MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
914 WEST PATAPSCO AVENUE • BALTIMORE, MARYLAND 21230-3432 • PHONE (410) 354-3300 • FAX (410) 354-3313
33439 WESTERN AVENUE • UNION CITY, CALIFORNIA 94587 • PHONE (510) 489-6300 • FAX (510) 489-6372
3162 BELICK STREET • SANTA CLARA, CA 95054 • PHONE (408) 748-3585 • FAX (510) 489-6372
13301 MCCALLEN PASS • AUSTIN, TEXAS 78753 • PHONE (512) 287-2500 • FAX (512) 287-2513

June 16, 2014

Freescale Semiconductor Inc.
3501 Ed Bluestein Blvd.
Austin, TX 78721

Dear Terrance de Silva,

Enclosed is the EMC Wireless test report for compliance testing of the Freescale Semiconductor Inc., KW24D512-USB as 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 Subpart C 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: (\Freescale Semiconductor Inc.\EMCA41798-FCC247)

Electromagnetic Compatibility Criteria
Test Report

for the

Freescale Semiconductor Inc.
KW24D512-USB

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

MET Report: EMCA41798-FCC247

June 16, 2014

Prepared For:

Freescale Semiconductor Inc.
3501 Ed Bluestein Blvd.
Austin, TX 78721

Prepared By:
MET Laboratories, Inc.
914 W. Patapsco Ave.
Baltimore, MD 21234

Electromagnetic Compatibility Criteria
Test Report

for the

Freescale Semiconductor Inc.
KW24D512-USB

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

Andy Shen, 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 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
∅	June 16, 2014	Initial Issue.

Table of Contents

I. Executive Summary 1
A. Purpose of Test 2
B. Executive Summary 2
II. Equipment Configuration 3
A. Overview 4
B. References 5
C. Test Site 5
D. Description of Test Sample 6
E. Equipment Configuration 6
F. Support Equipment 6
G. Mode of Operation 7
H. Method of Monitoring EUT Operation 7
I. Modifications 8
a) Modifications to EUT 8
b) Modifications to Test Standard 8
J. Disposition of EUT 8
III. Electromagnetic Compatibility Criteria for Unintentional Radiators 9
§ 15.107(a) Conducted Emissions Limits 10
§ 15.109(a) Radiated Emissions Limits 13
IV. Electromagnetic Compatibility Criteria for Intentional Radiators 16
§ 15.203 Antenna Requirement 17
§ 15.207(a) Conducted Emissions Limits 18
§ 15.247(a)(a) 6 dB and 99% Bandwidth 21
§ 15.247(b) Peak Power Output 25
§ 15.247(d) Radiated Spurious Emissions Requirements and Band Edge 27
§ 15.247(e) Peak Power Spectral Density 40
§ 15.247(i) Maximum Permissible Exposure 42
V. Test Equipment 43
VI. Certification & User's Manual Information 45
A. Certification Information 46
B. Label and User's Manual Information 50
VII. ICES-003 Procedural & Labeling Requirements 52

List of Tables

Table 1. Executive Summary of EMC Part 15.247 ComplianceTesting 2
Table 2. EUT Summary Table 4
Table 3. References 5
Table 4. Equipment Configuration 6
Table 5. Support Equipment 6
Table 6. Conducted Limits for Radio Frequency Devices calculated from FCC Part 15 Subsections 15.107(a) (b) 10
Table 7. Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz) 11
Table 8. Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz) 12
Table 9. Radiated Emissions Limits calculated from FCC Part 15, §15.109 (a) (b) 13
Table 10. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz 14
Table 11. Radiated Emissions Limits, Test Results, 1 GHz – 18 GHz 15
Table 12. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a) 18
Table 13. Conducted Emissions, 15.207(a), Phase Line, Test Results 19
Table 14. Conducted Emissions, 15.207(a), Neutral Line, Test Results 20
Table 15. 6 dB Occupied Bandwidth, Test Results 22
Table 16. 99% Occupied Bandwidth, Test Results 22
Table 17. Output Power Requirements from §15.247(b) 25
Table 18. Peak Power Output, Test Results 25
Table 19. Restricted Bands of Operation 27
Table 20. Radiated Emissions Limits Calculated from FCC Part 15, § 15.209 (a) 28
Table 21. Peak Power Spectral Density, Test Results 40
Table 22. Test Equipment List 44

List of Plots

Plot 1. Conducted Emissions, Phase Line Plot 11
Plot 2. Conducted Emissions, Neutral Line Plot 12
Plot 3. Radiated Emissions, 30 MHz - 1 GHz 14
Plot 4. Radiated Emissions, Above 1 GHz 15
Plot 5. Conducted Emissions, 15.207(a), Phase Line 19
Plot 6. Conducted Emissions, 15.207(a), Neutral Line 20
Plot 7. 6 dB Occupied Bandwidth, Low Channel 23
Plot 8. 6 dB Occupied Bandwidth, Mid Channel 23
Plot 9. 6 dB Occupied Bandwidth, High Channel 23
Plot 10. 99% Occupied Bandwidth, Low Channel 24
Plot 11. 99% Occupied Bandwidth, Mid Channel 24
Plot 12. 99% Occupied Bandwidth, High Channel 24
Plot 13. Peak Power Output, Low Channel 26
Plot 14. Peak Power Output, Mid Channel 26
Plot 15. Peak Power Output, High Channel 26
Plot 16. §15.209 Radiated Spurious Emissions, Low Channel, 30 MHz – 1 GHz 29
Plot 17. §15.209 Radiated Spurious Emissions, Low Channel, 1 GHz – 18 GHz, Average 29
Plot 18. §15.209 Radiated Spurious Emissions, Low Channel, 1 GHz – 18 GHz, Peak 30
Plot 19. §15.209 Radiated Spurious Emissions, Mid Channel, 30 MHz – 1 GHz 30
Plot 20. §15.209 Radiated Spurious Emissions, Mid Channel, 1 GHz – 18 GHz, Average 31
Plot 21. §15.209 Radiated Spurious Emissions, Mid Channel, 1 GHz – 18 GHz, Peak 31
Plot 22. §15.209 Radiated Spurious Emissions, High Channel, 30 MHz – 1 GHz 32
Plot 23. §15.209 Radiated Spurious Emissions, High Channel, 1 GHz – 18 GHz, Average 32
Plot 24. §15.209 Radiated Spurious Emissions, High Channel, 1 GHz – 18 GHz, Peak 33
Plot 25. §15.247(d) Radiated Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 20 dBc 34

Plot 26. §15.247(d) Radiated Spurious Emissions, Low Channel, 1 GHz – 18 GHz, 20 dBc....34
Plot 27. §15.247(d) Radiated Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 20 dBc....35
Plot 28. §15.247(d) Radiated Spurious Emissions, Mid Channel, 1 GHz – 18 GHz, 20 dBc....35
Plot 29. §15.247(d) Radiated Spurious Emissions, High Channel, 30 MHz – 1 GHz, 20 dBc....36
Plot 30. §15.247(d) Radiated Spurious Emissions, High Channel, 1 GHz – 18 GHz, 20 dBc....36
Plot 31. §15.209 Radiated Restricted Band Edge, Low Channel, Average Limit....37
Plot 32. §15.209 Radiated Restricted Band Edge, Low Channel, Peak Limit....37
Plot 33. §15.209 Radiated Restricted Band Edge, High Channel, Average Limit....38
Plot 34. §15.209 Radiated Restricted Band Edge, High Channel, Peak Limit....38
Plot 35. §15.247(d) Radiated Restricted Band Edge, Low Channel, Average Limit....39
Plot 36. §15.247(d) Radiated Restricted Band Edge, High Channel....39
Plot 37. Peak Power Spectral Density, Low Channel....41
Plot 38. Peak Power Spectral Density, Mid Channel....41
Plot 39. Peak Power Spectral Density, High Channel....41

List of Figures

Figure 1. Block Diagram of Test Configuration....6

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

IV. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Freescale Semiconductor Inc. KW24D512-USB, 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 KW24D512-USB. Freescale Semiconductor Inc. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the KW24D512-USB, 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 Freescale Semiconductor Inc., purchase order number 8300133616. 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 5 August 2012	Conducted Emission Limits for a Class B Digital Device	Compliant
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
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(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

Table 1. Executive Summary of EMC Part 15.247 ComplianceTesting

V. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Freescale Semiconductor Inc. to perform testing on the KW24D512-USB, under Freescale Semiconductor Inc.'s purchase order number 8300133616.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Freescale Semiconductor Inc., KW24D512-USB.

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

Model(s) Tested:	KW24D512-USB	
Model(s) Covered:	KW24D512-USB	
EUT Specifications:	Primary Power: 120 VAC, 60 Hz	
	FCC ID: RUN-USBKW24D IC: 6744A-USBKW24D	
	Type of Modulations:	O-QPSK
	Equipment Code:	DTS
	Peak RF Output Power:	-6.03 dBm
	EUT Frequency Ranges:	2405-2480 MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35º C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Andy Shen	
Report Date(s):	June 16, 2014	

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 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

Table 3. References

C. Test Site

All testing was performed at MET Laboratories, Inc., 13301 McCallen Pass, Austin, TX 78753. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 5 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

D. Description of Test Sample

The Freescale Semiconductor Inc. KW24D512-USB, Equipment Under Test (EUT), is a reference design for the Freescale ZigBee and RF4CE MCU platforms. The board is intended to be used as a ZigBee sniffer but also has the capability to transmit ZigBee at 2.4GHz band.

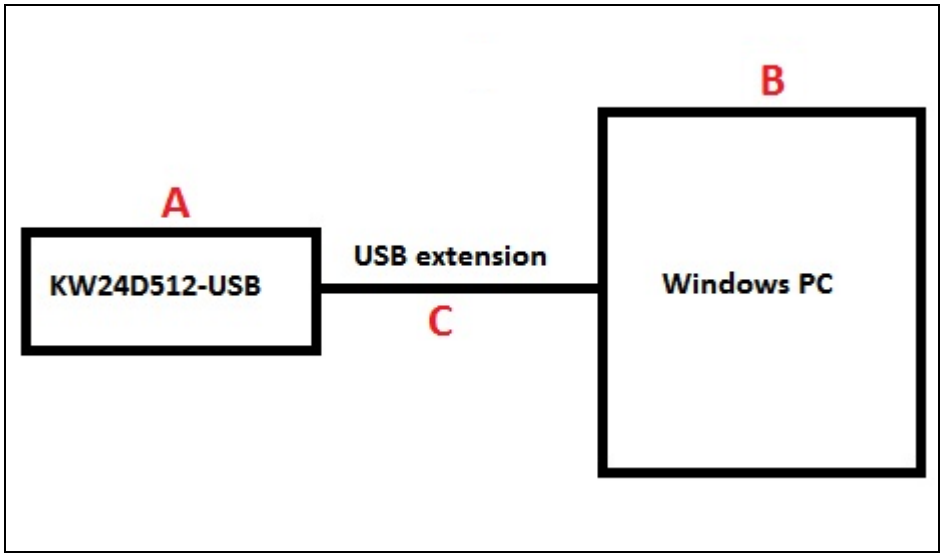


Figure 1. Block Diagram of Test Configuration

E. Equipment Configuration

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

Ref. ID	Name / Description	Model Number	Part Number	Serial Number	Revision
A	KW24D512-USB	N/A	KW24D512-USB	N/A	N/A

Table 4. Equipment Configuration

F. Support Equipment

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

Ref. ID	Name / Description	Manufacturer	Model Number
B	PC running Windows XP Professional or Windows 7	N/A	N/A
C	USB A male to USB A female (USB extension)	N/A	N/A

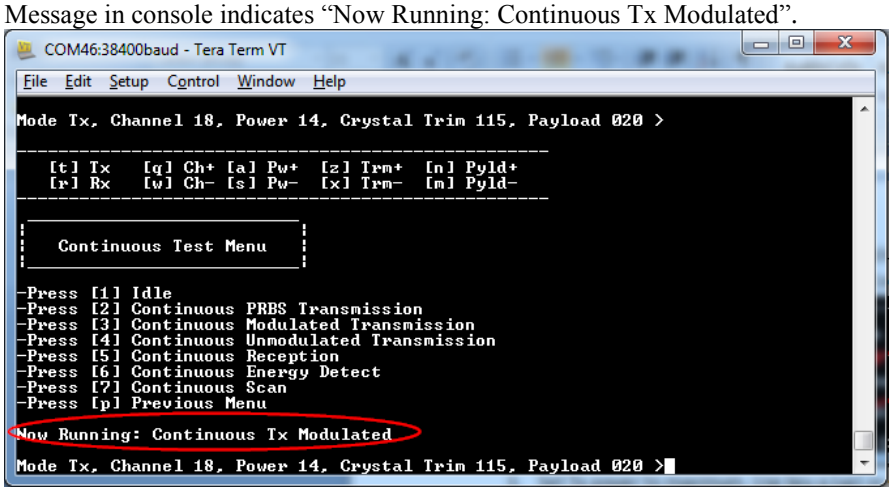
Table 5. Support Equipment

G. Mode of Operation

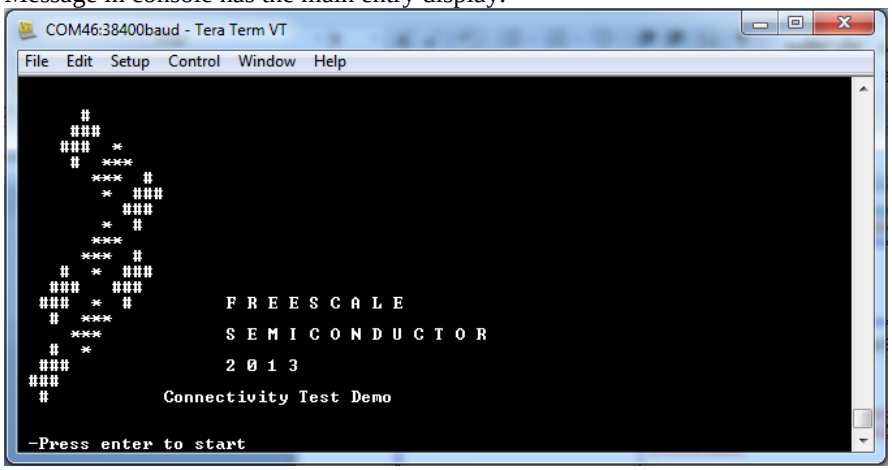
Normal transmitting mode (#1)
D1 LED green ON and D2, D3 OFF.
The EUT is transmitting a continuous modulated signal at channel 18 (2.440 GHz O-QPSK modulation) with maximum power.
Non transmitting mode (#2)
D1 LED green ON and D2, D3 BLINKING.
The EUT is and idle state not transmitting anything.

H. Method of Monitoring EUT Operation

Normal transmitting mode (#1)
D1 LED green ON and D2, D3 OFF.
Message in console indicates "Now Running: Continuous Tx Modulated".



Non transmitting mode (#2)
D1 LED green ON and D2, D3 BLINKING.
Message in console has the main entry display.



I. Modifications

a) Modifications to EUT

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the test standard.

J. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Freescale Semiconductor Inc. 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.

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 6. 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):

Kamel Atia

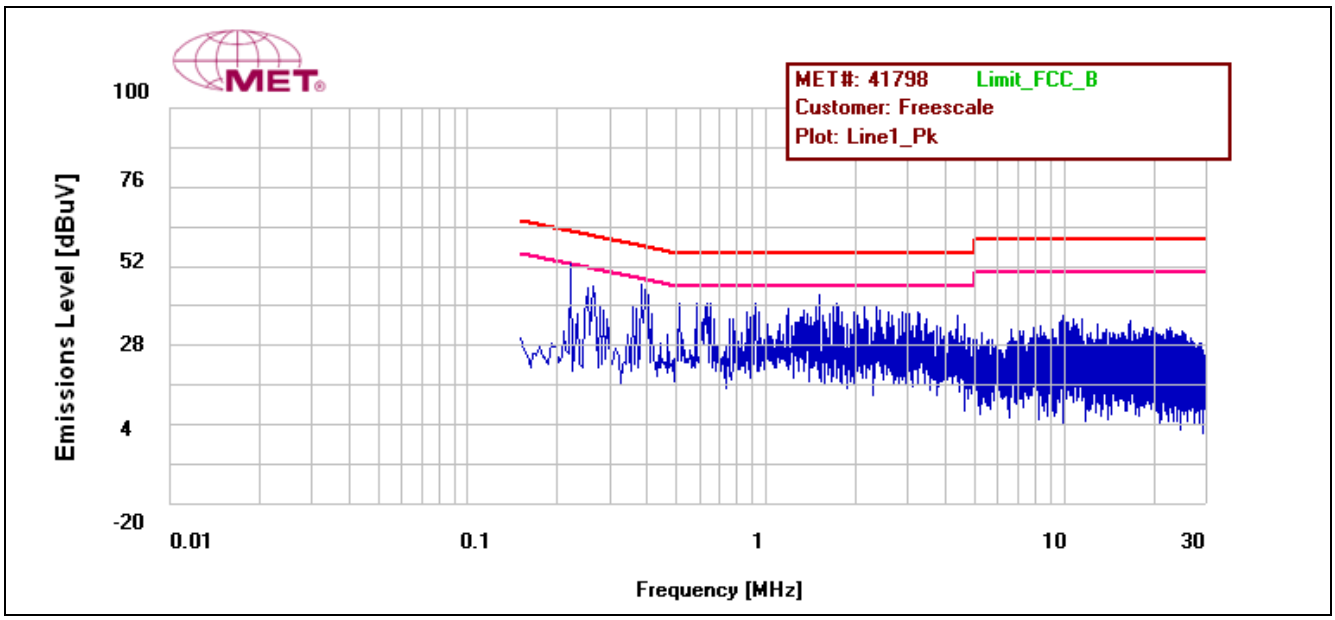
Test Date(s):

06/04/14

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

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta
Line1	0.222	52.63	62.753	-10.123	Pass	28.78	52.753	-23.973
Line1	0.398	45.73	57.917	-12.187	Pass	38.2	47.917	-9.717
Line1	0.382	42.81	58.257	-15.447	Pass	36.17	48.257	-12.087
Line1	0.262	49.5	61.38	-11.88	Pass	44.13	51.38	-7.25
Line1	0.254	49.68	61.637	-11.957	Pass	30.02	51.637	-21.617
Line1	1.51	38.46	56	-17.54	Pass	28.96	46	-17.04
Line1	0.170	47.76	64.963	-17.203	Pass	26.23	54.963	-28.733
Line1	0.298	42.03	60.314	-18.284	Pass	20	50.314	-30.314

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

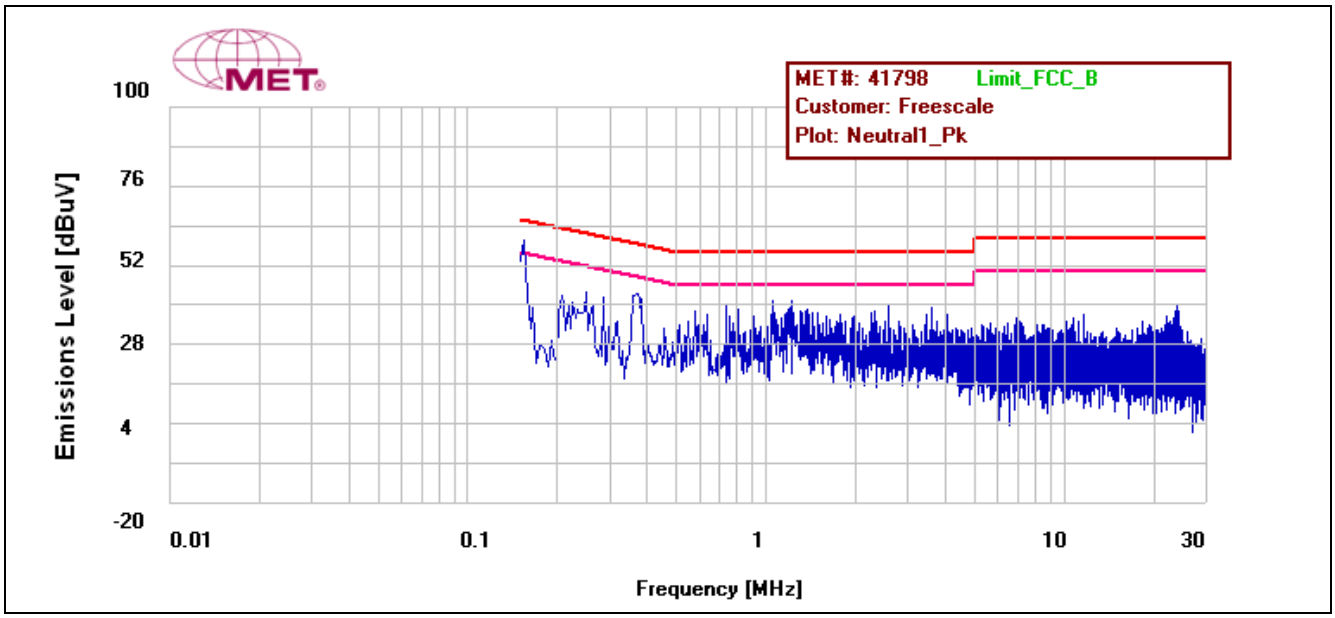


Plot 1. Conducted Emissions, Phase Line Plot

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

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta
Neutral1	0.154	55.08	65.782	-10.702	Pass	46.3	55.782	-9.482
Neutral1	0.250	44.83	61.769	-16.939	Pass	42.09	51.769	-9.679
Neutral1	0.375	34.53	58.41	-23.88	Pass	31.36	48.41	-17.05
Neutral1	0.206	33.26	63.372	-30.112	Pass	31.02	53.372	-22.352
Neutral1	0.286	39.62	60.654	-21.034	Pass	26.51	50.654	-24.144
Neutral1	1.21	33.62	56	-22.38	Pass	24.51	46	-21.49

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



Plot 2. Conducted Emissions, Neutral Line Plot

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 9.

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 9.

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 9. 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 5m 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 B requirement(s) of this section. Measured emissions were below applicable limits.

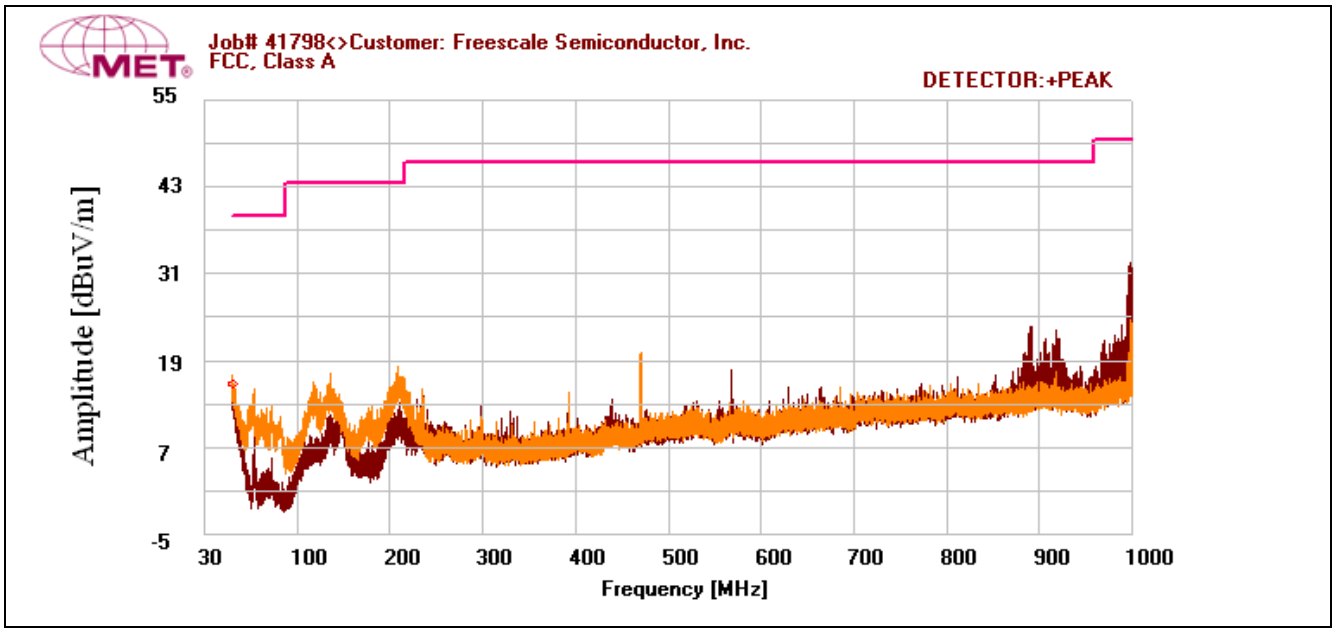
Test Engineer(s): Kamel Atia and Kristine Cabrera

Test Date(s): 06/03/14

Radiated Emissions Limits Test Results, Class B

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)
208.27	V	0	100	27.45	10.611	25.713	0	0	12.348	43.5	-31.152
392.58	V	22	400	22.4	15.203	26.021	0	0	11.582	46.4	-34.818
470	V	45.2	331	23.3	17	26.266	0	0	14.034	46.4	-32.366
568.58	H	0	327	25.7	18.486	26.128	0	0	18.058	46.4	-28.342
893.437	H	0	362.6	18.32	22.137	26.056	0	0	14.401	46.4	-31.999
918.1	H	0	15.23	18.32	22.238	25.95	0	0	14.608	46.4	-31.792

Table 10. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz

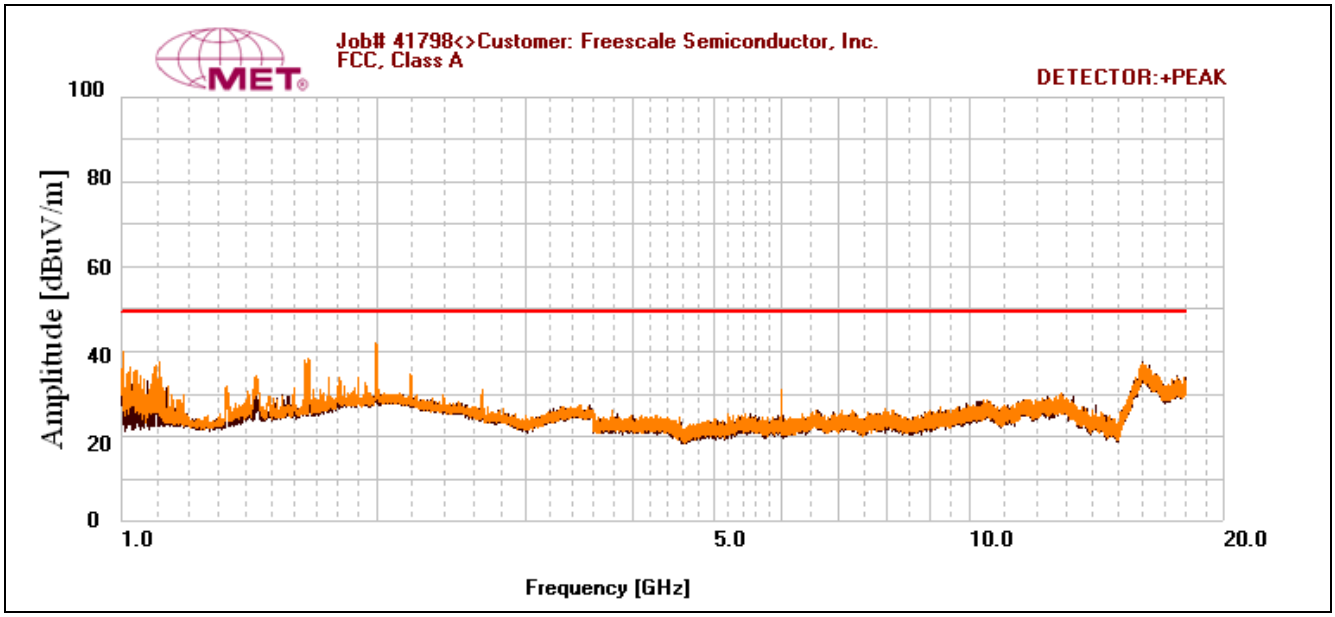


Plot 3. Radiated Emissions, 30 MHz - 1 GHz

Radiated Emissions Limits Test Results, Class B

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)
1098	V	267.1	200.0	23.05	27.718	35.968	0	-10.46	4.34	49.5	-45.16
1413	V	309.0	200.0	23.1	27.821	34.418	0	-10.46	6.043	49.5	-43.457
1649	V	351.8	200.0	27.1	28.767	33.257	0	-10.46	12.15	49.5	-37.35
1996	V	178.3	100	21.1	30.901	31.55	0	-10.46	9.991	49.5	-39.509
2198	V	180.1	147.8	21.6	31.424	33.025	0	-10.46	9.539	49.5	-39.961
6000	V	180.1	200	38.23	35.102	37.55	0	-10.46	25.322	49.5	-24.178

Table 11. Radiated Emissions Limits, Test Results, 1 GHz – 18 GHz



Plot 4. Radiated Emissions, 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 by having an integrated antenna.

Test Engineer(s): Andy Shen

Test Date(s): 04/18/14

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 Σ line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency range (MHz)	§ 15.207(a), Conducted Limit (dBμV)	
	Quasi-Peak	Average
* 0.15- 0.45	66 - 56	56 - 46
0.45 - 0.5	56	46
0.5 - 30	60	50

Table 12. 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.

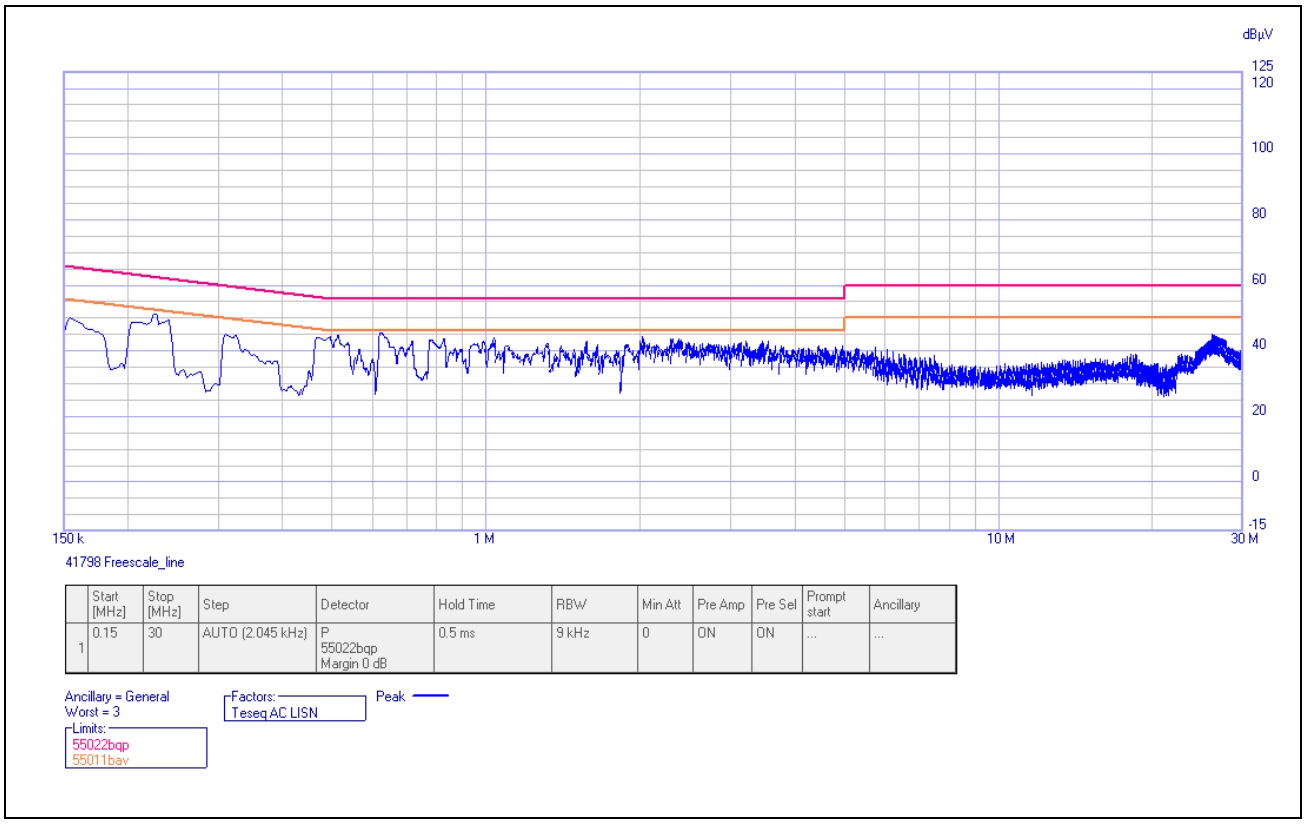
Test Engineer(s): Andy Shen

Test Date(s): 05/14/14

15.207(a) Conducted Emissions Test Results

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Line	0.160255	48.67	65.452	-16.782	Pass	33.86	55.452	-21.592	Pass
Line	0.217485	45.86	62.923	-17.063	Pass	40.31	52.923	-12.613	Pass
Line	0.34632	43.48	59.069	-15.589	Pass	34.17	49.069	-14.899	Pass
Line	0.54613	39.85	56	-16.15	Pass	23.72	46	-22.28	Pass
Line	1.21749	36.68	56	-19.32	Pass	29.51	46	-16.49	Pass
Line	2.303	32.55	56	-23.45	Pass	22.59	46	-23.41	Pass

Table 13. Conducted Emissions, 15.207(a), Phase Line, Test Results

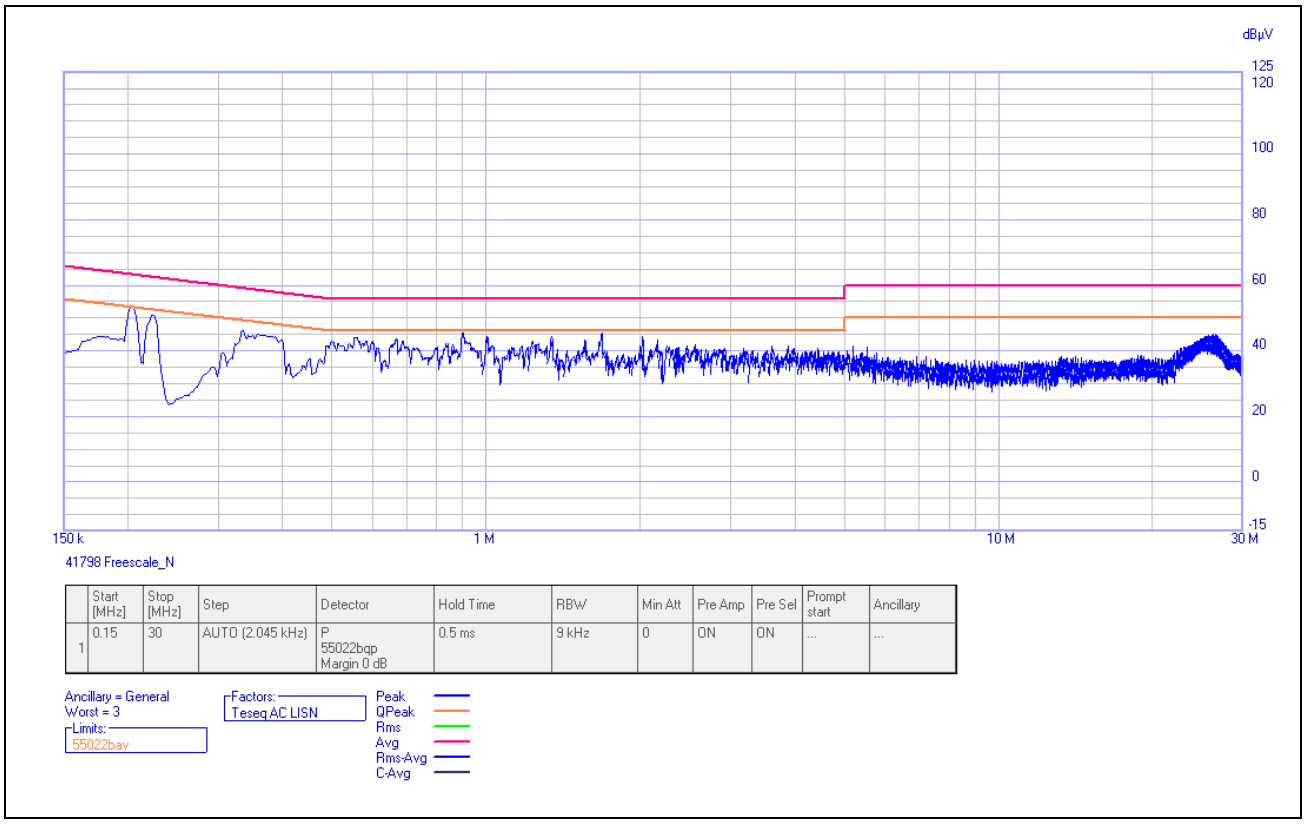


Plot 5. Conducted Emissions, 15.207(a), Phase Line

15.207(a) Conducted Emissions Test Results

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
N	0.22566	46.06	62.617	-16.557	Pass	39.36	52.617	-13.257	Pass
N	0.30951	42.66	60	-17.34	Pass	32.08	50	-17.92	Pass
N	0.6223	40.22	56	-15.78	Pass	25.55	46	-20.45	Pass
N	0.15409	52.2	65.777	-13.577	Pass	37.95	55.777	-17.827	Pass
N	26.13581	37.92	60	-22.08	Pass	29.02	50	-20.98	Pass
N	2.01913	36.75	56	-19.25	Pass	25.77	46	-20.23	Pass

Table 14. Conducted Emissions, 15.207(a), Neutral Line, Test Results



Plot 6. Conducted Emissions, 15.207(a), Neutral Line

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): Andy Shen

Test Date(s): 04/18/14

Occupied Bandwidth Test Results

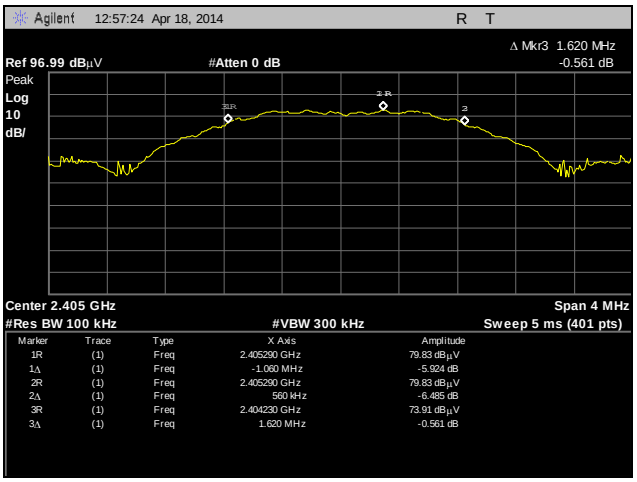
Occupied Bandwidth		
Carrier Channel	**Frequency (MHz)**	**Measured 6 dB Bandwidth (MHz)**
Low	2405	1.620
Mid	2440	1.610
High	2480	1.630

Table 15. 6 dB Occupied Bandwidth, Test Results

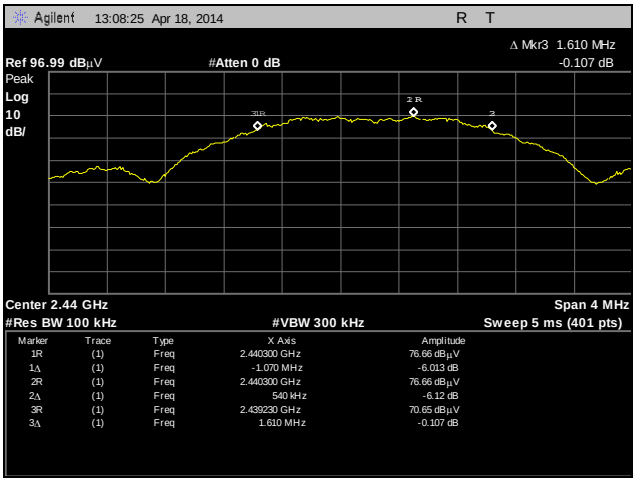
Occupied Bandwidth		
Carrier Channel	**Frequency (MHz)**	**Measured 99% Bandwidth (MHz)**
Low	2405	2.227
Mid	2440	2.197
High	2480	2.248

Table 16. 99% Occupied Bandwidth, Test Results

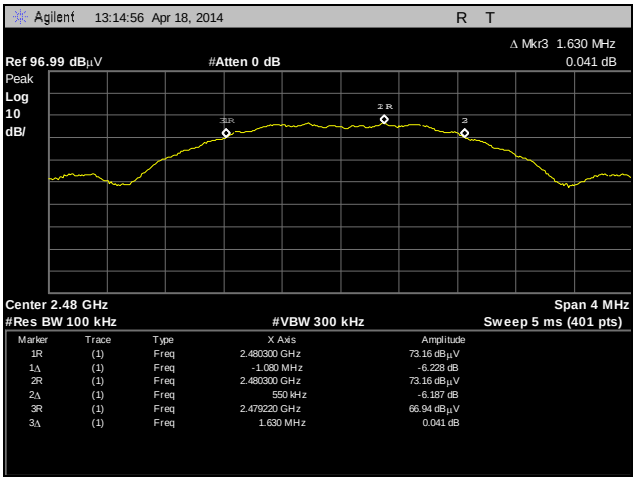
6 dB Occupied Bandwidth Test Results



Plot 7. 6 dB Occupied Bandwidth, Low Channel

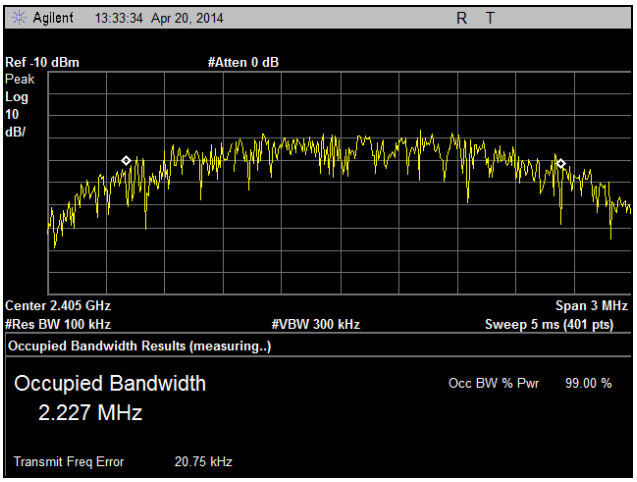


Plot 8. 6 dB Occupied Bandwidth, Mid Channel

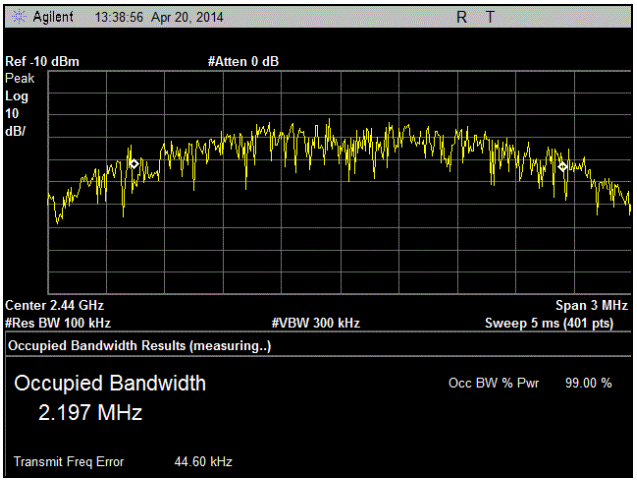


Plot 9. 6 dB Occupied Bandwidth, High Channel

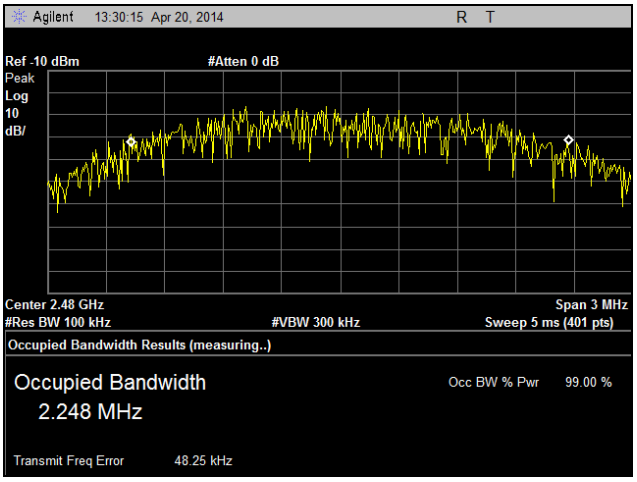
99% Occupied Bandwidth Test Results



Plot 10. 99% Occupied Bandwidth, Low Channel



Plot 11. 99% Occupied Bandwidth, Mid Channel



Plot 12. 99% Occupied Bandwidth, High Channel

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 17. Output Power Requirements from §15.247(b)

§15.247(b)(4): The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Procedure: The EUT was measured at the low, mid and high channels of each band at the maximum power level. The measurement distance was 1m. The measured field strength was first converted to an EIRP value by using the following equation:
EIRP (dBm) = E_0(dBuV/m) + 20log(d) – 104.8
Then the antenna gain was subtracted from this value to yield conducted power (antenna gain = 2 dBi).

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

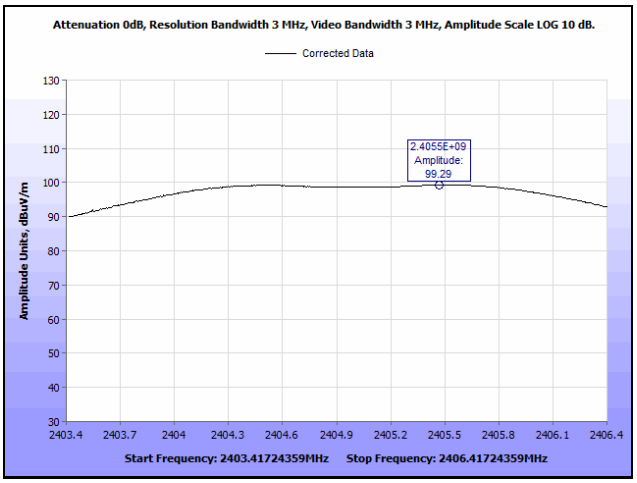
Test Engineer(s): Andy Shen

Test Date(s): 05/05/14

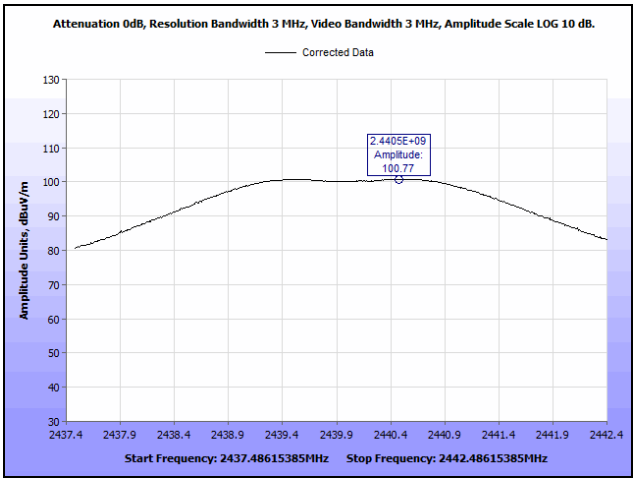
Peak Conducted Output Power				
Carrier Channel	**Frequency (MHz)**	**Measured Peak Field Strength (dBµV/m)**	**Measured Conducted Peak Output Power (dBm)**	**Margin (dB)**
Low	2405	99.29	-7.51	-37.51
Mid	2439	100.77	-6.03	-36.03
High	2480	91.5	-15.3	-45.3

Table 18. Peak Power Output, Test Results

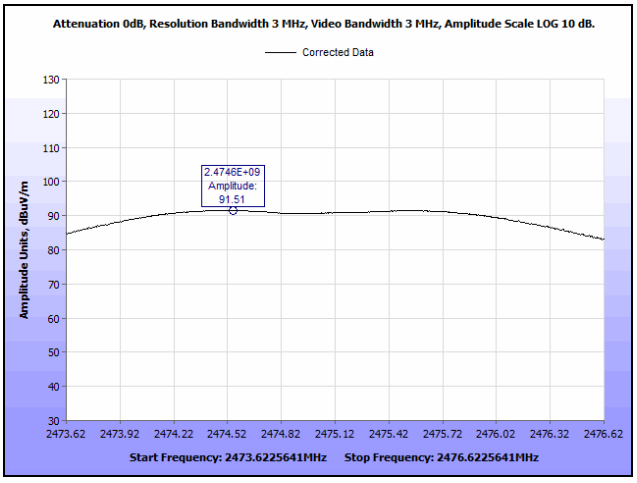
Peak Power Output Test Results



Plot 13. Peak Power Output, Low Channel



Plot 14. Peak Power Output, Mid Channel



Plot 15. Peak Power Output, High Channel

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 19. 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 20.

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

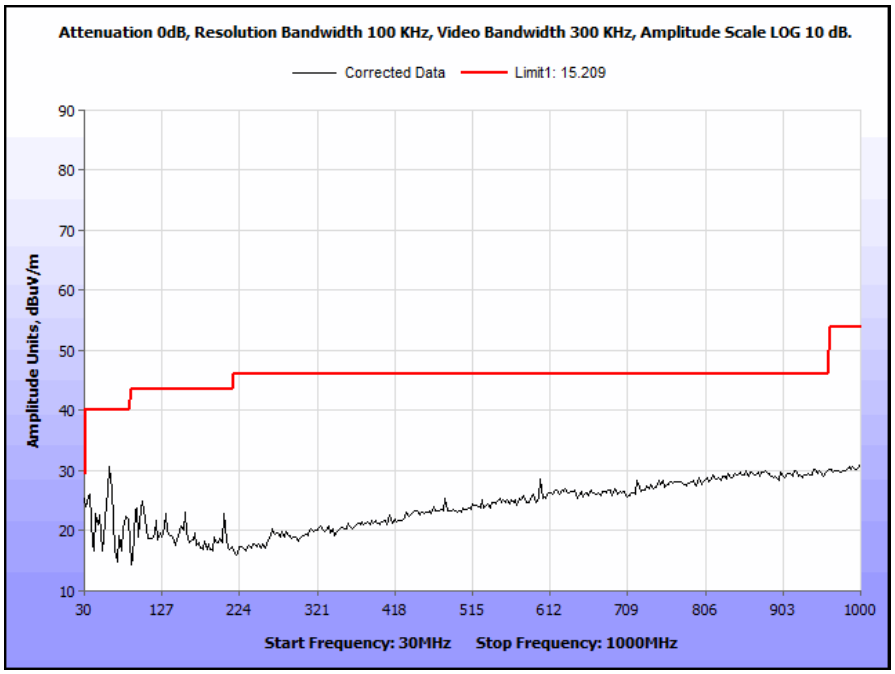
Test Procedures: The transmitter was turned on. Measurements were performed of the low, mid and high Channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line. Only noise floor was measured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

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

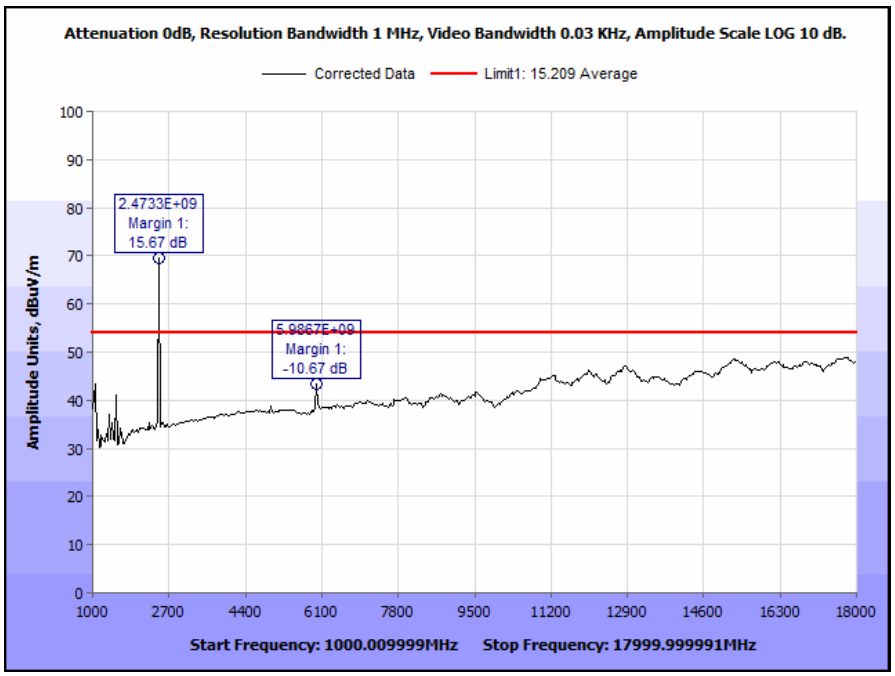
Test Engineer(s): Andy Shen

Test Date(s): 05/14/14

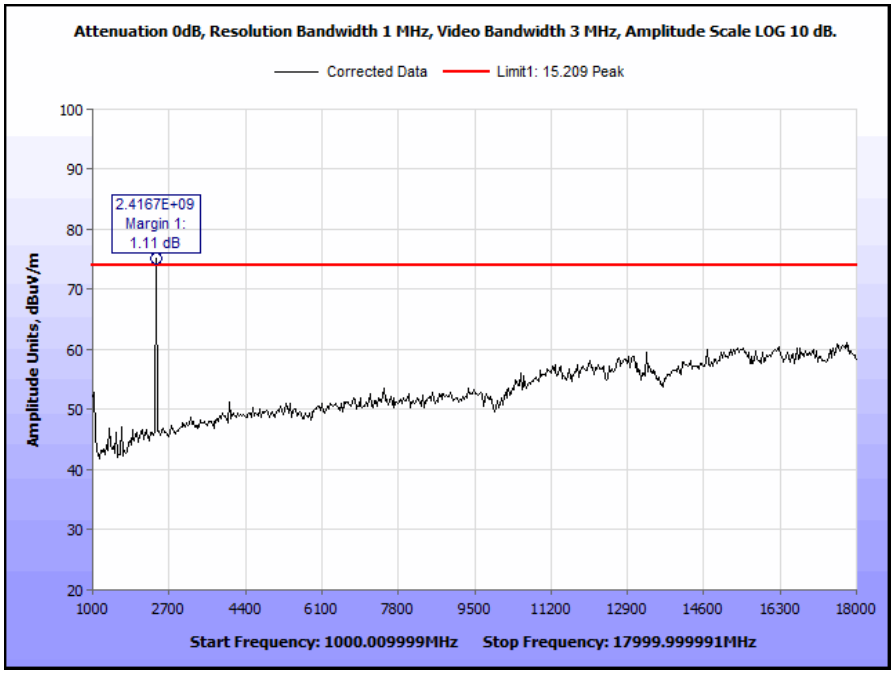
§15.209 Radiated Spurious Emissions Test Results



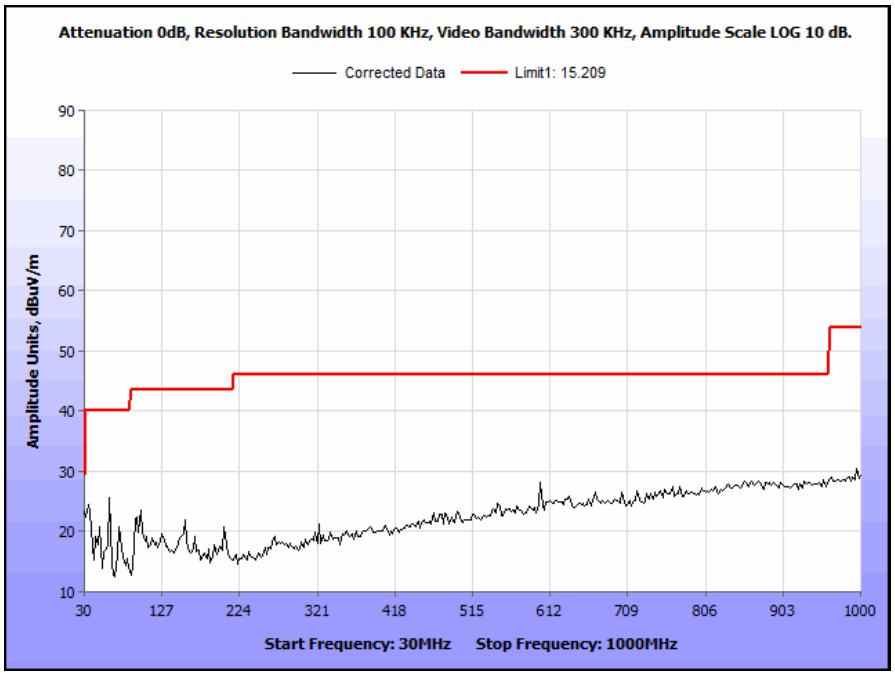
Plot 16. §15.209 Radiated Spurious Emissions, Low Channel, 30 MHz – 1 GHz



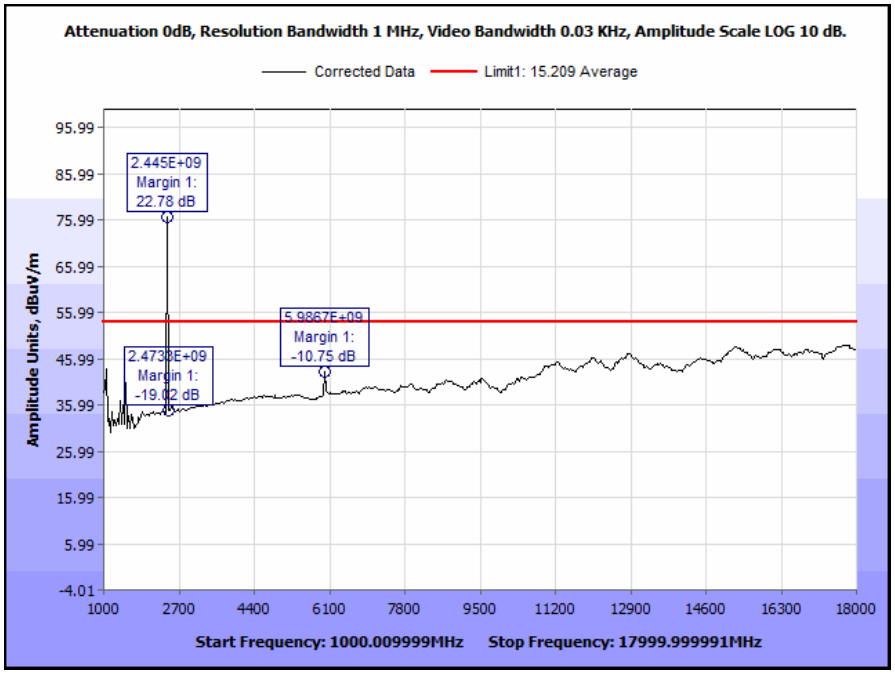
Plot 17. §15.209 Radiated Spurious Emissions, Low Channel, 1 GHz – 18 GHz, Average



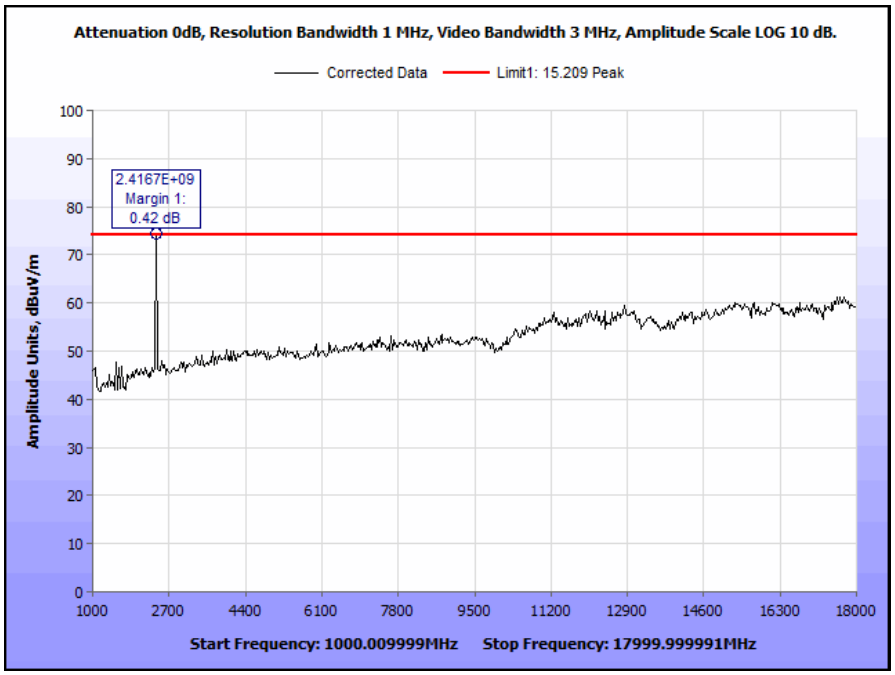
Plot 18. §15.209 Radiated Spurious Emissions, Low Channel, 1 GHz – 18 GHz, Peak



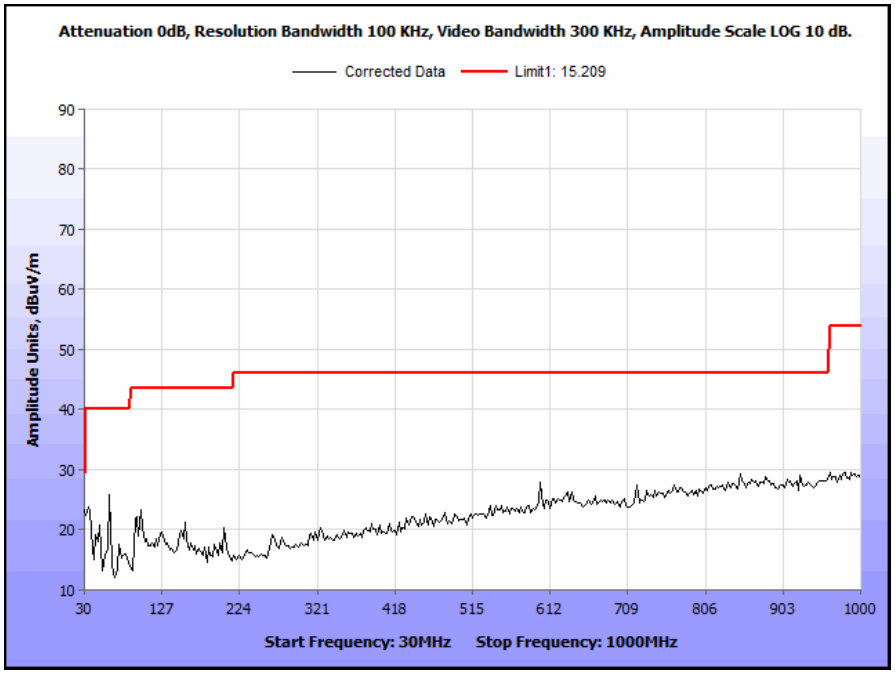
Plot 19. §15.209 Radiated Spurious Emissions, Mid Channel, 30 MHz – 1 GHz



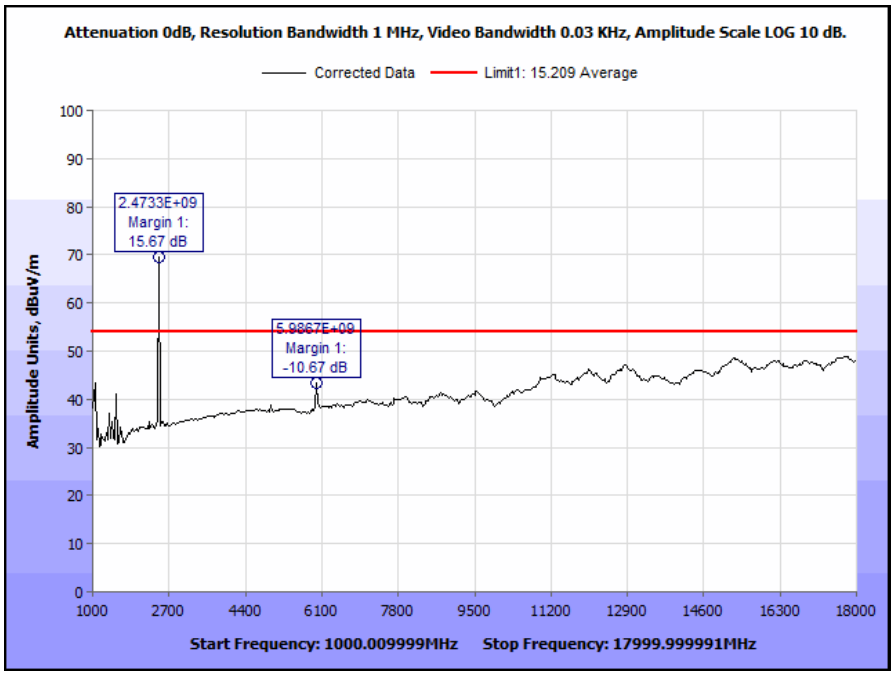
Plot 20. §15.209 Radiated Spurious Emissions, Mid Channel, 1 GHz – 18 GHz, Average



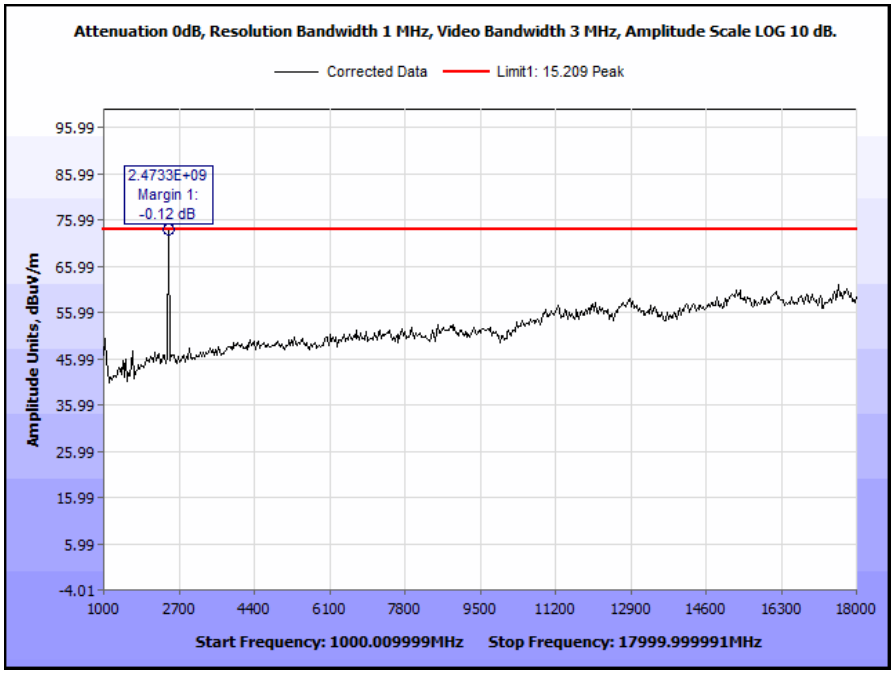
Plot 21. §15.209 Radiated Spurious Emissions, Mid Channel, 1 GHz – 18 GHz, Peak



Plot 22. §15.209 Radiated Spurious Emissions, High Channel, 30 MHz – 1 GHz

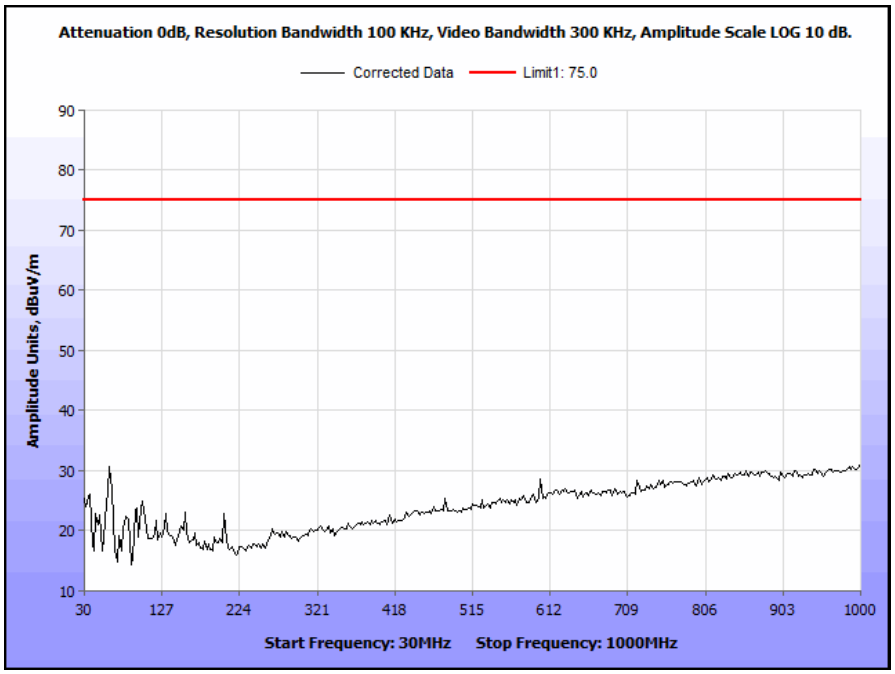


Plot 23. §15.209 Radiated Spurious Emissions, High Channel, 1 GHz – 18 GHz, Average

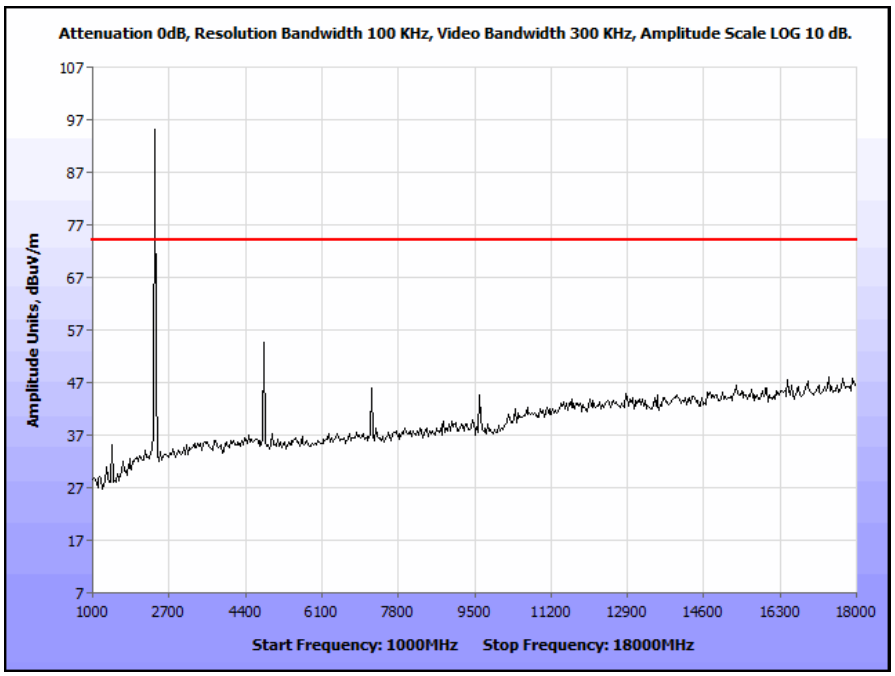


Plot 24. §15.209 Radiated Spurious Emissions, High Channel, 1 GHz – 18 GHz, Peak

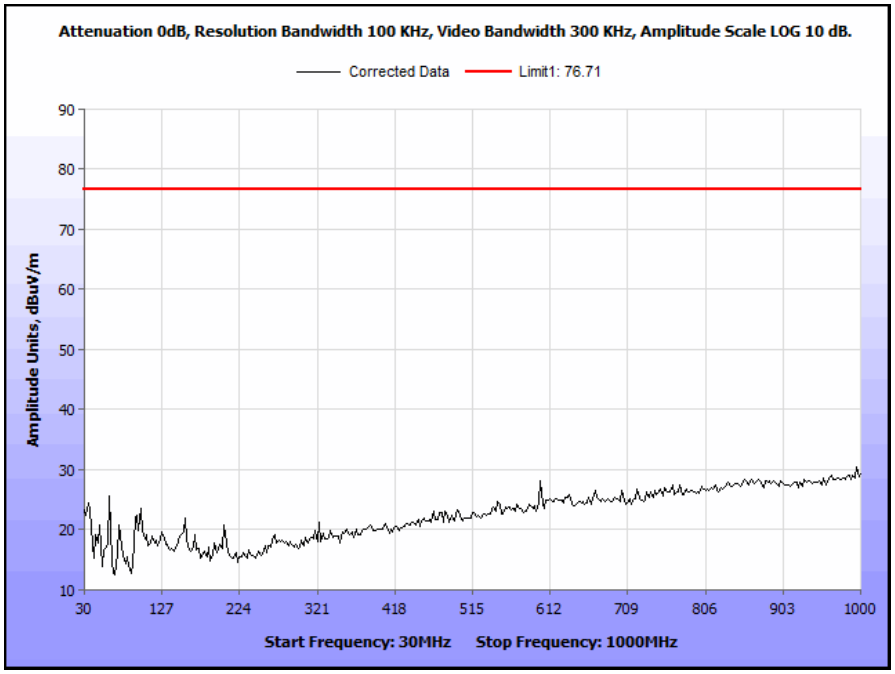
§15.247(d) Radiated Spurious Emissions Test Results



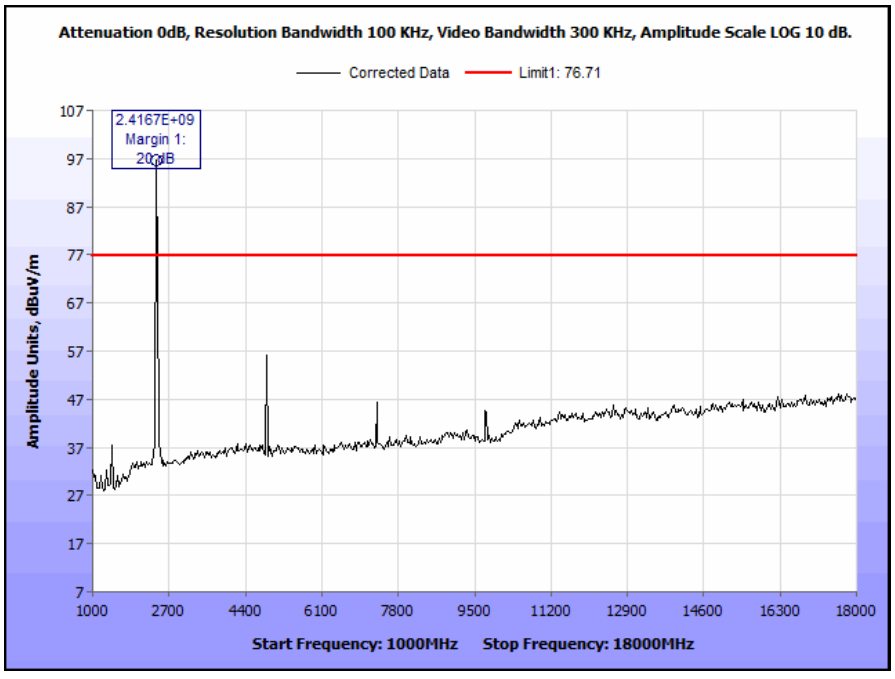
Plot 25. §15.247(d) Radiated Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 20 dBc



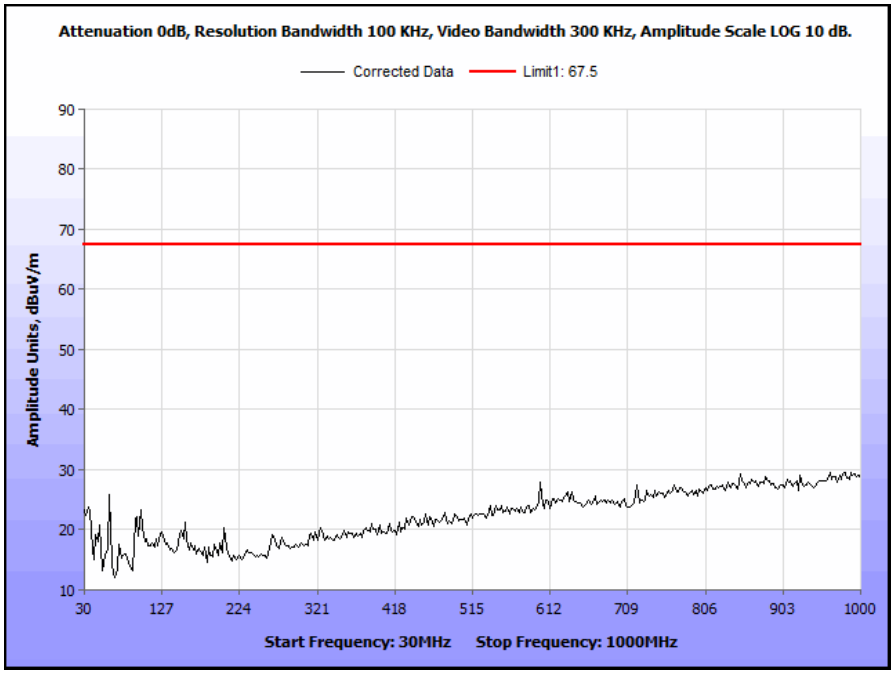
Plot 26. §15.247(d) Radiated Spurious Emissions, Low Channel, 1 GHz – 18 GHz, 20 dBc



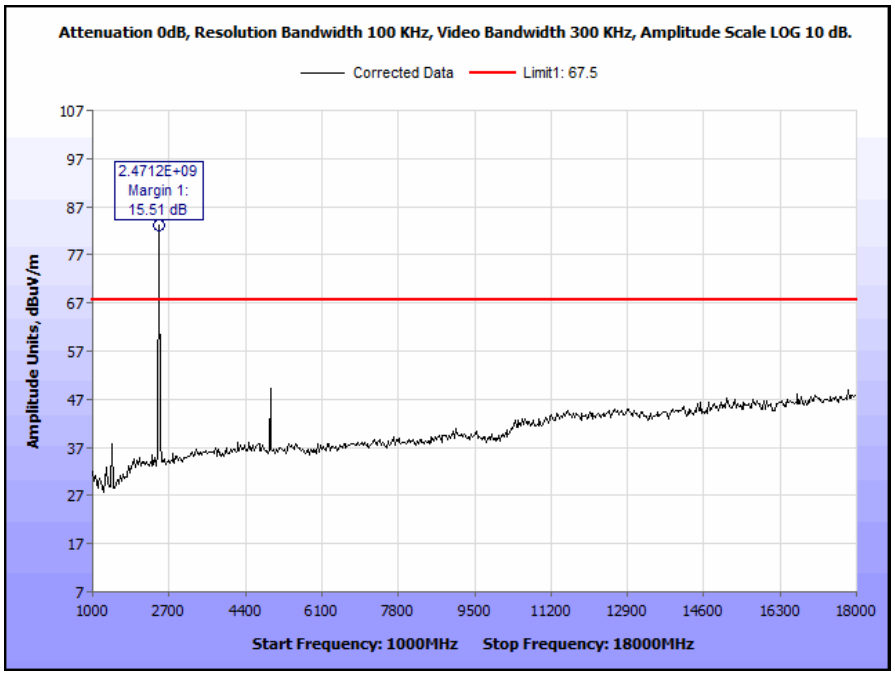
Plot 27. §15.247(d) Radiated Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 20 dBc



Plot 28. §15.247(d) Radiated Spurious Emissions, Mid Channel, 1 GHz – 18 GHz, 20 dBc



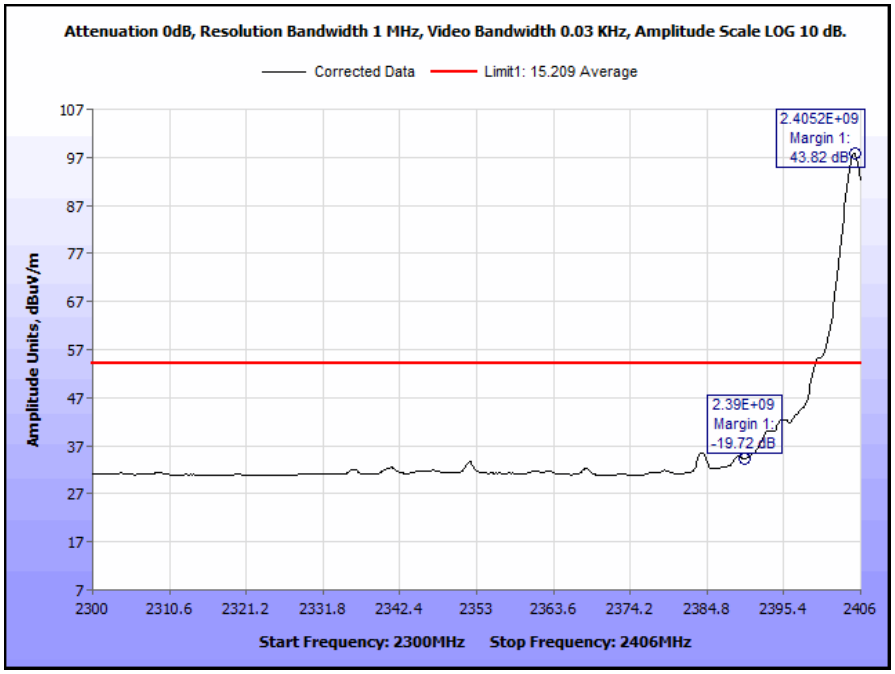
Plot 29. §15.247(d) Radiated Spurious Emissions, High Channel, 30 MHz – 1 GHz, 20 dBc



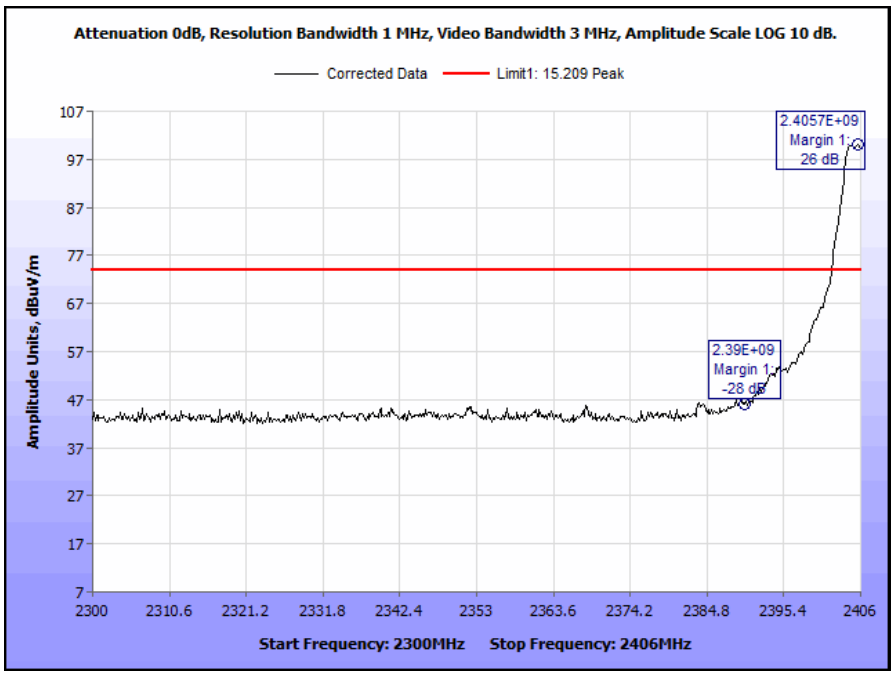
Plot 30. §15.247(d) Radiated Spurious Emissions, High Channel, 1 GHz – 18 GHz, 20 dBc

Radiated Band Edge Measurements

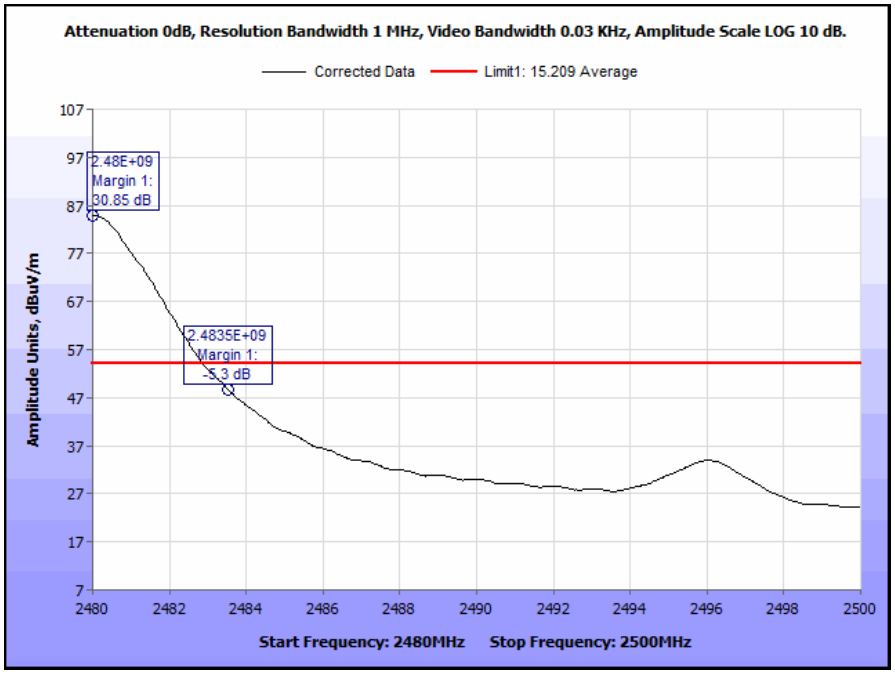
Test Procedures: The transmitter was turned on. Measurements were performed of the low and high Channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line.



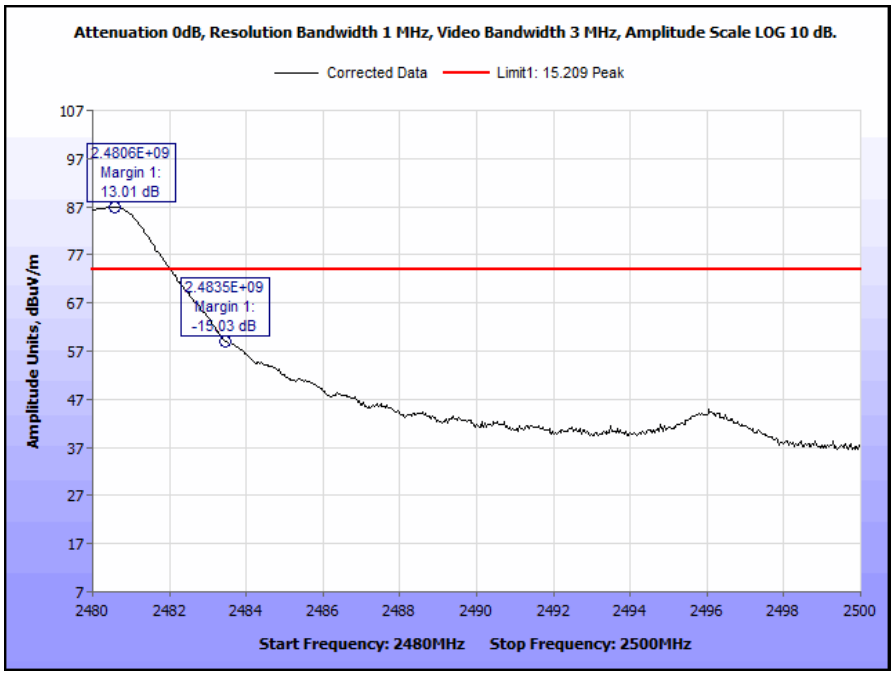
Plot 31. §15.209 Radiated Restricted Band Edge, Low Channel, Average Limit



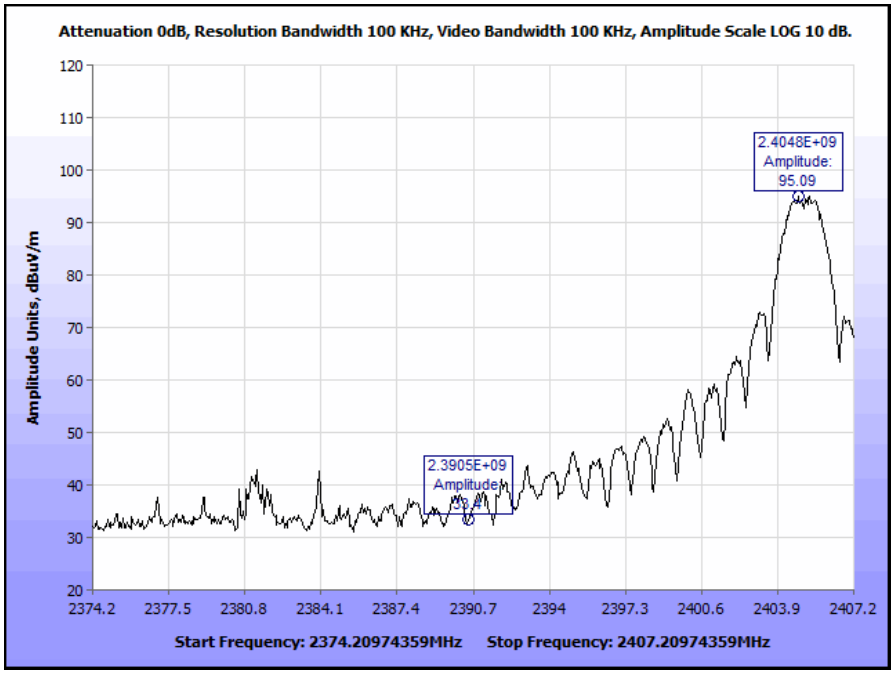
Plot 32. §15.209 Radiated Restricted Band Edge, Low Channel, Peak Limit



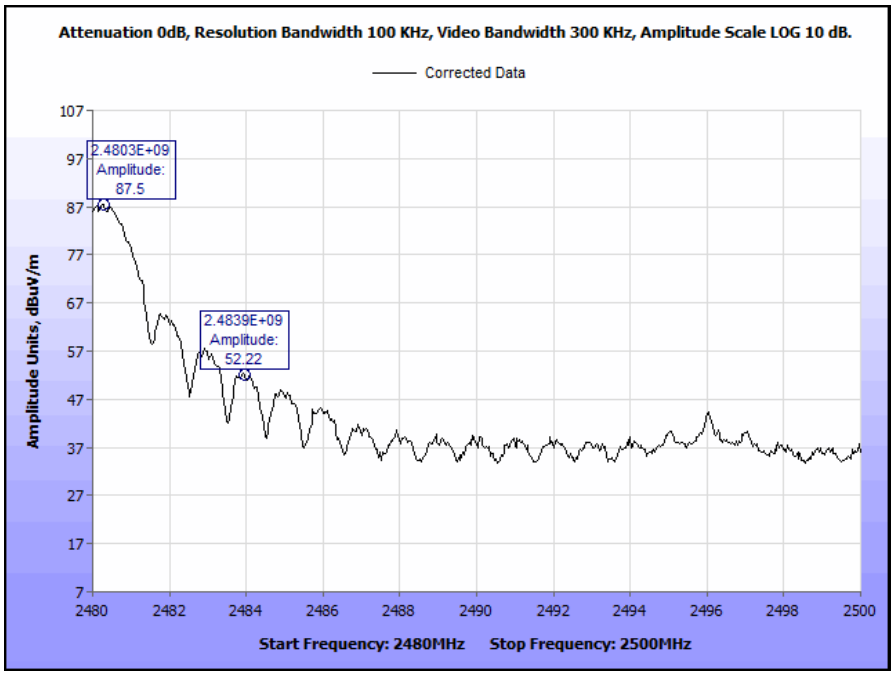
Plot 33. §15.209 Radiated Restricted Band Edge, High Channel, Average Limit



Plot 34. §15.209 Radiated Restricted Band Edge, High Channel, Peak Limit



Plot 35. §15.247(d) Radiated Restricted Band Edge, Low Channel, Average Limit



Plot 36. §15.247(d) Radiated Restricted Band Edge, High Channel

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 spectrum analyzer was set to an auto sweep time and a peak detector was used. Measurements were carried out at the low, mid and high channels. The measured field strengths were first converted to an EIRP value using the following equation:
EIRP(dBm) = E_0(dBuV/m) + 20log(d) – 104.8
This value was then converted to a conducted value by subtracting the 2 dBi antenna gain.

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).

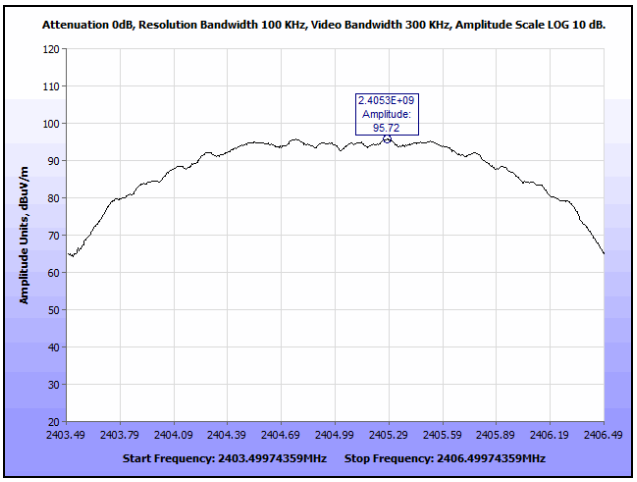
Test Engineer: Andy Shen

Test Date: 05/05/14

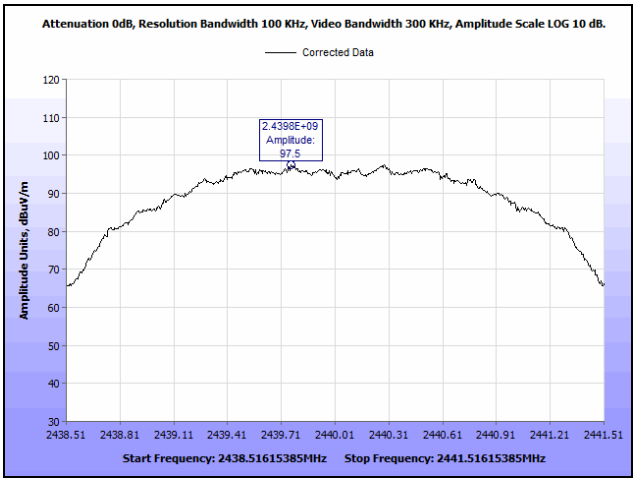
Peak Power Spectral Density				
Carrier Channel	**Frequency (MHz)**	**Calculated Conducted PPSD (dBm)**	**Limit (dBm)**	**Margin (dB)**
Low	2404	-11.08	8	-19.08
Mid	2440	-9.45	8	-17.45
High	2480	-17.7	8	-25.7

Table 21. Peak Power Spectral Density, Test Results

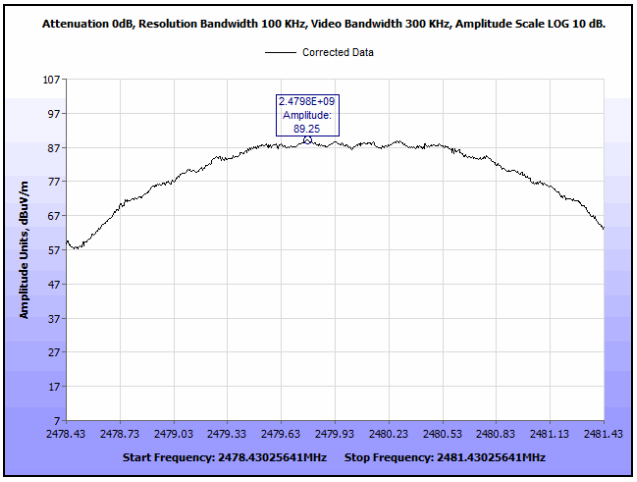
Peak Power Spectral Density



Plot 37. Peak Power Spectral Density, Low Channel



Plot 38. Peak Power Spectral Density, Mid Channel



Plot 39. Peak Power Spectral Density, High Channel

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 @ 2400-2483.5 MHz; highest conducted power = *-6.03dBm* (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

EUT maximum antenna gain = *2 dBi.*

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

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

where, S = Power Density (1 mW/cm^2)
P = Power Input to antenna (0.25 mW)
G = Antenna Gain (1.58 numeric)

S = (0.25*1.58/ 4*3.14*400) = 0.00008 mW/cm2

V. Test Equipment

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 #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1A1106	10 M SEMI-ANECHOIC CHAMBER (NSA)	ETS - LINDGREN	04X07	1/14/2014	7/14/2015
1S2523	PREAMPLIFIER	AGILENT TECHNOLOGIES	8449B	SEE NOTE	
1A1141	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4407B	5/12/2014	5/12/2015
1A1047	HORN ANTENNA	ETS - LINDGREN	3117	1/8/2014	7/8/2015
1A1147	BILOG ANTENNA	SUNOL SCIENCES CORP	JB3	12/26/2013	6/26/2015
1A1088	PREAMPLIFIER	ROHDE & SCHWARZ	TS-PR1	SEE NOTE	
1S2523	PREAMPLIFIER	AGILENT TECHNOLOGIES	8449B	SEE NOTE	

Table 22. Test Equipment List

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

VI. 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 user's 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

The manufacturer, importer or supplier shall meet the labelling requirements set out in this section for every ITE unit:

- (i) Prior to marketing in Canada, for ITE manufactured in Canada, and;
- (ii) Prior to importation into Canada, for imported ITE.

The presence of the label on the ITE represents the manufacturer's or importer's Self-Declaration of Compliance (SDoC) to Industry Canada ICES-003. Each unit of an ITE model shall bear a label indicating the model's compliance with ICES-003.

The label shall be permanently affixed to the ITE or displayed electronically and its text must be clearly legible. When the dimension of the device is too small or it is otherwise not practical to place the label on the ITE, the label shall be placed in a prominent location in the user manual supplied with the ITE. The user manual may be in an electronic format and must be readily available.

Labeling Requirements:

Industry Canada ICES-003 Compliance Label:

CAN ICES-3 (*)/NMB-3(*)

* Insert either "A" or "B" but not both to identify the applicable Class of ITE

End of Report