



**MET Laboratories, Inc.** *Safety Certification - EMI - Telecom Environmental Simulation*  
914 WEST PATAPSCO AVE • BALTIMORE, MD 21230 • PHONE (410) 354-3300 • FAX (410) 354-3313

September 29, 2008

Autani Corp.  
7125 Columbia Gateway Drive, Suite 200  
Columbia, MD 21046

Dear Herb Gill,

Enclosed is the EMC Wireless test report for compliance testing of the Autani Corp., RS485 to ZigBee Converter (RZC) 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: (\Autani Corp.\EMC24918-FCC247 Rev. 1)

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## **Electromagnetic Compatibility Criteria Test Report**

for the

**Autani Corp.  
RS485 to ZigBee Converter (RZC)**

**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: EMC24918-FCC247 Rev. 1**

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**Prepared For:**

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for Intentional Radiators

Dusmantha Tennakoon 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, Manager  
Electromagnetic Compatibility Lab



## Report Status Sheet

Revision	Report Date	Reason for Revision
∅	July 31, 2008	Initial Issue.
1	September 29, 2008	Engineer corrections.



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## List of Terms and Abbreviations

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



# I. Executive Summary





## A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Autani Corp. RS485 to ZigBee Converter (RZC), 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 RS485 to ZigBee Converter (RZC). Autani Corp. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the RS485 to ZigBee Converter (RZC), 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 Autani Corp., purchase order number 20080623. 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
Title 47 of the CFR, Part 15 §15.203	N/A	Antenna Requirement	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 §15.207(a)	RSS-210(7.2.2)	Conducted Emission Voltage	Compliant
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, §15.205	RSS-210(A8.5)	Radiated Spurious Emissions	Compliant
Title 47 of the CFR, Part 15 §15.247(d)	RSS-210(A8.5)	Conducted Spurious Emissions	Not Applicable
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**

Note: Highest receiver spurious emissions were 0.04 mV at 3m. (Industry Canada requirement)



## II. Equipment Configuration



## A. Overview

MET Laboratories, Inc. was contracted by Autani Corp. to perform testing on the RS485 to ZigBee Converter (RZC), under Autani Corp.'s purchase order number 20080501.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Autani Corp., RS485 to ZigBee Converter (RZC).

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

<b>Model(s) Tested:</b>	RS485 to ZigBee Converter (RZC)	
<b>Model(s) Covered:</b>	RS485 to ZigBee Converter (RZC)	
<b>EUT Specifications:</b>	Primary Power: 24VDC	
	FCC ID: V8NRZC1000110	
	Type of Modulations:	OQPSK
	Emission Designators:	2M76G1D
	Equipment Code:	DTS
	Peak RF Output Power:	-1.49 dBm (E.I.R.P.)
	EUT Frequency Ranges:	2405 – 2480 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>	Dusmantha Tennakoon	
<b>Date(s):</b>	July 31, 2008	

**Table 2. EUT Summary Table**

Note: Since the EUT had an integral antenna, all measurements were made radiated.



## 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 West 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 . In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.



## D. Description of Test Sample

The Autani Corp. RS485 to ZigBee Converter (RZC) is an electronic device used in an Energy Management System (EMS) to bridge between the wired RS485 communication layer and wireless ZigBee layer. This unit will wirelessly communicate with the EMS while being directly connected to some third party equipment through the wired RS485 interface. Data and control will be relayed from the EMS (the wireless interface) to a third party slave unit (the RS485 interface). The version of the hardware utilized for FCC certification is Revision 1.

## E. Mode of Operation

### Deployed Mode:

In a deployed environment the RZC has one mode of operation. In this mode of operation the RZC acts as a communication bridge between the wired RS485 interface and the wireless ZigBee interface. The intervals in which messages are sent and received are based on minimum and maximum reporting intervals dictated by the ZigBee specification for the particular third party equipment attached to the RZC.

In addition, there is one user push button switch and two visible LEDs. The push button is used for installation purposes only. A long push on the button (greater than three seconds) forces the device to leave the wireless network and rejoin. A short press (less than three seconds) triggers a unique activity based in which third party device type is attached. One LED flashes to represent network status. The other LED indicates a state unique to the attached third party device. In the normal mode of operation the pushbutton and LEDs serve no functional purpose once the device is installed and operational. All data and control are passed through the wireless interface.

### FCC Testing Mode:

The RZC has a special image programmed into the System On Chip (SOC) to facilitate the FCC testing. The following details the operation and how to change states.

There is one switch (SW1) and two LED's (D4-upper and D4-lower) on the RZC board. Their function is as follows:

- 1) At board power-on, both LED's are off and there is no RF transmission.
- 2) A long press (greater than three seconds) on SW1 repeatedly sequences the user through the following 4 states:

State 1)	RF channel 11 (2.405 GHz) is selected and a CW tone is transmitted. LED D4-upper turns solid green.
State 2)	RF channel 18 (2.440 GHz) is selected and a CW tone is transmitted. LED D4- upper turns solid amber.
State 3)	RF channel 26 (2.480 GHz) is selected and a CW tone is transmitted. LED D4- upper turns solid red.
State 4)	No channel is selected and the RF transmitter is turned off. ALL LED's are turned off.

3) A short press (greater than one second but less than three seconds) on SW1 while in States 1), 2) or 3) above causes the CW tone to be replaced with a pseudo-randomly modulated tone. LED D4-lower turns solid green while the pseudo-random modulation is in effect. This is the mode used for testing.

Figure 1 shows the end view of the RZC. The LEDs are the two left most holes that are vertically aligned. SW1 is accessed through the lower, smaller, middle hole. The right most, larger, upper hole is for the RS485 and power CAT5 wire.



Figure 1. Housing End View of Switch, LEDs, and Wire hole

## F. Modifications

### a) Modifications to EUT

For Spurious Radiated Emissions:

The hardware changes to pass spurious emissions (2<sup>nd</sup> harmonic) are:

WAS:  
C43 & C44 1.0pF  
NOW:  
C43 & C44 1.5pF

WAS:  
L7 2.2nH  
NOW:  
L7 3.9nH

WAS:  
R22 & R29 200 Ohms  
NOW:  
R22 & R29 300 Ohms

### b) Modifications to Test Standard

No modifications were made to the test standard.

## G. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Autani Corp. 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 4. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

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

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

**Test Procedures:** The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. The method of testing, test conditions, and test procedures of ANSI C63.4 were used. The EUT was powered through a 50 $\Omega$ /50 $\mu$ H LISN. An EMI receiver, connected to the measurement port of the LISN, scanned the frequency range from 150 kHz to 30 MHz in order to find the peak conducted emissions. All peak emissions within 6 dB of the limit were re-measured using a quasi-peak and/or average detector as appropriate.

**Test Results:** The EUT was found compliant with the Class B requirement(s) of this section. Measured emissions were below applicable limits.

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

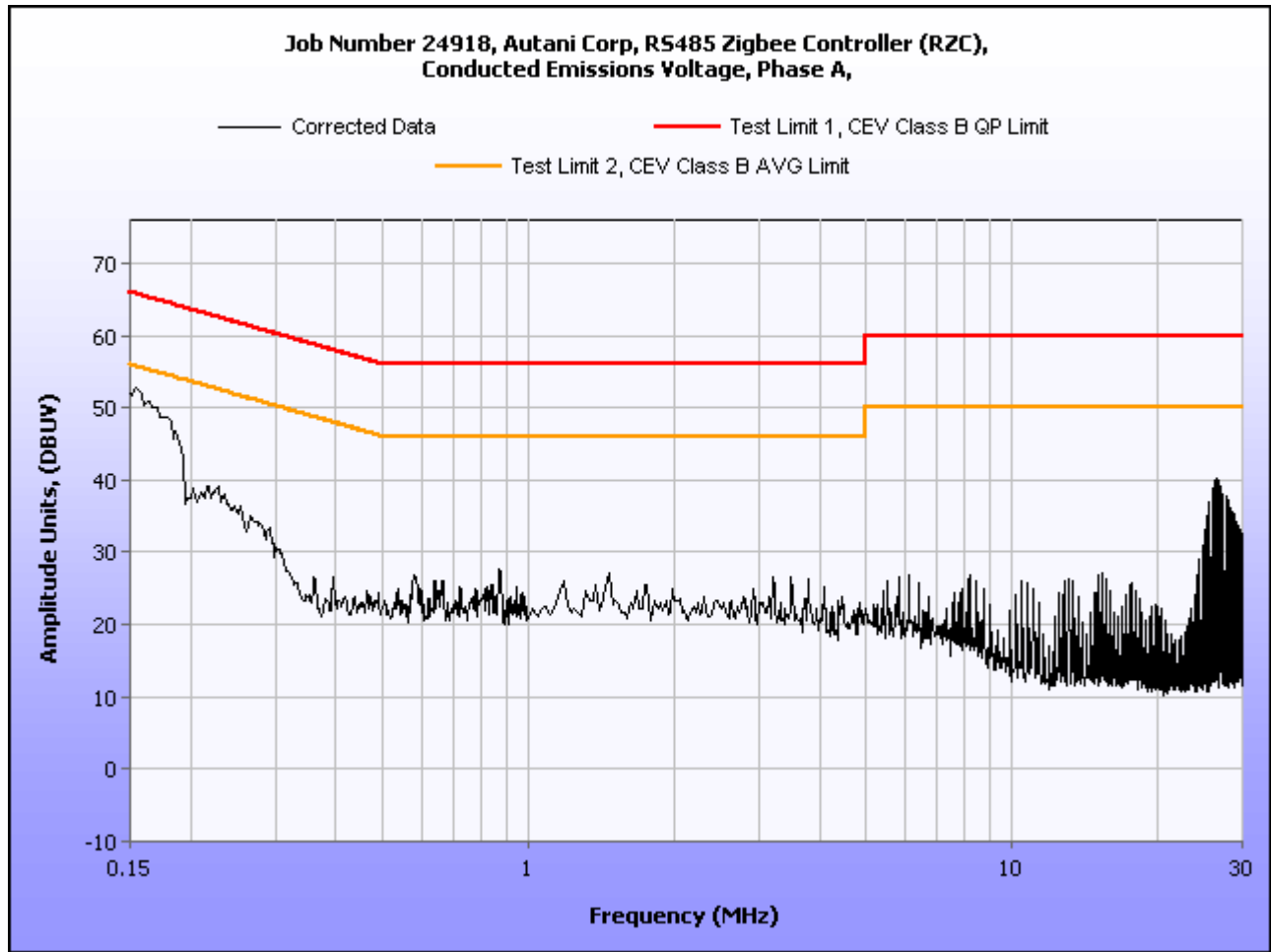
**Test Date(s):** 06/30/08



**Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)**

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
0.1512	29.12	0.08704	29.20704	65.93	-36.723	11.94	0.08704	12.02704	55.93	-43.903
26.52	32.13	0.22568	32.35568	60	-27.6443	18.52	0.22568	18.74568	50	-31.2543
0.2009	14.23	0.17	14.4	63.57	-49.17	-2.158	0.17	-1.988	53.57	-55.558
10.78	23.38	0.33	23.71	60	-36.29	22.26	0.33	22.59	50	-27.41
1.748	12.28	0.17	12.45	56	-43.55	6.844	0.17	7.014	46	-38.986
0.5825	12.96	0.17	13.13	56	-42.87	10.65	0.17	10.82	46	-35.18

**Table 5. Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz), FCC and ICES Limits**

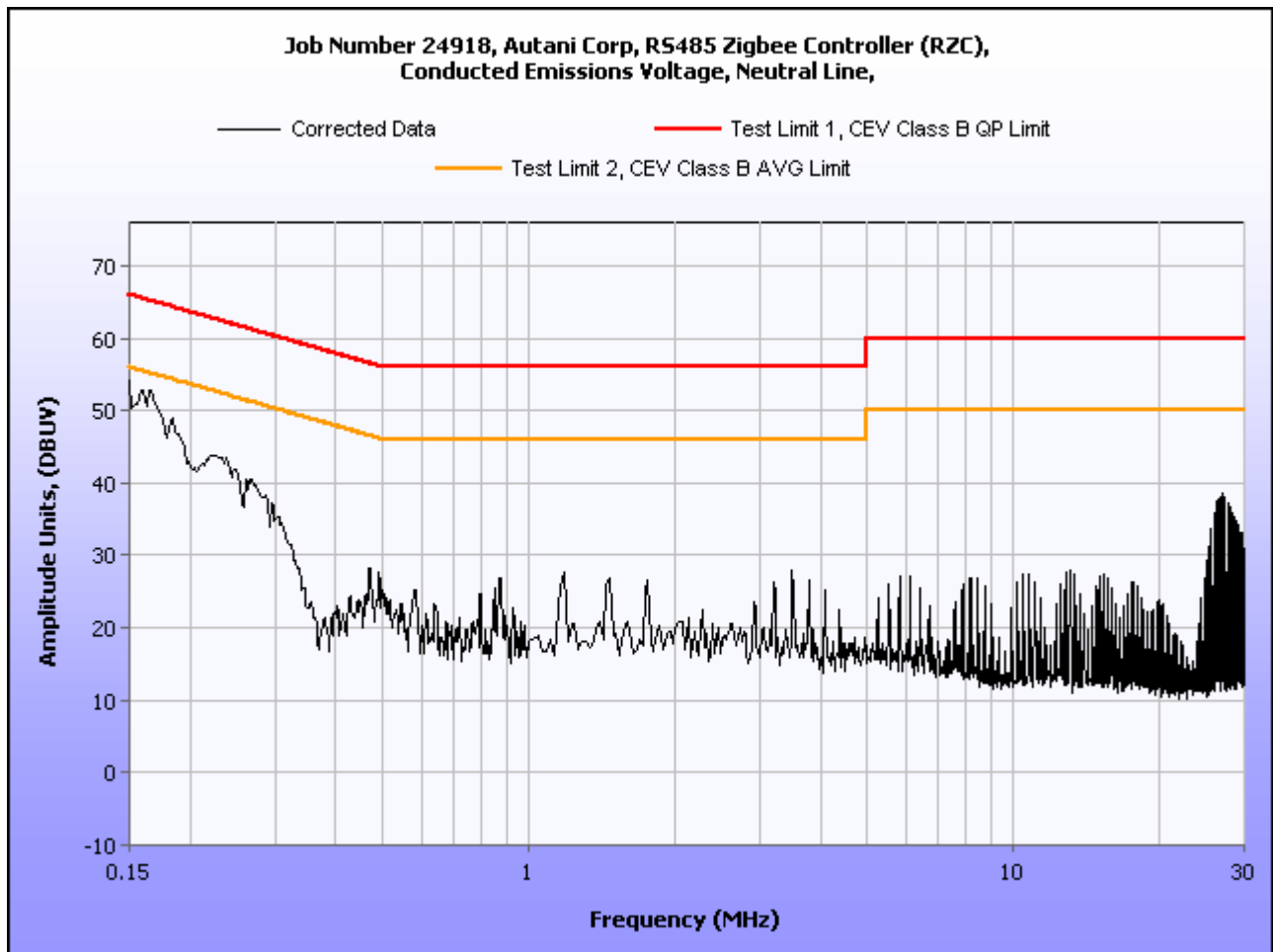


**Plot 1. Conducted Emission, Phase Line Plot**

### Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz)

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
0.1538	31.76	0.09146	31.85146	65.79	-33.9385	8.275	0.09146	8.36646	55.79	-47.4235
0.2262	20.76	0.17	20.93	62.59	-41.66	5.779	0.17	5.949	52.59	-46.641
27.1	37.19	0.2164	37.4064	60	-22.5936	30.73	0.2164	30.9464	50	-19.0536
13.12	25.47	0.33	25.8	60	-34.2	25.02	0.33	25.35	50	-24.65
3.495	23.94	0.17	24.11	56	-31.89	14.11	0.17	14.28	46	-31.72
0.8748	24.26	0.17	24.43	56	-31.57	18.6	0.17	18.77	46	-27.23

Table 6. Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz), FCC and ICES Limits



Plot 2. Conducted Emission, Neutral Line Plot

## Conducted Emission Limits Test Setup



**Photograph 1. Conducted Emissions Test Setup**

## Radiated Emission Limits

### § 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 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 found to comply with the Class B requirement(s) of this section. Measured emissions were below applicable limits.

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

**Test Date(s):** 06/26/08

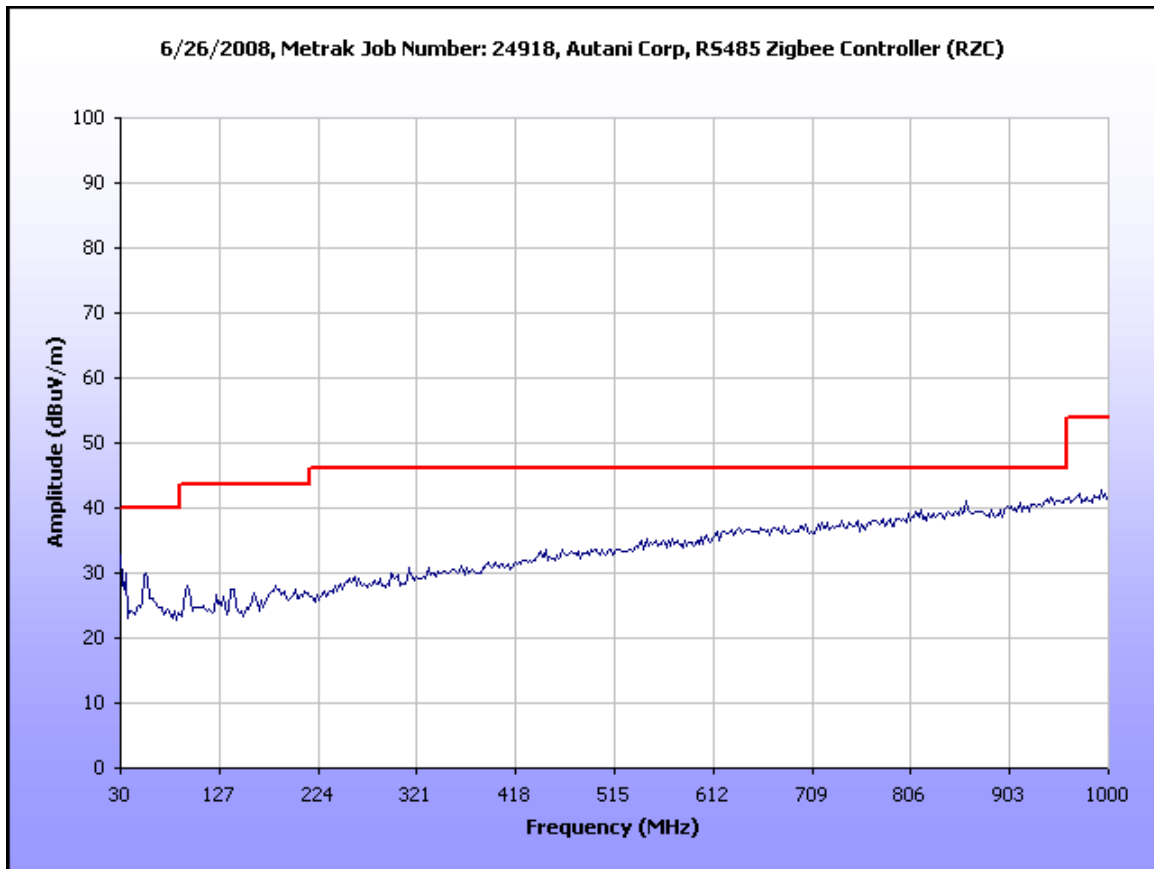


### Radiated Emissions Limits Test Results, Class B

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna Height (m)	Uncorrected EMI Meter Reading (dBuV)	Antenna Correction Factor (dB/m) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.027	360	H	2.90	7.48	5.51	0.70	0.00	13.69	40.00	-26.31
30.027	58	V	1.00	26.32	4.11	0.70	0.00	31.13	40.00	-8.87
35.841	232	H	1.00	8.24	8.12	0.60	0.00	16.96	40.00	-23.04
35.841	170	V	1.11	19.19	6.79	0.60	0.00	26.58	40.00	-13.42
55.979	335	H	3.11	6.23	10.08	0.70	0.00	17.01	40.00	-22.99
55.979	27	V	1.00	17.82	10.10	0.70	0.00	28.62	40.00	-11.38
96.794	360	H	1.75	8.94	7.74	1.08	0.00	17.76	43.50	-25.74
96.794	98	V	1.00	16.54	7.04	1.08	0.00	24.67	43.50	-18.83
141.391	2	H	2.07	16.88	7.86	1.03	0.00	25.77	43.50	-17.73
141.391	348	V	1.00	16.39	7.76	1.03	0.00	25.18	43.50	-18.32
*861.000	360	H	1.00	5.95	22.30	2.13	0.00	30.38	46.00	-15.62
861.000	0	V	1.00	5.95	21.88	2.13	0.00	29.96	46.00	-16.04

**Table 8. Radiated Emissions Limits Test Results, 30 MHz – 1GHz, FCC 15.109 Limits**

Notes: The EUT was tested at 3 m.  
\* Noise Floor.



**Plot 3. Radiated Emissions Limits Test Results, 30 MHz – 1 GHz, Class B**

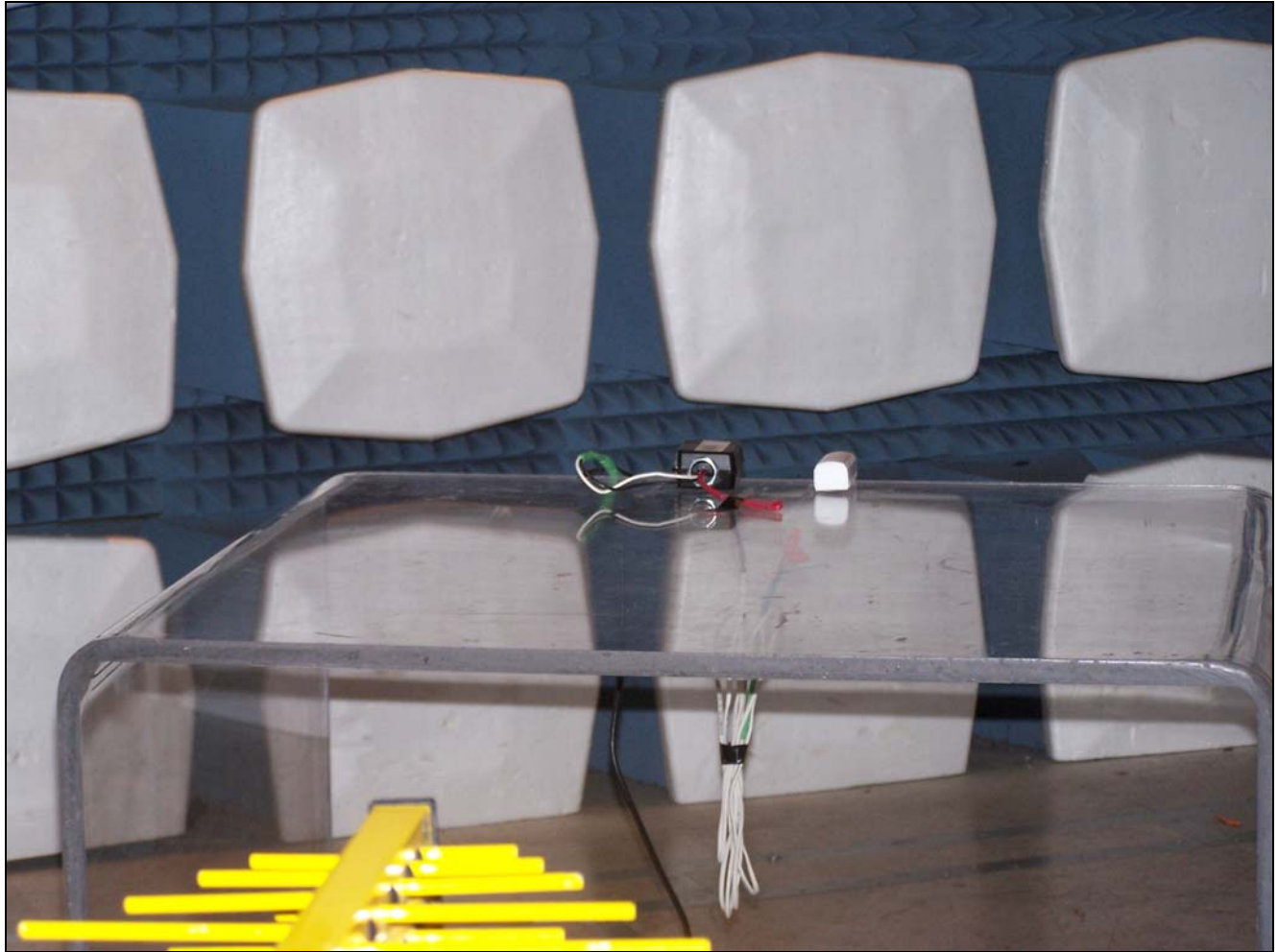


Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna Height (m)	Uncorrected EMI Meter Reading (dBuV)	Antenna Correction Factor (dB/m) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.027	360	H	2.90	7.48	5.51	0.70	10.46	3.23	30.00	-26.77
30.027	58	V	1.00	26.32	4.11	0.70	10.46	20.67	30.00	-9.33
35.841	232	H	1.00	8.24	8.12	0.60	10.46	6.50	30.00	-23.50
35.841	170	V	1.11	19.19	6.79	0.60	10.46	16.12	30.00	-13.88
55.979	335	H	3.11	6.23	10.08	0.70	10.46	6.55	30.00	-23.45
55.979	27	V	1.00	17.82	10.10	0.70	10.46	18.16	30.00	-11.84
96.794	360	H	1.75	8.94	7.74	1.08	10.46	7.30	30.00	-22.70
96.794	98	V	1.00	16.54	7.04	1.08	10.46	14.21	30.00	-15.79
141.391	2	H	2.07	16.88	7.86	1.03	10.46	15.31	30.00	-14.69
141.391	348	V	1.00	16.39	7.76	1.03	10.46	14.72	30.00	-15.28
*861.000	360	H	1.00	5.95	22.30	2.13	10.46	19.92	37.00	-17.08
861.000	0	V	1.00	5.95	21.88	2.13	10.46	19.50	37.00	-17.50

**Table 9. Radiated Emissions Limits Test Results, 30 MHz – 1GHz, ICES-003 Limits**

Notes: The EUT was tested at 3 m. The data has been corrected for comparison with the 10 m limit using the formula:  $20\log(3\text{ m}/10\text{ m})$  as expressed in the 'Distance Correction' column.  
\* Noise Floor.

## Radiated Emission Limits Test Setup



**Photograph 2. Radiated Emission Test Setup**



## **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 antenna is an integrated meandering PCB etched F-antenna and is permanently mounted. The EUT is therefore compliant with §15.203.

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



## 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  $\Omega$  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 Procedure:** The EUT was placed on a table 80cm high and placed in a shielded room. The EUT was situated such that the back of the EUT was 0.4 m from one wall of the vertical ground plane, and the remaining sides of the EUT were no closer than 0.8 m from any other conductive surface. The EUT was powered from a 50  $\Omega$ /50  $\mu$ H Line Impedance Stabilization Network (LISN). The EMC receiver scanned the frequency range from 150 kHz to 30 MHz. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50  $\Omega$ /50  $\mu$ H LISN as the input transducer to an EMC/field intensity meter. The tests were conducted in a RF-shielded enclosure.

**Test Results:** The EUT was found compliant with the requirement(s) of this section. Measured emissions were below applicable limits. Pre-scans were made on low, middle, and high channels. They all revealed similar emissions. Therefore, final measurements were made on the middle channel.

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

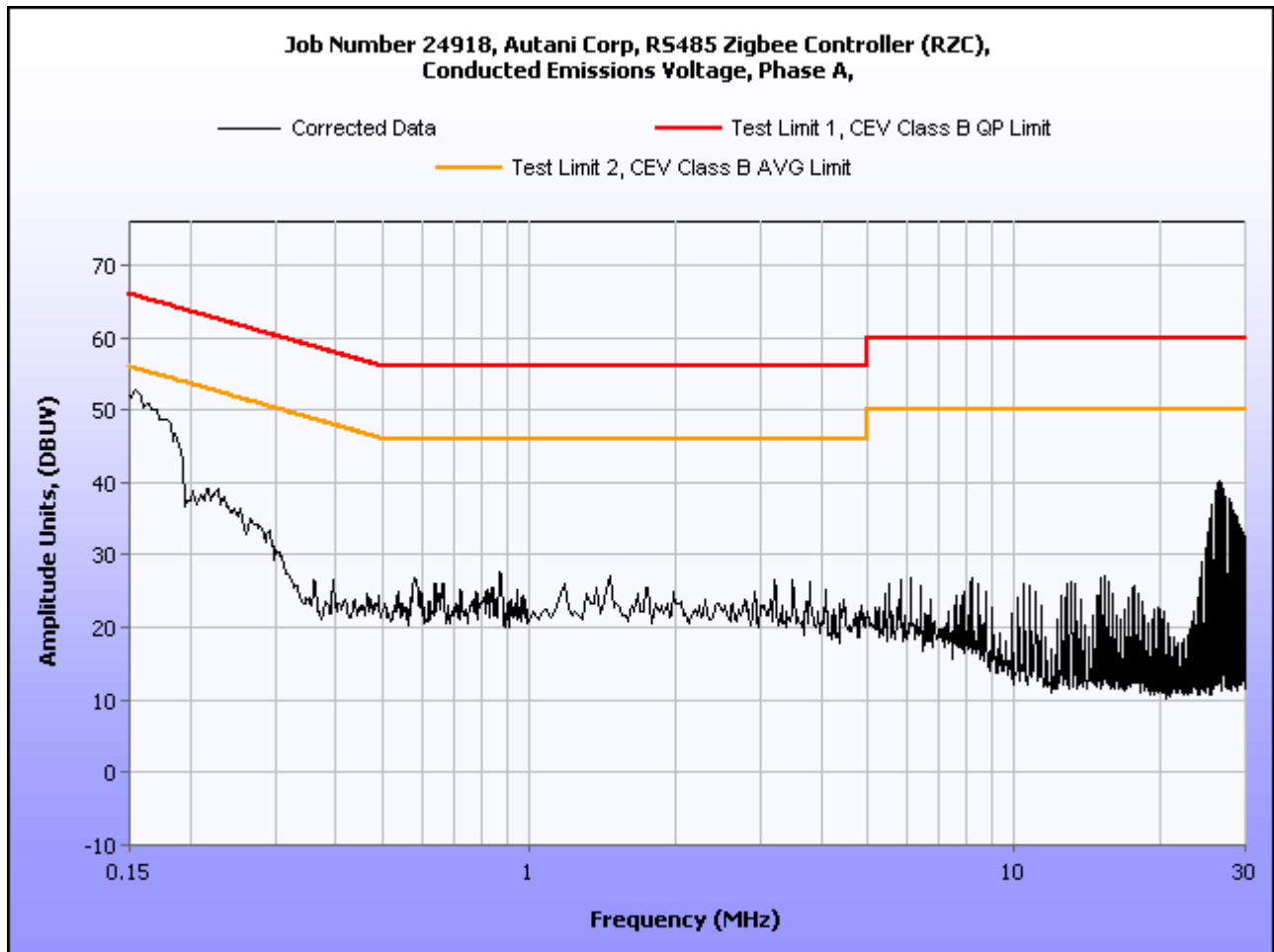
**Test Date(s):** 06/30/08



**Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)**

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
0.1512	29.12	0.08704	29.20704	65.93	-36.723	11.94	0.08704	12.02704	55.93	-43.903
26.52	32.13	0.22568	32.35568	60	-27.6443	18.52	0.22568	18.74568	50	-31.2543
0.2009	14.23	0.17	14.4	63.57	-49.17	-2.158	0.17	-1.988	53.57	-55.558
10.78	23.38	0.33	23.71	60	-36.29	22.26	0.33	22.59	50	-27.41
1.748	12.28	0.17	12.45	56	-43.55	6.844	0.17	7.014	46	-38.986
0.5825	12.96	0.17	13.13	56	-42.87	10.65	0.17	10.82	46	-35.18

**Table 11. Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)**



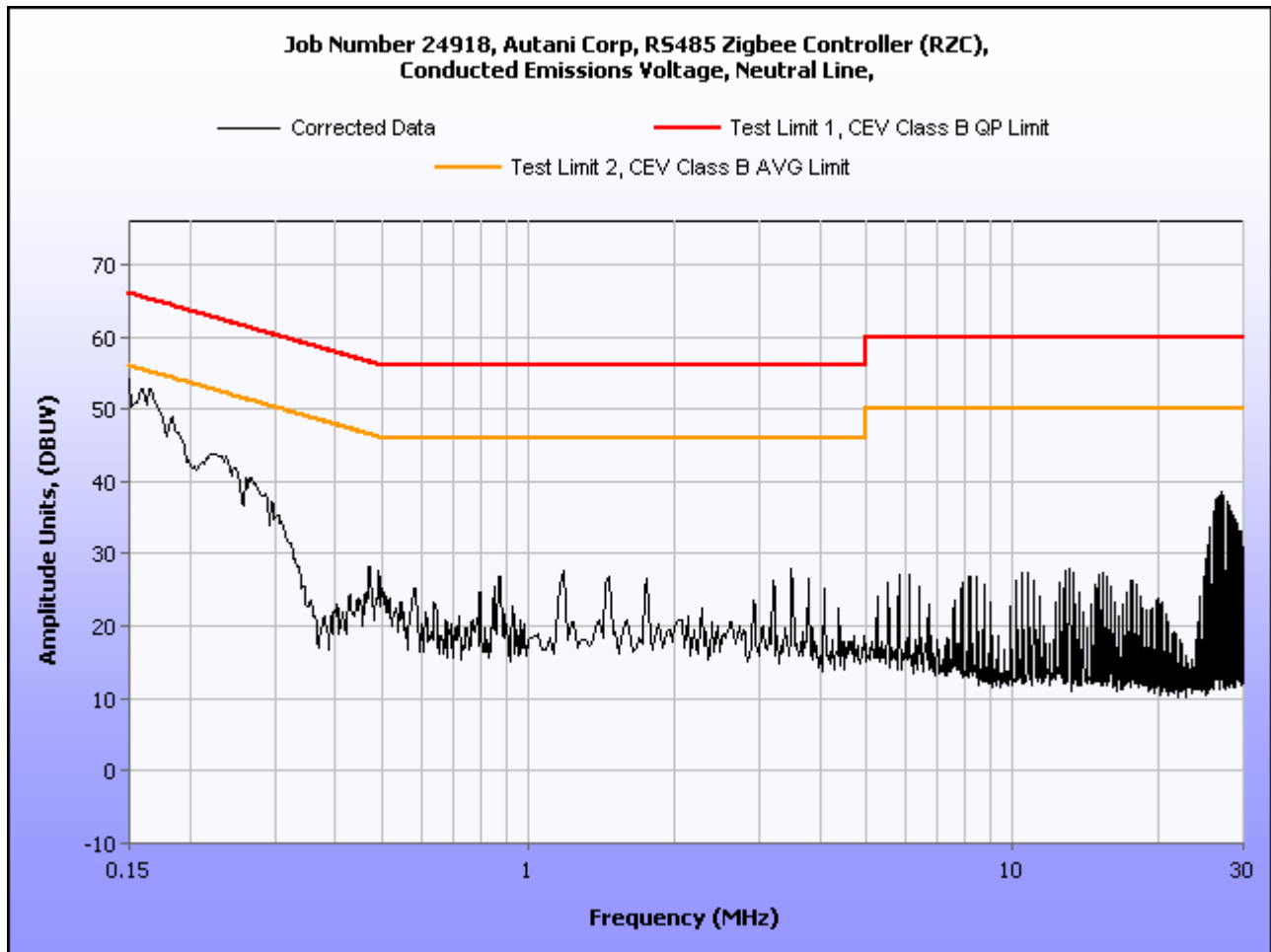
**Plot 4. Conducted Emission, Phase Line Plot**



**Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz)**

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
0.1538	31.76	0.09146	31.85146	65.79	-33.9385	8.275	0.09146	8.36646	55.79	-47.4235
0.2262	20.76	0.17	20.93	62.59	-41.66	5.779	0.17	5.949	52.59	-46.641
27.1	37.19	0.2164	37.4064	60	-22.5936	30.73	0.2164	30.9464	50	-19.0536
13.12	25.47	0.33	25.8	60	-34.2	25.02	0.33	25.35	50	-24.65
3.495	23.94	0.17	24.11	56	-31.89	14.11	0.17	14.28	46	-31.72
0.8748	24.26	0.17	24.43	56	-31.57	18.6	0.17	18.77	46	-27.23

Table 12. Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz)



Plot 5. Conducted Emission, Neutral Line Plot

## Conducted Emission Limits Test Setup



Photograph 3. Conducted Emissions Test Setup



### Electromagnetic Compatibility Criteria for Intentional Radiators

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

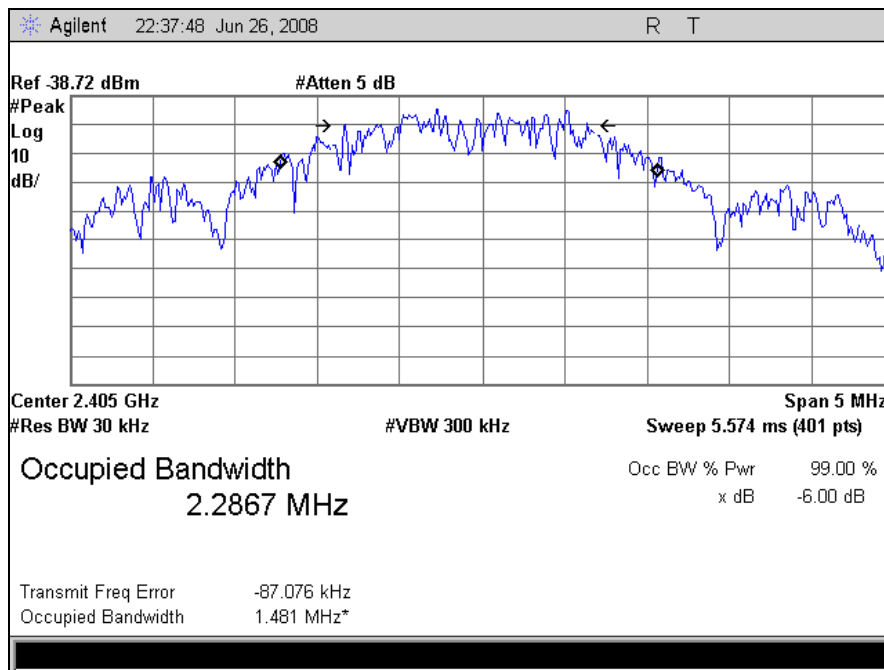
**Test Requirements:** § 15.247(a): Operation under the provisions of this section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

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.

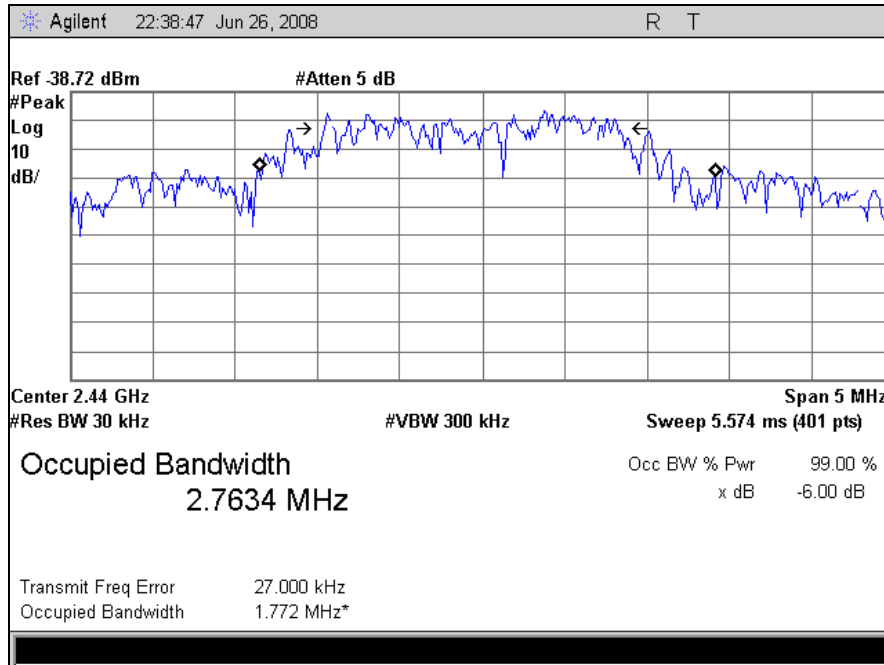
**Test Results** The EUT was found compliant with the requirement(s) of § 15.247 (a).

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

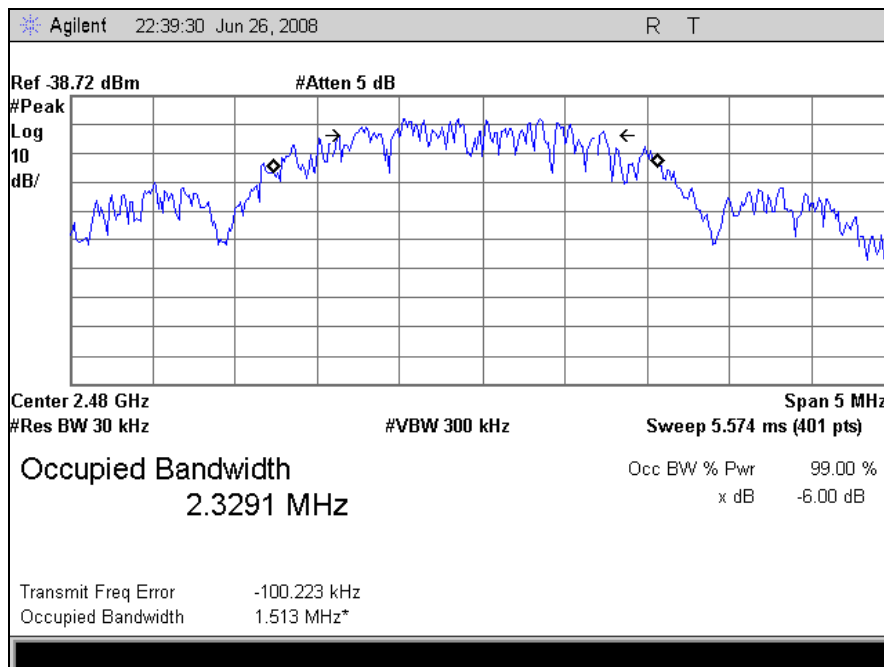
**Test Date(s):** 06/26/08



Plot 6. Occupied Bandwidth, Channel 11



Plot 7. Occupied Bandwidth, Channel 18



Plot 8. Occupied Bandwidth, Channel 26



**Photograph 4. Radiated Test Setup**





## 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 13. 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 13, 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.

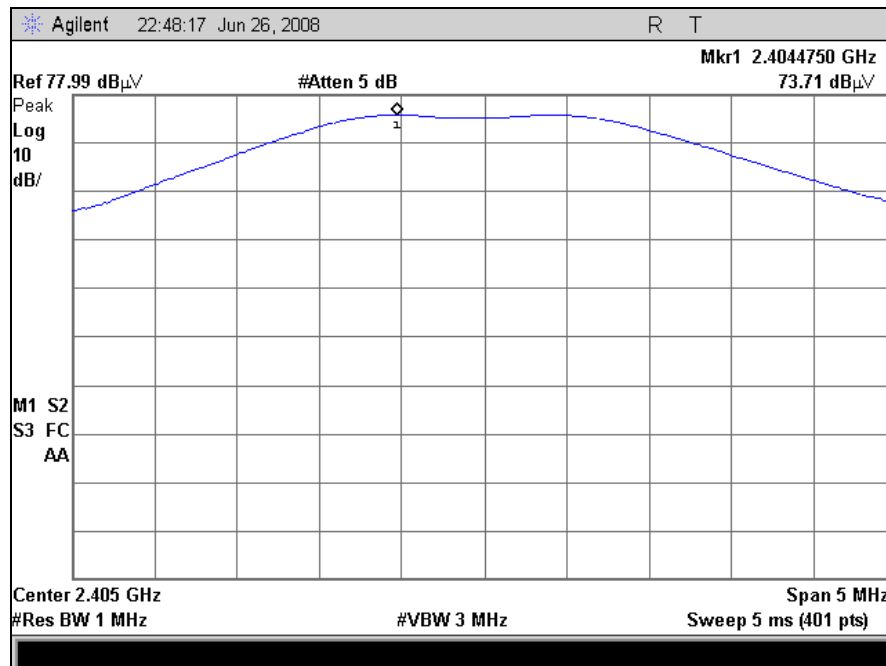
**Test Procedure:** FCC's alternate test procedures (KDB 558074) were used for making radiated power measurements. Measurements were made at 1m.



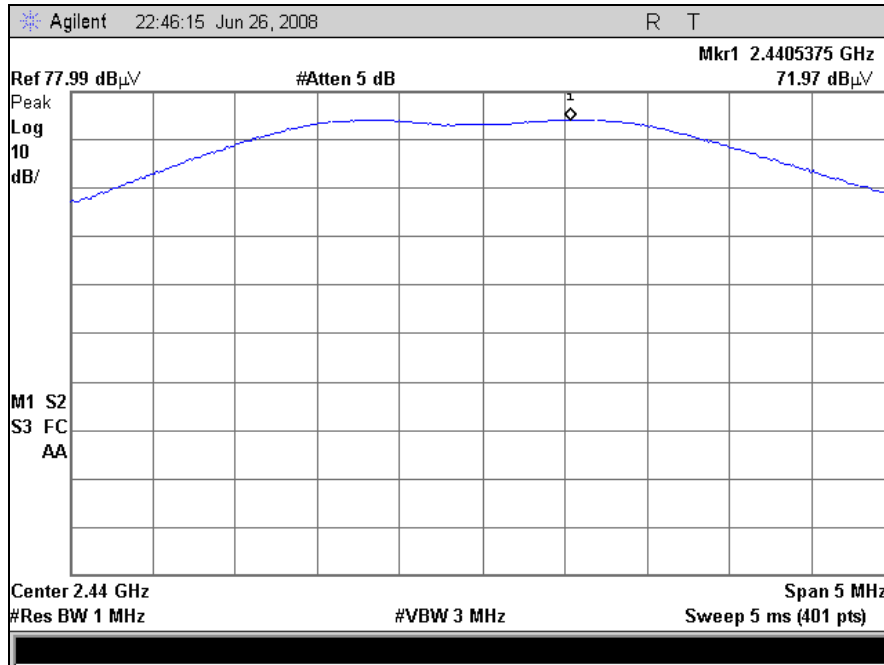
**Test Results:** Equipment complies with the Peak Power Output limits of § 15.247(b).

Channel	Frequency (GHz)	Measured SA reading @ 1m (dBuV)	ACF (dB) (+)	Cable Correction (dB) (+)	Corrected Reading Eo(dBuV/m)	EIRP= $E_o+20\log(d)-104.8$ (dBm)	Limit (dBm)
11	2.405	73.71	29	0.6	103.31	-1.49	36
18	2.44	71.97	29	0.7	101.67	-3.13	36
26	2.48	70.67	29	1	100.67	-4.13	36

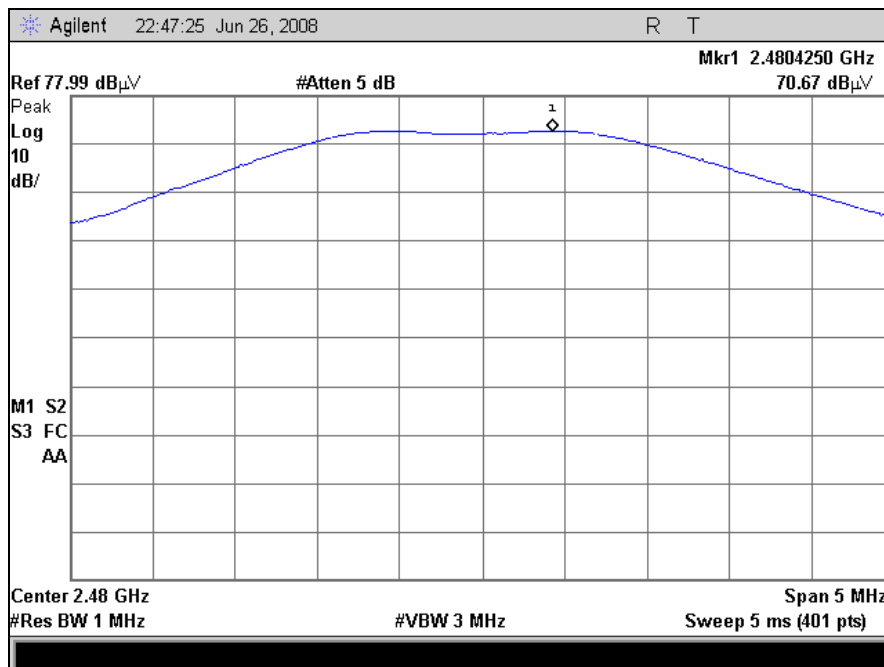
**Table 14. RF Output Power Test Results**



**Plot 9. EIRP, Channel 11**



Plot 10. EIRP, Channel 18



Plot 11. EIRP, Channel 26

Test Engineer(s): Dusmantha Tennakoon

Test Date(s): 06/26/08



## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(b) Peak Power Output and 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 between 2400 and 2483.5 MHz; Highest radiated power (EIRP) = -1.49 dBm. Therefore, **Limit for Uncontrolled exposure: 1 mW/cm<sup>2</sup>**.

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

$$S = \text{EIRP} / 4\pi R^2$$

where,

S = Power Density mW/m<sup>2</sup>

EIRP = Equivalent Isotropic Radiated Power

R = Distance to the center of radiation of the antenna (20 cm for Mobile minimum distance)

$$\text{EIRP} = 0.71 \text{ mW}$$

$$S = 0.71 / 4(3.1416)(20)^2$$

$$S = 0.00014 \text{ mW/cm}^2$$

Therefore, EUT meets the Uncontrolled Exposure limit.



**Photograph 5. Radiated Test Setup**



## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(d) Harmonic Emissions – Radiated and Conducted

**Test Requirements:** §15.247(d); §15.205, §15.209: 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 15. 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 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 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.

**Test Results:** The EUT complied with the Radiated Emission limits of §15.247(d); §15.205, §15.209 for Intentional Radiators.

The EUT was not applicable with the Conducted Spurious Emissions of §15.247(d). Since the antenna was integral to the unit measurements were made on a radiated basis. Therefore, conducted measurements were not possible.

Radiated spurs were investigated up to 24 GHz. There were no measurable emissions between 18-24 GHz.

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

**Test Date(s):** 06/30/08



**Electromagnetic Compatibility Criteria for Intentional Radiators**

**§ 15.247 (d) - Spurious Radiated Emissions**

Channel	Frequency (GHz)	Final measurement corrected for cable loss, preamp, ACF and distance (dBuV/m)	Limit (dBuV/m)	Remark	Pass/Fail
11	4.81	53.7	74	Peak	Pass
	4.81	43.19	54	Avg	Pass
	7.215	51.95	<20 dBc	Peak	Pass
	9.62	38.05	<20 dBc	Peak	Pass
18	4.88	57.64	74	Peak	Pass
	4.88	49.5	54	Avg	Pass
	7.32	43.28	74	Peak	Pass
	7.32	31.53	54	Avg	Pass
	9.76	29.51	<20 dBc	Peak	Pass
26	4.96	55.28	74	Peak	Pass
	4.96	46.9	54	Avg	Pass
	7.44	41.56	74	Peak	Pass
	7.44	30.52	54	Avg	Pass
	9.92	29.55	<20 dBc	Peak	Pass

**Table 16. Harmonics, Spurious Radiated Emissions, Test Results**

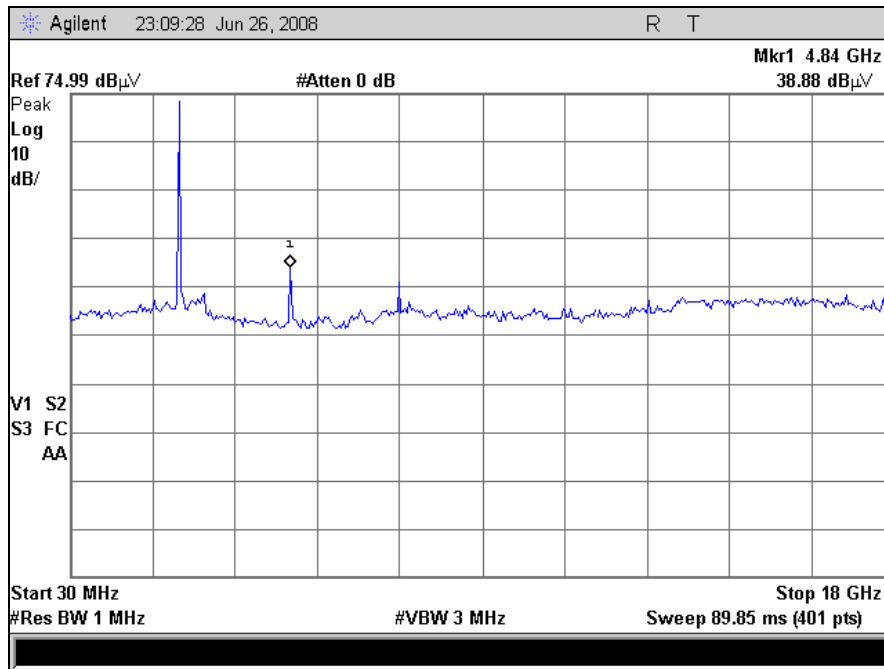




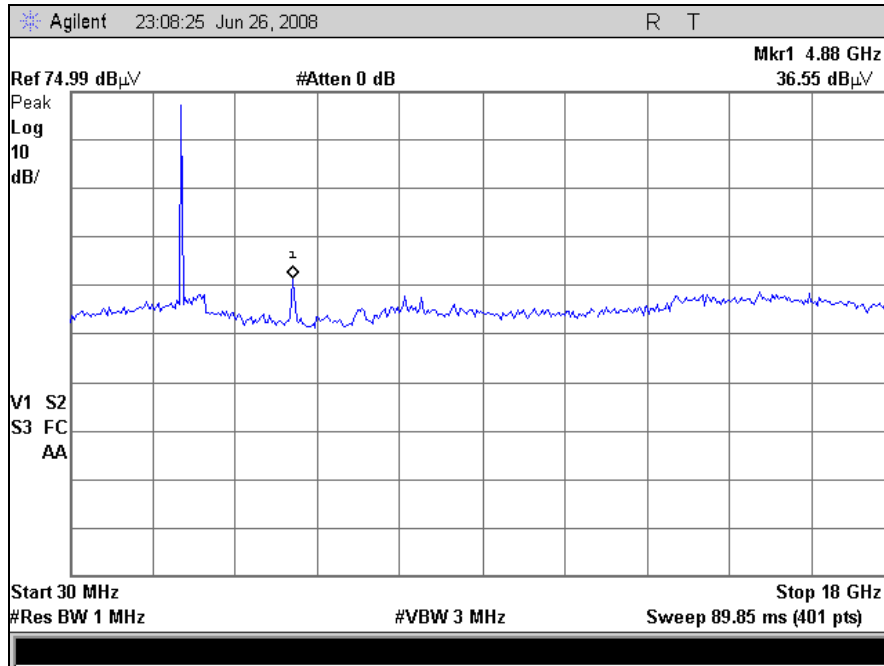
## Electromagnetic Compatibility Criteria for Intentional Radiators § 15.205, 15.209 Radiated Spurious Emissions Requirements

### Test Procedures

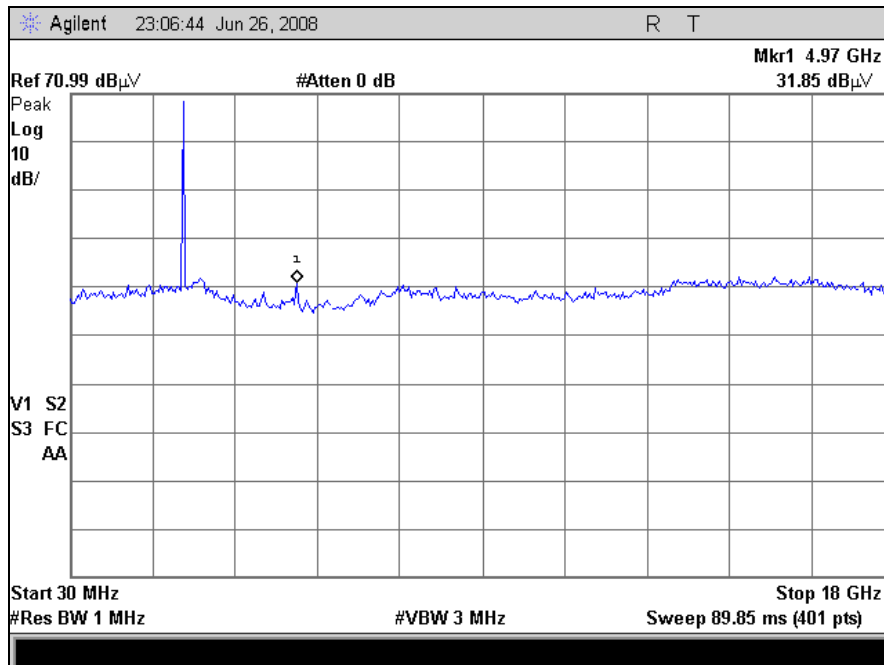
The EUT was placed inside a semi-anechoic chamber. A horn antenna was placed 1m away from the EUT for measuring the harmonics and spurious emissions. The EUT was rotated on all three orthogonal axes to find the highest spurious emissions. The height of the antenna was also varied to find the maximum emissions.



Plot 12. Radiated Spurious, Channel 11



Plot 13. Radiated Spurious, Channel 18



Plot 14. Radiated Spurious, Channel 26

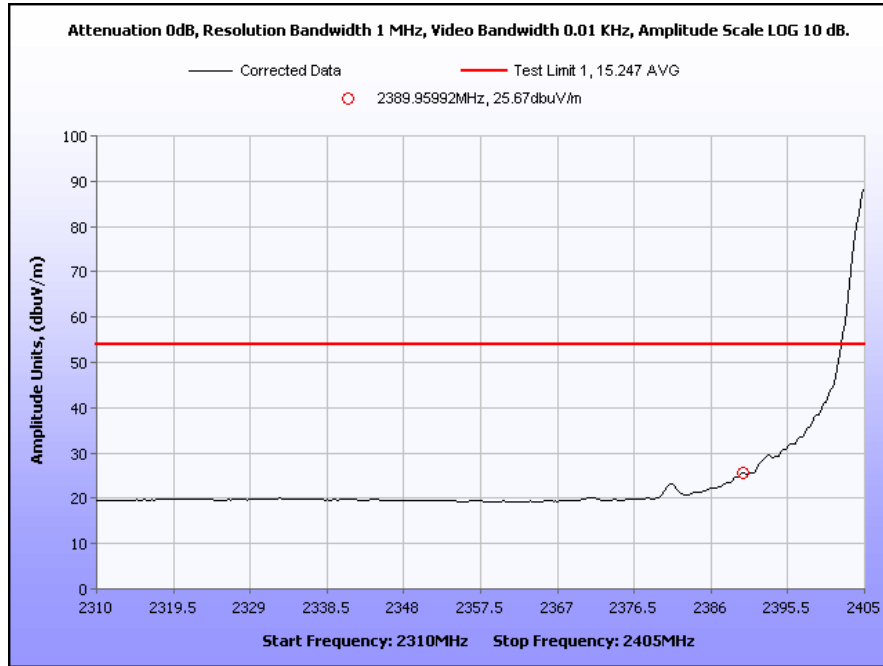


**Photograph 6. Radiated Test Setup**

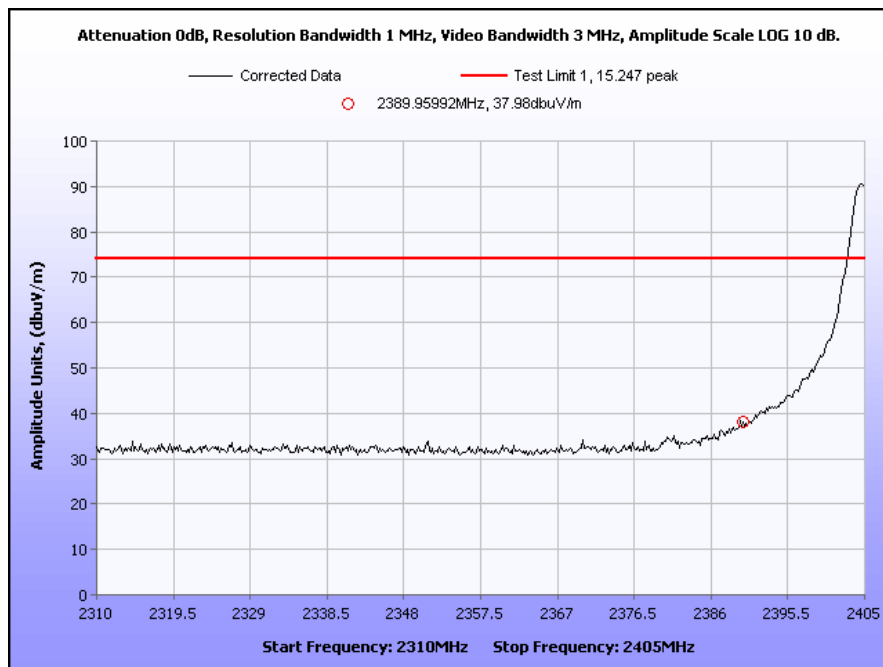


## Electromagnetic Compatibility Criteria for Intentional Radiators § 15.247(d) Restricted Band Requirements

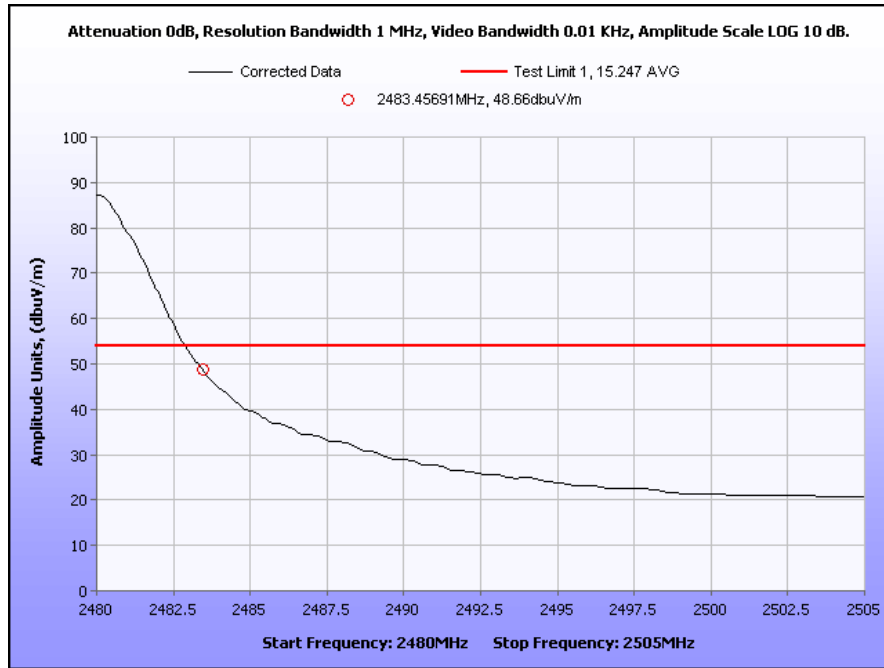
Note: All corrections have been accounted for in plots:



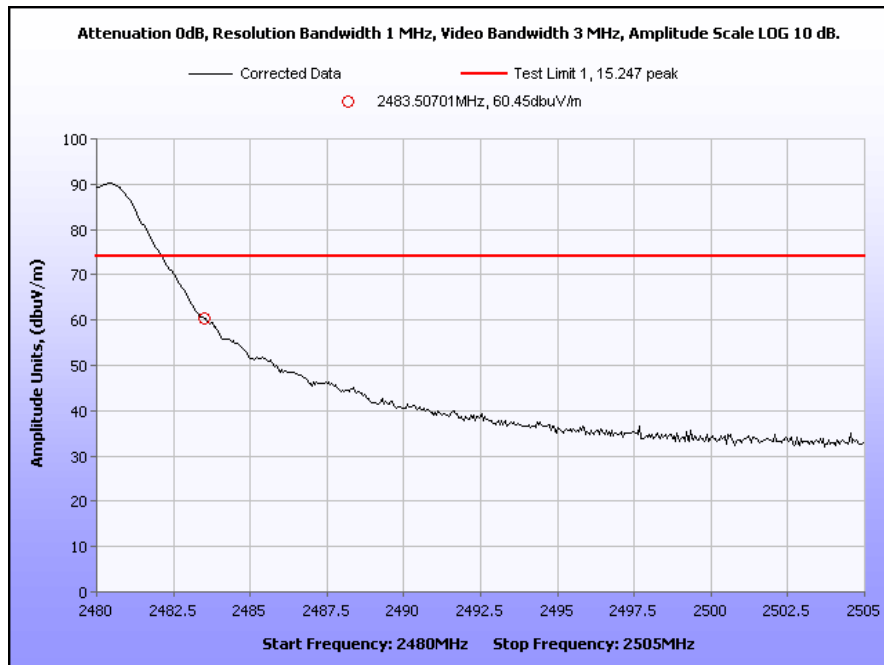
Plot 15. Radiated Restricted Band, Channel 11, Average



Plot 16. Radiated Restricted Band, Channel 11, Peak



Plot 17. Radiated Restricted Band, Channel 26, Average



Plot 18. Radiated Restricted Band, Channel 26, Peak



**Photograph 7. Radiated Test Setup**



## Electromagnetic Compatibility Criteria for Intentional Radiators

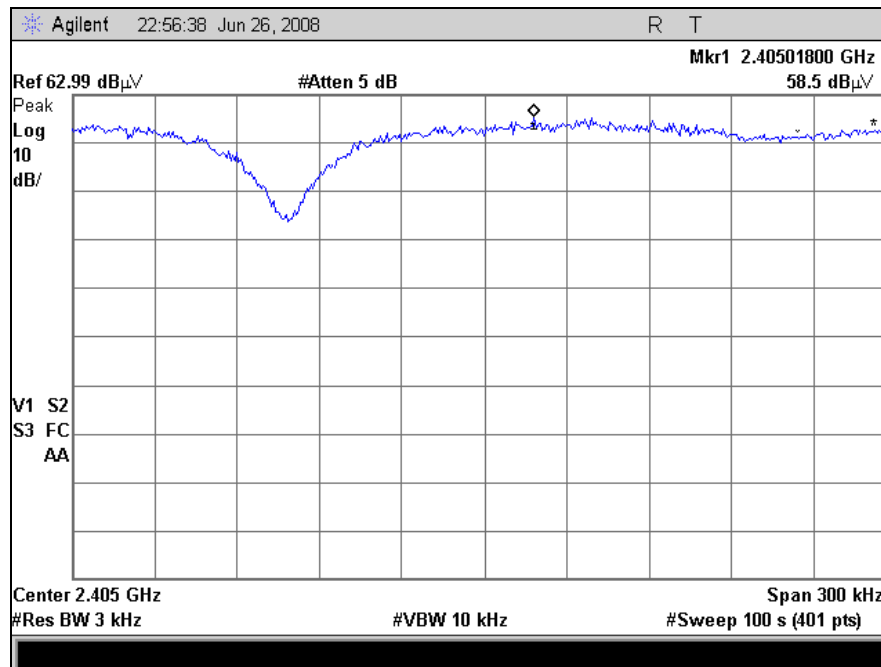
### § 15.247(e) Peak Power Spectral Density

**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.

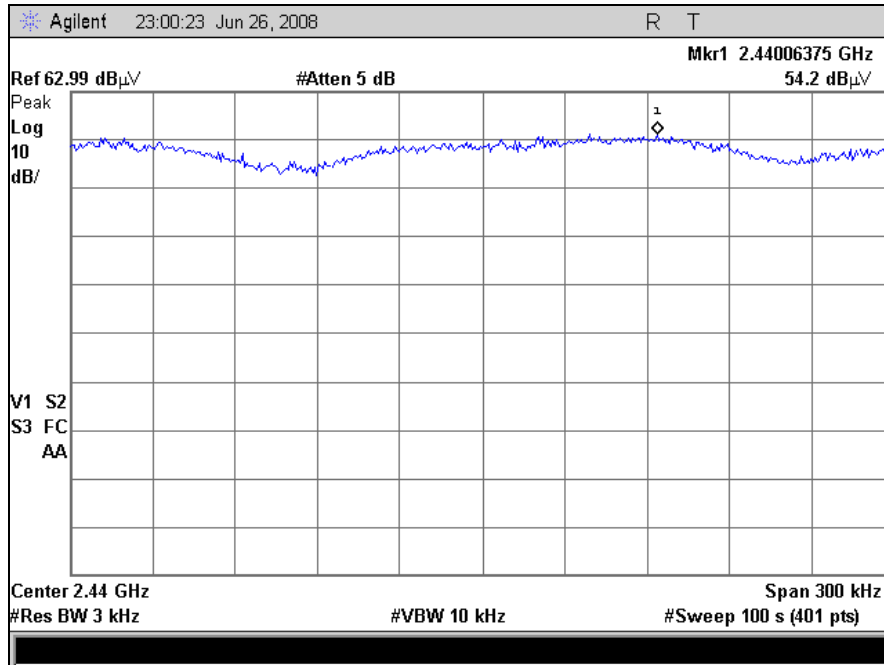
**Test Procedures:** FCC's alternate test procedures (KDB 558074) were used for making radiated Peak Power Spectral Density measurements. Measurements were made at 1m.

**Test Results:** Equipment complies with the peak power spectral density limits of § 15.247 (e).

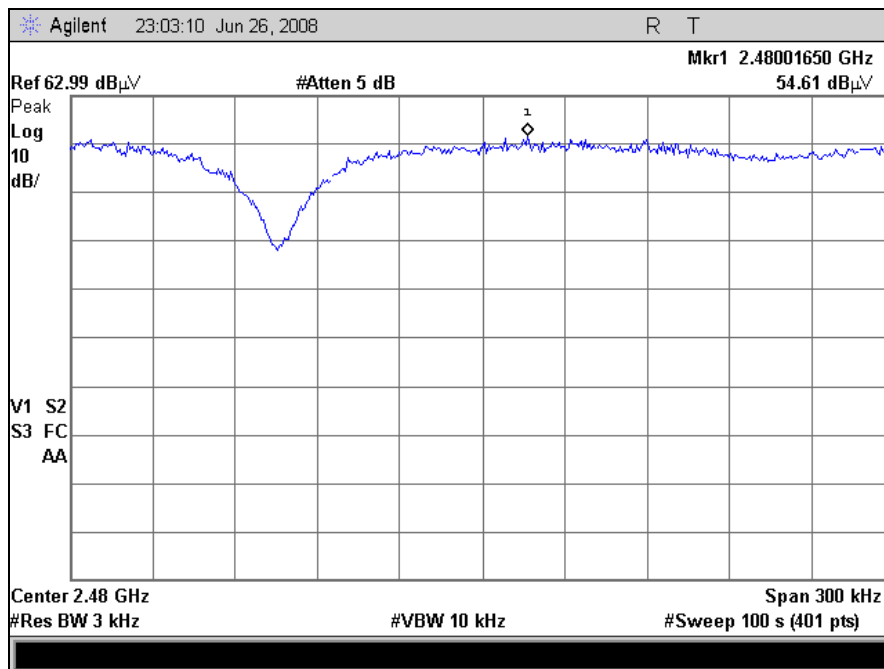
Channel	Frequency (GHz)	Measured SA reading @ 1m (dBuV)	ACF (dB) (+)	Cable Correction (dB) (+)	Corrected Reading Eo(dBuV/m)	EIRP= $E_o+20\log(d)-104.8$ (dBm)	Limit (dBm)
11	2.405	58.5	29	0.6	88.1	-16.7	8
18	2.44	54.2	29	0.7	83.9	-20.9	8
26	2.48	54.61	29	1	84.61	-20.19	8



Plot 19. Peak Power Spectral Density, Channel 11



Plot 20. Peak Power Spectral Density, Channel 18



Plot 21. Peak Power Spectral Density, Channel 26





**Photograph 8. Radiated Test Setup**



## IV. 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.

Conducted Emissions – 15.107, 207				Test Date: 06/30/08	
MET #	Equipment	Manufacturer	Model#	Cal Date	Cal Due
1T4502	COMB GENERATOR	COM-POWER	CGC-255	08/30/2007	08/30/2008
1T4079	LISN; SWITCH	SOLAR	8012-50-R-24-BNC	04/22/2008	04/22/2009
1T4620	THERMO-HYGROMETER	CONTROL COMPANY	S6-627-9	11/20/2006	11/20/2008
1T4382	SHIELD ROOM 6	FIL-SHIELD	N/A	01/31/2008	01/31/2009
1T4621	ESA-E SERIES SPECTRUM ANALYZER	AGILENT	E4402B	02/29/2008	03/01/2009
Radiated Emissions – 15.109				Test Date: 06/26/08	
MET #	Equipment	Manufacturer	Model	Cal Date	Cal Due
1T4632	THERMO/HYGROMETER	CONTROL COMPANY	S6-627-9	09/25/2007	09/25/2009
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	04/18/2008	04/18/2009
1T4300	SEMI-ANECHOIC CHAMBER # 1	EMC TEST SYSTEMS	NONE	02/17/2006	01/17/2009
1T4303	ANTENNA; BILOG	SCHAFNER - CHASE EMC	CBL6140A	06/29/2007	06/29/2008
1T4568	RADIATING NOISE SOURCE	MET LABORATORIES	N/A	SEE NOTE	
Radiated Emissions – 15.205, 209				Test Date: 06/30/08	
MET #	Equipment	Manufacturer	Model	Cal Date	Cal Due
1T4300	SEMI-ANECHOIC CHAMBER # 1	EMC TEST SYSTEMS	NONE	02/17/2006	01/17/2009
1T4612	ESA-E SERIES SPECTRUM ANALYZER	AGILENT	E4407B	01/04/2008	01/04/2009
1T4442	PRE-AMPLIFIER, MICROWAVE	MITEQ	AFS42-01001800-30-10P	SEE NOTE	
1T4592	RF FILTER KIT	VARIOUS	N/A	SEE NOTE	
1T2665	HORN ANTENNA	EMCO	3115	05/07/2008	05/07/2009
Peak EIRP Power, PSD				Test Date: 06/26/08	
1T2665	ANTENNA; HORN	EMCO	3115	07/19/2007	07/19/2008
1T4300	SEMI-ANECHOIC CHAMBER # 1	EMC TEST SYSTEMS	NONE	02/17/2006	01/17/2009
1T4612	ESA-E SERIES SPECTRUM ANALYZER	AGILENT	E4407B	01/04/2008	01/04/2009
6 dB Occupied Bandwidth				Test Date: 06/26/08	
1T2665	ANTENNA; HORN	EMCO	3115	07/19/2007	07/19/2008
1T4300	SEMI-ANECHOIC CHAMBER # 1	EMC TEST SYSTEMS	NONE	02/17/2006	01/17/2009
1T4612	ESA-E SERIES SPECTRUM ANALYZER	AGILENT	E4407B	01/04/2008	01/04/2009

Table 17. Test Equipment

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



## **V. 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.



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## 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.



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## 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.

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



# End of Report