



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

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January 29, 2013

Checkpoint Systems
101 Wolf Drive
West Deptford, NJ 08086

Dear Shawn Singh,

Enclosed is the EMC test report for compliance testing of the Checkpoint Systems, EAS Detection System, tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Part 15, Subpart B and ICES-003, Issue 5 August 2012 for a Class B Digital Device, and FCC Part 15.223 and 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: (\\Checkpoint Systems\\EMC36465-FCC223 Rev. 2)

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**Electromagnetic Compatibility Criteria
Test Report**

For the

**Checkpoint Systems
EAS Detection System**

Tested under

the FCC Certification Rules
contained in

Title 47 of the CFR, Parts 15 Subpart B & ICES-003
for Class B Digital Devices

&

15.223 & RSS-210, Issue 8, Dec. 2010
for Intentional Radiators

MET Report: EMC36465-FCC223 Rev. 2

January 29, 2013

Prepared For:

**Checkpoint Systems
101 Wolf Drive
West Deptford, NJ 08086**

**Prepared By:
MET Laboratories, Inc.
914 West Patapsco Avenue
Baltimore, MD 21230**

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15.223 & RSS-210, Issue 8, Dec. 2010
for Intentional Radiators

MET Report: EMC36465-FCC223 Rev. 2



Len Knight, 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 FCC Rules Parts 15B, 15.223 and Industry Canada standards ICES-003, Issue 5 August 2012, RSS-210, Issue 8, Dec. 2010 under normal use and maintenance.



Asad Bajwa,
Director, Electromagnetic Compatibility Lab



Report Status Sheet

Revision	Report Date	Reason for Revision
∅	November 29, 2012	Initial Issue.
1	December 3, 2012	Revised to reflect customer corrections.
2	January 29, 2013	Revised to reflect engineer corrections.

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List of Terms and Abbreviations

AC	A lternating C urrent
ACF	A ntenna C orrection F actor
Cal	C alibration
d	M easurement D istance
dB	D eci B els
dBμV	D eci-Bels above one m icro V olt
dBμV/m	D eci-Bels above one m icro V olt p er m eter
DC	D irect C urrent
DCF	D istance C orrection F actor
E	E lectric F ield
DSL	D igital S ubscriber L ine
ESD	E lectrostatic D ischarge
EUT	E quipment U nder T est
f	F requency
FCC	F ederal C ommunications C ommission
H	M agnetic F ield
GHz	G iga H ertz
Hz	H ertz
ICES	I nterference- C ausing E quipment S tandard
kHz	k ilo h ertz
kPa	k ilo p ascal
kV	k ilo V olt
LISN	L ine I mpedance S tabilization N etwork
MHz	M ega H ertz
μH	m icro H enry
μF	m icro F arad
μs	m icro s econds
RF	R adio F requency
RMS	R oot- M ean- S quare

1. Testing Summary

Title 47 of the CFR, Part 15, Subpart C, Reference	IC Reference RSS-210 Issue 8: 2010; RSS-GEN Issue 3: 2010	Description	Results
Title 47 CFR Part 15.107 (a)	ICES-003 Issue 5 August 2012	Conducted Emission Limits for a Class B Digital Device	Compliant
Title 47 CFR Part 15.109 (a)	ICES-003 Issue 5 August 2012	Radiated Emission Limits for a Class B Digital Device	Compliant
Title 47 of the CFR, Part 15 §15.203	N/A	Antenna Requirement	Compliant
N/A	RSS-Gen(4.6)	Occupied Bandwidth	Compliant
Title 47 of the CFR, Part 15 §15.207(a)	RSS-GEN (7.2.4)	Conducted Emission	Compliant
Title 47 of the CFR, Part 15 §15.223(a)	Field Strength of Fundamental Emission	RSS-210(A2.3)	Compliant
Title 47 of the CFR, Part 15 §15.223(b)	Field Strength of Spurious Emissions	RSS-210(A2.3)	Compliant

Table 1. Summary of Test Results



2. Equipment Configuration

2.1 Overview

MET Laboratories, Inc. was contracted by Checkpoint Systems to perform testing on the EAS Detection System, under Checkpoint Systems' purchase order number 1100231851.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Checkpoint Systems, EAS Detection System.

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

Filing Status:	Original	
Model(s) Tested:	EAS Detection System: Model#: CHASSIS ELECTRONIC EVOLVE F10	
EUT Specifications:	FCC ID: DO4EVOLVEF10 IC: 3356B-EVOLVEF10	
	Primary Power: 120 VAC, 60 Hz	
	Type of Modulations:	Pulse
	Equipment Code:	FAP
	EUT TX Frequency Ranges:	7.4 – 9.5 MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Evaluated by:	Len Knight	
Report Date(s):	January 29, 2013	



2.2 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 5 August 2012	Information Technology Equipment (ITE) — Limits and methods of measurement
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
ISO/IEC 17025:2005	General Requirements for the Competence of Testing and Calibration Laboratories
ANSI C63.10-2009	American National Standard for Testing Unlicensed Wireless Devices

2.3 Test Site

All testing was performed at MET Laboratories, Inc., 914 West Patapsco Avenue, Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a semi-anechoic chamber. In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

2.4 Description of Test Sample

The Checkpoint Systems EAS Detection System, Equipment Under Test (EUT), is an Electronic Article Surveillance (EAS) detection system which detects tags that are applied to merchandise. The pulse-listen EAS system triggers an alarm when a non-deactivated tag is detected.

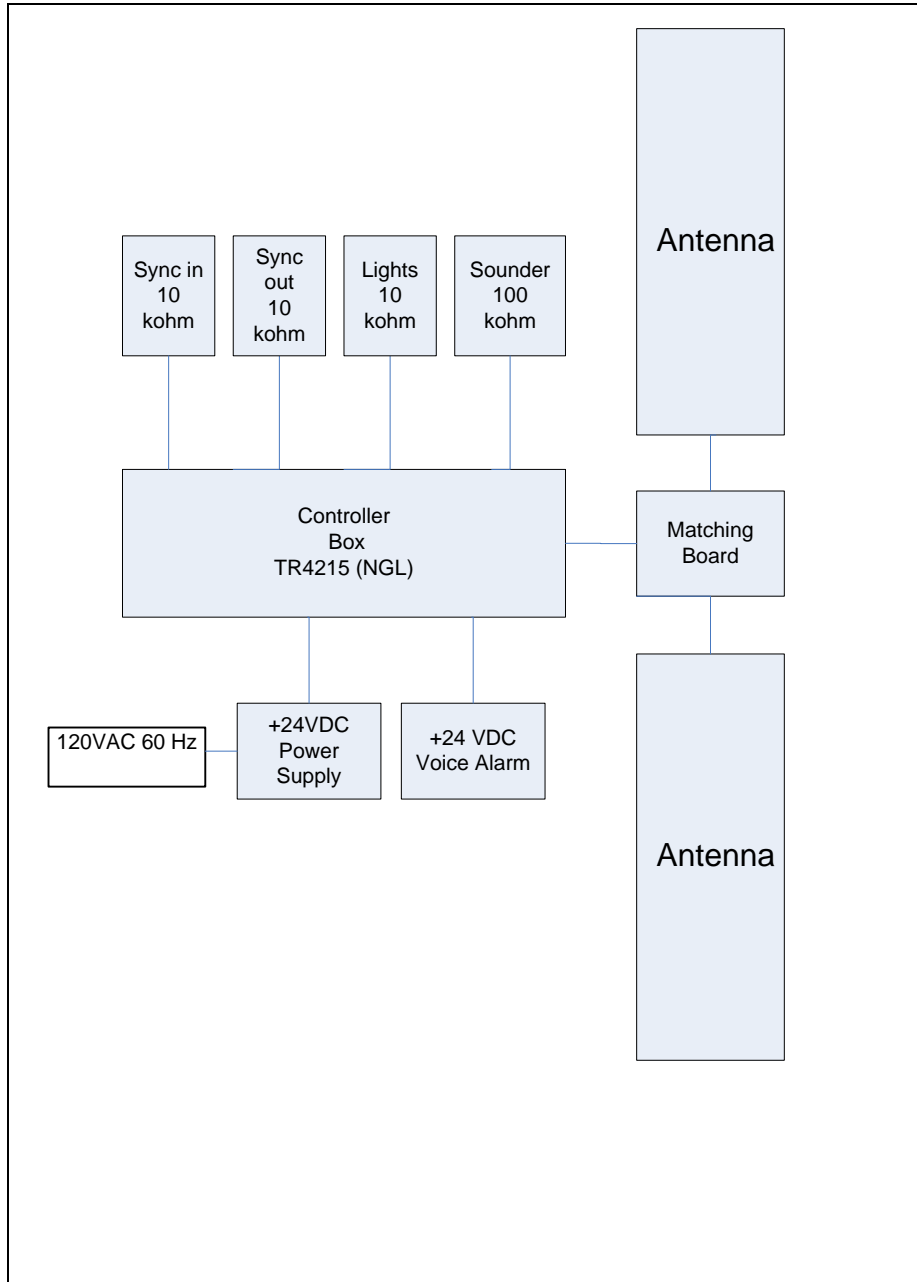


Figure 1. Block Diagram of Test Configuration



2.5 Equipment Configuration

The EUT is part of a system as shown in Figure 1, Block Diagram of Test Setup. All cards, etc., incorporated as part of the EUT is included in the following list.

Name / Description	Model Number	Serial Number
Checkpoint/Electronics Enclosure	CHASSIS ELECTRONIC EVOLVE F10	0403281024
Checkpoint/Flat Ferrite Antenna	F10	N/A
Checkpoint/Coupler Board	A1107	--
Checkpoint/Adapter Board	A1116	C0Q1088031
Checkpoint/DC Filter Board	A1057	03E20351077
Checkpoint/Reader Board	TR4215	0783718363A2681849
Globtek/ Power Supply	GT-2S5024D-ES	ROHS0002647151/07

Table 2. Equipment Configuration

2.6 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
DMS / Host Software	Checkpoint	Rev. 1.08.041	N/A
Tag/ 7.2, 8.2, 9.5 MHz	Checkpoint	N/A	N/A
Voice Alarm/EAS Voice Alarm	Checkpoint	7899324	027S3486273

Table 3. Support Equipment

2.7 Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty.	Length (m)	Shielded? (Y/N)	Termination Box ID & Port ID
1	RF	RG59 Coax	2	15	Yes	Controller Box
2	DC	DC output	1	4.5	Yes	Controller Box
3	J9	Voice Alarm	1	8.5	Yes	Controller Box
4	J11	Sounder	1	3	Yes	Control Box
5	J20	Sync in	1	3	Yes	Controller Box
6	J22	Sync out	1	3	Yes	Controller Box
7	J42	Lights	1	3	Yes	Controller Box

Table 4. Ports and Cabling Information



2.8 Mode of Operation

System transmits at a tag frequency (tune circuit) and listens to tag ring down.
Selected the following tag bands for low and high bands:

7.2, 8.2 MHz Pharma Band

{8325, 8325, 8325, 8325, 8075, 8075, 8075, 8075, 7600, 7600, 7600, 7600, 7200, 7200, 7200, 7200}

8.2 MHz Standard Band

{8450, 8450, 8450, 8450, 8325, 8325, 8325, 8325, 8075, 8075, 8075, 8075, 7950, 7950, 7950, 7950}

9.5 MHz Library Band

{9800, 9800, 9800, 9800, 9600, 9600, 9600, 9600, 9400, 9400, 9400, 9400, 9200, 9200, 9200, 9200}

2.9 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.

2.10 Disposition of EUT

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



3.0 Unintentional Radiators

3.1 §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 5. 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 5. 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.

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.

Table 5. Conducted Limits for Radio Frequency Devices calculated from FCC Part 15 Subsections 15.107(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, 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 B requirement(s) of this section. Measured emissions were below applicable limits.

Test Engineer(s): Zijun Tong

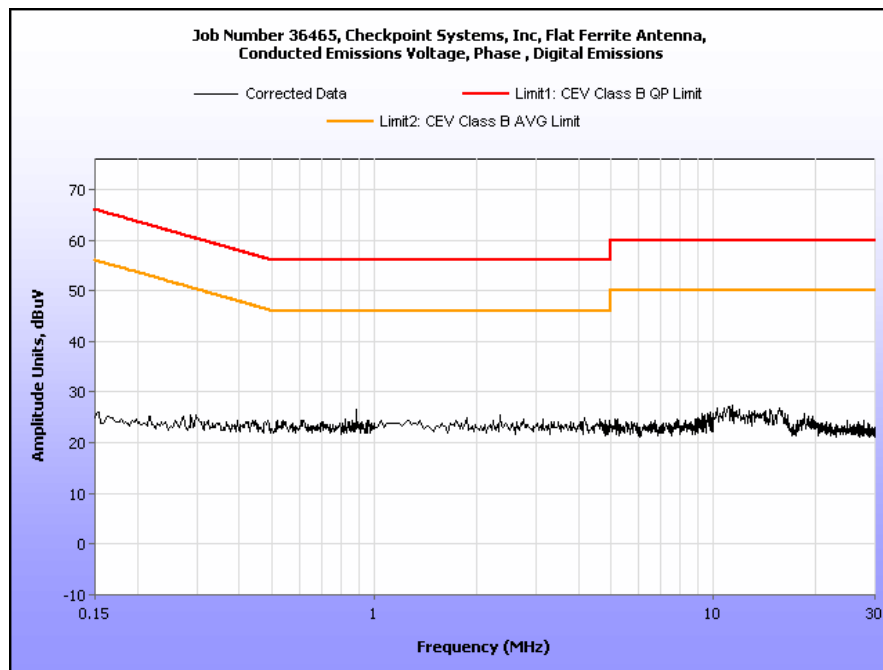
Test Date(s): 10/02/12



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

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
0.271	18.49	0	18.49	61.09	-42.6	12.69	0	12.69	51.09	-38.4
0.505	18.13	0	18.13	56	-37.87	12.36	0	12.36	46	-33.64
0.889	17.7	0	17.7	56	-38.3	11.96	0	11.96	46	-34.04
1.8	17.54	0	17.54	56	-38.46	12	0	12	46	-34
5.16	16.73	0.1	16.83	60	-43.17	11	0.1	11.1	50	-38.9
11.35	21.73	0.09	21.82	60	-38.18	18.33	0.09	18.42	50	-31.58

Table 6. Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)



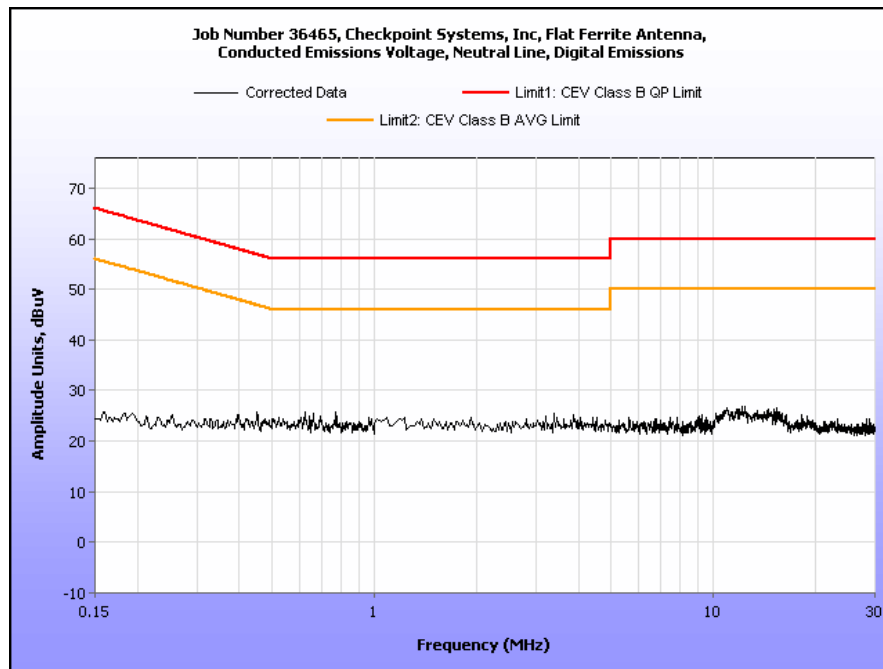
Plot 1. Conducted Emission, Phase Line Plot



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

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
0.271	18.76	0	18.76	61.09	-42.33	12.95	0	12.95	51.09	-38.14
0.505	18	0	18	56	-38	12.3	0	12.3	46	-33.7
0.889	17.77	0	17.77	56	-38.23	12.04	0	12.04	46	-33.96
1.8	17.55	0	17.55	56	-38.45	11.84	0	11.84	46	-34.16
5.16	16.87	0.1	16.97	60	-43.03	11.05	0.1	11.15	50	-38.85
11.35	20	0.09	20.09	60	-39.91	16.59	0.09	16.68	50	-33.32

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



Plot 2. Conducted Emission, Neutral Line Plot



3.2 §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 8.

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 8.

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

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

Since the EUT has only one mode of operation, which is transmitting, the EUT was transmitting during testing. Any emissions, whether digital or from the transmitter, were measured and compared to the appropriate Class B limit.

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

Test Engineer(s): Len Knight

Test Date(s): 11/01/12



Radiated Emissions Limits Test Results, Class B

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
56.478958	138	H	1.29	5.72	7.50	0.52	0.00	13.74	40.00	-26.26
56.478958	110	V	0.99	21.75	7.50	0.52	0.00	29.77	40.00	-10.23
64.660321	99	H	1.46	5.95	7.80	0.60	0.00	14.35	40.00	-25.65
64.660321	118	V	0.99	20.57	7.80	0.60	0.00	28.97	40.00	-11.03
449.4909	-1	H	1.37	6.09	17.20	1.74	0.00	25.03	46.00	-20.97
449.4909	113	V	0.99	14.26	17.20	1.74	0.00	33.20	46.00	-12.80
566.13259	84	H	1.89	8.89	19.15	2.01	0.00	30.05	46.00	-15.95
566.13259	41	V	0.99	15.61	19.15	2.01	0.00	36.77	46.00	-9.23
699.17877	153	H	1.37	6.91	20.78	2.33	0.00	30.02	46.00	-15.98
699.17877	136	V	0.99	9.92	20.78	2.33	0.00	33.03	46.00	-12.97
832.35644	171	H	1.62	6.98	22.40	2.59	0.00	31.97	46.00	-14.03
832.35644	43	V	0.99	12.63	22.40	2.59	0.00	37.62	46.00	-8.38

Table 9. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz, FCC Limits, Low Band

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
56.478958	138	H	1.29	5.72	7.50	0.52	10.46	3.28	30.00	-26.72
56.478958	110	V	0.99	21.75	7.50	0.52	10.46	19.31	30.00	-10.69
64.660321	99	H	1.46	5.95	7.80	0.60	10.46	3.89	30.00	-26.11
64.660321	118	V	0.99	20.57	7.80	0.60	10.46	18.51	30.00	-11.49
449.4909	-1	H	1.37	6.09	17.20	1.74	10.46	14.57	37.00	-22.43
449.4909	113	V	0.99	14.26	17.20	1.74	10.46	22.74	37.00	-14.26
566.13259	84	H	1.89	8.89	19.15	2.01	10.46	19.59	37.00	-17.41
566.13259	41	V	0.99	15.61	19.15	2.01	10.46	26.31	37.00	-10.69
699.17877	153	H	1.37	6.91	20.78	2.33	10.46	19.56	37.00	-17.44
699.17877	136	V	0.99	9.92	20.78	2.33	10.46	22.57	37.00	-14.43
832.35644	171	H	1.62	6.98	22.40	2.59	10.46	21.51	37.00	-15.49
832.35644	43	V	0.99	12.63	22.40	2.59	10.46	27.16	37.00	-9.84

Table 10. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz, ICES-003 Limits, Low Band



Radiated Emissions Limits Test Results, Class B

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
41.653307	174	H	1.95	4.86	13.11	0.43	0.00	18.40	40.00	-21.60
41.653307	134	V	1.00	20.67	13.11	0.43	0.00	34.21	40.00	-5.79
58.216433	90	H	2.00	5.26	7.50	0.53	0.00	13.29	40.00	-26.71
58.216433	90	V	1.00	20.84	7.50	0.53	0.00	28.87	40.00	-11.13
422.53006	271	H	2.00	11.71	16.65	1.61	0.00	29.97	46.00	-16.03
422.53006	126	V	1.00	19.35	16.65	1.61	0.00	37.61	46.00	-8.39
566.1022	261	H	2.00	14.86	19.14	2.01	0.00	36.01	46.00	-9.99
566.1022	113	V	1.00	16.75	19.14	2.01	0.00	37.90	46.00	-8.10
815.91182	249	H	2.12	8.46	22.22	2.56	0.00	33.24	46.00	-12.76
815.91182	248	V	1.00	10.63	22.22	2.56	0.00	35.41	46.00	-10.59
912.68236	303	H	1.21	6.51	23.00	2.79	0.00	32.30	46.00	-13.70
912.68236	168	V	1.00	9.92	23.00	2.79	0.00	35.71	46.00	-10.29

Table 11. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz, FCC Limits, Mid Band

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
41.653307	174	H	1.95	4.86	13.11	0.43	10.46	7.94	30.00	-22.06
41.653307	134	V	1.00	20.67	13.11	0.43	10.46	23.75	30.00	-6.25
58.216433	90	H	2.00	5.26	7.50	0.53	10.46	2.83	30.00	-27.17
58.216433	90	V	1.00	20.84	7.50	0.53	10.46	18.41	30.00	-11.59
422.53006	271	H	2.00	11.71	16.65	1.61	10.46	19.51	37.00	-17.49
422.53006	126	V	1.00	19.35	16.65	1.61	10.46	27.15	37.00	-9.85
566.1022	261	H	2.00	14.86	19.14	2.01	10.46	25.55	37.00	-11.45
566.1022	113	V	1.00	16.75	19.14	2.01	10.46	27.44	37.00	-9.56
815.91182	249	H	2.12	8.46	22.22	2.56	10.46	22.78	37.00	-14.22
815.91182	248	V	1.00	10.63	22.22	2.56	10.46	24.95	37.00	-12.05
912.68236	303	H	1.21	6.51	23.00	2.79	10.46	21.84	37.00	-15.16
912.68236	168	V	1.00	9.92	23.00	2.79	10.46	25.25	37.00	-11.75

Table 12. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz, ICES-003 Limits, Mid Band



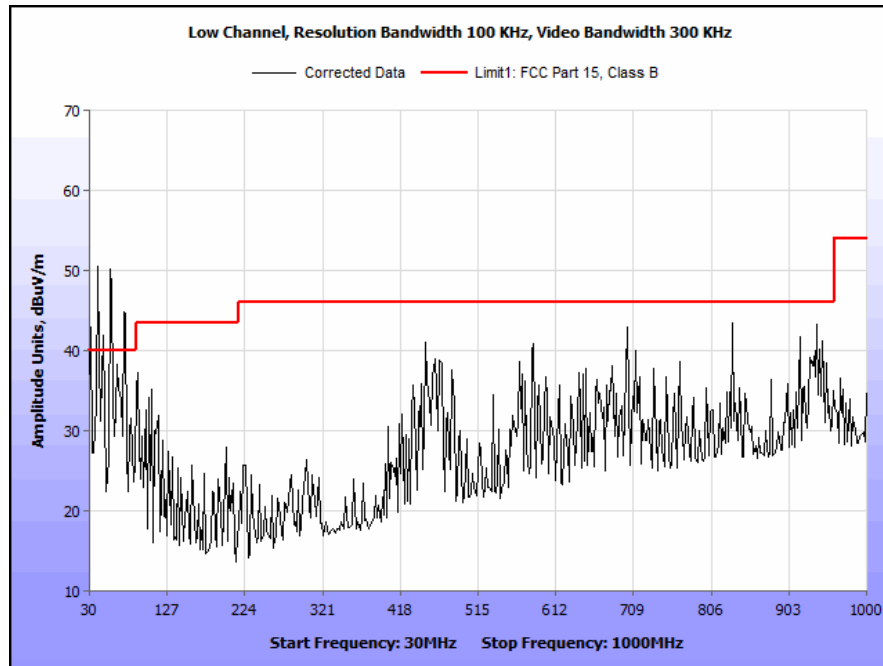
Radiated Emissions Limits Test Results, Class B

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
45.988978	308	H	1.70	5.57	10.41	0.45	0.00	16.43	40.00	-23.57
45.988978	92	V	1.00	20.10	10.41	0.45	0.00	30.96	40.00	-9.04
67.187375	63	H	1.52	15.78	7.94	0.61	0.00	24.33	40.00	-15.67
67.187375	77	V	1.00	29.96	7.94	0.61	0.00	38.51	40.00	-1.49
84.549098	108	H	1.84	10.24	7.70	0.72	0.00	18.66	40.00	-21.34
84.549098	144	V	1.00	24.03	7.70	0.72	0.00	32.45	40.00	-7.55
423.3016	157	H	1.90	9.96	16.67	1.61	0.00	28.24	46.00	-17.76
423.3016	131	V	1.00	20.75	16.67	1.61	0.00	39.03	46.00	-6.97
556.71944	149	H	2.00	16.03	18.83	1.99	0.00	36.85	46.00	-9.15
556.71944	251	V	1.00	19.10	18.83	1.99	0.00	39.92	46.00	-6.08
835.26052	313	H	1.57	7.23	22.40	2.58	0.00	32.21	46.00	-13.79
835.26052	241	V	1.00	11.93	22.40	2.58	0.00	36.91	46.00	-9.09

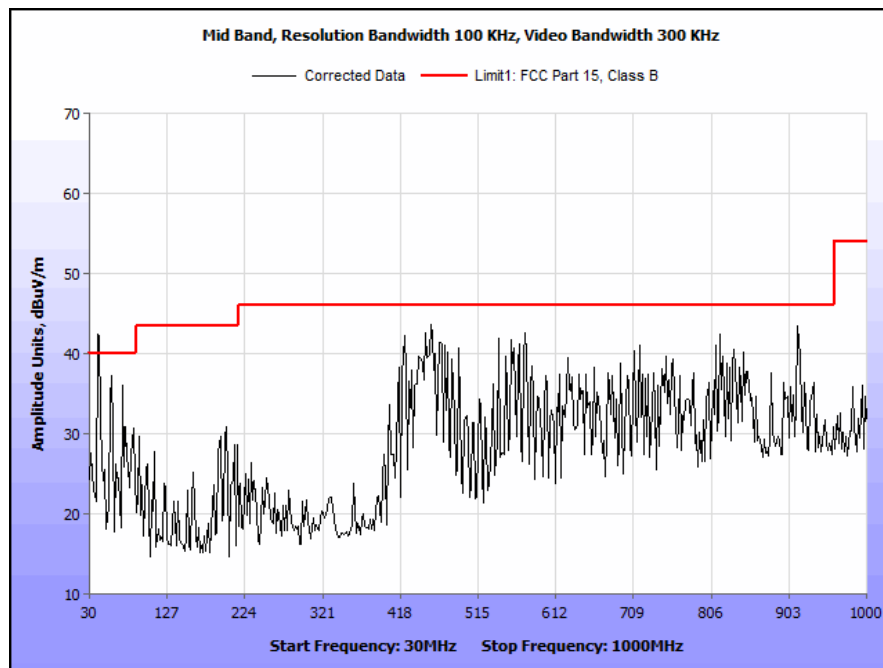
Table 13. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz, FCC Limits, High Band

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
45.988978	308	H	1.70	5.57	10.41	0.45	10.46	5.97	30.00	-24.03
45.988978	92	V	1.00	20.10	10.41	0.45	10.46	20.50	30.00	-9.50
67.187375	63	H	1.52	15.78	7.94	0.61	10.46	13.87	30.00	-16.13
67.187375	77	V	1.00	29.96	7.94	0.61	10.46	28.05	30.00	-1.95
84.549098	108	H	1.84	10.24	7.70	0.72	10.46	8.20	30.00	-21.80
84.549098	144	V	1.00	24.03	7.70	0.72	10.46	21.99	30.00	-8.01
423.3016	157	H	1.90	9.96	16.67	1.61	10.46	17.78	37.00	-19.22
423.3016	131	V	1.00	20.75	16.67	1.61	10.46	28.57	37.00	-8.43
556.71944	149	H	2.00	16.03	18.83	1.99	10.46	26.39	37.00	-10.61
556.71944	251	V	1.00	19.10	18.83	1.99	10.46	29.46	37.00	-7.54
835.26052	313	H	1.57	7.23	22.40	2.58	10.46	21.75	37.00	-15.25
835.26052	241	V	1.00	11.93	22.40	2.58	10.46	26.45	37.00	-10.55

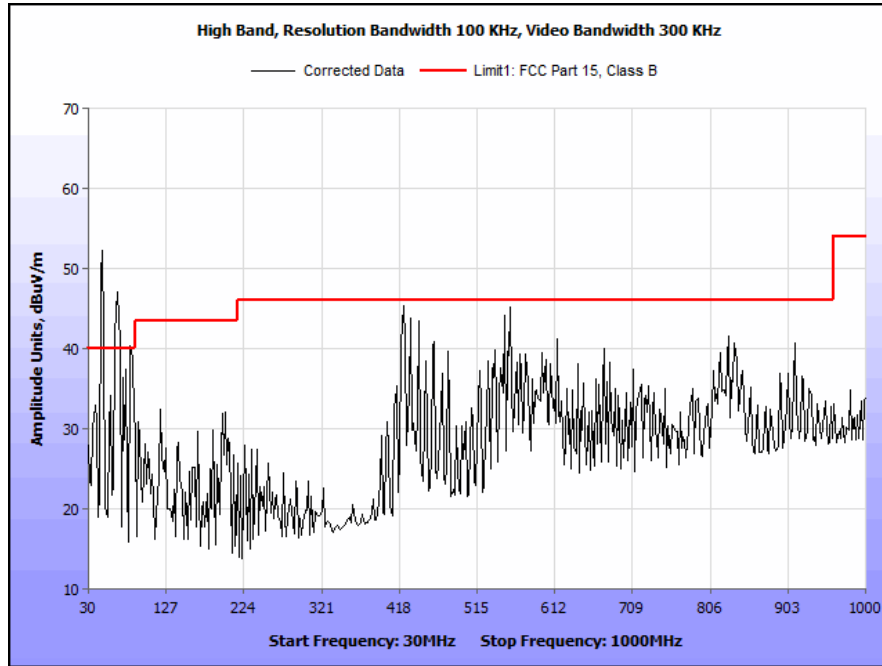
Table 14. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz, ICES-003 Limits, High Band



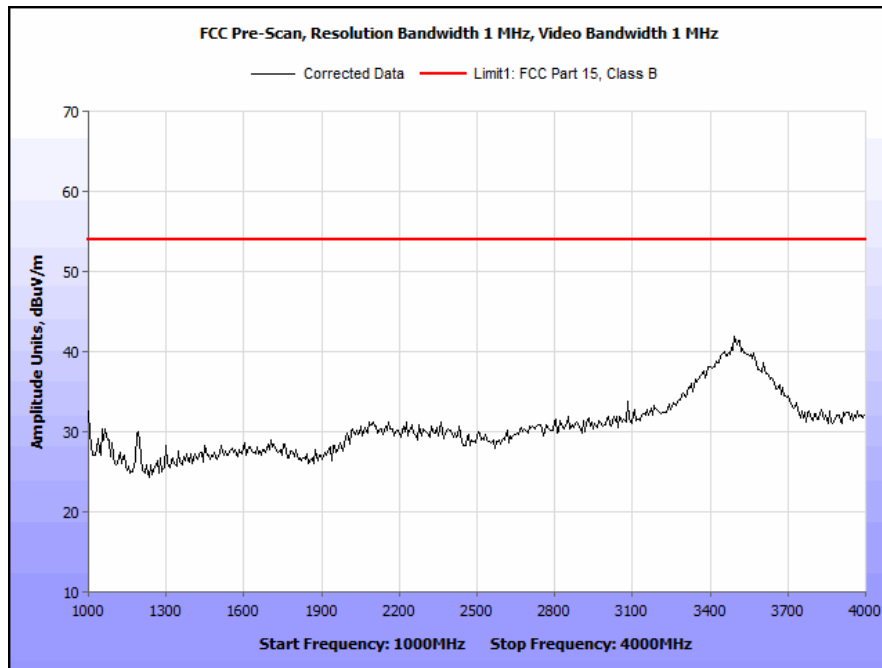
Plot 3. Radiated Emissions, Pre-Scan, 30 MHz - 1 GHz, Low Band



Plot 4. Radiated Emissions, Pre-Scan, 30 MHz - 1 GHz, Mid Band



Plot 5. Radiated Emissions, Pre-Scan, 30 MHz - 1 GHz, High Band



Plot 6. Radiated Emissions, Pre-Scan, 1 GHz - 4 GHz

4.0 Intentional Radiators

4.1 §15.203 Antenna Requirements

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. The antenna is integral to the system.

Test Engineer(s): Len Knight

Test Date(s): 10/31/12

Gain	Type
-40 dBi	Loop

Table 15. Antenna List

4.2 §15.223(a) 6 dB and 99% Bandwidth

Test Requirements: § 15.223(a): The field strength of any emission within the band 1.705 – 10.0 MHz shall not exceed 100 microvolts/meter at a distance of 30 meters. However, if the bandwidth of the emission is less than 10% of the center frequency, the field strength shall not exceed 15 microvolts/meter or (the bandwidth of the device in kHz) divided by (the center frequency of the device in MHz) microvolts/meter at a distance of 30 meters, whichever is the higher level. For the purposes of this section, bandwidth is determined at the points 6 dB down from the modulated carrier. The emission limits in this paragraph are based on measurement instrumentation employing an average detector. The provisions in §15.35(b) for limiting peak emissions apply.

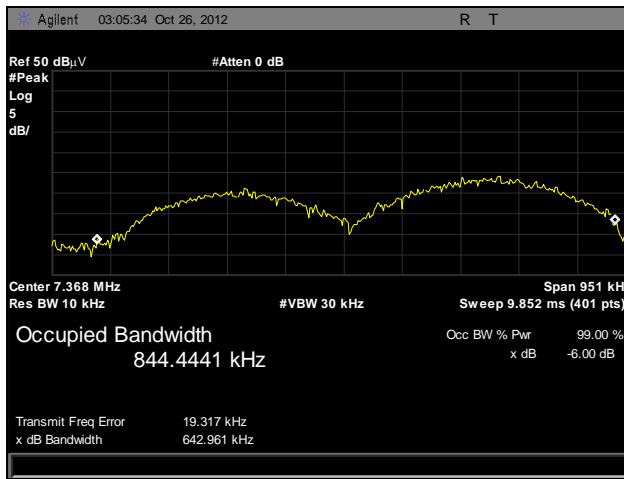
Test Procedure: The transmitter was on and transmitting. The 6 dB bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately 1% of the total span and a VBW > RBW. The 6 dB Bandwidth was measured and used to determine the field strength limit of the fundamental. The measurements were performed on the low, mid and high channels. Because of the nature of the pulse modulation, a peak detector using max hold was used for the 99% bandwidth measurement.

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

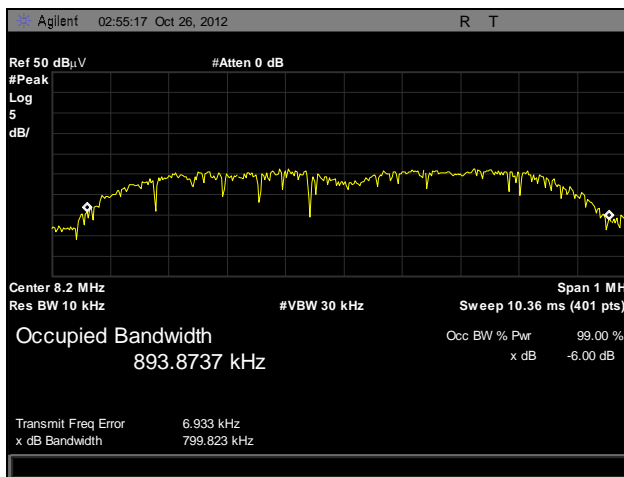
Test Engineer(s): Len Knight

Test Date(s): 10/29/12

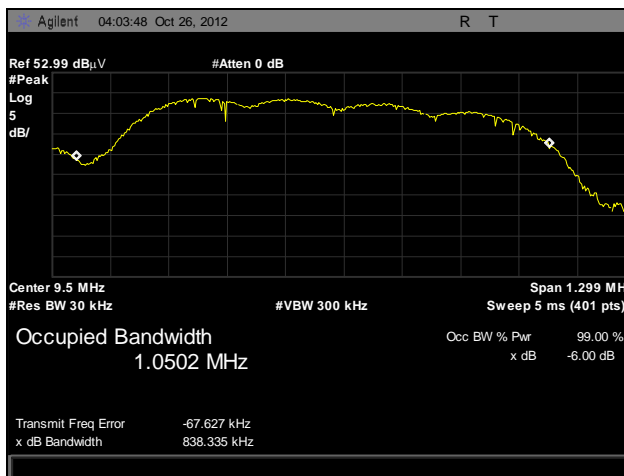
Occupied Bandwidth Test Results



Plot 7. Occupied Bandwidth, Low Channel



Plot 8. Occupied Bandwidth, Mid Channel



Plot 9. Occupied Bandwidth, High Channel

4.3 §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 μ H/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 (dB μ V)	
	Quasi-Peak	Average
* 0.15- 0.45	66 - 56	56 - 46
0.45 - 0.5	56	46
0.5 - 30	60	50

Table 16. 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 μ H Line Impedance Stabilization Network (LISN). The EMC receiver scanned the frequency range from 150 kHz to 30 MHz. Conducted Emissions measurements were made in accordance with *ANSI C63.4-2003 "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 μ H LISN as the input transducer to an EMC/field intensity meter. For the purpose of this testing, the transmitter was turned on. Scans were performed with the transmitter on.

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

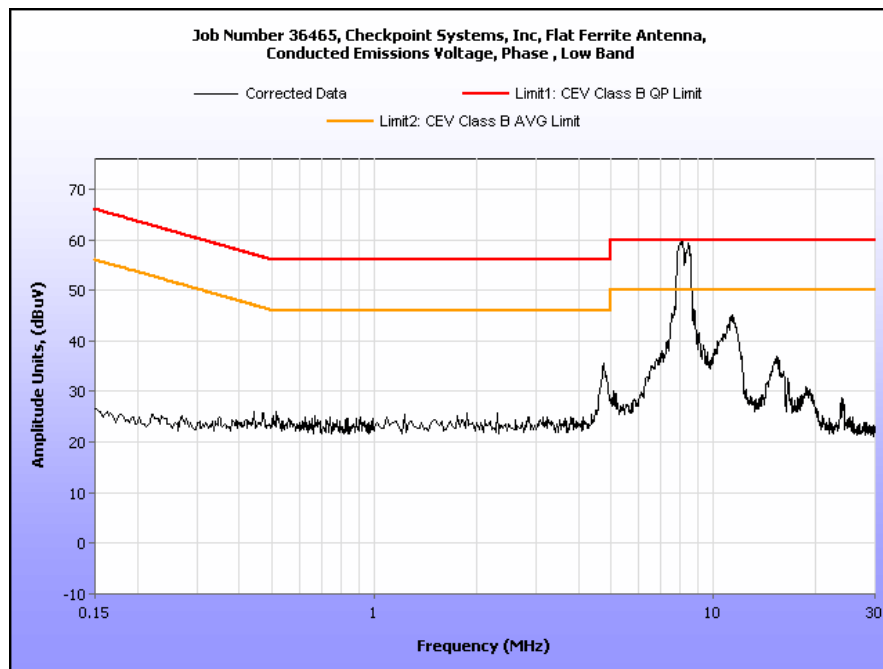
Test Engineer(s): Zijun Tong

Test Date(s): 10/02/12

15.207(a) Conducted Emissions Test Results, Low Band

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
4.744	31.67	0.09	31.76	56	-24.24	21.1	0.09	21.19	46	-24.81
7.932	56.63	0.03	56.66	60	-3.34	42.93	0.03	42.96	50	-7.04
8.079	56.41	0.03	56.44	60	-3.56	43.33	0.03	43.36	50	-6.64
8.439	55.94	0.05	55.99	60	-4.01	42.87	0.05	42.92	50	-7.08
8.799	42.48	0.05	42.53	60	-17.47	28.53	0.05	28.58	50	-21.42
11.46	42.43	0.08	42.51	60	-17.49	32.46	0.08	32.54	50	-17.46
15.33	33.26	0.05	33.31	60	-26.69	25.1	0.05	25.15	50	-24.85

Table 17. Conducted Emissions, 15.207(a), Phase Line, Test Results, Low Band

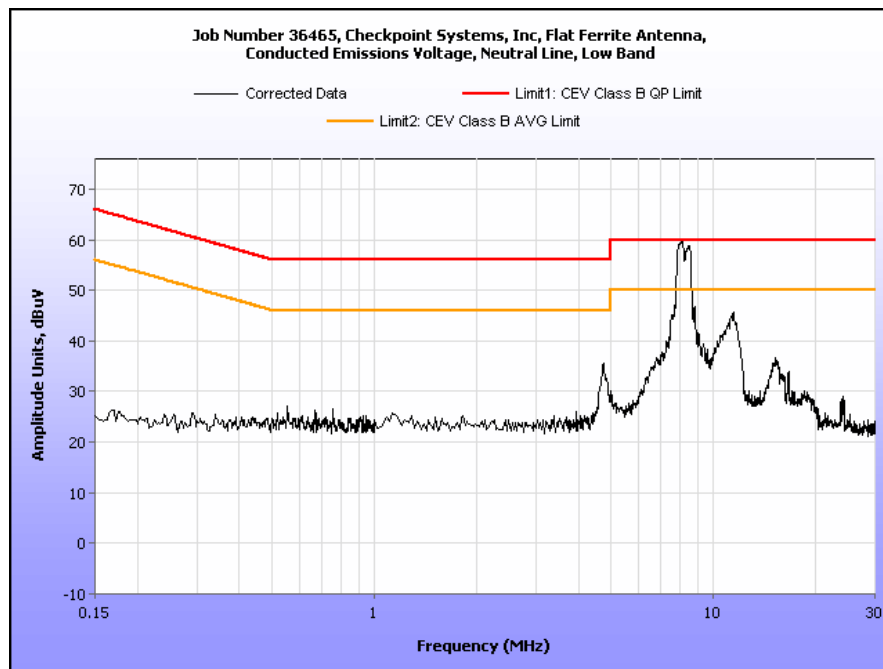


Plot 10. Conducted Emissions, 15.207(a), Phase Line, Low Band

15.207(a) Conducted Emissions Test Results, Low Band

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
4.756	31.52	0.09	31.61	56	-24.39	31.52	0.09	31.61	46	-14.39
7.953	56.94	0.03	56.97	60	-3.03	43.73	0.03	43.76	50	-6.24
8.06	56.78	0.03	56.81	60	-3.19	44.01	0.03	44.04	50	-5.96
8.453	56.35	0.05	56.4	60	-3.6	43.21	0.05	43.26	50	-6.74
8.806	42.56	0.05	42.61	60	-17.39	28.37	0.05	28.42	50	-21.58
11.47	42.78	0.08	42.86	60	-17.14	32.25	0.08	32.33	50	-17.67
15.31	33.21	0.05	33.26	60	-26.74	22.57	0.05	22.62	50	-27.38

Table 18. Conducted Emissions, 15.207(a), Neutral Line, Test Results, Low Band

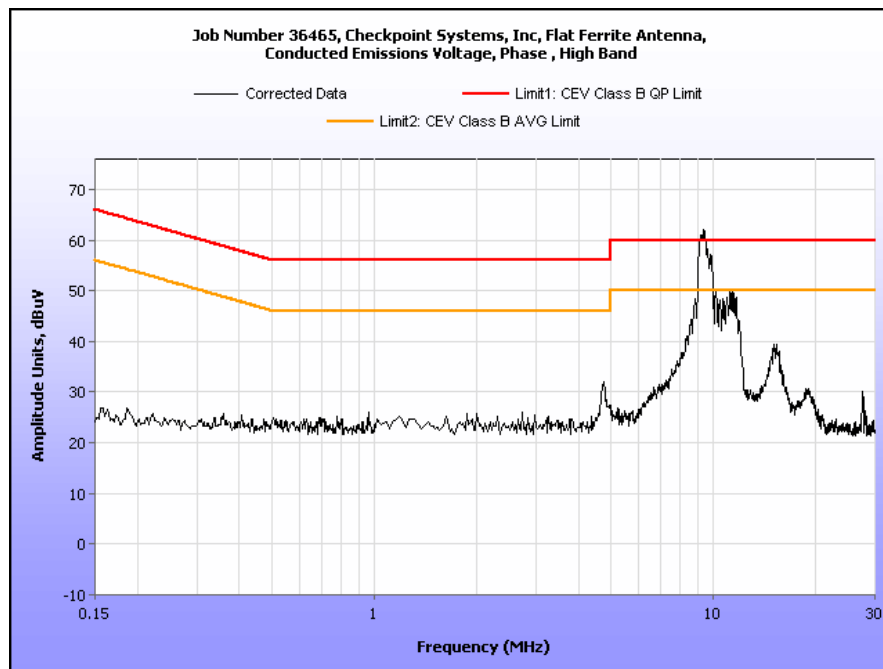


Plot 11. Conducted Emissions, 15.207(a), Neutral Line, Low Band

15.207(a) Conducted Emissions Test Results, High Band

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
4.738	28.09	0.08	28.17	56	-27.83	19.11	0.08	19.19	46	-26.81
9.208	58.76	0.06	58.82	60	-1.18	44.41	0.06	44.47	50	-5.53
9.395	58.3	0.07	58.37	60	-1.63	44.28	0.07	44.35	50	-5.65
9.829	52.2	0.09	52.29	60	-7.71	37.07	0.09	37.16	50	-12.84
11.45	47	0.08	47.08	60	-12.92	33.28	0.08	33.36	50	-16.64
15.37	35.35	0.05	35.4	60	-24.6	26.61	0.05	26.66	50	-23.34

Table 19. Conducted Emissions, 15.207(a), Phase Line, Test Results, High Band

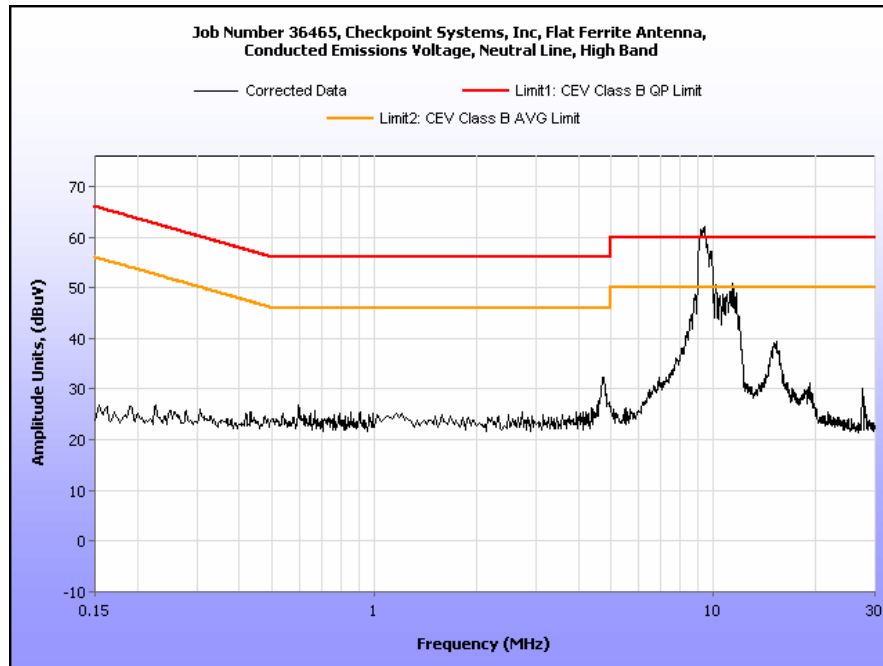


Plot 12. Conducted Emissions, 15.207(a), Phase Line, High Band

15.207(a) Conducted Emissions Test Results, High Band

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
4.732	28.03	0.08	28.11	56	-27.89	19.49	0.08	19.57	46	-26.43
9.206	59.01	0.06	59.07	60	-0.93	44.64	0.06	44.7	50	-5.3
9.394	58.61	0.07	58.68	60	-1.32	44.49	0.07	44.56	50	-5.44
9.845	52.81	0.09	52.9	60	-7.1	37.61	0.09	37.7	50	-12.3
11.44	47.45	0.08	47.53	60	-12.47	32.56	0.08	32.64	50	-17.36
15.34	35.68	0.05	35.73	60	-24.27	27.85	0.05	27.9	50	-22.1

Table 20. Conducted Emissions, 15.207(a), Neutral Line, Test Results, High Band



Plot 13. Conducted Emissions, 15.207(a), Neutral Line, High Band

Electromagnetic Compatibility Emission Criteria

3.2. §15.223(a) Field Strength of Fundamental Emission

Test Requirement(s): §15.223 (a) The field strength of any emissions within the band 1.705 – 10.0 MHz shall not exceed 100 microvolts/meter at a distance of 30 meters. However, if the bandwidth of the emission is less than 10% of the center frequency, the field strength shall not exceed 15 microvolts/meter or (the bandwidth of the device in kHz) divided by (the center frequency of the device in MHz) microvolts/meter at a distance of 30 meters, whichever is the higher level. For the purposes of this section, bandwidth is determined at the points 6 dB down from the modulated carrier. The emission limits in this paragraph are based on measurement instrumentation employing an average detector. The provisions in Section 15.35(b) for limiting peak emissions apply.

Test Procedure: The EUT was set to transmit at the different assigned bands and placed in an orientation typical of installation on an OATS. The method of testing and test conditions of ANSI C63.4: 2003 were used. The loop antenna was located 10 m from the EUT. Measurements were conducted with the loop antenna at coaxial (parallel) and planar (perpendicular) orientations. A peak detector was used with a 300 kHz RBW (instead of 10 kHz) for minimum pulse desensitization.

For the purposes of showing compliance, the measurements of the fundamental were made at a 10 m distance and then extrapolated to the 30 m published limit.

Test Results: The EUT was found compliant with Part 15.223 (a) requirements of this section.

Test Engineer(s): Len Knight

Test Date(s): 10/16/12 – 10/31/12

Calculation of In-Band Field Strength Limit

Low Channel:

6 dB Bandwidth – 642.961 kHz

Center Frequency – 7.4 MHz

$$642.961 / 7.4 = 86.887 \mu\text{V/m @ 30 m or } 38.78 \text{ dB}\mu\text{V/m}$$

Mid Channel:

6 dB Bandwidth – 799.823 kHz

Center Frequency – 8.2 MHz

$$799.823 / 8.2 = 97.539 \mu\text{V/m @ 30 m or } 39.79 \text{ dB}\mu\text{V/m}$$

High Channel:

6 dB Bandwidth – 838.335 kHz

Center Frequency – 9.5 MHz

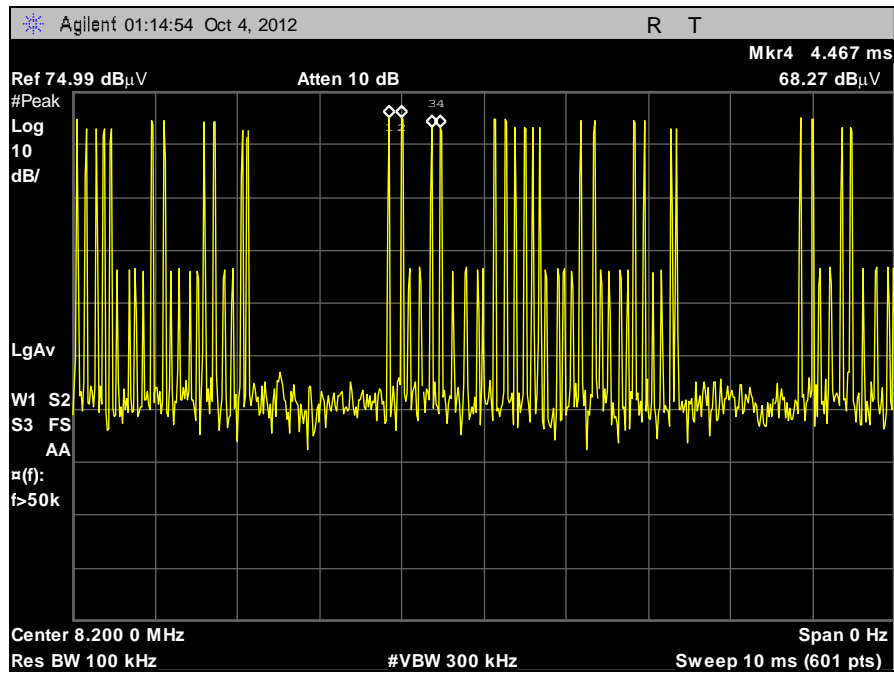
$$838.335 / 9.5 = 88.246 \mu\text{V/m @ 30 m or } 38.91 \text{ dB}\mu\text{V/m}$$

§15.35 Measurement Detector Functions and Bandwidths

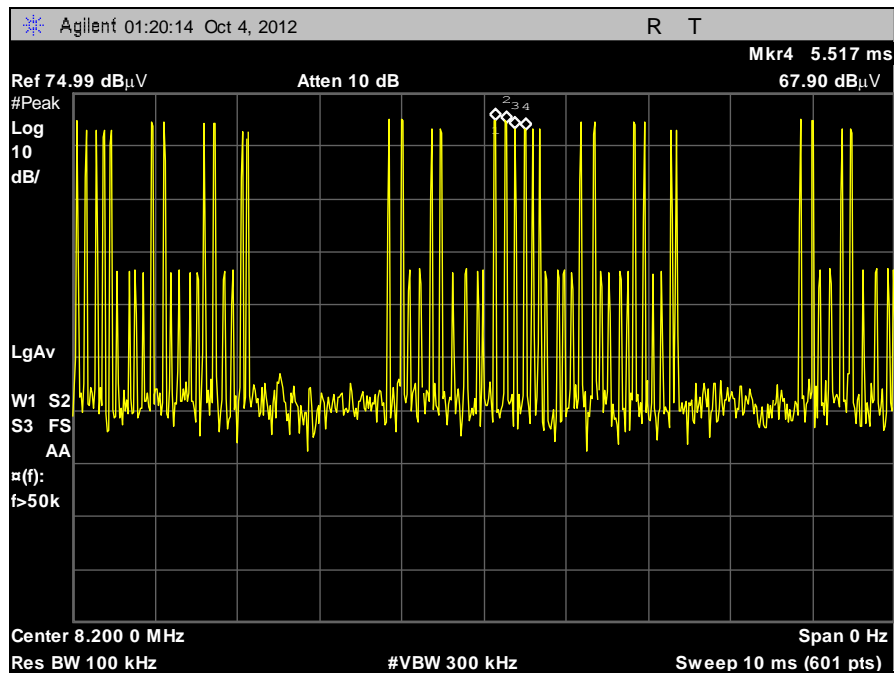
- (c) Unless otherwise specified, e.g., §15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including banking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

Pulse Duration	0.02253 ms
# of Pulses per Burst	16 pulses
Burst Duration	0.36048 ms
Transmitter Period	5.15 ms
Duty Cycle	6.99961165 %
Duty Cycle Correction Factor	-23.0985211 dB

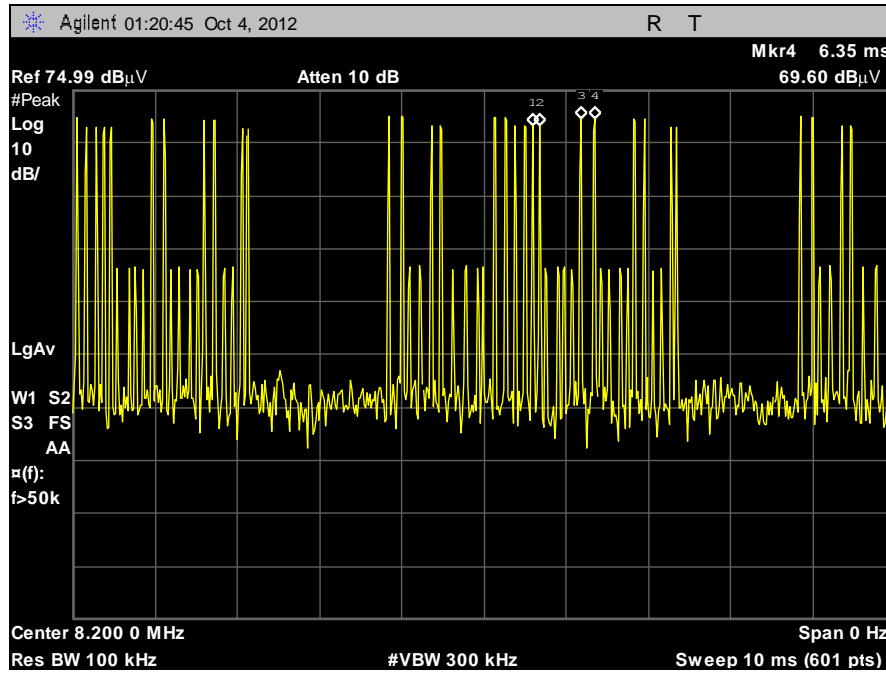
Table 21. Duty Cycle Correction Factor Calculation



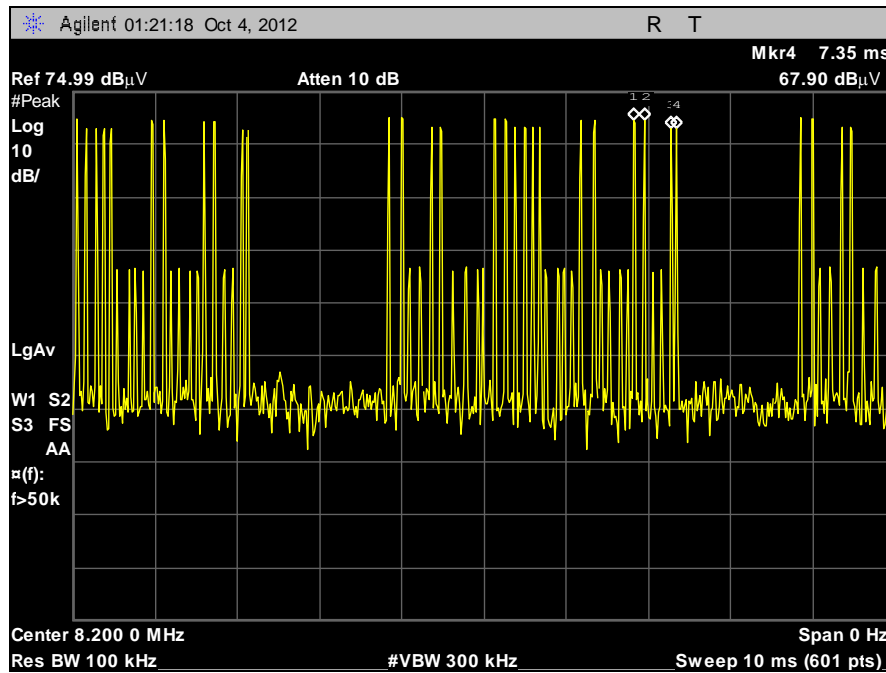
Plot 14. Radiated Emissions, Duty Cycle, # of Pulses, 1



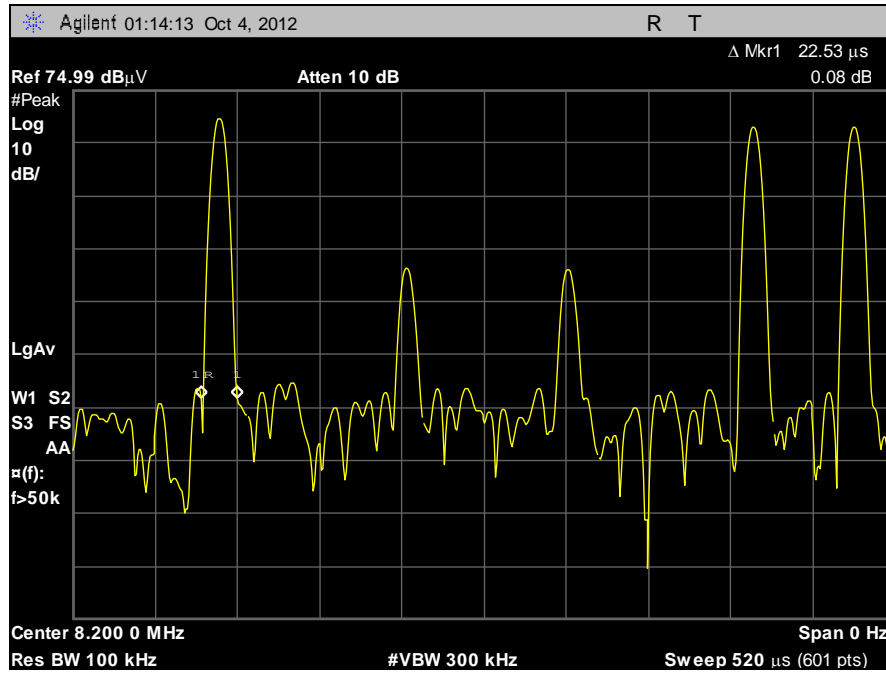
Plot 15. Radiated Emissions, Duty Cycle, # of Pulses, 2



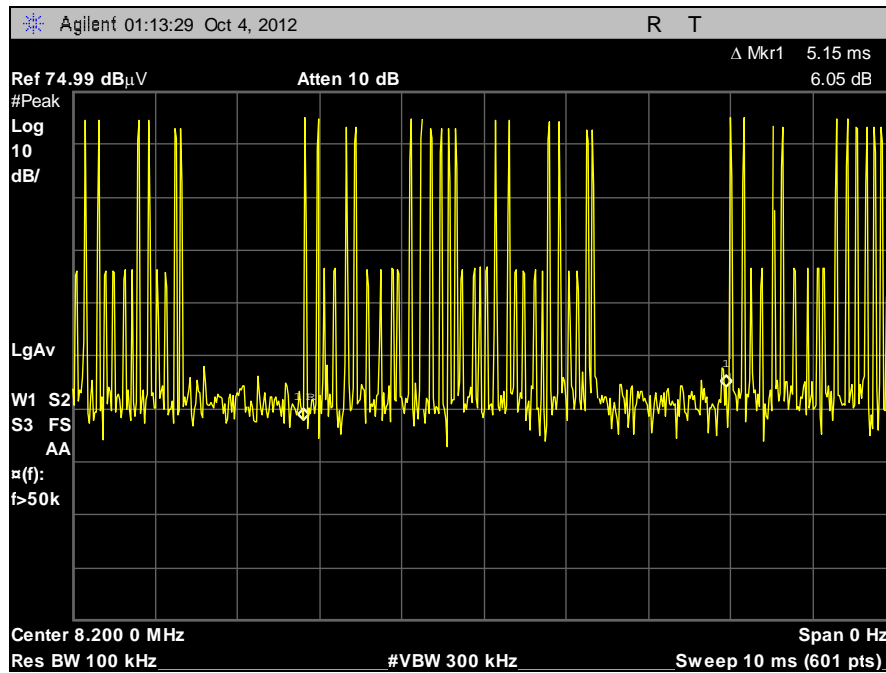
Plot 16. Radiated Emissions, Duty Cycle, # of Pulses, 3



Plot 17. Radiated Emissions, Duty Cycle, # of Pulses, 4



Plot 18. Radiated Emissions, Transmitter Burst Duration



Plot 19. Radiated Emissions, Transmitter Period

Calculations for Extrapolation Factor

§15.31 Measurement standards.

- (2) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

In order to extrapolate the correction factor, two peak measurements were taken at 10 m and 15 m.

The frequency of 7.94 MHz was used since this was the peak of the mid channel during preliminary measurements.

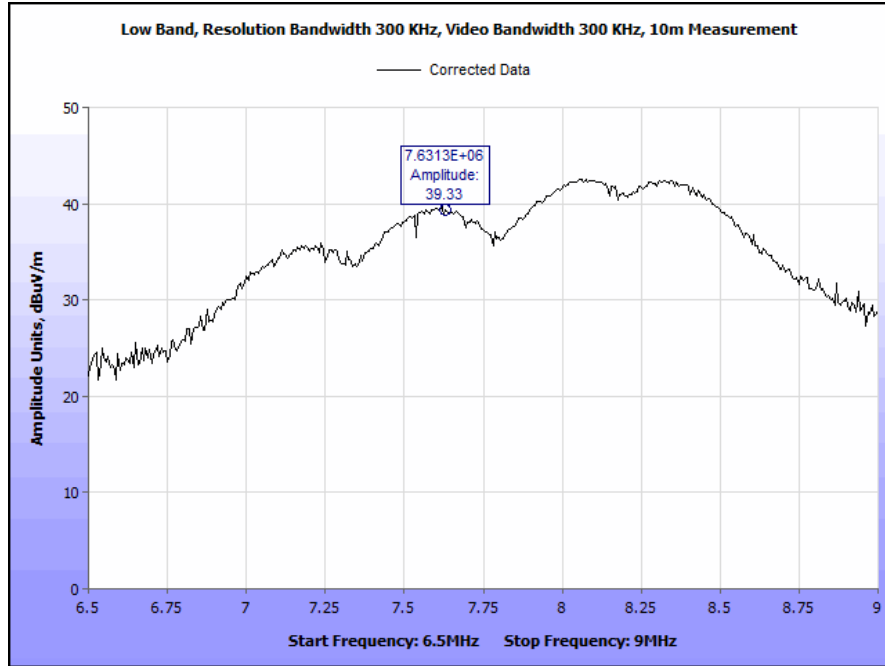
Measurement Distance	Meter Reading
10 m	48.35 dB μ V
15 m	38.88dB μ V

Calculate 10 – 15 m

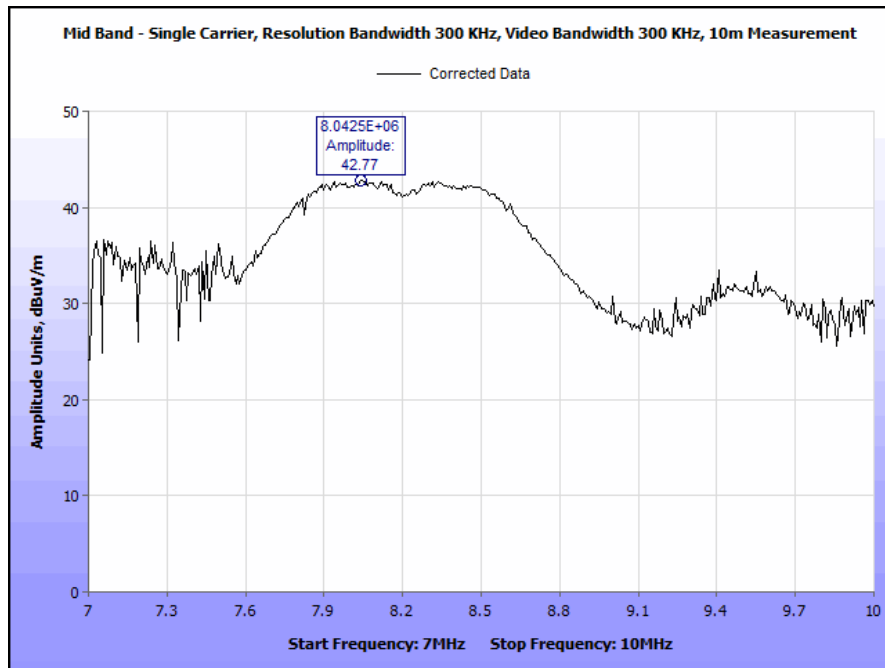
$$\begin{aligned} & \times \log (10/15) = (48.35 - 38.88) \\ & \times \log (0.666) = 9.47 \\ & \times (-0.17653) = 9.47 \\ & \times = 53.64 \end{aligned}$$

Correction used to extrapolate from 30 m published limit:
53 log (D1/D2)

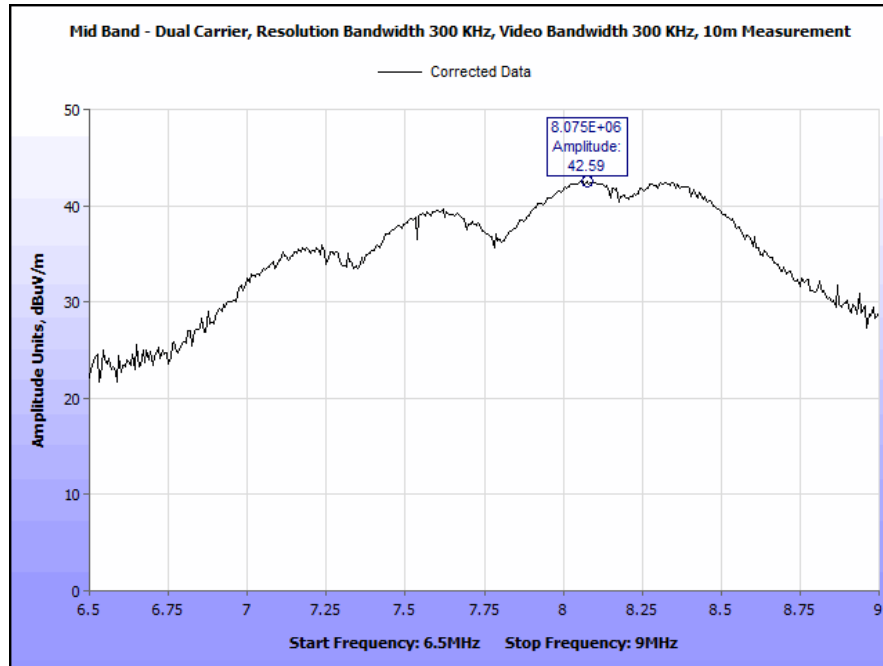
Band	Peak Meter Reading (dB μ V)	ACF (dB)	Distance Correction Factor (dB)	Peak Measurement (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Duty Cycle Correction Factor (dB)	Average Measurement (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)
Low	39.33	35.0	25.28	49.05	58.78	-9.73	23.09	25.96	38.78	-12.82
Mid	42.77	34.9	25.28	52.39	59.79	-7.4	23.09	29.3	39.79	-10.49
Low/Mid	42.59	34.9	25.28	52.21	59.79	-7.58	23.09	29.12	39.79	-10.67
High	47.73	34.7	25.28	57.15	58.91	-1.76	23.09	34.06	38.91	-4.85



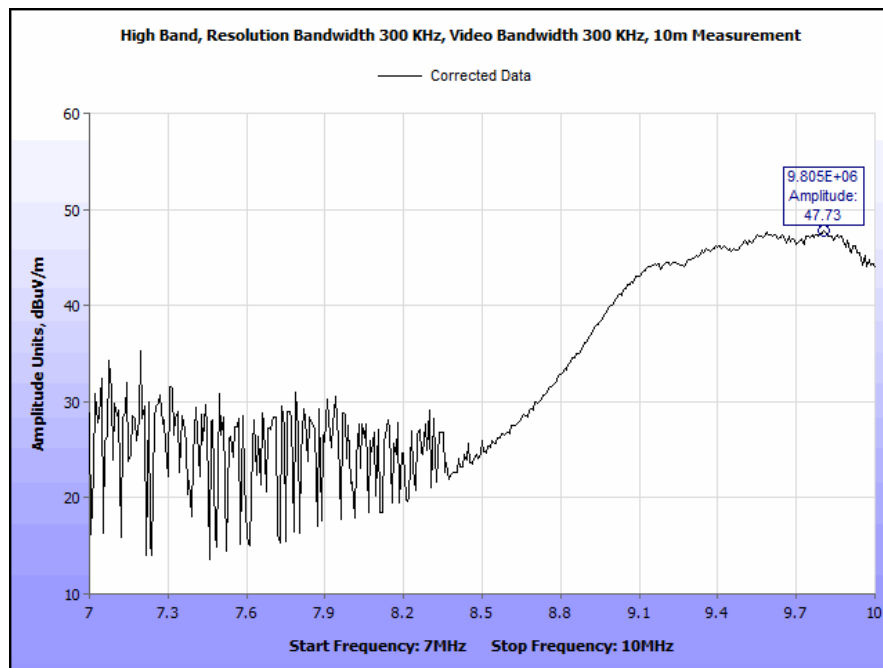
Plot 20. Peak Uncorrected Radiated Emission Measurement, Low Band, Fundamental



Plot 21. Peak Uncorrected Radiated Emission Measurement, Mid Band, Fundamental, Single Carrier



Plot 22. Peak Uncorrected Radiated Emission Measurement, Mid Band, Fundamental, Dual Carrier



Plot 23. Peak Uncorrected Radiated Emission Measurement, High Band, Fundamental

Electromagnetic Compatibility Emission Criteria

3.3. §15.223(b) Field Strength of Spurious Emissions

Test Requirement(s): §15.223 (b) The field strength of emissions outside of the band 1.705 – 10.0 MHz shall not exceed the general radiated emission limits in Section 15.209.

Test Procedures: The EUT was set to transmit and placed on a turn table inside a semi-anechoic chamber. The method of testing and test conditions of ANSI C63.4: 2003 were used. For measurements below 30 MHz a loop antenna placed 3m away from the unit was used. For measurements above 30 MHz a biconal antenna placed 3m away from the unit was used. Measurements were conducted with the loop antenna at coaxial (parallel) and planar (perpendicular) orientations.

For investigation of spurious emissions in the restricted bands, measurements were made using a loop antenna at a 10 m distance on the OATS.

The measurements made at 3 m with the loop antenna were then extrapolated to 30m using the following correction factor.

$$40\log(3/30) = -40 \text{ dB}$$

The measurements made at 10 m with the loop antenna were then extrapolated to 30 m using the following correction factor:

$$40\log(10/30) = -19.08 \text{ dB}$$

Test Results: The EUT was found compliant with Part 15.223 (b) requirements of this section.

Test Engineer(s): Len Knight

Test Date(s): 11/01/12

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
56.478958	138	H	1.29	5.72	7.50	0.52	0.00	13.74	40.00	-26.26
56.478958	110	V	0.99	21.75	7.50	0.52	0.00	29.77	40.00	-10.23
64.660321	99	H	1.46	5.95	7.80	0.60	0.00	14.35	40.00	-25.65
64.660321	118	V	0.99	20.57	7.80	0.60	0.00	28.97	40.00	-11.03
449.4909	-1	H	1.37	6.09	17.20	1.74	0.00	25.03	46.00	-20.97
449.4909	113	V	0.99	14.26	17.20	1.74	0.00	33.20	46.00	-12.80
566.13259	84	H	1.89	8.89	19.15	2.01	0.00	30.05	46.00	-15.95
566.13259	41	V	0.99	15.61	19.15	2.01	0.00	36.77	46.00	-9.23
699.17877	153	H	1.37	6.91	20.78	2.33	0.00	30.02	46.00	-15.98
699.17877	136	V	0.99	9.92	20.78	2.33	0.00	33.03	46.00	-12.97
832.35644	171	H	1.62	6.98	22.40	2.59	0.00	31.97	46.00	-14.03
832.35644	43	V	0.99	12.63	22.40	2.59	0.00	37.62	46.00	-8.38

Table 22. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz, Low Band

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
41.653307	174	H	1.95	4.86	13.11	0.43	0.00	18.40	40.00	-21.60
41.653307	134	V	1.00	20.67	13.11	0.43	0.00	34.21	40.00	-5.79
58.216433	90	H	2.00	5.26	7.50	0.53	0.00	13.29	40.00	-26.71
58.216433	90	V	1.00	20.84	7.50	0.53	0.00	28.87	40.00	-11.13
422.53006	271	H	2.00	11.71	16.65	1.61	0.00	29.97	46.00	-16.03
422.53006	126	V	1.00	19.35	16.65	1.61	0.00	37.61	46.00	-8.39
566.1022	261	H	2.00	14.86	19.14	2.01	0.00	36.01	46.00	-9.99
566.1022	113	V	1.00	16.75	19.14	2.01	0.00	37.90	46.00	-8.10
815.91182	249	H	2.12	8.46	22.22	2.56	0.00	33.24	46.00	-12.76
815.91182	248	V	1.00	10.63	22.22	2.56	0.00	35.41	46.00	-10.59
912.68236	303	H	1.21	6.51	23.00	2.79	0.00	32.30	46.00	-13.70
912.68236	168	V	1.00	9.92	23.00	2.79	0.00	35.71	46.00	-10.29

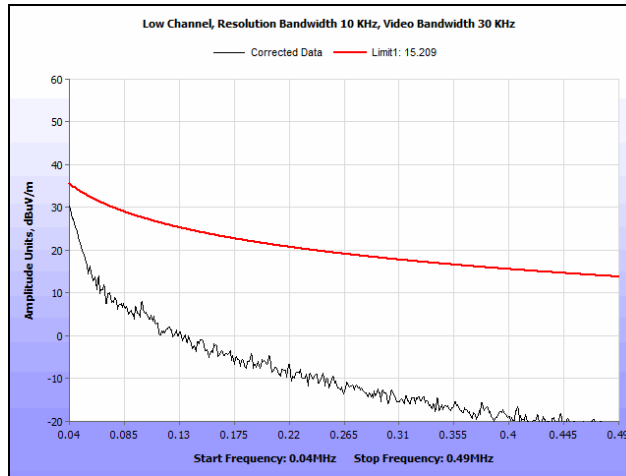
Table 23. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz, Mid Band

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Height (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB)	Cable Loss (dB)	Distance Correction Factor (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
8.3815	0	1.0	13.50	34.8	0.15	19.08	29.37	29.54	-0.17
8.2925	0	1.0	12.32	34.8	0.15	19.08	28.19	29.54	-1.35
8.364	0	1.0	13.04	34.8	0.15	19.08	28.91	29.54	-0.63
8.4145	0	1.0	13.20	34.8	0.15	19.08	29.07	29.54	-0.47

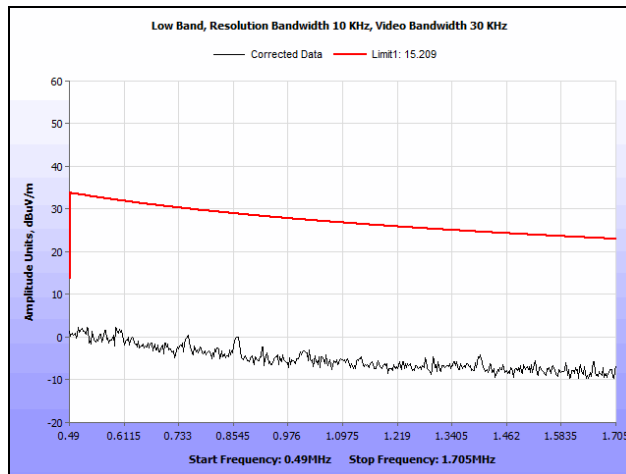
Table 24. Radiated Emissions Spurious in Restricted Bands, Mid Channel

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
10.0	0	N/A	1.0	7.45	34.7	6.15	19.08	23.22	40	-16.78
45.988978	308	H	1.70	5.57	10.41	0.45	0.00	16.43	40.00	-23.57
45.988978	92	V	1.00	20.10	10.41	0.45	0.00	30.96	40.00	-9.04
67.187375	63	H	1.52	15.78	7.94	0.61	0.00	24.33	40.00	-15.67
67.187375	77	V	1.00	29.96	7.94	0.61	0.00	38.51	40.00	-1.49
84.549098	108	H	1.84	10.24	7.70	0.72	0.00	18.66	40.00	-21.34
84.549098	144	V	1.00	24.03	7.70	0.72	0.00	32.45	40.00	-7.55
423.3016	157	H	1.90	9.96	16.67	1.61	0.00	28.24	46.00	-17.76
423.3016	131	V	1.00	20.75	16.67	1.61	0.00	39.03	46.00	-6.97
556.71944	149	H	2.00	16.03	18.83	1.99	0.00	36.85	46.00	-9.15
556.71944	251	V	1.00	19.10	18.83	1.99	0.00	39.92	46.00	-6.08
835.26052	313	H	1.57	7.23	22.40	2.58	0.00	32.21	46.00	-13.79
835.26052	241	V	1.00	11.93	22.40	2.58	0.00	36.91	46.00	-9.09

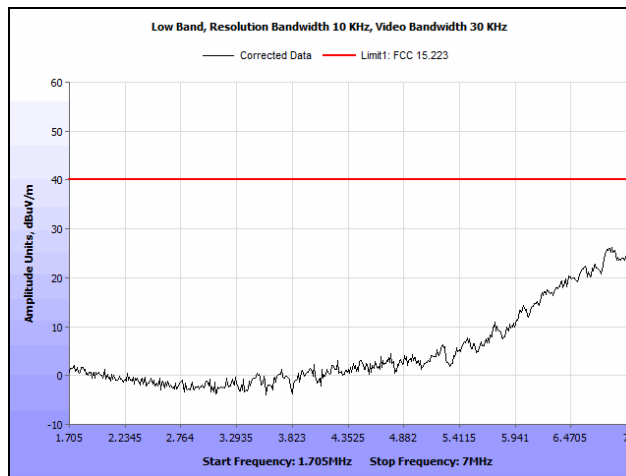
Table 25. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz, High Band



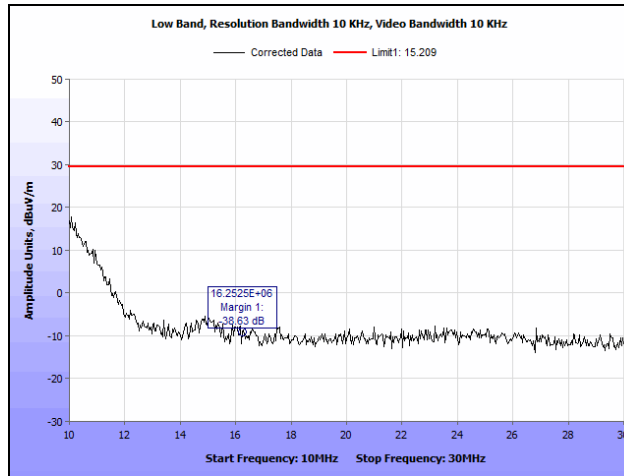
Plot 24. Radiated Spurious Emissions, 40 kHz – 490 kHz, Low Channel



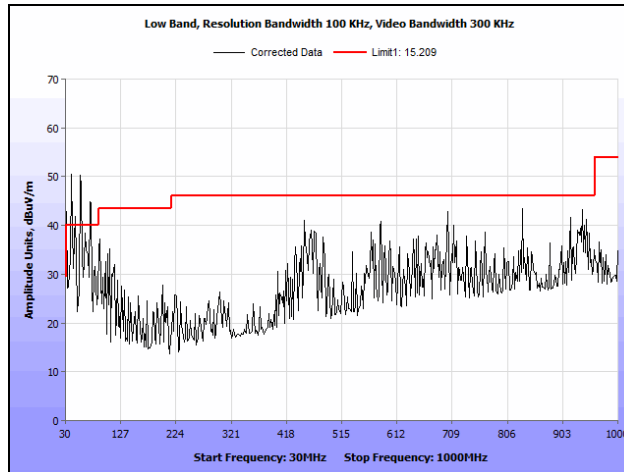
Plot 25. Radiated Spurious Emissions, 490 kHz – 1.705 MHz, Low Channel



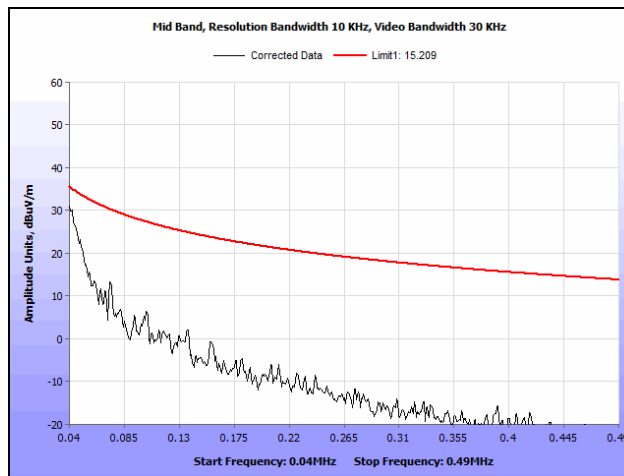
Plot 26. Radiated Spurious Emissions, 1.705 MHz – 7 MHz, Low Channel



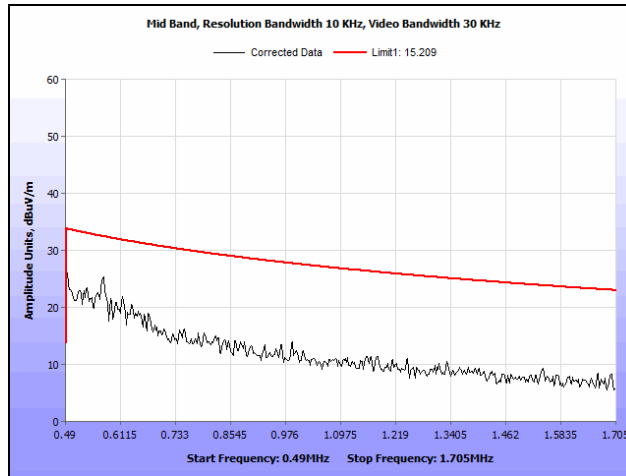
Plot 27. Radiated Spurious Emissions, 10 MHz – 30 MHz, Low Channel



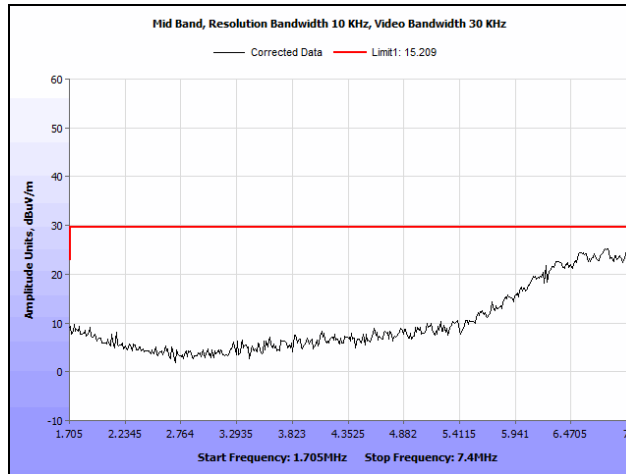
Plot 28. Radiated Spurious Emissions, 30 MHz – 1 GHz, Low Channel



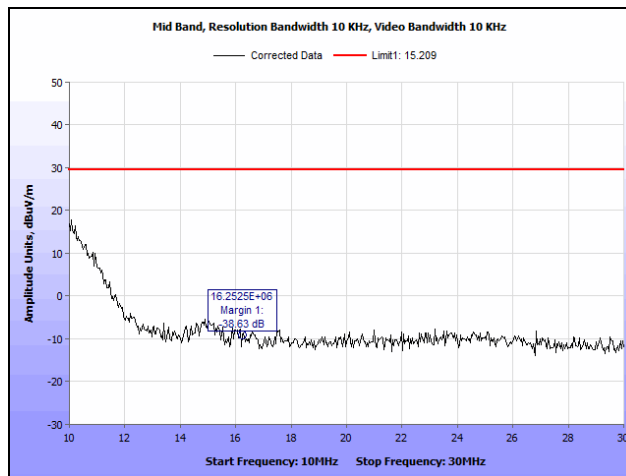
Plot 29. Radiated Spurious Emissions, 40 kHz – 490 kHz, Mid Channel



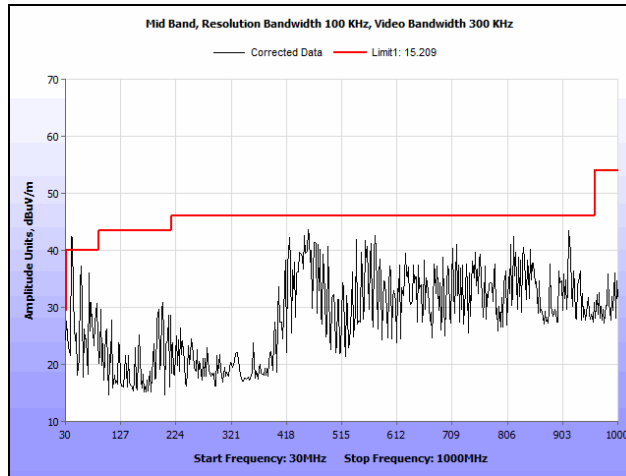
Plot 30. Radiated Spurious Emissions, 490 kHz – 1.705 MHz, Mid Channel



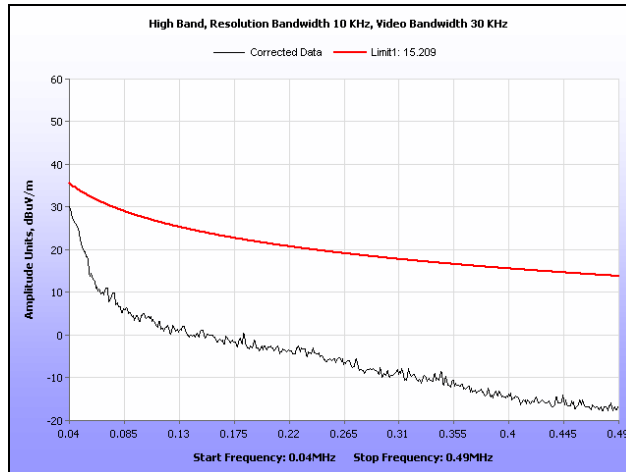
Plot 31. Radiated Spurious Emissions, 1.705 MHz – 7 MHz, Mid Channel



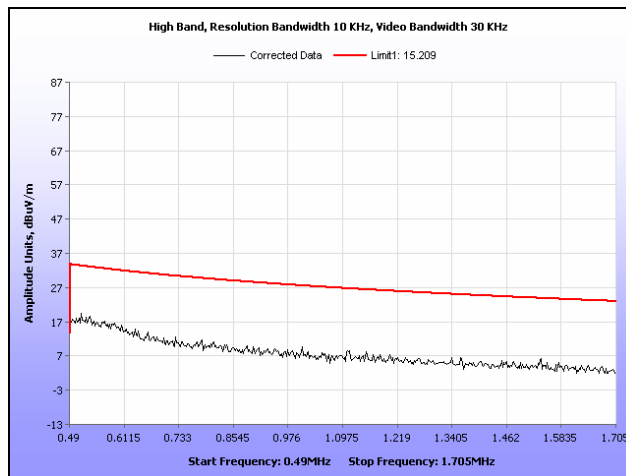
Plot 32. Radiated Spurious Emissions, 10 MHz – 30 MHz, Mid Channel



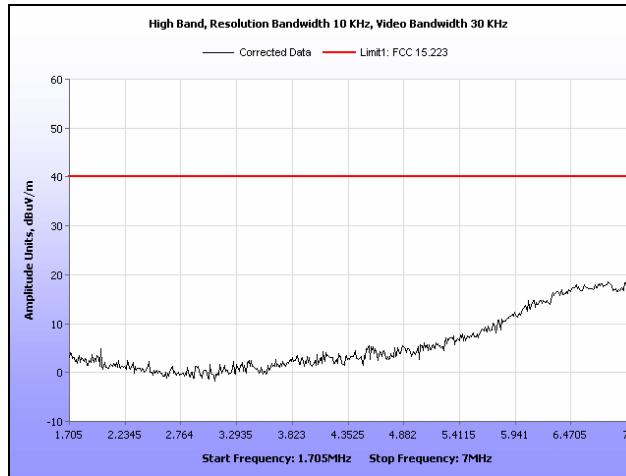
Plot 33. Radiated Spurious Emissions, 30 MHz – 1 GHz, Mid Channel



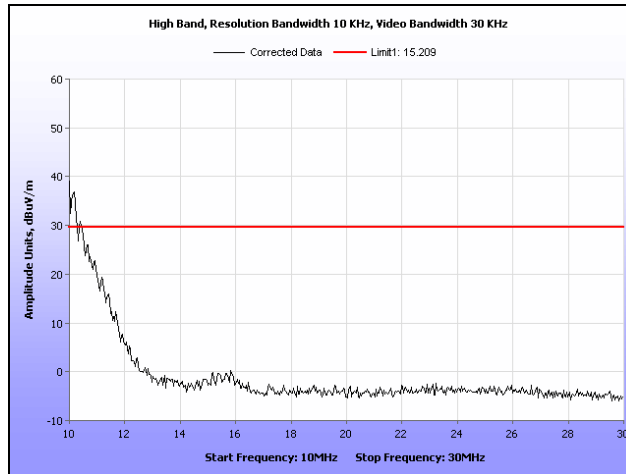
Plot 34. Radiated Spurious Emissions, 40 kHz – 490 kHz, High Channel



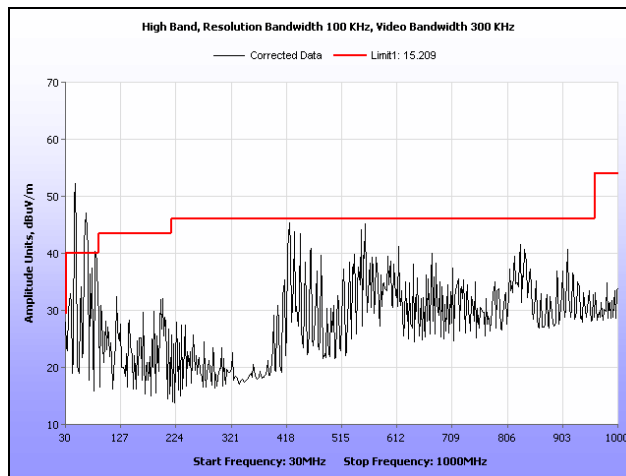
Plot 35. Radiated Spurious Emissions, 490 kHz – 1.705 MHz, High Channel



Plot 36. Radiated Spurious Emissions, 1.705 MHz – 7 MHz, High Channel

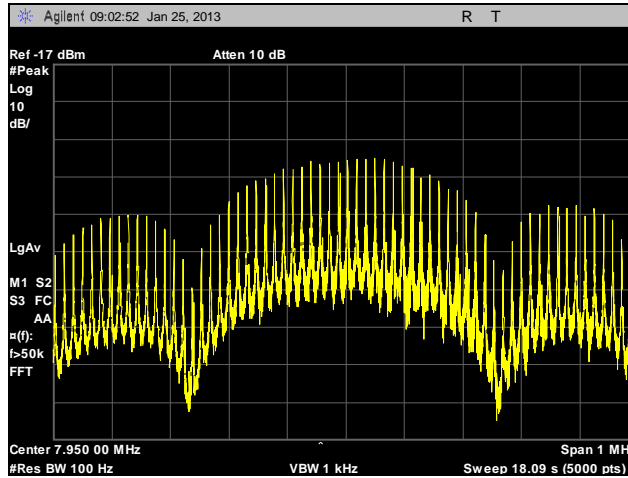


Plot 37. Radiated Spurious Emissions, 10 MHz – 30 MHz, High Channel

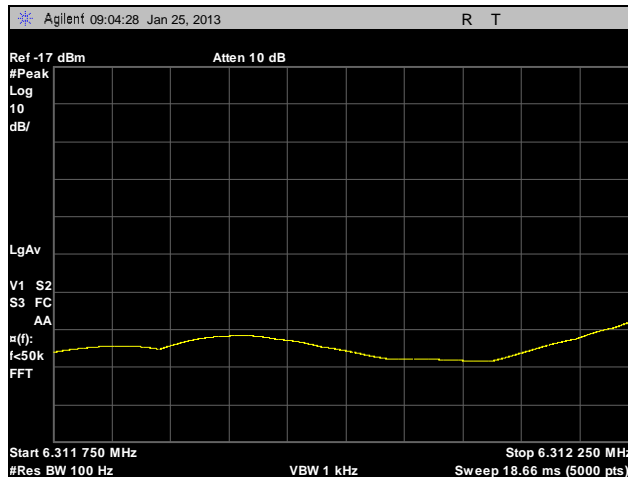


Plot 38. Radiated Spurious Emissions, 30 MHz – 1 GHz, High Channel

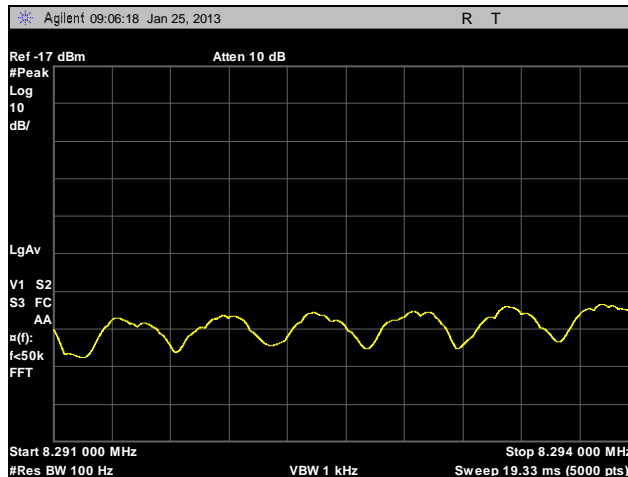
For the standard band, 8.2 MHz, additional measurements were made to show any emissions around the restricted bands. The EUT transmitted at its four different frequencies, 8.45 MHz, 8.325 MHz, 8.075 MHz, and 7.95 MHz.



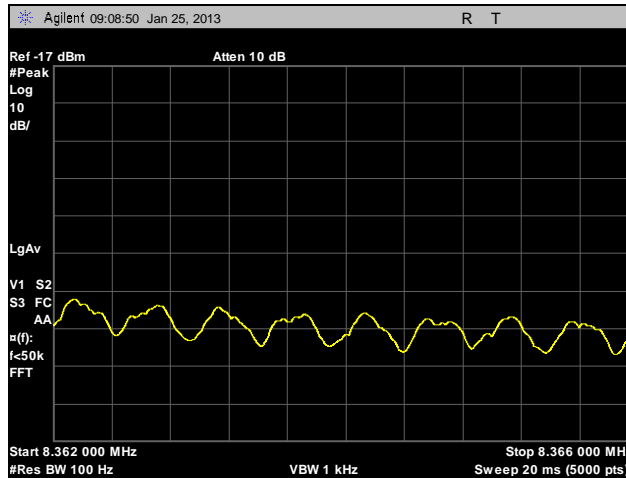
Plot 39. 7.95 MHz Channel



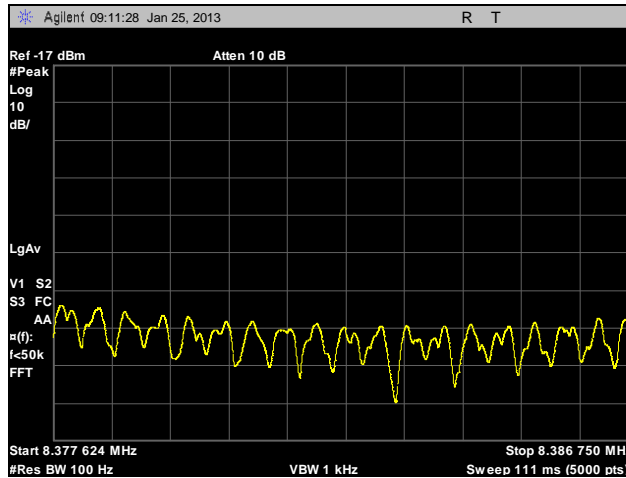
Plot 40. 6.31175 - 6.31225 MHz Restricted Band



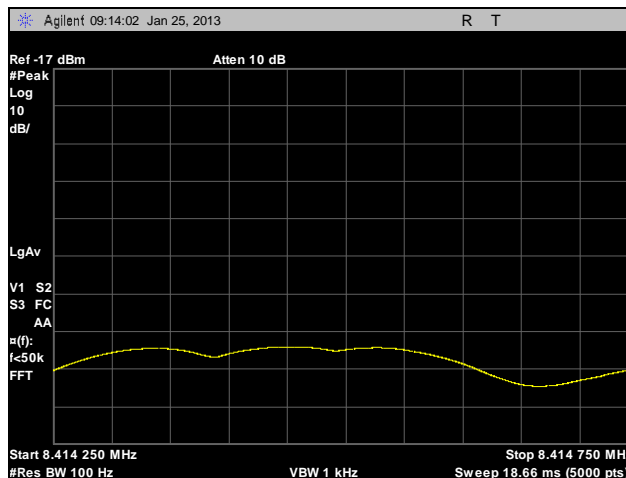
Plot 41. 8.291 - 8.294 MHz Restricted Band



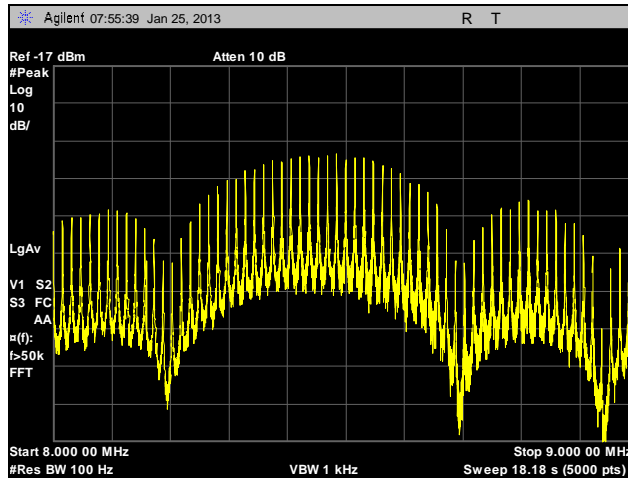
Plot 42. 8.362 - 8.366 MHz Restricted Band



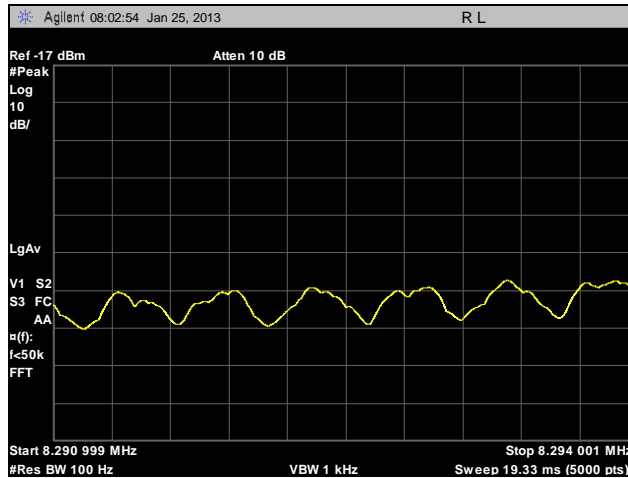
Plot 43. 8.37625 - 8.38675 MHz Restricted Band



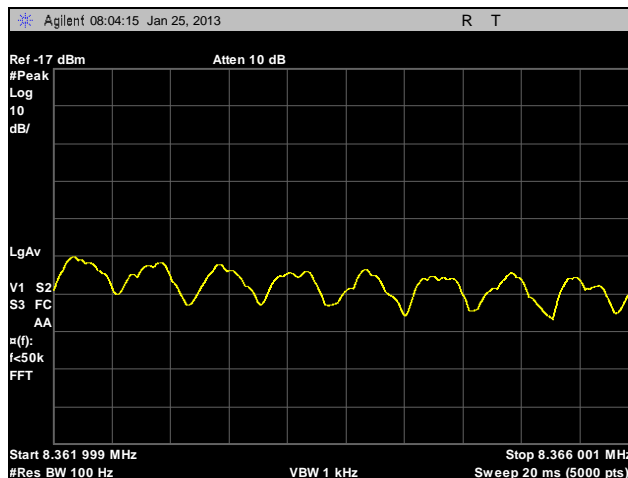
Plot 44. 8.41425 - 8.41475 MHz Restricted Band



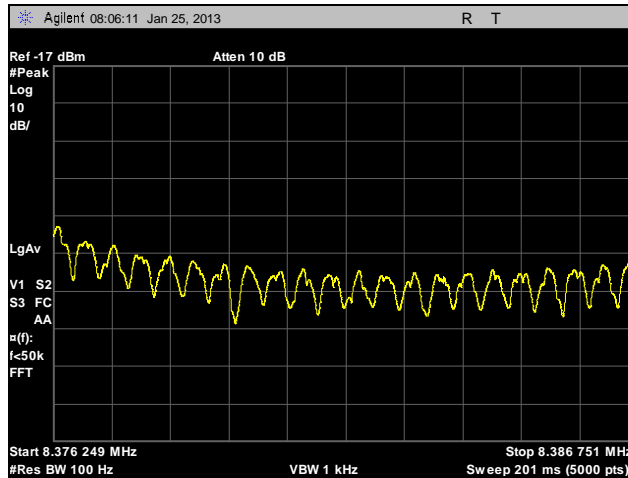
Plot 45. 8.45 MHz Channel



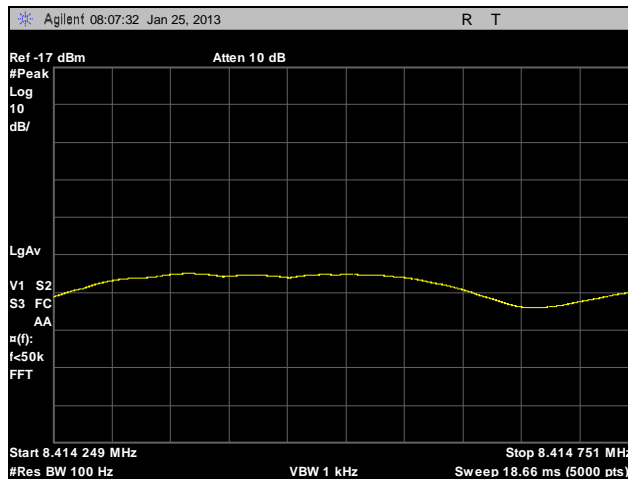
Plot 46. 8.291 - 8.294 MHz Restricted Band



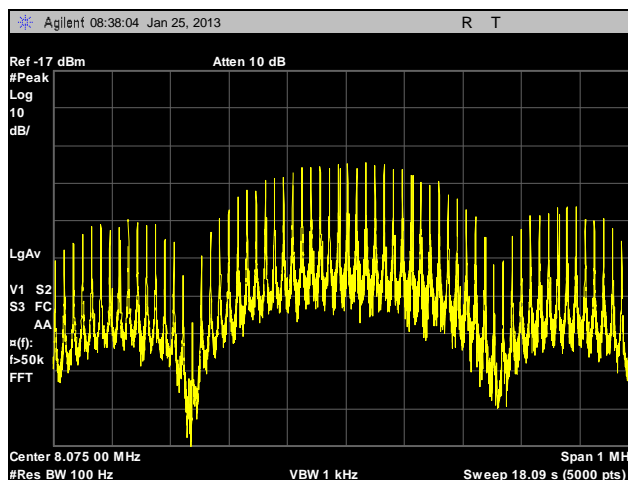
Plot 47. 8.362 - 8.366 MHz Restricted Band



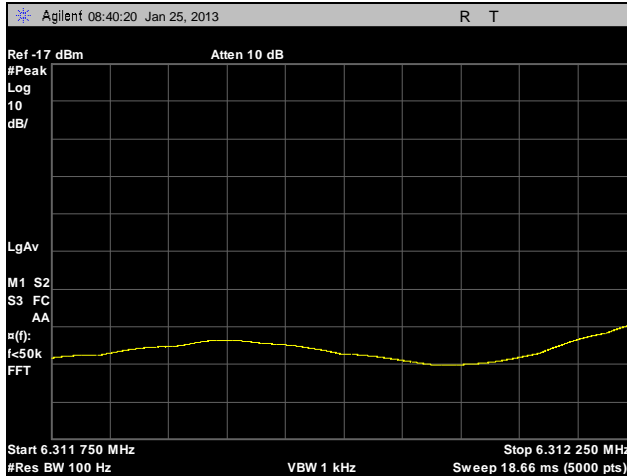
Plot 48. 8.37625 - 8.38675 MHz Restricted Band



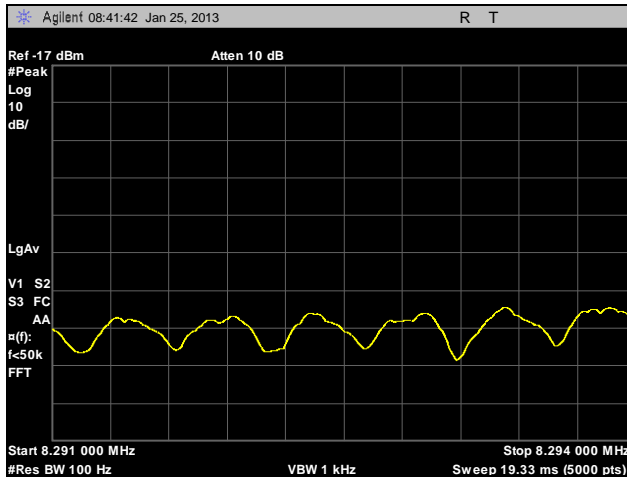
Plot 49. 8.41425 - 8.41475 MHz Restricted Band



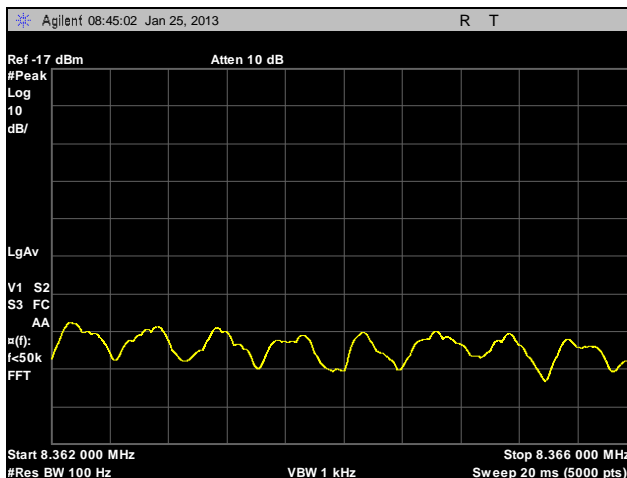
Plot 50. 8.075 MHz Channel



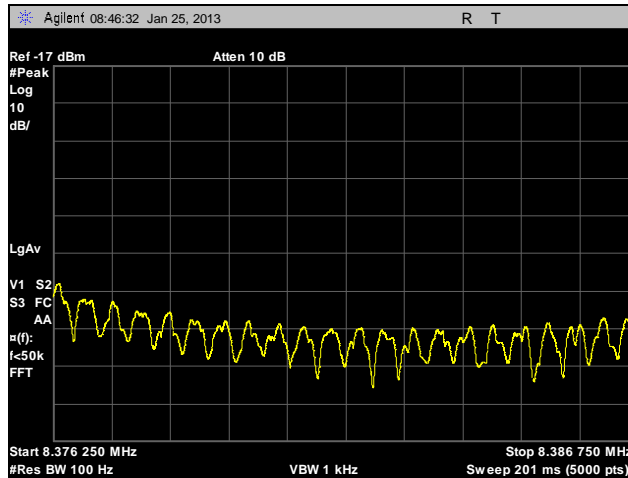
Plot 51. 6.31175 - 6.31225 MHz Restricted Band



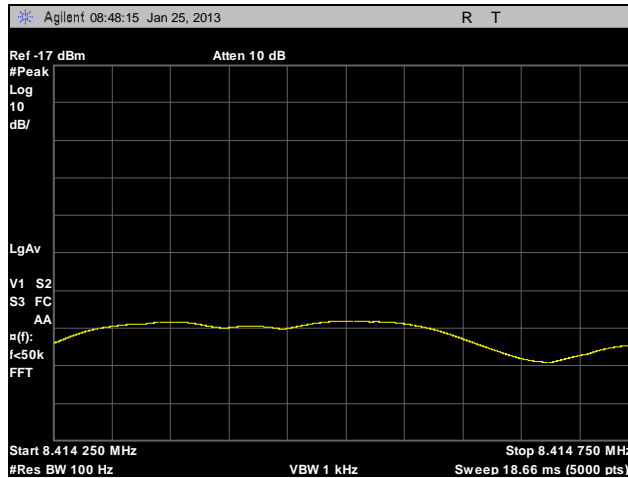
Plot 52. 8.291 - 8.294 MHz Restricted Band



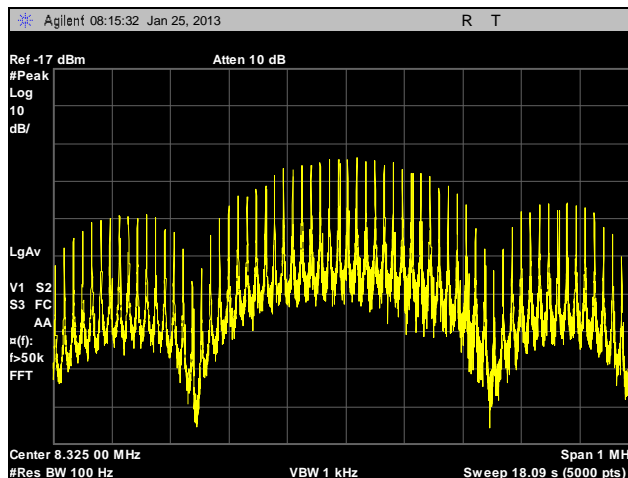
Plot 53. 8.362 - 8.366 MHz Restricted Band



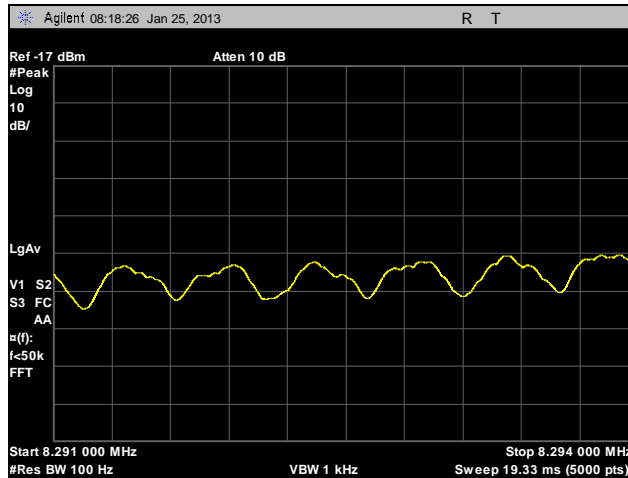
Plot 54. 8.37625 - 8.38675 MHz Restricted Band



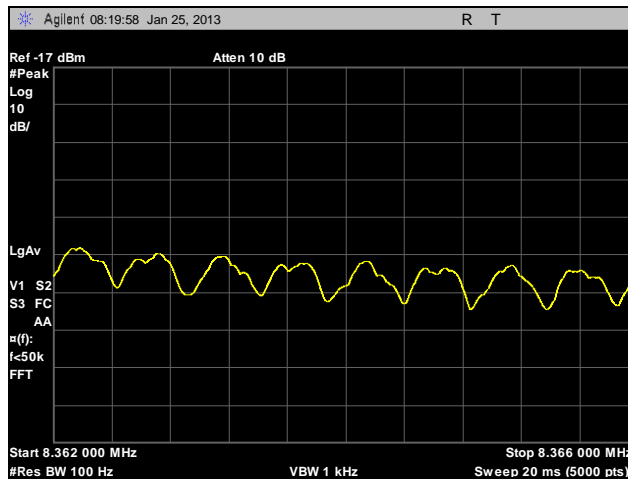
Plot 55. 8.41425 - 8.41475 MHz Restricted Band



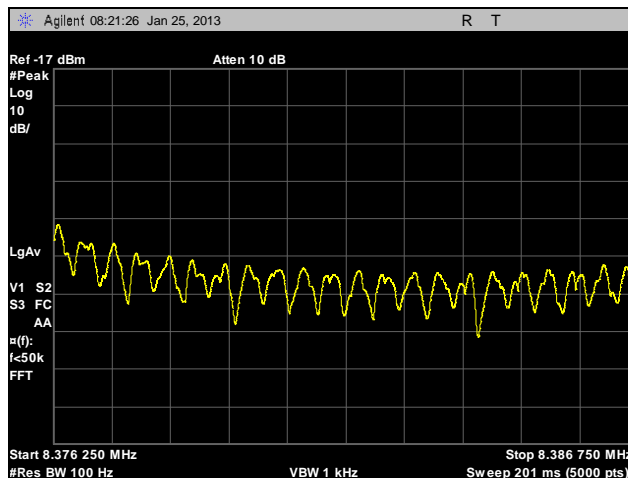
Plot 56. 8.325 MHz Channel



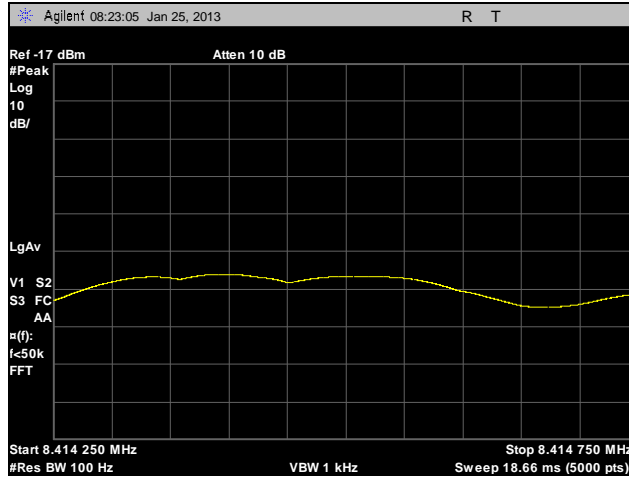
Plot 57. 8.291 - 8.294 MHz Restricted Band



Plot 58. 8.362 - 8.366 MHz Restricted Band



Plot 59. 8.37625 - 8.38675 MHz Restricted Band



Plot 60. 8.41425 - 8.41475 MHz Restricted Band



4.0. Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2005.

MET Asset #	Description	Manufacturer	Model	Last Cal Date	Cal Due Date
1T4771	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4446A	12/12/2011	12/12/2012
1T4563	LISN (10 AMP)	SOLAR ELECTRONICS	9322-50-R-10-BNC	11/30/2011	11/30/2012
1T4787	HYGOMETER / THERMOMETER / BAROMETER / DEW POINT PEN	CONTROL COMPANY	15-078-198, FB70423-245CD	2/15/2012	2/15/2014
1T4503	SHIELDED ROOM	UNIVERSAL SHIELDING CORP	N/A	SEE NOTE	
1T4644	HIGH-POWERED ATTENUATOR	INMET	18N10W-20DB	SEE NOTE	
1T4300	SEMI-ANECHOIC CHAMBER #1	EMC TEST SYSTEMS	NONE	8/23/2010	8/23/2013
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	7/16/2012	7/16/2013
1T4751	ANTENNA – BILOG	SUNOL SCIENCES	JB6	12/7/2011	12/7/2012
1T4800	PASSIVE LOOP ANTENNA	EMCO	6512	08/06/2012	02/06/2014
1T4612	SPECTRUM	AGILENT TECHNOLOGIES	E4407B	05/23/2012	11/23/2013
1T4568	RADIATING NOISE SOURCE	MET LABORATORIES	N/A	SEE NOTE	

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



5.0. Compliance 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 provision that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.



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.

§ 2.948 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.

¹ In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart C (of Part 15), which deals with unintentional radiators.



- (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.

§ 2.955 Retention of records.

- (a) For each equipment subject to verification, the responsible party, as shown in §2.909 shall maintain the records listed as follows:
 - (1) A record of the original design drawings and specifications and all changes that have been made that may affect compliance with the requirements of §2.953.
 - (2) A record of the procedures used for production inspection and testing (if tests were performed) to insure the conformance required by §2.953. (Statistical production line Emission testing is not required.)
- (b) The records listed in paragraph (a) of this section shall be retained for two years after the manufacture of said equipment item has been permanently discontinued, or until the conclusion of an investigation or a proceeding if the manufacturer or importer is officially notified that an investigation or any other administrative proceeding involving his equipment has been instituted.

§ 2.956 FCC inspection and submission of equipment for testing.

- (a) Each responsible party shall upon receipt of reasonable request:
 - (1) Submit to the Commission the records required by §2.955.
 - (2) Submit one or more sample units for measurements at the Commission's Laboratory.
 - (i) Shipping costs to the Commission's Laboratory and return shall be borne by the responsible party.
 - (ii) In the event the responsible party believes that shipment of the sample to the Commission's Laboratory is impractical because of the size or weight of the equipment, or the power requirement or for any other reason, the responsible party may submit a written explanation why such shipment is impractical and should not be required.



6.0. 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.



The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart C — 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 power line and ground at the power terminal. The lower limit applies at the band edges.



End of Report