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January 30, 2012

Electronic Systems Technology
415 North Quay St. Bldg. B-1
Kennewick, WA 99336

Dear Brent Strecker,

Enclosed is the EMC Wireless test report for compliance testing of the Electronic Systems Technology, ESTeem 195Ea 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\EMCS33737-FCC247)

Electromagnetic Compatibility Criteria
Test Report

for the

Electronic Systems Technology
ESTeem 195Ea

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: EMCS33737-FCC247

January 30, 2012

Prepared For:

Electronic Systems Technology
415 North Quay St. Bldg B-1
Kennewick, WA 99336

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

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&
15.247 Subpart C & RSS-210, Issue 8, Dec. 2010
for Intentional Radiators

Anderson Soungpanya, 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
∅	January 30, 2012	Initial Issue.

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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 195Ea, 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 195Ea. 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 195Ea, 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 1517. 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; RSS-GEN Issue 3: 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-GEN (7.2.4)	Conducted Emission Limits	Compliant
Title 47 of the CFR, Part 15 §15.247(a)(2)	RSS-Gen(4.6)	6dB Occupied Bandwidth	Compliant
		99% Occupied Bandwidth	Compliant
Title 47 of the CFR, Part 15 §15.247(b)	RSS-210(A8.4)	Peak Power Output	Compliant
Title 47 of the CFR, Part 15 §15.247(d); §15.209; §15.205	RSS-210(A8.5)	Radiated Spurious Emissions Requirements	Compliant
Title 47 of the CFR, Part 15 §15.247(d)	RSS-210(A8.5)	RF Conducted Spurious Emissions Requirements	Compliant
Title 47 of the CFR, Part 15 §15.247(d)	RSS-210(A8.5)	RF Conducted Band Edge	Compliant
Title 47 of the CFR, Part 15; §15.247(e)	RSS-210(A8.2)	Peak Power Spectral Density	Compliant
Title 47 of the CFR, Part 15 §15.247(i)	RSS-Gen(5.6)	Maximum Permissible Exposure (MPE)	Compliant
N/A	RSS-Gen(4.10)	Receiver Spurious Emissions	Compliant

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 195Ea, under Electronic Systems Technology's purchase order number 1517.

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 195Ea.

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

Model(s) Tested:	ESTeem 195Ea	
Model(s) Covered:	ESTeem 195Ea	
EUT Specifications:	Primary Power: 120 VAC, 60 Hz	
	FCC ID: ENPESTEEM195EA IC: 2163A-195EA	
	Type of Modulations:	OFDM
	Equipment Code:	DTS
	Peak RF Output Power:	29.99 dBm
	EUT Frequency Ranges:	5745-5825MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35º C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Anderson Soungpanya	
Report Date(s):	January 30, 2012	

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
CFR 47, Part 15, Subpart B	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
RSS-210, Issue 8, Dec. 2010	Low-power Licence-exempt Radiocommunications Devices (All Frequency Bands): Category I Equipment
RSS-GEN, Issue 3, Dec. 2010	General Requirements and Information for the Certification of Radio Apparatus
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 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 Electronic Systems Technology ESTeem 195Ea modem, Equipment Under Test (EUT), is a fully functional wireless LAN transceiver operating in the 5.725 -5.850 GHz band. The unit is typically used in law enforcement or industrial applications.

Photograph 1. Electronic Systems Technology ESTeem 195Ea

E. Equipment Configuration

Ref. ID	Name / Description	Model Number	Serial Number
A	ESTeem 5GHz Modem	195Ea	E-20253

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	R00071200290
Serial Cable	ESTeem	AA0621.1	NA
Ethernet Cable	ESTeem	AA09.2	NA

Table 5. Support Equipment

G. Ports and Cabling Information

ETHERNET INTERFACE

The ESTeem Model 195Ea's Ethernet Port is a Full and Half-Duplex Auto-negotiation interface supporting both 10 Mbps and 100 Mbps (10/100BaseT). The Ethernet port is compliant with IEEE 802.3at High-Power Over Ethernet (PoE) to provide data and power over the same CAT-5E grade Ethernet cable. The port is compatible with TIA/EIA-568B cable configuration (Figure 1).

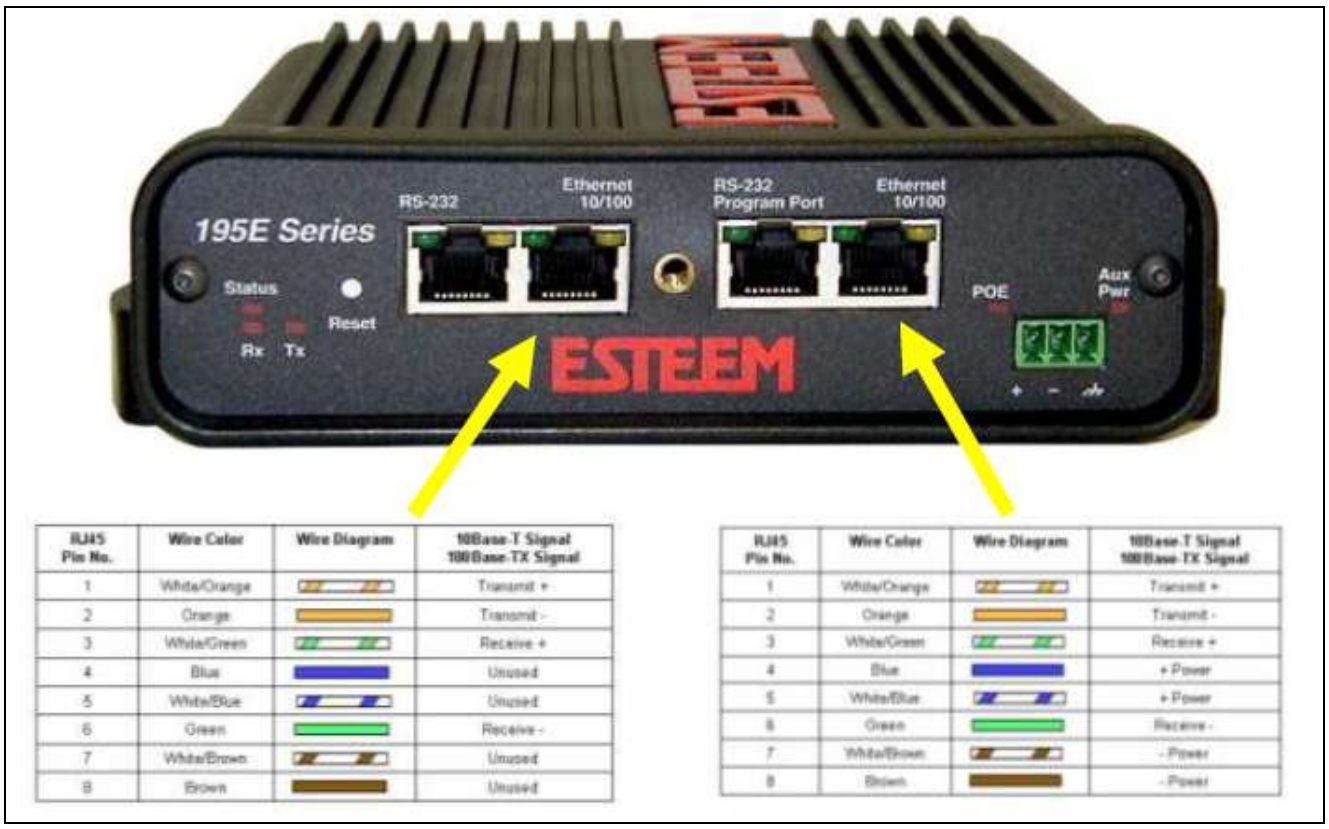


Figure 1. Ethernet Pin Layout

A second Ethernet port will be included in the 195Ea and can be used in Bridge Mode (HUB) or as a router.

CONFIGURING DHCP SERVER

The ESTeem 195Ea Ethernet port supports both client and server Dynamic Host Configuration Protocol (DHCP). Figure 2 shows the DHCP host configuration screen that will be shown if DHCP server is selected in the setup screens. Enter the values that match the DHCP configuration for your network.

Figure 2. DHCP Server Configuration

RS-232C PROGRAMMING PORT CONFIGURATION

The ESTeem Model 195Ea has a proprietary RS-232C interface in a RJ-45 connector on the front panel. To interface the 195Ea to the serial port on the computer, you need ESTeem cable AA0621 that combines a standard Ethernet patch cable to a 9-pin Female adapter.

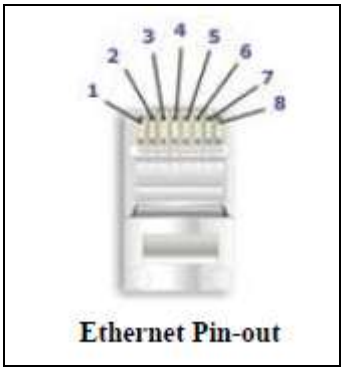
The serial port on the ESTeem Model 195Ea can be used to access the configuration menu in the ESTeem for system and network configuration. The ESTeem communications port operates at 38,400 bps, No Parity, 8 Data Bits and 1 Stop Bit (38,400,N,8,1). Configure your terminal program to match these settings.

Model 195Ea Serial Port Interface

RS-232C PROGRAMMING PORT PIN-OUT TABLE

ESTeem Model AA0621
RS-232C Port Pin-Out Table

RJ-45 Pin No.	Function	DB-9 Pin No.
4	Signal Ground (GND)	5
5	Receive Data (RxD)	2
6	Transmit Data (TxD)	3



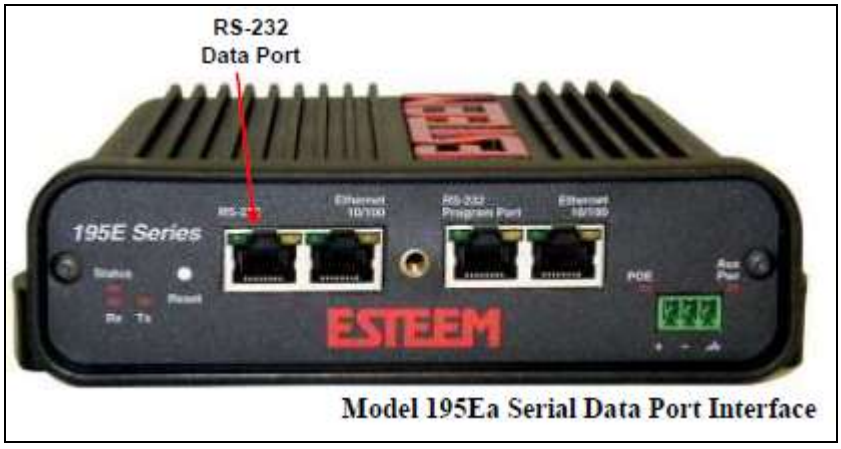
Ethernet Pin-out

RS-232C DATA PORT CONFIGURATION

The ESTeem Model 195Ea has an RS-232C interface in a JR-45 connector on the front panel that can be installed as an option. To interface the 195Ea to the serial port on the computer, you need serial cable with the following pin-out:

ESTeem Model AA0621
RS-232C Port Pin-Out Table

RJ-45 Pin No.	Function	DB-9 Pin No.
1	Data Set Ready (DSR)	6
2	Data Carrier Detect (DCD)	1
3	Data Terminal Ready (DTR)	4
4	Signal Ground (GND)	5
5	Receive Data (RxD)	2
6	Transmit Data (TxD)	3
7	Clear to Sent (CTS)	8
8	Request to Sent (RTS)	7



Model 195Ea Serial Data Port Interface

H. Mode of Operation

In RF Test Mode, the test sample can send RF packets as needed.

I. Method of Monitoring EUT Operation

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

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

Test Results: The EUT was compliant with the Class A requirement(s) of this section.

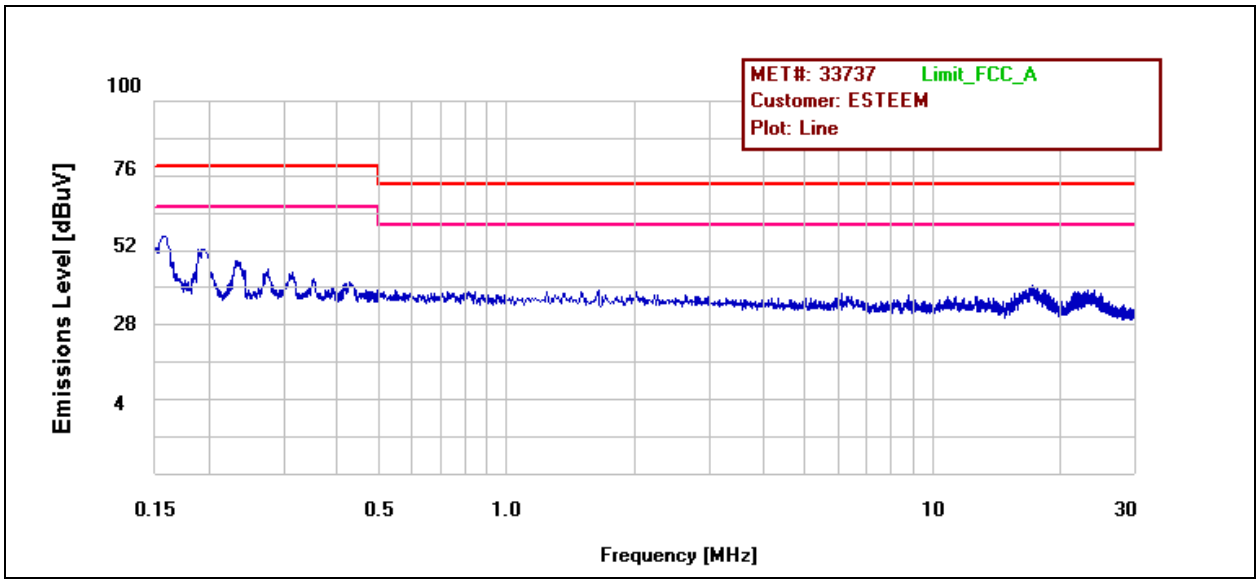
Test Engineer(s): Anderson Soungpanya

Test Date(s): 12/12/11 & 01/16/12

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

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Line	.157	55.04	79	-23.96	Pass	40.06	66	-25.94	Pass
Line	.193	49.05	79	-29.95	Pass	37.27	66	-28.73	Pass
Line	.234	45.38	79	-33.62	Pass	33.88	66	-32.12	Pass

Table 7. Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz), AC Adapter

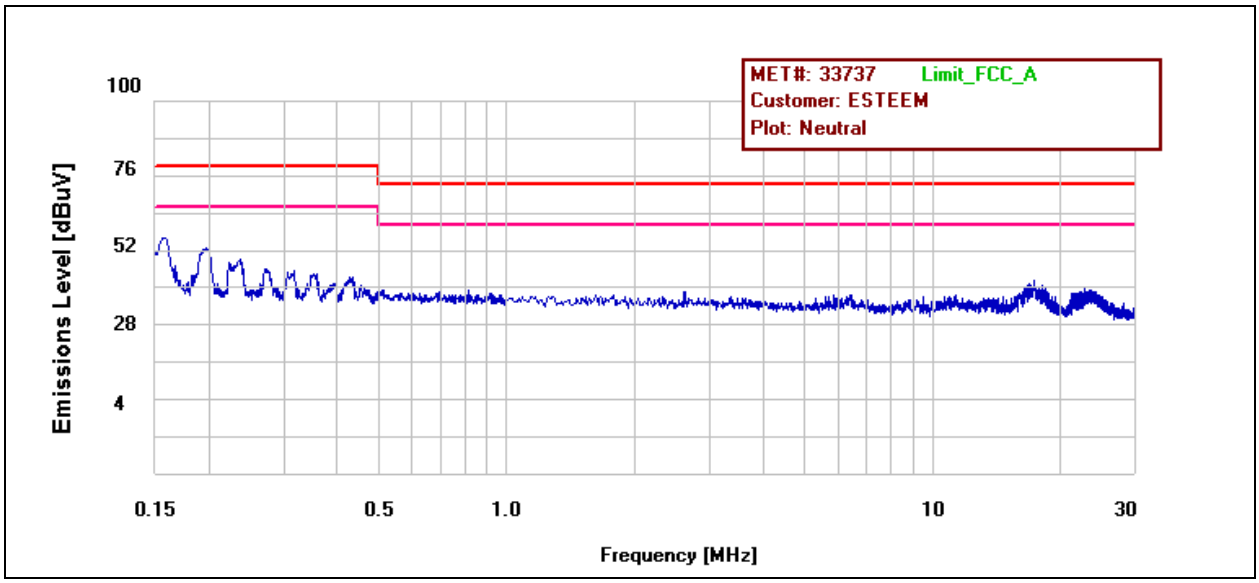


Plot 1. Conducted Emission, Phase Line Plot, AC Adapter

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

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Neutral	.156	54.61	79	-24.39	Pass	40.89	66	-25.11	Pass
Neutral	.193	50.52	79	-28.48	Pass	38.03	66	-27.97	Pass
Neutral	.235	45.32	79	-33.68	Pass	33.21	66	-32.79	Pass

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

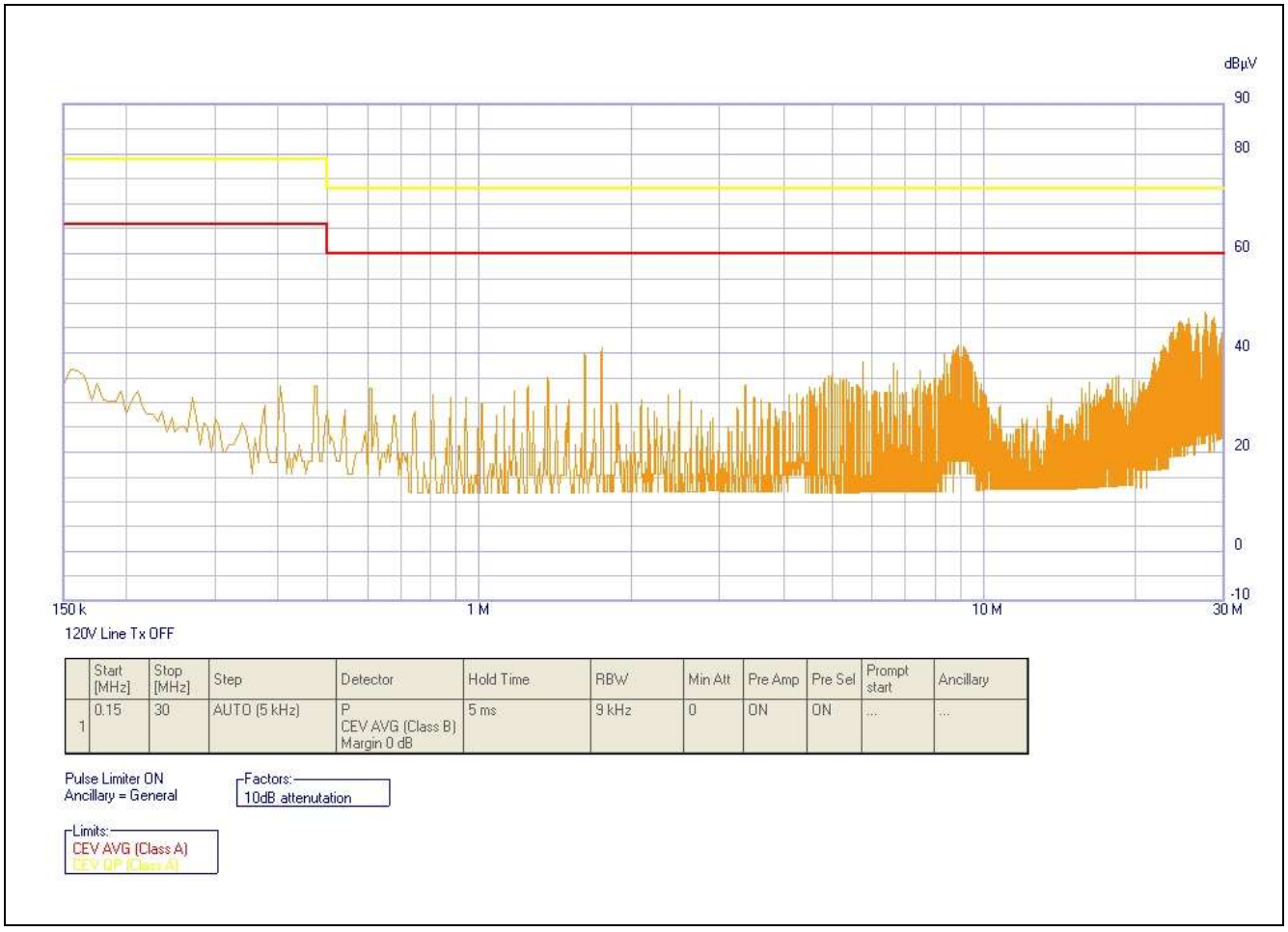


Plot 2. Conducted Emission, Neutral Line Plot, AC Adapter

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

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
120V Line Tx OFF	27.345	45.46	73	-27.54	Pass	39.38	60	-20.62	Pass
120V Line Tx OFF	28.48	45.55	73	-27.45	Pass	44.05	60	-15.95	Pass
120V Line Tx OFF	25.475	44.48	73	-28.52	Pass	43.16	60	-16.84	Pass
120V Line Tx OFF	1.75	39.41	73	-33.59	Pass	38.4	60	-21.6	Pass

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

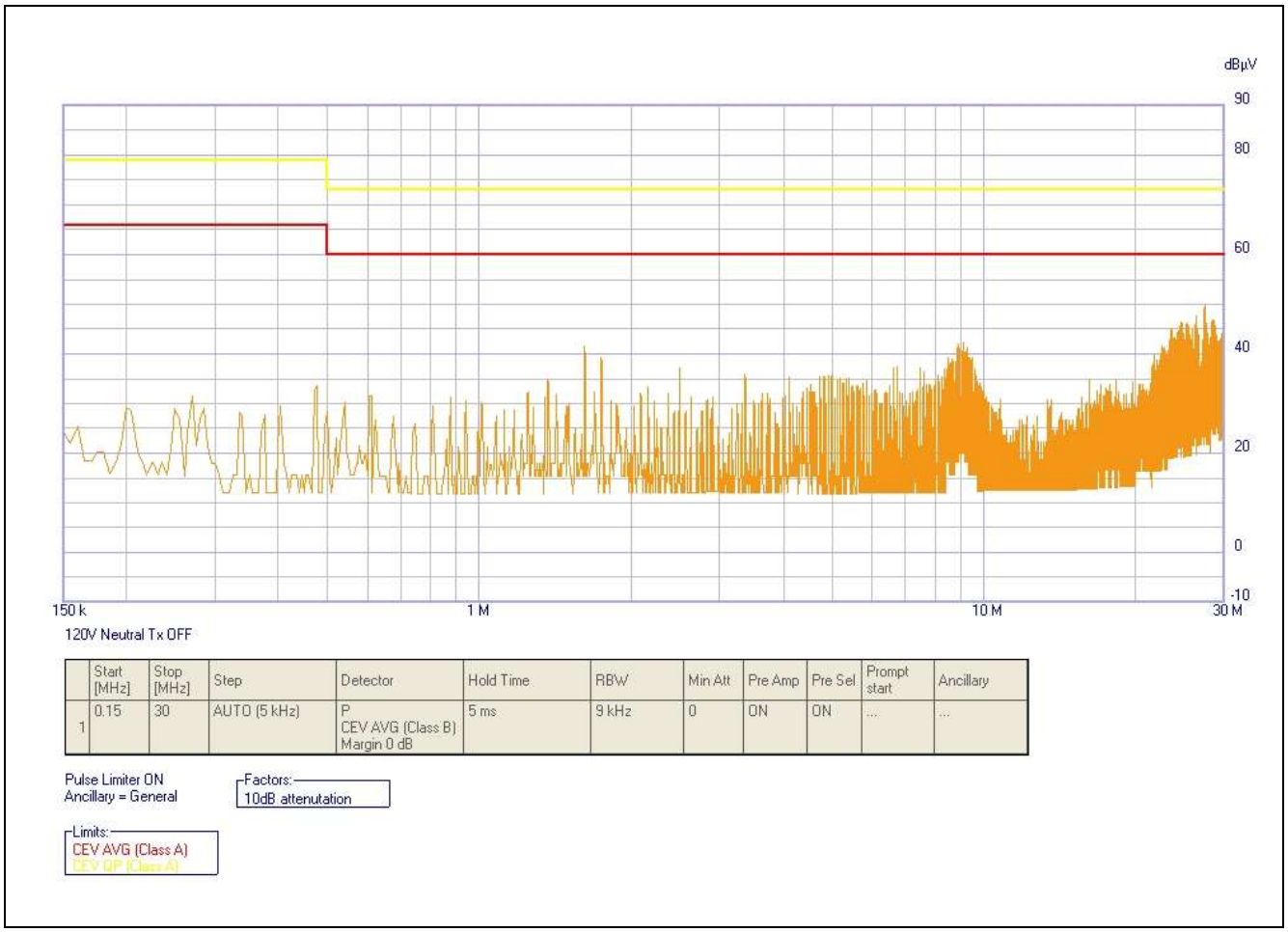


Plot 3. Conducted Emission, Phase Line Plot, POE

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

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
120V Neutral Tx OFF	27.345	46.21	73	-26.79	Pass	44.68	60	-15.32	Pass
120V Neutral Tx OFF	28.47	45.5	73	-27.5	Pass	44.39	60	-15.61	Pass
120V Neutral Tx OFF	26.475	45.38	73	-27.62	Pass	42.07	60	-17.93	Pass
120V Neutral Tx OFF	9.11	40.03	73	-32.97	Pass	38.76	60	-21.24	Pass
120V Neutral Tx OFF	1.62	39.77	73	-33.23	Pass	37.93	60	-22.07	Pass

Table 10. Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz), POE



Plot 4. Conducted Emission, Neutral Line Plot, POE

Conducted Emission Limits Test Setup

Photograph 2. Conducted Emissions, Test Setup, AC Supply (1)

Photograph 3. Conducted Emissions, Test Setup, AC Supply (2)

Photograph 4. Conducted Emissions, Test Setup, POE (1)

Photograph 5. Conducted Emissions, Test Setup, POE (2)

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 10 m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

Test Results: The EUT was compliant with the Class A requirement(s) of this section.

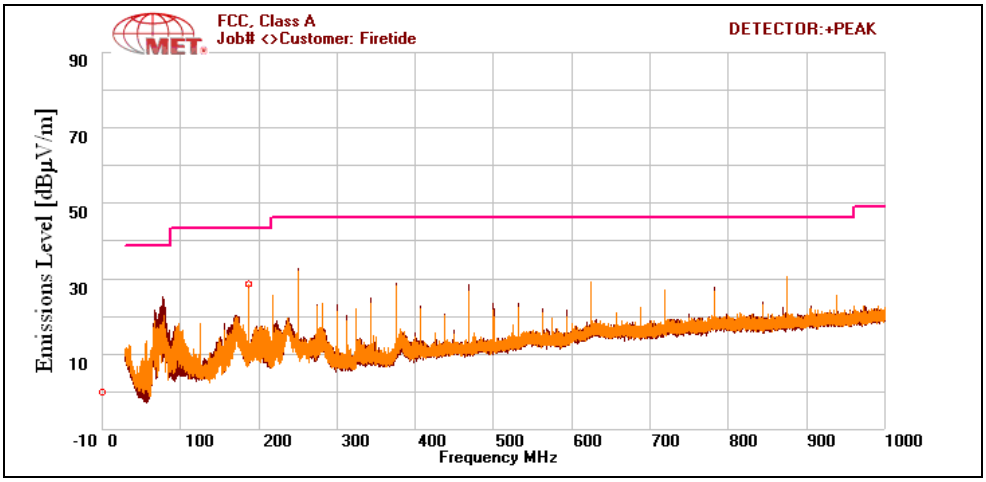
Test Engineer(s): Lionel Gabrillo

Test Date(s): 12/19/11 & 01/13/12

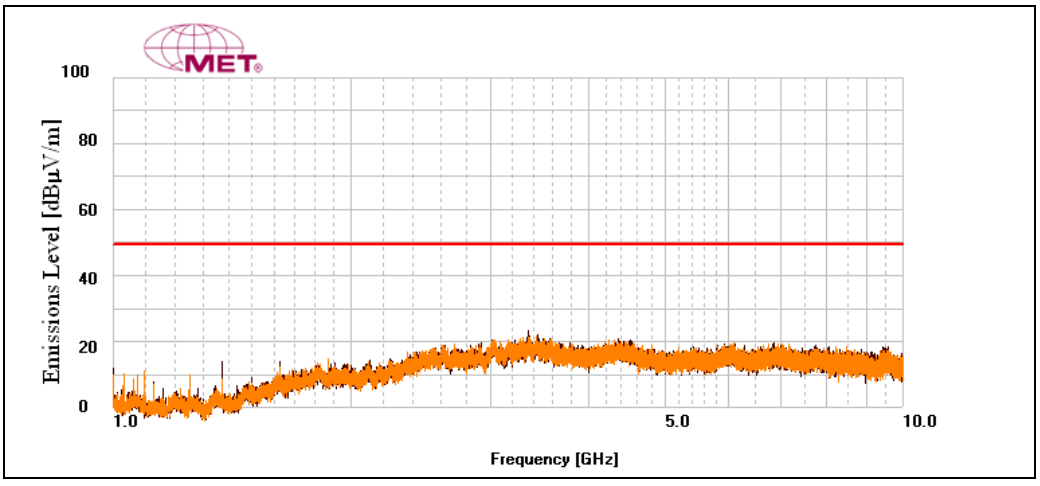
Radiated Emissions Limits Test Results, Class A

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)	Limit (dBuV)	Margin (dB)
77.94	H	346	349	32	6.888	0	2.374	-10.46	30.802	39	-8.198
187.51	H	78	122.11	26.45	9.2	0	3.778	-10.46	28.968	43.5	-14.532
187.23	V	171	100	31.2	9.2	0	3.775	-10.46	33.715	43.5	-9.785
250.07	V	176	100	18.44	12.107	0	3.74	-10.46	23.827	46.4	-22.573
249	H	286	100	26.4	12.02	0	3.743	-10.46	31.703	46.4	-14.697
874.9	V	283	100	2.2	20.102	0	6.455	-10.46	18.297	46.4	-28.103
1375	H	190.0	102.05	61.62	28.93	76.217	8.647	-10.46	12.52	49.5	-36.98

Table 12. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz, FCC Limits, AC Supply



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

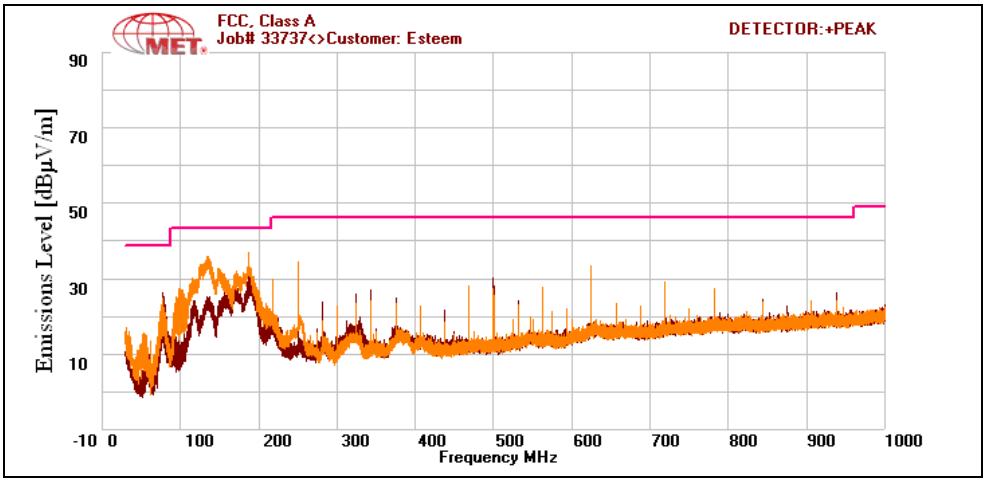


Plot 6. Radiated Emissions, Above 1 GHz, FCC Limits, AC Supply

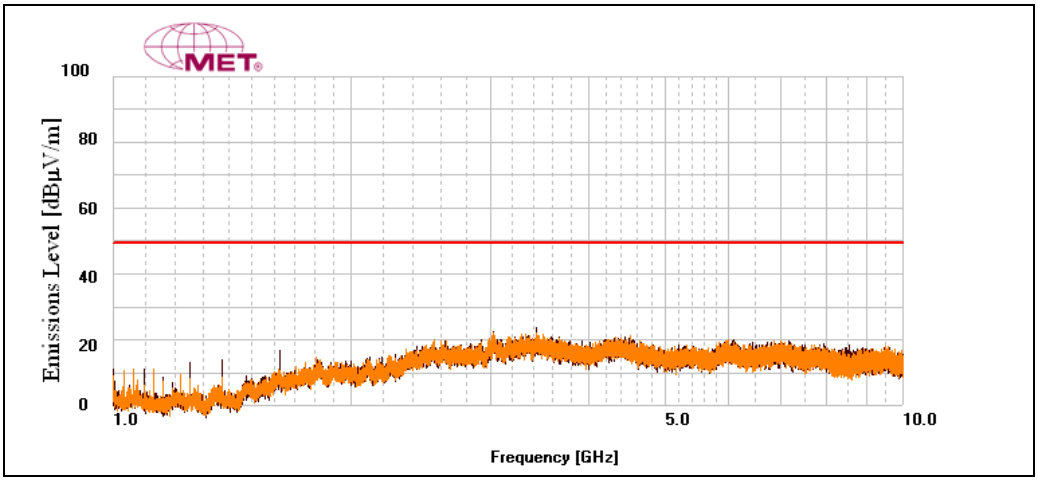
Radiated Emissions Limits Test Results, Class A

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)	Limit (dBuV)	Margin (dB)
187.52	V	75.0	100.0	35.4	9.2	0	3.778	-10.46	37.918	43.5	-5.582
130.4	V	114.0	100.0	29.48	11.98	0	3.172	-10.46	34.172	43.5	-9.328
250	V	193.0	100.0	29.31	12.1	0	3.74	-10.46	34.69	46.4	-11.71
187.48	H	263.0	181.29	35.2	9.2	0	3.777	-10.46	37.717	43.5	-5.783
250	H	246.0	100.0	26.47	12.1	0	3.74	-10.46	31.85	46.4	-14.55
625	V	157.0	100.0	21.11	19.2	0	5.32	-10.46	35.17	46.4	-11.23
1625	H	116.0	100.0	69.36	28.567	75.727	9.38	-10.46	21.12	49.5	-28.38

Table 13. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz, FCC Limits, POE



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

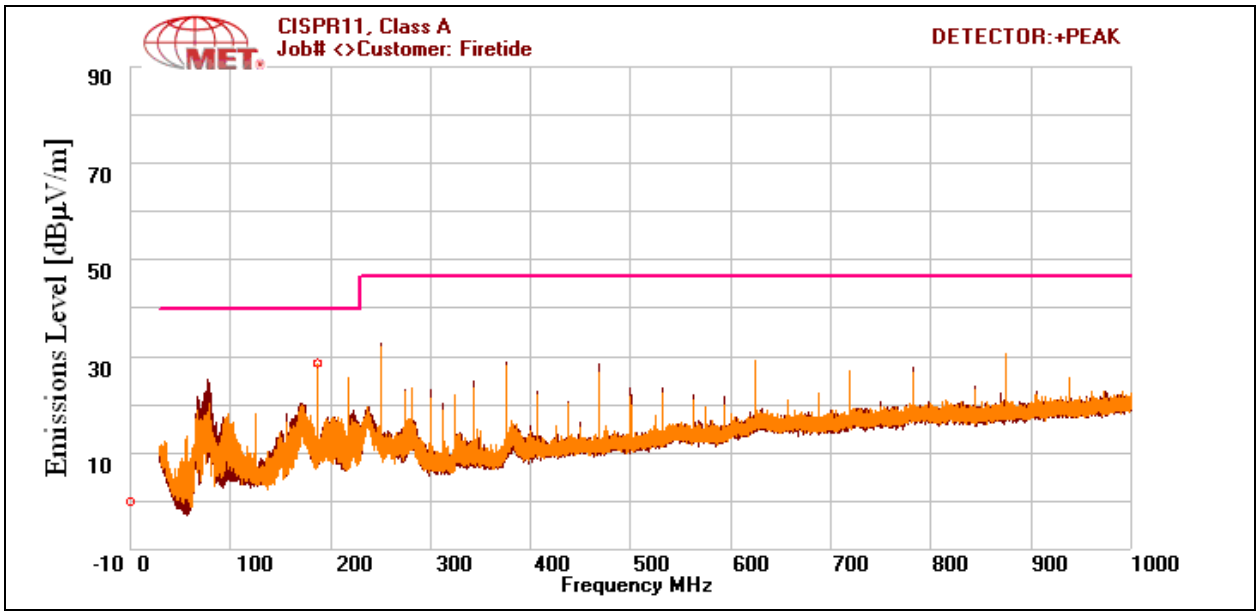


Plot 8. Radiated Emissions, Above 1 GHz, FCC Limits, POE

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)	Limit (dBuV)	Margin (dB)
77.94	H	346	349	32	6.888	0	2.374	-10.46	30.802	40	-9.198
187.51	H	78	122.11	26.45	9.2	0	3.778	-10.46	28.968	40	-11.032
187.23	V	171	100	31.2	9.2	0	3.775	-10.46	33.715	40	-6.285
250.07	V	176	100	18.44	12.107	0	3.74	-10.46	23.827	47	-23.173
249	H	286	100	26.4	12.02	0	3.743	-10.46	31.703	47	-15.297
874.9	V	283	100	2.2	20.102	0	6.455	-10.46	18.297	47	-28.703

Table 14. Radiated Emissions Limits, Test Results, ICES-003 Limits, AC Supply

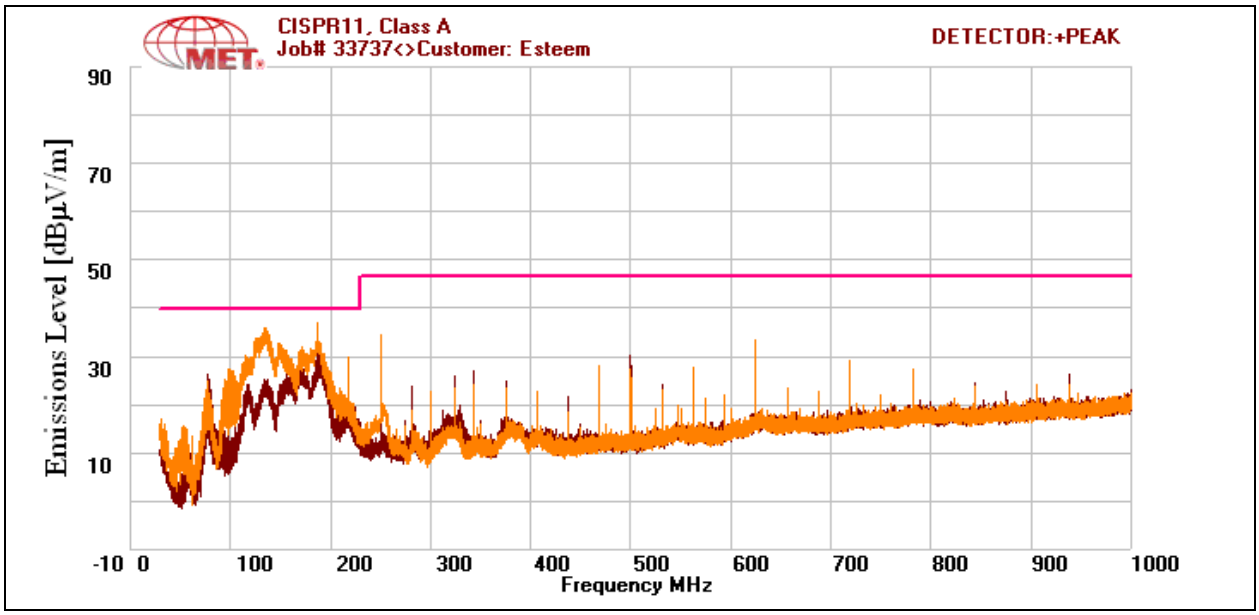


Plot 9. Radiated Emissions, ICES-003 Limits, AC Supply

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)	Limit (dBuV)	Margin (dB)
187.52	V	75.0	100.0	35.4	9.2	0	3.778	-10.46	37.918	40	-2.082
130.4	V	114.0	100.0	29.48	11.98	0	3.172	-10.46	34.172	40	-5.828
250	V	193.0	100.0	29.31	12.1	0	3.74	-10.46	34.69	47	-12.31
187.48	H	263.0	181.29	35.2	9.2	0	3.777	-10.46	37.717	40	-2.283
250	H	246.0	100.0	26.47	12.1	0	3.74	-10.46	31.85	47	-15.15
625	V	157.0	100.0	21.11	19.2	0	5.32	-10.46	35.17	47	-11.83

Table 15. Radiated Emissions Limits, Test Results, ICES-003 Limits, POE



Plot 10. Radiated Emissions, ICES-003 Limits, POE

Radiated Emission Limits Test Setup

Photograph 6. Radiated Emissions, Test Setup, 30 MHz – 1 GHz

Photograph 7. Radiated Emissions, Test Setup, Above 1 GHz

IV. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

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

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

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

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

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

Results: The EUT as tested is compliant the criteria of §15.203. Antenna uses a unique connector (reverse TNC) to attach to the EUT.

Test Engineer(s): Anderson Soungpanya

Test Date(s): 12/13/11

Gain	Type	Model	Manufacturer
6 dBi	Omni	AA20Ea	Electronic Systems Technology
22 dBi	Panel	AA205Ea	Electronic Systems Technology

Table 16. 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 17. 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.

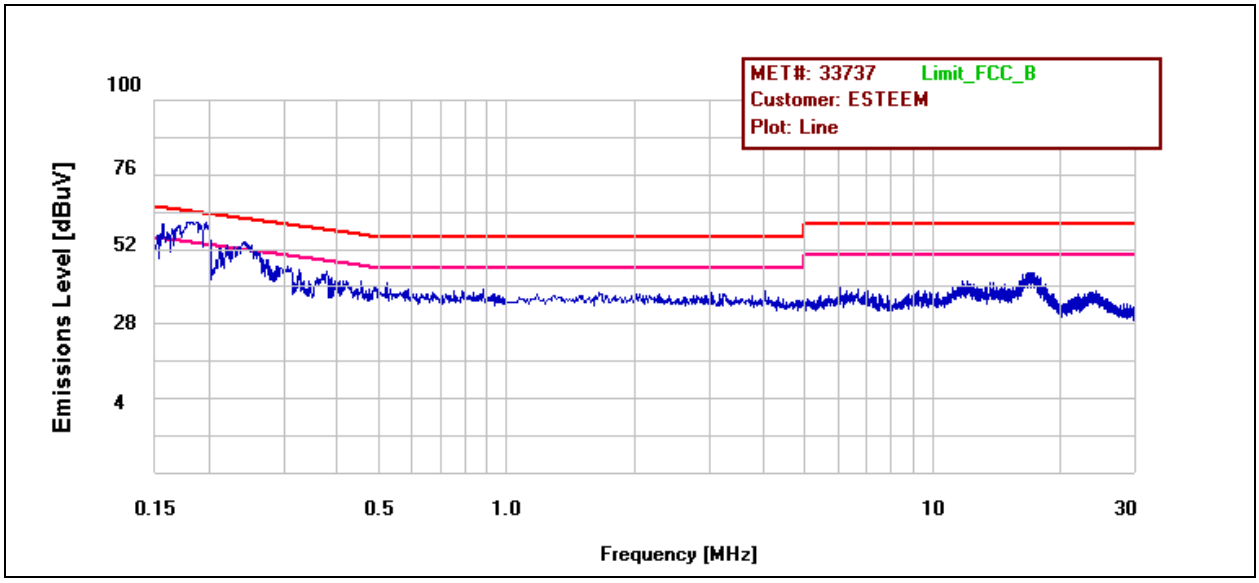
Test Engineer(s): Anderson Soungpanya

Test Date(s): 12/15/11

15.207(a) Conducted Emissions Test Results

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Line	.185	57.63	64.263	-6.633	Pass	40.67	54.263	-13.593	Pass
Line	.241	50.84	62.072	-11.232	Pass	36.85	52.072	-15.222	Pass
Line	16.91	38.25	60	-21.75	Pass	30.34	50	-19.66	Pass

Table 18. Conducted Emissions, 15.207(a), Phase Line, Test Results, AC Supply

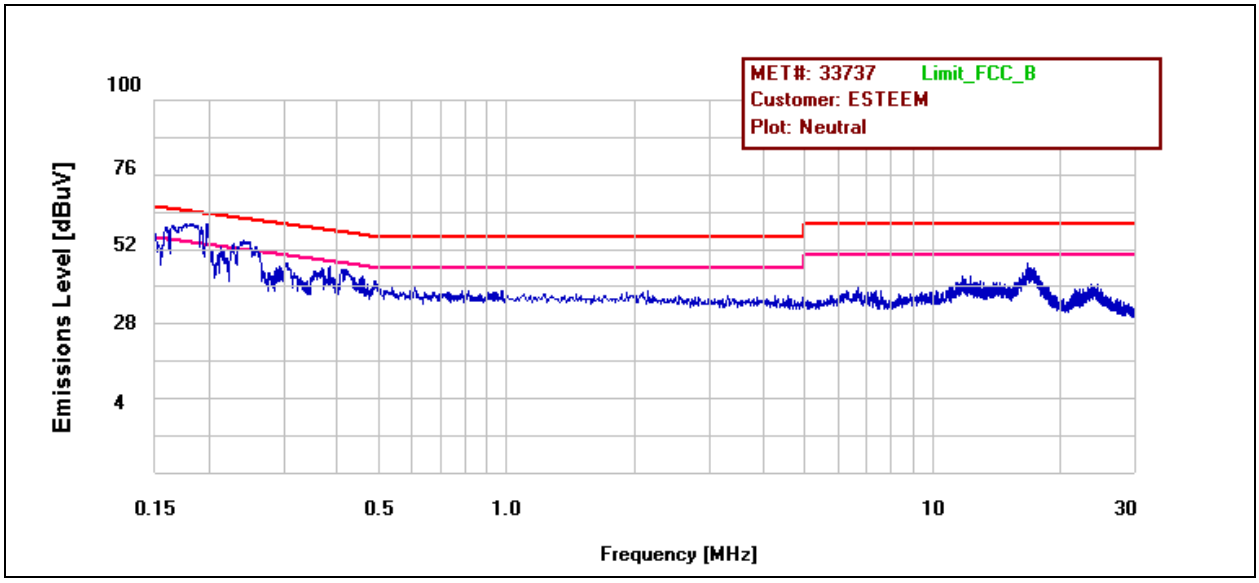


Plot 11. Conducted Emissions, 15.207(a), Phase Line, AC Supply

15.207(a) Conducted Emissions Test Results

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Neutral	.182	58.13	64.398	-6.268	Pass	41.36	54.398	-13.038	Pass
Neutral	.200	45.63	63.617	-17.987	Pass	30.81	53.617	-22.807	Pass
Neutral	.239	50.47	62.141	-11.671	Pass	36.42	52.141	-15.721	Pass

Table 19. Conducted Emissions, 15.207(a), Neutral Line, Test Results, AC Supply

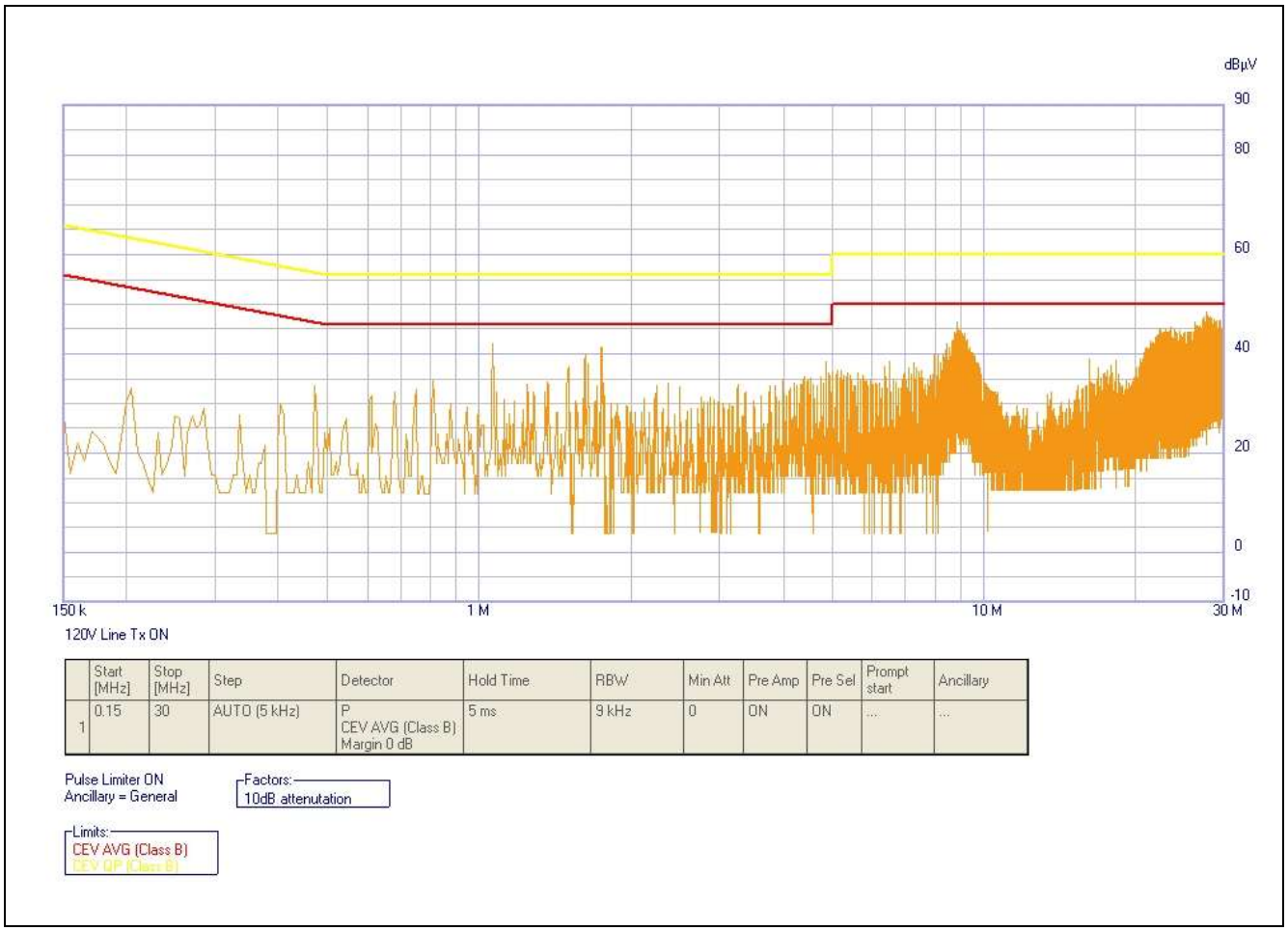


Plot 12. Conducted Emissions, 15.207(a), Neutral Line, AC Supply

15.207(a) Conducted Emissions Test Results

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Line	27.595	44.64	60	-15.36	Pass	41.15	50	-8.85	Pass
Line	1.625	39.06	56	-16.94	Pass	37.19	46	-8.81	Pass
Line	1.75	36.35	56	-19.65	Pass	34.99	46	-11.01	Pass
Line	8.865	42.26	60	-17.74	Pass	40.42	50	-9.58	Pass

Table 20. Conducted Emissions, 15.207(a), Phase Line, Test Results, POE

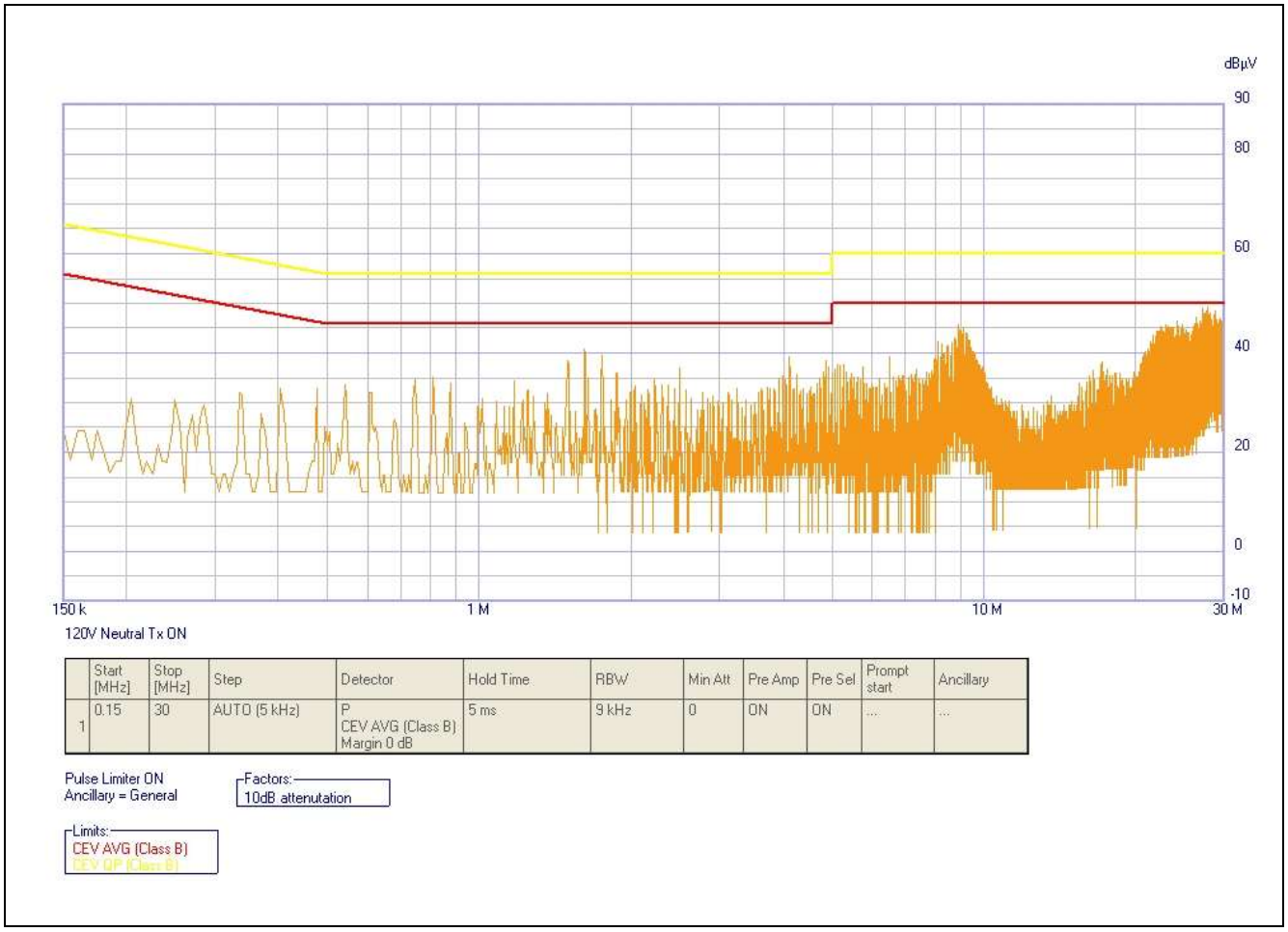


Plot 13. Conducted Emissions, 15.207(a), Phase Line, POE

15.207(a) Conducted Emissions Test Results

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Neutral	27.71	46.99	60	-13.01	Pass	44.79	50	-5.21	Pass
Neutral	25.46	44.94	60	-15.06	Pass	41.55	50	-8.45	Pass
Neutral	8.985	43.39	60	-16.61	Pass	40.32	50	-9.68	Pass
Neutral	1.62	39.23	56	-16.77	Pass	37.12	46	-8.88	Pass

Table 21. Conducted Emissions, 15.207(a), Neutral Line, Test Results, POE



Plot 14. Conducted Emissions, 15.207(a), Neutral Line, POE

15.207(a) Conducted Emissions Test Setup Photo

Photograph 8. Conducted Emissions, 15.207(a), Test Setup, AC/DC (1)

Photograph 9. Conducted Emissions, 15.207(a), Test Setup, AC/DC (2)

Photograph 10. Conducted Emissions, 15.207(a), Test Setup, POE (1)

Photograph 11. Conducted Emissions, 15.207(a), Test Setup, POE (2)

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 Procedure: The transmitter was on and transmitting at the highest output power. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately 1% of the total emission bandwidth, VBW > RBW. The 6 dB Bandwidth was measured and recorded. The measurements were performed on the low, mid and high channels.

Test Results The EUT was compliant with § 15.247 (a)(2).

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

Test Engineer(s): Anderson Soungpanya

Test Date(s): 12/08/11

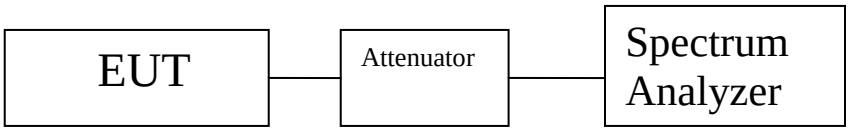


Figure 3. Block Diagram, Occupied Bandwidth Test Setup

Occupied Bandwidth Test Results

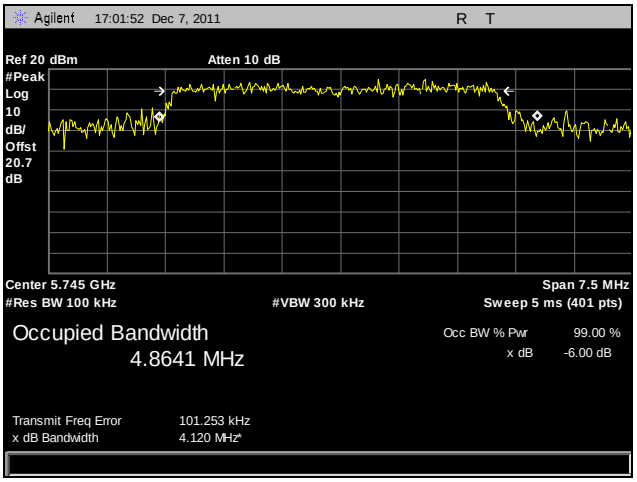
Occupied Bandwidth			
Mode	**Carrier Channel**	**Frequency (MHz)**	**Measured 6 dB Bandwidth (MHz)**
5 MHz	Low	5745	4.120
	Mid	5785	4.081
	High	5825	4.093
10 MHz	Low	5745	8.218
	Mid	5785	8.145
	High	5825	8.178
20 MHz	Low	5745	16.392
	Mid	5785	16.426
	High	5825	16.334

Table 22. 6 dB Occupied Bandwidth, Test Results

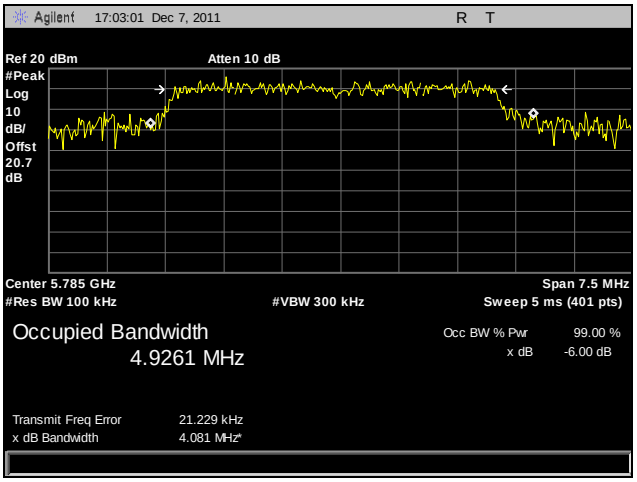
Occupied Bandwidth			
Mode	**Carrier Channel**	**Frequency (MHz)**	**Measured 99% Bandwidth (MHz)**
5 MHz	Low	5745	4.7720
	Mid	5785	4.7289
	High	5825	4.8685
10 MHz	Low	5745	9.8609
	Mid	5785	9.9656
	High	5825	9.3654
20 MHz	Low	5745	19.7698
	Mid	5785	19.0725
	High	5825	17.5082

Table 23. 99% Occupied Bandwidth, Test Results

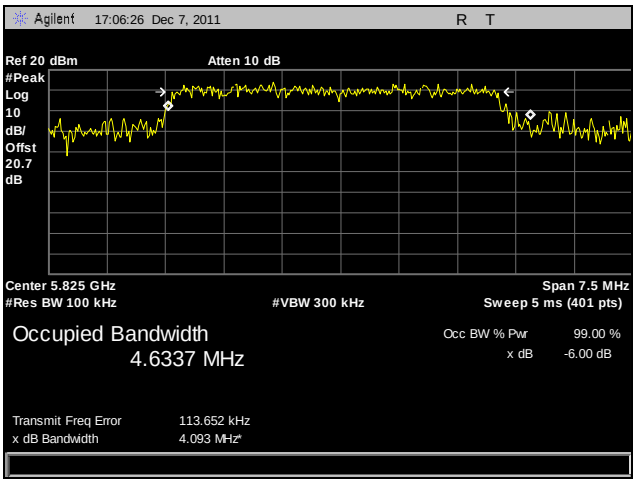
6dB Occupied Bandwidth Test Results, 5 MHz



Plot 15. 6 dB Occupied Bandwidth, Low Channel, 5 MHz

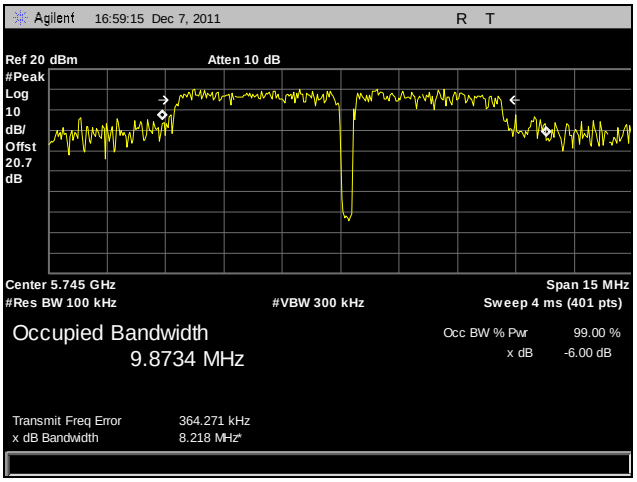


Plot 16. 6 dB Occupied Bandwidth, Mid Channel, 5 MHz

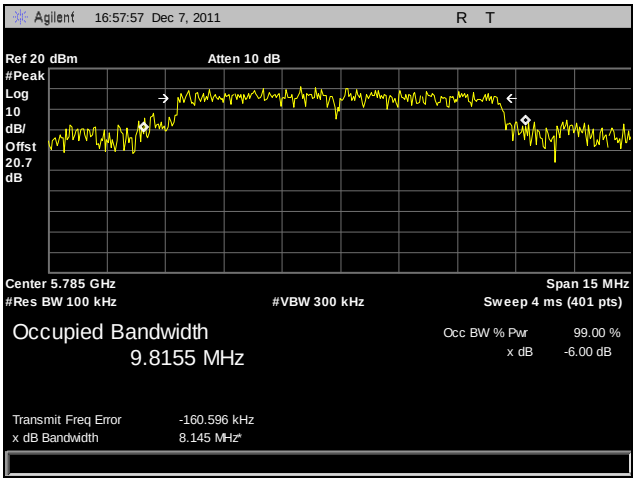


Plot 17. 6 dB Occupied Bandwidth, High Channel, 5 MHz

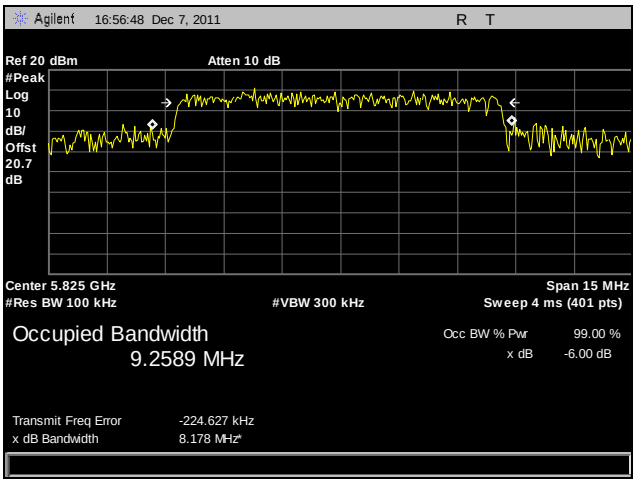
6dB Occupied Bandwidth Test Results, 10 MHz



Plot 18. 6 dB Occupied Bandwidth, Low Channel, 10 MHz

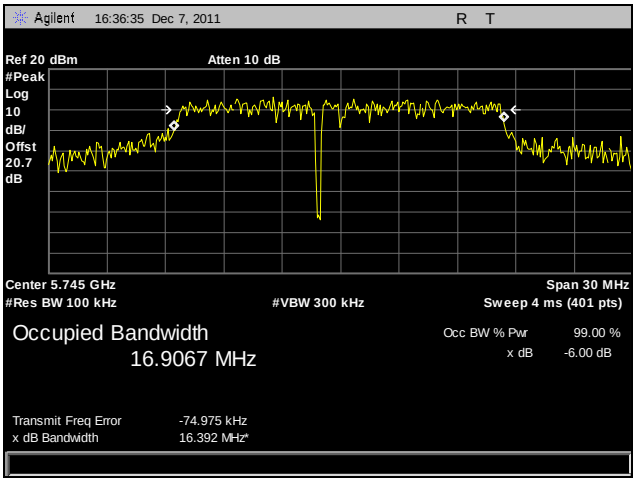


Plot 19. 6 dB Occupied Bandwidth, Mid Channel, 10 MHz

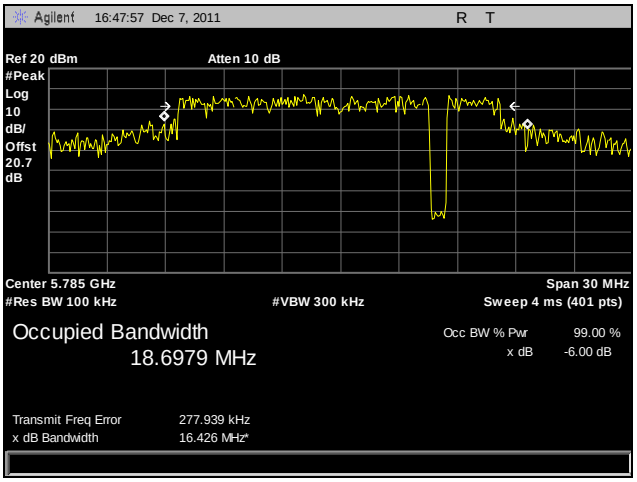


Plot 20. 6 dB Occupied Bandwidth, High Channel, 10 MHz

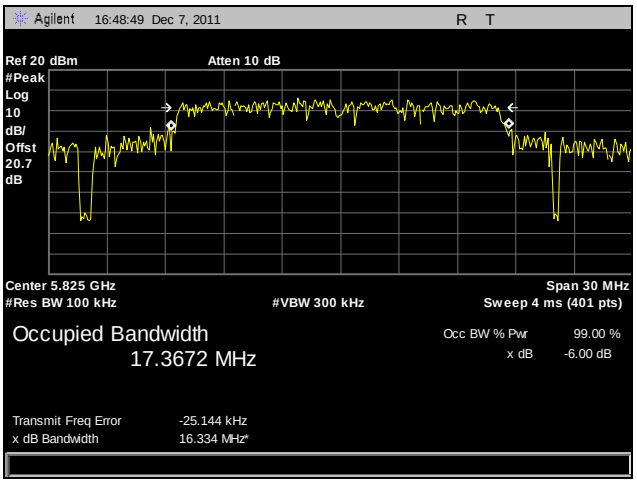
6dB Occupied Bandwidth Test Results, 20 MHz



Plot 21. 6 dB Occupied Bandwidth, Low Channel, 20 MHz

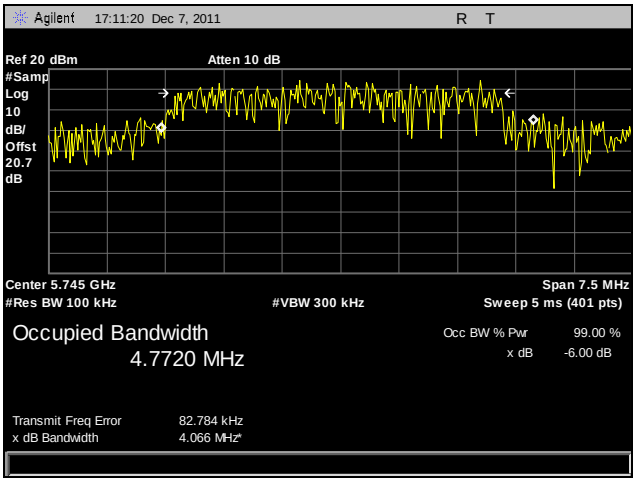


Plot 22. 6 dB Occupied Bandwidth, Mid Channel, 20 MHz

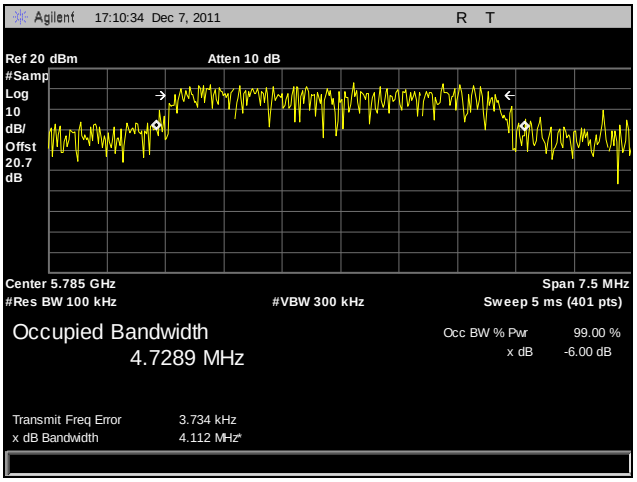


Plot 23. 6 dB Occupied Bandwidth, High Channel, 20 MHz

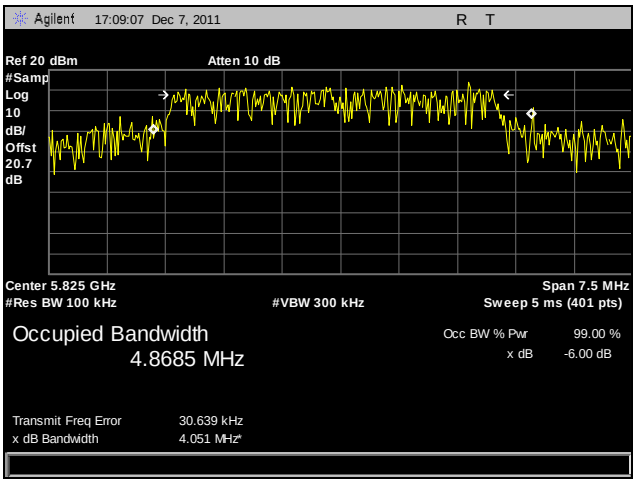
99% Occupied Bandwidth Test Results, 5 MHz



Plot 24. 99% Occupied Bandwidth, Low Channel, 5 MHz

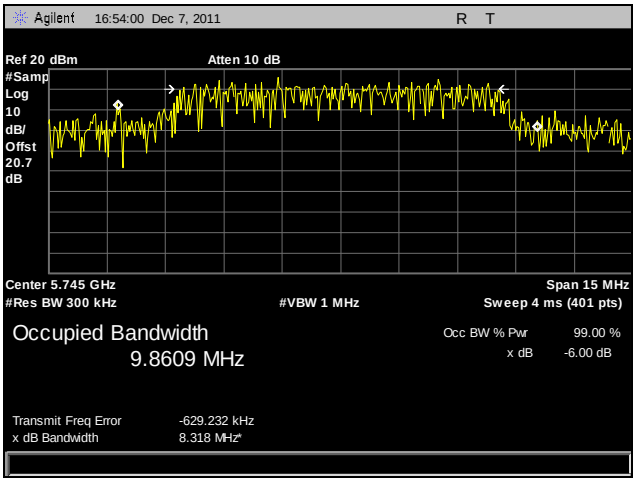


Plot 25. 99% Occupied Bandwidth, Mid Channel, 5 MHz

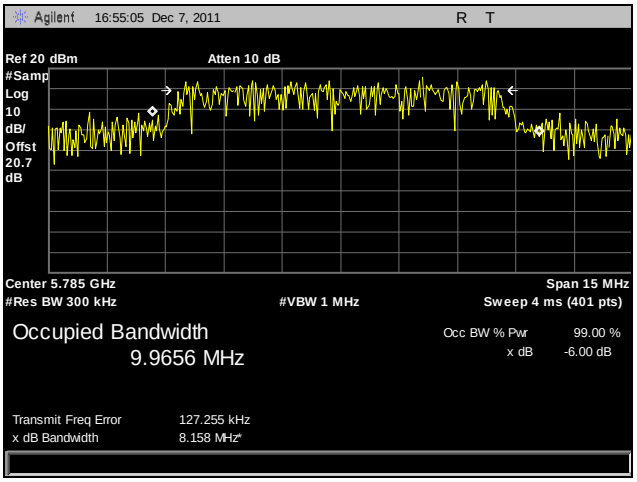


Plot 26. 99% Occupied Bandwidth, High Channel, 5 MHz

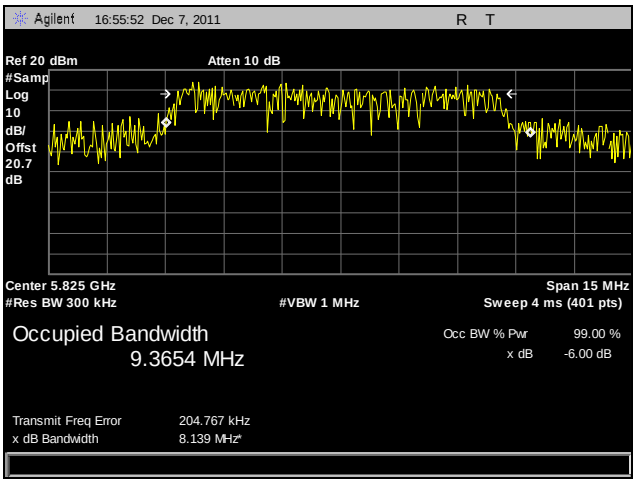
99% Occupied Bandwidth Test Results, 10 MHz



Plot 27. 99% Occupied Bandwidth, Low Channel, 10 MHz

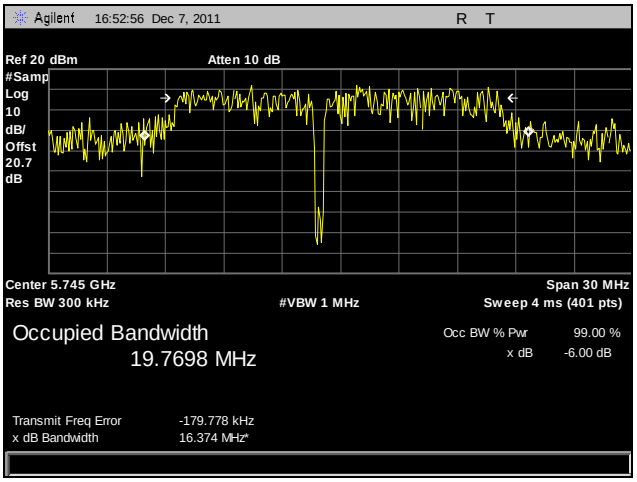


Plot 28. 99% Occupied Bandwidth, Mid Channel, 10 MHz

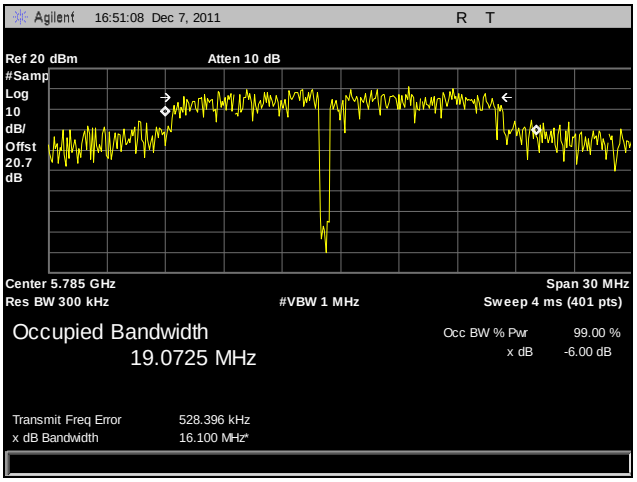


Plot 29. 99% Occupied Bandwidth, High Channel, 10 MHz

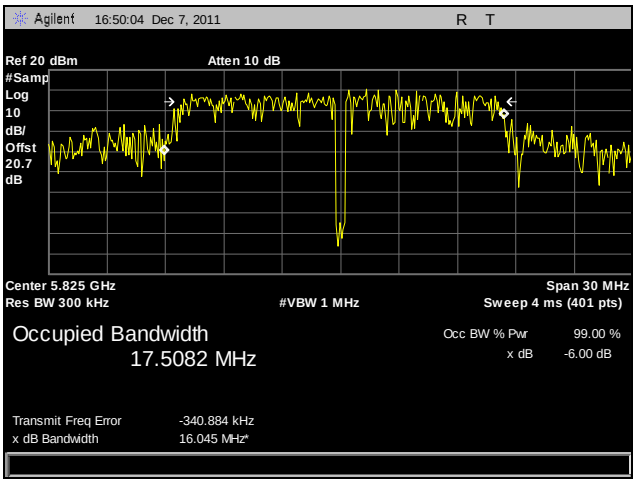
99% Occupied Bandwidth Test Results, 20 MHz



Plot 30. 99% Occupied Bandwidth, Low Channel, 20 MHz



Plot 31. 99% Occupied Bandwidth, Mid Channel, 20 MHz



Plot 32. 99% Occupied Bandwidth, High Channel, 20 MHz

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 24. 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 24, 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 spectrum analyzer. The EUT was measured at the low, mid and high channels of each band at the maximum power level.

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

Test Engineer(s): Anderson Soungpanya

Test Date(s): 12/13/11

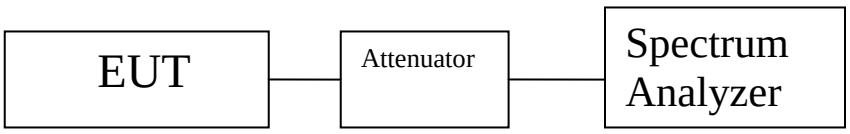


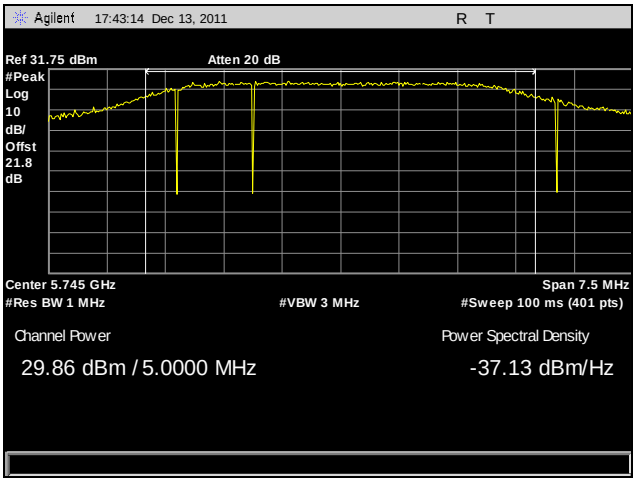
Figure 4. Peak Power Output Test Setup

Peak Power Output Test Results

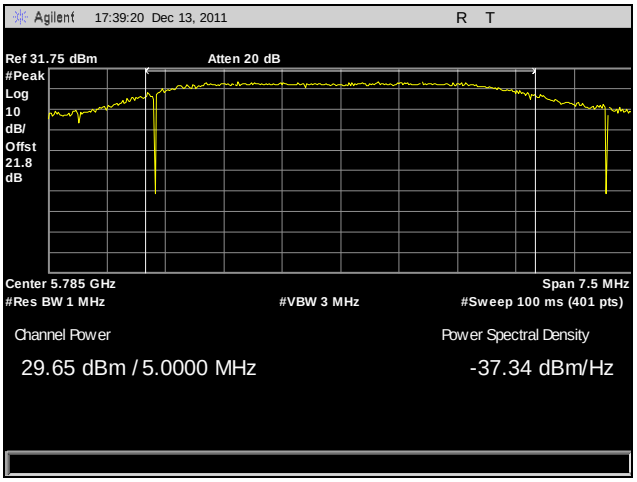
Peak Conducted Output Power			
Mode	**Carrier Channel**	**Frequency (MHz)**	**Measured Peak Output Power dBm**
5 MHz	Low	5745	29.86
	Mid	5785	29.65
	High	5825	29.71
10 MHz	Low	5745	29.69
	Mid	5785	29.99
	High	5825	29.99
20 MHz	Low	5745	29.52
	Mid	5785	29.91
	High	5825	29.98

Table 25. Peak Power Output, Test Results

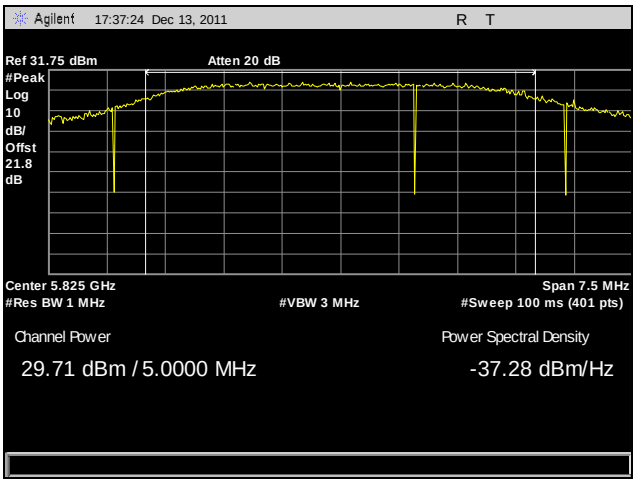
Peak Power Output Test Results, 5 MHz



Plot 33. Peak Power Output, Low Channel, 5 MHz

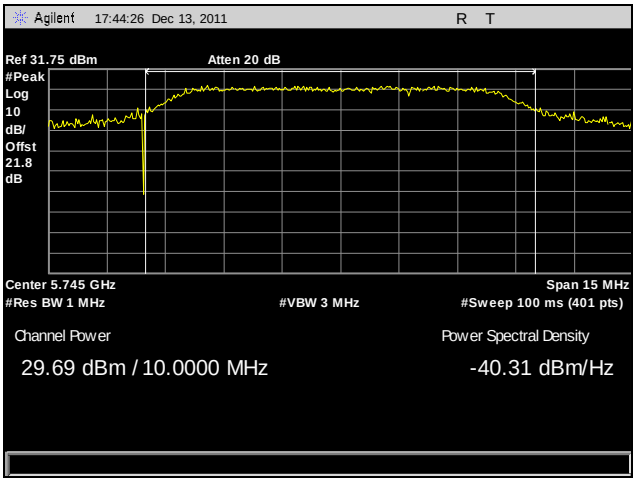


Plot 34. Peak Power Output, Mid Channel, 5 MHz

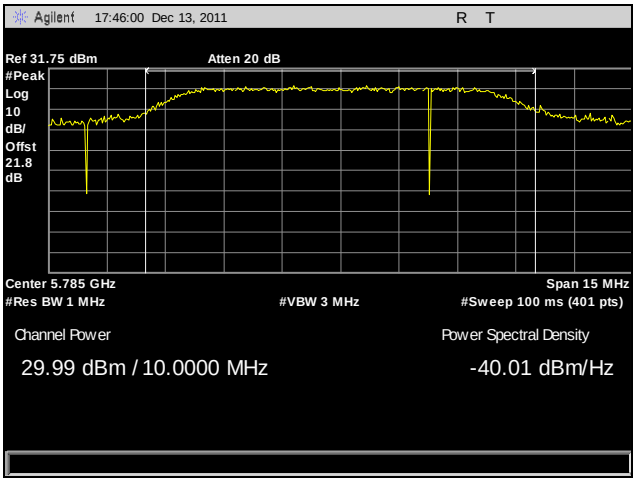


Plot 35. Peak Power Output, High Channel, 5 MHz

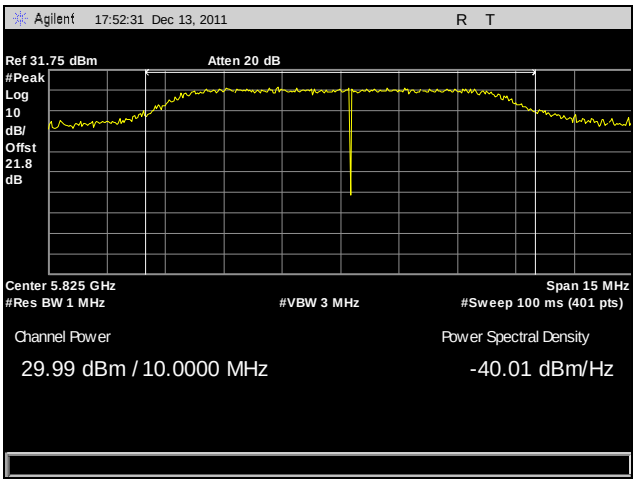
Peak Power Output Test Results, 10 MHz



Plot 36. Peak Power Output, Low Channel, 10 MHz

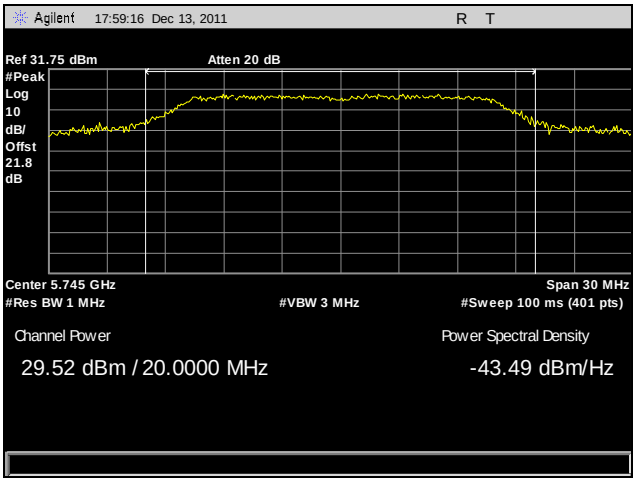


Plot 37. Peak Power Output, Mid Channel, 10 MHz

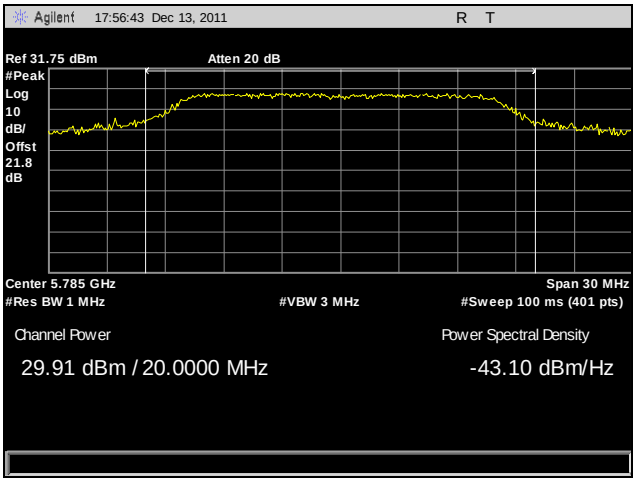


Plot 38. Peak Power Output, High Channel, 10 MHz

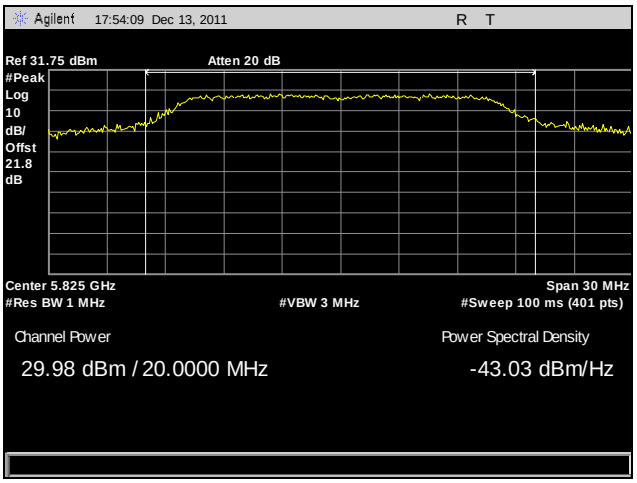
Peak Power Output Test Results, 20 MHz



Plot 39. Peak Power Output, Low Channel, 20 MHz



Plot 40. Peak Power Output, Mid Channel, 20 MHz



Plot 41. Peak Power Output, High Channel, 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 26. 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 27.

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

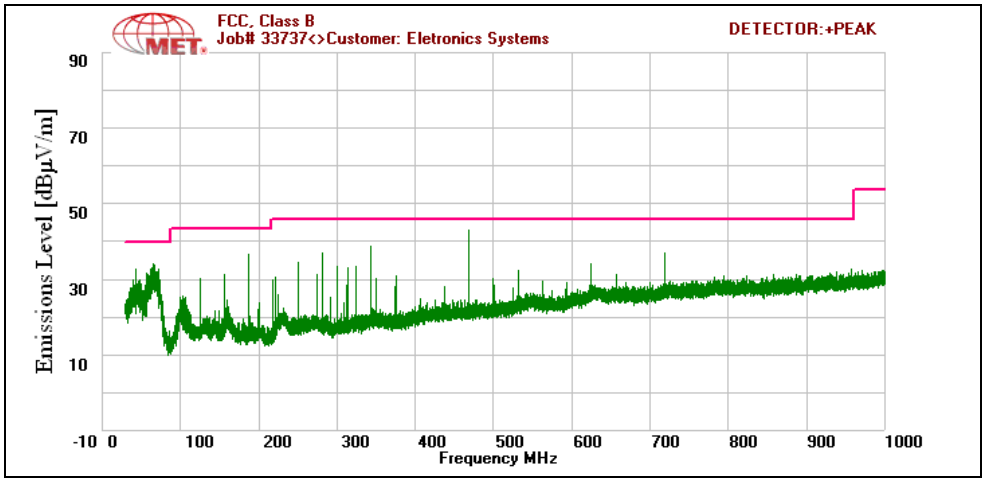
Test Procedures: The transmitter was turned on. Measurements were performed of the low, mid and high Channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line. Only noise floor was measured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

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

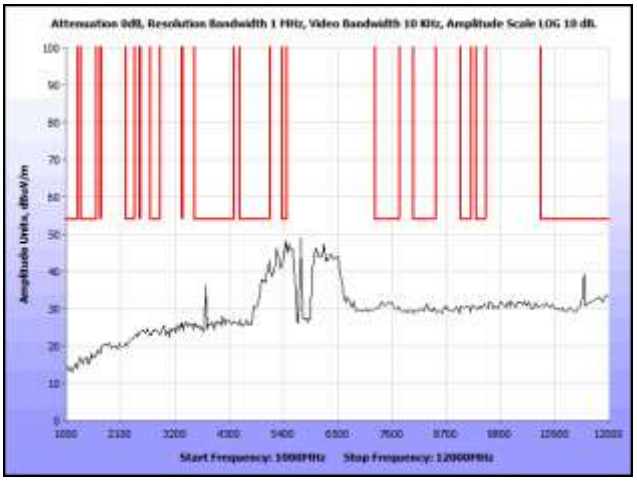
Test Engineer(s): Anderson Soungpanya

Test Date(s): 01/13/12

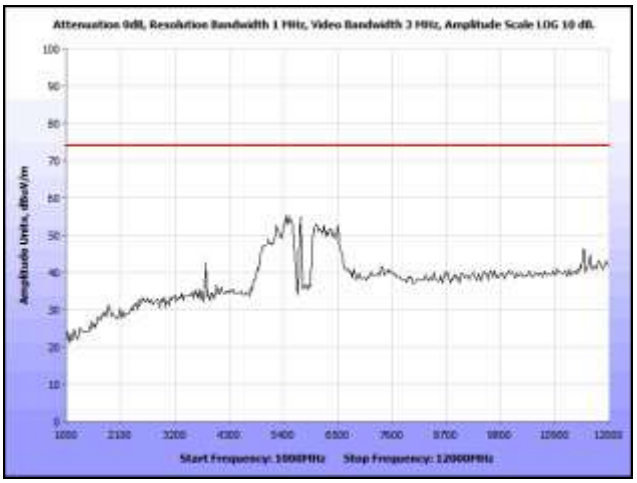
Radiated Spurious Emissions Test Results, 5 MHz, Omni



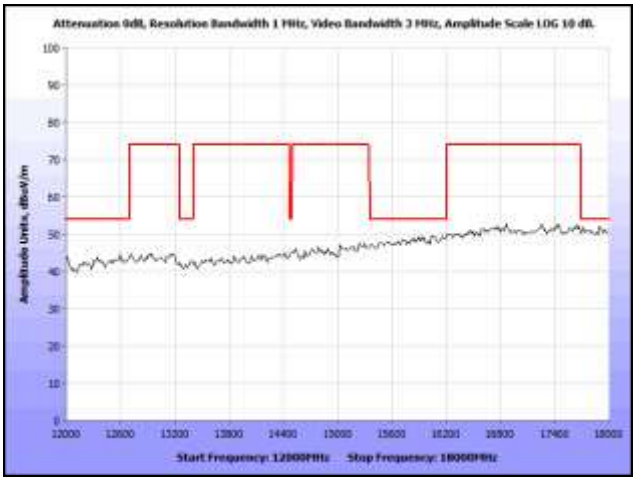
Plot 42. Radiated Spurious Emissions, Low Channel, 5 MHz, Omni, 30 MHz – 1 GHz



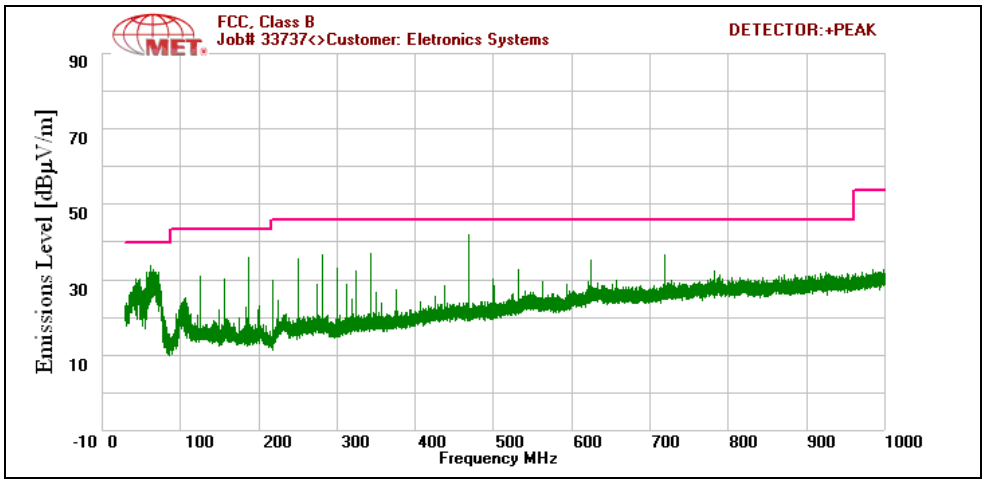
Plot 43. Radiated Spurious Emissions, Low Channel, 5 MHz, Omni, 1 GHz – 12 GHz, Average



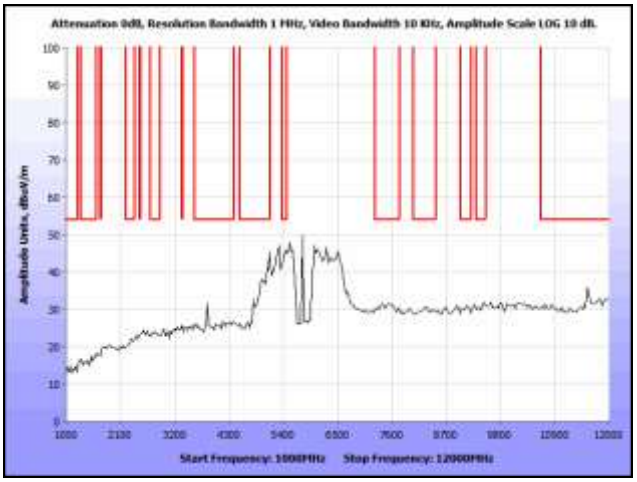
Plot 44. Radiated Spurious Emissions, Low Channel, 5 MHz, Omni, 1 GHz – 12 GHz, Peak



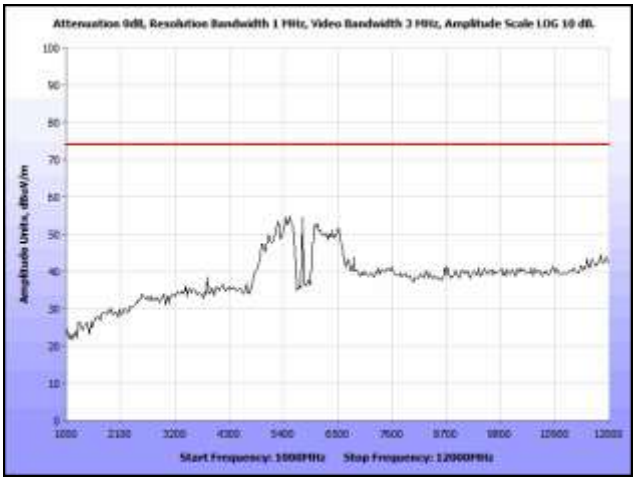
Plot 45. Radiated Spurious Emissions, Low Channel, 5 MHz, Omni, 12 GHz – 18 GHz



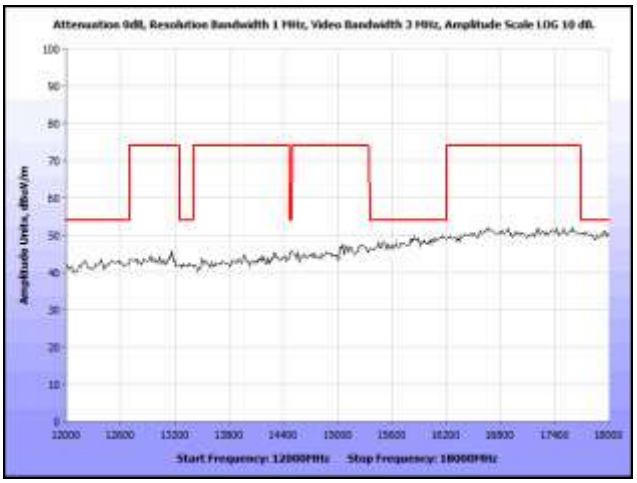
Plot 46. Radiated Spurious Emissions, Mid Channel, 5 MHz, Omni, 30 MHz – 1 GHz



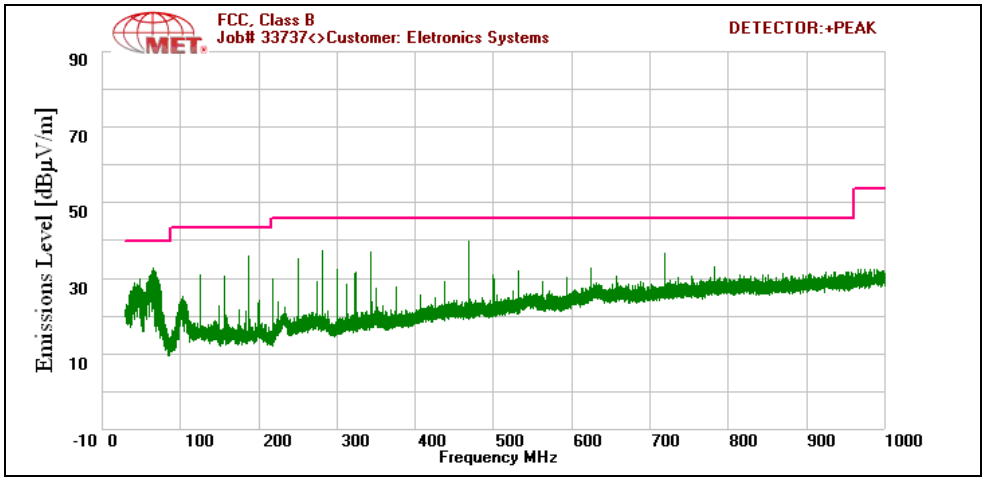
Plot 47. Radiated Spurious Emissions, Mid Channel, 5 MHz, Omni, 1 GHz – 12 GHz, Average



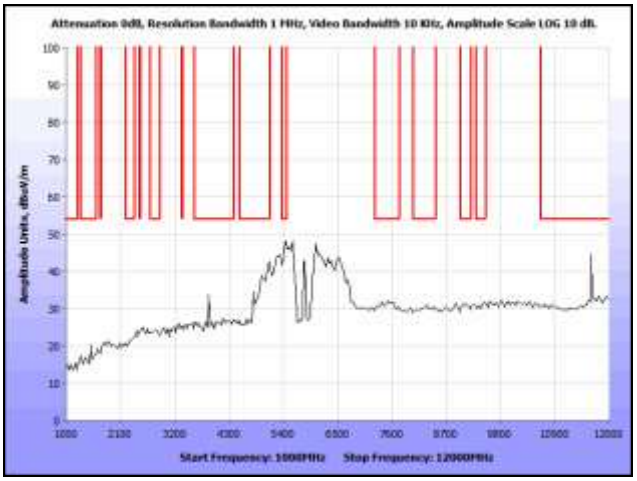
Plot 48. Radiated Spurious Emissions, Mid Channel, 5 MHz, Omni, 1 GHz – 12 GHz, Peak



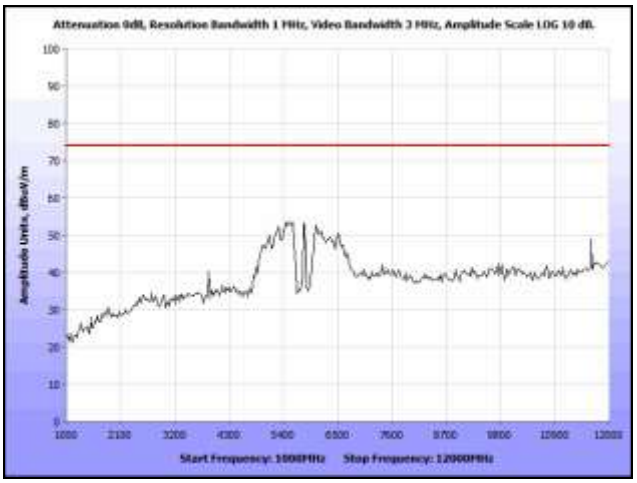
Plot 49. Radiated Spurious Emissions, Mid Channel, 5 MHz, Omni, 12 GHz – 18 GHz



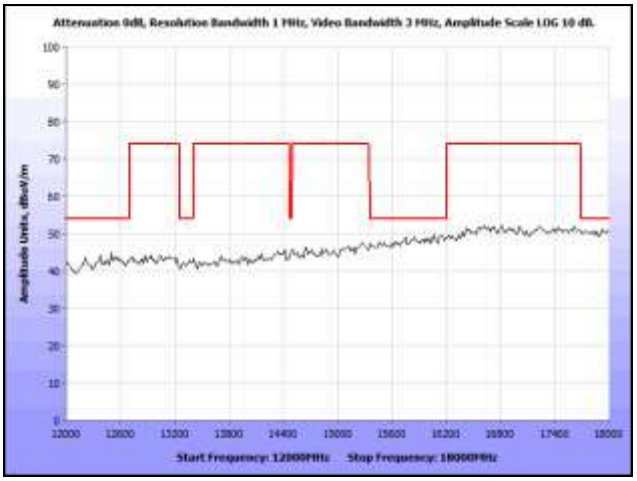
Plot 50. Radiated Spurious Emissions, Mid Channel, 5 MHz, Omni, 30 MHz – 1 GHz



Plot 51. Radiated Spurious Emissions, High Channel, 5 MHz, Omni, 1 GHz – 12 GHz, Average

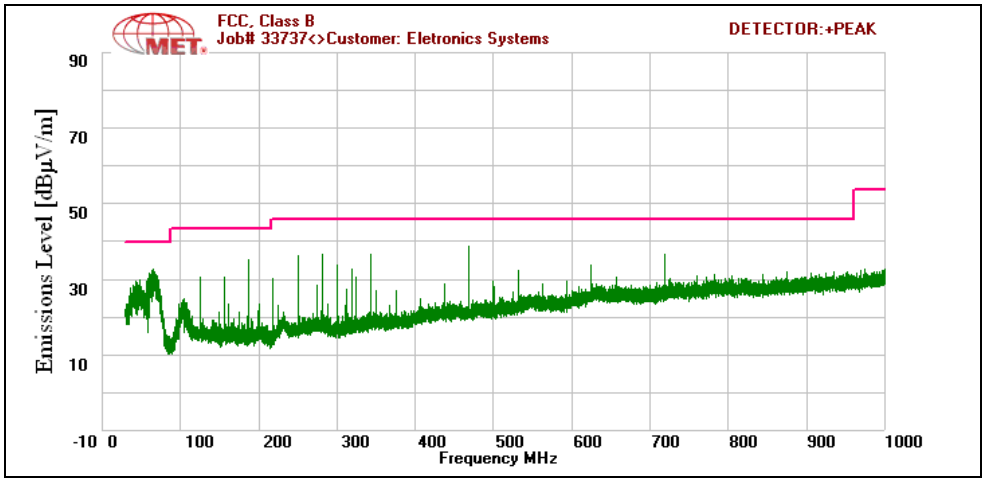


Plot 52. Radiated Spurious Emissions, High Channel, 5 MHz, Omni, 1 GHz – 12 GHz, Peak

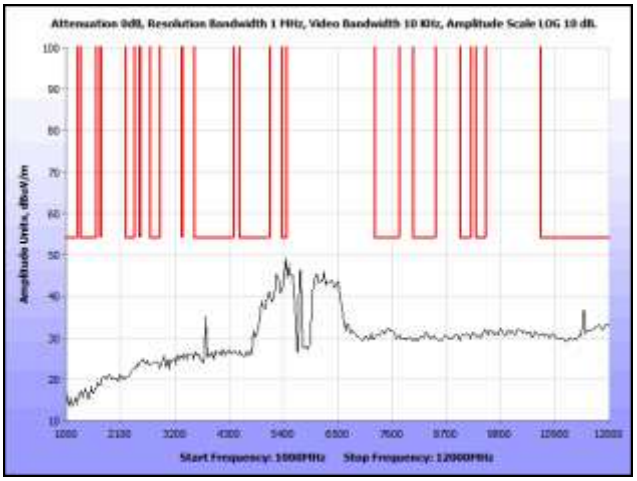


Plot 53. Radiated Spurious Emissions, High Channel, 5 MHz, Omni, 12 GHz – 18 GHz

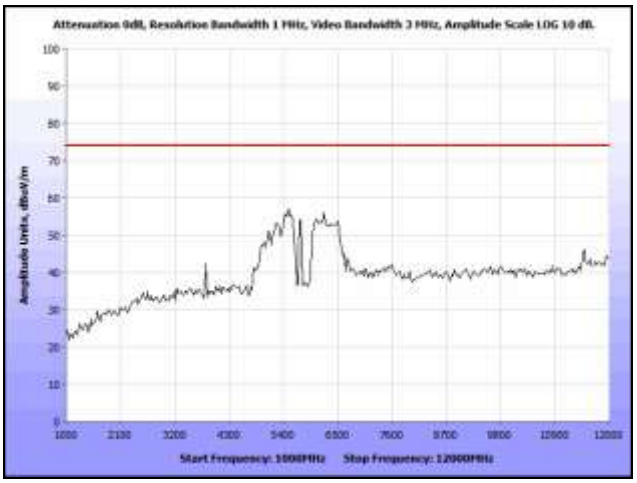
Radiated Spurious Emissions Test Results, 10 MHz, Omni



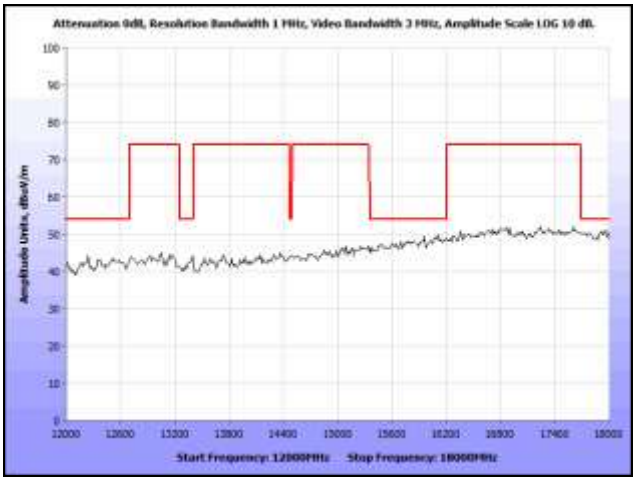
Plot 54. Radiated Spurious Emissions, Low Channel, 10 MHz, Omni, 30 MHz – 1 GHz



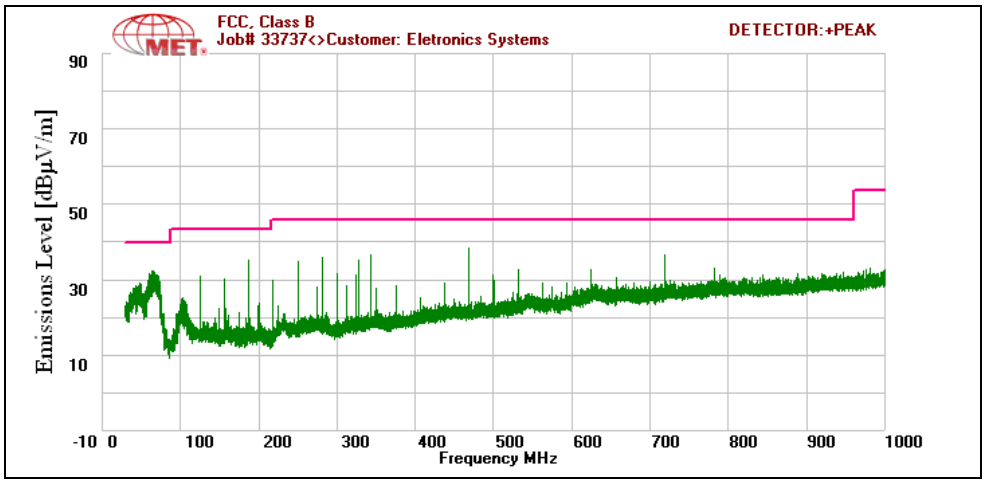
Plot 55. Radiated Spurious Emissions, Low Channel, 10 MHz, Omni, 1 GHz – 12 GHz, Average



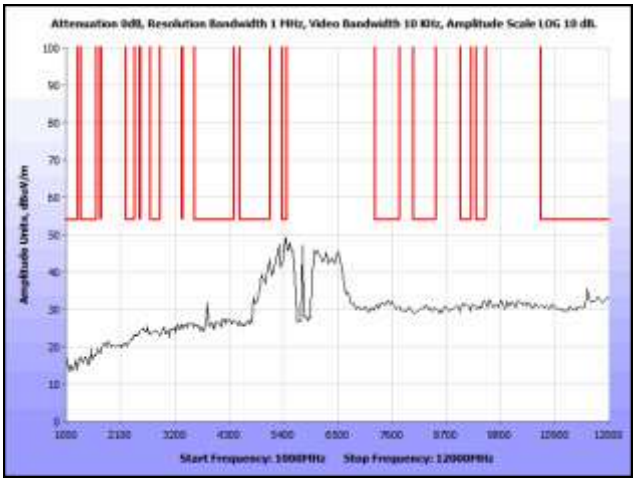
Plot 56. Radiated Spurious Emissions, Low Channel, 10 MHz, Omni, 1 GHz – 12 GHz, Peak



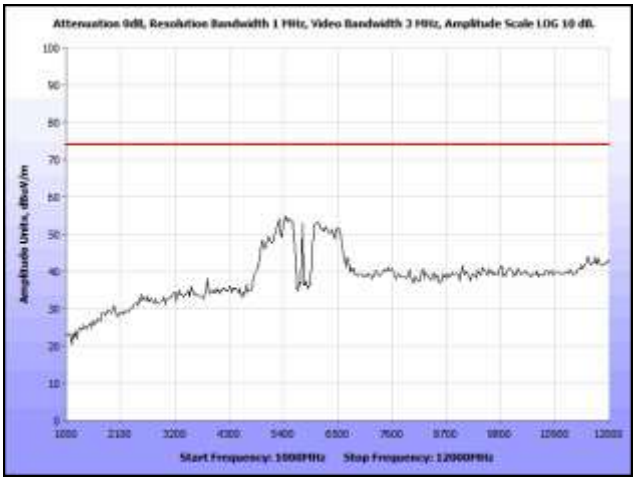
Plot 57. Radiated Spurious Emissions, Low Channel, 10 MHz, Omni, 12 GHz – 18 GHz



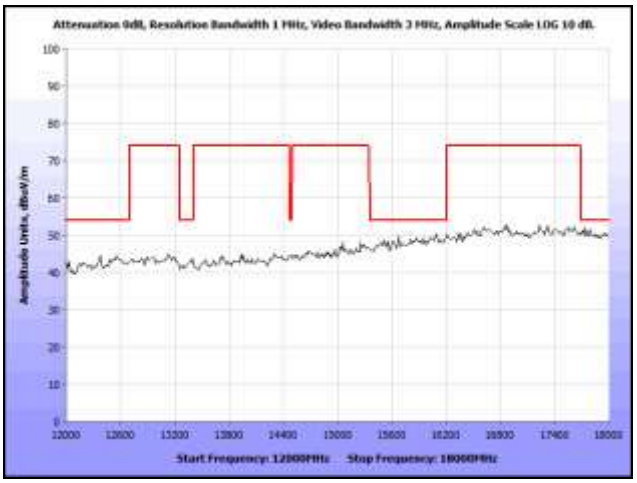
Plot 58. Radiated Spurious Emissions, Mid Channel, 10 MHz, Omni, 30 MHz – 1 GHz



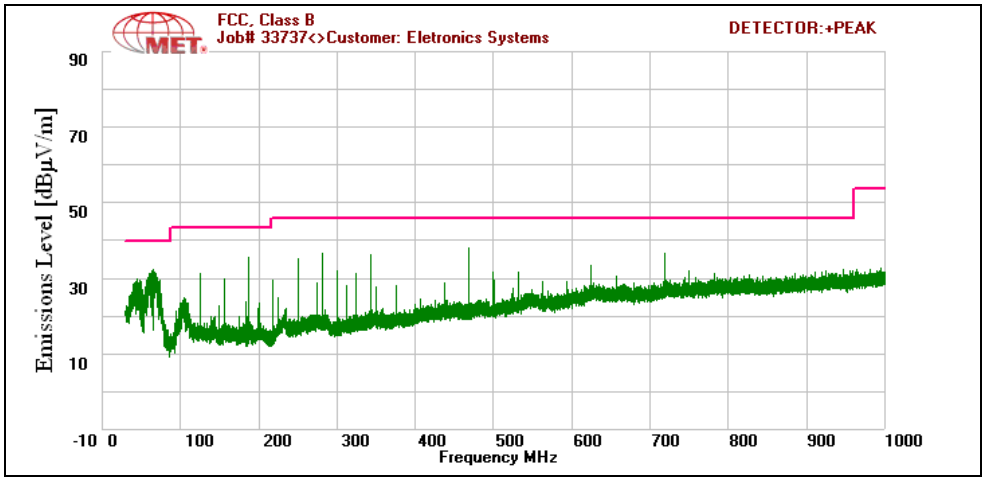
Plot 59. Radiated Spurious Emissions, Mid Channel, 10 MHz, Omni, 1 GHz – 12 GHz, Average



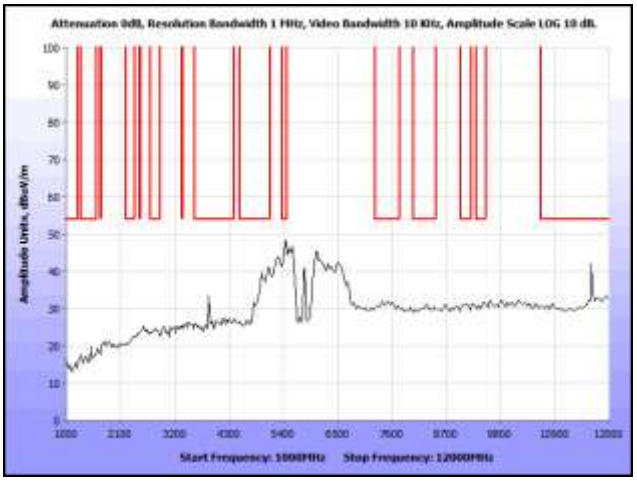
Plot 60. Radiated Spurious Emissions, Mid Channel, 10 MHz, Omni, 1 GHz – 12 GHz, Peak



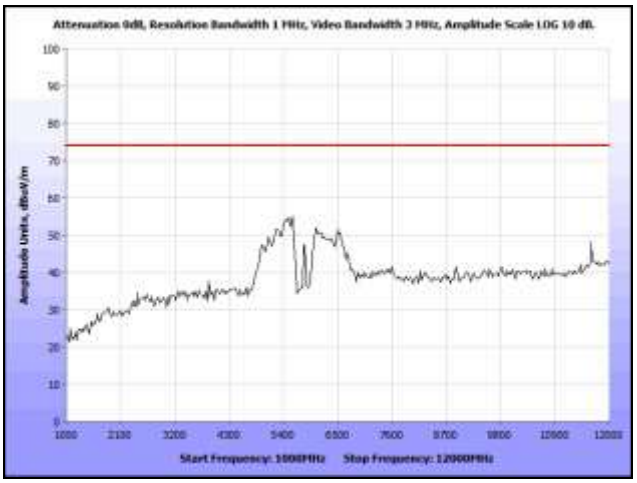
Plot 61. Radiated Spurious Emissions, Mid Channel, 10 MHz, Omni, 12 GHz – 18 GHz



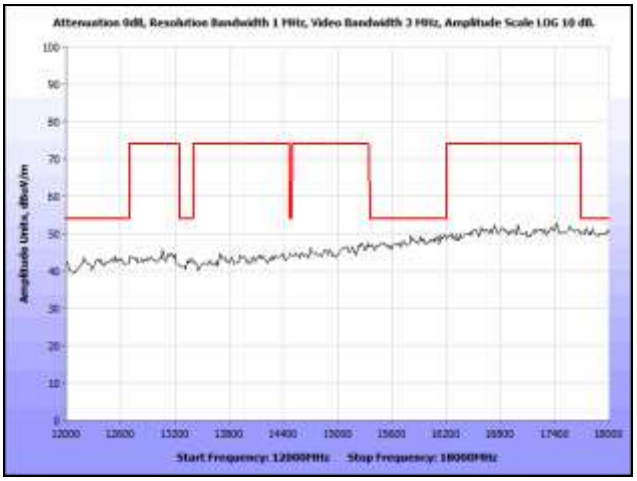
Plot 62. Radiated Spurious Emissions, High Channel, 10 MHz, Omni, 30 MHz – 1 GHz



Plot 63. Radiated Spurious Emissions, High Channel, 10 MHz, Omni, 1 GHz – 12 GHz, Average

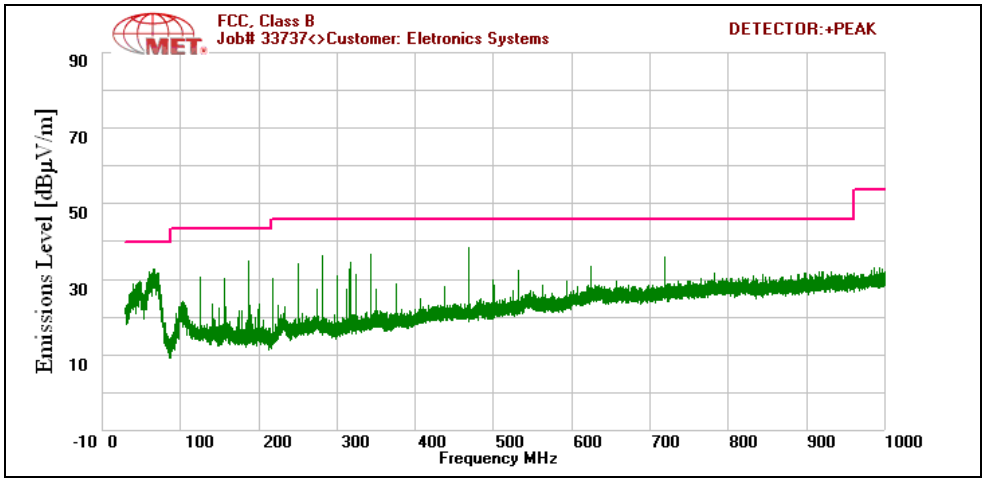


Plot 64. Radiated Spurious Emissions, High Channel, 10 MHz, Omni, 1 GHz – 12 GHz, Peak

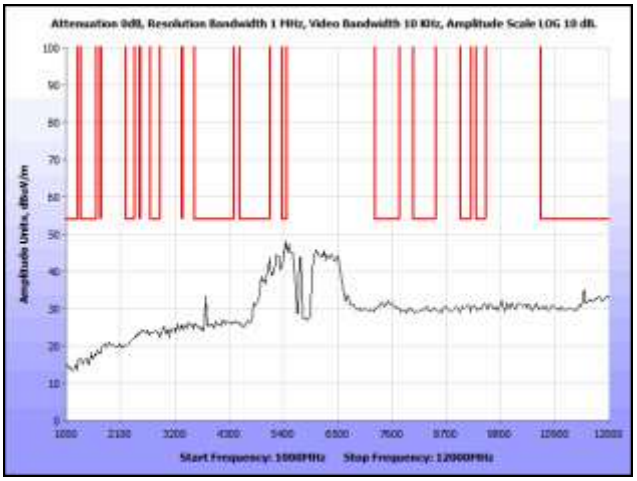


Plot 65. Radiated Spurious Emissions, High Channel, 10 MHz, Omni, 12 GHz – 18 GHz

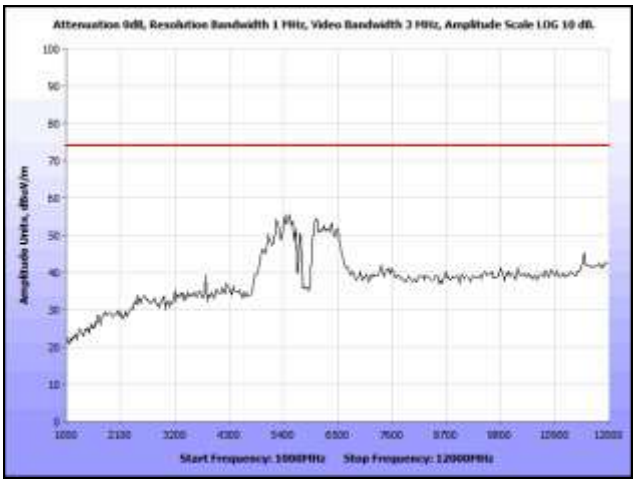
Radiated Spurious Emissions Test Results, 20 MHz, Omni



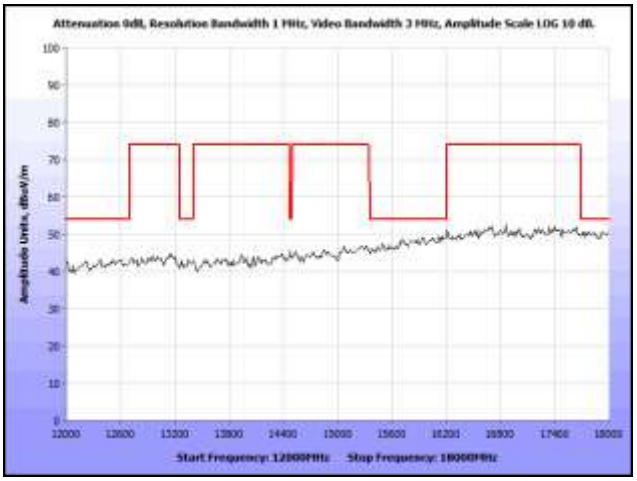
Plot 66. Radiated Spurious Emissions, Low Channel, 20 MHz, Omni, 30 MHz – 1 GHz



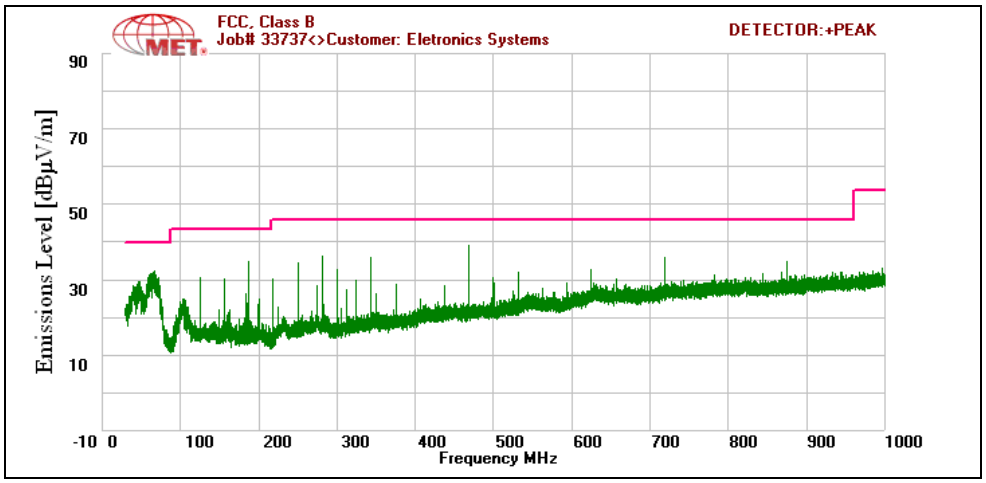
Plot 67. Radiated Spurious Emissions, Low Channel, 20 MHz, Omni, 1 GHz – 12 GHz, Average



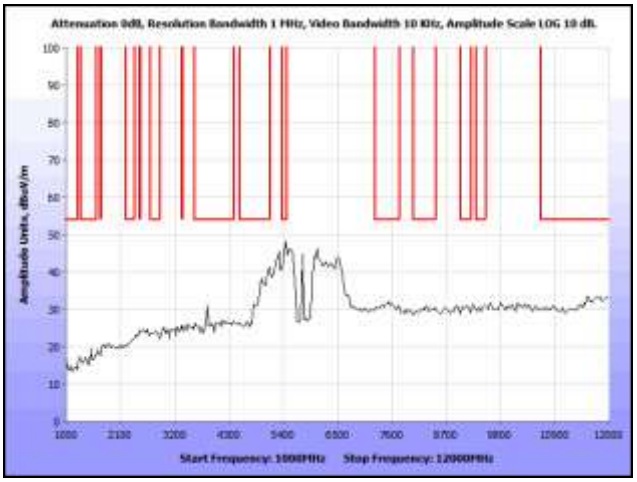
Plot 68. Radiated Spurious Emissions, Low Channel, 20 MHz, Omni, 1 GHz – 12 GHz, Peak



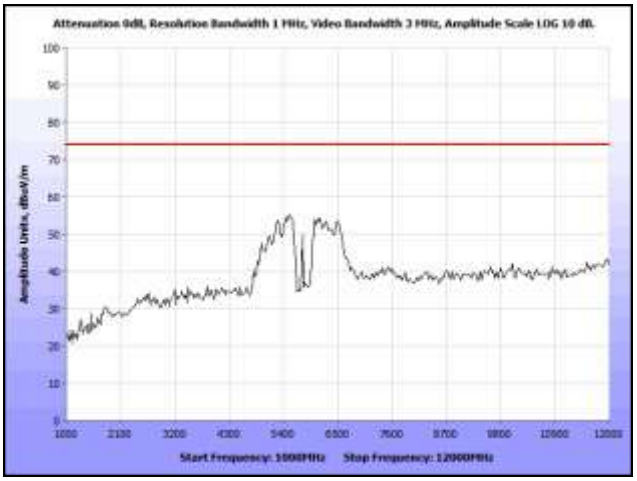
Plot 69. Radiated Spurious Emissions, Low Channel, 20 MHz, Omni, 12 GHz – 18 GHz



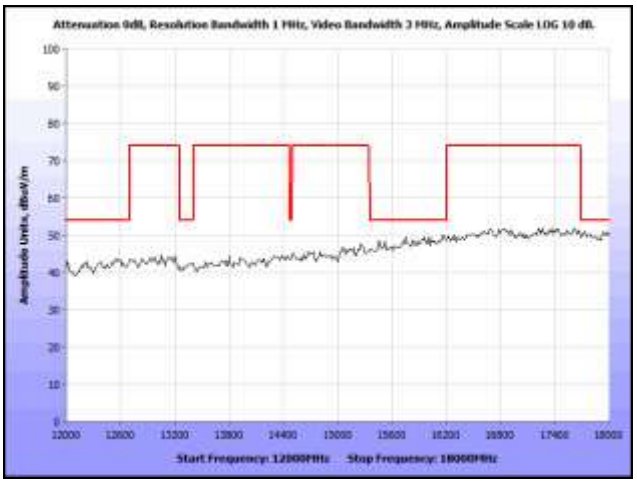
Plot 70. Radiated Spurious Emissions, Mid Channel, 20 MHz, Omni, 30 MHz – 1 GHz



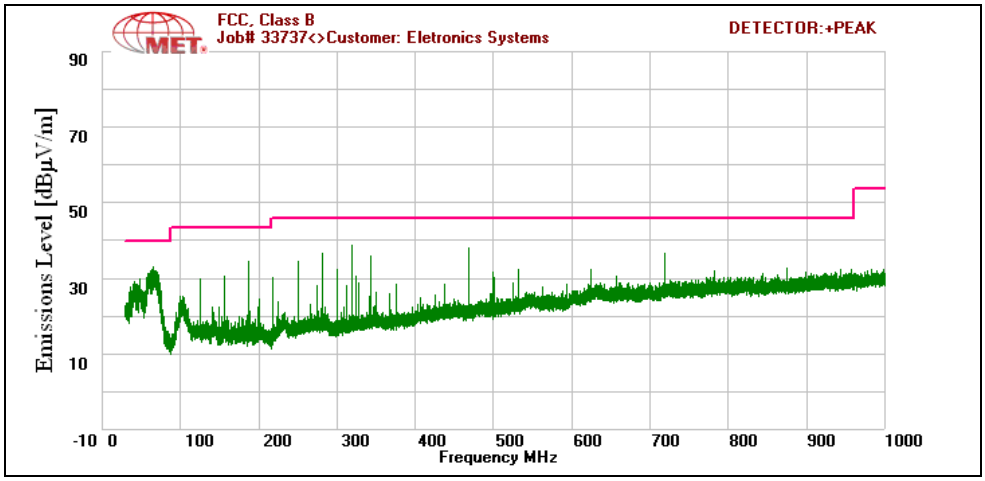
Plot 71. Radiated Spurious Emissions, Mid Channel, 20 MHz, Omni, 1 GHz – 12 GHz, Average



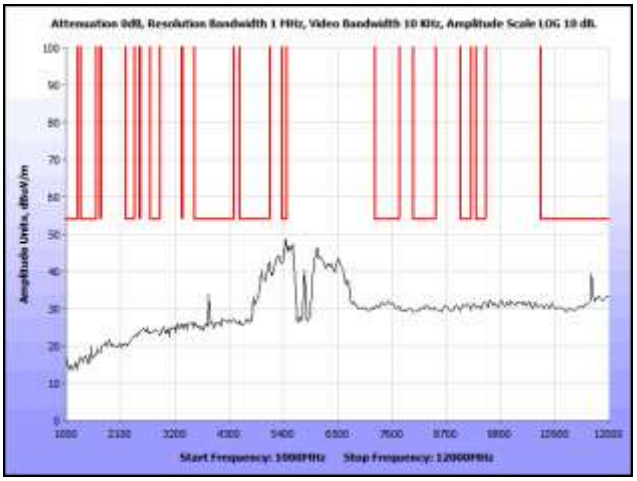
Plot 72. Radiated Spurious Emissions, Mid Channel, 20 MHz, Omni, 1 GHz – 12 GHz, Peak



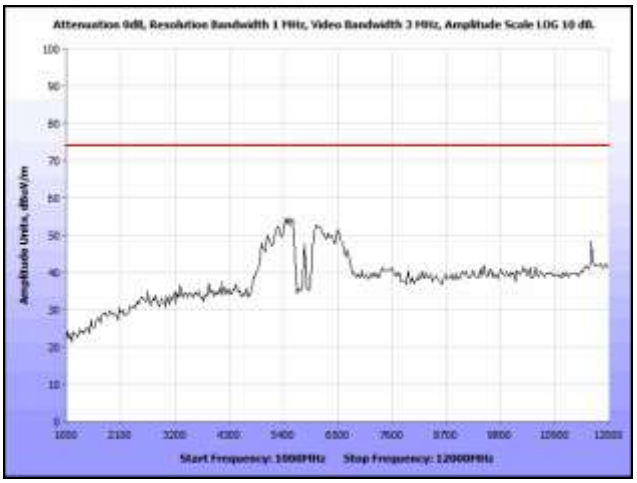
Plot 73. Radiated Spurious Emissions, Mid Channel, 20 MHz, Omni, 12 GHz – 18 GHz



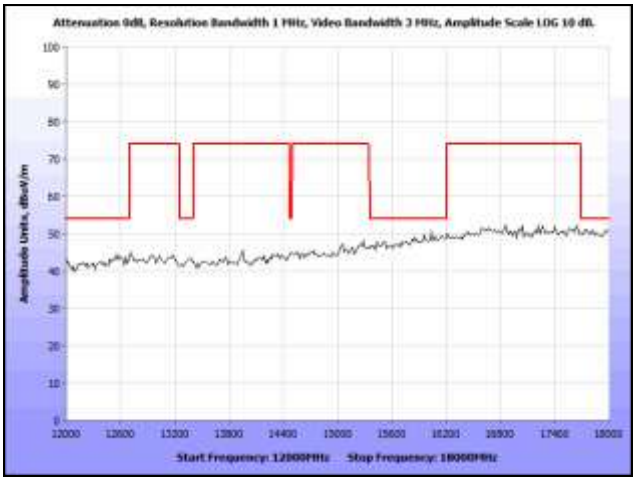
Plot 74. Radiated Spurious Emissions, High Channel, 20 MHz, Omni, 30 MHz – 1 GHz



Plot 75. Radiated Spurious Emissions, High Channel, 20 MHz, Omni, 1 GHz – 12 GHz, Average

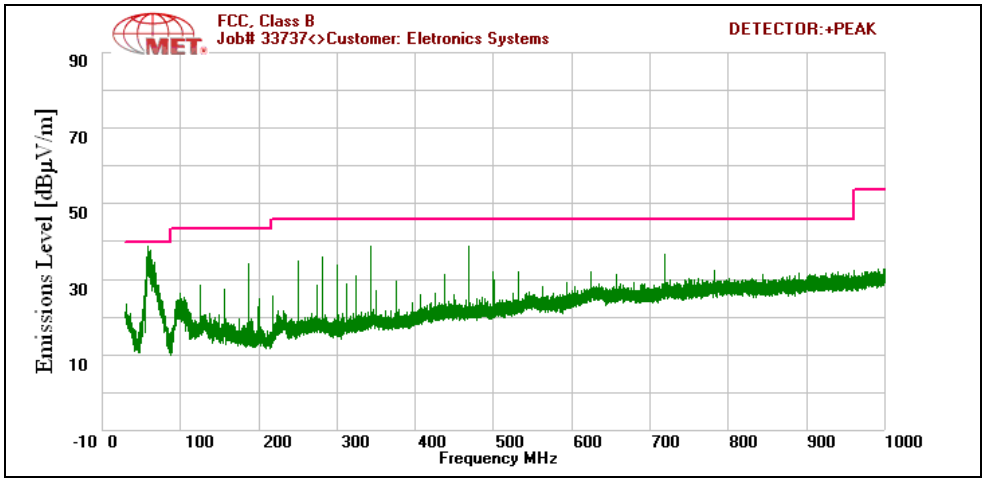


Plot 76. Radiated Spurious Emissions, High Channel, 20 MHz, Omni, 1 GHz – 12 GHz, Peak

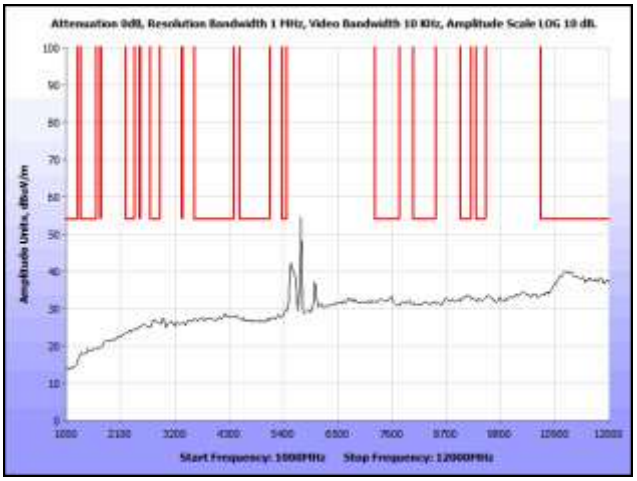


Plot 77. Radiated Spurious Emissions, High Channel, 20 MHz, Omni, 12 GHz – 18 GHz

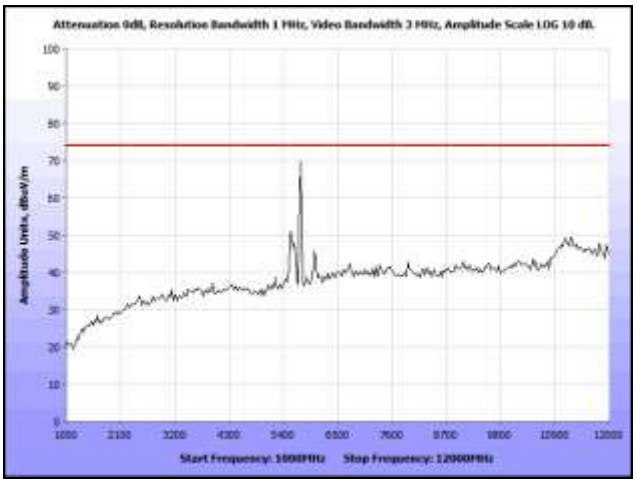
Radiated Spurious Emissions Test Results, 5 MHz, Panel



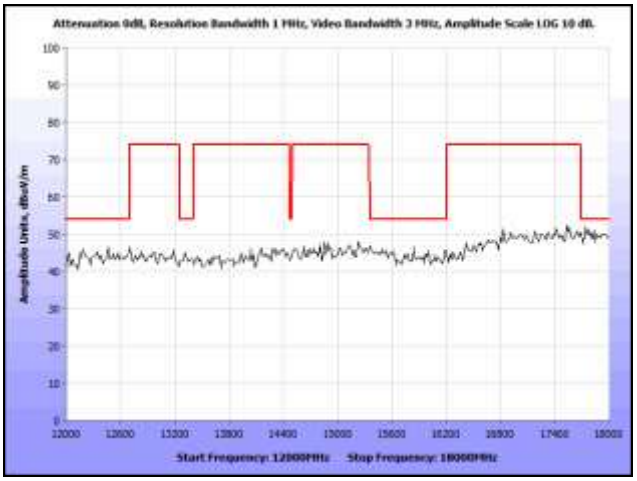
Plot 78. Radiated Spurious Emissions, Low Channel, 5 MHz, Panel, 30 MHz – 1 GHz



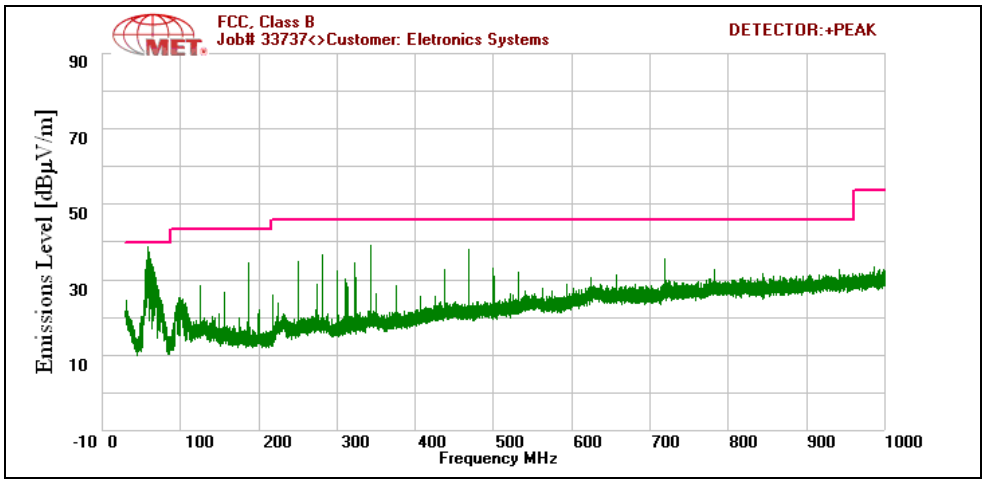
Plot 79. Radiated Spurious Emissions, Low Channel, 5 MHz, Panel, 1 GHz – 12 GHz, Average



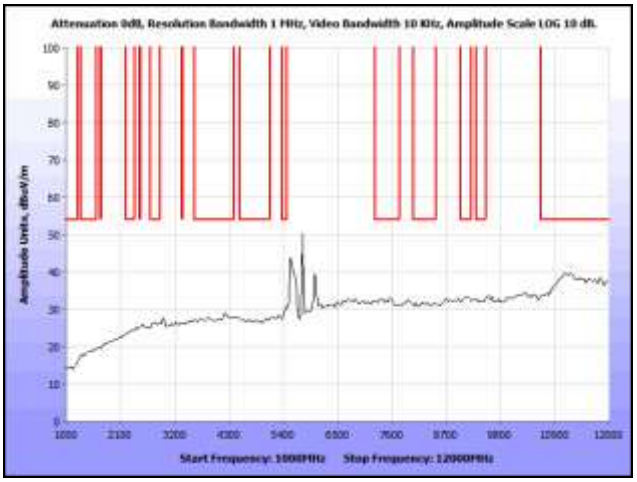
Plot 80. Radiated Spurious Emissions, Low Channel, 5 MHz, Panel, 1 GHz – 12 GHz, Peak



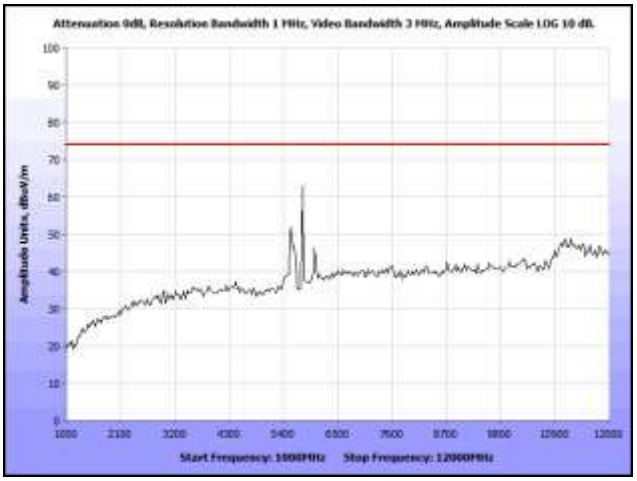
Plot 81. Radiated Spurious Emissions, Low Channel, 5 MHz, Panel, 12 GHz – 18 GHz



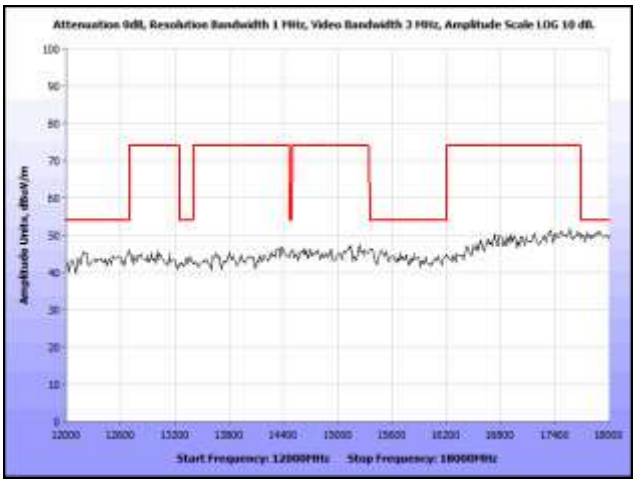
Plot 82. Radiated Spurious Emissions, Mid Channel, 5 MHz, Panel, 30 MHz – 1 GHz



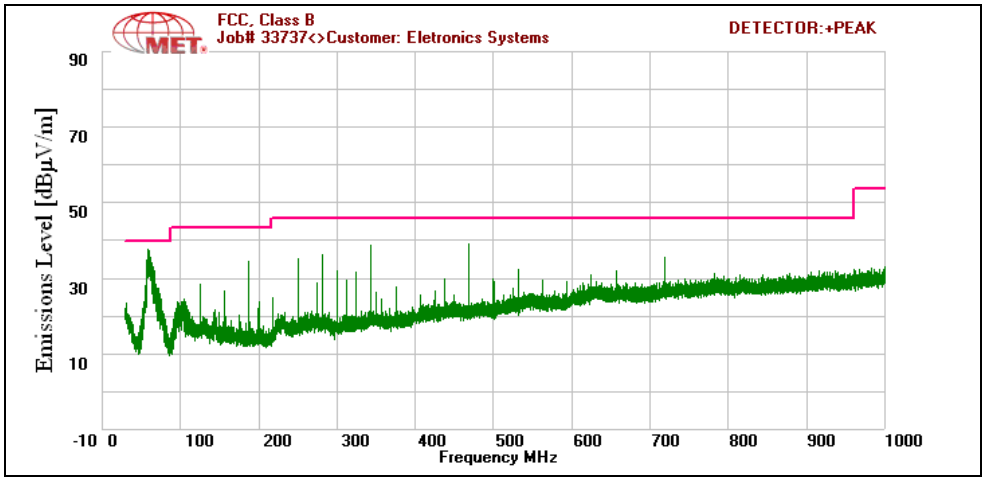
Plot 83. Radiated Spurious Emissions, Mid Channel, 5 MHz, Panel, 1 GHz – 12 GHz, Average



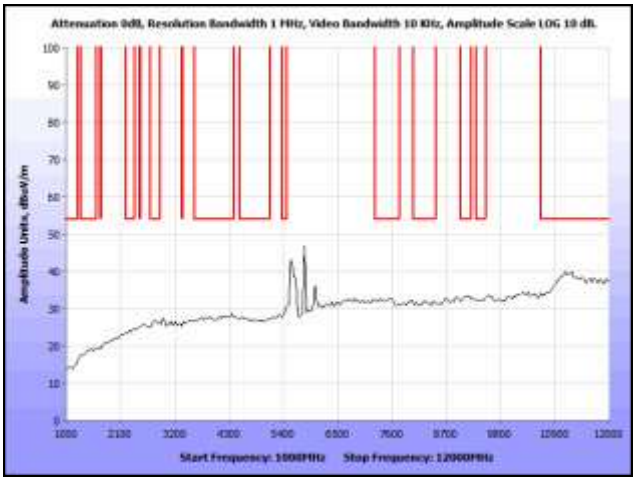
Plot 84. Radiated Spurious Emissions, Mid Channel, 5 MHz, Panel, 1 GHz – 12 GHz, Peak



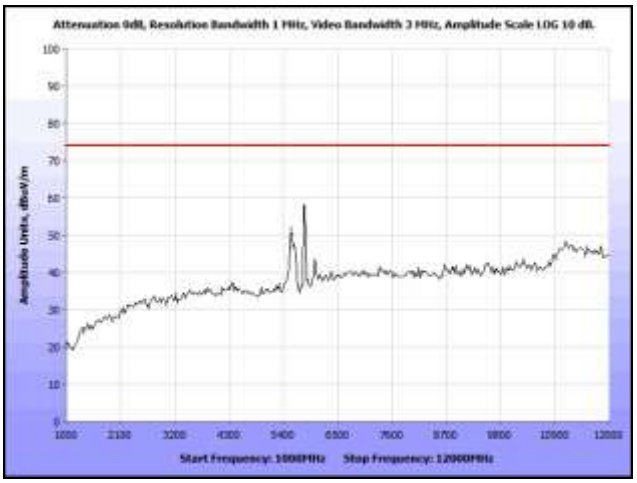
Plot 85. Radiated Spurious Emissions, Mid Channel, 5 MHz, Panel, 12 GHz – 18 GHz



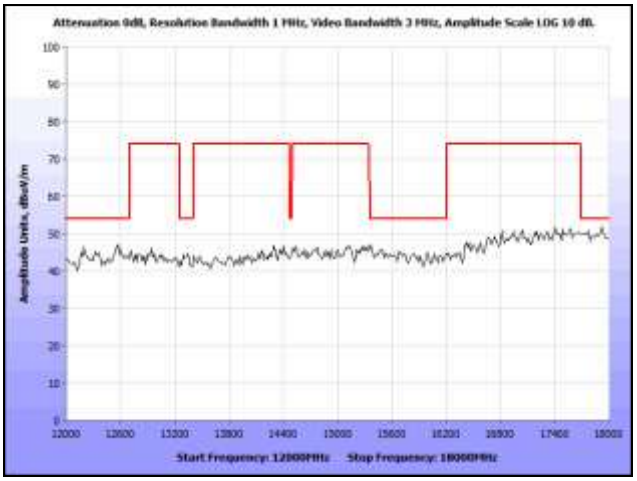
Plot 86. Radiated Spurious Emissions, High Channel, 5 MHz, Panel, 30 MHz – 1 GHz



Plot 87. Radiated Spurious Emissions, High Channel, 5 MHz, Panel, 1 GHz – 12 GHz, Average

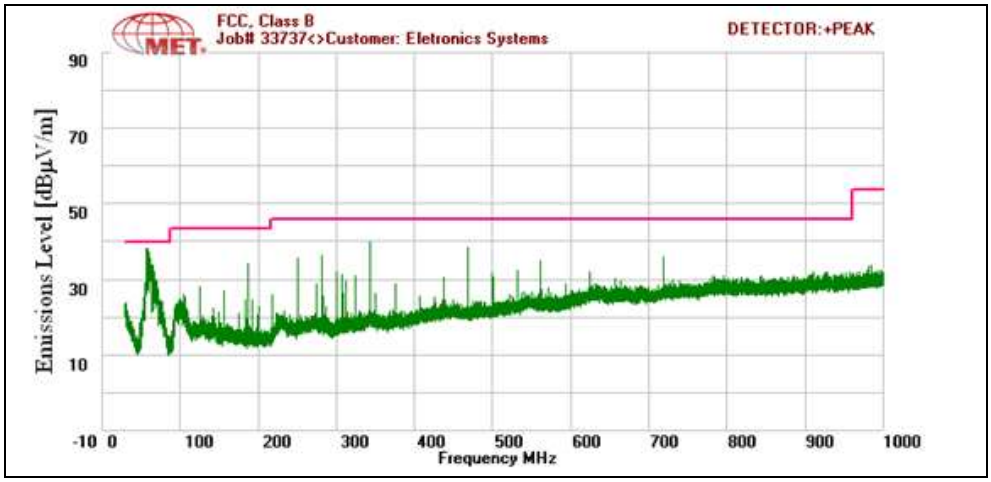


Plot 88. Radiated Spurious Emissions, High Channel, 5 MHz, Panel, 1 GHz – 12 GHz, Peak

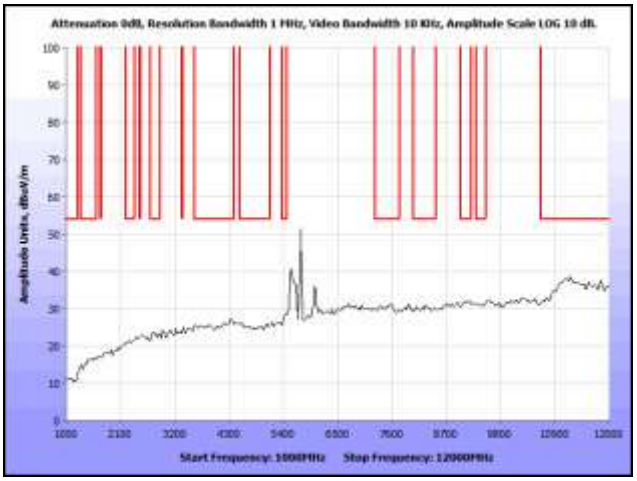


Plot 89. Radiated Spurious Emissions, High Channel, 5 MHz, Panel, 12 GHz – 18 GHz

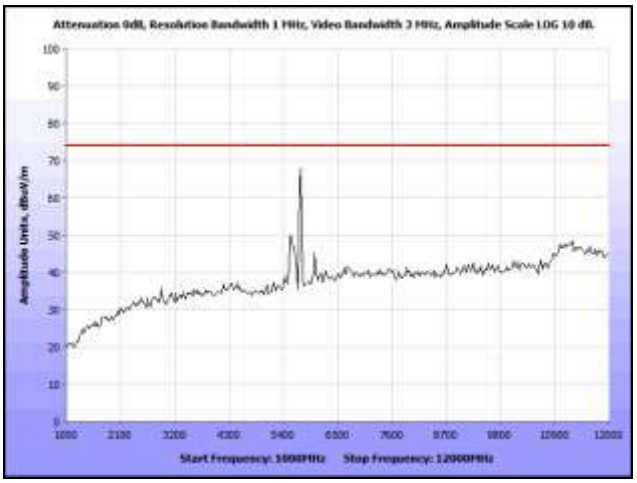
Radiated Spurious Emissions Test Results, 10 MHz, Panel



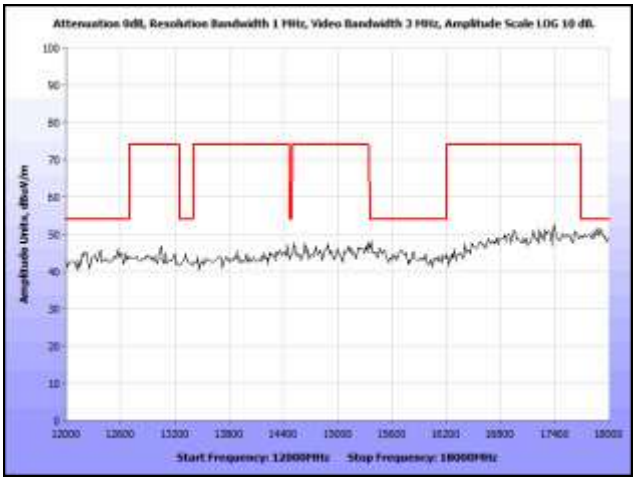
Plot 90. Radiated Spurious Emissions, Low Channel, 10 MHz, Panel, 30 MHz – 1 GHz



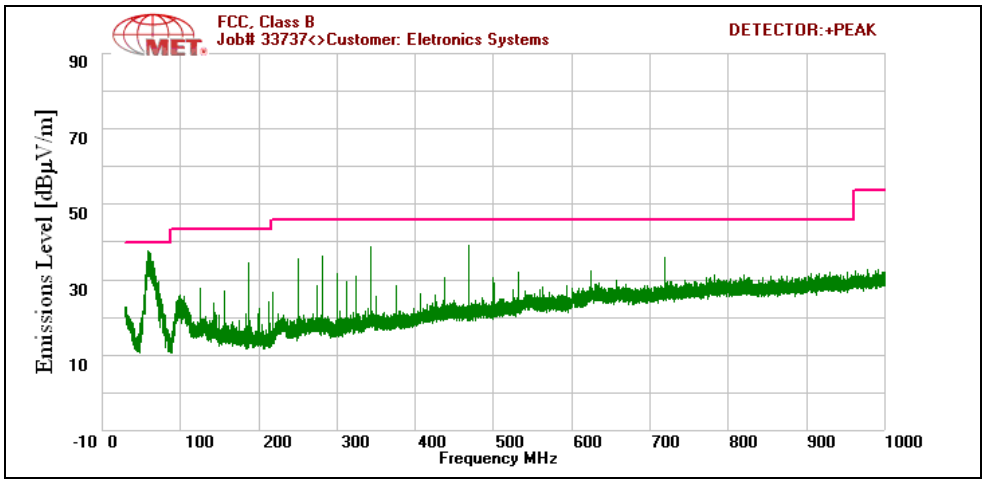
Plot 91. Radiated Spurious Emissions, Low Channel, 10 MHz, Panel, 1 GHz – 12 GHz, Average



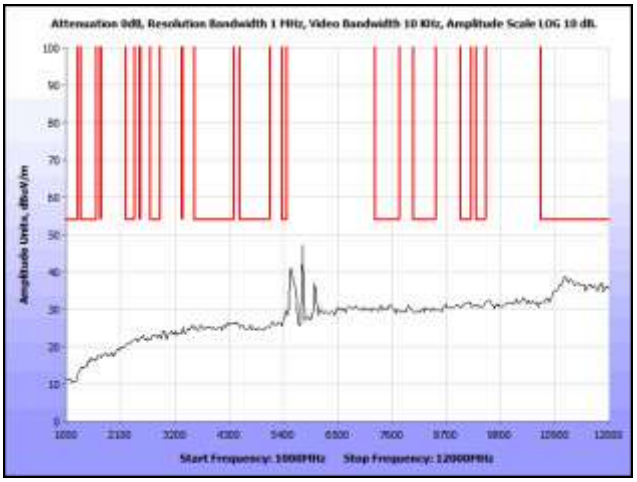
Plot 92. Radiated Spurious Emissions, Low Channel, 10 MHz, Panel, 1 GHz – 12 GHz, Peak



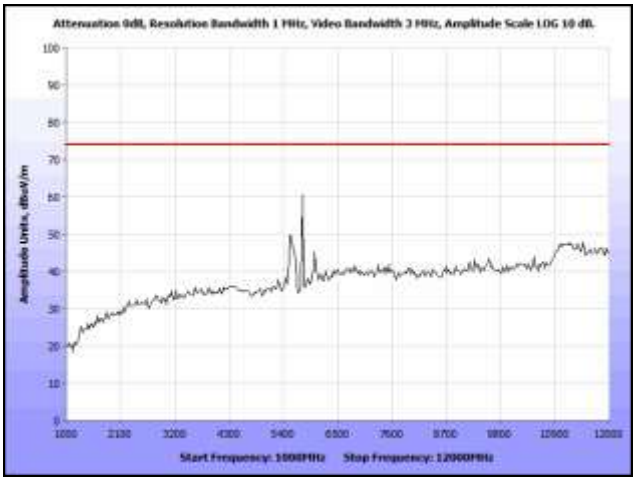
Plot 93. Radiated Spurious Emissions, Low Channel, 10 MHz, Panel, 12 GHz – 18 GHz



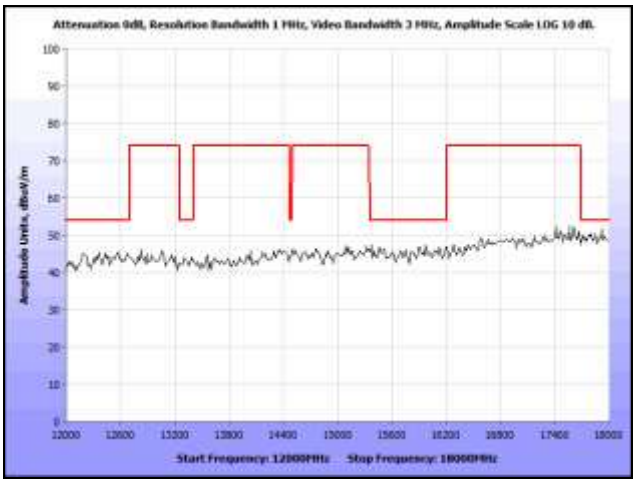
Plot 94. Radiated Spurious Emissions, Mid Channel, 10 MHz, Panel, 30 MHz – 1 GHz



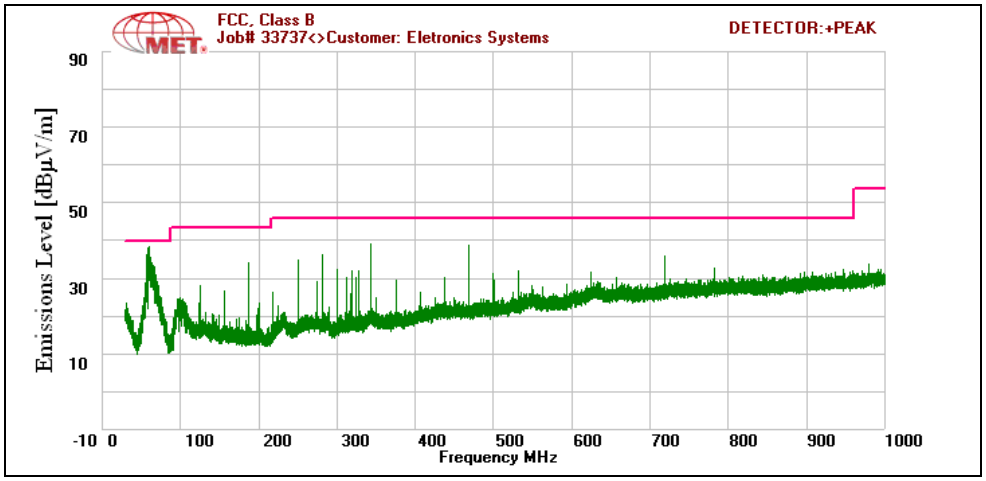
Plot 95. Radiated Spurious Emissions, Mid Channel, 10 MHz, Panel, 1 GHz – 12 GHz, Average



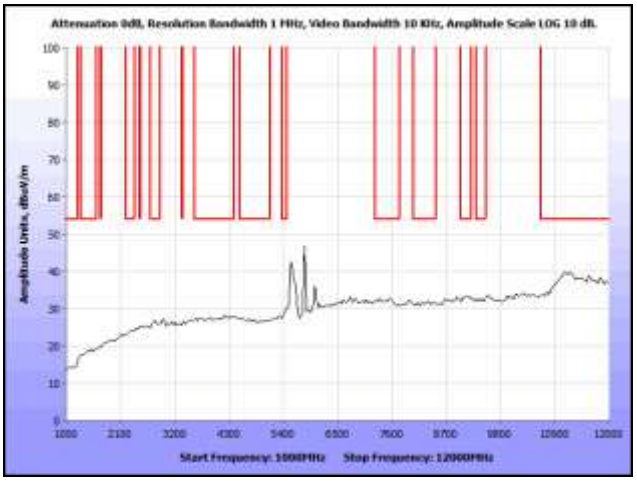
Plot 96. Radiated Spurious Emissions, Mid Channel, 10 MHz, Panel, 1 GHz – 12 GHz, Peak



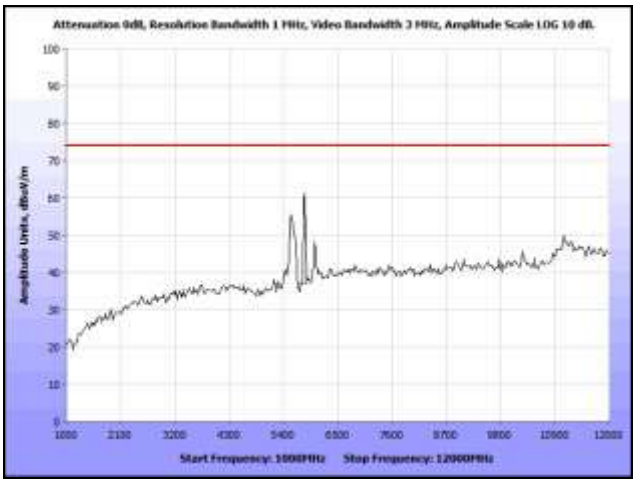
Plot 97. Radiated Spurious Emissions, Mid Channel, 10 MHz, Panel, 12 GHz – 18 GHz



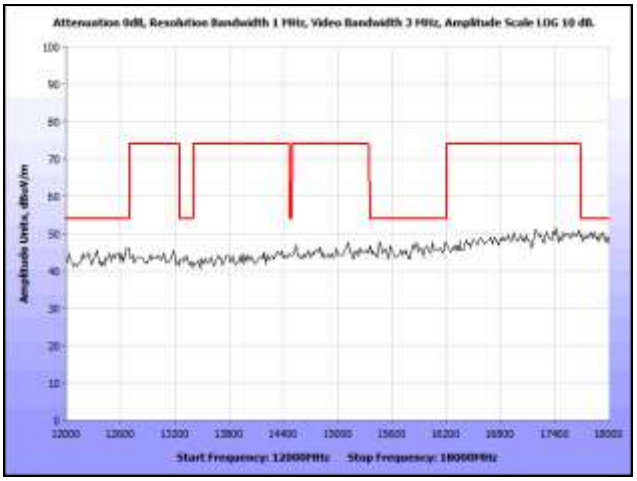
Plot 98. Radiated Spurious Emissions, High Channel, 10 MHz, Panel, 30 MHz – 1 GHz



Plot 99. Radiated Spurious Emissions, High Channel, 10 MHz, Panel, 1 GHz – 12 GHz, Average

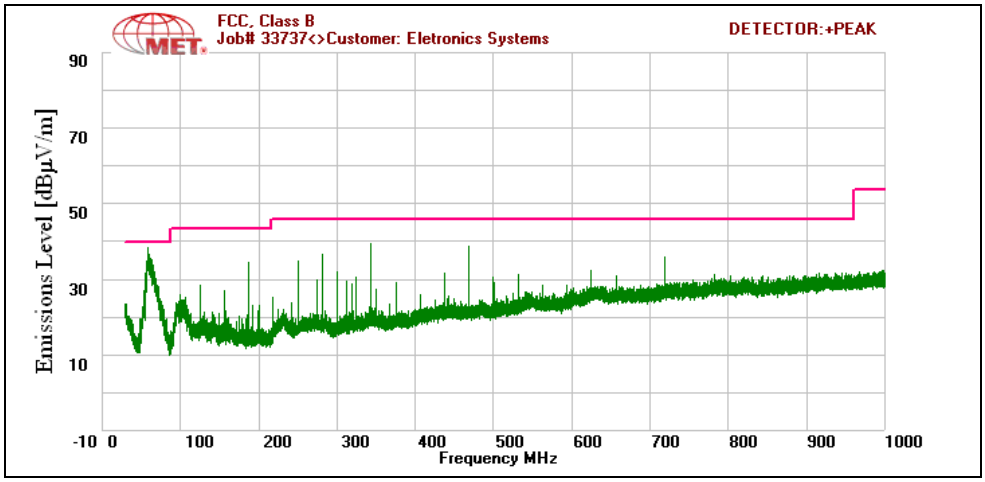


Plot 100. Radiated Spurious Emissions, High Channel, 10 MHz, Panel, 1 GHz – 12 GHz, Peak

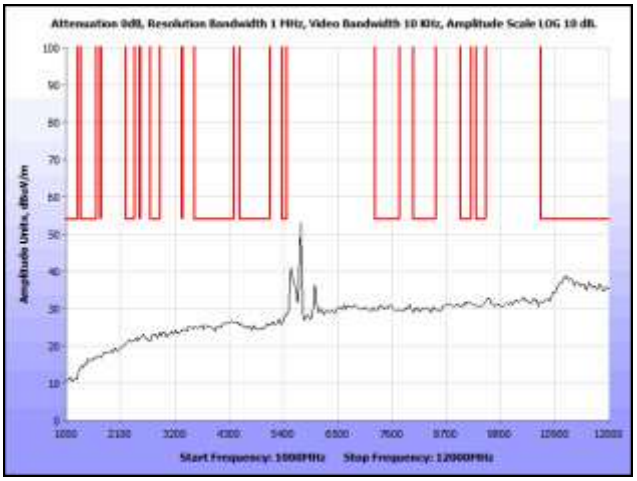


Plot 101. Radiated Spurious Emissions, High Channel, 10 MHz, Panel, 12 GHz – 18 GHz

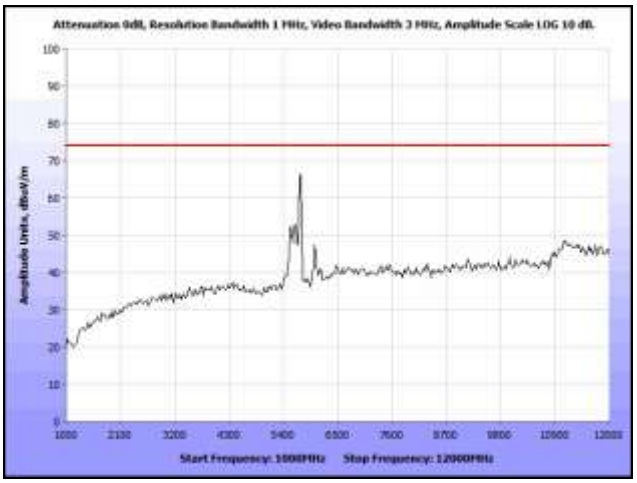
Radiated Spurious Emissions Test Results, 20 MHz, Panel



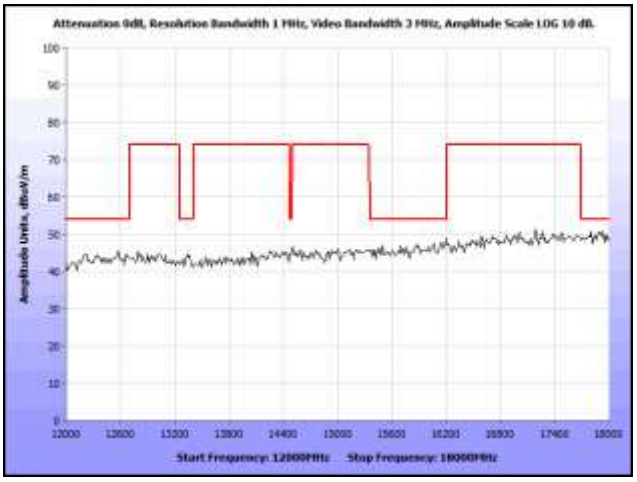
Plot 102. Radiated Spurious Emissions, Low Channel, 20 MHz, Panel, 30 MHz – 1 GHz



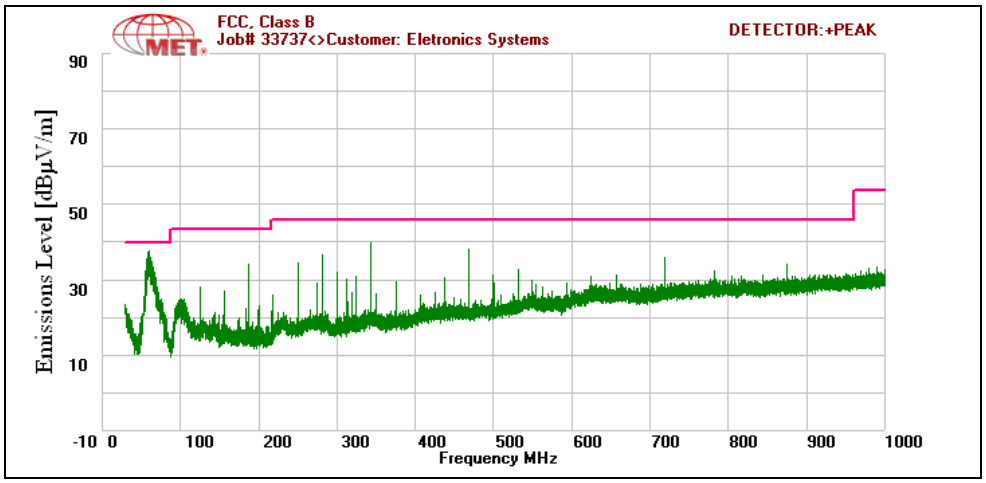
Plot 103. Radiated Spurious Emissions, Low Channel, 20 MHz, Panel, 1 GHz – 12 GHz, Average



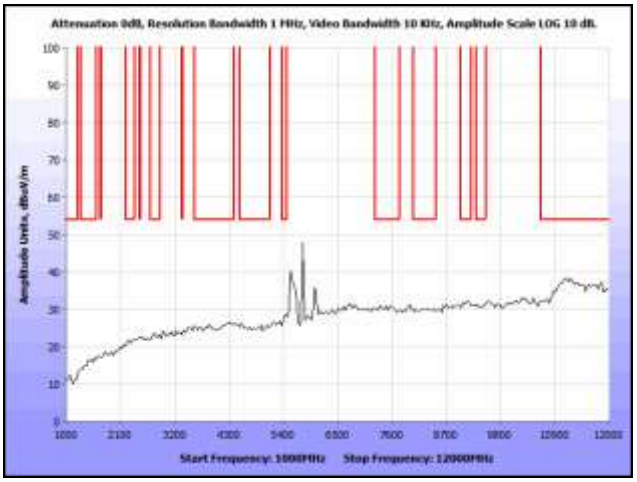
Plot 104. Radiated Spurious Emissions, Low Channel, 20 MHz, Panel, 1 GHz – 12 GHz, Peak



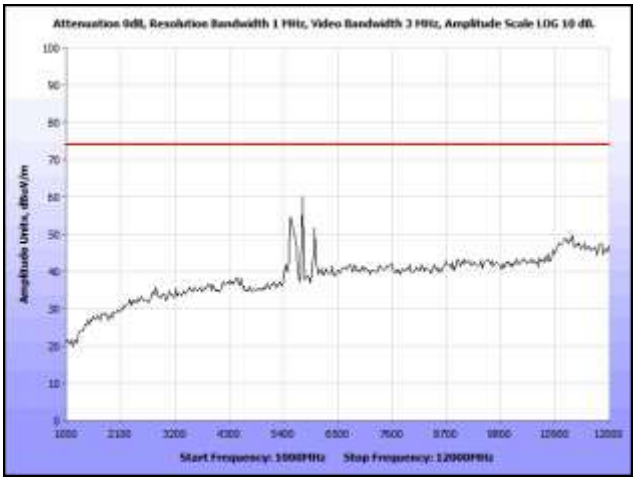
Plot 105. Radiated Spurious Emissions, Low Channel, 20 MHz, Panel, 12 GHz – 18 GHz



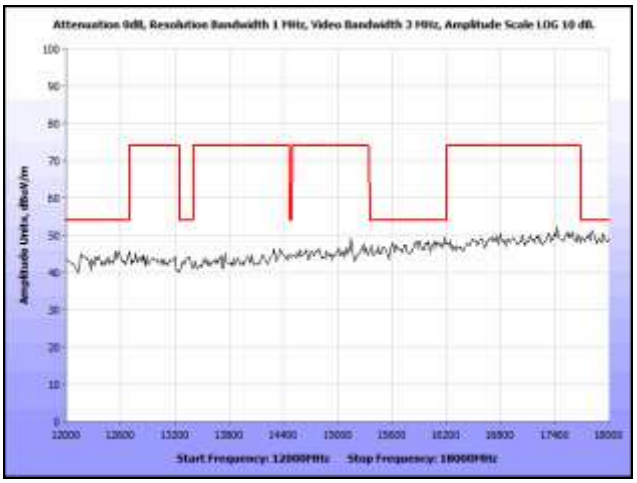
Plot 106. Radiated Spurious Emissions, Mid Channel, 20 MHz, Panel, 30 MHz – 1 GHz



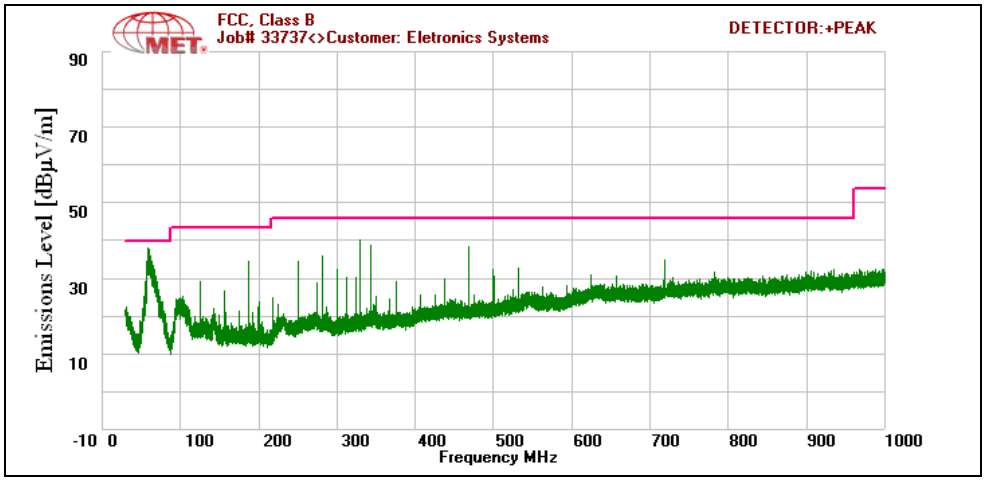
Plot 107. Radiated Spurious Emissions, Mid Channel, 20 MHz, Panel, 1 GHz – 12 GHz, Average



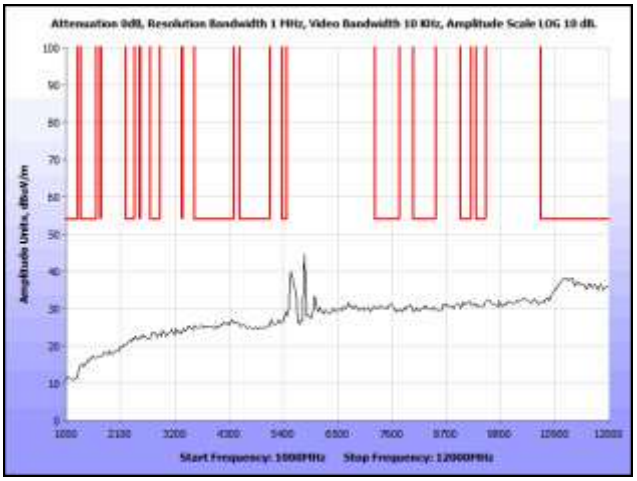
Plot 108. Radiated Spurious Emissions, Mid Channel, 20 MHz, Panel, 1 GHz – 12 GHz, Peak



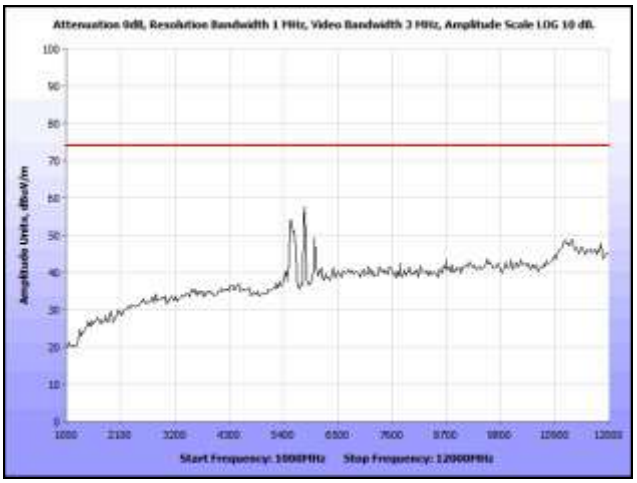
Plot 109. Radiated Spurious Emissions, Mid Channel, 20 MHz, Panel, 12 GHz – 18 GHz



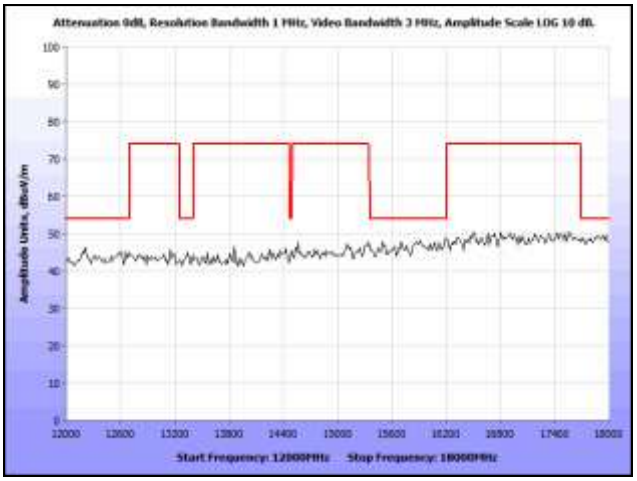
Plot 110. Radiated Spurious Emissions, Mid Channel, 20 MHz, Panel, 30 MHz – 1 GHz



Plot 111. Radiated Spurious Emissions, High Channel, 20 MHz, Panel, 1 GHz – 12 GHz, Average



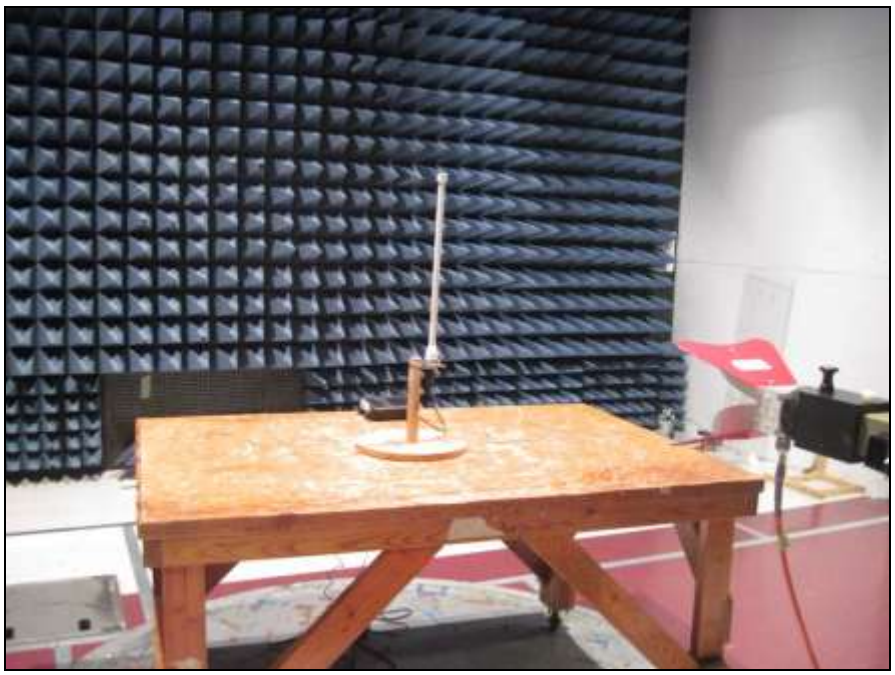
Plot 112. Radiated Spurious Emissions, High Channel, 20 MHz, Panel, 1 GHz – 12 GHz, Peak



Plot 113. Radiated Spurious Emissions, High Channel, 20 MHz, Panel, 12 GHz – 18 GHz

Radiated Spurious Emissions Test Setup

Photograph 12. Radiated Spurious Emissions, Test Setup, Omni Antenna, 30 MHz – 1 GHz



Photograph 13. Radiated Spurious Emissions, Test Setup, Omni Antenna, Above 1 GHz

Photograph 14. Radiated Spurious Emissions, Test Setup, Panel Antenna, 30 MHz – 1 GHz

Photograph 15. Radiated Spurious Emissions, Test Setup, Panel Antenna, Above 1 GHz

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

Since the EUT had an integral antenna, conducted measurements could not be performed. Measurements needed to be taken radiated. An antenna was located 3 m away from the EUT and plots were taken. The EUT was rotated through all three orthogonal axes. The plots were corrected for both antenna correction factor and cable lost.

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

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

Test Engineer(s): Anderson Soungpanya

Test Date(s): 12/13/11

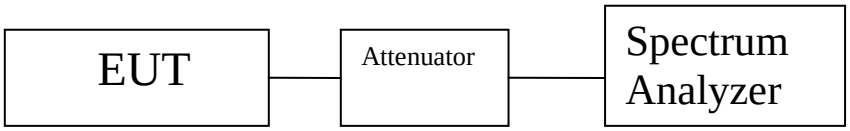
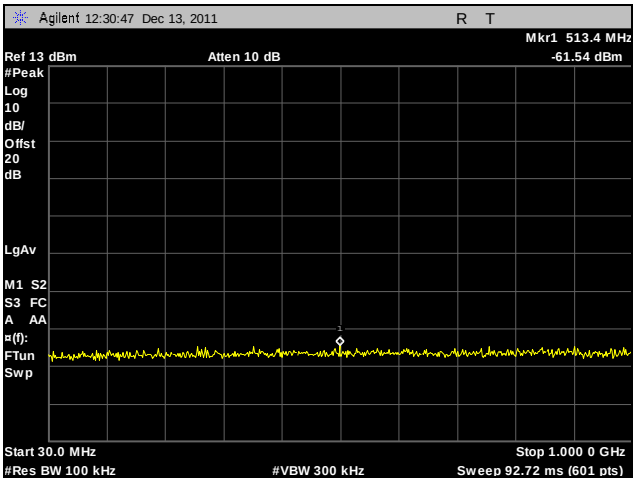
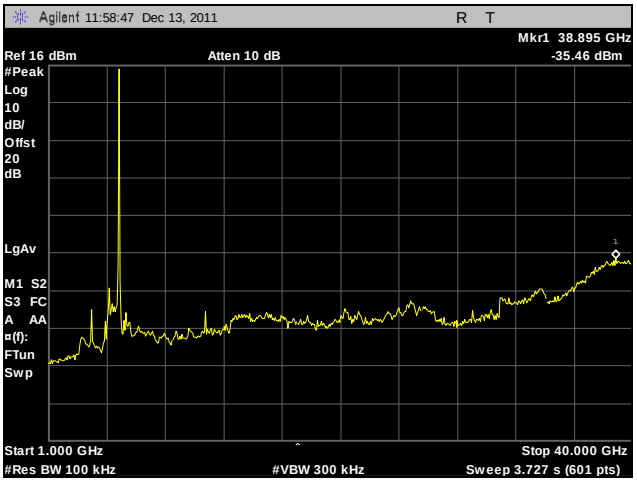


Figure 5. Block Diagram, Conducted Spurious Emissions Test Setup

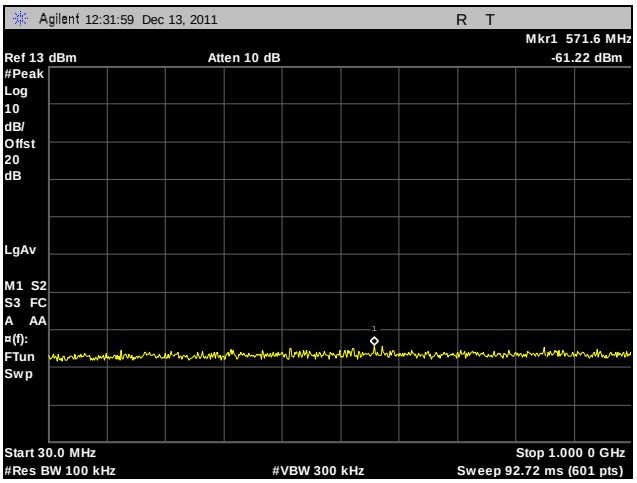
Conducted Spurious Emissions Test Results, 5 MHz



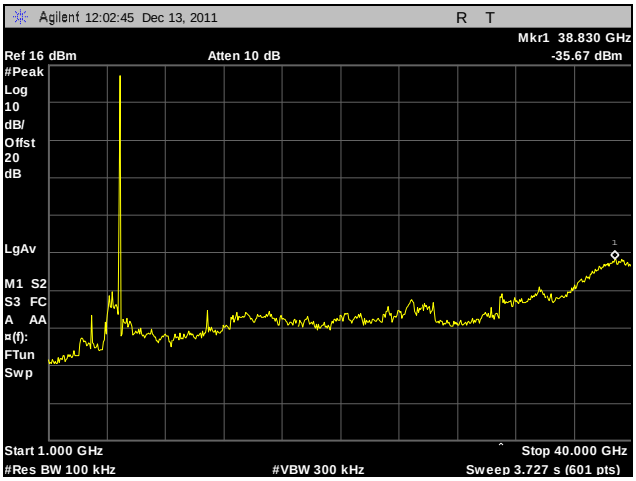
Plot 114. Conducted Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 5 MHz



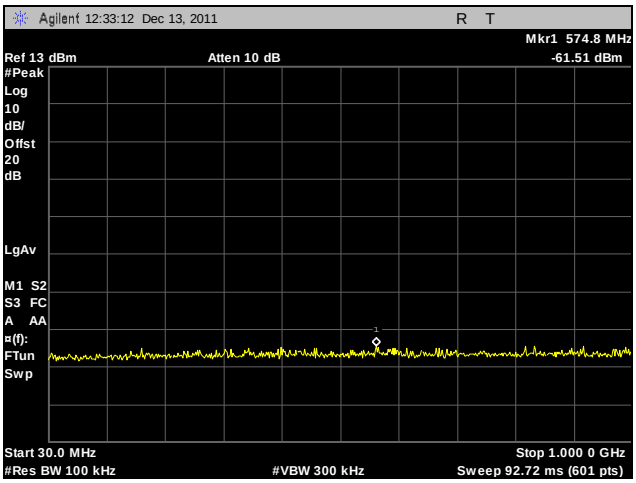
Plot 115. Conducted Spurious Emissions, Low Channel, 1 GHz – 40 GHz, 5 MHz



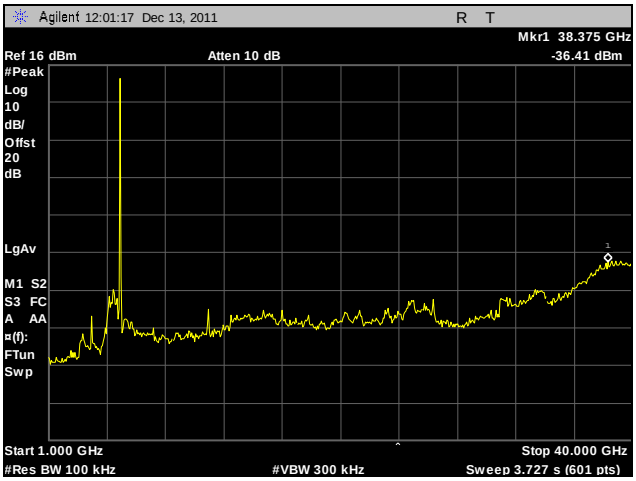
Plot 116. Conducted Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 5 MHz



Plot 117. Conducted Spurious Emissions, Mid Channel, 1 GHz – 40 GHz, 5 MHz

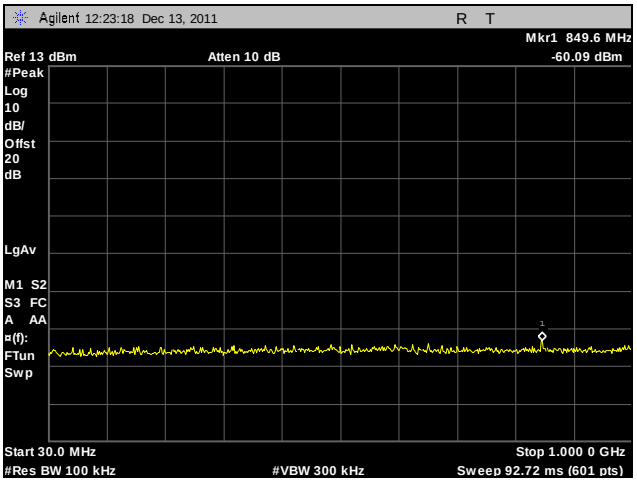


Plot 118. Conducted Spurious Emissions, High Channel, 30 MHz – 1 GHz, 5 MHz

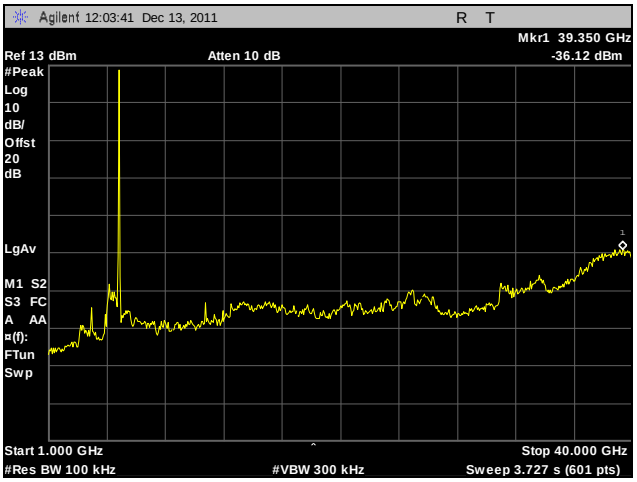


Plot 119. Conducted Spurious Emissions, High Channel, 1 GHz – 40 GHz, 5 MHz

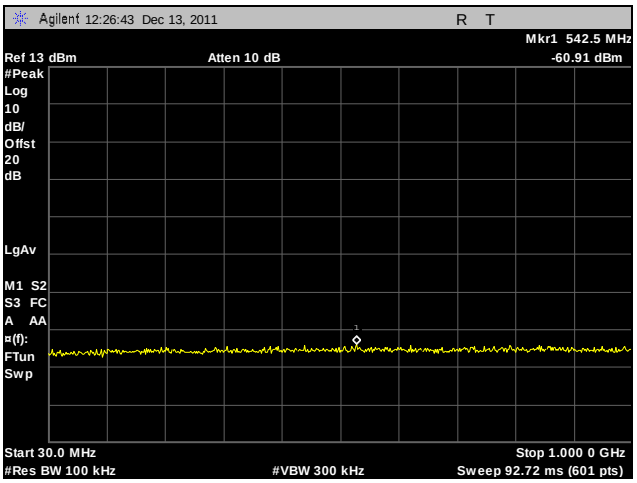
Conducted Spurious Emissions Test Results, 10 MHz



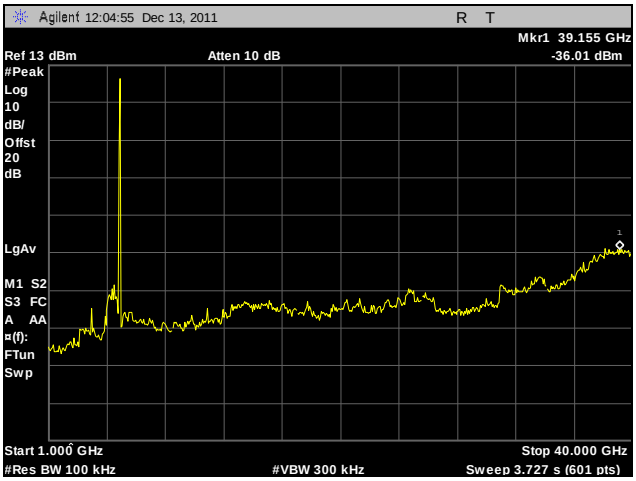
Plot 120. Conducted Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 10 MHz



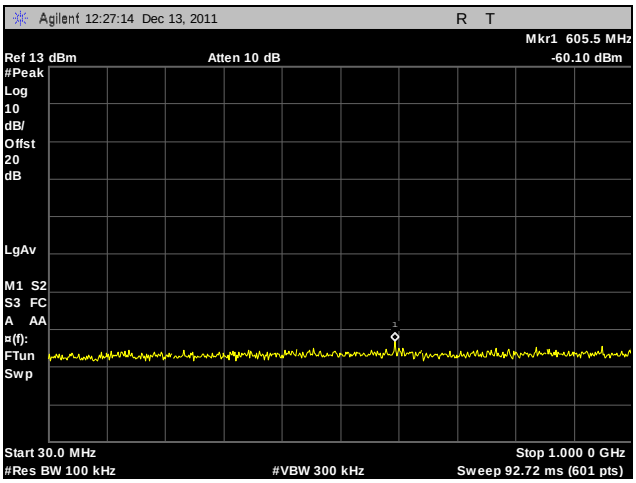
Plot 121. Conducted Spurious Emissions, Low Channel, 1 GHz – 40 GHz, 10 MHz



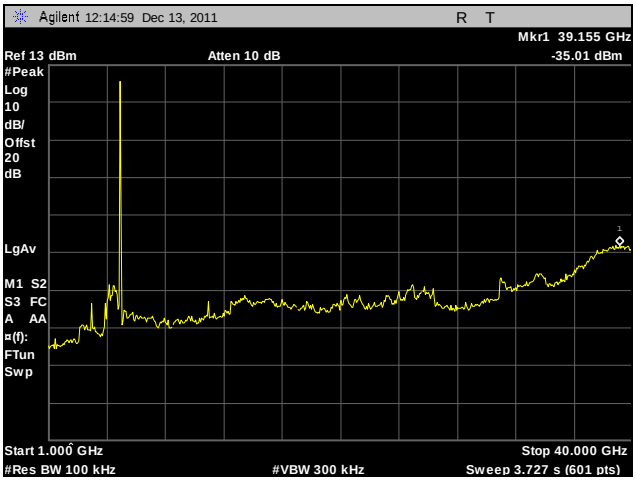
Plot 122. Conducted Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 10 MHz



Plot 123. Conducted Spurious Emissions, Mid Channel, 1 GHz – 40 GHz, 10 MHz

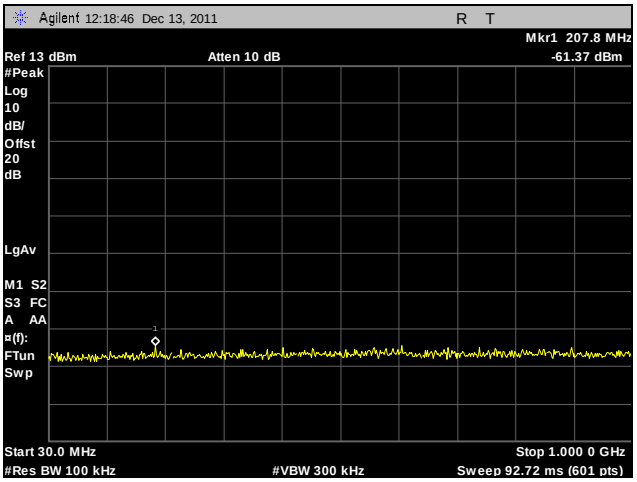


Plot 124. Conducted Spurious Emissions, High Channel, 30 MHz – 1 GHz, 10 MHz

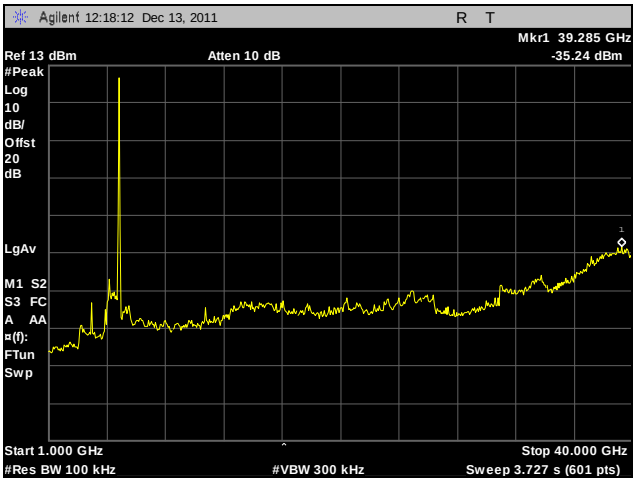


Plot 125. Conducted Spurious Emissions, High Channel, 1 GHz – 40 GHz, 10 MHz

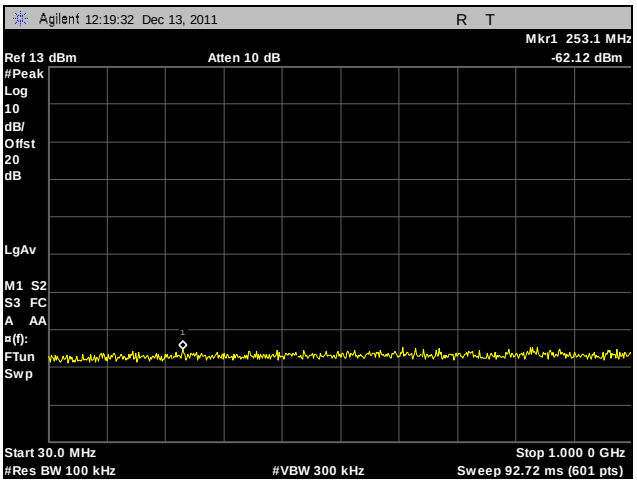
Conducted Spurious Emissions Test Results, 20 MHz



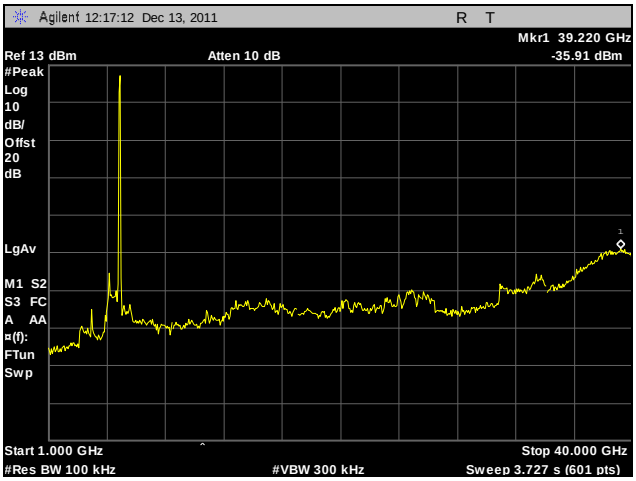
Plot 126. Conducted Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 20 MHz



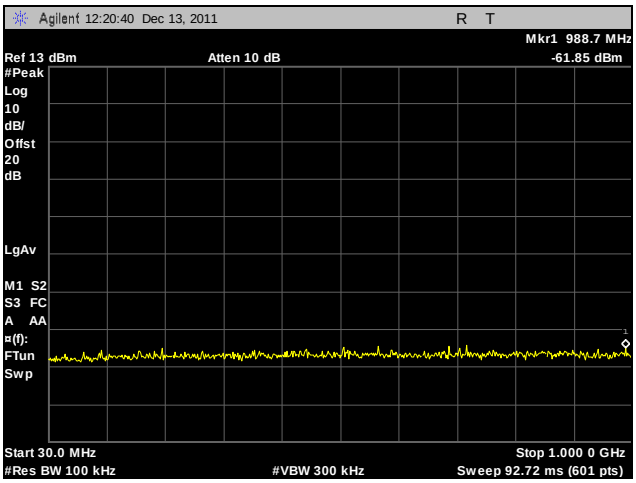
Plot 127. Conducted Spurious Emissions, Low Channel, 1 GHz – 40 GHz, 20 MHz



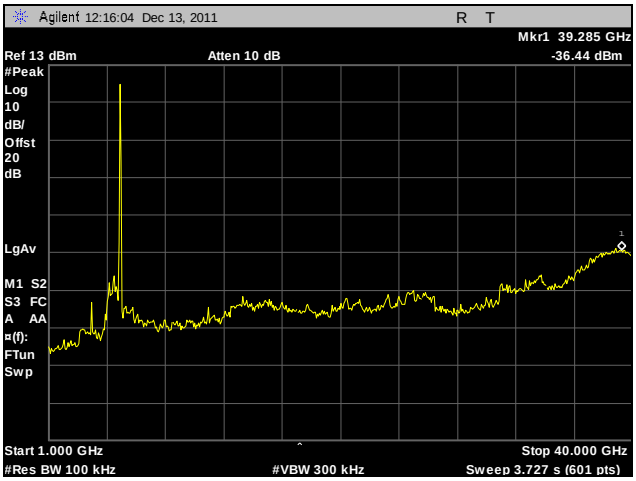
Plot 128. Conducted Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 20 MHz



Plot 129. Conducted Spurious Emissions, Mid Channel, 1 GHz – 40 GHz, 20 MHz

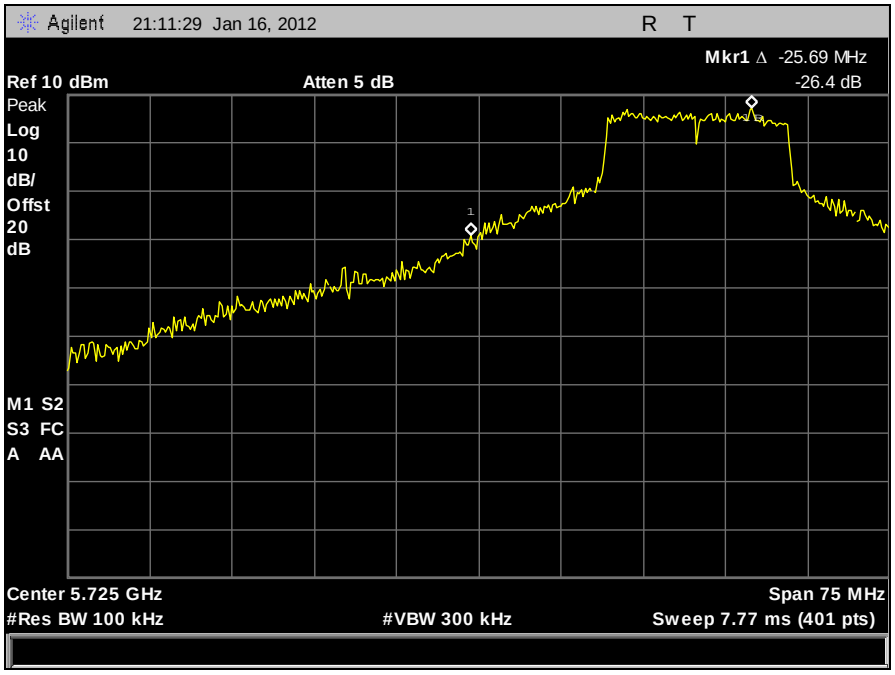


Plot 130. Conducted Spurious Emissions, High Channel, 30 MHz – 1 GHz, 20 MHz

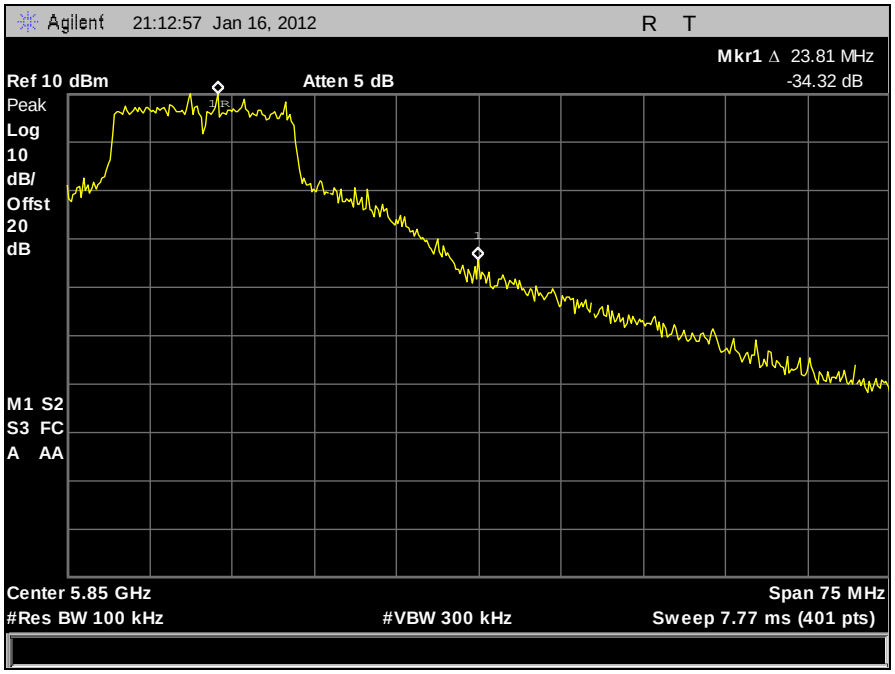


Plot 131. Conducted Spurious Emissions, High Channel, 1 GHz – 40 GHz, 20 MHz

Conducted Band Edge Test Results



Plot 132. Conducted Band Edge, Low Channel, 20MHz Bandwidth



Plot 133. Conducted Band Edge, High Channel, 20MHz Bandwidth

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: The EUT was compliant with the peak power spectral density limits of **§ 15.247 (e)**.

The peak power spectral density was determined from plots on the following page(s).

Test Engineer: Anderson Soungpanya

Test Date: 12/13/11

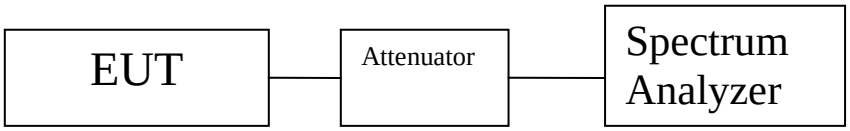


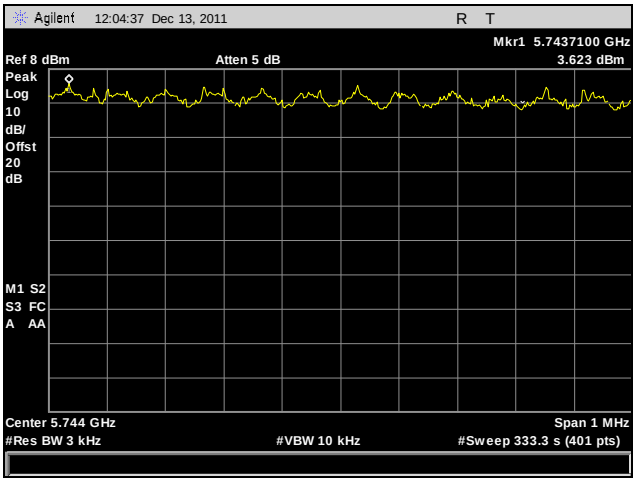
Figure 6. Block Diagram, Peak Power Spectral Density Test Setup

Peak Power Spectral Density Test Results

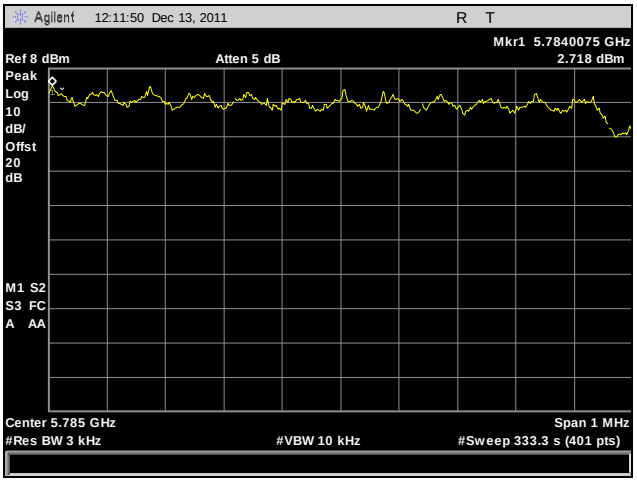
Peak Power Spectral Density					
Mode	**Carrier Channel**	**Frequency (MHz)**	**Measured PPSD (dBm)**	**Limit (dBm)**	**Margin (dB)**
5 MHz	Low	5745	3.623	8	-4.377
	Mid	5785	2.718	8	-5.282
	High	5825	2.423	8	-5.577
10 MHz	Low	5745	1.406	8	-6.594
	Mid	5785	-0.703	8	-8.703
	High	5825	-0.643	8	-8.643
20 MHz	Low	5745	-2.334	8	-10.334
	Mid	5785	-3.588	8	-11.588
	High	5825	-4.557	8	-12.557

Table 28. Peak Power Spectral Density, Test Results

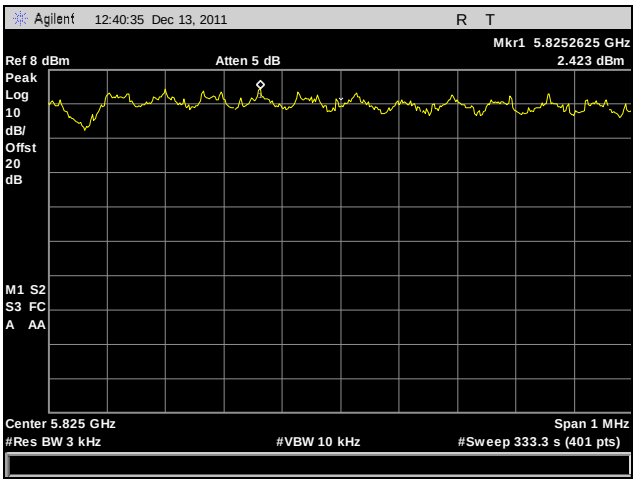
Peak Power Spectral Density, 5 MHz



Plot 134. Peak Power Spectral Density, Low Channel, 5 MHz

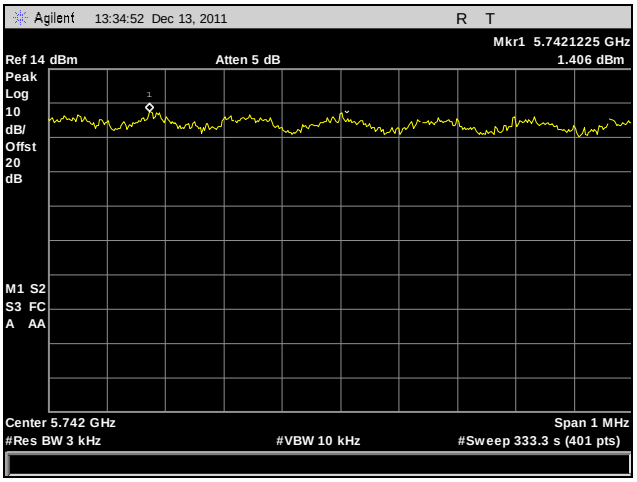


Plot 135. Peak Power Spectral Density, Mid Channel, 5 MHz

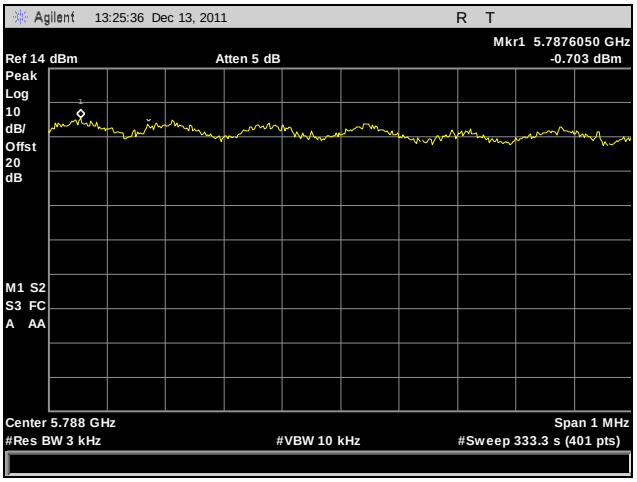


Plot 136. Peak Power Spectral Density, High Channel, 5 MHz

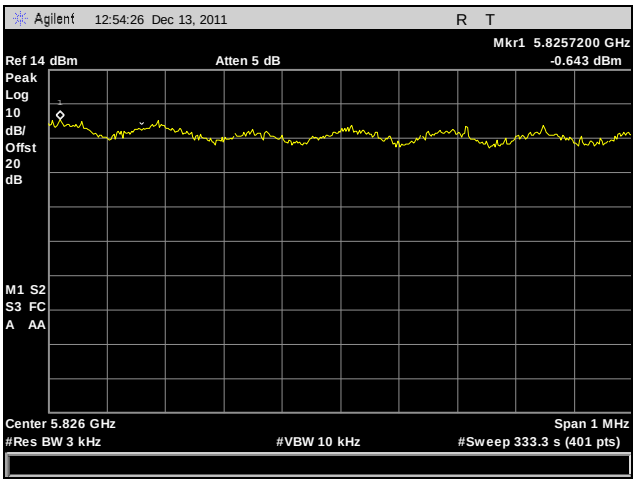
Peak Power Spectral Density, 10 MHz



Plot 137. Peak Power Spectral Density, Low Channel, 10 MHz

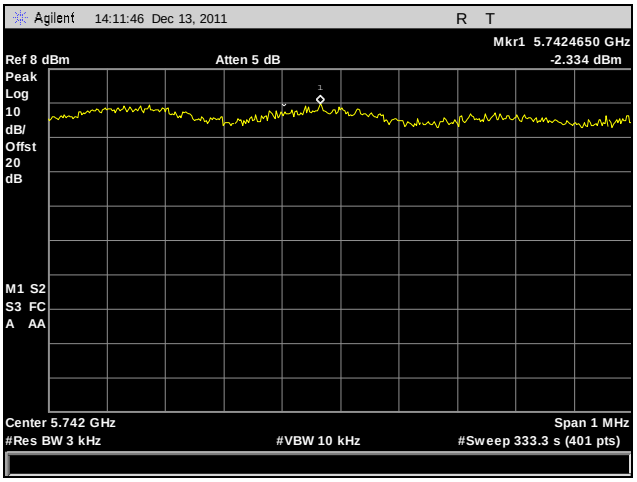


Plot 138. Peak Power Spectral Density, Mid Channel, 10 MHz

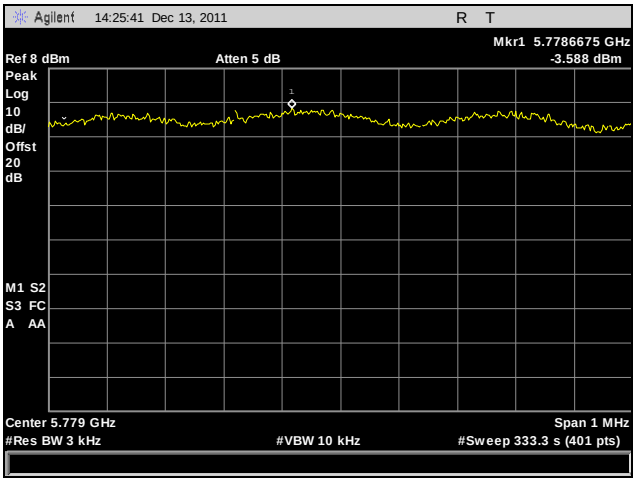


Plot 139. Peak Power Spectral Density, High Channel, 10 MHz

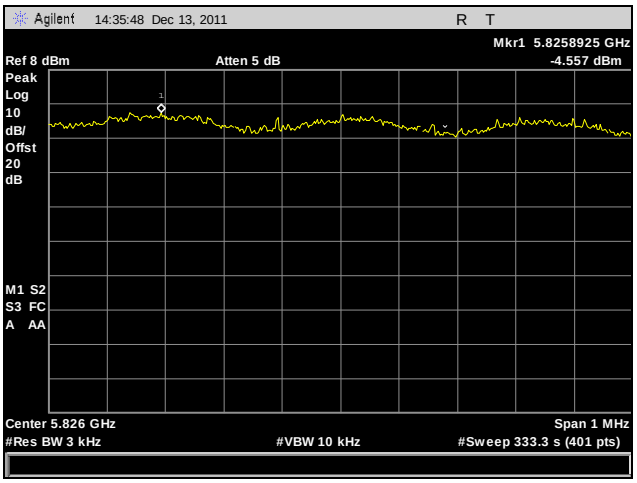
Peak Power Spectral Density, 20 MHz



Plot 140. Peak Power Spectral Density, Low Channel, 20 MHz



Plot 141. Peak Power Spectral Density, Mid Channel, 20 MHz



Plot 142. Peak Power Spectral Density, High Channel, 20 MHz

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.

MPE Limit Calculation: EUT's operating frequencies @ 5725-5850MHz; highest conducted power = *29.99 dbm (*peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

EUT maximum antenna gain = *22 dBi.*

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

$$S = PG / 4\pi R^2 \quad \text{or} \quad R = \sqrt{PG / 4\pi S}$$

where, S = Power Density (1 mW/cm^2)
P = Power Input to antenna (997.7mW)
G = Antenna Gain (158.5 numeric)

$R = (997.7*158.5/ 4*3.14*1.0)^{1/2} = (158124.8 / 12.56)^{1/2} = 112.2$cm

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 29.

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

Table 29. 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 Procedures: The EUT was programmed for receive mode only. Conducted measurements were taken at the antenna port of the EUT. 100 kHz resolution bandwidth was used from 30 MHz - 1 GHz and 300 kHz resolution was used for measurements done above 1 GHz. All plots are corrected for cable loss.

Test Results: Equipment is compliant with the Receiver Spurious Emissions Requirements of RSS-GEN.

Test Engineer(s): Anderson Soungpanya

Test Date(s): 12/13/11

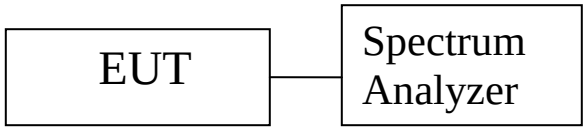
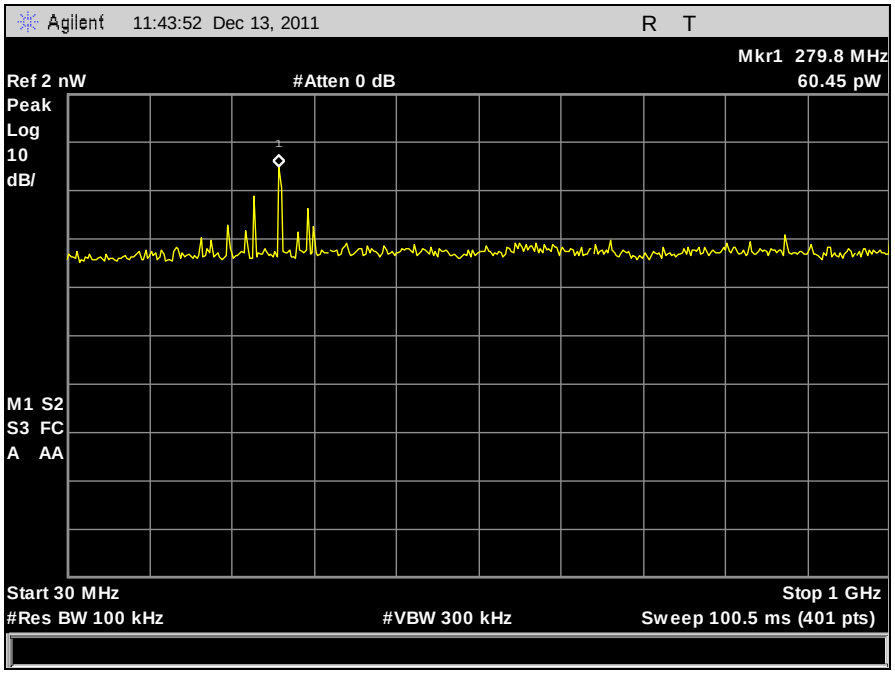
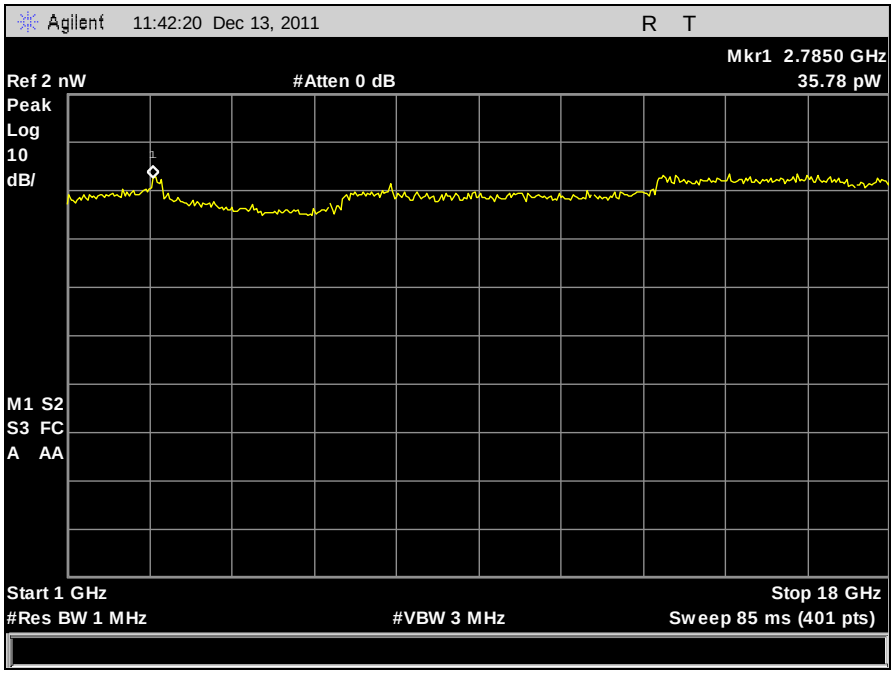


Figure 7. Block Diagram, Conducted Receiver Spurious Emissions Test Setup

Conducted Receiver Spurious Emissions



Plot 143. Receiver Spurious Emission, 30 MHz – 1 GHz



Plot 144. Receiver Spurious Emission, 1 GHz – 18 GHz

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	AGILENT/HP	E4407B	8/9/2011	8/9/2012
1S2691	DUAL-LINE V-LISN	TESEQ	NNB-51	3/31/2011	3/31/2012
1S2633	TRANSIENT LIMITER	FISCHER CUSTOM COMMUNICATIONS INC.	FCC-450B-2.4-N	2/18/2011	2/18/2012
1S2399	TURNTABLE CONTROLLER	SUNOL SCIENCE	SC99V	NO CALIBRATION REQUIRED	
1S2501	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESU40	06/09/2011	06/09/2012
1S2482	5 METER CHAMBER	PANASHIELD	641431	12/17/2011	12/17/2012
1S2460	SPECTRUM ANALYZER	AGILENT	E4407B	7/12/2011	7/12/2012
1S2583	SPECTRUM ANALYZER	AGILENT/HP	E4447A	3/18/2011	3/18/2012
1S2600	BILOG ANTENNA	TESEQ	CBL6112D	4/14/2010	4/14/2013
1S2501	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESU40	06/09/2011	06/09/2012
1S2198	HORN ANTENNA	EMCO	3115	9/29/2011	9/29/2012
NA	BAND PASS FILTER	MICRO-TRONICS	BRC50705-02	SEE NOTE	
N/A	HIGH PASS FILTER	MICRO-TRONICS	HPM13147	SEE NOTE	
1S2523	PREAMP (1-26.5GHZ)	AGILENT	8449B	SEE NOTE	

Table 30. Test Equipment List

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

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

