MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
914 WEST PATAPSCO AVENUE ● BALTIMORE, MARYLAND 21230-3432 ● PHONE (410) 354-3300 ● FAX (410) 354-3313
33439 WESTERN AVENUE ● UNION CITY, CALIFORNIA 94587 ● PHONE (510) 489-6300 ● FAX (510) 489-6372
3162 BELICK STREET ● SANTA CLARA, CALIFORNIA 95054 ● PHONE (408 748-3585 ● FAX (510) 489-6372

March 23, 2011

Electronic Systems Technology
415 North Quay St.
Kennewick, WA 99336

Dear Brent Strecker,

Enclosed is the EMC Wireless test report for compliance testing of the Electronic Systems Technology, ESTeem 195Ed as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Part 15, Subpart B, ICES-003, Issue 4 February 2004 for a Class A Digital Device and FCC Part 15 Subpart C, RSS-210, Issue 8, Dec. 2010 for Intentional Radiators.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,
MET LABORATORIES, INC.

Jennifer Warnell
Documentation Department

Reference: (\Electronic Systems Technology\EMCS82909-FCC247 Rev. 4)

Electromagnetic Compatibility Criteria
Test Report

for the

Electronic Systems Technology
ESTeem 195Ed

Tested under
the FCC Certification Rules
contained in
Title 47 of the CFR, Parts 15 Subpart B & ICES-003
for Class A Digital Devices
&
15.247 Subpart C & RSS-210, Issue 8, Dec. 2010
for Intentional Radiators

MET Report: EMCS82909-FCC247 Rev. 4

March 23, 2011

Prepared For:

Electronic Systems Technology
415 North Quay St.
Kennewick, WA 99336

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

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for Intentional Radiators

Minh Ly, Project Engineer
Electromagnetic Compatibility Lab

Jennifer Warnell
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules Parts 15B, 15.247 and Industry Canada standards ICES-003, Issue 4 February 2004, RSS-210, Issue 8, Dec. 2010 under normal use and maintenance.

Shawn McMillen,
Wireless Manager, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	February 15, 2011	Initial Issue.
1	February 16, 2011	Revised to add ICES-003 to Radiated Emissions section.
2	March 2, 2011	Revised per engineer corrections
3	March 10, 2011	Revised to add Conducted Output Power test results.
4	March 23, 2011	Revised to reflect engineer corrections.

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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
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**ert**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
µH	**microh**enry
µ	**microf**arad
µs	**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

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Electronic Systems Technology ESTeem 195Ed, with the requirements of Part 15, §15.247. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the ESTeem 195Ed. Electronic Systems Technology should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the ESTeem 195Ed, has been **permanently** discontinued.

B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, §15.247, in accordance with Electronic Systems Technology, purchase order number 1471. All tests were conducted using measurement procedure ANSI C63.4-2003.

FCC Reference 47 CFR Part 15.247:2005	IC Reference RSS-210 Issue 8: 2010	Description	Compliance
47 CFR Part 15.107 (a)	ICES-003 Issue 4 February 2004	Conducted Emission Limits for a Class A Digital Device	Compliant
47 CFR Part 15.109 (a)	ICES-003 Issue 4 February 2004	Radiated Emission Limits for a Class A Digital Device	Compliant
Title 47 of the CFR, Part 15 §15.203	N/A	Antenna Requirement	Compliant
Title 47 of the CFR, Part 15 §15.207(a)	RSS-210(7.2.2)	Conducted Emission Limits	Compliant
Title 47 of the CFR, Part 15 §15.247(a)(2)	RSS-Gen(4.6)	6dB Occupied Bandwidth	Refer to FCC ID: XQBFLR9G30 IC: 7503B-FLR9G30
		99% Occupied Bandwidth	Refer to FCC ID: XQBFLR9G30 IC: 7503B-FLR9G30
Title 47 of the CFR, Part 15 §15.247(b)	RSS-210(A8.4)	Peak Power Output	Refer to FCC ID: XQBFLR9G30 IC: 7503B-FLR9G30
Title 47 of the CFR, Part 15 §15.247(d); §15.209; §15.205	RSS-210(A8.5)	Radiated Spurious Emissions	Compliant
Title 47 of the CFR, Part 15 §15.247(d)	RSS-210(A8.5)	RF Conducted Spurious Emissions Requirements	Refer to FCC ID: XQBFLR9G30 IC: 7503B-FLR9G30
Title 47 of the CFR, Part 15 §15.247(d)	RSS-210(A8.5)	RF Conducted Band Edge	Refer to FCC ID: XQBFLR9G30 IC: 7503B-FLR9G30
Title 47 of the CFR, Part 15; §15.247(e)	RSS-210(A8.3)	Peak Power Spectral Density	Refer to FCC ID: XQBFLR9G30 IC: 7503B-FLR9G30
Title 47 of the CFR, Part 15 §15.247(i)	RSS-Gen(5.5)	Maximum Permissible Exposure (MPE)	Compliant
N/A	RSS-Gen(4.8)	Receiver Spurious Emissions	Refer to FCC ID: XQBFLR9G30 IC: 7503B-FLR9G30

Table 1. Executive Summary of EMC Part 15.247 ComplianceTesting

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Electronic Systems Technology to perform testing on the ESTeem 195Ed, under Electronic Systems Technology's purchase order number 1471.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Electronic Systems Technology, ESTeem 195Ed.

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

Model(s) Tested:	ESTeem 195Ed	
Model(s) Covered:	ESTeem 195Ed	
EUT Specifications:	Primary Power: 12 VDC	
	FCC ID: ENPESTEEM195ED-1 IC: 1457A-195ED1	
	Type of Modulations:	DSSS and OFDM
	Equipment Code:	DTS
	EUT Frequency Ranges:	907 – 922 MHz 917 – 922 MHz
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:	Minh Ly	
Report Date(s):	February 15, 2011	

Table 2. EUT Summary Table

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 8, Dec. 2010	Low-power Licence-exempt Radiocommunications Devices (All Frequency Bands): Category I Equipment
CFR 47, Part 15, Subpart B	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
ICES-003, Issue 4 February 2004	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
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
ANSI C63.10-2009	American National Standard for Testing Unlicensed Wireless Devices

Table 3. References

C. Test Site

All testing was performed at MET Laboratories, Inc., 3162 Belick St., Santa Clara, CA 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 5 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 Electronic Systems Technology ESTeem 195Ed, Equipment Under Test (EUT), is a fully functional wireless LAN transceiver operating in the 902-928 MHz band. The unit is typically used in law enforcement or industrial applications

Photograph 1. Electronic Systems Technology ESTeem 195Ed

E. Equipment Configuration

Name / Description	Model Number	Serial Number
ESTeem 900 MHz Modem	195Ed	E-17697

Table 4. Equipment Configuration

F. Support Equipment

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

Name / Description	Manufacturer	Model Number	Serial Number
POE	ITE	AA175/PW130	RB4800N01
AC Adapter	ITE	AA174/A3-60S12R-U	R00071200263
Serial Cable	ESTeem	AA0621.1	N/A
Ethernet Cable	ESTeem	AA09.2	N/A

Table 5. Support Equipment

G. Mode of Operation

There are 4 channels; 907, 912, 917, and 922 MHz. These four channels are programmable to use 5MHz and 10MHz bandwidths. Only channels 912 and 917MHz can use 20MHz bandwidths.

H. Method of Monitoring EUT Operation

RF energy will be present on the RF port when the Tx LED is illuminated.

I. 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.

J. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Electronic Systems Technology upon completion of testing.

III. Electromagnetic Compatibility Criteria for Unintentional Radiators

Electromagnetic Compatibility Criteria

§ 15.107 Conducted Emissions Limits

Test Requirement(s):

15.107 (a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 6. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

15.107 (b) For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 6. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals. The lower limit applies at the band edges.

15.207(a), Except as shown in paragraphs (b) and (c) of this section*, charging, AC adapters or battery eliminators the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the Table 6, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency range (MHz)	Class A Conducted Limits (dBμV)		*Class B Conducted Limits (dBμV)	
	Quasi-Peak	Average	Quasi-Peak	Average
* 0.15- 0.45	79	66	66 - 56	56 - 46
0.45 - 0.5	79	66	56	46
0.5 - 30	73	60	60	50
Note 1 — The lower limit shall apply at the transition frequencies. Note 2 — The limit decreases linearly with the logarithm if the frequency in the range 0.15 MHz to 0.5 MHz. * -- Limits per Subsection 15.207(a).				

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

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

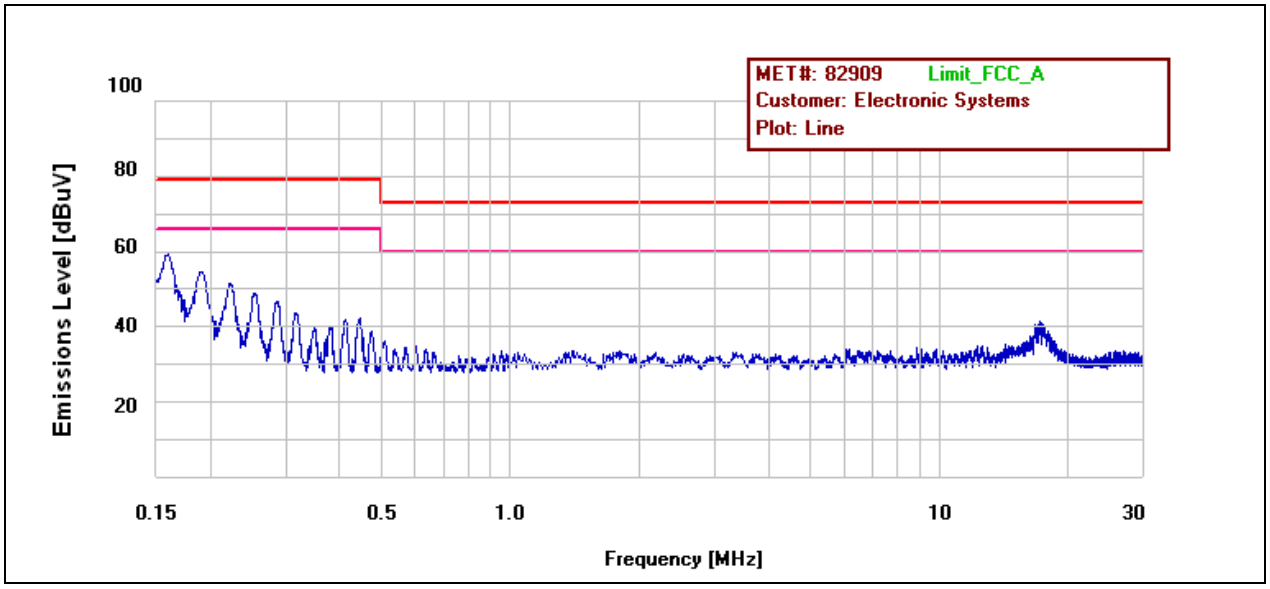
Test Engineer(s): Jia Li

Test Date(s): 12/27/10

Conducted Emissions - Voltage, Phase Line, AC Power, (12 VDC)

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Line	0.1583	57.64	79	-21.36	Pass	41.66	66	-24.34	Pass
Line	0.2207	49.4	79	-29.6	Pass	34.32	66	-31.68	Pass
Line	0.2847	44.35	79	-34.65	Pass	32.94	66	-33.06	Pass
Line	0.3147	40.96	79	-38.04	Pass	30.95	66	-35.05	Pass
Line	0.4421	39.53	79	-39.47	Pass	36.32	66	-29.68	Pass
Line	17.2	34.19	73	-38.81	Pass	27.57	60	-32.43	Pass

Table 7. Conducted Emissions - Voltage, Phase Line, AC Power, (12 VDC)

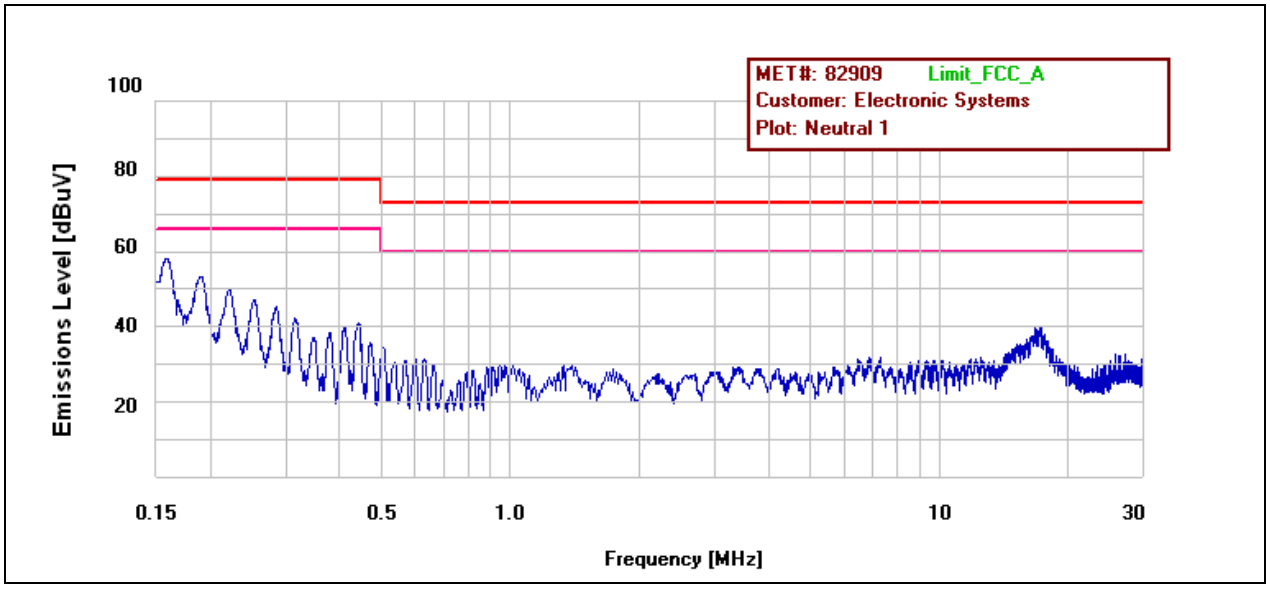


Plot 1. Conducted Emission, Phase Line Plot

Conducted Emissions - Voltage, AC Power, Neutral Line (12 VDC)

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Neutral	0.1573	57.22	79	-21.78	Pass	41.26	66	-24.74	Pass
Neutral	0.1886	52.61	79	-26.39	Pass	36.67	66	-29.33	Pass
Neutral	0.2197	48.86	79	-30.14	Pass	33.61	66	-32.39	Pass
Neutral	0.3119	39.43	79	-39.57	Pass	29.58	66	-36.42	Pass
Neutral	0.4405	39.74	79	-39.26	Pass	36.83	66	-29.17	Pass
Neutral	17.17	35.66	73	-37.34	Pass	28.88	60	-31.12	Pass

Table 8. Conducted Emissions - Voltage, AC Power, Neutral Line (12 VDC)

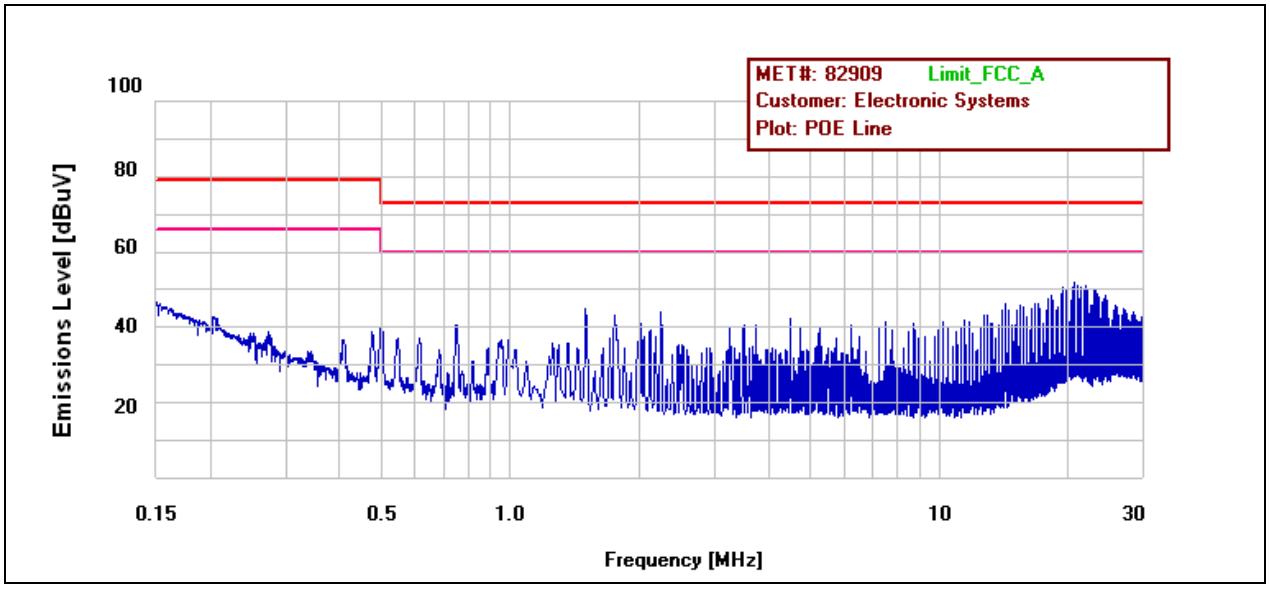


Plot 2. Conducted Emission, Neutral Line Plot

Conducted Emissions - Voltage, AC Power, POE Phase Line (12 VDC)

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
POE Line	0.1552	39.62	79	-39.38	Pass	17.7	66	-48.3	Pass
POE Line	0.7488	39.95	73	-33.05	Pass	38.29	60	-21.71	Pass
POE Line	1.498	44.55	73	-28.45	Pass	43.01	60	-16.99	Pass
POE Line	2.249	41.49	73	-31.51	Pass	38.13	60	-21.87	Pass
POE Line	4.498	34.95	73	-38.05	Pass	31.19	60	-28.81	Pass
POE Line	20.71	51.02	73	-21.98	Pass	49.67	60	-10.33	Pass

Table 9. Conducted Emissions - Voltage, AC Power, POE Phase Line (12 VDC)

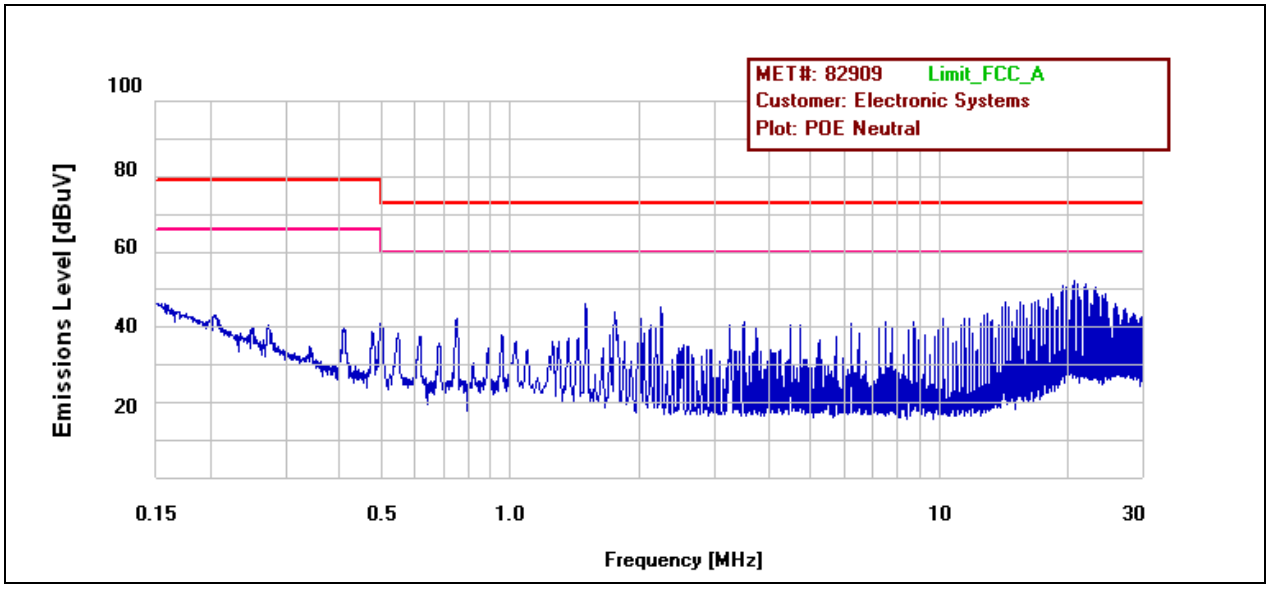


Plot 3. Conducted Emission, POE Phase Line Plot

Conducted Emissions - Voltage, AC Power, Neutral Line (12 VDC)

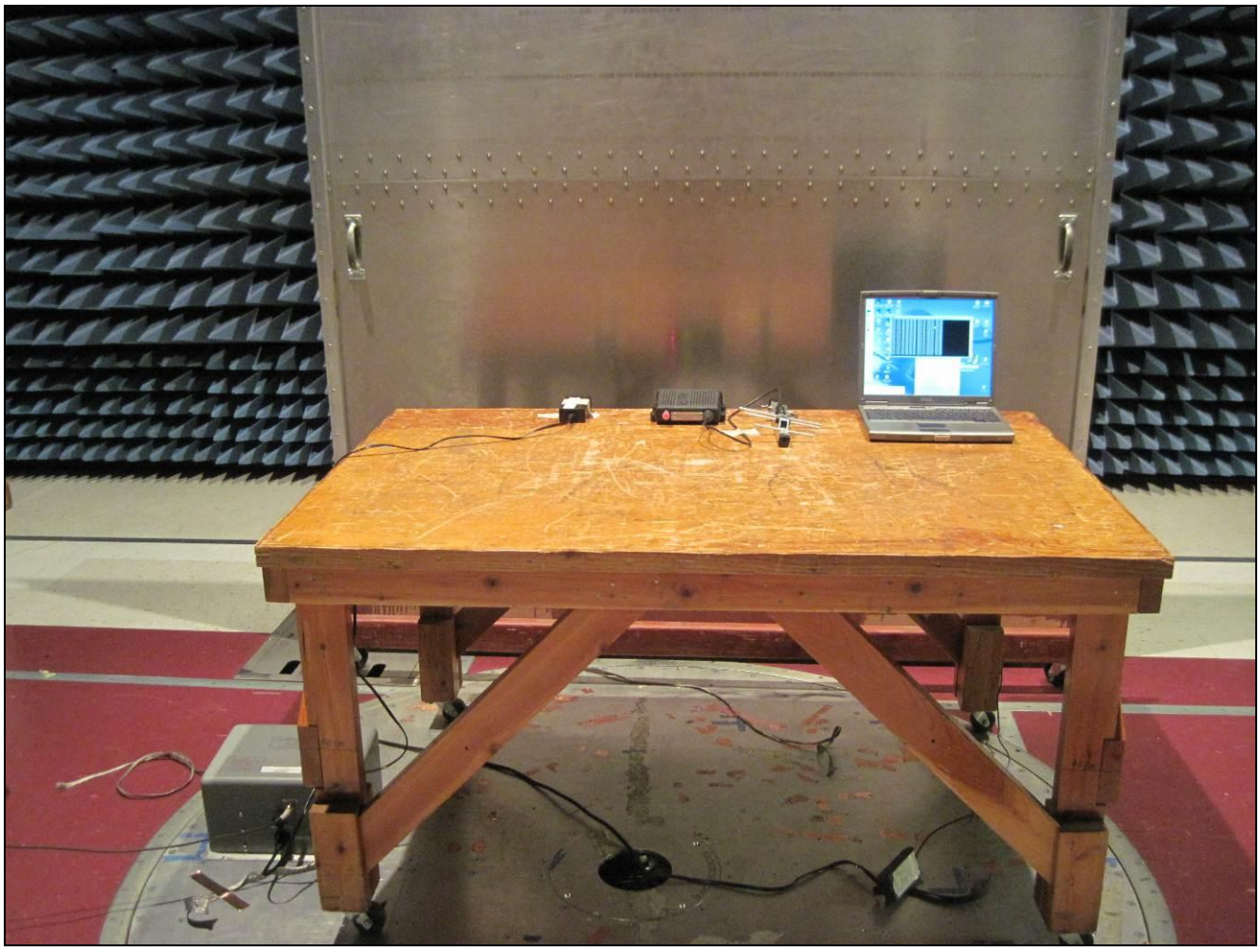
Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
POE Neutral	0.1518	40.72	79	-38.28	Pass	15.416	66	-50.584	Pass
POE Neutral	0.750	40.83	73	-32.17	Pass	38.48	60	-21.52	Pass
POE Neutral	1.498	45.49	73	-27.51	Pass	43.72	60	-16.28	Pass
POE Neutral	2.247	43.52	73	-29.48	Pass	41.18	60	-18.82	Pass
POE Neutral	6.239	40.59	73	-32.41	Pass	39.6	60	-20.4	Pass
POE Neutral	21.96	50.34	73	-22.66	Pass	48.23	60	-11.77	Pass

Table 10. Conducted Emissions - Voltage, AC Power, POE Neutral Line (12 VDC)



Plot 4. Conducted Emission, POE Neutral Line Plot

Conducted Emission Limits Test Setup



Photograph 2. Conducted Emissions, Test Setup

Radiated Emission Limits

§ 15.109 Radiated Emissions Limits

Test Requirement(s): **15.109 (a)** Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the Class B limits expressed in Table 11.

15.109 (b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the Class A limits expressed in Table 11.

Frequency (MHz)	Field Strength (dBµV/m)	
	§15.109 (b), Class A Limit (dBµV) @ 10m	§15.109 (a),Class B Limit (dBµV) @ 3m
30 - 88	39.00	40.00
88 - 216	43.50	43.50
216 - 960	46.40	46.00
Above 960	49.50	54.00

Table 11. Radiated Emissions Limits calculated from FCC Part 15, §15.109 (a) (b)

Test Procedures: The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. The method of testing and test conditions of ANSI C63.4 were used. An antenna was located 3m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

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

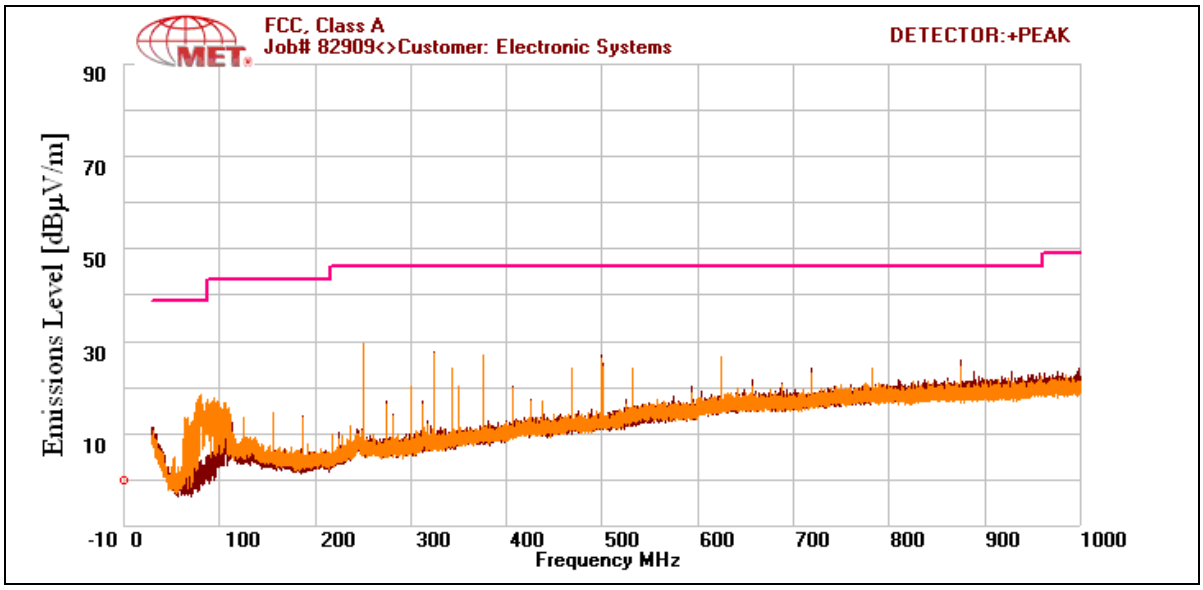
Test Engineer(s): Jia Li

Test Date(s): 12/27/10

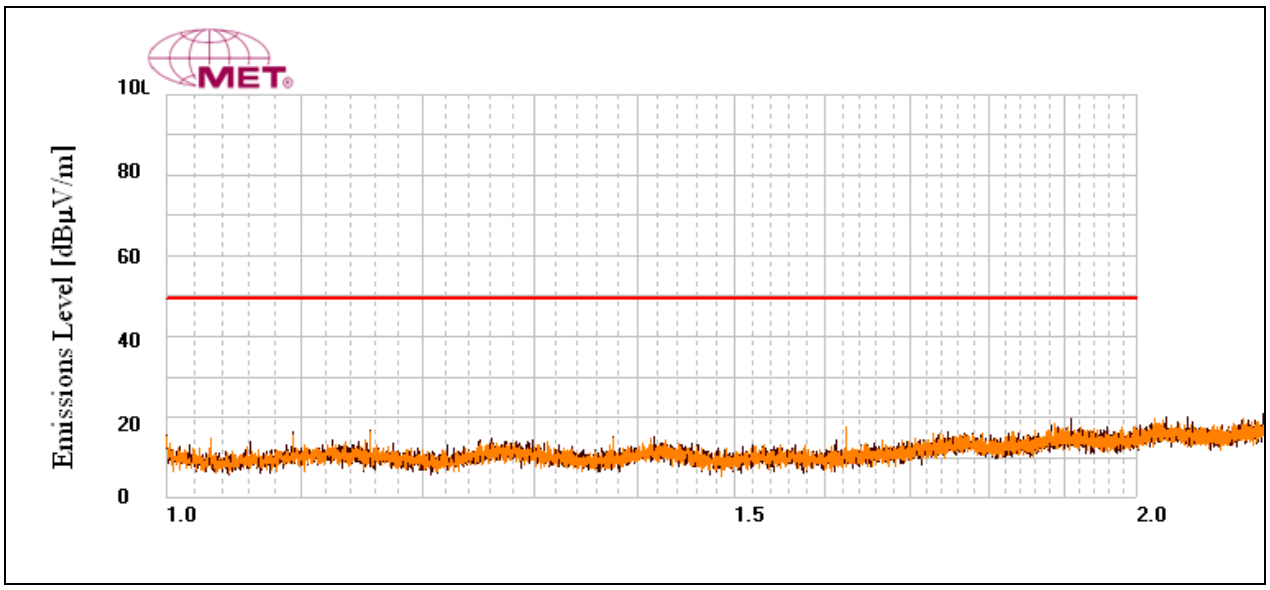
Radiated Emissions Limits Test Results, Class A

Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBuV)	ACF (dB/m)	Pre Amp Gain (dB)	CBL (dB)	DCF (dB)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
250	V	0	177.94	11.24	12.7	0	3.74	-10.46	17.22	46.4	-29.18
250	H	318	100	23.63	12.9	0	3.74	-10.46	29.81	46.4	-16.59
325	V	75	100	20.07	14.1	0	3.715	-10.46	27.425	46.4	-18.975
325	H	75	100	19.66	14.6	0	3.715	-10.46	27.515	46.4	-18.885
500	H	62	100	13.79	18	0	4.72	-10.46	26.05	46.4	-20.35
500	V	212	133.94	10.18	17.6	0	4.72	-10.46	22.04	46.4	-24.36

Table 12. Radiated Emissions Limits, Test Results, FCC Limits



Plot 5. Radiated Emissions, 30 MHz - 1 GHz, FCC Limits

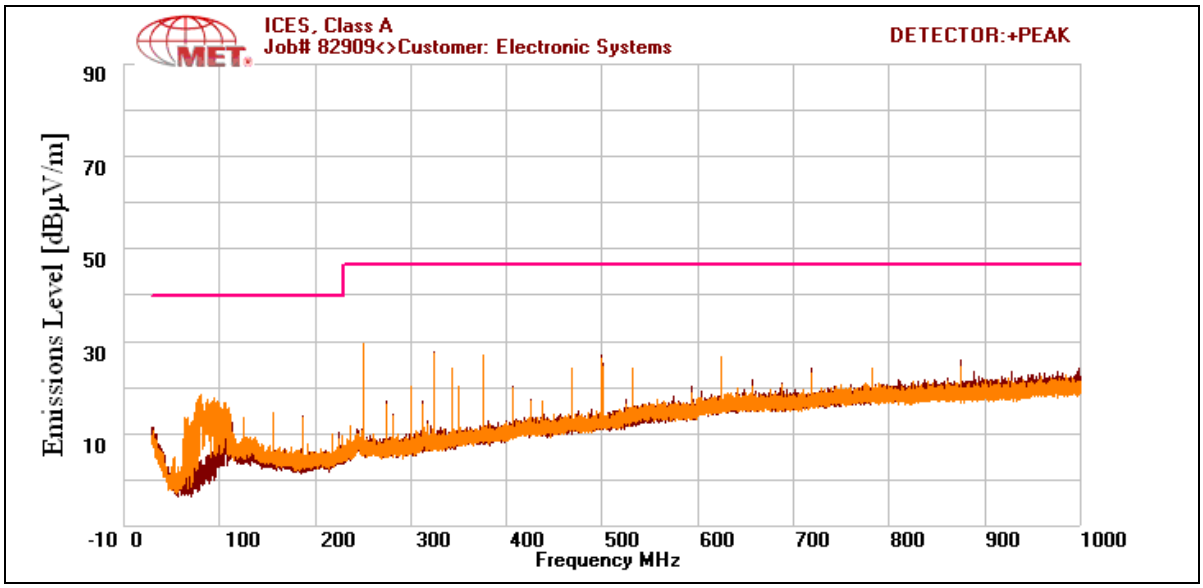


Plot 6. Radiated Emissions, Above 1 GHz, FCC Limits

Radiated Emissions Limits Test Results, Class A

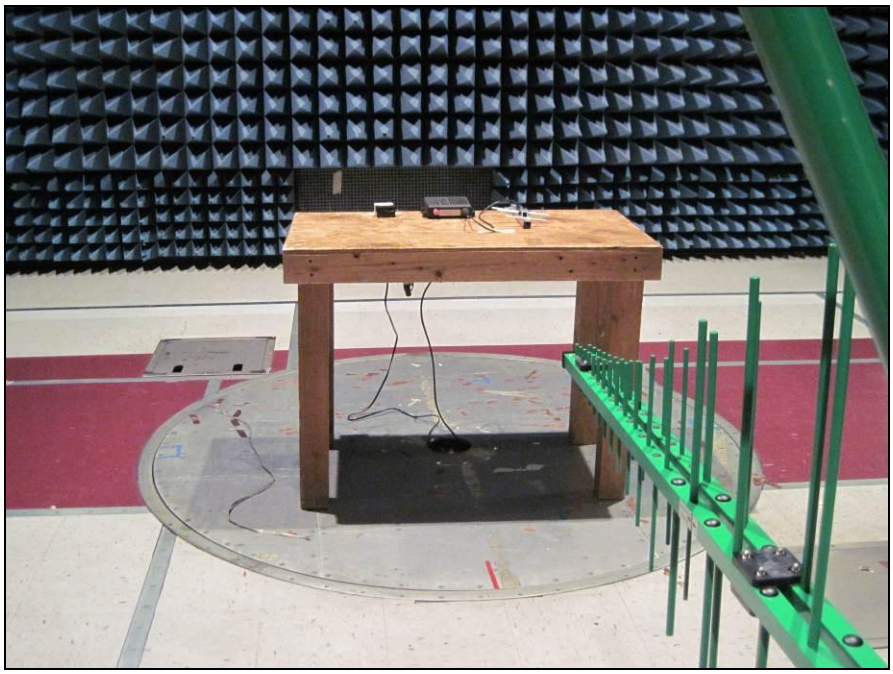
Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBuV)	ACF (dB/m)	Pre Amp Gain (dB)	CBL (dB)	DCF (dB)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
250	V	0	177.94	11.24	12.7	0	3.74	-10.46	17.22	47	-29.78
250	H	318	100	23.63	12.9	0	3.74	-10.46	29.81	47	-17.19
325	V	75	100	20.07	14.1	0	3.715	-10.46	27.425	47	-19.575
325	H	75	100	19.66	14.6	0	3.715	-10.46	27.515	47	-19.485
500	H	62	100	13.79	18	0	4.72	-10.46	26.05	47	-20.95
500	V	212	133.94	10.18	17.6	0	4.72	-10.46	22.04	47	-24.96

Table 13. Radiated Emissions Limits, Test Results, IC Limits



Plot 7. Radiated Emissions, 30 MHz - 1 GHz, IC Limits

Radiated Emission Limits Test Setup



Photograph 3. Radiated Emission, Test Setup, 30 MHz – 1 GHz

Photograph 4. Radiated Emission, Test Setup, 1 GHz – 2 GHz

IV. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

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

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

a.) Antenna must be permanently attached to the unit.

b.) Antenna must use a unique type of connector to attach to the EUT.

c.) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

Results: The EUT as tested meets the criteria of this rule by use of unique type connector to attach to the EUT. The EUT is therefore compliant with §15.203.

Test Engineer(s): Minh Ly

Test Date(s): 01/06/11

Antenna Description/ Gain	Manufacturer	Model Number
7dBi Omni	PCTel	MFB9155ROC
7dBi Yagi	Astron	918-3

Table 14. Antenna List

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.207(a) Conducted Emissions Limits

Test Requirement(s): **§ 15.207 (a):** For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 Ω 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 (dBμV)	
	Quasi-Peak	Average
* 0.15- 0.45	66 - 56	56 - 46
0.45 - 0.5	56	46
0.5 - 30	60	50

Table 15. 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 screen room. The EUT was situated such that the back of the EUT was 0.4 m from one wall of the vertical ground plane, and the remaining sides of the EUT were no closer than 0.8 m from any other conductive surface. The EUT was powered from a 50 Ω/50 μH 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 C63.4-2003 "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 μH LISN as the input transducer to an EMC/field intensity meter. For the purpose of this testing, the transmitter was turned on. Scans were performed with the transmitter on.

Test Results: The EUT was compliant with this requirement. Measured emissions were below applicable limits.

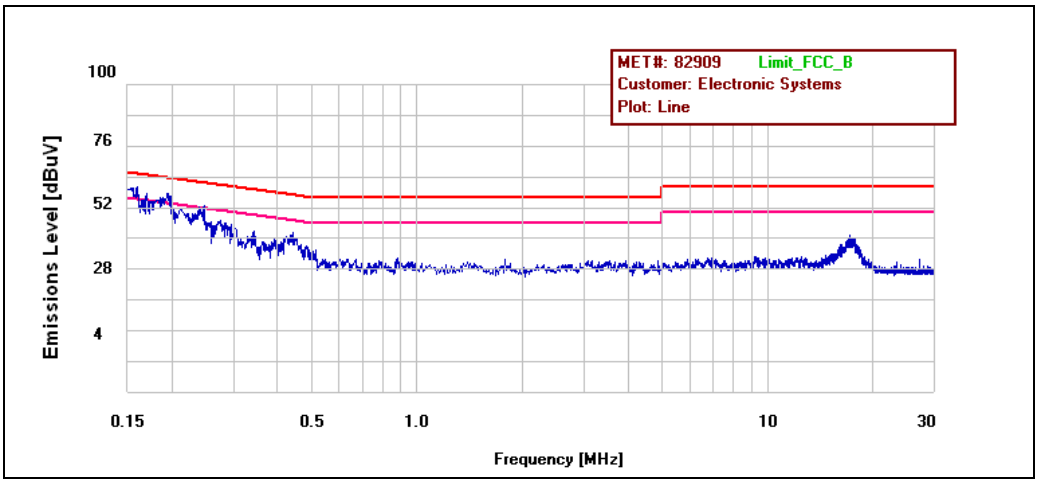
Test Engineer(s): Jia Li

Test Date(s): 01/06/11

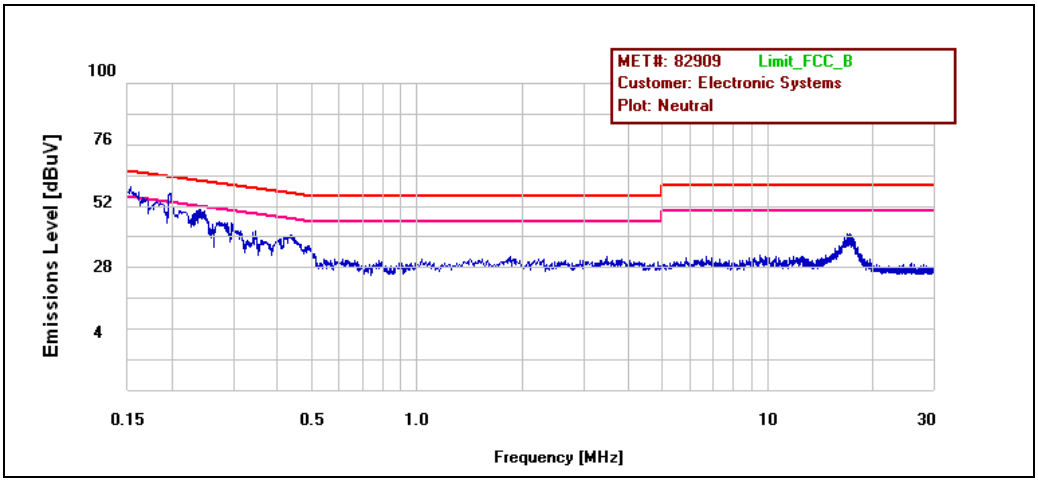
15.207(a) Conducted Emissions Test Results

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Line	0.1505	56.8	65.972	-9.172	Pass	40.81	55.972	-15.162	Pass
Line	0.1949	48.73	63.831	-15.101	Pass	24.43	53.831	-29.401	Pass
Line	0.244	46.93	61.97	-15.04	Pass	30.39	51.97	-21.58	Pass
Line	0.4401	36.37	57.084	-20.714	Pass	21.89	47.084	-25.194	Pass
Neutral	0.158.5	53.39	65.57	-12.18	Pass	34.67	55.57	-20.9	Pass
Neutral	0.1818	51.22	64.407	-13.187	Pass	34.8	54.407	-19.607	Pass
Neutral	0.2456	45.38	61.916	-16.536	Pass	28.86	51.916	-23.056	Pass

Table 16. Conducted Emissions, 15.207(a), Test Results



Plot 8. Conducted Emissions, 15.207(a), Phase Line

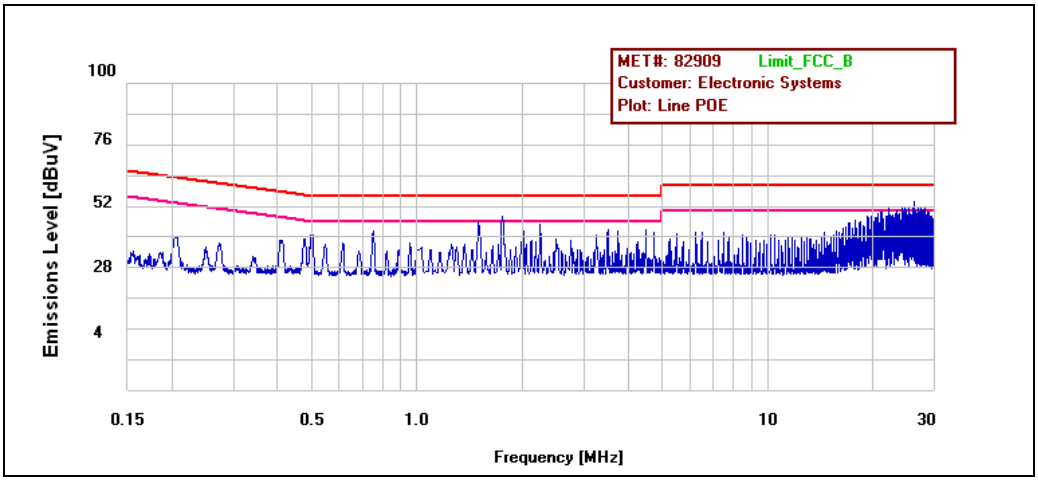


Plot 9. Conducted Emissions, 15.207(a), Neutral Line

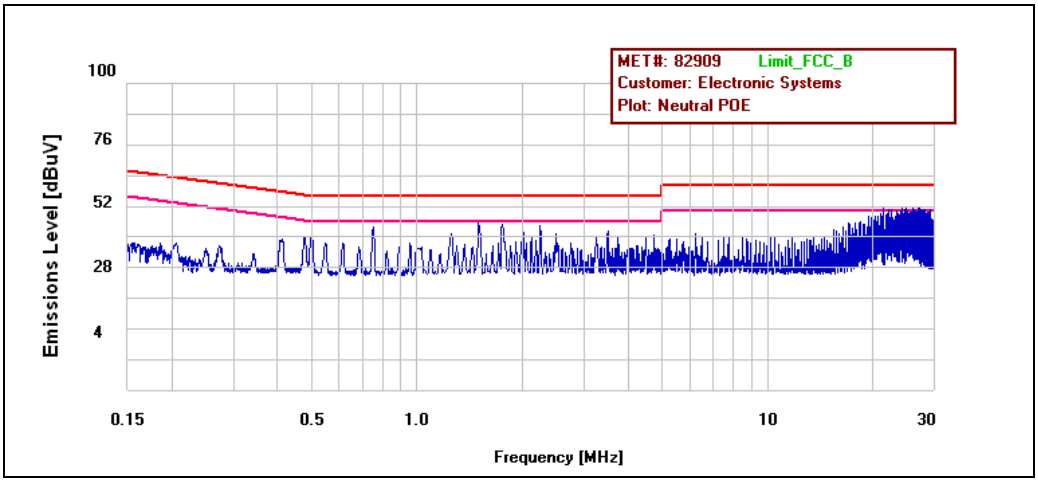
15.207(a) Conducted Emissions Test Results

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Line POE	1.747	44.9	56	-11.1	Pass	43.18	46	-2.82	Pass
Line POE	1.498	44.52	56	-11.48	Pass	42.39	46	-3.61	Pass
Line POE	2.248	41.71	56	-14.29	Pass	38.75	46	-7.25	Pass
Line POE	26.2	50.15	60	-9.85	Pass	46.42	50	-3.58	Pass
Neutral POE	0.748	40.13	56	-15.87	Pass	37.94	46	-8.06	Pass
Neutral POE	1.498	44.33	56	-11.67	Pass	42	46	-4	Pass
Neutral POE	1.747	44.42	56	-11.58	Pass	42.59	46	-3.41	Pass
Neutral POE	2.247	42.46	56	-13.54	Pass	40.04	46	-5.96	Pass
Neutral POE	21.96	46.24	60	-13.76	Pass	42.78	50	-7.22	Pass
Neutral POE	25.95	49.69	60	-10.31	Pass	46.46	50	-3.54	Pass

Table 17. Conducted Emissions, 15.207(a), POE, Test Results

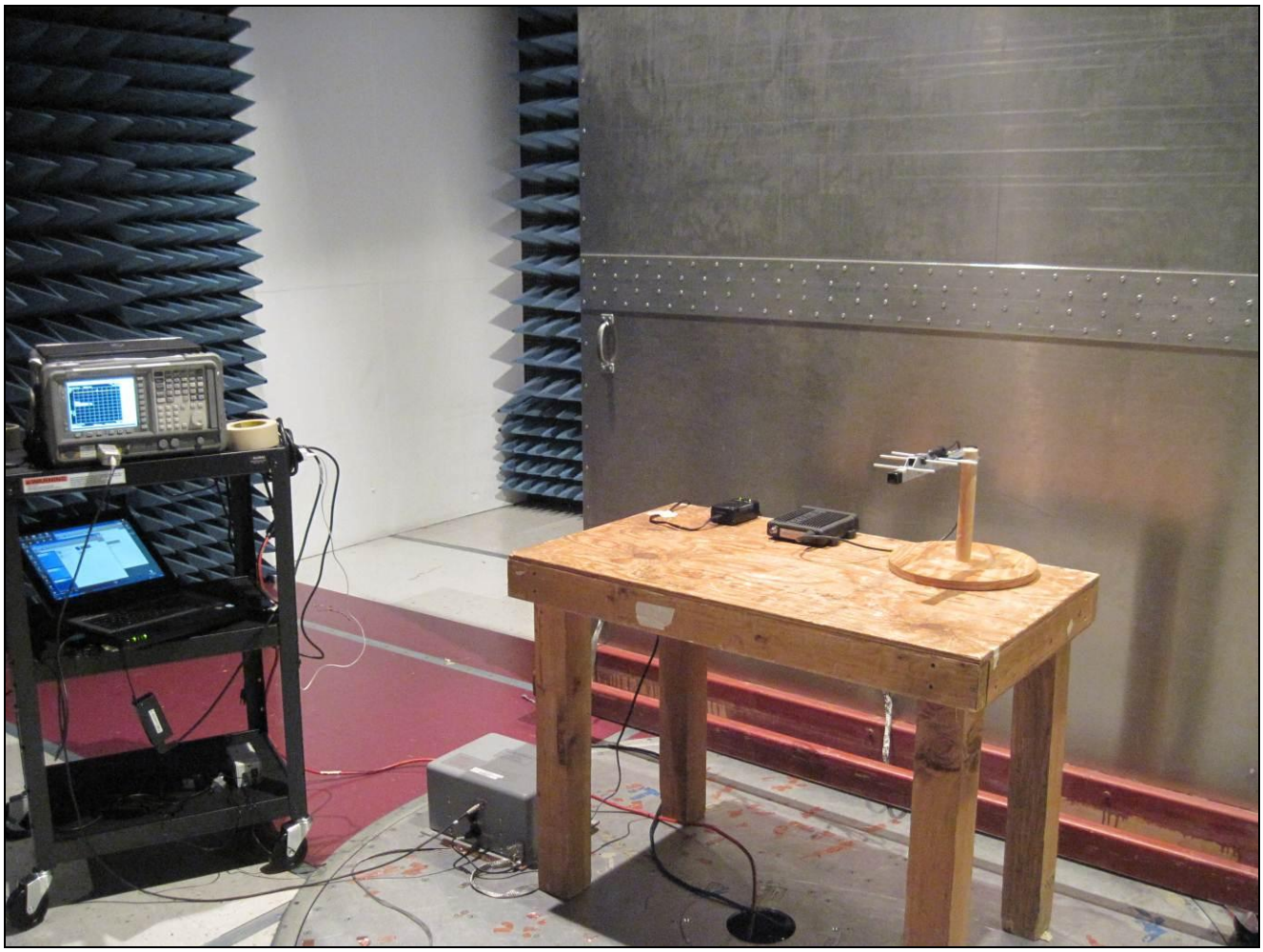


Plot 10. Conducted Emissions, 15.207(a), POE Phase Line



Plot 11. Conducted Emissions, 15.207(a), POE Neutral Line

15.207(a) Conducted Emissions Test Setup Photo



Photograph 5. Conducted Emissions, 15.207(a), Test Setup

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(a)(2) 6 dB and 99% Bandwidth

Test Requirements: **§ 15.247(a)(2):** Operation under the provisions of this section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

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

Test Results Refer to FCC ID: XQBFLR9G30 and IC: 7503B-FLR9G30.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(b) Peak Power Output

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 18. Output Power Requirements from §15.247(b)

§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 18, 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 and using a point to point application 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.

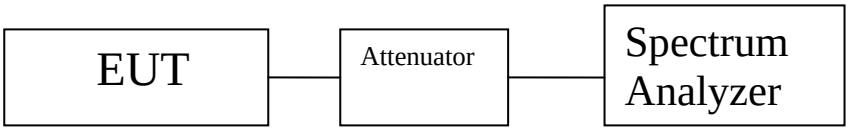
Fixed, point-to-point operation excludes the use of point-to-multipoint systems, omni-directional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum intentional radiator or, if the equipment is professionally installed, the 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 power meter. The EUT was measured for g mode only. The data for b mode was incorporated from modular testing report.

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

Test Engineer: Minh Ly

Test Date(s): 03/01/11



Peak Conducted Output Power (11B 20MHz)		
Frequency (MHz)	**Measured Peak Output Power dBm**	**Measured Peak Output Power Watts**
912	21.62	0.145
917	20.21	0.105

Table 19. Peak Conducted Output Power, 11B 20MHz

Peak Conducted Output Power (11G 5MHz)		
Frequency (MHz)	**Measured Peak Output Power dBm**	**Measured Peak Output Power Watts**
907	28.55	0.718
912	28.63	0.731
917	28.56	0.719
922	28.67	0.737

Table 20. Peak Conducted Output Power, 11G 5 MHz

Peak Conducted Output Power (11G 10MHz)		
Frequency (MHz)	**Measured Peak Output Power dBm**	**Measured Peak Output Power Watts**
907	28.64	0.732
912	28.63	0.731
917	28.72	0.747
922	28.71	0.745

Table 21. Peak Conducted Output Power, 11G 10 MHz

Peak Conducted Output Power (11G 20MHz)		
Frequency (MHz)	**Measured Peak Output Power dBm**	**Measured Peak Output Power Watts**
912	28.66	0.737
917	28.76	0.753

Table 22. Peak Conducted Output Power, 11G 20 MHz

Electromagnetic Compatibility Criteria for Intentional Radiators

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

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

§15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a).

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

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

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

Test Requirement(s): **§ 15.209 (a):** Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in Table 24.

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 24. 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

Test Results: The EUT was compliant with the Radiated Spurious Emission limits of **§ 15.247(d)**. Measured emissions were below applicable limits.

Test Engineer(s): Lionel Gabrillo

Test Date(s): 01/12/11

Radiated Spurious Emissions Test Results

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.	Limit @ 3 m (dBuV/m)	Delta (dB)
1.814	V	63.05	34.17	30.00	1.55	60.43	Peak	74	-13.57
2.721	V	47.33	34.29	32.72	2.53	48.29	Peak	74	-25.71
2.721	V	35.04	34.29	32.72	2.53	36.00	Avg	54	-18.00
3.628	V	51.14	34.04	32.86	2.89	52.86	Peak	74	-21.14
3.628	V	37.62	34.04	32.86	2.89	39.34	Avg	54	-14.66
4.535	V	42.75	34.07	33.97	4.13	46.78	Peak	74	-27.22
4.535	V	32.32	34.07	33.97	4.13	36.35	Avg	54	-17.65

Table 25. Harmonics, Test Results, 907 MHz, 5 MHz BW, Omni

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.	Limit @ 3 m (dBuV/m)	Delta (dB)
1.824	V	63.66	34.17	30.06	1.55	61.11	Peak	74	-12.89
2.736	V	54.19	34.30	32.72	2.56	55.17	Peak	74	-18.83
2.736	V	40.01	34.30	32.72	2.56	40.99	Avg	54	-13.01
3.648	V	50.51	34.03	32.88	2.96	52.32	Peak	74	-21.68
3.648	V	37.63	34.03	32.88	2.96	39.44	Avg	54	-14.56
4.56	V	43.34	34.07	33.98	4.14	47.39	Peak	74	-26.61
4.56	V	32.44	34.07	33.98	4.14	36.49	Avg	54	-17.51

Table 26. Harmonics, Test Results, 912 MHz, 5 MHz BW, Omni

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.	Limit @ 3 m (dBuV/m)	Delta (dB)
1.834	V	63.59	34.17	30.12	1.56	61.11	Peak	74	-12.89
2.751	V	51.51	34.31	32.72	2.59	52.52	Peak	74	-21.48
2.751	V	40.82	34.31	32.72	2.59	41.83	Avg	54	-12.17
3.668	V	51.47	34.02	32.89	3.02	53.37	Peak	74	-20.63
3.668	V	37.19	34.02	32.89	3.02	39.09	Avg	54	-14.91
4.585	V	43.1	34.07	33.98	4.16	47.17	Peak	74	-26.83
4.585	V	32.17	34.07	33.98	4.16	36.24	Avg	54	-17.76

Table 27. Harmonics, Test Results, 917 MHz, 5 MHz BW, Omni

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.	Limit @ 3 m (dBuV/m)	Delta (dB)
1.844	V	62.76	34.17	30.18	1.57	60.35	Peak	74	-13.65
2.766	V	44.17	34.31	32.73	2.62	45.21	Peak	74	-28.79
2.766	V	33.52	34.31	32.73	2.62	34.56	Avg	54	-19.44
3.688	V	50.41	34.01	32.91	3.09	52.40	Peak	74	-21.60
3.688	V	37.66	34.01	32.91	3.09	39.65	Avg	54	-14.35
4.61	V	42.95	34.08	33.98	4.18	47.04	Peak	74	-26.96
4.61	V	32.22	34.08	33.98	4.18	36.31	Avg	54	-17.69

Table 28. Harmonics, Test Results, 922 MHz, 5 MHz BW, Omni

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.	Limit @ 3 m (dBuV/m)	Delta (dB)
1.814	V	62.39	34.17	30.00	1.55	59.77	Peak	74	-14.23
2.721	V	48.16	34.29	32.72	2.53	49.12	Peak	74	-24.88
2.721	V	35.22	34.29	32.72	2.53	36.18	Avg	54	-17.82
3.628	V	47.43	34.04	32.86	2.89	49.15	Peak	74	-24.85
3.628	V	35.09	34.04	32.86	2.89	36.81	Avg	54	-17.19
4.535	V	42.93	34.07	33.97	4.13	46.96	Peak	74	-27.04
4.535	V	32.16	34.07	33.97	4.13	36.19	Avg	54	-17.81

Table 29. Harmonics, Test Results, 907 MHz, 10 MHz BW, Omni

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.	Limit @ 3 m (dBuV/m)	Delta (dB)
1.824	V	62.29	34.17	30.06	1.55	59.74	Peak	74	-14.26
2.736	V	53.52	34.30	32.72	2.56	54.50	Peak	74	-19.50
2.736	V	36.77	34.30	32.72	2.56	37.75	Avg	54	-16.25
3.648	V	47.57	34.03	32.88	2.96	49.38	Peak	74	-24.62
3.648	V	35.58	34.03	32.88	2.96	37.39	Avg	54	-16.61
4.56	V	42.91	34.07	33.98	4.14	46.96	Peak	74	-27.04
4.56	V	32.07	34.07	33.98	4.14	36.12	Avg	54	-17.88

Table 30. Harmonics, Test Results, 912 MHz, 10 MHz BW, Omni

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.	Limit @ 3 m (dBuV/m)	Delta (dB)
1.834	V	63.48	34.17	30.12	1.56	61.00	Peak	74	-13.00
2.751	V	50.58	34.31	32.72	2.59	51.59	Peak	74	-22.41
2.751	V	37.84	34.31	32.72	2.59	38.85	Avg	54	-15.15
3.668	V	48.2	34.02	32.89	3.02	50.10	Peak	74	-23.90
3.668	V	36.22	34.02	32.89	3.02	38.12	Avg	54	-15.88
4.585	V	42.54	34.07	33.98	4.16	46.61	Peak	74	-27.39
4.585	V	32.18	34.07	33.98	4.16	36.25	Avg	54	-17.75

Table 31. Harmonics, Test Results, 917 MHz, 10 MHz BW, Omni

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.	Limit @ 3 m (dBuV/m)	Delta (dB)
1.844	V	61.39	34.17	30.18	1.57	58.98	Peak	74	-15.02
2.766	V	43.81	34.31	32.73	2.62	44.85	Peak	74	-29.15
2.766	V	33.01	34.31	32.73	2.62	34.05	Avg	54	-19.95
3.688	V	49.07	34.01	32.91	3.09	51.06	Peak	74	-22.94
3.688	V	34.41	34.01	32.91	3.09	36.40	Avg	54	-17.60
4.61	V	42.89	34.08	33.98	4.18	46.98	Peak	74	-27.02
4.61	V	32.21	34.08	33.98	4.18	36.30	Avg	54	-17.70

Table 32. Harmonics, Test Results, 922 MHz, 10 MHz BW, Omni

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.	Limit @ 3 m (dBuV/m)	Delta (dB)
1.824	V	59.4	34.17	30.06	1.55	56.85	Peak	74	-17.15
2.736	V	55.8	34.30	32.72	2.56	56.78	Peak	74	-17.22
2.736	V	36.16	34.30	32.72	2.56	37.14	Avg	54	-16.86
3.648	V	46.34	34.03	32.88	2.96	48.15	Peak	74	-25.85
3.648	V	32.61	34.03	32.88	2.96	34.42	Avg	54	-19.58
4.56	V	42.55	34.07	33.98	4.14	46.60	Peak	74	-27.40
4.56	V	32.01	34.07	33.98	4.14	36.06	Avg	54	-17.94

Table 33. Harmonics, Test Results, 912 MHz, 20 MHz BW, Omni

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.	Limit @ 3 m (dBuV/m)	Delta (dB)
1.834	V	61.01	34.17	30.12	1.56	58.53	Peak	74	-15.47
2.751	V	60.31	34.31	32.72	2.59	61.32	Peak	74	-12.68
2.751	V	36.21	34.31	32.72	2.59	37.22	Avg	54	-16.78
3.668	V	49.46	34.02	32.89	3.02	51.36	Peak	74	-22.64
3.668	V	35.07	34.02	32.89	3.02	36.97	Avg	54	-17.03
4.585	V	42.43	34.07	33.98	4.16	46.50	Peak	74	-27.50
4.585	V	32.05	34.07	33.98	4.16	36.12	Avg	54	-17.88

Table 34. Harmonics, Test Results, 917 MHz, 20 MHz BW, Omni

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.	Limit @ 3 m (dBuV/m)	Delta (dB)
1.814	H	76.44	34.17	30.00	1.55	73.82	Peak	74	-0.18
2.721	H	44.56	34.29	32.72	2.53	45.52	Peak	74	-28.48
2.721	H	32.98	34.29	32.72	2.53	33.94	Avg	54	-20.06
3.628	H	45.56	34.04	32.86	2.89	47.28	Peak	74	-26.72
3.628	H	33.35	34.04	32.86	2.89	35.07	Avg	54	-18.93
4.535	H	43.51	34.07	33.97	4.13	47.54	Peak	74	-26.46
4.535	H	33.12	34.07	33.97	4.13	37.15	Avg	54	-16.85

Table 35. Harmonics, Test Results, 907 MHz, 5 MHz BW, Yagi

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.	Limit @ 3 m (dBuV/m)	Delta (dB)
1.824	H	75.71	34.17	30.06	1.55	73.16	Peak	74	-0.84
2.736	H	45.07	34.30	32.72	2.56	46.05	Peak	74	-27.95
2.736	H	32.37	34.30	32.72	2.56	33.35	Avg	54	-20.65
3.648	H	45.21	34.03	32.88	2.96	47.02	Peak	74	-26.98
3.648	H	33.29	34.03	32.88	2.96	35.10	Avg	54	-18.90
4.56	H	45.2	34.07	33.98	4.14	49.25	Peak	74	-24.75
4.56	H	32.93	34.07	33.98	4.14	36.98	Avg	54	-17.02

Table 36. Harmonics, Test Results, 912 MHz, 5 MHz BW, Yagi

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.	Limit @ 3 m (dBuV/m)	Delta (dB)
1.834	H	74.95	34.17	30.12	1.56	72.47	Peak	74	-1.53
2.751	H	46.51	34.31	32.72	2.59	47.52	Peak	74	-26.48
2.751	H	34.68	34.31	32.72	2.59	35.69	Avg	54	-18.31
3.668	H	43.73	34.02	32.89	3.02	45.63	Peak	74	-28.37
3.668	H	33.02	34.02	32.89	3.02	34.92	Avg	54	-19.08
4.585	H	43.74	34.07	33.98	4.16	47.81	Peak	74	-26.19
4.585	H	32.23	34.07	33.98	4.16	36.30	Avg	54	-17.70

Table 37. Harmonics, Test Results, 917 MHz, 5 MHz BW, Yagi

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.	Limit @ 3 m (dBuV/m)	Delta (dB)
1.844	H	73.84	34.17	30.18	1.57	71.43	Peak	74	-2.57
2.766	H	45.04	34.31	32.73	2.62	46.08	Peak	74	-27.92
2.766	H	33.36	34.31	32.73	2.62	34.40	Avg	54	-19.60
3.688	H	44.12	34.01	32.91	3.09	46.11	Peak	74	-27.89
3.688	H	32.61	34.01	32.91	3.09	34.60	Avg	54	-19.40
4.61	H	43.31	34.08	33.98	4.18	47.40	Peak	74	-26.60
4.61	H	32.32	34.08	33.98	4.18	36.41	Avg	54	-17.59

Table 38. Harmonics, Test Results, 922 MHz, 5 MHz BW, Yagi

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.	Limit @ 3 m (dBuV/m)	Delta (dB)
1.814	H	75.29	34.17	30.00	1.55	72.67	Peak	74	-1.33
2.721	H	45.37	34.29	32.72	2.53	46.33	Peak	74	-27.67
2.721	H	33.04	34.29	32.72	2.53	34.00	Avg	54	-20.00
3.628	H	43.99	34.04	32.86	2.89	45.71	Peak	74	-28.29
3.628	H	33.19	34.04	32.86	2.89	34.91	Avg	54	-19.09
4.535	H	43.44	34.07	33.97	4.13	47.47	Peak	74	-26.53
4.535	H	32.25	34.07	33.97	4.13	36.28	Avg	54	-17.72

Table 39. Harmonics, Test Results, 907 MHz, 10 MHz BW, Yagi

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.	Limit @ 3 m (dBuV/m)	Delta (dB)
1.824	H	73.14	34.17	30.06	1.55	70.59	Peak	74	-3.41
2.736	H	43.59	34.30	32.72	2.56	44.57	Peak	74	-29.43
2.736	H	32.47	34.30	32.72	2.56	33.45	Avg	54	-20.55
3.648	H	44.42	34.03	32.88	2.96	46.23	Peak	74	-27.77
3.648	H	32.84	34.03	32.88	2.96	34.65	Avg	54	-19.35
4.56	H	45.02	34.07	33.98	4.14	49.07	Peak	74	-24.93
4.56	H	33.19	34.07	33.98	4.14	37.24	Avg	54	-16.76

Table 40. Harmonics, Test Results, 912 MHz, 10 MHz BW, Yagi

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.	Limit @ 3 m (dBuV/m)	Delta (dB)
1.834	H	73.07	34.17	30.12	1.56	70.59	Peak	74	-3.41
2.751	H	47.11	34.31	32.72	2.59	48.12	Peak	74	-25.88
2.751	H	33.75	34.31	32.72	2.59	34.76	Avg	54	-19.24
3.668	H	43.67	34.02	32.89	3.02	45.57	Peak	74	-28.43
3.668	H	32.92	34.02	32.89	3.02	34.82	Avg	54	-19.18
4.585	H	43.04	34.07	33.98	4.16	47.11	Peak	74	-26.89
4.585	H	32.33	34.07	33.98	4.16	36.40	Avg	54	-17.60

Table 41. Harmonics, Test Results, 917 MHz, 10 MHz BW, Yagi

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.	Limit @ 3 m (dBuV/m)	Delta (dB)
1.844	H	72.69	34.17	30.18	1.57	70.28	Peak	74	-3.72
2.766	H	44.58	34.31	32.73	2.62	45.62	Peak	74	-28.38
2.766	H	33.17	34.31	32.73	2.62	34.21	Avg	54	-19.79
3.688	H	43.66	34.01	32.91	3.09	45.65	Peak	74	-28.35
3.688	H	32.44	34.01	32.91	3.09	34.43	Avg	54	-19.57
4.61	H	43.4	34.08	33.98	4.18	47.49	Peak	74	-26.51
4.61	H	32.27	34.08	33.98	4.18	36.36	Avg	54	-17.64

Table 42. Harmonics, Test Results, 922 MHz, 10 MHz BW, Yagi

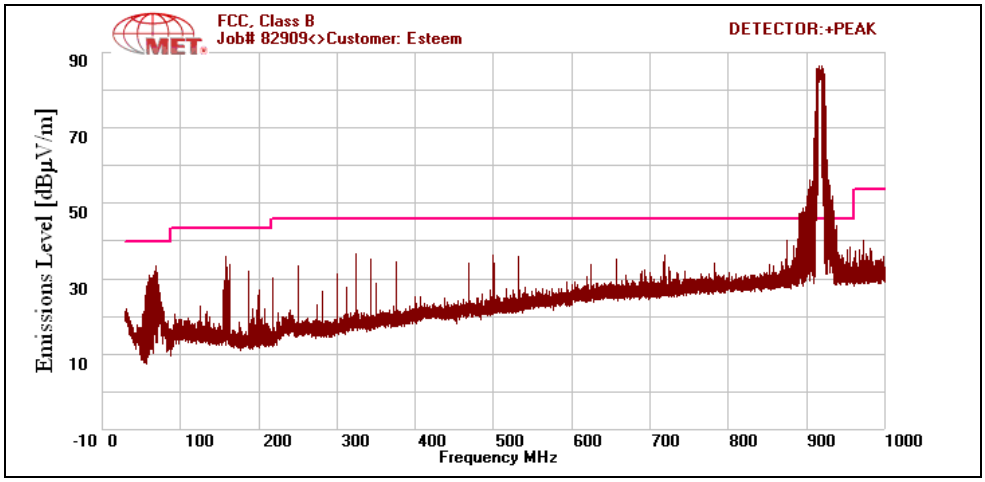
Freq. (GHz)	Antenna Polarity (H/V)	Raw Amp. @ 3 m (Peak) / (Avg.)	P. Amp (dB)	Ant. Cor. Factor (dB/m)	Cable Loss (dB)	EUT Field Strength Final Amp. (dBuV/m)	Limit Detector Peak / Avg.	Limit @ 3 m (dBuV/m)	Delta (dB)
1.824	H	71.37	34.17	30.06	1.55	68.82	Peak	74	-5.18
2.736	H	51.99	34.30	32.72	2.56	52.97	Peak	74	-21.03
2.736	H	33.51	34.30	32.72	2.56	34.49	Avg	54	-19.51
3.648	H	43.46	34.03	32.88	2.96	45.27	Peak	74	-28.73
3.648	H	32.88	34.03	32.88	2.96	34.69	Avg	54	-19.31
4.56	H	44.05	34.07	33.98	4.14	48.10	Peak	74	-25.90
4.56	H	32.26	34.07	33.98	4.14	36.31	Avg	54	-17.69

Table 43. Harmonics, Test Results, 912 MHz, 20 MHz BW, Yagi

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.	Limit @ 3 m (dBuV/m)	Delta (dB)
1.834	H	72.47	34.17	30.12	1.56	69.99	Peak	74	-4.01
2.751	H	59.61	34.31	32.72	2.59	60.62	Peak	74	-13.38
2.751	H	33.77	34.31	32.72	2.59	34.78	Avg	54	-19.22
3.668	H	44.99	34.02	32.89	3.02	46.89	Peak	74	-27.11
3.668	H	32.91	34.02	32.89	3.02	34.81	Avg	54	-19.19
4.585	H	44.81	34.07	33.98	4.16	48.88	Peak	74	-25.12
4.585	H	32.39	34.07	33.98	4.16	36.46	Avg	54	-17.54

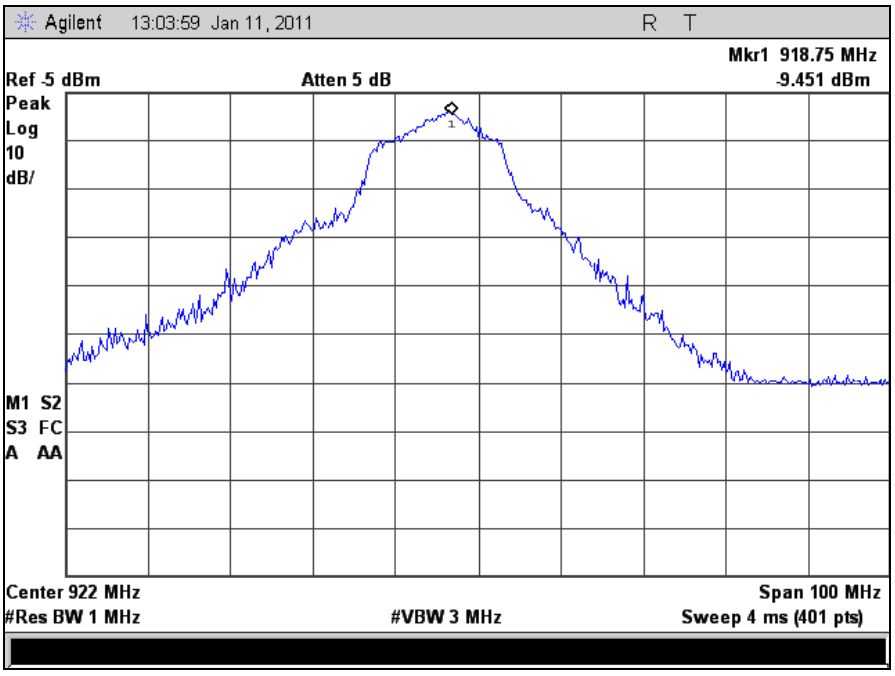
Table 44. Harmonics, Test Results, 917 MHz, 20 MHz BW, Yagi

Radiated Spurious Emissions Test Results



Plot 12. Radiated Spurious Emissions, 917 MHz Bandwidth, 5 MHz with Log Antenna (Worst Case)

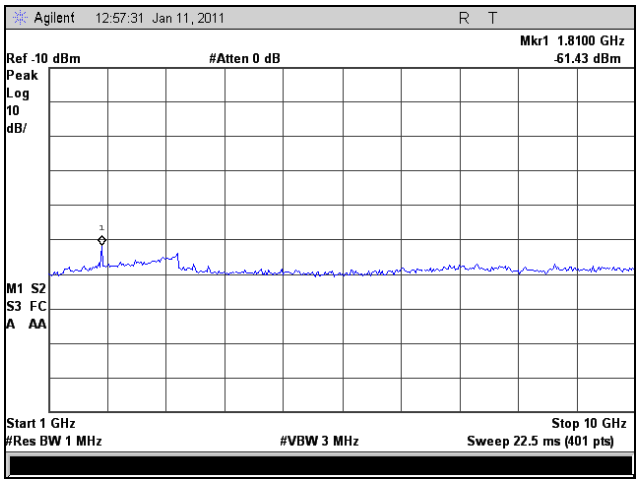
Note: Emissions in the 900-922MHz is from the fundamental.



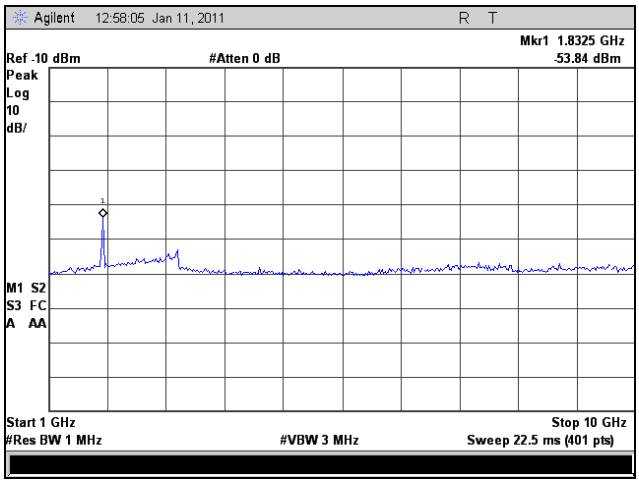
Plot 13. Radiated Spurious Emissions, Fundamental

Note: The Omni Antenna 5MHz BW Fundamental Freq at 918.75 Corrected Value = 118.374 dBuV. The highest emission from 1-10GHz = 83.625 dBuV which is -34.749dBc below the Fundamental Freq.

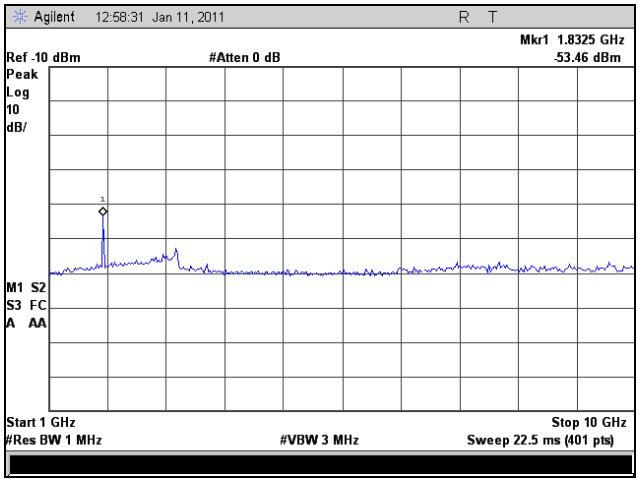
Antenna	Band Width		Frequency (MHz)	Measured Value with Cable Loss (dBm)	Measured Value with Cable Loss (dBuV)	ACF (dBuV)	Corrected Value (dBuV)
OMNI	5MHz	907 MHz	1810	-61.43	45.57	29.964	75.534
		912 MHz	1832.5	-53.84	53.16	30.085	83.245
		917 MHz	1832.5	-53.46	53.54	30.085	83.625
		922 MHz	1855	-58.16	48.84	30.206	79.046
	10MHz	907 MHz	1810	-55.99	51.01	29.964	80.974
		912 MHz	1832.5	-53.51	53.49	30.085	83.575
		917 MHz	1832.5	-55.1	51.9	30.085	81.985
		922 MHz	1832.5	-57.26	49.74	30.085	79.825
	20MHz	912 MHz	1832.5	-59.58	47.42	30.085	77.505
		917MHz	1832.5	-57.25	49.75	30.085	79.835
YAGI	5MHz	907 MHz	2980	-65.52	41.48	32.746	74.226
		912 MHz	2980	-63.88	43.12	32.746	75.866
		917 MHz	2957.5	-65.54	41.46	32.735	74.195
		922 MHz	1832.5	-64.41	42.59	30.085	72.675
	10MHz	907 MHz	2957.5	-65.89	41.11	32.735	73.845
		912 MHz	1832.5	-62.83	44.17	30.085	74.255
		917 MHz	1832.5	-64.29	42.71	30.085	72.795
		922 MHz	1832.5	-63.34	43.66	30.085	73.745
	20MHz	912 MHz	1832.5	-64.9	42.1	30.085	72.185
		917MHz	2957.5	-65.39	41.61	32.735	74.345



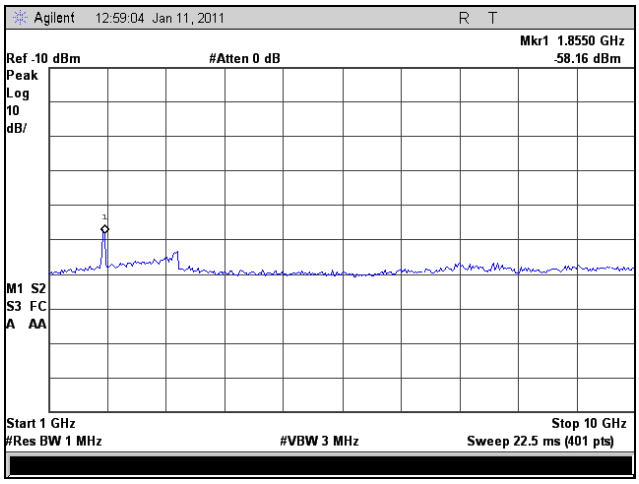
Plot 14. Radiated Spurious Emissions, 907 MHz, 5 MHz BW (1 – 10 GHz), Omni



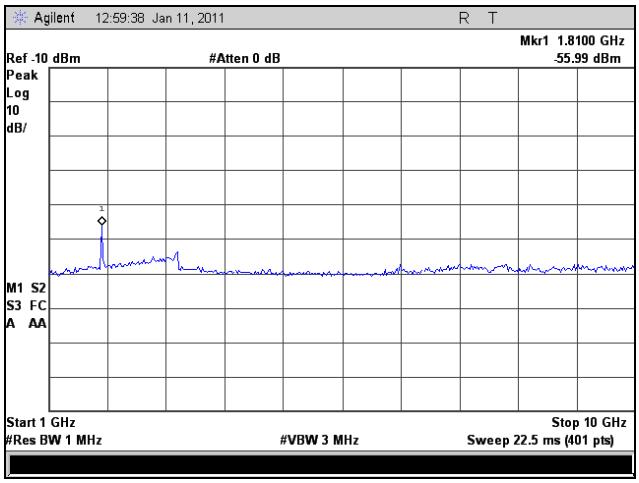
Plot 15. Radiated Spurious Emissions, 912 MHz, 5 MHz BW (1 – 10 GHz), Omni



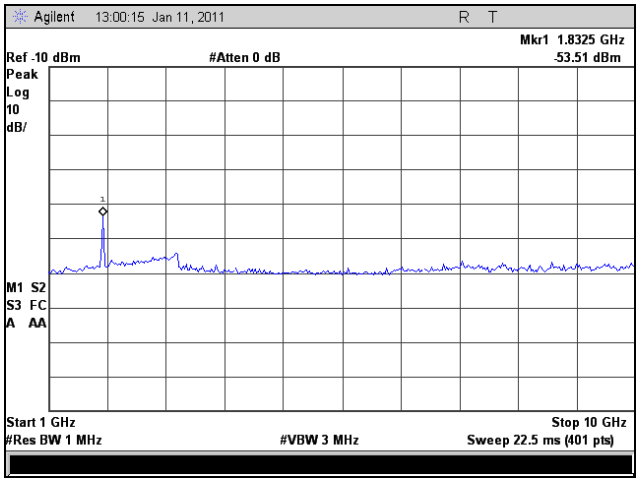
Plot 16. Radiated Spurious Emissions, 917 MHz, 5 MHz BW (1 – 10 GHz), Omni



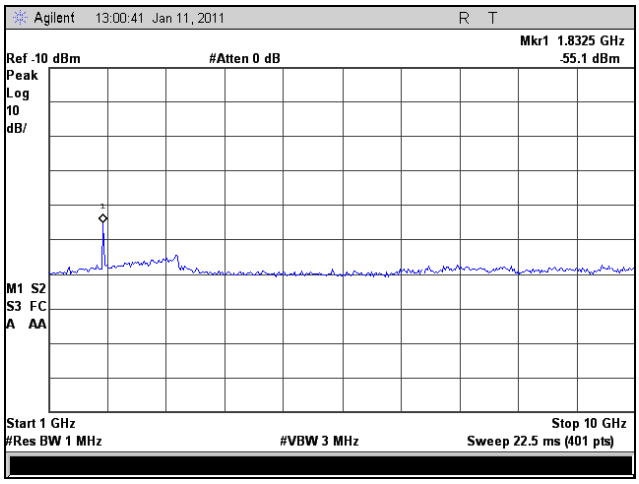
Plot 17. Radiated Spurious Emissions, 922 MHz, 5 MHz BW (1 – 10 GHz), Omni



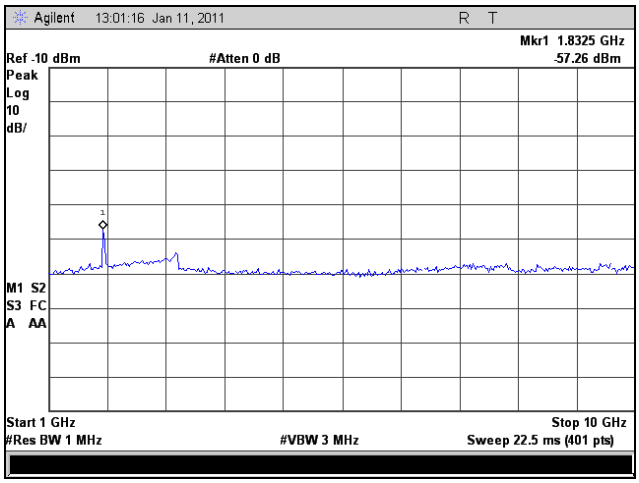
Plot 18. Radiated Spurious Emissions, 907 MHz, 10 MHz BW (1 – 10 GHz), Omni



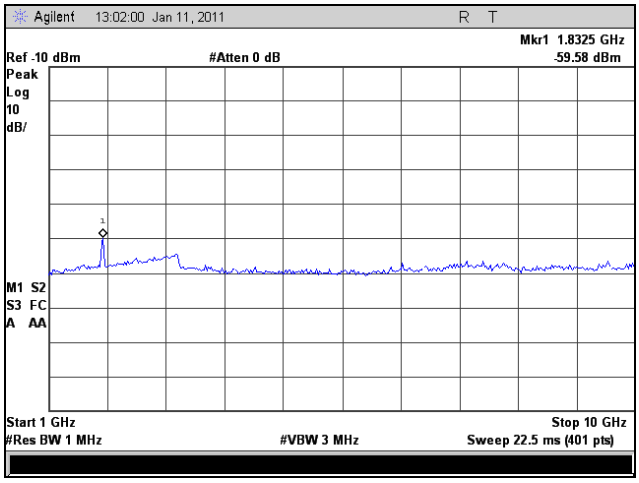
Plot 19. Radiated Spurious Emissions, 912 MHz, 10 MHz BW (1 – 10 GHz), Omni



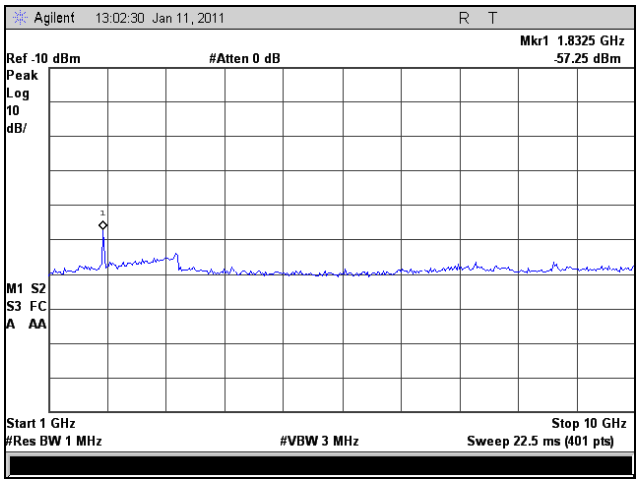
Plot 20. Radiated Spurious Emissions, 917 MHz, 10 MHz BW (1 – 10 GHz), Omni



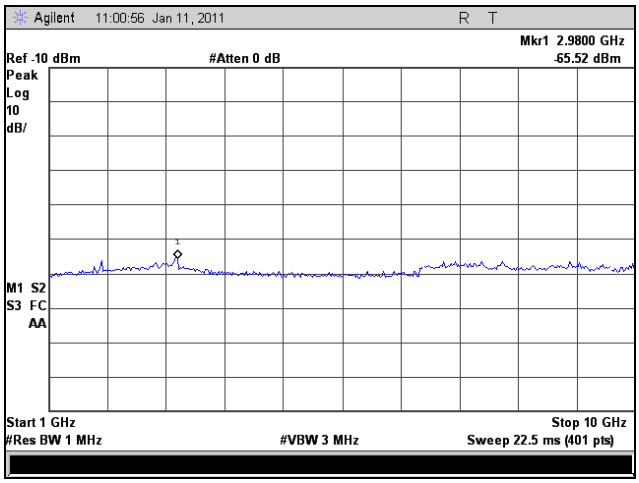
Plot 21. Radiated Spurious Emissions, 922 MHz, 10 MHz BW (1 – 10 GHz), Omni



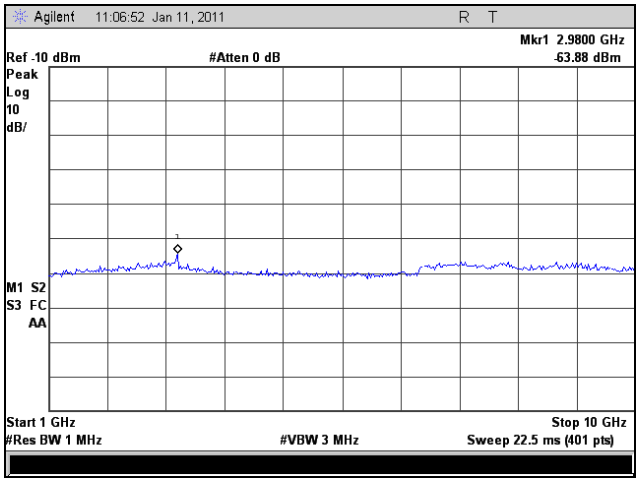
Plot 22. Radiated Spurious Emissions, 912 MHz, 20 MHz BW (1 – 10 GHz), Omni



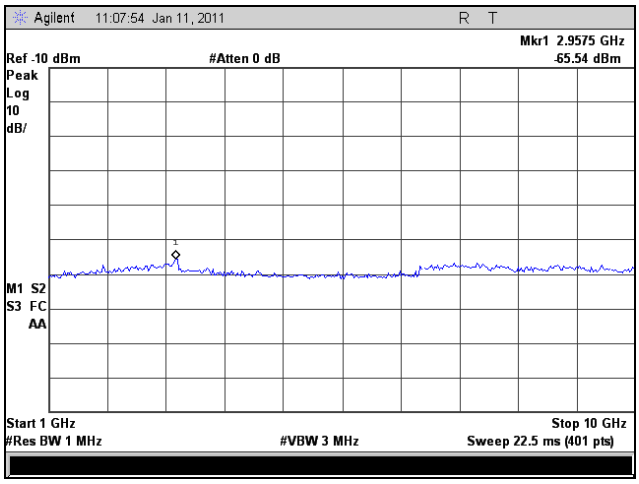
Plot 23. Radiated Spurious Emissions, 917 MHz, 20 MHz BW (1 – 10 GHz), Omni



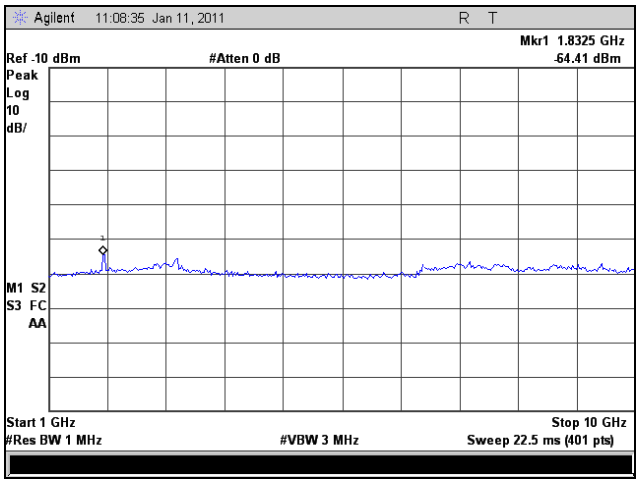
Plot 24. Radiated Spurious Emissions, 907 MHz, 5 MHz BW (1 – 10 GHz), Yagi



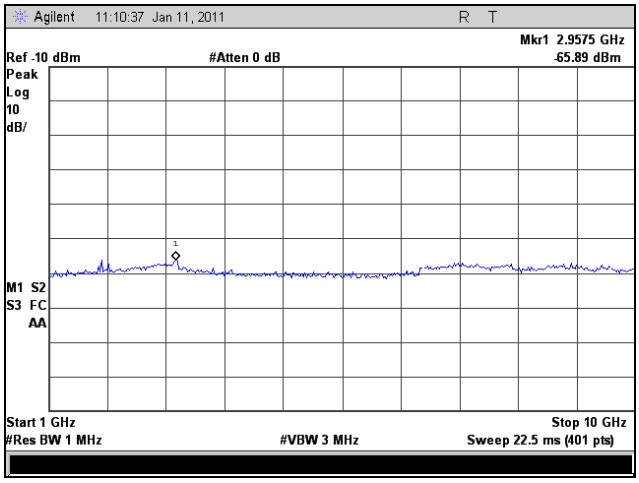
Plot 25. Radiated Spurious Emissions, 912 MHz, 5 MHz BW (1 – 10 GHz), Yagi



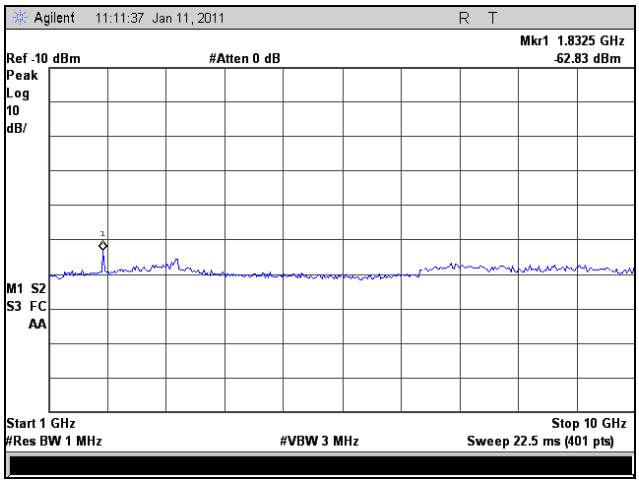
Plot 26. Radiated Spurious Emissions, 917 MHz, 5 MHz BW (1 – 10 GHz), Yagi



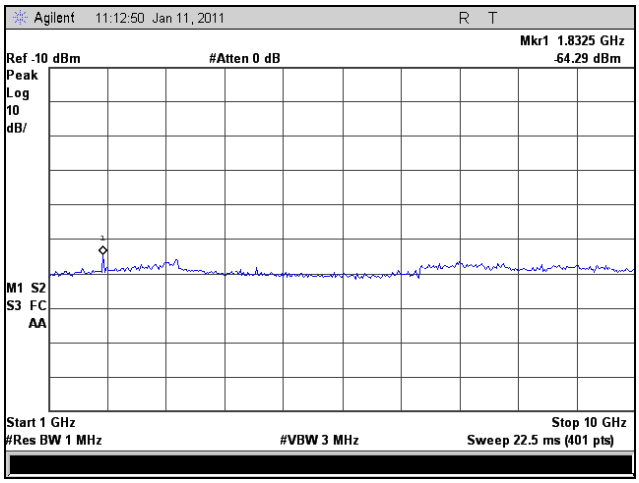
Plot 27. Radiated Spurious Emissions, 922 MHz, 5 MHz BW (1 – 10 GHz), Yagi



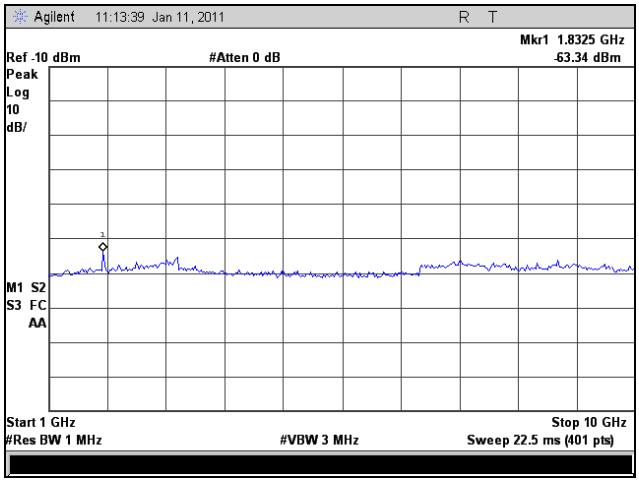
Plot 28. Radiated Spurious Emissions, 907 MHz, 10 MHz BW (1 – 10 GHz), Yagi



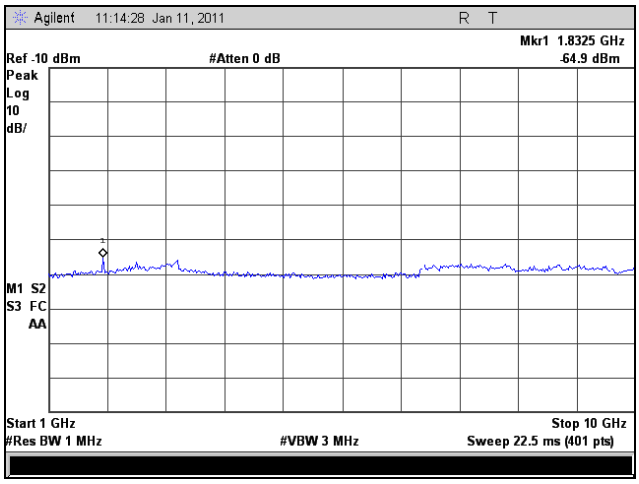
Plot 29. Radiated Spurious Emissions, 912 MHz, 10 MHz BW (1 – 10 GHz), Yagi



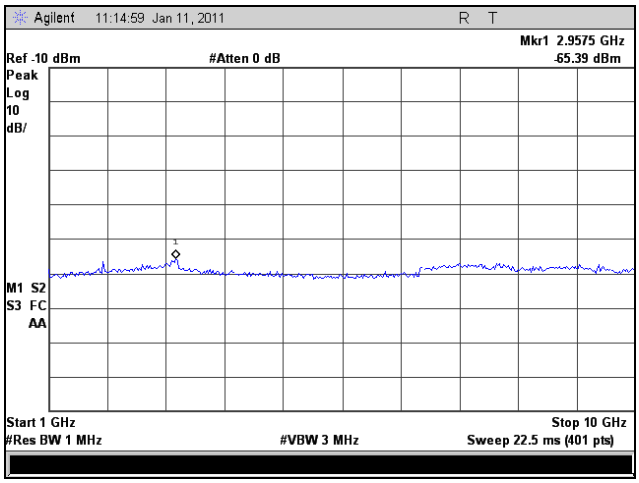
Plot 30. Radiated Spurious Emissions, 917 MHz, 10 MHz BW (1 – 10 GHz), Yagi



Plot 31. Radiated Spurious Emissions, 922 MHz, 10 MHz BW (1 – 10 GHz), Yagi



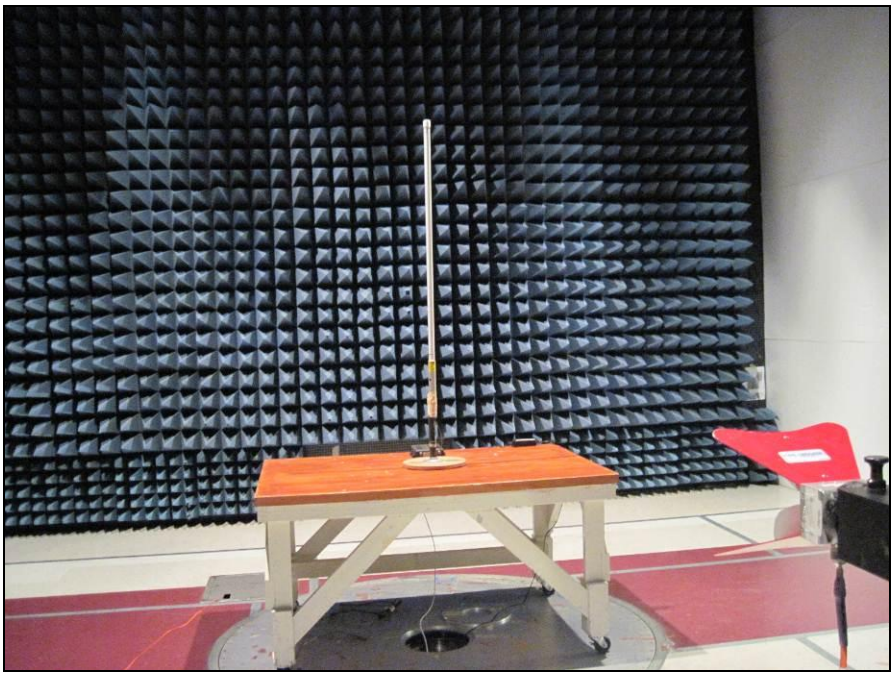
Plot 32. Radiated Spurious Emissions, 912 MHz, 20 MHz BW (1 – 10 GHz), Yagi



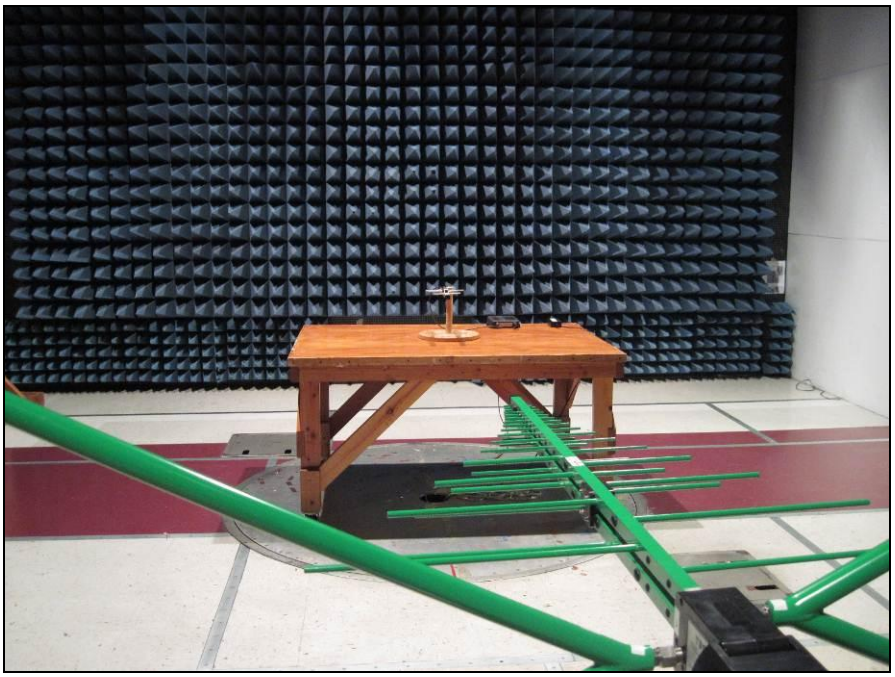
Plot 33. Radiated Spurious Emissions, 917 MHz, 20 MHz BW (1 – 10 GHz), Yagi

Radiated Spurious Emissions Test Setup

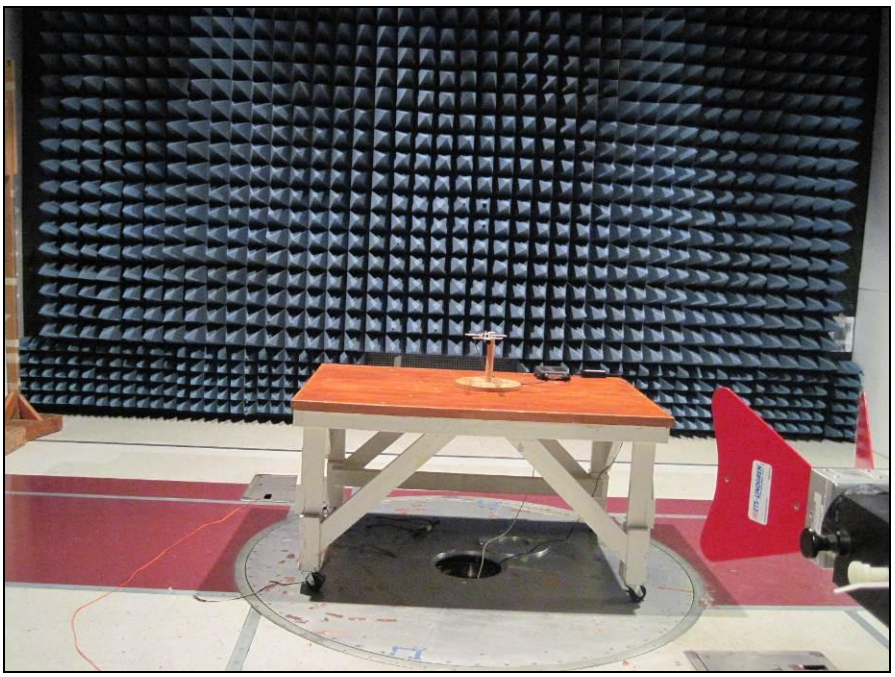
Photograph 6. Radiated Spurious Emissions, Test Setup 1, Omni



Photograph 7. Radiated Spurious Emissions, Test Setup 2, Omni



Photograph 8. Radiated Spurious Emissions, Test Setup 1, Yagi



Photograph 9. Radiated Spurious Emissions, Test Setup 2, Yagi

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(d) RF Conducted Spurious Emissions Requirements and Band Edge

Test Requirement: **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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Test Results Refer to FCC ID: XQBFLR9G30 and IC: 7503B-FLR9G30.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(e) Peak Power Spectral Density

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

Test Procedure: The transmitter was connected directly to a Spectrum Analyzer through an attenuator. The power level was set to the maximum level. A RBW of 1 MHz and VBW of 3 MHz were used to determine the peak emissions within the band. The Spectrum analyzer was then set to a RBW of 3 kHz and VBW was set to 10 kHz. The SPAN of the analyzer was set to 1 MHz with a 333.3 second sweep. Measurements were carried out at the low, mid and high channels.

Test Results Refer to FCC ID: XQBFLR9G30 and IC: 7503B-FLR9G30.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(i) Maximum Permissible 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.

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

$S = P G / 4\pi R^2$ or $R = \sqrt{PG / 4\pi S}$

where,

S = Power Density mW/m^2
P = Power (mW)
R = Distance to the center of radiation of the antenna
G = Maximum antenna gain

Maximum antenna gain for EUT = 7 dBi

MPE Limit Calculation: EUT's operating frequency is: 902-928MHz. Highest conducted power = 28.76 dBm. Therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2.**

$S = (751.62*5.011 / 4*3.14*20.0^2) = (3767.03 / 5024) =$ **0.75mW/cm^2**@ 20cm separation

Electromagnetic Compatibility Criteria for Intentional Radiators

RSS-GEN Receiver Spurious Emissions Requirements

Test Requirements: 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 45.

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

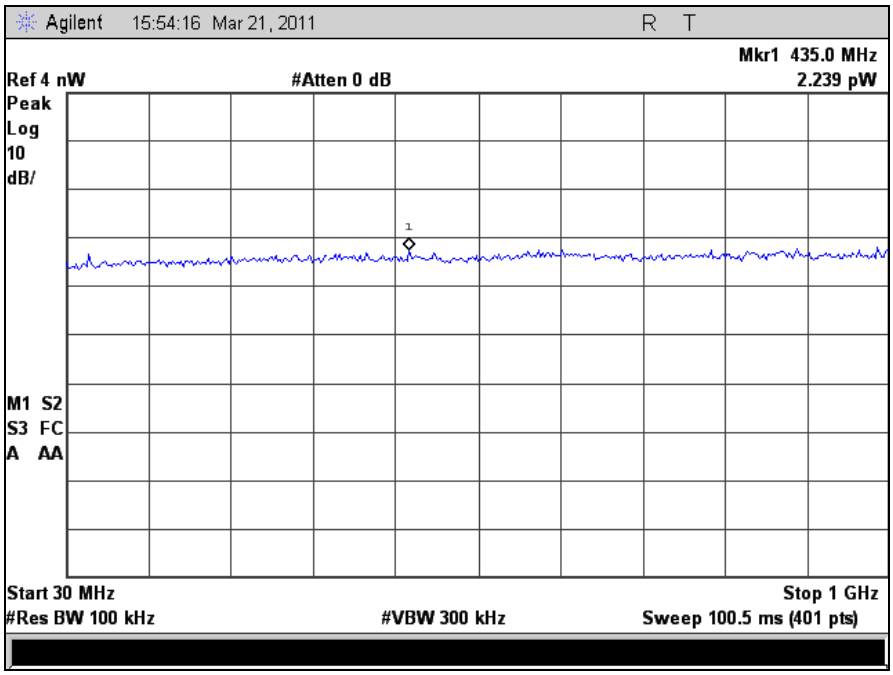
Table 45. Spurious Emission Limits for Receivers

(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.

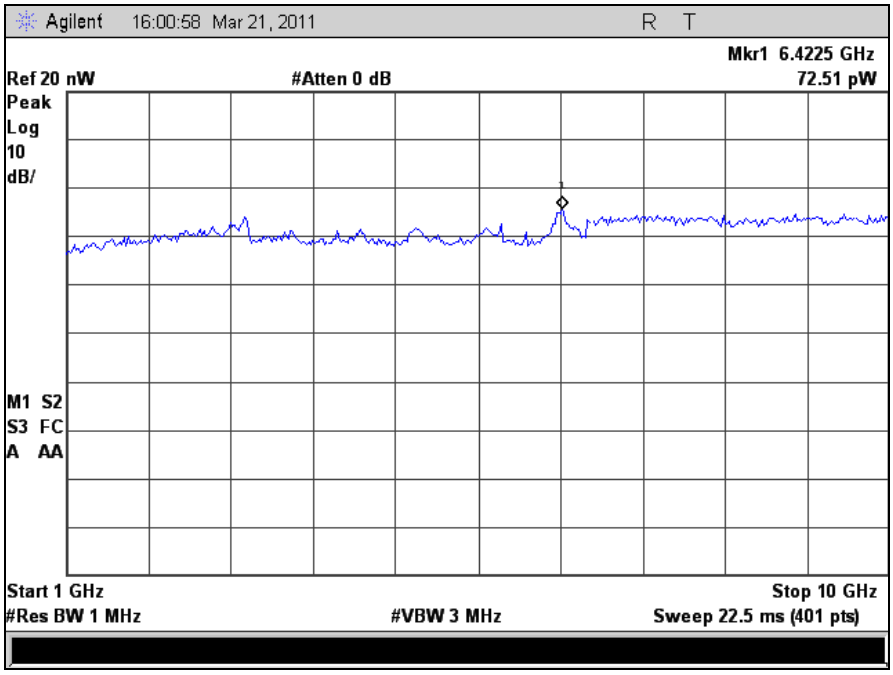
Test Results: The EUT was compliant with the Receiver Spurious Emission Requirements.

Test Engineer(s): Minh Ly

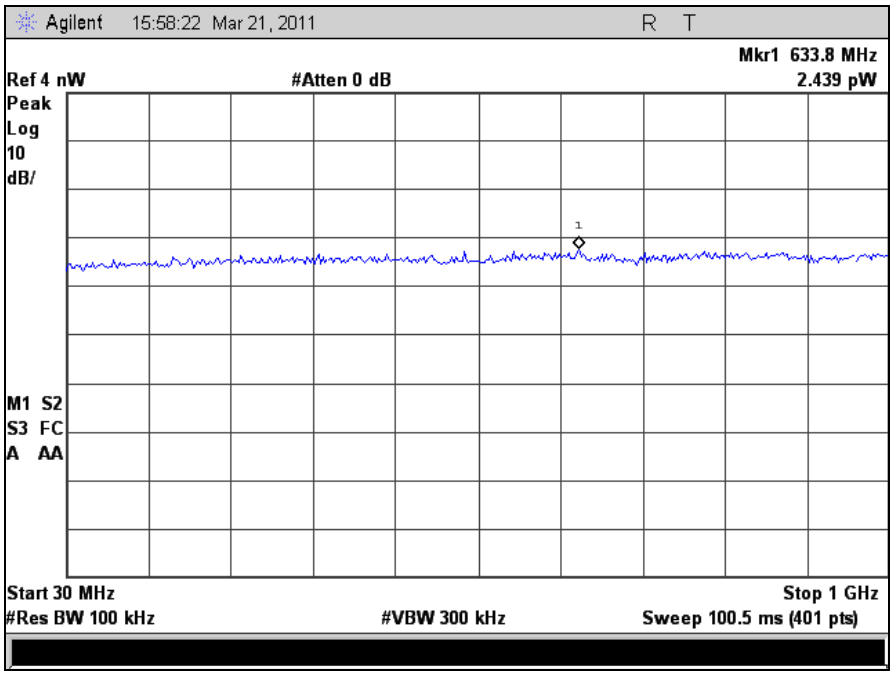
Test Date(s): 03/21/11



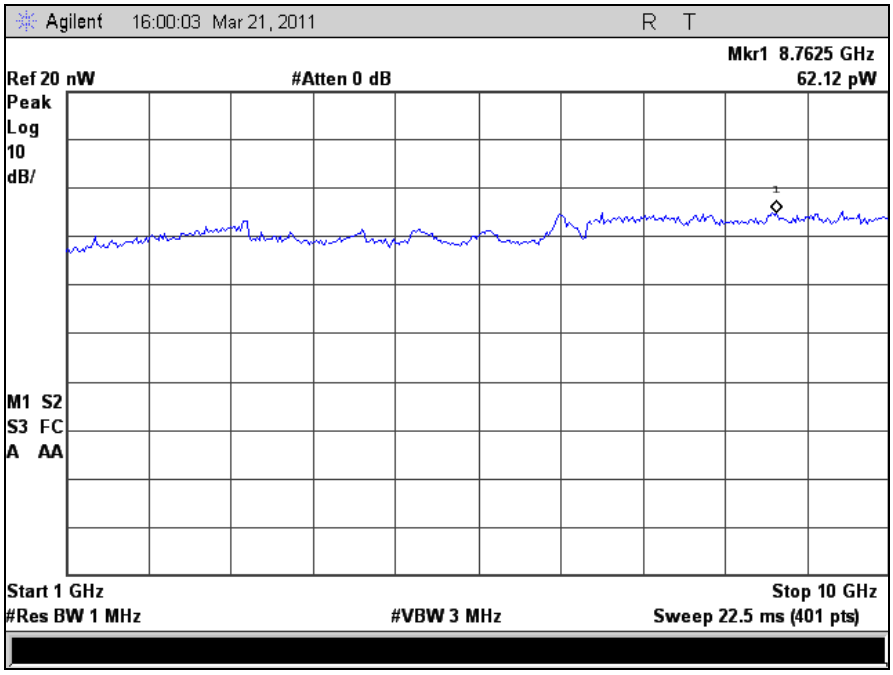
Plot 34. Conducted Receiver Spurious, 30 MHz – 1 GHz, Receiver Only Port



Plot 35. Conducted Receiver Spurious, 1 GHz – 10 GHz, Receiver Only Port



Plot 36. Conducted Receiver Spurious, 30 MHz – 1 GHz, Transmitter and Receiver Port



Plot 37. Conducted Receiver Spurious, 1 GHz – 10 GHz, Transmitter and Receiver Port

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
1S2607	SPECTRUM ANALYZER ESA-E	AGILENT/HEWLETT PACKARD	E4407B	7/30/2010	7/30/2011
1S2520	DIGITAL THERMO/HYGROMETER	CONTROL COMPANY	11-661-7D	11/18/2010	11/18/2011
1S2481	10M CHAMBER	ETS-LINGREN	DKE- 8X8 DBL	11/6/2010	11/6/2011
1S2421	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB 7	7/6/2010	7/6/2011
1S2614	OPTICAL AMPLIFIER	MITEQ	SCMT/R-100M18G	SEE NOTE	
1S2506	SPECTRUM ANALYZER (1-18GHZ)	RHODE & SCHWARZ	FSP	6/4/2010	6/4/2011
1S2600	BILOG ANTENNA	TESEQ	CBL6112D	4/14/2010	4/14/2011
1S2617	ACTIVE HORN ANTENNA	COM POWER	AHA-118	10/28/2010	10/28/2011
1S2482	5 METER CHAMBER	PANASHIELD	5 METER SEMI-ANECHOIC CHAMBER	11/17/2010	11/17/2011
1S2507	LINE IMPEDANCE STABILIZATION NETWORK (LISN)	SOLAR ELECTRONICS COMPANY	9252-50-R-24-BNC	10/12/2010	10/12/2011

Table 46. Test Equipment List

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

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

1. Label and User's Manual Information

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

§ 15.19 Labeling requirements.

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

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

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

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

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

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

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

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

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

§ 15.21 Information to user.

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

Verification & User's Manual Information

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

§ 15.105 Information to the user.

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

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

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

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

– Reorient or relocate the receiving antenna.

– Increase the separation between the equipment and receiver.

– Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

– Consult the dealer or an experienced radio/TV technician for help.

ICES-003 Procedural & Labeling Requirements

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

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

Procedural Requirements:

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

Section 6.1: A record of the measurements and results, showing the date that the measurements were completed, shall be retained by the manufacturer or importer for a period of at least five years from the date shown in the record and made available for examination on the request of the Minister.

Section 6.2: A written notice indicating compliance must accompany each unit of digital apparatus to the end user. The notice shall be in the form of a label that is affixed to the apparatus. Where because of insufficient space or other constraints it is not feasible to affix a label to the apparatus, the notice may be in the form of a statement in the user's manual.

Labeling Requirements:

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

> This Class [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.

End of Report

