

## MS8608A

### Digital Mobile Radio Transmitter Tester

9 kHz to 7.8 GHz



*Transmitter Tester for  
W-CDMA 3GPP  
Specification*

# Measures Wide-Band Signals up to IMT-2000 2 Mbit/s

The MS8608A is a transmitter tester equipped with an internal spectrum analyzer, a modulation analyzer and a power meter. One tester covers the development to manufacturing of base stations, mobile stations and devices.

The spectrum analyzer has resolution bandwidths up to 20 MHz, meaning that it can readily support measurement of a 2 Mbit/s (16 Mcps) wide-band signal for IMT-2000.

The modulation analyzer realizes all Vector Signal Analysis (VSA) functions through high-speed DSP processing.

The power sensor can perform highly accurate power measurements of  $\pm 0.4$  dB by using an amorphous power sensor.

Up to three dedicated measurement software options (such as W-CDMA and GSM/EDGE) can be installed simultaneously.

Input signals can be selected from either RF or I/Q inputs.

For I/Q signals, balanced or unbalanced input can also be selected.

It is equipped with GPIB, RS-232C and 10 Base-T (optional) interfaces for remote measurement. High-speed GPIB data transmission of 120 kbyte/s enables high-speed measurement on the manufacturing line. The monitor uses an easy-to-see 6.5 type TFT color LCD.



### MX860801B W-CDMA Measurement Software (sold separately)

#### Measurement functions

Modulation analysis: Carrier frequency, error vector modulation (EVM), phase error, magnitude error

Code domain analysis: Code domain power, code domain error, peak code domain error

Amplitude measurement: Transmitter power, transmitter power control

Adjacent channel power measurement

Occupied bandwidth measurement

I/Q level measurement

#### Performance

Modulation accuracy: Residual EVM (rms): 1% (typical)

Adjacent channel power measurement (filter method):

≥55 dBc (5 MHz offset), ≥62 dBc (10 MHz offset)

Adjacent channel power measurement (sweep method, typical):

68 dBc (5 MHz offset), 75 dBc (10 MHz offset)

### MX860802A GSM Measurement Software (sold separately)

#### Measurement functions

Modulation analysis:

Carrier frequency, phase error (RMS, PEAK), magnitude error

\* Filter complies with ETSI standards (for EDGE modulation analysis) selectable

Amplitude measurement: transmitter power

Measurement for rise/fall edge characteristics of the antenna power

Output RF spectrum measurement

Spurious measurement

I/Q level measurement

#### Performance

Modulation accuracy

Residual phase error: <0.5° (rms) [GMSK modulation]

Residual EVM: <1.0% (rms) [8PSK modulation]

Transmitter power: ±0.4 dB

### Spectrum Analyzer Functions

#### Frequency

Frequency range: 9 kHz to 7.8 GHz

Resolution bandwidth: 300 Hz to 3 MHz, 5 MHz, 10 MHz, 20 MHz (to 3 GHz)

Frequency span: Zero, 1 kHz to 7.8 GHz

Span accuracy: ±1%

Reference frequency accuracy: ±2 x 10<sup>-8</sup>/day, ±5 x 10<sup>-10</sup>/day (option)

#### Level

Maximum input level: +40 dBm (high-power input)

Input attenuator: 20 to 82 dB (high-power input, 2 dB steps)

1 dB gain compression: +3 dBm (≥500 MHz)

Two tone 3rd order distortion: ≤-85 dBc

#### Sweep

Frequency span: 10 ms to 1000 s

Time span: 1 μs to 1000 s

Refresh rate: >20 times/s

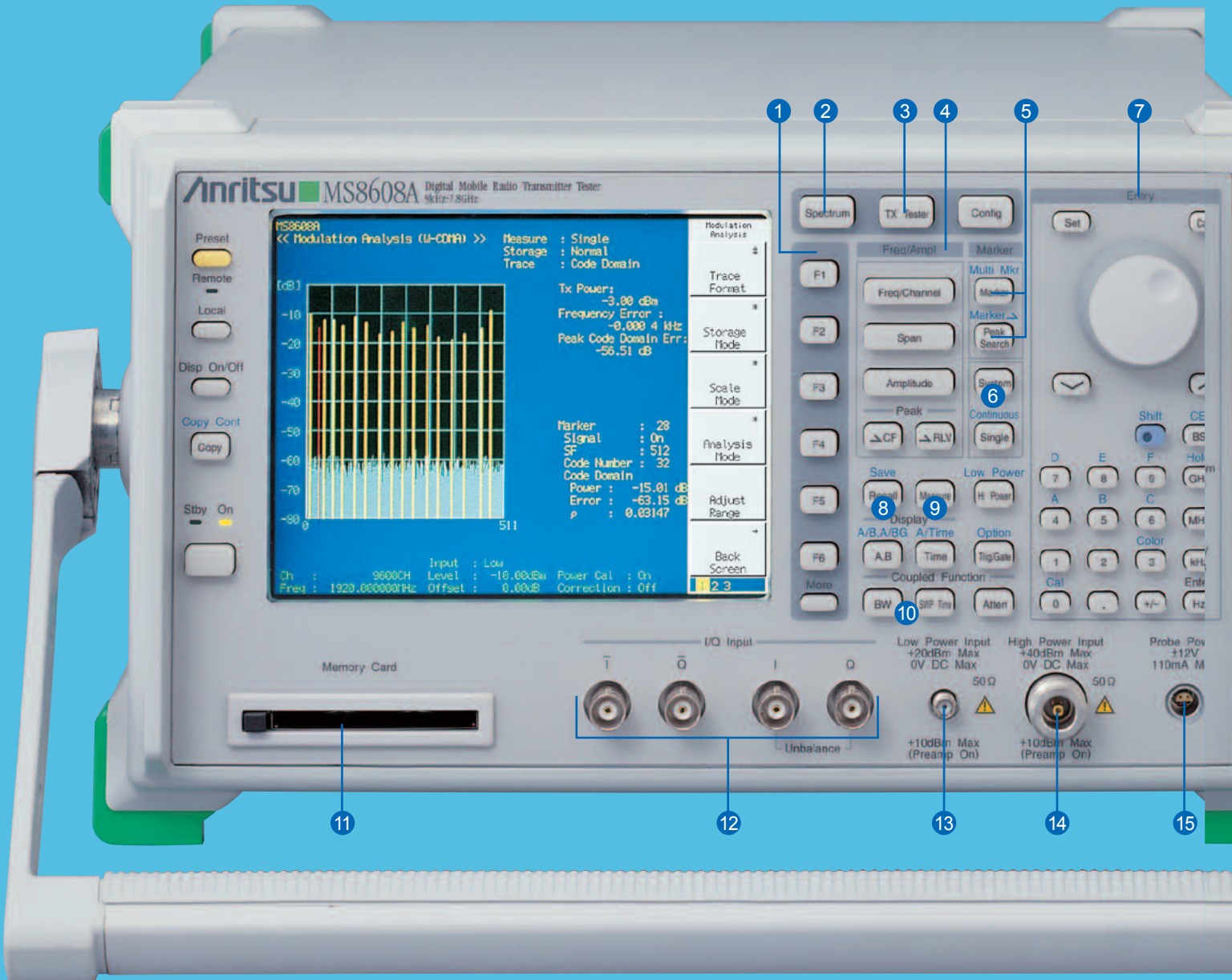
#### Others

Detection mode: Normal, positive, negative, sample, average, rms (option)

Measurement functions: Noise power, C/N, ACP, OBW, etc.

GPIO transmission speed: 120 kbyte/s

# Key Layout



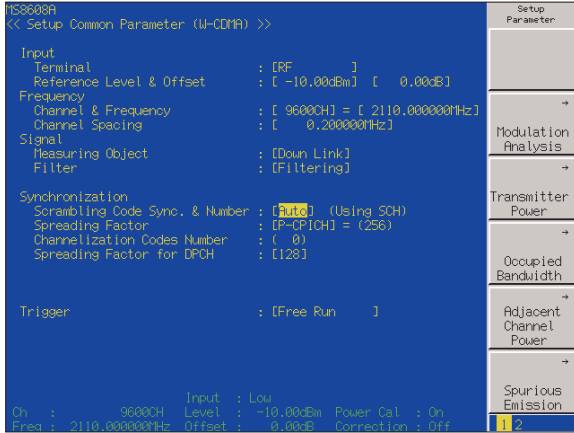
- ① **F1-F6:** Function keys F1 to F6 for selecting software menus on screen
- ② **Spectrum:** Switches to spectrum analyzer mode
- ③ **TX Tester:** Runs measurement software in transmitter test mode
- ④ **Freq/Ampl:** Main function for setting frequency, span and amplitude
- ⑤ **Marker:** Switches to normal marker as well as multimarker, zone marker, zone sweep, etc.
- ⑥ **System:** Used in transmitter test mode to select measurement software
- ⑦ **Entry:** Inputs alphanumeric values and units
- ⑧ **Save/Recall:** Saves/recalls measurement conditions and waveforms to/from internal memory and memory card
- ⑨ **Measure:** Executes calculations based on waveform data at high speed without external computer
- ⑩ **Coupled Function:** Sets non-main functions — Usually used at auto setting values
- ⑪ **Memory Card:** Slot for memory card for saving/recalling measured waveforms and measurement parameters
- ⑫ **I/Q Input:** Selects balanced or unbalanced input
- ⑬ **Low Power Input:** Input for signal with max. power of +20 dBm
- ⑭ **High Power Input:** Input for signal with max. power of +40 dBm
- ⑮ **Probe Power:** ±12 V power connector for FET probe
- ⑯ **IF Output:** Output for IF signal band-limited by RBW
- ⑰ **Wideband IF Output:** Output for IF signal before passage through RBW
- ⑱ **10 MHz/13 MHz Ref In:** 10/13 MHz external reference signal input
- ⑲ **10 MHz Ref Out:** 10 MHz external reference signal output
- ⑳ **Sweep (X):** Output for X-axis signal proportional to sweep output
- ㉑ **Video (Y):** Output for Y-axis signal proportional to video detection output
- ㉒ **SWP Status:** Sweep status signal output
- ㉓ **Trig/Gate In:** For inputting external trigger/gate signal (±10 V)
- ㉔ **Parallel:** Connector for printer
- ㉕ **VGA Out:** VGA signal output
- ㉖ **Ethernet:** For remote control via 10BASE-T Ethernet
- ㉗  **GPIB:** For remote control via GPIB
- ㉘ **RS-232C:** For remote control via RS-232C I/F



# W-CDMA Measurement Software

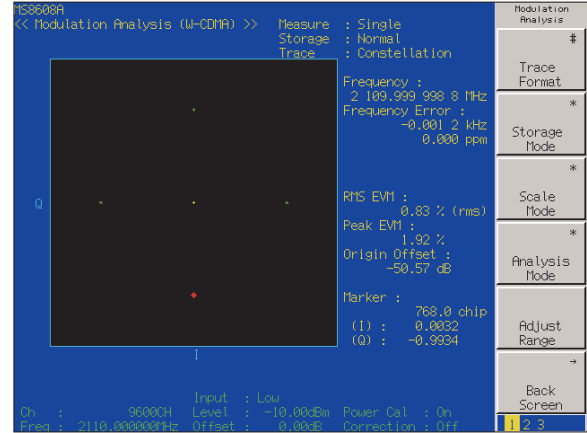
## Parameter Setup

The measurement parameters such as modulation accuracy and code domain power, etc. are set on the screen shown below. Measurement are simply performed via a soft-key menu after setting the measurement parameters.



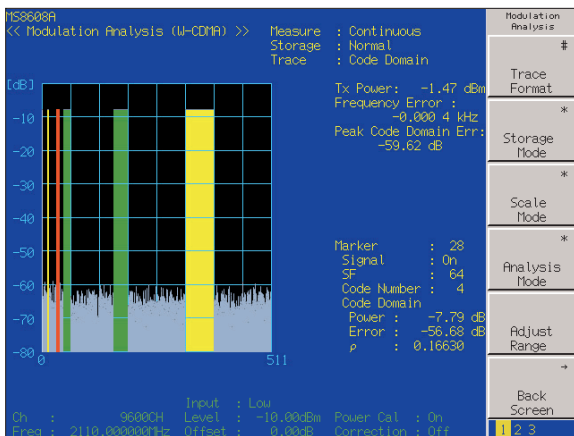
## Modulation Accuracy Measurement

The modulation accuracy of base station and mobile equipment can be measured and modulation analysis of multiple waveforms can be performed. The residual EVM (rms) accuracy is high (1%, typical).



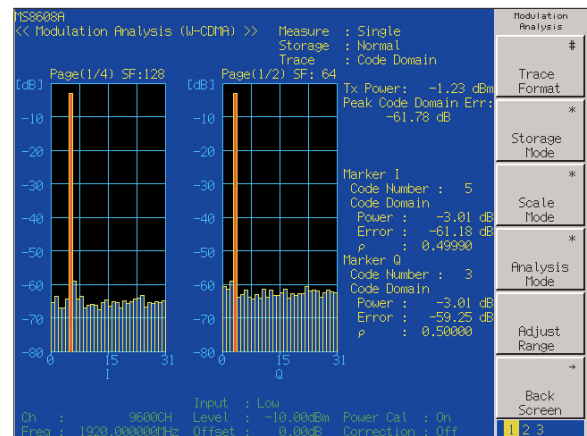
## Base Station Code Domain Power

Only 3 seconds are required for measurement. Either automatic detection of scrambling code from SCH, or specification of scrambling code can be selected.



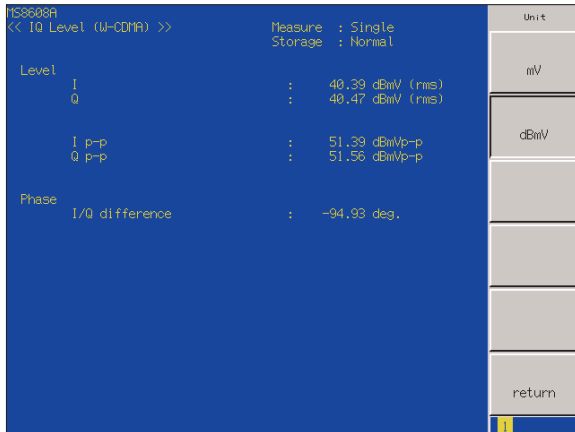
## Mobile Terminal Code Domain Power

Displays the code domain power measurement results of phase I and phase Q, separately. Either synchronization with DPCCCH or specification of spreading factor and code can be selected.



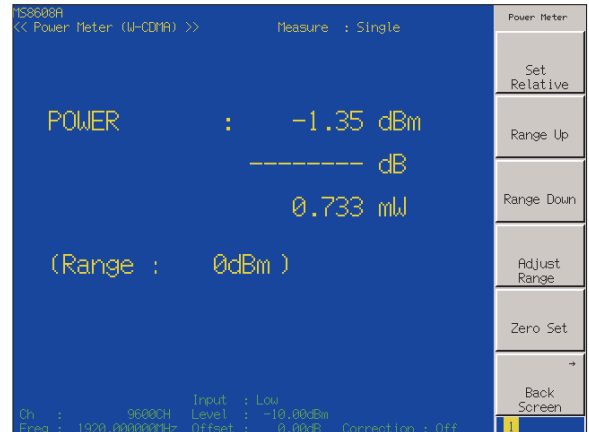
## I/Q Level Measurement

Measures and displays each I and Q input voltage (rms, p-p value). dBmV or mV units are selectable.



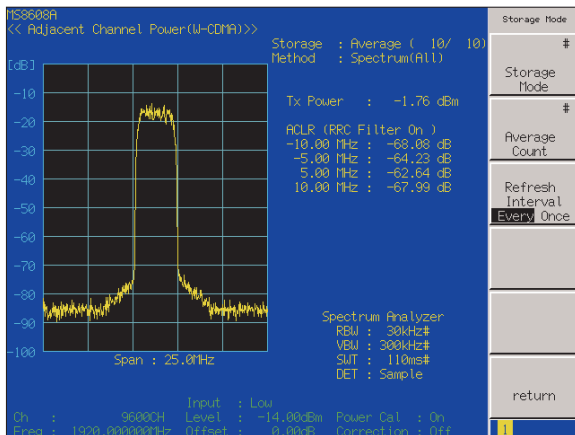
## Power Meter Function

The built-in power meter uses the amorphous power sensor and the measurement accuracy is very high ( $\pm 0.4$  dB).



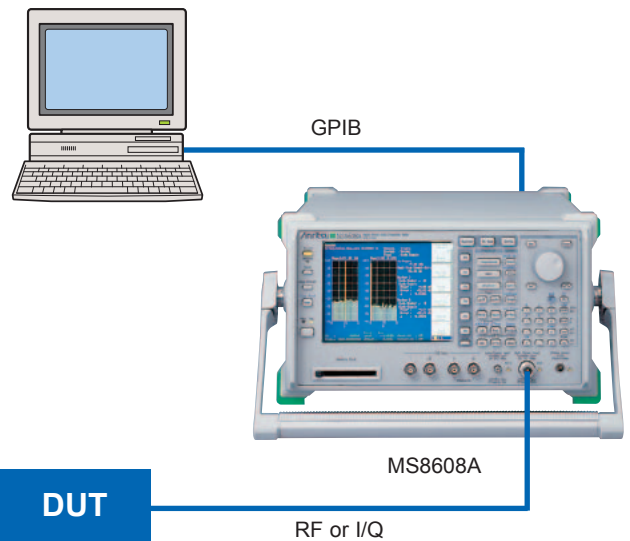
## Spectrum Analyzer Function

This analyzer has a wide dynamic range and various useful measurement functions.



## Demodulation Data Monitoring

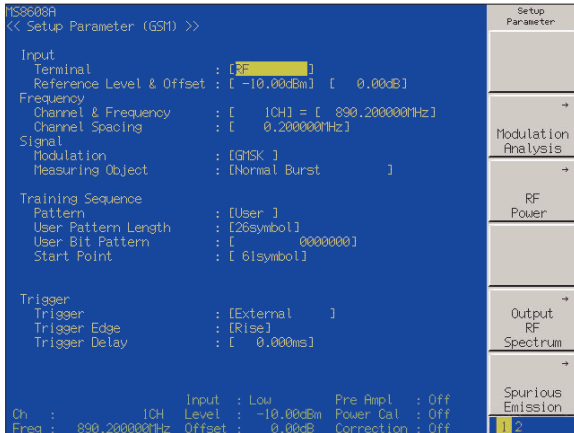
After de-spreading, up to 10 frames of I/Q data can be evaluated with external application software.



# GSM Measurement Software

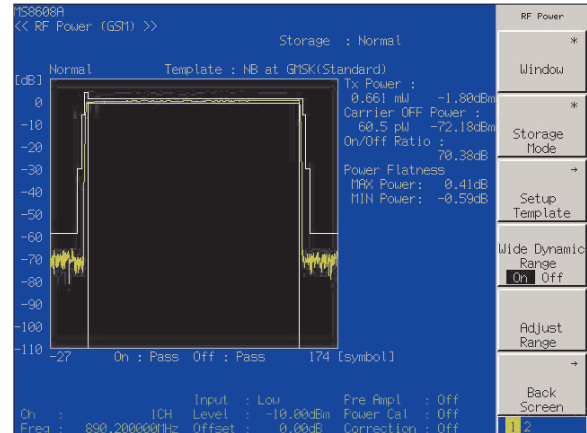
## Parameter Setup

The measurement parameters such as GMSK modulation of GSM and 8PSK modulation of EDGE are set on the screen shown below. Measurement are simply performed via a soft-key menu after setting the measurement parameters.



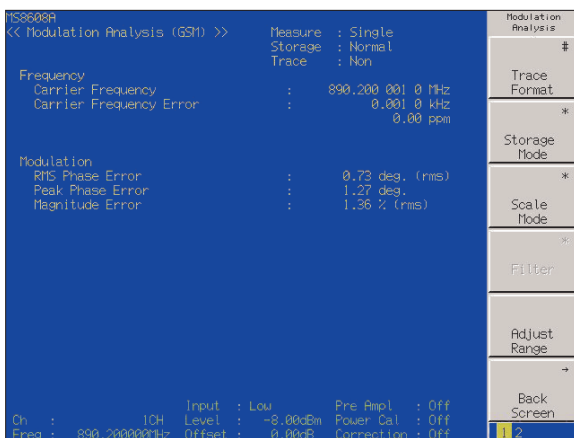
## Transmitter Power Measurement

The screen displays the amplitude waveforms with horizontal axis a symbol, vertical axis a level and the template simultaneously.



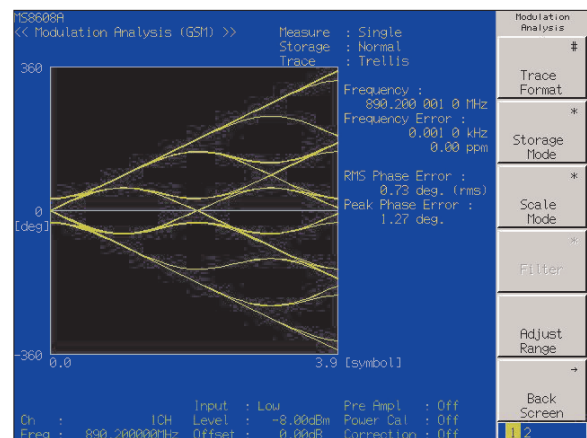
## Modulation Accuracy Measurement

The modulation accuracy is high. (The residual phase error of GMSK modulation: rms, <0.5° and residual EVM of 8PSK modulation: rms, <1.0%)



## Trellis Display Function

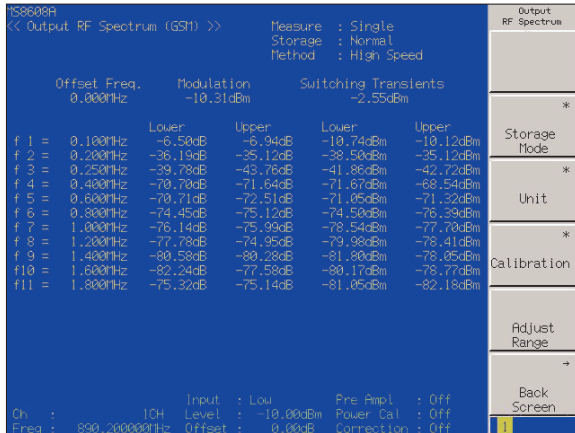
The screen displays the trellis and the modulation accuracy result simultaneously.





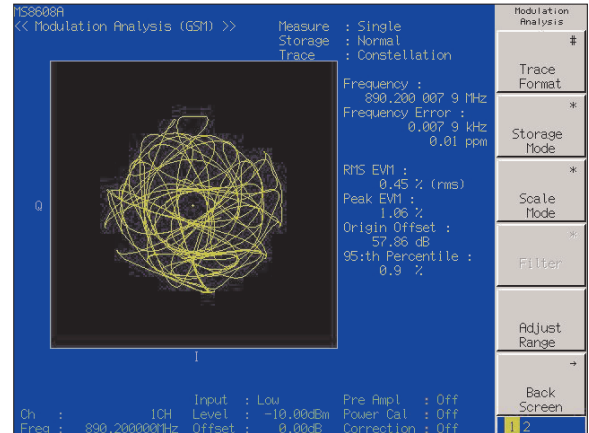
## Output RF Spectrum Measurement

The output RF spectrum measurement can be performed at high speed and simply.



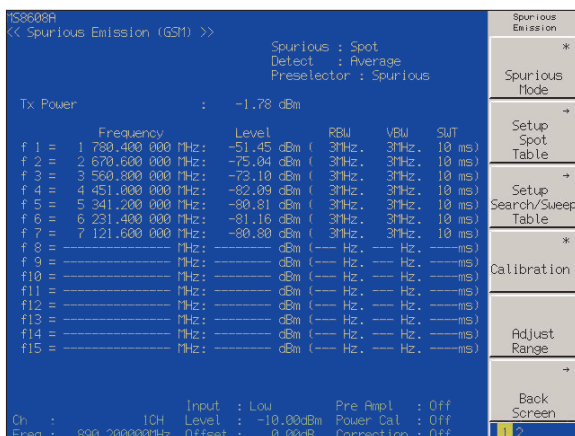
## EDGE Constellation Display

The following screen represents constellation display through the filter of the EDGE constellation display of the GSM standard.

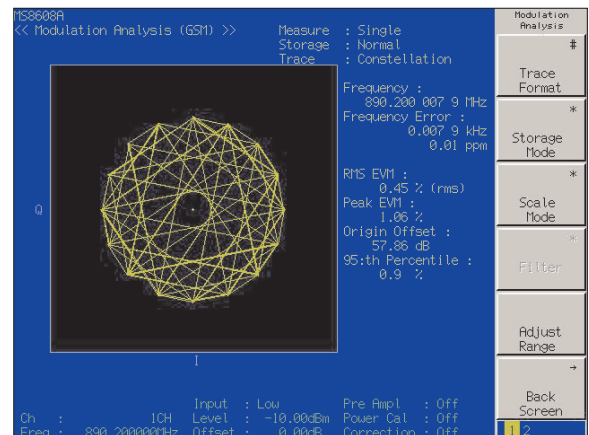


## Spurious Measurement

Spurious measurement has three kinds of method: Sweep, Search, and Spot. These can be selected depending on the usage.



The following screen represents constellation display of the 8PSK modulation through Nyquist filter and Gaussian inverse correction filter.



# Specifications

## ● MS8608A

Frequency range	9 kHz to 7.8 GHz, 9 kHz to 7.9 GHz (with option 35)
Max. input level	High-power input: +40 dBm (10 W), Low-power input: +20 dBm (100 mW)
Input impedance	High-power input 50 Ω, VSWR: ≤1.2 (≤3 GHz)/≤1.3 (>3 GHz) Low-power input Power meter: 50 Ω, VSWR: ≤1.3 (≤3 GHz) Except power meter: 50 Ω, VSWR: ≤1.5 (≤3 GHz)/≤2.0 (>3 GHz) *Input attenuator: ≥4 dB
Input connector	N-type (high-power input), SMA-type (low-power input), BNC-type (I/Q input)
I/Q input	Input: Balanced, unbalanced Input impedance: 1MΩ (parallel capacitance: <100 pF), 50 Ω Balanced input Differential Voltage: 0.1 to 1V(p-p), In-phase voltage ±2.5 V Unbalanced input: 0.1 to 1V(p-p), AC/DC switchable
Reference oscillator	Frequency: 10 MHz Starting characteristics: ≤5 × 10 <sup>-8</sup> (compared to frequency after 24 hour warm-up characteristics after 10 minute warm-up) Aging rate: ≤2 × 10 <sup>-8</sup> /day, ≤1 × 10 <sup>-7</sup> /year (compared to frequency after 24 hour warm-up) Temperature characteristics: ≤5 × 10 <sup>-8</sup> (0° to 50°C, compared to frequency at 25°C)
Power meter	Frequency range: 30 MHz to 3 GHz Level range: 0 to +40 dBm (high-power input), -20 to +20 dBm (low-power input) Measurement accuracy (after zero calibration): ±10%
Spectrum analyzer	Frequency
	Amplitude

Spectrum analyzer	Amplitude	<p>Reference level  Setting range: -80 to +50 dBm (high-power input), -100 to +30 dBm (low-power input)  Accuracy (high-power input, after calibration):  ±0.5 dB (-29.9 to +20 dBm), ±0.75 dB (-49.9 to -30 dBm, +20.1 to +40 dBm), ±1.5 dB (-60 to -50 dBm)  Accuracy (low-power input, after calibration):  ±0.5 dB (-49.9 to +0 dBm), ±0.75 dB (-69.9 to -50 dBm, +0.1 to +20 dBm), ±1.5 dB (-80 to -70 dBm)  *Frequency: 50 MHz, span: 1 MHz (Input attenuator, RBW, VBW and sweep time are set to AUTO.)  RBW switching uncertainty: ±0.3 dB (300 Hz to 5 MHz, referenced to RBW: 3 kHz)  Input attenuator: 20 to 82 dB (high-power input), 0 to 62 dB (low-power input), 2 dB steps  Frequency response: ±0.6 dB (9 kHz to 3.2 GHz, Band 0), ±1.0 dB (3.15 to 7.8 GHz, Band 1)  *Referenced to 50 MHz, input attenuator: 30 dB (high power input)/10 dB (low power input), 18° to 28°C  Log linearity: ±0.5 dB (0 to -20 dB, RBW: ≤1 kHz), ±1.0 dB (0 to -90 dB, RBW: ≤1 kHz)  2nd harmonic distortion:  ≤-60 dBc (10 to 200 MHz, Band 0, mixer input: -30 dBm)  ≤-75 dBc (200 to 850 MHz, Band 0, mixer input: -30 dBm)  ≤-70 dBc (0.85 to 1.6 GHz, Band 0, mixer input: -30 dBm)  ≤-90 dBc (1.6 to 3.9 GHz, Band 1, mixer input: -10 dBm)  Two tone 3rd order intermodulation distortion: ≤-70 dBc (10 to 100 MHz), ≤-85 dBc (0.1 to 7.8 GHz)  *Referenced to 50 MHz, input attenuator: 30 dB (high power input)/10 dB (low power input), 18° to 28°C  1 dB gain compression: ≥0 dBm (≥100 MHz), ≥+3 dBm (≥500 MHz)</p>
	Sweep	<p>Setting range: 10 ms to 1000 s (frequency axis sweep), 1 μs to 1000 s (time axis sweep)  Trigger switch: Free-run, triggered  Trigger source: Wide IF video, video, external (TTL level), external (±10 V), line  Trigger delay  Pre-trigger range: -time span to 0 s  Resolution: time span/500 or 100 ns whichever is larger.  Post trigger: 0 μs to 65.5 ms, Resolution: 100 ns (sweep time: ≤4.9 ms), 1 μs (sweep time: ≥5 ms)  Gate sweep mode  Gate delay range: 0 to 65.5 ms (resolution: 1 μs)  Gate length range: 2 μs to 65.5 ms (resolution: 1 μs)</p>
	Functions	<p>Number of data points: 501  Detection modes: Normal, Positive peak, Negative peak, Sample, Average, rms (option 04)  Display functions: Trace A, Trace B, Trace A/B, Trace A/BG, Trace A/Time  Storage functions: Normal, View, Max hold, Min hold, Average, Cumulative, Overwrite  Markers  Signal search: Auto tune, Peak → CF, Peak → Ref, Scroll  Zone markers: Normal, Delta  Marker function: Marker → CF, Marker → Ref, Marker → CF step size, Δ marker → Span, Zone → Span  Peak search: Peak, Next peak, Min dip, Next dip  Multi-marker: 10 max.  Measurements  Noise power: dBm/Hz, dBm/ch, dBμV/√Hz  C/N: dBc/Hz, dBc/CH  Occupied bandwidth: Power N% method, X-dB down method  Adjacent channel power  Reference measurement: Total power, reference level, in-band method  Display methods: Channel specified display (3 channels x 2), graphic display  Average power of burst signal: Average power within specified time range of time domain waveform  Template comparison measurement (time sweep): Upper limit x 2, lower limit x 2  Mask measurement (frequency sweep): Upper limit x 2, lower limit x 2</p>
Others	<p>Display: Color TFT-LCD, VGA 6.5 type  Hard copy: Hard copy of screen via parallel interface (ESC/P compatible printer)  Memory card interface: ATA Flash card (3.3/5 V)  GPIB:  Can be controlled from external controller (except power switch) when specified as device  Interface functions: SH1, AH1, T6, L4, SR1, RL1, PPO, DC1, DT1, C0, E2  Parallel interface: Centronics printer I/F, D-sub 25-pin connector (female)  Video output: Analog RGB output, D-sub 15-pin connector (female)</p>	
Dimensions and mass	320 (W) × 177 (H) × 411 (D) mm (except handle, feet, front cover and fan cover), ≤16 kg (nominal)	
Power	100 to 120/200 to 240 Vac (-15%/+10%, max. voltage: 250 V, automatic voltage selection), 47.5 to 63 Hz, ≤400 VA	
Operating temperature and humidity	0° to +50°C, ≤85% (no condensating)	
EMC	EN61326: 1997/A2: 2001 (Class A), EN61000-3-2: 2000 (Class A), EN61326: 1997/A2: 2001 (Annex A)	
LVD	EN61010-1: 2001 (Pollution Degree 2)	

## ● MX860801B W-CDMA Measurement Software

Guaranteed specifications after Adjust Range and Power Calibration keys pressed

Modulation/frequency measurement	<p>Frequency range: 50 MHz to 3 GHz, 50 MHz to 2.3 GHz (with option 08)            Input level: -40 to +40 dBm (average power, high-power input), -60 to +20 dBm (average power, low-power input), -80 to +10 dBm (average power, low-power input, pre-amplifier: on *1)            Carrier frequency accuracy: <math>\pm</math> (reference oscillator accuracy + 10 Hz)            *Input level: <math>\geq</math>-10 dBm (high-power input), <math>\geq</math>-30 dBm (low-power input), <math>\geq</math>-40 dBm (low-power input, pre-amplifier: on *1), at 1 code channel            Modulation accuracy (residual EVM): &lt;2% (rms)            *Input level: <math>\geq</math>-10 dBm (high-power input), <math>\geq</math>-30 dBm (low-power input), <math>\geq</math>-40 dBm (low-power input, pre-amplifier: on *1), at 1 code channel            Origin offset accuracy: <math>\pm</math>0.5 dB            *Input level: <math>\geq</math>-10 dBm (high-power input), <math>\geq</math>-30 dBm (low-power input), at 1 code channel, relative to signal with origin offset of -30 dBc            Waveform display (for 1 CH to multi-channel)            Constellation display, EVM vs. chip, amplitude error vs. chip, phase error vs. chip</p>
Code domain analysis	<p>Frequency range: 50 MHz to 3 GHz, 50 MHz to 2.3 GHz (with option 08)            Input level: -40 to +40 dBm (average power, high-power input), -60 to +20 dBm (average power, low-power input), -80 to +10 dBm (average power, low-power input, pre-amplifier: on *1)            Code domain power measurement accuracy:  <math>\pm</math>0.1 dB (code power: <math>\geq</math>-10 dBc), <math>\pm</math>0.3 dB (code power: <math>\geq</math>-25 dBc)            *Input level: <math>\geq</math>+10 dBm (high-power input), <math>\geq</math>-10 dBm (low-power input), <math>\geq</math>-20 dBm (pre-amplifier: on *1), the input signal does not have the origin offset            Code domain error measurement            Residual error: &lt;-50 dB, Measurement accuracy: <math>\pm</math>0.5 dB (at error of -30 dBc)            *Input level: <math>\geq</math>+10 dBm (high-power input), <math>\geq</math>-10 dBm (low-power input), <math>\geq</math>-20 dBm (pre-amplifier: on *1), the input signal does not have the origin offset, spread factor: 512 (down-link)/256 (up-link)            Display function: Code domain power, code domain error            Spread factor: 4 to 256 (up-link)/4 to 512 (down-link), I/Q separately displayed at up-link</p>
Amplitude measurement	<p>Frequency range: 50 MHz to 3 GHz, 50 MHz to 2.3 GHz (with option 08)            Input level: -40 to +40 dBm (average power, high-power input), -60 to +20 dBm (average power, low-power input), -80 to +10 dBm (average power, low-power input, pre-amplifier: on *1)            Transmitter power measurement            Measurement range: 0 to +40 dBm (average power, high-power input), -20 to +20 dBm (average power, low-power input), -20 to +10 dBm (average power, low-power input, pre-amplifier: on *1)            Accuracy: <math>\pm</math>0.4 dB (calibrated at internal power meter)            Power measurement linearity: <math>\pm</math>0.2 dB (0 to -40 dB)            *Input level: <math>\geq</math>+10 dBm (high-power input), <math>\geq</math>-10 dBm (low-power input), <math>\geq</math>-20 dBm (pre-amplifier: on *1), after the range adjusted, with the reference level setting unchanged            Filter selection function: Power measurement through RRC (<math>\alpha = 0.22</math>) filter            Transmitter power control measurement function: Relative power per slot, NO/GO evaluation</p>
Occupied bandwidth measurement	<p>Frequency range: 50 MHz to 3 GHz            Input level: -40 to +40 dBm (average power, high-power input), -60 to +20 dBm (average power, low-power input), -80 to +10 dBm (average power, low-power input, pre-amplifier: on *1)            Sweep mode: Displays result after signal measured with sweep spectrum analyzer            FFT mode: Displays result after FFT</p>
Adjacent channel power measurement	<p>Frequency range: 50 MHz to 3 GHz, 50 MHz to 2.3 GHz (with option 08)            Input level: +10 to +40 dBm (average power, high-power input), -10 to +20 dBm (average power, low-power input)            Sweep method (all): Calculates and displays result after signal measured with sweep spectrum analyzer            Sweep method (separate):            Calculates and displays power after each adjacent channel measured with sweep spectrum analyzer            Filter method:            Measures and displays power of adjacent channels after passing via built-in receiving filters (RRC: <math>\alpha = 0.22</math>)            Measurement range            Input level: +20 to +40 dBm (high-power input), 0 to +20 dBm (low-power input)  <math>\geq</math>55 dBc (5 MHz offset), <math>\geq</math>62 dBc (10 MHz offset)            *Filter method, wide dynamic range mode, 1 code channel  <math>\geq</math>50 dBc (5 MHz offset), <math>\geq</math>60 dBc (10 MHz offset) *At 16 multi-code channel            Input level: +10 to +40 dBm (high-power input), -10 to +20 dBm (low-power input)            55 dBc (5 MHz offset), 62 dBc (10 MHz offset)            *Filter method, wide dynamic range mode, 1 code channel (typical)            50 dBc (5 MHz offset), 60 dBc (10 MHz offset) *At 16 multi-code channel (typical)</p>

Spurious measurement	<p>Measurement frequency: 9 kHz to 7.8 GHz (except within carrier frequency <math>\pm 50</math> MHz)</p> <p>Input level (transmitter power):  +20 to +40 dBm (average power, high-power input), 0 to +20 dBm (average power, low-power input)</p> <p>Measurement method  [Sweep method]  Sweeps the specified range of frequency using the spectrum analyzer, and then detects and displays the peak value. Calculates the rate for transmission power value and displays it as power rate. Waveform detection mode: average  [Spot method]  Measures the specified frequency with time domain from the spectrum analyzer and then displays the average value. Calculates the rate for transmission power value and displays it as power rate. Waveform detection mode: average  [Search method]  Sweeps the specified frequency range using the spectrum analyzer to detect the peak value, then measures the frequency using the time domain to display the average value. Calculates the rate for transmission power value and displays it as power rate. Waveform detection mode: average</p> <p>Measurement range *2  [Carrier frequency: 1.8 to 2.2 GHz]  <math>\geq 79</math> dB (RBW: 1 kHz, 9 to 150 kHz, Band 0), <math>\geq 79</math> dB (RBW: 10 kHz, 150 kHz to 30 MHz, Band 0),  <math>\geq 79</math> dB (RBW: 100 kHz, 30 to 1000 MHz, Band 0)  [Normal mode]  <math>\geq 76 - f</math> [GHz] dB (RBW: 1 MHz, 1 to 3.15 GHz, Band 0), <math>\geq 76</math> dB (RBW: 1 MHz, 3.15 to 7.8 GHz, Band 1)  [Spurious mode (with option 03)]  <math>\geq 76</math> dB (RBW: 1 MHz, 1.6 to 7.8 GHz, Band 1)</p>
I/Q signal	<p>Input: Balanced, unbalanced  Input impedance: 1 M<math>\Omega</math> (parallel capacity: &lt;100 pF), 50 <math>\Omega</math>  Balanced input  Differential voltage: 0.1 to 1 V (p-p), In-phase voltage: <math>\pm 2.5</math> V  Unbalanced input: 0.1 to 1 V (p-p), AC/DC switchable  Measurement items:  Modulation accuracy, code domain power, amplitude, occupied bandwidth (FFT method), I/Q level  Residual vector error: &lt;2% (rms)  *Input level: <math>\geq 0.1</math> V (rms), DC coupling, the input signal does not have the origin offset  I/Q level measurement: Measures and displays each I, Q input voltage (rms, p-p)  I/Q phase difference measurement:  When the CW signal is inputted to I and Q input terminals, measures and displays the phase difference between I- and Q-phase signals.</p>

\*1: Can be set when MS8608A-08 option is installed in the main frame.

\*2: 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

## ● MX860802A GSM Measurement Software

Guaranteed specifications after Adjust Range and Power Calibration keys pressed

Modulation/frequency measurement	<p>Frequency range: 50 MHz to 2.7 GHz</p> <p>Input level:          -20 to +40 dBm (average power within burst, high-power input)          -40 to +20 dBm (average power within burst, low-power input)          -60 to +10 dBm (average power within burst, low-power input, pre-amplifier: on *1)</p> <p>Carrier frequency accuracy:  <math>\pm</math>(reference oscillator accuracy + 10 Hz)          *Input level (average power within burst: <math>\geq</math>-10 dBm (high-power input): <math>\geq</math>-30 dBm (low-power input), <math>\geq</math>-40 dBm (low-power input, pre-amplifier: on *1)</p> <p>Residual phase error (GMSK modulation):  <math>&lt;0.5^\circ</math> (rms), <math>&lt;2.0^\circ</math> (peak) *Input level (average power within burst): <math>\geq</math>-10 dBm (high-power input), <math>\geq</math>-30 dBm (low-power input), <math>\geq</math>-40 dBm (low-power input, pre-amplifier: on *1)</p> <p>Residual EVM (8PSK modulation): <math>&lt;1\%</math> (rms)</p> <p>Waveform display:          Trellis (GMSK modulation), eye pattern, EVM vs. bit (8PSK modulation), phase vs. bit, amplitude vs. symbol, I/Q diagram</p>
Amplitude measurement	<p>Frequency range: 50 MHz to 2.7 GHz</p> <p>Input level:          -20 to +40 dBm (average power within burst, high-power input)          -40 to +20 dBm (average power within burst, low-power input)          -60 to +10 dBm (average power within burst, low-power input, pre-amplifier: on *1)</p> <p>Transmitter power measurement (auto calibrated at internal power meter)</p> <p>Measurement range:          +10 to +40 dBm (average power within burst, high-power input)          -10 to +20 dBm (average power within burst, low-power input)          -10 to +10 dBm (average power within burst, low-power input, pre-amplifier: on *1)</p> <p>Accuracy: <math>\pm 0.4</math> dB</p> <p>Power measurement linearity:  <math>\pm 0.2</math> dB (0 to -30 dBm) *Input level (average power within burst): +10 dBm (high-power input), <math>\geq</math>-10 dBm (low-power input), <math>\geq</math>-20 dBm (low-power input, pre-amplifier: on *1), without changing the reference level setting after range optimization</p> <p>Carrier-off power measurement range          [Input level (average power within burst)]          +10 dBm (high-power input), <math>\geq</math>-10 dBm (low-power input), <math>\geq</math>-20 dBm (low-power input, pre-amplifier: on *1)          [Normal mode]  <math>\geq 60</math> dB (compared with average power within burst)          [Wide dynamic range mode]  <math>\geq 80</math> dB (high-power input: 1 W, compared with 10 mW of average power within burst, low-power input)          *Measurement limit is decided by average noise level (<math>\leq 50</math> dBm, 50 MHz to 2.7 GHz).</p> <p>Rise/fall characteristics:          Display rising/falling edges while synchronizing to modulation data of signal data to be measured. Standard line display possible (measured by 1 MHz bandwidth). NO/GO judgement function</p>
Output RF spectrum measurement	<p>Frequency range: 100 MHz to 2.7 GHz</p> <p>Input level:          +10 to +40 dBm (average power within burst, high-power input)          -10 to +20 dBm (average power within burst, low-power input)          -20 to +10 dBm (average power within burst, low-power input, pre-amplifier: on *1)</p> <p>Modulation portion measurement range:  <math>\geq 60</math> dB (<math>\geq 200</math> kHz offset), <math>\geq 68</math> dB (<math>\geq 250</math> kHz offset)          *CW signal, RBW: 30 kHz (<math>&lt;1.8</math> MHz offset), RBW: 100 kHz (<math>\geq 1.8</math> MHz offset)</p> <p>Transient portion measurement range: <math>\geq 63</math> dB (CW, <math>\geq 400</math> kHz offset)</p>
Spurious measurement	<p>Measurement frequency: 100 kHz to 7.8 GHz (except within carrier frequency <math>\pm 50</math> MHz)</p> <p>Input level (transmitter power):          +20 to +40 dBm (average power within burst, high-power input)          0 to +20 dBm (average power within burst, low-power input)</p> <p>Measurement method          [Sweep method]          Sweeps the specified range of frequency using the spectrum analyzer, and then detects and displays the peak value. Calculates the rate for transmission power value and displays it as power rate. Waveform detection mode: average          [Spot method]          Measures the specified frequency with time domain from the spectrum analyzer and then displays the average value. Calculates the rate for transmission power value and displays it as power rate. Waveform detection mode: average</p>

Spurious measurement	<p>[Search method] Sweeps the specified frequency range using the spectrum analyzer to detect the peak value, then measures the frequency using the time domain to display the average value. Calculates the rate for transmission power value and displays it as power rate. Waveform detection mode: average</p> <p>Measurement range [Carrier frequency: 0.8 to 1 GHz, 1.8 to 2 GHz] ≥72 dB (RBW: 10 kHz, 100 kHz to 50 MHz, Band 0), ≥72 dB (RBW: 100 kHz, 50 to 500 MHz, Band 0)</p> <p>[Normal mode] ≥66 -f [GHz] dB (RBW: 3 MHz, 0.5 to 3.15 GHz, Band 0, except harmonic frequency) ≥66 dB (RBW: 3 MHz, 3.15 to 7.8 GHz, Band 1)</p> <p>[Spurious mode (with option 03)] ≥66 dB (RBW: 3 MHz, 1.6 to 7.8 GHz, Band 1)</p>
I/Q signal	<p>Input: Balanced, unbalanced Input impedance: 1 MΩ (parallel capacity: &lt;100 pF), 50 Ω Balanced input Differential voltage: 0.1 to 1 V (p-p), In-phase voltage: ±2.5 V Unbalanced input: 0.1 to 1 V (p-p), AC/DC switchable Measurement items: Modulation accuracy, I/Q level Modulation accuracy Residual phase error: &lt;0.5° (rms), DC coupling Residual EVM: &lt;1.0% (rms), DC coupling *Input level: ≥0.1 V (rms), 18° to 28°C I/Q level measurement: Measures and displays each I, Q input voltage (rms, p-p) I/Q phase difference measurement: When the CW signal is inputted to I and Q input terminals, measures and displays the phase difference between I- and Q-phase signals.</p>

\*1: Can be set when MS8608A-08 option is installed in the main frame.

## Ordering Information

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

Model/Order No.	Name	Model/Order No.	Name
MS8608A	<b>Main frame</b> Digital Mobile Radio Transmitter Tester	MX860805A	π/4DQPSK Measurement Software
	<b>Standard accessories</b>	MX860820A	BER/BLER Measurement Software (requires MU860820A)
J0996B	Power cord, 2.6 m: 1 pc	MX860830A	Wireless LAN Measurement Software
JT32MA3-NT1	RS-232C cable: 1 pc	MX860850A	HSDPA Measurement Software
F0014	PC-ATA card (32 MB): 1 pc	W1746AE	W-CDMA operation manual
J0576B	Fuse, 6.3 A: 1 pc	W1795AE	MX860x02A operation manual
MX268001A	Coaxial cord (N-P · 5D-2W · N-P), 1 m: 1 pc	W1865AE	MX860x03A/MX268x03A operation manual
W1709AE	File transfer utility: 1 pc	W2090AE	MX860x04A/MX268x04A operation manual
W1744AE	MS8608A/8609A operation manual (Vol. 1): 1 copy	W1866AE	MX860x05A/MX268x05A operation manual
W1745AE	MS8608A/8609A operation manual (Vol. 2): 1 copy	W2154AE	MX860820A/MX860920A operation manual
	MS8608A/8609A operation manual (Vol. 3): 1 copy	W2080AE	MX268*30A/MX860*30A operation manual
	<b>Options</b>	W2131AE	MX860x50A operation manual
MS8608A-01	Precision frequency reference (aging rate: 5 × 10 <sup>-10</sup> /day)	J0576D	<b>Optional accessories</b>
MS8608A-02	Narrow resolution bandwidth (FFT)	J0127C	Coaxial cord (N-P · 5D-2W · N-P), 2 m
MS8608A-03	Extension of pre-selector lower limit (to 1.6 GHz)	J0127A	Coaxial cord (BNC-P · RG-58A/U · BNC-P), 0.5 m
MS8608A-04	Digital resolution bandwidth	MA1612A	Coaxial cord (BNC-P · RG-58A/U · BNC-P), 1 m
MS8608A-08	Pre-amplifier (100 kHz to 3 GHz)	J0395	Four-Way Junction Pad (5 to 3000 MHz)
MS8608A-09	Ethernet interface	B0472	High-power fixed attenuator (30 dB, 30 W, DC to 9 GHz)
MS8608A-35	7.9 GHz frequency extension	J0007	High-power fixed attenuator (30 dB, 100 W, DC to 18 GHz)
MS8608A-46	Auto-power recovery	J0008	GPIB cable, 1 m
MS8608A-47	Rack mount without handle (IEC)	B0452A	GPIB cable, 2 m
MS8608A-48	Rack mount without handle (JIS)	B0452B	Hard carrying case (with casters)
MU860820A	RER/BLER Measurement Software	B0329G	Hard carrying case (without casters)
	<b>Measurement software</b>	B0488	Front cover (3/4MW4U)
MX860801B	W-CDMA Measurement Software	B0480	Rear panel protective pad
MX860802A	GSM Measurement Software	A3933	Tilt handle soft type
MX860803A	cdma Measurement Software	H3930	Circulator (1760 to 2115 MHz)
MX860804A	CDMA2000 1xEV-DO Measurement Software		Isolator (1760 to 2115 MHz)
		MS8608A-90	<b>Maintenance/calibration service</b>
		MS8608A-91	Extended three year warranty service
			Extended five year warranty service



Specifications are subject to change without notice.

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