



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

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June 10, 2009

Comtech AeroAstro, Inc.  
20145 Ashbrook Place  
Ashburn, VA 20147

Dear Wayne Thomas,

Enclosed is the EMC Wireless test report for compliance testing of the Comtech AeroAstro, Inc., TrackPack as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Part 15, Subpart B, ICES-003, Issue 4 February 2004 for a Class B Digital Device and FCC Part 15 Subpart C, RSS-210, Issue 7, June 2007 for Intentional Radiators.

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: (\Comtech AeroAstro, Inc.\EMC26600-FCC247 Rev. 3)

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## **Electromagnetic Compatibility Criteria Test Report**

for the

**Comtech AeroAstro, Inc.  
Model TrackPack**

**Tested under**  
the FCC Certification Rules  
contained in  
Title 47 of the CFR, Parts 15 Subpart B & ICES-003  
for Class B Digital Devices  
&  
15.247 Subpart C & RSS-210, Issue 7, June 2007  
for Intentional Radiators

**MET Report: EMC26600-FCC247 Rev. 3**

June 10, 2009

**Prepared For:**

**Comtech AeroAstro, Inc.  
20145 Ashbrook Place  
Ashburn, VA 20147**

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

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for Class B Digital Devices  
&  
15.247 Subpart C & RSS-210, Issue 7, June 2007  
for Intentional Radiators



Jeffrey Hazen, Project Engineer  
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 capable of operation in accordance with the requirements of the FCC Rules Parts 15B, 15.247 and Industry Canada standards ICES-003, Issue 4 February 2004, RSS-210, Issue 7, June 2007 under normal use and maintenance.



Shawn McMillen,  
Wireless Manager, Electromagnetic Compatibility Lab

## Report Status Sheet

Revision	Report Date	Reason for Revision
∅	April 7, 2009	Initial Issue.
1	April 15, 2009	Editorial corrections.
2	April 28, 2009	Corrected battery voltage.
3	June 10, 2009	Corrections per engineer.

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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 <b>microamp</b>
dB $\mu$ V	Decibels above one <b>microvolt</b>
dB $\mu$ A/m	Decibels above one <b>microamp per meter</b>
dB $\mu$ V/m	Decibels above one <b>microvolt per meter</b>
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
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



# I. Executive Summary

## A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Comtech AeroAstro, Inc. TrackPack, with the requirements of Part 15, §15.247. 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 TrackPack. Comtech AeroAstro, Inc. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the TrackPack, 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, §15.247, in accordance with Comtech AeroAstro, Inc., purchase order number 003814. All tests were conducted using measurement procedure ANSI C63.4-2003.

FCC Reference	IC Reference	Description	Compliance
47 CFR Part 15.247:2005	RSS-210 Issue 7: 2007	Applicable Standard	Compliant
47 CFR Part 15.107 (a)	RSS-210 Issue 7: 2007	Conducted Emission Limits for a Class B Digital Device	Not Applicable
47 CFR Part 15.109 (a)	RSS-210 Issue 7: 2007	Radiated Emission Limits for a Class B Digital Device	Compliant
Title 47 of the CFR, Part 15 §15.203	N/A	Antenna Requirement	Compliant
Title 47 of the CFR, Part 15 §15.207(a)	RSS-210(7.2.2)	Conducted Emission Voltage	Not Applicable
Title 47 of the CFR, Part 15 §15.247(a)(1)	RSS-210(A8.1)	Occupied Bandwidth	Compliant
Title 47 of the CFR, Part 15 §15.247(b)	RSS-210(A8.4)	RF Output Power	Compliant
Title 47 of the CFR, Part 15 §15.209, §15.247(d)	RSS-210(A8.5)	Radiated Spurious Emissions	Compliant
Title 47 of the CFR, Part 15 §15.205	RSS-210(A8.5)	Emissions at Restricted Band	Compliant
Title 47 of the CFR, Part 15 §15.209, §15.247(d)	RSS-210(A8.5)	Conducted Spurious Emissions	Compliant
Title 47 of the CFR, Part 15; §15.247(e)	RSS-210(A8.3)	Power Spectral Density	Compliant
Title 47 of the CFR, Part 15 §15.247(i)	RSS Gen(5.5)	Maximum Permissible Exposure	Compliant
N/A	RSS Gen(4.8)	Receiver Spurious Emissions	Compliant

**Table 1. Executive Summary of EMC Part 15.247 Compliance Testing**

## II. Equipment Configuration

## A. Overview

MET Laboratories, Inc. was contracted by Comtech AeroAstro, Inc. to perform testing on the TrackPack, under Comtech AeroAstro, Inc.'s purchase order number 003814.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Comtech AeroAstro, Inc., TrackPack.

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

<b>Model(s) Tested:</b>	TrackPack	
<b>Model(s) Covered:</b>	6014-9000-01	
<b>EUT Specifications:</b>	Primary Power: 4.5 VDC	
	FCC ID: XGS-6014901	
	Type of Modulations:	DSSS (Direct Sequence Spread Spectrum)
	Equipment Code:	DTS
	Peak RF Output Power:	1.39 dBm
		0.517 dBm
		0.034 dBm
EUT Frequency Ranges:	2405 – 2475 MHz	
<b>Analysis:</b>	The results obtained relate only to the item(s) tested.	
<b>Environmental Test Conditions:</b>	Temperature: 15-35° C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
<b>Evaluated by:</b>	Jeffrey Hazen	
<b>Date(s):</b>	June 10, 2009	

**Table 2. EUT Summary Table**

## 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>RSS-210, Issue 7, June 2007</b>	Low-power Licence-exempt Radiocommunications Devices (All Frequency Bands): Category I Equipment
<b>CFR 47, Part 15, Subpart B</b>	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
<b>ICES-003, Issue 4 February 2004</b>	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
<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

Table 3. References

## C. 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.

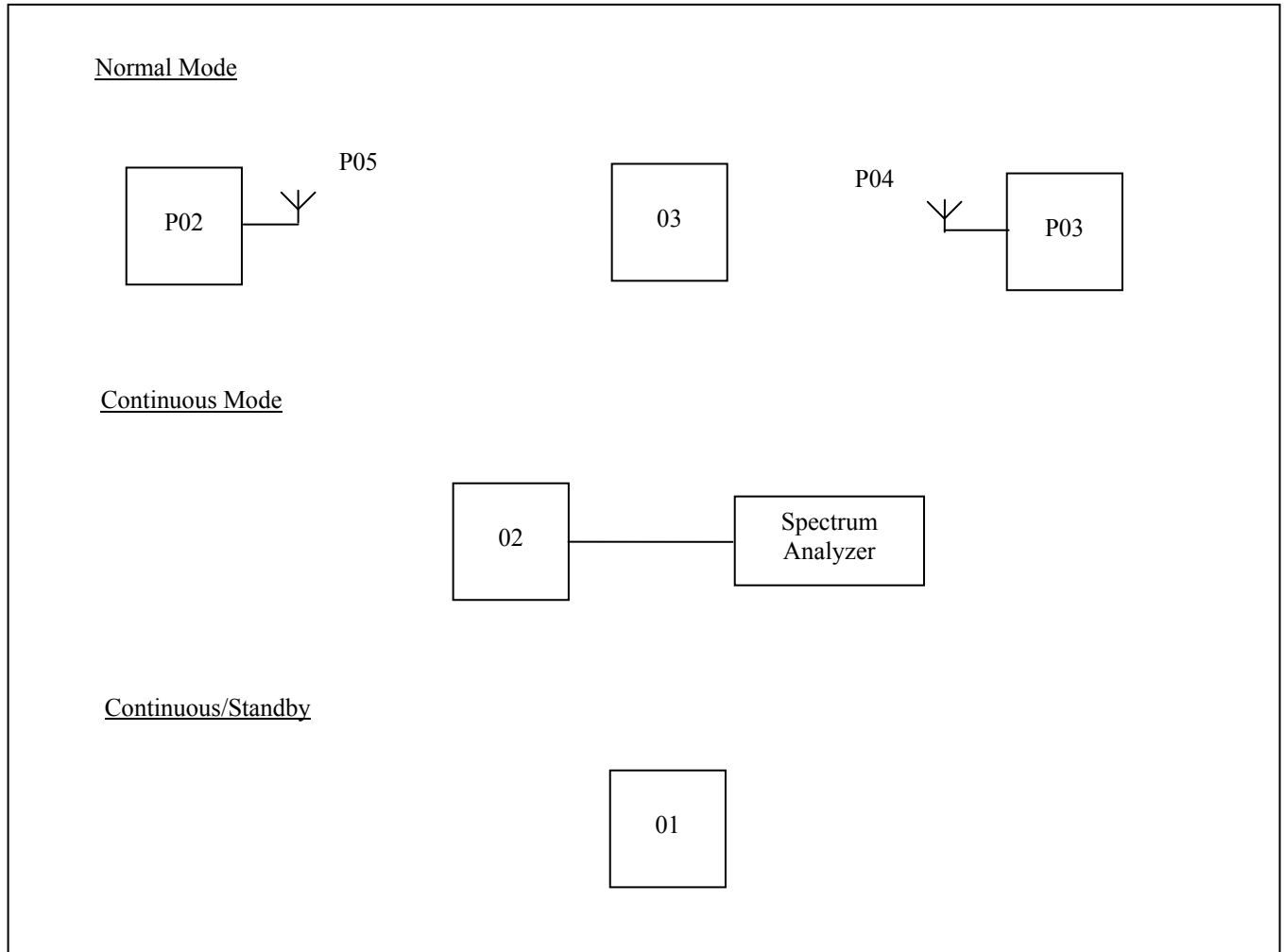
Radiated Emissions measurements were performed in a 3 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

## D. Description of Test Sample

The Comtech AeroAstro, Inc. TrackPack, Equipment Under Test (EUT), is a tracking device. It acquires its position using GPS and transmits it per schedule via a simplex satellite link. The device is configured via an 802.15.4 radio link.



Photograph 1. Comtech AeroAstro, Inc. TrackPack



**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	Serial Number
01	TRACKPACK UNIT #1	6014-9000-01	359450
02	TRACKPACK UNIT #2	6014-9000-01	357143
03	TRACKPACK UNIT #3	6014-9000-01	359845

**Table 4. Equipment Configuration**

## F. Support Equipment

Support equipment necessary for the operation and testing of the EUT is included in the following list.

Ref. ID	Name / Description	Manufacturer	Model Number	Serial Number
P01	POGO PIN BOARD	COMTECH AEROASTRO, INC.	N/A	N/A
P02	SPECTRUM ANALYZER	AGILENT	N1996A	MX4752927
P03	LAPTOP	APPLE	A1211	A-51040
P04	802.15.4USB MODEM	NETVOX	Z101	N/A
P05	SATCOM ANTENNA	SPECTRUM CONTROL	N/A	N/A

**Table 5. Support Equipment**

## G. Ports and Cabling Information

The EUT did not require any ports and cabling information for operation or monitoring.

## H. Mode of Operation

### Normal mode of operation (production code):

Every 15 seconds the device wakes up and listens for communication via the 802.15.4 radio. This radio is how the device is controlled, and the schedule set. At scheduled times the device will acquire position and transmit the information via the SATCOM transmitter.

### Continuous mode of operation:

The 802.15.4 subsystem is programmed to transmit continuously on one of 16 channels, which is configurable by the serial port. The GPS and SATCOM operation is not active for this mode. This mode is only intended for testing the 802.15.4 radio.

### Standby mode of operation:

Every 15 seconds the device wakes up and listens for communication via the 802.15.4 radio. GPS and SATCOM are inactive in this mode. Unit transmits on the 802.15.4 radio only when talked to.

## I. Method of Monitoring EUT Operation

For purposes of these tests, the indication of intended operation will be determined by querying the device via the 802.15.4 radio. Commands are implemented which will allow determination of normal function for the GPS and SATCOM subsystems. Function of the 802.15.4 radio and main microprocessor are inherently known by the ability to successfully communicate with the device.

Successful operation will be monitored through the reception of acknowledgement commands by an 802.15.4 USB dongle and shown through Hyperterminal. These acknowledgement commands will also verify the GPS operation. SATCOM transmission will be monitored visually on a spectrum analyzer.

## **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 Comtech AeroAstro, Inc. upon completion of testing.



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

## Electromagnetic Compatibility Criteria

### § 15.107 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 6. 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 6. 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.

**15.207(a)**, Except as shown in paragraphs (b) and (c) of this section\*, charging, AC adapters or battery eliminators 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 the Table 6, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency range (MHz)	Class A Conducted Limits (dB $\mu$ V)		*Class B Conducted Limits (dB $\mu$ V)	
	Quasi-Peak	Average	Quasi-Peak	Average
* 0.15- 0.45	79	66	66 - 56	56 - 46
0.45 - 0.5	79	66	56	46
0.5 - 30	73	60	60	50

Note 1 — The lower limit shall apply at the transition frequencies.  
 Note 2 — The limit decreases linearly with the logarithm if the frequency in the range 0.15 MHz to 0.5 MHz.  
 \* -- Limits per Subsection 15.207(a).

**Table 6. Conducted Limits for Radio Frequency Devices calculated from FCC Part 15 Subsections 15.107(a) (b) and 15.207(a)**

**Test Results:** The EUT was not applicable with the Class B requirement(s) of this section. The device is battery operated.

## Electromagnetic Compatibility Criteria

### § 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 7.

**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 7.

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 7. 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 3 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:** The EUT was compliant with the Class B requirement(s) of this section.

**Test Engineer(s):** Dusmantha Tennakoon

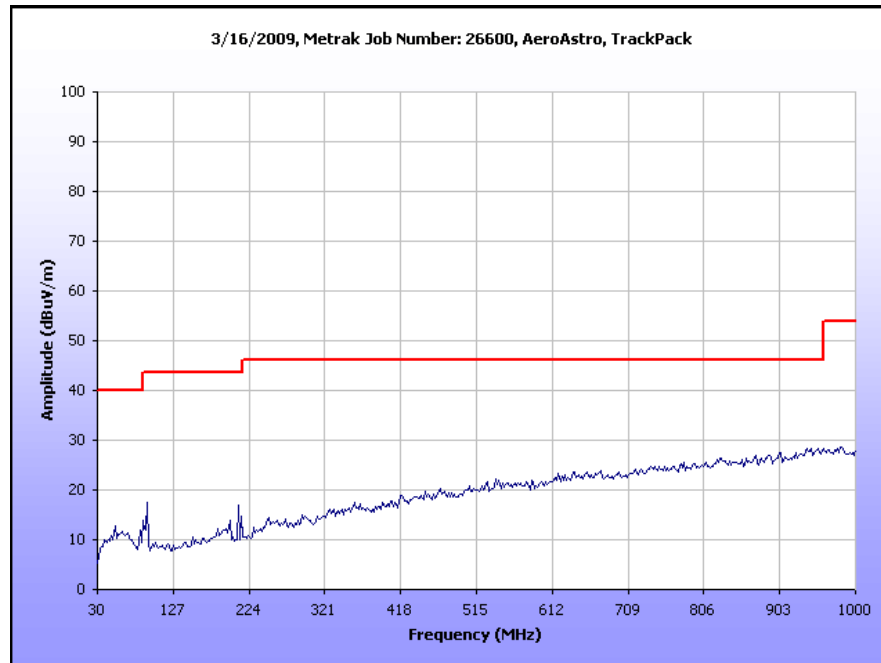
**Test Date(s):** 03/16/09

### Radiated Emissions Limits Test Results, Class B

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
60.693	0	H	1.00	5.26	10.20	0.24	0.00	15.70	40.00	-24.30
60.693	360	V	1.00	5.26	9.81	0.24	0.00	15.31	40.00	-24.69
87.974	0	H	1.00	5.10	6.92	0.21	0.00	12.23	40.00	-27.77
87.974	199	V	1.00	12.43	6.42	0.21	0.00	19.07	40.00	-20.93
95.045	0	H	1.00	6.65	7.80	0.22	0.00	14.67	43.50	-28.83
95.045	34	V	1.00	8.18	6.80	0.22	0.00	15.20	43.50	-28.30
211.226	0	H	3.00	5.72	10.60	0.56	0.00	16.88	43.50	-26.62
211.226	326	V	1.00	9.30	10.25	0.56	0.00	20.11	43.50	-23.39
526.285	360	H	1.00	5.26	17.45	2.28	0.00	24.99	46.00	-21.01
526.285	0	V	1.00	5.28	17.83	2.28	0.00	25.39	46.00	-20.61
901.794	0	H	1.00	5.57	22.64	3.04	0.00	31.25	46.00	-14.75
901.794	360	V	1.00	5.57	22.24	3.04	0.00	30.85	46.00	-15.15

**Table 8. Radiated Emissions Limits Test Results, FCC Limits**

Note: The EUT was tested at 3 m.



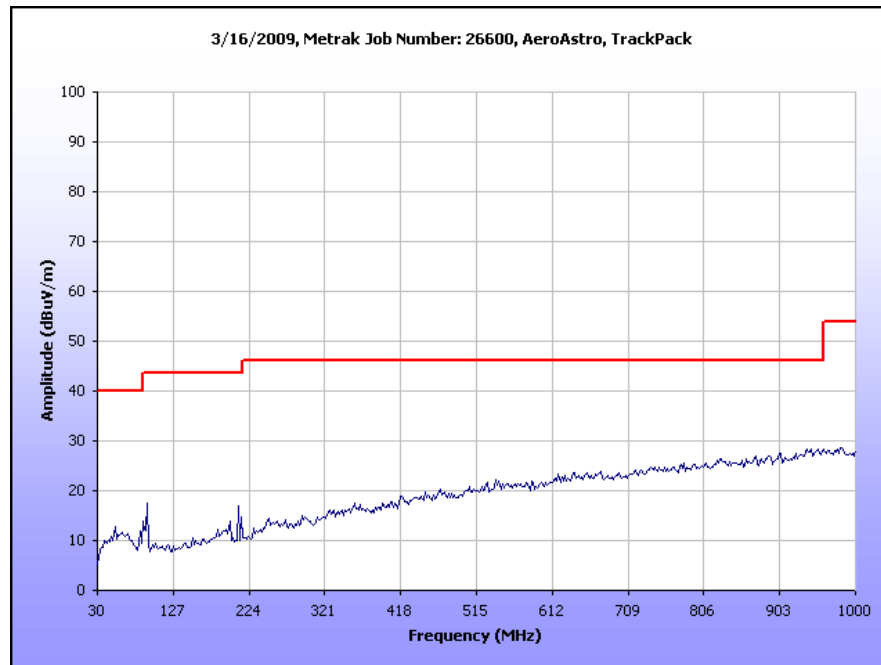
**Plot 1. Radiated Emissions, Pre-Scan, FCC Limits**

### Radiated Emissions Limits Test Results, Class B

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
60.693	0	H	1.00	5.26	10.20	0.24	10.46	5.24	30.00	-24.76
60.693	360	V	1.00	5.26	9.81	0.24	10.46	4.85	30.00	-25.15
87.974	0	H	1.00	5.10	6.92	0.21	10.46	1.77	30.00	-28.23
87.974	199	V	1.00	12.43	6.42	0.21	10.46	8.61	30.00	-21.39
95.045	0	H	1.00	6.65	7.80	0.22	10.46	4.21	30.00	-25.79
95.045	34	V	1.00	8.18	6.80	0.22	10.46	4.74	30.00	-25.26
211.226	0	H	3.00	5.72	10.60	0.56	10.46	6.42	30.00	-23.58
211.226	326	V	1.00	9.30	10.25	0.56	10.46	9.65	30.00	-20.35
526.285	360	H	1.00	5.26	17.45	2.28	10.46	14.53	37.00	-22.47
526.285	0	V	1.00	5.28	17.83	2.28	10.46	14.93	37.00	-22.07
901.794	0	H	1.00	5.57	22.64	3.04	10.46	20.79	37.00	-16.21
901.794	360	V	1.00	5.57	22.24	3.04	10.46	20.39	37.00	-16.61

**Table 9. Radiated Emissions Limits Test Results, ICES-003 Limits**

Note: The EUT was tested at 3 m.



**Plot 2. Radiated Emissions, Pre-Scan, ICES-003 Limits**

## Radiated Emission Limits Test Setup



**Photograph 2. Radiated Emission Test Setup 30 MHz - 1 GHz**

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

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.203 Antenna Requirement

**Test Requirement:** § 15.203: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

The structure and application of the EUT were analyzed to determine compliance with Section 15.203 of the Rules. Section 15.203 states that the subject device must meet at least one of the following criteria:

- a.) Antenna must be permanently attached to the unit.
- b.) Antenna must use a unique type of connector to attach to the EUT.
- c.) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

**Results:** The EUT uses an integral antenna, therefore it satisfies the requirements of this section.

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

**Test Date(s):** 03/17/09

Gain/Model	Manufacturer
0.9 dBi	Antenova



## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.207 Conducted Emissions Limits

**Test Requirement(s):** § 15.207 (a): For an intentional radiator 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 30MHz, shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50  $\Sigma$  line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency range (MHz)	§ 15.207(a), Conducted Limit (dB $\mu$ V)	
	Quasi-Peak	Average
* 0.15- 0.45	66 - 56	56 - 46
0.45 - 0.5	56	46
0.5 - 30	60	50

**Table 10. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)**

**Test Results:** The EUT was not applicable with this requirement. The EUT does not connect to an AC mains.

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(a) 6 dB and 99% Bandwidth

**Test Requirements:** § 15.247(a): Operation under the provisions of this section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

For systems using digital modulation techniques, the EUT may operate in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

**Test Procedure:** The transmitter was on and transmitting at the highest output power. A temporary connector was added to the antenna port of the EUT to enable conducted testing. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW of 100 kHz for FCC 15.247 testing, and approximately 1% of the total emission bandwidth for RSS-210 testing, with VBW > RBW. The 6 dB and 99 % Bandwidth was measured and recorded. The measurements were performed on the low, mid and high channels.

**Test Results** The EUT was compliant with § 15.247 (a).

The 6 dB and 99% Bandwidth was determined from the plots on the following pages.

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

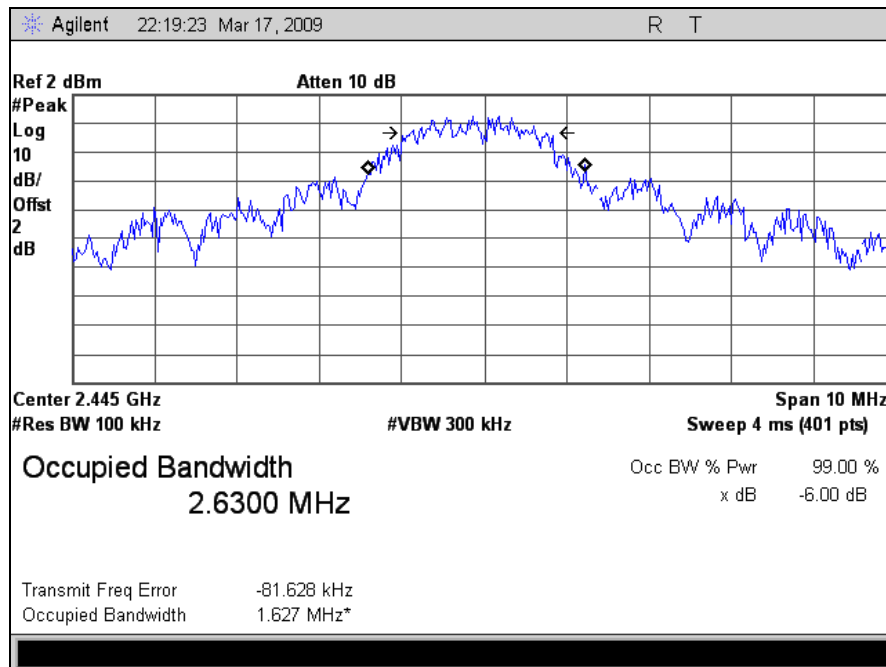
**Test Date(s):** 03/17/09

Carrier Channel	Frequency (MHz)	Measured 6 dB Bandwidth (MHz)	Measured 99% Bandwidth (MHz)
Low	2405 MHz	1.263 MHz	2.58 MHz
Mid	2445 MHz	1.627 MHz	2.907 MHz
High	2475 MHz	1.468 MHz	3.036 MHz

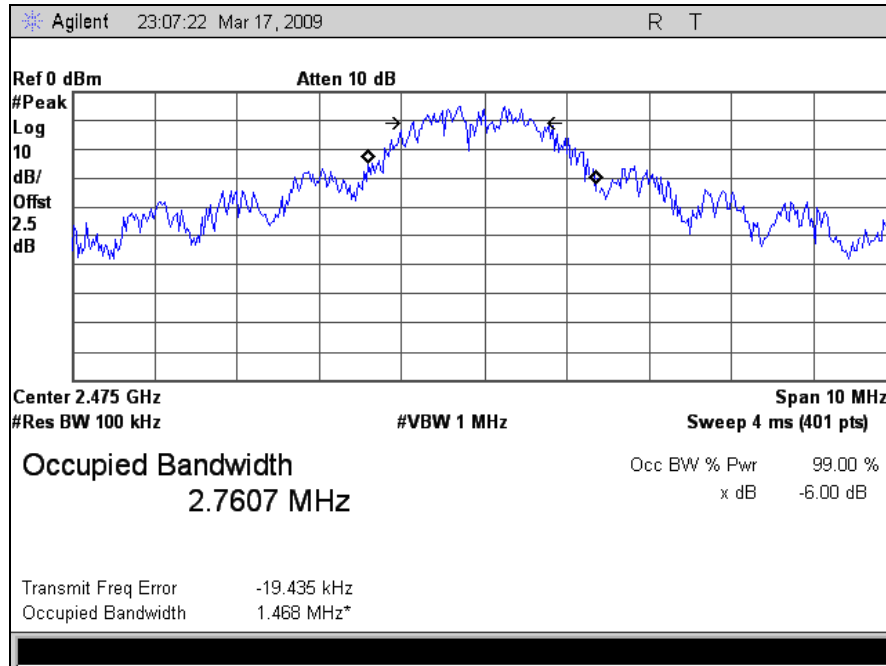
### Electromagnetic Compatibility Criteria for Intentional Radiators



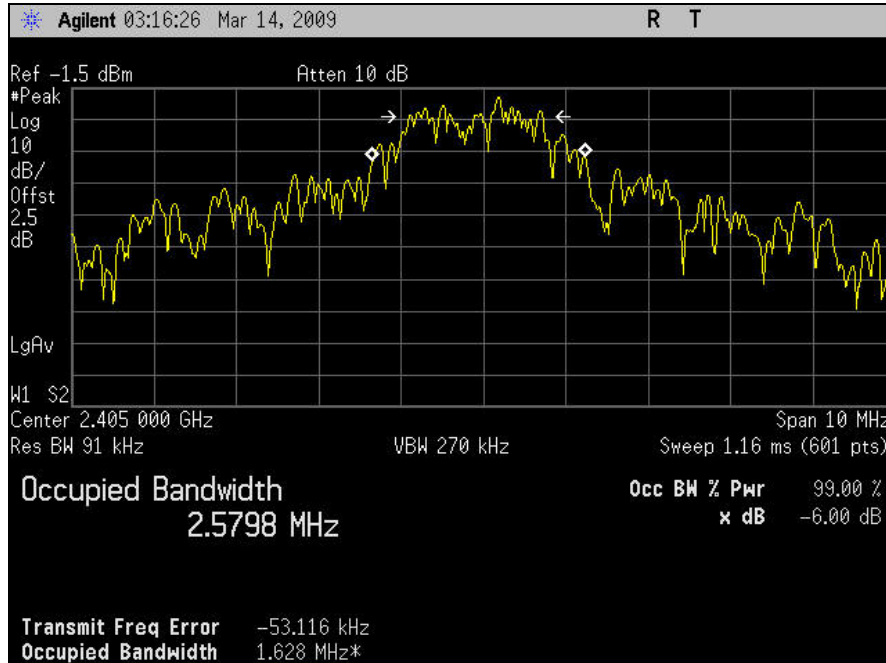
Plot 3. 6 dB Occupied Bandwidth, Low Channel



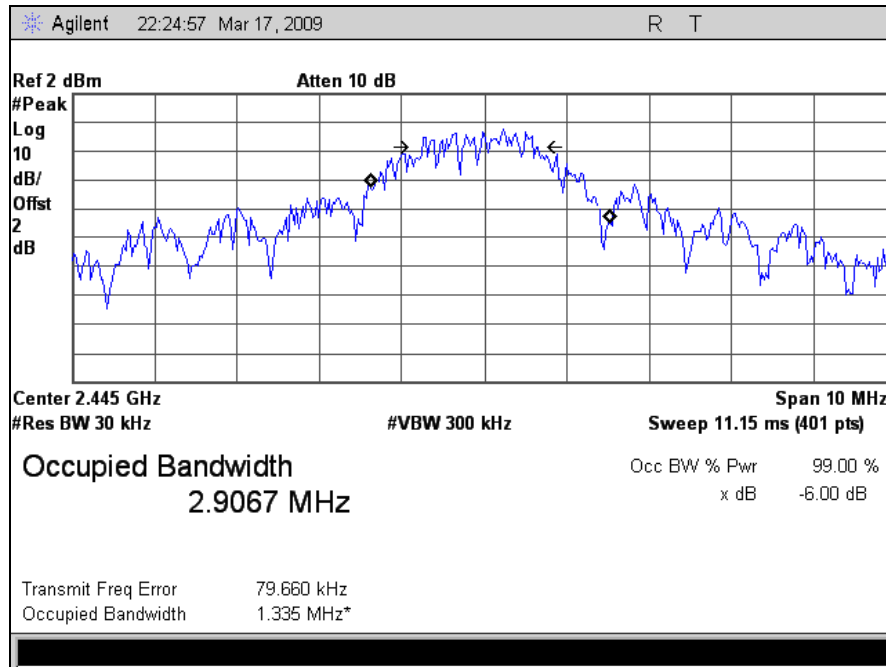
Plot 4. 6 dB Occupied Bandwidth, Mid Channel



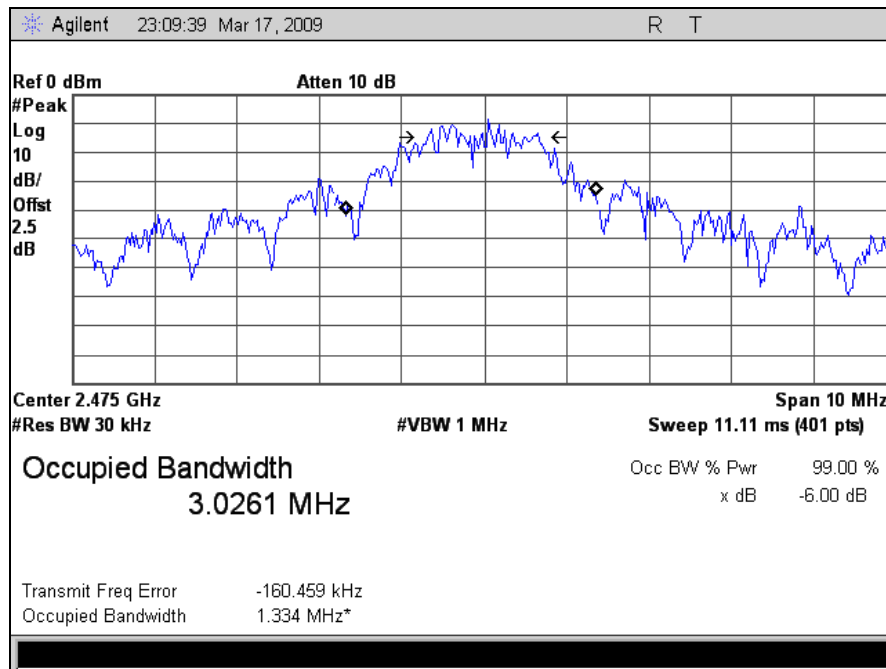
Plot 5. 6 dB Occupied Bandwidth, High Channel



Plot 6. 99% Occupied Bandwidth, Low Channel



**Plot 7. 99% Occupied Bandwidth, Mid Channel**



**Plot 8. 99% Occupied Bandwidth, High Channel**

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(b) Peak Power Output and RF Exposure

**Test Requirements:** §15.247(b): The maximum peak output power of the intentional radiator shall not exceed the following:

Digital Transmission Systems (MHz)	Output Limit (Watts)
902-928	1.000
2400-2483.5	1.000
5725- 5850	1.000

**Table 11. Output Power Requirements from §15.247**

§15.247(c): if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in the Table 11, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400 – 2483.5 MHz band may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 5725 – 5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

Fixed, point-to-point operation excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

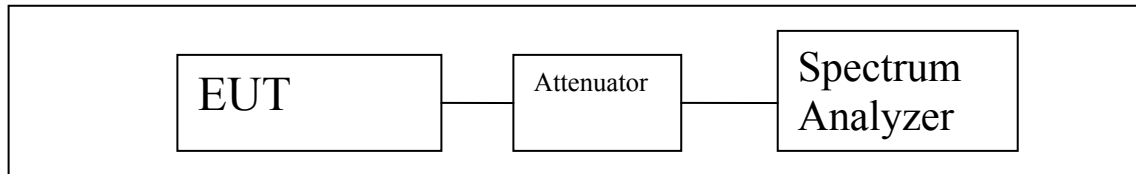
**Test Procedure:** The transmitter was connected to a calibrated spectrum analyzer. The EUT was measured at the low, mid and high channels of each band at a data rate which gave the maximum power level.

**Test Results:** The EUT was compliant with the Peak Power Output limits of § 15.247(b).

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

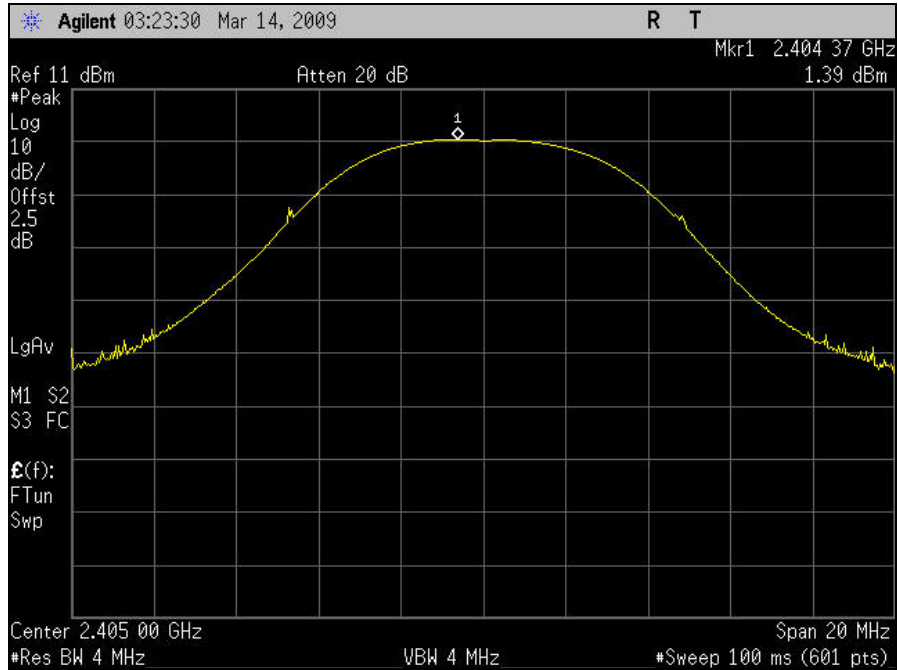
**Test Date(s):** 03/17/09

Carrier Channel	Frequency (MHz)	Measured Peak Output Power dBm
Low	2405	1.39
Mid	2445	0.517
High	2475	0.034

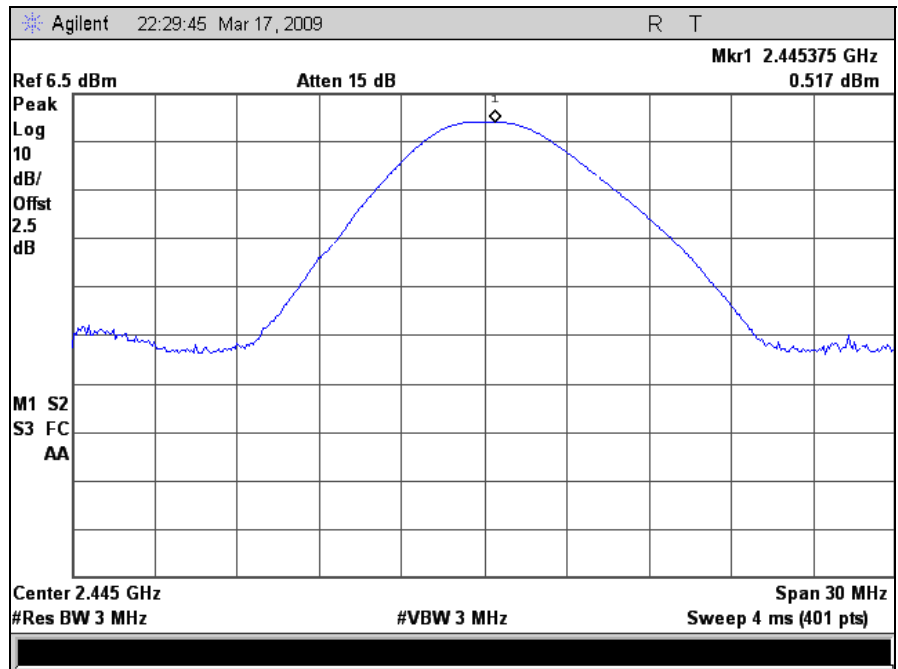


**Figure 2. Block Diagram of Test Setup for Peak Power Output**

### Peak Power Output

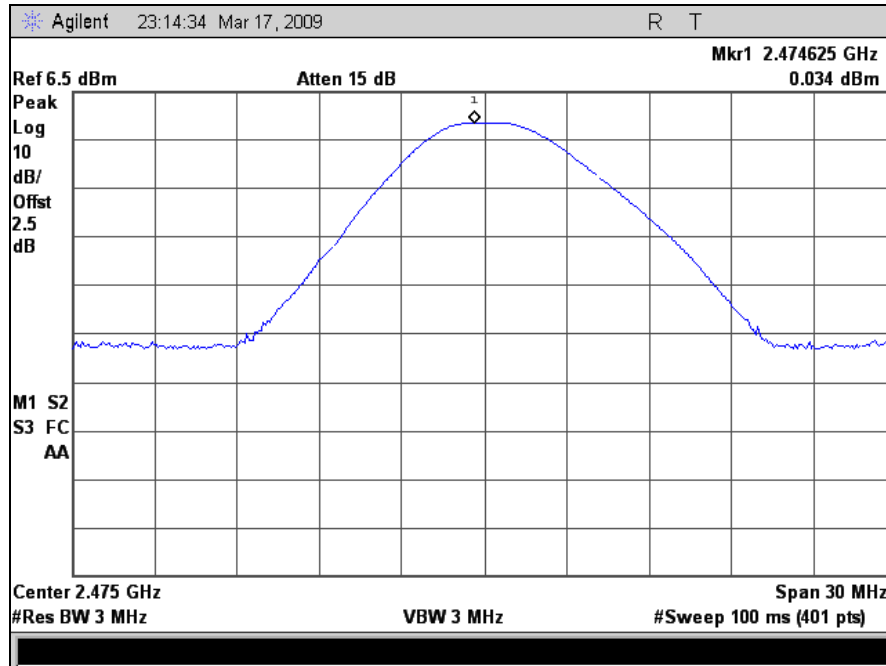


**Plot 9. Peak Output Power, Low Channel**



**Plot 10. Peak Output Power, Mid Channel**





**Plot 11. Peak Output Power, High Channel**



**Photograph 3. Peak Output Power, Test Setup**

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(b) RF Exposure

**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.

MPE Limit Calculation: EUT's operating frequencies @ 2400-2483.5 MHz; highest conducted power = 1.39 dBm (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm<sup>2</sup> or 10 W/m<sup>2</sup>**

EUT maximum antenna gain = 0.9 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 (1.38 mW)  
G = Antenna Gain (1.23 numeric)

$$R = (1.38 * 1.23 / 4 * 3.14 * 1.0)^{1/2} = (1.7 / 12.56)^{1/2} = 0.368 \text{ cm}$$
$$S = (1.38 * 1.23) / (4 * 3.14 * 20^2) = 1.7 / 5027 = 0.338 \mu\text{W/cm}^2 @ 20 \text{ cm}$$

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(d) Radiated Spurious Emissions Requirements and Band Edge Measurements

**Test Requirements:** §15.247(d); §15.205: Emissions outside the frequency band.

**§15.247(d):** In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, 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 12. Restricted Bands of Operation**

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490 – 0.510 MHz.

<sup>2</sup> Above 38.6

**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 13.

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

**Test Procedures:** The transmitter was turned. Measurements were performed of low, mid, and high channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit like. Only noise floor was measured above 18 GHz.

**Test Results:** The EUT was compliant with the requirements of this section.

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

**Test Date(s):** 03/16/09 – 03/18/09

### Harmonic Emissions Requirements – Radiated (802.15.4)

Channel	Frequency (MHz)	Corrected Amplitude @ 3m (dBuV/m)	Limit @ 3m (dBuV/m)	Margin (dB)	Measurement Type
11	4810	42.52	74	31.5	pk
	4810	34.5307	54	19.5	avg
	7215	44.6654	74	29.3	pk
	7215	33.5154	54	20.5	avg

Table 14. Radiated Harmonic Emissions, Low Channel

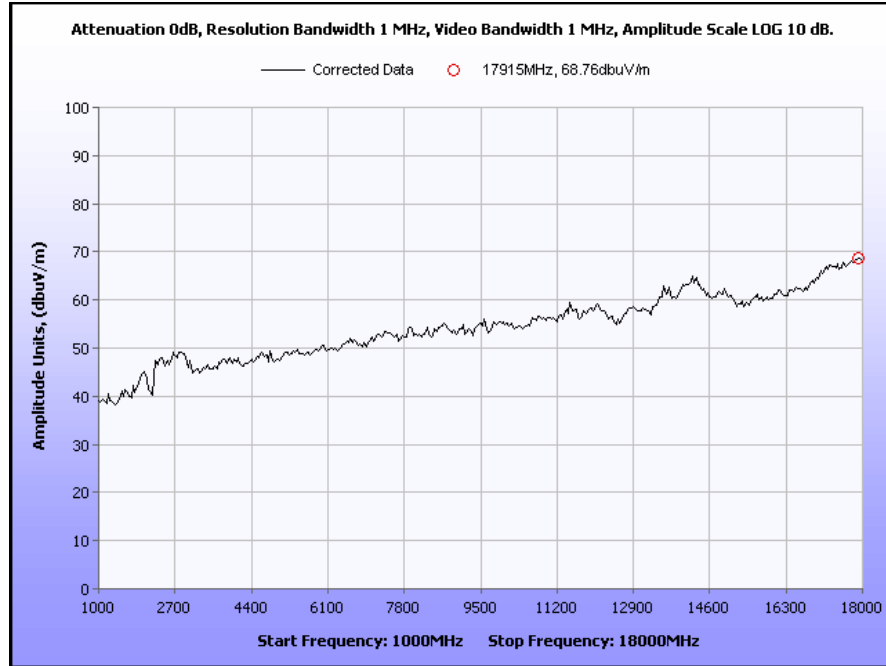
Channel	Frequency (MHz)	Corrected Amplitude @ 3m (dBuV/m)	Limit @ 3m (dBuV/m)	Margin (dB)	Measurement Type
19	4890	43.5095	74	30.5	pk
	4890	35.4195	54	18.6	avg
	7335	47.3703	74	26.6	pk
	7335	35.4103	54	18.6	avg
	9780	47.4874	74	26.5	pk
	9780	36.7374	54	17.3	avg

Table 15. Radiated Harmonic Emissions, Mid Channel

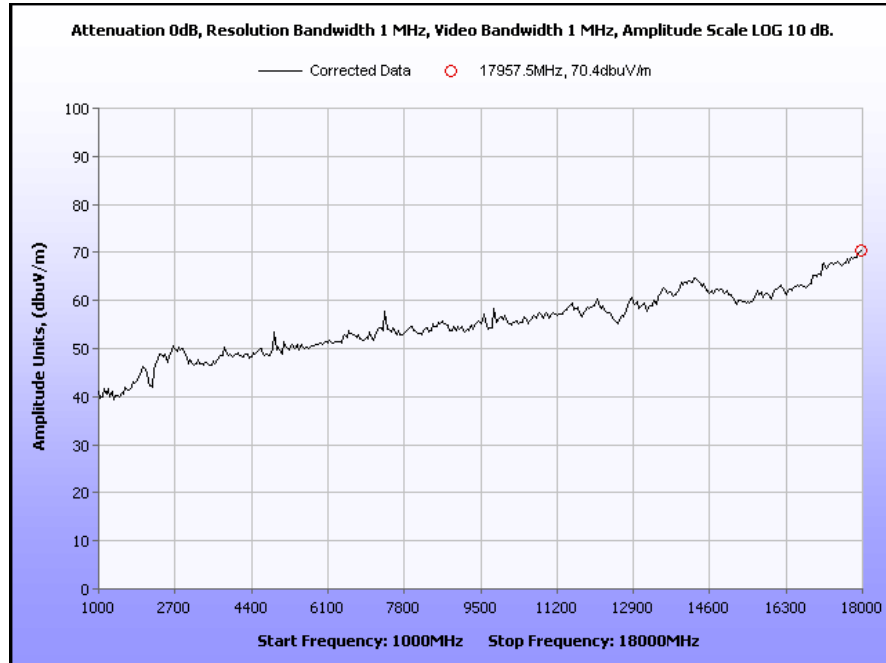
Channel	Frequency (MHz)	Corrected Amplitude @ 3m (dBuV/m)	Limit @ 3m (dBuV/m)	Margin (dB)	Measurement Type
25	4950	49.3921	74	24.6	pk
	4950	42.5721	54	11.4	avg
	7425	52.3816	74	21.6	pk
	7425	42.5716	54	11.4	avg
	9900	49.7566	74	24.2	pk
	9900	39.0966	54	14.9	avg

Table 16. Radiated Harmonic Emissions, High Channel

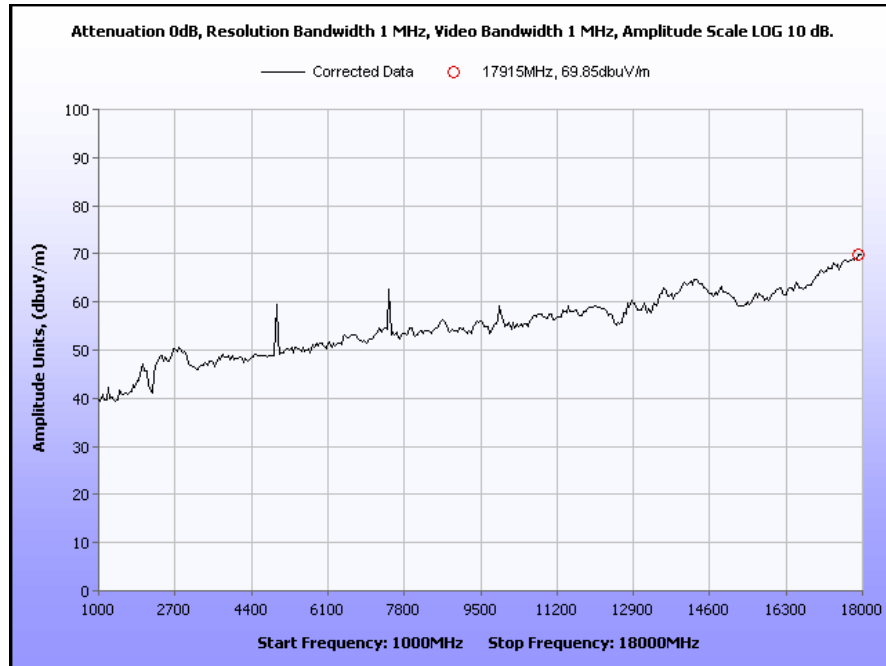
Note: All other emissions were measured at the noise floor of the spectrum analyzer



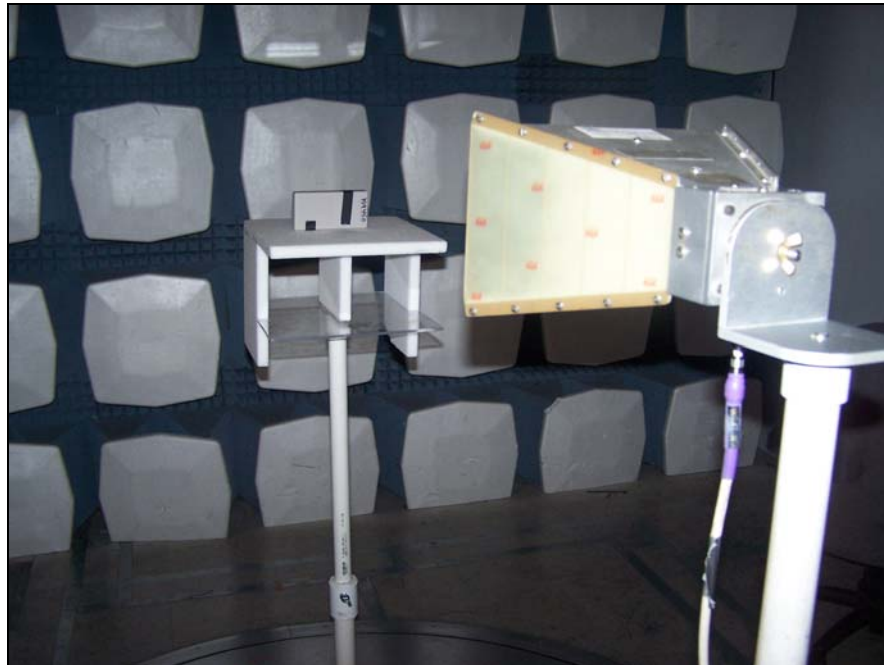
**Plot 12. Radiated Harmonic Emissions, Low Channel**



**Plot 13. Radiated Harmonic Emissions, Mid Channel**

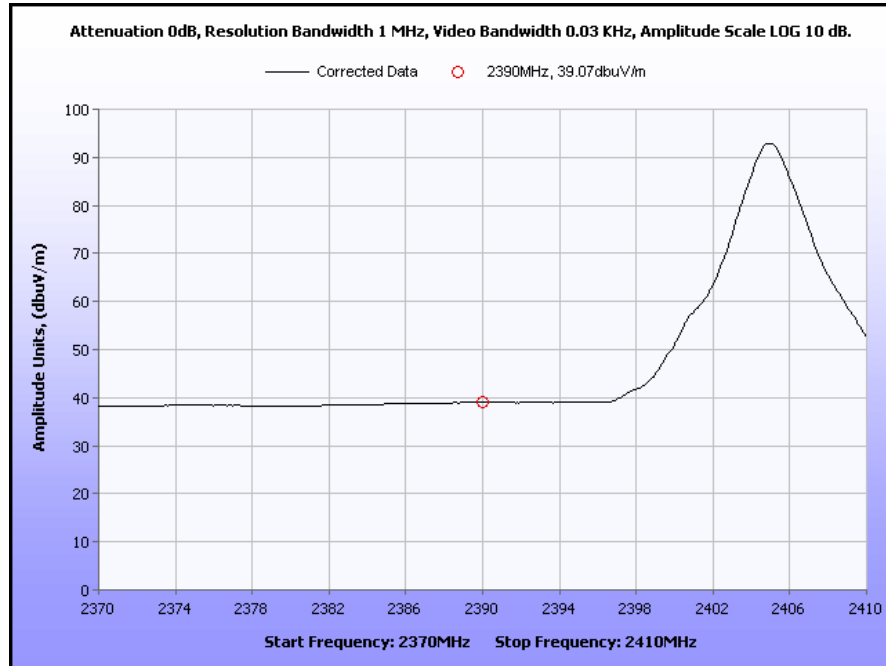


**Plot 14. Radiated Harmonic Emissions, High Channel**

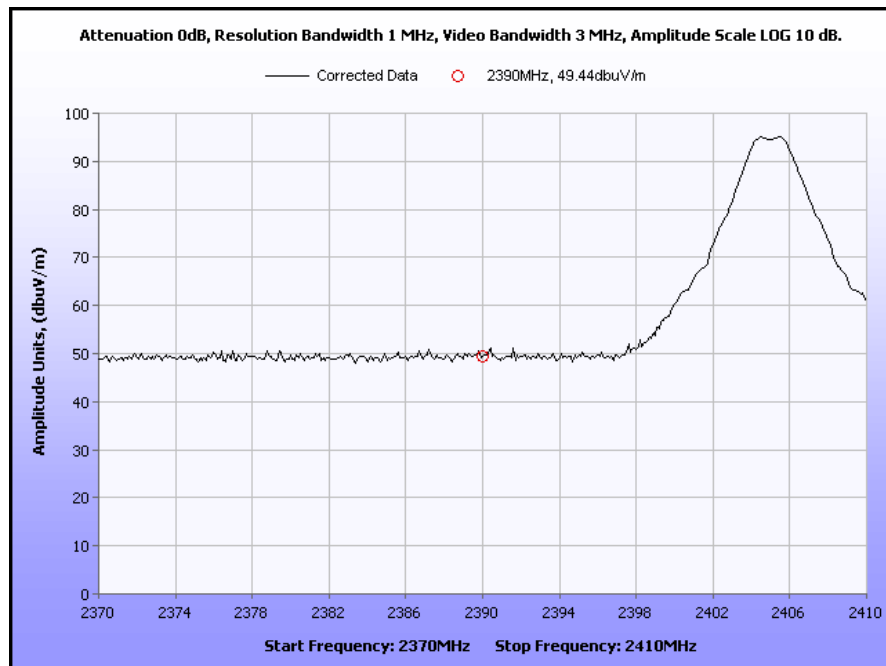


**Photograph 4. Radiated Harmonic Emissions, Test Setup**

## Radiated Band Edge Measurements

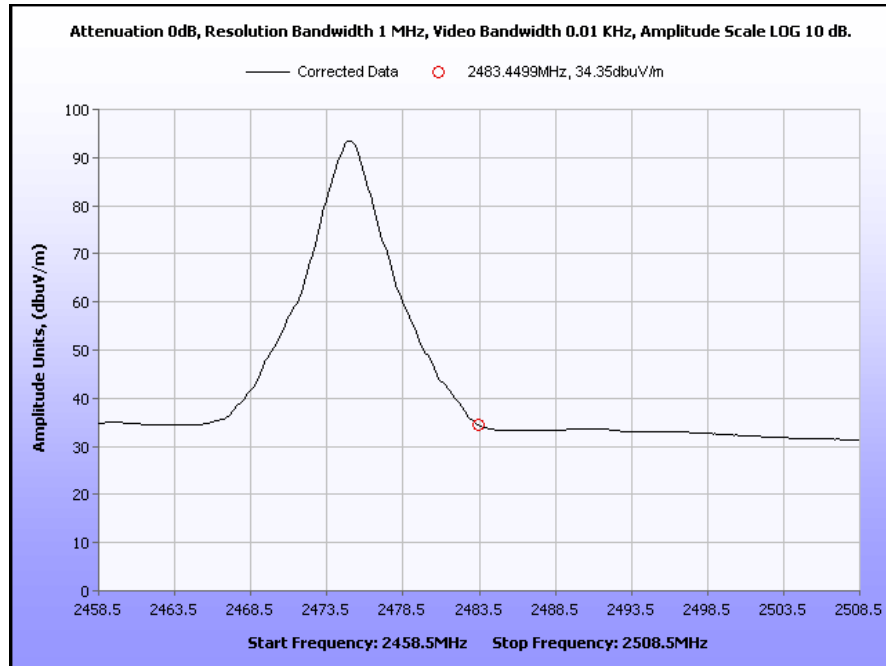


Plot 15. Lower Band Edge, Average

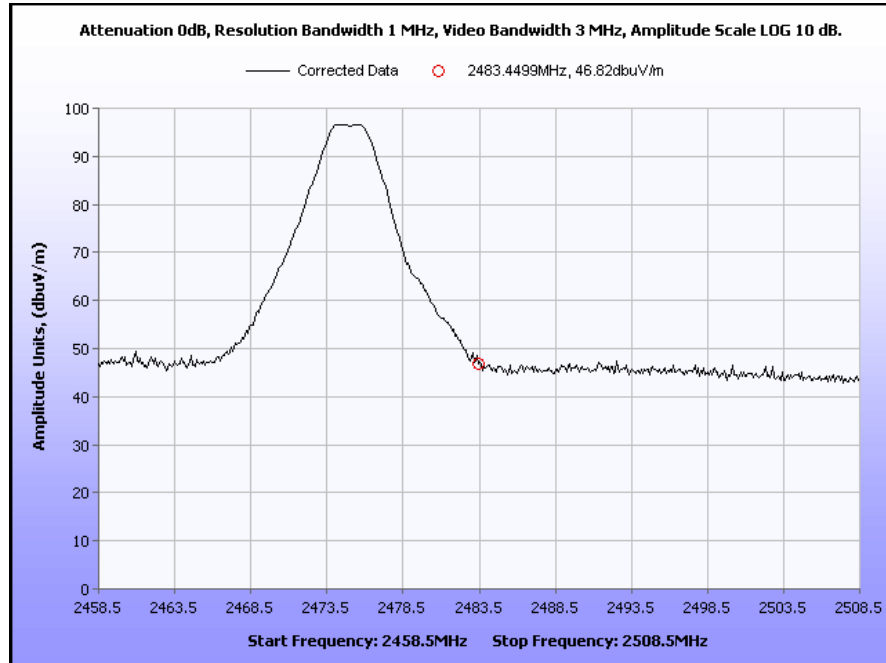


Plot 16. Lower Band Edge, Peak

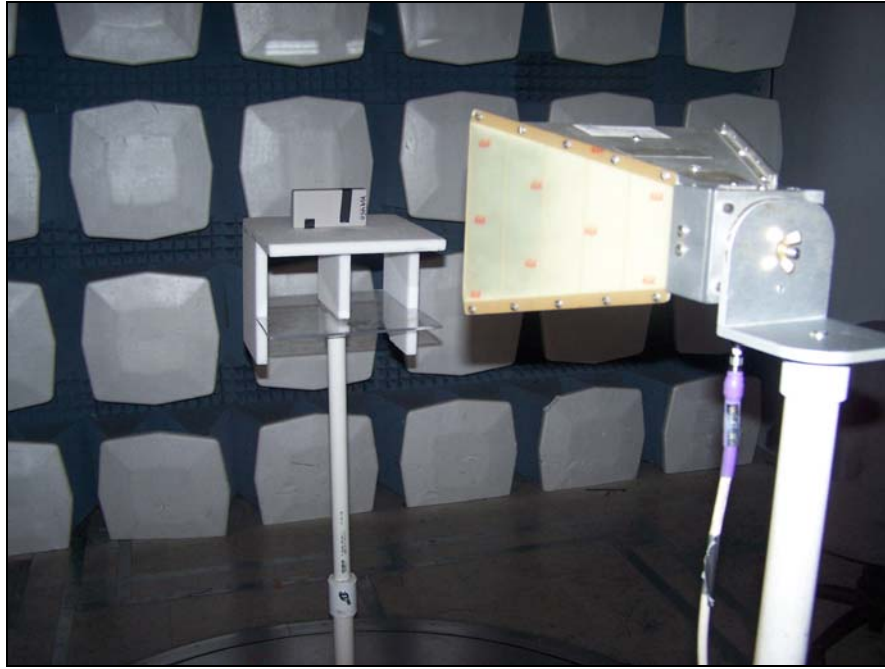




**Plot 17. Upper Band Edge, Average**



**Plot 18. Upper Band Edge, Peak**



**Photograph 5. Band Edge, Test Setup**

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(d) Spurious Emissions Requirements –RF Conducted

**Test Procedure:** 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 10<sup>th</sup> harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

For frequencies 1-18GHz, measurements were made at coupler port of a 20dB directional coupler. The output of the coupler was terminated by a 50Ω load. For frequencies 18-40GHz a HP11970A and HP11970K harmonic mixer was used. Each harmonic mixer was fed with a SMA to wave guide adapter.

**Test Results:** The EUT was compliant with the Spurious Emissions Requirements – RF Conducted limits of § 15.247 (d).

See following pages for detailed test results with RF Conducted Spurious Emissions and §15.205.

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

**Test Date(s):** 03/17/09

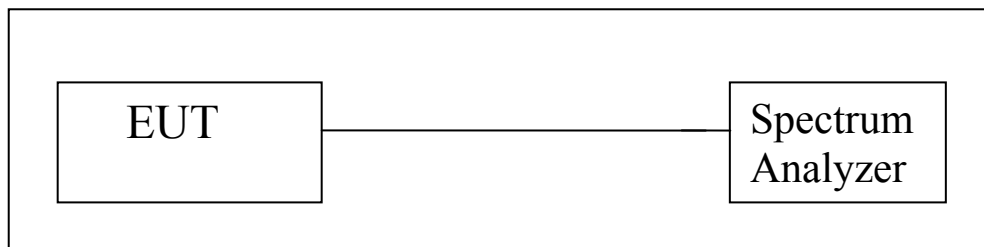
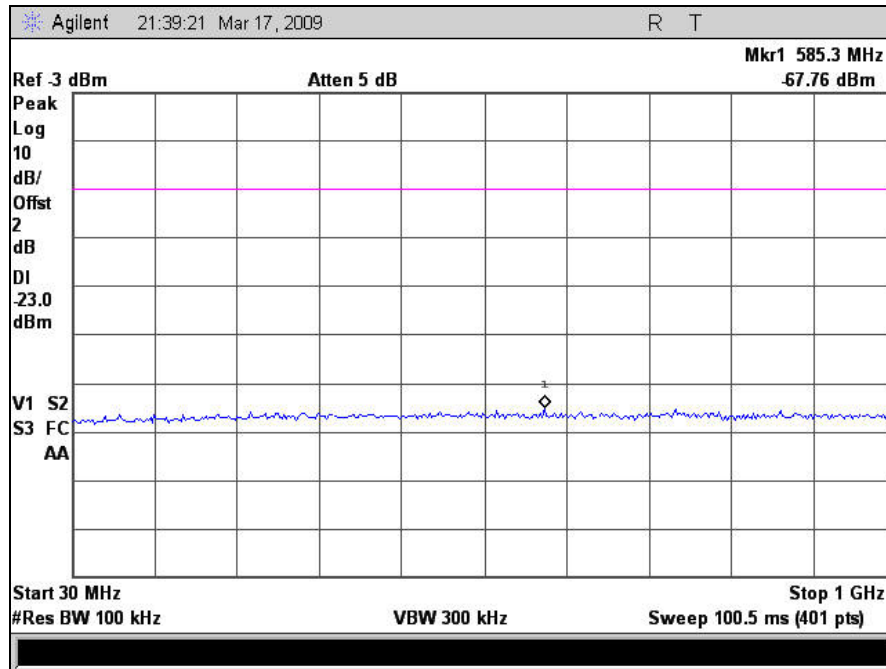
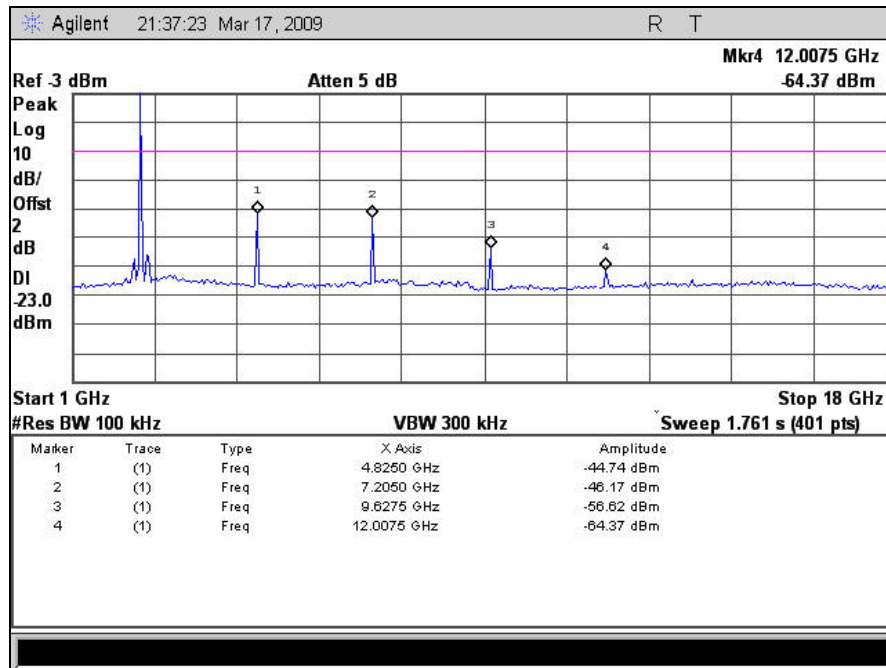


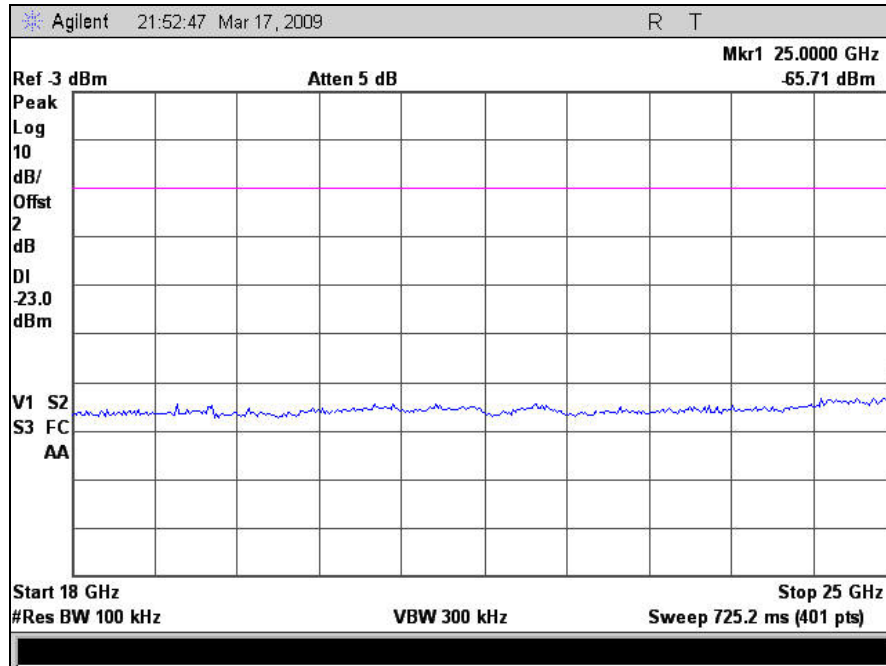
Figure 3. Block Diagram of Test Setup for Spurious Conducted Emissions



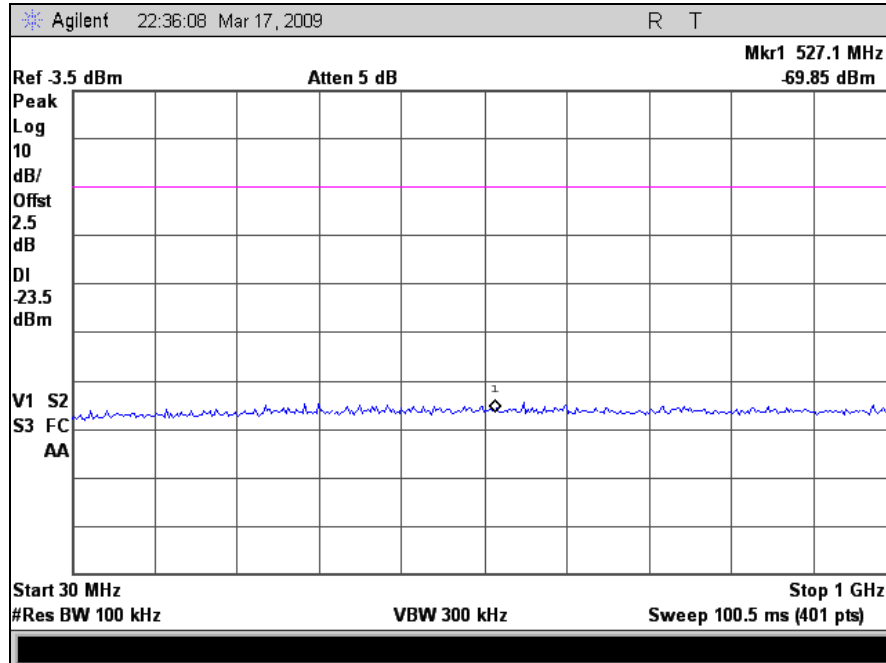
Plot 19. Spurious Conducted Emissions, Low Channel, 30 MHz – 1 GHz



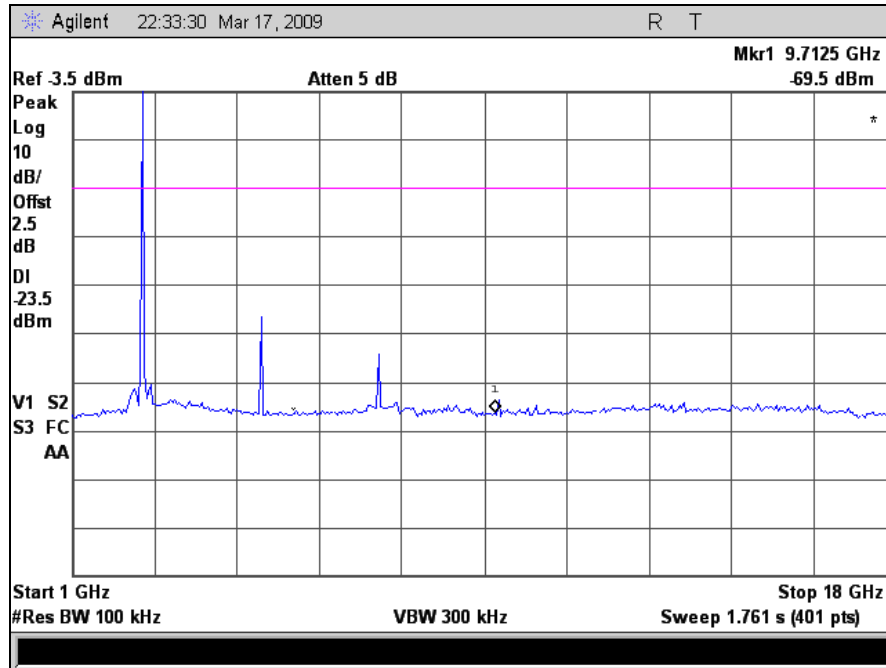
Plot 20. Spurious Conducted Emissions, Low Channel, 1 GHz – 18 GHz



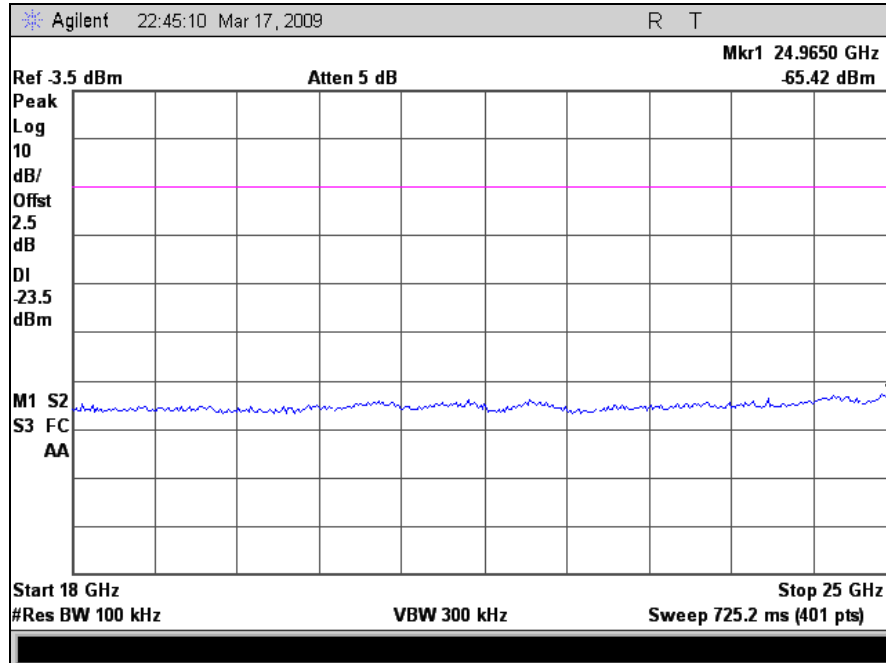
Plot 21. Spurious Conducted Emissions, Low Channel, 18 GHz – 25 GHz



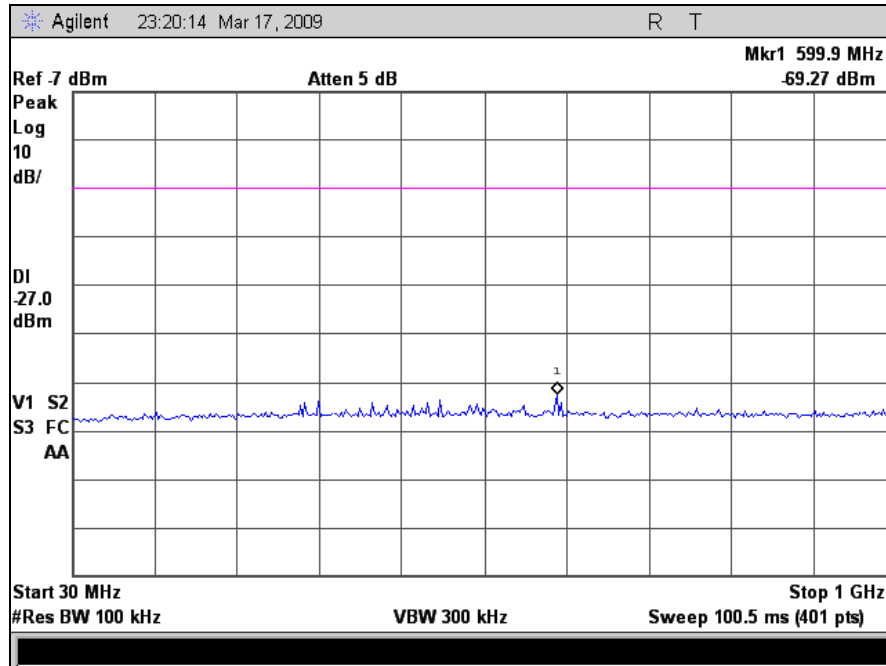
Plot 22. Spurious Conducted Emissions, Mid Channel, 30 MHz – 1 GHz



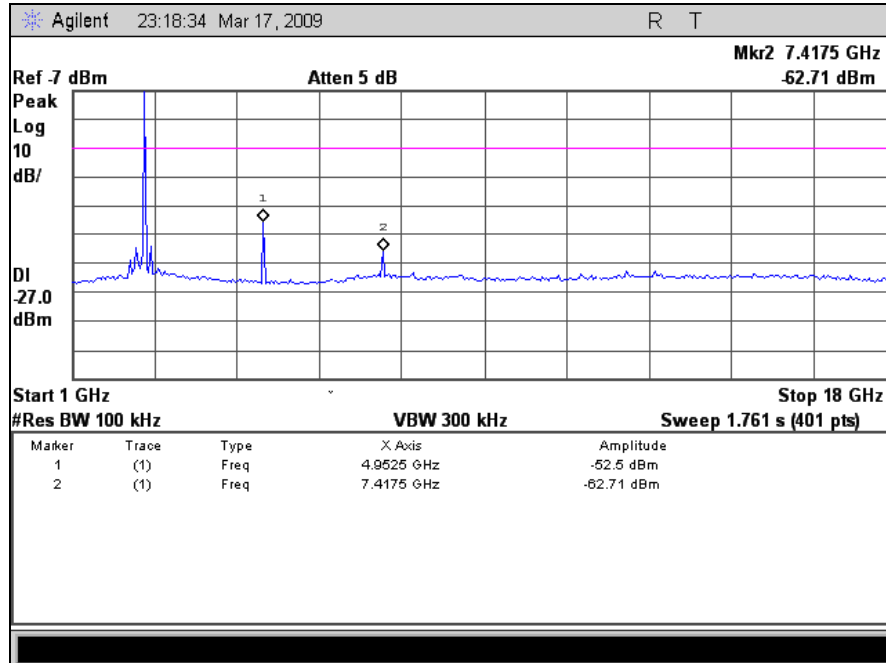
Plot 23. Spurious Conducted Emissions, Mid Channel, 1 GHz – 18 GHz



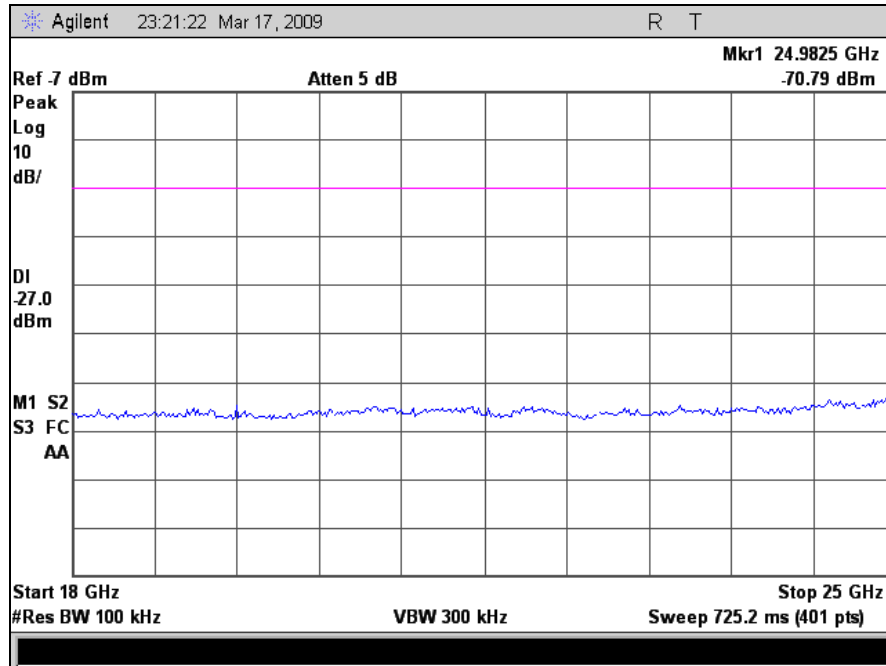
Plot 24. Spurious Conducted Emissions, Mid Channel, 18 GHz – 25 GHz



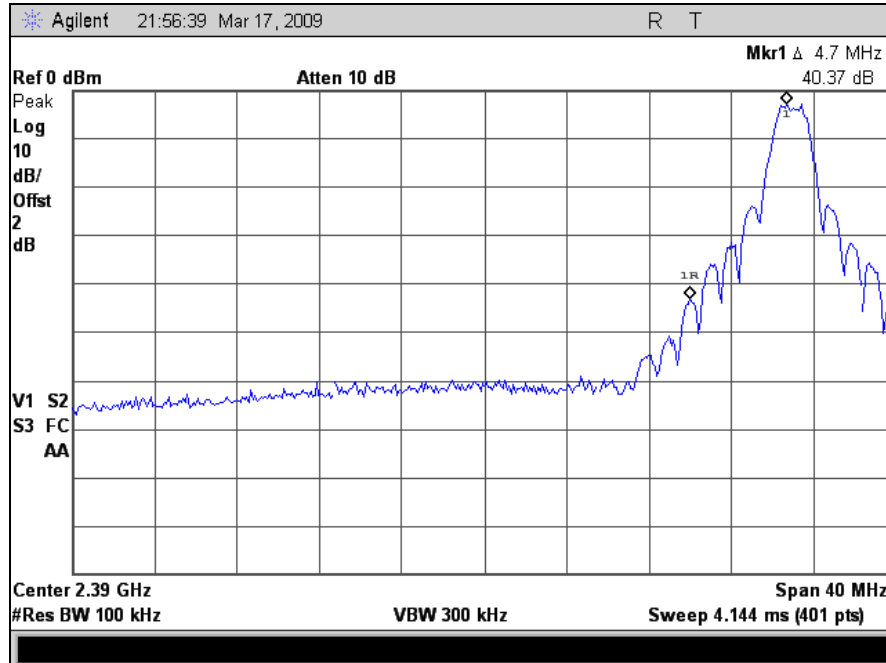
Plot 25. Spurious Conducted Emissions, High Channel, 30 MHz – 1 GHz



Plot 26. Spurious Conducted Emissions, High Channel, 1 GHz – 18 GHz

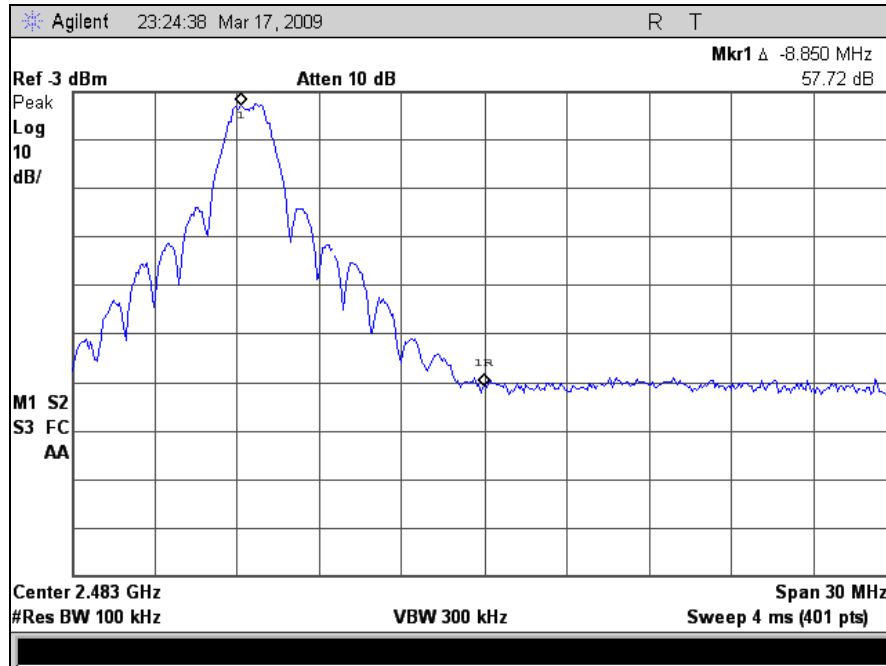


Plot 27. Spurious Conducted Emissions, High Channel, 18 GHz – 25 GHz



Plot 28. Spurious Conducted Emissions, Lower Band Edge





**Plot 29. Spurious Conducted Emissions, Upper Band Edge**



**Photograph 6. Spurious Conducted Emissions, Test Setup**

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(e) Peak Power Spectral Density

**Test Requirements:** §15.247(e): For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

**Test Procedure:** The transmitter was connected directly to a Spectrum Analyzer through an attenuator. The power level was set to the maximum level throughout each of the 100 sweeps of power averaging. The RBW was set to 3 kHz and a VBW set to 9 kHz or greater. The spectrum analyzer was set to an auto sweep time and a peak detector was used. Measurements were carried out at the low, mid and high channels.

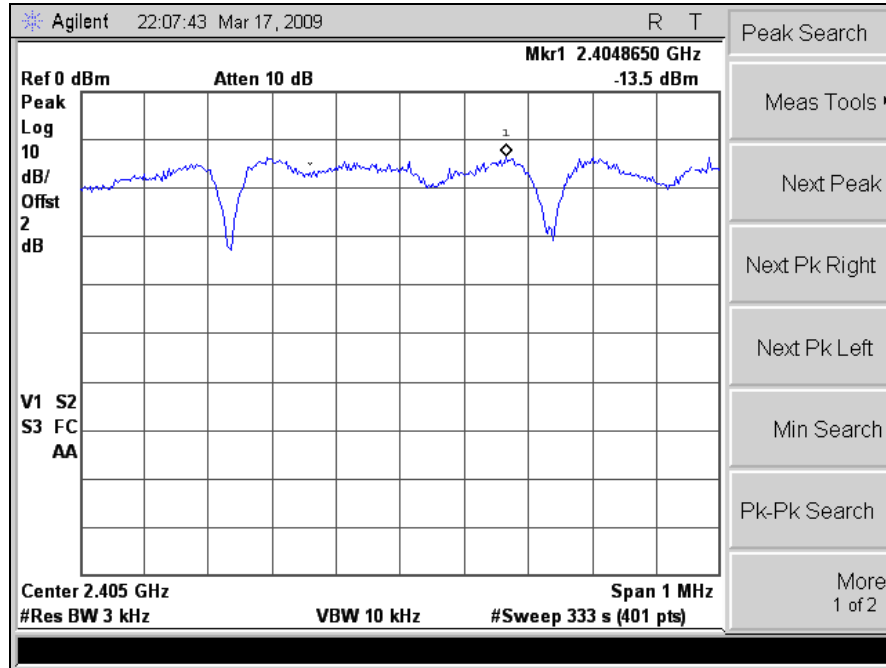
**Test Results:** The EUT was compliant with the peak power spectral density limits of § 15.247 (e).  
The peak power spectral density was determined from plots on the following page(s).

**Test Engineer:** Jeffrey Hazen

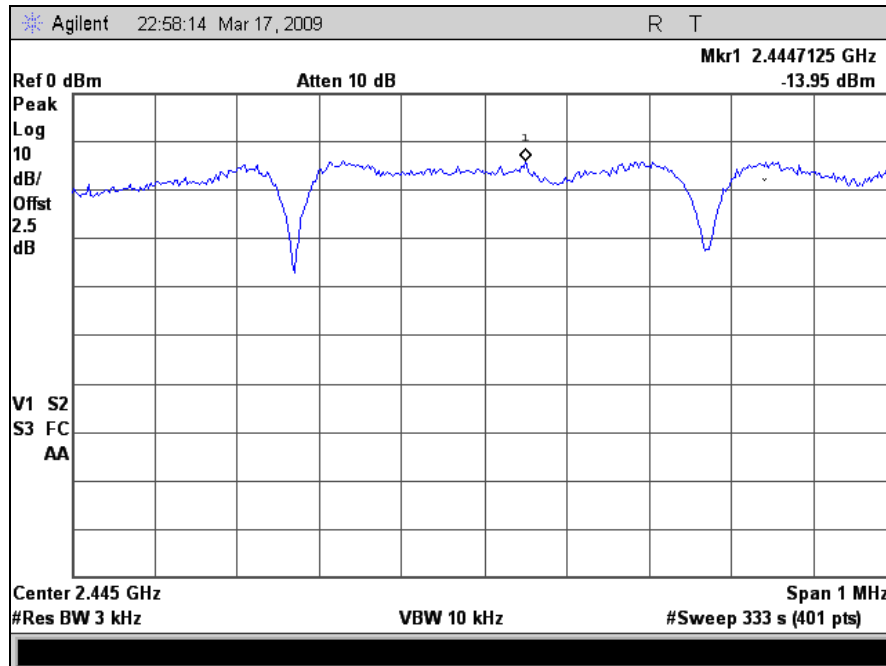
**Test Date:** 03/17/09

Carrier Channel	Frequency (GHz)	Measured PPSD (dBm)	Test Limit (dBm)	Margin (dB)
LOW	2.405	-13	8	21
MID	2.445	-13.95	8	21.95
HIGH	2.48	-14.04	8	22.04

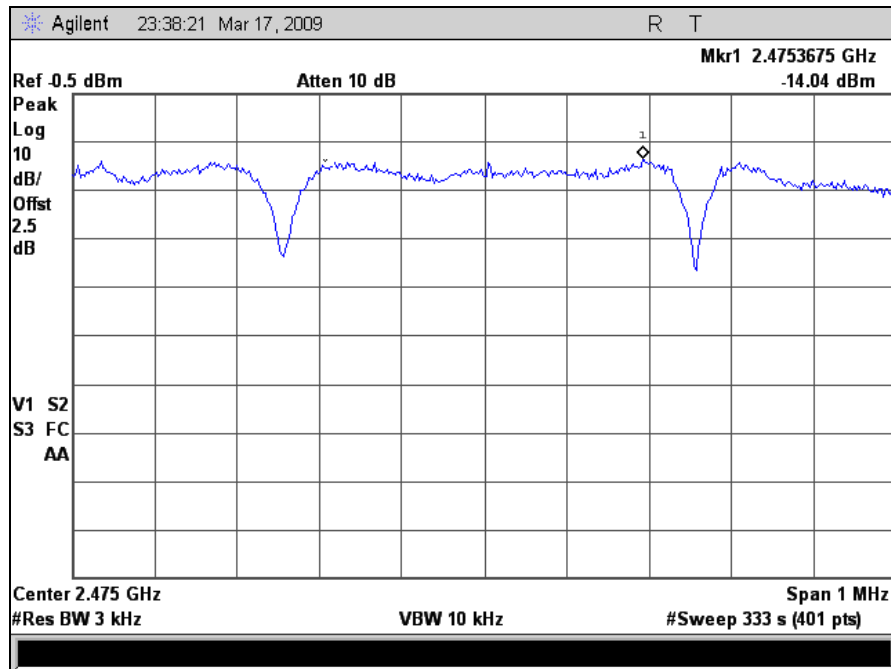
### Peak Power Spectral Density



Plot 30. Peak Power Spectral Density, Low Channel



Plot 31. Peak Power Spectral Density, Mid Channel



Plot 32. Peak Power Spectral Density, High Channel



Photograph 7. Peak Power Spectral Density, Test Setup

## 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
1T4632	THERMO/HYGROMETER	CONTROL COMPANY	S6-627-9	09/25/2007	09/25/2009
1T4568	RADIATING NOISE SOURCE	MET LABORATORIES	N/A	SEE NOTE	
1T4300	SEMI-ANECHOIC CHAMBER # 1	EMC TEST SYSTEMS	NONE	02/17/2006	05/22/2009
1T4303	ANTENNA; BILOG	SCHAFNER - CHASE EMC	CBL6140A	07/07/2008	07/07/2009
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	04/18/2008	04/18/2009
1T2511	ANTENNA; HORN	EMCO	3115	07/29/2008	07/29/2009
1T2665	HORN ANTENNA	EMCO	3115	05/07/2008	05/07/2009
1T4612	ESA-E SERIES SPECTRUM ANALYZER	AGILENT	E4407B	02/17/2009	02/17/2010
1T4442	PRE-AMPLIFIER, MICROWAVE	MITEQ	AFS42-01001800-30-10P	SEE NOTE	
1T4299	SIGNAL GENERATOR	HEWLETT PACKARD	E4432B	11/12/2008	11/12/2009
SN:3610A01262	SYNTHESIZER SWEEP GENERATOR	AGILENT	83752B	SEE NOTE	

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 A 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 A 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 commercial 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. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

- (b) 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.

## ICES-003 Procedural & Labeling Requirements

From the Industry Canada Electromagnetic Compatibility Advisory Bulletin entitled, "Implementation and Interpretation of the Interference-Causing Equipment Standard for Digital Apparatus, ICES-003" (EMCAB-3, Issue 2, July 1995):

"At present, CISPR 22: 2002 and ICES technical requirements are essentially equivalent. Therefore, if you have CISPR 22: 2002 approval by meeting CISPR Publication 22, the only additional requirements are: to attach a note to the report of the test results for compliance, indicating that these results are deemed satisfactory evidence of compliance with ICES-003 of the Canadian Interference-Causing Equipment Regulations; to maintain these records on file for the requisite five year period; and to provide the device with a notice of compliance in accordance with ICES-003."

### Procedural Requirements:

According to Industry Canada's Interference Causing Equipment Standard for Digital Apparatus ICES-003 Issue 4, February 2004:

- Section 6.1: A record of the measurements and results, showing the date that the measurements were completed, shall be retained by the manufacturer or importer for a period of at least five years from the date shown in the record and made available for examination on the request of the Minister.
- Section 6.2: A written notice indicating compliance must accompany each unit of digital apparatus to the end user. The notice shall be in the form of a label that is affixed to the apparatus. Where because of insufficient space or other constraints it is not feasible to affix a label to the apparatus, the notice may be in the form of a statement in the user's manual.

### Labeling Requirements:

The suggested text for the notice, in English and in French, is provided below, from the Annex of ICES-003:

This Class [<sup>2</sup>] digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe [<sup>1</sup>] est conforme à la norme NMB-003 du Canada.

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<sup>2</sup> Insert either A or B but not both as appropriate for the equipment requirements.

# End of Report