



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

33439 WESTERN AVENUE ! UNION CITY, CALIFORNIA 94587-3201 ! PHONE (510) 489-6300 ! FAX (510) 489-6372

May 5, 2007

Amedia Networks Inc.  
9444 Waples Street, Suite 290  
San Diego, CA 92121

Dear Lucy Chong,

Enclosed is the EMC test report for compliance testing of the Amedia Networks Inc., Digital Media Adapter, DMA3.1L as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-03 ed.), Title 47 of the CFR, Part 15 Subpart B for Unintentional Radiators, Title 47 of the CFR, Part 15.407 for Intentional Radiators, RSS-210, and ICES-003 Issue 4, February 2004.

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.

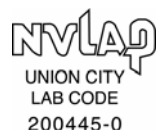
Cheryl Anicete  
Documentation Department

Reference: (\Amedia Networks Inc.\EMCU80077-FCC407)

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33439 WESTERN AVENUE ! UNION CITY, CALIFORNIA 94587-3201 ! PHONE (510) 489-6300 ! FAX (510) 489-6372

## **Electromagnetic Compatibility Criteria Test Report**

for the

**Amedia Networks Inc.  
Digital Media Adapter, DMA3.1L**

**Verified under**  
the FCC Certification Rules contained in  
Title 47 of the CFR, Part 15 Subpart B for Unintentional Radiators,  
Title 47 of the CFR, Part 15.407 for Intentional Radiators, and  
ICES-003 Issue 4, February 2004

**MET Report: EMCU80077-FCC407**

May 5, 2007

**Prepared For:**

**Amedia Networks Inc.  
9444 Waples Street, Suite 290  
San Diego, CA 92121**

**Prepared By:**  
**MET Laboratories, Inc.**  
33439 Western Ave  
Union City, CA 94587



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ICES-003 Issue 4, February 2004

Farida Rahmanzai, Project Engineer  
Electromagnetic Compatibility Lab

Cheryl Anicete  
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 capable of operation in accordance with the requirements of Part 15.407, of the FCC Rules under normal use and maintenance.

Asad Bajwa, Manager  
Electromagnetic Compatibility Lab



Amedia Networks Inc.  
Digital Media Adaptor DMA3.1L

Electromagnetic Compatibility  
CFR Title 47, Part 15, Subpart E

## Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	May 5, 2007	Initial Issue.



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## List of Terms and Abbreviations

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



## V. Executive Summary





## A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Amedia Networks Inc., Digital Media Adapter, DMA3.1L, with the requirements of Part 15, §15.407. Testing was performed to meet the modular approval requirement. 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 Digital Media Adapter, DMA3.1L. Amedia Networks Inc. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the Digital Media Adapter, DMA3.1L, has been **permanently** discontinued.

## B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, §15.407, in accordance with Amedia Networks Inc., purchase order number 134. All tests were conducted using measurement procedure ANSI C63.4-2003.

Reference	RSS-210 and RSS-GEN	Description	Results
15.403 (c)	A8.2	26dB Occupied Bandwidth	Compliant
15.407 (a)(1), (2), (3)	A9.2(3)	Conducted Transmitter Output Power	Compliant
15.407 (a)(1), (2), (3), (5)	A9.2(3)	Power Spectral Density	Compliant
15.407 (a)(6)	A9.2(3)	Peak Excursion	Compliant
15.407 (b)(1), (2), (5), (6)	A9.3(4)	Undesirable Emissions	Compliant
15.205/15.209	2.2	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Compliant
15.109	7.3	Radiated Spurious Emissions	Compliant
15.207	7.2.2	AC Conducted Emissions 150kHz – 30MHz	NA

**Table 1 Executive Summary of EMC Part 15.407 Compliance Testing**



## **VI. Equipment Configuration**



## A. Overview

MET Laboratories, Inc. was contracted by Amedia Networks Inc. to perform testing on the Digital Media Adapter, DMA3.1L, under Amedia Networks Inc.'s purchase order number 134

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Amedia Networks Inc., Digital Media Adapter, DMA3.1L.

The results obtained relate only to the item(s) tested.

<b>Model(s) Tested:</b>	DMA3.1L MT and DMA3.1L AP	
<b>Model(s) Covered:</b>	DMA3.1L MT and DMA3.1L AP	
<b>EUT Specifications:</b>	Primary Power: 5V DC	
	FCC ID: U8B-DMA3-1L	
	Type of Modulation: OFDM	
	Emission Designator: 19M9G1F	
	Equipment Code: UNII	
	Conducted RF Power (Peak):	Low Band (5190-5240 MHz) – 15.30 dBm
		High Band (5750-5790 MHz) - 23.88 dBm
	Equipment Frequency Range: 5190-5240 MHz 5750-5790 MHz	
<b>Analysis:</b>	The results obtained relate only to the item(s) tested.	
<b>Environmental Test Conditions:</b>	Temperature (15-35° C): 21°C	
	Relative Humidity (30-60%): 47%	
	Barometric Pressure (860-1060 mbar): 1009 mbar	
<b>Evaluated by:</b>	Farida Rahmanzai / Asad Bajwa	
<b>Date(s):</b>	April 28, 2007	



## B. References

<b>CFR 47, Part 15, Subpart C</b>	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 15: General Rules and Regulations, Allocation, Assignment, and Use of Radio Frequencies
<b>CFR 47, Part 15, Subpart B</b>	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
<b>CFR 47, Part 15, Subpart E</b>	Unlicensed National Information Infrastructure Devices (UNII)
<b>ANSI C63.4:2003</b>	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
<b>ANSI/NCSL Z540-1-1994</b>	Calibration Laboratories and Measuring and Test Equipment - General Requirements
<b>ANSI/ISO/IEC 17025:2000</b>	General Requirements for the Competence of Testing and Calibration Laboratories

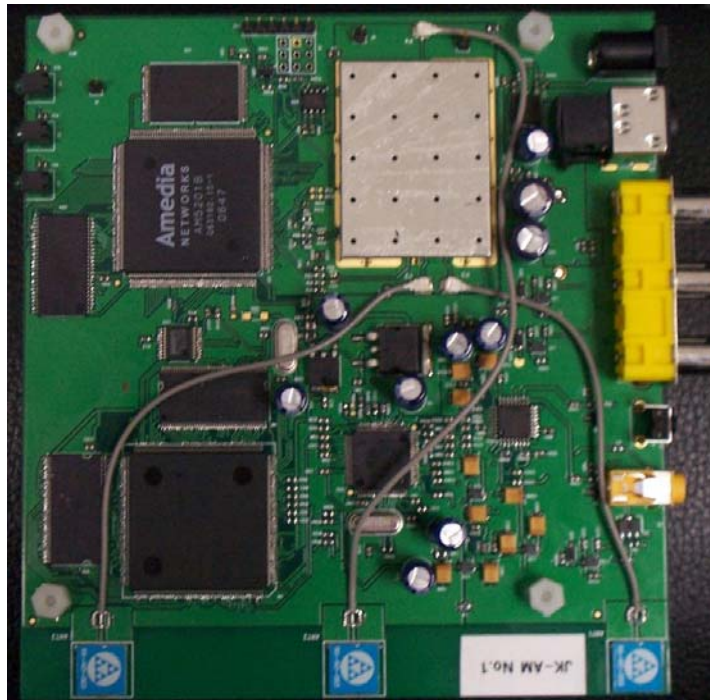
## C. Test Site

All testing was performed at MET Laboratories, Inc., 33439 Western Ave., Union City, California 94587. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

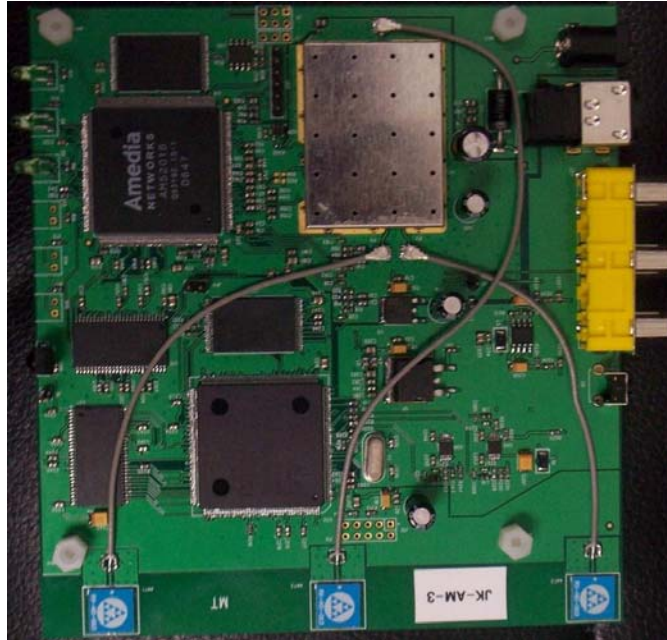
Radiated Emissions measurements were performed in a 10 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories. In accordance with §2.948(d), MET Laboratories has been accredited by the National Voluntary Laboratory Accreditation Program (Lab Code: 100273-0).

## D. Description of Test Sample

The Digital Media Adapter, DMA3.1L, Equipment under Test (EUT), provide wireless link between audio/video sources and audio/video displays. It's a complete module design for OEM of consumer electronics.



Photograph 1. EUT-1



Photograph 2: EUT-2

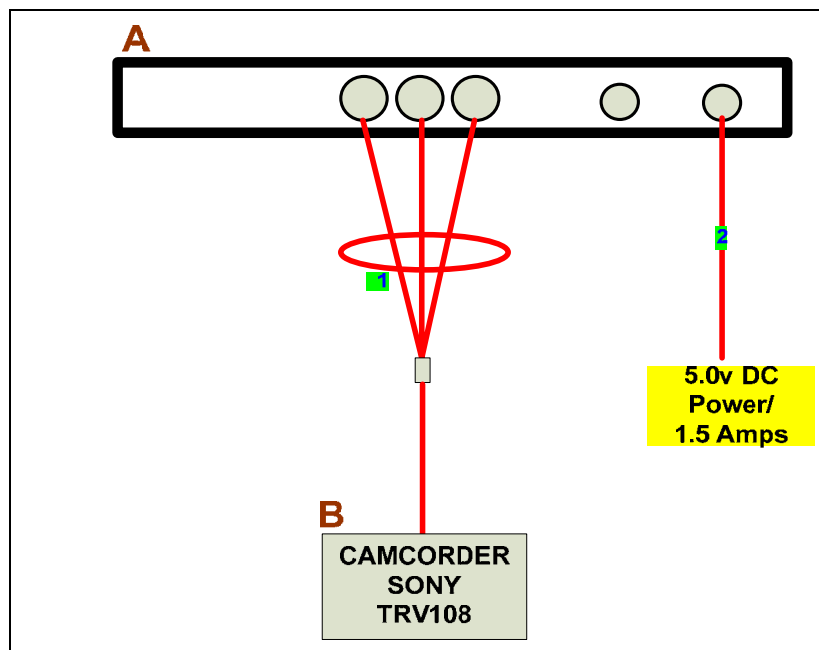


Figure 1. Block Diagram of Test Configuration



## E. 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	Part Number	Serial Number	Rev. #
A	EUT	DMA 3.1 MT	MT	N/A	E198681
		DMA 3.1L.AP	AP	N/A	E198681

Table 2. Equipment Configuration (Radiated Emissions)

## F. Support Equipment

Amedia Networks Inc. supplied support equipment necessary for the operation and testing of the Digital Media Adapter, DMA3.1L. All support equipment supplied is listed in the following Support Equipment List.

Ref. ID	Name / Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
B	Camcorder	Sony	TRV108	N/A

Table 3. Support Equipment

\* All 'customer supplied' support equipment will include the equipments calibration data. This column will be marked as either not applicable, not available, or will contain the calibration date supplied by the customer.

## G. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty.	Length (m)	Shielded (Yes/No)	Termination Box ID & Port ID
1	Video	Video Cable	1	1 m	No	B. Camcorder
2	DC Power	DC Cable	1	1 m	No	DC Power Supply
3	Port PS 1	No Connection				

Table 4. Ports and Cabling Information



## **H. Mode of Operation**

Audio and video signals provided by the camcorder is transmitted by the DMA3.1L AP to the DMA3.1L MT.

## **I. Method of Monitoring EUT Operation**

Signals from the camcorder can be seen on the TV connected to the DMA3.1L MT.

## **J. Modifications**

### **a) Modifications to EUT**

No modifications were made to the EUT.

### **b) Modifications to Test Standard**

No modifications were made to the test standard.

## **K. Disposition of EUT**

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





### **III. Electromagnetic Compatibility Criteria for Un-Intentional Radiators**



## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.109 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 10.

**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 10.

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 Subpart B, 15.109 (a)(b)**

**Test Procedure:**

- The EUT was placed on a non-metallic table top.
- Various antennas were placed near the EUT and measurements were taken of the field strengths and frequencies. For final radiated measurements, the EUT was placed in semi-anechoic chamber, and located 1 m and 3 m from an adjustable antenna mast.
- For pre-scanning, the spectrum analyzer scanned the frequency range from 30 MHz to 1 GHz to obtain an emission profile of the EUT. For each point of measurement, the turntable was rotated, and the antenna height was varied between 1 m and 4 m, in order to find the maximum radiated emissions.
- Measurements above 30 MHz were taken using the above procedures with the antenna in two polarizations: horizontal and vertical. Unless otherwise specified, measurements between 30 MHz and 1 GHz were made using a quasi-peak detector with a 120 kHz bandwidth.
- For measurements above 1 GHz, a 1 MHz detector was used with either a "peak" detector or an "average" detector. In general, all radiated emissions above 1 GHz measurements were made with the average detector unless otherwise noted.

**Test Results:** The EUT was found compliant with the Radiated Emission limits of **§15.109(a)**. See following pages for detailed test results.

**Test Engineer(s):** Farida Rahmanzai

**Test Date(s):** April 23, 2007



## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.109 Radiated Emissions Limits

#### Radiated Emissions from 30 MHz – 1 GHz

#### Quasi-Peak Results

Frequency (MHz)	Antenna Polarity (H/V)	EUT Azimuth (Degrees)	Antenna Height (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB/m) (+)	Cable Loss (dB) (+)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
159.97	H	263	100	29.896	9.399	0.65	39.945	43.5	-3.55
159.99	H	277	99	30.177	9.4	0.65	40.227	43.5	-3.27
269.92	H	295	99	24.505	12.998	0.885	38.388	46	-7.61
296.91	V	272	99	22.257	13.784	0.86	36.901	46	-9.09
378.03	H	316	231	24.081	16.321	1.148	41.55	46	-4.45
702.06	H	163	100	14.116	21.841	1.363	37.32	46	-8.6
810.05	V	243	100	11.653	22.301	1.5	35.454	46	-10.54

**Note:** When transmit mode or receive mode were activated, there are no differences to emissions. For above 1 GHz measurement up to 5<sup>th</sup> harmonic of the highest operating frequency, emissions are noise floor during receive mode.





## **IV. Electromagnetic Compatibility Criteria for Intentional Radiators**



## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.209 Radiated Emissions Limits

**Test Requirement(s):** § 15.209 (a): Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in Table 6.

Frequency (MHz)	§ 15.209(a), Radiated Emission Limits (dB $\mu$ V) @ 3m
30 - 88	40.00
88 - 216	43.50
216 - 960	46.00
Above 960	54.00

**Table 6. Radiated Emissions Limits Calculated from FCC Part 15, § 15.209 (a)**

**Test Procedure:** The transmitter was set to the mid channel at the highest output power and placed on a non-metallic table top inside a semi-anechoic chamber. Measurements were performed with the EUT rotated 360 degrees and varying the adjustable antenna mast with 1 m to 4 m height to determine worst case orientation for maximum emissions. Measurement were repeated the measurement at the low and highest channels.

For frequencies from 30 MHz to 1 GHz, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

For intentional radiators with a digital device portion which operates below 10 GHz, the spectrum was investigated as per §15.33(a)(1) and §15.33(a)(4); i.e., the lowest RF signal generated or used in the device up to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

In accordance with §15.35(b) the limit on the radio frequency emissions as measured using instrumentation with a peak detector function shall be 20 dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.

EUT Field Strength Final Amplitude = Raw Amplitude – Preamp gain + Antenna Factor + Cable Loss – Distance Correction Factor (1 meter)

**Test Results:** The EUT was found compliant with the Radiated Emission limits of §15.209(a) for Intentional Radiators. See following pages for detailed test results.

**Test Engineer(s):** Farida Rahmanzai

**Test Date(s):** April 23, 2007



## Electromagnetic Compatibility Criteria for Intentional Radiators

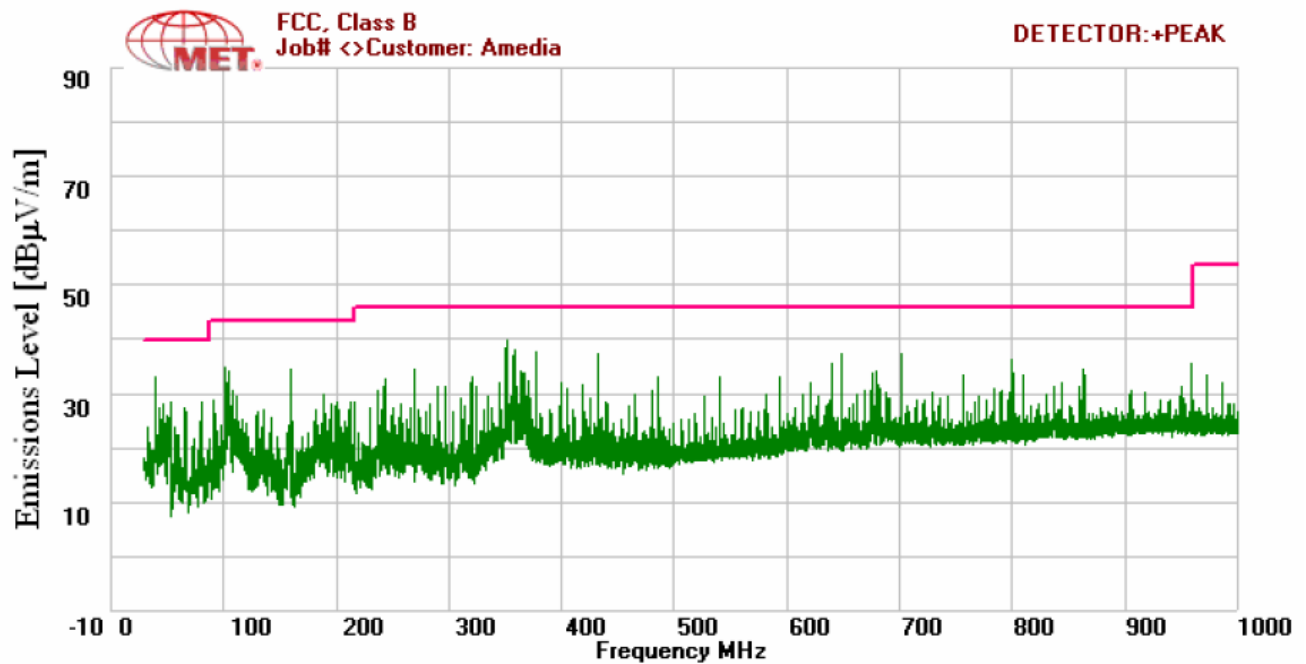
### § 15.209 Radiated Emissions Limits

#### Radiated Emissions from 30 MHz – 1 GHz

#### Quasi-Peak Results

Frequency (MHz)	Antenna Polarity (H/V)	EUT Azimuth (Degrees)	Antenna Height (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB/m) (+)	Cable Loss (dB) (+)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
159.97	H	263	100	29.896	9.399	0.65	39.945	43.5	-3.55
159.99	H	277	99	30.177	9.4	0.65	40.227	43.5	-3.27
269.92	H	295	99	24.505	12.998	0.885	38.388	46	-7.61
296.91	V	272	99	22.257	13.784	0.86	36.901	46	-9.09
378.03	H	316	231	24.081	16.321	1.148	41.55	46	-4.45
702.06	H	163	100	14.116	21.841	1.363	37.32	46	-8.6
810.05	V	243	100	11.653	22.301	1.5	35.454	46	-10.54

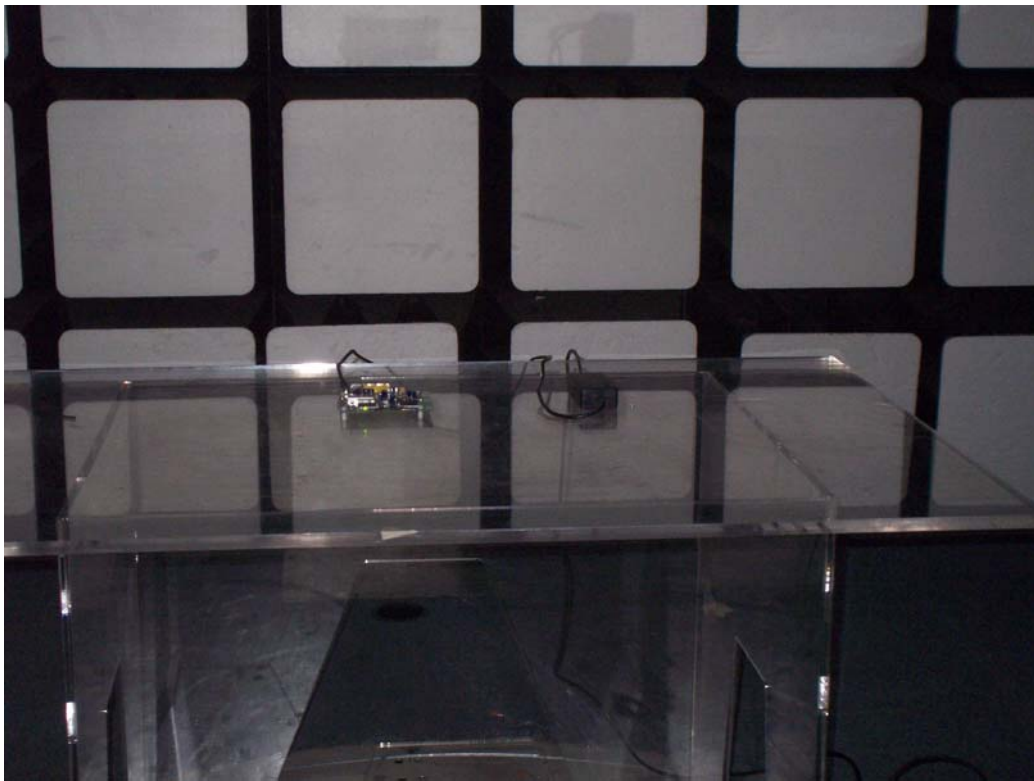
**Note:** When transmit mode or receive mode were activated, there are no differences to emissions. For above 1 GHz measurement up to 5<sup>th</sup> harmonic of the highest operating frequency, emissions are noise floor during receive mode.





## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.209 Radiated Emissions Limits



**Photograph 3. Radiated Emission Test Setup < 1 GHz**



## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.403(c) 26dB Bandwidth

**Test Requirements:** § 15.403 (c): Operation under the provisions of this section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

**Test Procedure:** The transmitter was set to the mid channel at the highest output power and connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately equal to 1% of the total emission bandwidth, VBW > RBW. The 26 dB Bandwidth was measured and recorded. The measurements were repeated at the low and high channels.

**Test Results** Equipment complies with § 15.407 (c). The 26 dB Bandwidth was determined from the plots on the following pages.

Low Band		
Carrier Channel	Frequency (MHz)	Measured 26 dB Bandwidth (MHz)
Low	5190	19.212
Mid	5230	19.934
High	5240	19.672

High Band		
Carrier Channel	Frequency (MHz)	Measured 26 dB Bandwidth (MHz)
Low	5750	18.6
Mid	5770	18.8
High	5790	18.26

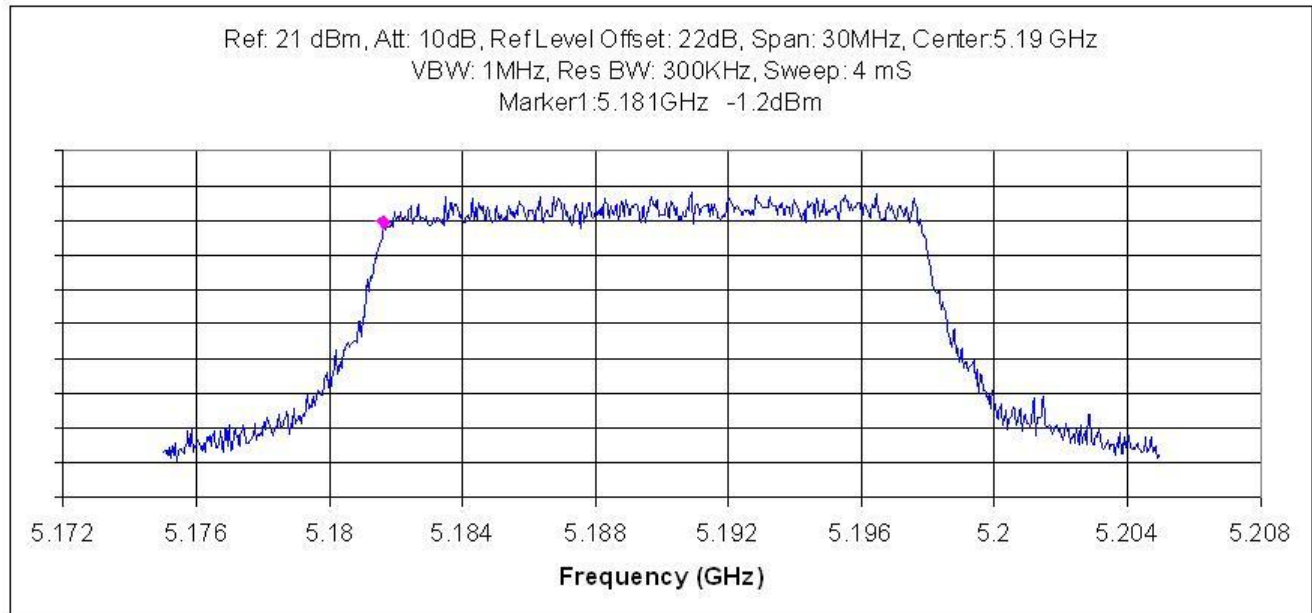
**Test Engineer:** Asad Bajwa

**Test Date:** April 24, 2007

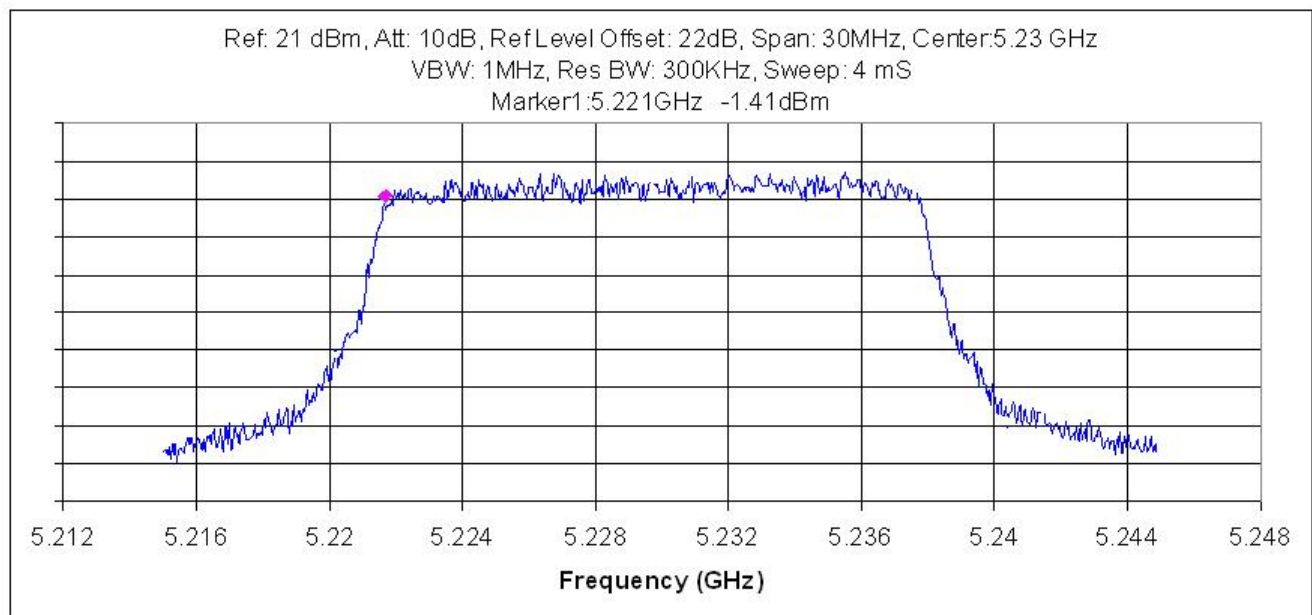




## Electromagnetic Compatibility Criteria for Intentional Radiators



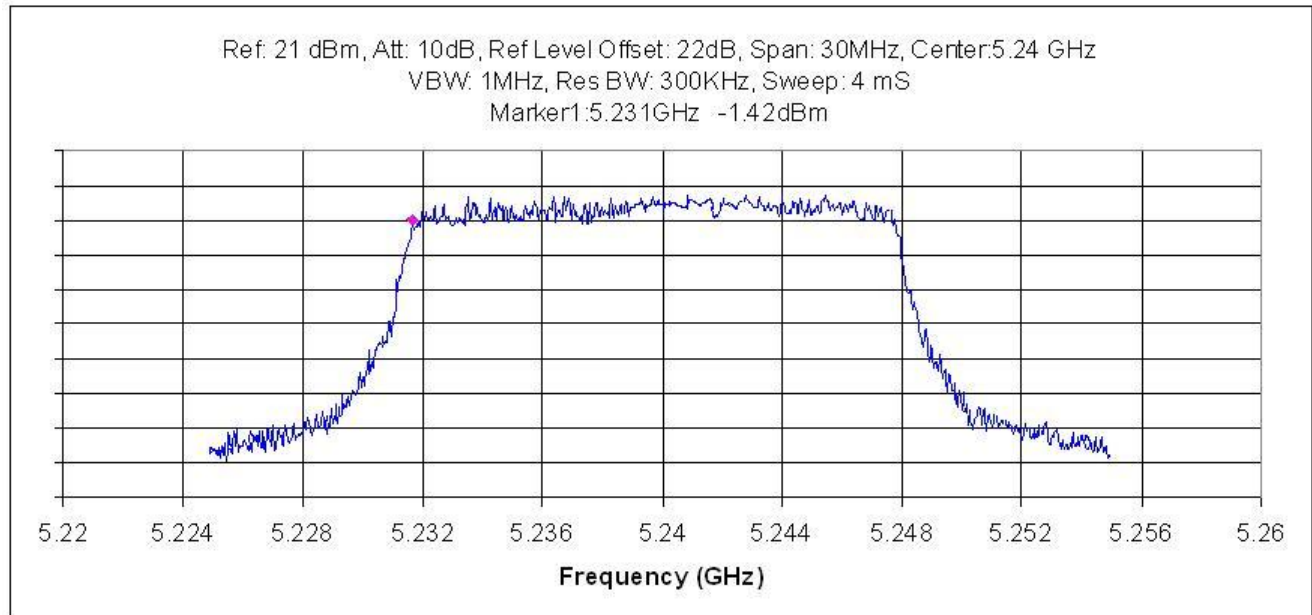
**Plot 1. Low Band Low Ch Occupied Band Width**



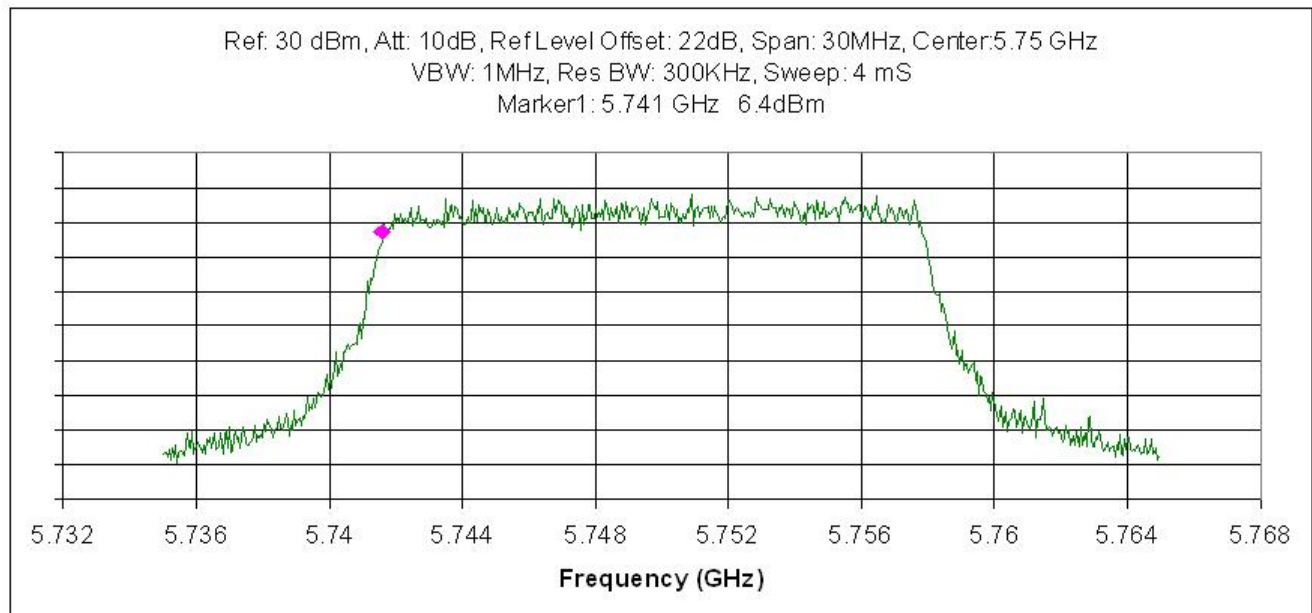
**Plot 2. Low Band Mid Ch Occupied Band Width**



## Electromagnetic Compatibility Criteria for Intentional Radiators



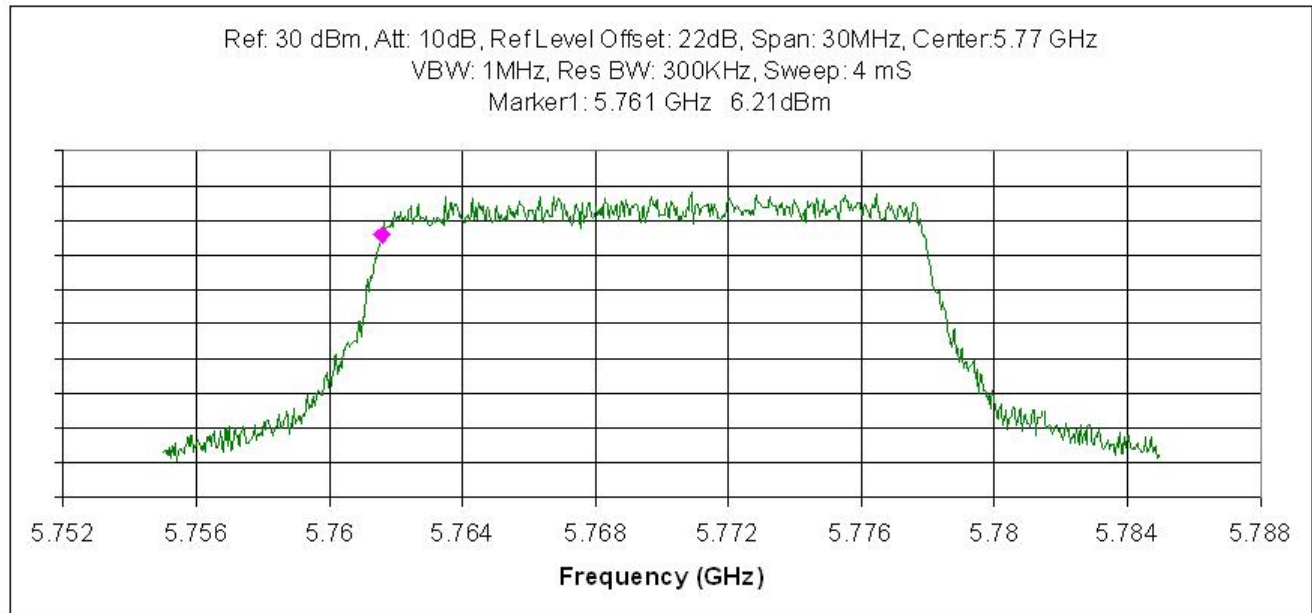
**Plot 3. Low Band High Ch Occupied Band Width**



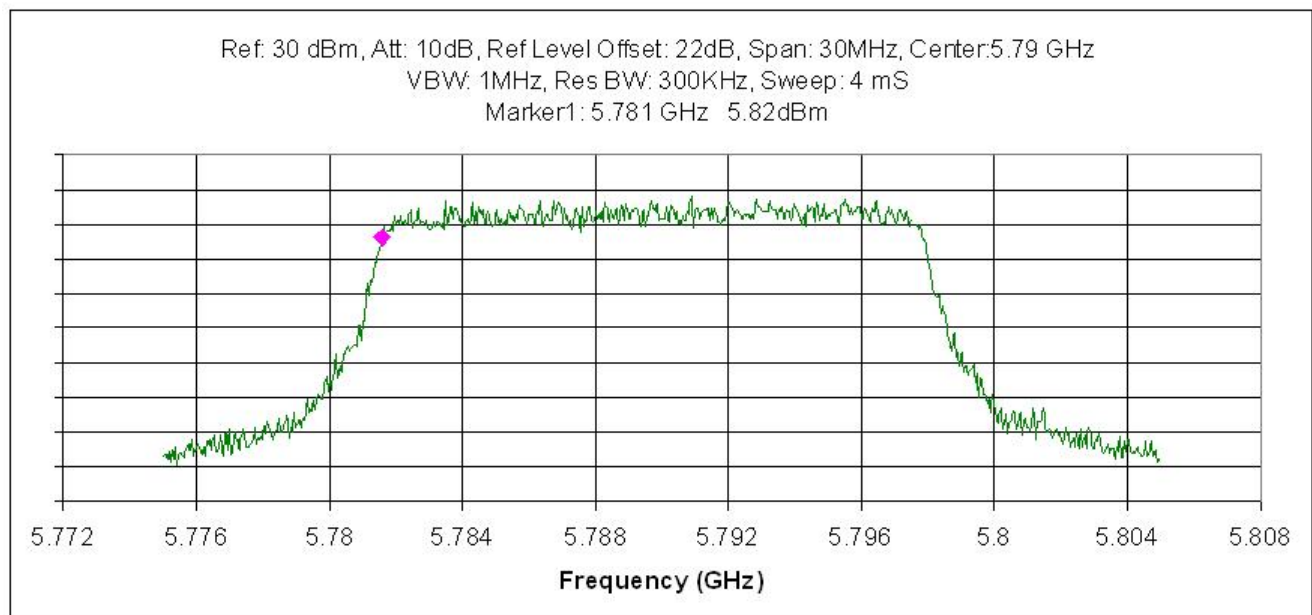
**Plot 4. High Band Low Ch Occupied Band Width**



## Electromagnetic Compatibility Criteria for Intentional Radiators



**Plot 5. High Band Mid Ch Occupied Band Width**



**Plot 6. High Band High Ch Occupied Band Width**



## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15. 407(a) (1), (2) RF Power Output

**Test Requirements:** §15.407(a) (1), (2): The maximum output power of the intentional radiator shall not exceed the following:

(MHz)	Output Limit (mW)
5150-5250	50
5725-5825	1000

**Table 7. Output Power Requirements from §15.407**

§15.407(a) (1): For the band 5.15-5.25 GHz the peak transmit power over the frequency band of operation shall not exceed the lesser 50mW or  $4\text{dBm} + 10\log B$ , where B is the 26-dB emission bandwidth in MHz.

**Test Procedure:** The transmitter was connected to a calibrated Power Meter. The EUT was measured at the low, mid and high channels of each band at all available data rates.

**Test Engineer:** Asad Bajwa

**Test Date:** April 24, 2007



**Test Results:** Equipment complies with the Peak Power Output limits of § 15.401(a) (1)

Low Band		
Frequency (MHz)	Measured Average Output Power (dBm)	Measured Peak Output Power (dBm)
5190	11.38	15.21
5230	11.42	15.24
5240	11.40	15.30

**Test Results:** Equipment complies with the Peak Power Output limits of § 15.401(a) (3)

High Band		
Frequency (MHz)	Measured Average Output Power (dBm)	Measured Peak Output Power (dBm)
5750	20.37	23.62
5770	20.43	23.88
5790	20.39	23.70



## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.407(a)(1), (a)(2) Peak Power Spectral Density

**Test Requirements:** § 15.407(a)(1), (a)(2): For digitally modulated systems, the conducted peak power spectral density from the intentional radiator to the antenna shall not be greater than 4dBm/MHz in the frequency band 5.15-5.25 GHz.

**Test Procedure:** The transmitter was connected directly to a Spectrum Analyzer through a directional coupler. The power was monitored at the coupler port with a Power Meter capable of measuring peak and average RF power. The power level was set to the maximum level on the EUT. The RBW was set to 1MHz and the VBW was set to 3MHz. The method of measurement #2 from the FCC Public Notice CA 02-2138 was used.

**Test Results:** Equipment complies with the peak power spectral density limits of § 15.407(a)(1), (a)(2). The peak power spectral density was determined from plots on the following page(s).

Low Band				
Carrier Channel	Frequency (MHz)	Measured PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5190	3.1	4	0.90
Mid	5230	3.4	4	0.60
High	5240	3.12	4	0.88

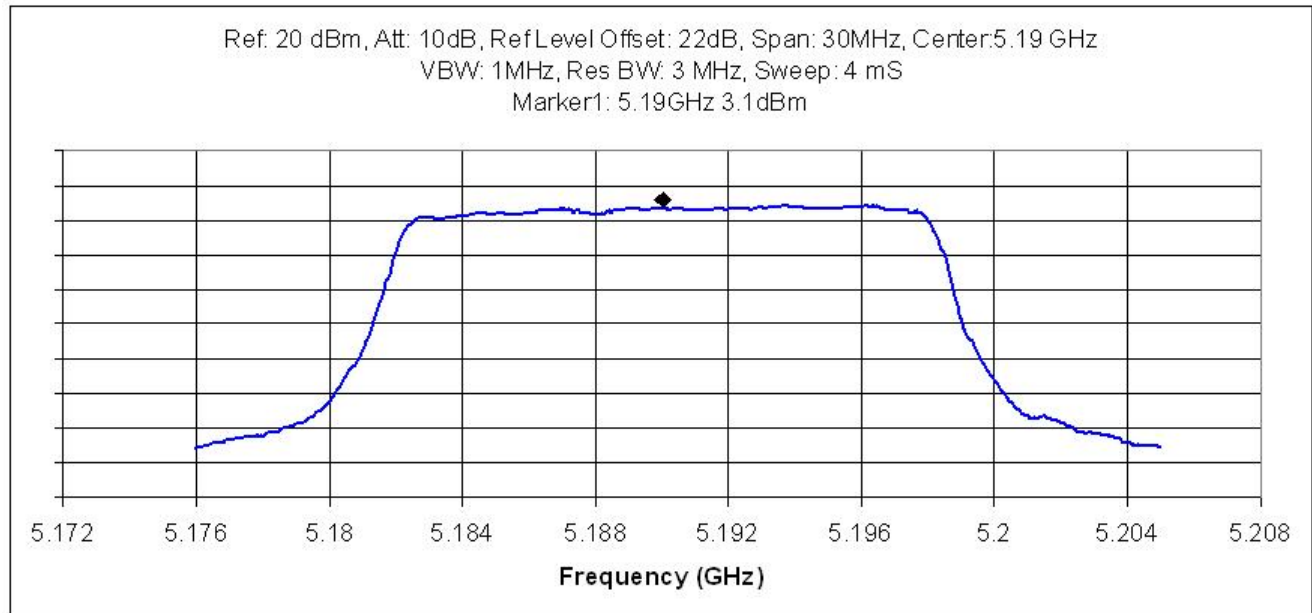
High Band				
Carrier Channel	Frequency (MHz)	Measured PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5750	9.2	17	7.8
Mid	5770	9.4	17	7.6
High	5790	9.12	17	7.88

**Test Engineer:** Asad Bajwa

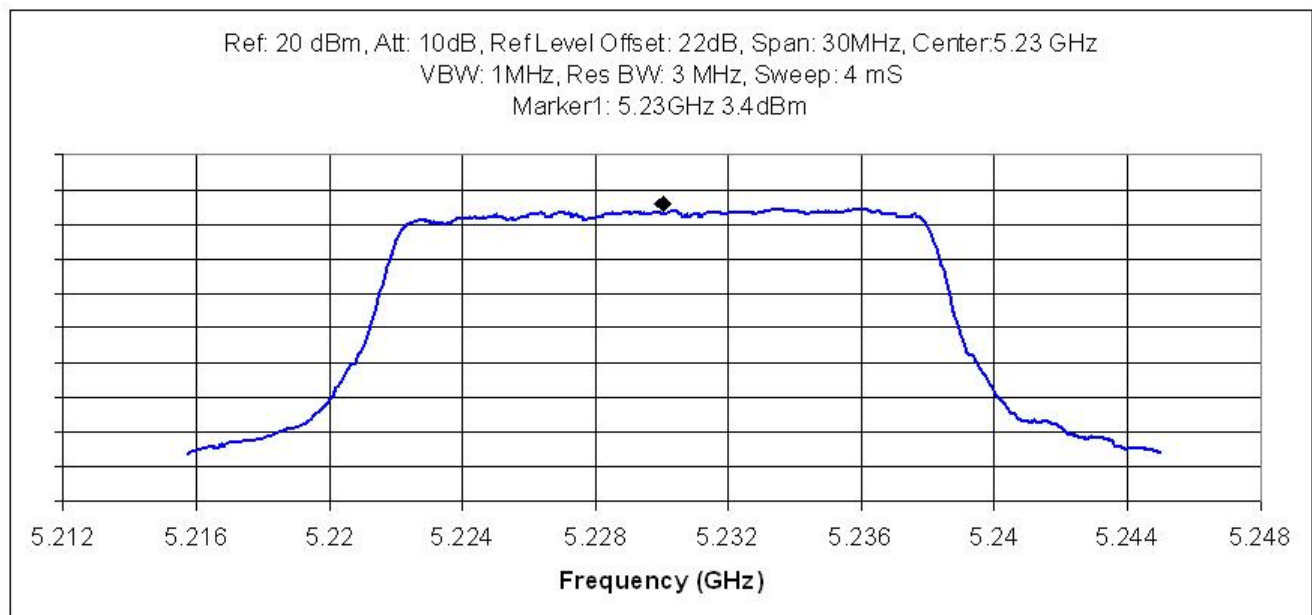
**Test Date:** April 24, 2007



## Electromagnetic Compatibility Criteria for Intentional Radiators



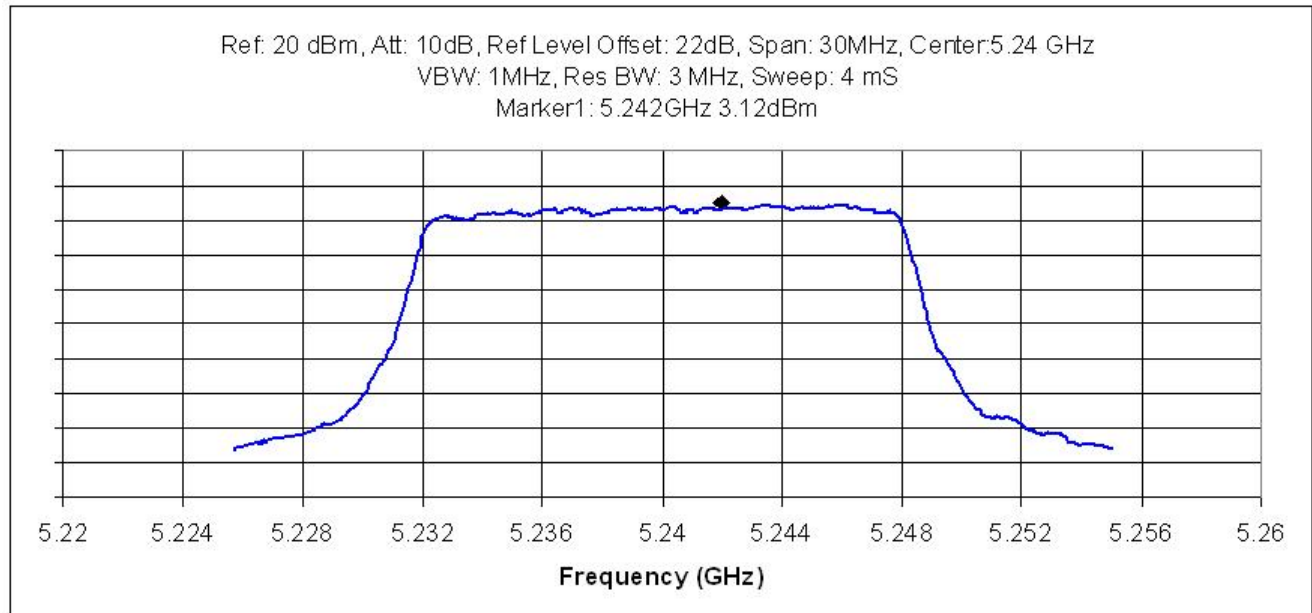
Plot 7. – Low Band Low Ch Peak Power Spectral Density



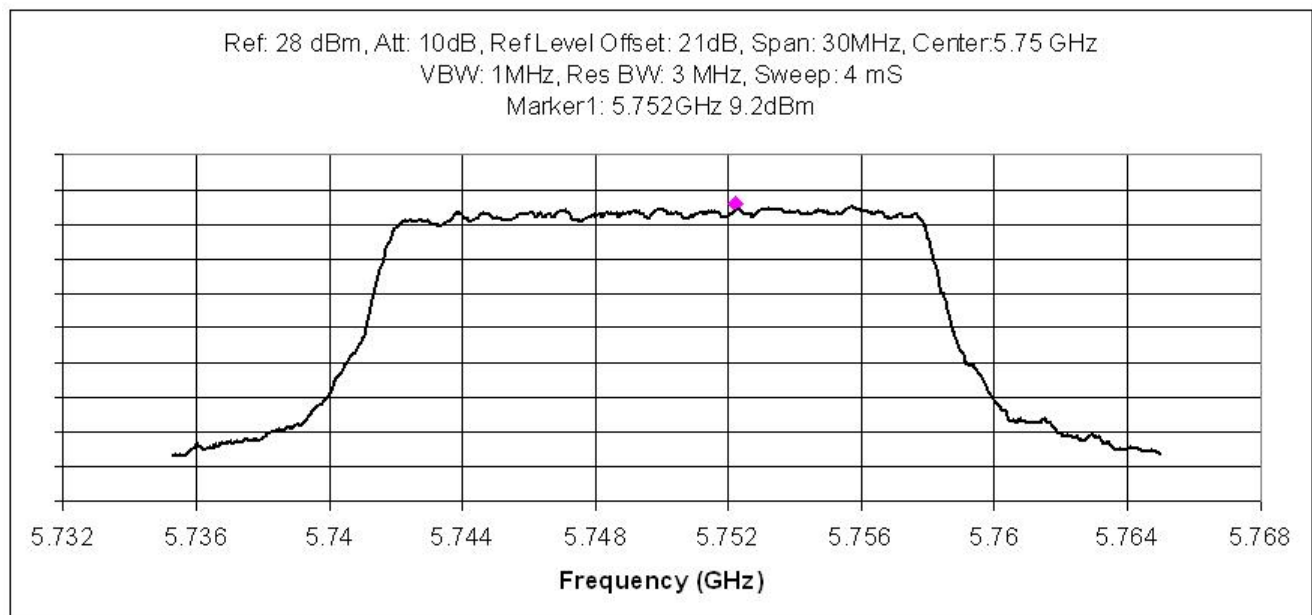
Plot 8. Low Band Mid Ch Peak Power Spectral Density



## Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 9. Low Band High Ch Peak Power Spectral Density

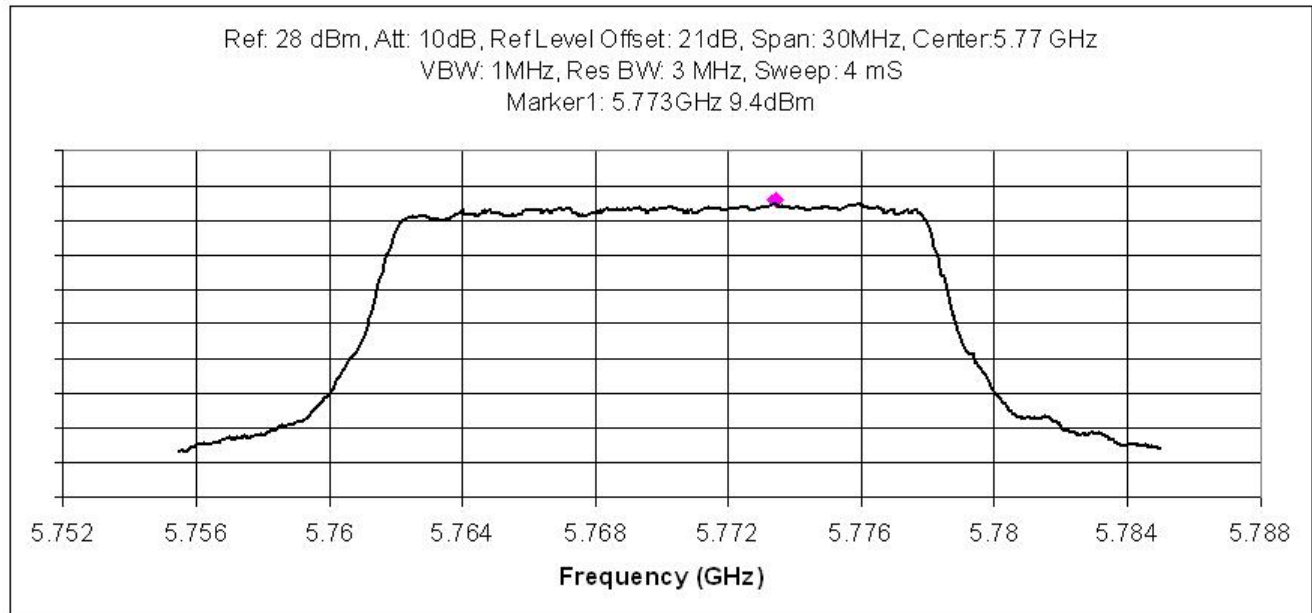


Plot 10. High Band Low Ch Peak Power Spectral Density

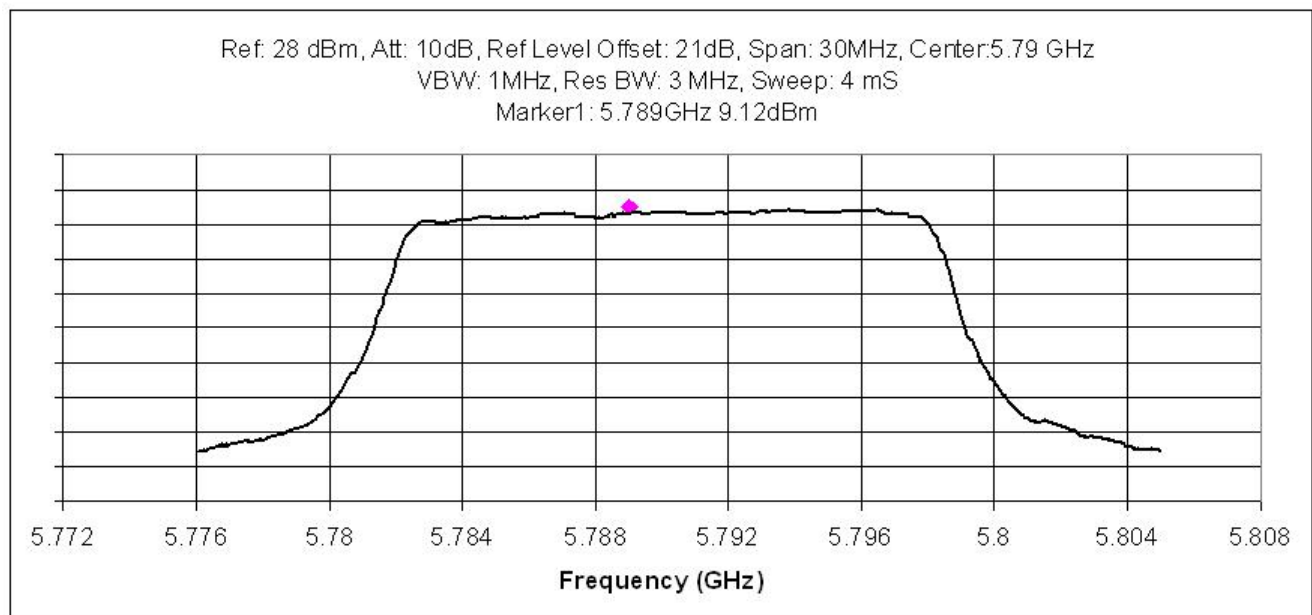




## Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 11. High Band Mid Ch Peak Power Spectral Density



Plot 12. High Band High Ch Peak Power Spectral Density



## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.407(a)(6) Peak Excursion Ratio

**Test Requirements:** § 15.407(a)(6): For digitally modulated systems, the peak excursion of the modulation envelope to the peak transmit power shall not exceed 13dB across any 1MHz bandwidth of the emission bandwidth whichever is less.

**Test Procedure:** The method of measurement #2 from the FCC Public Notice CA 02-2138 was used. The EUT was connected directly to the spectrum analyzer through cabling and attenuation. The 1<sup>st</sup> trace on the spectrum analyzer was set to RBW=1MHz, VBW=3MHz. The peak detector mode was used and the trace max held. The 2<sup>nd</sup> trace on the spectrum analyzer was set to a RBW=1MHz, VBW=30 kHz. The detector mode was set to sample detector.

The Peak Excursion Ratio was determined from the difference between the maximum found in each trace.

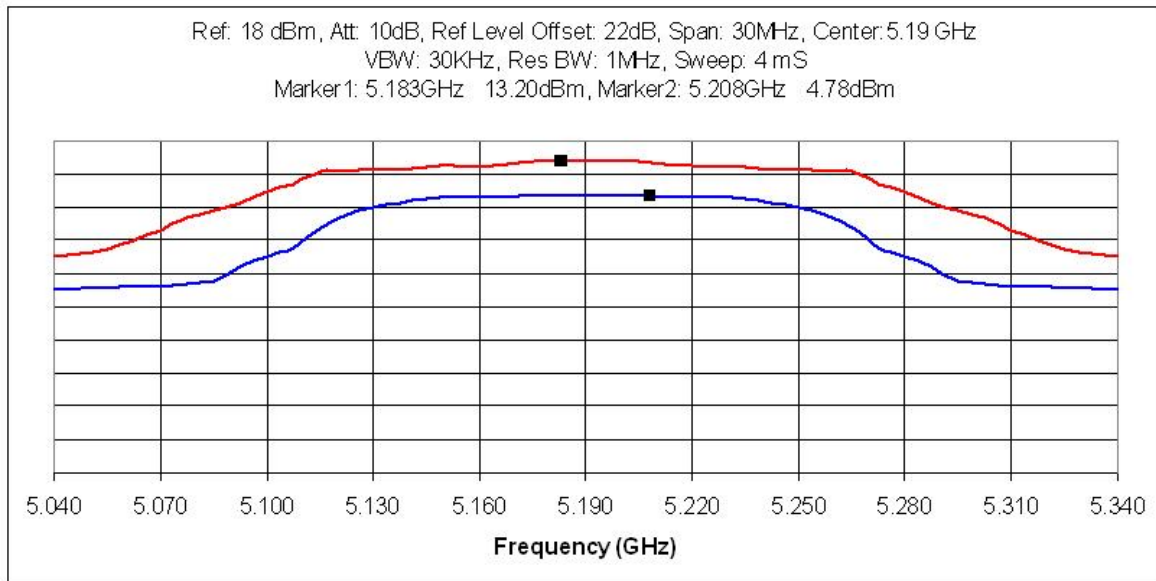
**Test Results:** Equipment complies with the peak excursion ratio limits of § 15.407(a)(6). The peak excursion ratio was determined from plots on the following page(s).

Low Band				
Carrier Channel	Frequency (MHz)	Excursion Ratio (dBm)	Limit (dBm)	Margin (dB)
Low	5190	8.42	13	4.85
Mid	5230	8.21	13	4.79
High	5240	9.23	13	3.77

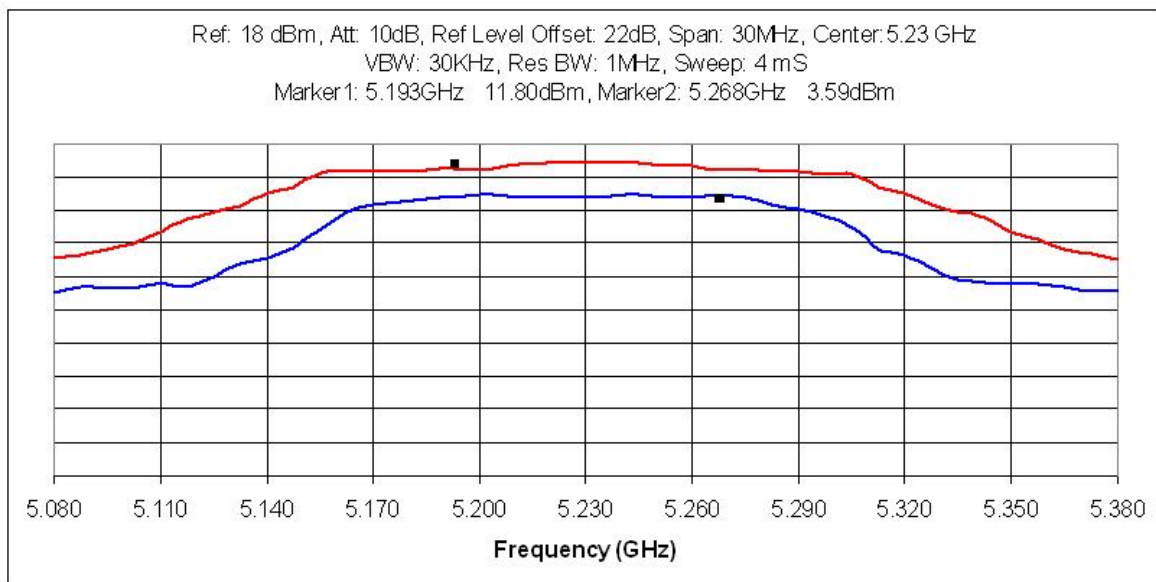
High Band				
Carrier Channel	Frequency (MHz)	Excursion Ratio (dBm)	Limit (dBm)	Margin (dB)
Low	5750	9.2	13	3.8
Mid	5770	9.3	13	3.7
High	5790	8.9	13	4.1

**Test Engineer:** Asad Bajwa

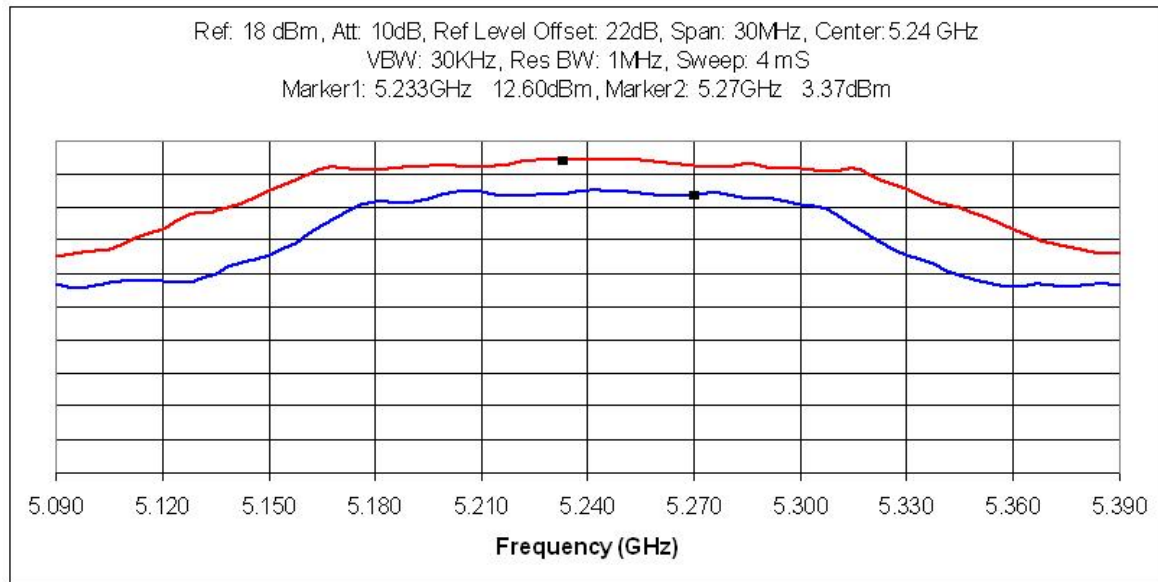
**Test Date:** April 24, 2007



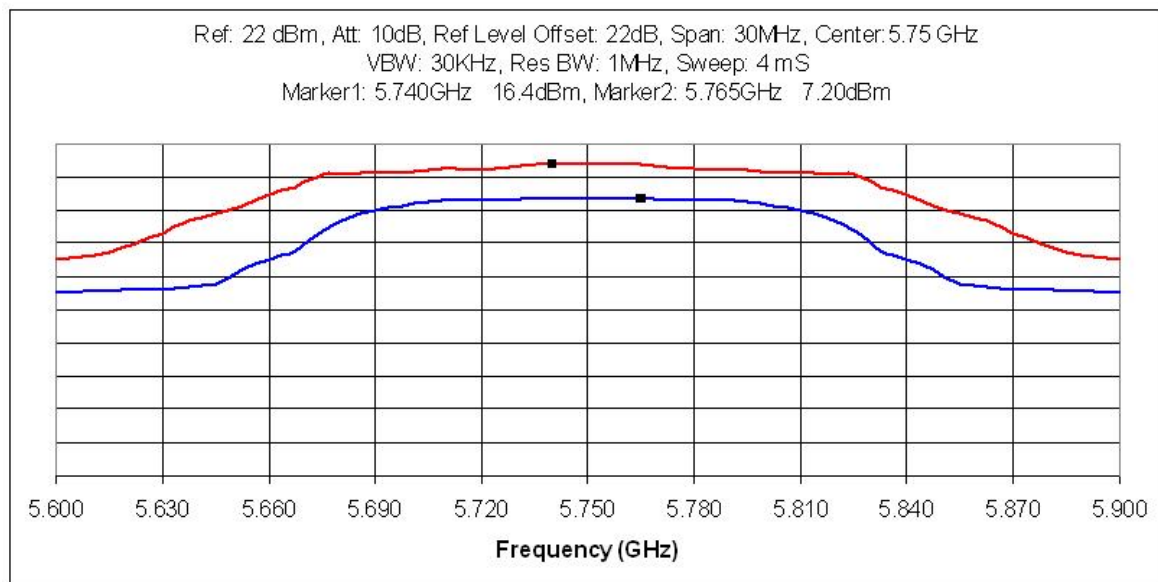
**Plot 13: Low Band Low Ch Peak Excursion Ratio**



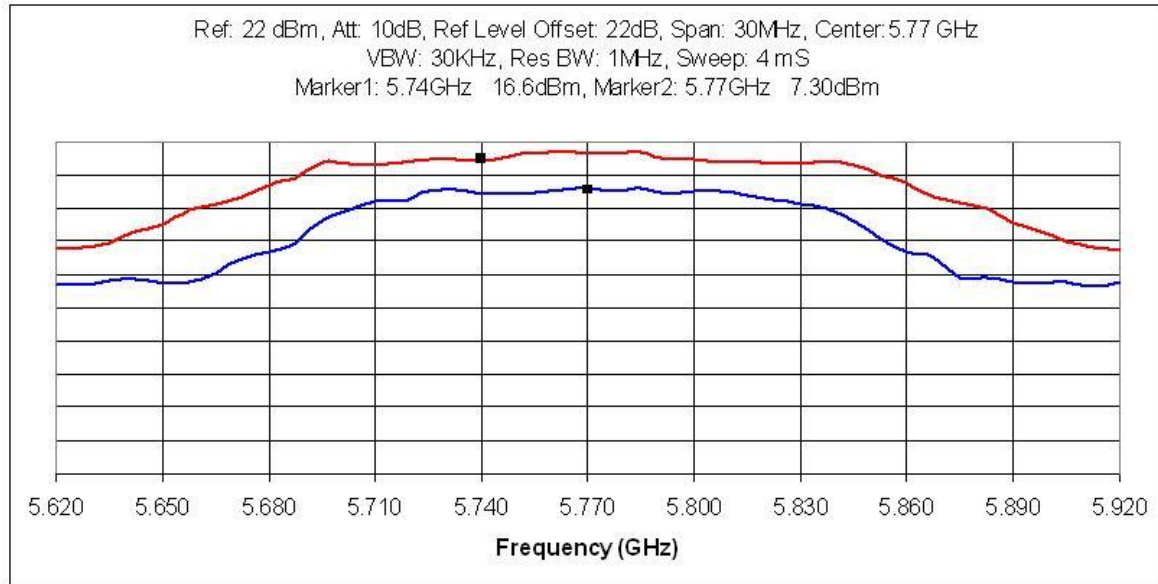
**Plot 14: Low Band Mid Ch Peak Excursion Ratio**



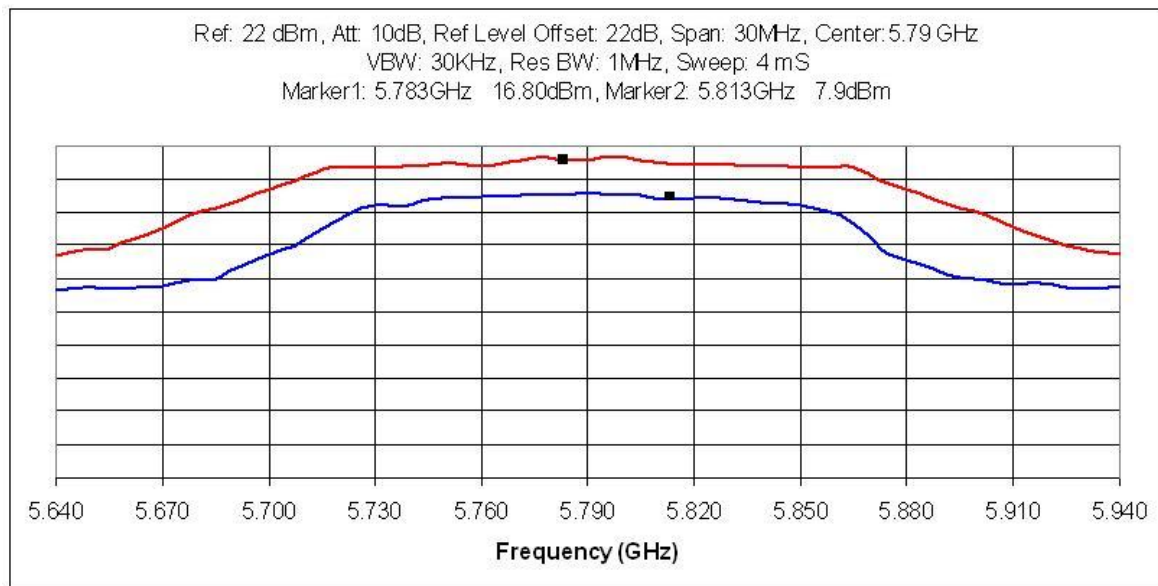
Plot 15: Low Band High Ch Peak Excursion Ratio



Plot 16: High Band Low Ch Peak Excursion Ratio



**Plot 17: High Band Mid Ch Peak Excursion Ratio**



**Plot 18: High Band High Ch Peak Excursion Ratio**



## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.407(b)(1),(2), (5), (6) Undesirable Emissions

**Test Requirements:** § 15.407(b)(1),(2), (5), (6); § 15.209 (a) §15.205: Emissions outside the frequency band.

§ 15.407(b)(1): In any 1MHz bandwidth outside the frequency band 5.15-5.25GHz in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power shall not exceed -27dBm.

§ 15.407(b)(6): Radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a).

§15.205(a): Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090–0.110-----	16.42–16.423	399.9–410	4.5–5.15
<sup>1</sup> 0.495–0.505-----	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905-----	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128-----	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775-----	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775-----	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218-----	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825-----	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225-----	123–138	2200–2300	14.47–14.5
8.291–8.294-----	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366-----	156.52475– 156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675-----	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475-----	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293-----	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025-----	240–285	3345.8–3358 36.	43–36.5
12.57675–12.57725-----	322–335.4	3600–4400	( <sup>2</sup> )

**Table 8. Restricted Bands of Operation**

**Test Engineer:** Asad Bajwa

**Test Date:** April 24, 2007



## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.407(b)(1): Harmonic Emissions Requirements – Radiated (Low Band)

Frequency (MHz)	Receive Antenna Polarity (H/V)	Uncorrected Field strength (dBμV)@ 3m	Preamp (dB)	Antenna Factor (dB)	Cable Loss (dB)	Distance Correction Factor (dB)	Corrected Field Strength @ 3m (dBμV)	Limit @ 3m (dBμV)	Margin (dB)	Measurement Type
10380	H	48.3	34.04	38.4	8.2	0	60.86	74	-13.14	pk
15570	H	47.8	32.96	38.3	11.1	0	64.24	74	-9.76	pk
15570	H	26.4	32.96	38.3	11.1	0	42.84	54	-11.16	avg
Low Channel 5190 MHz										
Frequency (MHz)	Receive Antenna Polarity (H/V)	Uncorrected Field strength (dBμV)@ 3m	Preamp (dB)	Antenna Factor (dB)	Cable Loss (dB)	Distance Correction Factor (dB)	Corrected Field Strength @ 3m (dBμV)	Limit @ 3m (dBμV)	Margin (dB)	Measurement Type
10460	H	49.7	34.04	38.4	8.2	0	62.26	74	-11.74	pk
15690	H	48.7	32.96	38.3	11.1	0	65.14	74	-8.86	pk
15690	H	29.4	32.96	38.3	11.1	0	45.84	54	-8.16	avg
Mid Channel 5230 MHz										
Frequency (MHz)	Receive Antenna Polarity (H/V)	Uncorrected Field strength (dBμV)@ 3m	Preamp (dB)	Antenna Factor (dB)	Cable Loss (dB)	Distance Correction Factor (dB)	Corrected Field Strength @ 3m (dBμV)	Limit @ 3m (dBμV)	Margin (dB)	Measurement Type
10480	H	47.5	34.04	38.4	8.2	0	60.06	74	-13.94	pk
15720	H	45.5	32.96	38.3	11.1	0	61.94	74	-12.06	avg
15720	H	28.9	32.96	38.3	11.1	0	45.34	54	-8.66	pk
High Channel 5240 MHz										

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



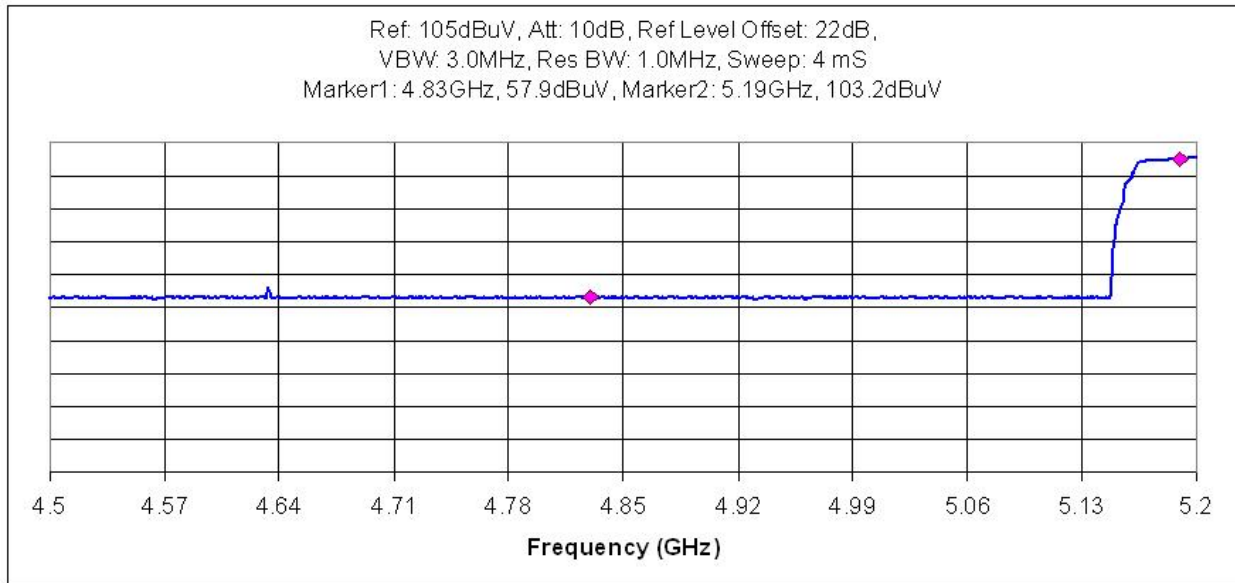
## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.407(b)(2): Harmonic Emissions Requirements – Radiated (High)

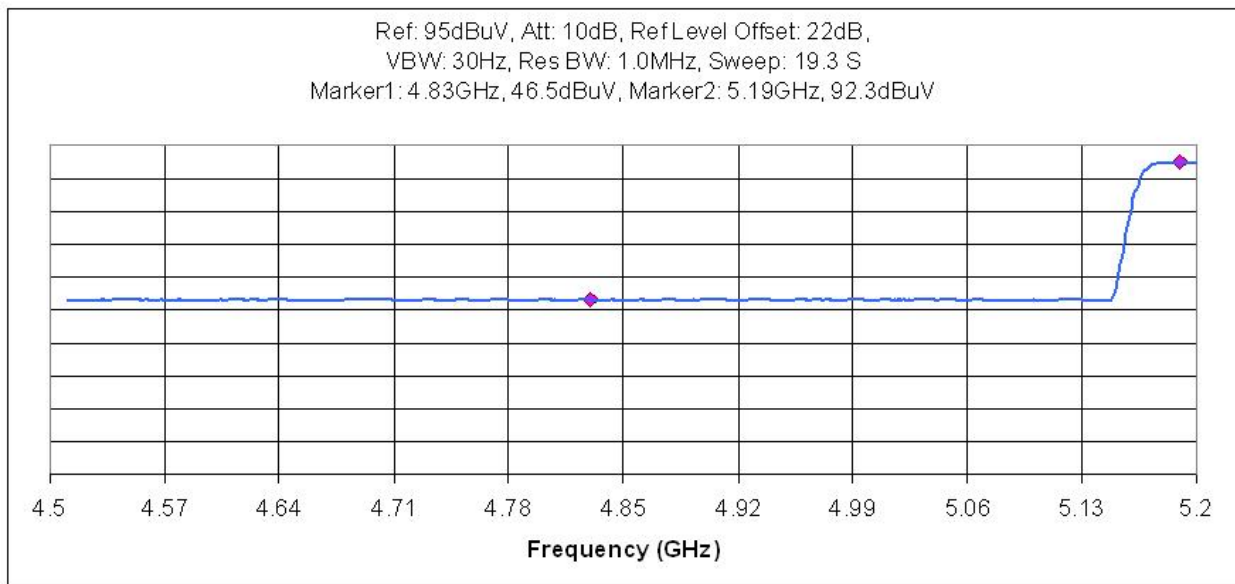
Frequency (MHz)	Receive Antenna Polarity (H/V)	Uncorrected Field strength (dBμV) @ 3m	Preamp (dB)	Antenna Factor (dB)	Cable Loss (dB)	Distance Correction Factor (dB)	Corrected Field Strength @ 3m (dBμV)	Limit @ 3m (dBμV)	Margin (dB)	Measurement Type
11500	H	41.2	34.04	38.4	8.2	0	53.76	74	-20.24	pk
17250	H	37.1	32.96	38.3	11.1	0	53.54	74	-20.46	pk
17250	H	26.2	32.96	38.3	11.1	0	42.64	54	-11.36	avg
Low Channel 5750 MHz										
Frequency (MHz)	Receive Antenna Polarity (H/V)	Uncorrected Field strength (dBμV) @ 3m	Preamp (dB)	Antenna Factor (dB)	Cable Loss (dB)	Distance Correction Factor (dB)	Corrected Field Strength @ 3m (dBμV)	Limit @ 3m (dBμV)	Margin (dB)	Measurement Type
11540	H	41.4	34.04	38.4	8.2	0	53.96	74	-20.04	pk
17310	H	38.2	32.96	38.3	11.1	0	54.64	74	-19.36	pk
17310	H	22.4	32.96	38.3	11.1	0	38.84	54	-15.16	avg
Mid Channel 5770 MHz										
Frequency (MHz)	Receive Antenna Polarity (H/V)	Uncorrected Field strength (dBμV) @ 3m	Preamp (dB)	Antenna Factor (dB)	Cable Loss (dB)	Distance Correction Factor (dB)	Corrected Field Strength @ 3m (dBμV)	Limit @ 3m (dBμV)	Margin (dB)	Measurement Type
11580	H	40.8	34.04	38.4	8.2	0	53.36	74	-20.64	pk
17370	H	38.6	32.96	38.3	11.1	0	55.04	74	-18.96	pk
17370	H	24.3	32.96	38.3	11.1	0	40.74	54	-13.26	avg
HIGH Channel 5790 MHz										

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





**Plot 19. Low Band Restricted band 4.5-5.15GHz, Peak**



**Plot 20. Low Band Restricted band 4.5-5.15GHz, Avg**



## Electromagnetic Compatibility Criteria for Intentional Radiators

**RF Exposure Requirements:** §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.

**Limit for Uncontrolled exposure: 1 mW/cm<sup>2</sup> or 10 W/m<sup>2</sup>**

EUT maximum antenna gain = 0 dBi.

Equation from page 18 of OET 65, Edition 97-01

$$S = PG / 4\pi R^2 \quad \text{or} \quad R = \sqrt{PG / 4\pi S}$$

where, S = Power Density (1 mW/cm<sup>2</sup>)  
P = Power Input to antenna (mW)  
G = Antenna Gain (63.1 numeric)

### Low Band

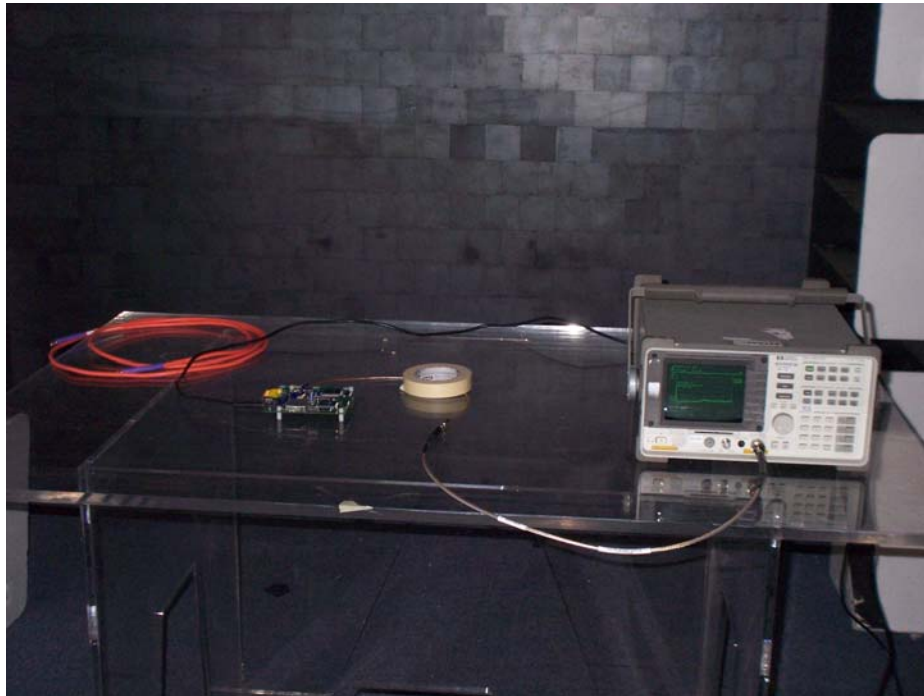
Power Input to Antenna in dBm	15.30
Power Input to Antenna in W	0.033884416
Antenna Gain in dBi	2
Numeric Antenna Gain	1.584893192
S (W/m2)	0.106893272

R=2.07 cm

### High Band

Power Input to Antenna in dBm	2388
Power Input to Antenna in W	0.244343055
Antenna Gain in dBi	2
Numeric Antenna Gain	1.584893192
S (W/m2)	0.770815376

R=5.55cm



**Photograph 4. Test Equipment and setup for various Radiated Measurements**



## V. Test Equipment



## 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 Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1U91	Analyzer, Spectrum	Hewlett Packard	8591EM	10/17/2006	10/17/2007
1U14	Transient Limiter	Hewlett Packard	11947A	8/10/2006	8/10/2007
1U34	Shield Room # 3	Universal Shielding Corp.	N/A	7/27/2006	7/27/2007
1U167	Line Impedance Stabilization Network	FISCHER CUST. COMM.	FCC-LISN-50/250-16-2	8/18/2006	8/18/2007
1U2	ANALYZER, SPECTRUM	HEWLETT PACKARD	8593EM	3/22/2007	3/22/2008
1U165	ANALYZER, SPECTRUM	HEWLETT PACKARD	8564E	8/18/2006	8/18/2007
1U77	PREAMPLIFIER	HEWLETT-PACKARD	8447F	See Note	
1U32	Semi- Anechoic Chamber	LINDGREN ENCLOSURES	FACT 4	5/4/2006	5/4/2007
1U170	BiConiLog ANTENNA	ETS-LINDGREN	3142C	6/29/2006	06/29/2007
1S2034	COUPLER, DIRECTIONAL 1-20 GHz	KRYTAR	101020020	SEE NOTE	
1S2041	COUPLER, BI DIRECTIONAL COAXIAL	NARDA	N/A	SEE NOTE	
1S2430	WideBand Power Meter	Anritsu Company	ML2488A	12-Mar-2007	12-Mar-2008
1S2432	WideBand Power Sensor	Anritsu Company	MA2491A	12-Mar-2007	12-Mar-2008
1S2128	Harmonic Mixer	Hewlett Packard	11970A	N/A	5/24/2007
1S2129	Harmonic Mixer	Hewlett Packard	11970K	N/A	5/24/2007

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



## **VI. Certification & User's Manual Information**



## Certification & User's Manual Information

### A. 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 proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.





## Certification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart J — 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.

### § 2.907 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.



## Certification & User's Manual Information

### § 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.



## Certification & User's Manual Information

### 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.

#### § 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.



## Verification & User's Manual Information

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.



**End of Report**