Product Brochure

Anritsu

MS8609A

Digital Mobile Radio Transmitter Tester

9 kHz to 13.2 GHz

Excellent Eco Product

Measures Wideband Signals up to 20 MHz

The MS8609A Digital Mobile Radio Transmitter Tester has a built-in spectrum analyzer, modulation analyzer, and power meter. One tester supports all the measurements needed to develop and manufacture base stations and mobile stations as well as to construct and maintain base stations.
The spectrum analyzer resolution bandwidth of 20 MHz readily supports measurement of wideband signals.
The modulation analyzer uses high-speed DSP to support all Vector Signal Analysis (VSA) functions.
Power can be measured with an accuracy of ±0.4 dB using the amorphous power sensor.
Up to three dedicated measurement software options for W-CDMA, GSM/EDGE, etc., can be installed simultaneously and input signals can be selected from either RF or I/Q. Balanced or unbalanced input can also be selected for I/Q signals.
Remote measurement is supported by GPIB, RS-232C and 10Base-T (optional) interfaces and the 120 kbyte/s speed of the GPIB I/F supports high-speed measurement on production lines.
The screen uses an easy-to-read 6.5-inch TFT color LCD.

Spectrum Analyzer Functions

Frequency

Frequency range: 9 kHz to 13.2 GHz
Resolution bandwidth: 300 Hz to 3 MHz, 5 MHz, 10 MHz, 20 MHz (to 3 GHz)
Frequency span: Zero, 1 kHz to 13.2 GHz
Span accuracy: ±1%
Reference frequency accuracy: ±2 x 10^{-8}/day, ±5 x 10^{-10}/day (option), ±1 x 10^{-10}/year (option)

Level

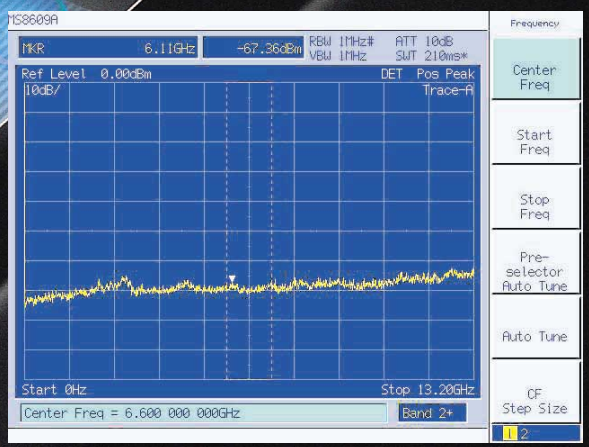
Maximum input level: +20 dBm
Input attenuator: 0 to 62 dB (2 dB steps)
1 dB gain compression: +3 dBm (≥500 MHz)
Two tone 3rd order distortion: ≤–85 dBc (0.1 to 3.2 GHz)

Sweep

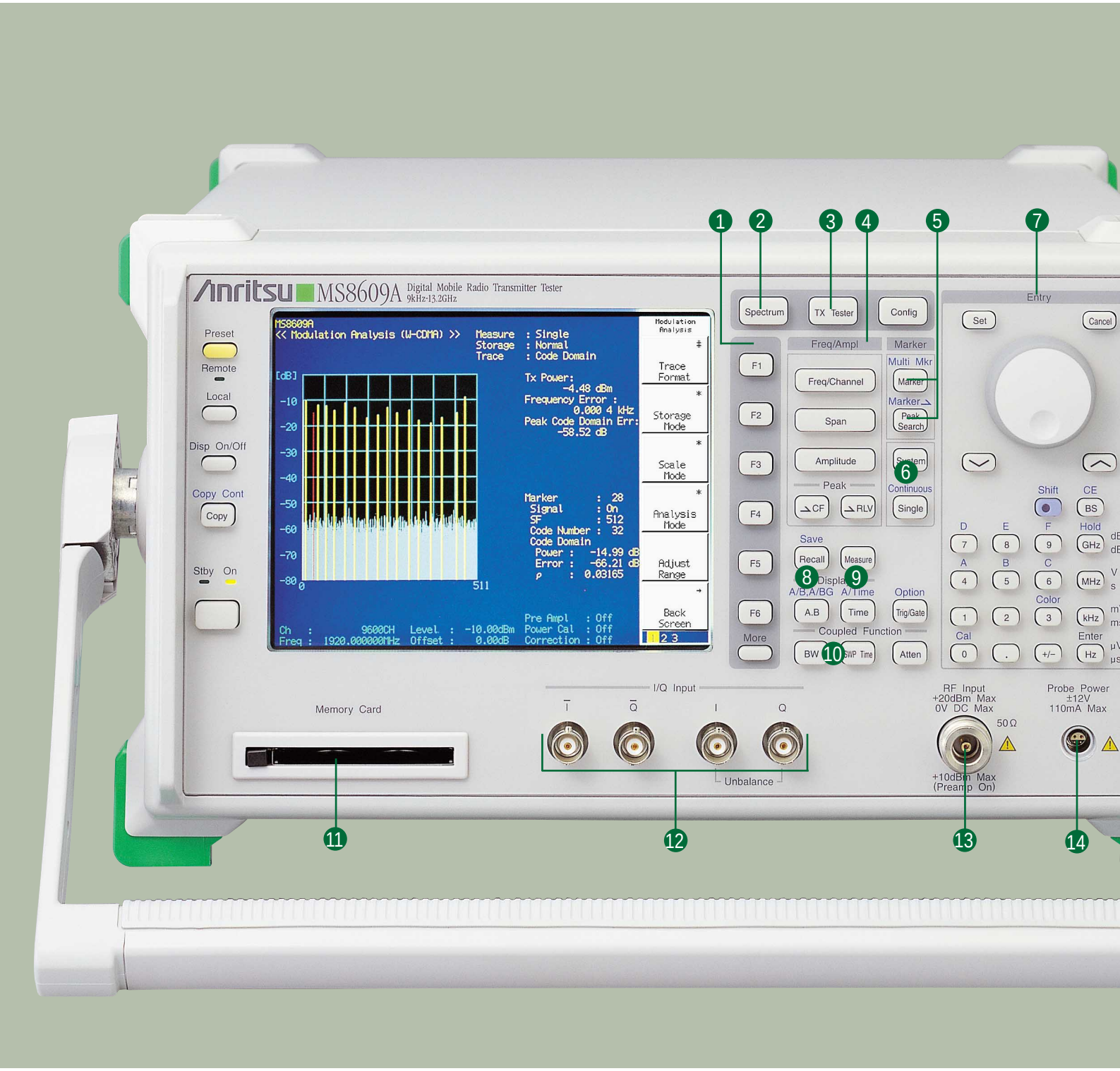
Frequency span: 10 ms to 1000 s
Time span: 1 µs to 1000 s
Refresh rate: >20 times/s

Others

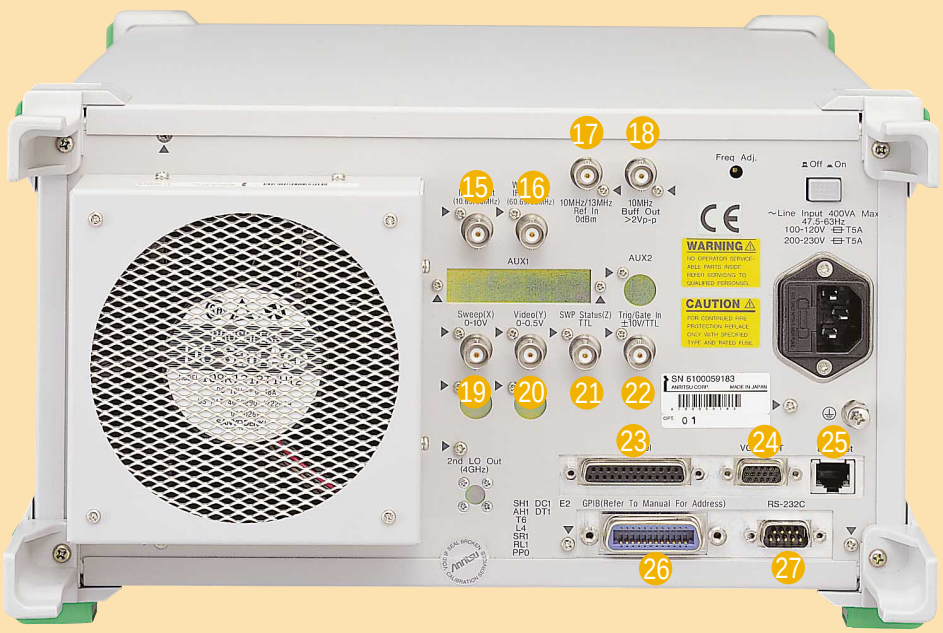
Detection mode: Normal, positive, negative, sample, average, RMS (option)
Measurement functions: Frequency counter, noise power, C/N, ACP, OBW, etc.
GPIB transmission speed: 120 kbyte/s



MS8609A Panel Layout



1. **F1-F6**: Function 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**: Selects measurement software in transmitter test mode
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. **Input**: Input for signal with max. power of +20 dBm
14. **Probe Power**: ±12 V power connector for FET probe
15. **IF Output**: Output for IF signal band-limited by RBW
16. **Wideband IF Output**: Output for IF signal before passage through RBW
17. **10 MHz/13 MHz Ref In**: 10/13 MHz external reference signal input
18. **10 MHz Ref Out**: 10 MHz external reference signal output
19. **Sweep (X)**: Output for X-axis signal proportional to sweep output
20. **Video (Y)**: Output for Y-axis signal proportional to video detection output
21. **SWP Status**: Sweep status signal output
22. **Trig/Gate In**: Input for external trigger/gate signal (±10 V)
23. **Parallel**: Connector for printer
24. **VGA Out**: Output for VGA signal
25. **Ethernet**: For remote control via 10BASE-T Ethernet
26. **GPIB**: For remote control via GPIB
27. **RS-232C**: For remote control via RS-232C I/F



Supports W-CDMA

MX860901B W-CDMA Measurement Software (sold separately)

Measurement functions

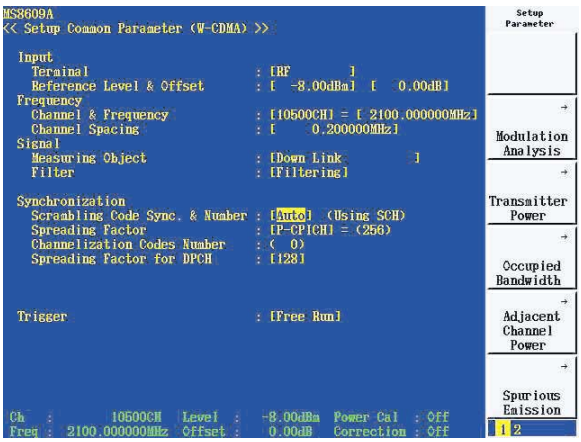
Modulation analysis: Carrier frequency, vector error, phase error, magnitude error
Code domain analysis: Code domain power, code domain error, peak code domain error
Amplitude measurement: Transmitter power, transmitter power control
Code vs time measurement
Demodulation measurement
CCDF measurement
Adjacent channel power measurement
Occupied bandwidth measurement
I/Q level measurement

Performance

Modulation accuracy: Residual vector error (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)

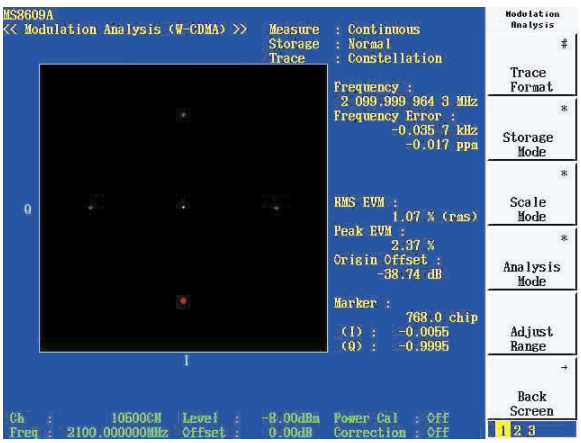
Parameter Setup

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



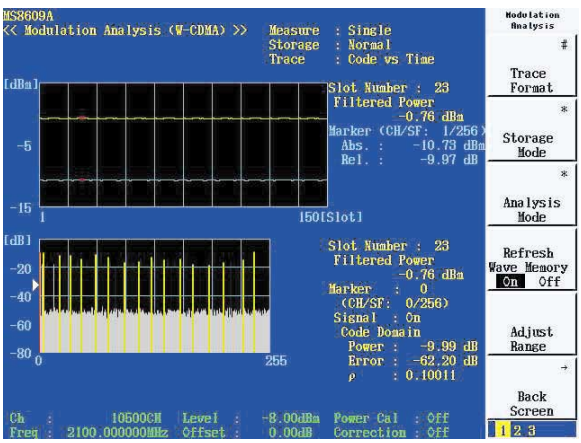
Modulation Accuracy Measurement

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



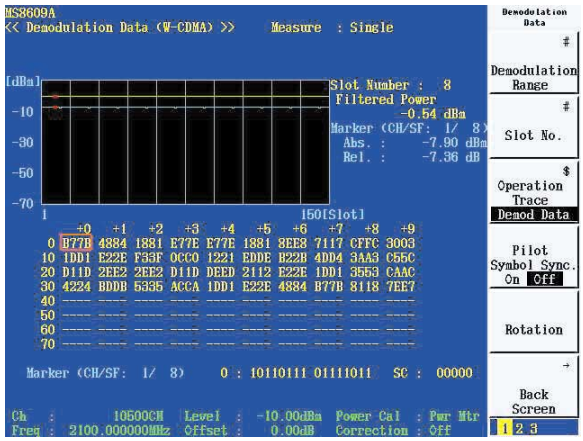
Code Domain Power

Only 1.5 seconds are required for measurement. Either automatic detection of scrambling code from SCH, or specification of scrambling code can be selected.



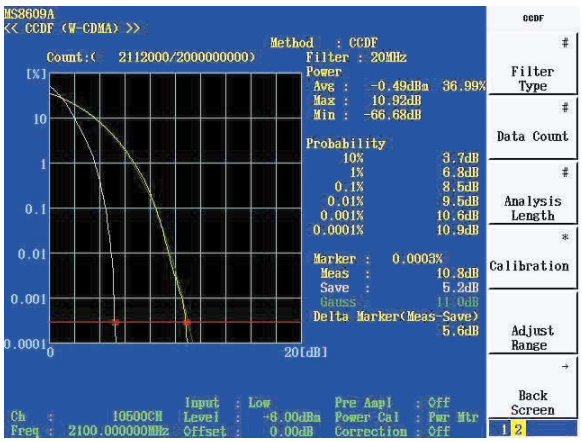
Demodulation Data Monitoring Function

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



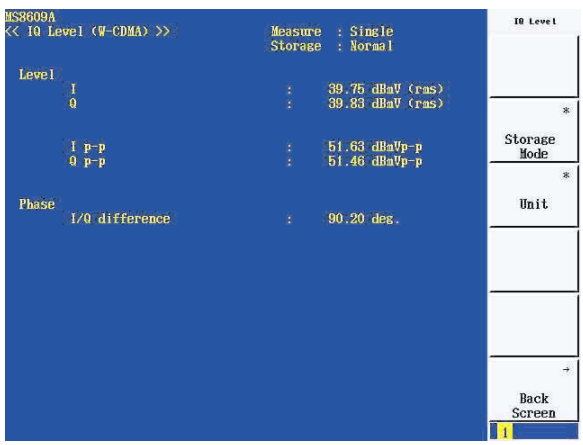
CCDF Measurement

This supports distribution or cumulative distribution display of the power difference between instantaneous power and average power. The 20 MHz max. filter bandwidth supports multi-carrier measurement.



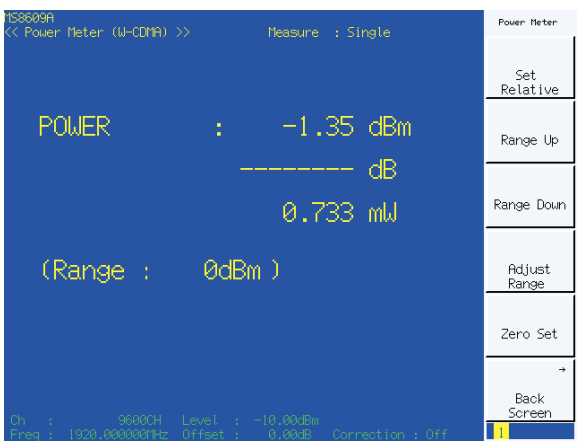
I/Q Level Measurement

Each I and Q input voltage (rms, p-p value) can be measured and displayed in dBmV or mV units.



Power Meter Function

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



Supports GSM, EDGE

MX860902A GSM Measurement Software (sold separately)

Measurement functions

Modulation analysis:

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

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

Amplitude measurement: Transmitter power

Measurement of rise/fall edge characteristics of antenna power

Output RF spectrum measurement

Spurious measurement

I/Q level measurement

Performance

Modulation accuracy

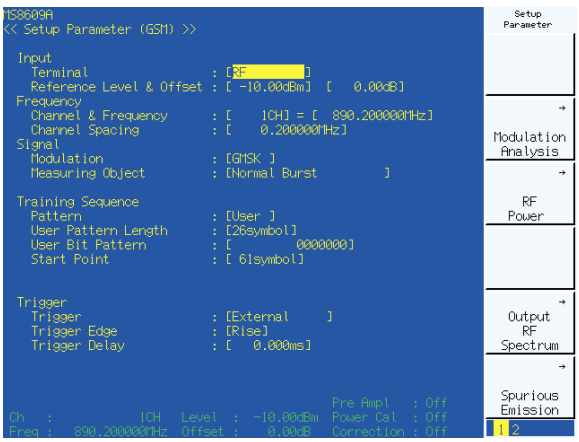
Residual phase error: <0.5° (rms) [GMSK modulation]

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

Transmitter power: ±0.4 dB

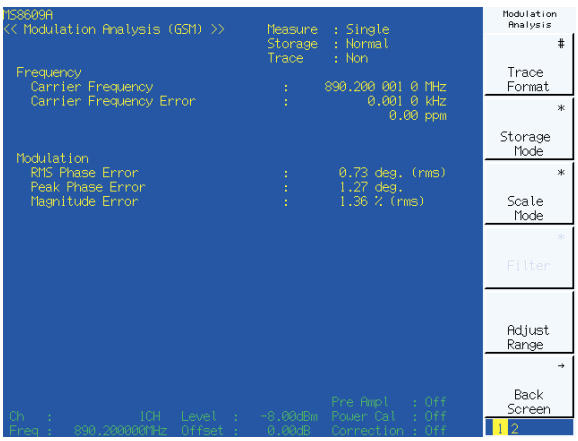
Parameter Setup

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



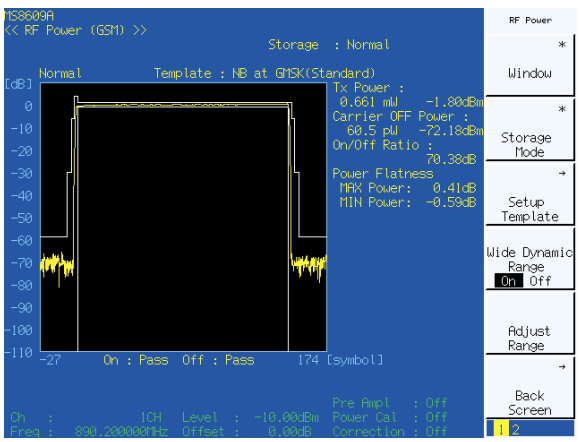
Modulation Accuracy Measurement

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



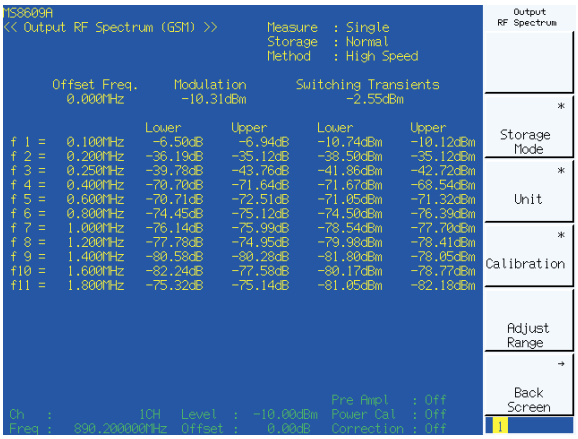
Transmitter Power Measurement

The screen displays the amplitude waveforms and template simultaneously with symbols on the horizontal axis and level on the vertical axis.



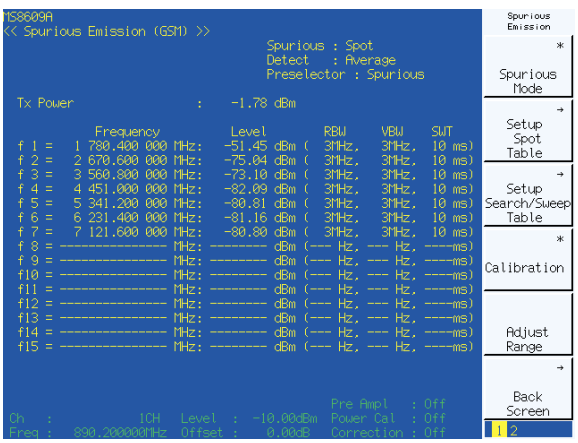
Output RF Spectrum Measurement

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



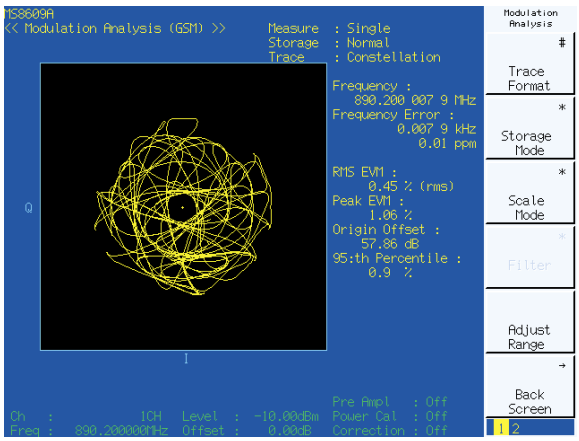
Spurious Measurement

Spurious measurement has three methods: Sweep, Search, Search, and Spot, which can be selected according to the usage.

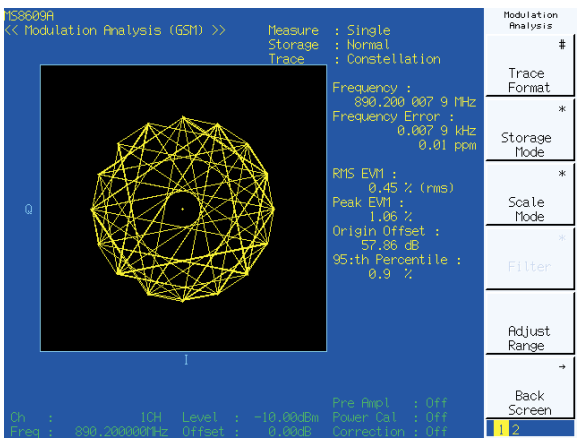


EDGE Constellation Display

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



The following screen shows the constellation display for the 8PSK modulation through a Nyquist filter and Gaussian inverse correction filter.



Supports cdmaOne and CDMA2000 1xRTT

MX860903A cdma Measurement Software (sold separately)

Measurement functions

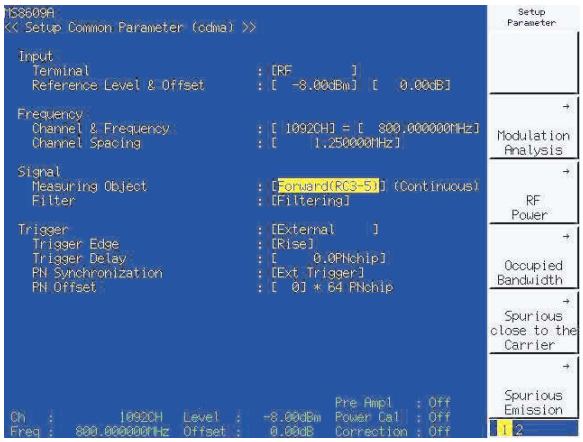
Modulation analysis:
- Carrier frequency, vector error, phase error, magnitude error

Code domain analysis:
- Code domain power, code domain timing offset, code domain phase offset

Amplitude measurement: Transmission power
Spurious close to the carrier measurement
Spurious measurement
Occupied bandwidth measurement
I/Q level measurement

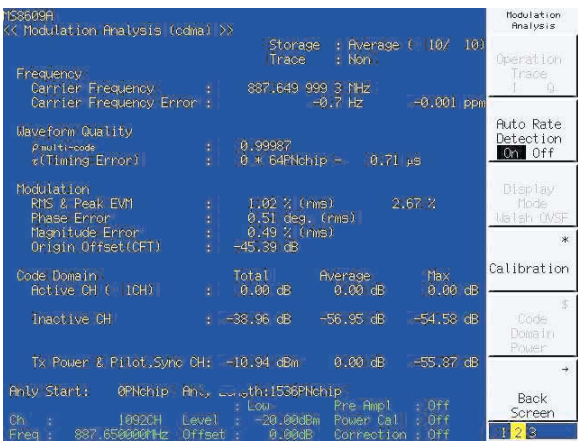
Parameter Setup

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



Modulation Accuracy Measurement

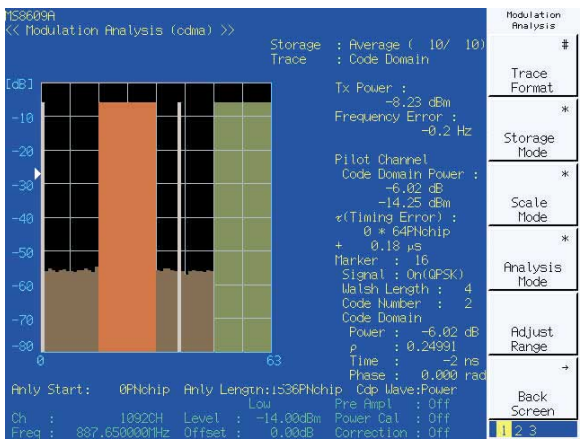
Frequency error, modulation accuracy and code domain analysis are performed and the results are displayed on the screen. The measurement accuracy is 1% (typical) for residual vector error (rms).



BTS Code Domain Analysis

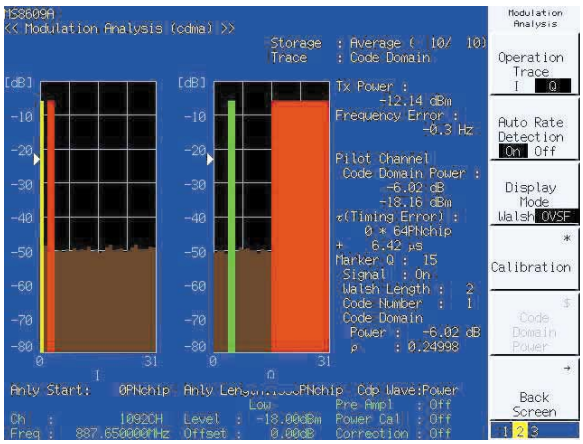
Only 2 seconds are required for code domain analysis of 1xRTT signals. RC1* through RC5 can be measured. The spreading factor of each code is detected automatically and displayed on the screen.

*Radio Configuration



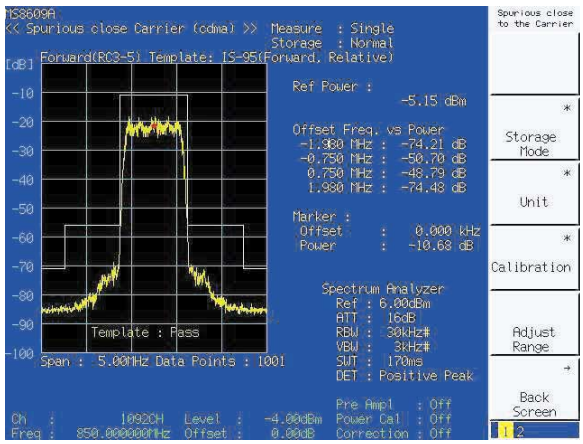
MS Code Domain Analysis

Code domain analysis of 1xRTT signals in RC3 and RC4 can be performed in only 2 seconds. Code domains of I/Q phase are displayed on the screen.



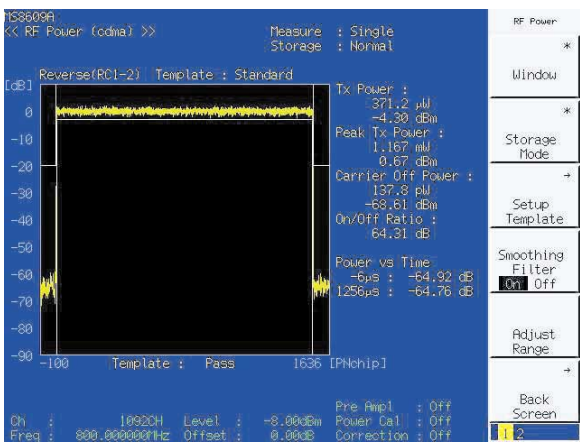
Spurious Close to Carrier Measurement

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



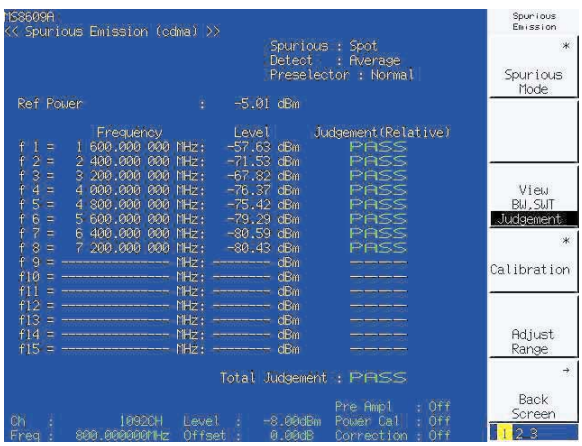
Transmission Power Measurement

When transmission power is measured, both the value and signal waveform are displayed on the screen. High powers are measured accurately using the built-in power meter function.



Spurious Measurement

A frequency table can be set at spurious measurement to provide PASS/FAIL results. Fifteen different frequencies and their limit values can be input.



Supports PDC, PHS and NADC

All-in-one Evaluation of π/4DQPSK transmission systems

MX860905A π/4DQPSK Measurement Software (sold separately)

Measurement functions

Modulation analysis:

Carrier frequency, vector error, phase error, magnitude error

Amplitude measurement:

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

Adjacent channel power measurement

Spurious measurement

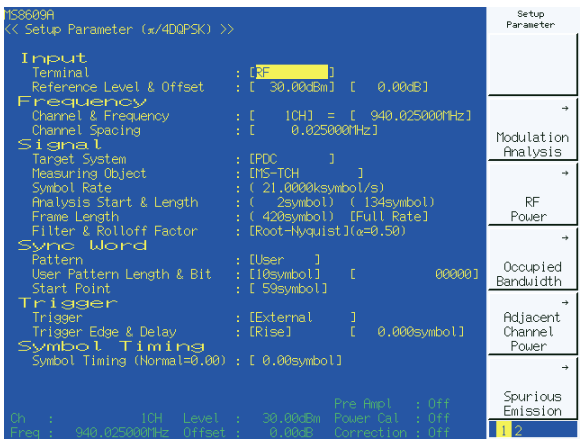
Occupied bandwidth measurement

I/Q level measurement

General purpose measurement

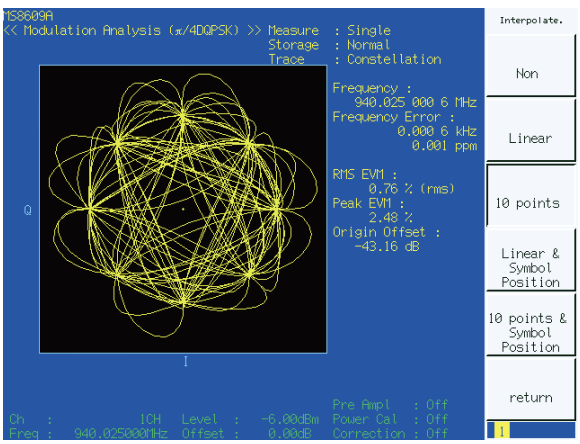
Parameter Setting

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



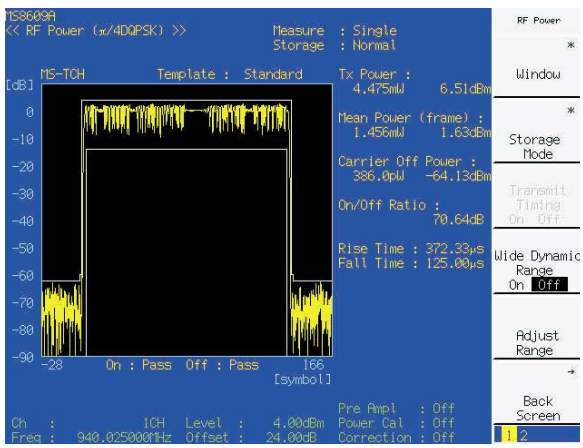
Modulation Accuracy Measurement

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



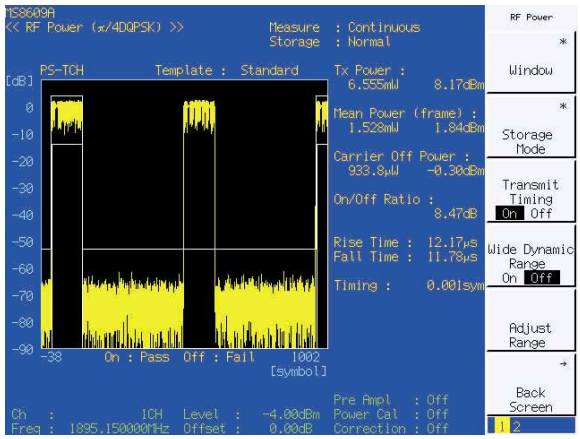
Transmitter Power Measurement

This screen displays the transmitter power and waveform. The power value is calibrated by the built-in power meter to achieve even higher power measurement accuracy.



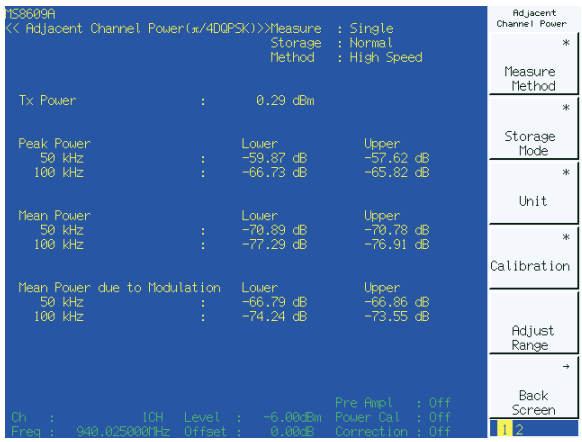
Transmission Timing Measurement

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



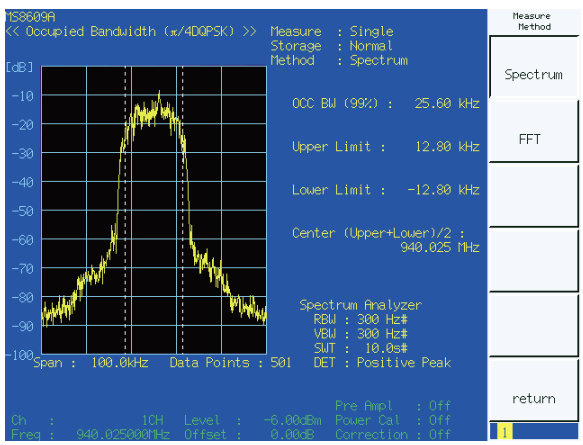
Adjacent Channel Power Measurement

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



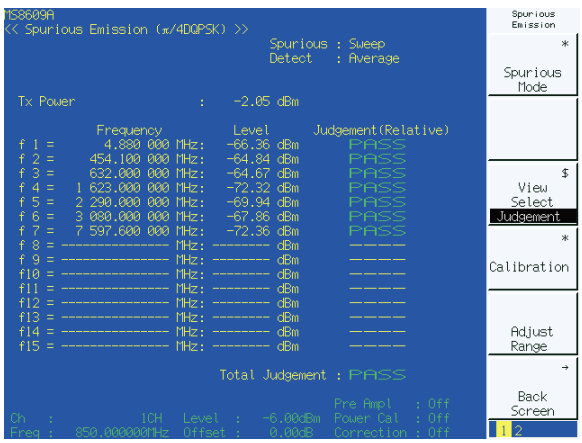
Occupied Bandwidth Measurement

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



Spurious Measurement

There are three spurious measurement methods: Spot, Sweep and Search. Up to 15 frequency and limit values can be set in the tables. Measurement results are displayed with a limit evaluation.



Specifications

• MS8609A

Frequency range		9 kHz to 13.2 GHz
Max. input level		+20 dBm (100 mW), continuous average power, DC input: 0 Vdc
Input impedance		Power meter 50 Ω, VSWR: ≤1.3 (30 MHz to 3 GHz) Except power meter 50 Ω, VSWR: ≤1.5 (input attenuator: ≥4 dB, ≤3 GHz)/≤2.3 (input attenuator: ≥10 dB, >3 GHz)
Input connector		N-type
Reference oscillator		Frequency: 10 MHz Starting characteristics: ≤5 x 10^{-8} (after 10 minute warm-up, compared to frequency after 24 hour 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: –20 to +20 dBm, Measurement accuracy (after zero calibration): ±10%
Spectrum analyzer	Frequency	Frequency setting Setting range: 9 kHz to 13.2 GHz, Pre-selector range: 3.15 to 13.2 GHz (Band 1 and 2) Frequency accuracy Accuracy: ± (display frequency x reference frequency accuracy + span x span accuracy + resolution bandwidth × 0.15 + 10 × N Hz) ✱N: Mixer harmonic order Normal marker: Same as display frequency accuracy Delta marker: Same as span accuracy Frequency span setting range: 0 Hz, 5 kHz to 13.2 GHz Span accuracy: ±1.0% (at single band sweep, number of data points: 1001) 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), ±40% (20 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: +20 dBm, DC voltage: 0 V Average noise level (RBW: 300 Hz, VBW: 1 Hz): [Without Option 08] ≤–124 dBm + 1.5 x f [GHz] dB (1 MHz to 2.5 GHz, Band 0) ≤–120 dBm + 1.5 x f [GHz] dB (2.5 to 3.2 GHz, Band 0) ≤–116 dBm (3.15 to 7.8 GHz, Band 1) ≤–107 dBm (7.7 to 13.2 GHz, Band 2) [With Option 08] ≤–122 dBm + 1.8 x f [GHz] dB (1 MHz to 2.5 GHz, Band 0) ≤–120 dBm + 1.8 x f [GHz] dB (2.5 to 3.2 GHz, Band 0) ≤–116 dBm (3.15 to 7.8 GHz, Band 1) ≤–107 dBm (7.7 to 13.2 GHz, Band 2) Residual response: ≤–100 dBm (1 MHz to 3.2 GHz, Band 0), ≤–90 dBm (3.15 to 7.8 GHz, Band 1) Reference level Setting range: –100 to +30 dBm Accuracy: ±0.75 dB (+0.1 to 20 dBm), ±0.5 dB (–49.9 to 0 dBm), ±0.75 dB (–69.9 to –50 dBm), ±1.5 dB (–80 to –70 dBm) ✱After calibration, 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), ±0.5 dB (10, 20 MHz) ✱After calibration, with RBW 3 kHz referenced Input attenuator: 0 to 62 dB (2 dB steps) Switching uncertainty: ±0.3 dB (10 to 50 dB), ±0.5 dB (52 to 62 dB) ✱After calibration, with 50 MHz, RF ATT 10 dB referenced Frequency response: ±0.6 dB (9 kHz to 3.2 GHz, Band 0), ±1.5 dB (3.15 to 7.8 GHz, Band 1✱1), ±2.0 dB (7.7 to 13.2 GHz, Band 2✱1) Log linearity: ±0.4 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), ≤–75 dBc (200 to 850 MHz, Band 0), ≤–70 dBc (0.85 to 1.6 GHz, Band 0), ≤–90 dBc (1.6 to 6.6 GHz, Band 1 and 2) Two-tone 3rd order distortion: ≤–70 dBc (10 to 100 MHz), ≤–85 dBc (0.1 to 3.2 GHz), ≤–80 dBc (3.15 to 7.8 GHz), ≤–75 dBc (7.7 to 13.2 GHz) ✱Frequency difference of two signals: ≥50 kHz, mixer input: –30 dBm 1 dB gain compression: ≥0 dBm (≥100 MHz), ≥+3 dBm (≥500 MHz, Band 0), ≥–3 dBm (≥3150 MHz, Band 1 and 2)

Spectrum analyzer	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, Line, External (TTL level), External (±10 V) Trigger delay Pre-trigger range: –time span to 0 s Resolution: time span/500 or 100 ns, whichever 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, 1001 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, Linear 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, dBµ$\sqrt{\text{Hz}}$ C/N: dBc/Hz, dBc/ch Frequency counter Resolution: 1 Hz, 10 Hz, 100 Hz, 1 kHz Measurement accuracy: ± (display frequency x reference frequency accuracy + 2 x N Hz + 1 LSB) ∗At S/N ≥20 dB and RBW ≤3 MHz, N: Mixer harmonic order 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 inch Hard copy: Hard copy of screen via parallel interface (ESC/P compatible printer) Memory card interface: ATA flash card (3.3/5V) 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 condensation)
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)

∗1: Reference frequency: 50 MHz, input attenuator: 10 dB, +18˚ to +28˚C

• MX860901B W-CDMA Measurement Software

Guaranteed specifications after pressing Adjust Range and Power Calibration keys

Modulation/frequency measurement	Frequency range: 50 MHz to 3 GHz, 50 MHz to 2.3 GHz (Option 08) Input level: –60 to +20 dBm (average power, pre-amplifier: off), –80 to +10 dBm (average power, pre-amplifier: on*1) Carrier frequency accuracy: ±(reference oscillator accuracy + 10 Hz) ★Input level: ≥–30 dBm (pre-amplifier: off), ≥–40 dBm (pre-amplifier: on*1),1 code channel Modulation accuracy (residual vector error): <2% (rms) ★Input level: ≥–30 dBm (pre-amplifier: off), ≥–40 dBm (pre-amplifier: on*1), 1 code channel Origin offset accuracy: ±0.5 dB ★Input level: ≥–30 dBm (pre-amplifier: off), ≥–40 dBm (pre-amplifier: on*1), 1 code channel, relative to signal with origin offset of –30 dBc Waveform display (for one-channel to multi-channel) Constellation, eye pattern, vector error vs. chip, phase error vs. chip, amplitude error vs. chip, code vs. slot
Code domain analysis	Frequency range: 50 MHz to 3 GHz, 50 MHz to 2.3 GHz (Option 08) Input level: –60 to +20 dBm (average power, pre-amplifier: off), –80 to +10 dBm (average power, pre-amplifier: on*1) Code domain power accuracy: ±0.1 dB (code power: ≥–10 dBc), ±0.3 dB (code power: ≥–25 dBc) ★Input level: ≥–10 dBm (pre-amplifier: off), ≥–20 dBm (pre-amplifier: on*1; the input signal does not have the origin offset. Code domain error Residual error: <–50 dB Accuracy: ±0.5 dB (error: relative to signal with origin offset of –30 dBc) ★Input level: ≥–10 dBm (pre-amplifier: off); ≥–20 dBm (pre-amplifier: on*1), spread factor: 512 (down-link)/256 (up-link), the input signal does not have the origin offset Display Function: Code domain power, code domain error Spread factor: 4 to 256 (up-link)/4 to 512 (down-link), spread factor auto detection function, SCH level measurement function, I/Q separately at up-link Code vs. slot measurement: Measures code domain power per slot of specified code channel for max.150 slots. (Supporting compressed mode in downlink)
Amplitude measurement	Frequency range: 50 MHz to 3 GHz, 50 MHz to 2.3 GHz (Option 08) Input level: –60 to +20 dBm (average power, pre-amplifier: off), –80 to +10 dBm (average power, pre-amplifier: on*1) Transmitter power measurement Measurement range: –20 to +20 dBm (average power, pre-amplifier: off), –20 to +10 dBm (average power, pre-amplifier: on*1) ★Auto calibrated at internal power meter Accuracy: ±0.4 dB Power measurement linearity: ±0.2 dB (0 to –40 dB) ★Input level: ≥–10 dBm (pre-amplifier: off); ≥–20 dBm (pre-amplifier: on*1), after range adjusted, with reference level setting unchanged Filter selection function: Power measurement through RRC (α= 0.22) filter Transmitter power control measurement function: Relative power display per slot for max. 150 slots, PASS/FAIL evaluation RACH measurement function: Measures time difference between preamble RACH signal and message RACH signal
Occupied bandwidth measurement	Frequency range: 50 MHz to 3 GHz Input level: –60 to +20 dBm (average power, pre-amplifier: off), –80 to +10 dBm (average power, pre-amplifier: on*1) Measurement method Sweep method: Displays result after signal measured with sweep spectrum analyzer FFT method: Displays result after FFT

Adjacent channel power measurement	Frequency range: 50 MHz to 3 GHz, 50 MHz to 2.3 GHz (Option 08, 30) Input level: –10 to +20 dBm (average power, pre-amplifier: off) Measurement method 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 passage via built-in receiving filters (RRC: α = 0.22) Measurement range Input level: ≥0 dBm (filter method, wide dynamic range mode) Code channel (1 code): ≥55 dBc (5 MHz offset), ≥62 dBc (10 MHz offset) Code channel (16 multi-code): ≥50 dBc (5 MHz offset), ≥60 dBc (10 MHz offset, without Option 08) Input level: ≥–10 dBm (filter method, wide dynamic range mode) Code channel (1 code): 55 dBc (5 MHz offset, typical), 62 dBc (10 MHz offset, typical) Code channel (16 multi-code): 50 dBc (5 MHz offset, typical), 60 dBc (10 MHz offset, typical)
Spurious measurement	Measurement frequency: 9 kHz to 12.75 GHz (except within carrier frequency ±50 MHz) Input level (transmitter power): 0 to +20 dBm (average power, pre-amplifier: off) 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 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 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 as power rate. Waveform detection mode: average Measurement range*2: ≥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) ≥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) *Carrier frequency: 1.8 to 2.2 GHz
Spectrum emission mask measurement	Measures the signal under measurement with sweep spectrum analyzer and displays template evaluation result.
Demodulation display	Outputs max. 10 frames of despread data for specified code channel.
CCDF measurement	Frequency range: 50 MHz to 3 GHz, 50 MHz to 2.3 GHz (Option 08, 30) Measurement level range: –60 to +20 dBm (average power, pre-amplifier: off), +30 dBm (peak power, pre-amplifier: off) –80 to +10 dBm (average power, pre-amplifier: on), +20 dBm (peak power, pre-amplifier: on) Measurement method CCDF: Cumulative distribution display of the power difference between instantaneous power and average power. APD: Distribution display of the power difference between instantaneous power and average power. Filter selection function: 20 MHz, 10 MHz, 5 MHz, 3 MHz, RRC: α = 0.22, RC: α = 0.22
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 MS8609A-08 option is installed in the main unit.
*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

• MX860902A GSM Measurement Software

Guaranteed specifications after pressing Adjust Range and Power Calibration keys

Modulation/frequency measurement	Frequency range: 50 MHz to 2.7 GHz Input level: –40 to +20 dBm (burst average power, pre-amplifier: off), –60 to +10 dBm (burst average power, pre-amplifier: on*1) Carrier frequency accuracy: ±(reference oscillator accuracy + 10 Hz) *Input level (burst average power): ≥–30 dBm (pre-amplifier: off), ≥–40 dBm (pre-amplifier: on*1) Residual phase error (GMSK modulation): <0.5 deg (rms), <2.0 deg (peak) *Input level (burst average power): ≥–30 dBm (pre-amplifier: off), ≥–40 dBm (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. bit, I/Q diagram
Amplitude measurement	Frequency range: 50 MHz to 2.7 GHz Input level: –40 to +20 dBm (burst average power, pre-amplifier: off), –60 to +10 dBm (burst average power, pre-amplifier: on*1) Transmitter power measurement (auto calibrated at internal power meter) Measurement range: –10 to +20 dBm (burst average power), –10 to +10 dBm (burst average power, pre-amplifier: on*1) Accuracy: ±0.4 dB Power measurement linearity: ±0.2 dB (0 to –30 dBm) *Input level (burst average power): ≥–10 dBm (pre-amplifier: off); ≥–20 dBm (pre-amplifier: on*1), without changing the reference level setting after range optimization Carrier-off power measurement range Input level (burst average power): ≥–10 dBm (pre-amplifier: off), ≥–20 dBm (pre-amplifier: on*1) Normal mode: ≥60 dB (compared with burst average power) Wide dynamic range mode: ≥80 dB (compared with 10 mW of burst average power) *Measurement limit is decided by average nose level (≤–70 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 judgment function
Output RF spectrum measurement	Frequency range: 100 MHz to 2.7 GHz Input level: –10 to +20 dBm (burst average power, pre-amplifier: off), –20 to +10 dBm (burst average power, 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 12.75 GHz (except within carrier frequency ±50 MHz) Input level (transmitter power): 0 to +20 dBm (burst average power, pre-amplifier: off) 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: ≥72 dB (RBW: 10 kHz, 100 kHz to 50 MHz, Band 0) ≥72 dB (RBW: 100 kHz, 50 to 500 MHz, Band 0) ≥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) *Carrier frequency: 0.8 to 1 GHz, 1.8 to 2 GHz

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 deg (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 CW signal input to I and Q input terminals, measures and displays the phase difference between I- and Q-phase signals

*1: Can be set when MS8609A-08 option is installed in the main unit.

• MX860903A cdma Measurement Software

The following specifications are guaranteed after the internal level is optimized. (The range of the internal receiver is adjusted automatically by pressing the Adjust Range key.)

Modulation/frequency measurement	Measurement frequency range: 50 MHz to 2.3 GHz Measurement level range: –40 to +20 dBm (average power within burst, pre-amplifier off) –60 to +10 dBm (average power within burst, pre-amplifier on*1) Carrier frequency accuracy: ±(reference oscillator accuracy + 10 Hz) *Input level: ≥–30 dBm (pre-amplifier off), ≥–40 dBm (pre-amplifier on*1), at 1 code channel Modulation accuracy (residual vector error): <2.0% (rms) *Input level: ≥–30 dBm (pre-amplifier off), ≥–40 dBm (pre-amplifier on*1), at 1 code channel Origin offset accuracy: ±0.50 dB *Input level: ≥–30 dBm (pre-amplifier off), ≥–40 dBm (pre-amplifier on*1), at 1 code channel, relative to signal with origin offset of –30 dBc Waveform display: Displays following items for 1 CH to multi CH input signals; constellation, eye pattern, vector error vs. chip number, phase error vs. chip number, amplitude error vs. chip number
Code domain analysis	Measurement frequency range: 50 MHz to 2.3 GHz Measurement level range: –40 to +20 dBm (average power within burst, pre-amplifier off) –60 to +10 dBm (average power within burst, pre-amplifier on*1) Analysis signal: Forward link (radio configuration 1 to 5) Reverse link (radio configuration 1 to 4) Reverse link (radio configuration 3, 4) at long code mask: 0 Code domain power accuracy: ±0.1 dB (code power: ≥–10 dBc), ±0.3 dB (code power: ≥–25 dBc) Display function: Code domain power, code domain timing offset, code domain phase offset
Amplitude measurement	Frequency range: 50 MHz to 2.3 GHz Measurement level range –40 to +20 dBm (average power within burst, pre-amplifier off) –60 to +10 dBm (average power within burst, pre-amplifier on*1) Tx Power measurement: (after level calibration using built-in power meter, automatic operation by pushing key) Measurement range: –20 to +20 dBm (average power within burst, pre-amplifier off) –20 to +10 dBm (average power within burst, pre-amplifier on*1) Accuracy: ±0.40 dB Power measurement linearity: ±0.20 dB (0 to –40 dB) *Input level: ≥+10 dBm (pre-amplifier off), ≥–20 dBm (pre-amplifier on*1), unchanged reference level setup after range adjustment, Burst analysis: Rising/falling characteristics and on/off ratio analysis function
Occupied bandwidth measurement	Frequency range: 50 MHz to 2.3 GHz Measurement level range: –40 to +20 dBm (average power within burst, pre-amplifier off) –60 to +10 dBm (average power within burst, pre-amplifier on*1) Measurement method Sweep method: Sweeps signal using spectrum analyzer and calculates result FFT Method: Analyzes signal with FFT and calculates result
Spurious close carrier to the measurement	Frequency range: 50 MHz to 2.3 GHz Input level range: 0 to +20 dBm (average power within burst, pre-amp off) Measurement method: Calculates and displays ratio of Tx power to power measured using spectrum analyzer with sweep Tx power measurement Tx power method: Carrier power measured in 1.23 MHz bandwidth SPA method: Carrier power measured in RBW: 3 MHz, VBW: 3 kHz, detection mode: sample, frequency span: 0 Hz Measurement range: ±50 dBc (900 kHz offset), ±60 dBc (1.98 MHz offset) *Input level (average power within burst): ≥0 dBm (pre-amplifier off), RBW: 30 kHz, VBW: 300 kHz, detection mode: positive

Spurious measurement	Measurement frequency range: 10 MHz to 12.75 GHz (except within ±50 MHz of carrier frequency) Input level range (Tx power): +20 to +40 dBm (average power within burst) Measurement method Sweep method: Sweeps specified frequency range using spectrum analyzer and calculates ratio of carrier power and peak value detected during the sweep. Detection mode is average Spot method: Measures average power of specified frequencies in time domain using spectrum Analyzer and calculates ratio of carrier power and measured power of the frequencies. Average detection mode Search method: Sweeps specified frequency range using spectrum analyzer and detects frequency of peak spurious. Measures average power of detected frequencies in time domain using spectrum analyzer and calculates ratio of carrier power and measured power for frequencies Average detection mode Tx Power measurement Tx power method: Carrier power measured in 1.23 MHz bandwidth SPA method: Carrier power measured in RBW: 3 MHz, VBW: 3 kHz, detection mode: sample, frequency span: 0 Hz Measurement range (typical) 79 dB (RBW: 10 kHz, 10 to 30 MHz, Band 0) 79 dB (RBW: 100 kHz, 30 to 1000 MHz, Band 0) *Carrier frequency: 800 to 1000 MHz/1.8 to 2.2 GHz, referential value of power ratio in Tx power*2 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)
Electric performance (I/Q input)	Input impedance: 1 MΩ (parallel capacitance: <100 pF), 50 Ω Balance input Differential voltage: 0.1 to 1 Vp-p, In-phase voltage: ±2.5 V Unbalance Input: 0.1 to 1 Vp-p DC/AC coupling: Changeable Measurement items: Modulation accuracy, code domain power, amplitude, occupied bandwidth (FFT method), I/Q level Modulation accuracy measurement (residual vector error): <2% (rms) *DC coupling, input level: ≥0.1 V (rms) I/Q Level measurement: Measures input level of I and Q (rms, p-p) I/Q Phase difference measurement: When CW signal input to I and Q input terminals, measures and displays phase difference between I- and Q-phase signals.

*1: Set when MS8609A-08 option installed in main frame
*2: When carrier frequency in 2030.354 to 2200 MHz range, spurious generated at following frequency:
f (spurious) = f (input) – 2030.345 MHz

• MX860905A π/4DQPSK Measurement Software

The following specifications are guaranteed after the internal level is optimized. (The Range of the internal receiver is adjusted automatically by pressing the Adjust Range key.)

Modulation/frequency measurement	Measured frequency range: 50 MHz to 2.1 GHz Measured level ranges: –40 to +20 dBm (average power within burst, pre-amplifier off*1) –60 to +10 dBm (average power within burst, pre-amplifier on*1) Carrier frequency accuracy: ± (reference oscillator accuracy + 10 Hz) ★Input level (average power within burst): ≥–30 dBm (pre-amplifier off*1), ≥–40 dBm (pre-amplifier on*1) Modulation accuracy (residual vector error) PDC/NADC: <0.5% (rms), PHS: <0.7% (rms) ★Input level: ≥–30 dBm (pre-amp off*1), ≥–40 dBm (pre-amplifier on*1), averaging: 10 times Origin offset accuracy: ±0.50 dB ★Input level (average power within burst): ≥–30 dBm (pre-amplifier off*1), ≥–40 dBm (pre-amplifier on*1), relative to signal with origin offset of –30 dBc Transmission rate accuracy: ±1 ppm ★Input level (average power within burst): ≥–30 dBm (pre-amplifier off*1), ≥–40 dBm (pre-amplifier on*1) Symbol rate: 2 to 300 k symbol/s Roll off ratio: 0.2 to 1.0 Analysis symbol: 48 to 1000 symbols Waveform displays: Constellation, eye diagram, EVM vs. symbol No., phase error vs. symbol No., amplitude error vs. symbol No.
Amplitude	Frequency range: 50 MHz to 2.1 GHz Measurement level ranges: –40 to +20 dBm (average power within burst, pre-amplifier off*1) –60 to +10 dBm (average power within burst, pre-amplifier on*1) Transmitter power measurement*1 Measurement ranges: –10 to +20 dBm (average power within burst, pre-amplifier off*1) –10 to +10 dBm (average power within burst, pre-amplifier on*1) Accuracy: ±0.40 dB Power measurement linearity: ±0.20 dB (0 to –30 dB) ★Input level (average power within burst): ≥–10 dBm (pre-amplifier off*1), ≥–20 dBm (pre-amp on*1), without changing measurement reference level setting after range optimization Carrier-off power measurement*3 Normal mode measurement range PDC/NADC: ≥65 dB, PHS: ≥60 dB ★Relative to average power within burst Wide dynamic range mode measurement range PDC/PHS: ≥90 dB (measurement limits of average noise level: ≤–80 dBm, 50 Hz to 2.1 GHz) PHS: ≥80 dB (measurement limits of average noise level: ≤–70 dBm, 50 Hz to 2.1 GHz) ★Average power within burst: 10 mW Rise/fall characteristics: Display rising/falling edges while synchronizing to modulation data of signal data to be measured. Standard line display, PASS/FAIL evaluation function
Occupied bandwidth measurement	Measured frequency range: 50 MHz to 2.1 GHz Measured level ranges: –40 to +20 dBm (average power within burst, pre-amplifier off*1) –60 to +10 dBm (average power within burst, pre-amplifier on*1) Measurement methods Sweep method: Calculates and displays result after signal measured with sweep spectrum analyzer FFT method: Calculates and displays result after FFT

Adjacent channel power measurement	Frequency range: 100 MHz to 2.1 GHz Input level range: –10 to +20 dBm (average power within burst, pre-amplifier off*1) –20 to +10 dBm (average power within burst, pre-amplifier on*1) Measurement methods Sweep method (all): Calculates and displays result after signal measured with sweep spectrum analyzer Sweep method (separate): Calculates and displays after measuring adjacent channel and next adjacent channel signal with sweep spectrum analyzer High-speed method: Calculates and displays after measuring adjacent channel and next adjacent channel power (rms) through internal receive filter Measurement range (CW signal input, at high-speed method) PDC: ≥60 dB (50 kHz offset), ≥65 dB (100 kHz offset) PHS: ≥60 dB (600 kHz offset), ≥60 dB (900 kHz offset) NADC: ≥30 dB (30 kHz offset), ≥60 dB (60 kHz offset), ≥65 dB (90 kHz offset) *Adjacent channel power averaging ratio found from average power within burst and during burst on interval
Spurious measurement	Measured frequency range: 100 kHz to 7.8 GHz (except within carrier frequency ±50 MHz) Input level range (transmitter power): –10 to +20 dBm (average power within burst, pre-amplifier off*1) –20 to +10 dBm (average power within burst, pre-amplifier on*1) Measurement methods Sweep method: Sweeps specified range of frequency using spectrum analyzer, and then detects and displays peak value Calculates rate for transmission power value and displays as power rate. Waveform detection mode: average Spot method: Measures specified frequency with time domain from spectrum analyzer and then displays average value Calculates rate for transmission power value and displays as power rate. Waveform detection mode: average Search method: Sweeps specified frequency range using spectrum analyzer to detect peak value, then measures frequency using time domain to display average value. Calculates rate for transmission power value and displays it as power rate Waveform detection mode: average
Electrical performance (I/Q input)	Input method: Balanced, unbalanced Input impedance: 1 MΩ (parallel capacitance: <100 pF), 50 Ω Input level range Balanced input Differential voltage range: 0.1 to 1 Vp-p, In-phase voltage range: ±2.5 V (at input terminal) Unbalanced input: 0.1 to 1 Vp-p (at input terminal, switchable DC/AC coupling) Measurement items: modulation accuracy, amplitude, occupied bandwidth (FFT method), I/Q level Modulation accuracy measurement Input level: ≥0.1 V (rms) *Temperature range: 10° to 28°C Residual vector error PDC/NADC: <0.5% (rms) *Typical, DC coupling PHS: <0.7% (rms) *Typical, DC coupling I/Q level measurement Level measurement: Measurement and display each I, Q input voltage (rms, p-p) I/Q phase difference measurement: Phase difference between I and Q phase signals when CW signal input to I and Q input terminals

*1: Set when MS8609A-08 option installed in main frame
*2: After level calibration using internal power meter
*3: Input level (average power within burst): ≥–10 dBm (pre-amplifier off*1), ≥–20 dBm (pre-amplifier on*1)

Options

• Option 01: Precision Frequency Reference

Frequency	10 MHz
Start-up characteristics	≤5 x 10^{-8}/7 min. (referenced to frequency at 24 hours after power-on)
Aging rate	≤±5 x 10^{-10}/day (referenced to frequency at 24 hours after power-on)
Temperature characteristics	≤±5 x 10^{-10} (referenced frequency at 0° to +50˚C and +25˚C)

• Option 02: Narrow Resolution Bandwidths (FFT)

Resolution bandwidth	Setting range: 1 Hz to 1 kHz (1, 3 sequence) Bandwidth accuracy: ±10% (RBW = 30, 300 Hz), ±10% Typical (RBW = 1, 3, 10, 100, 1 kHz) RBW selectivity (60 dB: 3 dB): ≤5:1 RBW switching uncertainty: ±0.5 dB
Span setting	Minimum setting span: 100 Hz
Average noise level display	Without Option 08, when RBW is 1 Hz, RF ATT is 0 dB, sample detection mode ≤–148.5 dBm + 1.5 x f [GHz] dB Typical (1 MHz to 2.5 GHz, Band 0) ≤–144.5 dBm + 1.5 x f [GHz] dB Typical (2.5 to 3.2 GHz, Band 0) ≤–138.5 dBm Typical (3.15 to 7.8 GHz, Band 1) ≤–129.5 dBm Typical (7.7 to 13.2 GHz, Band 2) With Option 08, pre-ampifier off, when RBW = 1 Hz, RF ATT = 0 dB, sample detection mode ≤–146.5 dBm + 1.5 x f [GHz] dB Typical (1 MHz to 2.5 GHz, Band 0) ≤–144.5 dBm + 1.5 x f [GHz] dB Typical (2.5 to 3.2 GHz, Band 0) ≤–138.5 dBm Typical (3.15 to 7.8 GHz, Band 1) ≤–129.5 dBm Typical (7.7 to 13.2 GHz, Band 2)

• Option 04: Digital Resolution Bandwidth

Resolution bandwidth	Setting range: 10 Hz to 1 MHz (1, 3 sequence) Bandwidth accuracy: ±10% (RBW ≥100 Hz), ±10% typical (RBW ≤30 Hz) Bandwidth selectivity (60 dB: 3 dB): ≤5:1 (RBW ≥100 Hz), ≤5:1 typical (RBW ≤30 Hz) RBW switching uncertainty: ±0.5 dB
Detection mode	NORMAL, POSITIVE PEAK, NEGATIVE PEAK, SAMPLE, RMS RMS: displays root-mean-square value of average power between sample points
Average noise level display	Without Option 08, when RBW = 10 Hz, RF ATT = 0 dB, sample detection mode ≤–136.5 dBm1.5 x f [GHz] dB Typical (1 MHz to 2.5 GHz, Band 0) ≤–132.5 dBm1.5 x f [GHz] dB Typical (2.5 to 3.2 GHz, Band 0) ≤–128.5 dBm Typical (3.15 to 7.8 GHz, Band 1) ≤–119.5 dBm Typical (7.7 to 13.2 GHz, Band 2) With Option 08, pre-amplifier off, when RBW = 10 Hz, RF ATT = 0 dB, sample detection mode ≤–134.5 dBm + 1.8 x f [GHz] dB Typical (1 MHz to 2.5 GHz, Band 0) ≤–132.5 dBm + 1.8 x f [GHz] dB Typical (2.5 to 3.2 GHz, Band 0) ≤–128.5 dBm Typical (3.15 to 7.8 GHz, Band 1) ≤–119.5 dBm Typical (7.7 to 13.2 GHz, Band 2)

• Option 05: Rubidium Reference Oscillator

Frequency	10 MHz
Start-up characteristics	±1 x 10^{-9}/7 min. (referenced to frequency 1 hour after power-on)
Aging rate	±1 x 10^{-10}/month (referenced to frequency 1 hour after power-on)
Temperature characteristics	±1 x 10^{-9} (referenced to frequency at 0° to +45˚C and +25˚C)
Accessories	J1066 Coaxial Code 0.15 m (BNC211-LP4)

• Option 08: Pre-amplifier

Gain	20 dB typical
Noise figure	6.5 dB typical (input frequency: ≤2 GHz),12 dB (input frequency: >2 GHz)
Frequency	Frequency range: 100 kHz to 3 GHz Band 0: 100 kHz to 3.0 GHz, 1–: 3.15 to 6.3 GHz, 1+: 6.2 to 7.8 GHz, 2+: 7.7 kHz to 13.2 GHz ∗Only Band 0 supports pre-amplifier
Amplitude	Level measurement: Average noise level to +10 dBm Max. input level: +10 dBm Average noise level: –137 dBm + 2.0 x f [GHz] dB (1 MHz to 2.5 GHz, Band 0) ∗At RBW 300 Hz, VBW 1 Hz, RF ATT 0 dB, and Sample detection mode Reference level Setting range Log scale: –120 to +10 dBm, or equivalent level Linear scale: 2.24 µV to 707 mV Reference level accuracy: ±0.90 dB (–69.9 to +10 dBm), ±1.50 dB (–90 to –70 dBm) ∗After calibration, referenced to 50 MHz, 1 MHz span (RF ATT, RBW, VBW, and sweep time set to AUTO) RBW Switching uncertainty: ±0.5 dB (300 Hz to 5 MHz), ±0.75 dB (10 MHz, 20 MHz) ∗After calibration, referenced to RBW 3 kHz RF ATT switching uncertainty: ±0.5 dB (10 to 50 dB), ±1.0 dB (52 to 62 dB) Frequency response: ±2.0 dB (100 kHz to 3 GHz) ∗Referenced to 100 MHz, when RF ATT = 10 to 50 dB, and temperature = +18° to +28˚C Linearity of waveform display Log scale (after calibration): ±0.5 dB (0 to –20 dB, RBW ≤1 kHz), ±1.0 dB (0 to –60 dB, RBW ≤1 kHz), ±1.5 dB (0 to –75 dB, RBW ≤1 kHz) Linear scale (after calibration): ±5% (relative to reference level) Spurious response: Two-tone 3rd order distortion: ≤–70 dBc (10 MHz to 3 GHz) ∗Frequency difference of two signals ≥50 kHz, at pre-amplifier input level∗1 of –55 dBm 1 dB gain compression: ≥–35 dBm (input frequency ≥100 MHz) ∗At pre-amplifier input level∗1 Input impedance: VSWR ≤2.5 typical

∗1: Pre-amplifier input level calculated as Pre-amplifier input level = RF input level – RF ATT setting level

• Option 09: Ethernet Interface

Function	Control by external controller (except power switch)
Connector	10BASE-T

• Option 30: LPF for 2 GHz Band Carrier Cut

Function	Suppresses distortion in spectrum analyzer by carrier wave (1.8 to 2 GHz) at W-CDMA low-frequency band spurious measurement ∗Option 08 cannot be installed simultaneously.
Frequency range	9 kHz to 3.2 GHz (LPF: OFF), 9 kHz to 1.0 GHz (LPF: ON)
LPF attenuation characteristics	≤–20 dB, –30 dB typical, at 1.8 to 2.2 GHz
Average noise level display	[LPF: ON] ≤–122 dBm + 2.0 x f [GHz] dB (1 MHz to 1.0 GHz, band 0) ∗RBW: 300 Hz, VBW: 1 Hz, RF ATT: 0 dB
Frequency response	[LPF: ON] ±1.0 dB (9 kHz to 1.0 GHz, band 0) ∗Referenced to 50 MHz, when RF ATT = 10 dB, and temperature = +18° to +28˚C

• Option 31: Low Noise Floor

Function	Used to decrease floor noise in frequency band 2+
Average noise level display	≤–112 dBm (7.7 to 13.2 GHz, band 2) ✱RBW: 300 Hz, VBW: 1 Hz, RF ATT: 0 dB

• Option 32: Maximum Input Level Extension

Function	Extends measurement level range to +26 dBm
Max. input level	+30 dBm (1 W), continuous wave average power
Power meter function	Level range: –14 to +26 dBm
Spectrum analyzer amplitude	Setting range Log scale: –100 to +40 dBm or Equivalent level Linear scale: 22.4 µV to 22.4 V Reference level accuracy: ±0.75 dB (+0.1 to +30 dBm), ±0.5 dB (–49.9 to 0 dBm), ±0.75 dB (–69.9 to –50 dBm), ±1.5 dB (–80 to –70 dBm) ✱After calibration, with 50 MHz frequency at 1 MHz span (RF ATT, RBW, VBW, and sweep time set to AUTO)

• Option 33: High Accuracy Power Measurement

Function	Improves power measurement accuracy without using internal power meter when MX860901A W-CDMA measurement software is used
Frequency range	1848 to 2171 MHz (Except 1995 to 2105 MHz)
Transmission power measurement range	–50 dBm to +20 dBm (average power)
Reference level	–10 dBm to +20 dBm
Transmission power accuracy	±0.4 dB ✱At reference input level, +25˚±3˚C, input ATT: AUTO, after calibration and except mismatch error
Power measurement linearity	±0.2 dB (0 to –40 dB) ✱Input level: ≥–10 dBm, at range optimization and no change of reference level setting.
Temperature coefficient	0.015 dB/˚C
Accessories	ATA flash memory card
Calibration interval	Six months

• Option 34: 4 GHz Lo Output

Outline	Outputs internal 4 GHz Lo signal to BNC connector on back panel
Function	Frequency: 4 GHz
	Frequency accuracy: ±(4 GHz x reference frequency accuracy) ±1 Hz
	–10 dBm (typical)
Spurious	≤–40 dBm

• Option 36: Power Meter Hi Limit Frequency Expansion (6 GHz)

Outline	Extends power meter hi limit frequency to 6 GHz
Frequency range	3 to 6 GHz
Level range	–20 to +20 dBm
Measurement level accuracy	±10% (after zero calibration)

• Option 37: Power Meter Hi Limit Frequency Expansion (6 GHz) (retrofit option)

Outline	Extends power meter hi limit frequency to 6 GHz
Frequency range	3 to 6 GHz
Level range	–20 to +20 dBm
Measurement level accuracy	±10% (after zero calibration)

• Option 46: Auto-Power Recovery

Function	Disables power switch on front panel and automatically restores power after power failure ON/OFF operation performed using Standby switch on rear panel ✱Power switch on front panel lacks latching function, so if power interrupted in ON status, Standby status held even after power restored

• Option 47: Rack Mount (IEC)

Function	For EC standard-compatible rack; tilt handle removed when mounted

• Option 48: Rack Mount (JIS)

Function	For JIS standard-compatible rack; tilt handle removed when mounted

Ordering Information

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

Model/Order No.	Name	
	Main frame	
MS8609A	Digital Mobile Radio Transmitter Tester	
	Standard accessories	
	Power cord, 2.6 m:	1 pc
J0996	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/MS8609A operation manual (Vol. 1):	1 copy
W1744AE	MS8608A/MS8609A operation manual (Vol. 2):	1 copy
W1745AE	MS8608A/MS8609A operation manual (Vol. 3):	1 copy
	Options	
MS8609A-01	Precision frequency reference (aging rate: 5 x 10^{-10}/day)	
MS8609A-02	Narrow resolution bandwidth (FFT)	
MS8609A-04	Digital resolution bandwidth	
MS8609A-05	Rubidium reference oscillator	
MS8609A-08	Pre-amplifier	
MS8609A-09	Ethernet interface	
MS8609A-30	LPF for 2 GHz band carrier cut	
MS8609A-31	Low noise floor	
MS8609A-32	Maximum input level extension	
MS8609A-33	High accuracy power measurement	
MS8609A-46	Auto-power recovery	
MS8609A-47	Rack mount without handle (JIS)	
MS8609A-48	Rack mount without handle (IEC)	
MU860920A	Demodulation Unit	

Model/Order No.	Name
	Measurement software
MX860901B	W-CDMA Measurement Software
MX860902A	GSM Measurement Software
MX860903A	cdma Measurement Software
MX860904A	CDMA2000 1xEV-DO Measurement Software
MX860905A	π/4DQPSK Measurement Software
MX860920A	BER/BLER Measurement Software (requires MU860920A)
MX860930A	Wireless LAN Measurement Software
MX860950A	HSDPA Measurement Software
MX860951A	W-CDMA Release5 uplink Measurement Software
MX860960A	TD-SCDMA Measurement Software
W1746AE	MX268x01B/MX860x01B Operation Manual
W1795AE	MX268x02A/MX860x02A Operation Manual
W1865AE	MX268x03A/MX860x03A Operation Manual
W2090AE	MX268x04A/MX860x04A Operation Manual
W1866AE	MX268x05A/MX860x05A Operation Manual
W2354AE	MX268107A/MX860x07A Operation Manual
W2154AE	MX860820A/MX860920A Operation Manual
W2080AE	MX268x30A/MX860x30A Operation Manual
W2131AE	MX860x50A Operation Manual
W2617AE	MX268x51A/MX860x51A Operation Manual
W2593AE	MX268x60A/MX860x60A 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
J0007	GPIB cable, 1 m
J0008	GPIB cable, 2 m
MA1612A	Four-Point Junction Pad (5 to 3000 MHz)
J0395	High-power fixed attenuator (30 dB, 30 W, DC to 8 GHz)
B0472	High-power fixed attenuator (30 dB, 100 W, DC to 18 GHz)
B0452A	Hard carrying case (with casters)
B0452B	Hard carrying case (without casters)
B0329G	Front cover (3/4 MW4U)
B0488	Rear panel protective pad
B0480	Tilt handle soft type
A3933	Circulator (1760 to 2115 MHz)
H3930	Isolator (1760 to 2115 MHz)
	Maintenance service
MS8609A-90	Extended three year warranty service
MS8609A-91	Extended five year warranty service

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Specifications are subject to change without notice.

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