

**Maintenance Manual**

# **BTS Master™ Model MT8222A**

**Base Station Analyzer**

The Anritsu logo is located in the bottom right corner of the page. It consists of the word "Anritsu" in a bold, sans-serif font. The letter "A" is stylized with a diagonal slash through it.

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# **DECLARATION OF CONFORMITY**

**Manufacturer's Name:** ANRITSU COMPANY

**Manufacturer's Address:** Microwave Measurements Division  
490 Jarvis Drive  
Morgan Hill, CA 95037-2809  
USA

declares that the product specified below:

**Product Name:** BTS Master

**Model Number:** MT8222A

conforms to the requirement of:

EMC Directive 89/336/EEC as amended by Council Directive 92/31/EEC & 93/68/EEC  
Low Voltage Directive 73/23/EEC as amended by Council directive 93/68/EEC

**Electromagnetic Interference: EN61326-1:1997 A1:1998 A2:2001 A3:2003**

**Emissions:** EN55011:1998 A1:1999 A2:2002 Group 1 Class A

**Immunity:** EN 61000-4-2:1995 A1:1998 A2:2001 - 4kV CD, 8kV AD  
EN 61000-4-3:2002 A1:2002 - 3V/m  
EN 61000-4-4:2004 - 0.5kV SL, 1kV PL  
EN 61000-4-5:1995 A1:2001 - 1kV L-L, 2kV L-E  
EN 61000-4-6:1996 A1:2001 - 3V  
EN 61000-4-11:1994 A1:2001 - 1 cycle @ 100%

## **Electrical Safety Requirement:**

**Product Safety:** The Product Complies when used with Company supplied Power Supply  
(tested to IEC 60950-1:2001)

  
Eric McLean, Corporate Quality Director

Morgan Hill, CA

17 APRIL 2006  
Date

European Contact: For Anritsu product EMC & LVD information, contact Anritsu LTD, Rutherford Close,  
Stevenage Herts, SG1 2EF UK, (FAX 44-1438-740202)

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## C-tick Conformity Marking

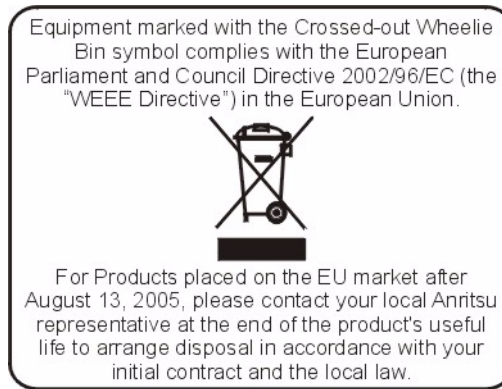
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## Mercury Notification

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# European Parliament and Council Directive 2002/96/EC



## Chinese RoHS Compliance Statement


产品中有毒有害物质或元素的名称及含量

For Chinese Customers Only YLNB

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 [Cr (VI)]	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷线路板 (PCA)	×	○	×	×	○	○
机壳、支架 (Chassis)	×	○	×	×	○	○
LCD	×	×	×	×	○	○
其他 (电缆、风扇、连接器等) (Appended goods)	×	○	×	×	○	○

○：表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006 标准规定的限量要求以下。  
 ×：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11363-2006 标准规定的限量要求。

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## Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Company uses the following symbols to indicate safety-related information. For your own safety, please read the information carefully *before* operating the equipment.

### Symbols Used in Manuals

#### Danger



This indicates a very dangerous procedure that could result in serious injury or death, and possible loss related to equipment malfunction, if not performed properly.

#### Warning



This indicates a hazardous procedure that could result in light-to-severe injury or loss related to equipment malfunction, if proper precautions are not taken.

#### Caution



This indicates a hazardous procedure that could result in loss related to equipment malfunction if proper precautions are not taken.

### Safety Symbols Used on Equipment and in Manuals

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions *before* operating the equipment. Some or all of the following five symbols may or may not be used on all Anritsu equipment. In addition, there may be other labels attached to products that are not shown in the diagrams in this manual.



This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.



This indicates a compulsory safety precaution. The required operation is indicated symbolically in or near the circle.



This indicates a warning or caution. The contents are indicated symbolically in or near the triangle.



This indicates a note. The contents are described in the box.



These indicate that the marked part should be recycled.

## For Safety

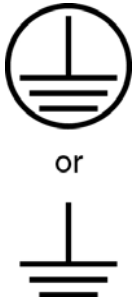
### Warning



Always refer to the operation manual when working near locations at which the alert mark, shown on the left, is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced.

Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.

### Warning



When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock.

### Warning



This equipment can not be repaired by the operator. Do not attempt to remove the equipment covers or to disassemble internal components. Only qualified service technicians with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision components.

### Caution



Electrostatic Discharge (ESD) can damage the highly sensitive circuits in the instrument. ESD is most likely to occur as test devices are being connected to, or disconnected from, the instrument's front and rear panel ports and connectors. You can protect the instrument and test devices by wearing a static-discharge wristband. Alternatively, you can ground yourself to discharge any static charge by touching the outer chassis of the grounded instrument before touching the instrument's front and rear panel ports and connectors. Avoid touching the test port center conductors unless you are properly grounded and have eliminated the possibility of static discharge.

Repair of damage that is found to be caused by electrostatic discharge is not covered under warranty.



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### Appendix B—Test Fixture

# Chapter 1 — General Information

## 1-1 Introduction

This manual provides maintenance instructions for the BTS Master Model MT8222A. This manual includes:

- General information in this chapter, including:
  - Lists of necessary test equipment to perform verification testing (Table 1-1, Table 1-2, Table 1-3, and Table 1-4)
  - Replaceable parts list (Table 1-5)
- Performance verification procedures:
  - Chapter 2, “Performance Verification, Spectrum Analyzer (SPA)”
  - Chapter 3, “Performance Verification, Cable and Antenna Analyzer”
  - Chapter 4, “Performance Verification, Power Meter”
  - Chapter 5, “Performance Verification, Options”
- Battery pack information (Chapter 6, “Battery Information”)
- Parts replacement procedures (Chapter 7, “Assembly Replacement”)
- Blank test records are included in Appendix A.
  - Copy the blank test records from Appendix A and use them to record measured values. These test records form a record of the performance of your MT8222A BTS Master. Anritsu recommends that you make a copy of the blank test records to document the measurements each time a Performance Verification is performed. Continuing to document this process each time it is performed provides a detailed history of instrument performance, which can allow you to observe trends.
- Photographs showing the correct setup of the test fixture for Option 44 testing is in Appendix B

Familiarity with the basic operation of the front panel keys (for example, how to change measurement mode, preset the unit, or the meaning of soft key or submenu key) is assumed.

<b>Caution</b> Before making any measurement, verify that all equipment has warmed up for at least 30 minutes.
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## 1-2 Anritsu Customer Service Centers

For the latest service and sales information in your area, please visit the following URL:

<http://www.anritsu.com/Contact.asp>

Choose a country for regional contact information.

## 1-3 Required Test Equipment

The following tables list the necessary test equipment to perform verification testing of the BTS Master Model MT8222A:

- Table 1-1, “Required Equipment for Spectrum Analyzer Verification” on page 1-2
- Table 1-2, “Required Equipment for Cable and Antenna Analyzer Verification” on page 1-2
- Table 1-3, “Required Equipment for Power Meter Verification” on page 1-3
- Table 1-4, “Required Equipment for Options Verification” on page 1-4

## Spectrum Analyzer Verification

**Table 1-1.** Required Equipment for Spectrum Analyzer Verification

Instrument	Critical Specification	Recommended Manufacturer / Model
Synthesized Signal Source	Frequency: 0.1 Hz to 20 GHz Power Output to +13 dBm	Anritsu Model MG3692A or B with options 2A, 4, 22, 15 <sup>a</sup>
Power Meter	Power Range: -70 to +20 dBm	Anritsu Dual Channel Model ML2438A
VNMS	10 MHz to 9 GHz	Anritsu MS4624A, B, or D
Calibration Kit for VNMS	10 MHz to 9 GHz	Anritsu Model 3753R
Power Sensor	Frequency: 10 MHz to 18 GHz Power Range: -67 to +20 dB	Anritsu Model MA2442D (quantity 2)
Frequency Reference	Frequency: 10 MHz	Symmetricom Model RubiSource T&M
Fixed Attenuator	10 dB Attenuation	Aeroflex/Weinschel Model 44-10 (quantity 2)
Power Splitter	Frequency: DC to 18 GHz	Aeroflex/Weinschel Model 1870A
Adapter	Frequency: DC to 20 GHz N(m)-N(m), 50 ohm	Anritsu Model 34NN50A
Adapter	Frequency: DC to 20 GHz K(m)-N(f), 50 ohm	Anritsu Model 34RKNF50
50 ohm Termination	Frequency: DC to 18 GHz	Anritsu Model 28N50-2
RF Coaxial Cable	Frequency: DC to 18 GHz N(m)-N(m), 50 ohm	Anritsu Model 15NN50-0.6B
Coaxial Cable	BNC(m) to BNC(m), 50 ohm	any

a.Option 15 is required for MG3692A models to achieve power of +13 dBm. MG3692B models do not require Option 15.

## Cable and Antenna Analyzer Verification

**Table 1-2.** Required Equipment for Cable and Antenna Analyzer Verification

Instrument	Critical Specification	Recommended Manufacturer/Model
Frequency Counter	Frequency: 2 GHz	Anritsu Model MF2412B
Open/Short	Frequency: DC to 18 GHz	Anritsu Model 22N50
Termination	Frequency: DC to 18 GHz Return Loss: 40 dB min.	Anritsu Model 28N50-2
Termination	Frequency: DC to 18 GHz Return Loss: 40 dB min.	Anritsu Model 28NF50-2
Adapter	Frequency: DC to 6 GHz N(f) to K(m)	Anritsu Model 34NFK50
Adapter	Frequency: DC to 20 GHz N(m) to N(m)	Anritsu Model 34NN50A
RF Coaxial Cable	Frequency: DC to 18 GHz N(m) to N(f), 50 ohm	Anritsu Model 15NNF50-0.6B
6 dB Offset Termination	Frequency: DC to 6.0 GHz	Anritsu Model SC7424
20 dB Offset Termination	Frequency: DC to 6.0 GHz	Anritsu Model SC7423

## Power Meter Verification

**Table 1-3.** Required Equipment for Power Meter Verification

Instrument	Critical Specification	Recommended Manufacturer / Model
Synthesized Signal Source	Frequency: 0.1 Hz to 20 GHz Power Output to +13 dBm	Anritsu Model MG3692A or B with options 2A, 4, 22, 15 <sup>a</sup>
Power Meter	Power Range: -70 to +20 dBm	Anritsu Dual Channel Model ML2438A
Frequency Reference	Frequency: 10 MHz	Symmetricom Model RubiSource T&M
Power Sensor	Frequency: 10 MHz to 18 GHz Power Range: -67 to +20 dB	Anritsu Model MA2442D (quantity 2)
Fixed Attenuator	10 dB Attenuation	Aeroflex/Weinschel Model 44-10
Power Splitter	Frequency: DC to 18 GHz	Aeroflex/Weinschel Model 1870A
Adapter	Frequency: DC to 20 GHz N(m) to N(m), 50 ohm	Anritsu Model 34NN50A
Adapter	Frequency: DC to 20 GHz K(m) to N(f), 50 ohm	Anritsu Model 34RKNF50
RF Coaxial Cable	Frequency: DC to 18 GHz N(m) to N(m), 50 ohm	Anritsu Model 15NN50-0.6B

a.)Option 15 is required for MG3692A models to achieve power of +13 dBm. MG3692B models do not require Option 15.

## Options Verification

Table 1-4. Required Equipment for Options Verification

Instrument	Critical Specification	Recommended Manufacturer/Model
Synthesized Signal Source	Frequency: 0.1 Hz to 20 GHz Power Output to +13 dBm	Anritsu Model MG3692A or B with options 2A, 4, 22, 15 <sup>a</sup>
RF Detector (for Option 5)	Frequency: 10 MHz to 20 GHz	Anritsu Model 560-7N50B
Power Meter	Power Range: –70 to +20 dBm	Anritsu Dual Channel Model ML2438A
RF Coaxial Cable	DC to 18 GHz N(m) to N(f) 50 ohm	Anritsu Model 15NN50-0.6B Quantity 3
GPS Antenna (for Option 31)		Anritsu PN 2000-1410
Frequency Reference	Frequency: 10 MHz	Symmetricom Model RubiSource T&M
Vector Signal Generator	Frequency: 100 kHz to 3 GHz	Anritsu Model MG3700A with Options: MG3700A-002, MG3700A-021 <sup>b</sup> and Waveform Data Licenses MX370001A and MX370108A
Sonet Analyzer (Options 50 to 53)		Anritsu MP1570A with MP0121A and MP0122A modules
Cable T1 Bantam Plug to Bantam Plug (Options 50 to 53)		Anritsu PN 806-16 Quantity 2
Cable 75 ohm BNC(m) to BNC(m) (Options 50 to 53)		Anritsu PN 3-806-169 Quantity 2
Cable RJ48 to dual Bantam (for Option 52)		Anritsu PN 806-117
Test Fixture (for Option 52)		Anritsu PN T3450
Power Sensor	Frequency: 10 MHz to 18 GHz Power Range: –60 to +20 dB	Anritsu Model MA2482D with Option 1 (quantity 2)
Power Splitter	Frequency: DC to 18 GHz	Aeroflex/Weinschel Model 1870A
Programmable Attenuator	Frequency: DC to 2 GHz Attenuation: 100 dB (in 1 and 10 dB steps)	Anritsu Model MN63A
Coupler	Frequency Range: 800 to 2400 MHz Coupling Factor: 30 dB	Anritsu PN 1091-307
Circulator	Frequency Range: 800 to 1000 MHz Isolation: 30 dB	Anritsu PN 1000-50
High Power Load	DC to 18 GHz, 10 W	Aeroflex/Weinschel Model M1418
Attenuator	Frequency Range: DC to 18 GHz Attenuation: 10 dB	Aeroflex/Weinschel Model 44-10 (quantity 2)
RF Limiter	Frequency: 10 MHz to 18 GHz, N(m) In, N(f) Out: 50 ohm	Anritsu Model 1N50C
50 ohm Termination	Frequency: DC to 18 GHz	Anritsu Model 28N50-2
RF Power Amplifier	Frequency: 100 to 1000 MHz, Gain: 35 dB min.	Mini Circuits Model TIA-1000-1R8
Adapter	N(m) to N(m)	Anritsu 34NN50A (quantity 3)
Adapter	RK(m) to N(f)	Anritsu 34RKNF50



**Table 1-4.** Required Equipment for Options Verification (Continued)

<b>Instrument</b>	<b>Critical Specification</b>	<b>Recommended Manufacturer/Model</b>
Adapter	BNC Male to N(f)	Midwest Microwave Model ADT-2615-NF-BNM-02 (quantity 2)
Adapter	N(f) to SMA(m)	Midwest Microwave Model ADT-2582-NF-SMM-02 Quantity: 4 each
Adapter	SMA(m) to SMA(m)	Midwest Microwave Model ADT-2594-MM-SMA-02
Adapter	BNC	LeCroy PP090 75 ohm Telecom
Adapter		LeCroy AP120 120 ohm Telecom
Load Test Fixture (for Option 10)	Resistance: 40 ohm, Power: 5 Watt	Anritsu PN T2904
Load Test Fixture (for Option 10)	Resistance: 105 ohm, Power: 1 Watt	Anritsu PN T3377
Load Test Fixture (for Option 10A)	Resistance: 78 ohm, Power: 1 Watt	Anritsu PN T3536
Digital Oscilloscope		LeCroy Model WaveRunner 62Xi with ET-PMT Electrical Telecom Mask software and TF-ET Telecom Adapter Set

a.Option 15 is required for MG3692A models to achieve power of +13 dBm. MG3692B models do not require Option 15.

b.Note that the MG3700A must also have several test pattern files installed into memory at the factory.

## 1-4 Replacement Parts List

**Table 1-5.** Replacement Parts

Part Number	Description
ND66428	Main/Spectrum Analyzer PCB Assembly, without Option 31 <sup>a</sup>
ND66429	Main/Spectrum Analyzer PCB Assembly, with Option 31 <sup>a</sup>
ND70341	VNA Module Assembly, with Option 10A
ND66124	VNA Module Assembly, with Option 26
ND66430	VNA Module Assembly, with Option 50
ND66433	VNA Module Assembly, without Option 26 and Option 50
ND66432	Option 5 PCB Assembly
ND69111	Option 51 PCB Assembly
ND67174	Option 52 PCB Assembly
ND69112	Option 53 PCB Assembly
3-15-118	LCD Display
61368	Clear plastic LCD protector
3-66549-3	LCD Backlight Inverter PCB
65681	Soft Carrying Case
65698	Case Top (excludes model ID Label and keypad items)
ND67173	Case Bottom (excludes tilt bail)
61588 / 65677	RF Connector Plate with Overlay (excludes connectors)
65674	Model MT8222A ID Label
513-64	Type N RF connector
64146-1	Battery Door
633-44	Li-ion Battery Pack
ND64383	Fan
633-26	3v RTC Battery
40-168-R	AC to DC Power Converter
3-2000-1567	Internal Compact Flash Card (512 MB)
65027-3	Main Keypad PCB
61362	Main Keypad
61363-1	Main Keyboard Bezel
61361	Submenu key Keypad
61378-1	Submenu key Bezel
61333-3	Submenu key PCB
790-625	Speaker
3-410-101	Encoder (excluding knob)
61360-2	Encoder Knob (excluding encoder)

a.)To make sure that the correct options are provided on the replacement unit when ordering a Main/Spectrum Analyzer PCB Assembly, all options that are installed in the instrument must be declared on the order. The installed options are listed on a label on the top of the MT8222A and can also be viewed in the System/Status display.

# Chapter 2 — Performance Verification, Spectrum Analyzer (SPA)

## 2-1 SPA Frequency Accuracy

This test verifies the frequency accuracy of the Spectrum Analyzer.

### Required Equipment:

- Symmetricom Model RubiSource T&M Frequency Reference
- Anritsu MG3692X Synthesized Signal Source
- Anritsu Model 15NN50-0.6B RF Coaxial Cable
- BNC(m) to BNC(m), 50 ohm Coaxial Cable

### Procedure

1. Connect the external 10 MHz Reference to the Anritsu MG3692X Synthesized Signal Source. Do not connect the external 10 MHz Reference to the MT8222A.
2. Connect the output of the synthesizer to the Spectrum Analyzer RF In of the MT8222A.
3. On the MT8222A, change the mode to **Spectrum Analyzer** and preset the unit.
4. Set the MG3692A/B output to 1 GHz CW, with an RF output level of  $-30$  dBm.
5. On the MT8222A, press the **Amplitude** key, and set the reference level to  $-10$  dBm.
6. Press the **Freq** key and set the center frequency to 1.0 GHz.
7. Press the **Span** submenu key, set the span to 10 kHz.
8. Press the **BW** submenu key and set RBW to 100 Hz.
9. Press the **VBW** submenu key and set to 30 Hz.
10. On the MT8222A, press the **Marker** key, and press the **Peak Search** submenu key.
11. Record the marker frequency in the test records in [Table A-1, “Spectrum Analyzer Frequency Accuracy”](#). Verify that it is within specification.
12. Set the synthesizer for 7.0 GHz and set the center frequency of the MT8222A to 7.0 GHz.
13. On the MT8222A, press the **Marker** key, and press the **Peak Search** submenu key.
14. Record the marker frequency in [Table A-1](#). Verify that it is within specification.

If the unit fails the Spectrum Analyzer Frequency Accuracy test, perform the Spectrum Analyzer Internal Reference Frequency Adjustment procedure in the next section. If the unit still fails the Frequency Accuracy test after the Internal Reference Frequency adjustment has been completed, replace the PCB assembly.

## 2-2 SPA Internal Reference Frequency Adjustment

Use this procedure to adjust the frequency if the unit fails the “SPA Frequency Accuracy” on page 2-1 verification test.

### Required Equipment:

- Symmetricom Model RubiSource T&M Frequency Reference
- Anritsu MG3692X Synthesized Signal Source
- Anritsu Model 15NN50-0.6B RF Coaxial Cable
- BNC(m) to BNC(m), 50 ohm Coaxial Cable

### Procedure

1. Connect the external 10 MHz Reference to the Anritsu MG3692A/B Synthesized Signal Source. Do not connect the external 10 MHz Reference to the MT8222A.
2. Connect the output of the synthesizer to the Spectrum Analyzer RF In of the MT8222A.
3. On the MT8222A, verify that the unit is in the Spectrum Analyzer mode and preset the unit.
4. Set the MG3692A/B output to 7 GHz with an RF output level of  $-30$  dBm.
5. On the MT8222A, press the **Amplitude** key and set the reference level to  $-10$  dBm.
6. Set the Atten Lvl to 0 dB.
7. Press the **Freq** key and set the center frequency to 7.0 GHz.
8. Press the **Span** key, use the keypad to enter 10, and press the kHz submenu key.
9. Press the **BW** submenu key and set the RBW to 100 Hz.
10. Press the **VBW** submenu key and set to 30 Hz.
11. Press and hold the **Shift** key and press the 4th, 6th, and 8th (below Esc) submenu keys together to enter the MT8222A Service Mode (Figure 2-1).



Figure 2-1. MT8222A Service Mode

12. Press the **Service Menu** submenu key, then the **APP Service** submenu key.
13. Press the **Calibration** submenu key, then the **10 MHz Ref** submenu key.
14. Use the **Up/Down** arrow keys or the rotary knob to slowly adjust the displayed signal to the center of the display. Allow the signal to stabilize between adjustments, and repeat as necessary.
15. Turn the MT8222A off, and then back on to exit Service Mode.

## 2-3 SPA SSB Phase Noise Verification

This test can be used to verify the single side band phase noise of the MT8222A.

### Required Equipment:

- Symmetricom Model RubiSource T&M Frequency Reference
- Anritsu MG3692X Synthesized Signal Source
- Anritsu Model 15NN50-0.6B RF Coaxial Cable
- BNC(m) to BNC(m), 50 ohm Coaxial Cable

### Procedure

1. Connect the external 10 MHz Reference to the Anritsu MG3692A/B Synthesized Signal Source.
2. Connect the output of the synthesizer to the Spectrum Analyzer RF In connector of the MT8222A.
3. Verify that the MT8222A is in the Spectrum Analyzer mode and preset the unit.
4. Set the MG3692A/B output to 7.09 GHz CW, with an RF output level of +13 dBm.
5. Press the **Amplitude** key, then set the reference level to 0 dBm.
6. Press the Atten Lvl submenu key, enter 15 dB.
7. Press the **Freq** key and set the center frequency to 7.090050 MHz.
8. Press the **Span** key, and set to 110 kHz.
9. Press the **BW** key and set the RBW to 1 kHz.
10. Press the **VBW** submenu key and set to 3 Hz.
11. Press the **Shift** key and then press the **Trace** (5) key.
12. Press Trace A Operations, and set the # of Averages to 7.
13. Wait until the Trace Count (left side of display) displays 7/7.
14. Press the **Marker** key and press the **Peak Search** submenu key.
15. Press the **Delta On/Off** submenu key to turn Delta on.
16. Use the keypad to enter 10 and press the kHz submenu key.
17. Subtract 30 from the dB value shown on the marker readout to convert the value to dBc/Hz (for example, if the marker reads –80 dB, the value becomes –110 dBc/Hz. Record the dBc/Hz value in [Table A-2, “Spectrum Analyzer SSB Phase Noise Verification”](#)).
18. Repeat steps 16 and 17 for 20 kHz marker delta, 30 kHz marker delta, and 100 kHz marker delta.

## 2-4 SPA Related Spurious (IRS) Signals

The following test verifies the input related spurious signals of the Spectrum Analyzer in Model MT8222A BTS Master.

### Required Equipment:

- Symmetricom Model RubiSource T&M Frequency Reference
- Anritsu MG3692X Synthesized Signal Source
- Anritsu Model 15NN50-0.6B RF Coaxial Cable
- BNC(m) to BNC(m), 50 ohm Coaxial Cable

### Procedure

1. Connect the 10 MHz reference source to the MG3692x Synthesized Signal Generator.
2. Connect the output of the Signal Generator to the Spectrum Analyzer RF In connector.

### 1674 MHz Input Related Spurious Check

3. Set the MG3692x output to 1674 MHz CW, with an RF output level of  $-30$  dBm.
4. Set the MT8222A to Spectrum Analyzer mode and then preset the unit.
5. Press the **Amplitude** key, then press the Reference Level submenu key.
6. Use the keypad to enter  $-27$  and press the dBm submenu key.
7. Press the Atten Lvl submenu key and enter 0, then press the dB submenu key.
8. Press the **Shift** key and then press the **Sweep** (3) key, then press the Detection submenu key and then the Peak submenu key.
9. Press the **Freq** key and press the Center Freq submenu key.
10. Use the keypad to enter 1674 and press the MHz submenu key.
11. Press the **Span** key, use the keypad to enter 2, and press the MHz submenu key.
12. Press the BW submenu key and press the RBW submenu key.
13. Use the keypad to enter 10 and press the kHz submenu key.
14. Press the VBW submenu key and use the keypad to enter 1, then press the kHz submenu key.
15. Wait until one sweep is completed.
16. Press the **Marker** key and press the Peak Search submenu key.
17. Record the Marker 1 amplitude reading for 1674 MHz in [Table A-3, "Spectrum Analyzer Input Related Spurious Verification, Input at 1674 MHz"](#).
18. Press the **Freq** key and press the Start Freq submenu key.
19. Use the keypad to enter 100 and press the kHz submenu key.
20. Press Stop Freq submenu key, enter 1673 and press the MHz submenu key.
21. Press the **Marker** key and press the Peak Search submenu key.
22. Record the Marker 1 amplitude reading in [Table A-3](#).
23. Calculate the input related spurious (IRS) level by subtracting the above Marker 1 reading from the Marker 1 reading in step 17. Record the result in [Table A-3](#).
24. Verify that the calculated result is  $\leq -38$  dBc.
25. Repeat steps 18 through 24, setting a start frequency of 1675 MHz and a stop frequency of 2800 MHz. Record the result to [Table A-3](#)

**1701 MHz Input Related Spurious Check**

26. Set the MG3692x output to 1701 MHz, with an RF output level of  $-30$  dBm.
27. On the MT8222A, press the **Freq** key and press the Center Freq submenu key.
28. Use the keypad to enter 1701 and press the MHz submenu key.
29. Press the **Shift** key and then press the **Trace** (5) key. Press the Trace A Operations submenu key.
30. Press the # of Average submenu key, use the keypad to enter 5 and then press the **Enter** key.
31. Wait until the Trace Count displays 5/5.
32. Press the **Marker** key and press the Peak Search submenu key.
33. Record the amplitude at 1701 MHz in [Table A-4, "Spectrum Analyzer Input Related Spurious Verification, Input at 1701 MHz"](#).
34. Press the **Freq** key and press the Start Freq submenu key.
35. Use the keypad to enter 26 and press the MHz submenu key.
36. Press Stop Freq submenu key, enter 28 and press the MHz submenu key.
37. Press the **Shift** key and then press the **Trace** (5) key. Press the Trace A Operations submenu key.
38. Press the # of Average submenu key, use the keypad to enter 5 and then press the **Enter** key.
39. Wait until the Trace Count displays 5/5.
40. Press the **Marker** key and press the Peak Search submenu key.
41. Record the Marker 1 amplitude reading in [Table A-4](#).
42. Calculate the input related spurious level by subtracting the above Marker 1 reading from the Marker 1 reading in step 33. Record the result in [Table A-4](#).
43. Verify that the calculated result is  $\leq -60$  dBc.

**2145 MHz Input Related Spurious Check**

44. Set the MG3692x output to 2145 MHz, with an RF output level of  $-30$  dBm.
45. On the MT8222A, press the **Freq** key and press the Center Freq submenu key.
46. Use the keypad to enter 2145 and press the MHz submenu key.
47. Press the **Shift** key and then press the **Trace** (5) key. Press the Trace A Operations submenu key.
48. Press the # of Average submenu key, use the keypad to enter 5 and then press the **Enter** key.
49. Wait until the Trace Count displays 5/5.
50. Press the **Marker** key and press the Peak Search submenu key.
51. Record the amplitude at 2145 MHz in [Table A-5, "Spectrum Analyzer Input Related Spurious Verification, Input at 2145 MHz"](#).
52. Press the **Freq** key and press the Start Freq submenu key.
53. Use the keypad to enter 470 and press the MHz submenu key.
54. Press Stop Freq submenu key, enter 472 and press the MHz submenu key.
55. Press the **Shift** key and then press the **Trace** (5) key. Press the Trace A Operations submenu key.
56. Press the # of Average submenu key, use the keypad to enter 5 and then press the **Enter** key.
57. Wait until the Trace Count displays 5/5.
58. Press the **Marker** key and press the Peak Search submenu key.
59. Record the Marker 1 amplitude reading to the test records in [Table A-5](#).
60. Calculate the input related spurious level by subtracting the above Marker 1 reading from the Marker 1 reading in step 51. Record the result in [Table A-5](#).
61. Verify that the calculated result is  $\leq -60$  dBc.

## 2-5 Spectrum Analyzer Resolution Bandwidth

This test verifies the resolution bandwidth accuracy of the Spectrum Analyzer in BTS Master Model MT8222A.

### Required Equipment:

- Symmetricom Model RubiSource T&M Frequency Reference
- Anritsu MG3692X Synthesized Signal Source
- Anritsu Model 15NN50-0.6B RF Coaxial Cable
- BNC(m) to BNC(m), 50 ohm Coaxial Cable
- Aeroflex/Weinschel Model 1870A Power Splitter

### Procedure

1. Connect the external 10 MHz Reference to both the MG3692x Synthesized Signal Generator and the MT8222A BTS Master.
2. Set the MT8222A to Spectrum Analyzer mode and then preset the unit.
3. Set the MT8222A as follows:  
Center Frequency: 1.0 GHz  
Reference Level: -10 dBm  
Atten Lvl: 0 dB
4. Set the MG3692x to 1 GHz CW, with an output level of -30 dBm. Apply the signal to the Spectrum Analyzer RF In connector of the MT8222A.
5. On the MT8222A, set the span to 4.5 MHz.
6. Press the BW submenu key and set the RBW to 3 MHz.
7. Under the **Measure** menu, press OCC BW and set it to ON.
8. Press the dBc submenu key and enter 3.
9. Record the occupied bandwidth in [Table A-6, "Spectrum Analyzer Resolution Bandwidth Accuracy"](#) and verify that it is within specification.
10. Repeat steps 5 through 9 for all other settings in [Table A-6](#).



## 2-6 SPA Residual Spurious Response

The following test verifies the residual spurious response of the Spectrum Analyzer in Model MT8222A BTS Master. This test is performed using the positive peak detection mode. There are two parts to this test:

- “Residual Spurious Test with Preamp On”
- “Residual Spurious Test with Preamp Off”

### Required Equipment:

- Anritsu Model 28N50-2 50 ohm Termination

### Residual Spurious Test with Preamp On

1. Connect the 50 ohm termination to the Spectrum Analyzer RF In connector.
2. Set the MT8222A to Spectrum Analyzer mode and then preset the unit.
3. Press the **Amplitude** key, then press the Reference Level submenu key.
4. Use the keypad to enter  $-40$  and press the dBm submenu key.
5. Press the Atten Lvl submenu key and enter 0, then press the dB submenu key.
6. Ensure that the Pre Amp On/Off submenu key is in the On position. If the preamp is off, press the Pre Amp On/Off submenu key to turn it on.
7. Press the **Shift** key and then press the **Sweep** (3) key, then press the Detection submenu key and then the Peak submenu key.
8. Press the BW submenu key and press the RBW submenu key.
9. Use the keypad to enter 10 and press the kHz submenu key.
10. Press the VBW submenu key and use the keypad to enter 1, then press the kHz submenu key.
11. Press the **Freq** key and press the Start Freq submenu key.
12. Use the keypad to enter 100 and press the kHz submenu key.
13. Press the Stop Freq submenu key, enter 10 and press the MHz submenu key.
14. Wait until one sweep is completed.
15. Press the **Marker** key and press the Peak Search submenu key.
16. Verify that the Marker 1 amplitude reading is  $\leq -100$  dBm and record the reading in [Table A-7](#), “Spectrum Analyzer Residual Spurious (Pre-Amp On)”.

**Note**

If a spur with amplitude larger than  $-100$  dBm occurs, wait another full sweep and observe whether the spur occurs at the same point on the second sweep. If the spur does not occur at the same point on the second sweep, then the spur on the first sweep does not cause the test to fail.

17. Repeat steps 11 through 16 for the other start and stop frequencies listed in [Table A-7](#).

### Residual Spurious Test with Preamp Off

1. Connect the 50 ohm termination to the Spectrum Analyzer RF In connector.
2. Set the MT8222A to Spectrum Analyzer mode and then preset the unit.
3. Press the **Amplitude** key, then press the Reference Level submenu key.
4. Use the keypad to enter  $-40$  and press the dBm submenu key.
5. Press the Atten Lvl submenu key and enter 0, then press the dB submenu key.
6. Ensure that the Pre Amp On/Off submenu key is in the **Off** position. If the preamp is on, press the Pre Amp On/Off submenu key to turn it off.

7. Press the **Shift** key and then press the **Sweep** (3) key, then press the **Detection** submenu key and then the **Peak** submenu key.
8. Press the **Freq** key and press the **Start Freq** submenu key.
9. Use the keypad to enter 100 and press the **kHz** submenu key.
10. Press the **Stop Freq** submenu key, enter 10 and press the **MHz** submenu key.
11. Press the **BW** submenu key and press the **RBW** submenu key.
12. Use the keypad to enter 3 and press the **kHz** submenu key.
13. Press the **VBW** submenu key and use the keypad to enter 300, then press the **Hz** submenu key.
14. Wait until one sweep is completed.
15. Press the **Marker** key and press the **Peak Search** submenu key.
16. Record the Marker 1 amplitude reading in [Table A-8](#), “[Spectrum Analyzer Residual Spurious \(Pre Amp Off\)](#)” and verify that it is  $\leq -90$  dBm.

<b>Note</b>	If a spur with amplitude larger than $-90$ dBm occurs, wait another full sweep and observe whether the spur occurs at the same point on the second sweep. If the spur does not occur at the same point on the second sweep, then the spur on the first sweep does not cause the test to fail.
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17. Repeat steps 8 through 16 for the other start and stop frequencies listed in [Table A-8](#).

## 2-7 SPA Displayed Average Noise Level (DANL)

This test verifies the Displayed Average Noise Level of the MT8222A. This test is performed using the RMS detection mode, with pre-amp on.

### Required Equipment:

- Anritsu Model 28N50-2 50 ohm Termination

### Procedure

1. Connect the 50 ohm termination to the MT8222A Spectrum Analyzer RF In.
2. Verify that the MT8222A is in the Spectrum Analyzer mode and preset the unit.
3. Press the **Amplitude** submenu key, then press the Atten Lvl submenu key and enter 0 dB. Set the Reference Level to -50 dBm.
4. Press the Pre Amp On/Off submenu key to turn the preamplifier on.
5. Press the **Shift** key and then press the **Sweep** (3) key, then press the **Detection** submenu key then the **RMS** submenu key.
6. Press the **BW** submenu key. Select RBW of 100 kHz.
7. Press the **Marker** key and the **More** submenu key.
8. Press the **Peak Search** submenu key.
9. Enter the **Start** and **Stop** frequencies from [Table A-9, "Spectrum Analyzer DANL \(Preamp On\)"](#).
10. Wait until one sweep has been completed.
11. Record the Marker reading in the Measured (100 kHz) column [Table A-9](#).
12. Repeat steps 9 through 11 for the other frequencies in [Table A-9](#). For each measured 100 kHz value in the chart, convert this to 1 Hz RBW value by subtracting 50 dB. For example, if the marker shows a value of -100 dBm at 100 kHz RBW, the computed value at 1 Hz RBW is -150 dBm. Enter the computed values in the Calculated dBm column of [Table A-9](#).

## 2-8 SPA Absolute Amplitude Accuracy

The tests in this section verify the absolute amplitude accuracy of the Spectrum Analyzer in Model MT8222A BTS Master. There are two parts to this test:

- “50 MHz Amplitude Accuracy Verification Test Procedure”
- “Amplitude Accuracy Across Frequency Verification Test Procedure”

### Required Equipment:

- Anritsu MG3692X Synthesized Signal Source
- Anritsu Dual Channel Model ML2438A Power Meter
- Anritsu Model MA2442D Power Sensor (2)
- Anritsu Model 15NN50-0.6B RF Coaxial Cable
- Anritsu Model 34NN50A N(m) to N(m) Adapter
- Anritsu Model 34RKNF50 K(m) to N(f) Adapter
- Symmetricom Model RubiSource T&M Frequency Reference
- Aeroflex/Weinschel Model 1870A Power Splitter
- Aeroflex/Weinschel Model 44-10 10 dB Attenuator
- BNC(m) to BNC(m), 50 ohm Coaxial Cable

### Spectrum Analyzer Test Setup

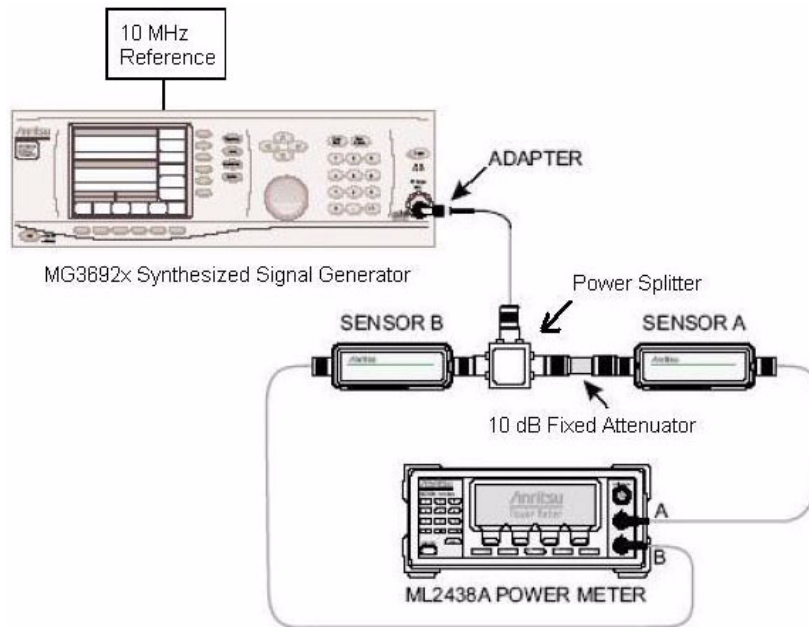


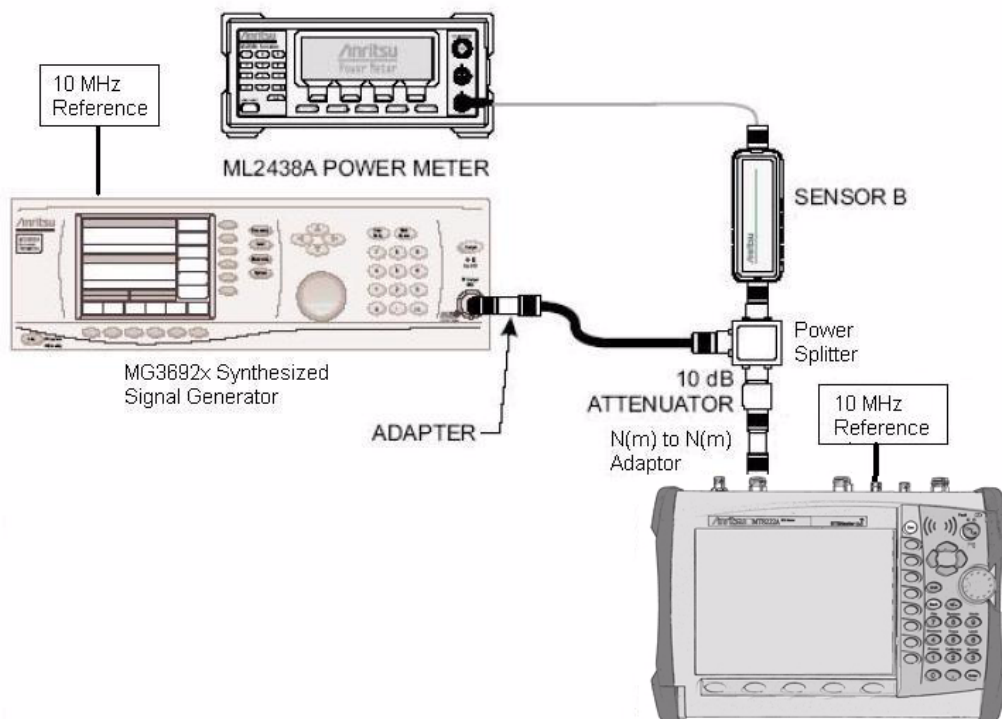
Figure 2-2. Test Setup Components Characterization

### 50 MHz Amplitude Accuracy Verification Setup

1. Connect the MA2442D power sensors to the power meter and calibrate the sensors.
2. Connect the 10 MHz Reference source to the 10 MHz Ref In connector of the MG3692x Synthesized Signal Generator.
3. Connect the model 1870A power splitter to the MG3692x output and sensor B to one of the power splitter outputs (Refer to [Figure 2-2](#)).

4. Install the 10 dB fixed attenuator to the other power splitter output and then connect sensor A to the end of the Attenuator.
5. Set the frequency of the MG3692x to 50 MHz.
6. Set the power meter to display both Channels A and B. Press the **Sensor** key, the **Cal Factor** submenu key, and then the **Freq** submenu key. Use the keypad to enter the value matching the frequency of MG3692x as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Repeat for Channel B. Press the **System** key to display the power reading.
7. Adjust the power level of the MG3692x to get a reading on sensor A that matches the power level in the first column of the chart below.
8. Record the sensor B reading in the Sensor B Reading column in [Table A-10, “50 MHz Amplitude Accuracy Verification Setup”](#).
9. Repeat steps 7 and 8 for the other power levels in the first column and record the Sensor B reading in the second column.

### 50 MHz Amplitude Accuracy Verification Test Procedure



**Figure 2-3.** 50 MHz Amplitude Accuracy Verification Setup

1. Connect the equipment as shown in [Figure 2-3](#).

**Note** To maintain test setup integrity, do not disconnect sensor B, the power splitter or the fixed attenuator.

2. Set the MT8222A to Spectrum Analyzer mode and then preset the unit.
3. Set the MT8222A center frequency to 50 MHz.
4. Set the span to 10 kHz.
5. Press the BW submenu key and set the VBW to 10 Hz.

6. Set the RBW to 1 kHz.
7. Press the **Amplitude** key and set the Reference Level to 10 dBm.
8. Set the Atten Lvl to 30dB.
9. Adjust the MG3692x power level so that the power meter sensor B matches the sensor B value shown on the characterization chart in [Table A-10, “50 MHz Amplitude Accuracy Verification Setup”](#)
10. Press the **Marker** key and press the Peak Search submenu key.
11. Record the Marker 1 amplitude reading in [Table A-11, “50 MHz Amplitude Accuracy Verification”](#).
12. Repeat steps 9 through 11 for the other power levels in [Table A-11](#), change Reference Level and Atten Lvl settings as required.

### Amplitude Accuracy Across Frequency Verification Setup

1. Connect both MA2442D power sensors to the power meter and calibrate the sensors.
2. Connect the equipment as shown in [Figure 2-2](#).
3. Set the MG3692x frequency to 10.1 MHz.
4. Set the power meter to display both Channels A and B. Press the **Sensor** key, the Cal Factor submenu key, and then the Freq submenu key. Use the keypad to enter the value matching the frequency of MG3692x as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Repeat for Channel B. Press the **System** key to display the power reading.
5. Adjust the MG3692x output level so that Sensor A reading is  $-2 \text{ dBm} \pm 0.1 \text{ dB}$ .
6. Record the Sensor B reading to the  $-2 \text{ dBm}$  column in [Table A-12, “Characterization Chart for Amplitude Accuracy Across Frequency”](#).
7. Adjust the MG3692x output level so that Sensor A reading is  $-30 \text{ dBm} \pm 0.1 \text{ dB}$ .
8. Record the Sensor B reading to the  $-30 \text{ dBm}$  column in [Table A-12](#).
9. Repeat steps 3 through 8 for all the frequencies listed in [Table A-12](#).

### Amplitude Accuracy Across Frequency Verification Test Procedure

1. Connect the equipment as shown in [Figure 2-3](#).

**Note** To maintain test setup integrity, do not disconnect sensor B, the power splitter or the fixed attenuator.

2. Set the MT8222A to Spectrum Analyzer mode and then preset the unit.
3. Press the BW submenu key. Then set the RBW to 1 kHz and the VBW to 10 Hz.
4. Press the Span submenu key, set the span to 10 kHz.
5. Set the MG3692x frequency to 10.1 MHz CW.
6. Set the MG3692x output to  $-20 \text{ dBm}$ .
7. Set the power meter to display Channel B. Press the **Sensor** key, the Cal Factor submenu key, and then the Freq submenu key. Use the keypad to enter the value matching the frequency of MG3692x as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Press the **System** key to display the power reading.
8. Adjust the MG3692x output power so that the power meter displays a reading that matches the Sensor B reading for  $-30 \text{ dBm}$  from [Table A-12](#).
9. On the MT8222A, press the **Amplitude** key, then set the Reference Level to  $-20 \text{ dBm}$ .
10. Press the Freq submenu key, then press the Center Freq submenu key.

11. Enter 10.1 MHz (or the next frequency).
12. Press the **Amplitude** key, then set the Atten Lvl to 0 dB.
13. Press the **Marker** key and press the **Peak Search** submenu key.
14. Record the Marker 1 amplitude reading in [Table A-13, “Amplitude Accuracy Across Frequency Verification”](#).
15. Verify that the Marker 1 amplitude reading is within the specification.
16. Repeat steps 12 to 15 for Atten Lvl of 5 dB, 10 dB, 15 dB and 20 dB.
17. Adjust the MG3692x output power so that the power meter displays a reading that matches the Sensor B reading in [Table A-12](#) for -2 dBm.
18. On the MT8222A, press the **Amplitude** key, then set the Reference Level to 10 dBm.
19. Repeat steps 12 to 15 for Atten Lvl of 25 dB, 30 dB, and 35 dB.
20. Repeat steps 5 to 19 for all the frequencies in [Table A-13](#).

## 2-9 Spectrum Analyzer RF Input VSWR Verification

### Required Equipment:

- Anritsu MS4624x Vector Network Measurement System (VNMS)
- Anritsu Model 15NN50-0.6B RF Coaxial Cable

### Procedure

1. Install a Type N cable on **Port 1** of the MS4624x (VNMS) so that the test port (open end of cable) is the male connector.
2. On the VNMS, make the following selections:  
Press the **Default** key and press **Continue**. Allow the unit to default.  
Under the **Freq** key, set the start frequency to 10 MHz and the stop frequency to 7.1 GHz.  
Press the **CH1** key.  
Under the **Display** key, press **Display Mode** and press **Single Channel**.  
Under the **Meas** key, ensure **S11** is selected.  
Under the **Display** key, press **Graph Type** and press **SWR**.  
Under the **Display** key, press **Scale** and set the resolution to .5 (x1). Set the reference value to 2.0 (x1)  
Under the **Display** key, press **Limits**. Turn the Upper Limit on and set it to 2.0 (x1).  
Under the **Marker** key, make the following selections:  
Display Markers set to **ON**  
Press **Marker Readout**  
Set **Marker 1** to **ON**
3. Press the **Cal** key and make the following selections:  
Perform Cal  
Manual Cal  
2 Port  
Next Cal Step  
Reflection Only  
Port 1 Only  
Normal (1601 pts max)  
Next Cal Step  
Port 1 Connector = Type N (M)  
Start Cal
4. Perform the calibration at the end of the cable as prompted by the VNMS, using the female components from the cal kit (no adapters).
5. After the calibration is complete, make sure the LED on the **Cal** key is on.
6. Make the following selections on the MT8222A:  
Set mode to **Spectrum Analyzer**, preset the unit.  
Under the **Amplitude** key, set the **Atten Lvl** to 10 dB.  
Under the **Sweep** Menu, set the **Sweep** to **Single**.
7. Connect the MT8222A Spectrum Analyzer RF In connector to the end of the cable where the calibration was performed.
8. Verify that the red measurement data falls completely under the Limit Line.
9. Under the VNMS **Marker** key, press **Marker to Peak**, then **Marker to Max**, and record the maximum value in [Table A-14, "Spectrum Analyzer RF Input VSWR Verification"](#) (10 dB Attenuation line).
10. Change the MT8222A **Atten Lvl** to 20 dB and verify that the measurement falls completely under the Limit Line. Record the maximum value as read from the marker in [Table A-14](#).
11. Change the MT8222A **Atten Lvl** to 60 dB and verify the measurement falls completely under the Limit Line. Record the maximum value as read from the marker in [Table A-14](#).



# Chapter 3 — Performance Verification, Cable and Antenna Analyzer

## 3-1 Frequency Accuracy

The following test is used to verify the CW frequency accuracy of the RF source in the MT8222A.

### Required Equipment:

- Anritsu Model MF2412B Frequency Counter
- Anritsu Model 15NNF50-0.6B RF Coaxial Cable

### Procedure

1. Verify that the MT8222A is in Cable and Antenna Analyzer Mode mode and preset the unit.
2. Verify that no external 10 MHz reference is connected to the MT8222A.
3. Press **Shift, Sweep** keys.
4. Verify that the RF Immunity is set to Normal.
5. Press the **Freq/Dist** key and set the center frequency to **2.0 GHz**, and the span to **0 Hz**.
6. Connect the RF cable from the MT8222A VNA Reflection RF Out to the Frequency Counter.
7. Turn on the Frequency Counter and press the **Preset** key.
8. Record the frequency data in [Table A-15, “VNA Frequency Accuracy”](#).

## 3-2 Return Loss Accuracy

This test is used to verify the accuracy of return loss measurements. Measurement calibration of the MT8222A is required for this test.

### Required Equipment:

- Anritsu Model SC7424 6 dB Offset Termination
- Anritsu Model SC7423 20 dB Offset Termination

### Procedure

1. Verify that the MT8222A is in Cable and Antenna Analyzer mode and preset the unit.
2. Press the **Measurement** key, then press the Return Loss submenu key.
3. Press the **Shift** key, then press the **Calibrate** (2) key. Verify that Cal Type is set to 1-Port and Cal Power is High.
4. Press the **Start Cal** submenu key. Follow the instructions on the screen to perform a calibration.
5. After the calibration is complete, install the 20 dB offset termination.
6. Press the **Amplitude** key, set Top to 17 dB, and Bottom to 23 dB.
7. Select the **Limits** menu, turn the Upper Limit On and set it to 18.4 dB.
8. Turn the Lower Limit On and set it to 21.6 dB.
9. Verify that the data display falls between the limit lines.
10. Press the **Marker** key and press the **Peak Search** submenu key. Record the marker value, then press the **Valley Search** submenu key and record the marker value. Record the worst case of the two values in [Table A-16, “VNA Return Loss Accuracy Verification”](#).
11. Remove the 20 dB offset and install the 6 dB offset.
12. Press the **Amplitude** key, set Top to 4.0 dB, and set Bottom to 8.0 dB.
13. Select the **Limits** menu, turn the Upper Limit On and set it to 5.0 dB.
14. Turn the Lower Limit On and set it to 7.0 dB.
15. Verify that the data display falls between the limit lines.
16. Press the **Marker** key and press the **Peak Search** submenu key. Record the marker value, then press the **Valley Search** submenu key and record the marker value. Record the worst case of the two values in [Table A-16](#).

## 3-3 System Dynamic Range

This test is used to verify the system dynamic range. Measurement calibration of the MT8222A is required for this test.

### Required Equipment:

- Anritsu Model 22N50 Open/Short
- Anritsu Model 28N50-2 Termination (2)
- Anritsu Model 15NNF50-0.6B RF Coaxial Cable

### Procedure

1. Verify that the MT8222A is in Cable and Antenna Analyzer mode and preset the unit.
2. Press the **Measurement** key, then press 2-Port Gain (a red dot will appear on the selected item)
3. Press the **Shift** key, then press the **Sweep** (3) key.
4. Verify that RF Immunity is set to High
5. Press the **Shift** key, then press the **Calibrate** (2) key.
6. Verify that the Cal Type is set to 2-Port and the Cal Power is set to High.
7. Press the Start Cal submenu key and follow the on screen instructions to perform an OSL-THRU-ISOL calibration.
8. After the calibration is complete, disconnect one end of the cable and connect loads so that both the VNA Reflection Port and VNA RF In Port are terminated.
9. Press **Shift, Sweep** (3), and press Averaging. Verify that Averaging is set to Off.
10. Press the **Amplitude** key and set the Bottom to  $-120$  dB and the Top to  $-50$  dB.
11. Press **Shift, Limit** (6), and set the Limit to On.
12. Press the Limit Edit submenu key and verify that the frequency is set to 10 MHz.
13. Press Move Limit and set the limit to  $-80$  dB.
14. Press Add Point, press Frequency, and enter 3.0 GHz.
15. Press Add Point, press Frequency, and enter 3.01 GHz.
16. Press Point Value and enter  $-70$  dB.
17. Press Add Point and press Frequency. Enter 4.00 GHz or enter 5.50 GHz if Option 26 is installed (6 GHz upper frequency).
18. Press Point Value and enter  $-70$  dB. Skip to step 23 if Option 26 is *NOT* installed.

### Option 26 Units Only

19. Press Add Point, press Frequency, enter 5.51 GHz.
20. Press Point Value and enter  $-65$  dB.
21. Press Add Point, press Frequency, enter 6.00 GHz.
22. Press Point Value and enter  $-65$  dB.

### For All Units

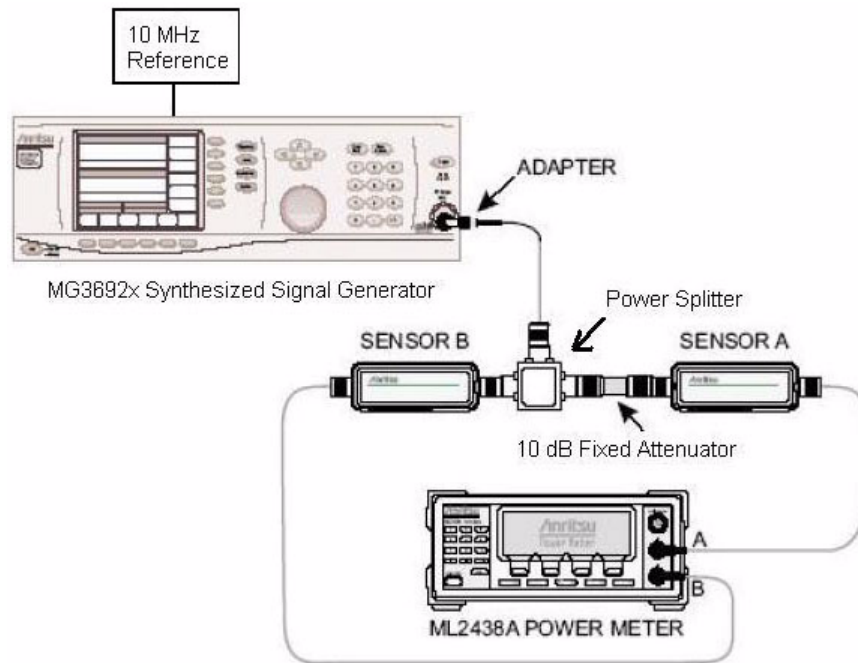
23. Verify the display of the system dynamic range is below the limit lines (the data will be unstable, but should remain below the limit lines.)
24. Use a marker to find the maximum peak of each frequency band and enter the value in [Table A-17, "VNA System Dynamic Range Verification"](#).



# Chapter 4 — Performance Verification, Power Meter

## 4-1 Power Meter Measurement Accuracy

The tests in this section verify the level accuracy of the MT8222A Power Meter function.



**Figure 4-1.** Power Meter Measurement Accuracy

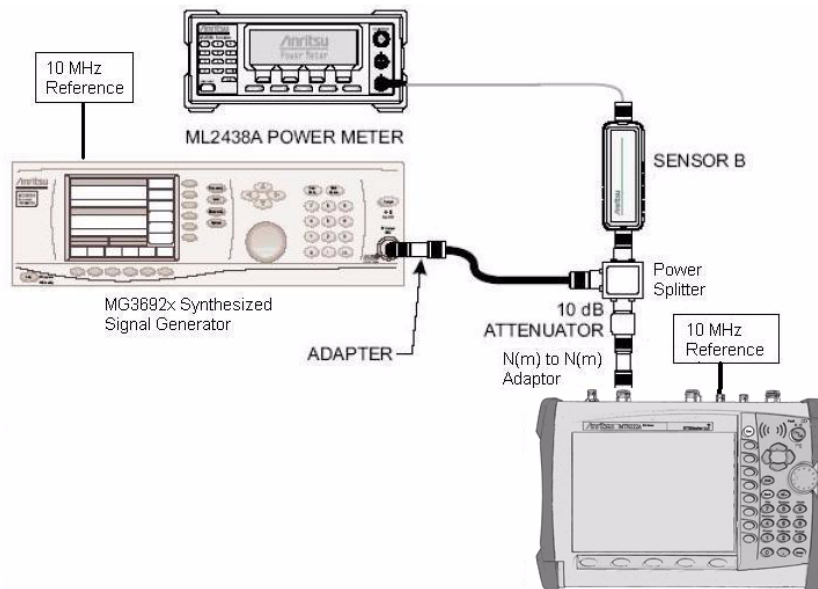
### Required Equipment:

- Anritsu Model MG3692x Synthesized Signal Source
- Anritsu Dual Channel Model ML2438A Power Meter
- Anritsu Model MA2442D Power Sensor (2)
- Aeroflex/Weinschel Model 44-10 Fixed Attenuator
- Aeroflex/Weinschel Model 1870A Power Splitter
- Symmetricom Model RubiSource T&M Frequency Reference
- Anritsu Model 34NN50A Adapter
- Anritsu Model 34RKNF50 Adapter
- Anritsu Model 15NN50-0.6BRF Coaxial Cable

## Component Characterization

1. Connect both MA2442D power sensors to the power meter and calibrate the sensors.
2. Connect the model 1870A power splitter to the MG3692A/B output and sensor B to one of the power splitter outputs (Refer to [Figure 4-1](#)).
3. Install the 10 dB Fixed Attenuator to the other power splitter output and then connect sensor A to the end of the Attenuator.
4. Set the power meter to display both Channels A and B. Press the **Sensor** key, the **Cal Factor** submenu key, and then the **Freq** submenu key. Use the keypad to enter the value matching the frequency of MG3692A/B as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Repeat for Channel B. Press the **System** key to display the power reading.
5. Adjust the power level of the MG3692A/B to get a reading on sensor A that matches the power level (within  $\pm 0.1$  dB) in the first column in [Table A-18](#), “[Characterization Chart for Power Meter Verification](#)”.
6. Record the sensor B reading in the **Sensor B Reading** column in [Table A-18](#).
7. Repeat steps 5 and 6 for the other power levels in the first column, recording the Sensor B reading in the second column.
8. Repeat the above steps for the next input frequency.

### Setup:



**Figure 4-2.** Internal Power Meter Accuracy Verification

### Procedure

1. Connect the equipment as shown in [Figure 4-2](#).
2. Verify that the MT8222A is in the Power Meter mode and preset the unit.
3. Set the MT8222A span to 3 MHz.
4. Set the MT8222A center frequency to 50 MHz.
5. Adjust the MG3692A/B power so that the power meter sensor B matches the sensor B value shown in the [Table A-18](#).
6. Record the reading on the MT8222A display in [Table A-19](#), “[Internal Power Meter Accuracy Verification](#)”.

7. Repeat steps 4 to 6 for the next test power level in [Table A-19, “Internal Power Meter Accuracy Verification”](#).
8. Repeat steps 4 to 6 for the next test frequency in [Table A-19](#).





# Chapter 5 — Performance Verification, Options

The sections below contain tests that can be used to verify the option performance of BTS Master Model MT8222A.

Refer to [Chapter 2](#) for instructions to verify the basic spectrum analyzer, [Chapter 3](#) to verify the cable and antenna analyzer, and [Chapter 4](#) to verify power meter functions of the MT8222A

Each verification section begins with a list of required equipment applicable to that section.

Copy the blank test records from [Appendix A](#) and use them to record measured values. These test records form a record of the performance of your MT8222A BTS Master. Anritsu recommends that you make a copy of the blank test records to document the measurements each time a Performance Verification is performed. Continuing to document this process each time it is performed provides a detailed history of instrument performance, which can allow you to observe trends.

## 5-1 Power Monitor (Option 5)

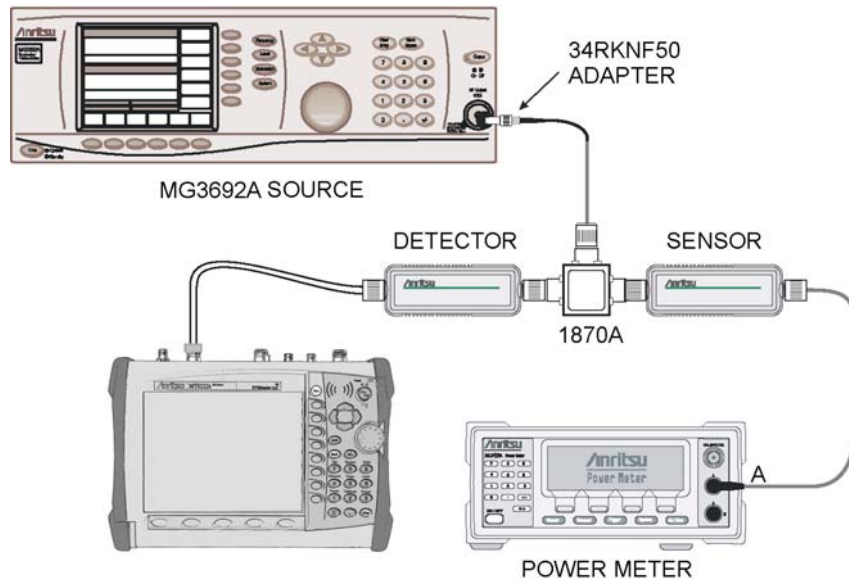
This test is used to verify the accuracy of the power measurements when the Power Monitor (Option 5) is installed in the MT8222A.

### Required Equipment:

- Anritsu Model 560-7N50B RF Detector
- Anritsu Model MG3692x Synthesized Signal Source
- Anritsu Dual Channel Model ML2438A Power Meter
- Anritsu Model MA2482D Power Sensor
- Anritsu 34RKNF50 Adapter
- Aeroflex/Weinschel Model 1870A Power Splitter

### Procedure

1. Set the MT8222A to Power Monitor mode and preset the unit.
2. Install the 560-7N50B detector to the MT8222A.
3. Set the MG3692A/B output to 1.0 GHz.
4. Connect the MA2482D power sensor to the power meter and calibrate the sensor.
5. Connect the equipment as shown in [Figure 5-1](#).



**Figure 5-1.** Power Monitor (Option 5) Verification

6. On the power meter, set the Sensor Cal Factor for 1 GHz.
7. On the MG3692A/B press the **Level** key and adjust the power level so that the power meter reads  $-40.0$  dBm.
8. Verify that the MT8222A reading is within tolerances shown in [Table A-20](#), “Option 5 Power Monitor Accuracy”.
9. Repeat steps 7 and 8 for the other power level settings shown in [Table A-20](#).

## 5-2 Bias Tee (Option 10)

This test verifies that the optional Bias Tee in the Cable and Antenna Analyzer of the BTS Master Model MT8222A is functional.

### Required Equipment:

- Anritsu PN T3377 Load Test Fixture
- Anritsu PN T2904 Load Test Fixture

### Procedure

1. Connect the external power supply (Anritsu PN 40-168-R) to the MT8222A BTS Master.
2. Press the **On/Off** key to turn on the MT8222A.
3. Set the MT8222A to Cable and Antenna Analyzer mode and preset the unit.
4. Press the **Shift** key, and then the **Sweep** (3) key.

### Low Current Test

1. Press the **Bias Tee** submenu key and verify that the **12V** submenu key is selected and that the **Current** submenu key is set to **Low**.
2. Press the **Bias Tee On/Off** submenu key to turn on the Bias Tee.
3. Connect the Anritsu T3377 105 ohm load to the RF In test port.
4. Verify that the voltage and current readings that are displayed on the left side of the screen are within the specifications that are shown in [Table 5-1](#).

**Table 5-1.** Bias Tee Verification, 105 ohm Load, Low Current

<b>Voltage Setting (V)</b>	12	15	18	21	25
<b>Voltage Specification (V)</b>	±0.5	±0.6	±0.7	±0.8	±1.0
<b>Current Specification (mA)</b>	85 to 145	113 to 173	142 to 202	172 to 230	199 to 259

5. Press each of the voltage setting submenu keys and verify that the voltage and current readings that are displayed on the left side of the screen are within the specifications that are shown in [Table 5-1](#).

### High Current Test

1. Press the **Current** submenu key and set the Bias Tee current to **High**.
2. Verify that the voltage and current readings that are displayed on the left side of the screen are within the specifications that are shown in [Table 5-2](#).
3. Press the **15V** submenu key and verify the voltage and current readings displayed on the left side of the screen are within the specifications shown in [Table 5-2](#).

**Table 5-2.** Bias Tee Verification, 105 ohm Load, High Current

<b>Voltage Setting (V)</b>	12	15
<b>Voltage Specification (V)</b>	±0.5	±0.6
<b>Current Specification (mA)</b>	85 to 145	113 to 173

4. Disconnect the Anritsu T3377 105 ohm load and connect the Anritsu T2904 40 ohm load to the RF In port.

5. Press the 12V submenu key and verify that the voltage and current readings that are displayed on the left side of the screen are within the specifications that are shown in [Table 5-3](#).

**Table 5-3.** Bias Tee Verification, 40 ohm Load, High Current

<b>Voltage Setting (V)</b>	12	15
<b>Voltage Specification (V)</b>	$\pm 0.5$	$\pm 0.6$
<b>Current Specification (mA)</b>	25 to 350	325 to 425

6. Press the 15V submenu key and verify that the voltage and current readings that are displayed on the left side of the screen are within the specifications that are shown in [Table 5-3](#).

## Fault Test

1. Press the Current submenu key and set the Bias Tee current to Low.
2. Press the 15V submenu key.
3. Connect the Anritsu T2904 40 ohm load to the RF In port.
4. Verify that the instrument makes a clicking sound and that the Bias Tee current reading that is displayed on the left side of the screen is 0 mA.

## 5-3 Bias Tee (Option 10A)

This test verifies that the optional Bias Tee in the Cable and Antenna Analyzer of the BTS Master Model MT8222A is functional. The following tests are included:

- “Low Current Test Verification”
- “High Current Test Verification”
- “Fault Verification”

### Low Current Test Verification

The tests in this section verify the Bias Tee (Option 10A) low current operation of the MT8222A in Cable and Antenna Analyzer mode.

#### Equipment Required

- Anritsu 40-168-R External Power Supply
- Load Test Fixture, 105 Ohm, 1 watt, Anritsu PNI T3449

#### Procedure

1. Connect the external power supply (Anritsu PN 40-168-R) to the MT8222A BTS Master.
2. Press the **On/Off** key to turn on the MT8222A.
3. Set the MT8222A to Cable and Antenna Analyzer mode and preset the unit.
4. Press the **Shift** key, and then the **Sweep** (3) key.

#### Low Current Test

1. Press the **Bias Tee** submenu key and verify that the **12V** submenu key is selected and that the **Current** submenu key is set to **LOW**.
2. Connect the Anritsu T3377 105 ohm load to the RF In test port.
3. Press the **Bias Tee On/Off** submenu key to turn on the Bias Tee.
4. Verify that the voltage and current readings that are displayed on the left side of the screen are within the specifications shown in [Table 5-4](#).

**Table 5-4.** Bias Tee Verification, 105 ohm Load, Low Current

Voltage Setting (V)	12	15	18	21	24
Voltage Specification (V)	± 0.5	± 0.6	± 0.7	± 0.8	± 1.0
Current Specification (mA)	85 to 145	113 to 173	142 to 202	172 to 230	199 to 259

5. Select each of the voltage setting submenu keys and verify that the voltage and current readings that are displayed on the left side of the screen are within the specifications that are shown in [Table 5-4](#).

## High Current Test Verification

The tests in this section verify the Bias Tee (Option 10A) high current operation of the MT8222A in Cable and Antenna Analyzer mode.

### Equipment Required

- Anritsu 40-168-R External Power Supply
- Load Test Fixture, 105 Ohm, 1 watt, Anritsu PNI T3449
- Load Test Fixture, 40 Ohm, 5 watt, Anritsu PNI T2904
- Load Test Fixture, 78 Ohm, 1 watt, Anritsu PNI T3536

### Procedure

1. Connect the external power supply (Anritsu PN 40-168-R) to the MT8222A BTS Master.
2. Press the **On/Off** key to turn on the MT8222A.
3. Set the MT8222A to Cable and Antenna Analyzer mode and preset the unit.
4. Press the **Shift** key, and then the **Sweep** (3) key.

### High Current Test

1. Press the Bias Tee soft key and verify that the 12V soft key is selected and that the Current soft key is set to High.
2. Connect the Anritsu T3377 105 ohm load to the RF In test port.
3. Press the Bias Tee On/Off soft key to turn on the Bias Tee.
4. Verify that the voltage and current readings that are displayed on the left side of the screen are within the specifications that are shown in [Table 5-5](#).
5. Press the 15V soft key and verify that the voltage and current readings that are displayed on the left side of the screen are within the specifications that are shown in [Table 5-5](#).

**Table 5-5.** Bias Tee Verification, 105 ohm Load, High Current

<b>Voltage Setting (V)</b>	12	15
<b>Voltage Specification (V)</b>	±0.5	±0.6
<b>Current Specification (mA)</b>	85 to 145	113 to 173

6. Press the Bias Tee On/Off soft key to turn off the Bias Tee. Disconnect the Anritsu T3377 105 ohm load and connect the Anritsu T2904 40 ohm load to the RF In port.
7. Press the Bias Tee On/Off soft key to turn on the Bias Tee.
8. Press the 12V soft key and verify that the voltage and current readings that are displayed on the left side of the screen are within the specifications that are shown in [Table 5-6](#).
9. Press the 15V soft key and verify that the voltage and current readings that are displayed on the left side of the screen are within the specifications that are shown in [Table 5-6](#).

**Table 5-6.** Bias Tee Verification, 40 ohm Load, High Current

<b>Voltage Setting (V)</b>	12	15
<b>Voltage Specification (V)</b>	±0.5	±0.6
<b>Current Specification (mA)</b>	250 to 350	325 to 425

10. Press the Bias Tee On/Off soft key to turn off the Bias Tee. Disconnect the Anritsu T2904 40 ohm load and connect the Anritsu T3536 78 ohm load to the RF In port.
11. Press the Bias Tee On/Off soft key to turn on the Bias Tee.
12. Press the 32V soft key and verify that the voltage and current readings that are displayed on the left side of the screen are within the specifications that are shown in [Table 5-7](#).

**Table 5-7.** Bias Tee Verification (Option 10A only), 78 ohm Load, High Current

<b>Voltage Setting (V)</b>	32
<b>Voltage Specification (V)</b>	±0.5
<b>Current Specification (mA)</b>	390 to 430

## Fault Verification

The tests in this section verify the Bias Tee (Option 10A) fault condition of the MT8222A in Cable and Antenna Analyzer mode.

### Equipment Required

- Anritsu 40-168-R External Power Supply
- Load Test Fixture, 40 Ohm, 5 watt, Anritsu PNI T2904

### Procedure

1. Connect the external power supply (Anritsu PN 40-168-R) to the MT8222A BTS Master.
2. Press the **On/Off** key to turn on the MT8222A.
3. Set the MT8222A to Cable and Antenna Analyzer mode and preset the unit.
4. Press the **Shift** key, and then the **Sweep** (3) key.

### Fault Test

5. Press the Current soft key and set the Bias Tee current to Low.
6. Press the 15V soft key.
7. Connect the Anritsu T2904 40 ohm load to the RF In port.
8. Press the Bias Tee On/Off soft key to turn on the Bias Tee.
9. Verify that the instrument makes a clicking sound and that the Bias Tee current reading that is displayed on the left side of the screen is 0 mA.
10. Press the Bias Tee On/Off soft key to turn off the Bias Tee.

## 5-4 GPS (Option 31)

The following test verifies the GPS option in Model MT8222A BTS Master.

### Required Equipment:

- Anritsu PN 2000-1410 GPS Antenna
- Anritsu Model MG3692x Synthesized Signal Source
- Symmetricom Model RubiSource T&M Frequency Reference

### Procedure

1. Connect the GPS antenna to the GPS Antenna connector on the MT8222A.

**Note** If no fixed GPS antenna is available, the Anritsu 2000-1410 GPS antenna can be used for this test. Ensure that the Anritsu 2000-1410 GPS antenna is in a direct line-of-sight relationship to the satellites or the antenna must be placed outside without any obstructions.

2. Press the **Shift** key and then the **System** key.
3. Press the **GPS** submenu key, then press the **GPS On/Off** submenu key to turn the GPS On.
4. When the GPS fix is acquired, the GPS indicator at the top of the LCD display will turn green. The latitude and the longitude will also be displayed next to the GPS indicator.
5. Wait for about three minutes after the Reference Source indicator in the lower left hand corner of the LCD display has changed to **GPS High Accuracy**.

**Note** If GPS fix is acquired using the Anritsu 2000-1410 GPS antenna placed outside, bringing the instrument inside will lose satellite tracking. A red cross will appear on the green GPS indicator and the Reference Source indicator will change to **Int Hi Accy**. The following test will verify frequency accuracy to a lesser specification.

6. Connect the external 10 MHz Reference to the Anritsu MG3692x Synthesized Signal Generator.

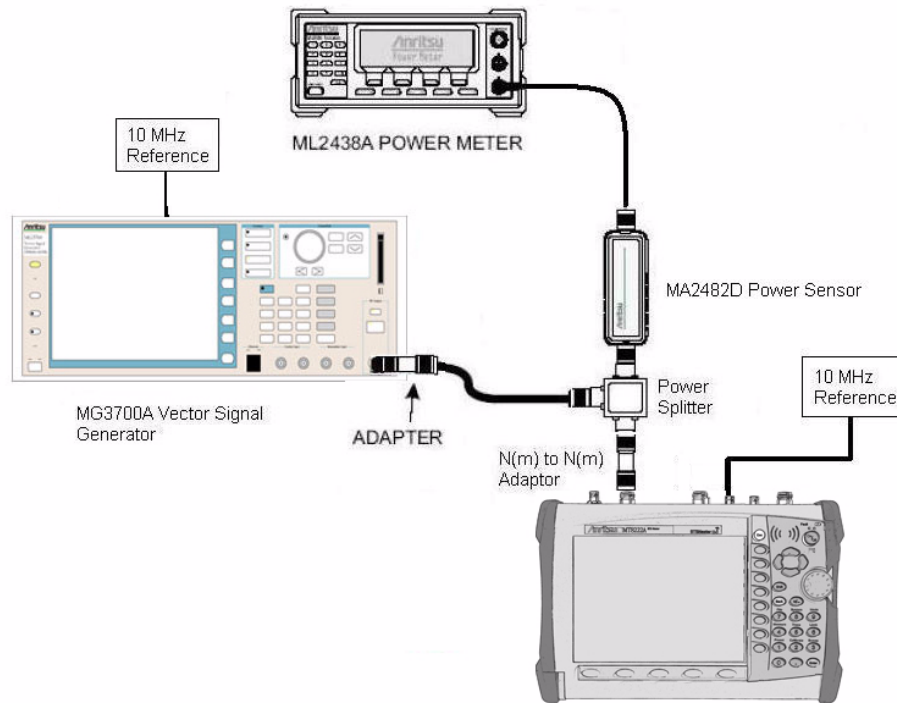
**Note** Do not connect the external 10 MHz Reference to the MT8222A BTS Master.

7. Connect the output of the synthesized Signal Generator to the Spectrum Analyzer RF In of the MT8222A.
8. On the MT8222A, change the mode to **Spectrum Analyzer** and preset the unit.
9. Set the MG3692x output to 7 GHz CW, with an RF output level of  $-30$  dBm.
10. On the MT8222A, press the **Amplitude** key, and set the reference level to  $-10$  dBm.
11. Press the **Freq** submenu key and set the center frequency to 7.0 GHz.
12. Press the **Span** submenu key and set the span to 10 kHz.
13. Press the **BW** submenu key and set RBW to 100 Hz.
14. Press the **VBW** submenu key and set to 30 Hz.
15. Press the **Marker** key, and press the **Peak Search** submenu key.
16. Record the marker frequency in the **Measured Value** column in [Table A-21, “Option 31 GPS Receiver, Spectrum Analyzer Frequency Accuracy”](#).
17. Subtract the marker value from 7 GHz and record the result in the **Error** column in [Table A-21, “Option 31 GPS Receiver, Spectrum Analyzer Frequency Accuracy”](#) and verify that it is within specification.



## 5-5 GSM/GPRS/EDGE Signal Analyzer (Options 40 and/or 41)

The tests in this section verify the optional GSM/GPRS/EDGE Signal Analyzer functions in Model MT8222A BTS Master.



**Figure 5-2.** GSM/GPRS/EDGE Signal Analyzer Option Verification

### Required Equipment:

- Anritsu Model MG3700A Vector Signal Generator
- Anritsu Dual Channel Model ML2438A Power Meter
- Symmetricom Model RubiSource T&M Frequency Reference
- Anritsu Model MA2482D Power Sensor
- Aeroflex/Weinschel Model 1870A Power Splitter
- Anritsu 34NN50A N(m) to N(m) Adaptor

### Set up Procedure

1. Connect the equipment as shown in [Figure 5-2](#).
2. Calibrate the power sensor prior to connecting to the power splitter.
3. On the power meter, press the **Sensor** key, the **Cal Factor** submenu key, and then the **Freq** submenu key. Use the keypad to enter 850 MHz as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Press the **System** key to display the power reading.
4. Set the MT8222A mode to GSM/GPRS/EDGE Signal Analyzer and preset the unit.

## GSM Burst Power, Frequency Error and Phase Error Tests Procedure

1. On the MG3700A, press the **Preset** key (yellow key on the upper left hand side).
2. Press the down arrow key or turn the knob to select Yes.
3. Press the **Set** key.

<b>Note</b> Both <b>Set</b> keys on the MG3700A perform the same function.
--

4. Press the F1 submenu key to select Load File to Memory.
5. Press the F1 submenu key again to select Select Package.
6. Using the down arrow key step through the selection list until the GSM option is highlighted.
7. Press the **Set** key.
8. Press the F6 (Return) submenu key.
9. Press the **Set** key. The Select Package box will appear. Use the rotary knob to highlight GSM and press the **Set** key to select.
10. Another file list will appear. Use the rotary knob to select GsmBurst\_1slot and press the **Set** key to select.
11. Press the **MOD On/Off** key to turn the Modulation LED on and verify the “Playing” indicator in the center of the LCD is flashing.
12. Press the **Frequency** key, enter 850 MHz.
13. Press the **Level** key, enter -10 and press the dBm submenu key.
14. Adjust the MG3700A output so that the power meter reads  $-10 \text{ dBm} \pm 0.2 \text{ dB}$ .
15. On the MT8222A, press the Frequency submenu key and enter 850 MHz as the center frequency.
16. Press the Measurements submenu key and press GSM/EDGE Summary (a red dot will appear on the label).
17. For MT8222A with Option 40 (GSM/GPRS/EDGE RF Measurements), subtract the displayed Burst Power value from the power meter reading in step 14. Then add 9.21 dB to the result to get the Burst Power error. Record the calculated Burst Power error and the displayed value of Freq Error to the **At 850 MHz, -10 dBm Level, TCH Pattern** row of [Table A-22, “Option 40 GSM/GPRS/EDGE RF Measurements”](#)
18. For MT8222A with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed Phase Err RMS (deg) to the **At 850 MHz, -10 dBm Level, TCH Pattern** row in [Table A-23, “Option 41 GSM/GPRS/EDGE Demodulator”](#).
19. Verify that the measured values in step 17 and/or step 18 are within specifications.
20. On the MG3700A, change the selected signal pattern to GsmBurst\_8slot.
21. Adjust the Level of the MG3700A so that the power meter reads  $-50 \text{ dBm} \pm 0.2 \text{ dB}$ . Then wait 15 seconds to allow the MT8222A to update its measured results.
22. For MT8222A with Option 40 (GSM/GPRS/EDGE RF Measurements), subtract the displayed Burst Power value from the power meter reading in step 21. Then add 0.2 dB to the result to get the Burst Power error. Record the calculated Burst Power error and the displayed value of Freq Error to the **At 850 MHz, -50 dBm Level, TCH ALL Pattern** row in [Table A-22](#).
23. For MT8222A with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed Phase Err RMS (deg) to the **At 850 MHz, -50 dBm Level, TCH ALL Pattern** row in [Table A-23](#).
24. Verify that the measured values in step 22 and/or step 23 are within specifications.
25. Change the frequency of MG3700A to 1800 MHz.

26. On the power meter, press the **Sensor** key, the Cal Factor submenu key, and then the Freq submenu key. Use the keypad to enter 1800 MHz as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Press the **System** key to display the power reading.
27. Adjust the level of the MG3700A so that the power meter reads  $-10 \text{ dBm} \pm 0.2 \text{ dB}$ .
28. On the MT8222A, set the center frequency to 1800 MHz. Then wait 15 seconds to allow the MT8222A to update its measured results.
29. For MT8222A with Option 40 (GSM/GPRS/EDGE RF Measurements), subtract the displayed Burst Power value from the power meter reading in step 27. Then add 0.2 dB to the result to get the Burst Power error. Record the calculated Burst Power error and the displayed value of Freq Error to the **At 1800 MHz, -10 dBm Level, TCH ALL Pattern** row in [Table A-22, "Option 40 GSM/GPRS/EDGE RF Measurements"](#).
30. For MT8222A with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed Phase Err RMS (deg) to **At 1800 MHz, -10 dBm Level, TCH ALL Pattern** row in [Table A-23, "Option 41 GSM/GPRS/EDGE Demodulator"](#).
31. Verify that the measured values in step 29 and/or step 30 are within specifications.
32. On the MG3700A, change the selected pattern to GsmBurst\_1slot.
33. Adjust the level of the MG3700A so that the power meter reads  $-50 \text{ dBm} \pm 0.2 \text{ dB}$ . Then wait 15 seconds to allow the MT8222A to update its measured results.
34. For MT8222A with Option 40 (GSM/GPRS/EDGE RF Measurements), subtract the displayed Burst Power value from the power meter reading in step 33. Then add 9.21 dB to the result to get the Burst Power error. Record the calculated Burst Power error and the displayed value of Freq Error in the **At 1800 MHz, -50 dBm, TCH Pattern** row in [Table A-22](#).
35. For MT8222A with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed Phase Err RMS (deg) to **At 1800 MHz, -50 dBm, TCH Pattern** row in [Table A-23](#).
36. Verify that the measured values in step 34 and/or step 35 are within specifications.

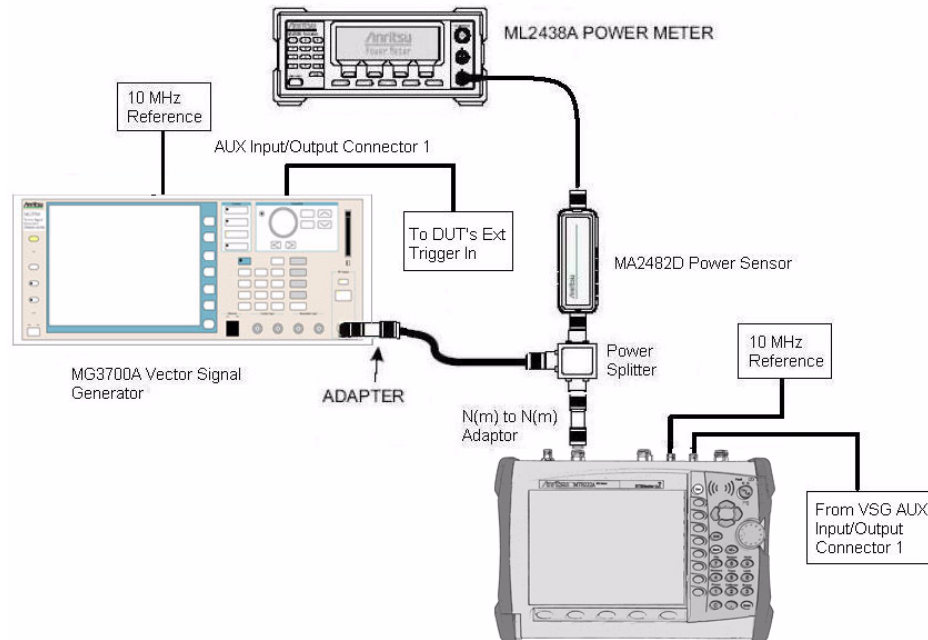
## EDGE Burst Power, Frequency Error and Residual Error Tests Procedure

1. Ensure that the equipment settings are unchanged from the previous test.
2. On the MG3700A, change the selected pattern to DL\_MCS-9\_1SLOT.
3. Adjust the level of the MG3700A so that the power meter reads  $-50 \text{ dBm} \pm 0.2 \text{ dB}$ . Then wait 15 seconds to allow the MT8222A to update its measured results.
4. For MT8222A with Option 40 (GSM/GPRS/EDGE RF Measurements), subtract the displayed Burst Power value from the power meter reading in step 3. Then record the calculated Burst Power error and the displayed value of Freq Error to the **At 1800 MHz, -50 dBm Level, DL\_MCS-9\_1SLOT Pattern** row in [Table A-22](#).
5. For MT8222A with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed EVM(rms) to the **At 1800 MHz, -50 dBm Level, DL\_MCS-9\_1SLOT Pattern** row in [Table A-23](#).
6. Verify that the measured values in step 4 and/or step 5 are within specifications.
7. On the MG3700A, change the selected pattern to DL\_MCS-9\_4SLOT.
8. Adjust the level of the MG3700A so that the power meter reads  $-10 \text{ dBm} \pm 0.2 \text{ dB}$ . Then wait 15 seconds to allow the MT8222A to update its measured results.
9. For MT8222A with Option 40 (GSM/GPRS/EDGE RF Measurements), subtract the displayed Burst Power value from the power meter reading in step 8. Then record the calculated Burst Power error and the displayed value of Freq Error to the **At 1800 MHz, -10 dBm Level, DL\_MCS-9\_4SLOT Pattern** row in [Table A-22](#).
10. For MT8222A with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed EVM(rms) to the **At 1800 MHz, -10 dBm Level, DL\_MCS-9\_4SLOT Pattern** row in [Table A-23](#).
11. Verify that the measured values in step 9 and/or step 10 are within specifications.

12. Change the frequency of MG3700A to 850 MHz.
13. On the power meter, press the **Sensor** key, the Cal Factor submenu key, and then the Freq submenu key. Use the keypad to enter 850 MHz as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Press the **System** key to display the power reading.
14. Adjust the level of the MG3700A so that the power meter reads  $-50 \text{ dBm} \pm 0.2 \text{ dB}$ .
15. On the MT8222A, set the center frequency to 850 MHz. Then wait 15 seconds to allow the MT8222A to update its measured results.
16. For MT8222A with Option 40 (GSM/GPRS/EDGE RF Measurements), record the displayed values of Burst Power and Freq Error to **At 850 MHz,  $-50 \text{ dBm}$  Level, DL\_MCS-9\_4SLOT Pattern** row in [Table A-22, "Option 40 GSM/GPRS/EDGE RF Measurements"](#)
17. For MT8222A with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed EVM(rms) to **At 850 MHz,  $-50 \text{ dBm}$  Level, DL\_MCS-9\_4SLOT Pattern** row in [Table A-23, "Option 41 GSM/GPRS/EDGE Demodulator"](#).
18. Verify that the measured values in step 16 and/or step 17 are within specifications.
19. On the MG3700A, change the selected pattern to DL\_MCS-9\_1SLOT.
20. Adjust the level of the MG3700A so that the power meter reads  $-10 \text{ dBm} \pm 0.2 \text{ dB}$ . Then wait 15 seconds to allow the MT8222A to update its measured results.
21. For MT8222A with Option 40 (GSM/GPRS/EDGE RF Measurements), record the displayed values of Burst Power and Freq Error to **At 850 MHz,  $-10 \text{ dBm}$  Level, DL\_MCS-9\_1SLOT Pattern** row in [Table A-22](#).
22. For MT8222A with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed EVM(rms) to **At 850 MHz,  $-10 \text{ dBm}$  Level, DL\_MCS-9\_1SLOT Pattern** row in [Table A-23](#).
23. Verify that the measured values in step 21 and/or step 22 are within specifications.

## 5-6 CDMA Signal Analyzer (Options 42 and/or 43)

The tests in this section verify the optional CDMA Signal Analyzer functions in Model MT8222A BTS Master.



**Figure 5-3.** CDMA Signal Analyzer Option Verification

### Required Equipment:

- Anritsu Model MG3700A Vector Signal Generator
- Anritsu Dual Channel Model ML2438A Power Meter
- Anritsu Model MA2482D Power Sensor
- Symmetricom Model RubiSource T&M Frequency Reference
- Aeroflex/Weinschel Model 1870A Power Splitter
- Anritsu 34NN50A N(m) to N(m) Adaptor

### Set up Procedure

1. Connect the equipment as shown in [Figure 5-3](#).
2. Calibrate the power sensor prior to connecting to the power splitter.
3. On the power meter, press the **Sensor** key, the **Cal Factor** submenu key, and then the **Freq** submenu key. Use the keypad to enter 870.03 MHz as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Press the **System** key to display the power reading.
4. Set the MT8222A mode to CDMA Signal Analyzer and preset the unit.

## cdmaOne Channel Power, Frequency Error, Rho and Tau Tests Procedure

1. On the MG3700A, press the **Preset** key (yellow key on the upper left hand side).
2. Press the down arrow key or turn the knob to select Yes.
3. Press the **Set** key.

<b>Note</b> Both <b>Set</b> keys on the MG3700A perform the same function.
--

4. Press the F1 submenu key to select Load File to Memory.
5. Press the F1 submenu key again to select Select Package.
6. Using the down arrow key step through the selection list until the CDMA2000 option is highlighted.
7. Press the **Set** key.
8. Press the Return (F6) submenu key.
9. Press the **Set** key. The Select Package box will appear. Use the rotary knob to highlight CDMA2000 and press the **Set** key to select.
10. Another file list will appear. Use the rotary knob to select FWD\_RC1-2\_9channel and press the **Set** key.
11. Press the **MOD On/Off** key to turn the Modulation LED on and verify the “Playing” indicator in the center of the LCD is flashing.
12. Press the **Frequency** key, enter 870.03 MHz.
13. Press the **Level** key, enter -30 and press the dBm submenu key.
14. Adjust the MG3700A output so that the power meter reads -30 dBm ± 0.2 dB.
15. On the MT8222A, press the Frequency submenu key and enter 870.03 MHz for the center frequency.
16. Press the Measurements submenu key and press CDMA Summary (a red dot will appear on the label).
17. Press the Setup submenu key and press PN Setup. Then change PN Trigger to Ext by pressing the PN Trigger submenu key twice. Wait 15 seconds to allow the MT8222A to update its measured results.
18. For MT8222A with Option 42 (CDMA RF Measurements), subtract the displayed Channel Power value from the power meter reading in step 14. Then record the calculated Channel Power error to the **At 870.03 MHz, -30 dBm Level, cdmaOne** row in [Table A-24, “Option 42 CDMA RF Measurements”](#).
19. For MT8222A with Option 43 (cdmaOne and CDMA2000 1xRTT Demodulator), record the displayed Freq Error, Rho and Tau to the **At 870.03 MHz, -30 dBm Level, cdmaOne** row in [Table A-25, “Option 43 cdmaOne and CDMA2000 1xRTT Demodulator”](#).
20. Verify that the measured values in step 18 and/or step 19 are within specifications.
21. On the power meter, press the **Sensor** key, the Cal Factor submenu key, and then the Freq submenu key. Use the keypad to enter 1930 MHz as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Press the **System** key to display the power reading.
22. Set the MG3700A frequency to 1930.05 MHz.
23. Adjust the MG3700A output so that the power meter reads -30 dBm ± 0.2 dB.
24. On the MT8222A, press the Frequency submenu key and enter 1930.05 MHz for the center frequency. Wait 15 seconds to allow the MT8222A to update its measured results.
25. For MT8222A with Option 42 (CDMA RF Measurements), subtract the displayed Channel Power value from the power meter reading in step 23. Then record the calculated Channel Power error to the **At 1930.05 MHz, -30 dBm Level, cdmaOne** row in [Table A-24](#).
26. For MT8222A with Option 43 (cdmaOne and CDMA2000 1xRTT Demodulator), record the displayed Freq Error, Rho and Tau to the **At 1930.05 MHz, -30 dBm Level, cdmaOne** row in [Table A-25](#).
27. Verify that the measured values in step 25 and/or step 26 are within specifications.



## CDMA2000 Channel Power, Frequency Error, Rho and Tau Tests Procedure

1. Ensure that the equipment settings are unchanged from the previous test.
2. On the MG3700A, change the selected pattern to FWD\_RC3-5\_9channel.
3. Adjust the level of the MG3700A so that the power meter reads  $-30 \text{ dBm} \pm 0.2 \text{ dB}$ . Then wait 15 seconds to allow the MT8222A to update its measured results.
4. For MT8222A with Option 42 (CDMA RF Measurements), subtract the displayed Channel Power value from the power meter reading in step 3. Then record the calculated Channel Power error to the **At 1930.05 MHz, -30 dBm Level, CDMA2000** row in [Table A-24](#).
5. For MT8222A with Option 43 (cdmaOne and CDMA2000 1xRTT Demodulator), record the displayed Freq Error, Rho and Tau to the **At 1930.05 MHz, -30 dBm Level, CDMA2000** row in [Table A-25](#).
6. Verify that the measured values in step 4 and/or step 5 are within specifications.
7. On the power meter, press the **Sensor** key, the Cal Factor submenu key, and then the Freq submenu key. Use the keypad to enter 870.03 MHz as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Press the **System** key to display the power reading.
8. Set the MG3700A frequency to 870.03 MHz.
9. Adjust the MG3700A output so that the power meter reads  $-30 \text{ dBm} \pm 0.2 \text{ dB}$ .
10. On the MT8222A, press the Frequency submenu key and enter 870.03 MHz as the center frequency. Then wait 15 seconds to allow the MT8222A to update its measured results.
11. For MT8222A with Option 42 (CDMA RF Measurements), subtract the displayed Channel Power value from the power meter reading in step 9. Then record the calculated Channel Power error to the **At 870.03 MHz, -30 dBm Level, CDMA2000** row in [Table A-24](#).
12. For MT8222A with Option 43 (cdmaOne and CDMA2000 1xRTT Demodulator), record the displayed Freq Error, Rho and Tau to the **At 870.03 MHz, -30 dBm Level, CDMA2000** row in [Table A-25](#).
13. Verify that the measured values in step 11 and/or step 12 are within specifications.

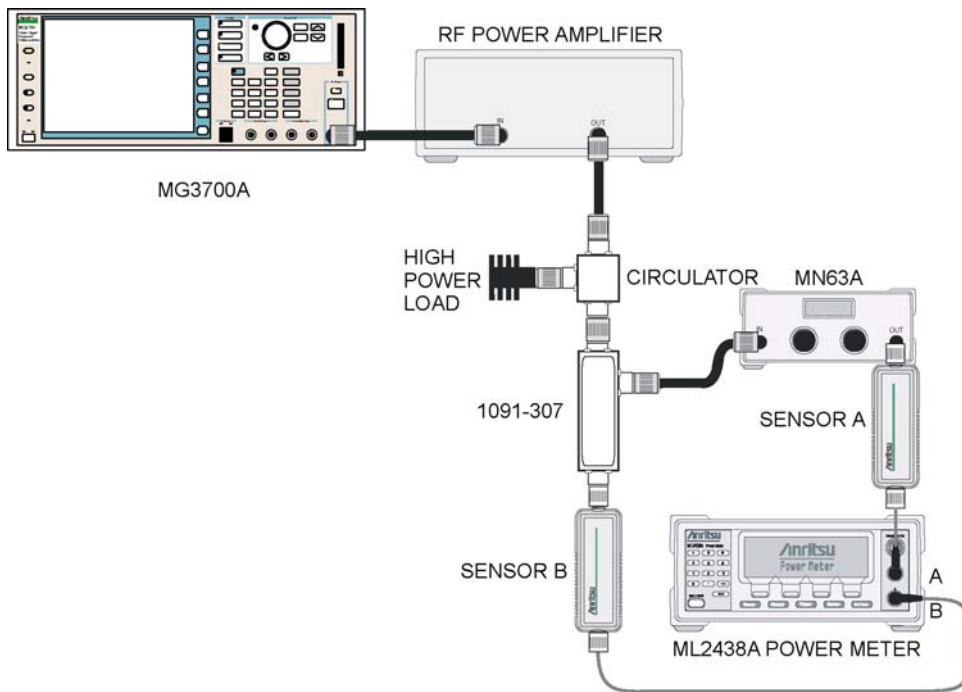
## 5-7 WCDMA/HSDPA Signal Analyzer (Options 44, 45 and/or 65)

The tests in this section can be used to verify the functionality of the WCDMA/HSDPA Signal Analyzer mode of the Model MT8222A BTS Master. The tests include:

- “WCDMA Absolute Power Accuracy Verification (Option 44)”
- “WCDMA Occupied Bandwidth (OBW) Verification (Option 44)”
- “WCDMA RF Channel Power Accuracy and Adjacent Channel Leakage Ratio (ACLR) Verification (Option 44)”
- “HSDPA RF Channel Power Accuracy and Adjacent Channel Leakage Ratio (ACLR) Verification (Option 44)”
- “Error Vector Magnitude (EVM) Verification (Options 45 or 65)”

### WCDMA Absolute Power Accuracy Verification (Option 44)

This test verifies the WCDMA absolute power accuracy in WCDMA/HSDPA Signal Analyzer mode.



**Figure 5-4.** WCDMA Absolute Power Accuracy Verification

#### Required Equipment:

- Anritsu Model MG3700A Vector Signal Generator
- Anritsu Dual Channel Model ML2438A Power Meter
- Mini Circuits Model TIA-1000-1R8 RF Power Amplifier
- Anritsu Model MN63A Programmable Attenuator
- Anritsu Model MA2482D Power Sensor (2)
- Anritsu PN 1091-307 Coupler
- Anritsu PN 1000-50 Circulator
- Aeroflex/Weinschel Model M1418 High Power Load

1. Connect the MG3700A, RF power amplifier, attenuator, power meter, and sensors as shown in [Figure 5-4](#).



2. Turn on the MG3700A, RF amplifier, attenuator and the power meter.
3. Connect the power sensors to the power meter and then calibrate the sensors.
4. Press the **On/Off** key to turn on the MT8222A and wait until the measurement display appears then press the **Shift** key and press the **Mode** (9) key to activate the mode selection menu.
5. Use the **Up/Down** arrow keys to select WCDMA and press the **Enter** key.
6. Press the **Shift** key, the **Preset** (1) key, and then the Preset submenu key.
7. On the MG3700A, press the **Preset** key (yellow key on the upper left hand side).
8. Press the **Down** arrow key to select Yes.
9. Press the **Set** key.

**Note** Both **Set** keys on the MG3700A perform the same function.

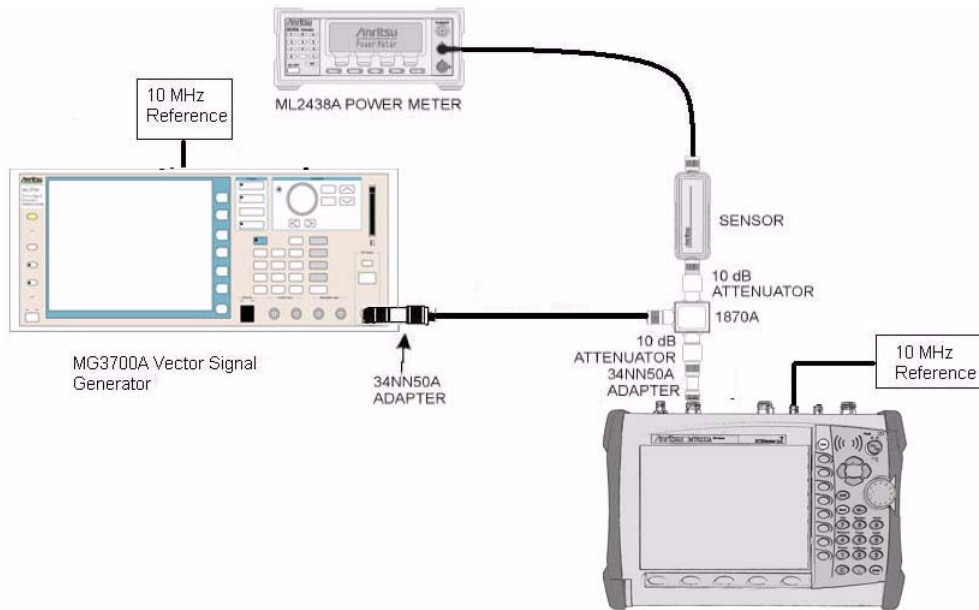
10. Press the F1 submenu key to select Load File to Memory.
11. Press the F1 submenu key again to select Select Package.
12. Using the down arrow key step through the selection list until the W-CDMA(BS Tx test) option is highlighted.
13. Press the **Set** key.
14. Press the Return (F6) submenu key.
15. Press the **Set** key.
16. Using the down arrow key step through the selection list until the TestModel\_1\_16DPCH option is highlighted.
17. Press the **Set** key.
18. Press the **MOD On/Off** key and verify that the Modulation indicator on the display is on.
19. Press the **Frequency** key, enter 881.5 MHz then press the MHz submenu key.
20. Press the **Level** key, enter -28 and press the dBm submenu key.
21. Use the knob to adjust the power level so sensor B reads +10 dBm.
22. Set the MN63A attenuator to 0 dB.
23. Record the sensor A reading (PMA.10) in [Table A-26, "Option 44, Sensor A and B Reading Components Characterization"](#). This should be around -20 dBm.
24. Record the sensor B reading (PMB.10) in [Table A-26](#).
25. Calculate  $\Delta 1$  which is the error of the coupler output port deviation from ideal +10 dBm using the following formula:  
$$\Delta 1 \text{ (dBm)} = (10 \text{ dBm} - \text{PMB.10})$$
26. Record the  $\Delta 1$  value in [Table A-26](#).
27. Calculate the accurate value of sensor A reading for coupler port output of +10 dBm (PMA.10C) using the following formula:  
$$\text{PMA.10C} = \text{PMA.10} + \Delta 1$$
28. Record the calculated value in [Table A-26](#).
29. Set the MN63A attenuator to 18 dB and record sensor A reading (PMA.18) in [Table A-26](#).
30. Calculate the accurate attenuation value using the following formula:  
$$\text{ATT.18} = (\text{PMA.10} - \text{PMA.18})$$
31. Record the calculated value in [Table A-26](#).

32. Turn off the RF output of the MG3700A.
33. Disconnect the coupler from sensor B and connect the coupler to the MT8222A BTS Master RF In port.
34. Set the MN63A attenuator to 0 dB.
35. On the MT8222A press the **Center Freq** submenu key, enter 881.5 and then press the **Enter** key.
36. Press the **Measurements** submenu key, then the **RF Measurement** submenu key, then the **Spectrum** submenu key.
37. On the MG3700A turn on the RF output and use the knob to adjust power level to read the value of PMA.10C on sensor A.
38. Record the MG3700A power level setting (MG3700A.10) in [Table A-27, “Option 44, Power Level Setting Components Characterization”](#).
39. On the MT8222A press the **Amplitude** key and then press the **Adjust Range** submenu key.
40. Record the channel power reading in the **Measured Power** column in [Table A-28, “Option 44, WCDMA Absolute Power Accuracy”](#).
41. Use the following formula to calculate the absolute power accuracy of the MT8222A at +10 dBm:  
$$\text{Error} = \text{Measured Power} - 10$$
42. Record the calculated value in the **Error** column in [Table A-28](#) and verify that it is within specification.
43. Turn off the RF output of the MG3700A.
44. Set the MN63A attenuator to 18 dB.
45. Calculate the value of the MG3700A setting (MG3700A.28) for +28 dBm Test Level using the following formula:  
$$\text{MG3700A.28} = \text{MG3700A.10} + \text{ATT.18}$$
46. Record the calculated value in the [Table A-27](#).
47. On the MG3700A turn on the RF output and use the knob to adjust power level to the recorded MG3700A.28 value in [Table A-27](#).
48. On the MT8222A press the **Amplitude** key and then press the **Adjust Range** submenu key.
49. Record channel power reading in the **Measured Power** column of [Table A-28](#).
50. Use the following formula to calculate the absolute power accuracy of the MT8222A at +28 dBm:  
$$\text{Error} = \text{Measured Power} - 28$$
51. Record the calculated value in the **Error** column of [Table A-28](#).
52. Turn off the RF output of the MG3700A.
53. Set the MN63A attenuator to 0 dB.
54. Set power level of the MG3700A to -38 dBm.
55. Calculate the value of sensor A reading (PMA-10) for -10 dBm Test Level using the following formula:  
$$\text{PMA-10} = \text{PMA.10C} - 20$$
56. Record the calculated value in [Table A-27](#).
57. Turn on the RF output and use the knob to adjust power level to read the value of PMA-10 on sensor A.
58. On the MT8222A press the **Amplitude** key and then press the **Adjust Range** submenu key.
59. Record channel power reading in the **Measured Power** column of [Table A-28](#).
60. Use the following formula to calculate the absolute power accuracy of the MT8222A at -10 dBm:  
$$\text{Error} = \text{Measured Power} - (-10)$$
61. Record the calculated value in the **Error** column of [Table A-28](#).
62. Turn off the RF output of the MG3700A.

63. Set the MN63A attenuator to 0 dB.
64. Decrease power level of the MG3700A by 10 dB.
65. Calculate the value of sensor A reading (PMA-20) for –20 dBm Test Level using the following formula:  
$$\text{PMA-20} = \text{PMA.10C} - 30$$
66. Record the calculated value in [Table A-27](#).
67. Turn on the RF output and use the knob to adjust power level to read the value of PMA-20 on sensor A.
68. On the MT8222A press the **Amplitude** key and then press the **Adjust Range** submenu key.
69. Record channel power reading in the **Measured Power** column of [Table A-28](#).
70. Turn off the RF output of the MG3700A.
71. Use the following formula to calculate the absolute power accuracy of MT8222A at –20 dBm:  
$$\text{Error} = \text{Measured Power} - (-20)$$
72. Record the calculated value in the **Error** column of [Table A-28](#).

## WCDMA Occupied Bandwidth (OBW) Verification (Option 44)

The tests in this section can be used to verify the WCDMA occupied bandwidth in WCDMA/HSDPA Signal Analyzer Mode.



**Figure 5-5.** WCDMA Occupied Bandwidth (OBW) Verification

### Required Equipment:

- Anritsu Model MG3700A Vector Signal Generator
- Symmetricom Model RubiSource T&M Frequency Reference
- Anritsu Dual Channel Model ML2438A Power Meter
- Anritsu Model MA2482D Power Sensor
- Aeroflex/Weinschel Model 1870A Power Splitter
- Anritsu 34NN50A Adapter (2)
- Aeroflex/Weinschel Model 44-10 Attenuator (2)

### Procedure

1. Turn on the MG3700A Vector Signal Generator and the ML2438A power meter.
2. Connect the power sensor to the power meter and calibrate the sensor.
3. Connect the MG3700A, splitter, attenuator, power meter, and sensor as shown in [Figure 5-5](#).
4. Press the **On/Off** key to turn on the MT8222A and wait until the measurement display appears then press the **Shift** key then press the **Mode** (9) key to activate the mode selection menu.
5. Use the **Up/Down** arrow keys to select WCDMA and press the **Enter** key.
6. Press the **Shift** key, the **Preset** (1) key, and then the Preset submenu key.
7. On the MG3700A, press the **Preset** key (yellow key on the upper left hand side).
8. Press the down arrow key to select Yes.

9. Press the **Set** key.

<b>Note</b> Both <b>Set</b> keys on the MG3700A perform the same function.
--

10. Press the F1 submenu key to select Load File to Memory.
11. Press the F1 submenu key again to select Select Package.
12. Using the down arrow key step through the selection list until the W-CDMA(BS Tx test) option is highlighted.
13. Press the **Set** key.
14. Press the Return (F6) submenu key.
15. Press the **Set** key.
16. Using the down arrow key step through the selection list until the TestModel\_1\_16DPCH option is highlighted.
17. Press the **Set** key.
18. Press the **MOD On/Off** key and verify that the modulation indicator on the display is on.
19. Press the **Frequency** key, then enter the frequencies from the [Table A-29](#), “[Option 44, WCDMA Occupied Bandwidth \(OBW\)](#)” starting with 881.5 and press the MHz submenu key.
20. Press the **Level** key, then enter -2 and press the **dBm** key.
21. Use the knob to adjust the power level so the power meter reads -20 dBm, record reading in the **Power Meter Reading** column of [Table A-29](#).
22. On MT8222A press the Center Frequency submenu key, enter frequencies from [Table A-29](#) starting with 881.5 then press the **Enter** key.
23. Press the Measurements submenu key, then the RF Measurement submenu key, and then press the Channel Spectrum submenu key.
24. Press the **Amplitude** key, then press the Adjust Range submenu key.
25. Record the OBW reading in the **OBW** column of [Table A-29](#) and verify that it is within 4.2 MHz ± 100 kHz.
26. Repeat steps 19 to 25 for all the frequencies in [Table A-29](#).

## WCDMA RF Channel Power Accuracy and Adjacent Channel Leakage Ratio (ACLR) Verification (Option 44)

The tests in this section can be used to verify the WCDMA RF Channel Power Accuracy and ACLR Accuracy in WCDMA/HSDPA Signal Analyzer Mode.

### Procedure

1. Turn on the MG3700A Vector Signal Generator and the ML2438A power meter.
2. Connect the power sensor to the power meter and calibrate the sensor.
3. Connect the MG3700A, splitter, attenuator, power meter, and sensor as shown in [Figure 5-5](#).
4. Press the **On/Off** key to turn on the MT8222A and wait until the measurement display appears then press the **Shift** key then press the **Mode** (9) key to activate the mode selection menu.
5. Use the **Up/Down** arrow keys to select WCDMA and press the **Enter** key.
6. Press the **Shift** key, the **Preset** (1) key, and then the Preset submenu key.
7. On the MG3700A, press the **Preset** key (yellow key on the upper left hand side).

8. Press the down arrow key to select Yes.
9. Press the **Set** key.

<b>Note</b> Both <b>Set</b> keys on the MG3700A perform the same function.
--

10. Press the F1 submenu key to select Load File to Memory.
11. Press the F1 submenu key again to select Select Package.
12. Using the down arrow key step through the selection list until W-CDMA(BS Tx test) option is highlighted.
13. Press the **Set** key.
14. Press the Return (F6) submenu key.
15. Press the **Set** key.
16. Using the down arrow key step through the selection list until the TestModel\_1\_16DPCH option is highlighted.
17. Press the **Set** key.
18. Press the **MOD On/Off** key and verify that the modulation indicator on the display is on.
19. Press the **Frequency** key, then enter 881.5 and press the MHz submenu key.
20. Press the **Level** key, then enter -2 and press the **dBm** key.
21. Use the knob to adjust the power meter to read -20 dBm and record the Power Meter reading in the **Power Meter Reading** column of [Table A-30, "Option 44, WCDMA RF Channel Power Accuracy"](#).
22. On the MT8222A press the Center Frequency submenu key, enter 881.5, and then press the **Enter** key.
23. Press the Measurements submenu key, then the RF Measurement submenu key, and then press ACLR.
24. Press the **Amplitude** key, then press the Adjust Range submenu key.
25. Record the measured CH 1 power in dBm to the **Measured RF Channel Power** column of the [Table A-30](#).
26. Calculate the RF Channel Power Error using the following formula:  

$$\text{RF Channel Power Error (dB)} = \text{Measured RF Channel Power} - 0.246 - \text{Power Meter reading}$$
27. Record calculated value to the **RF CH Power Error** column of the [Table A-30](#) and verify that it is within specifications ( $\pm 1.25$  dB).
28. Record all four measured Adjacent Channel Leakage Ratios in dB at -10 MHz Offset, -5 MHz Offset, 5 MHz Offset and 10 MHz Offset in the **Measured ACLR** column of the [Table A-31, "Option 44, WCDMA ACLR Accuracy"](#).
29. Calculate the ACLR Error at -10 and 10 MHz Offset using the following formula:  

$$\text{ACLR Error at -10 or 10 MHz Offset} = 10 \text{ LOG}_{10}(10^{(-50/10)} + 10^{(\text{Measured\_ACLR}/10)}) - (-50) \text{ dB}$$
30. Record in the calculated results to the corresponding cells in the **Calculated ACLR Error** column on the [Table A-31](#) and verify that it is within specification.
31. Calculate the ACLR Error at 5 MHz Offset using the following formula:  

$$\text{ACLR Error at -5 or 5 MHz Offset} = 10 \text{ LOG}_{10}(10^{(-45/20)} + 10^{(\text{Measured\_ACLR}/10)}) - (-45) \text{ dB}$$
32. Record in the calculated results to the corresponding cells in the **Calculated ACLR Error** column on the [Table A-31](#) and verify that it is within specification.
33. Repeat steps 19 to 32 for the other frequencies in [Table A-31](#).

## HSDPA RF Channel Power Accuracy and Adjacent Channel Leakage Ratio (ACLR) Verification (Option 44)

The tests in this section can be used to verify the RF Channel Power Accuracy and ACLR Accuracy for HSDPA signal in WCDMA/HSDPA Signal Analyzer Mode.

### Procedure

1. Turn on the MG3700A Vector Signal Generator and the ML2438A power meter.
2. Connect the power sensor to the power meter and calibrate the sensor.
3. Connect the MG3700A, splitter, attenuator, power meter, and sensor as shown in [Figure 5-5, “WCDMA Occupied Bandwidth \(OBW\) Verification” on page 5-20](#).
4. Press the **On/Off** key to turn on the MT8222A and wait until the measurement display appears then press the **Shift** key then press the **Mode** (9) key to activate the mode selection menu.
5. Use the **Up/Down** arrow keys to select WCDMA and press the **Enter** key.
6. Press the **Shift** key, the **Preset** (1) key, and then the Preset submenu key.
7. On the MG3700A, press the **Preset** key (yellow key on the upper left hand side).
8. Press the down arrow key to select Yes.
9. Press the **Set** key.

<b>Note</b> Both <b>Set</b> keys on the MG3700A perform the same function.
--

10. Press the F1 submenu key to select Load File to Memory.
11. Press the F1 submenu key again to select Select Package.
12. Using the down arrow key step through the selection list until the W-CDMA(BS Tx test) option is highlighted.
13. Press the **Set** key.
14. Press the Return (F6) submenu key.
15. Press the **Set** key.
16. Using the down arrow key step through the selection list until the TestModel\_5\_8HSPDSCH option is highlighted.
17. Press the **Set** key.
18. Press the **MOD On/Off** key and verify that the Modulation indicator on the display is on.
19. Press the **Frequency** key, then enter 2680.5 and press the MHz submenu key.
20. Press the **Level** key, then enter -2 and press the **dBm** key.
21. Use the knob to adjust the power meter to read -20 dBm and record the Power Meter reading in the **Power Meter Reading** column of [Table A-32, “Option 44, HSDPA RF Channel Power Accuracy”](#).
22. On the MT8222A press the Center Frequency submenu key, enter 2680.5, and then press the **Enter** key.
23. Press the Measurements submenu key, then the RF Measurement submenu key, and then press ACLR.
24. Press the **Amplitude** key, then press the Adjust Range submenu key.
25. Record the measured CH 1 power in dBm to the **Measured RF Channel Power** column of the [Table A-32](#).
26. Calculate the RF Channel Power Error using the following formula:

$$\text{RF Channel Power Error (dB)} = \text{Measured RF Channel Power} - 0.246 - \text{Power Meter reading}$$

27. Record calculated value to the **RF CH Power Error** column in [Table A-32](#) and verify that it is within specifications ( $\pm 1.25$  dB).
28. Record all four measured Adjacent Channel Leakage Ratios in dB at  $-10$  MHz Offset,  $-5$  MHz Offset,  $5$  MHz Offset, and  $10$  MHz Offset in the **Measured ACLR** column of [Table A-33](#), "[Option 44, HSDPA ACLR Accuracy](#)".
29. Calculate the ACLR Error at  $-10$  and  $10$  MHz Offset using the following formula:
- $$\text{ACLR Error at } -10 \text{ or } 10 \text{ MHz Offset} = 10 \text{ LOG}_{10}(10^{(-50/10)} + 10^{(\text{Measured\_ACLR}/10)}) - (-50) \text{ dB}$$
30. Record in the calculated results to the corresponding cells in the **Calculated ACLR Error** column of the [Table A-33](#) and verify that it is within specification.
31. Calculate the ACLR Error at  $5$  MHz Offset using the following formula:
- $$\text{ACLR Error at } -5 \text{ or } 5 \text{ MHz Offset} = 10 \text{ LOG}_{10}(10^{(-45/20)} + 10^{(\text{Measured\_ACLR}/10)}) - (-45) \text{ dB}$$
32. Record in the calculated results to the corresponding cells in the **Calculated ACLR Error** column of [Table A-33](#) and verify that it is within specification.
33. Repeat steps 19 to 32 for the other offsets listed in [Table A-33](#).



## Error Vector Magnitude (EVM) Verification (Options 45 or 65)

The tests in this section can be used to verify the functionality of the WCDMA and/or HSDPA Demodulator of the WCDMA/HSDPA Signal Analyzer in the MT8222A BTS Master.

### Procedure

1. Turn on the MG3700A Vector Signal Generator and the ML2438A power meter.
2. Connect the power sensor to the power meter and calibrate the sensor.
3. Connect the MG3700A, splitter, attenuator, power meter, and sensor as shown in [Figure 5-5](#).
4. Press the **On/Off** key to turn on the MT8222A and wait until the measurement display appears then press the **Shift** key then press the **Mode** (9) key to activate the mode selection menu.
5. Use the **Up/Down** arrow keys to select WCDMA and press the **Enter** key.
6. Press the **Shift** key, the **Preset** (1) key, and then the **Preset** submenu key.
7. On the MG3700A, press the **Preset** key (yellow key on the upper left hand side).
8. Press the down arrow key to select **Yes**.
9. Press the **Set** key.

<b>Note</b> Both <b>Set</b> keys on the MG3700A perform the same function.
--

10. Press the F1 submenu key to select Load File to Memory.
11. Press the F1 submenu key again to select Select Package.
12. Using the down arrow key step through the selection list until the W-CDMA(BS Tx test) option is highlighted.
13. Press the **Set** key.
14. Press the Return (F6) submenu key.
15. Press the **Set** key.
16. Using the down arrow key step through the selection list until the TestModel\_4\_opt option is highlighted.
17. Press the **Set** key.
18. Press the **MOD On/Off** key and verify that the modulation indicator on the display is on.
19. Press the **Frequency** key, then enter 1962.5 and press the MHz submenu key.
20. Press the **Level** key, then enter -2 and press the **dBm** key.
21. Use the knob to adjust the power meter to read -20 dBm.
22. On the MT8222A, press the Center Frequency submenu key, enter 1962.5 and then press the MHz submenu key.
23. Press the Measurements submenu key, then press the Demodulator submenu key, and then press the Modulation Summary submenu key.
24. Press the Setup submenu key, then press the Auto Scrambling submenu key to turn it on.
25. Press the Max Spreading Factor submenu key to set it to 512.
26. Press the **Amplitude** key, then press the Adjust Range submenu key.
27. Record the EVM reading to [Table A-34, "WCDMA Error Vector Magnitude \(Test Model 4; Option 45 or 65\)"](#) and verify that it is < 2.5%.

This completes the EVM test for MT8222A with Option 45 and the first EVM test for MT8222A with Option 65.

**For MT8222A with Option 65**

28. On the MG3700A, press the **Preset** key (yellow key on the upper left hand side).
29. Press the down arrow key to select Yes.
30. Press the **Set** key.

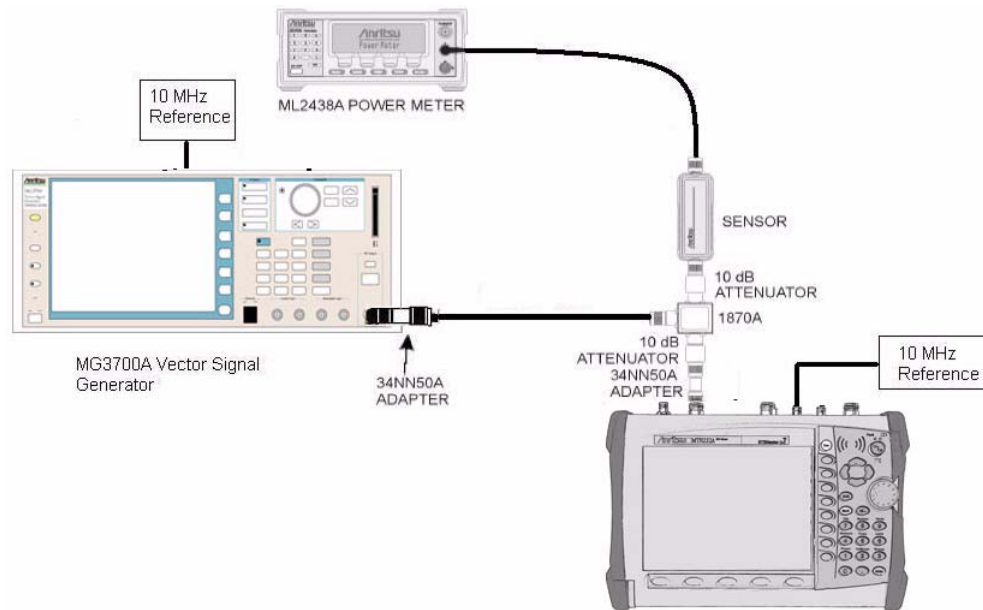
<b>Note</b> Both <b>Set</b> keys on the MG3700A perform the same function.
--

31. Press the F1 submenu key to select Load File to Memory.
32. Press the F1 submenu key again to select Select Package.
33. Using the down arrow key step through the selection list until the W-CDMA(BS Tx test) option is highlighted.
34. Press the **Set** key.
35. Press the Return (F6) submenu key.
36. Press the **Set** key.
37. Using the down arrow key step through the selection list until the TestModel\_5\_8HSPDSCH option is highlighted.
38. Press the **Set** key.
39. Press the **MOD On/Off** key and verify that the Modulation indicator on the display is on.
40. Press the **Frequency** key, then enter 1962.5 and press the MHz submenu key.
41. Press the **Level** key, then enter -2 and press the **dBm** key.
42. Use the knob to adjust the power meter to read -20 dBm.
43. On the MT8222A, press the Center Frequency submenu key, enter 1962.5 and then press the **MHz** submenu key.
44. Press the Measurements submenu key, then press the Demodulator submenu key, and then press the Modulation Summary submenu key.
45. Press the Setup submenu key, then press the Auto Scrambling submenu key to turn it on.
46. Press the Max Spreading Factor submenu key to set it to 512.
47. Press the **Amplitude** key, then press the Adjust Range submenu key.
48. Record the EVM reading to [Table A-35, “HSDPA Error Vector Magnitude \(Test Model 5; Option 65\)”](#) and verify that it is < 2.5%.

This completes the two EVM tests for MT8222A with Option 65.

## 5-8 Fixed WiMAX Signal Analyzer (Options 46 and/or 47)

The tests in this section verify the functionality of the Fixed WiMAX Signal Analyzer of the MT8222A BTS Master.



**Figure 5-6.** Fixed WiMAX Channel Power Accuracy Tests

### Required Equipment:

- Anritsu Model MG3700A Vector Signal Generator
- Symmetricom Model RubiSource T&M Frequency Reference
- Anritsu Dual Channel Model ML2438A Power Meter
- Anritsu Model MA2482D Power Sensor
- Aeroflex/Weinschel Model 1870A Power Splitter
- Anritsu 34NN50A Adapter (2)
- Aeroflex/Weinschel Model 44-10 Attenuator (2)

## Fixed WiMAX Channel Power Accuracy Tests (Option 46) Procedure

1. Connect the MA2482D Power Sensor to the power meter and zero the meter.
2. Set the cal factor frequency of the power sensor to 2600.5 MHz.
3. Connect the Power Sensor, 1870A splitter, 10 dB attenuators (quantity 2), as shown in [Figure 5-6](#).
4. Set the MG3700A as follows:
  - a. Press the yellow Preset button (answer yes to the question).
  - b. Press the **Set** key.
  - c. Press the F1 submenu key to select Load File to Memory.
  - d. Press the F1 submenu key again to select Select Package.
  - e. Using the down arrow key step through the selection list until WiMax is highlighted.
  - f. Press the **Set** key.
  - g. Press the Return (F6) submenu key.
  - h. Press the **Set** key. The Select Package list box will appear. Again select WiMax and press the **Set** key.
  - i. Another file list will appear. Select (highlight) Mx10g32.
  - j. Press the **Set** key.
  - k. Press the **MOD On/Off** key and verify that the LED is on. Ensure that the “Playing” indicator is displaying the moving pattern.
  - l. Press the **Frequency** key, then enter 2600.5 MHz.
  - m. Press the **Level** key, then enter 2 dBm. Turn the output on.
5. Adjust the MG3700A level setting with the knob so that the power meter reads  $-15.0 \text{ dBm} \pm 0.2 \text{ dB}$ .
6. Set the MT8222A to Fixed WiMax Signal Analyzer Mode and preset the unit.
7. Set the MT8222A as follows:
  - a. Press the Freq submenu key and set the center frequency to 2600.5 MHz.
  - b. Press the Setup submenu key and set the Bandwidth to 10 MHz.
  - c. Press the CP Ratio submenu key (under the Setup submenu key) and set the CP Ratio to 1/32.
  - d. Press the Measurements submenu key and press RF, then press Power vs. Time.
8. Record the MT8222A Channel Power (RSSI) reading to the **Measured Channel Power (RSSI)** column in [Table A-36](#), “[Option 46, Fixed WiMAX Channel Power Accuracy](#)”.
9. Calculate the Channel Power Error by subtracting the MT8222A “Channel Power (RSSI)” reading from the power meter reading in step 5. Record the result to the **Error** column in the [Table A-36](#).
10. Verify that the error is within specification.
11. Adjust the MG3700A level setting to approximately  $-33 \text{ dBm}$  so that the power meter reads  $-50.0 \text{ dBm}$ .
12. Record the MT8222A Channel Power (RSSI) reading to the **Measured Channel Power (RSSI)** column in [Table A-36](#).
13. Calculate the Channel Power Error by subtracting the MT8222A “Channel Power (RSSI)” reading from the power meter reading in step 11. Record the result to the **Error** column in [Table A-36](#).
14. Verify that the error is within specification.
15. Set the cal factor frequency of the power sensor to 3600.5 MHz.
16. Set the MG3700A frequency to 3600.5 MHz.
17. Change the center frequency of MT8222A to 3600.5 MHz.

18. Measure the Channel Power (RSSI) for both  $-15$  and  $-50$  dBm and then record the measured result and calculated error to [Table A-36](#).
19. Verify that the error is within specification.
20. Set the cal factor frequency of the power sensor to 5600.5 MHz.
21. Set MG3700A frequency to 5600.5 MHz.
22. Change the center frequency of MT8222A to 5600.5 MHz.
23. Repeat steps 18 to 19.

### Fixed WiMAX Residual EVM and Frequency Error Tests (Option 47) Procedure

1. Connect the MA2482D Power Sensor to the power meter and zero the meter.
2. Set the cal factor frequency of the power sensor to 2600.5 MHz.
3. Connect the Power Sensor, 1870A splitter, 10 dB attenuators (quantity 2), as shown in [Figure 5-6](#).
4. Set the MG3700A as follows:
  - a. Press the yellow **Preset** button (answer yes to the question).
  - b. Press the **Set** key.
  - c. Press the F1 submenu key to select Load File to Memory.
  - d. Press the F1 submenu key again to select Select Package.
  - e. Using the down arrow key step through the selection list until WiMax is highlighted.
  - f. Press the **Set** key.
  - g. Press the Return (F6) submenu key.
  - h. Press the **Set** key. The Select Package list box will appear. Again select WiMax and press **Set**.
  - i. Another file list will appear. Select Mx10g32.
  - j. Press the **Set** key.
  - k. Press the **MOD On/Off** key and verify that the LED is on. Ensure that the “Playing” indicator is displaying the moving pattern.
  - l. Press the **Frequency** key, then enter 2600.5 MHz.
  - m. Press the **Level** key, then enter 2 dBm. Turn the output on.
5. Adjust the MG3700A Level setting with the knob so that the power meter reads  $-15.0$  dBm  $\pm$  0.2 dB.
6. Set the MT8222A to Fixed WiMax Signal Analyzer Mode and preset the unit.
7. Set the MT8222A as follows:
  - a. Press the **Freq** submenu key and set the center frequency to 2600.5 MHz.
  - b. Press the **Setup** submenu key and set the bandwidth to 10 MHz.
  - c. Press the **CP Ratio** submenu key (under the Setup submenu key) and set the CP Ratio to 1/32.
  - d. Press the **Measurements** submenu key and press Demodulator, then press Modulation Summary.
8. Record the MT8222A EVM(rms) reading to the **EVM(rms)** column in [Table A-37](#), “[Option 47, Fixed WiMAX Residual EVM](#)”.
9. Verify that the measured EVM is within specification.
10. Adjust the MG3700A Level setting to approximately  $-33$  dBm so that the power meter reads  $-50.0$  dBm.
11. Record the MT8222A EVM(rms) reading to the **EVM(rms)** column in [Table A-37](#)
12. Verify that the measured EVM is within specification.

13. Record the MT8222A Freq Error reading in [Table A-38](#), “[Option 47, Fixed WiMAX Frequency Error](#)”.
14. Verify that the measured frequency error is within specification.
15. Set the cal factor frequency of the power sensor to 3600.5 MHz.
16. Set the MG3700A frequency to 3600.5 MHz.
17. Change the center frequency of the MT8222A to 3600.5 MHz.
18. Measure the EVM(rms) for both  $-15$  and  $-50$  dBm and then record the measured results in [Table A-37](#).
19. Verify that the measured EVM is within specification.
20. Set the cal factor frequency of the power sensor to 5600.5 MHz.
21. Set the MG3700A frequency to 5600.5 MHz.
22. Adjust the MG3700A level setting with the knob so that the power meter reads  $-15.0$  dBm  $\pm$  0.2 dB.
23. Change the center frequency of the MT8222A to 5600.5 MHz.
24. Record the MT8222A EVM(rms) reading to the **EVM(rms)** column in [Table A-37](#).
25. Verify that the measured EVM is within specification.
26. Adjust the MG3700A level setting to approximately  $-33$  dBm so that the power meter reads  $-50.0$  dBm  $\pm$  0.2 dB.
27. Record the MT8222A EVM(rms) reading to the **EVM(rms)** column in [Table A-37](#).
28. Verify that the measured EVM is within specification.
29. Record the MT8222A frequency error reading in [Table A-38](#).
30. Verify that the measured frequency error is within the specification.

## 5-9 T1 Analyzer (Options 50 and 51)

These tests verify the functionality of the T1 Analyzer in the MT8222A. They include:

- “T1 Clock Frequency Test”
- “T1 Transmit Level Test”

### Required Equipment:

- Anritsu MP1570A with MP0121A and MP0122A modules Sonet Analyzer
- Symmetricom Model RubiSource T&M Frequency Reference
- Anritsu PN 806-16 Cable T1 Bantam Plug to Bantam Plug (2)
- LeCroy Model WaveRunner 62Xi Digital Oscilloscope

### T1 Clock Frequency Test

This test will verify that the internal signal is being clocked at the correct frequency and verify that the clock recovery circuit can generate the correct frequency.

#### Basic Instructions for Operation of MP1570A:

The Test Menu, Result, and Analyze keys all should be pressed so their LEDs are on.

The green Start/Stop key should also be pressed so its LED is on.

The Setup key toggles between two displays. You will need to change Parameters under both these displays.

#### Note

If the required parameter is not visible under the present display, press the **Setup** key, and the required parameter will appear on the new display.

#### Changing the Setup Parameters:

Use the arrow keys to highlight different parameters that will need to be changed. Use the **Set** key to display the menu of choices for each parameter.

Use the **Up/Down** arrow keys to highlight the desired setting, then press the **Set** key to accept the highlighted setting.

1. Connect the External 10 MHz Reference Signal to the rear panel of the MP1570A.
2. On the MT8222A, press **Shift, Mode**, and use the **Up/Down** keys to select T1 Analyzer.
3. Press **Shift, Preset** (1). Press the Preset submenu key to preset the unit.
4. Set up the MP1570A as follows:

Mapping set to Tx&Rx

Configuration set to SDH/PDH

Meas. Mode set to Out\_of\_service

Bit Rate to 1.5M

MUX/DEMUX: set to OFF (not present on all units).

Frame set to ON

1.5M Code set to B8ZS

Framed set to ESF

DSX set to 0 ft.

Clock set to internal

Monitor Mode is set to OFF

5. Change to the other Setup display (press the **Setup** key again) and set as follows:
  - Test Pattern set to PRBS15
  - Invert mode set to OFF
  - Analyze set to Freq. monitor.
6. Using an 806-16 bantam cable, connect the MT8222A TX connector to the MP1570A AMI/B8ZS Input (on the MP0122A module).
7. Using another 806-16 bantam cable, connect the MT8222A RX connector to the MP1570A AMI/B8ZS Output (on the MP0122A module).
8. On the MT8222A, press the Configuration submenu key near the bottom left corner of the display and verify that “Tx Clock” is set to Internal, “Line Code” is set to B8ZS and “Framing” is set to ESF. Then set “Tx LBO” to 0 dB and “Pattern/Loop” to PRBS-15.
9. The MT8222A T1 frequency and ppm error will appear on the MP1570A. Record the ppm error value in the row **Internal Clock Error** in [Table A-39](#), “Option 50, T1 Frequency Clock” and [Table A-40](#), “Option 51, T1 Frequency Clock”.
10. On the MP1570A, change “Pattern” to All One.
11. On the MT8222A, press the Configuration submenu key.
12. Use the rotary knob to select Tx Clock and set Tx Clock to Recovered.
13. Press the Measurements submenu key and press Rx Signal.
14. Press the Start/Stop submenu key so Measure On is displayed in the lower left corner of the monitor screen.
15. Record the frequency value on the MT8222A in the row **Recovered Clock Frequency** in [Table A-39](#) and [Table A-40](#).

## T1 Transmit Level Test

This test verifies the transmit level of the T1 signal from the MT8222A.

1. Install the LeCroy AP100 100 ohm Telecom Adapter to Channel 1 input of LeCroy Oscilloscope.
2. Connect the bantam to bantam cable from the Tx port on the T1 interface of the MT8222A to the input of the LeCroy AP100 adapter on the Oscilloscope.
3. Set the MT8222A to T1 Analyzer Mode and preset the unit.
4. Press the Configuration submenu key and set up the MT8222A as follows:
  - Test Mode – DS1
  - Line code – B8ZS
  - Tx Clock – Internal
  - Tx LBO – 0dB
  - Rx Input – Terminate
  - Framing – ESF
  - Payload Type – 1.544Mb
5. Press the Pattern/Loop submenu key and select All Ones.
6. On the LeCroy Oscilloscope, use the stylus to tap on File on the Toolbar. Press Recall Setup... and then tap the Recall Default button to reset the oscilloscope.
7. Press the **Auto Setup** key and then tap the Confirm button. Wait until the oscilloscope displays a stable trace.
8. Tap on Measure on the Toolbar and select Std Vertical.
9. Record the displayed peak to peak voltage to [Table A-41](#), “T1 Transmitted Level Voltage”.
10. Verify that the measured peak to peak voltage is between 4.8 and 7.2 volts.



11. Change Tx LBO to  $-7.5$  dB on the MT8222A.
12. Record the displayed peak to peak voltage to [Table A-41](#) and verify that it is between 2.4 and 3.6 volts.
13. Change Tx LBO to  $-15$  dB on the MT8222A.
14. Record the displayed peak to peak voltage to [Table A-41](#) and verify that it is between 0.7 and 1.5 volts.
15. Disconnect the bantam cable from the oscilloscope and connect it to the Rx port on the MT8222A.
16. On the MT8222A, press the **Measurements** submenu key and press Rx Signal.
17. Press the **Start/Stop** submenu key to turn measurements on.
18. Read the Vpp value from the displayed table and record to [Table A-42](#), “T1 Transmitted Level Vpp Reading.”
19. Verify that the measured Vpp value is between 0.7 and 1.5 volts.
20. Change Tx LBO to  $-7.5$  dB on the MT8222A.
21. Record the displayed peak to peak voltage to [Table A-42](#) and verify that it is between 2.4 and 3.6 volts.
22. Change Tx LBO to 0 dB on the MT8222A.
23. Record the displayed peak to peak voltage to [Table A-42](#) and verify that it is between 4.8 and 7.2 volts.

## 5-10 E1 Analyzer Verification (Options 52)

The following tests verify the functionality of the E1 Analyzer option in the MT8222A. They include:

- “E1 Clock Frequency Test”
- “E1 Transmit Level Test”

### Required Equipment:

- Anritsu MP1570A with MP0121A and MP0122A modules Sonet Analyzer
- Symmetricom Model RubiSource T&M Frequency Reference
- Anritsu PN 806-16 Cable T1 Bantam Plug to Bantam Plug (2)
- Anritsu PN 3-806-169 Cable 75 ohm BNC(m) to BNC(m) (2)
- Anritsu PN 806-117 Cable RJ48 to dual Bantam
- Anritsu PN T3450 Test Fixture
- LeCroy Model WaveRunner 62Xi Digital Oscilloscope

### E1 Clock Frequency Test

This test will verify that the internal signal is being clocked at the correct frequency and verify that the clock recovery circuit can generate the correct frequency.

#### Basic Instructions for Operation of MP1570A:

The Test Menu, Result, and Analyze keys all should be pressed so their LEDs are on.

The green Start/Stop key should also be pressed so its LED is on.

The Setup key toggles between two displays. You will need to change Parameters under both these displays.

#### Note

If the required parameter is not visible under the present display, press the **Setup** key, and the required parameter will appear on the new display.

#### Changing the Setup Parameters:

Use the arrow keys to highlight different parameters that will need to be changed. Use the **Set** key to display the menu of choices for each parameter.

Use the **Up/Down** arrow keys to highlight the desired setting, then press the **Set** key to accept the highlighted setting.

1. Connect the External 10MHz Reference Signal to the rear panel of the MP1570A.

2. Set up the MP1570A as follows:

Set Mapping to Tx&Rx

Set Config. to SDH/PDH

Set Bit Rate to 2M

Set Frame to ON

Set Channel to 30ch

Set CRC4 to ON

Set Signalling to OFF

Set Interface to Unbalanced

Set Clock to internal

Set Monitor Mode to OFF

3. Press the **Test Menu** key and set up the MP1570A as follows:
  - Set Test menu to Manual
  - Set Test Pattern to PRBS15
  - Set Invert mode to OFF
  - Set Analyze to Freq. monitor
4. Set the mode of the instrument to **E1 Analyzer** and preset the unit.
5. Press the **Configuration** submenu key (below the display)
6. Ensure that Tx Clock is set to **Internal**.
7. Use the down arrow key to highlight **Input Connector**.
8. Press the **BNC 75 Ohms** submenu key.
9. Press the **Pattern** submenu key. Use the rotary knob to highlight **PRBS15** and press the **Select Pattern** submenu key.
10. Connect a 75 ohm BNC cable (PN 3-806-169) between Tx port of the MT8222A and the CMI/HDB3 Input of the MP0121A Module on the MP1570A.
11. Connect a 75 ohm BNC cable (PN 3-806-169) between Rx port of the MT8222A and the CMI/HDB3 Output of the MP0121A Module on the MP1570A.
12. On the MP1570A, allow the status bar on the bottom of the display to complete at least one sweep.
13. Record the ppm reading to the **Internal Clock Error** row in [Table A-43, “Option 52, E1 Frequency Clock”](#).
14. On the MT8222A, press the **Measurements** submenu key and then the **Rx Signal** submenu key.
15. Press the **Start/Stop** submenu key to turn measurement on (“Measure ON” appears in the lower left corner of the display).
16. Record the frequency reading on the display to the **Recovered Clock Frequency** row in [Table A-43](#).
17. Press the **Start/Stop** submenu key to stop the measurement.

## E1 Transmit Level Test

This test verifies the transmit level of the E1 signal from the MT8222A.

### BNC (75 ohm Unbalanced [Single End]) Interface Check

1. Install the LeCroy PP090 75 ohm Telecom Adapter to Channel 1 input of LeCroy Oscilloscope.
2. Connect the 75 ohm BNC cable (PN 3-806-169) from the Tx port on the E1 interface of the MT8222A to the 75 ohm adapter on the Oscilloscope.
3. Set the MT8222A to **E1 Analyzer Mode** and preset the unit.
4. Use the rotary knob to highlight **Input Connector** and then press the **BNC 75 Ohms** submenu key to switch the input connector.
5. Press the **Pattern** submenu key and use the right arrow key to highlight **All Ones**. Press the **Select Pattern** submenu key.
6. On the LeCroy Oscilloscope, use the stylus to tap on **File** on the Toolbar. Press **Recall Setup...** and then tap the **Recall Default** button to reset the oscilloscope.
7. Press the **Auto Setup** key and then tap the **Confirm** button. Wait until the oscilloscope displays a stable trace.
8. Tap on **Measure** on the Toolbar and select **Std Vertical**.
9. Record the displayed P1 peak to peak voltage in [Table A-44, “Option 52, E1 Transmitted Level Voltage”](#).
10. Verify that the measured peak to peak voltage is between 4.2 and 5.2 volts.

11. Disconnect the BNC cable from the oscilloscope and connect it to the Rx port on the MT8222A.
12. On the MT8222A, press the Measurements submenu key and press Rx Signal.
13. Press the Start/Stop submenu key to turn measurements on (“Measure ON” appears in the lower left corner of the display).
14. Read the Vpp value from the displayed table and record it in [Table A-45, “Option 52, E1 Transmitted Level Vpp Reading”](#).

#### RJ48 (120 ohm Balanced [Differential Pair]) Interface Check

1. Install the LeCroy AP120 120 ohm Telecom Adapter to Channel 1 input of LeCroy Oscilloscope.
2. Connect the RJ48 end of the Bantam “Y” plug to RJ48 cable (PN 806-117) the E1 RJ48 interface of the MT8222A.
3. Connect the Transmit Bantam plug of the Bantam “Y” plug to RJ48 cable to the T3450 Test Fixture (Bantam jack to Bantam jack adapter) and then connect a bantam plug to the Siemens jack adapter cable between the open Bantam jack on the T3450 Test Fixture and the Siemens connector of the Telecom adapter on the Oscilloscope.
4. Set the MT8222A to E1 Analyzer Mode and preset the unit.
5. Use the rotary knob to highlight Input Connector and then press the RJ48 120 Ohms submenu key to switch the input connector.
6. Press the Pattern submenu key and use the right arrow key to highlight All Ones. Press the Select Pattern submenu key.
7. On the LeCroy Oscilloscope, use the stylus to tap on File on the Toolbar. Press Recall Setup... and then tap the Recall Default button to reset the oscilloscope.
8. Press the **Auto Setup** key and then tap the Confirm button. Wait until the oscilloscope displays a stable trace.
9. Tap on Measure on the Toolbar and select Std Vertical.
10. Record the displayed P1 peak to peak voltage in [Table A-44, “Option 52, E1 Transmitted Level Voltage”](#).
11. Verify that the measured peak to peak voltage is between 5.4 and 6.6 volts.
12. On the T3450 Test Fixture, disconnect the Bantam plug end of the cable from the oscilloscope.
13. Connect the Receive Bantam plug of the Bantam “Y” plug to RJ48 cable to the open jack of T3450 Test Fixture.
14. On the MT8222A, press the Measurements submenu key and press Rx Signal.
15. Press the Start/Stop submenu key to turn measurements on (“Measure ON” appears in the lower left corner of the display).
16. Read the Vpp value from the displayed table and record it in [Table A-45](#).

## 5-11 T1/T3 Analyzer (Option 53)

The following tests verify the functionality of the T1/T3 Analyzer option in the MT8222A. They include:

- “T1 Clock Frequency Test”
- “T1 Transmitted Level Verification”
- “T3 Frequency Clock Test”
- “T3 Transmitted Level Verification”

### Required Equipment:

- Anritsu MP1570A with MP0121A and MP0122A modules Sonet Analyzer
- Symmetricom Model RubiSource T&M Frequency Reference
- Anritsu PN 806-16 Cable T1 Bantam Plug to Bantam Plug (2)
- Anritsu PN 3-806-169 Cable 75 ohm BNC(m) to BNC(m) (2)
- LeCroy Model WaveRunner 62Xi Digital Oscilloscope

### T1 Clock Frequency Test

This test verifies that the internal signal is being clocked at the correct frequency.

#### Basic Instructions for Operation of MP1570A:

The Test Menu, Result, and Analyze keys all should be pressed so their LEDs are on.

The green Start/Stop key should also be pressed so its LED is on.

The Setup key toggles between two displays. You will need to change Parameters under both these displays.

#### Note

If the required parameter is not visible under the present display, press the **Setup** key, and the required parameter will appear on the new display.

#### Changing the Setup Parameters:

Use the arrow keys to highlight different parameters that will need to be changed. Use the **Set** key to display the menu of choices for each parameter.

Use the **Up/Down** arrow keys to highlight the desired setting, then press the **Set** key to accept the highlighted setting.

1. Connect the External 10 MHz Reference Signal to the rear panel of the MP1570A.
2. Set up the MP1570A as follows:

Set Mapping to Tx&Rx  
 Set Config. to SDH/PDH  
 Set Bit Rate to 1.5M  
 Set MUX/DEMUX to OFF (not present on all units)  
 Set Frame to ON  
 Set 1.5M Code to B8ZS  
 Set Framed to ESF  
 Set DSX to 0 ft  
 Set Clock to internal  
 Set Monitor Mode to OFF

3. Press the **Test Menu** key and set up the MP1570A as follows:
  - Set Test menu to Manual
  - Set Test Pattern to PRBS15
  - Set Invert mode to OFF
  - Set Analyze to Freq. monitor
4. On the MT8222A, ensure the mode is set to T1/T3 Analyzer and preset the unit.
5. Under the Configuration submenu key, highlight Test Mode and press the DS1 submenu key.
6. Using a Bantam plug to Bantam plug cable (PN 806-16), connect the MT8222A T1 Tx connector to the MP1570A AMI/B8ZS Input (on the MP0122A module).
7. Using another Bantam plug to Bantam plug cable, connect the MT8222A Rx connector to the MP1570A AMI/B8ZS Output (on the MP0122A module).
8. On the MT8222A, press the Configuration submenu key and verify that the Tx Clock is set to Internal.
9. On the MP1570A, allow the status bar on the bottom of the display to complete at least one sweep.
10. Read the ppm error shown on the MP1570A and record in [Table A-46, "Option 53, T1/T3 Frequency Clock"](#).
11. On the MT8222A, change the Tx Clock setting to Recovered.
12. Using the bantam plug to bantam plug cable, connect the T1 Tx to the Rx connector.
13. Under the Measurements submenu key, activate Rx Signal (a red dot appears on label).
14. Press the Start/Stop submenu key to turn measurement on ("Measure ON" appears in the lower left corner of the display).
15. Record the frequency reading (center of display) to the **Recovered Clock Frequency** row in [Table A-46](#).

## T1 Transmitted Level Verification

This test verifies the transmit level of the T1 signal from the MT8222A.

1. Preset the MT8222A. Under the Configuration submenu key, highlight Test Mode and press the DS1 submenu key.
2. Ensure Tx LBO is set to 0 dB.
3. Connect the AP100 (100 ohm) adapter to the oscilloscope Channel 1 input.
4. Install a bantam-to-bantam cable between the T1 Tx output and the adapter on the oscilloscope.
5. On the oscilloscope, press the blue **Auto Setup** button. Ensure the **Touch Screen** button is activated.
6. View the Channel 1 peak-to-peak voltage and record it as the Measured Voltage (peak-to-peak) in [Table A-47, "Option 53, T1 Transmitted Level Voltage"](#). Horizontal instability of the signal is normal.
7. On the MT8222A, change the Tx LBO setting from 0 dB to -7.5 dB.
8. Record the -7.5dB measured voltage (peak-to-peak) in [Table A-47](#).
9. On the MT8222A, change the Tx LBO setting to -15 dB.
10. Record the -15dB Measured Voltage (peak-to-peak) in [Table A-47](#).
11. Press the Measurements submenu key and press Rx Signal.
12. Disconnect the cable from the oscilloscope and use the cable to connect the T1 Tx and Rx connectors together.
13. Record the (-15 db) Vpp measurement shown on the MT8222A display onto the test record, **Vpp Reading** column, **-15 dB** row, in [Table A-48, "Option 53, T1 Transmitted Level Vpp Reading"](#).
14. Change the Tx LBO (Configuration submenu key) to -7.5 dB.

15. Under the Measurements submenu key, view the Vpp value and record in **-7.5 dB** row of [Table A-48](#).
16. Change the Tx LBO to 0 dB.
17. Under the Measurements submenu key, view the Vpp value and record in **0 dB** row of [Table A-48](#).

### T3 Frequency Clock Test

This test verifies that the internal signal is being clocked at the correct frequency.

1. Connect the External 10MHz Reference Signal to the rear panel of the MP1570A.
2. On the MT8222A, ensure the mode is set to T1/T3 Analyzer and preset the unit.
3. Under the Configuration submenu key, highlight Test Mode and press the DS3 submenu key.
4. Set Tx Clock to Internal.
5. Set Tx LBO to DSX.
6. Press the Pattern/Loop submenu key and then select All Ones pattern.
7. Set up the MP1570A as follows:
  - Set Mapping to Tx&Rx
  - Set Config. to SDH/PDH
  - Set Meas. Mode to Out\_of\_service
  - Set Bit Rate to 45M
  - Set MUX/DEMUX to OFF (not present on all units)
  - Set Frame to ON
  - Set 45M Framed to C-bit
  - Set X-Bit to 11
  - Set DSX to 0 ft
  - Set Clock to internal
  - Set Monitor Mode to OFF
8. Change to the other Setup display by pressing the **Setup** key and set the Test Pattern to All 1.
9. Set Analyze to Freq Monitor.
10. Using a 75 ohm BNC cable (PN: 3-806-169), connect the MT8222A Tx connector to the MP1570A B3ZS Input (on the MP0122A module).
11. Using a second 75 ohm BNC cable, connect the MT8222A Rx connector to the MP1570A B3ZS Output (on the MP0122A module).
12. Allow the status bar on the bottom of the display to complete at least one sweep.
13. View the ppm error shown on the MP1570A and record in [Table A-49](#), “[Option 53, T3 Frequency Clock](#)”.
14. On the MT8222A, change the Tx Clock setting to Recovered.
15. Under the Measurements submenu key, activate Rx Signal (a red dot appears on label).
16. Press the Start/Stop submenu key to turn measurements on (“Measure ON” appears in the lower left corner of the display).
17. Record the frequency reading (center of display) in the **Recovered Clock Frequency** row of [Table A-49](#).

## T3 Transmitted Level Verification

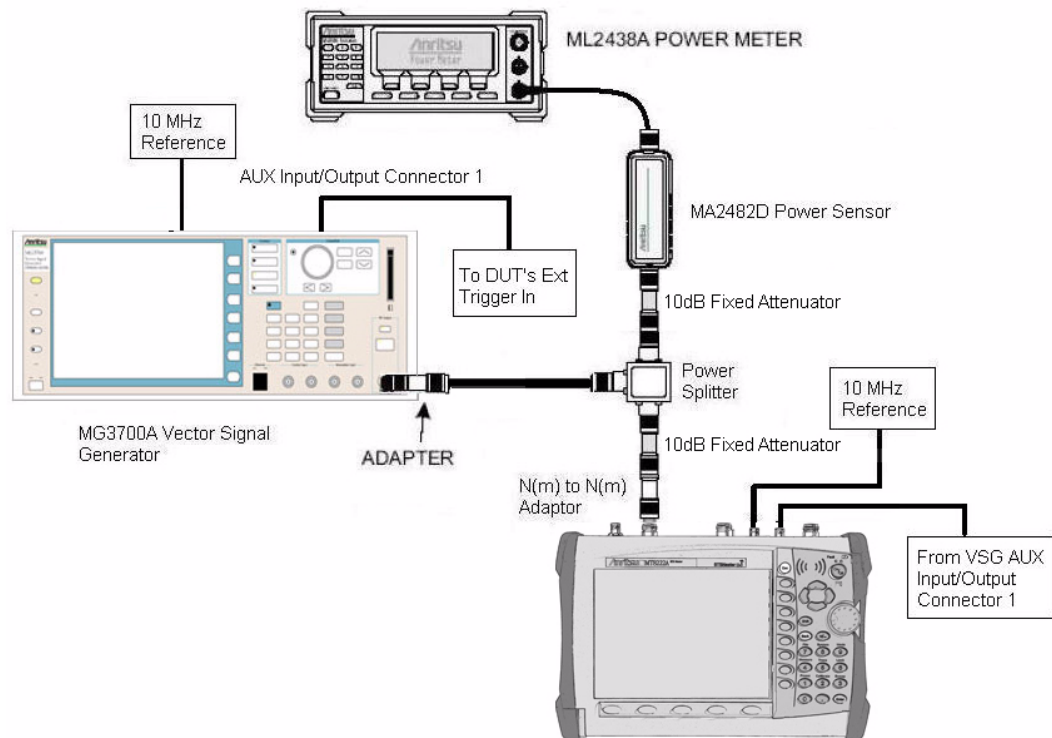
This test verifies the transmit level of the T3 signal from the MT8222A.

1. Preset the MT8222A. Under the Configuration submenu key, highlight Test Mode and press the DS3 submenu key.
2. Ensure Tx LBO is set to Low.
3. Press the Pattern/Loop submenu key and then select All Ones pattern.
4. Connect the PP090 75 ohm adapter to the oscilloscope Channel 1 input.
5. Install a 75 ohm BNC-BNC cable between the T3 Tx output and the 75 ohm adapter on the oscilloscope.
6. On the oscilloscope, press the blue **Auto Setup** button. Ensure the **Touch Screen** button is activated.
7. View the Channel 1 peak-to-peak voltage and record in the **LOW** row of [Table A-50](#) (Horizontal instability of the signal is normal).
8. On the MT8222A, change the Tx LBO setting to DSX.
9. Record the **DSX** measured voltage (peak-to-peak) in [Table A-50](#).
10. Press the Measurements submenu key and press Rx Signal.
11. Disconnect the BNC cable from the oscilloscope and use the cable to connect the T3 Tx and Rx connectors together.
12. Press the **Start/Stop** submenu key to turn measurements on (“Measure ON” appears in the lower left corner of the display).
13. Record the Vpp measurement shown on the MT8222A display in the **DSX** row of [Table A-51, “Option 53, T3 Transmitted Level Vpp Reading”](#).
14. Change Tx LBO setting (under Configuration submenu key) to Low.
15. Under the Measurements submenu key, view the Vpp value and record in the **LOW** row of [Table A-51](#).



## 5-12 TD-SCDMA Signal Analyzer (Options 60 and/or 61)

The tests in this section verify the function of the optional TD-SCDMA Signal Analyzer in Model MT8222A BTS Master.



**Figure 5-7.** TD-SCDMA Signal Analyzer Option Verification

### Required Equipment:

- Anritsu Model MG3700A Vector Signal Generator
- Symmetricom Model RubiSource T&M Frequency Reference
- Anritsu Dual Channel Model ML2438A Power Meter
- Anritsu Model MA2482D Power Sensor
- Aeroflex/Weinschel Model 1870A Power Splitter
- Anritsu 34NN50A Adapter (2)
- Aeroflex/Weinschel Model 44-10 Attenuator (2)

### Set up Procedure

1. Connect the equipment as shown in [Figure 5-7](#).
2. Calibrate the power sensor prior to connecting to the power splitter.
3. On the power meter, press the **Sensor** key, the **Cal Factor** submenu key, and then the **Freq** submenu key. Use the keypad to enter 2010 MHz as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Press the **System** key to display the power reading.
4. Set the power meter to Averaging, Moving and 256 samples.
5. Set the MT8222A to TD-SCDMA Signal Analyzer mode and preset the unit.

## TD-SCDMA Channel Power, Frequency Error, EVM and Tau Tests Procedure

**Note** The TD-SCDMA pattern requires a Waveform Data license MX370001A that must be purchased.

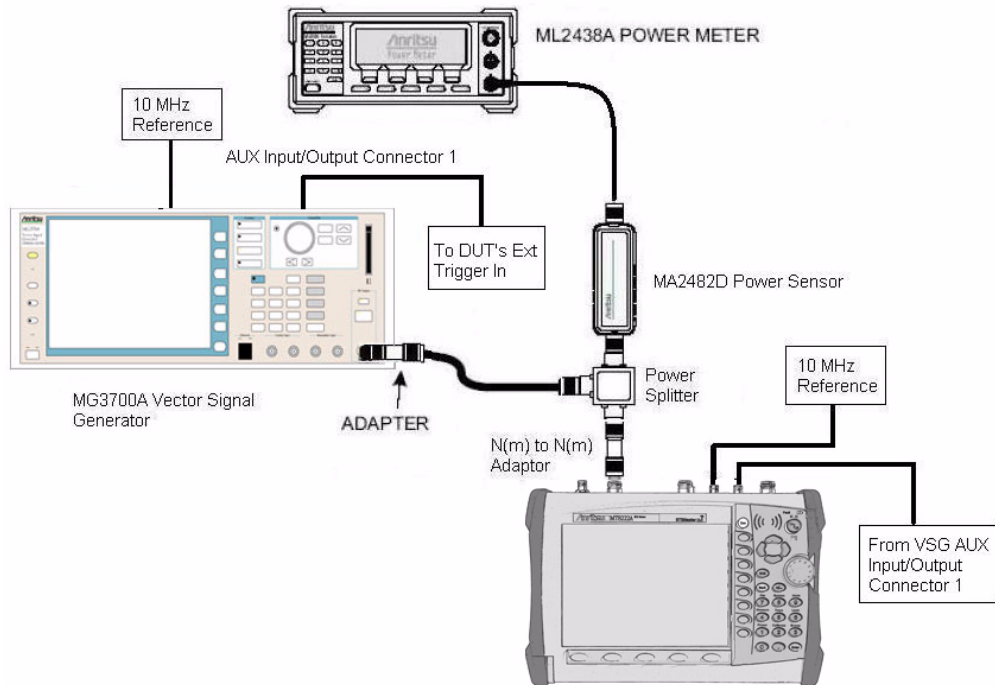
1. On the MG3700A, press the **Preset** key (yellow key on the upper left hand side).
2. Press the down arrow key or turn the knob to select Yes.
3. Press the **Set** key.

**Note** Both **Set** keys on the MG3700A perform the same function.

4. Press the F1 submenu key to select Load File to Memory.
5. Press the F1 submenu key again to select Select Package.
6. Using the down arrow key step through the selection list until the TD-SCDMA(MX370001A) option is highlighted.
7. Press the **Set** key.
8. Press the Return (F6) submenu key.
9. Press the **Set** key. The Select Package box will appear. Use the rotary knob to highlight TD-SCDMA(MX370001A) and press the **Set** key to select.
10. Another file list will appear. Use the rotary knob to select rmc-P-CCPCH\_bs\_dl and press the **Set** key to select.
11. Press the **MOD On/Off** key to turn the Modulation LED on and verify the “Playing” indicator in the center of the LCD is flashing.
12. Press the **Frequency** key, enter 2010 MHz.
13. Press the **Level** key, enter -20 and press the dBm submenu key.
14. Adjust the MG3700A output so that the power meter reads  $-45 \text{ dBm} \pm 0.5 \text{ dB}$ .
15. On the MT8222A, press the Frequency submenu key and enter 2010 MHz as center frequency.
16. Press the Measurements submenu key and press TD-SCDMA Summary (a red dot will appear on the label).
17. Press the Setup submenu key and press PN Setup. Then change PN Trigger to Ext by pressing the PN Trigger submenu key twice. Then wait 15 seconds to allow the MT8222A to update its measured results.
18. For MT8222A with Option 60 (TD-SCDMA RF Measurements), subtract the displayed channel power value from the power meter reading in step 14. Then record the calculated channel power error in [Table A-52, “Option 60, 61 TD-SCDMA Verification \(at 2010 MHz, -45 dBm Level, TD-SCDMA\)”](#).
19. For MT8222A with Option 61 (TD-SCDMA Demodulator), record the displayed frequency error, EVM and Tau in [Table A-52](#).
20. Verify that the measured values in step 18 and/or step 19 are within specifications.

## 5-13 EVDO Signal Analyzer (Options 62 and/or 63)

The tests in this section verify the function of the optional EVDO Signal Analyzer in Model MT8222A BTS Master.



**Figure 5-8.** EVDO Signal Analyzer Option Verification

### Required Equipment:

- Anritsu Model MG3700A Vector Signal Generator
- Symmetricom Model RubiSource T&M Frequency Reference
- Anritsu Dual Channel Model ML2438A Power Meter
- Anritsu Model MA2482D Power Sensor
- Aeroflex/Weinschel Model 1870A Power Splitter
- Anritsu 34NN50A Adapter (2)

### Set Up Procedure

1. Calibrate the power sensor.
2. Connect the equipment as shown in [Figure 5-8](#).
3. On the power meter, press the **Sensor** key, the **Cal Factor** submenu key, and then the **Freq** submenu key. Use the keypad to enter **870.03 MHz** as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Press the **System** key to display the power reading.
4. Set the MT8222A mode to EVDO Signal Analyzer and preset the unit.

**8-PSK Modulation Channel Power, Frequency Error, Rho and Tau Tests**

1. On the MG3700A, press the **Preset** key (yellow key on the upper left hand side).
2. Press the down arrow key or turn the knob to select Yes.
3. Press the **Set** key.

<b>Note</b>	Both <b>Set</b> keys on the MG3700A perform the same function.
-------------	--

4. Press the F1 submenu key to select Load File to Memory.
5. Press the F1 submenu key again to select Select Package.
6. Using the down arrow key step through the selection list until the CDMA2000\_1xEV-DO option is highlighted.
7. Press the **Set** key.
8. Press the Return (F6) submenu key.
9. Press the **Set** key. The Select Package box will appear. Use the rotary knob to highlight CDMA2000\_1xEV-DO and press the **Set** key to select.
10. Another File List will appear. Use the rotary knob to select FWD\_921\_6KBPS\_2SLOT and press the **Set** key to select.
11. Press the **MOD On/Off** key to turn the Modulation LED on and verify the “Playing” indicator in the center of the LCD is flashing.
12. Press the **Frequency** key, enter 870.03 MHz.
13. Press the **Level** key, enter -30 and press the dBm submenu key.
14. Adjust the MG3700A output so that the power meter reads -50 dBm ± 0.2 dB.
15. On the MT8222A, press the Frequency submenu key and enter 870.03 MHz for the center frequency.
16. Press the Measurements submenu key and press EVDO Summary (a red dot will appear on the label).
17. Press the Setup submenu key and press PN Setup. Then change PN Trigger to Ext by pressing the PN Trigger submenu key twice. Then wait 15 seconds to allow the MT8222A to update its measured results.
18. For MT8222A with Option 62 (EVDO RF Measurements), subtract the displayed Channel Power value from the power meter reading in step 14. Then record the calculated Channel Power error to the **At 870.03 MHz, -50 dBm Level, 921.6kps 8-PSK Modulation** row in [Table A-53, “Option 62 EVDO RF Measurements”](#).
19. For MT8222A with Option 63 (EVDO Demodulator), record the displayed Freq Error, Rho Pilot and Tau to the **At 870.03 MHz, -50 dBm Level, 921.6kps 8-PSK Modulation** row in [Table A-54, “Option 63 EVDO Demodulator”](#).
20. Verify that the measured values in step 18 and/or step 19 are within specifications.

**QPSK Modulation Channel Power, Frequency Error, Rho and Tau Tests**

1. Ensure that the equipment settings are unchanged from the previous test.
2. On the MG3700A, change the selected pattern to FWD\_38\_4KBPS\_16SLOT.
3. On the power meter, press the **Sensor** key, the Cal Factor submenu key, and then the Freq submenu key. Use the keypad to enter 1930 MHz as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Press the **System** key to display the power reading.
4. Set the MG3700A frequency to 1930.05 MHz.
5. Adjust the MG3700A output so that the power meter reads 0 dBm ± 0.2 dB.

6. On the MT8222A, press the Frequency submenu key and enter 1930.05 MHz as the center frequency. Wait 15 seconds to allow the MT8222A to update its measured results.
7. For MT8222A with Option 62 (EVDO RF Measurements), subtract the displayed Channel Power value from the power meter reading in [step 14 of the 8-PSK Test](#). Then record the calculated Channel Power error to the **At 1930.05 MHz, 0 dBm Level, 38.4kps QPSK Modulation** row in [Table A-53, "Option 62 EVDO RF Measurements"](#).
8. For MT8222A with Option 63 (EVDO Demodulator), record the displayed Freq Error, Rho Pilot and Tau to the **At 1930.05 MHz, 0 dBm Level, 38.4kps QPSK Modulation** row in [Table A-54, "Option 63 EVDO Demodulator"](#).
9. Verify that the measured values in step 7 and/or step 8 are within specifications.

## 16-QAM Modulation Channel Power, Frequency Error, Rho and Tau Tests

1. Ensure that the equipment settings are unchanged from the previous test. The power sensor Cal Factor frequency should still be at 1930 MHz, the MG3700A frequency and MT8222A center frequency should still be at 1930.05 MHz.
2. On the MG3700A, change the selected pattern to FWD\_2457\_6KBPS\_1SLOT.
3. Adjust the MG3700A output so that the power meter reads  $-50 \text{ dBm} \pm 0.2 \text{ dB}$ .
4. Wait 15 seconds to allow the MT8222A to update its measured results.
5. For MT8222A with Option 62 (EVDO RF Measurements), subtract the displayed Channel Power value from the power meter reading in [step 14 of the 8-PSK Test](#). Then record the calculated Channel Power error to the **At 1930.05 MHz, -50 dBm Level, 2457.6kps 16-QAM Modulation** row in [Table A-53](#).
6. For MT8222A with Option 63 (EVDO Demodulator), record the displayed Freq Error, Rho Pilot and Tau to the **At 1930.05 MHz, -50 dBm Level, 2457.6kps 16-QAM Modulation** row in [Table A-54](#).
7. Verify that the measured values in step 5 and/or step 6 are within specifications.

## Idle Slot Channel Power, Frequency Error, Rho and Tau Tests

1. Ensure that the equipment settings are unchanged from the previous test. The power sensor Cal Factor frequency should still be at 1930 MHz, the MG3700A frequency and MT8222A center frequency should still be at 1930.05 MHz.
2. On the MG3700A, change the selected pattern to FWD\_IDLE.
3. Adjust the MG3700A output so that the power meter reads  $-50 \text{ dBm} \pm 0.2 \text{ dB}$ .
4. Wait 15 seconds to allow the MT8222A to update its measured results.
5. For MT8222A with Option 62 (EVDO RF Measurements), subtract the displayed Channel Power value from the power meter reading in [step 14 of the 8-PSK Test](#). Then record the calculated Channel Power error to the **At 1930.05 MHz, -50 dBm Level, IDLE SLOT** row in [Table A-53](#).
6. For MT8222A with Option 63 (EVDO Demodulator), record the displayed Freq Error, Rho Pilot and Tau to the **At 1930.05 MHz, -50 dBm Level, IDLE SLOT** row in [Table A-54](#).
7. Verify that the measured values in step 5 and/or step 6 are within specifications.
8. On the power meter, press the **Sensor** key, the Cal Factor submenu key, and then the Freq submenu key. Use the keypad to enter 870.03 MHz as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Press the **System** key to display the power reading.
9. Set the MG3700A frequency to 870.03 MHz.
10. Adjust the MG3700A output so that the power meter reads  $-10 \text{ dBm} \pm 0.2 \text{ dB}$ .
11. On the MT8222A, press the Frequency submenu key and enter 870.03 MHz for the center frequency. Wait 15 seconds to allow the MT8222A to update its measured results.

12. For MT8222A with Option 62 (EVDO RF Measurements), subtract the displayed Channel Power value from the power meter reading in [step 14 of the 8-PSK Test](#). Then record the calculated Channel Power error to the **At 870.03 MHz, -10 dBm Level, IDLE SLOT** row in [Table A-53](#).
13. For MT8222A with Option 63 (EVDO Demodulator), record the displayed Freq Error, Rho Pilot and Tau to the **At 870.03 MHz, -10 dBm Level, IDLE SLOT** row in [Table A-54](#).
14. Verify that the measured values in step 12 and/or step 13 are within specifications.

## 5-14 DVB-T/H Signal Analyzer (Option 64)

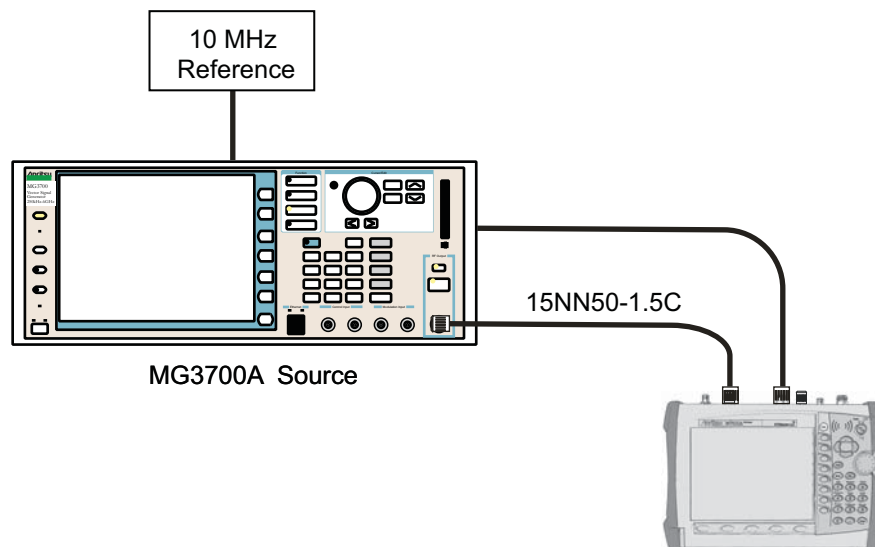
### Introduction

The tests in this section verify the performance of the optional DVB-T/H Signal Analyzer option of the MT8222A. These tests include:

- “Frequency Accuracy and Residual MER Verification”
- “Frequency Lock Range Verification”
- “Level Accuracy Verification”
- “1 dB Compression Level Verification”
- “Noise Floor Verification”

### Frequency Accuracy and Residual MER Verification

The tests in this section verify the frequency accuracy and residual modulation error ratio (MER) of the MS2711B in DVB-T/H Signal Analyzer mode.



**Figure 5-9.** DVB-T/H Signal Analyzer Option Verification

### Equipment Required

- Symmetricom Model RubiSource T&M Frequency Reference
- Anritsu MG3700A Vector Signal Generator
- Anritsu 15NN50-1.5C RF Cable



**Procedure:**

1. Connect the 10 MHz External Reference signal to the MG3700A and the MT8222A as shown in [Figure 5-9, “DVB-T/H Signal Analyzer Option Verification”](#).
2. On MG3700A, press the yellow **Preset** key on the upper left side of the instrument.
3. Press the **Down Arrow** key to select Yes.
4. Press the **Set** key.

<b>Note</b> Both <b>Set</b> keys on the MG3700A perform the same function.
--

5. Press the F1 soft key to select Load File to Memory.
6. Press the F1 soft key again to select Select Package.
7. Use the **Down Arrow** key to step through the selection list until the Digital\_Broadcast option is highlighted.
8. Press the **Set** key.
9. Press the F6 soft key labeled Return.
10. Press the **Set** key.
11. Use the **Down Arrow** key to step through the selection list until the Digital\_Broadcast option is highlighted.
12. Press the **Set** key.
13. Use the **Down Arrow** key to step through the selection list until the DVB-T\_H\_00 option is highlighted.
14. Press the **Set** key.
15. Set the level to  $-20$  dBm.
16. Set the frequency to 470 MHz.
17. Press the **Baseband** key and then the **More** key.
18. Press the F5 soft key labeled Pattern Combination [Defined].
19. Press the **Set** key.
20. Use the **Down Arrow** key to step through the selection list until the Digital\_Broadcast option is highlighted.
21. Press the **Set** key.
22. Use the **Down Arrow** key to step through the selection list until the DVB-T\_H\_00 option is highlighted.
23. Press the **Set** key.
24. Rotate the knob to highlight Freq Offset and use the numeric keypad to enter 4 MHz.
25. Ensure the **Modulation On/Off** key and the **Output** key both have LEDs On.
26. Connect the MG3700A Output to MT8222A Spectrum Analyzer RF In connector.
27. Set the mode of the MT8222A to DVB-T/H Signal Analyzer and preset the unit.
28. Press the Meas Selection soft key, then select Modulation Analysis.
29. Press the Frequency/Level soft key, and set the Reference Level to  $-20$  dBm.
30. Ensure that Channel is set to 21.
31. Press the Meas Setup soft key and then the Meas Mode soft key.
32. Use the **Up/Down** arrow keys to highlight Average and press the **Enter** key.
33. Press the Average Count soft key, then enter 10 and press the **Enter** key.
34. Wait until Average (10/10) appears at the top of the display.



35. Record the Frequency Offset reading on the MT8222A in the **Channel 21, Ref Level –20 dBm** row in [Table A-55, “Option 64, DVB-T/H Signal Analyzer Frequency Accuracy”](#).
36. Record the MER Total reading on the MT8222A to the **Channel 21** row, **Total MER Preamp Off** column in [Table A-56, “Option 64, DVB-T/H Signal Analyzer Residual MER”](#).
37. Set the MG3700A Level to –50 dBm.
38. Set the MT8222A Reference Level to –50 dBm.
39. Wait until Average (10/10) appears at the top of the display.
40. Record the Frequency Offset reading on the MT8222A to the **Channel 21, Ref Level –50 dBm** row in [Table A-55](#).
41. Record the MER Total reading on the MT8222A to the **Channel 21** row, **Total MER Preamp On** column in [Table A-56](#).
42. Set MT8222A Preamp to OFF.
43. Set the MG3700A frequency to 662 MHz and Level to –20 dBm.
44. Change the MT8222A to Channel 45 and set the Reference Level to –20 dBm.
45. Repeat step 34 through step 41.
46. Set MT8222A Preamp to OFF.
47. Set the MG3700A frequency to 854 MHz and Level to –20 dBm.
48. Change the MT8222A to Channel 69 and set Reference Level to –20 dBm.
49. Repeat step 34 through step 41.

## Frequency Lock Range Verification

The test in this section can be used to verify the frequency lock range of the MT8222A in DVB-T/H Signal Analyzer mode.

### Equipment Required:

- Anritsu MG3700A Vector Signal Generator
- Symmetricom Model RubiSource T&M Frequency Reference
- Anritsu 15NN50-1.5C RF Cable

### Procedure:

1. Connect the 10 MHz Frequency Reference source to the Anritsu MG3700A and MT8222A as shown in [Figure 5-9 on page 5-47](#).
2. On the MG3700A, press the yellow **Preset** key located on the upper left side of the instrument.
3. Press the **Down Arrow** key to select Yes.
4. Press the **Set** key.

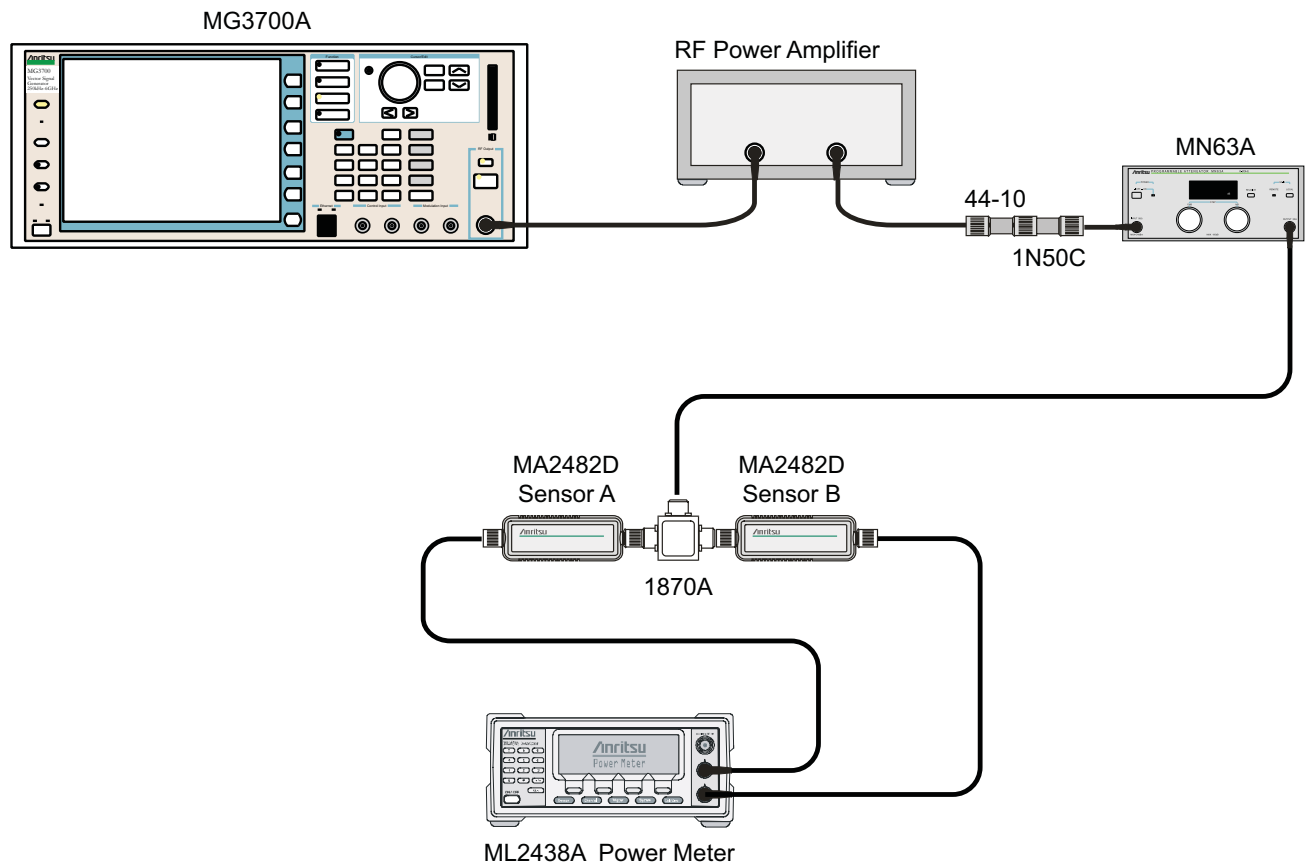
<b>Note</b> There are two <b>Set</b> keys and they both perform the same function.
--

5. Press the F1 soft key to select Load File to Memory.
6. Press the F1 soft key again to select Select Package.
7. Use the **Down Arrow** key to step through the selection list until the Digital\_Broadcast option is highlighted.
8. Press the **Set** key.
9. Press the F6 soft key labeled Return.

10. Press the **Set** key.
11. Use the **Down Arrow** key to step through the selection list until the Digital\_Broadcast option is highlighted.
12. Press the **Set** key.
13. Use the **Down Arrow** key to step through the selection list until the DVB-T\_H\_00 option is highlighted.
14. Press the **Set** key.
15. Set the frequency to 474.09 MHz.
16. Set the level to -20dBm.
17. Ensure the **Modulation On/Off** key and the **Output** key both have LEDs On.
18. Set the mode of the MT8222A to DVB-T/H Signal Analyzer. Press the **Shift** key, the **Preset** (1) key, and then select the **Preset** soft key to reset the unit.
19. Input the MG3700A signal into the Spectrum Analyzer RF In connector of the MT8222A.
20. On MT8222A, press the Frequency/Level soft key and ensure Channel is set to 21.
21. Set the Reference Level to -20dBm.
22. Press the Meas Selection soft key and select Modulation Analysis.
23. Press the Meas Setup soft key and then the Meas Mode soft key.
24. Use the rotary knob to highlight Average and press the **Enter** key.
25. Press the Average Count soft key, then enter 10 and press the **Enter** key.
26. Wait until Average (10/10) appears at the top of the display.
27. Record the Frequency Error in the **Channel 21, 474.09 MHz** row in [Table A-57, "Option 64, DVB-T/H Signal Analyzer Frequency Lock Range"](#).
28. On the MG3700A, set the frequency to 473.91 MHz.
29. Press Execute Measure. After Average (10/10) appears, record the Frequency Offset in the **Channel 21, 473.91 MHz** row in [Table A-57](#).

## Level Accuracy Verification

The tests in this section verify the level accuracy of the MT8222A in DVB-T/H Signal Analyzer mode.



**Figure 5-10.** DVB-T/H Option 64, Level Accuracy Verification – Two Sensors

### Equipment Required:

- Anritsu MG3700A Vector Signal Generator
- Anritsu MN63A Programmable Attenuator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensors (2)
- Anritsu 1N50C RF Limiter
- Anritsu 34NN50A Adapter
- Anritsu 15NNF50-1.5C RF Coaxial Cables (3)
- Aeroflex/Weinschel 1870A Power Splitter
- Aeroflex/Weinschel 44-10 10 dB Fixed Attenuator
- Mini-Circuits TIA-1000-1R8 RF Power Amplifier
- Midwest Microwave ADT-2615-NF-BNM-02 Adapters (2)

**Procedure:**

1. Confirm that the Power Amplifier is off.
2. Connect the MG3700A Signal Generator, Power Amplifier with N(f) to BNC(m) adapters, RF Limiter, MN63A Programmable Attenuator, Power Divider, Power Meter, and Power Sensors as shown in [Figure 5-10, “DVB-T/H Option 64, Level Accuracy Verification – Two Sensors”](#).
3. On the MG3700A, press the yellow **Preset** key located on the upper left side of the instrument.
4. Press the **Down Arrow** key to select **Yes**.
5. Press the **Set** key.

<b>Note</b> There are two <b>Set</b> keys and they perform the same function.
---

6. Press the F1 soft key to select Load File to Memory.
7. Press the F1 soft key again to select Select Package.
8. Use the **Down Arrow** key to step through the selection list until the Digital\_Broadcast option is highlighted.
9. Press the **Set** key.
10. Press the F6 soft key labeled Return.
11. Press the **Set** key.
12. Use the **Down Arrow** key to step through the selection list until the Digital\_Broadcast option is highlighted.
13. Press the **Set** key.
14. Use the **Down Arrow** key to step through the selection list until the DVB-T\_H\_00 option is highlighted.
15. Press the **Set** key.
16. Perform a Zero/Cal on Sensor A and Sensor B of the power meter. Set the cal factor of both sensors to 474 MHz.
17. Set the MG3700A frequency to 474 MHz.
18. Set the level to  $-25$  dBm.
19. Ensure the **Modulation On/Off** key and the **Output** key both have LEDs On.
20. Turn on the power amplifier and allow it to warm up for at least 5 minutes.
21. Adjust the MN63A Attenuator so that Sensor A reading is  $-10$  dBm  $\pm$  1 dBm. Record the attenuation reading in the **474 MHz** row, **MS63A Attenuation Reading AT(-10)** column in [Table A-58, “Option 64, Readings for Sensor A, Sensor B, DAB\(-10\), and MN63A Attenuation AT\(-10\)”](#).
22. On the MG3700A, adjust the power level so that Power Meter Sensor A reading is  $-10.0$  dBm  $\pm$  0.2 dBm.
23. Record the following values to the appropriate table cells in the **474 MHz** row of [Table A-58, “Option 64, Readings for Sensor A, Sensor B, DAB\(-10\), and MN63A Attenuation AT\(-10\)”](#).
  - Power Meter Sensor A reading.
  - Power Meter Sensor B reading.
24. Subtract the Sensor A reading from the Sensor B reading and record the result to the **DAB (-10)** column of [Table A-58, “Option 64, Readings for Sensor A, Sensor B, DAB\(-10\), and MN63A Attenuation AT\(-10\)”](#).
25. Calculate the AT(set) values for Test Levels  $-10$  dBm through  $-45$  dBm and record the values to the **AT(set) column** of [Table A-60, “Option 64, DVB-T/H Signal Analyzer Level Accuracy Measurement Channel = 21ch \(474 MHz\)”](#).

26. Remove Sensor A from the Power Splitter and then connect the Power Splitter to the MT8222A Spectrum Analyzer RF In with an N(m) to N(m) Adapter as shown in Figure 5-11, “DVB-T/H Option 64, Level Accuracy Verification – Sensor B Only”.

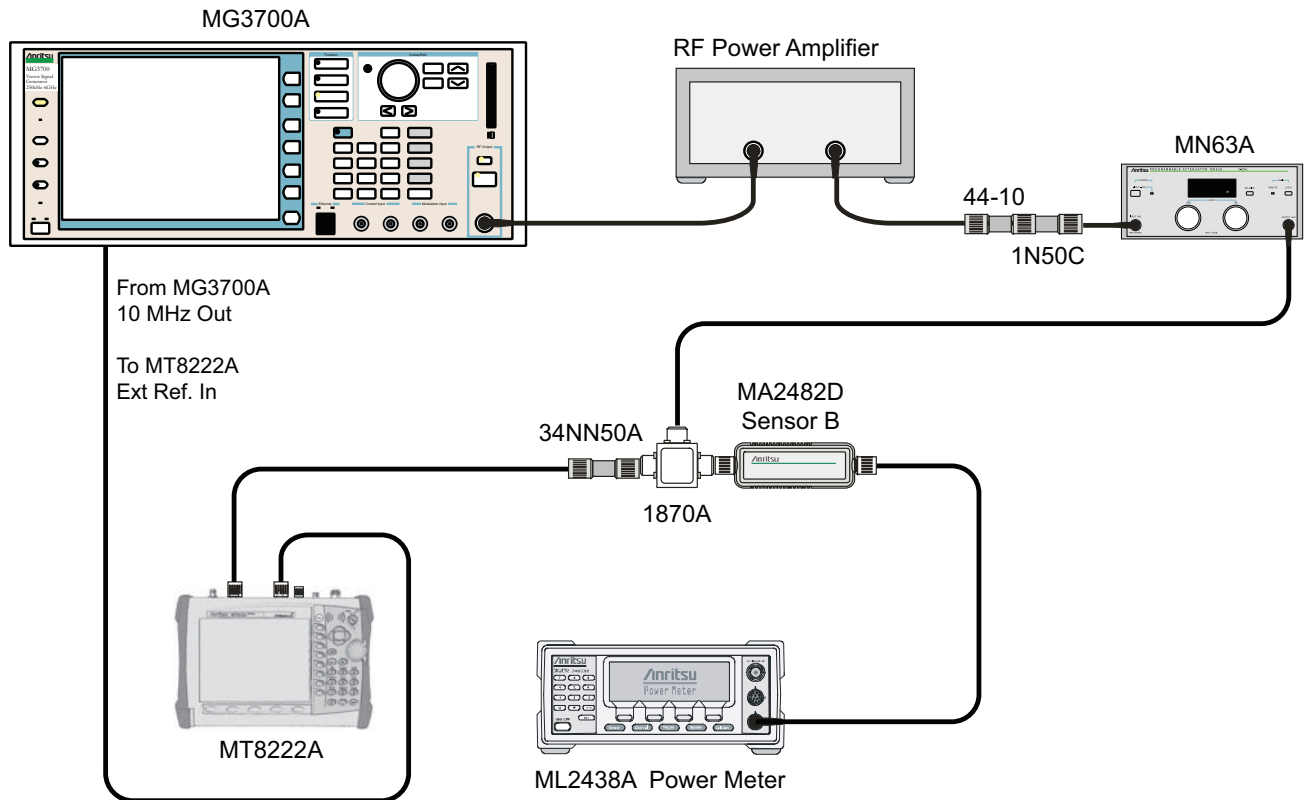


Figure 5-11. DVB-T/H Option 64, Level Accuracy Verification – Sensor B Only

27. Record the new Power Meter Sensor B reading to the **SB(-10)** box in Table A-60, “Option 64, DVB-T/H Signal Analyzer Level Accuracy Measurement Channel = 21ch (474 MHz)”.
28. On the MT8222A, set the mode to DVB-T/H Signal Analyzer and preset the unit.
29. Press the Frequency/Level soft key, ensure Channel 21 is selected and the Preamp is OFF.
30. Change the Reference Level to  $-10\text{dBm}$ .
31. Press the Meas Setup soft key and then the Meas Mode soft key.
32. Use the **Up/Down** arrow keys to highlight Average and press the **Enter** key.
33. Change the Average Count to 50 if required.
34. After Average (50/50) appears at the top of the display, record the Channel Power from the MT8222A to the **M(Level)** column under “**Pre Amp Off**” in Table A-60.
35. Calculate the Deviation using the following formula:

$$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \text{DAB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$

**Note** Since  $\text{AT}(-10)$  is the same as  $\text{AT}(\text{set})$ ,  $[-\text{AT}(-10) + \text{AT}(\text{set})] = 0$

36. Record the result to the **Dev** column under “**Preamp Off**” in Table A-60 and verify that it is within specification.
37. Set the MN63A attenuation to the next  $\text{AT}(\text{set})$  value in Table A-60.

38. Press the Frequency/Level soft key and set the Reference Level of the MT8222A to –15 dBm.
39. After Average (50/50) appears, record the –15 dBm Channel Power from the MT8222A to the **M(Level)** column under “**Preamp Off**” in [Table A-60](#).

40. Calculate the Deviation using the following formula:

$$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \text{DAB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$

41. Record the result to the **Dev** column under “**Preamp Off**” in [Table A-60](#) and verify that it is within specification.

42. Set the MN63A attenuation to the next AT(set) value in [Table A-60](#).

43. Set the Reference Level of MT8222A to –20 dBm.

44. After Average (50/50) appears, record the –20 dBm Channel Power from the MT8222A the **M(Level)** column under “**Preamp Off**” in [Table A-60](#).

45. Calculate the Deviation using the following formula:

$$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \text{DAB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$

46. Record the result to the **Dev** column under “**Preamp Off**” in [Table A-60](#) and verify that it is within specification.

47. Press the Frequency/Level soft key and set Preamp to ON. Change the Reference Level if required.

48. After Average (50/50) appears, record the –20 dBm Channel Power from the MT8222A the **M(Level)** column under “**Pre Amp On**” in [Table A-60](#).

49. Calculate the Deviation using the following formula:

$$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \text{DAB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$

50. Record the result to the **Dev** column under “**Preamp On**” in [Table A-60](#) and verify that it is within specification.

51. Repeat step 43 through step 50 for Test levels –25 dBm to –45 dBm. Change Reference Level and switch Preamp per the **Pre Amp On/Off** column in [Table A-60](#).

52. Turn off the power amplifier, disconnect the power splitter from the MT8222A, and reconnect Sensor A to the power splitter as shown in [Figure 5-10](#), “[DVB-T/H Option 64, Level Accuracy Verification – Two Sensors](#)”.

53. Set the MN63A attenuation to 10 dB.

54. Set the MG3700A level to –60 dBm.

55. Turn on the power amplifier and allow it to warm up for at least 5 minutes.

56. Adjust the MN63A Attenuator so that the Sensor A reading is –50 dBm  $\pm$  1 dBm. Record the attenuation reading in [Table A-59](#), “[Option 64, Readings for Sensor A, Sensor B, DAB\(–50\), and MN63A Attenuation AT\(–50\)](#)” in the last column, **MN63A Attenuation AT(–50)**.

57. On the MG3700A adjust the power level so that Power Meter Sensor A reading is –50.0 dBm  $\pm$  0.2 dBm.

58. Record the following value in the appropriate columns in [Table A-59](#).

- Power Meter Sensor A reading in the **Sensor A Reading** column.
- Power Meter Sensor B reading in the **Sensor B Reading** column.

59. Subtract the Sensor A reading from Sensor B reading and record the result in the **DAB(–50)** column of [Table A-59](#).

$$\text{DAB}(-50) = \text{Sensor B Reading} - \text{Sensor A Reading}$$

60. Calculate the AT(set) values for Test Levels –55 dBm through –84 dBm and record the values in the **AT(set)** column in [Table A-60](#).

61. Remove Sensor A from the Power Splitter and then connect the Power Splitter to the MT8222A Spectrum Analyzer RF In with an N(m) to N(m) adapter.

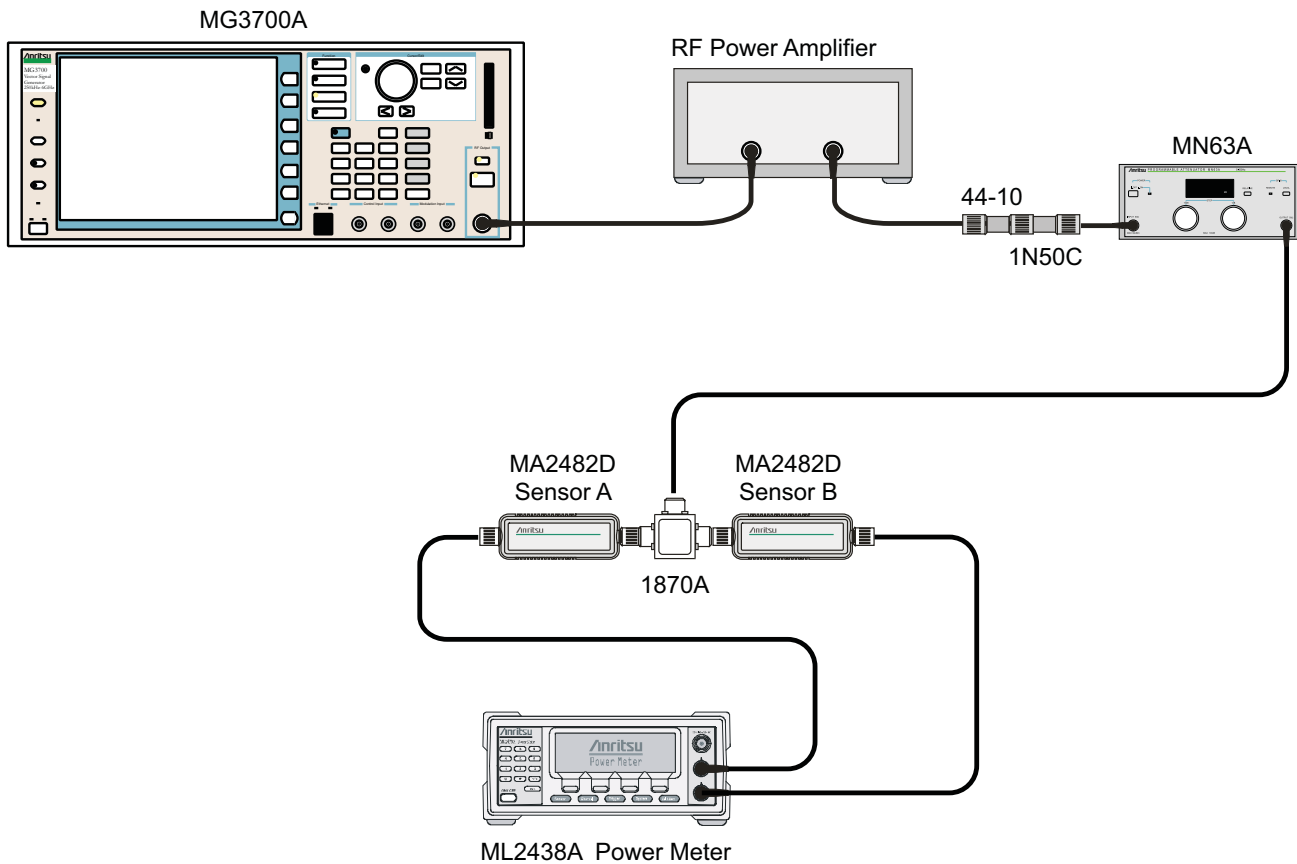
62. Record the new Power Meter Sensor B reading to the **SB(-50)** box in [Table A-60](#).
63. Repeat step 43 through step 51 for Test Levels -50 dBm to -84 dBm. Change the Reference Level and switch the Preamp on or off per the **Ref Level Pre Amp On/Off** column in [Table A-60](#). Use the following formula to calculate Deviation:

$$\text{Deviation} = M(\text{Level}) - \text{SB}(-50) - \text{DAB}(-50) - \text{AT}(-50) + \text{AT}(\text{set})$$

64. Repeat step 16 through step 63 for frequencies 666 MHz (Ch 45) and record in [Table A-61](#), “[Option 64, DVB-T/H Signal Analyzer Level Accuracy Measurement Channel = 45ch \(666 MHz\)](#)”. Repeat step 16 through step 63 for frequencies 858 MHz (Ch 69) and record in [Table A-62](#), “[Option 64, DVB-T/H Signal Analyzer Level Accuracy Measurement Channel = 69ch \(858 MHz\)](#)”. Set cal factor of both power sensors to 666 MHz or 858 MHz as required.

## 1 dB Compression Level Verification

The tests in this section verify the accuracy of the MT8222A is not degraded by compression when operating in the DVB-T/H Signal Analyzer mode.



**Figure 5-12.** DVB-T/H Option 64, 1 dB Compression Level Verification – Two Sensors

### Equipment Required:

- Anritsu MG3700A Vector Signal Generator
- Anritsu MN63A Programmable Attenuator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensors (2)
- Anritsu 1N50C RF Limiter
- Anritsu 34NN50A Adapter
- Anritsu 15NNF50-1.5C RF Coaxial Cables (3)
- Aeroflex/Weinschel 1870A Power Splitter
- Aeroflex/Weinschel 44-10 10 dB Fixed Attenuator
- Mini-Circuits TIA-1000-1R8 RF Power Amplifier
- Midwest Microwave ADT-2615-NF-BNM-02 Adapters (2)

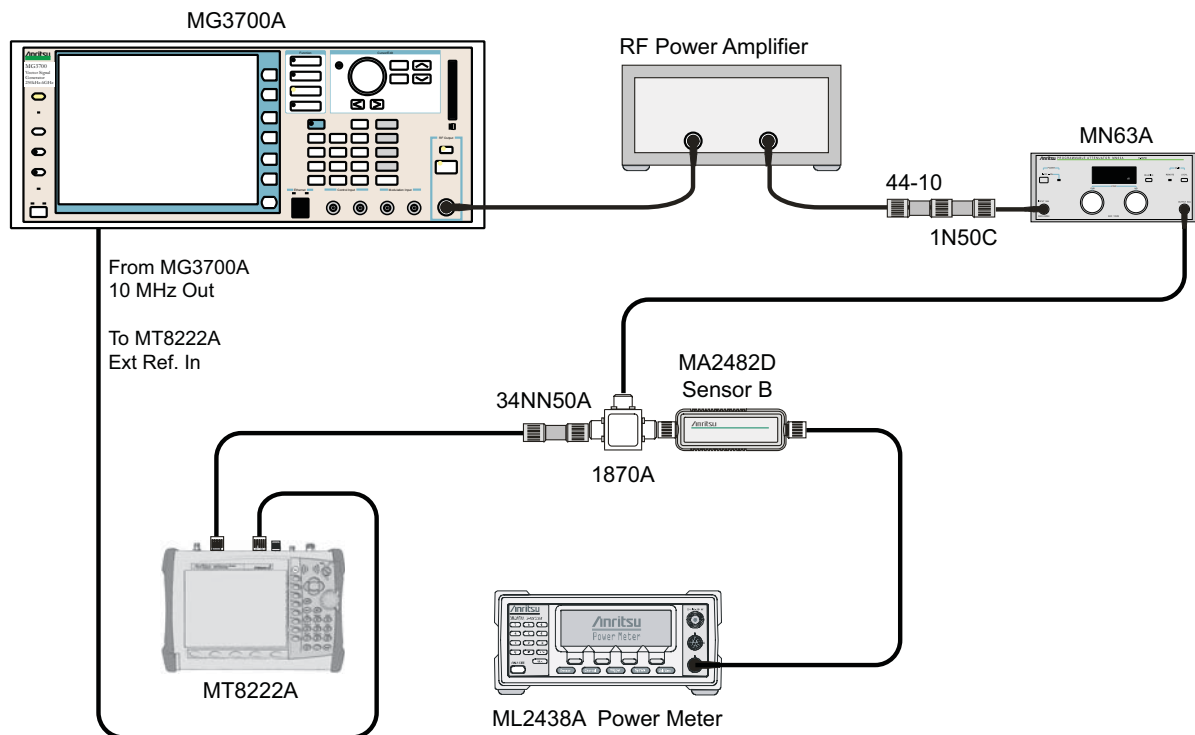


**Procedure:**

1. Ensure that the Power Amplifier is OFF.
2. On the Power Meter, set Low Level Averaging to Low and Averaging to Moving with 50 averages. Also set the power meter to read True RMS.
3. Perform a Zero/Cal on both sensors of the power meter.
4. Connect the MG3700A Signal Generator, Power Amplifier with N(f) to BNC(m) Adapters, RF Limiter, MN63A Programmable Attenuator, Power Divider, Power Meter, and Power Sensors as shown in [Figure 5-12, “DVB-T/H Option 64, 1 dB Compression Level Verification – Two Sensors”](#).
5. On the MG3700A, press the **MOD On/Off** button to turn Modulation Off so that the **Mod On/Off LED** is Off.
6. Set the level output of the MG3700A to  $-25$  dBm.
7. Set the MN63A attenuation to 20 dB.
8. Turn on the power amplifier and allow it to warm up at least five minutes.

**474 MHz Tests**

9. Set the cal factor of both sensors to 474 MHz.
10. Set the MG3700A frequency to 474 MHz.
11. Adjust the MN63A attenuation so that the Power Meter Sensor A reading is  $-25$  dBm  $\pm$  1 dBm. Record the MN63A attenuation readout to the **AT(-25)** column, **474 MHz (Ch 21)** row in [Table A-63, “Option 64, Readings for Sensor A and MN63A Attenuation at AT\(-25\), AT\(-15\), AT\(-50\), and AT\(-43\)”](#).
12. Adjust the Level of the MG3700A so that the Power Meter Sensor A reads  $-25.0$  dBm  $\pm$  0.05 dBm. Record the Sensor A reading in the **M(Sa)** column in [Table A-63](#).
13. Remove Sensor A from the splitter and connect the MT8222A RF In to the open end of the splitter using an adapter as shown in [Figure 5-13, “DVB-T/H Option 64, 1 dB Compression Level Verification – Sensor B Only”](#).

**Figure 5-13.** DVB-T/H Option 64, 1 dB Compression Level Verification – Sensor B Only

14. Set the MT8222A to DVB-T/H Signal Analyzer mode and preset the unit.
15. Press the Meas Selection soft key and ensure Signal Power is activated.
16. Press the Frequency/Level soft key and ensure the MT8222A is set to Channel 21 and the Preamp is Off.
17. Set the Reference Level to  $-25\text{dBm}$ .
18. Record the MT8222A Channel Power reading, MeasCP( $-25$ ), to the  **$-25\text{ dBm Test Level}$**  row and the **Meas. Value (dBm)** column of [Table A-64, "Option 64, DVB-T/H Signal Analyzer 1 dB Compression Level \(Pre Amp Off\)](#).
19. Calculate the difference, Delta( $-25$ ), using the following formula:
 
$$\text{Delta}(-25) = M(\text{Sa}) - \text{MeasCP}(-25)$$
20. Record the result to the **Delta** column in [Table A-64](#). Verify that the result is less than 1 dB.
21. Calculate AT( $-15$ ) using the following formula:
 
$$\text{AT}(-15) = \text{AT}(-25) - 10$$
22. Set the MN63A attenuation to AT( $-15$ ).

<b>Note</b>	The Over Range message on the MT8222A is normal.
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23. Record the MT8222A Channel Power reading, MeasCP( $-15$ ), to the  **$-15\text{ dBm Test Level}$**  row, **Meas.Value** column of [Table A-64](#).
24. Calculate the Delta at  $-15\text{ dBm}$  Input using the following formula:
 
$$\text{Delta}(-15) = M(\text{Sa}) + 10 - \text{MeasCP}(-15) + \text{Delta}(-25)$$
25. Record the result to the **Delta** column of [Table A-64](#). Verify that it is less than 1 dB.
26. Calculate the value of AT( $-50$ ) using the following formula:
 
$$\text{AT}(-50) = \text{AT}(-25) + 25$$
27. Adjust the MN63A attenuation to AT( $-50$ ).
28. Set the Reference Level on the MT8222A to  $-50\text{ dBm}$  and turn the Preamp On.
29. Record the MT8222A Channel Power reading, MeasCP( $-50$ ), to the  **$-50\text{ dBm Test Level}$**  row, **Meas. Value** column in [Table A-65, "Option 64, DVB-T/H Signal Analyzer 1 dB Compression Level \(Pre Amp On\)](#).
30. Calculate the Delta at  $-50\text{ dBm}$  Input, Delta( $-50$ ), using the following formula:
 
$$\text{Delta}(-50) = M(\text{Sa}) - 25 - \text{MeasCP}(-50) + \text{Delta}(-25)$$
31. Record the result to the **Delta** column of [Table A-65](#). Verify that it is less than 1 dB.
32. Calculate the AT( $-43$ ) using the following formula:
 
$$\text{AT}(-43) = \text{AT}(-25) + 18$$
33. Set the MN63A attenuation to AT( $-43$ ).

<b>Note</b>	The Over Range message on the MT8222A is normal.
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34. Record the MT8222A Channel Power reading, MeasCP( $-43$ ), in the  **$-43\text{ dBm Test Level}$**  row of the **Meas. Value** column in [Table A-65](#).
35. Calculate the Delta at  $-43\text{ dBm}$  Input, Delta( $-43$ ), using the following formula:
 
$$\text{Delta}(-43) = M(\text{Sa}) - 18 - \text{MeasCP}(-43) + \text{Dev}(-50)$$
36. Record the result to the **Delta** column in [Table A-65](#). Verify that it is less than 1 dB.

**666 MHz Tests**

37. Remove the MT8222A from the test setup and reinstall Sensor A to the open splitter output as shown in [Figure 5-12, “DVB-T/H Option 64, 1 dB Compression Level Verification – Two Sensors”](#) on page 5-56
38. Set the MG3700A frequency to 666 MHz and ensure the **Mod On/Off LED** is Off.
39. Set the cal factor of both sensors to 666 MHz.
40. Adjust the MN63A attenuation so that the Power Meter Sensor A reads  $-25 \text{ dBm} \pm 1 \text{ dBm}$ . Record the MN63A attenuation readout to the **AT(-25)** column, **666 MHz** row in [Table A-63, “Option 64, Readings for Sensor A and MN63A Attenuation at AT\(-25\), AT\(-15\), AT\(-50\), and AT\(-43\)”](#) on page A-32.
41. Adjust the Level of the MG3700A so that the Power Meter Sensor A reads  $-25.0 \text{ dBm} \pm 0.05 \text{ dBm}$ . Record the Sensor A reading to the **M(Sa)** column in [Table A-63](#).
42. Remove Sensor A from the splitter and connect the MT8222A RF In to the open end of the splitter using an adapter as shown in [Figure 5-13, “DVB-T/H Option 64, 1 dB Compression Level Verification – Sensor B Only”](#).
43. Set the MT8222A to Channel 45.
44. Set the Preamp to Off and the Reference Level to  $-25 \text{ dBm}$ .
45. Repeat step 18 through step 36.

**858 MHz Tests**

46. Remove the MT8222A from the test setup and reinstall Sensor A to the open splitter output as shown in [Figure 5-12, “DVB-T/H Option 64, 1 dB Compression Level Verification – Two Sensors”](#) on page 5-56.
47. Set the MG3700A frequency to 858 MHz and ensure the **Mod On/Off LED** is Off.
48. Set the cal factor of both sensors to 858 MHz.
49. Adjust the MN63A attenuation so that Power Meter Sensor A reads  $-25 \text{ dBm} \pm 1 \text{ dBm}$ . Record the MN63A attenuation readout to the **AT(-25)** column, **858 MHz** row in [Table A-63, “Option 64, Readings for Sensor A and MN63A Attenuation at AT\(-25\), AT\(-15\), AT\(-50\), and AT\(-43\)”](#) on page A-32.
50. Adjust the Level of the MG3700A so that Power Meter Sensor A reads  $-25.0 \text{ dBm} \pm 0.05 \text{ dB}$ . Record the Sensor A reading in the **M(Sa)** column in [Table A-63](#).
51. Remove Sensor A from the splitter and connect the MT8222A RF In to the open end of the splitter using an adapter as shown in [Figure 5-13, “DVB-T/H Option 64, 1 dB Compression Level Verification – Sensor B Only”](#) on page 5-57.
52. Set the MT8222A to Channel 69.
53. Set the Preamp to Off and Reference Level to  $-25 \text{ dBm}$ .
54. Repeat step 18 through step 36.

## Noise Floor Verification

The tests in this section verify the noise floor of the MT8222A in DVB-T/H Signal Analyzer mode.

### Equipment Required

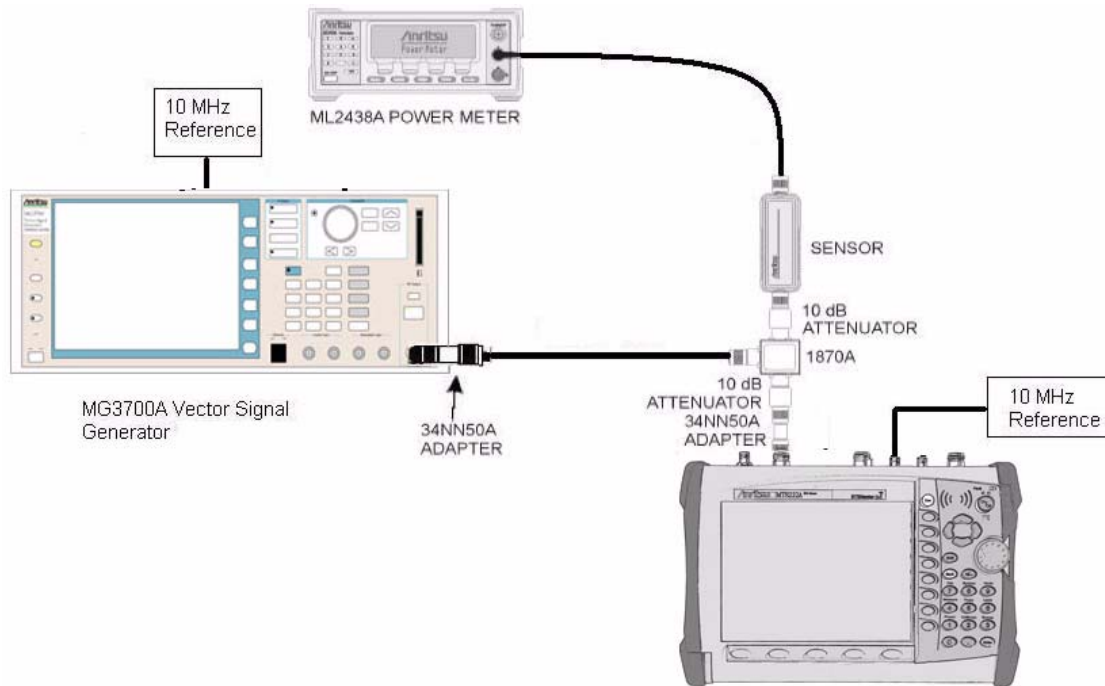
- Anritsu 28N50-2 50 ohm Termination

### Procedure

1. Set the mode of the MT8222A to DVB-T/H Analyzer and preset the unit.
2. Install a 50 ohm Termination to the Spectrum Analyzer RF In connector.
3. Ensure the Channel is set to 21 and Pre Amp is Off.
4. Press the Meas Setup soft key. Change Meas Mode to Average, leave Average Count set to 50.
5. Press the Frequency/Level soft key and set the Reference Level to  $-25$  dBm.
6. After Averages (50/50) appears at the top of the display, record the Channel Power to **Channel 21** row **Preamp Off, Measured Value** column in [Table A-66, "Option 64, DVB-T/H Signal Analyzer Noise Floor"](#).
7. Set the Preamp to On.
8. Set the Reference Level to  $-50$  dBm.
9. After Averages (50/50) appears at the top of the display, record to **Channel 21** row **Preamp On, Measured Value** column in [Table A-66, "Option 64, DVB-T/H Signal Analyzer Noise Floor"](#).
10. Change the channel to Channel 45. Set Pre Amp to Off.
11. Repeat step 5 through step 9 for Channel 45. Record in **Channel 45** row of [Table A-66](#).
12. Change the channel to Channel 69. Set Pre Amp to Off.
13. Repeat steps 5 through 9 for Channel 69. Record in **Channel 69** row of [Table A-66](#).

## 5-15 Mobile WiMAX Signal Analyzer (Options 66 and/or 67)

The tests in this section verify the functionality of the Mobile WiMAX Signal Analyzer of the MT8222A BTS Master.



**Figure 5-14.** Mobile WiMAX Channel Power Accuracy Tests

### Required Equipment:

- Anritsu Model MG3700A Vector Signal Generator
- Symmetricom Model RubiSource T&M Frequency Reference
- Anritsu Dual Channel Model ML2438A Power Meter
- Anritsu Model MA2482D Power Sensor
- Aeroflex/Weinschel Model 1870A Power Splitter
- Anritsu 34NN50A Adapter (2)
- Aeroflex/Weinschel Model 44-10 Attenuator (2)

## Mobile WiMAX Channel Power Accuracy Tests (Option 66)

1. Connect the MA2482D Power Sensor to the power meter and zero the sensor.
2. Set the Power Meter measurement mode to True RMS, set Averaging MODE to Moving and Averaging NUMBER to 256.
3. Set the cal factor frequency of the power sensor to 2600.5 MHz.
4. Connect the Power Sensor, 1870A splitter, 10 dB attenuators (quantity 2), as shown in [Figure 5-14, “Mobile WiMAX Channel Power Accuracy Tests”](#).

### Channel Power Accuracy (10 MHz Bandwidth and 10ms Frame Length)

5. Set the MG3700A as follows:
  - a. Press the yellow Preset button (answer yes to the question).
  - b. Press the **Set** key
  - c. Press the F1 submenu key to select Load File to Memory.
  - d. Press the F1 submenu key again to select Select Package.
  - e. Using the down arrow key step through the selection list until mWiMax is highlighted.
  - f. Press the **Set** key.
  - g. Press the Return (F6) submenu key.
  - h. Press the **Set** key. The Select Package list box will appear. Again select mWiMax and press **Set**.
  - i. Another file list will appear, select 10m1024g8\_0\_10\_cap.
  - j. Press the **Set** key.
  - k. Press the **MOD On/Off** key and verify that the LED is on. Ensure that the “Playing” indicator is displaying the moving pattern.
  - l. Press the **Frequency** key, then enter 2600.5 MHz.
  - m. Press the **Level** key, then enter 2 dBm. Turn the output on.
6. Adjust the MG3700A level setting with the knob so that the power meter reads  $-15.0 \text{ dBm} \pm 0.2 \text{ dB}$ .
7. Set the MT8222A to Mobile WiMax Signal Analyzer mode and preset the unit.
8. Set the MT8222A as follows:
  - a. Press the Freq submenu key and set the center frequency to 2600.5 MHz.
  - b. Press the Setup submenu key and set the bandwidth to 10 MHz.
  - c. Press the Frame Length submenu key and set the frame length to 10ms.
  - d. Press the Measurements submenu key and press RF, then press Power vs. Time.
9. Calculate the Channel Power Error by subtracting the MT8222A “Channel Power (RSSI)” reading from the power meter reading in step 6. Record the result to the **Error** column in [Table A-67, “Option 66 Mobile WiMAX Channel Power Accuracy”](#)
10. Verify that the error is within specification.
11. Adjust the MG3700A level setting to approximately  $-33 \text{ dBm}$  so that the power meter reads  $-50.0 \text{ dBm} \pm 0.2 \text{ dB}$ .
12. Record the MT8222A Channel Power (RSSI) reading to the **Measured Channel Power (RSSI)** column in [Table A-67](#).
13. Calculate the Channel Power Error by subtracting the MT8222A “Channel Power (RSSI)” reading from the power meter reading in step 11. Record the result to the **Error** column in [Table A-67](#).
14. Verify that the error is within specification.

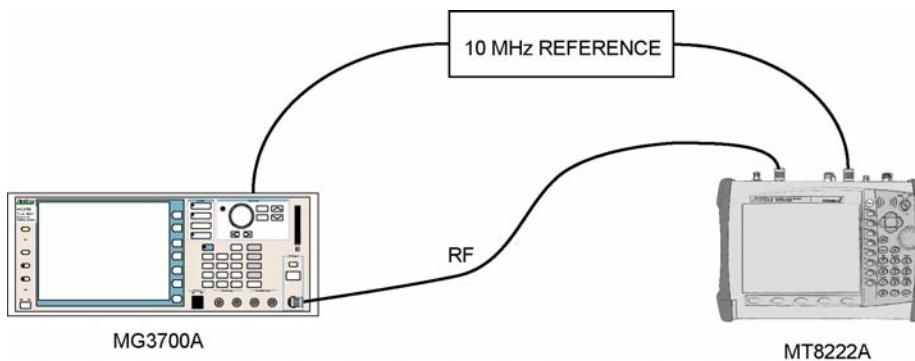
15. Set the cal factor frequency of the power sensor to 3600.5 MHz.
16. Set the MG3700A frequency to 3600.5 MHz.
17. Change the center frequency of the MT8222A to 3600.5 MHz.
18. Measure the Channel Power (RSSI) for both  $-15$  and  $-50$  dBm and then record the measured result and calculated error in [Table A-67](#).
19. Verify that the error is within specification.

#### Channel Power Accuracy (5 MHz Bandwidth and 5 ms Frame Length)

20. Set the MG3700A as follows:
  - a. Press the yellow **Preset** button (answer yes to the question).
  - b. Press the **Set** key
  - c. Press the F1 submenu key to select Load File to Memory.
  - d. Press the F1 submenu key again to select Select Package.
  - e. Using the down arrow key step through the selection list until mWiMax is highlighted.
  - f. Press the **Set** key.
  - g. Press the Return (F6) submenu key.
  - h. Press the **Set** key. The Select Package list box will appear. Again select mWiMax and press **Set**.
  - i. Another file list will appear. Select 5m512g8\_2\_5\_cap.
  - j. Press the **Set** key.
  - k. Press the **MOD On/Off** key and verify that the LED is on. Ensure that the “Playing” indicator is displaying the moving pattern.
  - l. Press the **Frequency** key, then enter 2600.5 MHz.
  - m. Press the **Level** key, then enter 2 dBm. Turn the output on.
21. Adjust the MG3700A level setting with the knob so that the power meter reads  $-15.0$  dBm  $\pm$  0.2 dB.
22. Set the MT8222A to Mobile WiMax Signal Analyzer mode and preset the unit.
23. Set the MT8222A as follows:
  - a. Press the Freq submenu key and set the center frequency to 2600.5 MHz.
  - b. Press the Setup submenu key and set the bandwidth to 5 MHz.
  - c. Press the Frame Length submenu key and set the frame length to 5 ms.
  - d. Press the Measurements submenu key and press RF, then press Power vs. Time.
24. Repeat steps 9 to 19 for the bandwidth and frame length and record the results in [Table A-67](#).



## Mobile WiMAX Residual EVM and Frequency Error Tests (Option 67)



**Figure 5-15.** Mobile WiMAX Residual EVM and Frequency Error Tests

1. Connect the 10 MHz Reference to the 10MHz/5MHz Ref Input of the MG3700A and the Ext Ref In of the MT8222A as shown in [Figure 5-15](#).
2. Connect the RF Out of the MG3700A to the Spectrum Analyzer RF In connector of the MT8222A.

### Residual EVM and Frequency Error (10 MHz Bandwidth and 10 ms Frame Length)

3. Set the MG3700A as follows:
  - a. Press the yellow **Preset** button (answer **yes** to the question).
  - b. Press the **Set** key
  - c. Press the F1 submenu key to select Load File to Memory.
  - d. Press the F1 submenu key again to select Select Package.
  - e. Using the down arrow key step through the selection list until mWiMax is highlighted.
  - f. Press the **Set** key.
  - g. Press the Return (F6) submenu key.
  - h. Press the **Set** key. The Select Package list box will appear. Again select mWiMax and press **Set**.
  - i. Another file list will appear. Select 10m1024g8\_0\_10\_cap.
  - j. Press the **Set** key.
  - k. Press the **MOD On/Off** key and verify that the LED is on. Ensure that the “Playing” indicator is displaying the moving pattern.
  - l. Press the **Frequency** key, then enter 2600.5 MHz.
  - m. Press the **Level** key, then enter -15 dBm. Turn the output on.
4. Set the MT8222A to Mobile WiMax Signal Analyzer Mode and preset the unit.
5. Set the MT8222A as follows:
  - a. Press the Freq submenu key and set the center frequency to 2600.5 MHz
  - b. Press the Setup submenu key and set the bandwidth to 10 MHz.
  - c. Press the CP Ratio submenu key (under the Setup submenu key) and set the CP Ratio to 1/8.
  - d. Press the Frame Length submenu key and set the frame length to 10 ms.
  - e. Press the Demod submenu key and set Demod to FCH.
  - f. Press the Measurements submenu key and press Demodulator, then press Modulation Summary.
6. Record the MT8222A EVM(rms) reading in the **10 MHz Bandwidth and 10 ms Frame Length** section of [Table A-68](#), “Mobile WiMAX Residual EVM.”



7. Verify that the measured EVM is within specification.
8. Set the MG3700A level to  $-50.0$  dBm.
9. Record the MT8222A EVM(rms) reading in the **10 MHz Bandwidth and 10 ms Frame Length** section of [Table A-68](#).
10. Verify that the measured EVM is within specification.
11. On the MT8222A, press the **Setup** submenu key and set Demod to Auto.
12. Record the MT8222A Freq Error reading in the **10 MHz Bandwidth and 10 ms Frame Length** section of [Table A-69](#), “[Mobile WiMAX Frequency Error](#)”.
13. Verify that the measured frequency error is within specification.
14. Set MG3700A frequency to 3600.5 MHz.
15. On the MT8222A, change the center frequency to 3600.5 MHz.
16. Press the **Setup** submenu key and set Demod to FCH.
17. Measure the EVM(rms) for both  $-15$  and  $-50$  dBm and then record the measured results **10 MHz Bandwidth and 10 ms Frame Length** section of [Table A-68](#).
18. Verify that the measured EVM is within specification.
19. Repeat steps 11 to 13 to measure the Freq Error at  $-50$  dBm and record in the **10 MHz Bandwidth and 10 ms Frame Length** section of [Table A-69](#).

#### Residual EVM and Frequency Error (5 MHz Bandwidth and 5ms Frame Length)

20. Set the MG3700A as follows:
  - a. Press the yellow **Presets** button (answer yes to the question).
  - b. Press the **Set** key.
  - c. Press the F1 submenu key to select Load File to Memory.
  - d. Press the F1 submenu key again to select Select Package.
  - e. Using the down arrow key step through the selection list until mWiMax is highlighted.
  - f. Press the **Set** key.
  - g. Press the Return (F6) submenu key.
  - h. Press the **Set** key. The Select Package list box will appear. Again select mWiMax and press Set.
  - i. Another file list will appear. Select 5m512g8\_2\_5\_cap.
  - j. Press the **Set** key.
  - k. Press the **MOD On/Off** key and verify that the LED is on. Ensure that the “Playing” indicator is displaying the moving pattern.
  - l. Press the **Frequency** key, then enter 2600.5 MHz.
  - m. Press the **Level** key, then enter  $-15$  dBm. Turn the output on.

21. Set the MT8222A as follows:
  - a. Press the Freq submenu key and set the center frequency to 2600.5 MHz.
  - b. Press the Setup submenu key and set the bandwidth to 5 MHz.
  - c. Press the CP Ratio submenu key (under the Setup submenu key) and set the CP Ratio to 1/8.
  - d. Press the Frame Length submenu key and set the Frame Length to 5 ms.
  - e. Press the Demod submenu key and set Demod to FCH.
  - f. Press the Measurements submenu key and press Demodulator, then press Modulation Summary.
22. Repeat steps 6 to 19 with the new bandwidth and frame length settings and record the results in the **5 MHz Bandwidth and 5 ms Frame Length** sections of [Table A-68](#) and [Table A-69](#).

## 5-16 DVB-T/H SFN Analyzer (Option 78)

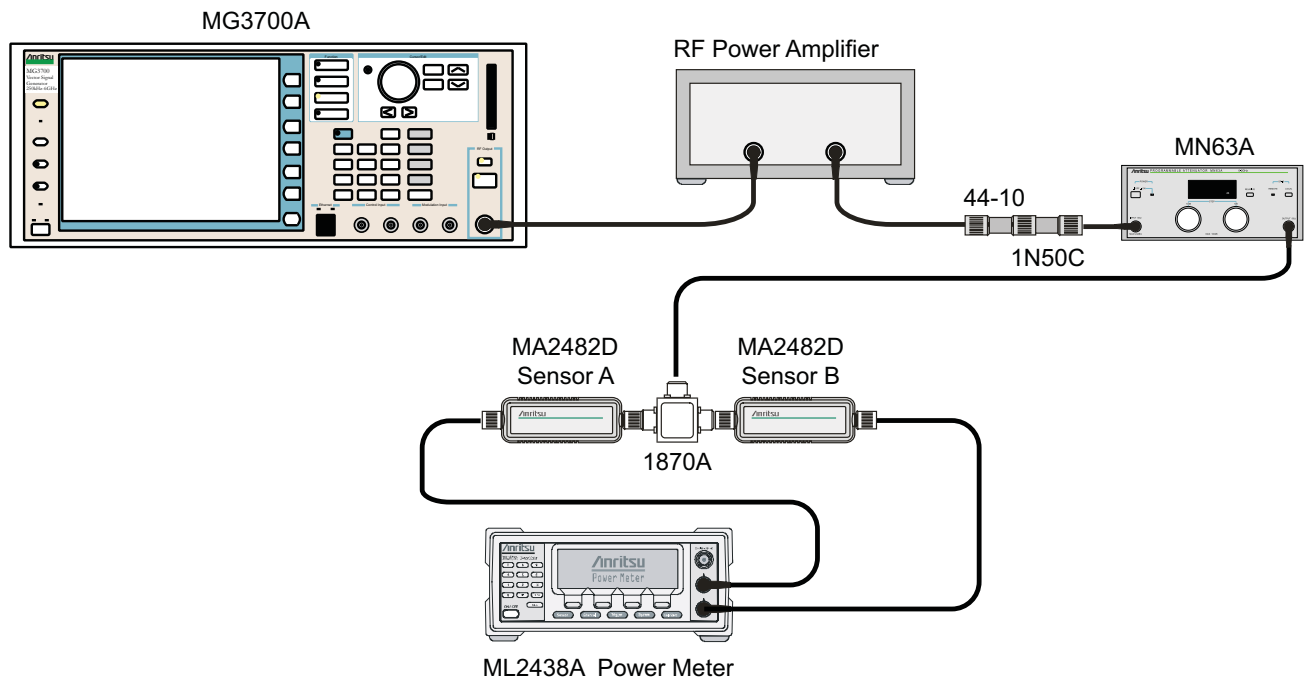
### Introduction

The tests in this section verify the performance of the optional DVB-T/H SFN Analyzer option of the MT8222A. These tests include:

- “Level Accuracy Verification”
- “1 dB Compression Level Verification”
- “Noise Floor Verification”

### Level Accuracy Verification

The tests in this section verify the level accuracy of the MT8222A in DVB-T/H SFN Analyzer mode.



**Figure 5-16.** DVB-T/H SFN Analyzer Option 78, Level Accuracy Verification – Two Sensors

### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu MN63A Programmable Attenuator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensors (2)
- Anritsu 1N50C RF Limiter
- Anritsu 34NN50A Adapter
- Anritsu 15NNF50-1.5C RF Coaxial Cables (3)
- Aeroflex/Weinschel 1870A Power Splitter
- Aeroflex/Weinschel 44-10 10 dB Fixed Attenuator
- Mini-Circuits TIA-1000-1R8 RF Power Amplifier
- Midwest Microwave ADT-2615-NF-BNM-02 Adapters (2)

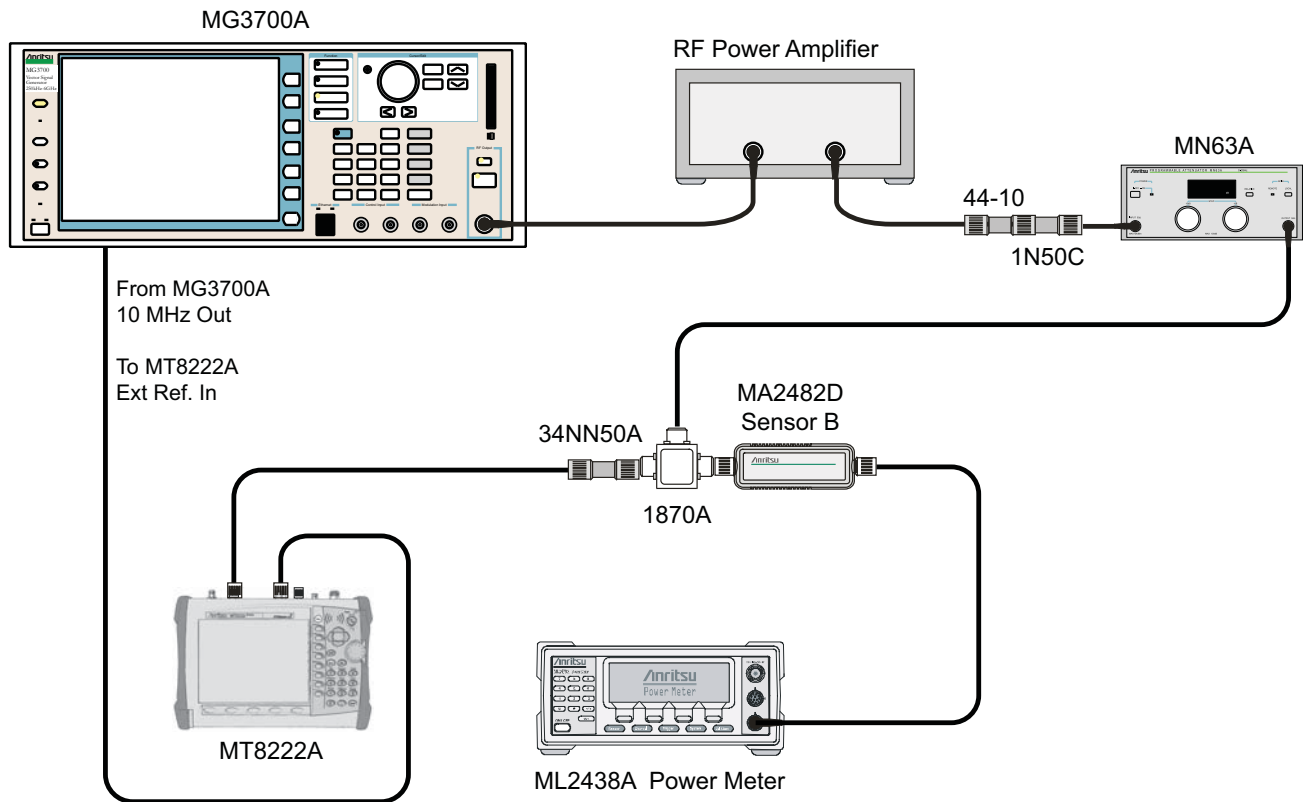
**Procedure**

1. Ensure that the Power Amplifier is off.
2. Connect the MG3700A Signal Generator, Power Amplifier with N(f) to BNC(m) Adapters, RF Limiter, MN63A Programmable Attenuator, Power Divider, Power Meter, and Power Sensors as shown in [Figure 5-16, “DVB-T/H SFN Analyzer Option 78, Level Accuracy Verification – Two Sensors”](#).
3. On MG3700A, press the yellow **Preset** key located in the upper left side of the instrument.
4. Press the **Down Arrow** key to select Yes.
5. Press the **Set** key.

<b>Note</b> The two <b>Set</b> keys and they both provide the same functions.
---

6. Press the F1 soft key to select Load File to Memory.
7. Press the F1 soft key again to select Select Package.
8. Use the **Down Arrow** key to step through the selection list until the Digital\_Broadcast option is highlighted.
9. Press the **Set** key.
10. Press the F6 soft key Return.
11. Press the **Set** key.
12. Use the **Down Arrow** key to step through the selection list until the Digital\_Broadcast option is highlighted.
13. Press the **Set** key.
14. Use the **Down Arrow** key to step through the selection list until the DVB-T\_H\_00 option is highlighted.
15. Press the **Set** key.
16. Perform Zero/Cal on Sensor A and Sensor B of the power meter. Set the cal factor of both sensors to 474 MHz.
17. Set the MG3700A frequency to 474 MHz.
18. Set the level to –25 dBm.
19. Ensure the **Modulation On/Off** key and the **Output** key both have LEDs On.
20. Turn on the power amplifier and allow it to warm up for at least 5 minutes.
21. Adjust the MN63A Attenuator so that Sensor A reading is –10 dBm ± 1 dB. Record the attenuation reading in the **AT(–10)** column, **474 MHz** row of [Table A-70, “Option 78, Readings for Sensor A, Sensor B, DAB\(–10\), and MN63A Attenuation AT\(–10\)”](#).
22. On the MG3700A, adjust the power level so that Power Meter Sensor A reading is –10.0 dBm ± 0.2 dB.
23. Record the following values to the appropriate columns in [Table A-70](#):
  - Power Meter Sensor A reading to “Sensor A Reading”
  - Power Meter Sensor B reading to “Sensor B Reading”
24. Subtract Sensor A reading from Sensor B reading and record the result to the **DAB(–10)** column in [Table A-70](#).
 
$$\text{DAB(–10)} = \text{Sensor Reading B} - \text{Sensor A Reading}$$
25. Calculate the AT(set) values for Test Levels –10 dBm through –45 dBm and record the values to the **AT(set)** column in [Table A-72, “Option 78, DVB-T/H Signal Analyzer Level Accuracy Measurement Channel = 21ch \(474 MHz\)”](#).

26. Remove Sensor A from the Power Splitter and then connect the Power Splitter to the MT8222A Spectrum Analyzer RF In with an N(m) to N(m) adapter as shown in [Figure 5-17](#).



**Figure 5-17.** DVB-T/H SFN Option 78, Level Accuracy Verification Setup - Sensor B Only

27. Record the new Power Meter Sensor B reading in the **SB(-10)** box in [Table A-72](#), “[Option 78, DVB-T/H Signal Analyzer Level Accuracy Measurement Channel = 21ch \(474 MHz\)](#)”.
28. On the MT8222A, set the mode to DVB-T/H SFN Analyzer and preset the unit.
29. Press the Meas Setup soft key and set Meas Mode to Single.
30. Press the Frequency/Level soft key and ensure Channel is 21 and Preamp is Off.
31. Change the Reference Level to -10dBm.
32. After the data appears on the left of the display, record the -10 dBm Channel Power from the MT8222A to the **M(Level)** column under “**Pre Amp Off**” in [Table A-72](#).
33. Calculate the Deviation using the following formula:

$$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \text{DAB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$

**Note** AT(-10) is the same as AT(set),  $[- \text{AT}(-10) + \text{AT}(\text{set})] = 0$

34. Record the result to the **Dev** column under “**Pre Amp Off**” in [Table A-72](#) and verify that it is within specification.
35. Set the MN63A attenuation to the next AT(set) value in [Table A-72](#).
36. Press the Frequency/Level soft key and set the Reference Level of the MT8222A to -15 dBm.
37. After the data appears on the left of the display, record the -15 dBm Channel Power from the MT8222A to the **M(Level)** column under “**Preamp Off**” in [Table A-72](#).

38. Calculate the Deviation using the following formula:

$$\text{Deviation} = M(\text{Level}) - SB(-10) - DAB(-10) - AT(-10) + AT(\text{set})$$

39. Record the result to the **Dev** column under “**Pre Amp Off**” in [Table A-72](#) and verify that it is within specification.
40. Set the MN63A attenuation to the next AT(set) value in [Table A-72](#).
41. Set the Reference Level of the MT8222A to –20 dBm.
42. After the data appears on the left of the display, record the –20 dBm Channel Power from the MT8222A the **M(Level)** column under “**Preamp Off**” in [Table A-72](#).
43. Calculate the Deviation using the following formula:
- $$\text{Deviation} = M(\text{Level}) - SB(-10) - DAB(-10) - AT(-10) + AT(\text{set})$$
44. Record the result to the **Dev** column under “**Pre Amp Off**” in [Table A-72](#) and verify that it is within specification.
45. Press the Frequency/Level soft key and set Preamp to On. Change the Reference Level if required.
46. After the data appears on the left of the display, record the –20 dBm Channel Power from the MT8222A the **M(Level)** column under “**Preamp On**” in [Table A-72](#).
47. Calculate the Deviation using the following formula:
- $$\text{Deviation} = M(\text{Level}) - SB(-10) - DAB(-10) - AT(-10) + AT(\text{set})$$
48. Record the result to the **Dev** column under “**Pre Amp On**” in [Table A-72](#) and verify that it is within specification.
49. Repeat step 43 through step 48 for Test Levels –25 dBm to –45 dBm. Change Reference Level and switch Preamp per the “**Ref Level Pre Amp On**” and “**Ref Level Pre Amp Off**” columns in [Table A-72](#).
50. Turn off the power amplifier, disconnect the power splitter from the MT8222A, reconnect Sensor A to the power splitter as shown in [Figure 5-16](#), “[DVB-T/H SFN Analyzer Option 78, Level Accuracy Verification – Two Sensors](#)”.
51. Set the MN63A attenuation to 10 dB.
52. Set the MG3700A Level to –60 dBm.
53. Turn on the power amplifier and allow it to warm up for at least 5 minutes.
54. Adjust the MN63A Attenuator so that Sensor A reading is –50 dBm ± 1 dBm. Record the attenuation reading in [Table A-71](#), “[Option 78, Readings for Sensor A, Sensor B, DAB\(–50\), and MN63A Attenuation AT\(–50\)](#)”, column **AT(–50)**.
55. On MG3700A adjust power level so that Power Meter Sensor A reading is –50.0 dBm ± 0.2 dBm.
56. Record Power Meter Sensor A reading, Power Meter Sensor B reading and MN63A Attenuation reading in [Table A-71](#).
57. Subtract Sensor A reading from Sensor B reading and record the result in the **DAB(–50)** column of [Table A-71](#).
- $$DAB(-50) = \text{Sensor B Reading} - \text{Sensor A Reading}$$
58. Calculate the AT(set) values for Test Levels –55 dBm through –84 dBm and record the values in the **AT(set)** column in [Table A-72](#).
59. Remove Sensor A from the Power Splitter and then connect the Power Splitter to the MT8222A Spectrum Analyzer RF In with an N male to N male adapter as shown in [Figure 5-17](#), “[DVB-T/H SFN Option 78, Level Accuracy Verification Setup - Sensor B Only](#)”.
60. Record the new Power Meter Sensor B reading in the **SB(–50)** box in [Table A-72](#).

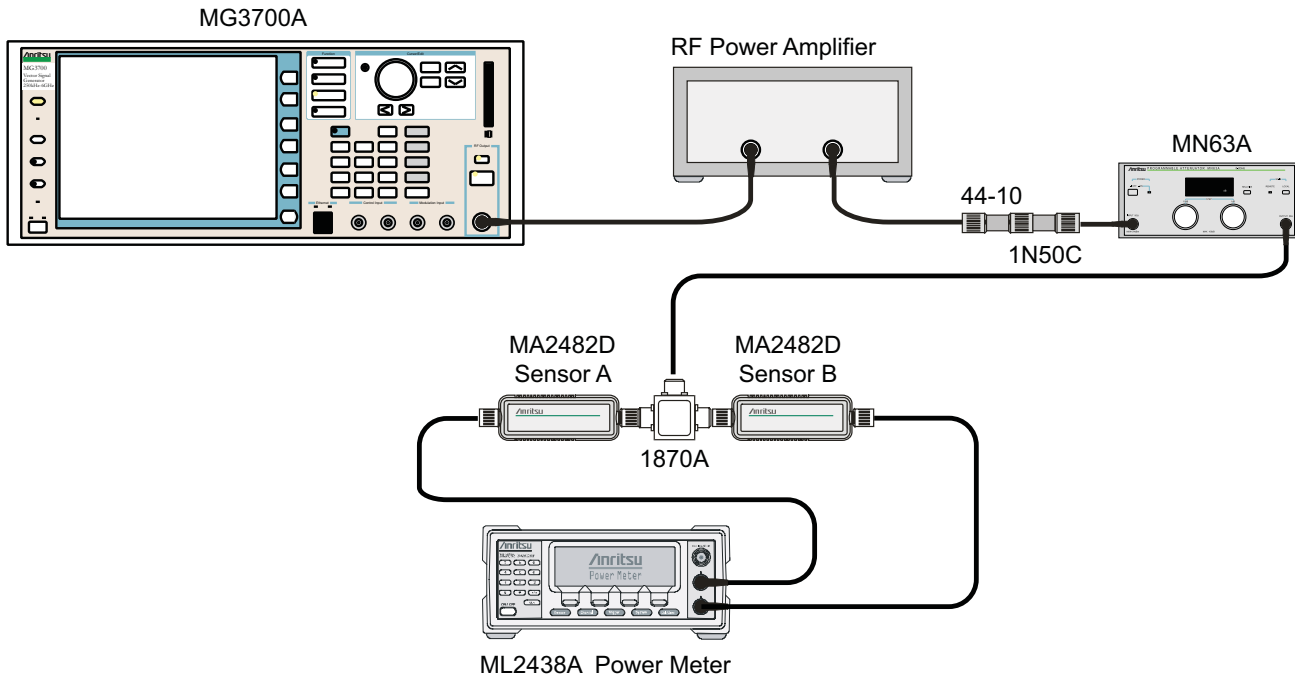
61. Repeat step 43 through step 51 for Test levels  $-50$  dBm to  $-84$  dBm. Change the Reference Level and switch Pre Amp on or off per the **Ref Level Pre Amp On/Off** column in [Table A-72](#). Use the following formula to calculate Deviation:

$$\text{Deviation} = M(\text{Level}) - SB(-50) - DAB(-50) - AT(-50) + AT(\text{set})$$

62. Repeat step 16 through step 61 for frequencies 666 MHz (Ch 45) and 858 MHz (Ch 69). Set the cal factor of both power sensors to 666 MHz or 858 MHz as required.
- For 666 MHz, Channel 45, use [Table A-73](#), “Option 78, DVB-T/H Signal Analyzer Level Accuracy Measurement Channel = 45ch (666 MHz).”
  - For 858 MHz, Channel 69, use [Table A-74](#), “Option 78, DVB-T/H Signal Analyzer Level Accuracy Measurement Channel = 69ch (858 MHz).”

## 1 dB Compression Level Verification

The tests in this section verify the accuracy of the MT8222A is not degraded by compression when operating in the DVB-T/H SFN Analyzer mode.



**Figure 5-18.** DVB-T/H SFN Analyzer Option 78, 1 dB Compression Level Verification - Two Sensors

### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu MN63A Programmable Attenuator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensors (2)
- Anritsu 1N50C RF Limiter
- Anritsu 34NN50A Adapter
- Anritsu 15NNF50-1.5C RF Coaxial Cables (3)
- Aeroflex/Weinschel 1870A Power Splitter
- Aeroflex/Weinschel 44-10 10 dB Fixed Attenuator
- Mini-Circuits TIA-1000-1R8 RF Power Amplifier
- Midwest Microwave ADT-2615-NF-BNM-02 Adapters (2)

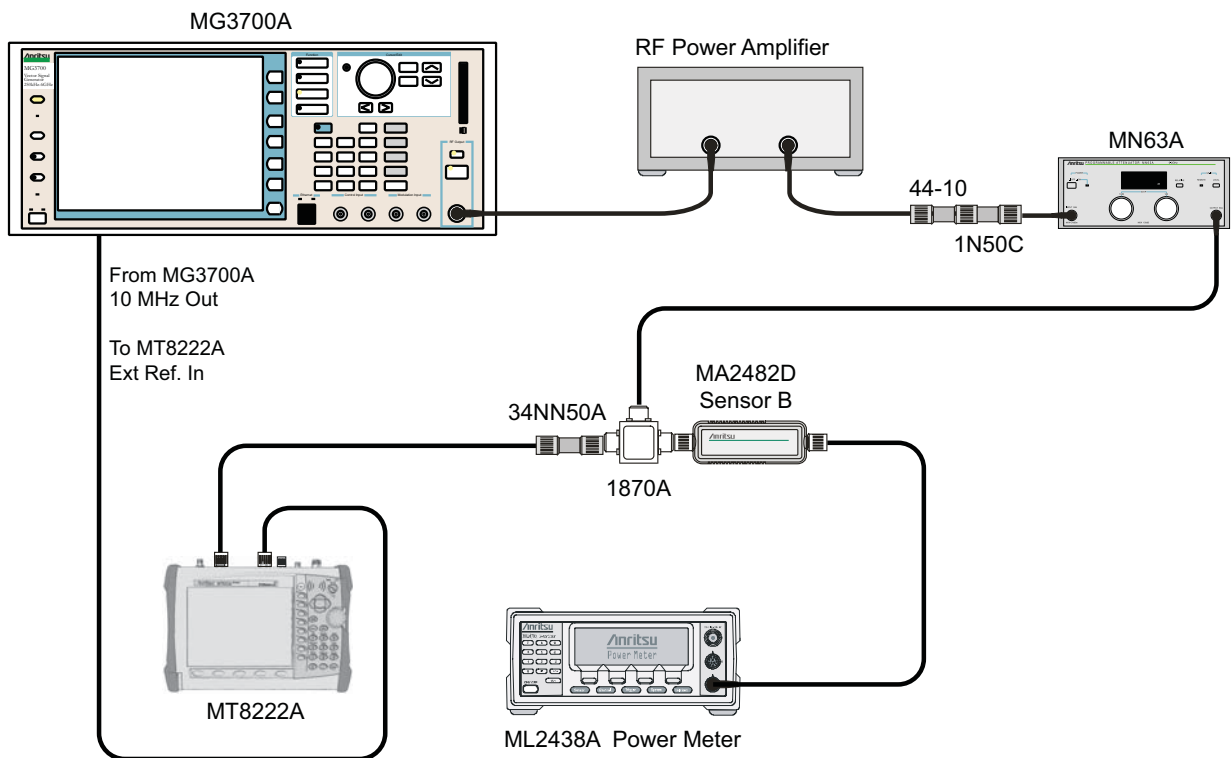


**Procedure**

1. Ensure that the Power Amplifier is off.
2. On the Power Meter, set Low Level Averaging to Low and Averaging to Moving with 50 averages. Set the Power Meter to read True RMS.
3. Perform a Zero/Cal on both sensors of the power meter.
4. Connect the MG3700A Signal Generator, Power Amplifier with N(f) to BNC(m) adapters, RF Limiter, MN63A Programmable Attenuator, Power Divider, Power Meter, and Power Sensors as shown in [Figure 5-18, “DVB-T/H SFN Analyzer Option 78, 1 dB Compression Level Verification - Two Sensors”](#).
5. On the MG3700A, press the **MOD On/Off** button to turn Modulation Off so that the **Mod On/Off LED** is Off.
6. Set the level output of the MG3700A to  $-25$  dBm.
7. Set the MN63A attenuation to 20 dB.
8. Turn on the power amplifier and allow it to warm up at least five minutes.

**474 MHz Tests**

9. Set the cal factor of both sensors to 474 MHz.
10. Set the MG3700A frequency to 474 MHz.
11. Adjust the MN63A attenuation so that the Power Meter Sensor A reading is  $-25$  dBm  $\pm$  1 dBm. Record the MN63A attenuation readout to the **AT(-25) column** of [Table A-75, “Option 78, Readings for Sensor A and MN63A Attenuation at AT\(-25\), AT\(-15\), AT\(-50\), and AT\(-43\)”](#).
12. Remove Sensor A from the splitter and connect the MT8222A RF In to the open end of the splitter using an adapter as shown in [Figure 5-19, “DVB-T/H SFN Analyzer Option 78, 1 dB Compression Level Verification – Sensor B Only”](#)

**Figure 5-19.** DVB-T/H SFN Analyzer Option 78, 1 dB Compression Level Verification – Sensor B Only

13. Set the MT8222A to DVB-T/H SFN Analyzer mode and preset the unit.
14. Press the Meas Setup soft key and set Meas Mode to Single.
15. Press the Frequency/Level soft key and ensure the MT8222A Channel is set to 21 and Preamp is Off.
16. Set the Reference Level to  $-25$  dBm.
17. Record the MT8222A Channel Power reading, MeasCP( $-25$ ), to the  **$-25$  dBm Test Level** row in [Table A-76, “Option 78, DVB-T/H Signal Analyzer 1 dB Compression Level \(Pre Amp Off\)”](#).
18. Calculate the difference, Delta( $-25$ ), using the following formula:  

$$\text{Delta}(-25) = M(\text{Sa}) - \text{MeasCP}(-25)$$
19. Record the result to the **Delta** column in [Table A-76](#). Verify that the result is less than 1 dB.
20. Calculate AT( $-15$ ) using the following formula:  

$$\text{AT}(-15) = \text{AT}(-25) - 10$$
21. Set the MN63A attenuation to AT( $-15$ ).

<b>Note</b>	The Over Range message on the MT8222A is normal.
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22. Record the MT8222A Channel Power reading, MeasCP( $-15$ ), to the  **$-15$  dBm Test Level** row of the **Meas Value** column in [Table A-76](#).
23. Calculate the Delta at  $-15$  dBm Input using the following formula:  

$$\text{Delta}(-15) = M(\text{Sa}) + 10 - \text{MeasCP}(-15) + \text{Delta}(-25)$$
24. Record the result to the Delta column in [Table A-76](#). Verify that it is less than 1 dB.
25. Calculate the value of AT( $-50$ ) using the following formula:  

$$\text{AT}(-50) = \text{AT}(-25) + 25$$
26. Adjust the MN63A attenuation to AT( $-50$ ).
27. Set the Reference Level on the MT8222A to  $-50$  dBm and turn the Preamp On.
28. Record the MT8222A Channel Power reading, MeasCP( $-50$ ), to the  **$-50$  dBm Test Level** row, **Meas. Value** column in [Table A-77, “Option 78, DVB-T/H Signal Analyzer 1 dB Compression Level \(Pre Amp On\)”](#).
29. Calculate the Delta at  $-50$  dBm Input, Delta( $-50$ ), using the following formula:  

$$\text{Delta}(-50) = M(\text{Sa}) - 25 - \text{MeasCP}(-50) + \text{Delta}(-25)$$
30. Record the result to the Delta column in [Table A-77](#). Verify that it is less than 1 dB.
31. Calculate the AT( $-43$ ) using the following formula:  

$$\text{AT}(-43) = \text{AT}(-25) + 18$$
32. Set the MN63A attenuation to AT( $-43$ ).

<b>Note</b>	The Over Range message on the MT8222A is normal.
-------------	--

33. Record the MT8222A Channel Power reading, MeasCP( $-43$ ), in the  **$-43$  dBm Test Level** row, **Meas. Value** column in [Table A-77](#).
34. Calculate the Delta at  $-43$  dBm Input, Delta( $-43$ ), using the following formula:  

$$\text{Delta}(-43) = M(\text{Sa}) - 18 - \text{MeasCP}(-43) + \text{Dev}(-50)$$
35. Record the result to the **Delta** column in [Table A-77](#). Verify that it is less than 1 dB.

**666 MHz Tests**

36. Remove the MT8222A from the test setup and reinstall Sensor A to the open splitter output as shown in [Figure 5-18, “DVB-T/H SFN Analyzer Option 78, 1 dB Compression Level Verification - Two Sensors”](#)
37. Set the MG3700A frequency to 666 MHz and ensure the **Mod On/Off LED** is Off.
38. Set the cal factor of both sensors to 666 MHz.
39. Adjust the MN63A attenuation so that the Power Meter Sensor A reads  $-25 \text{ dBm} \pm 1 \text{ dBm}$ . Record the MN63A attenuation readout to the **AT(-25)** column in [Table A-75](#).
40. Adjust the Level of the MG3700A so that the Power Meter Sensor A reads  $-25.0 \text{ dBm} \pm 0.05 \text{ dBm}$ . Record the Sensor A reading to the **M(Sa)** column in [Table A-75](#).
41. Remove Sensor A from the splitter and connect the MT8222A RF In to the open end of the splitter using an adapter as shown above in [Figure 5-19, “DVB-T/H SFN Analyzer Option 78, 1 dB Compression Level Verification – Sensor B Only”](#)
42. Set the MT8222A Channel to 45.
43. Set Preamp to Off and Reference Level to  $-25 \text{ dBm}$ .
44. Repeat step 17 through step 36 and record the results in [Table A-77, “Option 78, DVB-T/H Signal Analyzer 1 dB Compression Level \(Pre Amp On\)](#).

**858 MHz Tests**

45. Remove the MT8222A from the test setup and reinstall Sensor A to the open splitter output as shown in [Figure 5-18, “DVB-T/H SFN Analyzer Option 78, 1 dB Compression Level Verification - Two Sensors”](#).
46. Set the MG3700A frequency to 858 MHz and ensure the **Mod On/Off LED** is Off.
47. Set the cal factor of both sensors to 858 MHz.
48. Adjust the MN63A attenuation so that the Power Meter Sensor A reads  $-25 \text{ dBm} \pm 1 \text{ dBm}$ . Record the MN63A attenuation readout to the AT(-25) column in [Table A-75](#).
49. Adjust the Level of the MG3700A so that the Power Meter Sensor A reading is  $-25.0 \text{ dBm} \pm 0.05 \text{ dBm}$ .
50. Record the Sensor A reading to the **M(Sa)** column in [Table A-75](#).
51. Remove Sensor A from the splitter and connect the MT8222A RF In to the open end of the splitter using an adapter as shown in above in [Figure 5-19, “DVB-T/H SFN Analyzer Option 78, 1 dB Compression Level Verification – Sensor B Only”](#).
52. Set the MT8222A Channel to 69.
53. Set Preamp to Off and Reference Level to  $-25 \text{ dBm}$ .
54. Repeat step 17 through step 36 and record the results in [Table A-77](#).

## Noise Floor Verification

The tests in this section verify the noise floor of the MT8222A in DVB-T/H SFN Analyzer mode.

### Equipment Required

- Anritsu 28N50-2 50 ohm Termination

### Procedure

1. Set the mode of the MT8222A to DVB-T/H SFN Analyzer and preset the unit.
2. Install a 50 ohm termination to the Spectrum Analyzer RF In connector.
3. Set the Channel to 21 and set the Preamp to Off.
4. Set the Reference Level to  $-25$  dBm.
5. Record the Channel Power [dBm] as shown in the lower left corner of the display in the **Preamp Off** column, **Channel 21** row in [Table A-78, "Option 78, DVB-T/H Signal Analyzer Noise Floor"](#).
6. Set the Preamp to On and change the Reference Level to  $-50$  dBm.
7. Record the Channel Power [dBm] as shown in the lower left corner of the display in the **Preamp On** column, **Channel 21** row in [Table A-78](#).
8. Change the Channel to 45, and set the Preamp to Off.
9. Repeat step 4 through step 7 for Channel 45 and record the results in [Table A-78](#).
10. Change the Channel to 69, set Preamp to Off.
11. Repeat step 4 through step 7 for Channel 69 and record the results in [Table A-78](#).

## 5-17 LTE Signal Analyzer (Option 541 and/or 542)

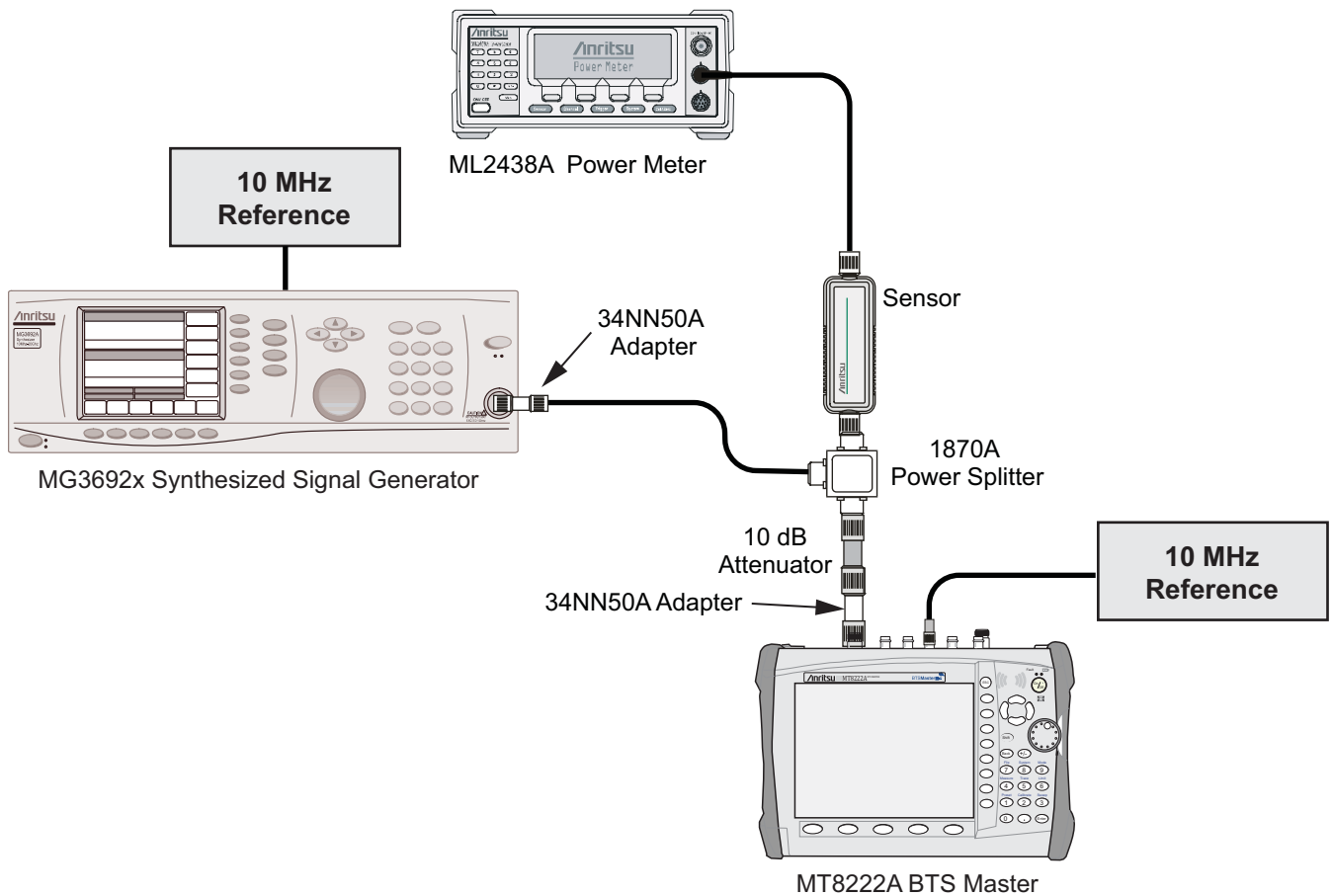
The tests in this section verify the functionality of the LTE Signal Analyzer of the MT8222A BTS Master. There are tests for the following:

- “LTE Channel Power Accuracy Tests (Option 541)” on page 5-78
- “LTE Residual EVM and Frequency Error Tests (Option 542)” on page 5-79

### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensor
- Anritsu 34NN50A Adapter (2)
- Anritsu 15NNF50-1.5C RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Aeroflex/Weinschel 44-10 10 dB Fixed Attenuator (2)
- Anritsu PN 3-806-169 Coaxial Cable
- 10 MHz Reference Standard

### Procedure



**Figure 5-20.** LTE Signal Analyzer Option Verification

## LTE Channel Power Accuracy Tests (Option 541)

The tests in this section verify the function of the optional LTE Signal Analyzer in Model MT8222A BTS Master.

### Procedure

1. Connect the MA2482D Power Sensor to the power meter and zero the meter.
2. Set the Power Meter Measurement MODE to True RMS, set Averaging MODE to Moving, and set Averaging NUMBER to 256.
3. Set the calibration factor frequency of the power sensor to 750 MHz.
4. Connect the Power Sensor, 1870A splitter, 10 dB attenuators (quantity 2), as shown in [Figure 5-20](#), “LTE Signal Analyzer Option Verification”.

<b>Note</b> The LTE pattern requires a Waveform Data license MX370108A that must be purchased.
--

<b>Note</b> Both <b>Set</b> keys on the MG3700A perform the same function.
--

5. Set the MG3700A as follows:
  - a. Press the yellow **Preset** button (answer yes to the question).
  - b. Press the **Set** key.
  - c. Press the (F1) soft key to select Load File to Memory.
  - d. Press the (F1) soft key again to select Select Package.
  - e. Using the **Down Arrow** key step through the selection list until “LTE\_DL\_E-TM” is highlighted.
  - f. Press the **Set** key.
  - g. Press the (F6) soft key Return.
  - h. Press the **Set** key. The Select Package list box will appear. Again select LTE\_DL\_E-TM and then the **Set** key.
  - i. Another file list will appear. Select (highlight) E-TM\_1-1\_10M.
  - j. Press the **Set** key.
  - k. Press the **MOD On/Off** key and verify that the LED is On. Confirm that the “playing” indicator is displaying the moving pattern.
  - l. Press the **Frequency** key, then enter 750 MHz.
  - m. Press the **Level** key, then enter 2 dBm.
  - n. Turn the output On.
6. Adjust the MG3700A Level setting with the knob so that the power meter reads  $-10.0 \text{ dBm} \pm 0.5 \text{ dB}$ .
7. Set the MT8222A to LTE Signal Analyzer mode and preset the unit.
8. Set the MT8222A as follows:
  - a. Press the Freq soft key and set the Center Freq to 750 MHz.
  - b. Press the Measurements soft key and select RF, then select Channel Spectrum.
9. Record the MT8222A Channel Power reading in the **750 MHz, -10 dBm** row, **Measured Channel Power** column in [Table A-79](#), “Option 541, LTE Channel Power Accuracy”.
10. Calculate the Channel Power Error by subtracting the MT8222A Channel Power reading from the power meter reading in Step 6. Record the result in the **750 MHz, -10 dBm** row, **Error** column in [Table A-79](#).
11. Verify that the error is within specification.

12. Adjust the MG3700A Level setting to approximately  $-33$  dBm so that the power meter reads  $-50.0$  dBm  $\pm 0.5$  dB.
13. Record the MT8222A Channel Power reading in the **750 MHz,  $-50$  dBm** row, **Measured Channel Power** column in [Table A-79](#).
14. Calculate the Channel Power Error by subtracting the MT8222A Channel Power reading from the power meter reading that was recorded in Step 13. Record the result in the **750 MHz,  $-50$  dBm** row, **Error** column in [Table A-79](#).
15. Verify that the error is within specification.
16. Set the calibration factor frequency of the power sensor to 2150 MHz.
17. Set the MG3700A frequency to 2100 MHz. Press the **Set** key.
18. Change the MT8222A center frequency to 2150 MHz.
19. Measure the Channel Power for  $-10$  dBm and  $-50$  dBm and then record the measured result and the calculated error in the **2150 MHz** rows in [Table A-79](#).

## LTE Residual EVM and Frequency Error Tests (Option 542)

The tests in this section verify the function of the optional Mobile WiMAX Signal Analyzer in Model MT8222A BTS Master.

### Procedure

1. Connect the MA2482D Power Sensor to the power meter and zero the meter.
2. Set the Power Meter Measurement MODE to True RMS, set Averaging MODE to Moving, and set Averaging NUMBER to 256.
3. Set the calibration factor frequency of the power sensor to 750 MHz.
4. Connect the Power Sensor, 1870A splitter, 10 dB attenuators (quantity 2), as shown in [Figure 5-20](#).

<b>Note</b>	The LTE pattern requires a Waveform Data license MX370108A that must be purchased.
-------------	--

<b>Note</b>	Both <b>Set</b> keys on the MG3700A perform the same function.
-------------	--

5. Set the MG3700A as follows:
  - a. Press the yellow **Preset** button (answer yes to the question).
  - b. Press the **Set** key
  - c. Press the (F1) soft key to select Load File to Memory.
  - d. Press the (F1) soft key again to select Select Package.
  - e. Using the **Down Arrow** key step through the selection list until LTE\_DL\_E-TM is highlighted.
  - f. Press the **Set** key.
  - g. Press the (F6) soft key Return.
  - h. Press the **Set** key. The Select Package list box will appear. Again select LTE\_DL\_E-TM and **Set**.
  - i. Another file list will appear. Select (highlight) E-TM\_3-1\_10M.
  - j. Press the **Set** key.
  - k. Press the **MOD On/Off** key and verify that the LED is On. Confirm that the “playing” indicator is displaying the moving pattern.
  - l. Press the **Frequency** key, then enter 750 MHz.

- m. Press the **Level** key, then enter 2 dBm.
        - n. Turn the output On.
6. Adjust the MG3700A Level setting with the knob so that the power meter reads  $-10.0 \text{ dBm} \pm 0.5 \text{ dB}$ .
7. Set the MT8222A to LTE Signal Analyzer mode and preset the unit.
8. Set the MT8222A as follows:
  - a. Press the Freq soft key and set the Center Freq to 750 MHz.
  - b. Press the Measurements soft key and select Modulation Measurements.
  - c. Press the Constellation soft key.
9. Record the MT8222A Residual EVM and Frequency Error reading in the **750 MHz, -10 dBm** section of [Table A-80, "Option 542, LTE Residual EVM and Frequency Accuracy"](#).
10. Verify that the values are within specification.
11. Adjust the MG3700A Level setting to approximately  $-33 \text{ dBm}$  so that the power meter reads  $-50.0 \text{ dBm} \pm 0.5 \text{ dB}$ .
12. Record the MT8222A Residual EVM and Frequency Error reading in the **750 MHz, -50 dBm** section of [Table A-80](#).
13. Verify that the values are within specification.
14. Set the calibration factor frequency of the power sensor to 2150 MHz.
15. Set the MG3700A frequency to 2150 MHz. Press the **Set** key.
16. Adjust the MG3700A Level setting with the knob so that the power meter reads  $-10.0 \text{ dBm} \pm 0.5 \text{ dB}$ .
17. Change the MT8222A center frequency to 2150 MHz.
18. Record the MT8222A Residual EVM and Frequency Error reading in the **2150 MHz, -10 dBm** section of [Table A-80](#).
19. Verify that the values are within specification.
20. Adjust the MG3700A Level setting to approximately  $-33 \text{ dBm}$  so that the power meter reads  $-50.0 \text{ dBm} \pm 0.5 \text{ dB}$ .
21. Record the MT8222A Residual EVM and Frequency Error reading in the **2150 MHz, -50 dBm** section of [Table A-80](#).
22. Verify that the values are within specification.



# Chapter 6 — Battery Information

## 6-1 General Information

The following information relates to the care and handling of the Anritsu 633-44 battery pack and Lithium-Ion batteries in general.

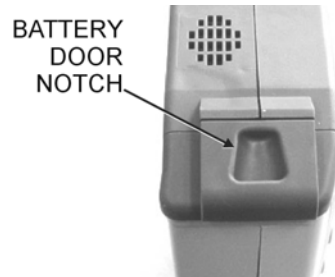
- The 633-44 battery pack supplied with the MT8222A may need charging before use. Before using the MT8222A, the internal battery may be charged either in the MT8222A, using either the AC-DC Adapter (40-168) or the 12-Volt DC adapter (806-141), or separately in the optional Dual Battery Charger (2000-1374).
- Use only Anritsu approved battery packs. Some non-approved battery packs will fit into the MT8222A, but are electrically incompatible and will not charge correctly.
- Recharge the battery only in the MT8222A or in an Anritsu approved charger.
- When the MT8222A or the charger is not in use, disconnect it from the power source.
- Do not charge batteries for longer than 24 hours; overcharging may shorten battery life.
- If left unused a fully charged battery will discharge itself over time.
- Temperature extremes affect the ability of the battery to charge: allow the battery to cool down or warm up as necessary before use or charging.
- Discharge the battery from time to time to improve battery performance and battery life.
- The battery can be charged and discharged hundreds of times, but it will eventually wear out.
- The battery may need to be replaced when the operating time between charging becomes noticeably shorter than normal.
- Never use a damaged or worn out charger or battery.
- Storing the battery in extreme hot or cold places will reduce the capacity and lifetime of the battery.
- Never short-circuit the battery terminals.
- Do not drop, mutilate or attempt to disassemble the battery.
- Do not dispose of batteries in a fire!
- Batteries must be recycled or disposed of properly. Do not place batteries in household garbage.
- Always use the battery for its intended purpose only.

## 6-2 Battery Pack Removal and Replacement

This section provides instructions for the removal and replacement of the MT8222A battery pack.

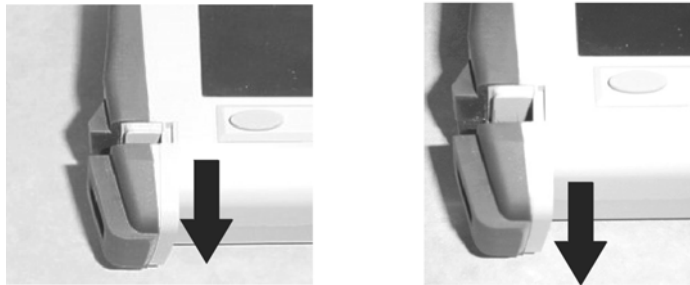
Many of the procedures in this section are generic, and apply to many similar instruments. Photos and illustrations used are representative and may show instruments other than the MT8222A.

1. With the MT8222A laying flat, face up, on a stable surface, locate the battery access door, as illustrated in [Figure 6-1](#).



**Figure 6-1.** Battery Access Door Notch

2. Place a finger in the battery access door notch and push the door down towards the bottom of the instrument, as illustrated in [Figure 6-2](#).



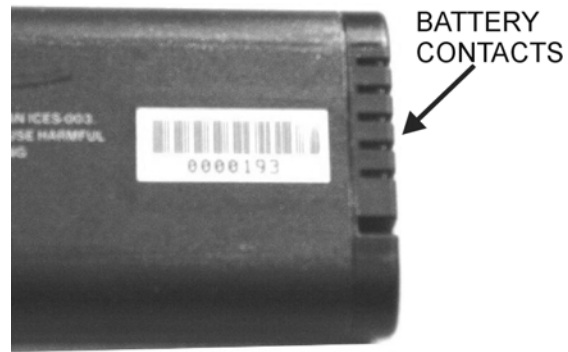
**Figure 6-2.** Removing the Battery Access Door

3. Remove the battery access door.
4. With the battery access door completely removed, grasp the flexible handle of the battery and pull the battery straight out of the unit ([Figure 6-3](#)).



**Figure 6-3.** Removing the Battery

5. Replacement is the opposite of removal. Note the orientation of the battery contacts, and be sure to insert the new battery with the contacts facing the bottom of the unit ([Figure 6-4](#)).



**Figure 6-4.** Battery Contacts



# Chapter 7 — Assembly Replacement

This chapter describes the removal and replacement procedures for the various assemblies. [Table 1-5, “Replacement Parts”](#) on page 1-6 lists the replaceable parts. The following removal and replacement procedures are included in this chapter:

- “Opening the MT8222A Case”
- “Removing the Spectrum Analyzer PCB”
- “Removing the VNA Module”
- “Removing the Main PCB/LCD Assembly”
- “Main PCB Real Time Clock (RTC) Battery Removal and Replacement”
- “Main Keypad Membrane and PCB Replacement”
- “Replacing the Function Key Keypad”
- “Function Key Membrane and Switchpad Replacement”

## Caution

Only qualified personnel should open the case and replace internal assemblies. Assemblies shown in [Table 1-5, “Replacement Parts”](#) are typically the only items that may be replaced. Because they are highly fragile, items that must be soldered may not be replaced without specialized training.

Removing RF shields from PC boards or adjustment of screws on or near the shields may detune sensitive RF circuits and will result in degraded instrument performance. All work should be performed in a static-safe work area.

## 7-1 Opening the MT8222A Case

This procedure provides instructions for opening the MT8222A case. Except for keypad parts replacement (see sections later in this chapter), the case must be opened for all maintenance operations.

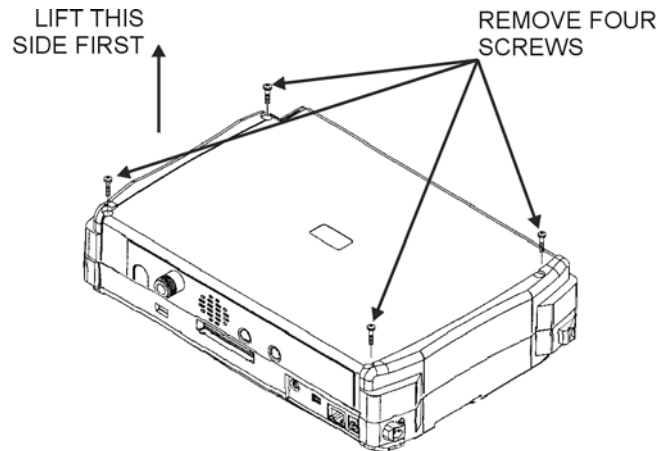
**Caution**

The MT8222A contains components that can be easily damaged by electrostatic discharge (ESD). An ESD safe work area and proper ESD handling procedures that conform to ANSI/ESD S20.20-1999 or ANSI/ESD S20.20-2007 is mandatory to avoid ESD damage when handling subassemblies or components found in the MT8222A instrument.

Before opening the case, it is strongly recommended that all internally saved files be saved to a PC using the Master Software Tools utility program or copied to an external CF card on the MT8222A. In the event that the Main PCB needs to be replaced, this will prevent permanent loss of these files.

To open the MT8222A case:

1. On the RF connector panel, remove the four small Phillips-head screws surrounding the Spectrum Analyzer RF In connector.
2. Remove the battery door and battery as shown in [Figure 6-1](#) and [Figure 6-2](#).
3. Place the MT8222A face down.
4. Use a Phillips screwdriver to remove the four screws securing the two halves of the MT8222A case together ([Figure 7-1](#)).



**Figure 7-1.** Remove the Four Screws

5. Remove the four small screws surrounding the SPA RF In connector.

6. Stand the unit up in the normal operating position and separate the two halves by about 2 inches. Three cables must be disconnected before the two halves can be separated:

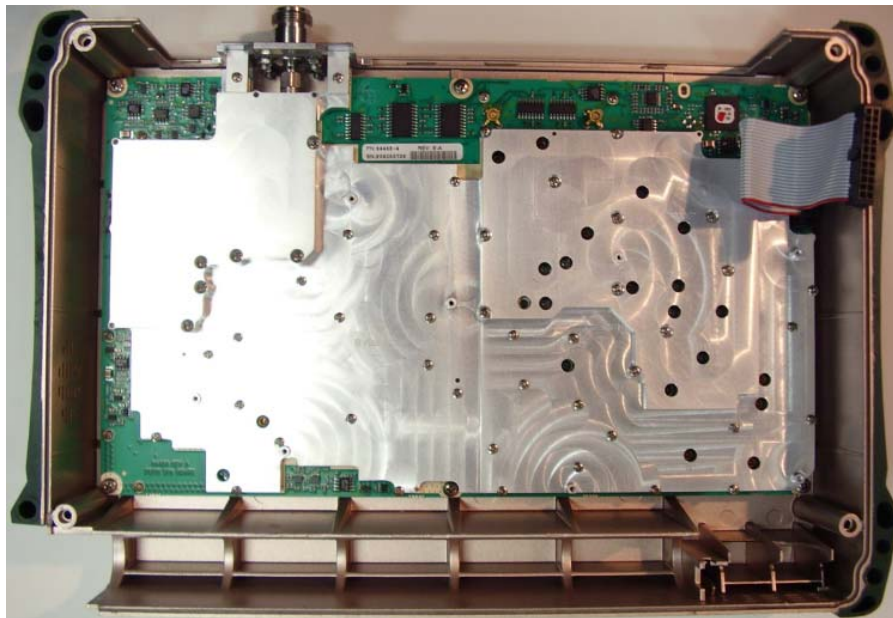


**Figure 7-2.** Separating the Case

7. Under the VNA RF In connector is a 7 cm long ribbon cable. Disconnect either side of this ribbon cable.
8. Unplug the two RF cables plugged into the top of the Spectrum Analyzer PCB (see [Figure 7-2](#)). The two halves of the MT8222A can now be completely separated.

## 7-2 Removing the Spectrum Analyzer PCB

The Spectrum Analyzer PCB is attached to the case bottom cover and can be removed from the case cover by removing the six larger screws around the edge of the PCB (see [Figure 7-3](#)). Do not loosen or remove any smaller size screws from the Spectrum Analyzer assembly.



**Figure 7-3.** Spectrum Analyzer PCB

## 7-3 Removing the VNA Module

The VNA module, Main PCB, and LCD are mounted together (in that order) and mounted to the case top cover. To continue with disassembly, the VNA module (and Option 5 or 5x PCB, if present) must first be disconnected from the Main PCB (see [Figure 7-4](#)).



**Figure 7-4.** VNA Module

### VNA Module and Option 5 or 50, 51, 52, 53 PCB Removal and Replacement

If the unit is fitted with Option 5, 50, 51, 52, or 53, a small PCB is mounted on the VNA module which will need to be removed in most cases. The PCB is different for each of the options. Earlier revisions of this PCB cover a screw which prevents removal of the VNA module and Main PCB, and in this situation, the Option 5 or 5x PCB must be removed.

#### Regarding returns to factory:

If the unit has Option 5 and the VNA module is to be replaced, the Option 5 PCB should not be returned to the factory with the VNA module.

If the unit has Option 50 and the VNA module is to be replaced, the Option 50 PCB must be returned to the factory mounted on the VNA module.

If the unit has Options 51, 52, or 53, and the VNA module is to be replaced, the Option PCB should not be returned to the factory with the VNA module.

If the unit has Option 31 (GPS) use a T1451 socket to remove the special nut on the RF panel. Securely tape the Option 31 connector to an RF shield on the VNA module so that the weight of the GPS connector does not strain the GPS wire.

If the unit is fitted with Option 5, the small PCB is mounted on the VNA module which will need to be removed. If the VNA module is to be replaced, the Option 5 PCB should not be returned to the factory with the VNA module.

If the unit has Option 31 (GPS) use a T1451 socket to remove the decorative nut on the RF panel. Securely tape the Option 31 connector to an RF shield on the VNA module so that the weight of the GPS connector does not strain the GPS wire.



1. After removing the Option 5 PCB, use a 7 mm wrench to hold the standoffs under the seven mounting screws that attach the VNA board. Remove all nine screws that are holding the VNA module to the Main PCB (see [Figure 7-4](#)).
2. Unplug all snap-in RF cables that hold the module to the Main PCB and lift off the VNA module. Do not remove any RF cables that have a wrench-type connector. There are no replaceable parts on the VNA module except the Option 5 board.

Replacement of the VNA module and Option 5 PCB is the opposite of removal.

## 7-4 Removing the Main PCB/LCD Assembly

1. Make note of the cable locations and routing. Unplug all snap-in RF cables. Push the external CF card ejector button to the in position. Using a 7 mm wrench, remove the 7 standoffs that hold the Main PCB in the case. Because of the “Lok-Tite” used, these standoffs may be somewhat difficult to remove.
2. Unplug the cables to the fan, battery pack connector, and knob from the Main PCB. Lift the Main PCB/LCD assembly out of the case.

### Removing the LCD and Backlight Driver PCB from the Main PCB

1. Using a tool such as tweezers or a knife blade, gently unplug one end of the 4 cm long LCD digital data cable (wraps around the edge of the Main PCB). Unplug the 8-wire bias cable that connects between the backlight driver PCB and the Main PCB. Unplug the high voltage wires at the connector on the backlight driver PCB.
2. Remove the four screws that attach the LCD to the Main PCB. Remove the two screws that attach the backlight driver PCB to the Main PCB.
3. Lift off the LCD and backlight driver PCB.

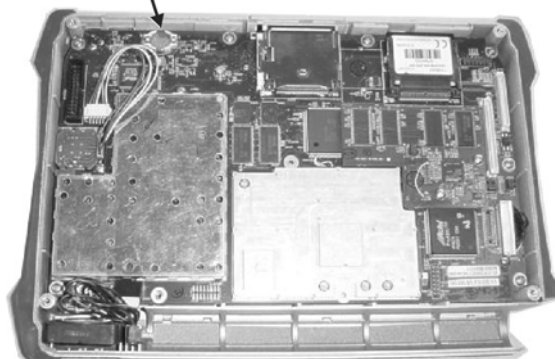
Replacement is the opposite of removal. Before installing the Main PCB/LCD assembly into the case, ensure all wires of the LCD bias cable are pushed under the backlight driver PCB where they cannot interfere with the keyboard connector.

<b>Note</b>	The Main PCB assembly and the Spectrum Analyzer module are always replaced as a set. See <a href="#">Table 1-5, “Replacement Parts”</a> on <a href="#">page 1-6</a> for the correct part number for the set.
-------------	--

## 7-5 Main PCB Real Time Clock (RTC) Battery Removal and Replacement

Refer to [Figure 7-5](#) for the location of this battery. Refer to the parts list in [Table 1-5, “Replacement Parts”](#) on page 1-6 for the battery part number.

REAL TIME CLOCK BATTERY



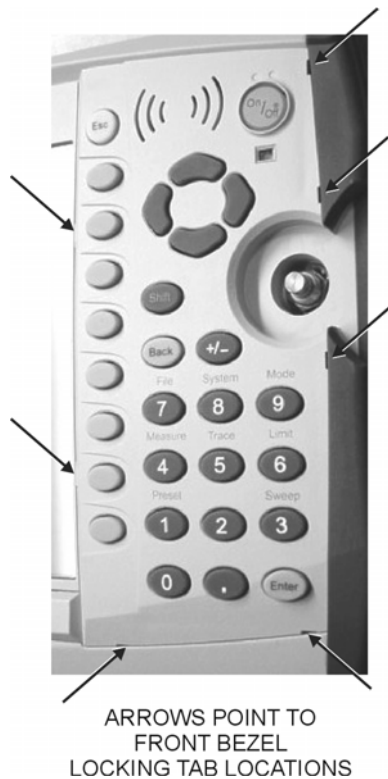
**Figure 7-5.** RTC Battery Location

1. Carefully remove the old battery.
2. Install the new battery with positive side (+) facing up.
3. Apply two small drops of RTV compound bridging the top of the battery and the holder to hold the battery secure.

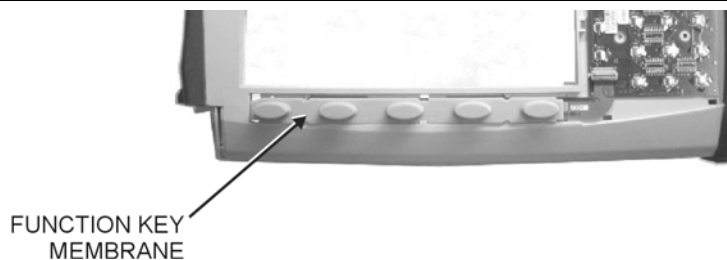
## 7-6 Main Keypad Membrane and PCB Replacement

This procedure provides instructions for removing and replacing the main keypad (on the right of the LCD) membrane and PCB. All keypad parts can be replaced without opening the MT8222A case.

1. Place the instrument face up.
2. There are eight locking tabs holding the keypad bezel to the case. Using a small flat-blade screwdriver, carefully pry the front bezel locking tabs free of the main body of the case. This will expose the keypad membrane (see [Figure 7-6](#) and [Figure 7-7](#)).



**Figure 7-6.** Front Bezel



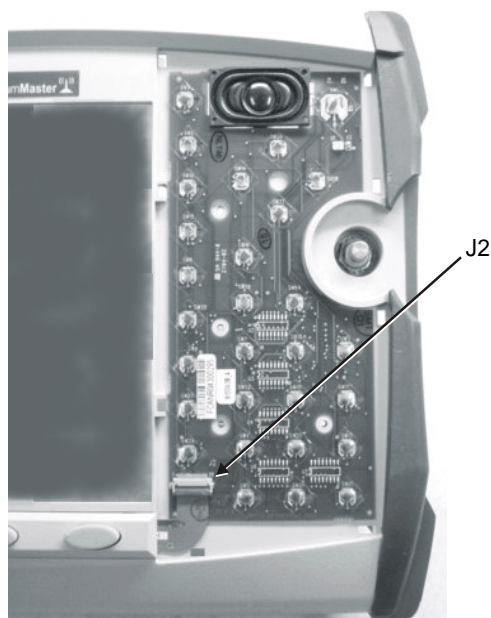
**Figure 7-7.** Function Key Membrane

3. Remove the keypad membrane by carefully lifting the speaker and pulling the membrane off of the keypad PCB.

**Note** The speaker is held in place by four locating pins on the inside of the keypad bezel. When the keypad bezel is removed, the speaker is held only by the fragile connecting wires. Use care not to damage the speaker wires when removing or replacing the keypad membrane or PCB.

## 7-7 Replacing the Function Key Keypad

1. Disconnect the function key flexible switchpad from J2 of the keypad PCB by carefully lifting the locking tab on connector J2 to release the flexible switchpad (Figure 7-8).



**Figure 7-8.** Function Key Keypad

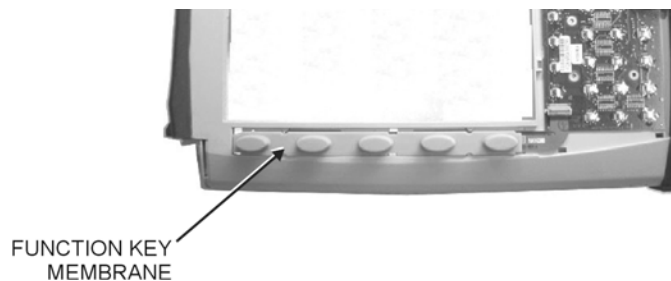
2. Remove the keypad PCB, taking care not to damage the speaker wires.
3. Reverse the above steps to install the replacement assembly, with the following cautions:  
Carefully close the locking tab on connector J2 to secure the flexible switchpad connection. The tab should “snap” into position when fully closed.

Insert the membrane over the keypad PCB, and under the speaker. Take care to properly orient the membrane so that the rubber pins are aligned with the keypad switches on the PCB. The speaker is held in place by four locating pins on the inside of the keypad bezel. Verify that the four locating pins are properly seated into the four corner holes of the speaker when reinstalling the bezel. Verify that all locking tabs are fully seated into the main body of the case when reinstalling the bezel.

## 7-8 Function Key Membrane and Switchpad Replacement

This procedure provides instructions for replacing the function key membrane and switchpad. All keypad parts can be replaced without opening the MT8222A case.

1. Place the instrument face up on a static protected work surface.
2. Remove the keypad bezel and membrane as directed in the section immediately above.
3. There are six locking tabs holding the function key bezel to the case. Using a small flat blade screwdriver or knife blade, carefully pry the function key bezel locking tabs free of the main body of the case. This will expose the function key membrane.
4. Remove the function key membrane by gently pulling the membrane up and away from the front panel (Figure 7-9).



**Figure 7-9.** Function Key Membrane

5. Disconnect the function key flexible switchpad from J2 of the keypad PCB by carefully lifting the locking tab on connector J2 to release the flexible switchpad.
6. Reverse the above steps to install the replacement switchpad or membrane.
7. Carefully close the locking tab on connector J2 to secure the flexible switchpad connection. The tab should “snap” into position when fully closed.



# Chapter 8 — Troubleshooting

This chapter describes the primary troubleshooting operations that can be performed by all Anritsu Service Centers. Perform the troubleshooting suggestions in the order they are listed. Operators of the MT8222A should refer to the User Guide for troubleshooting help.

Only qualified Anritsu personnel should replace internal assemblies. Major subassemblies shown in [Table 1-5, “Replacement Parts” on page 1-6](#) are typically the items that may be replaced. Because they are highly fragile, items that must be soldered may not be replaced without special training. Removal of RF shields from PC boards or adjustment of screws on or near the shields will detune sensitive RF circuits and will result in degraded instrument performance.

## Turn-on Problems

### Unit cannot boot-up, no activity occurs when the On/Off key is pressed:

1. Battery may be fully discharged. Use an external charger (Anritsu part number 2000-1374) to charge a completely discharged battery.
2. Battery may be the wrong type. Use only Anritsu approved battery packs. Some non-approved battery packs will fit into the MT8222A, but are electrically incompatible and will not charge correctly.
3. External power supply may have failed or be the wrong type. Replace the external power supply.
4. On/Off switch is damaged. Replace the keypad PCB or rubber keypad.
5. Main PCB has failed. Replace the Main PCB/Spectrum Analyzer assembly.

### Unit begins the boot process, but does not complete boot-up:

1. Using Master Software Tools, perform the Emergency Repair procedure, then update the system software (via the Tools menu).
2. Main PCB has failed. Replace the Main PCB/Spectrum Analyzer assembly.

### Unit makes normal boot-up sounds, but the display has a problem:

1. If the display is dim, check the brightness setting under the System Menu / System Options.
2. Replace the Backlight Driver PCB.
3. Replace the LCD assembly.
4. The Main PCB has failed. Replace the Main PCB/Spectrum Analyzer assembly.

### Boot-up Self Test fails:

1. Perform a Master Reset.  
If the message relates to the RTC battery, replace the RTC battery on the Main PCB.
2. The Main PCB has failed. Replace the Main PCB/Spectrum Analyzer assembly

## Other Problems

**Battery Pack Charging Problems:** refer to [Chapter 6, “Battery Information”](#).

### Lock Error messages:

1. This message normally appears for 2 to 3 seconds when an external 10 MHz Reference is applied.
2. Spectrum Analyzer PCB has failed. Replace the Main/Spectrum Analyzer assembly.

**Option 5, Power Monitor, Problems:**

1. Verify correct operation of RF detector (see User's Guide for a list of suitable detectors).
2. Replace the Option 5 PCB. No recalibration is required.

**Spectrum Analyzer Problems:**

1. Inspect the Spectrum Analyzer RF In connector for damage.
2. Refer to the User Guide.
3. Update system software using Master Software Tools (via Tools menu).
4. Spectrum Analyzer PCB has failed. Replace the Main/Spectrum Analyzer assembly.

**Cable and Antenna Analyzer Problems:**

1. Inspect the VNA RF In and VNA Reflection connectors for damage.
2. Inspect the Open, Short, Load and cable(s) for damage. Verify their operation on a suitable measurement instrument.
3. Refer to the User Guide.
4. Update system software using Master Software Tools (via Tools menu).
5. VNA module has failed. Replace the VNA module. No recalibration is required.

**Option 50 Problems:**

1. Replace the VNA Module with Option 50 assembly. This assembly has been calibrated at the factory.

**Option 51, 52 or 53 Problems:**

1. Replace the Option 51, 52, or 53 PCB (see [Table 1-5, "Replacement Parts" on page 1-6](#)). No recalibration is required.

**Other Issues:**

1. Perform a Master Reset.
2. Refer to the User Guide.
3. Update system software using Master Software Tools (via Tools menu).
4. Replace the Main PCB/Spectrum Analyzer assembly.



# Appendix A — Test Records

This appendix provides test records that can be used to record the performance of the MT8222A. Anritsu recommends that you make a copy of the following test record pages and document the measurements each time a Performance Verification is performed. Continuing to document this process each time it is performed provides a detailed history of instrument performance, which can allow you to observe trends.

## A-1 Test Records for Spectrum Analyzer Verification

MT8222A Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_  
Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

### A-1 Test Records for Spectrum Analyzer Verification

**Table A-1.** Spectrum Analyzer Frequency Accuracy

Frequency	Measured Value	Specification (Typical)
1 GHz	GHz	$\pm 300$ Hz
7 GHz	GHz	$\pm 2.1$ kHz

**Table A-2.** Spectrum Analyzer SSB Phase Noise Verification

Frequency	Measured Value	Specification
10 kHz	dBc/Hz	$\leq -100$ dBc/Hz
20 kHz	dBc/Hz	$\leq -100$ dBc/Hz
30 kHz	dBc/Hz	$\leq -100$ dBc/Hz
100 kHz	dBc/Hz	$\leq -102$ dBc/Hz

### Spectrum Analyzer Input Related Spurious Verification

#### Input Related Spurs for $-30$ dBm

**Table A-3.** Spectrum Analyzer Input Related Spurious Verification, Input at 1674 MHz

Measured input signal level at 1674 MHz \_\_\_\_\_ dBm

Start Freq	Stop Freq	Measured Spur Level	Calculated IRS	Specification
100 kHz	1673 MHz	dBm	dBc	$-38$ dBc max
1675 MHz	2800 MHz	dBm	dBc	$-38$ dBc max

**Table A-4.** Spectrum Analyzer Input Related Spurious Verification, Input at 1701 MHz

Measured input signal level at 1701 MHz \_\_\_\_\_ dBm

Start Freq	Stop Freq	Measured Spur Level	Calculated IRS	Specification
26 MHz	28 MHz	dBm	dBc	$-60$ dBc max

**Table A-5.** Spectrum Analyzer Input Related Spurious Verification, Input at 2145 MHz

Measured input signal level at 2145 MHz \_\_\_\_\_ dBm

Start Freq	Stop Freq	Measured Spur Level	Calculated IRS	Specification
470 MHz	472 MHz	dBm	dBc	$-60$ dBc max

MT8222A Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_  
 Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Table A-6.** Spectrum Analyzer Resolution Bandwidth Accuracy

RBW Setting	Span	VBW	Measured Value	Specification
3 MHz	4.5 MHz	Auto	Hz	2.7 MHz to 3.3 MHz
1 MHz	1.5 MHz	Auto	Hz	900 kHz to 1.1 MHz
300 kHz	450 kHz	Auto	Hz	270 kHz to 330 kHz
100 kHz	150 kHz	Auto	Hz	90 kHz to 110 kHz
30 kHz	45 kHz	Auto	Hz	27 kHz to 33 kHz
10 kHz	15 kHz	Auto	Hz	9 kHz to 11 kHz
3 kHz	4.5 kHz	Auto	Hz	2.7 kHz to 3.3 kHz
1 kHz	2 kHz	Auto	Hz	900 Hz to 1.1 kHz
300 Hz	450 Hz	Auto	Hz	270 Hz to 330 Hz
100 Hz	150 Hz	Auto	Hz	90 Hz to 110 Hz
30 Hz	50 Hz	3 Hz	Hz	27 Hz to 33 Hz
10 Hz	30 Hz	3 Hz	Hz	9 Hz to 11 Hz

**Table A-7.** Spectrum Analyzer Residual Spurious (Pre-Amp On)

Start Freq	Stop Freq	Measured Values	Specification (dBm)
100 kHz	10 MHz	dBm	≤ -100 dBm
10 MHz	1 GHz	dBm	≤ -100 dBm
1 GHz	2 GHz	dBm	≤ -100 dBm
2 GHz	3 GHz	dBm	≤ -100 dBm
3 GHz	4 GHz	dBm	≤ -100 dBm
4 GHz	5 GHz	dBm	≤ -100 dBm
5 GHz	6 GHz	dBm	≤ -100 dBm
6 GHz	7.1 GHz	dBm	≤ -100 dBm

## A-1 Test Records for Spectrum Analyzer Verification

MT8222A Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_  
 Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Table A-8.** Spectrum Analyzer Residual Spurious (Pre Amp Off)

Start Freq	Stop Freq	RBW	VBW	Measured Values	Specification (dBm)
100 kHz	10 MHz	3 kHz	300 Hz	dBm	≤ -90
10 MHz	1.0 GHz	30 kHz	10 kHz	dBm	≤ -90
1.0 GHz	2.2 GHz	10 kHz	300 kHz	dBm	≤ -90
2.2 GHz	2.7 GHz	1 kHz	300 kHz	dBm	≤ -90
2.7 GHz	2.8 GHz	1 kHz	100 kHz	dBm	≤ -90
2.8 GHz	3.199 GHz	10 kHz	300 kHz	dBm	≤ -90
3.2 GHz	4.009 GHz	30 kHz	1 kHz	dBm	≤ -84
4.009 GHz	5.083 GHz	10 kHz	300 Hz	dBm	≤ -84
5.083 GHz	5.895 GHz	10 kHz	100 Hz	dBm	≤ -84
5.895 GHz	7.1 GHz	10 kHz	100 kHz	dBm	≤ -84

**Exceptions:**

Frequency	Spur Level
250, 300, and 250 MHz	-85 dBm max.
-4010 MHz	-80 dBm max.
-5084 MHz	-70 dBm max.
-5894 MHz	-75 dBm max.
-7028 MHz	-80 dBm max.

**Table A-9.** Spectrum Analyzer DANL (Preamp On)

Start Freq	Stop Freq	RBW	VBW	Measured dBm (100K RBW)	Calculated dBm (1 Hz RBW)	1 Hz Specification
10 MHz	1.0 GHz	100 kHz	1 kHz			≤ -161 dBm
1.0 GHz	2.2 GHz	100 kHz	1 kHz			≤ -159 dBm
2.2 GHz	2.8 GHz	100 kHz	300 Hz			≤ -153 dBm
2.8 GHz	4.0 GHz	100 kHz	300 Hz			≤ -159 dBm
4.0 GHz	7.1 GHz	100 kHz	300 Hz			≤ -154 dBm

MT8222A Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_  
 Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Table A-10.** 50 MHz Amplitude Accuracy Verification Setup

Test Power Level @ 50 MHz	Required Sensor B Reading
0 dBm	dBm
-4 dBm	dBm
-10 dBm	dBm
-14 dBm	dBm
-20 dBm	dBm
-24 dBm	dBm
-30 dBm	dBm
-34 dBm	dBm
-40 dBm	dBm
-44 dBm	dBm
-50 dBm	dBm

MT8222A Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_  
 Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

## Spectrum Analyzer Amplitude Accuracy Verification

Table A-11. 50 MHz Amplitude Accuracy Verification

Input Power Level	Reference Level	Input Atten. Level	Measured Reading	Specification
0 dBm	10 dBm	30 dB	dBm	$\pm 1.25$ dB
-4 dBm	10 dBm	30 dB	dBm	$\pm 1.25$ dB
-10 dBm	0 dBm	20 dB	dBm	$\pm 1.25$ dB
-14 dBm	0 dBm	20 dB	dBm	$\pm 1.25$ dB
-20 dBm	-10 dBm	10 dB	dBm	$\pm 1.25$ dB
-24 dBm	-10 dBm	10 dB	dBm	$\pm 1.25$ dB
-30 dBm	-20 dBm	0 dB	dBm	$\pm 1.25$ dB
-34 dBm	-20 dBm	0 dB	dBm	$\pm 1.25$ dB
-40 dBm	-30 dBm	0 dB	dBm	$\pm 1.25$ dB
-44 dBm	-30 dBm	0 dB	dBm	$\pm 1.25$ dB
-50 dBm	-40 dBm	0 dB	dBm	$\pm 1.25$ dB

MT8222A Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Table A-12.** Characterization Chart for Amplitude Accuracy Across Frequency

Required Sensor B Reading for:	-2 dBm	-30 dBm
10.1 MHz	dBm	dBm
50 MHz	dBm	dBm
100 MHz	dBm	dBm
500 MHz	dBm	dBm
1000 MHz	dBm	dBm
2000 MHz	dBm	dBm
3000 MHz	dBm	dBm
4000 MHz	dBm	dBm
5000 MHz	dBm	dBm
6000 MHz	dBm	dBm
7000 MHz	dBm	dBm

## A-1 Test Records for Spectrum Analyzer Verification

MT8222A Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_  
 Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Table A-13.** Amplitude Accuracy Across Frequency Verification (1 of 3)

Frequency	Input Power	Atten Lvl	Marker 1 Reading	Specification
10.1 MHz	-30	0		± 1.25 dB
	-30	5		± 1.25 dB
	-30	10		± 1.25 dB
	-30	20		± 1.25 dB
	-2	25		± 1.25 dB
	-2	30		± 1.25 dB
	-2	35		± 1.25 dB
50 MHz	-30	0		± 1.25 dB
	-30	5		± 1.25 dB
	-30	10		± 1.25 dB
	-30	20		± 1.25 dB
	-2	25		± 1.25 dB
	-2	30		± 1.25 dB
	-2	35		± 1.25 dB
100 MHz	-30	0		± 1.25 dB
	-30	5		± 1.25 dB
	-30	10		± 1.25 dB
	-30	20		± 1.25 dB
	-2	25		± 1.25 dB
	-2	30		± 1.25 dB
	-2	35		± 1.25 dB
500 MHz	-30	0		± 1.25 dB
	-30	5		± 1.25 dB
	-30	10		± 1.25 dB
	-30	20		± 1.25 dB
	-2	25		± 1.25 dB
	-2	30		± 1.25 dB
	-2	35		± 1.25 dB



MT8222A Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_  
 Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

Table A-13. Amplitude Accuracy Across Frequency Verification (2 of 3)

Frequency	Input Power	Atten Lvl	Marker 1 Reading	Specification
1000 MHz	-30	0		± 1.25 dB
	-30	5		± 1.25 dB
	-30	10		± 1.25 dB
	-30	20		± 1.25 dB
	-2	25		± 1.25 dB
	-2	30		± 1.25 dB
	-2	35		± 1.25 dB
2000 MHz	-30	0		± 1.25 dB
	-30	5		± 1.25 dB
	-30	10		± 1.25 dB
	-30	20		± 1.25 dB
	-2	25		± 1.25 dB
	-2	30		± 1.25 dB
	-2	35		± 1.25 dB
3000 MHz	-30	0		± 1.25 dB
	-30	5		± 1.25 dB
	-30	10		± 1.25 dB
	-30	20		± 1.25 dB
	-2	25		± 1.25 dB
	-2	30		± 1.25 dB
	-2	35		± 1.25 dB
4000 MHz	-30	0		± 1.25 dB
	-30	5		± 1.25 dB
	-30	10		± 1.25 dB
	-30	20		± 1.25 dB
	-2	25		± 1.25 dB
	-2	30		± 1.25 dB
	-2	35		± 1.25 dB

## A-1 Test Records for Spectrum Analyzer Verification

MT8222A Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Table A-13.** Amplitude Accuracy Across Frequency Verification (3 of 3)

Frequency	Input Power	Atten Lvl	Marker 1 Reading	Specification
5000 MHz	-30	0		± 1.25 dB
	-30	5		± 1.25 dB
	-30	10		± 1.25 dB
	-30	20		± 1.25 dB
	-2	25		± 1.25 dB
	-2	30		± 1.25 dB
	-2	35		± 1.25 dB
6000 MHz	-30	0		± 1.25 dB
	-30	5		± 1.25 dB
	-30	10		± 1.25 dB
	-30	20		± 1.25 dB
	-2	25		± 1.25 dB
	-2	30		± 1.25 dB
	-2	35		± 1.25 dB
7000 MHz	-30	0		± 1.25 dB
	-30	5		± 1.25 dB
	-30	10		± 1.25 dB
	-30	20		± 1.25 dB
	-2	25		± 1.25 dB
	-2	30		± 1.25 dB
	-2	35		± 1.25 dB

**Table A-14.** Spectrum Analyzer RF Input VSWR Verification

Attenuation	VSWR	Specification
10 dB		< 2.0:1
20 dB		< 2.0:1
60 dB		< 2.0:1

MT8222A Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_  
 Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

## A-2 Test Records for Cable and Antenna Analyzer Verification

**Table A-15.** VNA Frequency Accuracy

Frequency Reading @ 2.0 GHz	Specification
	±50 kHz

**Table A-16.** VNA Return Loss Accuracy Verification

Return Loss	Measured Value	Specification
20 dB		$18.4 \text{ dB} \leq x \leq 21.6 \text{ dB}$
6 dB		$5 \text{ dB} \leq x \leq 7 \text{ dB}$

**Table A-17.** VNA System Dynamic Range Verification

Frequency Range	Measured Value	Specification
10 MHz to 3 GHz		$\leq -80 \text{ dB}$
> 3 GHz to 4 GHz		$\leq -70 \text{ dB}$
> 4 GHz to 5.5 GHz		$\leq -70 \text{ dB}$ (for Option 26 only)
> 5.5 GHz to 6 GHz		$\leq -65 \text{ dB}$ (for Option 26 only)

### A-3 Test Records for Power Meter Verification

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MT8222A Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

### A-3 Test Records for Power Meter Verification

**Table A-18.** Characterization Chart for Power Meter Verification

Frequency	Test Power Level	Required Sensor B Reading
50 MHz	0 dBm	dBm
	-50 dBm	dBm
7000 MHz	0 dBm	dBm
	-50 dBm	dBm

**Table A-19.** Internal Power Meter Accuracy Verification

Frequency	Input Power	Measured Value	Specification
50 MHz	0		$\pm 1.25$ dB
	-50		$\pm 1.5$ dB
7000 MHz	0		$\pm 1.75$ dB
	-50		$\pm 1.75$ dB

MT8222A Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_  
 Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

## A-4 Test Records for Available Options

**Table A-20.** Option 5 Power Monitor Accuracy

Power Level on ML Meter	Measured Value on MT8222A	Error	Specification
-40.0 dBm	dBm	dB	$\pm 1.0$ dB
-30.0 dBm	dBm	dB	$\pm 1.0$ dB
0.0 dBm	dBm	dB	$\pm 1.0$ dB
+10.0 dBm	dBm	dB	$\pm 1.0$ dB

**Table A-21.** Option 31 GPS Receiver, Spectrum Analyzer Frequency Accuracy

Frequency	Measured Value	Error	Specification
7 GHz	GHz	Hz	$\pm 4.75$ Hz (w/GPS Hi Accy) or $\pm 9.5$ Hz (w/Int Hi Accy)

## A-4 Test Records for Available Options

MT8222A Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_  
 Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Table A-22.** Option 40 GSM/GPRS/EDGE RF Measurements

Error Type	Measured Value	Specification
<b>At 850 MHz, –10 dBm Level, TCH Pattern</b>		
Burst Power Error	dB	±1.5 dB
Frequency Error	Hz	±10 Hz
<b>At 850 MHz, –50 dBm Level, TCH ALL Pattern</b>		
Burst Power Error	dB	±1.5 dB
Frequency Error	Hz	±10 Hz
<b>At 1800 MHz, –10 dBm Level, TCH ALL Pattern</b>		
Burst Power Error	dB	±1.5 dB
Frequency Error	Hz	±10 Hz
<b>At 1800 MHz, –50 dBm Level, TCH Pattern</b>		
Burst Power Error	dB	±1.5 dB
Frequency Error	Hz	±10 Hz
<b>At 850 MHz, –10 dBm Level, DL_MCS-9_1SLOT Pattern</b>		
Burst Power Error	dB	±1.5 dB
Frequency Error	Hz	±10 Hz
<b>At 850 MHz, –50 dBm Level, DL_MCS-9_4SLOT Pattern</b>		
Burst Power Error	dB	±1.5 dB
Frequency Error	Hz	±10 Hz
<b>At 1800 MHz, –10 dBm Level, DL_MCS-9_4SLOT Pattern</b>		
Burst Power Error	dB	±1.5 dB
Frequency Error	Hz	±10 Hz
<b>At 1800 MHz, –50 dBm Level, DL_MCS-9_1SLOT Pattern</b>		
Burst Power Error	dB	±1.5 dB
Frequency Error	Hz	±10 Hz

MT8222A Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

Table A-23. Option 41 GSM/GPRS/EDGE Demodulator

Measurement	Measured Value	Specification
<b>At 850 MHz, -10 dBm Level, TCH Pattern</b>		
Phase Err RMS (Deg)	Deg	≤ 1 Deg
<b>At 850 MHz, -50 dBm Level, TCH ALL Pattern</b>		
Phase Err RMS (Deg)	Deg	≤ 1 Deg
<b>At 1800 MHz, -10 dBm Level, TCH ALL Pattern</b>		
Phase Err RMS (Deg)	Deg	≤ 1 Deg
<b>At 1800 MHz, -50 dBm Level, TCH Pattern</b>		
Phase Err RMS (Deg)	Deg	≤ 1 Deg
<b>At 850 MHz, -10 dBm Level, DL_MCS-9_1SLOT Pattern</b>		
EVM RMS	%	≤ 2.5%
<b>At 850 MHz, -50 dBm Level, DL_MCS-9_4SLOT Pattern</b>		
EVM RMS	%	≤ 2.5%
<b>At 1800 MHz, -10 dBm Level, DL_MCS-9_4SLOT Pattern</b>		
EVM RMS	%	≤ 2.5%
<b>At 1800 MHz, -50 dBm Level, DL_MCS-9_1SLOT Pattern</b>		
EVM RMS	%	≤ 2.5%

Table A-24. Option 42 CDMA RF Measurements

Measurement	Measured Value	Specification
<b>At 870.03 MHz, -30 dBm Level, cdmaOne</b>		
EVM RMS	dB	±1.5 dB
<b>At 1930.05 MHz, -30 dBm Level, cdmaOne</b>		
EVM RMS	dB	±1.5 dB
<b>At 870.03 MHz, -30 dBm Level, CDMA2000</b>		
EVM RMS	dB	±1.5 dB
<b>At 1930.05 MHz, -30 dBm Level, CDMA2000</b>		
EVM RMS	dB	±1.5 dB

## A-4 Test Records for Available Options

MT8222A Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Table A-25.** Option 43 cdmaOne and CDMA2000 1xRTT Demodulator

Measurement	Measured Value	Specification
<b>At 870.03 MHz, -30 dBm Level, cdmaOne</b>		
Frequency Error	Hz	$\pm 20$ Hz
Rho		$0.99 \leq x \leq 1$
Tau	$\mu\text{s}$	$\pm 1$ $\mu\text{s}$
<b>At 1930.05 MHz, -30 dBm Level, cdmaOne</b>		
Frequency Error	Hz	$\pm 20$ Hz
Rho		$0.99 \leq x \leq 1$
Tau	$\mu\text{s}$	$\pm 1$ $\mu\text{s}$
<b>At 870.03 MHz, -30 dBm Level, CDMA2000</b>		
Frequency Error	Hz	$\pm 20$ Hz
Rho		$0.99 \leq x \leq 1$
Tau	$\mu\text{s}$	$\pm 1$ $\mu\text{s}$
<b>At 1930.05 MHz, -30 dBm Level, CDMA2000</b>		
Frequency Error	Hz	$\pm 20$ Hz
Rho		$0.99 \leq x \leq 1$
Tau	$\mu\text{s}$	$\pm 1$ $\mu\text{s}$



MT8222A Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

### Option 44 WCDMA and HSDPA RF Measurements

**Table A-26.** Option 44, Sensor A and B Reading Components Characterization

Frequency	PMA.10 (dBm)	PMB.10 (dBm)	$\Delta 1$ (dBm)	PMA.10C (dBm)	PMA.18 (dBm)	ATT.18 (dB)
881.5 MHz						

**Table A-27.** Option 44, Power Level Setting Components Characterization

Frequency	MG3700A.10 Setting	MG3700A.28 Setting	PMA-10	PMA-20
881.5 MHz	dBm	dBm	dBm	dBm

**Example Values:**

PMA.10	PMB.10	$\Delta 1$	PMA.10C	PMA.18	ATT.18
-22.6	10.0	0.0	-22.6	-40.5	17.9
MG3700A.10	MG3700A.28	PMA-10	PMA-20		
-30.9	-13.0	-42.6	-52.6		

**Table A-28.** Option 44, WCDMA Absolute Power Accuracy

Test Level	Measured Power	Error	Specification
+28 dBm	dBm	dB	$\pm 1.25$ dB
+10 dBm	dBm	dB	$\pm 1.25$ dB
-10 dBm	dBm	dB	$\pm 1.25$ dB
-20 dBm	dBm	dB	$\pm 1.25$ dB

## A-4 Test Records for Available Options

MT8222A Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Table A-29.** Option 44, WCDMA Occupied Bandwidth (OBW)

Frequency	Power Meter Reading	OBW	Specification
881.5 MHz	dBm		4.2 MHz $\pm$ 100 kHz
1962.5 MHz	dBm		4.2 MHz $\pm$ 100 kHz
2680.5 MHz	dBm		4.2 MHz $\pm$ 100 kHz

**Table A-30.** Option 44, WCDMA RF Channel Power Accuracy

Frequency	Power Meter Reading	Measured RF Channel Power	RF Channel Power Error	Specification
881.5 MHz				$\pm$ 1.25 dB max
1962.5 MHz				$\pm$ 1.25 dB max
2680.5 MHz				$\pm$ 1.25 dB max

**Table A-31.** Option 44, WCDMA ACLR Accuracy

Frequency/Offset (MHz)	Measured ACLR	Calculated ACLR Error	Specification
881.5 / -10			$\pm$ 0.8 dB
881.5 / -5			$\pm$ 0.8 dB
881.5 / 5			$\pm$ 0.8 dB
881.5 / 10			$\pm$ 0.8 dB
1962.5 / -10			$\pm$ 0.8 dB
1962.5 / -5			$\pm$ 0.8 dB
1962.5 / 5			$\pm$ 0.8 dB
1962.5 / 10			$\pm$ 0.8 dB
2680.5 / -10			$\pm$ 1.0 dB
2680.5 / -5			$\pm$ 1.0 dB
2680.5 / 5			$\pm$ 1.0 dB
2680.5 / 10			$\pm$ 1.0 dB

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**Table A-32.** Option 44, HSDPA RF Channel Power Accuracy

Frequency	Power Meter Reading	Measured RF Channel Power	RF Channel Power Accuracy	Specification
2680.5 MHz				± 1.25 dB max

**Table A-33.** Option 44, HSDPA ACLR Accuracy

Frequency/Offset (MHz)	Measured ACLR	Calculated ACLR Error	Specification
2680.5 / -10			± 1.0 dB
2680.5 / -5			± 1.0 dB
2680.5 / 5			± 1.0 dB
2680.5 / 10			± 1.0 dB

**Option 45 WCDMA Demodulator and Option 65 WCDMA/HSDPA Demodulator****Table A-34.** WCDMA Error Vector Magnitude (Test Model 4; Option 45 or 65)

Frequency (MHz)	Measured Value	Specification
1962.5	EVM %	≤ 2.5 %

**Table A-35.** HSDPA Error Vector Magnitude (Test Model 5; Option 65)

Frequency (MHz)	Measured Value	Specification
1962.5	EVM %	≤ 2.5 %

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### Option 46 Fixed WiMAX RF Measurements

Table A-36. Option 46, Fixed WiMAX Channel Power Accuracy

Frequency	Input Power	Measured Channel Power (RSSI)	Error	Specification
2600.5 MHz	-15 dBm	dBm	dB	± 1.5 dB
2600.5 MHz	-50 dBm	dBm	dB	± 1.5 dB
3600.5 MHz	-15 dBm	dBm	dB	± 1.5 dB
3600.5 MHz	-50 dBm	dBm	dB	± 1.5 dB
5600.5 MHz	-15 dBm	dBm	dB	± 1.5 dB
5600.5 MHz	-50 dBm	dBm	dB	± 1.5 dB

### Option 47 Fixed WiMAX Demodulator

Table A-37. Option 47, Fixed WiMAX Residual EVM

Frequency	Power	BW	EVM (RMS)	Specification
2600.5 MHz	-15 dBm	10 MHz	%	≤ 3.5%
2600.5 MHz	-50 dBm	10 MHz	%	≤ 3.5%
3600.5 MHz	-15 dBm	10 MHz	%	≤ 3.5%
3600.5 MHz	-50 dBm	10 MHz	%	≤ 3.5%
5600.5 MHz	-15 dBm	10 MHz	%	≤ 3.5%
5600.5 MHz	-50 dBm	10 MHz	%	≤ 3.5%

Table A-38. Option 47, Fixed WiMAX Frequency Error

Frequency	Power	Frequency Error	Specification
2600.5 MHz	-50 dBm	Hz	± 10 Hz
5600.5 MHz	-50 dBm	Hz	± 10 Hz

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Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

### Options 50 and 51 T1 Analyzer Verification

**Table A-39.** Option 50, T1 Frequency Clock

Measurement	Measured Value	Specification
Internal Clock Error		± 30 ppm
Recovered Clock Frequency		1543985 to 1544015 Hz

**Table A-40.** Option 51, T1 Frequency Clock

Measurement	Measured Value	Specification
Internal Clock Error		± 5 ppm
Recovered Clock Frequency		1543992 to 1544008 Hz

**Table A-41.** T1 Transmitted Level Voltage

Measurement	Measured Value	Specification
Tx LBO: 0 dB		4.8 to 7.2 Vp-p
Tx LBO: -7.5 dB		2.4 to 3.6 Vp-p
Tx LBO: -15 dB		0.5 to 1.7 Vp-p

**Table A-42.** T1 Transmitted Level Vpp Reading

Measurement	Vpp Reading	Specification
Tx LBO: 0 dB		4.8 to 7.2 Vp-p
Tx LBO: -7.5 dB		2.4 to 3.6 Vp-p
Tx LBO: -15 dB		0.5 to 1.7 Vp-p

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Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

### Option 52 E1 Analyzer Verification

**Table A-43.** Option 52, E1 Frequency Clock

Measurement	Measured Value	Specification
Internal Clock Error		± 5 ppm
Recovered Clock Frequency		204790 to 2048010 Hz

**Table A-44.** Option 52, E1 Transmitted Level Voltage

Measurement	Measured Value	Specification
120 ohm (RJ48 Interface)		5.4 to 6.6 Vp-p
75 ohm (BNC Interface)		4.2 to 5.2 Vp-p

**Table A-45.** Option 52, E1 Transmitted Level Vpp Reading

Measurement	Measured Value	Specification
120 ohm (RJ48 Interface)		5.4 to 6.6 Vp-p
75 ohm (BNC Interface)		4.2 to 5.2 Vp-p

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Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

### Option 53 T1/T3 Analyzer Verification

**Table A-46.** Option 53, T1/T3 Frequency Clock

Measurement	Measured Value	Specification
Internal Clock Error		$\pm 5$ ppm
Recovered Clock Frequency		1543992 to 1544008 Hz

**Table A-47.** Option 53, T1 Transmitted Level Voltage

Measurement	Measured Value	Specification
Tx LBO: 0 dB		4.8 to 7.2 Vp-p
Tx LBO: -7.5 dB		2.4 to 3.6 Vp-p
Tx LBO: -15 dB		0.5 to 1.7 Vp-p

**Table A-48.** Option 53, T1 Transmitted Level Vpp Reading

Measurement	Measured Value	Specification
Tx LBO: -15 dB		0.5 to 1.7 Vp-p
Tx LBO: -7.5 dB		2.4 to 3.6 Vp-p
Tx LBO: 0 dB		4.8 to 7.2 Vp-p

**Table A-49.** Option 53, T3 Frequency Clock

Measurement	Measured Value	Specification
Internal Clock Error		$\pm 5$ ppm
Recovered Clock Frequency		44735776 to 44736224 Hz

## A-4 Test Records for Available Options

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**Table A-50.** Option 53, T3 Transmitted Level Voltage

Measurement	Measured Value	Specification
DSX		0.72 to 1.7 V p-p
LOW		0.72 to 1.7 V p-p

**Table A-51.** Option 53, T3 Transmitted Level Vpp Reading

Measurement	Measured Value	Specification
LOW		0.72 to 1.7 V p-p
DSX		0.72 to 1.7 V p-p

### Option 60, 61 TD-SCDMA

**Table A-52.** Option 60, 61 TD-SCDMA Verification (at 2010 MHz, -45 dBm Level, TD-SCDMA)

Measurement	Measured Value	Specification
Channel Power (Error)		$\pm 1$ dB
EVM		< 3%
Frequency Error		$\pm 20$ Hz
Tau		$\pm 0.1$ $\mu$ s



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**Option 62 EVDO RF Measurements**

Table A-53. Option 62 EVDO RF Measurements

Measurement	Measured Value	Specification
<b>At 870.03 MHz, -50 dBm Level, 921.6kps 8-PSK Modulation</b>		
Channel Power Error	dB	± 1.5 dB
<b>At 1930.05 MHz, 0 dBm Level, 38.4kps QPSK Modulation</b>		
Channel Power Error	dB	± 1.5 dB
<b>At 1930.05 MHz, -50 dBm Level, 2457.6kps 16-QAM Modulation</b>		
Channel Power Error	dB	± 1.5 dB
<b>At 870.03 MHz, -10 dBm Level, Idle Slot</b>		
Channel Power Error	dB	± 1.5 dB
<b>At 1930.05 MHz, -50 dBm Level, Idle Slot</b>		
Channel Power Error	dB	± 1.5 dB

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Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

### Option 63 EVDO Demodulator

Table A-54. Option 63 EVDO Demodulator

Measurement	Measured Value	Specification
<b>At 870.03 MHz, -50 dBm Level, 921.6kps 8-PSK Modulation</b>		
Frequency Error	Hz	$\pm 20$ Hz
Rho		$0.99 \leq x \leq 1$
Tau	$\mu$ s	$\pm 1$ $\mu$ s
<b>At 1930.05 MHz, 0 dBm Level, 38.4kps QPSK Modulation</b>		
Frequency Error	Hz	$\pm 20$ Hz
Rho		$0.99 \leq x \leq 1$
Tau	$\mu$ s	$\pm 1$ $\mu$ s
<b>At 1930.05 MHz, -50 dBm Level, 2457.6kps 16-QAM Modulation</b>		
Frequency Error	Hz	$\pm 20$ Hz
Rho		$0.99 \leq x \leq 1$
Tau	$\mu$ s	$\pm 1$ $\mu$ s
<b>At 870.03 MHz, -10 dBm Level, Idle Slot</b>		
Frequency Error	Hz	$\pm 20$ Hz
Rho		$0.99 \leq x \leq 1$
Tau	$\mu$ s	$\pm 1$ $\mu$ s
<b>At 1930.05 MHz, -50 dBm Level, Idle Slot</b>		
Frequency Error	Hz	$\pm 20$ Hz
Rho		$0.99 \leq x \leq 1$
Tau	$\mu$ s	$\pm 1$ $\mu$ s

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Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Option 64 DVB-T/H Signal Analyzer****Table A-55.** Option 64, DVB-T/H Signal Analyzer Frequency Accuracy

Channel	Ref Level (dBm)	Frequency Error	Specification
21	-20	Hz	$\pm 0.3$ Hz
	-50	Hz	$\pm 0.3$ Hz
45	-20	Hz	$\pm 0.3$ Hz
	-50	Hz	$\pm 0.3$ Hz
69	-20	Hz	$\pm 0.3$ Hz
	-50	Hz	$\pm 0.3$ Hz

**Table A-56.** Option 64, DVB-T/H Signal Analyzer Residual MER

Channel	Total MER Pre Amp Off	Specification	Total MER Pre Amp On	Specification
21	dB	$\geq 42$ dB	dB	$\geq 42$ dB
45	dB	$\geq 42$ dB	dB	$\geq 42$ dB
69	dB	$\geq 42$ dB	dB	$\geq 42$ dB

**Table A-57.** Option 64, DVB-T/H Signal Analyzer Frequency Lock Range

Channel	Frequency (MHz)	Measured Frequency Error	Specification
21	474.09	Hz	$\pm 0.3$ Hz
21	473.91	Hz	$\pm 0.3$ Hz

**A-4 Test Records for Available Options**

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**MT8222A** Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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**Table A-58.** Option 64, Readings for Sensor A, Sensor B, DAB(-10), and MN63A Attenuation AT(-10)

<b>Frequency (Channel)</b>	<b>Sensor A Reading</b>	<b>Sensor B Reading</b>	<b>DAB(-10)</b>	<b>MN63A Attenuation Reading, AT(-10)</b>
474 MHz (Ch 21)				
666 MHz (Ch 45)				
858 MHz (Ch 69)				

**Table A-59.** Option 64, Readings for Sensor A, Sensor B, DAB(-50), and MN63A Attenuation AT(-50)

<b>Frequency (Channel)</b>	<b>Sensor A Reading</b>	<b>Sensor B Reading</b>	<b>DAB(-50)</b>	<b>MN63A Attenuation Reading, AT(-50)</b>
474 MHz (Ch 21)				
666 MHz (Ch 45)				
858 MHz (Ch 69)				

MT8222A Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Table A-60.** Option 64, DVB-T/H Signal Analyzer Level Accuracy  
Measurement Channel = 21ch (474 MHz)

Test Level (dBm)	AT(set) (dB)	SB(-10) or SB(-50) (dBm)	Input Level (dBm)	Ref Level PreAmp Off / On	Pre Amp Off		Pre Amp On		Spec (dB)
					M(Level) (dBm)	Dev (dB)	M(Level) (dBm)	Dev (dB)	
-10	=AT(-10)			-10 / NA					±2.0
-15	=AT(-10) + 5=			-15 / NA					±2.0
-20	=AT(-10) + 10=			-20 / -20					±2.0
-25	=AT(-10) + 15=			-25 / -20					±2.0
-30	=AT(-10) + 20=			-25 / -30					±2.0
-35	=AT(-10) + 25=			-25 / -30					±2.0
-40	=AT(-10) + 30=			-25 / -40					±2.0
-45	=AT(-10) + 35=			-25 / -40					±2.0
-50	=AT(-50)			-25 / -50					±2.0
-55	=AT(-50) + 5=			-25 / -50					±2.0
-60	=AT(-50) + 10=			-25 / -50					±2.0
-65	=AT(-50) + 15=			NA / -50					±2.0
-70	=AT(-50) + 20=			NA / -50					±2.0
-75	=AT(-50) + 25=			NA / -50					±2.0
-80	=AT(-50) + 30=			NA / -50					±2.0
-84	=AT(-50) + 34=			NA / -50					±2.0

**A-4 Test Records for Available Options**

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Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Table A-61.** Option 64, DVB-T/H Signal Analyzer Level Accuracy  
Measurement Channel = 45ch (666 MHz)

Test Level (dBm)	AT(set) (dB)	SB(-10) or SB(-50) (dBm)	Input Level (dBm)	Ref Level PreAmp Off / On	Pre Amp Off		Pre Amp On		Spec (dB)
					M(Level) (dBm)	Dev (dB)	M(Level) (dBm)	Dev (dB)	
-10	=AT(-10)			-10 / NA					±2.0
-15	=AT(-10) + 5=			-15 / NA					±2.0
-20	=AT(-10) + 10=			-20 / -20					±2.0
-25	=AT(-10) + 15=			-25 / -20					±2.0
-30	=AT(-10) + 20=			-25 / -30					±2.0
-35	=AT(-10) + 25=			-25 / -30					±2.0
-40	=AT(-10) + 30=			-25 / -40					±2.0
-45	=AT(-10) + 35=			-25 / -40					±2.0
-50	=AT(-50)			-25 / -50					±2.0
-55	=AT(-50) + 5=			-25 / -50					±2.0
-60	=AT(-50) + 10=			-25 / -50					±2.0
-65	=AT(-50) + 15=			NA / -50					±2.0
-70	=AT(-50) + 20=			NA / -50					±2.0
-75	=AT(-50) + 25=			NA / -50					±2.0
-80	=AT(-50) + 30=			NA / -50					±2.0
-84	=AT(-50) + 34=			NA / -50					±2.0

MT8222A Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Table A-62.** Option 64, DVB-T/H Signal Analyzer Level Accuracy  
Measurement Channel = 69ch (858 MHz)

Test Level (dBm)	AT(set) (dB)	SB(-10) or SB(-50) (dBm)	Input Level (dBm)	Ref Level PreAmp Off / On	Pre Amp Off		Pre Amp On		Spec (dB)
					M(Level) (dBm)	Dev (dB)	M(Level) (dBm)	Dev (dB)	
-10	=AT(-10)			-10 / NA					±2.0
-15	=AT(-10) + 5=			-15 / NA					±2.0
-20	=AT(-10) + 10=			-20 / -20					±2.0
-25	=AT(-10) + 15=			-25 / -20					±2.0
-30	=AT(-10) + 20=			-25 / -30					±2.0
-35	=AT(-10) + 25=			-25 / -30					±2.0
-40	=AT(-10) + 30=			-25 / -40					±2.0
-45	=AT(-10) + 35=			-25 / -40					±2.0
-50	=AT(-50)			-25 / -50					±2.0
-55	=AT(-50) + 5=			-25 / -50					±2.0
-60	=AT(-50) + 10=			-25 / -50					±2.0
-65	=AT(-50) + 15=			NA / -50					±2.0
-70	=AT(-50) + 20=			NA / -50					±2.0
-75	=AT(-50) + 25=			NA / -50					±2.0
-80	=AT(-50) + 30=			NA / -50					±2.0
-84	=AT(-50) + 34=			NA / -50					±2.0

**A-4 Test Records for Available Options**

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Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Table A-63.** Option 64, Readings for Sensor A and MN63A Attenuation at AT(-25), AT(-15), AT(-50), and AT(-43)

Frequency (Channel)	Sensor A Reading, M(Sa)	MN63A Attenuation Reading, AT(-25)	MN63A Attenuation, AT(-15)	MN63A Attenuation, AT(-50)	MN63A Attenuation, AT(-43)
474 MHz (Ch 21)					
666 MHz (Ch 45)					
858 MHz (Ch 69)					

**Table A-64.** Option 64, DVB-T/H Signal Analyzer 1 dB Compression Level (Pre Amp Off)

Channel	Test Level (dBm)	Ref Level (dBm)	Measured Value (dBm)	Delta (dB)	Spec (dB)
21	-25	-25			$\Delta < 1$
	-15	-25			$\Delta < 1$
45	-25	-25			$\Delta < 1$
	-15	-25			$\Delta < 1$
69	-25	-25			$\Delta < 1$
	-15	-25			$\Delta < 1$



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**Table A-65.** Option 64, DVB-T/H Signal Analyzer 1 dB Compression Level (Pre Amp On)

Channel	Test Level (dBm)	Ref Level (dBm)	Measured Value (dBm)	Delta (dB)	Spec (dB)
21	-50	-50			$\Delta < 1$
	-43	-50			$\Delta < 1$
45	-50	-50			$\Delta < 1$
	-43	-50			$\Delta < 1$
69	-50	-50			$\Delta < 1$
	-43	-50			$\Delta < 1$

**Table A-66.** Option 64, DVB-T/H Signal Analyzer Noise Floor

Channel	Frequency (MHz)	Pre-Amp Off			Pre-Amp On		
		Ref Level (dBm)	Measured Value (dBm)	Specification (dBm)	Ref Level (dBm)	Measured Value (dBm)	Specification (dBm)
21	474	-25		$\leq 69$	-50		$\leq 93$
45	666	-25		$\leq 69$	-50		$\leq 93$
69	858	-25		$\leq 69$	-50		$\leq 93$

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Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

### Option 66 Mobile WiMAX RF Measurements

**Table A-67.** Option 66 Mobile WiMAX Channel Power Accuracy

Frequency (MHz)	Input Power (dBm )	Measured Channel Power (RSSI)	Error	Specification dB
<b>Mobile WiMAX Channel Power Accuracy (10 MHz Bandwidth and 10 ms Frame Length)</b>				
2600.5	-15	dBm	dB	± 1.5 dB
2600.5	-50	dBm	dB	± 1.5 dB
3600.5	-15	dBm	dB	± 1.5 dB
3600.5	-50	dBm	dB	± 1.5 dB
<b>Mobile WiMAX Channel Power Accuracy (5 MHz Bandwidth and 5 ms Frame Length)</b>				
2600.5	-15	dBm	dB	± 1.5 dB
2600.5	-50	dBm	dB	± 1.5 dB
3600.5	-15	dBm	dB	± 1.5 dB
3600.5	-50	dBm	dB	± 1.5 dB

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Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Option 67 Mobile WiMAX Demodulator**

**Table A-68.** Mobile WiMAX Residual EVM

Frequency (MHz)	Power (dBm)	BW (MHz)	EVM (rms)	Specification
<b>Mobile WiMAX Residual EVM (10 MHz Bandwidth and 10 ms Frame Length)</b>				
2600.5	-15	10	%	≤ 3.0%
2600.5	-50	10	%	≤ 3.0%
3600.5	-15	10	%	≤ 3.0%
3600.5	-50	10	%	≤ 3.0%
<b>Mobile WiMAX Residual EVM (5 MHz Bandwidth and 5 ms Frame Length)</b>				
2600.5	-15	10	%	≤ 3.0%
2600.5	-50	10	%	≤ 3.0%
3600.5	-15	10	%	≤ 3.0%
3600.5	-50	10	%	≤ 3.0%

**Table A-69.** Mobile WiMAX Frequency Error

Frequency (MHz)	Power (dBm)	Freq Error	Specification
<b>Mobile WiMAX Frequency Error (10 MHz Bandwidth and 10 ms Frame Length)</b>			
2600.5	-50	Hz	± 10 Hz
3600.5	-50	Hz	± 10 Hz
<b>Mobile WiMAX Frequency Error (5 MHz Bandwidth and 5 ms Frame Length)</b>			
2600.5	-50	Hz	± 10 Hz
3600.5	-50	Hz	± 10 Hz

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Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Option 78 DVB-T/H SFN Analyzer**

**Table A-70.** Option 78, Readings for Sensor A, Sensor B, DAB(-10), and MN63A Attenuation AT(-10)

Frequency (Channel)	Sensor A Reading	Sensor B Reading	DAB(-10)	MN63A Attenuation Reading, AT(-10)
474 MHz (Ch 21)				
666 MHz (Ch 45)				
858 MHz (Ch 69)				

**Table A-71.** Option 78, Readings for Sensor A, Sensor B, DAB(-50), and MN63A Attenuation AT(-50)

Frequency (Channel)	Sensor A Reading	Sensor B Reading	DAB(-50)	MN63A Attenuation Reading, AT(-50)
474 MHz (Ch 21)				
666 MHz (Ch 45)				
858 MHz (Ch 69)				

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Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Table A-72.** Option 78, DVB-T/H Signal Analyzer Level Accuracy  
Measurement Channel = 21ch (474 MHz)

Test Level (dBm)	AT(set) (dB)	SB(-10) or SB(-50) (dBm)	Input Level (dBm)	Ref Level PreAmp Off / On	Pre Amp Off		Pre Amp On		Spec (dB)
					M(Level) (dBm)	Dev (dB)	M(Level) (dBm)	Dev (dB)	
-10	=AT(-10)			-10 / NA					±2.0
-15	=AT(-10) + 5=			-15 / NA					±2.0
-20	=AT(-10) + 10=			-20 / -20					±2.0
-25	=AT(-10) + 15=			-25 / -20					±2.0
-30	=AT(-10) + 20=			-25 / -30					±2.0
-35	=AT(-10) + 25=			-25 / -30					±2.0
-40	=AT(-10) + 30=			-25 / -40					±2.0
-45	=AT(-10) + 35=			-25 / -40					±2.0
-50	=AT(-50)			-25 / -50					±2.0
-55	=AT(-50) + 5=			-25 / -50					±2.0
-60	=AT(-50) + 10=			-25 / -50					±2.0
-65	=AT(-50) + 15=			NA / -50					±2.0
-70	=AT(-50) + 20=			NA / -50					±2.0
-75	=AT(-50) + 25=			NA / -50					±2.0
-80	=AT(-50) + 30=			NA / -50					±2.0
-84	=AT(-50) + 34=			NA / -50					±2.0

**A-4 Test Records for Available Options**

**MT8222A** Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Table A-73.** Option 78, DVB-T/H Signal Analyzer Level Accuracy  
Measurement Channel = 45ch (666 MHz)

Test Level (dBm)	AT(set) (dB)	SB(-10) or SB(-50) (dBm)	Input Level (dBm)	Ref Level PreAmp Off / On	Pre Amp Off		Pre Amp On		Spec (dB)
					M(Level) (dBm)	Dev (dB)	M(Level) (dBm)	Dev (dB)	
-10	=AT(-10)			-10 / NA					±2.0
-15	=AT(-10) + 5=			-15 / NA					±2.0
-20	=AT(-10) + 10=			-20 / -20					±2.0
-25	=AT(-10) + 15=			-25 / -20					±2.0
-30	=AT(-10) + 20=			-25 / -30					±2.0
-35	=AT(-10) + 25=			-25 / -30					±2.0
-40	=AT(-10) + 30=			-25 / -40					±2.0
-45	=AT(-10) + 35=			-25 / -40					±2.0
-50	=AT(-50)			-25 / -50					±2.0
-55	=AT(-50) + 5=			-25 / -50					±2.0
-60	=AT(-50) + 10=			-25 / -50					±2.0
-65	=AT(-50) + 15=			NA / -50					±2.0
-70	=AT(-50) + 20=			NA / -50					±2.0
-75	=AT(-50) + 25=			NA / -50					±2.0
-80	=AT(-50) + 30=			NA / -50					±2.0
-84	=AT(-50) + 34=			NA / -50					±2.0

MT8222A Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Table A-74.** Option 78, DVB-T/H Signal Analyzer Level Accuracy  
Measurement Channel = 69ch (858 MHz)

Test Level (dBm)	AT(set) (dB)	SB(-10) or SB(-50) (dBm)	Input Level (dBm)	Ref Level PreAmp Off / On	Pre Amp Off		Pre Amp On		Spec (dB)
					M(Level) (dBm)	Dev (dB)	M(Level) (dBm)	Dev (dB)	
-10	=AT(-10)			-10 / NA					±2.0
-15	=AT(-10) + 5=			-15 / NA					±2.0
-20	=AT(-10) + 10=			-20 / -20					±2.0
-25	=AT(-10) + 15=			-25 / -20					±2.0
-30	=AT(-10) + 20=			-25 / -30					±2.0
-35	=AT(-10) + 25=			-25 / -30					±2.0
-40	=AT(-10) + 30=			-25 / -40					±2.0
-45	=AT(-10) + 35=			-25 / -40					±2.0
-50	=AT(-50)			-25 / -50					±2.0
-55	=AT(-50) + 5=			-25 / -50					±2.0
-60	=AT(-50) + 10=			-25 / -50					±2.0
-65	=AT(-50) + 15=			NA / -50					±2.0
-70	=AT(-50) + 20=			NA / -50					±2.0
-75	=AT(-50) + 25=			NA / -50					±2.0
-80	=AT(-50) + 30=			NA / -50					±2.0
-84	=AT(-50) + 34=			NA / -50					±2.0

## A-4 Test Records for Available Options

MT8222A Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Table A-75.** Option 78, Readings for Sensor A and MN63A Attenuation at AT(-25), AT(-15), AT(-50), and AT(-43)

Frequency (Channel)	Sensor A Reading, M(Sa)	MN63A Attenuation Reading, AT(-25)	MN63A Attenuation, AT(-15)	MN63A Attenuation, AT(-50)	MN63A Attenuation, AT(-43)
474 MHz (Ch 21)					
666 MHz (Ch 45)					
858 MHz (Ch 69)					

**Table A-76.** Option 78, DVB-T/H Signal Analyzer 1 dB Compression Level (Pre Amp Off)

Channel	Test Level (dBm)	Ref Level (dBm)	Measured Value (dBm)	Delta (dB)	Spec (dB)
21	-25	-25			$\Delta < 1$
	-15	-25			$\Delta < 1$
45	-25	-25			$\Delta < 1$
	-15	-25			$\Delta < 1$
69	-25	-25			$\Delta < 1$
	-15	-25			$\Delta < 1$



MT8222A Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Table A-77.** Option 78, DVB-T/H Signal Analyzer 1 dB Compression Level (Pre Amp On)

Channel	Test Level (dBm)	Ref Level (dBm)	Measured Value (dBm)	Delta (dB)	Spec (dB)
21	-50	-50			$\Delta < 1$
	-43	-50			$\Delta < 1$
45	-50	-50			$\Delta < 1$
	-43	-50			$\Delta < 1$
69	-50	-50			$\Delta < 1$
	-43	-50			$\Delta < 1$

**Table A-78.** Option 78, DVB-T/H Signal Analyzer Noise Floor

Channel	Frequency (MHz)	Pre-Amp Off			Pre-Amp On		
		Ref Level (dBm)	Measured Value (dBm)	Specification (dBm)	Ref Level (dBm)	Measured Value (dBm)	Specification (dBm)
21	474	-25		$\leq 69$	-50		$\leq 93$
45	666	-25		$\leq 69$	-50		$\leq 93$
69	858	-25		$\leq 69$	-50		$\leq 93$

**Option 541 LTE RF Measurements**

**Table A-79.** Option 541, LTE Channel Power Accuracy

Frequency (MHz)	Input Power (dBm)	Measured Channel Power (dBm)	Error (dB)	Specification (dB)
750	-10			$\pm 1.5$ dB
	-50			$\pm 1.5$ dB
2150	-10			$\pm 1.5$ dB
	-50			$\pm 1.5$ dB

MT8222A Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

### Option 542 LTE Demodulator

**Table A-80.** Option 542, LTE Residual EVM and Frequency Accuracy

Measurement	Measured Value	Specification
<b>750 MHz @ -10 dBm</b>		
Frequency Error	Hz	± 10 Hz
EVM (rms)	%	< 2.5 %
<b>750 MHz @ -50 dBm</b>		
Frequency Error	Hz	± 10 Hz
EVM (rms)	%	< 2.5 %
<b>2150 MHz @ -10 dBm</b>		
Frequency Error	Hz	± 10 Hz
EVM (rms)	%	< 2.5 %
<b>2150 MHz @ -50 dBm</b>		
Frequency Error	Hz	± 10 Hz
EVM (rms)	%	< 2.5 %

# Appendix B — Test Fixture

Setup of the test fixture required for Option 44 testing.

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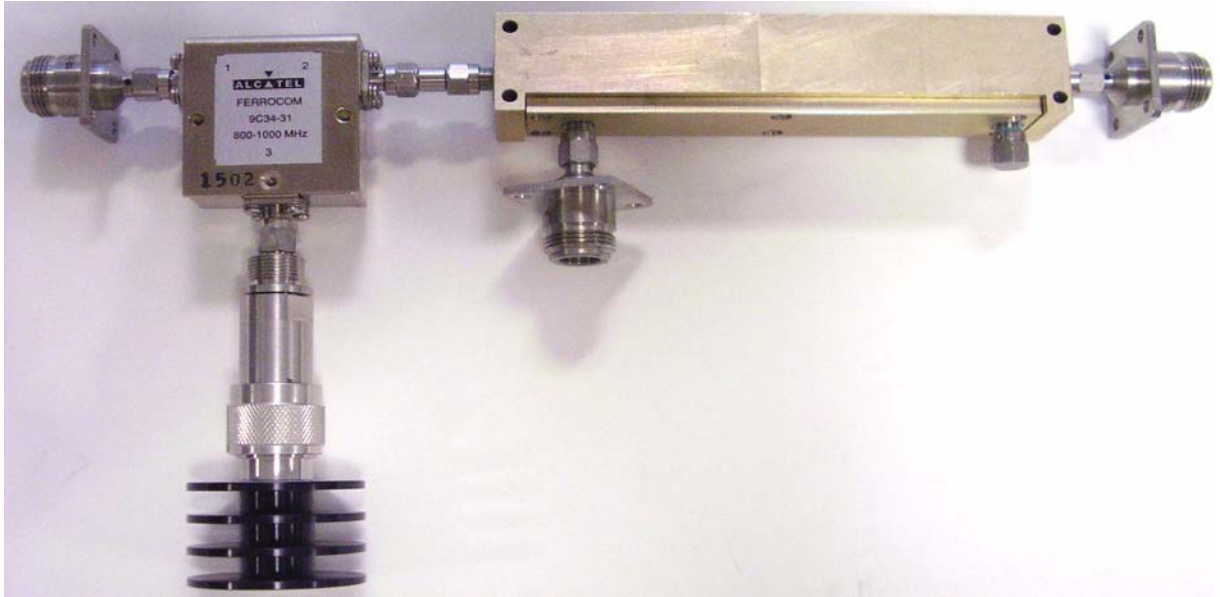


Figure B-1.

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Figure B-2.

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# Anritsu

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