



## **MET Laboratories, Inc.** *Safety Certification - EMI - Telecom Environmental Simulation*

914 WEST PATAPSCO AVENUE • BALTIMORE, MARYLAND 21230-3432 • PHONE (410) 354-3300 • FAX (410) 354-3313

33439 WESTERN AVENUE • UNION CITY, CALIFORNIA 94587 • PHONE (510) 489-6300 • FAX (510) 489-6372

3162 BELICK STREET • SANTA CLARA, CALIFORNIA 95054 • PHONE (408) 748-3585 • FAX (510) 489-6372

December 5, 2008

Motorola, Inc.  
1064 Greenwood Blvd. Suite 400  
Lake Mary, FL 32746

Dear Thai Le,

Enclosed is the EMC Wireless test report for compliance testing of the Motorola, Inc., 4.9 GHz WMC7300 PCMCIA Card, tested to the requirements of Title 47 of the Code of Federal Regulations (CFR), Part 90 Subpart 7 for Land Mobile Radio Services and Part 15 Subpart B for a Class A Digital Device.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,  
MET LABORATORIES, INC.

Jennifer Warnell  
Documentation Department

Reference: (Motorola, Inc.\EMC24964-FCC90 Rev. 1)

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### **Electromagnetic Compatibility Criteria Test Report**

For the

**Motorola, Inc.  
Model 4.9 GHz WMC7300 PCMCIA Card**

Tested under

**The FCC Verification Rules  
Contained in Title 47 of the CFR, Part 90, Subpart Y  
for Private Land Mobile Radio Services  
and Part 15, Subpart B for a Class A Digital Device**

**MET Report: EMC24964-FCC90 Rev. 1**

December 5, 2008

**Prepared For:  
Motorola, Inc.  
1064 Greenwood Blvd. Suite 400  
Lake Mary, FL 32746**

**Prepared By:  
MET Laboratories, Inc.  
914 W. Patapsco Ave.  
Baltimore, MD 21230**



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**MET Report: EMC24964-FCC90 Rev. 1**

Jeffrey Hazen  
Electromagnetic Compatibility Lab

Jennifer Warnell  
Documentation Department

**Engineering Statement:** The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is / is not capable of operation in accordance with the requirements of Part 90, Subpart Y and Part 15, Subpart B of the FCC Rules under normal use and maintenance.

Shawn McMillen  
Wireless Manager, Electromagnetic Compatibility Lab



## Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	October 3, 2008	Initial Issue.
1	December 5, 2008	Engineer corrections.



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## List of Terms and Abbreviations

<b>AC</b>	Alternating Current
<b>ACF</b>	Antenna Correction Factor
<b>Cal</b>	Calibration
<i>d</i>	Measurement Distance
<b>dB</b>	Decibels
<b>dB<math>\mu</math>A</b>	Decibels above one <b>microamp</b>
<b>dB<math>\mu</math>V</b>	Decibels above one <b>microvolt</b>
<b>dB<math>\mu</math>A/m</b>	Decibels above one <b>microamp per meter</b>
<b>dB<math>\mu</math>V/m</b>	Decibels above one <b>microvolt per meter</b>
<b>DC</b>	Direct Current $\mu$
<b>E</b>	Electric Field
<b>DSL</b>	Digital Subscriber Line
<b>ESD</b>	Electrostatic Discharge
<b>EUT</b>	Equipment Under Test
<i>f</i>	Frequency
<b>FCC</b>	Federal Communications Commission
<b>GR-1089-CORE</b>	( <b>GR</b> ) General Requirement(s) imposed by the NEBS standard, ( <b>CORE</b> ) Central Office Recovery Express (AT&T), ( <b>1089</b> ) specifies various parts of the General Requirements under Bellcore Technical Standard, Requirements for Electromagnetic Compatibility and Electrical Safety - Generic Criteria for Network Telecommunications Equipment
<b>GRP</b>	Ground Reference Plane
<b>H</b>	Magnetic Field
<b>HCP</b>	Horizontal Coupling Plane
<b>Hz</b>	Hertz
<b>IEC</b>	International Electrotechnical Commission
<b>kHz</b>	kilohertz
<b>kPa</b>	kilopascal
<b>kV</b>	kilovolt
<b>LISN</b>	Line Impedance Stabilization Network
<b>MHz</b>	Megahertz
<b><math>\mu</math>H</b>	microhenry
<b><math>\mu</math></b>	microfarad
<b><math>\mu</math>s</b>	microseconds
<b>NEBS</b>	Network Equipment-Building System
<b>PRF</b>	Pulse Repetition Frequency
<b>RF</b>	Radio Frequency
<b>RMS</b>	Root-Mean-Square
<b>TWT</b>	Traveling Wave Tube
<b>V/m</b>	Volts per meter
<b>VCP</b>	Vertical Coupling Plane



# **Executive Summary**



## 1. Testing Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 90, Subpart Y. All tests were conducted using measurement procedure ANSI TIA/EIA-603-A-2004.

Title 47 of the CFR, Part 90, Subpart Y, and FCC 04-265 Reference and Test Description	Conformance			Comments
	Yes	No	N/A	
<i>Yes - Equipment complies with the Requirement</i> <i>No - Equipment does not comply with the Requirement</i> <i>N/A - Not applicable to the equipment under tests</i>				
2.1046; 90.1215(a) Peak Power Output	✓			Measured emissions below applicable limits.
2.1046; 90.1215(a) Peak Power Spectral Density	✓			Measured emissions below applicable limits.
2.1047(a) Modulation Characteristics			✓	EUT is non-voice, data only.
2.1049; 90.210(M) Occupied Bandwidth (Emission Mask)	✓			Measured emissions below applicable limits.
2.1051; 90.210(M) Spurious Emissions at Antenna Terminals	✓			Measured emissions below applicable limits.
2.1053; 90.210(M) Radiated Spurious Emissions	✓			Measured emissions below applicable limits.
2.1055(a) (1); 90.213 Frequency Stability over Temperature Variations	✓			Compliant by Similarity – Please refer to FCC ID: QJEWMC73000705.
2.1055(d) (2) Frequency Stability over Voltage Variations	✓			Compliant by Similarity – Please refer to FCC ID: QJEWMC73000705.
90.214 Transient Frequency Behavior			✓	EUT operating frequency is at 4.9 GHz.
15.107	✓			Compliant by Similarity – Please refer to FCC ID: QJEWMC73000705.
15.109	✓			Compliant by Similarity – Please refer to FCC ID: QJEWMC73000705.



Motorola, Inc.  
4.9 GHz WMC7300 PCMCIA Card

Electromagnetic Compatibility  
Equipment Configuration  
CFR Title 47 Part 90 Subpart Y & Part 15 Subpart B

# Equipment Configuration



## 2. Equipment Configuration

### 2.1. Overview

MET Laboratories, Inc. was contracted by Motorola, Inc. to perform testing on the 4.9 GHz WMC7300 PCMCIA Card under purchase order number 032306\_01.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Motorola, Inc., 4.9 GHz WMC7300 PCMCIA Card.

An EMC evaluation to determine compliance of the TB 4.9 with the requirements of Part 90, Subpart Y, was conducted. (All references are to the most current version of Title 47 of the Code of Federal Regulations in effect). In accordance with §2.1033, the following data is presented in support of the Certification of the TB4.9. Motorola, Inc.. should retain a copy of this document and it should be kept on file for at least five years after the manufacturing of the EUT has been **permanently** discontinued. The results obtained relate only to the item(s) tested.

<b>Model(s) Tested:</b>	4.9 GHz WMC7300 PCMCIA Card										
<b>Model(s) Covered:</b>	4.9 GHz WMC7300 PCMCIA Card										
<b>EUT Specifications:</b>	<p>Primary Power Source: Laptop</p> <p>FCC ID: QJE-WMC73000715</p> <table><tr><td>Type of Modulations:</td><td>QDMA</td></tr><tr><td>Emission Designators:</td><td><p>Channel 0: 17.2132 MHz – 17M2W7D</p><p>Channel 1: 17.2413 MHz – 17M2W7D</p><p>Channel 2: 17.1910 MHz – 17M2W7D</p><p>Channel 3: 17.2012 MHz – 17M2W7D</p></td></tr><tr><td>Peak and Average Output Power:</td><td><p>26.68 dBm (Peak)</p><p>22.64 (Avg)</p></td></tr><tr><td>Equipment Code:</td><td>TNB</td></tr><tr><td>EUT Frequency Ranges:</td><td>4950 – 4980 MHz</td></tr></table>	Type of Modulations:	QDMA	Emission Designators:	<p>Channel 0: 17.2132 MHz – 17M2W7D</p> <p>Channel 1: 17.2413 MHz – 17M2W7D</p> <p>Channel 2: 17.1910 MHz – 17M2W7D</p> <p>Channel 3: 17.2012 MHz – 17M2W7D</p>	Peak and Average Output Power:	<p>26.68 dBm (Peak)</p> <p>22.64 (Avg)</p>	Equipment Code:	TNB	EUT Frequency Ranges:	4950 – 4980 MHz
Type of Modulations:	QDMA										
Emission Designators:	<p>Channel 0: 17.2132 MHz – 17M2W7D</p> <p>Channel 1: 17.2413 MHz – 17M2W7D</p> <p>Channel 2: 17.1910 MHz – 17M2W7D</p> <p>Channel 3: 17.2012 MHz – 17M2W7D</p>										
Peak and Average Output Power:	<p>26.68 dBm (Peak)</p> <p>22.64 (Avg)</p>										
Equipment Code:	TNB										
EUT Frequency Ranges:	4950 – 4980 MHz										
<b>Analysis:</b>	The results obtained relate only to the item(s) tested.										
<b>Environmental Test Conditions:</b>	<p>Temperature (15-35° C):</p> <p>Relative Humidity (30-60%):</p> <p>Barometric Pressure (860-1060 mbar):</p>										
<b>Evaluated by:</b>	Jeffrey Hazen										
<b>Date(s):</b>	December 5, 2008										



## 2.2. Test Site

All testing was performed at MET Laboratories, Inc., 914 W. Patapsco Ave., Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

## 2.3. Description of Test Sample

The Motorola, Inc. 4.9 GHz WMC7300 PCMCIA Card, is a wireless modem card that allows any computing device that supports PC cards to access MOTOMESH network. This card also forms instant broadband meshes between themselves and other MEA client devices when no MOTOMESH infrastructure is present.

## 2.4. Equipment Configuration

The EUT was set up as outlined in Figure 1, Block Diagram of Test Setup. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Name / Description	Model Number	Serial Number
N/A	4.9 GHZ PCMCIA CARD	WMC7300	00:05:12:10:05:54

Table 1. Equipment Configuration

## 2.5. Support Equipment

Motorola, Inc. supplied support equipment necessary for the operation and testing of the 4.9 GHz WMC7300 PCMCIA Card. All support equipment supplied is listed in the following Support Equipment List.

Ref. ID	Name / Description	Manufacturer	Model Number
N/A	LAPTOP W/ DOCKING STATION	DELL	INSPIRON 3800 PPX
N/A	LAPTOP/DOCKING STATION POWER SUPPLY	DELL	AA20031
N/A	MODULAR FIXTURE	MOTOROLA	PWB HMM000006

Table 2. Support Equipment

## 2.6. Ports and Cabling Information

Cable Description or reason for no cable	Qty.	Length (m)	Shielded? (Y/N)	Termination Box ID & Port ID
STANDARDDB-9 RS-232 CABLE ASSEMBLY	1	1	N	N/A
MMCX TO SMA RF CABLE ASSEMBLY	1	0.2	Y	N/A
FIXTURE POWER CABLE ASSEMBLY	1	1	N	N/A

Table 3. Ports and Cabling Information

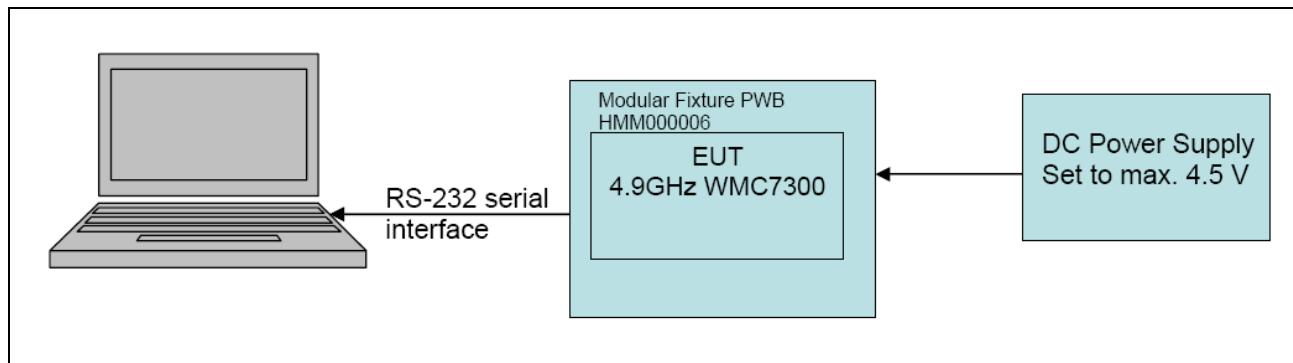


Figure 1. Block Diagram of Test Configuration

## 2.7. Method of Monitoring EUT Operation

The EUT is a Software Defined Radio that functions in a half duplex operation using a protocol that accesses any of the 4 different channels for communication. In test mode, the EUT can be run to generate traffic on any of the 4 different channels at a specified power setting and transmit duty cycle.

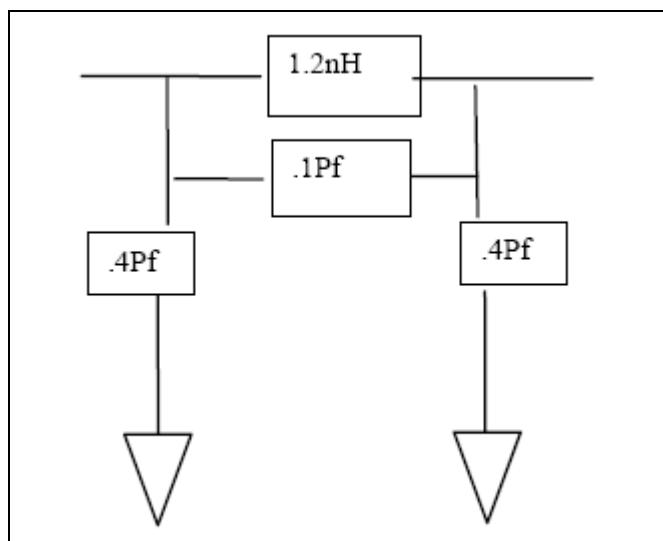
## 2.8. Modifications

### 2.8.1. Modifications to EUT

Changes made to 4.9 GHz MEA to attenuate the harmonic for the Conducted Spurious Emissions test:

C187 at output of U36 RFPA changed from .5 to .6 pf.

A 'PI' elliptical filter was added between the RF SW output U35 pin 5 and the Antenna Jack J1



### 2.8.2. Modifications to Test Standard

No modifications were made to the EUT.

## 2.9. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Motorola, Inc. upon completion of testing.



Motorola, Inc.  
4.9 GHz WMC7300 PCMCIA Card

Electromagnetic Compatibility  
Unintentional Radiators  
CFR Title 47 Part 90 Subpart Y & Part 15 Subpart B

### **III. Electromagnetic Compatibility Criteria for Unintentional Radiators**



### 3. Electromagnetic Compatibility Criteria for Unintentional Radiators

#### 3.1. Conducted Emissions Limits

**Test Requirement(s):** **15.107 (a)** “Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 4. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.”

**15.107 (b)** “For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 4. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals. The lower limit applies at the band edges.”

Frequency range (MHz)	15.107(b), Class A Limits (dB $\mu$ V)		15.107(a), Class B Limits (dB $\mu$ V)	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15- 0.5	79	66	66 - 56	56 - 46
0.5 – 5.0	73	60	56	46
5.0 - 30	73	60	60	50

Note — The lower limit shall apply at the transition frequencies.

**Table 4. Conducted Limits for Radio Frequency Devices calculated from FCC Part 15 Section 15.107(a) (b)**

**Test Results:** The EUT is not applicable to this requirement. The EUT is powered by a DC power supply.



### 3.2. Radiated Emissions Limits

**Test Requirement(s):** **15.109 (a)** Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the Class B limits expressed in Table 5.

**15.109 (b)** The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the Class A limits expressed in Table 5.

Frequency (MHz)	Field Strength (dB $\mu$ V/m)	
	§15.109 (b), Class A Limit (dB $\mu$ V) @ 10m	§15.109 (a), Class B Limit (dB $\mu$ V) @ 3m
30 - 88	39.00	40.00
88 - 216	43.50	43.50
216 - 960	46.40	46.00
Above 960	49.50	54.00

**Table 5. Radiated Emissions Limits calculated from FCC Part 15, §15.109 (a) (b)**

**Test Procedures:**

The EUT was placed on a 0.8m-high wooden table inside a semi-anechoic chamber. The method of testing and test conditions of ANSI C63.4 were used. An antenna was located 10 m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

**Test Results:**

Please refer to FCC ID: QJEWMC73000705.



Motorola, Inc.  
4.9 GHz WMC7300 PCMCIA Card

Electromagnetic Compatibility  
Intentional Radiators  
CFR Title 47, Part 90, Subpart Y & Part 15 Subpart B

## IV. Electromagnetic Compatibility Criteria for Intentional Radiators

## 4. Electromagnetic Compatibility RF Power Output Requirements

### 4.1. RF Power Output

**Test Requirement(s):** **§2.1046 and §90.1215(a) with FCC 04-265**

**Test Procedures:** As required by 47 CFR 2.1046, *RF power output measurements* were made at the RF output terminals using a Directional Coupler through a Spectrum Analyzer and Power Meter. Peak output power was measured for each channel, using a peak detector with the RBW set to a minimum of 1% of the Occupied Bandwidth and  $VBW > RBW$ . Peak power was used to determine whether to use the M or L mask. Average output power was measured with the same settings, except an average detector was used rather than a peak detector. Both types of output power tests were performed by integrating the power over the occupied bandwidth.

A laptop was connected to EUT to control the RF power output and frequency channel. The EUT was connected through a Directional Coupler to a Spectrum Analyzer to monitor the frequency and to a Power Meter to measure the Peak and Average power. The EUT power was adjusted enough to produce maximum output power as specified in the owner's manual. The output power was then recorded with peak and average reading. Measurements were made at all channels.

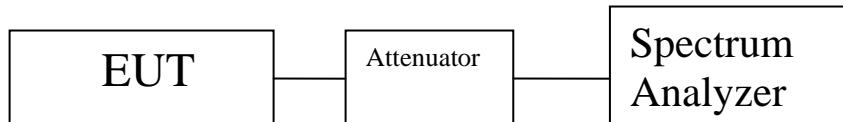
**Test Results:** Equipment complies with 47CFR 2.1046 and 90.1215(a) with FCC 04-265.

All RF Power output measurements were direct connection to RF output Terminal of EUT from a Power Meter.

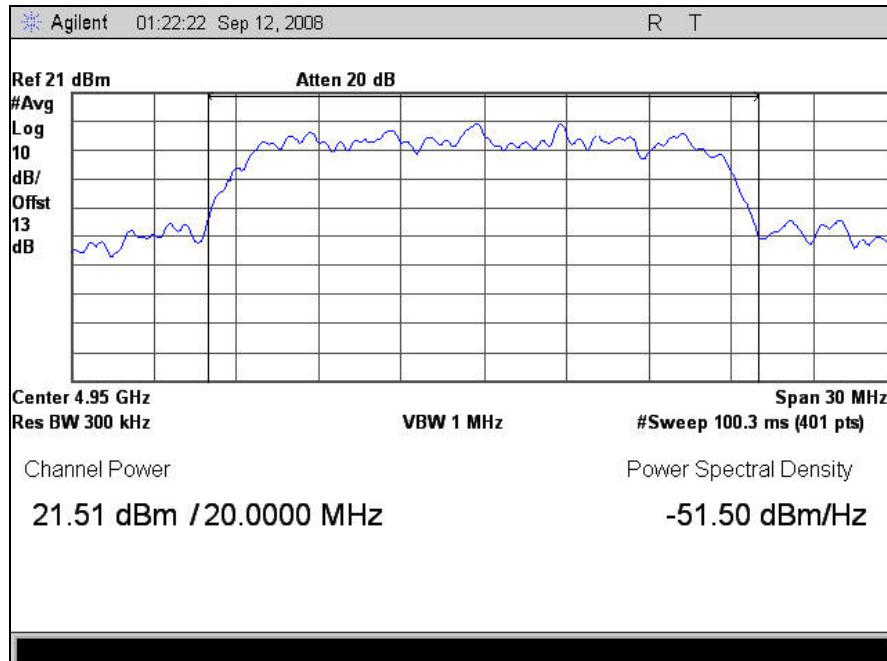
RF Power Output		
Frequency (MHz)	Peak Power (dBm)	Average Power (dBm)
20 MHz		
4950.0	25.66	21.51
4960.0	26.58	22.44
4970.0	26.36	22.21
4980.0	26.36	22.64

**Test Engineer(s):** Jeffrey Hazen

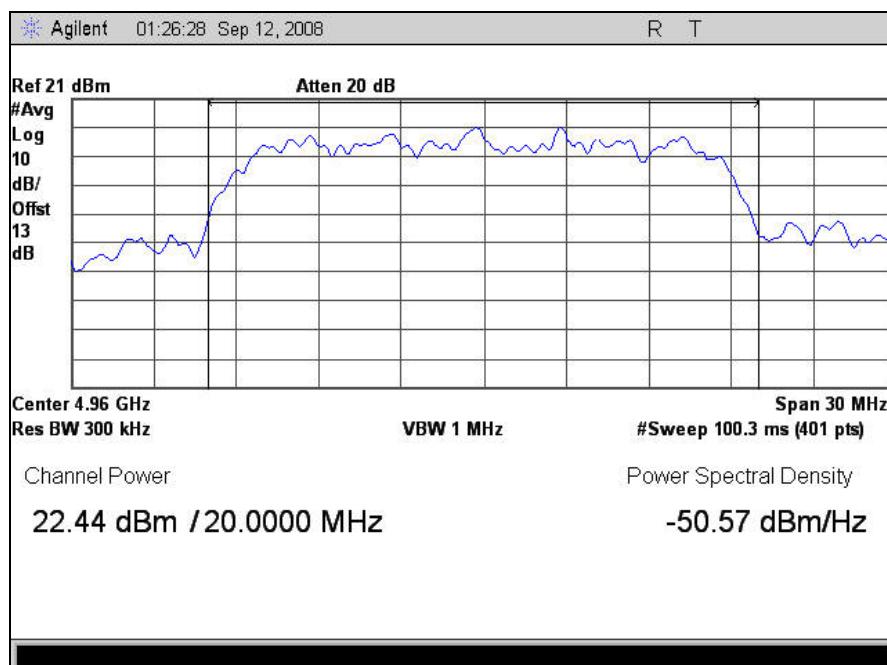
**Test Date(s):** 09/11/08



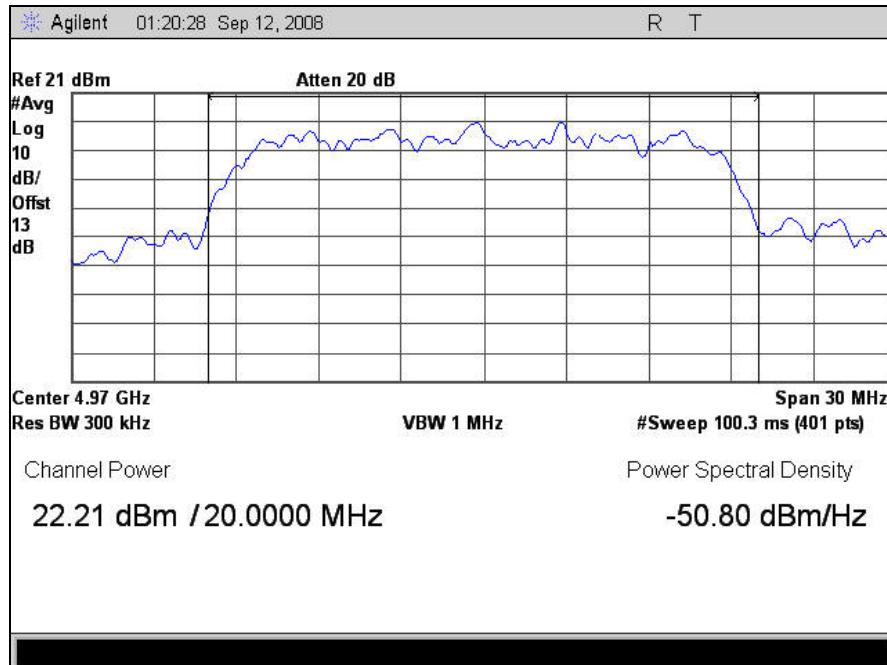
**Figure 2. RF Power Output Test Setup**



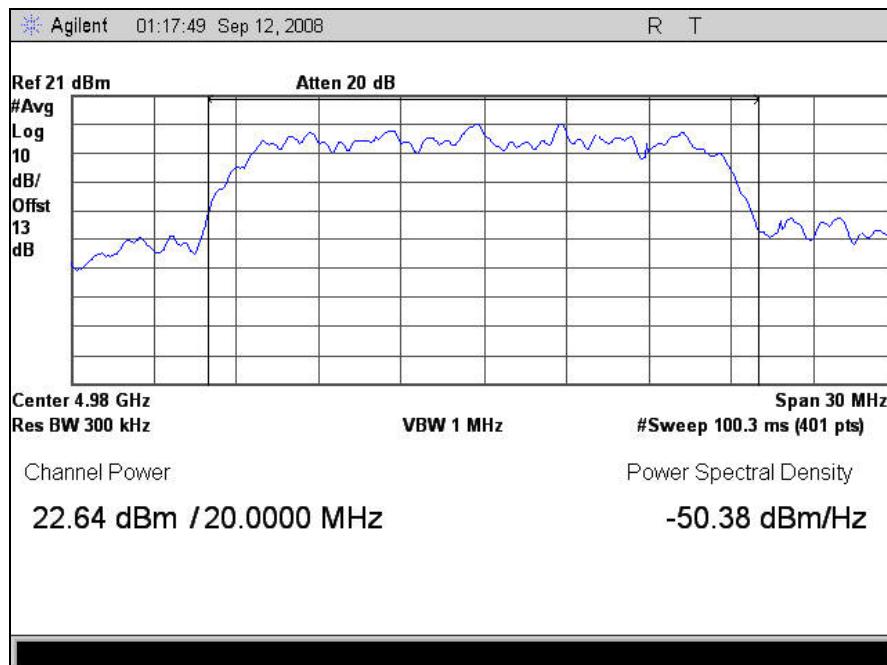
Plot 1. Average Output Power, Channel 0, 21 dBm Setting



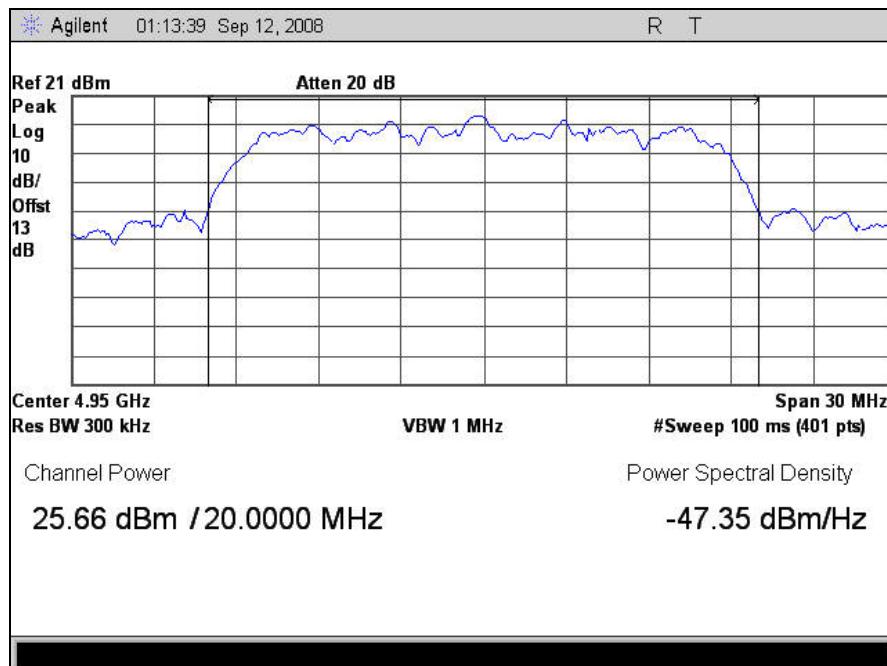
Plot 2. Average Output Power, Channel 1, 22 dBm Setting



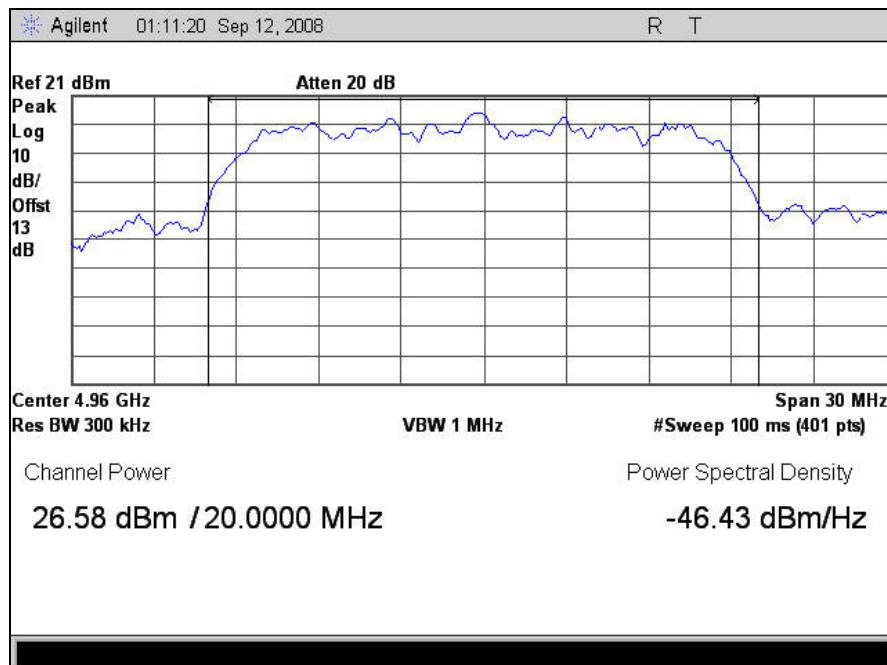
Plot 3. Average Output Power, Channel 2, 21 dBm Setting



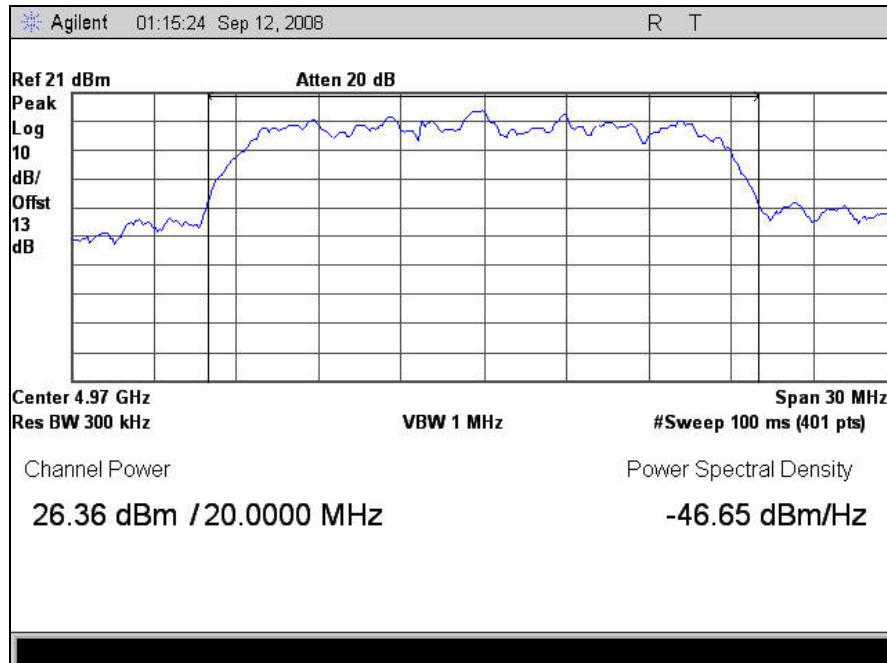
Plot 4. Average Output Power, Channel 3, 21 dBm Setting



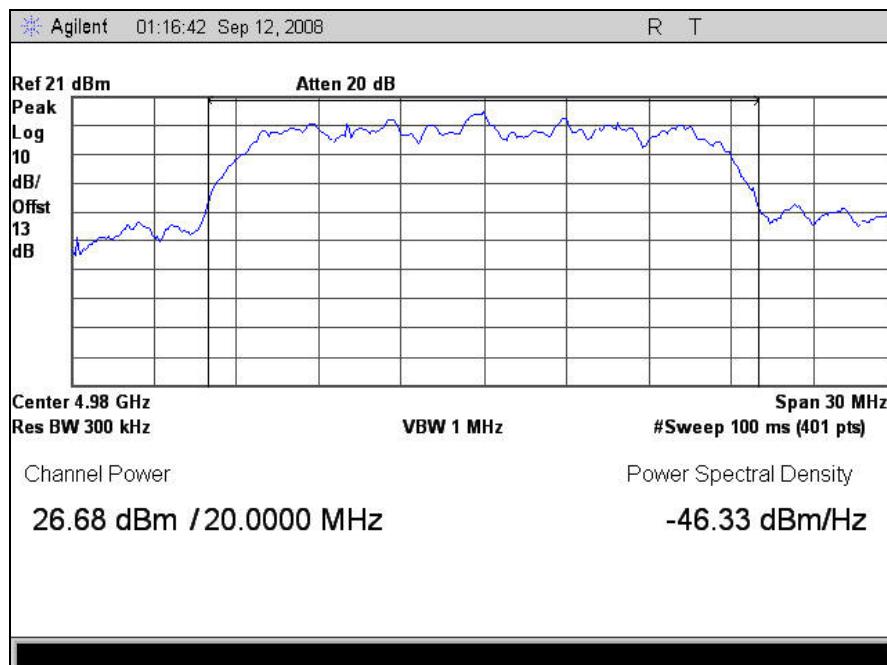
Plot 5. Peak Output Power, Channel 0, 21 dBm Setting



Plot 6. Peak Output Power, Channel 1, 22 dBm Setting



Plot 7. Peak Output Power, Channel 2, 21 dBm Setting



Plot 8. Peak Output Power, Channel 3, 21 dBm Setting

## 4.2. Peak Power Spectral Density

**Test Requirement(s):** §90.1215(a) with FCC 04-265

**Test Procedures:** As required by 47 CFR 2.1046, *RF power output measurements* were made at the RF output terminals using a Directional Coupler through a Spectrum Analyzer and Power Meter.

A laptop was connected to EUT to control the RF power output and frequency channel. The EUT was connected to a Spectrum Analyzer in order to measure the power level. The Spectrum Analyzer was set to a RBW = 1 MHz and VBW > 1 MHz. The EUT power was adjusted at the maximum output power level. The max hold key from the Spectrum Analyzer was activated capturing the modulated envelope of the EUT. The Peak Power Spectral Density was then recorded. Measurements were made for all channels.

**Test Results:** Equipment complies with 47 CFR 2.1046 and 90.1215(a) with FCC 04-265 (High Power devices). The EUT does not exceed 21 dBm/MHz peak power spectral density at the carrier frequency.

The following pages show measurements of Peak Power Spectral Density plots which is recorded below:

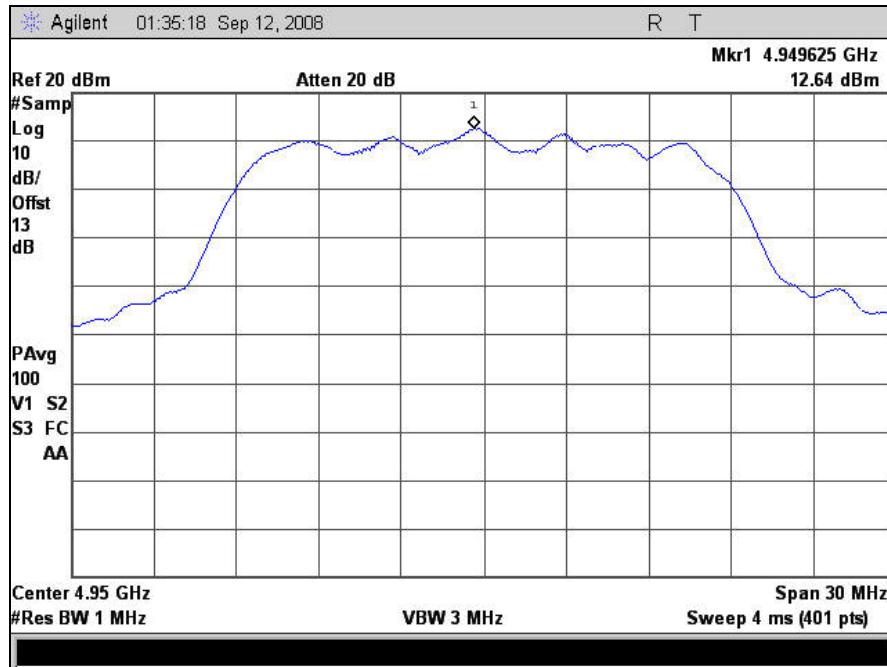
Peak Power Spectral Density				
Plot #	Frequency (MHz)	EUT Channel Bandwidth (MHz)	Measured Power Spectral Density (dBm)	Limit (dBm)
1	4950.0	20 MHz	12.64	19
2	4960.0		12.9	19
3	4970.0		13.16	19
4	4980.0		13.74	19

**Test Engineer(s):** Jeffrey Hazen

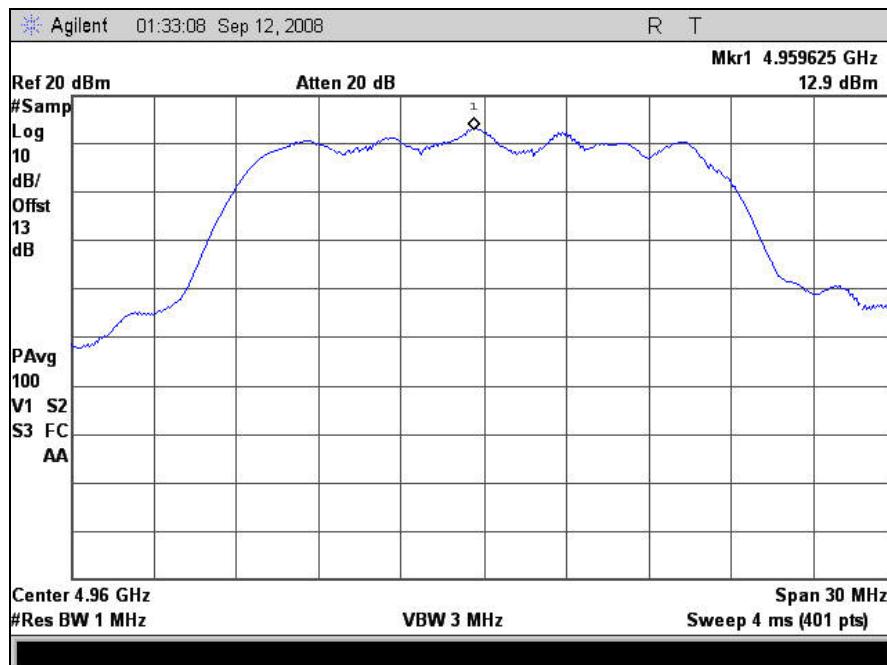
**Test Date(s):** 09/11/08



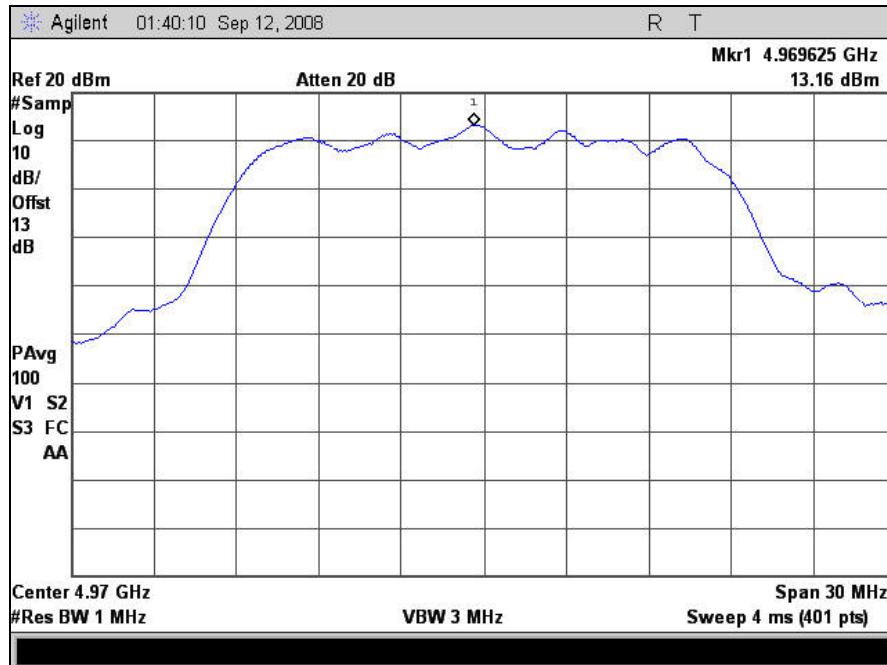
Figure 3. PPSD Test Setup



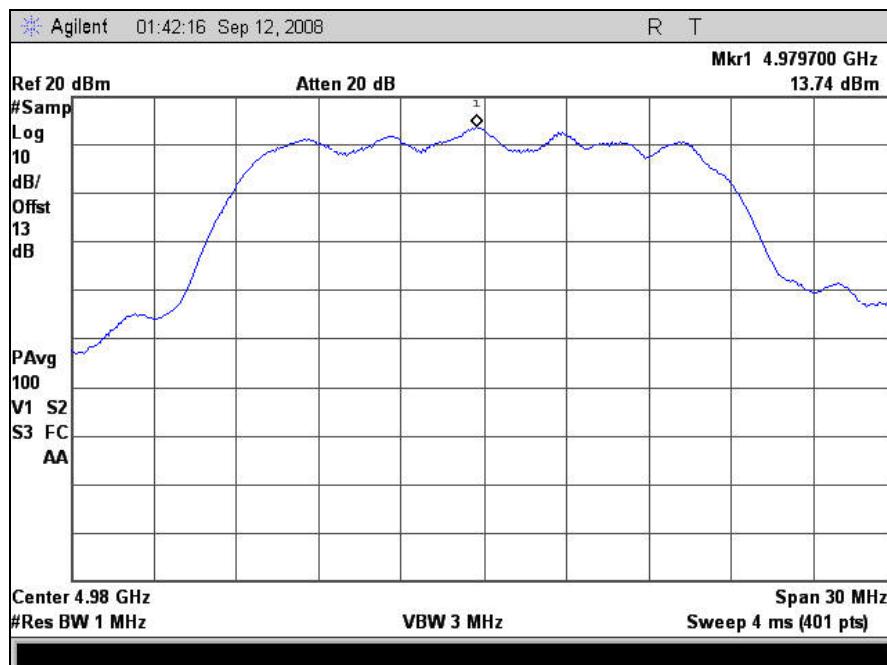
Plot 9. PPSD, Channel 0, 21 dBm Setting



Plot 10. Channel 1, 22 dBm Setting



Plot 11. Channel 2, 21 dBm Setting



Plot 12. Channel 3, 21 dBm Setting

## 5. Electromagnetic Compatibility Occupied Bandwidth Requirements

### 5.1. Occupied Bandwidth (Emission Mask)

**Test Requirement(s):** §2.1049 and §90.210 (M) with FCC 04-265 (Emissions Mask M)

**Test Procedures:** As required by 47 CFR 2.1049, *occupied bandwidth measurements* were made at the RF output terminals using a Spectrum Analyzer.

A laptop was connected to EUT to control the RF power output and frequency channel. The EUT was connected to a Spectrum Analyzer and a Power Meter to monitor the output power level. The measured highest Average Power was set relative to zero dB reference. The RBW of the Spectrum Analyzer was set to at least 1% of the channel bandwidth. The EUT power was adjusted at the maximum output power level. Measurements were carried out for all channels of the TX band.

**Test Results:** Equipment complies with Section 2.1049 and 90.210(M) with FCC 04-265 (Emission Mask M). The EUT does not exceed the Emission Masks limit.

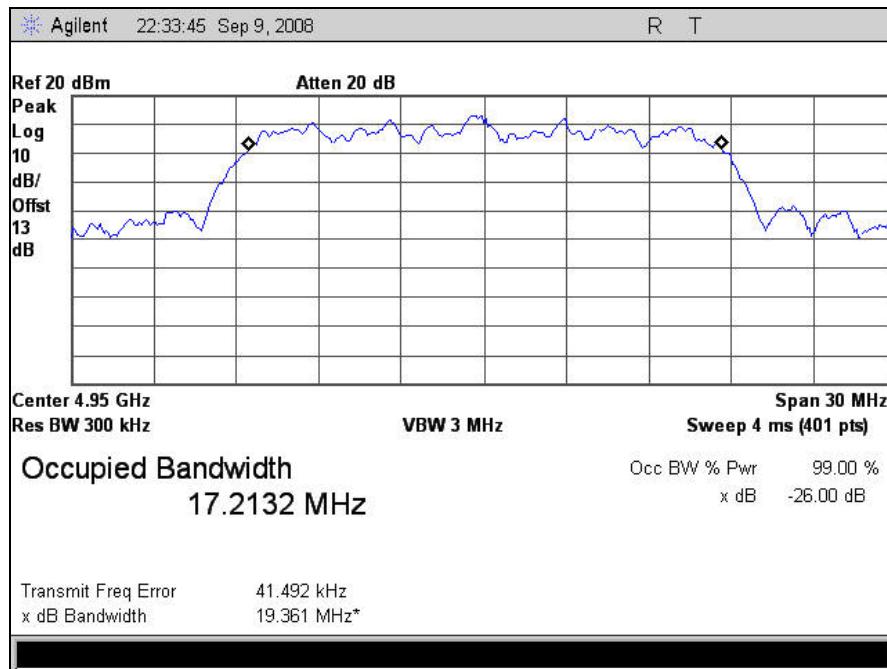
The following pages show measurements of Occupied Bandwidth and Emission Mask plots:

**Test Engineer(s):** Jeffrey Hazen

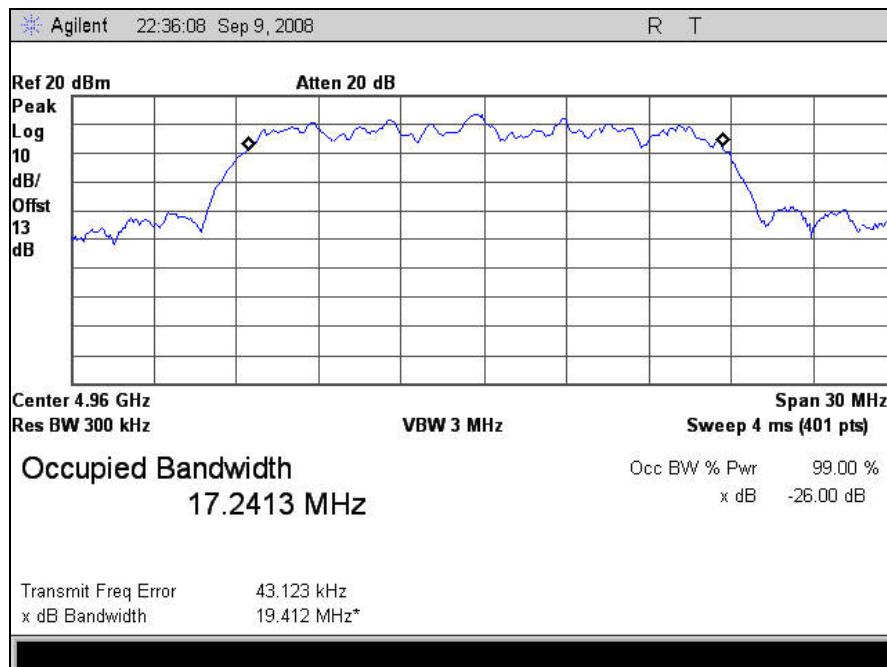
**Test Date(s):** 09/11/08



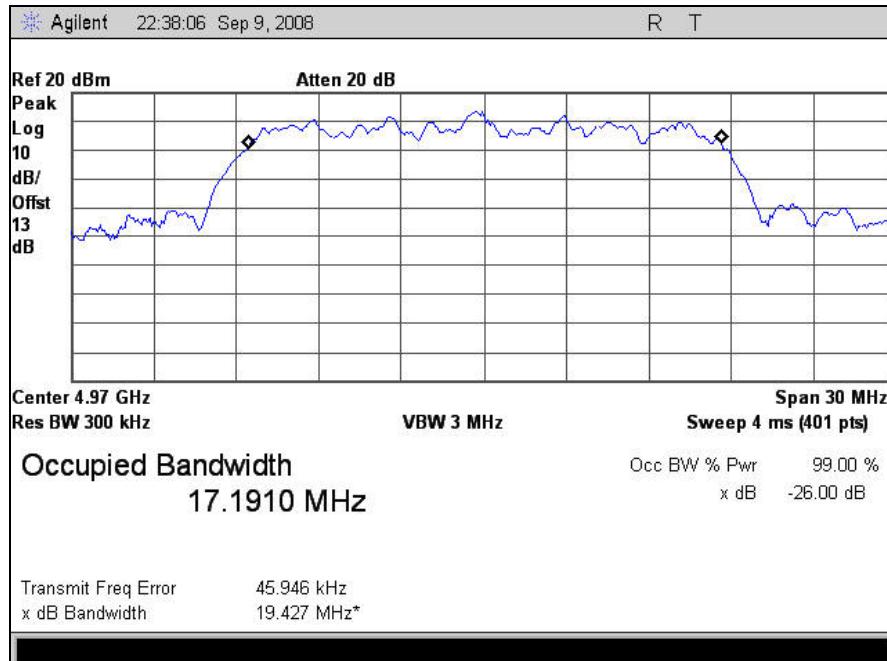
**Figure 4. Occupied Bandwidth (Emission Mask) Test Setup**



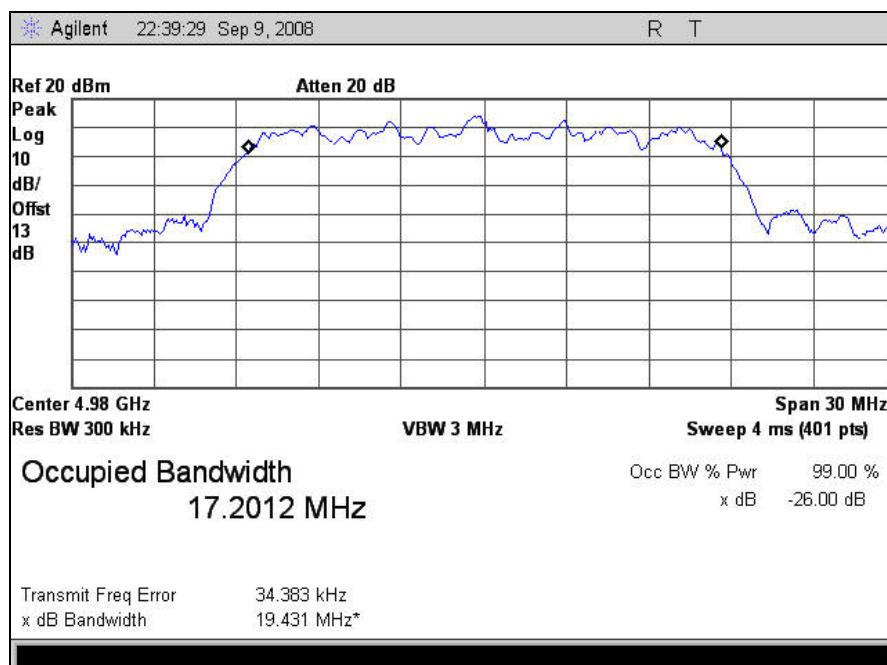
Plot 13. Occupied Bandwidth, Channel 0, 26 dB Bandwidth



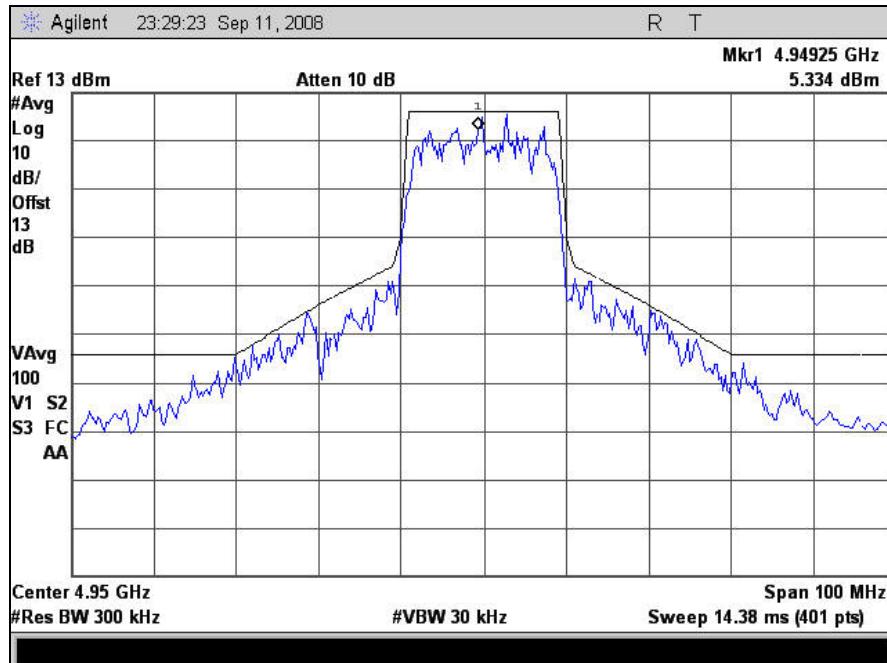
Plot 14. Occupied Bandwidth, Channel 1, 26 dB Bandwidth



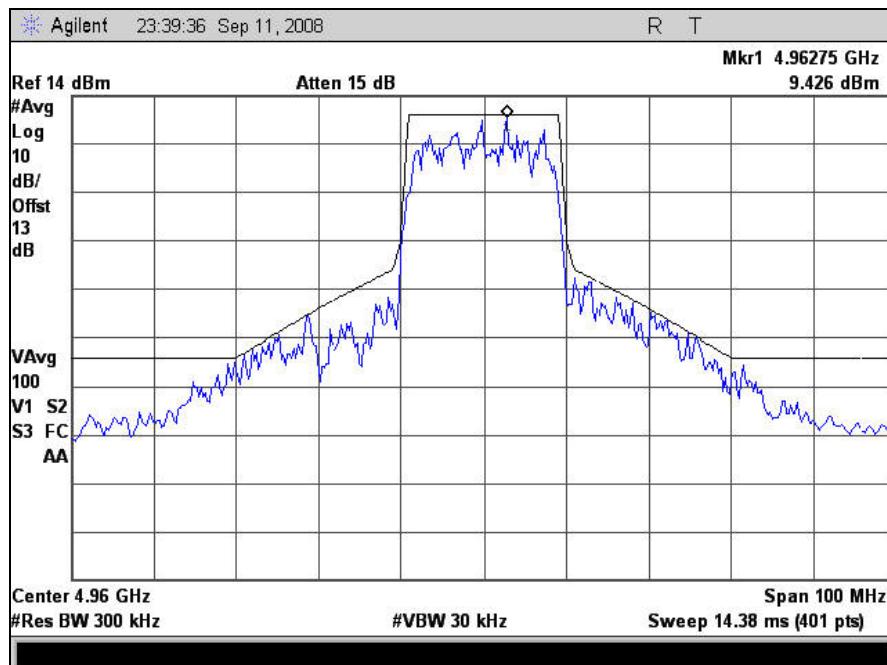
Plot 15. Occupied Bandwidth, Channel 2, 26 dB Bandwidth



Plot 16. Occupied Bandwidth, Channel 3, 26 dB Bandwidth



Plot 17. Emission Mask, Channel 0, 21 dBm Output Power Setting

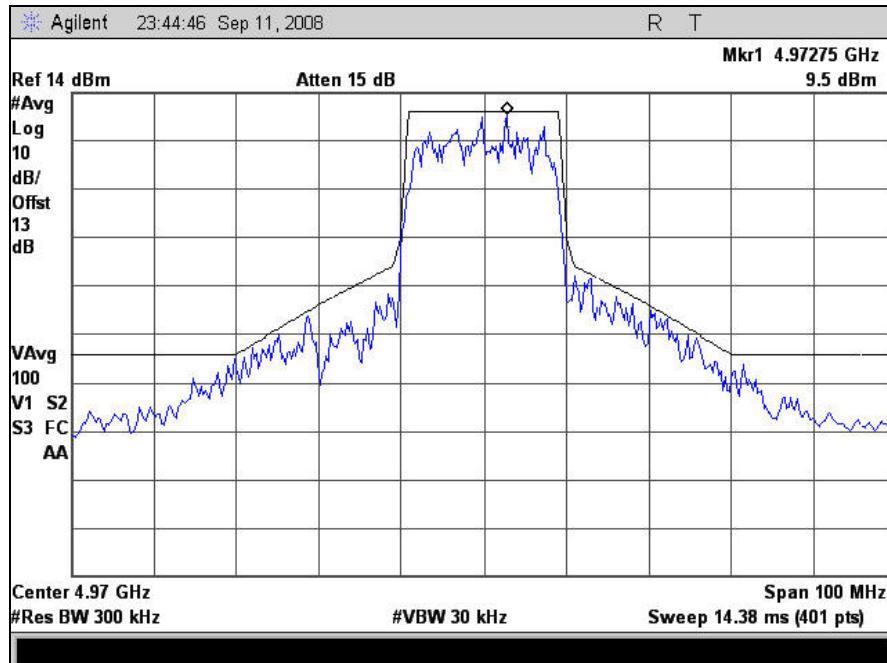


Plot 18. Emission Mask, Channel 1, 22 dBm Output Power Setting

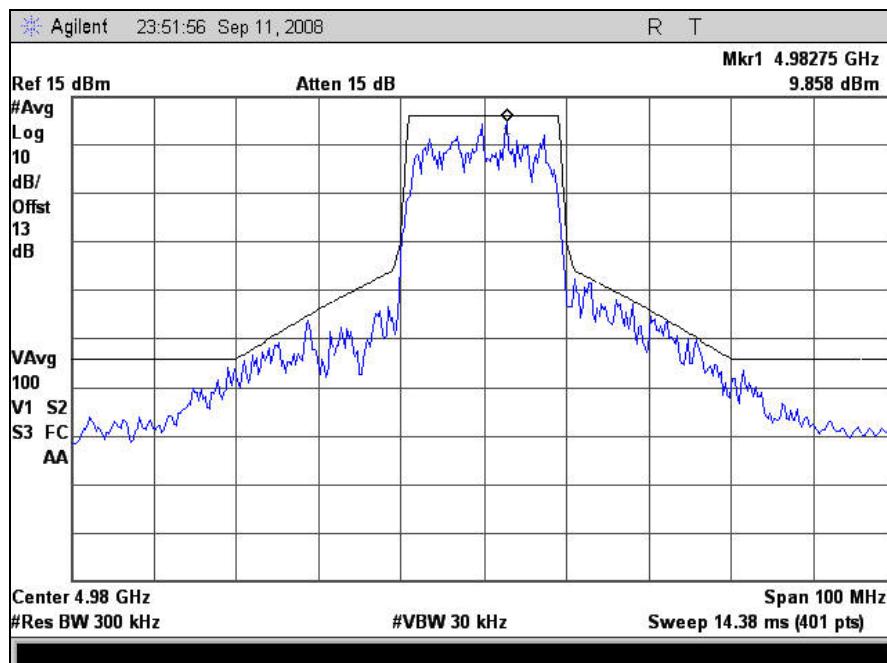


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Plot 19. Emission Mask, Channel 2, 21 dBm Output Power Setting



Plot 20. Emission Mask, Channel 2, 21 dBm Output Power Setting

## 6. Electromagnetic Compatibility Spurious Emissions at Antenna Terminal Requirements

### 6.1. Spurious Emissions at Antenna Terminals

**Test Requirement(s):** §2.1051 and §90.210(M) with FCC 04-265

**Test Procedures:** As required by 47 CFR 2.1051, *spurious emissions at antenna terminal measurements* were made at the RF output terminals using a Directional Coupler through a Spectrum Analyzer and Power Meter.

A laptop was connected to EUT to control the RF power output and frequency channel. The EUT was connected to a Spectrum Analyzer and a Power Meter to monitor the output power level. The Spectrum Analyzer was set to sweep 30 MHz and up to 10<sup>th</sup> harmonic of the fundamental or 40 GHz which ever is the lesser. Measurements were made for all channels.

For frequencies 1-18 GHz, measurements were made using a spectrum analyzer. For frequencies 20-40 GHz a HP11970A and HP11970K harmonic mixer was used. Each harmonic mixer was fed with a SMA to wave guide adapter.

The Conducted Spurious Emissions *Limit* is obtained by the following:

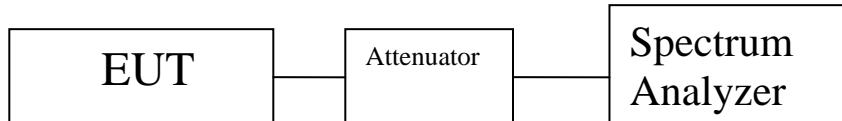
§90.210.m.6

On any frequency removal from the assigned frequency between above 150% of the authorized bandwidth: 50 dB or  $55 + 10 \log (P)$  dB, whichever is the lesser attenuation.

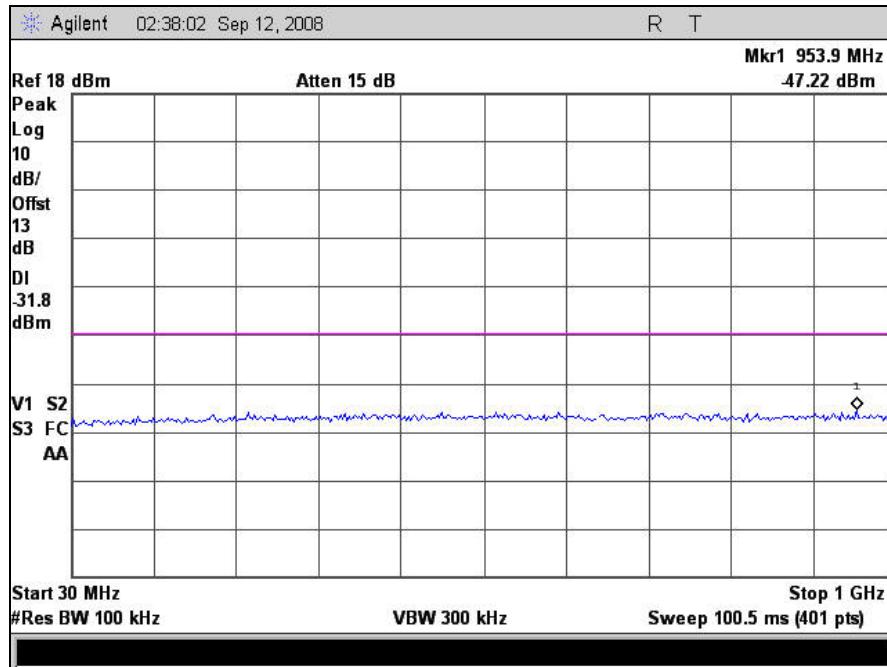
**Test Results:** Equipment complies with Section 2.1051 and 90.210(M) with FCC 04-265. Emissions above 20 GHz were at the noise floor.

**Test Engineer(s):** Jeffrey Hazen

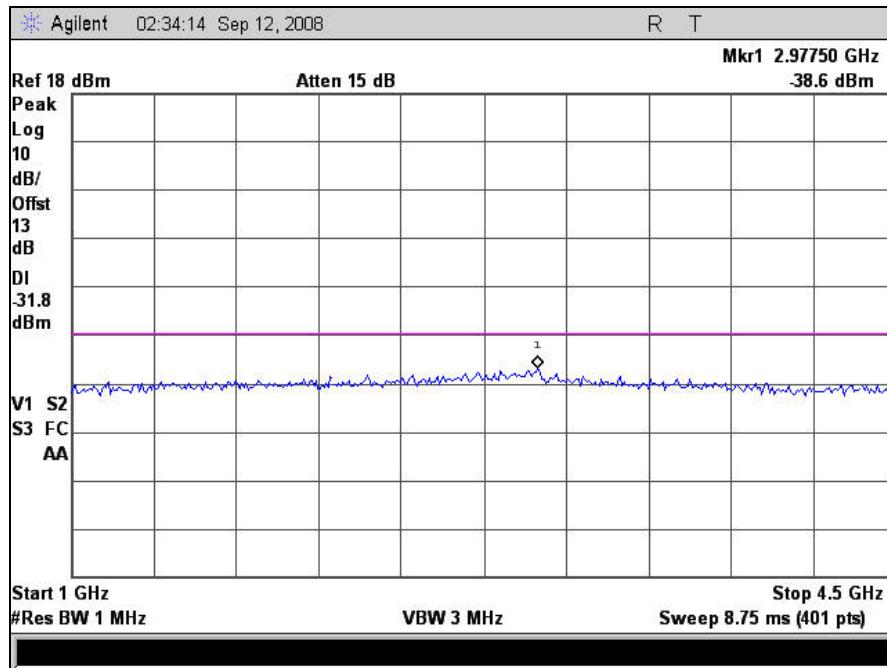
**Test Date(s):** 09/11/08



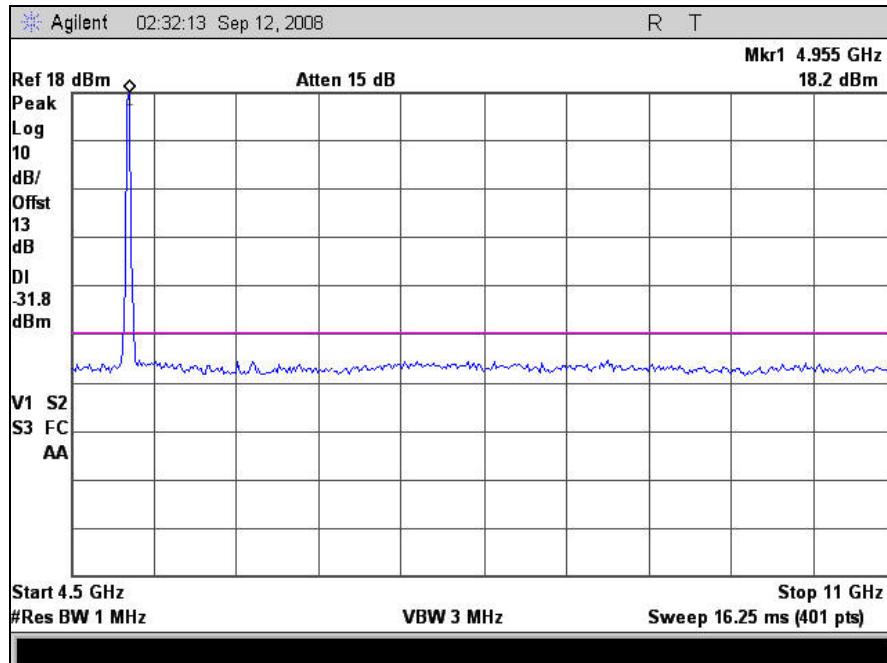
**Figure 5. Spurious Emissions at Antenna Terminals Test Setup**



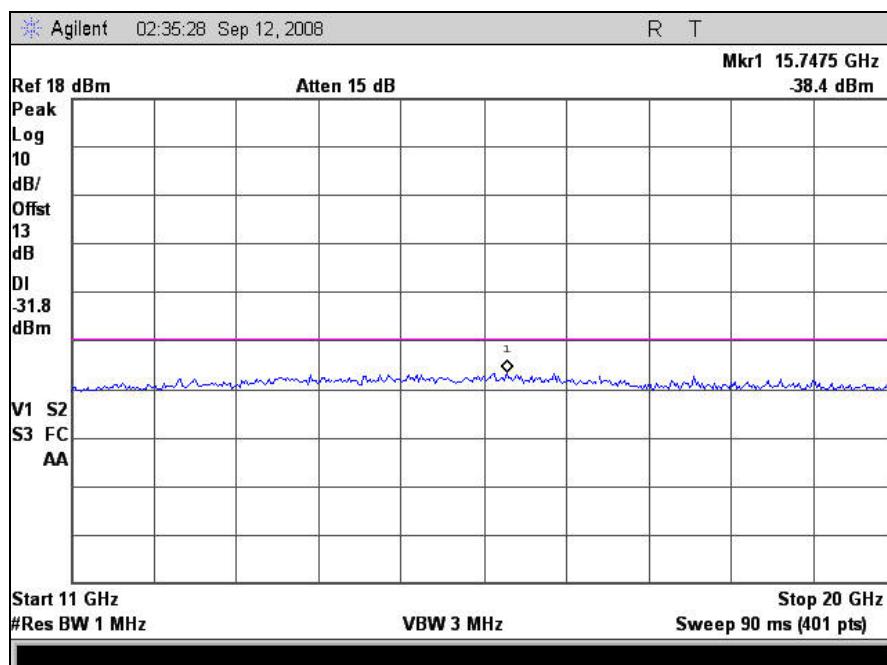
Plot 21. Conducted Spurious Emissions, Channel 0, 30 MHz – 1 GHz



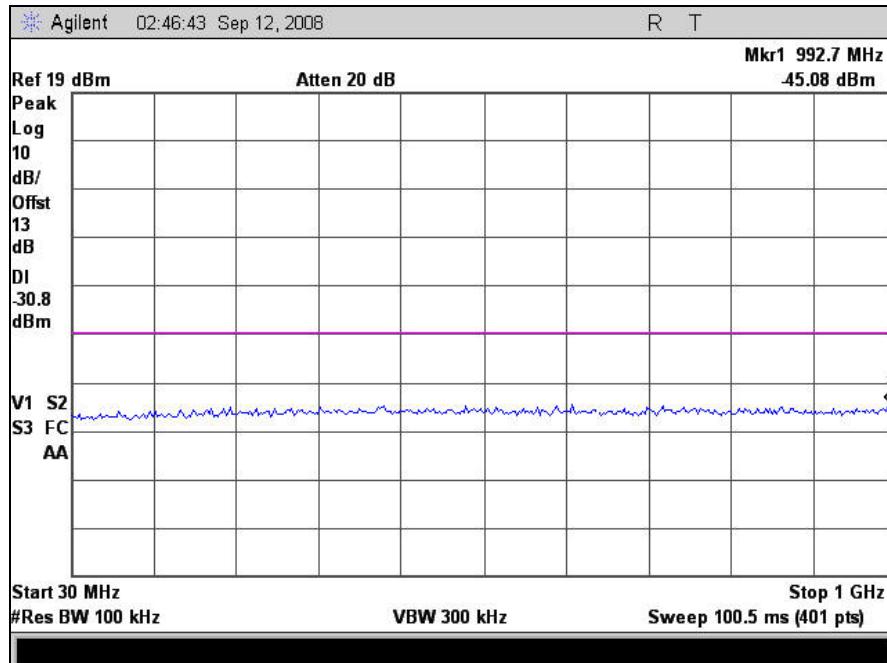
Plot 22. Conducted Spurious Emissions, Channel 0, 1 GHz – 4.5 GHz



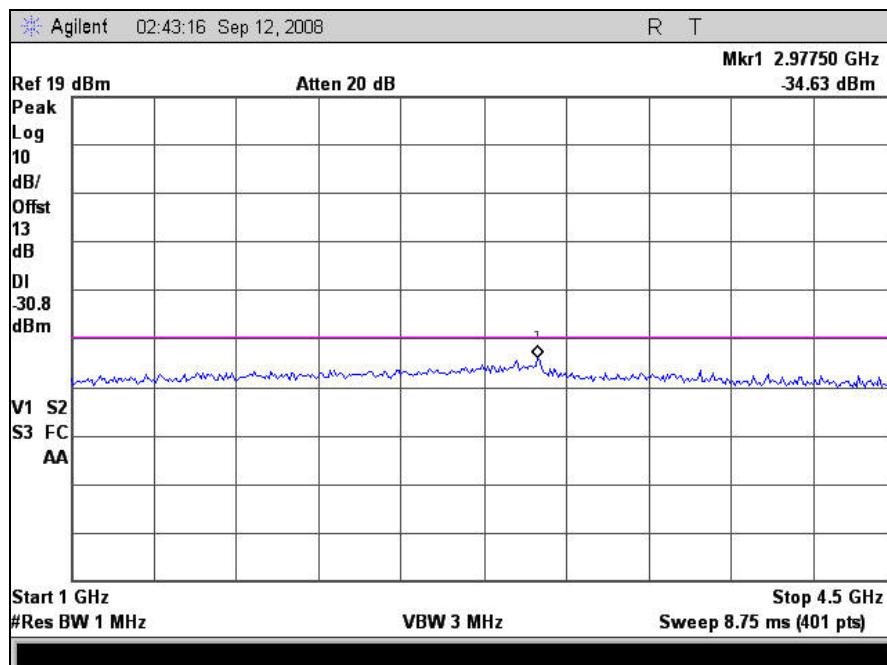
Plot 23. Conducted Spurious Emissions, Channel 0, 4.5 GHz – 11 GHz



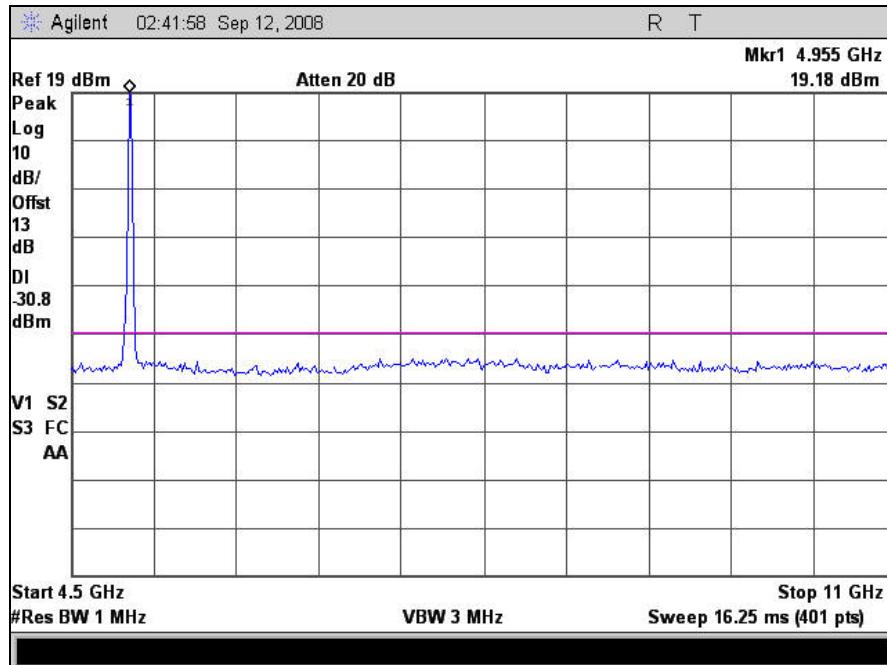
Plot 24. Conducted Spurious Emissions, Channel 0, 11 GHz – 20 GHz



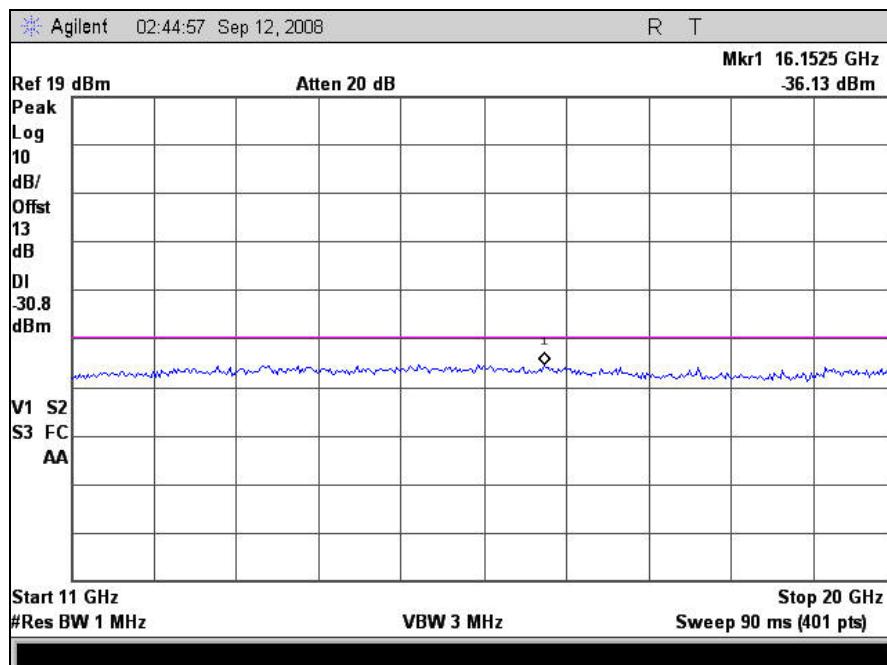
Plot 25. Conducted Spurious Emissions, Channel 1, 30 MHz – 1 GHz



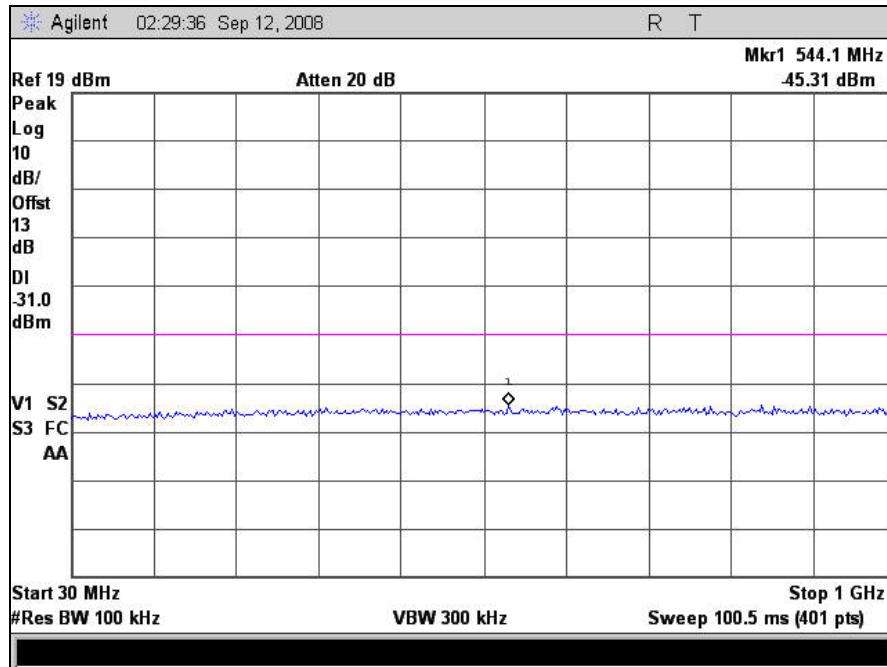
Plot 26. Conducted Spurious Emissions, Channel 1, 1 GHz – 4.5 GHz



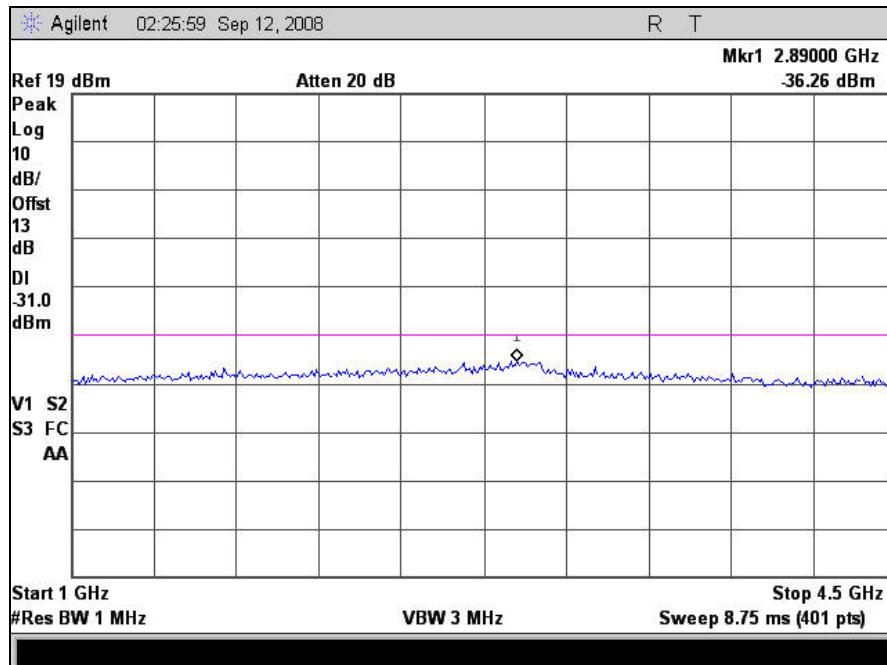
Plot 27. Conducted Spurious Emissions, Channel 1, 4.5 GHz – 11 GHz



Plot 28. Conducted Spurious Emissions, Channel 1, 11 GHz – 20 GHz



Plot 29. Conducted Spurious Emissions, Channel 2, 30 MHz – 1 GHz

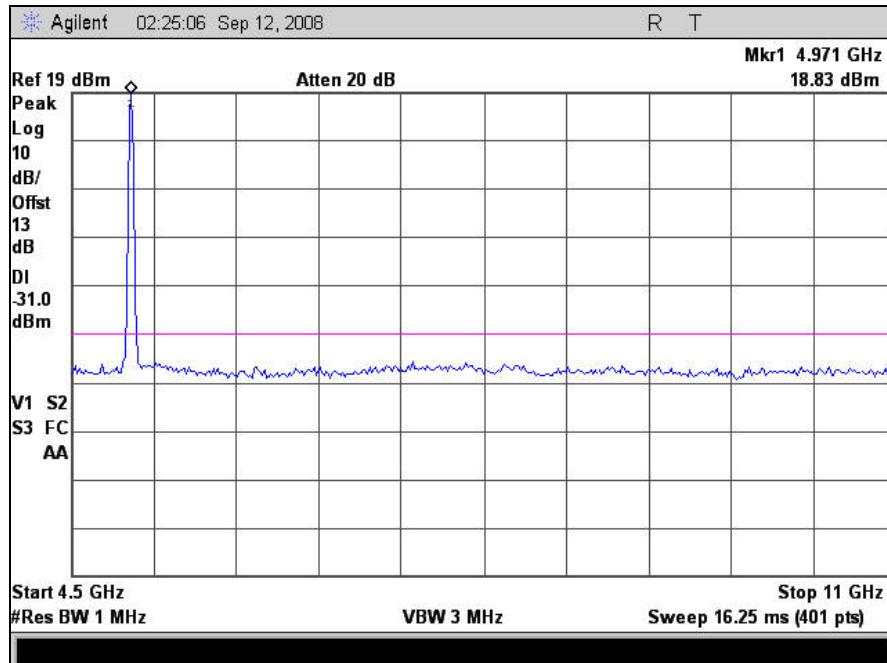


Plot 30. Conducted Spurious Emissions, Channel 2, 1 GHz – 4.5 GHz

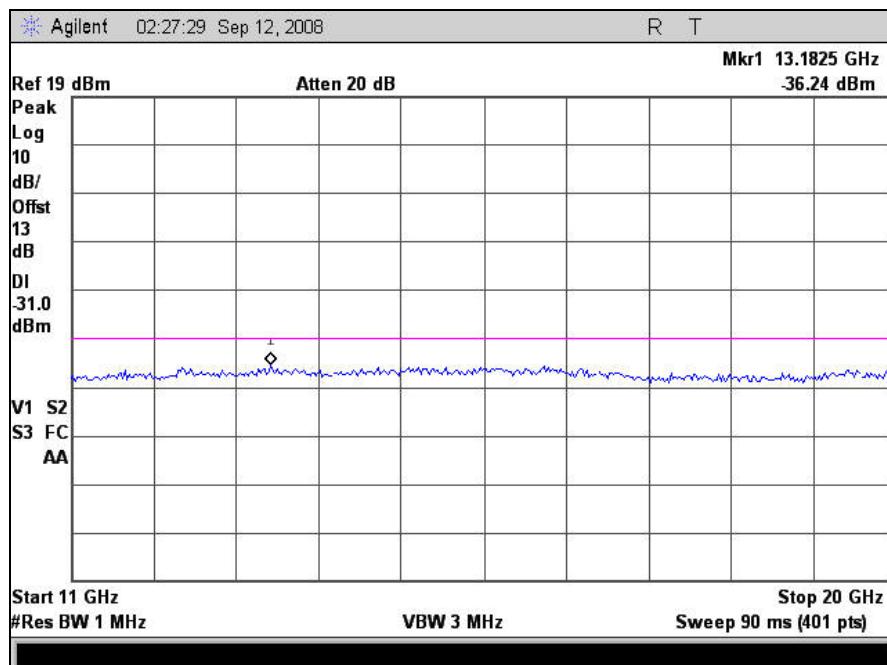


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Plot 31. Conducted Spurious Emissions, Channel 2, 4.5 GHz – 11 GHz

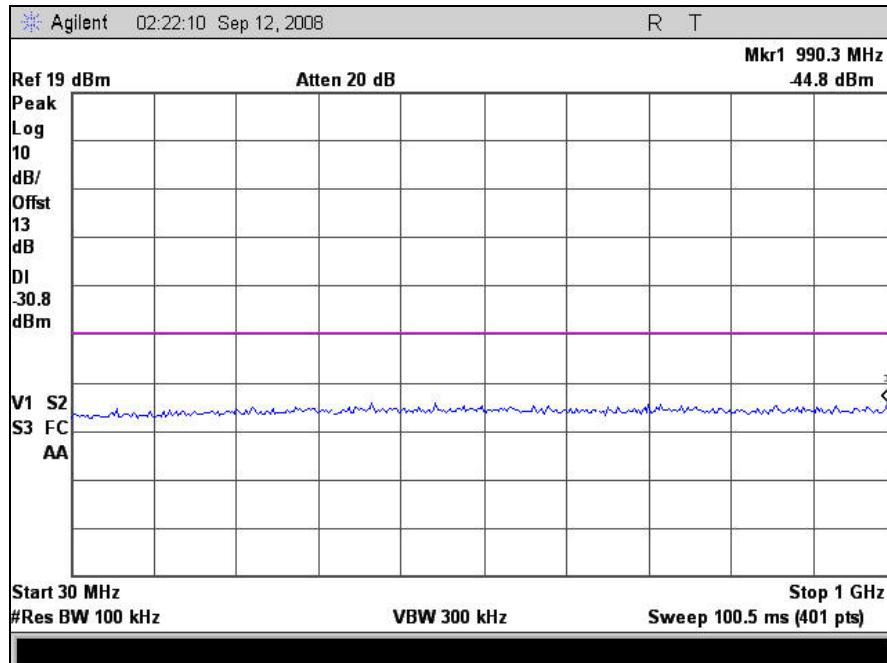


Plot 32. Conducted Spurious Emissions, Channel 2, 11 GHz – 20 GHz

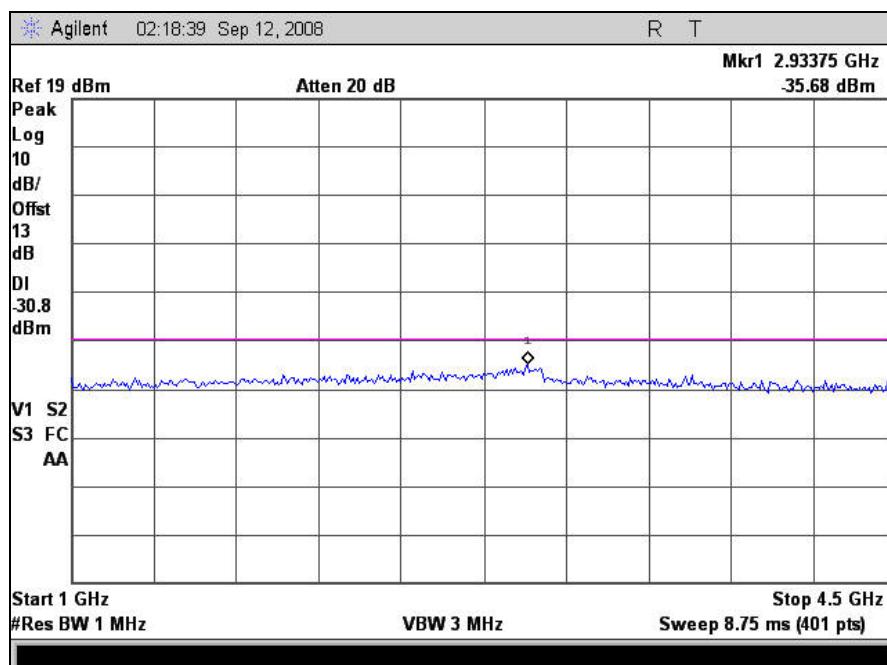


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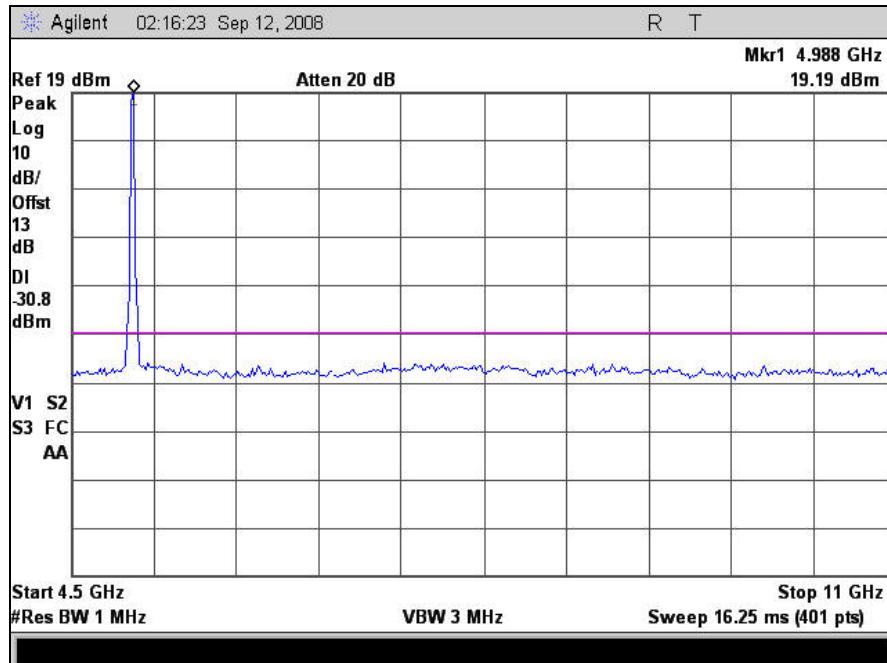
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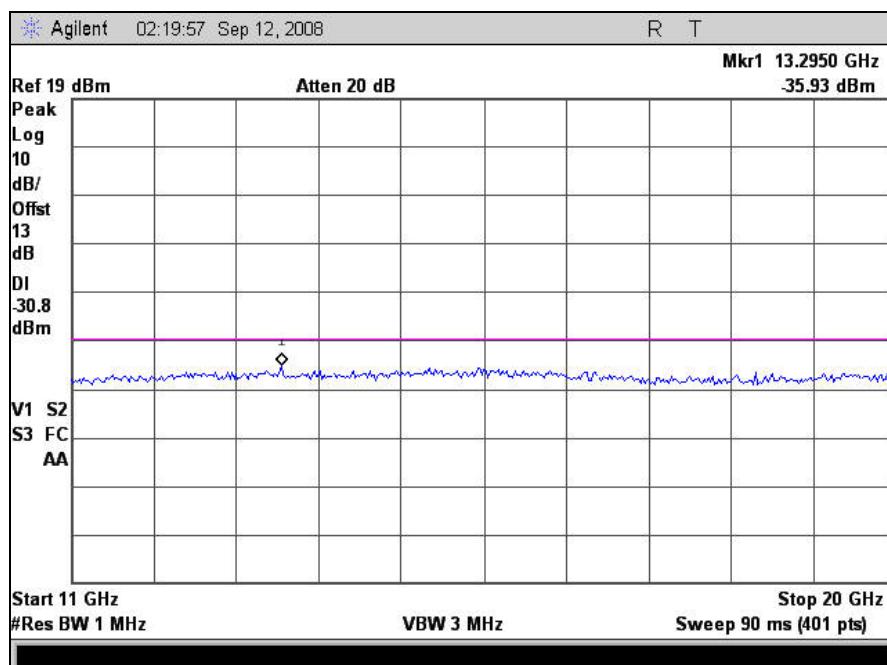
Plot 33. Conducted Spurious Emissions, Channel 3, 30 MHz – 1 GHz



Plot 34. Conducted Spurious Emissions, Channel 3, 1 GHz – 4.5 GHz



Plot 35. Conducted Spurious Emissions, Channel 3, 4.5 GHz – 11 GHz



Plot 36. Conducted Spurious Emissions, Channel 3, 11 GHz – 20 GHz



## 7. Electromagnetic Compatibility Radiated Emissions Requirements

### 7.1. Radiated Emissions (Substitution Method)

**Test Requirement(s):** §2.1053 and §90.210

**Test Procedures:** As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* were made in accordance with the procedures of TIA/EIA-603-A-2001 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

Radiated emission measurements were performed inside a 3 meter semi-anechoic chamber. The EUT was set at a distance of 3m from the receiving antenna for emissions from 30 MHz to 1 GHz and 1 m for emissions above 1 GHz. The EUT's RF ports were terminated to 50ohm load. The EUT was set to transmit all channels of the transmitter frequency range for spurious emissions above 1 GHz, and for a single channel from 30 MHz to 1 GHz. Only a single channel was observed below 1 GHz to ensure that the unintentional radiator emissions were well below the test limit. For all radiated spurious emissions, the transmitter was operated at its maximum power level. The EUT was rotated about 360° and the receiving antenna scanned from 1-4m in order to capture the maximum emission. A calibrated antenna source was positioned in place of the EUT and the previously recorded signal was duplicated. The maximum EIRP of the emission was calculated by adding the forward power to the calibrated source plus its appropriate gain value for emissions within 6 dB of the limit. EIRP was otherwise computed using the equation  $EIRP \text{ (dBm)} = E \text{ (dBuV/m)} + 20 \log d(m) - 104.8$ . These steps were carried out with the receiving antenna in both vertical and horizontal polarization. Harmonic emissions up to the 10<sup>th</sup> or 40 GHz, which ever was the lesser, were investigated.

The test limit for this section was set to the same limit as for Section 6.1 of this report, or 50 dB attenuation to the peak emission of the fundamental.

**Test Results:** Equipment complies with Section 2.1053 and 90.210. The emissions for all channels from 18 GHz to 40 GHz were at the noise floor level. The compliance of emissions in this frequency range are demonstrated here using Channel 1 as an example.

**Test Engineer(s):** Jeffrey Hazen

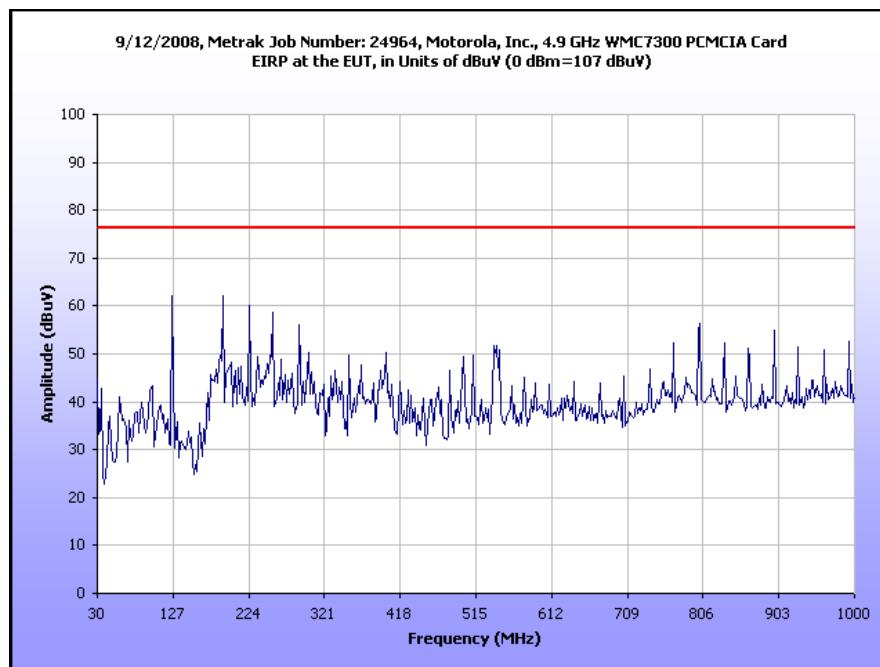
**Test Date(s):** 09/24/08



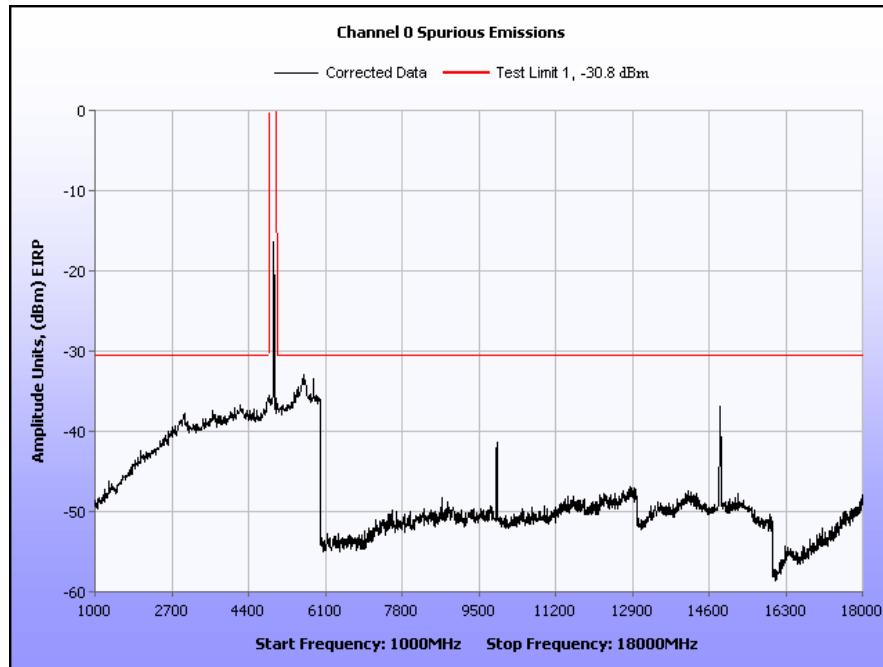
## Radiated Emissions (Substitution Method) Test Results

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected EMI Meter Reading (dBuV)	Antenna Correction Factor (dB/m) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Peak Amplitude (dBm)	Limit (dBm)	Margin (dB)
128.00441	260	H	1.6556	18.6	7.46	1.31	95.26	-67.89	-30.8	-37.09
128.00441	185	V	1	22.21	7.96	1.31	95.26	-63.78	-30.8	-32.98
191.99299	286	H	1.1604	39.81	10.44	1.40	95.26	-43.61	-30.8	-12.81
191.99299	222	V	1	33.06	9.82	1.40	95.26	-50.98	-30.8	-20.18
128.004	289	H	1.1604	25.24	7.46	1.31	95.26	-61.25	-30.8	-30.45
128.004	174	V	1.0004	27.4	7.96	1.31	95.26	-58.59	-30.8	-27.79
223.98998	295	H	0.9995	40.7	10.60	1.45	95.26	-42.51	-30.8	-11.71
223.98998	14	V	0.986	31.97	10.86	1.45	95.26	-50.98	-30.8	-20.18
256.00301	288	H	1.0004	35.68	13.14	1.57	95.26	-44.87	-30.8	-14.07
256.00301	183	V	1.0021	28.15	12.84	1.57	95.26	-52.70	-30.8	-21.90
799.98397	347	H	1	26.42	21.50	2.48	95.26	-44.86	-30.8	-14.06
799.98397	66	V	0.9873	24.31	21.50	2.48	95.26	-46.97	-30.8	-16.17
287.98096	280	H	1.0004	31.09	12.92	1.57	95.26	-49.68	-30.8	-18.88
287.98096	174	V	1.0395	24.41	12.28	1.57	95.26	-57.00	-30.8	-26.20

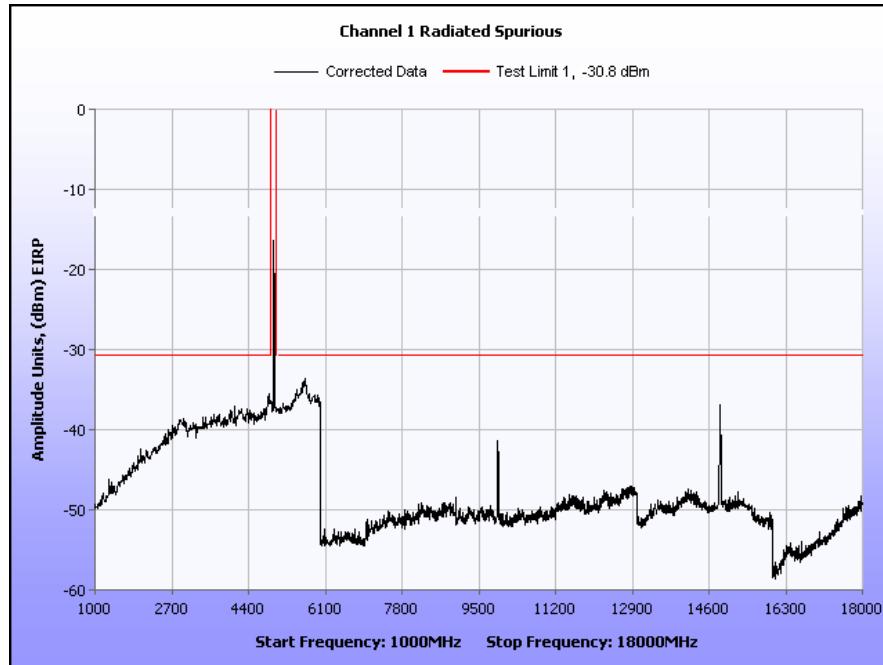
Notes: All other emissions were measured at the noise floor of the spectrum analyzer.



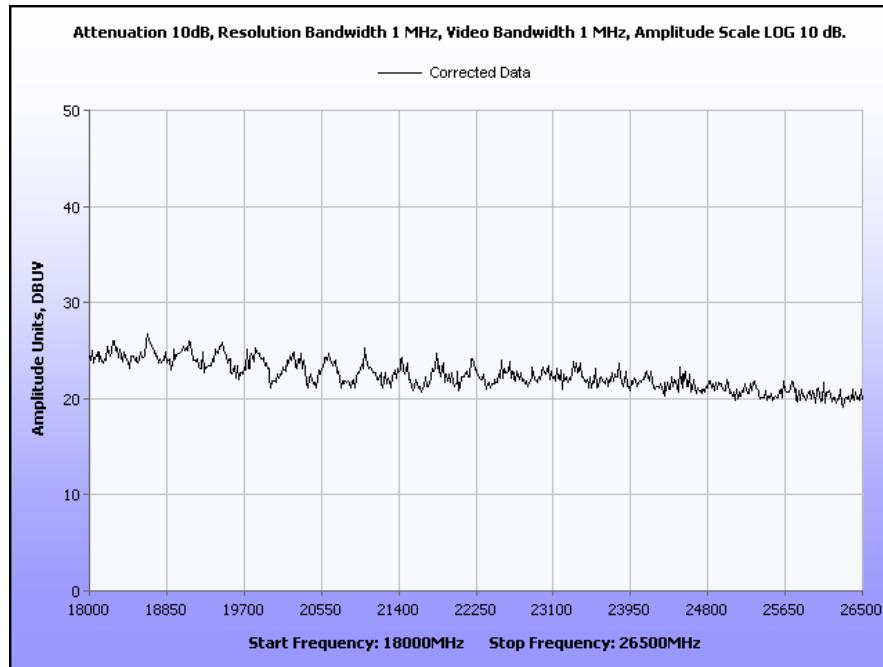
Plot 37. Radiated Emissions, Pre-Scan, 30 MHz – 1 GHz



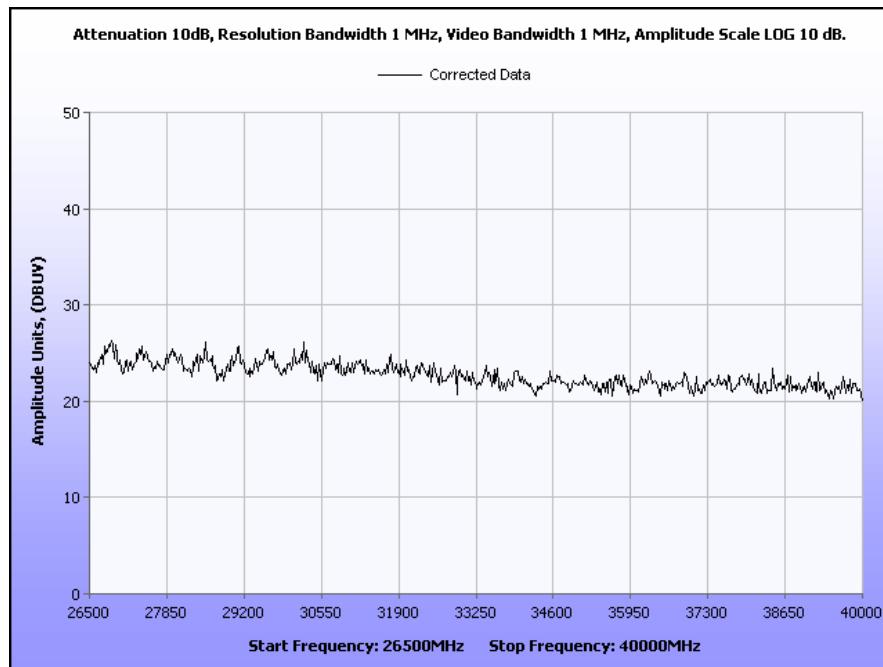
Plot 38. Radiated Spurious, Channel 0, 1 GHz – 18 GHz



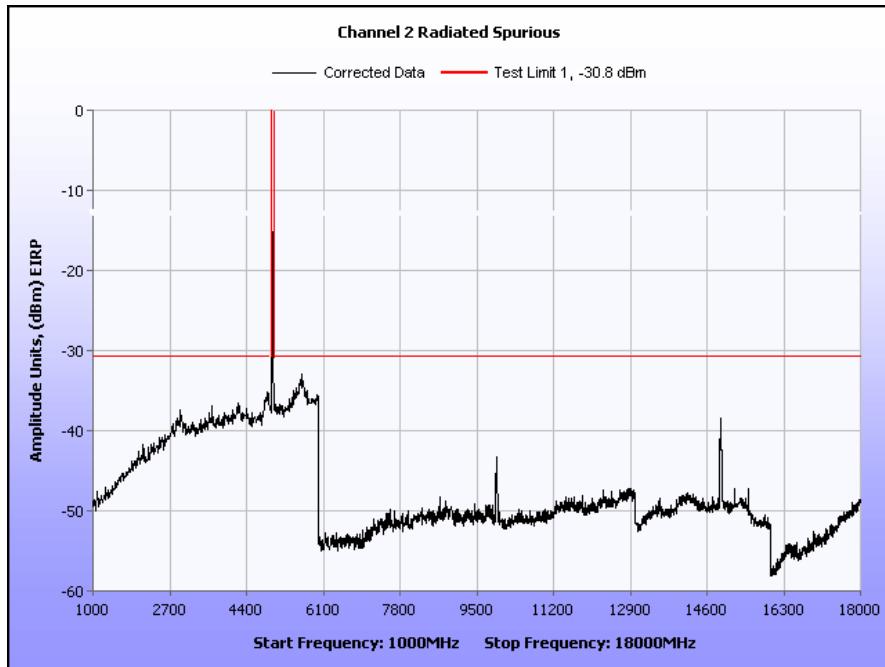
Plot 39. Radiated Spurious, Channel 1, 1 GHz – 18 GHz



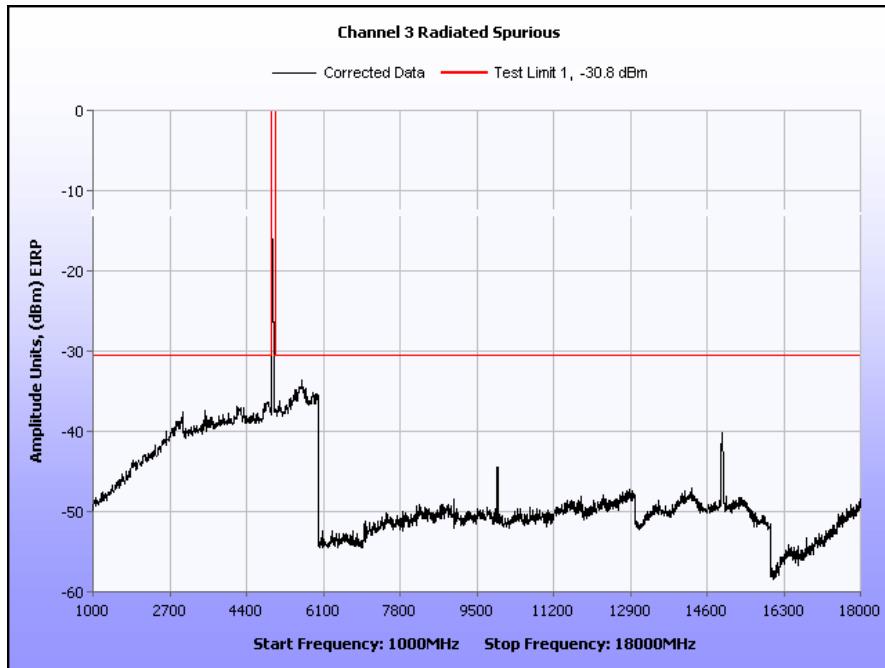
Plot 40. Radiated Spurious, Channel 1, 18 GHz – 26.5 GHz



Plot 41. Radiated Spurious, Channel 1, 26.5 GHz – 40 GHz



Plot 42. Radiated Spurious, Channel 2, 1 GHz – 18 GHz



Plot 43. Radiated Spurious, Channel 3, 1 GHz – 18 GHz



## 8. Electromagnetic Compatibility Frequency Stability Requirements

### 8.1. Frequency Stability

**Test Requirement(s):** §2.1055 and §90.213

**Test Procedures:** As required by 47 CFR 2.1055, *Frequency Stability measurements* were made at the RF output terminals using a Directional Coupler through a Spectrum Analyzer and Power Meter.

The EUT was placed in the Environmental Chamber and support equipments are outside the chamber on a table. The EUT was set to transmitter at a data rate corresponding to 20 MHz BW. The frequency counter option on the Spectrum Analyzer was used to measure frequency deviations. The frequency drift was investigated for every  $10^C$  increment until the unit is stabilized then recorded the reading in tabular format with the temperature range of -30 to  $50^C$ .

Voltage supplied to EUT is 120 VAC reference temperature was done at  $20^C$ . The voltage was varied by  $\pm 15\%$  of nominal

**Test Results:** Please refer to FCC ID: QJEWMC73000705.



## 9. RF Exposure Requirements

**RF Exposure Requirements:** **§90.1217, §1.1307(b)(1) and §1.1307(b)(2):** Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

**RF Radiation Exposure Limit:** **§1.1310:** As specified in this section, the Maximum Permissible Exposure (MPE) Limit shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Sec. 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Sec. 2.1093 of this chapter.

**Test Results:** MPE is determined at the time of installation.



## 10. Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ANSI/NCSL Z540-1-1994 and ANSI/ISO/IEC 17025:2000.

MET #	Equipment	Manufacturer	Model#	Cal Date	Cal Due
1T4442	PRE-AMPLIFIER, MICROWAVE	MITEQ	AFS42-01001800-30-10P	SEE NOTE	
1T4612	ESA-E SERIES SPECTRUM ANALYZER	AGILENT	E4407B	01/04/2008	01/04/2009
1T4080	SPECTRUM ANALYZER W/ MEMORY MODULE	HEWLETT PACKARD	8563A	09/28/2007	09/28/2008
1T4323	HARMONIC MIXER 18 TO 26.5 GHZ	HEWLETT PACKARD	11970K	SEE NOTE	
1T4155	HARMONIC MIXER 26.5 TO 40 GHZ	HEWLETT PACKARD	11970A	SEE NOTE	
1T4300	SEMI-ANECHOIC CHAMBER # 1	EMC TEST SYSTEMS	NONE	02/17/2006	01/17/2009
1T2511	ANTENNA; HORN	EMCO	3115	07/29/2008	07/29/2009
1T4612	ESA-E SERIES SPECTRUM ANALYZER	AGILENT	E4407B	01/04/2008	01/04/2009
1T4352	MOBILE COMMUNICATION DC SOURCE	AGILENT	66311B	SEE NOTE	
1T4627	THERMO/HYGROMETER	CONTROL COMPANY	S6-627-9	09/25/2007	09/25/2009
1T4270	DIGITAL MULTIMETER	FLUKE	87III	01/11/2008	01/11/2009
1T4354	SIGNAL GENERATOR	HEWLETT PACKARD	83752A	05/08/2008	05/08/2009

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.



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## Certification & User's Manual Information



## 11. Certification Label & User's Manual Information

### 11.1. Certification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

#### § 2.801 Radio-frequency device defined.

As used in this part, a radio-frequency device is any device which in its operation is capable of Emitting radio-frequency energy by radiation, conduction, or other means. Radio- frequency devices include, but are not limited to:

- (a) The various types of radio communication transmitting devices described throughout this chapter.
- (b) *The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.*
- (c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.
- (d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

#### § 2.803 Marketing of radio frequency devices prior to equipment authorization.

- (a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:
  - (1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or
  - (2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.
- (d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.



(e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:

- (i) *Compliance testing;*
- (ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;
- (iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;
- (iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or
- (v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.

(e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.

(f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a provision that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.



**The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart Y — Equipment Authorization Procedures:**

**§ 2.901 Basis and Purpose**

- (a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is to be operated.<sup>1</sup> *In addition to the technical standards provided, the rules governing the service may require that such equipment be verified by the manufacturer or importer,* be authorized under a Declaration of Conformity, or receive an equipment authorization from the Commission by one of the following procedures: certification or registration.
- (b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant, whichever is applicable.

**§ 2.902 Certification.**

- (a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.
- (b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

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<sup>1</sup> In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart B (of Part 15), which deals with unintentional radiators.



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**§ 2.948 Description of measurement facilities.**

- (a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.
  - (1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.
    - (i) *If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.*
    - (ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.
  - (2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.



## 11.2. Label and User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart A — General:

### § 15.19 Labeling requirements.

(a) *In addition to the requirements in Part 2 of this chapter, a device subject to certification or verification shall be labeled as follows:*

(1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73 of this chapter, land mobile operation under Part 90, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

(2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.

(3) All other devices shall bear the following statement in a conspicuous location on the device:

*This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.*

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.



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### § 15.21 Information to user.

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart B — Unintentional Radiators:

#### § 15.105 Information to the user.

(a) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



**Motorola, Inc.**  
**4.9 GHz WMC7300 PCMCIA Card**

**Electromagnetic Compatibility**  
**End of Report**  
**CFR Title 47 Part 90 Subpart Y & Part 15 Subpart B**

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## **End of Report**