MX860832A/MX860932A

Wireless LAN Measurement Software Limited Version

(For MS8608A/MS8609A Digital Mobile Radio Transmitter Tester)

For Evaluation of Wireless LAN Equipment and Devices

For evaluation of Wireless LAN equipment and Devices

Compatible with IEEE802.11a/b/g, HiperLAN2, HiSWANa

– From Development and Production to Construction and Maintenance –

The MS860832A/MS860932A Wireless LAN Measurement Software limited version is application software used by the MS8608A/MS8609A Digital Mobile Radio Transmitter Tester. 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.

Measurement 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
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.

```
<< Setup Common Parameter (WLAN) >>                          Setup
                                                           Parameter
   Input                                                      →
     Terminal                    : [RF       ]             Batch
                                                           Measure
     Reference Level             : [  -6.00dBm]
     Offset Level                : [   0.00dB]               →
   Frequency                                               Modulation
     Carrier Frequency           : [ 5230.000000MHz]       Analysis
   Signal                                                    →
     Target System               : [IEEE802.11a]
     Measuring Object            : [Burst    ]             RF
     Data Rate                   : [54Mbps  ]             Power
     Modulation                  : [OFDM-64QAM ]
                                                             →
   Trigger                       : [Free Run]             Occupied
                                                          Bandwidth

                                                          Adjacent
                                                          Channel
                                                          Power

                                                          Spectrum
   System : IEEE802.11a  Freq   :  5230.000000MHz         Mask
   Rate   : 54Mbps       Level  :  -6.00dBm
   Mod    : OFDM-64QAM   Offset :   0.00dB    Correction : Off  1 2
```

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 Analysis (WLAN) >>    Measure  : Single     Modulation
                                    Storage  : Normal      Analysis
                                    Trace    : No Trace      ‡
                                                           Trace
   Frequency                                               Format
     Carrier Frequency     :  5 230.000 005 7 MHz
     Carrier Frequency Error :          5.7 Hz     0.001 ppm   ※
                                                           Storage
   Modulation                                              Mode
     EVM (RMS)             :       1.31 %    -37.65 dB
     EVM (Peak)            :       5.54 %                    ※
     Phase Error (RMS)     :       0.75 deg.               Signal
                                                           Setup
   Spectrum
     Carrier Leak          :     -31.10 dB
     Flatness (Outside) Max. :     0.18 dB  (Subcarrier:  26)  Flatness
                        Min. :    -0.22 dB  (Subcarrier: -26)  Measurement
             (Inside)   Max. :     0.12 dB  (Subcarrier:  16)  On  Off
                        Min. :    -0.13 dB  (Subcarrier: -16)

                                                           Adjust
                                                           Range

                                                           Back
   System : IEEE802.11a  Freq   :  5230.000000MHz          Screen
   Rate   : Auto         Level  :  -6.00dBm
   Mod    : Auto         Offset :   0.00dB    Correction : Off  1 2
```

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.

```
<< Occupied Bandwidth (WLAN) >>   Measure  : Single      Occupied
                                  Storage  : Normal       Bandwidth
[dB]
                                   OCC BW (99%)  :    15.60 MHz
   0
                                   Upper Limit   :     7.80 MHz     ※
  -10                                                             Storage
                                   Lower Limit   :    -7.80 MHz     Mode
  -20
                                   Center (Upper+Lower)/2 :
  -30                                              2412.000 MHz

  -40                               OCC BW (90%)  :    10.20 MHz     ※

  -50                                                           Calibration
                                    Spectrum Analyzer
  -60                                  Ref  :   -4.00dBm#
                                       ATT  :     26dB          Adjust
                                       RBW  :    300kHz#        Range
  -70                                  VBW  :    300kHz#
   Span :  60.0MHz Data Points : 1001  SWT  :    500ms#          →
                                       DET  : Positive Peak     Back
   System : IEEE802.11b  Freq   :  2412.000000MHz              Screen
   Rate   : 11Mbps       Level  :  -4.00dBm    Pre Ampl  : On
   Mod    : CCK-11Mbps   Offset :   0.00dB     Correction : Off  1 2
```
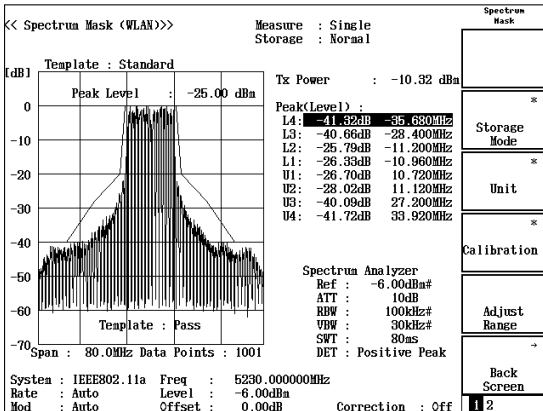
Adjacent Channel Power

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

```
<< Adjacent Channel Power (WLAN)>>                          Storage Mode
                                   Storage  : Average (  3/  3)    ‡
[dB]  TELEC  : Indoor             Method   : Spectrum(All)    Storage
                                                             Mode
  -10
                                                               ‡
  -30                                                        Average
                                                             Count
  -50
                                                             Refresh
                                                             Interval
       Span : 100MHz Data Points : 1001                      Every Once


   Tx Power :  -11.03 dBm
                                    Spectrum Analyzer
   ACLR                                 Ref  :    4.00dBm#
     -40.0 MHz : -51.54 dBm             ATT  :     20dB
     -20.0 MHz : -41.83 dBm             RBW  :    300kHz#
      20.0 MHz : -42.10 dBm             VBW  :    300kHz#
      40.0 MHz : -51.27 dBm             SWT  :     10ms#
                                        DET  : Positive Peak    return
   System : IEEE802.11a  Freq   :  5230.000000MHz
   Rate   : Auto         Level  :  -6.00dBm
   Mod    : Auto         Offset :   0.00dB    Correction : Off  1
```

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.

```
<< Spectrum Mask (WLAN)>>        Measure : Single        Spectrum
                                 Storage : Normal         Mask

    Template : Standard
[dB]
      Peak Level       :    -25.00 dBm        Tx Power        :  -10.32 dBm
  0                                           Peak(Level) :                          *
                                                 L4: -41.32dB  -35.680MHz        Storage
 -10                                             L3: -40.66dB  -28.400MHz          Mode
                                                 L2: -25.79dB  -11.200MHz
                                                 L1: -26.33dB  -10.960MHz              *
 -20                                             U1: -26.70dB   10.720MHz
                                                 U2: -23.02dB   11.120MHz          Unit
                                                 U3: -40.09dB   27.200MHz
 -30                                             U4: -41.72dB   33.920MHz
                                                                                      *
 -40                                                                           Calibration

 -50                                          Spectrum Analyzer
                                                 Ref  :   -6.00dBm#
 -60                                             ATT  :   10dB
              Template : Pass                    RBW  :  100kHz#               Adjust
                                                 VBW  :   30kHz#               Range
 -70                                             SWT  :   80ms
    Span :  80.0MHz Data Points : 1001           DET  : Positive Peak               →

 System : IEEE802.11a  Freq  :  5230.000000MHz                                  Back
 Rate   : Auto         Level :    -6.00dBm                                      Screen
 Mod    : Auto         Offset :    0.00dB       Correction : Off               █2
```

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.

```
<< Spurious Emission (WLAN) >>       Storage  : Normal          Spurious
                                     Spurious : Sweep           Emission
                                     Detect   : Positive Peak        *

                                                                  Spurious
   Tx Power                 :    -10.32 dBm                         Mode

                                                                      *
          Frequency            Level      Judgement    Limit      Storage
 f 1 =  5 130.240 000 MHz:   0.000 µW/M PASS      2.50  µW/M       Mode
 f 2 =  5 146.272 000 MHz:   0.000 µW/M PASS     15.0  µW/M
 f 3 =  5 250.616 000 MHz:   0.000 µW/M PASS     15.0  µW/M           $
 f 4 =  5 260.028 000 MHz:   0.000 µW/M PASS      0.200 µW/M       View
 f 5 = ————————— MHz: ——————— µW/M ————  ——————— µW/M           Select
 f 6 = ————————— MHz: ——————— µW/M ————  ——————— µW/M          Judgement
 f 7 = ————————— MHz: ——————— µW/M ————  ——————— µW/M
 f 8 = ————————— MHz: ——————— µW/M ————  ——————— µW/M               *
 f 9 = ————————— MHz: ——————— µW/M ————  ——————— µW/M
 f10 = ————————— MHz: ——————— µW/M ————  ——————— µW/M          Calibration
 f11 = ————————— MHz: ——————— µW/M ————  ——————— µW/M
 f12 = ————————— MHz: ——————— µW/M ————  ——————— µW/M
 f13 = ————————— MHz: ——————— µW/M ————  ——————— µW/M          Adjust
 f14 = ————————— MHz: ——————— µW/M ————  ——————— µW/M          Range
 f15 = ————————— MHz: ——————— µW/M ————  ——————— µW/M

                    Total Judgement : PASS                          →

 System : IEEE802.11a  Freq  :  5230.000000MHz                 Back
 Rate   : Auto         Level :    -6.00dBm                     Screen
 Mod    : Auto         Offset :    0.00dB      Correction : Off  █2 3
```

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)

```
<< Batch Measure (WLAN) >>                                    Batch
                                                             Measure
 Modulation Analysis       : PASS
   Frequency Error         :    -125.9 Hz     (200000.0 Hz)   Measure
   EVM(RMS)                :   -37.96 dB    ( -16.00 dB)       Start
     (Peak)                :     4.53 %     (——————— %)
   Phase Error             :     0.70 deg.  ( 179.86 deg.)       →
   Carrier Leak            :   -30.44 dB    ( -15.00 dB)      Setup
   Flatness(Outside)       : -0.04 dB  -0.13 dB ( -4.00,  2.00)  Measure
        (Inside)           :  0.04 dB  -0.04 dB ( -2.00,  2.00)  Table

 RF Power                  : PASS                                $
   TX Power                :   -12.26 dBm   ( -15.00,  -8.00)  View
   Carrier Off Power       :    55.87 nW    (——————— mW)      Select
   On/Off Ratio            :    30.27 dB    (——————— dB)      Page 1

 Occupied Bandwidth        : PASS                                *
   Occupied Bandwidth(99%) :    16.64 MHz   (  18.00 MHz)    Calibration

 Adjacent Channel Power    : PASS
   20MHz(Lower & Upper)    : -35.14 dB  -35.25 dB ( -25.00 dB)
   40MHz(Lower & Upper)    : -44.37 dB  -44.51 dB ( -40.00 dB)  Adjust
                                                               Range
 Spectrum Mask             : PASS
                                                                  →
            Total Judgement : PASS                           Back
 System : IEEE802.11a  Freq  :  5230.000000MHz               Screen
 Rate   : Auto         Level :    -6.00dBm                    █2
 Mod    : Auto         Offset :    0.00dB    Correction : Off
```

```
<< Batch Measure (WLAN) >>                                    Batch
                                                             Measure

 Spurious Emission 1        : PASS      )                    Measure
  (5G Data Comm:Spurious                                      Start

  f 1 =  3 236.984 340 MHz :   0.000 µW/M   (  2.50  µW/M)      →
  f 2 =  5 091.928 840 MHz :   0.000 µW/M   ( 15.0   µW/M)    Setup
  f 3 =  5 281.593 860 MHz :   0.000 µW/M   ( 15.0   µW/M)    Measure
  f 4 =  7 744.154 240 MHz :   0.000 µW/M   (  0.200 µW/M)    Table
  f 5 = 11 757.926 500 MHz :   0.000 µW/M   (  0.000 µW/M)       $
  f 6 = 14 841.154 500 MHz :   0.000 µW/M   (  0.000 µW/M)    View
  f 7 = 16 244.813 840 MHz :   0.000 µW/M   (  0.000 µW/M)    Select
  f 8 = ————————— MHz : ——————— µW/M   (——————— µW/M)        Page 2
  f 9 = ————————— MHz : ——————— µW/M   (——————— µW/M)           *
  f10 = ————————— MHz : ——————— µW/M   (——————— µW/M)
  f11 = ————————— MHz : ——————— µW/M   (——————— µW/M)        Calibration
  f12 = ————————— MHz : ——————— µW/M   (——————— µW/M)
  f13 = ————————— MHz : ——————— µW/M   (——————— µW/M)
  f14 = ————————— MHz : ——————— µW/M   (——————— µW/M)        Adjust
  f15 = ————————— MHz : ——————— µW/M   (——————— µW/M)        Range

                                                                  →
            Total Judgement : PASS                           Back
                                                             Screen
 System : IEEE802.11a  Freq  :  5230.000000MHz               █2
 Rate   : Auto         Level :    -6.00dBm
 Mod    : Auto         Offset :    0.00dB    Correction : Off
```

Specifications

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 MS8608A-08 and MS8609A-08 are installed in the main frame.

● IEEE802.11a, IEEE802.11g (ERP-OFDM, DSSS-OFDM), HiSWANa(∗1), HiperLAN2(∗2)   1/3

Model	MX860832A	MX860932A
Modulation type	OFDM-64QAM, OFDM-16QAM, OFDM-QPSK,OFDM-BPSK	
Data rate	[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) [HiperLAN2] 54, 36, 27, 18, 12, 9, 6 Mbps	
Modulation analysis — Measurement items	Frequency (carrier frequency, carrier frequency error), Modulation characteristic (EVM-RMS, EVM-Peak, phase error-RMS), OFDM-spectrum (carrier leak, spectrum flatness)	
Modulation analysis — Frequency range	[IEEE802.11a, HiSWANa, HiperLAN2]: 100 MHz to 6 GHz, 100 MHz to 3 GHz (pre-amp On) [IEEE802.11g (ERP-OFDM, DSSS-OFDM)]: 100 MHz to 3 GHz	
Modulation analysis — Measurement frequency intake range	[IEEE802.11a, HiSWANa, HiperLAN2] Temperature: +18˚ to +35 ˚C, setting frequency: ±120 kHz (3 to 6 GHz), ±80 kHz (100 MHz to 3 GHz) [IEEE802.11g (ERP-OFDM, DSSS-OFDM)] Temperature: +18˚ to +35 ˚C, setting frequency: ±80 kHz	
Modulation analysis — Measurement level range	High Input: –6 to +38 dBm, –26 to +38 dBm (pre-amp On) Low Input: –26 to +18 dBm, –46 to +18 dBm (pre-amp On)	–26 to +18 dBm, –26 to +26 dBm (With Opt. 32), –46 to +18 dBm (pre-amp On)
Modulation analysis — Carrier frequency accuracy	[IEEE802.11a, HiSWANa, HiperLAN2]: Frequency: 4.9 to 6 GHz [IEEE802.11g (ERP-OFDM, DSSS-OFDM)]: Frequency: 2.4 to 2.5 GHz Input level: –10 dBm, (MS8608A: Low Input) Averaging 30 times, Temperature: +18˚ to +35 ˚C, ± (reference frequency accuracy x setting frequency + 500 Hz)	
Modulation analysis — Modulation accuracy	[IEEE802.11a, HiSWANa, HiperLAN2]: Frequency: 4.9 to 6 GHz [IEEE802.11g (ERP-OFDM, DSSS-OFDM)]: Frequency: 2.4 to 2.5 GHz Input level: –10 dBm (MS8608A: Low Input), Averaging 30 times, Temperature: +18˚ to +35 ˚C 1.5 %rms (typ.)	
Modulation analysis — Analysis length	Setting range: 1 to 1367OFDM symbol Setting resolution: 1OFDM symbol Setting method: Manual setting, Auto setting (at burst signal only. When "Data rate" is set to "Auto." HiperLAN2 is not supported.)	
Modulation analysis — Analysis start position (HiSWANa only)	Setting range: 1 to [1367 – ("Analysis length" setting value) + 1] OFDM symbol Setting resolution: 1 OFDM symbol	
Modulation analysis — Storage mode	Normal: Refresh waveform/data for each measurement. Average: Data display averages the result for the designated number of measurements. Averaging count: 2 to 999. Waveform display is same as "Normal" mode.	

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

	Model	MX860832A	MX860932A
RF power	Measurement frequency range	[IEEE802.11a, HiSWANa, HiperLAN2]: 100 MHz to 6 GHz, 100 MHz to 3 GHz (pre-amp On) [IEEE802.11g (ERP-OFDM, DSSS-OFDM)]: 100 MHz to 3 GHz	
	Measurement level range	High Input: –6 to +38 dBm, –26 to +38 dBm (pre-amp On) Low Input: –26 to +18 dBm, –46 to +18 dBm (pre-amp On)	–26 to +18 dBm, –26 to +26 dBm (With Opt. 32), –46 to +18 dBm (pre-amp On)
	Measurement items*3	Average power, Maximum Power, carrier off power (at burst signal), Burst on/off ratio (at burst signal)	

	Burst average power accuracy	(MS8608A: Low Input)
		[IEEE802.11a, HiSWANa, HiperLAN2]
		  Frequency: 4.9 to 6 GHz, Input level: –18 to 0 dBm, Averaging 30 times
		  ≤±2.7 dB
		[IEEE802.11g (ERP-OFDM, DSSS-OFDM)]
		  Frequency: 2.4 to 2.5 GHz, Input level: –18 to 0 dBm, –38 to 0 dBm (pre-amp On), Averaging 30 times
		  ≤±1.7 dB,
		  ≤±2.0 dB (pre-amp On)	

	Burst rising detection method	Selects from (1) and (2). (1) The rising edge is detected from change of a signal level. (2) The rising edge is detected from a preamble signal. (Preamble Search)	
	Burst signal length detection method	Selects from (1) and (2). (1) Input data length (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) Setting resolution: 1 OFDM symbol Setting method: Manual setting, Auto setting (at burst signal only.)	
	Storage mode	Normal: Refresh waveform/data for each measurement. Average: Data display averages the result for the designated number of measurements. 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" mode.	
Occupied frequency bandwidth	Frequency range	[IEEE802.11a, HiSWANa, HiperLAN2]: 100 MHz to 6 GHz, 100 MHz to 3 GHz (pre-amp On) [IEEE802.11g (ERP-OFDM, DSSS-OFDM)]: 100 MHz to 3 GHz	
	Reference level range	High Input: –6 to +38 dBm, –26 to +38 dBm (pre-amp On) Low Input: –26 to +18 dBm, –46 to +18 dBm (pre-amp On)	–26 to +18 dBm, –26 to +26 dBm (With Opt. 32), –46 to +18 dBm (pre-amp On)
	Measurement 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. Average: Displays the measured result value averaged for the designated number of measurements. Averaging count: 2 to 999. Waveform display is same as "Normal" mode.	
Adjacent channel leakage power	Target system	IEEE802.11a, HiSWANa, HiperLAN2	
	Frequency range	100 MHz to 6 GHz, 100 MHz to 3 GHz (pre-amp On)	
	Reference level range	High Input: +4 to +38 dBm, –16 to +38 dBm (pre-amp On) Low Input: –16 to +18 dBm, –36 to +18 dBm (pre-amp On)	–16 to +18 dBm, –16 to +26 dBm (With Opt. 32), –36 to +18 dBm (pre-amp On)

	Measurement method	Sweep method (All):
		  After measuring the signal range including upper/lower second adjacent channels at a time with the sweep type spectrum analyzer performs calculation of adjacent/second adjacent channels and displays the result.
		Sweep method (Separate):
		  After measuring adjacent channel and the channel next to the adjacent channel with the sweep type spectrum analyzer performs calculation and displays the result.	

	Storage mode	Normal: Refresh waveform/data for each measurement. Average: Displays the measured result value averaged for the designated number of measurements. Averaging count: 2 to 999. Waveform display is same as "Normal" mode.	

• IEEE802.11a, IEEE802.11g (ERP-OFDM, DSSS-OFDM), HiSWANa[*1], HiperLAN2[*2]   3/3

Model		MX860832A	MX860932A
Spectrum mask	Frequency range	[IEEE802.11a, HiSWANa, HiperLAN2]: 100 MHz to 6 GHz, 100 MHz to 3 GHz (pre-amp On) [IEEE802.11g (ERP-OFDM, DSSS-OFDM)]: 100 MHz to 3 GHz	
	Reference level range	High Input: +4 to +38 dBm, −16 to +38 dBm (pre-amp On) Low Input: −16 to +18 dBm, −36 to +18 dBm (pre-amp On)	−16 to +18 dBm, 0 to +26 dBm (With Opt. 32), −36 to +18 dBm (pre-amp On)
	Template	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. Average: Displays the measured result value averaged for the designated number of measurements. Averaging count: 2 to 999. Waveform display is same as "Normal" mode.	
Spurious	Frequency range	9 kHz to 7.8 GHz	9 kHz to 13.2 GHz
	Reference level range	High Input: +14 to +38 dBm Low Input: −6 to +18 dBm	−6 to +18 dBm, 0 to +26 dBm (With Opt. 32)

	Measurement method	Sweep method:
		    Detects and displays the peak value after sweeping the designated frequency range with the spectrum analyzer.
		    Calculates and displays the ratio to the transmitted power value (power ratio). Detection mode is Positive Peak.
		 Spot method:
		    Displays the average value after measuring the designated frequency in time domain of the spectrum analyzer.
		    Calculates and displays the ratio to the transmitted power value (power ratio). Detection mode is Sample.
		 Search method:
		    Measures the frequency in time domain and displays the average value after sweeping the designated frequency range
		    with the spectrum analyzer and detecting the peak value. Calculates and displays the ratio to the transmitted power
		    value (power ratio). Detection mode is Sample.	

	Storage mode	Normal: Refresh waveform/data for each measurement. Average: Displays the measured result value averaged for the designated number of measurements. Averaging count: 2 to 999. Waveform display is same as "Normal" mode.	
Batch measure- ment	Measurement items	Frequency accuracy, EVM-RMS, EVM-Peak, Phase error-RMS, Carrier leak, Spectrum flatness (at burst signal), TX-power, Carrier off power (at burst signal), On/Off ratio (at burst signal), Occupied frequency bandwidth, Adjacent channel leakage power, Spectrum mask, Spurious (Two tables can be chosen) ∗ "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.	

∗1: HiSWANa 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 modulation type is not constant.
∗2: HiperLAN2 cannot carry out the following measurement.
     1) The same measurement as '∗1'.
     2) 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		MX860832A	MX860932A
Modulation type		CCK, DQPSK, DBPSK	
Data rate		11, 5.5, 2, 1 Mbps, Auto (automatic recognition at burst signal only)	
Filter		No Filter Gaussian　BT = 0.3 to 1.0 (setting resolution: 0.1) Rectangular Root Raised Cosine　α = 0.30 to 1.00 (setting resolution: 0.01)	
Modulation analysis	Measurement items	Frequency (Carrier frequency, Carrier frequency error), Modulation Characteristic (EVM-RMS, EVM-Peak, Phase error-RMS, Amplitude error-RMS, Origin offset)	
	Frequency range	100 MHz to 3 GHz	
	Measurement frequency intake range	Temperature: +18˚ to +35 ˚C, setting frequency ±80 kHz	
	Reference level range	High Input: –6 to +38 dBm, –26 to +38 dBm (pre-amp On) Low Input: –26 to +18 dBm, –46 to +18 dBm (pre-amp On)	–26 to +18 dBm, –26 to +26 dBm (With Opt. 32), –46 to +18 dBm(pre-amp On)
	Carrier frequency accuracy	Frequency: 2.4 to 2.5 GHz, Input level: –10 dBm (MS8608A: Low Input), Averaging: 30 times, Temperature: +18˚ to +35 ˚C ± (reference frequency accuracy x setting frequency + 200 Hz)	
	Modulation accuracy	Frequency: 2.4 to 2.5 GHz, Input level: –10 dBm (MS8608A: Low Input), Averaging: 30 times, Temperature: +18˚ to +35 ˚C 2.3 %rms (typ.)	
	Analysis length	Setting range: 256 to 4096 chip Setting resolution: 1 chip Setting method: Manual setting, Auto setting (at burst signal only. When "Data rate" is set to "Auto.")	
	Storage mode	Normal: Refresh waveform/data for each measurement. Average: Displays the measured result value averaged for the designated number of measurements. 　　　　　Averaging count: 2 to 999. Waveform display is same as "Normal" mode.	
RF power	Frequency range	100 MHz to 3 GHz	
	Measurement level range	High Input: –6 to +38 dBm, –26 to +38 dBm (pre-amp On) Low Input: –26 to +18 dBm, –46 to +18 dBm (pre-amp On)	–26 to +18 dBm, –26 to +26 dBm (With Opt. 32), –46 to +18 dBm(pre-amp On)
	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 power accuracy	(MS8608A: Low input) Frequency: 2.4 to 2.5 GHz, Averaging 30 times ≤±1.7 dB (Input level: –18 to 0 dBm), ≤±2.0 dB (Input level: –38 to 0 dBm, pre-amp On)	
	Burst rising detection method	Selects from (1) and (2). (1) The rising edge is detected from change of a signal level. (2) The rising edge is detected from a preamble signal. (Preamble Search)	
	Burst signal length detection method	Selects from (1) and (2). (1) Input data length (2) The falling edge is detected from change of a signal level. (Ramp-down Detection)	
	Analysis length	Setting range: 256 to 4096 chip Setting resolution: 1 chip Setting method: Manual setting, Auto setting (at burst signal only.)	
	Storage mode	Normal: Refresh waveform/data for each measurement. Average: Displays the measured result value averaged for the designated number of measurements. 　　　　　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" mode.	
Occupied frequency bandwidth	Frequency range	100 MHz to 3 GHz	
	Reference level range	High Input: –6 to +38 dBm, –26 to +38 dBm (pre-amp On) Low Input: –26 to +18 dBm, –46 to +18 dBm (pre-amp On)	–26 to +18 dBm, –26 to +26 dBm (With Opt. 32), –46 to +18 dBm(pre-amp On)
	Measurement method	BW (99%): 99% of the total radiation power is defined as the contained frequency width. BW (90%) : Frequency bandwidth containing 90% of the total radiation power. This value is called "spreading bandwidth" 　　　　　　in TELEC's Technical Regulations Conformity Certification.	
	Storage mode	Normal: Refresh waveform/data for each measurement. Average: Displays the measured result value averaged for the designated number of measurements. 　　　　　Averaging count: 2 to 999. Waveform display is same as "Normal" mode.	

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

Model		MX860832A	MX860932A
Spectrum mask	Frequency range	100 MHz to 3 GHz	
	Reference level range	High Input: +4 to +38 dBm, −16 to +38 dBm (pre-amp On) Low Input: −16 to +18 dBm, −36 to +18 dBm (pre-amp On)	−16 to +18 dBm, 0 to +26 dBm (With Opt. 32), −36 to +18 dBm(pre-amp On)
	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. Average: Displays the measured result value averaged for the designated number of measurements. Averaging count: 2 to 999. Waveform display is same as "Normal" mode.	
Spurious	Frequency range	9 kHz to 7.8 GHz	9 kHz to 13.2 GHz
	Reference level range	High Input: +14 to +38 dBm Low Input: −6 to +18 dBm	−6 to +18 dBm, 0 to +26 dBm (With Opt. 32)

	Measurement method	Sweep method:
		  Detects and displays the peak value after sweeping the designated frequency range with the spectrum analyzer.
		  Calculates and displays the ratio to the transmitted power value (power ratio). Detection mode is Positive Peak.
		Spot method:
		  Displays the average value after measuring the designated frequency in time domain of the spectrum analyzer.
		  Calculates and displays the ratio to the transmitted power value (power ratio). Detection mode is Sample.
		Search method:
		  Measures the frequency in time domain and displays the average value after sweeping the designated frequency range with the spectrum analyzer and detecting the peak value. Calculates and displays the ratio to the transmitted power value (power ratio). Detection mode is Sample.	

	Storage mode	Normal: Refresh waveform/data for each measurement. Average: Displays the measured result value averaged for the designated number of measurements. Averaging count: 2 to 999. Waveform display is same as "Normal" mode.	
Batch 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	MX860832A	MX860932A
Input impedance	1 MΩ (parallel capacitance <100 pF), 50 Ω	
Balance input	Differential voltage: 0.1 to 1 Vp-p (input terminals) In-phase voltage: ±2.5 V (input terminals)	
Unbalance input	0.1 to 1 Vp-p (input terminals) DC/AC coupling Changeable	

Measurement items	[IEEE802.11a, IEEE802.11g (ERP-OFDM, DSSS-OFDM), HiSWANa, HiperLAN2]
	  Modulation accuracy/frequency, RF power, Batch measurement, IQ level,
	[IEEE802.11b, IEEE802.11g (ERP-DSSS/CCK)]
	  Modulation accuracy/frequency, RF power, 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-phase and Q-phase signals.	

Ordering Information

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

Model/Order No.	Name	
	Main frame	
MX860832A	Wireless LAN Measurement Software Limited Version (for MS8608A)	
MX860932A	Wireless LAN Measurement Software Limited Version (for MS8609A)	
	Standard accessories	
JT32MA3-NT1	PC-ATA card (32 MB, for backup):	1 pc
W2137AE	MX268X32A/MX860X32A Operation Manual:	1 copy

/Inritsu

Specifications are subject to change without notice.

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