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

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December 8, 2009

Ubiquiti Networks
91 E. Tasman Drive
San Jose, CA 95134

Dear Robert Pera,

Enclosed is the EMC Wireless Class II Permissive Change/Reassessment test report for compliance testing of the Ubiquiti Networks, XR5 as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), 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 Sanchez
Documentation Department

Reference: (\Ubiquiti Networks\EMCS27379-FCC247_Rev1)

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Electromagnetic Compatibility Criteria
Class II Permissive Change/Reassessment Test Report

for the

Ubiquiti Networks
Model XR5

Tested under
Title 47 of the CFR, Ch. 1 (10-1-06 ed.), FCC 15.247 Subpart C &
RSS-210, Issue 7, June 2007
for Intentional Radiators

MET Report: EMCS27379-FCC247_Rev1

December 8, 2009

Prepared For:

Ubiquiti Networks
91 E. Tasman Drive
San Jose, CA 95134

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Tested under
Title 47 of the CFR, Parts 15.247 Subpart C
& RSS-210, Issue 7, June 2007
for Intentional Radiators

Anderson Soungpanya, Project Engineer
Electromagnetic Compatibility Lab

Jennifer Sanchez
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 Part 15.247 and Industry Canada standard RSS-210, Issue 7, June 2007 under normal use and maintenance.

Shawn McMillen, Manager
Electromagnetic Compatibility Lab

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Report Status Sheet

Revision	Report Date	Reason for Revision
∅	August 6, 2009	Initial Issue.
1	August 11, 2009	Final Issue
2	December 8, 2009	Rev 1

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent µ
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**er**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**ert**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µ**H**	**microh**enry
µ	**microf**arad
µ**s**	**micros**econds
NEBS	**N**etwork **E**quipment-**B**uilding **S**ystem
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

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I. Executive Summary

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A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Ubiquiti Networks XR5, with the requirements of Part §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 XR5. Ubiquiti Networks should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the XR5, 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 §15.247, in accordance with TeraHop Networks, Inc. purchase order number 1857. All tests were conducted using measurement procedure ANSI C63.4-2003.

FCC Reference 47 CFR Part 15.247:2005	**IC Reference** RSS-210 Issue 7: 2007	**Description**	**Compliance**
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	Not Applicable
Title 47 of the CFR, Part 15 §15.247(a)(1)	RSS-210(A8.1)	Occupied Bandwidth	Not Applicable
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 and Conducted Spurious Emissions	Compliant
Title 47 of the CFR, Part 15; §15.247(e)	RSS-210(A8.3)	Power Spectral Density	Not Applicable
Title 47 of the CFR, Part 15 §15.247(i)	RSSGen(5.5)	Maximum Permissible Exposure	Compliant
N/A	RSSGen(4.8)	Receiver Spurious Emissions	Compliant

Table 1 Executive Summary of EMC Part 15.247 ComplianceTesting

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II. Equipment Configuration

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A. Overview

MET Laboratories, Inc. was contracted by TeraHop Networks, Inc. to perform Class II Permissive Change/Reassessment testing on the Ubiquiti Networks, XR5 with additional antenna.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Ubiquiti Networks, XR5.

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

Model(s) Tested:	XR5	
Model(s) Covered:	XR5	
EUT Specifications:	Primary Power: 110VAC, 60 Hz	
	FCC ID: SWX-XR5 IC ID: 6545A-XR5	
	Type of Modulations:	OFDM (Orthogonal Frequency Division multiplexing)
	Equipment Code:	DTS
	Peak RF Output Power:	29.89dBm
	EUT Frequency Ranges:	5745 – 5825MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35º C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Anderson Soungpanya	
Date(s):	July 24 & 28, 2009 and December 4, 2009	

Table 2. EUT Summary Table

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B. References

CFR 47, Part 15, Subpart C	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 15: General Rules and Regulations, Allocation, Assignment, and Use of Radio Frequencies
RSS-210, Issue 7, June 2007	Low-power Licence-exempt Radiocommunications Devices (All Frequency Bands): Category I Equipment
ANSI C63.4:2003	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI/NCSL Z540-1-1994	Calibration Laboratories and Measuring and Test Equipment - General Requirements
ANSI/ISO/IEC 17025:2000	General Requirements for the Competence of Testing and Calibration Laboratories

Table 3. References

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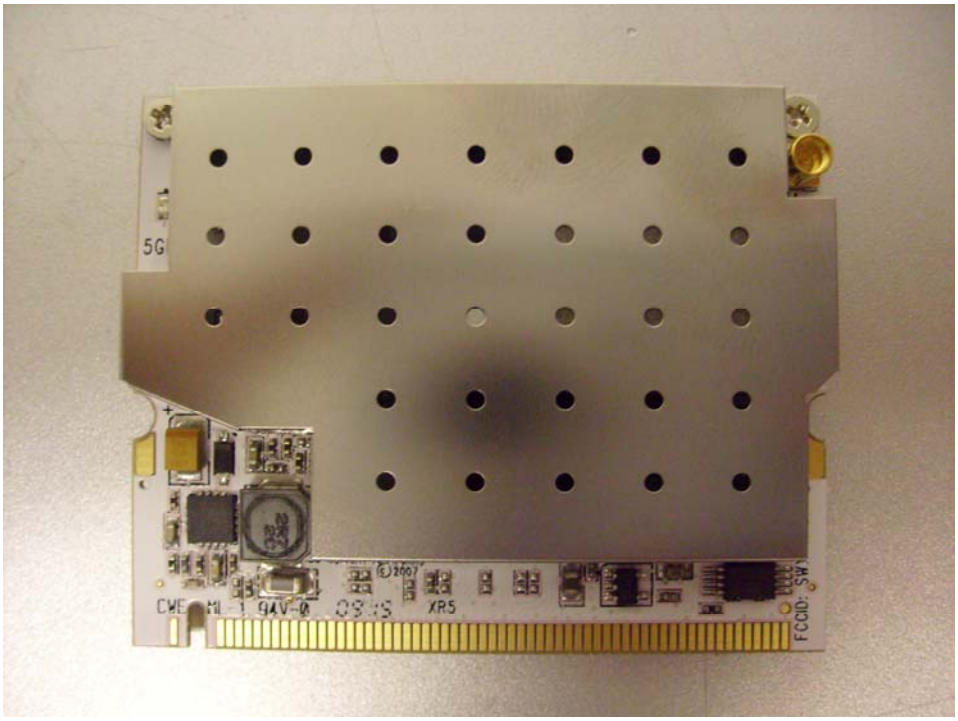
C. Test Site

All testing was performed at MET Laboratories, Inc., 3162 Belick Street, Santa Clara, California 95054. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 10 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

D. Description of Test Sample

The Ubiquiti Networks XR5, is a 5.8 GHz modular wireless device (PCMCIA).



Photograph 1. Ubiquiti Networks XR5

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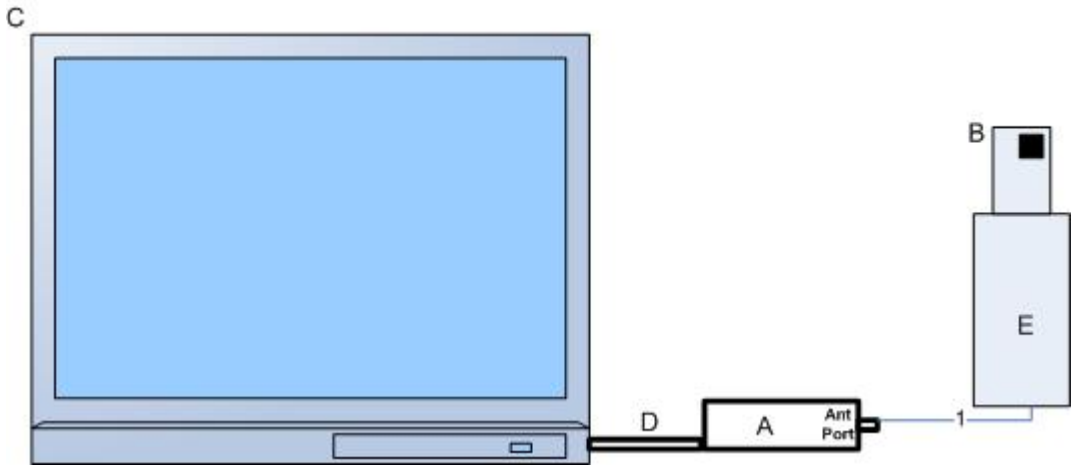

Figure 1. Block Diagram of Test Configuration

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E. Equipment Configuration

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

Ref. ID	Name / Description	Model Number	Serial Number
A	5GHz Wireless Module (Ubiquiti)	XR5	0927 00156D657519
B	Antenna (TeraHop)	R X-N0-003	PCB 42-00011-01 (Rev 1)
E	Antenna Adapter Card (TeraHop)	NA	NA

Table 4. Equipment Configuration

F. Support Equipment

Ubiquiti Networks supplied support equipment necessary for the operation and testing of the XR5. All support equipment supplied is listed in the following Support Equipment List.

Ref. ID	Name / Description	Manufacturer	Model Number
C	Laptop	Dell	Inspiron 2650
D	PCMCIA Card	Ubiquiti	NA

Table 5. Support Equipment

* The 'Customer Supplied Calibration Data' column will be marked as either not applicable, not available, or will contain the calibration date supplied by the customer.
** The AC/DC Adapter was use to power the EUT for testing purpose only, will not be sold with radio.

G. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty.	Length (m)	Shielded? (Y/N)	Termination Box ID & Port ID
1	A, Antenna Port	Coaxial	1	0.1	Y	Antenna Adapter Port
2	Antenna Adapter Port	NA (Direct Connection)	1	NA	NA	B, Antenna
3	D, PCMCIA Card	NA (Direct Connection)	1	NA	NA	C, Laptop

Table 6. Ports and Cabling Information

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H. Mode of Operation

The EUT operates in OFDM mode.

I. Method of Monitoring EUT Operation

The EUT is monitored by a Laptop with Atheros radio test software.

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 Ubiquiti Networks upon completion of testing.

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III. Electromagnetic Compatibility Criteria for Intentional Radiators

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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 as tested meets the criteria of this rule by being permanently attached. The EUT is therefore compliant with §15.203.

Type	Gain	Model	Manufacturer
Chip Antenna	4.61dBi	FR05-S1-NO-1-003	Fractus

Test Engineer(s): Anderson Soungpanya

Test Date(s): July 28, 2009

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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 7. 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 7, 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, omni-directional 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 using a peak detector. The EUT was measured at the low, mid and high channels of each band at a data rate which gave the maximum power level.

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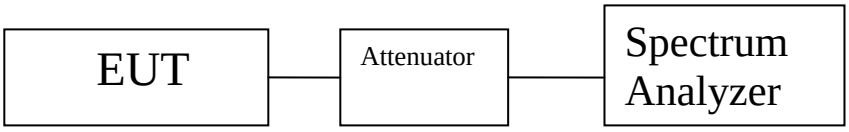
Test Results: Equipment complies with the Peak Power Output limits of **§ 15.247(b)**.

802.11a		
Carrier Channel	**Frequency (MHz)**	**Measured Peak Output Power dBm**
Low	5745	29.50
Mid	5785	29.48
High	5825	29.89

Test Engineer(s): Anderson Soungpanya

Test Date(s): July 24, 2009



Block Diagram 1. Peak Power Output Test Setup

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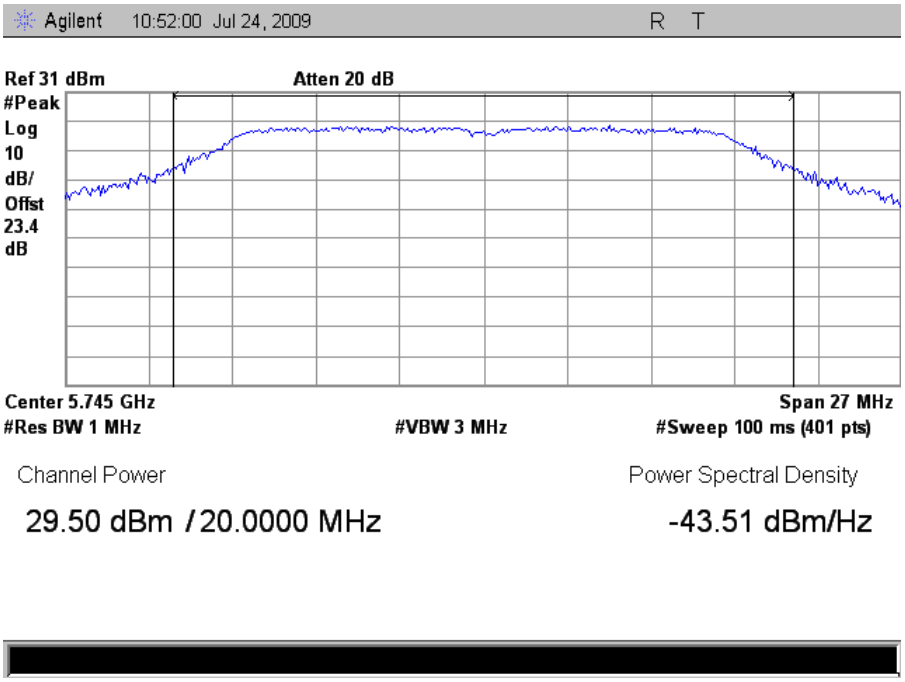
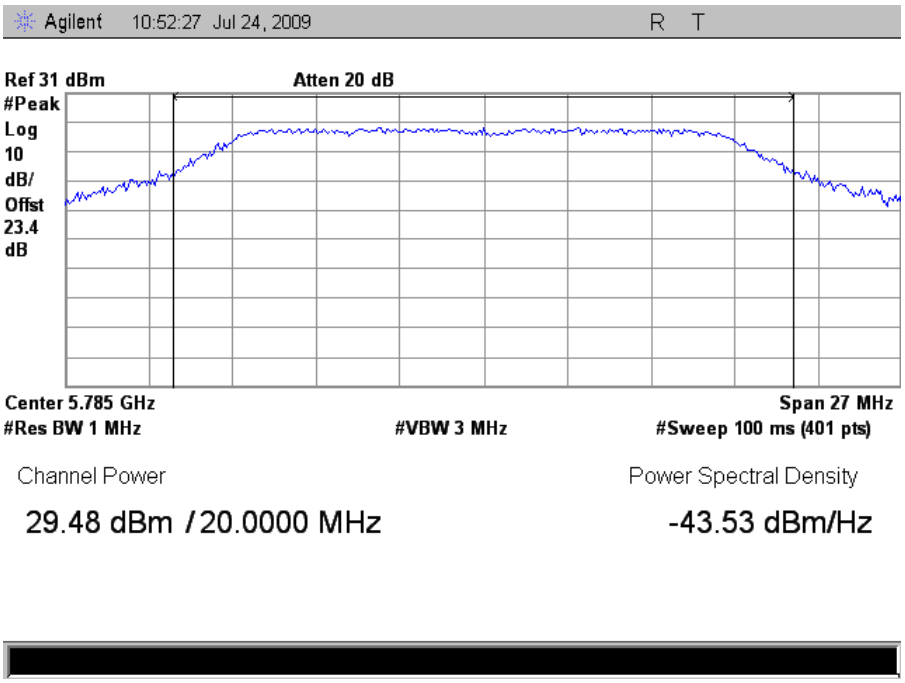
RF Output Power Test Results



Plot 1. RF Output Power – Low Channel



Plot 2. RF Output Power – Mid Channel

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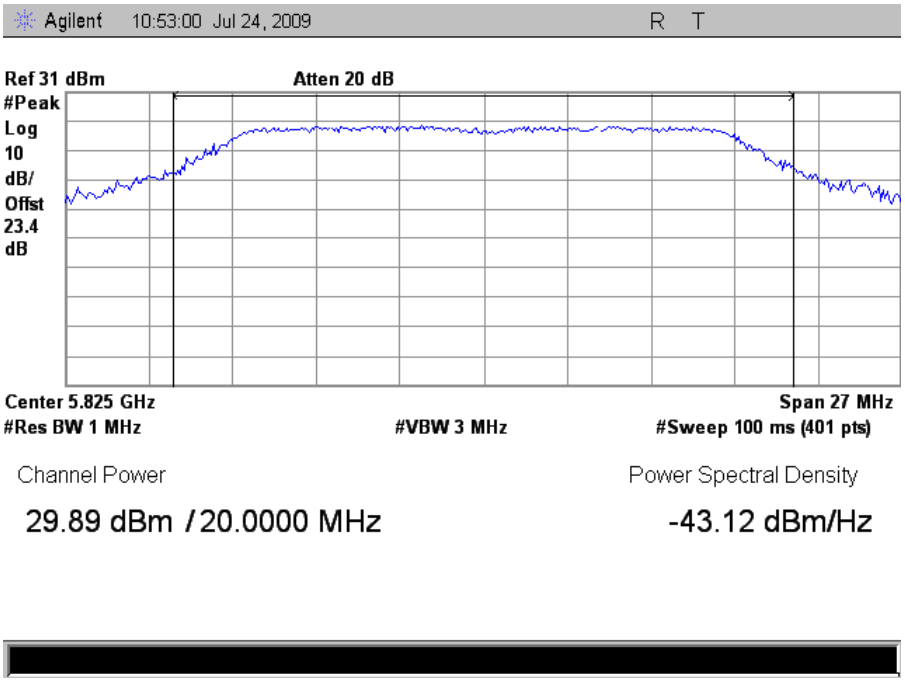
RF Output Power Test Results



Plot 3. RF Output Power – High Channel

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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 @ 5745 – 5825MHz; highest conducted power = 29.98dBm (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

EUT maximum antenna gain = **4.61dBi Chip Antenna**

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^2)
P = Power Input to antenna (974.9896mW)
G = Antenna Gain (2.89 numeric)

S = (975*2.89/ 4*3.14*20.0^2)= (2818.383/ 5024) = **0.056mW/cm^2** @ 20cm separation

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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
[1] 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	([2])

Table 8. Restricted Bands of Operation

[1] Until February 1, 1999, this restricted band shall be 0.490 – 0.510 MHz.
[2] Above 38.6

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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 9.

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

Table 9. Radiated Emissions Limits Calculated from FCC Part 15, § 15.209 (a)

Test Procedure: The transmitter was set to the mid channel at the highest output power and placed on a 0.8 m high wooden table inside in a semi-anechoic chamber. Measurements were performed with the EUT rotated 360 degrees and varying the adjustable antenna mast with 1 m to 4 m height to determine worst case orientation for maximum emissions. Measurement were repeated the measurement at the low and highest channels.

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

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

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

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

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

Test Engineer(s): Anderson Soungpanya

Test Date(s): July 28, 2009

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Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(d) Harmonic Emissions Requirements – Radiated (802.11a)

Freq. (GHz)	Antenna Polarity (H/V)	Raw Amp. @ 1 m (Peak) / (Avg)	P.Amp (dB)	Ant. Cor. Factor (dB/m)	Cable Loss (dB)	Distance Correction Factor (dB)	EUT Field Strength Final Amp. (dBµV/m)	Limit Detector Peak / Avg	Limit @ 3 m (dBµV/m)	Delta (dB)
11.49	V	45.82	34.86	39.79	8.02	-9.54	49.23	Peak	74	-24.77
11.49	V	31.76	34.86	39.79	8.02	-9.54	35.17	Avg	54	-18.83
17.235	V	47.43	34.01	42.82	9.90	-9.54	56.60	Peak	74	-17.40
17.235	V	34.11	34.01	42.82	9.90	-9.54	40.93	Avg	54	-13.07
Low Channel 5745MHz										
Freq. (GHz)	**Antenna Polarity (H/V)**	**Raw Amp. @ 1 m (Peak) / (Avg)**	**P.Amp (dB)**	**Ant. Cor. Factor (dB/m)**	**Cable Loss (dB)**	**Distance Correction Factor (dB)**	**EUT Field Strength Final Amp. (dBµV/m)**	**Limit Detector Peak / Avg**	**Limit @ 3 m (dBµV/m)**	**Delta (dB)**
11.57	V	46.23	34.91	39.88	7.70	-9.54	49.36	Peak	74	-24.64
11.57	V	33.52	34.91	39.88	7.70	-9.54	36.65	Avg	54	-17.35
17.355	V	47.46	33.93	43.15	9.63	-9.54	56.77	Peak	74	-17.23
17.355	V	34.17	33.93	43.15	9.63	-9.54	43.48	Avg	54	-10.52
Mid Channel 5785MHz										
Freq. (GHz)	**Antenna Polarity (H/V)**	**Raw Amp. @ 1m (Peak) / (Avg)**	**P.Amp (dB)**	**Ant. Cor. Factor (dB/m)**	**Cable Loss (dB)**	**Distance Correction Factor (dB)**	**EUT Field Strength Final Amp. (dBµV/m)**	**Limit Detector Peak / Avg**	**Limit @ 3 m (dBµV/m)**	**Delta (dB)**
11.65	V	46.69	34.96	39.94	7.13	-9.54	49.26	Peak	74	-24.74
11.65	V	33.28	34.96	39.94	7.13	-9.54	35.85	Avg	54	-18.15
17.475	V	47.57	33.89	43.59	9.28	-9.54	57.00	Peak	74	-17.00
17.475	V	33.67	33.89	43.59	9.28	-9.54	43.10	Avg	54	-10.90
High Channel 5825MHz										

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

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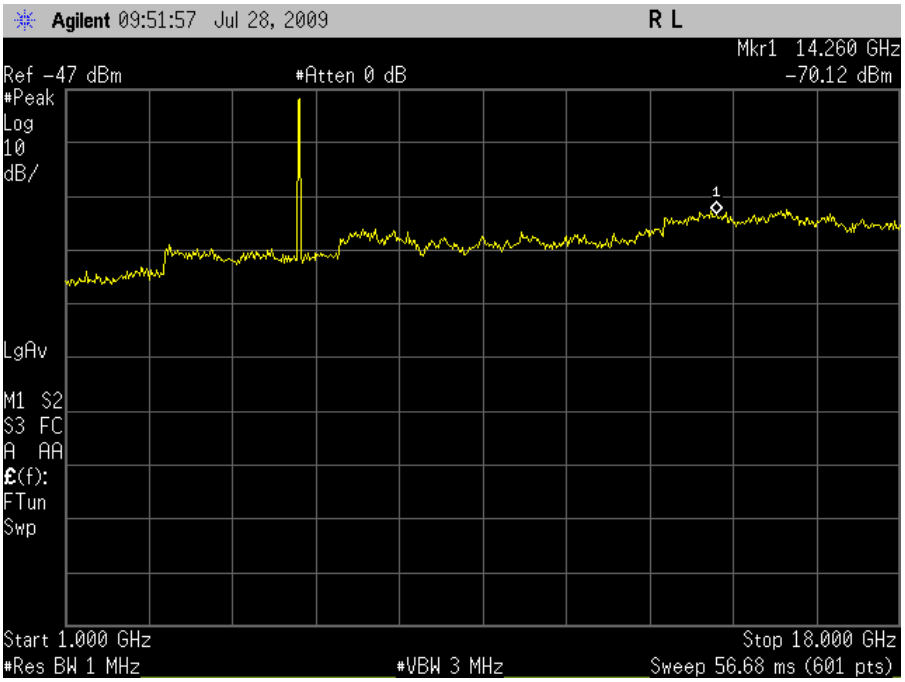
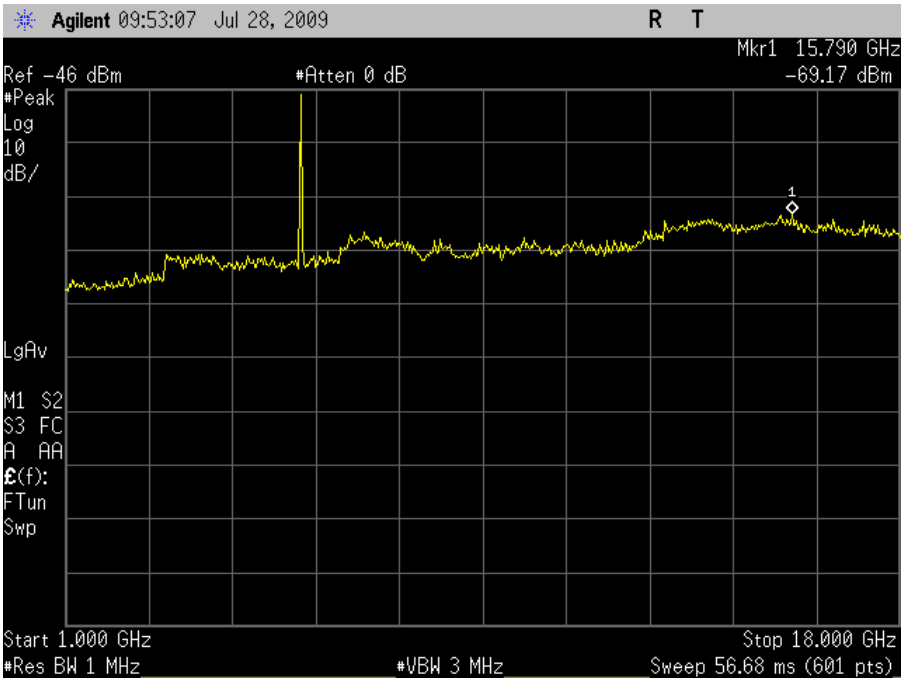
Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(d) Spurious Emissions Requirements – Radiated (802.11a)



Plot 4. Low Channel Radiated Spurious Emissions - 1-18GHz



Plot 5. Mid Channel Radiated Spurious Emissions - 1-18GHz

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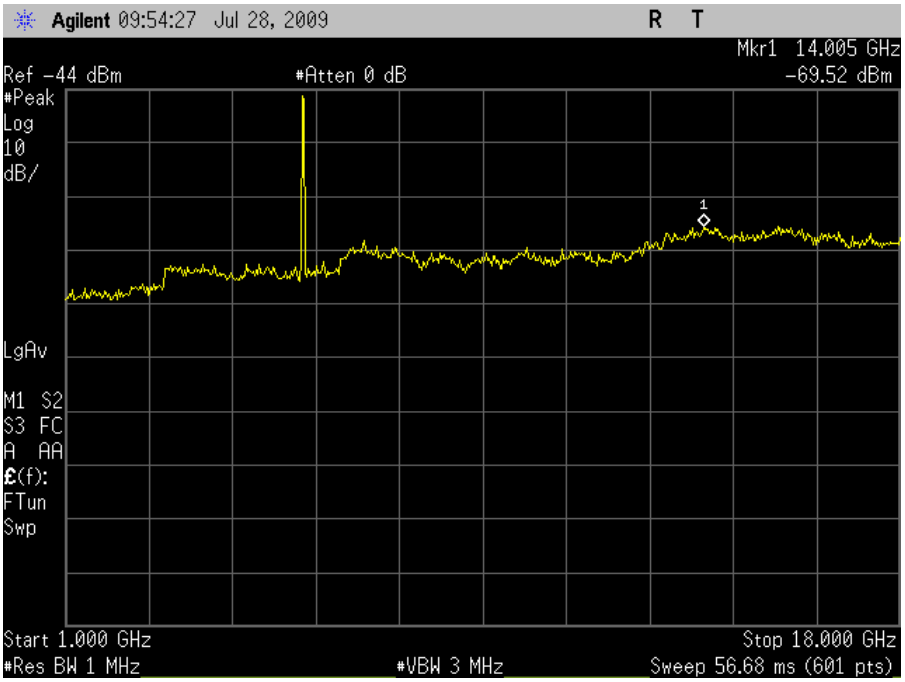
§ 15.247(d) Spurious Emissions Requirements – Radiated (802.11a)



Plot 6. High Channel Radiated Spurious Emissions - 1-18GHz

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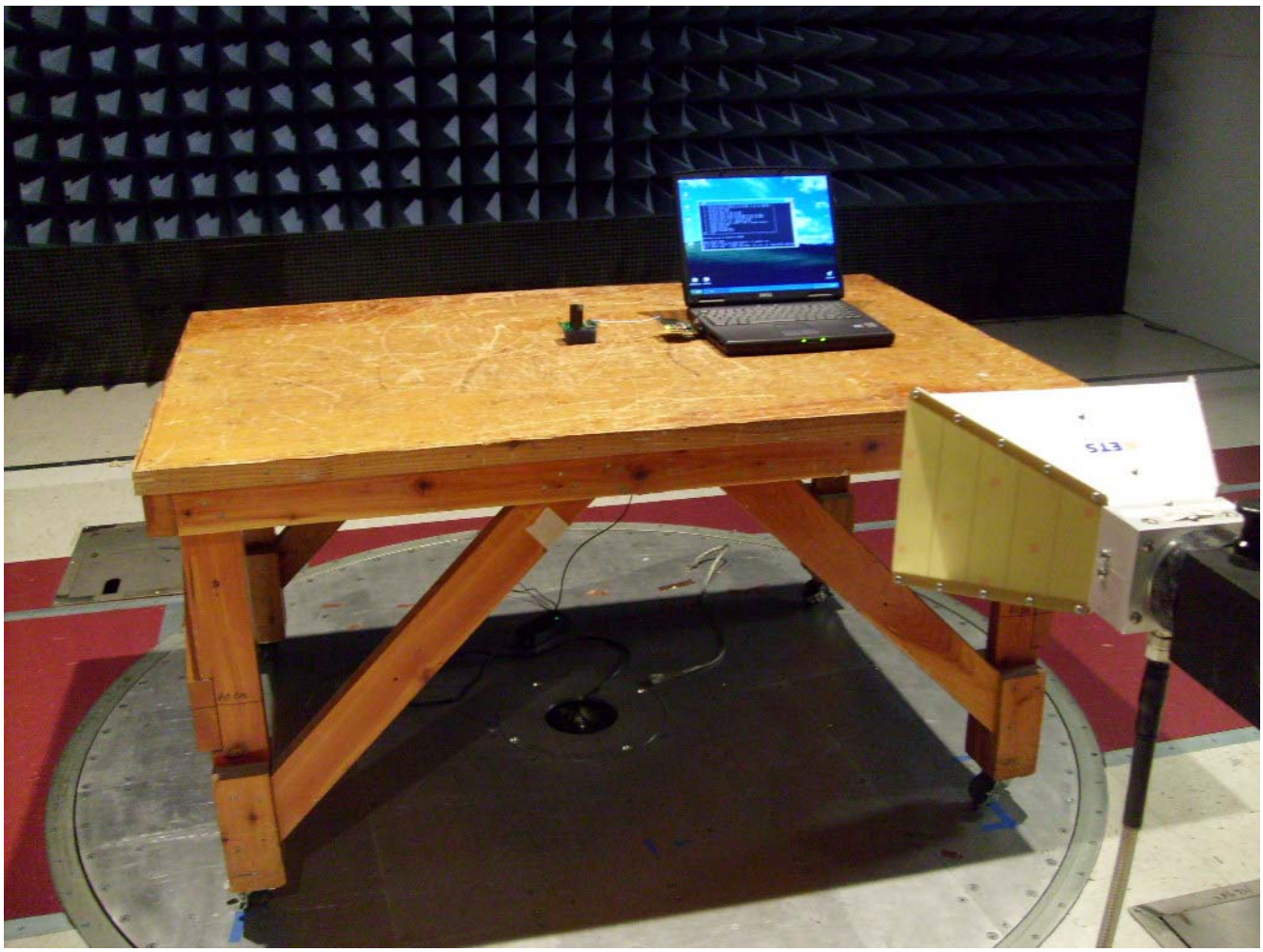
Electromagnetic Compatibility Criteria for Intentional Radiators
Test Setup Photographs



Photograph 2. Test Equipment and setup for various Radiated Measurements

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Electromagnetic Compatibility Criteria for Intentional Radiators

RSS-GEN Receiver Spurious Emissions

Test Requirement(s): **RSS-Gen, Section 4.8; RSS-Gen, Section 6**

The receiver shall be operated in the normal receive mode near the mid-point of the band over which the receiver is designed to operate.

Radiated emission measurements are to be performed using a calibrated open-area test site. As an alternative, the conducted measurement method may be used when the antenna is detachable. In such a case, the receiver spurious signal may be measured at the antenna port.

For either method, the search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

For emissions below 1 GHz, measurements employing a CISPR quasi-peak detector shall be used. Above 1 GHz, measurements employing an average detector shall be used.

The following receiver spurious emission limits shall be complied with:

(a) If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 1 of RSS-Gen. The resolution bandwidth of the spectrum analyzer shall be 100 kHz for spurious emission measurements below 1.0 GHz, and 1.0 MHz for measurements above 1.0 GHz.
(b) If a conducted measurement is made, no spurious output signals appearing at the antenna terminals shall exceed 2 nanowatts per any 4 kHz spurious frequency in the band 30-1000 MHz, or 5 nanowatts above 1 GHz.

Spurious Frequency (MHz)	Field Strength (microvolt/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960	500

Table 10. Spurious Emission Limits for Receivers (Table 1 from RSS-Gen)

Test Procedure: The EUT was set to receive mode. Measurements were made with 100 kHz resolution bandwidth for emissions below 1GHz and a 1MHz resolution bandwidth for emissions above 1 GHz.

Test Results: The EUT was compliant with the requirements of **RSS-Gen, Section 4.8** and **RSS-Gen, Section 6**. See following pages for detailed test results.

Test Engineer: Anderson Soungpanya

Test Date: 12/04/2009

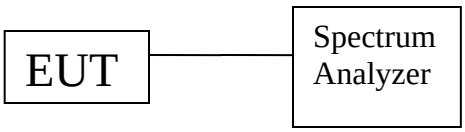

Figure 2. Receiver Spurious Test Configuration

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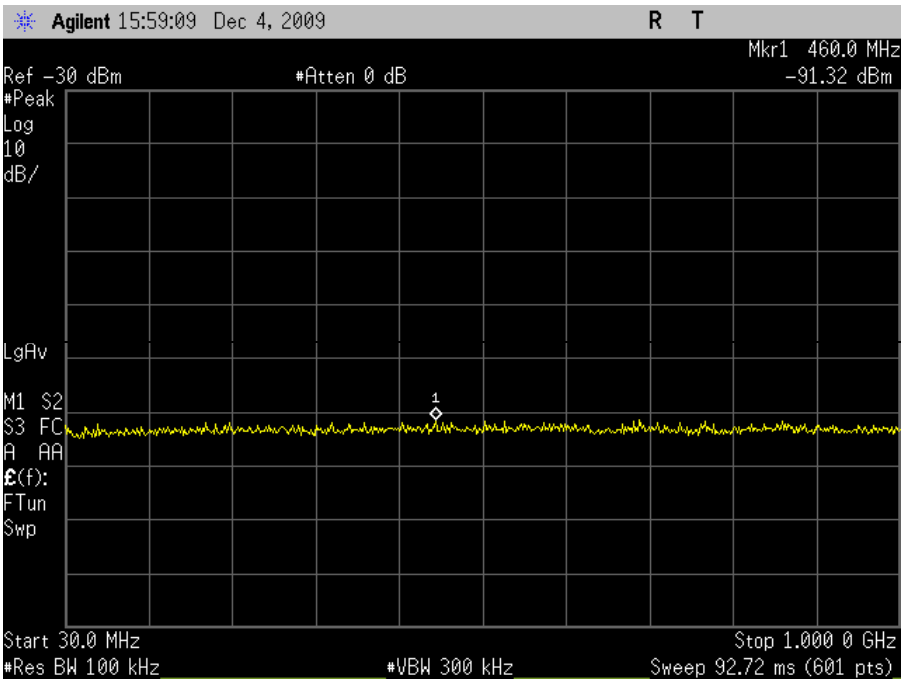
Receiver Spurious Emissions



Plot 7. Receiver Spurious Emissions, 30MHz – 1GHz

Frequency (MHz)	Amplitude (dBm)	Amplitude (nW)	Limit (nW)	Margin (nW)
460	-91.32	0.000739656	2	1.999260344

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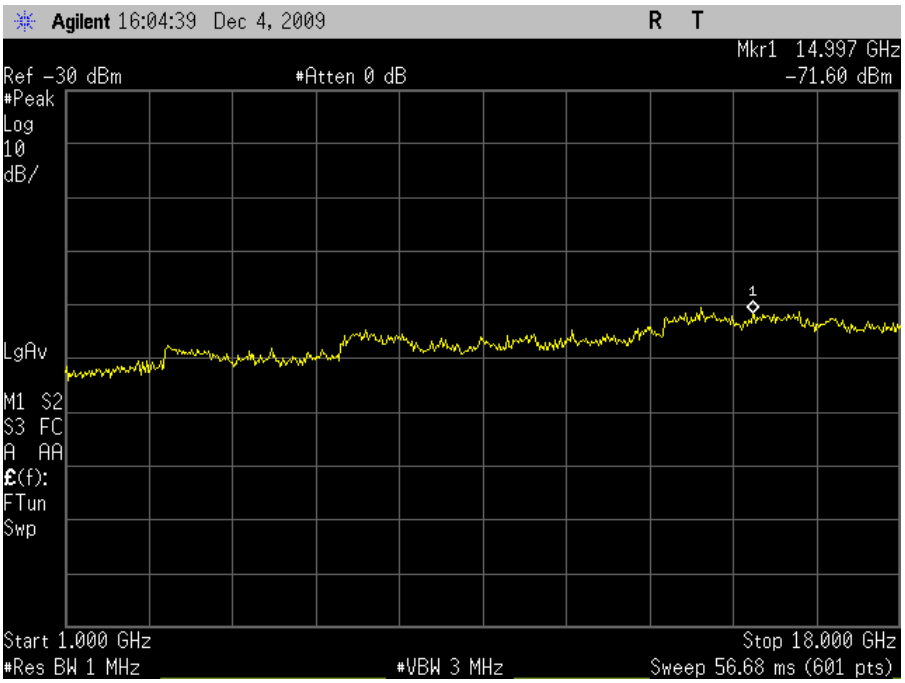
Receiver Spurious Emissions



Plot 8. Receiver Spurious Emissions, 1GHz – 18GHz

Frequency (GHz)	Amplitude (dBm)	Amplitude (nW)	Limit (nW)	Margin (nW)
14.997	-71.60	0.06934737	5	4.93065263

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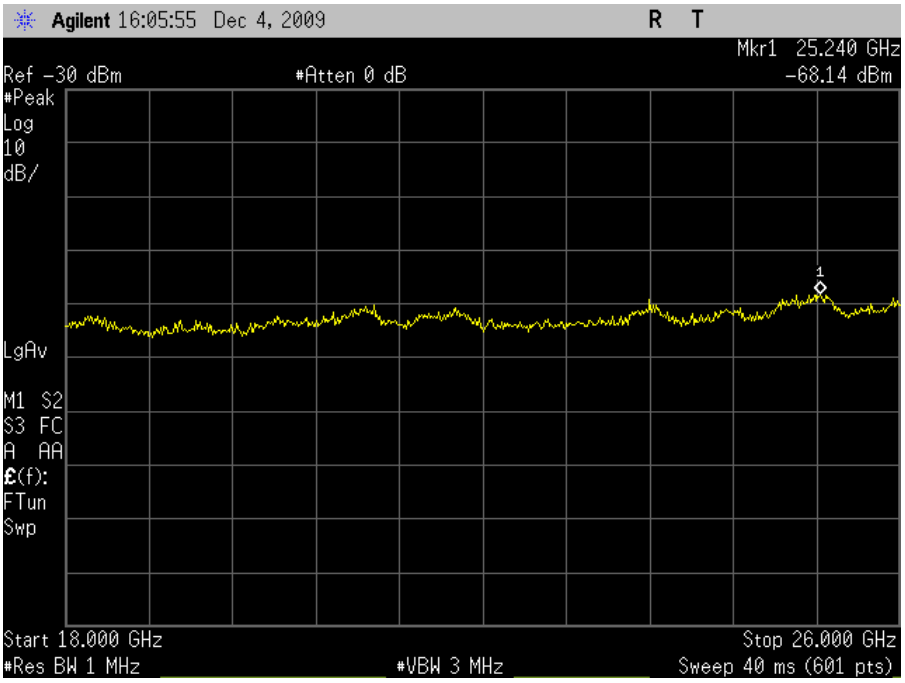
Receiver Spurious Emissions



Plot 9. Receiver Spurious Emissions, 18GHz – 26GHz

Frequency (GHz)	Amplitude (dBm)	Amplitude (nW)	Limit (nW)	Margin (nW)
25.240	-68.14	0.153826088	5	4.846173912

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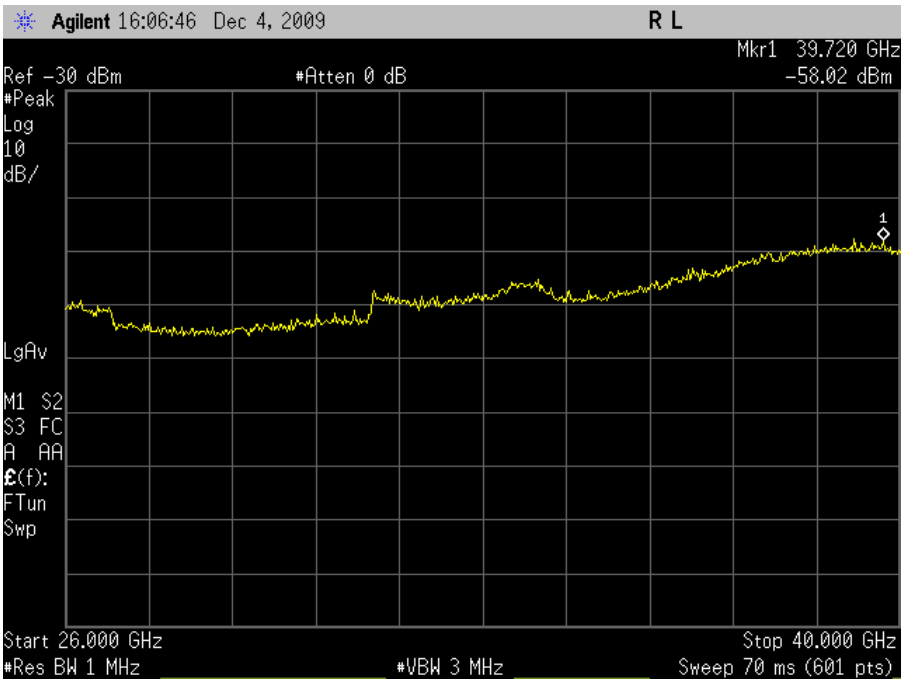
Receiver Spurious Emissions



Plot 10. Receiver Spurious Emissions, 26GHz – 40GHz

Frequency (GHz)	Amplitude (dBm)	Amplitude (nW)	Limit (nW)	Margin (nW)
39.720	-58.02	1.588656469	5	3.411343531

-

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IV. Test Equipment

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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
1S2406	Spectrum Analyzer	Agilent	E4407	4/14/09	4/14/10
1S2198	HORN ANTENNA	EMCO	3115	9/10/09	9/10/10
1S2121	PREAMP	HEWLETT PACKARD	8449B	10/26/08	10/26/09
1S2583	SPECTRUM ANALYZER	AGILENT	E4447A	1/12/09	1/12/10
1S2485	BILOG ANTENNA	TESEQ	CBL-6112D	1/26/09	1/26/10
1S2520	Thermo-Hygrometer	Fisher Scientific	11-661-7D	11/14/2007	11/13/2009
1S2482	5M CHAMBER	PANASHEILD	641431	11/18/08	11/18/09
1S2484	BILOG ANTENNA	TESEQ	CBL 6112D	1/21/2008	7/21/2009
N/A	HIGH PASS FILTER	MICRO-TRONICS	HPM13146	SEE NOTE	

Table 11. Test Equipment List

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

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V. Certification & User's Manual Information

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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.

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(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.[1] *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.

[1] 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.

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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.

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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.

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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 [2] digital apparatus complies with Canadian ICES-003.
>
> Cet appareil numérique de la classe [1] est conforme à la norme NMB-003 du Canada.

[2] Insert either A or B but not both as appropriate for the equipment requirements.

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End of Report

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