MS8608A
Digital Mobile Radio Transmitter Tester
9 kHz to 7.8 GHz

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

**Parameter Setup**

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

**Modulation Accuracy Measurement**

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

**Base Station Code Domain Power**

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

**Mobile Terminal Code Domain Power**

Displays the code domain power measurement results of phase I and phase Q, separately. Either synchronization with 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.

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**EDGE Constellation Display**

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

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**Spurious Measurement**

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

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The following screen represents constellation display of the 8PSK modulation through Nyquist filter and Gaussian inverse correction filter.
### MS8608A

<table>
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<th>Specifications</th>
<th>Details</th>
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<tr>
<td><strong>Frequency range</strong></td>
<td>9 kHz to 7.8 GHz, 9 kHz to 7.9 GHz (with option 35)</td>
</tr>
<tr>
<td><strong>Max. input level</strong></td>
<td>High-power input: +40 dBm (10 W), Low-power input: +20 dBm (100 mW)</td>
</tr>
</tbody>
</table>
| **Input impedance** | High-power input: 50 Ω, VSWR: ≤1.2 (≤3 GHz)/≤1.3 (>3 GHz)  
  Low-power input: Power meter: 50 Ω, VSWR: ≤1.3 (≤3 GHz)  
  Except power meter: 50 Ω, VSWR: ≤1.5 (≤3 GHz)/≤2.0 (≥3 GHz) +Input attenuator: ≥4 dB |
| **Input connector** | N-type (high-power input), SMA-type (low-power input), BNC-type (I/Q input) |
| **I/Q input** | Input: Balanced, unbalanced  
  Input impedance: 1MΩ (parallel capacitance: <100 pF), 50 Ω  
  Balanced input: Differential Voltage: 0.1 to 1V(p-p), In-phase voltage ±2.5 V  
  Unbalanced input: 0.1 to 1V(p-p), AC/DC switchable |
| **Reference oscillator** | Frequency: 10 MHz  
  Starting characteristics: ≤5 × 10⁻⁸ (compared to frequency after 24 hour warm-up characteristics after 10 minute warm-up)  
  Aging rate: ≤2 × 10⁻⁸/day, ≤1 × 10⁻⁷/year (compared to frequency after 24 hour warm-up)  
  Temperature characteristics: ≤5 × 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% |
| **Frequency** | [Frequency setting](#)  
  Setting range: 9 kHz to 3.2 GHz (Band: 0), 3.15 to 7.8 GHz (Band: 1)  
  Pre-selector range: 3.15 to 7.8 GHz (Band: 1)  
  Frequency 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) |
| **Spectrum analyzer** | 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]  
  s≤–104 dBm + 1.5 f [GHz] dB (high-power input, 1 MHz to 2.5 GHz, Band 0, input attenuator: 20 dB)  
  s≤–100 dBm + 1.5 f [GHz] dB (high-power input, 2.5 to 3.2 GHz, Band 0, input attenuator: 20 dB)  
  s≤–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]  
  s≤–102 dBm + 1.8 f [GHz] dB (high-power input, 1 MHz to 2.5 GHz, Band 0, input attenuator: 20 dB)  
  s≤–100 dBm + 1.8 f [GHz] dB (high-power input, 2.5 to 3.2 GHz, Band 0, input attenuator: 20 dB)  
  s≤–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]  
  s≤–124 dBm + 1.5 f [GHz] dB (low-power input, 1 MHz to 2.5 GHz, Band 0, input attenuator: 0 dB)  
  s≤–120 dBm + 1.5 f [GHz] dB (low-power input, 2.5 to 3.2 GHz, Band 0, input attenuator: 0 dB)  
  s≤–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]  
  s≤–122 dBm + 1.8 f [GHz] dB (low-power input, 1 MHz to 2.5 GHz, Band 0, input attenuator: 0 dB)  
  s≤–120 dBm + 1.8 f [GHz] dB (low-power input, 2.5 to 3.2 GHz, Band 0, input attenuator: 0 dB)  
  s≤–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]  
  s≤–128 dBm + 1.8 f [GHz] dB (low-power input, 1 MHz to 3.2 GHz, input attenuator: 20 dB)  
  s≤–120 dBm + 1.8 f [GHz] dB (low-power input, 3.15 to 7.8 GHz, input attenuator: 20 dB)  
  s≤–100 dBm + 0.8 f [GHz] dB (low-power input, 1 MHz to 3.2 GHz, input attenuator: 0 dB)  
  s≤–90 dBm (low-power input, 3.15 to 7.8 GHz, input attenuator: 0 dB) |
| **Amplitude** | 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)  
  ≤–90 dBm (low-power input, 3.15 to 7.8 GHz, input attenuator: 0 dB) |
### Spectrum Analyzer

| **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  

### Amplitude

| **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.  
|**Gate delay range:** | 0 to 65.5 ms, Resolution: 100 ns (sweep time: ≤4.9 ms), 1 µs (sweep time: ≥5 ms)  
|**Gate length range:** | 2 µs to 65.5 ms (resolution: 1 µs)  

### Sweep

| **Number of data points:** 501  
|**Detection modes:** | Normal, Positive peak, Negative peak, Sample, Average, rms (option 04)  
|**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, ∆ marker → Span, Zone → Span  
|**Peak search:** | Peak, Next peak, Min dip, Next dip  
|**Multi-marker:** | 10 max.  
|**Measurements:** | Noise power: dBm/Hz, dBm/µV/√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:** | Upper limit x 2, lower limit x 2  

### Functions

| **Dimensions and mass:** 320 (W) × 177 (H) × 411 (D) mm (except handle, feet, front cover and fan cover), ≤16 kg (nominal)  
|**Power:** | 100 to 120/200 to 240 Vac (−15%+10%, max. voltage: 250 V, automatic voltage selection), 47.5 to 63 Hz, ≤400 VA  
|**Operating temperature and humidity:** | 0˚ to +50˚C, ≤85% (no condensing)  
|**LVD:** | EN61010-1: 2001 (Pollution Degree 2)
### 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 ‘*’)
- **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 ‘*’)

### Guaranteed specifications after Adjust Range and Power Calibration keys pressed

<table>
<thead>
<tr>
<th>Modulation/frequency measurement</th>
<th>Frequency range: 50 MHz to 3 GHz, 50 MHz to 2.3 GHz (with option 08)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input level:</strong> –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 ‘*’)</td>
<td></td>
</tr>
<tr>
<td><strong>Carrier frequency accuracy:</strong> ± (reference oscillator accuracy + 10 Hz)</td>
<td></td>
</tr>
<tr>
<td><strong>Input level:</strong> ≥–10 dBm (high-power input), ≥–30 dBm (low-power input), ≥–40 dBm (low-power input, pre-amplifier: on ‘*’)</td>
<td></td>
</tr>
</tbody>
</table>

### 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 ‘*’)
- **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), ≥–30 dBm (low-power input), ≥–40 dBm (low-power input, pre-amplifier: on ‘*’), the input signal does not have the origin offset
- **Residual error:** ≤<50 dB, Measurement accuracy: ±0.5 dB (at error of –30 dB)
- **Input level:** ≥–10 dBm (high-power input), ≥–30 dBm (low-power input), ≥–40 dBm (low-power input, pre-amplifier: on ‘*’), 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 ‘*’)
- **Transmitter power 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 ‘*’)
- **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 ‘*’), 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 ‘*’)
- **Sweep mode:** Displays result after signal measured with sweep spectrum analyzer
- **FFT mode:** Displays result after FFT

### Adjacent channel 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:** 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) *At 16 multi-code channel
- **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

<table>
<thead>
<tr>
<th>Measurement frequency: 9 kHz to 7.8 GHz (except within carrier frequency ±50 MHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input level (transmitter power):</td>
</tr>
<tr>
<td>+20 to +40 dBm (average power, high-power input), 0 to +20 dBm (average power, low-power input)</td>
</tr>
<tr>
<td>Measurement method</td>
</tr>
<tr>
<td>Sweep method</td>
</tr>
<tr>
<td>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</td>
</tr>
<tr>
<td>[Spot method]</td>
</tr>
<tr>
<td>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</td>
</tr>
<tr>
<td>[Search method]</td>
</tr>
<tr>
<td>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</td>
</tr>
</tbody>
</table>

### Measurement range

- **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.

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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.

\[ f_{\text{spurious}} = f_{\text{input}} - 2030.345 \text{ MHz} \]
### Modulation/frequency measurement

<table>
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<tr>
<th>Frequency range: 50 MHz to 2.7 GHz</th>
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<tbody>
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<td>Input level:</td>
</tr>
<tr>
<td>–20 to +40 dBm (average power within burst, high-power input)</td>
</tr>
<tr>
<td>–40 to +20 dBm (average power within burst, low-power input)</td>
</tr>
<tr>
<td>–60 to +10 dBm (average power within burst, low-power input, pre-amplifier: on *)</td>
</tr>
</tbody>
</table>

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 *)

Residual phase error (GMSK modulation):

<0.5˚ (rms), <2.0˚ (peak)

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

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<tr>
<th>Frequency range: 50 MHz to 2.7 GHz</th>
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<tr>
<td>Input level:</td>
</tr>
<tr>
<td>–20 to +40 dBm (average power within burst, high-power input)</td>
</tr>
<tr>
<td>–40 to +20 dBm (average power within burst, low-power input)</td>
</tr>
<tr>
<td>–60 to +10 dBm (average power within burst, low-power input, pre-amplifier: on *)</td>
</tr>
</tbody>
</table>

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 *)

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, pre-amplifier: on *), 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, pre-amplifier: on *)

[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

<table>
<thead>
<tr>
<th>Frequency range: 100 MHz to 2.7 GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input level:</td>
</tr>
<tr>
<td>+10 to +40 dBm (average power within burst, high-power input)</td>
</tr>
<tr>
<td>–10 to +20 dBm (average power within burst, low-power input)</td>
</tr>
<tr>
<td>–20 to +10 dBm (average power within burst, low-power input, pre-amplifier: on *)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Measurement frequency: 100 kHz to 7.8 GHz (except within carrier frequency ±50 MHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input level (transmitter power):</td>
</tr>
<tr>
<td>+20 to +40 dBm (average power within burst, high-power input)</td>
</tr>
<tr>
<td>0 to +20 dBm (average power within burst, low-power input)</td>
</tr>
</tbody>
</table>

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**

[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)

**Spurious measurement**

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

- 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.

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**Ordering Information**

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

<table>
<thead>
<tr>
<th>Model/Order No.</th>
<th>Name</th>
<th>Model/Order No.</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS8608A</td>
<td>Digital Mobile Radio Transmitter Tester</td>
<td>MX860805A</td>
<td>π/4DQPSK Measurement Software</td>
</tr>
<tr>
<td>J0996B</td>
<td>Power cord, 2.6 m: 1 pc</td>
<td>MX860802A</td>
<td>BER/BLER Measurement Software (requires MU860820A)</td>
</tr>
<tr>
<td>J0576B</td>
<td>RS-232C cable: 1 pc</td>
<td>MX8608030A</td>
<td>Wireless LAN Measurement Software</td>
</tr>
<tr>
<td>J0576B</td>
<td>Modulation accuracy, I/Q level</td>
<td>MX860850A</td>
<td>HSDPA Measurement Software</td>
</tr>
<tr>
<td>W1709AE</td>
<td>Coaxial cord (N-P · 5D-2W · N-P), 1 m: 1 pc</td>
<td>W1746AE</td>
<td>W-CDMA operation manual</td>
</tr>
<tr>
<td>W1744AE</td>
<td>Input level: ≥0.1 V (rms), 18˚ to 28˚C</td>
<td>W1795AE</td>
<td>MX660x02A operation manual</td>
</tr>
<tr>
<td>W1745AE</td>
<td>I/Q level measurement: Measures and displays each I, Q input voltage (rms, p-p)</td>
<td>W1865AE</td>
<td>MX660x03A/MX268x03A operation manual</td>
</tr>
<tr>
<td></td>
<td><strong>Options</strong></td>
<td>W2090AE</td>
<td>MX660x04A/MX268x04A operation manual</td>
</tr>
<tr>
<td></td>
<td>Narrow frequency reference (aging rate: 5 × 10⁻¹⁰/day)</td>
<td>W1866AE</td>
<td>MX660x05A/MX268x05A operation manual</td>
</tr>
<tr>
<td>MS8608A-01</td>
<td>Extension of pre-selector lower limit (to 1.6 GHz)</td>
<td>W2154AE</td>
<td>MX680820A/MX690920A operation manual</td>
</tr>
<tr>
<td>MS8608A-02</td>
<td>Digital resolution bandwidth</td>
<td>W2080AE</td>
<td>MX268+30A/MX860+30A operation manual</td>
</tr>
<tr>
<td>MS8608A-03</td>
<td>Ethernet interface</td>
<td>W2131AE</td>
<td>MX660x05A operation manual</td>
</tr>
<tr>
<td>MS8608A-04</td>
<td>Auto-power recovery</td>
<td></td>
<td><strong>Optional accessories</strong></td>
</tr>
<tr>
<td>MS8608A-08</td>
<td>Pre-amplifier (100 kHz to 3 GHz)</td>
<td>J0576D</td>
<td>Coaxial cord (N-P · 5D-2W · N-P), 2 m</td>
</tr>
<tr>
<td>MS8608A-09</td>
<td>Ethernet interface</td>
<td>J0127C</td>
<td>Coaxial cord (BNC-P · RG-58A/U · BNC-P), 0.5 m</td>
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<tr>
<td>MS8608A-35</td>
<td>7.9 GHz frequency extension</td>
<td>J0127A</td>
<td>Coaxial cord (BNC-P · RG-58A/U · BNC-P), 1 m</td>
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<tr>
<td>MS8608A-46</td>
<td>Auto-power recovery</td>
<td>MA1612A</td>
<td>Four-Way Junction Pad (5 to 3000 MHz)</td>
</tr>
<tr>
<td>MS8608A-47</td>
<td>Rack mount without handle (IEC)</td>
<td>J0395</td>
<td>High-power fixed attenuator (30 dB, 30 W, DC to 9 GHz)</td>
</tr>
<tr>
<td>MS8608A-48</td>
<td>Rack mount without handle (JIS)</td>
<td>B0472</td>
<td>High-power fixed attenuator (30 dB, 100 W, DC to 18 GHz)</td>
</tr>
<tr>
<td>MU860820A</td>
<td>RER/BLER Measurement Software</td>
<td>J0007</td>
<td>GPIB cable, 1 m</td>
</tr>
<tr>
<td>MU860820A</td>
<td>W-CDMA Measurement Software</td>
<td>J0008</td>
<td>GPIB cable, 2 m</td>
</tr>
<tr>
<td>MU860820A</td>
<td>GSM Measurement Software</td>
<td>B0452A</td>
<td>Hard carrying case (with casters)</td>
</tr>
<tr>
<td>MU860830A</td>
<td>cdma Measurement Software</td>
<td>B0452B</td>
<td>Hard carrying case (without casters)</td>
</tr>
<tr>
<td>MU860830A</td>
<td>CDMA2000 1xEV-DO Measurement Software</td>
<td>B0329G</td>
<td>Front cover (3/4M4W4U)</td>
</tr>
<tr>
<td>MU860830A</td>
<td>CDMA2000 1xEV-DO Measurement Software</td>
<td>B0488</td>
<td>Rear panel protective pad</td>
</tr>
<tr>
<td>MU860830A</td>
<td>CDMA2000 1xEV-DO Measurement Software</td>
<td>B0480</td>
<td>Tilt handle soft type</td>
</tr>
<tr>
<td>MU860830A</td>
<td>CDMA2000 1xEV-DO Measurement Software</td>
<td>A3933</td>
<td>Circulator (1760 to 2115 MHz)</td>
</tr>
<tr>
<td>MU860830A</td>
<td>CDMA2000 1xEV-DO Measurement Software</td>
<td>H3930</td>
<td>Isolator (1760 to 2115 MHz)</td>
</tr>
<tr>
<td>MU860830A</td>
<td>CDMA2000 1xEV-DO Measurement Software</td>
<td></td>
<td><strong>Maintenance/calibration service</strong></td>
</tr>
<tr>
<td>MU860830A</td>
<td>CDMA2000 1xEV-DO Measurement Software</td>
<td>MS8608A-90</td>
<td>Extended three year warranty service</td>
</tr>
<tr>
<td>MU860830A</td>
<td>CDMA2000 1xEV-DO Measurement Software</td>
<td>MS8608A-91</td>
<td>Extended five year warranty service</td>
</tr>
</tbody>
</table>

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