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 ±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^{-8}/day, ±5 x 10^{-10}/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

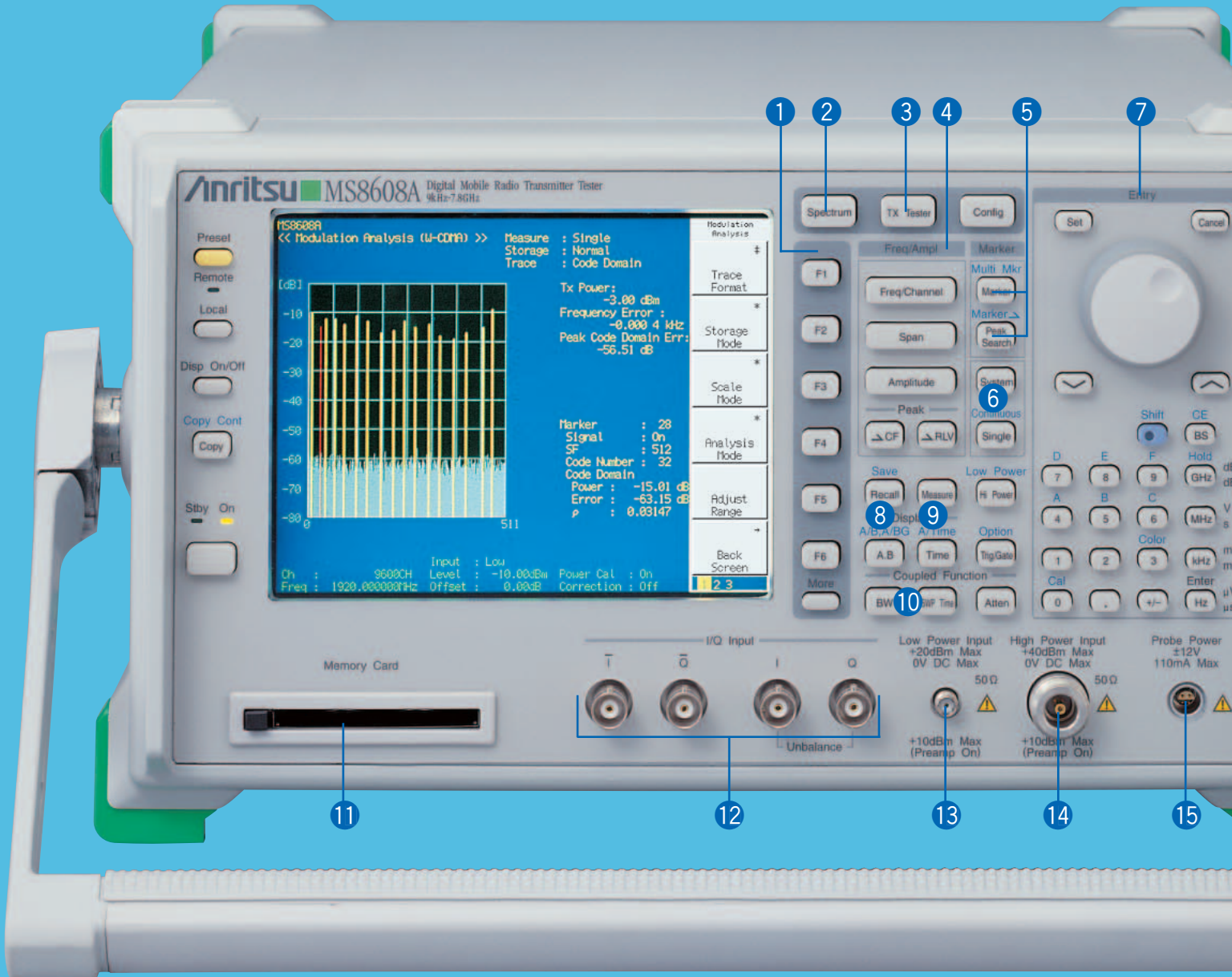Time span: 1 µs to 1000 s

Refresh rate: >20 times/s

Others

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

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

GPIB transmission speed: 120 kbyte/s

Key Layout

❶ **F1-F6**: Function keys F1 to F6 for selecting software menus on screen

❷ **Spectrum**: Switches to spectrum analyzer mode

❸ **TX Tester**: Runs measurement software in transmitter test mode

❹ **Freq/Ampl**: Main function for setting frequency, span and amplitude

❺ **Marker**: Switches to normal marker as well as multimarker, zone marker, zone sweep, etc.

❻ **System**: Used in transmitter test mode to select measurement software

❼ **Entry**: Inputs alphanumeric values and units

❽ **Save/Recall**: Saves/recalls measurement conditions and waveforms to/from internal memory and memory card

❾ **Measure**: Executes calculations based on waveform data at high speed without external computer

❿ **Coupled Function**: Sets non-main functions — Usually used at auto setting values

⓫ **Memory Card**: Slot for memory card for saving/recalling measured waveforms and measurement parameters

⓬ **I/Q Input**: Selects balanced or unbalanced input

⓭ **Low Power Input**: Input for signal with max. power of +20 dBm

⓮ **High Power Input**: Input for signal with max. power of +40 dBm

⓯ **Probe Power**: ±12 V power connector for FET probe

⓰ **IF Output**: Output for IF signal band-limited by RBW

⓱ **Wideband IF Output**: Output for IF signal before passage through RBW

⓲ **10 MHz/13 MHz Ref In**: 10/13 MHz external reference signal input

⓳ **10 MHz Ref Out**: 10 MHz external reference signal output

⓴ **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.
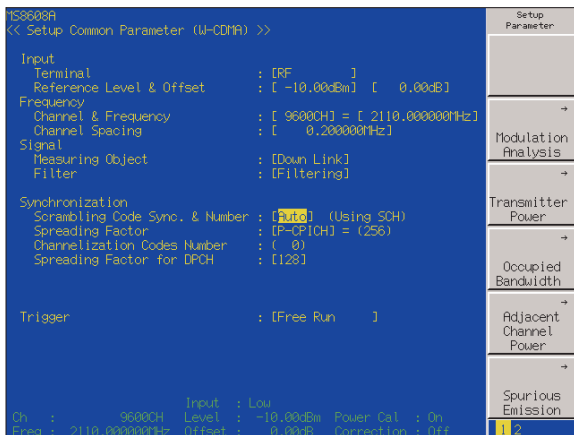
Modulation Accuracy Measurement

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).
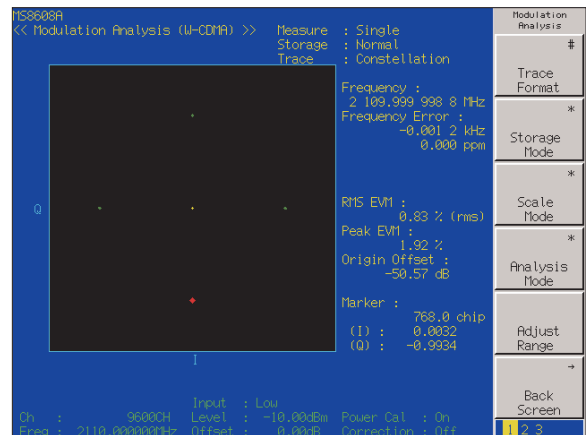
Base Station Code Domain Power

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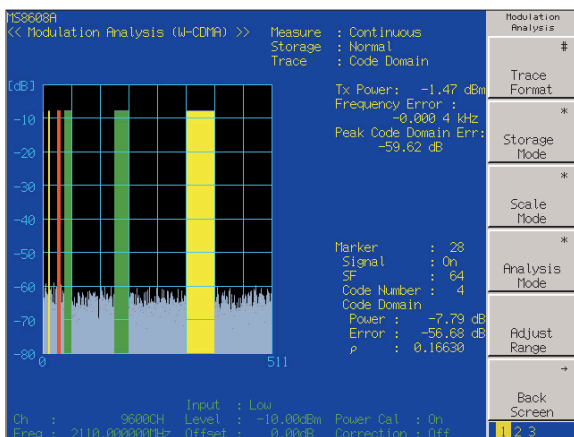
Mobile Terminal Code Domain Power

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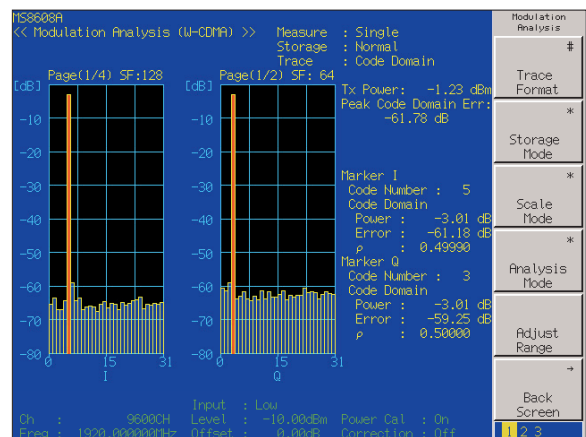
I/Q Level Measurement

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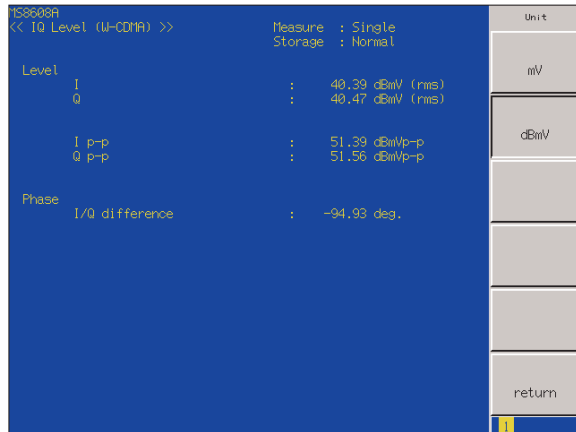
Power Meter Function

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

Spectrum Analyzer Function

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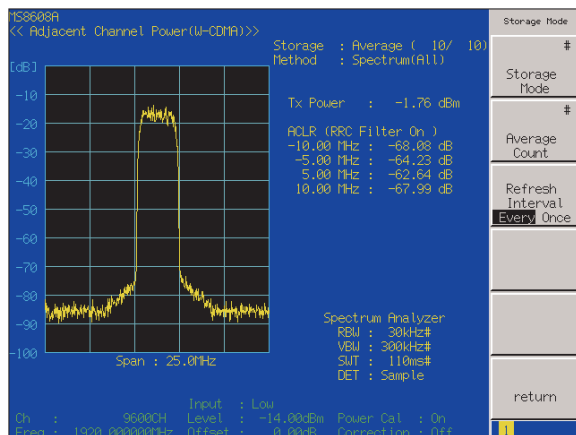
Demodulation Data Monitoring

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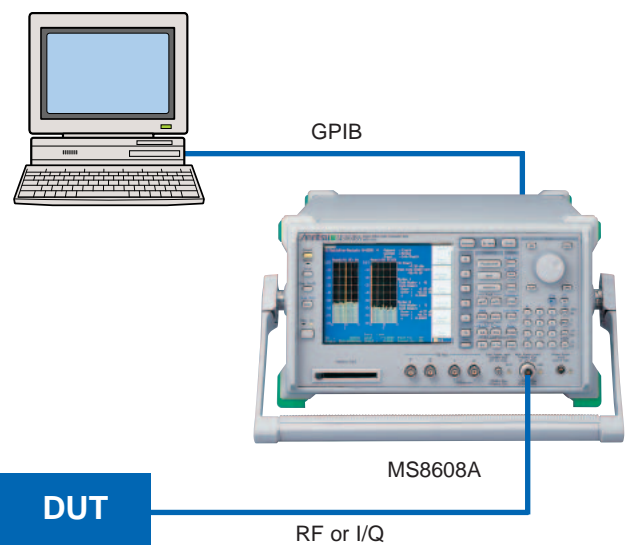
GSM Measurement Software

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.
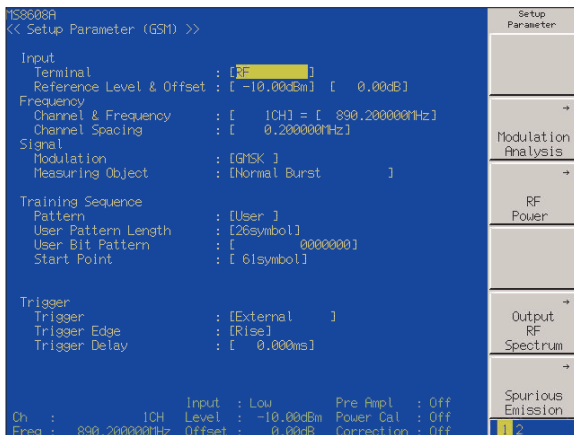

Transmitter Power Measurement

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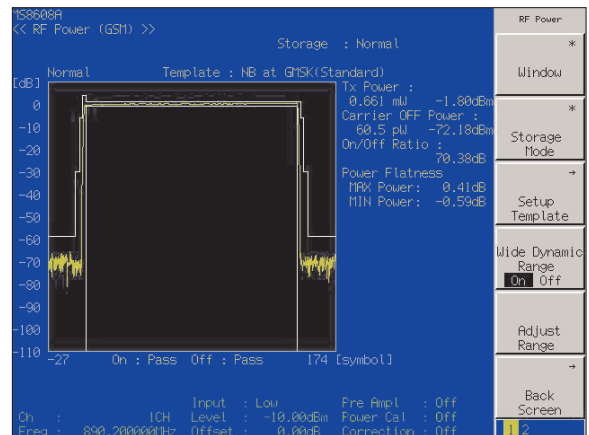
Modulation Accuracy Measurement

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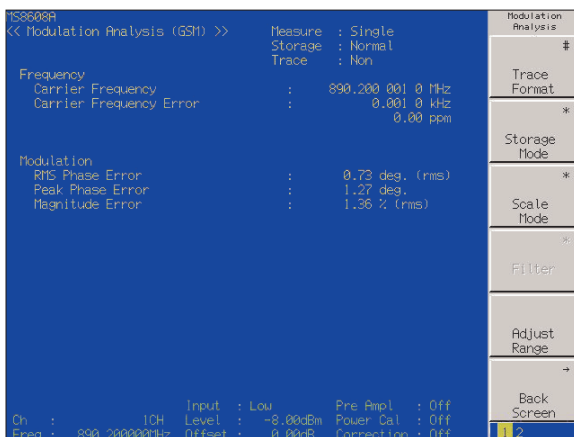
Trellis Display Function

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.

```
MS8608A
<< Output RF Spectrum (GSM) >>        Measure  : Single          Output
                                      Storage  : Normal      RF Spectrum
                                      Method   : High Speed

        Offset Freq.   Modulation      Switching Transients
          0.000MHz       -10.31dBm             -2.55dBm

                   Lower      Upper      Lower      Upper       Storage
 f 1 =   0.100MHz   -6.50dB    -6.94dB   -10.74dBm  -10.12dBm     Mode
 f 2 =   0.200MHz  -36.19dB   -35.12dB   -38.50dBm  -35.12dBm
 f 3 =   0.250MHz  -39.78dB   -43.76dB   -41.86dBm  -42.72dBm
 f 4 =   0.400MHz  -70.70dB   -71.64dB   -71.67dBm  -68.54dBm      Unit
 f 5 =   0.600MHz  -70.71dB   -72.51dB   -71.05dBm  -71.32dBm
 f 6 =   0.800MHz  -74.45dB   -75.12dB   -74.50dBm  -76.39dBm
 f 7 =   1.000MHz  -76.14dB   -75.99dB   -78.54dBm  -77.70dBm
 f 8 =   1.200MHz  -77.78dB   -74.95dB   -79.98dBm  -78.41dBm  Calibration
 f 9 =   1.400MHz  -80.58dB   -80.28dB   -81.80dBm  -78.05dBm
 f10 =   1.600MHz  -82.24dB   -77.58dB   -80.17dBm  -78.77dBm
 f11 =   1.800MHz  -75.32dB   -75.14dB   -81.05dBm  -82.18dBm
                                                              Adjust
                                                              Range

                                                               Back
                  Input  : Low       Pre Ampl  : Off          Screen
 Ch  :        1CH Level  : -10.00dBm  Power Cal : Off
 Freq :  890.200000MHz Offset :   0.00dB  Correction : Off
```

Spurious Measurement

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

```
MS8608A
<< Spurious Emission (GSM) >>                               Spurious
                                                            Emission
                            Spurious : Spot
                            Detect    : Average
                            Preselector : Spurious          Spurious
                                                             Mode
 Tx Power               :   -1.78 dBm

           Frequency        Level     RBW    VBW    SWT      Setup
 f 1 =  1 780.400 000 MHz: -51.45 dBm ( 3MHz.  3MHz.  10 ms)  Spot
 f 2 =  2 670.600 000 MHz: -75.04 dBm ( 3MHz.  3MHz.  10 ms)  Table
 f 3 =  3 560.800 000 MHz: -73.10 dBm ( 3MHz.  3MHz.  10 ms)
 f 4 =  4 451.000 000 MHz: -82.09 dBm ( 3MHz.  3MHz.  10 ms)  Setup
 f 5 =  5 341.200 000 MHz: -80.81 dBm ( 3MHz.  3MHz.  10 ms) Search/Sweep
 f 6 =  6 231.400 000 MHz: -81.16 dBm ( 3MHz.  3MHz.  10 ms)  Table
 f 7 =  7 121.600 000 MHz: -80.80 dBm ( 3MHz.  3MHz.  10 ms)
 f 8 = --------------- MHz: ------- dBm (--- Hz. --- Hz. ----ms)
 f 9 = --------------- MHz: ------- dBm (--- Hz. --- Hz. ----ms) Calibration
 f10 = --------------- MHz: ------- dBm (--- Hz. --- Hz. ----ms)
 f11 = --------------- MHz: ------- dBm (--- Hz. --- Hz. ----ms)
 f12 = --------------- MHz: ------- dBm (--- Hz. --- Hz. ----ms)
 f13 = --------------- MHz: ------- dBm (--- Hz. --- Hz. ----ms)  Adjust
 f14 = --------------- MHz: ------- dBm (--- Hz. --- Hz. ----ms)  Range
 f15 = --------------- MHz: ------- dBm (--- Hz. --- Hz. ----ms)

                                                               Back
                  Input  : Low       Pre Ampl  : Off          Screen
 Ch  :        1CH Level  : -10.00dBm  Power Cal : Off
 Freq :  890.200000MHz Offset :   0.00dB  Correction : Off
```
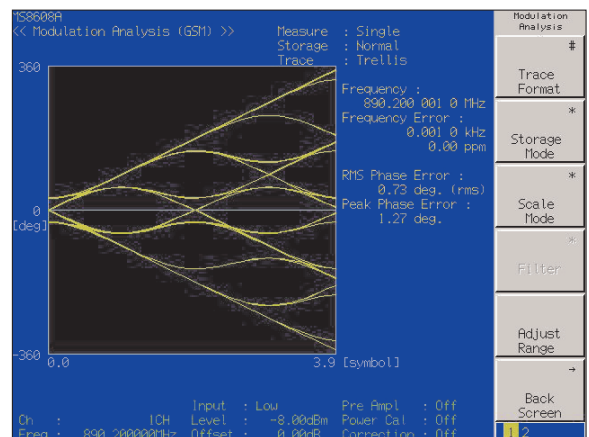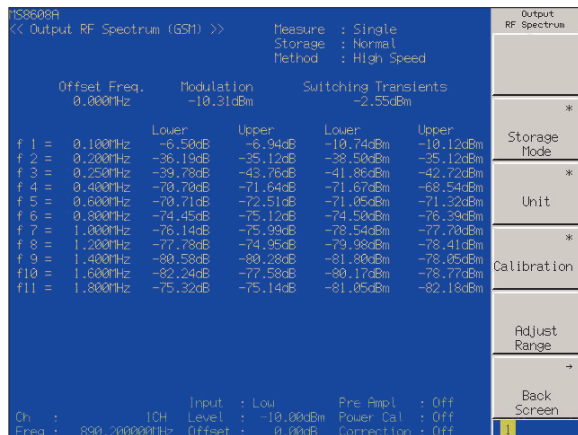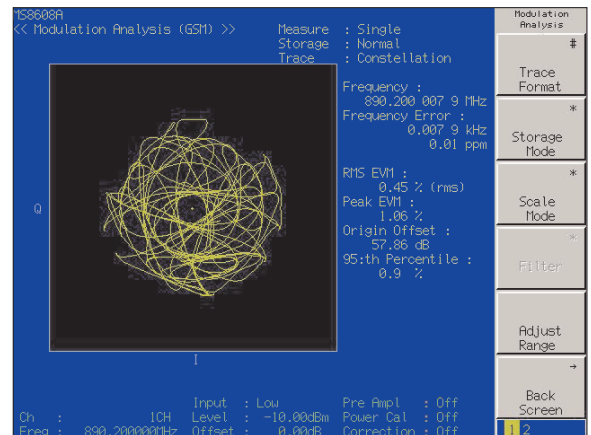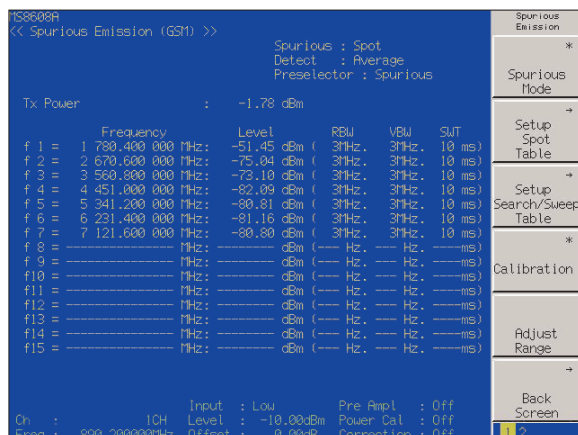
EDGE Constellation Display

The following screen represents constellation display through the filter of the EDGE constellation display of the GSM standard.
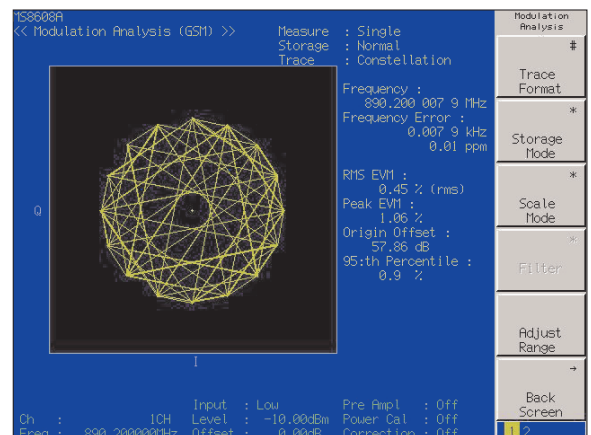
```
MS8608A
<< Modulation Analysis (GSM) >>    Measure  : Single       Modulation
                                   Storage  : Normal         Analysis
                                   Trace    : Constellation
                                                              Trace
                           Frequency :                        Format
                             890.200 007 9 MHz
                           Frequency Error :
                                   0.007 9 kHz               Storage
                                   0.01 ppm                    Mode
 Q
                           RMS EVM :                          Scale
                               0.45 % (rms)                    Mode
                           Peak EVM :
                               1.06 %
                           Origin Offset :                    Filter
                               57.86 dB
                           95:th Percentile :
                               0.9 %                          Adjust
                                                              Range
              I
                                                               Back
                  Input  : Low       Pre Ampl  : Off          Screen
 Ch  :        1CH Level  : -10.00dBm  Power Cal : Off
 Freq :  890.200000MHz Offset :   0.00dB  Correction : Off
```

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

```
MS8608A
<< Modulation Analysis (GSM) >>    Measure  : Single       Modulation
                                   Storage  : Normal         Analysis
                                   Trace    : Constellation
                                                              Trace
                           Frequency :                        Format
                             890.200 007 9 MHz
                           Frequency Error :
                                   0.007 9 kHz               Storage
                                   0.01 ppm                    Mode
 Q
                           RMS EVM :                          Scale
                               0.45 % (rms)                    Mode
                           Peak EVM :
                               1.06 %
                           Origin Offset :                    Filter
                               57.86 dB
                           95:th Percentile :
                               0.9 %                          Adjust
                                                              Range
              I
                                                               Back
                  Input  : Low       Pre Ampl  : Off          Screen
 Ch  :        1CH Level  : -10.00dBm  Power Cal : Off
 Freq :  890.200000MHz Offset :   0.00dB  Correction : Off
```

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 x 10^{-8} (compared to frequency after 24 hour warm-up characteristics after 10 minute warm-up) Aging rate: ≤2 x 10^{-8}/day, ≤1 x 10^{-7}/year (compared to frequency after 24 hour warm-up) Temperature characteristics: ≤5 x 10^{-8} (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	Frequency setting
		  Setting range: 9 kHz to 3.2 GHz (Band: 0), 3.15 to 7.8 GHz (Band: 1) ＊Setting resolution: 1 Hz
		  Pre-selector range: 3.15 to 7.8 GHz (Band: 1)
		Frequency accuracy
		  Display accuracy: ± (display frequency x reference frequency accuracy + span x span accuracy + resolution bandwidth x 0.15 + 10 Hz)
		  Normal marker: Same as display frequency accuracy
		  Delta marker: Same as span accuracy
		Frequency span setting range: 0 Hz, 5 kHz to 7.8 GHz
		  Span accuracy: ±1.0% (at single band sweep)
		RBW (resolution bandwidth)
		  Setting range: 300 Hz to 3 MHz (1-3 sequence), 5 MHz, 10 MHz, 20 MHz (Band 0)
		  Accuracy: ±20% (300 Hz to 10 MHz)
		  Selectivity (60 dB: 3 dB): ≤15:1
		VBW (video bandwidth): 1 Hz to 3 MHz (1-3 sequence), off
		Sideband noise: ≤−108 dBc/Hz (1 GHz, 10 kHz offset), ≤−120 dBc/Hz (1 GHz, 100 kHz offset)

	Amplitude	Maximum input level
		  Continuous average power: +40 dBm (high-power input), +20 dBm (low-power input)
		  DC voltage: 0 V
		Average noise level (at RBW: 300 Hz, VBW: 10 Hz):
		 [Without Option 08]
		  ≤−104 dBm + 1.5 f [GHz] dB (high-power input, 1 MHz to 2.5 GHz, Band 0, input attenuator: 20 dB)
		  ≤−100 dBm + 1.5 f [GHz] dB (high-power input, 2.5 to 3.2 GHz, Band 0, input attenuator: 20 dB)
		  ≤−100 dBm + 0.8 f [GHz] dB (high-power input, 3.15 to 7.8 GHz, Band 1, input attenuator: 20 dB)
		 [With Option 08]
		  ≤−102 dBm + 1.8 f [GHz] dB (high-power input, 1 MHz to 2.5 GHz, Band 0, input attenuator: 20 dB)
		  ≤−100 dBm + 1.8 f [GHz] dB (high-power input, 2.5 to 3.2 GHz, Band 0, input attenuator: 20 dB)
		  ≤−100 dBm + 0.8 f [GHz] dB (high-power input, 3.15 to 7.8 GHz, Band 1, input attenuator: 20 dB)
		 [Without Option 08]
		  ≤−124 dBm + 1.5 f [GHz] dB (low-power input, 1 MHz to 2.5 GHz, Band 0, input attenuator: 0 dB)
		  ≤−120 dBm + 1.5 f [GHz] dB (low-power input, 2.5 to 3.2 GHz, Band 0, input attenuator: 0 dB)
		  ≤−120 dBm + 0.8 f [GHz] dB (low-power input, 3.15 to 7.8 GHz, Band 1, input attenuator: 0 dB)
		 [With Option 08]
		  ≤−122 dBm + 1.8 [GHz] dB (low-power input, 1 MHz to 2.5 GHz, Band 0, input attenuator: 0 dB)
		  ≤−120 dBm + 1.8 f [GHz] dB (low-power input, 2.5 to 3.2 GHz, Band 0, input attenuator: 0 dB)
		  ≤−120 dBm + 0.8 f [GHz] dB (low-power input, 3.15 to 7.8 GHz, Band 1, input attenuator: 0 dB)
		Residual response: ≤−80 dBm (high-power input, 1 MHz to 3.2 GHz, input attenuator: 20 dB)
		            ≤−70 dBm (high-power input, 3.15 to 7.8 GHz, input attenuator: 20 dB)
		            ≤−100 dBm (low-power input, 1 MHz to 3.2 GHz, input attenuator: 0 dB)
		            ≤−90 dBm (low-power input, 3.15 to 7.8 GHz, input attenuator: 0 dB)

Spectrum analyzer	Amplitude	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)
		  ∗Frequency difference of two signals: ≥50 kHz, mixer input: −30 dBm
		1 dB gain compression: ≥0 dBm (≥100 MHz), ≥+3 dBm (≥500 MHz)

	Sweep	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)

	Functions	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/$\sqrt{Hz}$
		  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

Others		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, PP0, 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)

Dimensions and mass		320 (W) x 177 (H) x 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	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: ± (reference oscillator accuracy + 10 Hz) 　*Input level: ≥−10 dBm (high-power input), ≥−30 dBm (low-power input), ≥−40 dBm (low-power input, pre-amplifier: on [*1]), at 1 code channel Modulation accuracy (residual EVM): <2% (rms) 　*Input level: ≥−10 dBm (high-power input), ≥−30 dBm (low-power input), ≥−40 dBm (low-power input, pre-amplifier: on [*1]), at 1 code channel Origin offset accuracy: ±0.5 dB 　*Input level: ≥−10 dBm (high-power input), ≥−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
Code domain analysis	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: 　±0.1 dB (code power: ≥−10 dBc), ±0.3 dB (code power: ≥−25 dBc) 　*Input level: ≥+10 dBm (high-power input), ≥−10 dBm (low-power input), ≥−20 dBm (pre-amplifier: on [*1]), the input signal does not have the origin offset Code domain error measurement 　Residual error: <−50 dB, Measurement accuracy: ±0.5 dB (at error of −30 dBc) 　*Input level: ≥+10 dBm (high-power input), ≥−10 dBm (low-power input), ≥−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
Amplitude measurement	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: ±0.4 dB (calibrated at internal power meter) Power measurement linearity: ±0.2 dB (0 to −40 dB) 　*Input level: ≥+10 dBm (high-power input), ≥−10 dBm (low-power input), ≥−20 dBm (pre-amplifier: on [*1]) , after the range adjusted, with the reference level setting unchanged Filter selection function: Power measurement through RRC (α = 0.22) filter Transmitter power control measurement function: Relative power per slot, NO/GO evaluation
Occupied bandwidth measurement	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
Adjacent channel power measurement	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: α = 0.22) Measurement range 　Input level: +20 to +40 dBm (high-power input), 0 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 　　　　　　≥50 dBc (5 MHz offset), ≥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)

Spurious measurement	Measurement frequency: 9 kHz to 7.8 GHz (except within carrier frequency ±50 MHz)
	Input level (transmitter power):
	  +20 to +40 dBm (average power, high-power input), 0 to +20 dBm (average power, low-power input)
	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
	Measurement range [*2]
	  [Carrier frequency: 1.8 to 2.2 GHz]
	  ≥79 dB (RBW: 1 kHz, 9 to 150 kHz, Band 0), ≥79 dB (RBW: 10 kHz, 150 kHz to 30 MHz, Band 0),
	  ≥79 dB (RBW: 100 kHz, 30 to 1000 MHz, Band 0)
	  [Normal mode]
	  ≥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)
	  [Spurious mode (with option 03)]
	  ≥76 dB (RBW: 1 MHz, 1.6 to 7.8 GHz, Band 1)

I/Q signal	Input: Balanced, unbalanced
	Input impedance: 1 MΩ (parallel capacity: <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, code domain power, amplitude, occupied bandwidth (FFT method), I/Q level
	Residual vector error: <2% (rms)
	      ∗Input level: ≥0.1 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.

∗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	Frequency range: 50 MHz to 2.7 GHz
	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])
	Carrier frequency accuracy:
	  ±(reference oscillator accuracy + 10 Hz)
	  ∗Input level (average power within burst: ≥–10 dBm (high-power input): ≥–30 dBm (low-power input),
	  ≥–40 dBm (low-power input, pre-amplifier: on [1])
	Residual phase error (GMSK modulation):
	  <0.5˚ (rms), <2.0˚ (peak) ∗Input level (average power within burst): ≥–10 dBm (high-power input),
	  ≥–30 dBm (low-power input), ≥–40 dBm (low-power input, pre-amplifier: on [1])
	Residual EVM (8PSK modulation): <1% (rms)
	Waveform display:
	  Trellis (GMSK modulation), eye pattern, EVM vs. bit (8PSK modulation), phase vs. bit, amplitude vs. symbol, I/Q diagram

Amplitude measurement	Frequency range: 50 MHz to 2.7 GHz
	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])
	Transmitter power measurement (auto calibrated at internal power meter)
	  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])
	  Accuracy: ±0.4 dB
	Power measurement linearity:
	  ±0.2 dB (0 to –30 dBm) ∗Input level (average power within burst): +10 dBm (high-power input), ≥–10 dBm
	  (low-power input), ≥–20 dBm (low-power input, pre-amplifier: on [1]), without changing the reference level
	  setting after range optimization
	Carrier-off power measurement range
	  [Input level (average power within burst)]
	  +10 dBm (high-power input), ≥–10 dBm (low-power input), ≥–20 dBm (low-power input, pre-amplifier: on [1])
	  [Normal mode]
	  ≥60 dB (compared with average power within burst)
	  [Wide dynamic range mode]
	  ≥80 dB (high-power input: 1 W, compared with 10 mW of average power within burst, low-power input)
	  ∗Measurement limit is decided by average nose level (≤50 dBm, 50 MHz to 2.7 GHz).
	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

Output RF spectrum measurement	Frequency range: 100 MHz to 2.7 GHz
	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])
	Modulation portion measurement range:
	  ≥60 dB (≥200 kHz offset), ≥68 dB (≥250 kHz offset)
	  ∗CW signal, RBW: 30 kHz (<1.8 MHz offset), RBW: 100 kHz (≥1.8 MHz offset)
	Transient portion measurement range: ≥63 dB (CW, ≥400 kHz offset)

Spurious measurement	Measurement frequency: 100 kHz to 7.8 GHz (except within carrier frequency ±50 MHz)
	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)
	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

Spurious measurement	[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
	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)
	  [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)
	  [Spurious mode (with option 03)]
	    ≥66 dB (RBW: 3 MHz, 1.6 to 7.8 GHz, Band 1)

I/Q signal	Input: Balanced, unbalanced
	Input impedance: 1 MΩ (parallel capacity: <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: <0.5˚ (rms), DC coupling
	  Residual EVM: <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.

*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	
	Main frame	
MS8608A	Digital Mobile Radio Transmitter Tester	
	Standard accessories	
	Power cord, 2.6 m:	1 pc
J0996B	RS-232C cable:	1 pc
JT32MA3-NT1	PC-ATA card (32 MB):	1 pc
F0014	Fuse, 6.3 A:	1 pc
J0576B	Coaxial cord (N-P · 5D-2W · N-P), 1 m:	1 pc
MX268001A	File transfer utility:	1 pc
W1709AE	MS8608A/8609A operation manual (Vol. 1):	1 copy
W1744AE	MS8608A/8609A operation manual (Vol. 2):	1 copy
W1745AE	MS8608A/8609A operation manual (Vol. 3):	1 copy
	Options	
MS8608A-01	Precision frequency reference (aging rate: 5 x 10^{-10}/day)	
MS8608A-02	Narrow resolution bandwidth (FFT)	
MS8608A-03	Extension of pre-selector lower limit (to 1.6 GHz)	
MS8608A-04	Digital resolution bandwidth	
MS8608A-05	Rubidium reference oscillator	
MS8608A-08	Pre-amplifier (100 kHz to 3 GHz)	
MS8608A-09	Ethernet interface	
MS8608A-35	7.9 GHz frequency extension	
MS8608A-46	Auto-power recovery	
MS8608A-47	Rack mount without handle (IEC)	
MS8608A-48	Rack mount without handle (JIS)	
MU860820A	RER/BLER Measurement Software	
	Measurement software	
MX860801B	W-CDMA Measurement Software	
MX860802A	GSM Measurement Software	
MX860803A	cdma Measurement Software	
MX860804A	CDMA2000 1xEV-DO Measurement Software	

Model/Order No.	Name
MX860805A	π/4DQPSK Measurement Software
MX860820A	BER/BLER Measurement Software (requires MU860820A)
MX860830A	Wireless LAN Measurement Software
MX860850A	HSDPA Measurement Software
W1746AE	W-CDMA operation manual
W1795AE	MX860x02A operation manual
W1865AE	MX860x03A/MX268x03A operation manual
W2090AE	MX860x04A/MX268x04A operation manual
W1866AE	MX860x05A/MX268x05A operation manual
W2154AE	MX860820A/MX860920A operation manual
W2080AE	MX268∗30A/MX860∗30A operation manual
W2131AE	MX860x50A operation manual
	Optional accessories
J0576D	Coaxial cord (N-P · 5D-2W · N-P), 2 m
J0127C	Coaxial cord (BNC-P · RG-58A/U · BNC-P), 0.5 m
J0127A	Coaxial cord (BNC-P · RG-58A/U · BNC-P), 1 m
MA1612A	Four-Way Junction Pad (5 to 3000 MHz)
J0395	High-power fixed attenuator (30 dB, 30 W, DC to 9 GHz)
B0472	High-power fixed attenuator (30 dB, 100 W, DC to 18 GHz)
J0007	GPIB cable, 1 m
J0008	GPIB cable, 2 m
B0452A	Hard carrying case (with casters)
B0452B	Hard carrying case (without casters)
B0329G	Front cover (3/4MW4U)
B0488	Rear panel protective pad
B0480	Tilt handle soft type
A3933	Circulator (1760 to 2115 MHz)
H3930	Isolator (1760 to 2115 MHz)
	Maintenance / calibration service
MS8608A-90	Extended three year warranty service
MS8608A-91	Extended five year warranty service

/Anritsu

Specifications are subject to change without notice.

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