



MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
33439 WESTERN AVENUE ! UNION CITY, CALIFORNIA 94587-3201 ! PHONE (510) 489-6300 ! FAX (510) 489-6372

September 25, 2008

Apprion, Inc.
NASA Ames Research Pk Bldg 19
Suite 1000
Moffett Field, CA 94035

Dear Jim Arthur,

Enclosed is the EMC Wireless test report for compliance testing of the Apprion, Inc., IONizer (Wireless Access Point) as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-03 ed.), Title 47 of the CFR, Part 15.407 and Industry Canada RSS- 210, Issue 6, September 2005 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: (\Apprion, Inc.\EMCS80117-FCC407_Rev4)

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Electromagnetic Compatibility Criteria Test Report

for the

**Apprion, Inc.
Model IONizer (Wireless Access Point)**

Verified under
the FCC Certification Rules
contained in
Title 47 of the CFR, Part 15.407 and RSS-210 Issue 6, September 2005
for Intentional Radiators

MET Report: EMC80117-FCC407_Rev3

September 25, 2008

Prepared For:

**Apprion, Inc.
NASA Ames Research Pk Bldg 19
Suite 1000
Moffett Field, CA 94035**

Prepared By:
MET Laboratories, Inc.
3162 Belick Street,
Santa Clara, CA 95054



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Model IONizer (Wireless Access Point)

Tested Under

the FCC Certification Rules
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Title 47 of the CFR, Part 15.407 and RSS-210 Issue 6, September 2005
for Intentional Radiators




Shawn McMillen, 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 Part 15.407, of the FCC Rules and Industry Canada RSS-210 rules under normal use and maintenance.



Tony Permsombut, Manager
Electromagnetic Compatibility Lab



Apprion, Inc.
IONizer (Wireless Access Point)

Electromagnetic Compatibility
Report History
CFR Title 47, Part 15, Subpart E; Industry Canada RSS-210

Report Status Sheet

| Revision | Report Date | Reason for Revision |
|----------|--------------------|------------------------------------|
| Ø | May 22, 2008 | Initial Issue. |
| 1 | August 27, 2008 | Correct Model numbers |
| 2 | September 25, 2008 | Correct Harmonics Data for 5.15GHz |
| 3 | January 26, 2009 | Rev 3 |
| 4 | March 18, 2009 | Rev 4 |



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List of Terms and Abbreviations

| | |
|--------------|---|
| AC | Alternating Current |
| ACF | Antenna Correction Factor |
| Cal | Calibration |
| <i>d</i> | Measurement Distance |
| dB | Decibels |
| dB μ A | Decibels above one microamp |
| dB μ V | Decibels above one microvolt |
| dB μ A/m | Decibels above one microamp per meter |
| dB μ V/m | Decibels above one microvolt per meter |
| DC | Direct Current μ |
| E | Electric Field |
| DSL | Digital Subscriber Line |
| ESD | Electrostatic Discharge |
| EUT | Equipment Under Test |
| <i>f</i> | Frequency |
| FCC | Federal Communications Commission |
| GRP | Ground Reference Plane |
| H | Magnetic Field |
| HCP | Horizontal Coupling Plane |
| Hz | Hertz |
| IEC | International Electrotechnical Commission |
| kHz | kilohertz |
| kPa | kilopascal |
| kV | kilovolt |
| LISN | Line Impedance Stabilization Network |
| MHz | Megahertz |
| μ H | microhenry |
| μ | microfarad |
| μ s | microseconds |
| PRF | Pulse Repetition Frequency |
| RF | Radio Frequency |
| RMS | Root-Mean-Square |
| TWT | Traveling Wave Tube |
| V/m | Volts per meter |
| VCP | Vertical Coupling Plane |



Apprion, Inc.
IONizer (Wireless Access Point)

Electromagnetic Compatibility
Executive Summary
CFR Title 47, Part 15, Subpart E; Industry Canada RSS-210

I. Executive Summary



A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Apprion, Inc. IONizer (Wireless Access Point), with the requirements of Part 15, §15.407. 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 IONizer (Wireless Access Point). Apprion, Inc. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the IONizer (Wireless Access Point), has been **permanently** discontinued.

B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, §15.407, in accordance with Apprion, Inc., purchase order number 305. All tests were conducted using measurement procedure ANSI C63.4-2003.

| FCC Reference | RSS-210 Cross Reference | Description | Results |
|-----------------------------------|------------------------------|---|-----------|
| 15.403 © | RSS-210(A8.1) | 26dB Occupied Bandwidth | Compliant |
| 15.407 (a)(1), (2), (3) | RSS-210(A8.4) | Conducted Transmitter Output Power | Compliant |
| 15.407 (a)(1), (2), (3), (5) | RSS-210(A8.3) | Power Spectral Density | Compliant |
| 15.407 (a)(6) | N/A | Peak Excursion | Compliant |
| 15.407 (b)(1), (2), (4), (5), (6) | RSS-210 (A9.3(4)) | Undesirable Emissions | Compliant |
| 15.205/15.209 | RSS-210(A8.5)/ RSS-210(A8.5) | General Field Strength Limits (Restricted Bands and Radiated Emission Limits) | Compliant |
| 15.207 | RSS-210(7.2.2) | AC Conducted Emissions 150KHz – 30MHz | Compliant |
| 15.203 | N/A | Antenna Requirement | Compliant |

Table 1 Executive Summary of EMC Part 15.407 Compliance Testing



II. Equipment Configuration



A. Overview

MET Laboratories, Inc. was contracted by Apprion, Inc. to perform testing on the IONizer (Wireless Access Point), under Apprion, Inc.'s purchase order number 305.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Apprion, Inc. IONizer (Wireless Access Point).

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

| | | | | |
|---------------------------------------|--|----------------|----------------|---------------|
| Model(s) Tested: | 2100-120 2200-120 | | | |
| Model(s) Covered: | 20X0-XXX, 21X0-XXX, 22X0-XXX, 23X0-XXX 4000-200, 4000-220, 4100-200, 4100-220, 4200-200, 4200-220, 4300-200, 4300-220, 4020-200, 4020-220, 4120-120, 4120-200, 4120-220, 4220-120, 4220-200, 4220-220, 4320-200, 4320-220 | | | |
| EUT Specifications: | Primary Power: 49VDC Power Over Ethernet (PoE) | | | |
| | FCC ID: VAJ-APP2X001 IC: 7102A-APP2X001 | | | |
| | Type of Modulations: | OFDM | | |
| | Equipment Code: | NII | | |
| | Peak RF Output Power: | | 5.15GHz | 5.8GHz |
| | | DCMA82: | 0.03W | - |
| | CM9 | 0.028W | 0.101W | |
| EUT Frequency Ranges: | 5150 – 5250MHz & 5745 – 5825MHz | | | |
| Analysis: | The results obtained relate only to the item(s) tested. | | | |
| Environmental Test Conditions: | Temperature: 15-35° C | | | |
| | Relative Humidity: 30-60% | | | |
| | Barometric Pressure: 860-1060 mbar | | | |
| Evaluated by: | Shawn McMillen | | | |
| Date(s): | August 27, 2008 | | | |

Table 2. EUT Summary Table



B. References

| | |
|------------------------------------|--|
| CFR 47, Part 15, Subpart E | Unlicensed National Information Infrastructure Devices (UNII) |
| RSS-210, Issue 6, Sept 2005 | 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



C. Test Site

All testing was performed at MET Laboratories, Inc., 4855 Patrick Henry Drive, Building 6, Santa Clara, California 95054, Industry Canada Site #3467. 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 Apprion, Inc. IONizer (Wireless Access Point), is a Wireless Network Appliance with two 802.11 RF modules that can operate in either b, g, or a mode.



Photograph 1. Apprion, Inc. IONizer (Wireless Access Point)

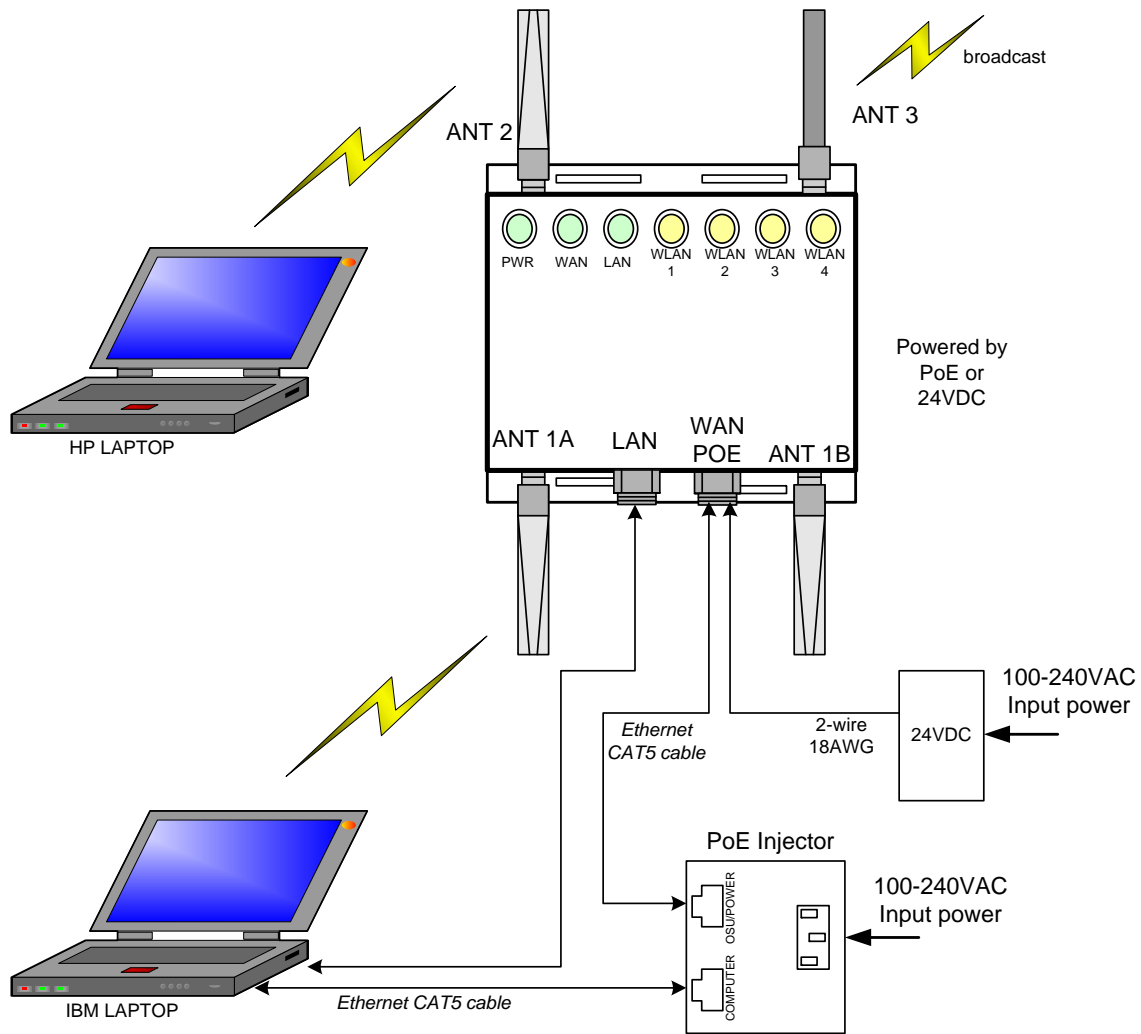


Figure 1. Block Diagram of Test Configuration



E. Equipment Configuration

The EUT was set up as outlined in **Error! Reference source not found.** and **Error! Reference source not found.**, Block Diagram of Test Setup. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

| Ref. ID | Name / Description | Model Number | Part Number | Serial Number |
|---------|--|----------------------|----------------|---------------|
| A | Kilmajaro (wireless access point) | 2100-120 2200-120 | N/A | n/a |
| B | POE Power Supply | N/A | N/A | N/A |
| C | AC-DC Adapter | TR9CX1000POE-Y | N/A | 00242105 |
| J | 5.8 GHz 7 dBi Omni Antenna/ MFG: Pacific Wireless | N/A | OD58M-12 | N/A |
| | 5.8 GHz 16 dBi Sector Antenna/ MFG: Pacific Wireless | N/A | SA58-120-16-WB | N/A |
| | 5.8 GHz 19 dBi Panel Antenna/ MFG: Pacific Wireless | N/A | PA58-19 | N/A |

Table 4. Equipment Configuration

F. Support Equipment

IONizer (Wireless Access Point) supplied support equipment necessary for the operation and testing of the IONizer (Wireless Access Point). All support equipment supplied is listed in the following Support Equipment List.

| Ref. ID | Name / Description | Manufacturer | Model Number |
|---------|---------------------|-------------------|----------------|
| D | PC | Dell | DC8M |
| E | Spectrum Analyzer | HP | 4407 |
| F | Temperature Chamber | Tenny Engineering | T630 |
| G | VariAC | Staco | 3PN2210 |
| H | Laptop | Dell | Latitude D2620 |

Table 5. Support Equipment



Apprion, Inc.
IONizer (Wireless Access Point)

Electromagnetic Compatibility
Equipment Configuration
CFR Title 47, Part 15, Subpart E; Industry Canada RSS-210

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 |
|--|------------------|--|------|------------|----------------|--------------------------------|
| FCC Radiated Measurement (5GHz) | | | | | | |
| 1 | A Front, WAN/POE | CAT5 | 1 | 3 | No | B, OSU/Power |
| 2 | A Front, LAN | CAT5 | 1 | 15 | No | D |
| 3 | B, Computer | CAT5 | 1 | 15 | No | D |
| 4 | B | Power Cord | 1 | 1 | No | C |
| 5 | C | Power Cord | 1 | 2 | No | 110VAC Power Supply |
| FCC Unintentional Emissions | | | | | | |
| 1 | A Front, WAN/POE | CAT5 | 1 | 3 | No | B, OSU/Power |
| 2 | A Front, LAN | CAT5 | 1 | 15 | No | D |
| 3 | B, Computer | CAT5 | 1 | 15 | No | D |
| 4 | B | Power Cord (Added ferrite Steward 28A202900A0) | 1 | 1 | No | C |
| 5 | C | Power Cord | 1 | 2 | No | 110VAC -240VAC Power Supply |

Table 6. Ports and Cabling Information



H. Mode of Operation

- Forced continuous transmit test on both RF modules
- Ping test on two Ethernet ports and RF modules.

I. Method of Monitoring EUT Operation

A Spectrum Analyzer and a Power Meter was use to monitor the EUT's transmitter channel and power output.

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 Apprion, Inc. upon completion of testing.



III. Electromagnetic Compatibility Criteria for Intentional Radiators



Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

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

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

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

Results: The EUT as tested meets the criteria of this rule by virtue of having professionally installed. The EUT is therefore compliant with §15.203.

| CM9 Radio | | | | |
|-----------|-------------|----------------|----------------|--------------------|
| Gain | Type | Freq Range | Model | Manufacturer |
| 7dBi | Omni | 5.15 – 5.25GHz | 89-1088-000 | Apprion |
| 12dBi | Omni | 5.8GHz | OD58M-12 | Pacific Wireless |
| 16dBi | Sector | 5.8GHz | SA58-120-16-WB | Laird Technologies |
| 19dBi | Directional | 5.8GHz | PA58-19 | Laird Technologies |

| DCMA82 Radio | | | | |
|--------------|------|----------------|-------------|--------------|
| Gain | Type | Freq Range | Model | Manufacturer |
| 7dBi | Omni | 5.15 – 5.25GHz | 89-1088-000 | Apprion |

Test Engineer(s): Shawn McMillen



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 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 Σ 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 μ V) | |
|--------------------------|---|---------|
| | Quasi-Peak | Average |
| * 0.15- 0.45 | 66 - 56 | 56 - 46 |
| 0.45 - 0.5 | 56 | 46 |
| 0.5 - 30 | 60 | 50 |

Table 7. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)

Test Procedure: The EUT was placed on a 0.8 m-high wooden table inside a semi-anechoic chamber. 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 Ω /50 μ H Line Impedance Stabilization Network (LISN). The EMC receiver scanned the frequency range from 150 kHz to 30 MHz. Conducted Emissions measurements were made in accordance with *ANSI C63.4-1992 "Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz"*. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω /50 μ H LISN as the input transducer to an EMC/field intensity meter.

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

Test Engineer(s): Billy Kwan

Test Date(s): May 1, 2007

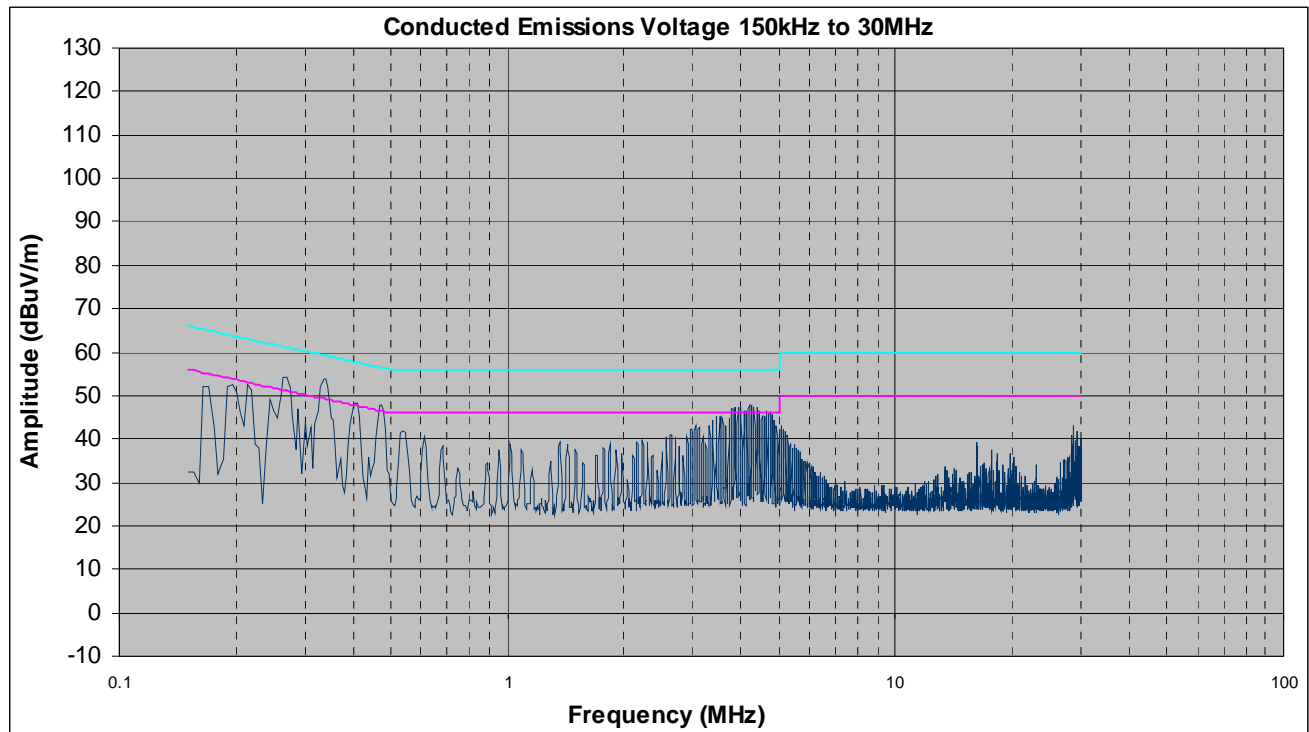


Limits for § 15.207 Conducted Disturbance at Mains Terminals, Test Results

Conducted Emissions Test Results

| Frequency. (MHz) | Corrected Amplitude (dBuV) QP | Limit (dBuV) QP | Results QP | Margin (dB) QP | Corrected Amplitude (dBuV) AVG | Limit (dBuV) AVG | Results AVG | Margin (dB) AVG |
|---------------------|-------------------------------------|--------------------|---------------|-------------------|--------------------------------------|------------------------|----------------|--------------------|
| 0.272 | 52.17 | 61.06 | PASS | -8.89 | 45.22 | 51.06 | PASS | -5.84 |
| 0.407 | 47.34 | 57.71 | PASS | -10.37 | 38.59 | 47.71 | PASS | -9.12 |
| 4.198 | 45.41 | 56 | PASS | -10.59 | 40.11 | 46 | PASS | -5.89 |
| 0.473 | 46.14 | 56.46 | PASS | -10.32 | 38.42 | 46.46 | PASS | -8.04 |

Table 8. Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)



Plot 1. Conducted Emission Limits, Phase Line Plot

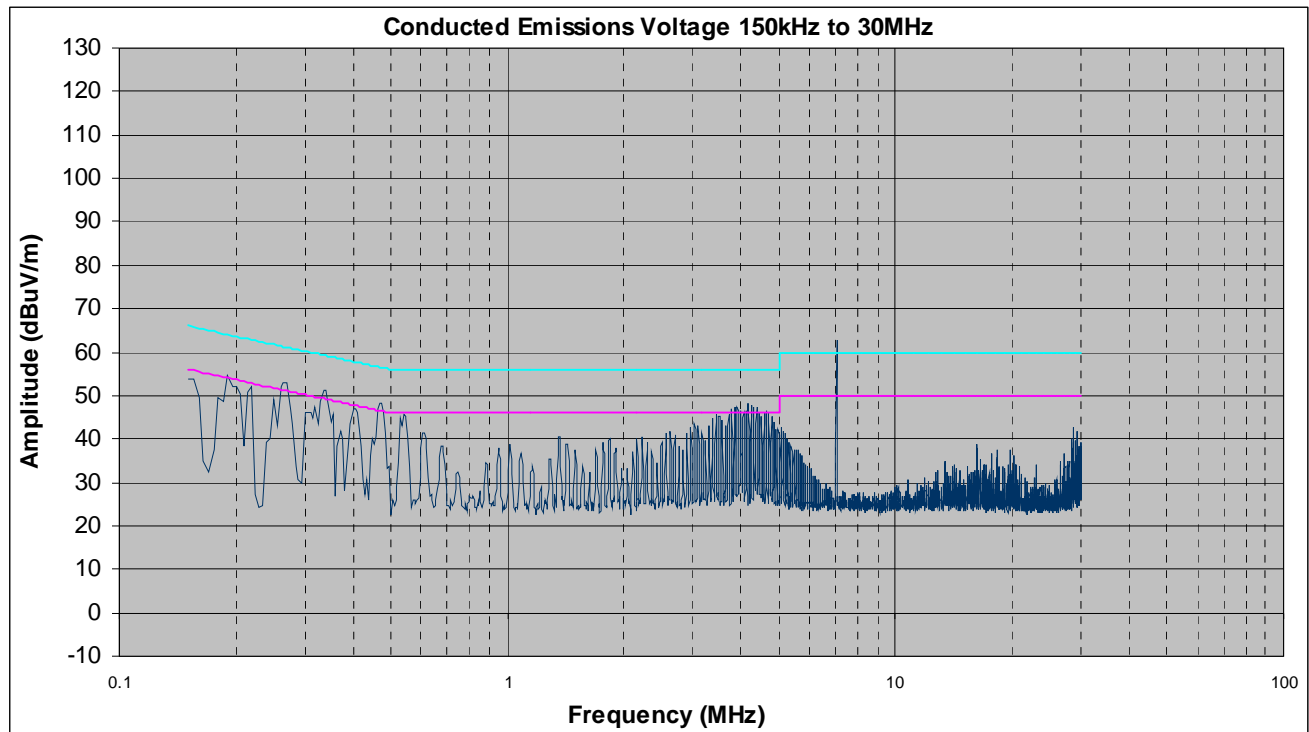


Limits for § 15.207 Conducted Disturbance at Mains Terminals, Test Results

Conducted Emissions Test Results

| Frequency. (MHz) | Corrected Amplitude (dBuV) QP | Limit (dBuV) QP | Results QP | Margin (dB) QP | Corrected Amplitude (dBuV) AVG | Limit (dBuV) AVG | Results AVG | Margin (dB) AVG |
|---------------------|-------------------------------------|--------------------|---------------|-------------------|--------------------------------------|---------------------|----------------|--------------------|
| 0.271 | 47.22 | 61.09 | PASS | -13.87 | 40.75 | 51.09 | PASS | -10.34 |
| 0.408 | 44.31 | 57.69 | PASS | -13.38 | 36.18 | 47.69 | PASS | -11.51 |
| 0.475 | 46.81 | 56.43 | PASS | -9.62 | 38.64 | 46.43 | PASS | -7.79 |
| 4.202 | 45.45 | 56 | PASS | -10.55 | 40.02 | 46 | PASS | -5.98 |

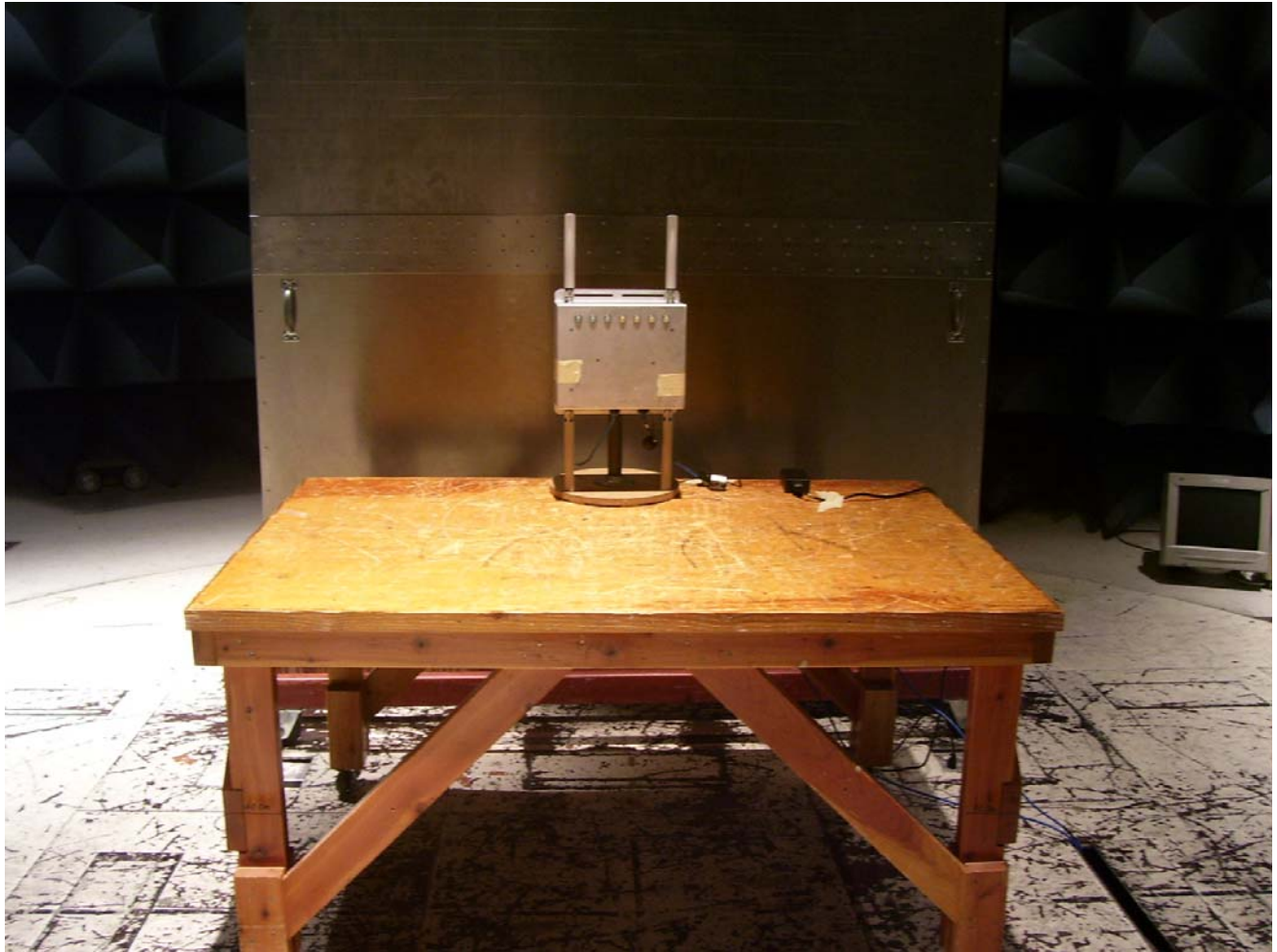
Table 9. Conducted Emissions - Voltage, AC Power, Neutral Line, (120 VAC, 60 Hz)



Plot 2. Conducted Emission Limits, Neutral Line Plot

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.207 Conducted Emissions Limits



Photograph 2. Conducted Emission Test Setup



Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.403(c) 26dB Bandwidth

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

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

Test Results Equipment complies with § 15.407 (c). Please refer to FCC IDs: NKRCM9 & NKRDCMA82.



Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 407(a) (1), (2) RF Power Output

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

| Digital Transmission Systems (MHz) | Output Limit (mW) |
|---------------------------------------|----------------------|
| 5150-5250 | 50 |
| 5250-5350 | 250 |

Table 10. Output Power Requirements from §15.407

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

§15.407(a) (2): For the band 5.25-5.35GHz the peak transmit power over the frequency band of operation shall not exceed the lesser of 250mW or $11\text{dBm} + 10\log B$, where B is the 26-dB emission bandwidth in MHz.

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

Test Results: Please refer to FCC IDs: NKRCM9 & NKRDCMA82.



Electromagnetic Compatibility Criteria for Intentional Radiators

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

Test Requirements: § 15.407(a)(1), (a)(2): For digitally modulated systems, the conducted peak power spectral density from the intentional radiator to the antenna shall not be greater than 4dBm/MHz in the frequency band 5.15-5.25 GHz and 11dBm/MHz in the frequency band 5.25-5.35GHz.

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

Test Results: Equipment complies with the peak power spectral density limits of § 15.407(a)(1), (a)(2). Please refer to FCC IDs: NKRCM9 & NKRDCMA82.



Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(a)(6) Peak Excursion Ratio

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

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

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

Test Results: Equipment complies with the peak excursion ratio limits of § 15.407(a)(6). Please refer to FCC IDs: NKRCM9 & NKRDCMA82.



Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(b)(1),(2), (4) (5), (6) Undesirable Emissions

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

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

§ 15.407(b)(2): In any 1MHz bandwidth outside the frequency band 5.25-5.35GHz in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power shall not exceed -27dBm.

§ 15.407(b)(4): For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.

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

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

| MHz | MHz | MHz | GHz |
|-------------------------------|-------------------------|----------------|------------------|
| 0.090–0.110----- | 16.42–16.423 | 399.9–410 | 4.5–5.15 |
| 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 11. Restricted Bands of Operation



| | |
|--------------------------|---|
| Test Procedure: | <p>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.</p> <p>For frequencies from 30 MHz to 1 GHz, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.</p> <p>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.</p> <p>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.</p> <p>$\text{EUT Field Strength Final Amplitude} = \text{Raw Amplitude} - \text{Preamp gain} + \text{Antenna Factor} + \text{Cable Loss} - \text{Distance Correction Factor (1 meter)}$</p> |
| Test Results: | <p>The EUT was found compliant with the Radiated Emission limits of §15.209(a) & §15.205 for Intentional Radiators. All emissions were investigate up to the 10th harmonic of the fundamental. Emissions greater than 18GHz were found to be at the noise floor of the spectrum analyzer. See following pages for detailed test results.</p> |
| Test Engineer(s): | Shawn McMillen/ Anderson Soungpanya |
| Test Date(s): | April 10, 2007 & July 25, 2008 |



Electromagnetic Compatibility Criteria for Intentional Radiators – CM9

§ 15.407(b)(1): Harmonic Emissions Requirements – Radiated (802.11a) 7dbi Omni

| Frequency (MHz) | Receive Antenna Polarity (H/V) | Uncorrected Field strength (dBμV)@ 3m | Preamp (dB) | Antenna Factor (dB) | Cable Loss (dB) | Distance Correction Factor (dB) | Corrected Field Strength @ 3m (dBμV) | Limit @ 3m (dBμV) | Margin (dB) | Measurement Type |
|----------------------|--------------------------------|---------------------------------------|-------------|---------------------|-----------------|---------------------------------|--------------------------------------|-------------------|-------------|------------------|
| 10360 | V | 41.2 | 35.2 | 38.1 | 6.7 | 0 | 50.7 | 74 | -23.3 | Peak |
| 10360 | V | 30.1 | 35.2 | 38.1 | 6.7 | 0 | 39.6 | 54 | -14.4 | Average |
| 15540 | V | 41.4 | 34.3 | 38.3 | 7.8 | 0 | 53.2 | 74 | -20.8 | Peak |
| 15540 | V | 30.4 | 34.3 | 38.3 | 7.8 | 0 | 42.2 | 54 | -11.8 | Average |
| Low Channel 5180MHz | | | | | | | | | | |
| Frequency (MHz) | Receive Antenna Polarity (H/V) | Uncorrected Field strength (dBμV)@ 3m | Preamp (dB) | Antenna Factor (dB) | Cable Loss (dB) | Distance Correction Factor (dB) | Corrected Field Strength @ 3m (dBμV) | Limit @ 3m (dBμV) | Margin (dB) | Measurement Type |
| 10480 | V | 40.1 | 35.2 | 38.1 | 6.7 | 0 | 49.6 | 74 | -24.4 | Peak |
| 10480 | V | 29.9 | 35.2 | 38.1 | 6.7 | 0 | 39.4 | 54 | -14.6 | Average |
| 15720 | V | 41.4 | 34.3 | 38.3 | 7.8 | 0 | 53.2 | 74 | -20.9 | Peak |
| 15720 | V | 29.9 | 34.3 | 38.3 | 7.8 | 0 | 41.7 | 54 | -12.3 | Average |
| High Channel 5240MHz | | | | | | | | | | |

Note 1: All other emissions were measured at the noise floor of the spectrum analyzer

Note 2: The emissions listed in this table verify the EUT is compliant with the -27dBm/MHz EIRP limit (68.23dBμV/m) for out of band emissions, see equation below. All peak emissions are less than 68.23dBμV/m.

$$E = 1000000 \times \sqrt{30P} / 3 \text{ } \mu\text{V/m}$$

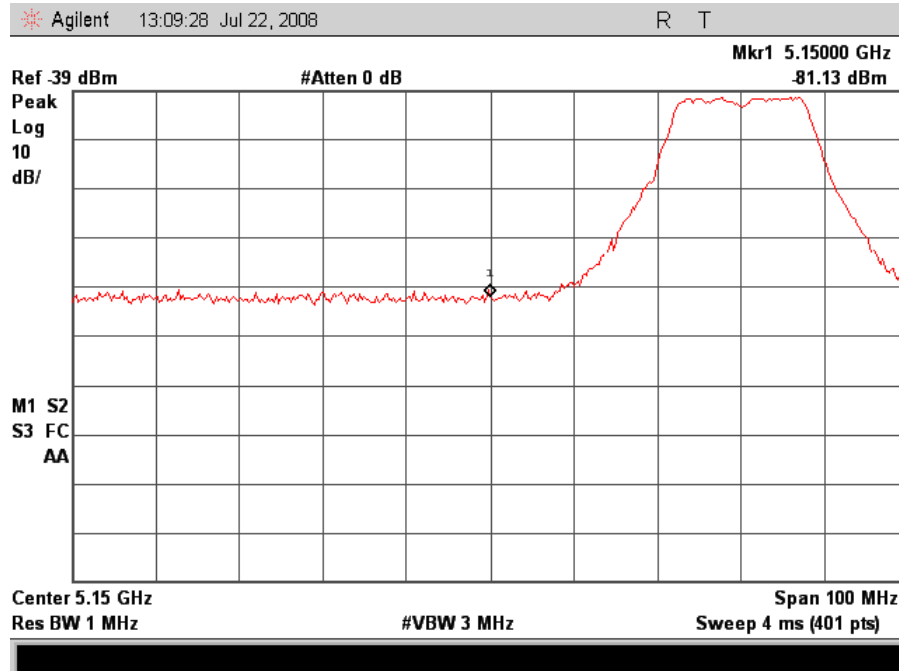
Where P is EIRP in Watts

Therefore: -27dBm/MHz = 68.23dBμV/m

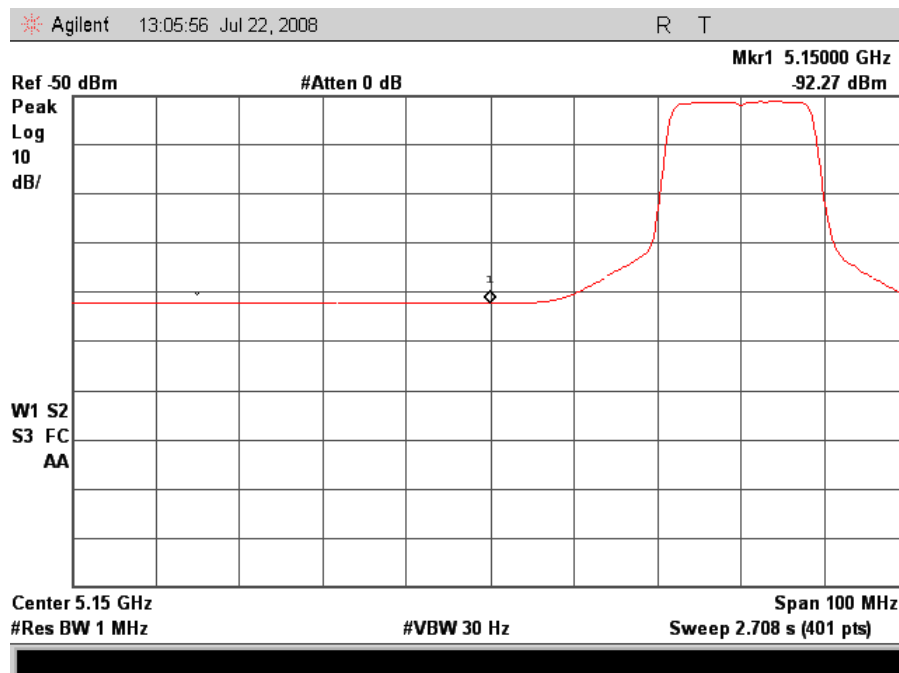


Electromagnetic Compatibility Criteria for Intentional Radiators – CM9

§ 15.407(b)(1): Harmonic Emissions Requirements – Radiated (802.11a) 7dbi Omni



Plot 3. Band Edge, Low Channel, Peak



Plot 4. Band Edge, Low Channel, Avg



Electromagnetic Compatibility Criteria for Intentional Radiators – CM9

§ 15.407(b)(1): Harmonic Emissions Requirements – Radiated (802.11a) 7dbi Omni

| Freq. (GHz) | Antenna Polarity (H/V) | Raw Amp. @ 1 m (dBm) | Raw Amp. @ 1m (dBuV) | Ant. Cor. Factor (dB/m) | Cable Loss (dB) | Distance Correction Factor (dB) | Corrected Field Strength (dBuV) | Limit @ 3 m (dBuV) |
|-------------|------------------------|----------------------|----------------------|-------------------------|-----------------|---------------------------------|---------------------------------|--------------------|
| 5.150 | V | -81.13 | 14.11 | 33.1 | 7.90 | 9.54 | 45.57 | 74 |
| 5.150 | V | -92.27 | 2.97 | 33.1 | 7.90 | 9.54 | 35.26 | 54 |

| Freq. (GHz) | Antenna Polarity (H/V) | Raw Amp. @ 1 m (dBm) | Ant. Cor. Factor (dB/m) | Cable Loss (dB) | Distance Correction Factor (dB) | Corrected Field Strength (dBm) | Limit @ 3 m (dBm) |
|-------------|------------------------|----------------------|-------------------------|-----------------|---------------------------------|--------------------------------|-------------------|
| 5.150 | V | -81.13 | 33.1 | 7.90 | 9.54 | -49.67 | -27 |



Electromagnetic Compatibility Criteria for Intentional Radiators – CM9

§ 15.407(b)(4): Harmonic Emissions Requirements – Radiated (802.11a) 12dBi Omni

| Frequency (MHz) | Receive Antenna Polarity (H/V) | Uncorrected Field strength (dBμV) @ 3m | Preamp (dB) | Antenna Factor (dB) | Cable Loss (dB) | Distance Correction Factor (dB) | Corrected Field Strength @ 3m (dBμV) | Limit @ 3m (dBμV) | Margin (dB) | Measurement Type |
|----------------------|--------------------------------|--|-------------|---------------------|-----------------|---------------------------------|--------------------------------------|-------------------|-------------|------------------|
| 11490 | V | 40.8 | 34.7 | 39 | 9.4 | 0 | 54.5 | 74 | -19.5 | pk |
| 11490 | V | 29.9 | 34.7 | 39 | 9.4 | 0 | 43.6 | 54 | -10.4 | avg |
| 17235 | V | 39.0 | 33.0 | 44.5 | 11.8 | 0 | 62.3 | 74 | -11.7 | pk |
| Low Channel 5745MHz | | | | | | | | | | |
| Frequency (MHz) | Receive Antenna Polarity (H/V) | Uncorrected Field strength (dBμV) @ 3m | Preamp (dB) | Antenna Factor (dB) | Cable Loss (dB) | Distance Correction Factor (dB) | Corrected Field Strength @ 3m (dBμV) | Limit @ 3m (dBμV) | Margin (dB) | Measurement Type |
| 11530 | V | 39.2 | 34.7 | 39 | 9.4 | 0 | 52.9 | 74 | -21.1 | pk |
| 11530 | V | 29.9 | 34.7 | 39 | 9.4 | 0 | 43.6 | 54 | -10.4 | avg |
| 17295 | V | 41.4 | 33.0 | 44.5 | 11.8 | 0 | 64.7 | 74 | -9.3 | pk |
| Mid Channel 5765MHz | | | | | | | | | | |
| Frequency (MHz) | Receive Antenna Polarity (H/V) | Uncorrected Field strength (dBμV) @ 3m | Preamp (dB) | Antenna Factor (dB) | Cable Loss (dB) | Distance Correction Factor (dB) | Corrected Field Strength @ 3m (dBμV) | Limit @ 3m (dBμV) | Margin (dB) | Measurement Type |
| 11610 | V | 39.9 | 34.7 | 39 | 9.4 | 0 | 53.6 | 74 | -20.4 | pk |
| 11610 | V | 29.8 | 34.7 | 39 | 9.4 | 0 | 43.5 | 54 | -10.5 | avg |
| 17415 | V | 38.9 | 33.0 | 44.5 | 11.8 | 0 | 62.2 | 74 | -11.8 | pk |
| High Channel 5805MHz | | | | | | | | | | |

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

Note 2: The emissions listed in this table verify the EUT is compliant with the -27dBm/MHz EIRP limit (68.23dBμV/m) for out of band emissions, see equation below. All peak emissions are less than 68.23dBμV/m.

$$E = 1000000 \times \sqrt{30P} / 3 \mu V/m$$

Where P is EIRP in Watts

Therefore: -27dBm/MHz = 68.23dBμV/m



Electromagnetic Compatibility Criteria for Intentional Radiators – CM9

§ 15.407(b)(4): Harmonic Emissions Requirements – Radiated (802.11a) 16dBi Sector

| Frequency (MHz) | Receive Antenna Polarity (H/V) | Uncorrected Field strength (dBμV) @ 3m | Preamp (dB) | Antenna Factor (dB) | Cable Loss (dB) | Distance Correction Factor (dB) | Corrected Field Strength @ 3m (dBμV) | Limit @ 3m (dBμV) | Margin (dB) | Measurement Type |
|----------------------|--------------------------------|--|-------------|---------------------|-----------------|---------------------------------|--------------------------------------|-------------------|-------------|------------------|
| 11490 | V | 43.5 | 34.7 | 39 | 9.4 | 0 | 57.2 | 74 | -16.8 | pk |
| 11490 | V | 31.2 | 34.7 | 39 | 9.4 | 0 | 44.9 | 54 | -9.1 | avg |
| 17235 | V | 40.2 | 33.0 | 44.5 | 11.8 | 0 | 63.5 | 74 | -10.5 | pk |
| Low Channel 5745MHz | | | | | | | | | | |
| Frequency (MHz) | Receive Antenna Polarity (H/V) | Uncorrected Field strength (dBμV) @ 3m | Preamp (dB) | Antenna Factor (dB) | Cable Loss (dB) | Distance Correction Factor (dB) | Corrected Field Strength @ 3m (dBμV) | Limit @ 3m (dBμV) | Margin (dB) | Measurement Type |
| 11530 | V | 42.7 | 34.7 | 39 | 9.4 | 0 | 56.4 | 74 | -17.6 | pk |
| 11530 | V | 30.6 | 34.7 | 39 | 9.4 | 0 | 44.3 | 54 | -9.7 | avg |
| 17295 | V | 40.9 | 33.0 | 44.5 | 11.8 | 0 | 64.2 | 74 | -9.8 | pk |
| Mid Channel 5765MHz | | | | | | | | | | |
| Frequency (MHz) | Receive Antenna Polarity (H/V) | Uncorrected Field strength (dBμV) @ 3m | Preamp (dB) | Antenna Factor (dB) | Cable Loss (dB) | Distance Correction Factor (dB) | Corrected Field Strength @ 3m (dBμV) | Limit @ 3m (dBμV) | Margin (dB) | Measurement Type |
| 11610 | V | 40.9 | 34.7 | 39 | 9.4 | 0 | 54.6 | 74 | -19.4 | pk |
| 11610 | V | 30.9 | 34.7 | 39 | 9.4 | 0 | 44.6 | 54 | -9.4 | avg |
| 17415 | V | 43.2 | 33.0 | 44.5 | 11.8 | 0 | 66.5 | 74 | -7.5 | pk |
| High Channel 5805MHz | | | | | | | | | | |

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

Note 2: The emissions listed in this table verify the EUT is compliant with the -27dBm/MHz EIRP limit (68.23dBμV/m) for out of band emissions, see equation below. All peak emissions are less than 68.23dBμV/m.

$$E = 1000000 \times \sqrt{30P} / 3 \mu\text{V/m}$$

Where P is EIRP in Watts

Therefore: -27dBm/MHz = 68.23dBμV/m



Electromagnetic Compatibility Criteria for Intentional Radiators – CM9

§ 15.407(b)(4): Harmonic Emissions Requirements – Radiated (802.11a) 19dBi Panel

| Frequency (MHz) | Receive Antenna Polarity (H/V) | Uncorrected Field strength (dBμV) @ 3m | Preamp (dB) | Antenna Factor (dB) | Cable Loss (dB) | Distance Correction Factor (dB) | Corrected Field Strength @ 3m (dBμV) | Limit @ 3m (dBμV) | Margin (dB) | Measurement Type |
|----------------------|--------------------------------|--|-------------|---------------------|-----------------|---------------------------------|--------------------------------------|-------------------|-------------|------------------|
| 11490 | V | 41.2 | 34.7 | 39 | 9.4 | 0 | 54.9 | 74 | -19.1 | pk |
| 11490 | V | 32.2 | 34.7 | 39 | 9.4 | 0 | 45.9 | 54 | -8.1 | avg |
| 17235 | V | 40.7 | 33.0 | 44.5 | 11.8 | 0 | 64.0 | 74 | -10.0 | pk |
| Low Channel 5745MHz | | | | | | | | | | |
| Frequency (MHz) | Receive Antenna Polarity (H/V) | Uncorrected Field strength (dBμV) @ 3m | Preamp (dB) | Antenna Factor (dB) | Cable Loss (dB) | Distance Correction Factor (dB) | Corrected Field Strength @ 3m (dBμV) | Limit @ 3m (dBμV) | Margin (dB) | Measurement Type |
| 11530 | V | 41.5 | 34.7 | 39 | 9.4 | 0 | 55.2 | 74 | -18.8 | pk |
| 11530 | V | 32.0 | 34.7 | 39 | 9.4 | 0 | 45.7 | 54 | -8.3 | avg |
| 17295 | V | 40.2 | 33.0 | 44.5 | 11.8 | 0 | 63.5 | 74 | -10.5 | pk |
| Mid Channel 5765MHz | | | | | | | | | | |
| Frequency (MHz) | Receive Antenna Polarity (H/V) | Uncorrected Field strength (dBμV) @ 3m | Preamp (dB) | Antenna Factor (dB) | Cable Loss (dB) | Distance Correction Factor (dB) | Corrected Field Strength @ 3m (dBμV) | Limit @ 3m (dBμV) | Margin (dB) | Measurement Type |
| 11610 | V | 42.0 | 34.7 | 39 | 9.4 | 0 | 55.7 | 74 | -18.3 | pk |
| 11610 | V | 32.6 | 34.7 | 39 | 9.4 | 0 | 46.3 | 54 | -7.7 | avg |
| 17415 | V | 42.2 | 33.0 | 44.5 | 11.8 | 0 | 65.5 | 74 | -8.5 | pk |
| High Channel 5805MHz | | | | | | | | | | |

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

Note 2: The emissions listed in this table verify the EUT is compliant with the -27dBm/MHz EIRP limit (68.23dBμV/m) for out of band emissions, see equation below. All peak emissions are less than 68.23dBμV/m.

$$E = 1000000 \times \sqrt{30P} / 3 \text{ } \mu\text{V/m}$$

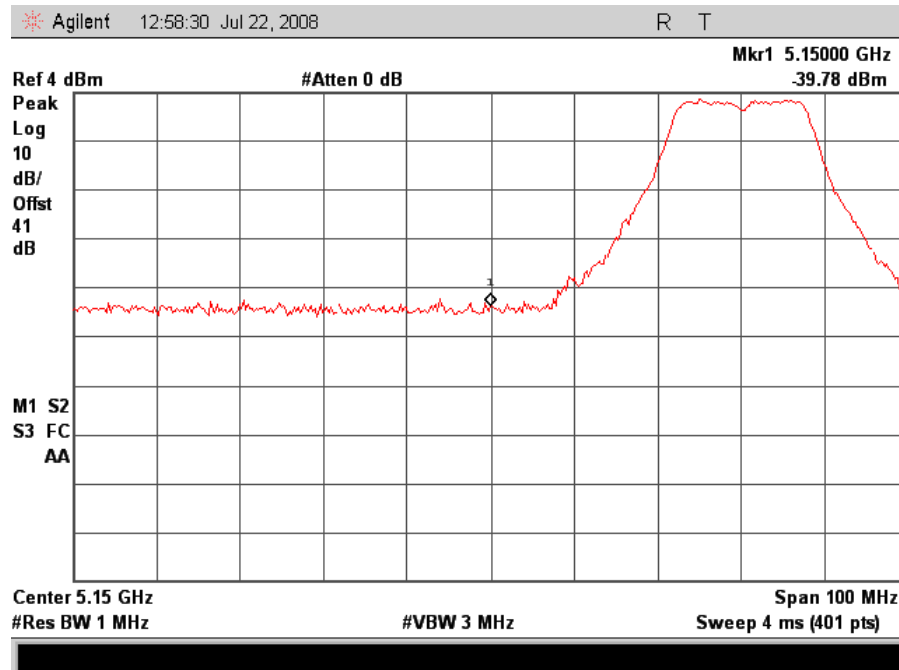
Where P is EIRP in Watts

Therefore: -27dBm/MHz = 68.23dBμV/m

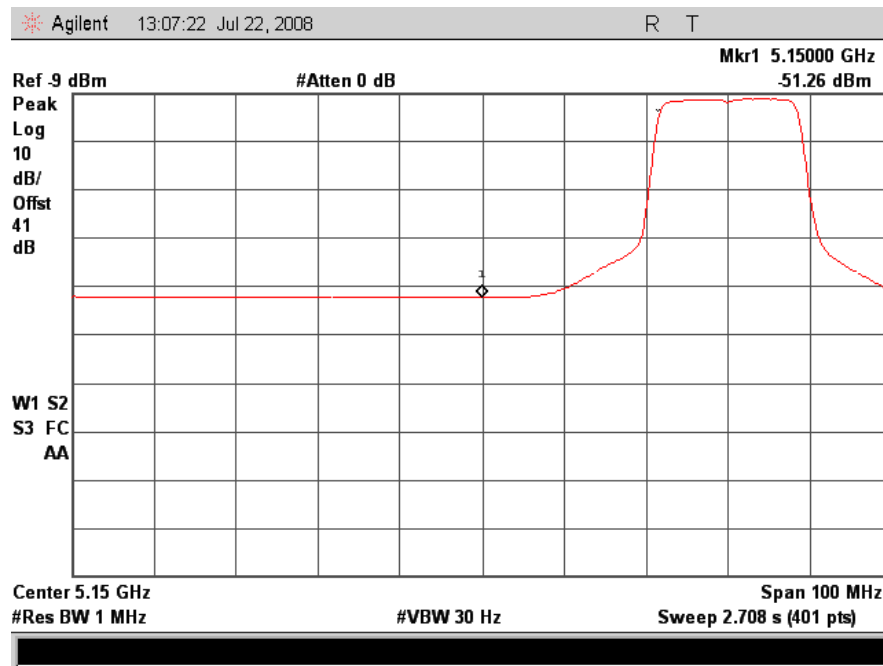


Electromagnetic Compatibility Criteria for Intentional Radiators – DCMA82

§ 15.407(b)(4): Harmonic Emissions Requirements – Radiated (802.11a) 7dBi Omni



Plot 5. Band Edge, Low Channel, Peak



Plot 6. Band Edge, Low Channel, Avg



Electromagnetic Compatibility Criteria for Intentional Radiators – DCMA82

§ 15.407(b)(4): Harmonic Emissions Requirements – Radiated (802.11a) 7dBi Omni

| Freq. (GHz) | Antenna Polarity (H/V) | Raw Amp. @ 1 m (dBm) | Raw Amp. @ 1m (dBuV) | Ant. Cor. Factor (dB/m) | Cable Loss (dB) | Distance Correction Factor (dB) | Corrected Field Strength (dBuV) | Limit @ 3 m (dBuV) |
|-------------|------------------------|----------------------|----------------------|-------------------------|-----------------|---------------------------------|---------------------------------|--------------------|
| 5.150 | V | -39.78 | 55.46 | 0 | 0 | 9.54 | 45.92 | 74 |
| 5.150 | V | -51.26 | 43.98 | 0 | 0 | 9.54 | 34.44 | 54 |

| Freq. (GHz) | Antenna Polarity (H/V) | Raw Amp. @ 1 m (dBm) | Ant. Cor. Factor (dB/m) | Cable Loss (dB) | Distance Correction Factor (dB) | Corrected Field Strength (dBm) | Limit @ 3 m (dBm) |
|-------------|------------------------|----------------------|-------------------------|-----------------|---------------------------------|--------------------------------|-------------------|
| 5.150 | V | -39.78 | 0 | 0 | 9.54 | -49.32 | -27 |

Note: Antenna factor and cable loss are counted as zero since they were put in as an offset.



Electromagnetic Compatibility Criteria for Intentional Radiators – DCMA82

| Freq. (GHz) | Antenna Polarity (H/V) | Raw Amp. @ 3 m (Peak) / (Avg) | P.Amp (dB) | Ant. Cor. Factor (dB/m) | Cable Loss (dB) | EUT Field Strength Final Amp. (dBuV/m) | Limit Detector Peak / Avg (Peak) / (Avg) | Limit @ 3 m (dBuV/m) | Delta (dB) |
|-------------|------------------------|-------------------------------|------------|-------------------------|-----------------|--|--|----------------------|------------|
| 10.48 | V | 44.56 | 35.23 | 38.20 | 11.24 | 58.77 | Peak | 74 | -15.23 |
| 10.48 | V | 32.72 | 35.23 | 38.20 | 11.24 | 46.93 | Avg | 54 | -7.07 |
| 15.72 | V | 45.09 | 34.92 | 37.59 | 15.13 | 62.88 | Peak | 74 | -11.12 |
| 15.72 | V | 32.79 | 34.92 | 37.59 | 15.13 | 50.58 | Avg | 54 | -3.42 |

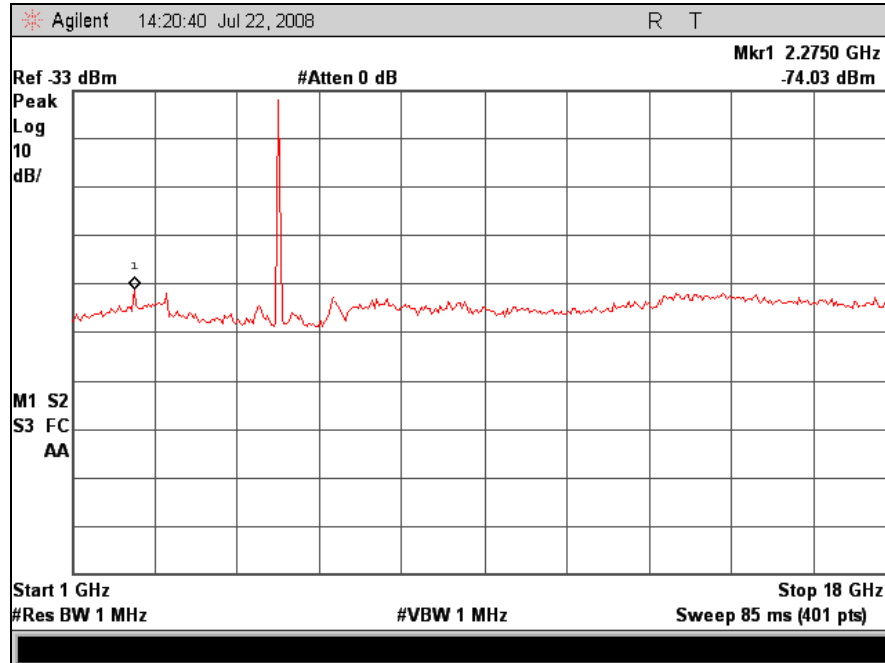
Table 12. Radiated Harmonics, High Channel

| Freq. (GHz) | Antenna Polarity (H/V) | Raw Amp. @ 3 m (Peak) / (Avg) | P.Amp (dB) | Ant. Cor. Factor (dB/m) | Cable Loss (dB) | EUT Field Strength Final Amp. (dBuV/m) | Limit Detector Peak / Avg (Peak) / (Avg) | Limit @ 3 m (dBuV/m) | Delta (dB) |
|-------------|------------------------|-------------------------------|------------|-------------------------|-----------------|--|--|----------------------|------------|
| 10.36 | V | 44.74 | 35.34 | 38.22 | 11.23 | 58.86 | Peak | 74 | -15.14 |
| 10.36 | V | 32.59 | 35.34 | 38.22 | 11.23 | 46.71 | Avg | 54 | -7.29 |
| 15.54 | V | 44.98 | 34.83 | 37.89 | 15.41 | 63.45 | Peak | 74 | -10.55 |
| 15.54 | V | 32.68 | 34.83 | 37.89 | 15.41 | 51.15 | Avg | 54 | -2.85 |

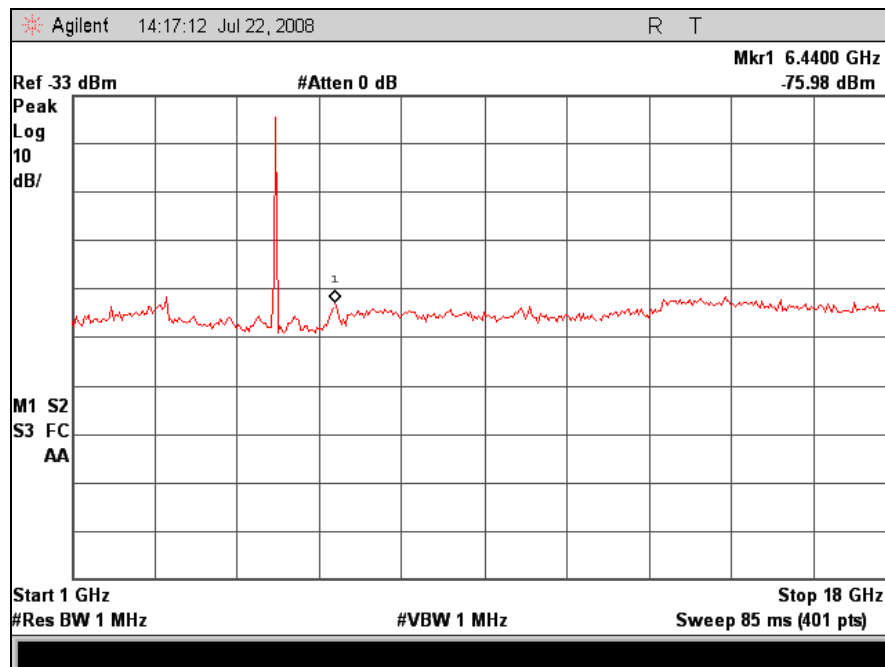
Table 13. Radiated Harmonics, Low Channel



Electromagnetic Compatibility Criteria for Intentional Radiators

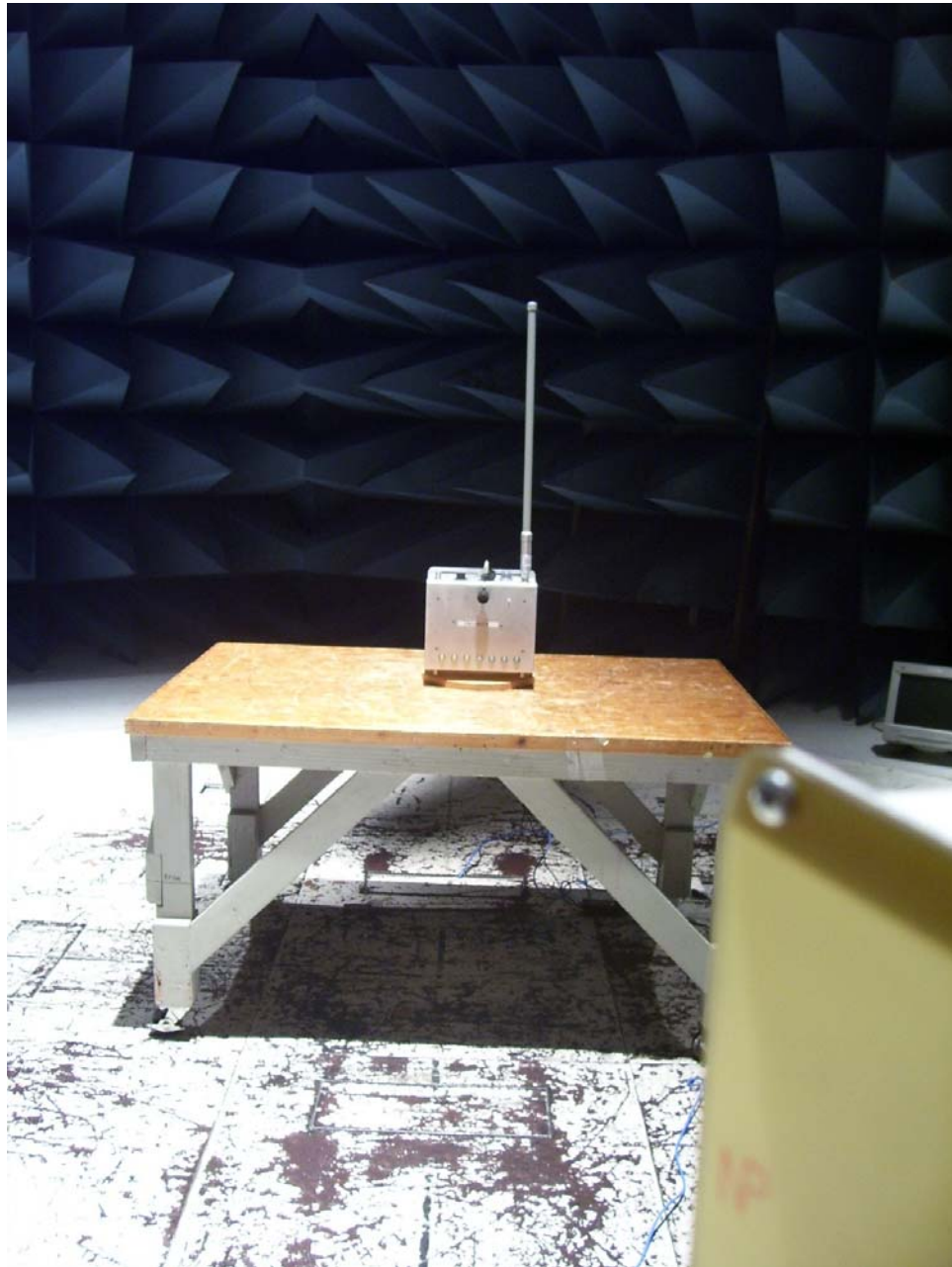


Plot 7. Radiated Emissions, High Channel, 1 – 18 GHz



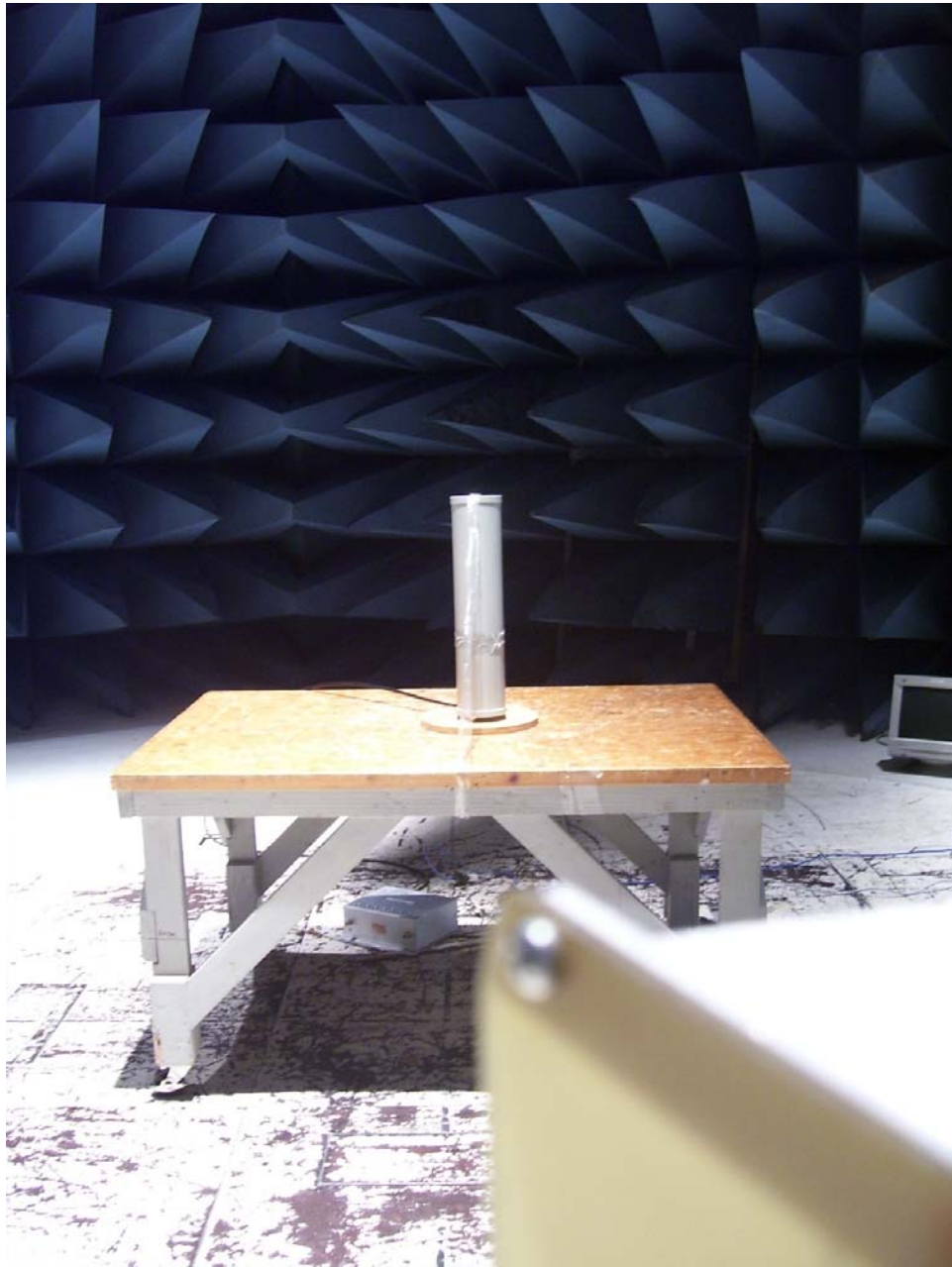
Plot 8. Radiated Emissions, Low Channel, 1 – 18 GHz

Radiated Emissions Test Setup Photographs



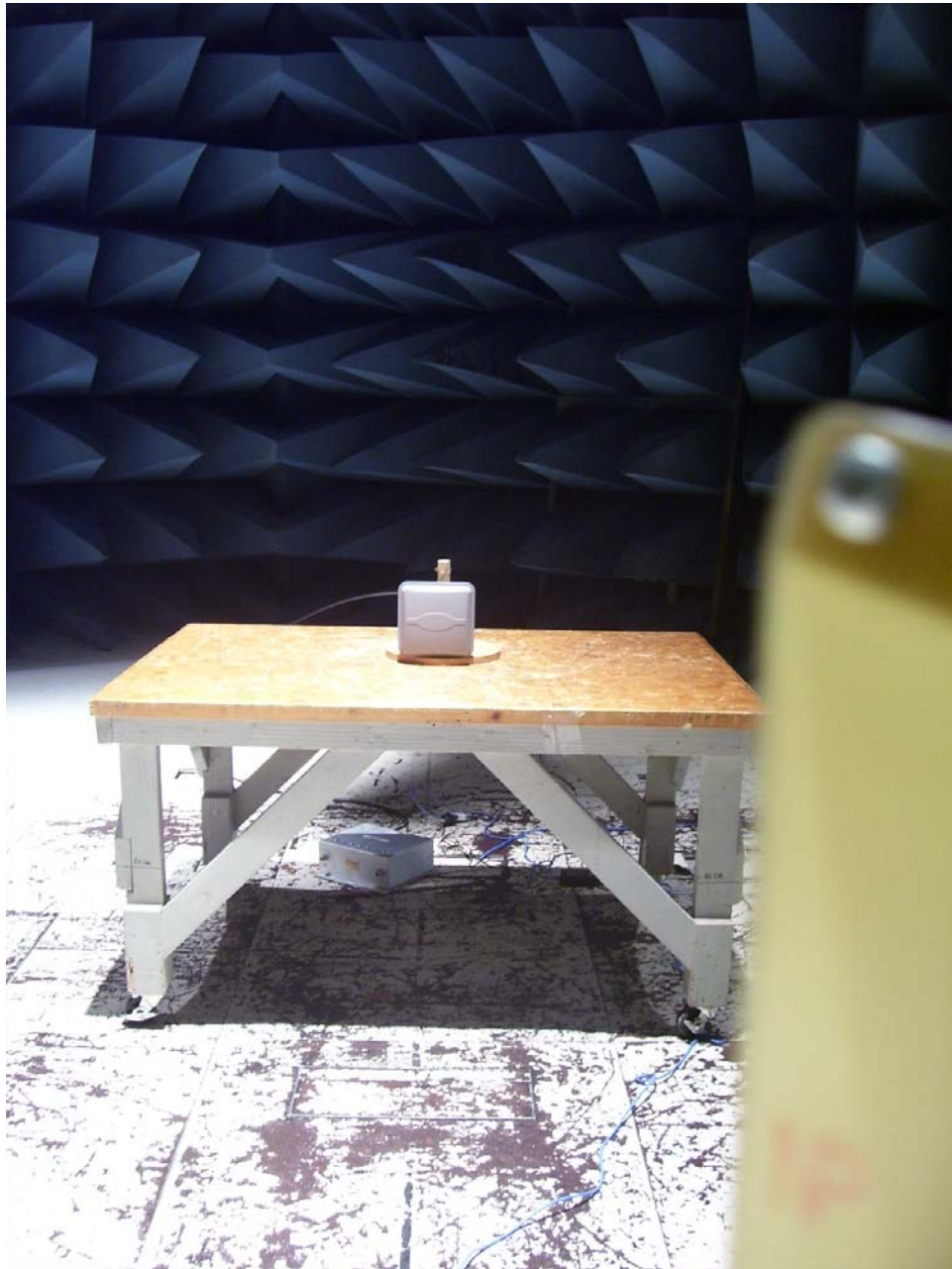
Photograph 3. Test Equipment and setup for various Radiated Measurements – 7dBi

Radiated Emissions Test Setup Photographs



Photograph 4. Test Equipment and setup for various Radiated Measurements – 16dBi

Radiated Emissions Test Setup Photographs

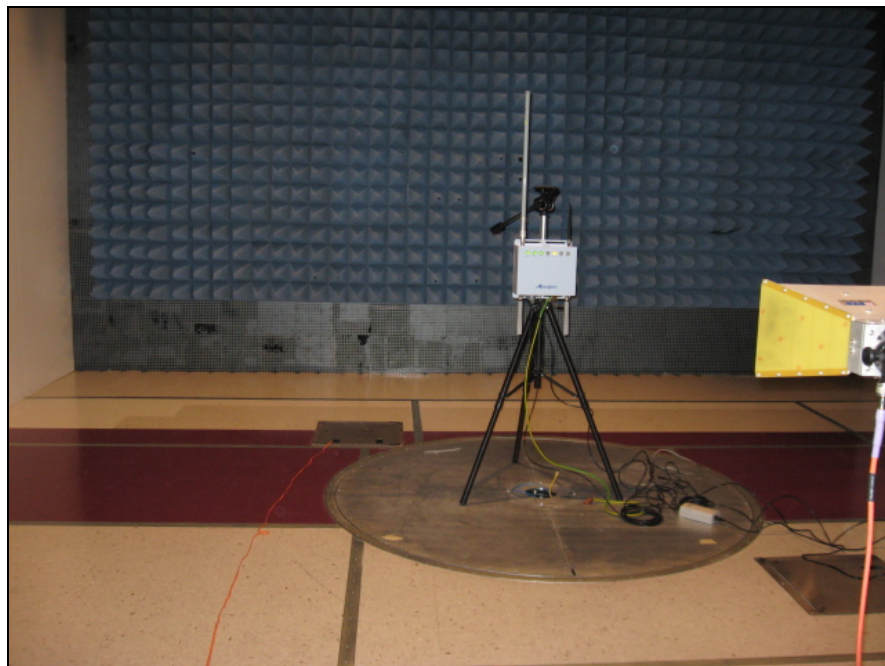


Photograph 5. Test Equipment and setup for various Radiated Measurements – 19dBi

Radiated Emissions Test Setup Photographs



Photograph 6. Test Equipment and setup for various Radiated Measurements, 1m Distance Setup



Photograph 7. Test Equipment and setup for various Radiated Measurements, 3m Distance Setup



Apprion, Inc.
IONizer (Wireless Access Point)

Electromagnetic Compatibility
Test Equipment
CFR Title 47, Part 15, Subpart E; Industry Canada RSS-210

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.

| MET Asset # | Equipment | Manufacturer | Model | Last Cal Date | Cal Due Date |
|-------------|---------------------------------|-----------------|-----------|---------------|--------------|
| 1S2421 | EMI RECEIVER | ROHDE&SCHWARZ | ESIB 7 | 03/27/2007 | 03/27/2008 |
| 1S2184 | BILOG ANTENNA | CHASE | CBL6112A | 01/03/2007 | 01/03/2008 |
| 1S2121 | PRE-AMPLIFIER | HEWLETT PACKARD | 8449B | 11/28/2006 | 11/28/2007 |
| 1S2198 | ANTENNA, HORN | EMCO | 3115 | 08/17/2006 | 08/17/2007 |
| 1S2202 | ANTENNA, HORN, 1 METER | EMCO | 3116 | 04/10/2007 | 04/10/2010 |
| N/A | HIGH PASS FILTER | MICRO-TRONICS | HPM13146 | SEE NOTE | |
| 1S2263 | CHAMBER, 10 METER | RANTEC | N2-14 | 8/15/2006 | 8/15/2007 |
| 1S2430 | WIDEBAND POWER METER | ANRITSU COMPANY | ML2488A | 03/12/2007 | 03/12/2008 |
| 1S2432 | WIDEBAND POWER SENSOR | ANRITSU COMPANY | MA2491A | 03/12/2007 | 03/12/2008 |
| 1S2460 | Analyzer, Spectrum 9 kHz-40GHz | Agilent | E4407B | 07/06/2005 | 07/06/2008 |
| 1S2034 | COUPLER, DIRECTIONAL 1-20 GHz | KRYTAR | 101020020 | SEE NOTE | |
| 1S2041 | COUPLER, BI DIRECTIONAL COAXIAL | NARDA | N/A | SEE NOTE | |
| 1S2128 | Harmonic Mixer | Hewlett Packard | 11970A | 10/26/2006 | 10/26/2008 |
| 1S2129 | Harmonic Mixer | Hewlett Packard | 11970K | 10/26/2006 | 10/26/2008 |

Table 14. Test Equipment List – 2007



Apprion, Inc.
IONizer (Wireless Access Point)

Electromagnetic Compatibility
Test Equipment
CFR Title 47, Part 15, Subpart E; Industry Canada RSS-210

| MET Asset # | Equipment | Manufacturer | Model | Last Cal Date | Cal Due Date |
|-------------|-------------------|-------------------|-----------------------|---------------|--------------|
| 1S2438 | TRANSIENT LIMITER | AGILENT | 11947A | 10/25/07 | 10/25/08 |
| 1S2198 | HORN ANTENNA | EMCO | 3115 | 8/31/07 | 8/31/08 |
| 1S2121 | PREAMP | HEWLETT PACKARD | 8449B | 10/26/08 | 10/26/09 |
| 1S2460 | SPECTRUM ANALYZER | AGILENT | E4407B | 3/23/08 | 3/23/09 |
| 1S2501 | EMI TEST RECEIVER | ROHDE & SCHWARZ | ESU 40 | 4/8/08 | 4/8/09 |
| 1S2507 | AC LISN | SOLAR ELECTRONICS | TYPE 9252-50-R-24-BNC | 4/22/08 | 4/22/09 |
| 1S2482 | 5M CHAMBER | PANASHIELD | N/A | 11/18/07 | 11/18/08 |

Table 15. Test Equipment – July 2008

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.



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.



Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

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



Certification & User's Manual Information

Label and User's Manual Information

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

§ 15.19 Labeling requirements.

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

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

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

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

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

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

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

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

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

§ 15.21 Information to user.

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



Verification & User's Manual Information

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

§ 15.105 Information to the user.

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

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

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



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Electromagnetic Compatibility
End of Report
CFR Title 47, Part 15, Subpart E; Industry Canada RSS-210

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