency range                          | 100 MHz to 3 GHz   |   |                           |  |  |  |
|                 | Measurement<br>frequency intake<br>range | Femperature: +18° to +35 °C, setting frequency ±80 kHz   |   |                           |  |  |  |
|                 | range                                    | -26 to +26 dBm, -46 to +26 dBm (pre-amp On) -26 to +24 dBm   |   |                           |  |  |  |
|                 | Carrier frequency<br>accuracy            | Frequency: 2.4 to 2.5 GHz, Input level: ± (reference frequency accuracy x settir   | –10 dBm, Averaging: 30 times, Temperatu<br>ng frequency + 200 Hz) | re: +18° to +35 °C        |  |  |  |
|                 | Modulation<br>accuracy                   | Frequency: 2.4 to 2.5 GHz, Input level: -<br>2.3%rms (typ.)  | -10 dBm, Averaging: 30 times, Temperatu                           | re: +18° to +35 °C        |  |  |  |
| Modulation      | Display waveform                         | Constellation, EVM vs chip number, Pha   | ase error vs chip number, Eye-diagram                             |                           |  |  |  |
| analysis        | Constellation                            | Error scale: 5%, 10%, 20%, 35%, OFF  | It is available when "Data rate" is not set                       | to "Auto".)               |  |  |  |
|                 | EVM vs chip                              | Vertical line (full scale): 5%, 10%, 20%, 50%, 100%<br>Horizontal line: Chip number 256 to 4096 chip   |   |                           |  |  |  |
|                 | Phase error vs. chip                     | Vertical line (full scale): 5 deg, 10 deg, 20 deg, 50 deg, 100 deg<br>Horizontal line: Chip number 256 to 4096 chip  |   |                           |  |  |  |
|                 | Analysis length                          | Setting range: 256 to 4096 chip<br>Setting resolution: 1 chip<br>Setting method: Manual setting, Auto setting (at burst signal only. When "Data rate" is set as "Auto.")   |   |                           |  |  |  |
|                 | Storage mode                             | Normal: Refresh waveform/data for each measurement.<br>Average: Displays the measured result value averaged for the designated number of measurements.<br>Averaging count: 2 to 999. Waveform display is same as "Normal" mode.<br>Overwrite: Waveform is overwritten without erasing previous waveform. Data display is same as "Normal" mode.  |   |                           |  |  |  |
|                 | Frequency range                          | 100 MHz to 3 GHz   |   |                           |  |  |  |
|                 | Measurement level<br>range               | -26 to +26 dBm, -46 to +26 dBm (pre-amp On) -26 to +24 dBm   |   |                           |  |  |  |
|                 | Measurement<br>items <sup>*1</sup>       | Average power, Maximum power, Carrier off power (at burst signal), Burst on/off ratio (at burst signal), Burst rising/fallin time (at burst signal)  |   |                           |  |  |  |
|                 | Burst average power accuracy             | Frequency: 2.4 to 2.5 GHz, Averaging 30 times         Frequency: 2.4 to 2.5 GHz, Averaging 30 times           ≤±1.7 dB (Input level: -18 to 0 dBm),         Input level: -26 to 0 dF           ≤±2.0 dB (Input level: -38 to 0 dBm, pre-amp On)         Averaging 30 times. ≤  |   |                           |  |  |  |
|                 | Burst rising detection method            | Selects from (1) and (2).<br>(1) The rising edge is detected from change of a signal level.<br>(2) The rising edge is detected from a preamble signal. (Preamble Search)   |   |                           |  |  |  |
|                 | Burst signal length detection method     | Selects from (1) and (2).<br>(1) Input data length<br>(2) The falling edge is detected from change of a signal level. (Ramp-down Detection)  |   |                           |  |  |  |
| RF power        | Slot display                             | A time domain waveform is displayed.<br>Vertical line: Unit = dBm, dB, %<br>Horizontal line<br>At burst signal: -20.0 (fixed) to 5680.0 µs (based on burst length)<br>At continuous signal: 0.0 to 5660.0 µs (fixed)   |   |                           |  |  |  |
|                 | Transient display                        | Displays zoom of the rising and falling e<br>Vertical line: Unit = dBm, dB, %<br>Horizontal line: 8.0 to 40.0 µs (setting re   | dges of a slot.<br>solution: 0.1 μs)                              |                           |  |  |  |
|                 | Analysis length                          | Setting range: 256 to 4096 chip<br>Setting resolution: 1 chip<br>Setting method: Manual setting, Auto set  | tting (at burst signal only.)                                     |                           |  |  |  |
|                 | Storage mode                             | Normal: Refresh waveform/data for each measurement.<br>Average: Displays the measured result value averaged for the designated number of measurements.<br>Averaging count: 2 to 999. Waveform display is same as "Normal" mode.<br>Overwrite: Waveform is overwritten without erasing previous waveform. Data display is same as "Normal" mode.  |   |                           |  |  |  |

## • IEEE802.11b, IEEE802.11g (ERP-DSSS/CCK) 2/3

| Model                              |                          | MX268130A  | MX268330A   | MX268730A   |  |  |  |  |  |
|------------------------------------|--------------------------|--|---|---|--|--|--|--|--|
|                                    | Frequency range          | 100 MHz to 3 GHz   | 1   | 1   |  |  |  |  |  |
| Occupied<br>frequency<br>bandwidth | Reference level<br>range | -26 to +26 dBm, -46 to +26 dBm (pre-a  | amp On)   | -26 to +24 dBm  |  |  |  |  |  |
|                                    | Measurement<br>method    | BW (99%): 99% of the total radiation power is defined as the contained frequency width.<br>BW (90%): Frequency bandwidth containing 90% of the total radiation power. This value is called "spreading bandwidth" in<br>TELEC's Technical Regulations Conformity Certification.   |   |   |  |  |  |  |  |
|                                    | Storage mode             | Normal: Refresh waveform/data for each measurement.<br>Average: Displays the measured result value averaged for the designated number of measurements.<br>Averaging count: 2 to 999. Waveform display is same as "Normal" mode.  |   |   |  |  |  |  |  |
|                                    | Frequency range          | 100 MHz to 3 GHz   | 100 MHz to 3 GHz  |   |  |  |  |  |  |
| Spectrum<br>mask                   | Reference level<br>range | -16 to +26 dBm, -36 to +26 dBm (pre-a  | -16 to +26 dBm, -36 to +26 dBm (pre-amp On) -16 to +24 dBm  |   |  |  |  |  |  |
|                                    | Template                 | Corresponds to the spectrum mask define 19.5.4/19.7.2. Arbitrary spectrum mask in the spectrum mask in the spectrum mask is the spectrum mask in the spectrum mask is the spectrum mask in the spectrum mask is the spectru | ned in IEEE std 802.11b-1999 18.4.7.3 an<br>is also available.  | d IEEE std 802.11g-2003   |  |  |  |  |  |
|                                    | Storage mode             | Normal: Refresh waveform/data for each<br>Average: Displays the measured result<br>Averaging count: 2 to 999. Wa   | Normal: Refresh waveform/data for each measurement.<br>Average: Displays the measured result value averaged for the designated number of measurements.<br>Averaging count: 2 to 999. Waveform display is same as "Normal" mode. |   |  |  |  |  |  |
|                                    | Frequency range          | 9 kHz to 3 GHz   | 9 kHz to 7.8 GHz  | 9 kHz to 30 GHz   |  |  |  |  |  |
|                                    | Reference level<br>range | -6 to +26 dBm  |   | -6 to +24 dBm   |  |  |  |  |  |
| Spurious                           | Measurement<br>method    | Sweep method:<br>Detects and displays the peak value after sweeping the designated frequency range with the spectrum analyzer.<br>Calculates and displays the ratio to the transmitted power value (power ratio). Detection mode is Positive Peak.<br>Spot method:<br>Displays the average value after measuring the designated frequency in time domain of the spectrum analyzer.<br>Calculates and displays the ratio to the transmitted power value (power ratio). Detection mode is Sample.<br>Search method:<br>Measures the frequency in time domain and displays the average value after sweeping the designated frequency range<br>with the spectrum analyzer and detecting the peak value. Calculates and displays the ratio to the transmitted power value<br>(power ratio). Detection mode is Sample.   |   |   |  |  |  |  |  |
|                                    | Storage mode             | Normal: Refresh waveform/data for each measurement.<br>Average: Displays the measured result value averaged for the designated number of measurements.<br>Averaging count: 2 to 999. Waveform display is same as "Normal" mode.  |   |   |  |  |  |  |  |
|                                    | Frequency range          | 100 MHz to 3 GHz   | 100 MHz to 6 GHz,<br>100 MHz to 3 GHz (pre-amp On)  | 100 MHz to 6 GHz  |  |  |  |  |  |
|                                    | Reference level<br>range | -26 to +26 dBm, -46 to +26 dBm (pre-a  | -26 to +24 dBm  |   |  |  |  |  |  |
|                                    | Measurement<br>method    | CCDF: Displays cumulative distribution of difference between instantaneous power and average power.<br>APD: Displays distribution of difference between instantaneous power and average power.   |   |   |  |  |  |  |  |
|                                    | Data count               | 10,000 to 2,000,000,000  |   |   |  |  |  |  |  |
| CCDF                               | Analysis time            | 0.001 to 100 ms  | 0.001 to 100 ms   |   |  |  |  |  |  |
| 002.                               | Filter Selection         | 22 MHz, 20 MHz, 10 MHz, 5 MHz, 3 MH  | Hz, RRC: $\alpha$ = 0.22, RC: $\alpha$ = 0.22   |   |  |  |  |  |  |
|                                    | Trigger                  | Free run: Regardless of the state of an input signal, a signal is taken in continuously.<br>Wide IF: A signal is taken in synchronizing with a video signal.<br>Trigger edge: Rise, Fall<br>Trigger delay: -10000 to +10000 μs<br>Trigger level: High, Middle, Low<br>External: A signal is taken in synchronizing with the trigger signal inputted into a "Trig/Gate In" connector on the back.<br>Trigger edge: Rise, Fall<br>Trigger delay: -10000 to +10000 μs   |   |   |  |  |  |  |  |
| Batch                              | Measurement items        | Frequency accuracy, EVM-RMS, EVM-F<br>power (at burst signal), On/Off ratio (at b<br>bandwidth, Spectrum mask, Spurious (T   | Peak, Phase error-RMS, Amplitude error-R<br>burst signal ), Burst signal rising/falling tim<br>wo tables can be chosen)   | RMS, Origin offset, TX-power, Carrier off<br>e (at burst signal ), Occupied frequency |  |  |  |  |  |
| measurement                        | Judgement                | According to the judgment value set per measurement item, PASS or FAIL judgment is automatically performed for each measurement item   |   |   |  |  |  |  |  |

## • IEEE802.11b, IEEE802.11g (ERP-DSSS/CCK) 3/3

| Model MX26813                        |                            | MX268130A   | MX268330A  | MX268730A |  |  |  |  |  |
|--------------------------------------|----------------------------|---|--|-----------|--|--|--|--|--|
|                                      | Frequency range            | 100 MHz to 3 GHz  | 100 MHz to 3 GHz   |           |  |  |  |  |  |
|                                      | Measurement level<br>range | -26 to +26 dBm, -46 to +26 dBm (pre-a   | -26 to +26 dBm, -46 to +26 dBm (pre-amp On) -26 to +24 dBm |           |  |  |  |  |  |
|                                      | Analysis length            | 11,000 to 44,000 chip (setting resolution   | 11,000 to 44,000 chip (setting resolution: 1 chip)         |           |  |  |  |  |  |
|                                      | Measurement range          | 0.0 to ±50.0 ppm  |  |           |  |  |  |  |  |
| Chip clock<br>error mea-<br>surement | Measurement<br>resolution  | 0.1 ppm   |  |           |  |  |  |  |  |
|                                      | Measurement<br>accuracy    | Frequency range: 2.4 to 2.5 GHz<br>± (reference frequency accuracy x 10 <sup>6</sup> + 1.0) ppm<br>per chip rate (11 MHz).  |  |           |  |  |  |  |  |
|                                      | Storage mode               | Normal: Refresh waveform/data for each measurement.<br>Average: Displays the measured result value averaged for the designated number of measurements.<br>Averaging count: 2 to 999. Waveform display is same as "Normal" mode. |  |           |  |  |  |  |  |

\*1: When burst interval is 20 μs or less, the Wireless LAN software cannot measure the following item rightly:
 1) Carrier off power, 2) On/Off ratio and 3) Burst rising/falling time.

## • Electric performance (IQ input)

| Model   | MX268130A   | MX268330A  | MX268730A       |  |  |  |
|---|---|--|-----------------|--|--|--|
| Input impedance   | 1 M $\Omega$ (parallel capacitance <100 pF), 50   | 1 MΩ (parallel capacitance <100 pF), 50 Ω                    |                 |  |  |  |
| Balance input   | With MS2681A-17/MS2683A-17<br>Differential voltage: 0.1 to 1 Vp-p (input<br>In-phase voltage: ±2.5 V (input terminals   | _  |                 |  |  |  |
|   | With MS2681A-18/MS2683A-18  |  | With MS2687B-18 |  |  |  |
| Unbalance input   | 0.1 to 1 Vp-p (input terminals)<br>DC/AC coupling Changeable  | 0.1 to 1 Vp-p (input terminals)<br>DC/AC coupling Changeable |                 |  |  |  |
| Measurement items   | [IEEE802.11a, IEEE802.11g (ERP-OFDM, DSSS-OFDM), HiSWANa, HiperLAN2]<br>Modulation accuracy/frequency, RF power, CCDF, Batch measurement, IQ level, Symbol rate error measurement<br>[HiSWANa, HiperLAN2]<br>Modulation accuracy/frequency, RF power, CCDF, Batch measurement, IQ level<br>[IEEE802.11b, IEEE802.11g (ERP-DSSS/CCK)]<br>Modulation accuracy/frequency, RF power, CCDF Batch measurement, IQ level |  |                 |  |  |  |
| IQ level measurement  | Measures input level of I and Q (rms, p-p)  |  |                 |  |  |  |
| IQ phase difference measurement When the CW signal is inputted to I and Q input terminals, measures and displays the phase difference betwee and Q-phase signals. |   |  |                 |  |  |  |

## Wireless LAN Measurement Software limited version MX268132A/MX268332A/MX268732A

#### - From Development and Production to

The MX268132A/MX268332A/MX268732A Wireless LAN Measurement Software limited version is application software used by the MS2681A/MS2683A/MS2687B spectrum analyzer. A transmission system conforming to the wireless LAN standards can be evaluated by installing this wireless LAN measurement software into the spectrum analyzer.

#### Features

- Conforms to the IEEE802.11a, IEEE802.11b, IEEE802.11g (ERP-OFDM, DSSS-OFDM, ERP-DSSS/CCK), HiSWANa and HiperLAN2 standards.
- Analyzes OFDM signals those realize high-speed data transfer at 54 Mbps
- Integrates a high-performance DSP, enabling high-speed and high-accuracy measurement using the fast A/D sampling (at 64 MHz). Modulation accuracy measurement can be completed in 1 sec or less.
- Capable of measuring harmonics up to 5-time waves of the 5-GHz band wireless LAN (IEEE802.11a, HiSWANa, HiperLAN2) in use of MS2687B.
- One-touch operation of tests on transmission characteristics, including modulation analysis and spurious.
- Provides a batch measurement function which automatically measures items that were individually measured before, and displays judgement results for the specified reference value.

#### Measured items

Modulation analysis: [IEEE802.11a, IEEE802.11g (ERP-OFDM, DSSS-OFDM), HiSWANa, HiperLAN2] Frequency (Carrier frequency, Carrier frequency error) Modulation Characteristic (EVM-RMS, EVM-Peak, Phase error-RMS) OFDM-spectrum (Carrier leak, Spectrum flatness)

[IEEE802.11b, IEEE802.11g (ERP-DSSS/CCK)] Frequency (Carrier frequency, Carrier frequency error) Modulation Characteristic (EVM-RMS, EVM-Peak, Phase error-RMS, Amplitude error-RMS, Origin offset)

#### Power

Average power, Maximum Power, Carrier off power, Burst on/off ratio, Burst rising/falling time Occupied bandwidth, Spreading bandwidth Adjacent channel power Spectrum mask Spurious, Out-band leakage power CCDF, APD Macro function (Batch processing)

#### **Setup Common Parameter**

This screen is used to set common parameters such as signaling system, input level, frequency, data rate, and target system before starting analysis. Setting these parameters simplifies measurement operations.

| <pre>&lt;&lt; Setum Common Parameter ()</pre>                          | WLAND >>  | Setup<br>Parameter                |
|--|---|-----------------------------------|
| T  |   | ÷                                 |
| Terminal   | : (RF )   | Batch                             |
| Reference Level<br>Offset Level  | : [ -6.00dBm]<br>: [ 0.00dB]  | +                                 |
| Frequency<br>Carrier Frequency   | : [ 5230.00000MHz]  | Modulation<br>Analysis            |
| Signal<br>Target Systen<br>Measuring Object<br>Data Rate<br>Modulation | : [1EEE802.11a]<br>: [Burst ]<br>: [ <u>34[Dys</u> ]<br>: [SPDM-640AM ] | →<br>RF<br>Power<br>→             |
| Trigger  | : [Free Run]  | Occupied<br>Bandwidth             |
|  |   | →<br>Adjacent<br>Channel<br>Power |
|  |   | +                                 |
| System : IEEE802.11a Freq  | : 5230.000000MHz  | Spectrum<br>Mask                  |
| Mod : OFDM-640AM Offs  | et: 0.00dB Correction :   | off 12                            |

#### **Modulation Analysis**

Displays numeric results, including the frequency, execution value and maximum value of the modulation accuracy (EVM) and the execution value of the phase error.

|                       |        |                 |           |              |           | Modulation  |
|-----------------------|--------|-----------------|-----------|--------------|-----------|-------------|
|                       |        |                 |           | a: 1         |           | Analysis    |
| < Modulation Analysis | (WLAN) | <i>&gt;&gt;</i> | measu     | re : Single  |           |             |
|                       |        |                 | Stora     | ge : Normal  |           | #           |
|                       |        |                 | Trace     | : No Trace   |           |             |
|                       |        |                 |           |              |           | Trace       |
| Frequency             |        |                 |           |              |           | Format      |
| Connion Engranor      |        |                 | E 920 000 | 00E 7 101a   |           | 10110.0     |
|                       |        | •               | 0 200.000 | 500 T miz    | 0.001     | *           |
| Carrier Frequency I   | EFFOF  | :               |           | 5.7 HZ       | 0.001 ppn |             |
|                       |        |                 |           |              |           | Storage     |
| Modulation            |        |                 |           |              |           | Wede        |
| EVM (RMS)             |        |                 | 1.31 %    | -37.65 dB    |           | lioue       |
| EVM (Peak)            |        |                 | 5.54 %    |              |           | *           |
| Phase Error (RMS)     |        |                 | 0.75 de   | <i>a</i>     |           |             |
| Those Error (his)     |        | •               | 0.15 46   | ь.           |           | Cignal      |
| C                     |        |                 |           |              |           | 5160a1      |
| Spectrum              |        |                 |           |              |           | Setup       |
| Carrier Leak          |        | :               | -31.10 dB |              |           |             |
| Flatness (Outside)    | Max.   | :               | 0.18 dB   | (Subcarrier: | 26)       | Flatnood    |
|                       | Min.   | :               | -0.22 dB  | (Subcarrier: | -26)      | ria uess    |
| (Inside)              | Max    |                 | 0 12 dB   | (Subcarrier) | 16)       | neasurement |
| (110)1007             | Min    | Ξ.              | -0 13 dB  | (Subcarrier: | -16)      | On Off      |
|                       |        | •               | 0.10 W    | Composition. | 107       |             |
|                       |        |                 |           |              |           |             |
|                       |        |                 |           |              |           |             |
|                       |        |                 |           |              |           | Adjust      |
|                       |        |                 |           |              |           | Range       |
|                       |        |                 |           |              |           |             |
|                       |        |                 |           |              |           | -           |
|                       |        |                 |           |              |           |             |
| Creaton , LEEERON 11a | Fnog   |                 | E920 000  | 000100       |           | Back        |
| System : IEEE802.118  | rreq   | •               | 0200.000  | UUU III Z    |           | Screen      |
| Rate : Auto           | revel  | :               | -o.00dBn  |              |           |             |
| Mod : Auto            | Offset | :               | 0.00dB    | Correct      | ion : Off | 1 Z         |

#### **Occupied Bandwidth**

Displays the occupied bandwidth, which includes 99% of the total emission power, in graph and numeric data forms. Also, the IEEE802.11b/11g displays the numeric data of spreading bandwidth, which includes 90% of the total emission power.



### **Adjacent Channel Power**

Displays the power to second adjacent channel in widerange graph and numeric data forms. It is also possible to display the power for each channel separately.



#### **Spectrum Mask**

Executes pass/fail judgement using the standard line corresponding to each wireless LAN system. The level difference of the measured value or the measured level value is also displayed with its frequency.



## Spurious

Displays the measured results for the spurious, including frequency, level, judgement result (PASS/FAIL), specifications, RBW and VBW in three sweep modes, on three separate screens.

Measured results are automatically judged and the PASS/FAIL is displayed by presetting the Limit.



#### Macro Function (Batch Processing)

By presetting the judgement values, each item listed below is batch measured and judged automatically. Measured results are displayed on four separate screens.

Frequency accuracy, EVM-RMS, EVM-Peak, Phase error-RMS, Amplitude error-RMS, Origin offset, Carrier leak, Spectrum flatness (at burst signal), TX-power, Carrier off power (at burst signal), On/Off ratio (at burst signal), Burst signal rising/falling time (at burst signal), Occupied bandwidth, Adjacent channel power, Spectrum mask, Spurious (Two tables can be chosen)





Specified values are obtained after warming up the equipment for 30 minutes at a constant ambient temperature and then performing calibration.

Guaranteed specifications after Adjust Range and Level Calibration keys pressed.

Pre-amp On can be set when MS2681A-08 and MS2683A-08 are installed in the main frame.

IQ-input can be set when MS2681A-17/18, MS2683A-17/18 and MS2687B-18 are installed in the main frame.

## • IEEE802.11a, IEEE802.11g (ERP-OFDM, DSSS-OFDM), HiSWANa<sup>(\*1)</sup>, HiperLAN2<sup>(\*2)</sup> 1/3

|                        | Model  | MX268132A  | MX268332A   | MX268732A   |  |  |
|------------------------|--|--|---|---|--|--|
| Modulation typ         | e  | OFDM-64QAM, OFDM-16QAM, OFDM-  | QPSK,OFDM-BPSK  | 1   |  |  |
| Data rate              |  | [IEEE802.11a, IEEE802.11g (ERP-OFDM, DSSS-OFDM)]:<br>54, 48, 36, 24, 18, 12, 9, 6 Mbps, Auto (at burst signal only)<br>[HiSWANa]: 54, 36, 27, 18, 12, 9, 6 Mbps, Auto (at burst signal only)<br>[Hispert AN2]: 54, 36, 27, 18, 12, 9, 6 Mbps |   |   |  |  |
|                        | Measurement items                            | Frequency (carrier frequency, carrier fre<br>RMS),OFDM-spectrum (carrier leak, spe   | quency error), Modulation Characteristic (<br>ectrum flatness)  | EVM-RMS, EVM-Peak, phase error-   |  |  |
|                        | Frequency range                              | 100 MHz to 3 GHz   | [IEEE802.11a, HiSWANa, HiperLAN2]:<br>100 MHz to 6 GHz,<br>100 MHz to 3 GHz (pre-amp On)<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]: 100 MHz to 3 GHz  | [IEEE802.11a, HiSWANa, HiperLAN2]:<br>100 MHz to 6 GHz<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]:<br>100 MHz to 3 GHz |  |  |
|                        | Measurement<br>frequency intake<br>range     | [IEEE802.11a, HiSWANa, HiperLAN2]<br>Temperature: +18° to +35 °C,<br>setting frequency: ±120 kHz (3 to 6 GH<br>[IEEE802.11g (ERP-OFDM, DSSS-OFD<br>Temperature: +18° to +35 °C, setting fr   | [IEEE802.11a, HiSWANa, HiperLAN2]<br>Temperature: +18° to +35 °C,<br>setting frequency: ±120 kHz (3 to 6 GHz, MS2681A is object outside.), ±80 kHz (100 MHz to 3 GHz)<br>[IEEE802.11g (ERP-OFDM, DSSS-OFDM)]<br>Temperature: +18° to +35 °C, setting frequency: ±80 kHz |   |  |  |
|                        | Measurement level<br>range                   | -26 to +26 dBm, -46 to +26 dBm (pre-   | amp On)   | -26 to +24 dBm  |  |  |
| Modulation<br>analysis | Carrier frequency<br>accuracy                | [IEEE802.11a, HiSWANa, HiperLAN2]<br>Frequency: 2 to 2.5 GHz<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]<br>Frequency: 2.4 to 2.5 GHz  | [IEEE802.11a, HiSWANa, HiperLAN2]<br>Frequency: 4.9 to 6 GHz<br>[IEEE802.11g (ERP-OFDM, DSSS-OFDM)]<br>Frequency: 2.4 to 2.5 GHz  |   |  |  |
|                        |  | Input level: –10 dBm, Averaging 30 times, Temperature: +18° to +35 °C,<br>± (reference frequency accuracy x setting frequency + 500 Hz)  |   |   |  |  |
|                        | Modulation<br>accuracy                       | [IEEE802.11a, HiSWANa, HiperLAN2]<br>Frequency: 2 to 2.5 GHz<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]<br>Frequency: 2.4 to 2.5 GHz  | [IEEE802.11a, HiSWANa, HiperLAN2]<br>Frequency: 4.9 to 6 GHz<br>[IEEE802.11g (ERP-OFDM, DSSS-OFD<br>Frequency: 2.4 to 2.5 GHz   | M)]   |  |  |
|                        |  | Input level: -10 dBm, Averaging 30 times, Temperature: +18° to +35 °C<br>1.5%rms (typ.)  |   |   |  |  |
|                        | Analysis length                              | Setting range: 1 to 1367 OFDM symbol<br>Setting resolution: 1 OFDM symbol<br>Setting method: Manual setting, Auto setting (at burst signal only. When "Data rate" is set to "Auto." HiperLAN2 is not<br>supported.)                          |   |   |  |  |
|                        | Analysis Start<br>Position<br>(HiSWANa only) | Setting range: 1 to [1367 – ("Analysis length" setting value) + 1] OFDM symbol<br>Setting resolution: 1 OFDM symbol  |   |   |  |  |
|                        | Storage mode                                 | Normal: Refresh waveform/data for each measurement.<br>Average: Data display averages the result for the designated number of measurements.<br>Averaging count: 2 to 999. Waveform displays are same as "Normal" mode.                       |   |   |  |  |
| RF power               | Measurement<br>frequency range               | 100 MHz to 3 GHz   | [IEE802.11a, HiSWANa, HiperLAN2]:<br>100 MHz to 6 GHz,<br>100 MHz to 3 GHz (pre-amp On)<br>[IEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]: 100 MHz to 3 GHz  | [IEEE802.11a, HiSWANa, HiperLAN2]:<br>100 MHz to 6 GHz<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]:<br>100 MHz to 3 GHz |  |  |
|                        | Measurement level<br>range                   | -26 to +26 dBm, -46 to +26 dBm (pre-a  | amp On)   | -26 to +24 dBm  |  |  |
|                        | Measurement items*3                          | Average power, Maximum power, Carrie   | er off power (at burst signal), Burst on/off r  | atio (at burst signal)  |  |  |

## • IEEE802.11a, IEEE802.11g (ERP-OFDM, DSSS-OFDM), HiSWANa<sup>(\*1)</sup>, HiperLAN2<sup>(\*2)</sup> 2/3

| Model                                   |                                      | MX269122A  | MY269222A  | MY269722A  |  |  |  |
|---|--------------------------------------|--|--|--|--|--|--|
|   |                                      | IVIA200132A  |  | WIA200732A   |  |  |  |
|   | Burst average<br>power accuracy      | [IEEE802.11a, HiSWANa, HiperLAN2]<br>Frequency: 2 to 2.5 GHz<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]<br>Frequency: 2.4 to 2.5 GHz<br>Averaging 30 times<br>≤±1.7 dB (Input level: −18 to 0 dBm)<br>≤±2.0 dB (pre-amp On, Input level:<br>−38 to 0 dBm)   | [IEEE002.113, HISWANA, HIPELAN2]<br>Frequency: 4.9 to 6 GHz,<br>Input level: $-18$ to 0 dBm,<br>Averaging 30 times<br>$\leq \pm 2.7$ dB<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]<br>Frequency: 2.4 to 2.5 GHz,<br>Input level: $-18$ to 0 dBm,<br>-38 to 0 dBm (pre-amp On),<br>Averaging 30 times<br>$\leq \pm 1.7$ dB,<br>$\leq \pm 2.0$ dB (pre-amp On)                                    | [IEEE802.11a, HiSWANa, HiperLAN2]<br>Frequency: 4.9 to 6 GHz,<br>Input level:–26 to 0 dBm,<br>Averaging 30 times<br>≤±2.9 dB<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]<br>Frequency: 2.4 to 2.5 GHz,<br>Input level: –26 to 0 dBm,<br>Averaging 30 times<br>≤±1.9 dB |  |  |  |
| RF power                                | Burst rising detection method        | Selects from (1) and (2).<br>(1) The rising edge is detected from cha<br>(2) The rising edge is detected from a p  | Selects from (1) and (2).<br>(1) The rising edge is detected from change of a signal level.<br>(2) The rising edge is detected from a preamble signal. (Preamble Search)   |  |  |  |  |
|   | Burst signal length detection method | Selects from (1) and (2).<br>(1) Input data length<br>(2) The falling edge is detected from change of a signal level. (Ramp-down Detection)  |  |  |  |  |  |
|   | Analysis length                      | Setting range: 1 to 1367 OFDM symbol (DSSS-OFDM: 1 to 1300 OFDM symbol)<br>Setting resolution: 1 OFDM symbol<br>Setting method: Manual setting, Auto setting (at burst signal only.)   |  |  |  |  |  |
|   | Storage mode                         | Normal: Refresh waveform/data for each measurement.<br>Average: Data display averages the result for the designated number of measurements.<br>Averaging count: 2 to 999. Waveform display is same as "Normal" mode.<br>Overwrite: Waveform is overwritten without erasing previous waveform. Data display is same as "Normal" mode. |  |  |  |  |  |
|   | Frequency range                      | 100 MHz to 3 GHz   | [IEEE802.11a, HISWANa, HiperLAN2]:<br>100 MHz to 6 GHz,<br>100 MHz to 3 GHz (pre-amp On)<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]: 100 MHz to 3 GHz   | [IEEE802.11a, HISWANa, HiperLAN2]:<br>100 MHz to 6 GHz<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]:<br>100 MHz to 3 GHz  |  |  |  |
| frequency                               | Reference level<br>range             | -26 to +26 dBm, -46 to +26 dBm (pre-amp On) -26 to +24 dBm   |  |  |  |  |  |
| Danuwiuti                               | Measurement<br>method                | BW (99%): 99% of the total radiation power is defined as the contained frequency width.  |  |  |  |  |  |
|   | Storage mode                         | Normal: Displays the measured result value and waveform after every measurement.<br>Average: Data display averages the result for the designated number of measurements.<br>Averaging count: 2 to 999. Waveform display is same as "Normal" mode.  |  |  |  |  |  |
|   | Target system                        | IEEE802.11a, HiSWANa, HiperLAN2  |  |  |  |  |  |
|   | Frequency range                      | 100 MHz to 3 GHz   | 100 MHz to 6 GHz,<br>100 MHz to 3 GHz (pre-amp On)   | 100 MHz to 6 GHz   |  |  |  |
|   | Reference level<br>range             | -16 to +26 dBm, -36 to +26 dBm (pre-   | amp On)  | -16 to +24 dBm   |  |  |  |
| Adjacent<br>channel<br>leakage<br>power | Measurement<br>method                | Sweep method (All):<br>After measuring the signal range include<br>analyzer performs calculation of adjace<br>Sweep method (Separate):<br>After measuring adjacent channel and<br>performs calculation and displays the lit  | Sweep method (All):<br>After measuring the signal range including upper/lower second adjacent channels at a time with the sweep type spectru<br>analyzer performs calculation of adjacent/second adjacent channels and displays the result.<br>Sweep method (Separate):<br>After measuring adjacent channel and the channel next to the adjacent channel with the sweep type spectrum analyzer |  |  |  |  |
|   | Storage mode                         | Normal: Refresh waveform/data for eac<br>Average: Displays the measured result<br>Averaging count: 2 to 999. Wa  | h measurement.<br>value averaged for the designated numbe<br>aveform display is same as "Normal" mode  | r of measurements.   |  |  |  |

| Model                |                          | MX268132A  | MX268332A   | MX268732A   |  |  |  |
|----------------------|--------------------------|--|---|---|--|--|--|
|                      | Frequency range          | 100 MHz to 3 GHz   | [IEEE802.11a, HiSWANa, HiperLAN2]:<br>100 MHz to 6 GHz,<br>100 MHz to 3 GHz (pre-amp On)<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]: 100 MHz to 3 GHz          | [IEEE802.11a, HiSWANa, HiperLAN2]:<br>100 MHz to 6 GHz<br>[IEEE802.11g (ERP-OFDM,<br>DSSS-OFDM)]:<br>100 MHz to 3 GHz |  |  |  |
| Spectrum<br>mask     | Reference level<br>range | -16 to +26 dBm, -36 to +26 dBm (pre-   | amp On)   | -16 to +24 dBm  |  |  |  |
|                      | Template                 | Corresponds to the spectrum mask defi<br>Arbitrary spectrum mask is also availab   | Corresponds to the spectrum mask defined in IEEE std 802.11a-1999 17.3.9.2 and IEEE std 802.11g-2003 19.5.4/19.7.2 Arbitrary spectrum mask is also available. |   |  |  |  |
|                      | Storage mode             | Normal: Refresh waveform/data for each measurement.<br>Average: Displays the measured result value averaged for the designated number of measurements.<br>Averaging count: 2 to 999. Waveform display is same as "Normal" mode.  |   |   |  |  |  |
|                      | Frequency range          | 9 kHz to 3 GHz   | 9 kHz to 7.8 GHz  | 9 kHz to 30 GHz   |  |  |  |
|                      | Reference level<br>range | -6 to +26 dBm  | -6 to +24 dBm   |   |  |  |  |
| Spurious             | Measurement<br>method    | Sweep method:<br>Detects and displays the peak value after sweeping the designated frequency range with the spectrum analyzer.<br>Calculates and displays the ratio to the transmitted power value (power ratio). Detection mode is Positive Peak.<br>Spot method:<br>Displays the average value after measuring the designated frequency in time domain of the spectrum analyzer.<br>Calculates and displays the ratio to the transmitted power value (power ratio). Detection mode is Sample.<br>Search method:<br>Measures the frequency in time domain and displays the average value after sweeping the designated frequency range<br>with the spectrum analyzer and detecting the peak value. Calculates and displays the ratio to the transmitted power value<br>(power ratio). Detection mode is Sample. |   |   |  |  |  |
|                      | Storage mode             | Normal: Refresh waveform/data for each measurement.<br>Average: Displays the measured result value averaged for the designated number of measurements.<br>Averaging count: 2 to 999. Waveform display is same as "Normal" mode.  |   |   |  |  |  |
| Batch<br>measurement | Measurement<br>items     | Frequency accuracy, EVM-RMS, EVM-Peak, Phase error-RMS, Carrier leak, Spectrum flatness (at burst signal), TX-power,<br>Carrier off power (at burst signal), On/Off ratio (at burst signal), Occupied frequency bandwidth, Adjacent channel leakage<br>power, Spectrum mask, Spurious (Two tables can be chosen)<br>* "Adjacent channel leakage power" can be measured complying with "IEEE802.11a, HiSWANa, HiperLAN2."   |   |   |  |  |  |
|                      | Judgement                | According to the judgment value set per measurement item, PASS or FAIL judgment is automatically performed for each measurement item.  |   |   |  |  |  |

## • IEEE802.11a, IEEE802.11g (ERP-OFDM, DSSS-OFDM), HiSWANa<sup>(\*1)</sup>, HiperLAN2<sup>(\*2)</sup> 3/3

\*1: HiSWANa measurement function cannot carry out the following measurement.

1) Measurement for every MAC frame

Measurement of a signal whose cyclic prefix duration is not 800 ns
 Measurement of a continuous signal whose modulation type is not constant.

\*2: HiperLAN2 measurement function cannot carry out the following measurement.

The same measurement as '\*1'.
 Measurement of a burst signal whose modulation type on payload is not constant.

3) Measurement of power time mask.

\*3: When burst interval is 20 µs or less, the Wireless LAN software cannot measure the following item rightly:

1) Carrier off power, 2) On/Off ratio

## • IEEE802.11b, IEEE802.11g (ERP-DSSS/CCK) 1/2

| Model   |  | MX268132A   | MX268332A  | MX268732A  |  |  |  |  |
|---|--|---|--|--|--|--|--|--|
| Modulation typ  | e  | CCK, DQPSK, DBPSK   |  |  |  |  |  |  |
| Data rate   |  | 11, 5.5, 2, 1 Mbps, Auto (automatic recognition at burst signal only)   |  |  |  |  |  |  |
| Filter  |  | No Filter<br>Gaussian BT = 0.3 to 1.0 (setting resolution: 0.1)<br>Rectangular<br>Root Raised Cosine $\alpha = 0.30$ to 1.00 (setting resolution: 0.01)   |  |  |  |  |  |  |
|   | Measurement items                        | Frequency (Carrier frequency, Carrier fr<br>RMS, Amplitude error-RMS, Origin offse  | equency error), Modulation Characteristic  | (EVM-RMS, EVM-Peak, Phase error-                           |  |  |  |  |
|   | Frequency range                          | 00 MHz to 3 GHz   |  |  |  |  |  |  |
|   | Measurement<br>frequency intake<br>range | Temperature: +18° to +35 °C, setting fre  | emperature: +18° to +35 °C, setting frequency ±80 kHz  |  |  |  |  |  |
|   | Measurement level<br>range               | -26 to +26 dBm, -46 to +26 dBm (pre-a   | amp On)  | -26 to +24 dBm   |  |  |  |  |
| Modulation<br>analysis  | Carrier frequency<br>accuracy            | Frequency: 2.4 to 2.5 GHz, Input level:<br>± (reference frequency accuracy x setting  | <ul> <li>–10 dBm, Averaging: 30 times, Temperatung frequency + 200 Hz)</li> </ul>  | ıre: +18° to +35 °C  |  |  |  |  |
|   | Modulation<br>accuracy                   | Frequency: 2.4 to 2.5 GHz, Input level: 2.3%rms (typ.)  | -10 dBm, Averaging: 30 times, Temperatu  | ıre: +18° to +35 °C  |  |  |  |  |
|   | Analysis length                          | Setting range: 256 to 4096 chip<br>Setting resolution: 1 chip<br>Setting method: Manual setting, Auto setting (at burst signal only. When "Data rate" is set as "Auto.")  |  |  |  |  |  |  |
|   | Storage mode                             | Normal: Refresh waveform/data for each measurement.<br>Average: Displays the measured result value averaged for the designated number of measurements.<br>Averaging count: 2 to 999. Waveform display is same as "Normal" mode. |  |  |  |  |  |  |
|   | Frequency range                          | 100 MHz to 3 GHz  |  |  |  |  |  |  |
|   | Measurement level<br>range               | -26 to +26 dBm, -46 to +26 dBm (pre-amp On) -26 to +24 dBm  |  |  |  |  |  |  |
|   | Measurement items*1                      | Average power, Maximum power, Carrier off power (at burst signal), Burst on/off ratio (at burst signal), Burst rising/falling time (at burst signal)  |  |  |  |  |  |  |
|   | Burst average                            | Frequency: 2.4 to 2.5 GHz, Averaging 3 $\leq \pm 1.7$ dB (Input level: -18 to 0 dBm),   | 0 times  | Frequency: 2.4 to 2.5 GHz,<br>Input level: -26 to 0 dBm,   |  |  |  |  |
|   |  | ≤±2.0 dB (Input level: -38 to 0 dBm, pre  | e-amp On)  | Averaging 30 times, ≤±1.9 dB                               |  |  |  |  |
| RF power  | Burst rising detection method            | <ul> <li>(1) The rising edge is detected from change of a signal level.</li> <li>(2) The rising edge is detected from a preamble signal. (Preamble Search)</li> </ul>   |  |  |  |  |  |  |
|   | Burst signal length detection method     | Selects from (1) and (2).<br>(1) Input data length<br>(2) The falling edge is detected from change of a signal level. (Ramp-down Detection)   |  |  |  |  |  |  |
|   | Analysis length                          | Setting resolution: 1 chip<br>Setting method: Manual setting, Auto setting (at burst signal only.)  |  |  |  |  |  |  |
| Storage mode         Normal: Refresh waveform/data for each measurement.<br>Average: Displays the measured result value averaged for the designated number of measurements.<br>Averaging count: 2 to 999. Waveform display is same as "Normal" mode.           Overwrite: Waveform is overwritten without erasing previous waveform. Data display is same as "Normal" |  |   |  | r of measurements.<br>e.<br>vlay is same as "Normal" mode. |  |  |  |  |
|   | Frequency range                          | 100 MHz to 3 GHz  | ·  |  |  |  |  |  |
|   | Reference level<br>range                 | -26 to +26 dBm, -46 to +26 dBm (pre-a   | amp On)  | -26 to +24 dBm   |  |  |  |  |
| Occupied<br>frequency<br>bandwidth  | Measurement<br>method                    | BW (99%): 99% of the total radiation pc<br>BW (90%): Frequency bandwidth contai<br>TELEC's Technical Regulation   | wer is defined as the contained frequency<br>ining 90% of the total radiation power. This<br>ons Conformity Certification. | / width.<br>s value is called "spreading bandwidth" in     |  |  |  |  |
|   | Storage mode                             | Normal: Refresh waveform/data for eac<br>Average: Displays the measured result<br>Averaging count: 2 to 999. Wa   | h measurement.<br>value averaged for the designated numbe<br>weform display is same as "Normal" mode                       | r of measurements.<br>9.                                   |  |  |  |  |

## • IEEE802.11b, IEEE802.11g (ERP-DSSS/CCK) 2/2

| Model                |                          | MX268132A  | MX268332A        | MX268732A       |  |  |
|----------------------|--------------------------|--|------------------|-----------------|--|--|
| Spectrum<br>mask     | Frequency range          | 100 MHz to 3 GHz   |                  |                 |  |  |
|                      | Reference level<br>range | -16 to +26 dBm, -36 to +26 dBm (pre-amp On)  |                  | -16 to +24 dBm  |  |  |
|                      | Template                 | Corresponds to the spectrum mask defined in IEEE std 802.11b-1999 18.4.7.3 and IEEE std 802.11g-2003 19.5.4/19.7.2. Arbitrary spectrum mask is also available.   |                  |                 |  |  |
|                      | Storage mode             | Normal: Refresh waveform/data for each measurement.<br>Average: Displays the measured result value averaged for the designated number of measurements.<br>Averaging count: 2 to 999. Waveform display is same as "Normal" mode.  |                  |                 |  |  |
| Spurious             | Frequency range          | 9 kHz to 3 GHz   | 9 kHz to 7.8 GHz | 9 kHz to 30 GHz |  |  |
|                      | Reference level<br>range | -6 to +26 dBm  |                  | -6 to +24 dBm   |  |  |
|                      | Measurement<br>method    | Sweep method:<br>Detects and displays the peak value after sweeping the designated frequency range with the spectrum analyzer.<br>Calculates and displays the ratio to the transmitted power value (power ratio). Detection mode is Positive Peak.<br>Spot method:<br>Displays the average value after measuring the designated frequency in time domain of the spectrum analyzer.<br>Calculates and displays the ratio to the transmitted power value (power ratio). Detection mode is Sample.<br>Search method:<br>Measures the frequency in time domain and displays the average value after sweeping the designated frequency range<br>with the spectrum analyzer and detecting the peak value. Calculates and displays the ratio to the transmitted power value<br>(power ratio). Detection mode is Sample. |                  |                 |  |  |
|                      | Storage mode             | Normal: Refresh waveform/data for each measurement.<br>Average: Displays the measured result value averaged for the designated number of measurements.<br>Averaging count: 2 to 999. Waveform display is same as "Normal" mode.  |                  |                 |  |  |
| Batch<br>measurement | Measurement items        | Frequency accuracy, EVM-RMS, EVM-Peak, Phase error-RMS, Amplitude error-RMS, Origin offset, TX-power, Carrier off power (at burst signal), On/Off ratio (at burst signal), Burst signal rising/falling time (at burst signal), Occupied frequency bandwidth, Spectrum mask, Spurious (Two tables can be chosen)  |                  |                 |  |  |
|                      | Judgement                | According to the judgment value set per measurement item, PASS or FAIL judgment is automatically performed for each measurement item.  |                  |                 |  |  |

\*1: When burst interval is 20 µs or less, the Wireless LAN software cannot measure the following item rightly:
1) Carrier off power, 2) On/Off ratio and 3) Burst rising/falling time.

## • Electric performance (IQ input)

| Model   | MX268132A  | MX268332A   | MX268732A   |  |  |
|---|--|---|---|--|--|
| Input impedance 1 M $\Omega$ (parallel capacitance <100 pF), 50 $\Omega$  |  |   |   |  |  |
| Balance input   | With MS2681A-17/MS2683A-17<br>Differential voltage: 0.1 to 1 Vp-p (input terminals)  |   | _   |  |  |
|   | In-phase voltage: ±2.5 V (input terminal   |   |   |  |  |
| Unbalance input   | With MS2681A-18/MS2683A-18<br>0.1 to 1 Vp-p (input terminals)<br>DC/AC coupling Changeable   |   | With MS2687B-18<br>0.1 to 1 Vp-p (input terminals)<br>DC/AC coupling Changeable |  |  |
| Measurement items   | [IEEE802.11a, IEEE802.11g (ERP-OFD<br>Modulation accuracy/frequency, RF po<br>[IEEE802.11b, IEEE802.11g (ERP-DSS<br>Modulation accuracy/frequency, RF po | M, DSSS-OFDM), HiSWANa, HiperLAN2]:<br>wer, Batch measurement, IQ level<br>S/CCK)]:<br>wer, Batch measurement, IQ level |   |  |  |
| I/Q level measurement   | Measures input level of I and Q (rms, p-p)   |   |   |  |  |
| IQ phase difference measurement When the CW signal is inputted to I and Q input terminals, measures and displays the phase difference between I-pha<br>and Q-phase signals. |  |   |   |  |  |

# **Ordering Information**

Please specify the model/order number, name, and quantity when ordering.

| Model  | Name   | Remarks  |
|--|--|--|
| MX268101B<br>MX268301B<br>MX268701B  | <ul> <li>Main frame –</li> <li>W-CDMA Measurement Software</li> <li>W-CDMA Measurement Software</li> <li>W-CDMA Measurement Software</li> </ul>  | For MS2681A<br>For MS2683A<br>For MS2687B  |
| MX268102A  | GSM Measurement Software   | For MS2681A  |
| MX268302A  | GSM Measurement Software   | For MS2683A  |
| MX268702A  | GSM Measurement Software   | For MS2687B  |
| MX268103A  | cdma Measurement Software  | For MS2681A  |
| MX268303A  | cdma Measurement Software  | For MS2683A  |
| MX268703A  | cdma Measurement Software  | For MS2687B  |
| MX268104A  | 1xEV-DO Measurement Software   | For MS2681A  |
| MX268304A  | 1xEV-DO Measurement Software   | For MS2683A  |
| MX268704A  | 1xEV-DO Measurement Software   | For MS2687B  |
| MX268105A  | $\pi$ /4DQPSK Measurement Software   | For MS2681A  |
| MX268305A  | $\pi$ /4DQPSK Measurement Software   | For MS2683A  |
| MX268705A  | $\pi$ /4DQPSK Measurement Software   | For MS2687B  |
| MX268130A  | Wireless LAN Measurement Software  | For MS2681A  |
| MX268330A  | Wireless LAN Measurement Software  | For MS2683A  |
| MX268730A  | Wireless LAN Measurement Software  | For MS2687B  |
| MX268132A  | Wireless LAN Measurement Software Limited Version  | For MS2681A  |
| MX268332A  | Wireless LAN Measurement Software Limited Version  | For MS2683A  |
| MX268732A  | Wireless LAN Measurement Software Limited Version  | For MS2687B  |
| W1746AE<br>W1854AE<br>W1865AE<br>W2090AE<br>W1866AE<br>W2080AE<br>W2137AE<br>JT32MA3-NT1 | - Standard accessories -<br>W-CDMA operation manual<br>MX268102A/302A/702A operation manual<br>MX860x03A/MX268x03A operation manual<br>MX860x04A/MX268x04A operation manual<br>MX860x05A/MX268x05A operation manual<br>MX268*30A/MX860*30A operation manual<br>MX268*32A/MX860*32A operation manual<br>PC ATA Card (32 MB, for backup) | For MX268101B/268301B/268701B<br>For MX268102A/268302A/268702A<br>For MX268103A/268303A/268703A<br>For MX268104A/268304A/268704A<br>For MX268150A/268330A/268730A<br>For MX268132A/268332A/268732A |

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