Application Note

MX860803A/MX860903A
cdma Measurement Software

MS8608A/MS8609A
Digital Mobile Radio Transmitter Tester
MX860803A/MX860903A
cdma Measurement Software
Application Note

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Anritsu Corporation
Version 1.0

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Appendix
1. Other Tx characteristics
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1. CDMA2000 1x Standard

1.1 Related standards
1.2 Frequency and channel
1.3 Radio configuration (RC)
1.4 BTS Measurement items

1.1 Related standards

3GPP2 C.S0002
*Physical Layer* Standard for cdma2000 Spread Spectrum Systems

3GPP2 C.S0010
Recommended Minimum Performance Standards for cdma2000 Spread Spectrum *Base Stations*

3GPP2 C.S0011
Recommended Minimum Performance Standards for cdma2000 Spread Spectrum *Mobile Stations*

3GPP2 Homepage
http://www.3gpp2.org/Public_html/specs/index.cfm
Anyone can download
1.2 Frequencies and channels

- Class 0: 800 MHz Band
- Class 1: 1900 MHz Band
- Class 2: TACS Band
- Class 3: JTACS Band
- Class 4: Korean PCS Band
- Class 5: 450 MHz Band
- Class 6: 2 GHz Band
- Class 7: 700 MHz Band
- Class 8: 1800 MHz Band
- Class 9: 900 MHz Band
- Class 10: Secondary 800 MHz Band
- Class 11: 400 MHz European PAMR Band
- Class 12: 800 MHz PAMR Band
1.3 Radio configuration (RC)

Each RC has a different data rate, error correction, and modulation method.

<table>
<thead>
<tr>
<th>RC</th>
<th>SR</th>
<th>Data Rate</th>
<th>Error Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1x</td>
<td>1200 - 9600</td>
<td>1/2</td>
</tr>
<tr>
<td>2</td>
<td>1x</td>
<td>1800 - 14400</td>
<td>1/2</td>
</tr>
<tr>
<td>3</td>
<td>1x</td>
<td>1500 - 153600</td>
<td>1/4</td>
</tr>
<tr>
<td>4</td>
<td>1x</td>
<td>1500 - 307200</td>
<td>1/2</td>
</tr>
<tr>
<td>5</td>
<td>1x</td>
<td>1800 - 230400</td>
<td>1/4</td>
</tr>
<tr>
<td>6</td>
<td>3x</td>
<td>1500 - 307200</td>
<td>1/6</td>
</tr>
<tr>
<td>7</td>
<td>3x</td>
<td>1500 - 614400</td>
<td>1/3</td>
</tr>
<tr>
<td>8</td>
<td>3x</td>
<td>1800 - 460800</td>
<td>1/4 or 1/3</td>
</tr>
<tr>
<td>9</td>
<td>3x</td>
<td>1800 - 1036800</td>
<td>1/2 or 1/3</td>
</tr>
</tbody>
</table>

**IS-95**

1x

3x

The MX860x03A can measure IS-95 and 1x. 3x is not being used now.

1.4 BTS Measurement items

<table>
<thead>
<tr>
<th>C.S0010</th>
<th>Transmission Characteristics</th>
<th>MS8608/09A</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1.2</td>
<td>Frequency tolerance</td>
<td>Yes</td>
</tr>
<tr>
<td>4.2.1.1</td>
<td>Pilot timing tolerance</td>
<td>Yes</td>
</tr>
<tr>
<td>4.2.1.2</td>
<td>Pilot channel to code channel time tolerance</td>
<td>Yes</td>
</tr>
<tr>
<td>4.2.1.3</td>
<td>Pilot channel to code channel phase tolerance</td>
<td>Yes</td>
</tr>
<tr>
<td>4.2.2</td>
<td>Waveform quality</td>
<td>Yes</td>
</tr>
<tr>
<td>4.2.3</td>
<td>Forward power control sub-channel</td>
<td>Yes</td>
</tr>
<tr>
<td>4.3.1</td>
<td>Total power</td>
<td>Yes</td>
</tr>
<tr>
<td>4.3.2</td>
<td>Pilot power</td>
<td>Yes</td>
</tr>
<tr>
<td>4.3.3</td>
<td>Code domain power</td>
<td>Yes</td>
</tr>
<tr>
<td>4.4.1</td>
<td>Conducted spurious emissions</td>
<td>Yes</td>
</tr>
<tr>
<td>4.4.2</td>
<td>Radiated spurious emissions</td>
<td>Yes</td>
</tr>
<tr>
<td>4.4.3</td>
<td>Inter-base station transmission intermodulation</td>
<td>Yes</td>
</tr>
<tr>
<td>4.4.4</td>
<td>Occupied bandwidth</td>
<td>Yes</td>
</tr>
</tbody>
</table>
2. Connections

2.1 Connection to signal generator

2.2 Connection to base station

CDMA2000 1x Waveform Pattern:
- FWD: FWD_RC1-2_9channel, FWD_RC3-5_9channel
- RVS: RVS_RC1_FCH, RVS_RC3_FCH

MG3700A

MS8608A

MX860803A/MX860903A
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2.2 Connection to base station

- **Antenna port**
  - e.g. +43 dBm

  **Need ATT 30 dB**

- **MS8608A**
  - High Power Input Max. +40 dBm
  - Low Power Input Max. +20 dBm

- **MS8609A**
  - Input Max. +20 dBm

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3. BTS Tx Characteristics test

- 3.1 Frequency tolerance (4.1.2*)
- 3.2 Pilot timing tolerance (4.2.1.1)
- 3.3 Waveform quality (4.2.2)
- 3.4 Total power (4.3.1)
- 3.5 Pilot power (4.3.2)
- 3.6 Code domain power (4.3.3)
- 3.7 Conducted spurious emissions (4.4.1)
- 3.8 Occupied bandwidth (4.4.4)

*The number in parentheses means the standard chapter.
MX860x03A Settings

Setup Common Parameter Screen

1. Set Channel & Frequency.
   - Forward (RC1-2): IS-95
   - Reverse (RC1-2): IS-95
   - Forward (RC3-5): 1x
   - Reverse (RC3-4): 1x
   - QPSK
   - OQPSK

2. Select Measuring Object.
   - Filter+EQ: Forward
   - Filter: Reverse
   - No Filter

   - Filter+EQ: Forward
   - Filter: Reverse
   - No Filter

4. Free Run set as Trigger


Screen 1

<table>
<thead>
<tr>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
<th>F6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modulation Analysis</td>
<td>RF Power</td>
<td>Occupied Bandwidth</td>
<td>Spurious Close to the Carrier</td>
<td>Spurious Emissions</td>
<td></td>
</tr>
</tbody>
</table>

Screen 2

<table>
<thead>
<tr>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
<th>F6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Meter</td>
<td>Power Meter</td>
<td>Power Meter</td>
<td>Power Meter</td>
<td>Power Meter</td>
<td>Power Meter</td>
</tr>
</tbody>
</table>
3.1 Frequency tolerance (4.1.2)

The frequency tolerance test measures the frequency of the modulated signal.

**Standard**

Frequency tolerance
±0.05 ppm

- Press the [F1] Trace Format key and select Non.
- Press the [F5] Adjust Range key.

---

3.2 Pilot Timing (4.2.1.1)

**Use External Trigger.**

- Press External trigger at the Setup Common Parameter screen.
- Press the [F1] Trace Format key and select Non.
- Press the [F5] Adjust Range key.

**Standard**

Time Reference: 10 µs max.
3.3 Waveform quality (4.2.2)

The waveform quality test measures waveform power between the actual waveform and ideal waveform.

- Press the [F1] Trace Format key and select Non.
- Press the [F5] Adjust Range key.

3.4 Total power (4.3.1)

The carrier is measured using the power meter.

- Press the [F6] Power Meter key at the Setup Common Parameter screen 2.
- Disconnect the input cable.
- Connect the input cable.
3.4 Total power (4.3.1)

RF Power is used for multi-carriers.

**Standard**

RF Power Output  
+2 dB to -4 dB

- Press the [F3] RF Power key at the Setup Common Parameter screen 1.
- Press the [F1] Window key.
- Press the [F1] Slot key.
- Press the [F6] Return key.
- Press the [F5] Adjust Range key.

3.5 Pilot power (4.3.2)

The pilot power test measures the ratio of the pilot power to total power. There are two code domain screens: RC1-2 using Walsh code, and RC3-5 using OVSF code. The following are TEST MODEL signals.
3.5 Pilot power IS-95 (4.3.2)

When Measuring Object is RC1-2

- **Standard**
  - Within ±0.5 dB
  - e.g. Test Model
  - -7 dBm ±0.5 dB
  - = -6.5 to -7.5 dB

- Press the [F1] Trace Format key and select Code Domain.
- Press the [F5] Adjust Range key.

3.5 Pilot power CDMA2000 1x (4.3.2)

When Measuring Object is RC3-5

- **Standard**
  - Within ±0.5 dB
  - e.g. Test Model
  - -7 dBm ±0.5 dB
  - = -6.5 to -7.5 dB

- Press the [F1] Trace Format key and select Code Domain.
- Press the [F5] Adjust Range key.
3.6 Code domain power IS-95 (4.3.3)

The power of inactive channels must be less than the standard.

When Measuring Object is RC1-2

**Standard**

- >27 dB

**Inactive channels**

- Press the [F1] Trace Format key and select Code Domain.
- Press the [F5] Adjust Range key.

3.6 Code domain power CDMA2000 1x (4.3.3)

The power of inactive channels must be less than the standard.

When Measuring Object is RC3-5

**Standard**

- >31.5 dB

**Inactive channels**

- Press the [F1] Trace Format key and select Code Domain.
- Press the [F5] Adjust Range key.
### 3.7 Conducted spurious emissions (4.4.1)

The spurious emission test measures emissions at frequencies that are outside the assigned CDMA channel. The standard is decided by each class.

**e.g. Band Class**

0, 2, 3, 5, 7, 9 and 10

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3GPP2 C.S0010
### 3.7 Conducted spurious emissions (4.4.1)

**Class 0, 2, 3, 5, 7, 9 and 10**

- **A**: -13 dBm
- **B**: -36 dBm

**Limit (RBW)**

- 4 MHz: -60 dBc (30 kHz)
- 1.98 MHz: -45 dBc (30 kHz)
- 750 kHz: -45 dBc (30 kHz)
- 750 kHz: -60 dBc (30 kHz)
- 1.98 MHz: -60 dBc (30 kHz)
- 4 MHz: -60 dBc (30 kHz)

**Class 1, 4, 6 and 8**

- **A**: -13 dBm
- **B**: -36 dBm

**Limit (RBW)**

- 4 MHz: -55 dBc (30 kHz)
- 2.25 MHz: -45 dBc (30 kHz)
- 1.25 MHz: -55 dBc (30 kHz)
- 2.25 MHz: -45 dBc (30 kHz)
- 1.25 MHz: -55 dBc (30 kHz)
- 885 kHz: -45 dBc (30 kHz)
- 885 kHz: -60 dBc (30 kHz)
- 1.98 MHz: -45 dBc (30 kHz)
- 1.98 MHz: -55 dBc (30 kHz)
- 4 MHz: -13 dBm (1 MHz)
- 4 MHz: -45 dBc (30 kHz)

### 3.7 Conducted spurious emission (4.4.1)

#### Spurious Close Carrier Screen

- **Offset Freq. vs Power**
  - L1: -0.75kHz, 56.96 dB
  - H1: 0.75kHz, 85.10 dB
  - L2: -1.9kHz, 70.77 dB
  - H2: 1.9kHz, 65.14 dB

- **Marker**
  - Offset: 0.0kHz, Power: -12.5dB (+/20kHz)

- **Spectrum Analyzer**
  - Ref: 0.00dB
  - ATT: 10dB
  - BW: 30kHz
  - SWF: 1kHz

- **Spurious close carrier (class)**
  - Class 0, 2, 3, 5, 7, 9 and 10
  - Class 1, 4, 6 and 8

- **Pre Ampli:** Off
- **Power cal:** Off
- **Correction:** Off

- **Measure Method**
  - Relative

- **Storage Mode**
  - Chart

- **Calibration**
  - Data Points: 3001
  - Reference: 0.00dB
  - Template: Pass

- **Spurious Close Carrier Screen**

#### Instructions

- Press the [F5] Spurious Close to Carrier key at the Setup Common Parameter screen 1.
- Press the [F1] Measure Method key.
- Press the [F2] or [F3] Band Class key.
- Press the [F6] Return key.
- Press the [F5] Adjust Range key.
3.8 Occupied bandwidth (4.4.4)

The occupied bandwidth test measures the power in 99% of the modulated carrier.

<table>
<thead>
<tr>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth &lt;1.48 MHz</td>
</tr>
</tbody>
</table>

- Press the [F4] Occupied Bandwidth key at the Setup Common Parameter screen 1.
- Press the [F5] Adjust Range key.

Appendix

1. Other Tx characteristics

(1) Pilot channel to code channel time tolerance (4.2.1.2)
(2) Pilot channel to code channel phase tolerance (4.2.1.3)
(3) Forward power control sub-channel (4.2.3)
(4) Radiated spurious emissions (4.4.2)
(5) Inter-base station transmission intermodulation (4.4.3)

- MG3700A Settings
(1) Pilot channel to code channel time tolerance (4.2.1.2)

Pilot channel to code channel time tolerance is the permissible error in timing between the radiated pilot channel and the other code channels transmitted out of the RF output port containing the same pilot channel within one Forward CDMA Channel.

**Standard**

Time Reference: $\pm 50$ ns

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(2) Pilot channel to code channel phase tolerance (4.2.1.3)

Pilot Channel to code channel phase tolerance is the permissible error in RF phase between the radiated pilot channel and the other channels within one Forward CDMA Channel.

**Standard**

Phase Reference: $<0.15$ radians

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(3) Forward power control sub-channel (4.2.3)

The forward (downlink) power control sub-channel test checks that the power control bits have the correct sense, position, delay, and amplitude.
(4) Radiated spurious emissions (4.4.2)

Current region-specific radio regulation rules apply.

(5) Inter-base station transmission intermodulation (4.4.3)

The inter-base station transmitter intermodulation test measures when another base station connects to the antenna connector of the base station.

Figure 6.5.1-9. Functional Setup for Inter-Base Station Intermodulation Test

2. MG3700A Settings

Select CDMA2000 using the [F1] key (HDD → Memory).

Select ALL Load and press the [Set] key.
- FWD: FWD_RC1-2_9channel
- FWD_RC3-5_9channel
- RVS: RVS_RC1_FCH
- RVS_RC3_FCH

Discover What's Possible™
MS8609A-E-F-3
2. MG3700A Settings