CANADA:

16 - 211 Schoolhouse Street

Coquitlam, British Columbia

Canada V3K 4X9

ELECTROMAGNETIC COMPATIBILITY TEST REPORT TO FCC 47 CFR Part 15 SUBPART C SECTION 15.247 & INDUSTRY CANADA RSS-210, RSS-Gen Issue4

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Testing laboratory:	Quality Auditing Institute
Address:	16 – 211 Schoolhouse Street, Coquitlam, BC, V3K 4X9, Canada

Accreditations (ISO 17025):

Standard Council of Canada: Accredited Laboratory No. 743
International Accreditation Service Inc.: Accredited Laboratory: No. TL-239

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Applicant's name:	Energy Aware Technology Inc.
Address:	Suite 515 – 88 East Pender Street Vancouver, BC, Canada V6A 3X3
Contact:	Jon Hallam
Email:	jon.hallam@energy-aware.com
Phone:	604-638-7763 **Fax:** 604-608-3378

Test Standard:	RSS-Gen Issue 4; RSS-210, Issue 8;FCC Part 15.247

Model Number:	W1
Manufacturer:	Energy Aware Technology Inc.
IC Certificate number:	8253A-W1
FCC Registration:	W72-W1

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Neurio Sensor W1(EUT)

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Revision History

Date	Report Number	Rev #	Details	Authors Initials
Dec 30, 2014	E10565-1410	0.0	Draft Test Report	JQ
Jan 12, 2015	E10565-1410	0.1	*Draft Test Report*	*JQ*
Jan 15, 2015	E10565-1410	1.0	*Final Test Report*	*JQ*
Jan 19, 2015	E10565-1410	2.0	*Revisions as per TCB requests*	*RA*

All previous versions of this report have been superseded by the latest dated revision as listed in the above table. Please dispose of all previous electronic and paper printed revisions accordingly.

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Section I. GENERAL TEST INFORMATION

EMC TEST SUMMARY

The following tests demonstrate testimony for the FCC & IC Marks for Transceivers / electromagnetic compatibility testing for this EUT.

Test / Requirement Description	Applicable FCC Rule Parts	Applicable Industry Canada Rule Parts	Results
Antenna requirement	FCC 47 CFR Part 15.203	Rss-Gen Issue 4	Complies
RF Peak Power Output	FCC Part 15.247 (b)(3)	RSS 210 Issue 8 A8.4(4)	Complies
Occupied Bandwidth 6dB Bandwidth	FCC Part 15.247 (b)(3)	RSS 210 Issue 8 A8.2(a)	Complies
Power Spectral Density	FCC Part 15.247 (e)	RSS 210 Issue 8 A8.2(b)	Complies
Out-of-band Emissions (Band edge)	FCC Part 15.247 (d) RSS 210 Issue 8 A8.2(a)	RSS 210 Issue 8 A8.5	Complies
Conducted Spurious Emissions	FCC Part 15.247 (d)	RSS 210 Issue 8 A8.5	Complies
Radiated Spurious Emissions-Transmit Mode	FCC Part 15.247 (d), FCC Part 15.209 (a), FCC Part 15.205	RSS 210 Issue 8 A2.5,A8.5, Rss-Gen Issue 4	Complies
Radiated Spurious Emissions - Receive Mode	FCC Part 15.247 (d), FCC Part 15.209 (a), FCC Part 15.205	RSS-210, ICES-003 Issue 5	Complies
Duty Cycle Correction	FCC Part 15.35(C)	RSS-GEN ISSUE 4 RSS-210	Complies
AC Mains Conducted Emissions	FCC Part 15.207	RSS-210	Complies
Frequency Stability	FCC Part 15.215(c)	RSS-Gen Issue 4	Complies
RF Exposure Evaluation	FCC 1.1310	N/A	Complies

Tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC 15.247 & Industry Canada RSS-210. The manufacturer is responsible for the tested product configuration, continued product compliance with these standards listed, and for the appropriate auditing of subsequent products as required.

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Tested By Rajinder Atwal ,
RF/EMC Test Engineer

X

Reviewed By Aman Jathaul,
EMC Project Manager

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PRODUCT DESCRIPTION

Applicant:	Energy Aware Technology Inc. 515-88 East Pender St, Vancouver, BC, Canada V6A 3X3
Equipment Under Test:	Neurio Sensor W1
Trade Name:	Neurio Sensor
Model:	W1
Date of Test:	Dec 02 – Dec 24 2014

EUT	Neurio Sensor W1
Functional Description	WiFi-enabled residential energy monitor
Operational Description	Utilizes split-core current transformers to monitor the energy consumption of a home. Utilizes a 802.11n-compliant WiFi module to transmit this energy data to a cloud service for further analysis
FRN	0018589234
FCC ID	W72-W1
IC	8253A-W1
Manufacturer	Energy Aware Technology Inc
Model/Type	W1
Transmitter Type	802.11n-compliant
Frequency Range	2412-2462Mhz
Transmit Power	19dBm
Modulation	CCK, DSSS, OFDM
Number of Channels	11
Antenna	Quarter-wave dipole whip antenna
Software and Firmware	0.2.2

ANTENNA DESCRIPTION

Polarization	Vertical
Compact Size	3.25”
RoHS	Yes
Frequency Range	2.4-2.5GHz
Linear Max Gain	2.0dBi
Impedance	50Ω

FACILITIES AND ACCREDITATION

Main Laboratory Headquarters:	Quality Auditing Institute
Headquarters Location/Address:	16 – 211 Schoolhouse Street, Coquitlam, BC, 3K 4X9, Canada
Associated Laboratory:	Quality Auditing Institute (Remote Location)
EMC Laboratory Address:	19473 Fraser Way, Pitt Meadows, BC, V3Y 2V4, Canada

FCC Test Site Registration Number:
(3 m /10 m Open Area Test Site [OATS] and 3 m Semi-Anechoic Chamber [SAC]): 226383

Industry Canada Test Site Registration Number (3m SAC): 9543B-1

Standard Council of Canada: ISO/IEC 17025:2005 Accredited Laboratory No. 743

International Accreditation Service Inc.: ISO/IEC 17025:2005 Accredited Laboratory: No. TL-239

Tested by: Aman Jathaul

Reviewed by: David Johanson

ENVIROMENTAL CONDITIONS: INDOORS

Temperature: 22-28ºC R.H.: 39.7 - 54.4%

TESTING METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4:2009, ANSI C63.10:2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, and Rss-Gen Issue 4, Issue 3 and RSS-210, Issue 8. The FCC testing was also done using the FCC KDB 558074 D01 DTS Measurement Guidance v03r02.

EUT TESTING CONFIGURATION

The tests were performed at 3 modulations for the purpose of compliance. The transmitter was set for continuous operation at fundamental frequencies in modulated modes of operation.

WORST TEST CASE

Worst-case orientation was determined by rotating the EUT on three orthogonal planes, during the pre-compliance test and final radiated emissions tests were performed in that worst orientation. The orientation shown in the test setup pictures in Appendix A of this report is the worst test setup scenario.

GENERAL TEST PROCEDURES

RF Conducted Emissions

The EUT is placed on a test bench connected directly to an EMI Receive and Spectrum Analyzer Conducted emissions are measured in the frequency range 9kHz to 25GHz using CISPR Peak, Quasi-Peak and Average detectors. EUT was set up to transmit modulated signal at particular channel at full power.

AC Mains Conducted Emissions

Measurements were made using a test receiver with 9 kHz bandwidth, CISPR Quasi-Peak and Average detector.

Radiated Emissions

The EUT is placed on the turntable 0.8m above a ground plane 3m away from a receiving antenna. Height of receiving antenna varied from 1m to 4m, its polarity changes from vertical to horizontal. Turntable rotates 360 degrees. Motion of turntable and receiving antenna allows determining position of maximum emission level. Quasi-peak detector applies for measurements of emissions with frequency range of 30 to 1000MHz. and average/peak detector otherwise.

MEASUREMENT UNCERTAINTY

Radio Frequency .....: ±1,5 x 10-5
Total RF power, conducted.....: ±1 dB
RF power density, conducted.....: ±2.75 dB
Spurious emissions, conducted.....: ±3 dB
All emissions, radiated.....: ±3.5 dB
Temperature.....: ±1ºC
Humidity.....: ±5 %
DC and low frequency voltages.....: ±3 %

Test Equipment List

Semi-Anechoic Chamber Equipment List

Manufacturer	Model	Description	Serial No.	Last Cal	Cal Due Date
ETS Lindgren	2165	Turntable	00043677	N/A	N/A
ETS Lindgren	2125	Mast	00077487	N/A	N/A
Sunol Sciences	JB3	Biconilog Antenna 30MHz-3GHz (Prescan use only)	A120106	28-Oct-2013	28-Oct-2015
Rohde & Schwarz	ESU40	EMI Receiver	100011	26-June-2012	26-Jun-2015
ETS Lindgren	3117	Horn Antenna	00075944	29-Aug-2013	29-Aug-2015
EMCO	6502	Loop Antenna	2178	8/21/2014	8/21/2017
ETS Lindgren	S201	5 meter Semi-Anechoic Chamber	1030	Conditional Use	Conditional Use
AH Systems	PAM118	Amplifier 10KHz-18GHz	189	Conditional Use	Conditional Use
AH Systems	PAM-1840H	Amplifier 18-40GHz	152	14-Jun-2013	14-Jun-2016

Measurement Software List

Manufacturer	Model	Version	Description
Rhode & Schwarz	EMC 32	6.20.0	Emissions Pre-scan Test Software

Section II: Requirements as FCC and Industry Canada

Test Summary:

	Test	Standard	Description	Result
Part 1	Antenna requirement	FCC 47 CFR Part 15.203 Rss-Gen Issue 4 (7.1.2)	Soldered, non-replaceable antenna	Complies
Part 2	RF Peak Power Output	FCC Part 15.247 (b)(3) RSS 210 Issue 8 A8.4(4)	Maximum peak conducted output power shall not exceed 1 W. Except as provided in Section RSS 210 A8.4 (5), the e.i.r.p. shall not exceed 4 W.	Complies
Part 3	Occupied Bandwidth 6dB Bandwidth	FCC Part 15.247 (a)(2) RSS 210 Issue 8 A8.2(a)	The minimum -6 dB bandwidth shall be at least 500 kHz.	Complies
Part 4	Power Spectral Density	FCC Part 15.247 (e) RSS 210 Issue 8 A8.2(b)	The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission	Complies
Part 5	Out-of-band Emissions (Band edge)	FCC Part 15.247 (d) RSS 210 Issue 8 A8.5	In any 100 kHz bandwidth outside the frequency band in which the digitally modulated device is operating, the RF power that is produced shall be at least 20dB.	Complies
Part 6	Conducted Spurious Emissions	FCC Part 15.247 (d) RSS 210 Issue 8 A8.5	In any 100 kHz bandwidth outside the frequency band in which the digitally modulated device is operating, the RF power that is produced shall be at least 20dB.	Complies
Part 7	Radiated Spurious Emissions-Transmit Mode	FCC Part 15.247 (d) FCC Part 15.209 (a) RSS 210 Issue 8 A2.5,A8.5 RSS Gen Issue 3	Radiated emissions requirements as stated in the Standards.	Complies
Part 8	Radiated Spurious Emissions – Receive Mode	FCC Part 15.247 (d) FCC Part 15.209 (a) ICES-003 Issue 5	Radiated emissions requirements as stated in the Standards	Complies
Part 9	Duty Cycle Correction	FCC Part 15.35(C) RSS-GEN ISSUE 4,RSS-210	Measurement and Calculation for duty cycle correction as stated in the standards.	Complies
Part 10	AC Mains Conducted Emissions	FCC 15.207 & RSS-210	Conducted emissions requirements as stated in the Standards	Complies
Part 11	Frequency Stability	FCC Part 15.215(c) & RSS-Gen Issue 8 (8.11)	Measured at temperatures of -20°C (-4°F), +20°C (+68°F) and +50°C (+122°F)	Complies
Part 12	RF Exposure Evaluation	FCC 1.1310	Evaluate the environmental impact of human exposure to radiofrequency (RF) radiation	Complies

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Part 1 - Antenna Requirements

DATE:	Dec-02- 2014
TEST STANDARD:	FCC 47 CFR Part 15.203 and IC Rss-Gen Issue 4 Section 7.1.2
APPLICABLE REGULATIONS:	"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 the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited."… "the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded."
RESULT:	This unit meets antenna requirement by the use of reverse polarity type SMA connectors.

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Part 2 - RF Peak Power Output

DATE: Dec -10 -2014

TEST STANDARD: FCC Part 15.247 (b)(3) RSS 210 Issue 8 A8.4(4)

TEST REQUIREMENT: For systems employing digital modulation techniques operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz, the maximum peak conducted output power shall not exceed 1 W (30dBm). Except as provided in RSS 210 Section A8.4 (5), the e.i.r.p. shall not exceed 4 W.

TEST SETUP: The antenna port of EUT was directly connected to a spectrum analyser.

MEASUREMENT METHOD: As called by the standards above.

DEVICE DESCRIPTIONS: As described in the above EUT description and set up section.

EMISSIONS DATA:

Modulation	Channel	Frequency	UnCorr. PK	Corr. Factor	Corr. PK Power	Limit PK Power
		MHz	dBm	dB	dBm	dBm
802.11b	1	2.412	-11.84	30	**18.16**	30
	6	2.437	-12.20	30	17.80	30
	11	2.462	-12.86	30	17.14	30
802.11g	1	2.412	-13.59	30	16.41	30
	6	2.437	-14.13	30	15.87	30
	11	2.462	-14.84	30	15.16	30
802.11n	1	2.412	-13.66	30	16.34	30
	6	2.437	-14.14	30	15.86	30
	11	2.462	-14.89	30	15.11	30

RESULTS: Pass: Complies.

Part 3 - Occupied Bandwidth 6dB Bandwidth

DATE: Dec-09-2014

TEST STANDARD: FCC Part 15.247 (a) (2) and RSS 210 Issue 8 A8.2

TEST REQUIREMENT: The minimum -6 dB bandwidth shall be at least 500 kHz.

TEST SETUP: The antenna port of EUT was directly connected to a spectrum analyzer.

MEASUREMENT METHOD: As called by the standards above.

DEVICE DESCRIPTIONS: As described in the above EUT description and set up section.

EMISSIONS DATA:

Modulation	Channel	Frequency (GHz)	6dB Bandwidth (MHz)
802.11b	Low	2.412	8.4
	Mid	2.437	8.1
	High	2.462	9.0
802.11g	Low	2.412	14.6
	Mid	2.437	14.7
	High	2.462	15.1
802.11n	Low	2.412	14.3
	Mid	2.437	14.2
	High	2.462	14.8

RESULTS: Pass: Complies.

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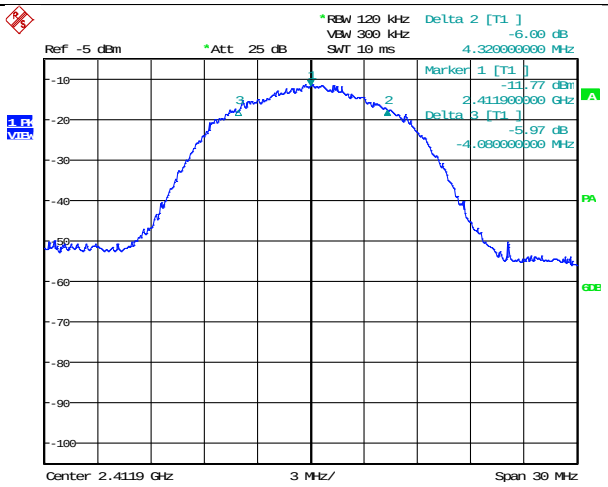
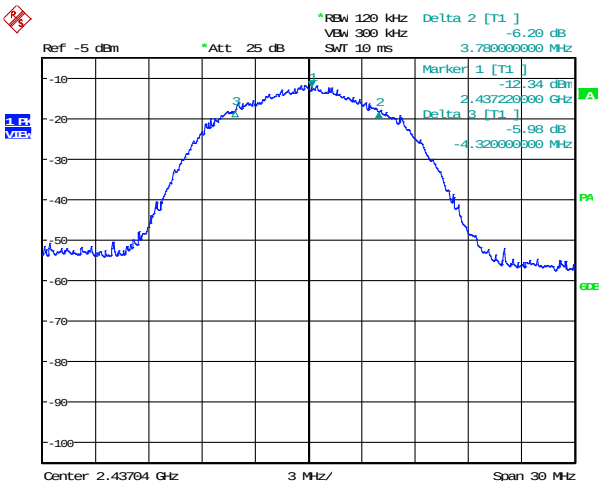
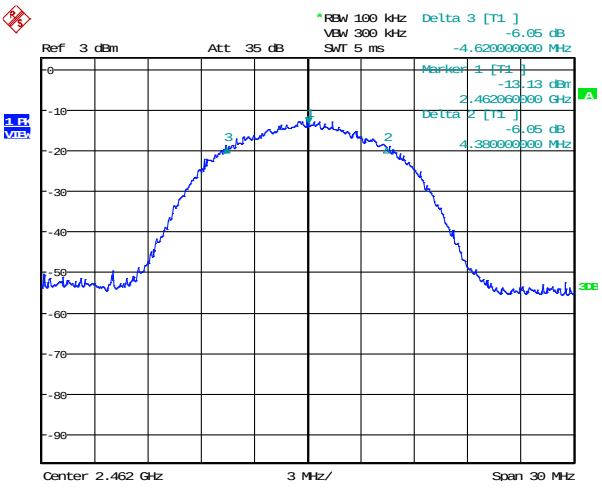
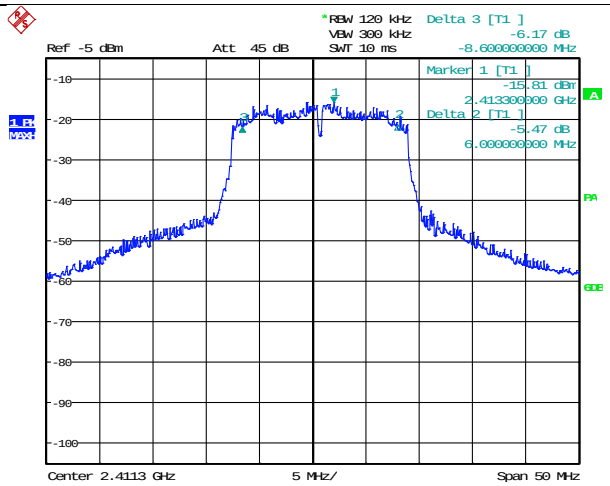
TEST PLOTS (6dB OCCUPIED BANDWIDTH):

Modulation 802.11b	 Date: 9.DEC.2014 20:46:48
 Date: 9.DEC.2014 20:50:48	 Date: 9.DEC.2014 21:03:02

Modulation 802.11g



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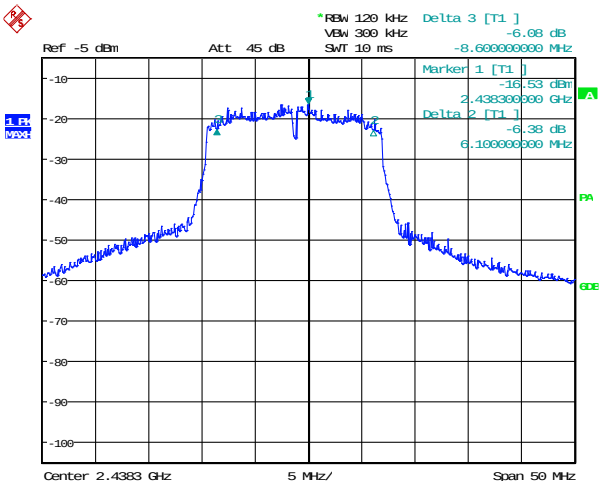

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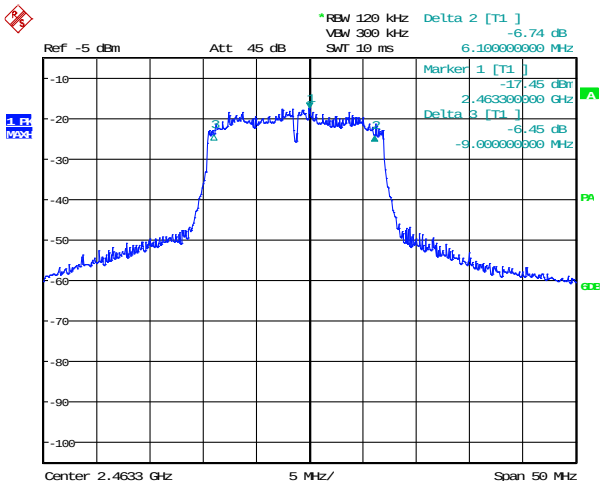

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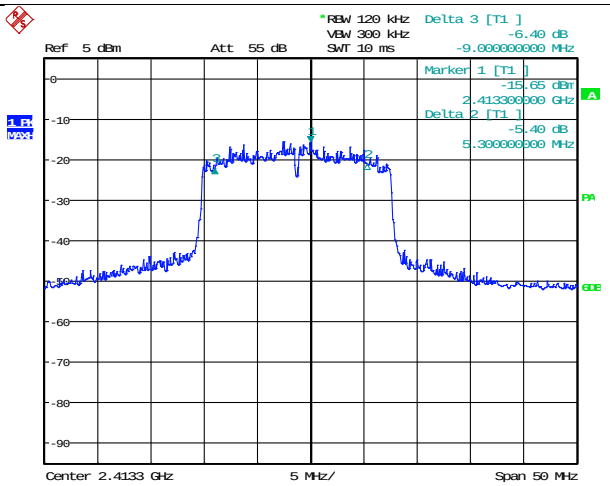
Modulation 802.11n



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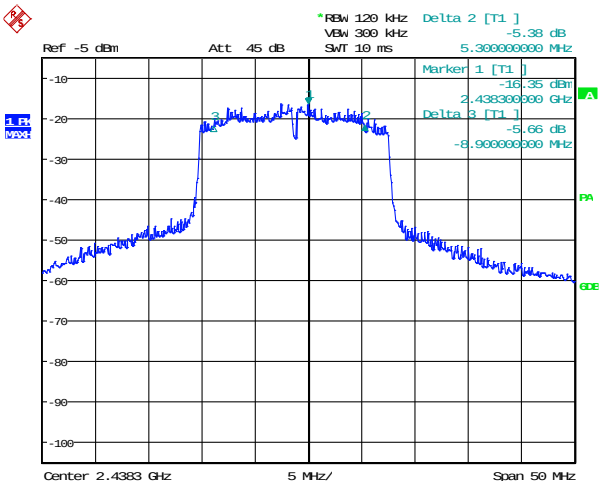

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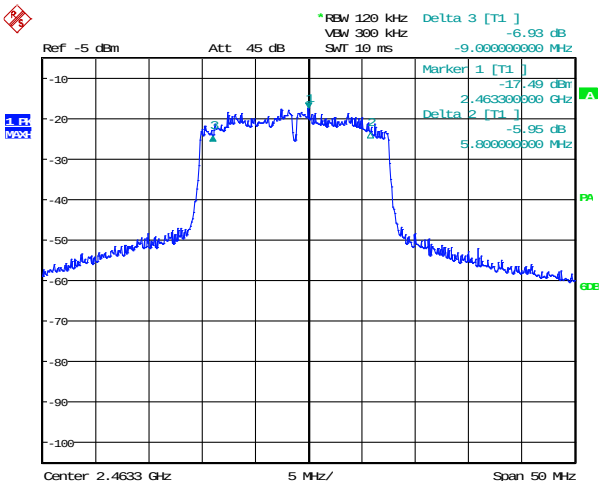

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Part 4 - Power Spectral Density

DATE: Dec-18-2014

TEST STANDARD: FCC Part 15.247 (e) and RSS 210 Issue 8 A 8.2(b)

TEST REQUIREMENT: The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission. The power spectral density was determined using the same method as is used to determine the conducted output power).

TEST SETUP: The antenna port of EUT was directly connected to a spectrum analyzer.

MEASUREMENT METHOD: As called by the standards above.

DEVICE DESCRIPTIONS: As described in the above EUT description and set up section.

EMISSIONS DATA:

Modulation	Channel	Frequency	Un-Corrected PSD	Correction Factor	Corrected PSD	Limit	Results
		(GHz)	(dBm)	(dB)	(dBm)	(dBm)	Pass/Fail
802.11b	Low	2.412	-4.8	2	-2.8	8	Pass
	Mid	2.437	-5.56	2	-3.56	8	Pass
	High	2.462	-7.28	2	-5.28	8	Pass
802.11g	Low	2.412	-9.14	2	-7.14	8	Pass
	Mid	2.437	-11.1	2	-9.1	8	Pass
	High	2.462	-9.98	2	-7.98	8	Pass
802.11n	Low	2.412	-8.77	2	-6.77	8	Pass
	Mid	2.437	-11.05	2	-9.05	8	Pass
	High	2.462	-11.69	2	-9.69	8	Pass

RESULTS: PASS: Complies.

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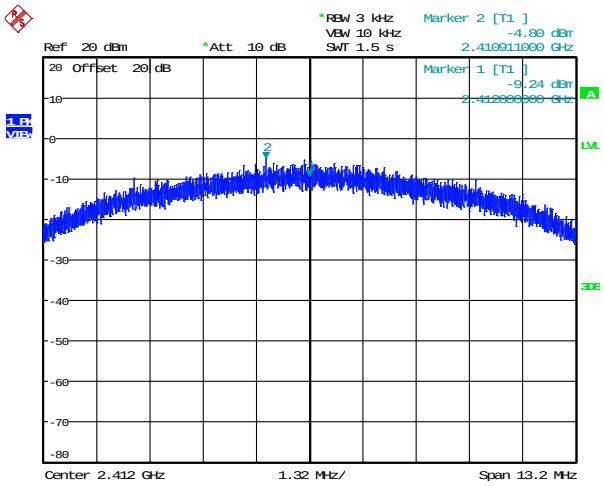
TEST PLOTS (POWER SPRCTRAL DENSITY):

Modulation 802.11B



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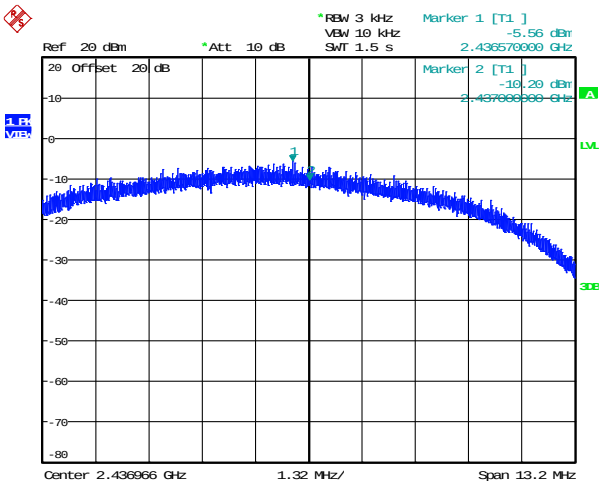

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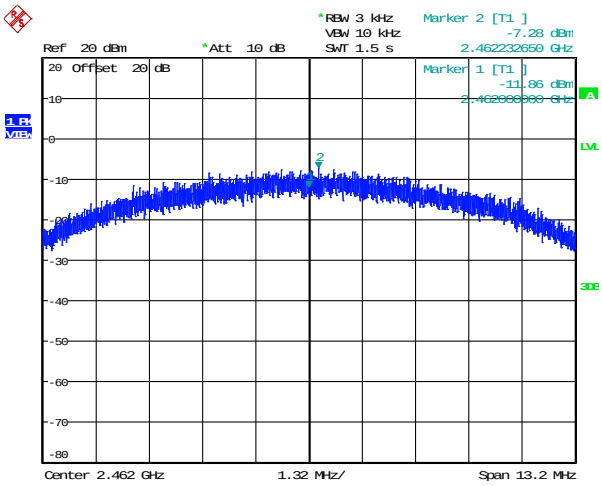

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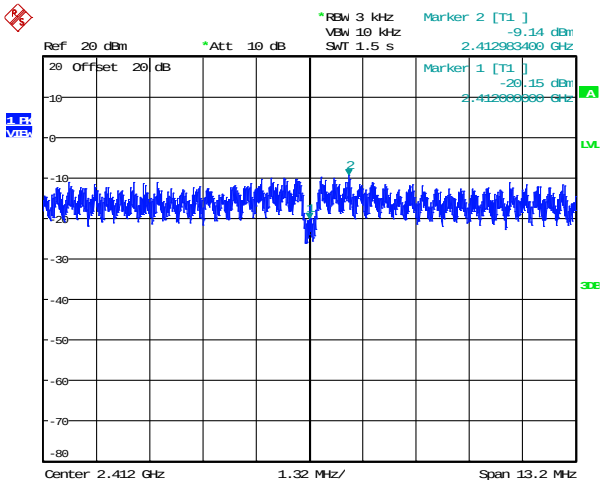
Modulation 802.11g



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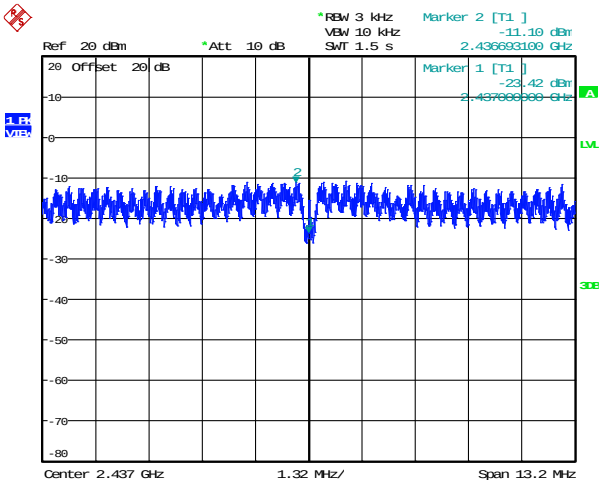

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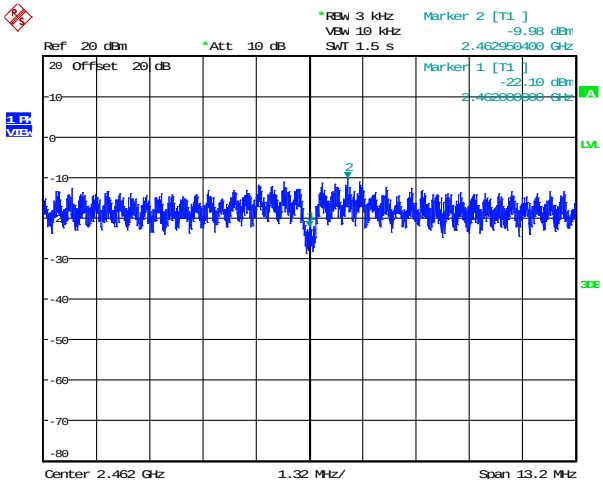

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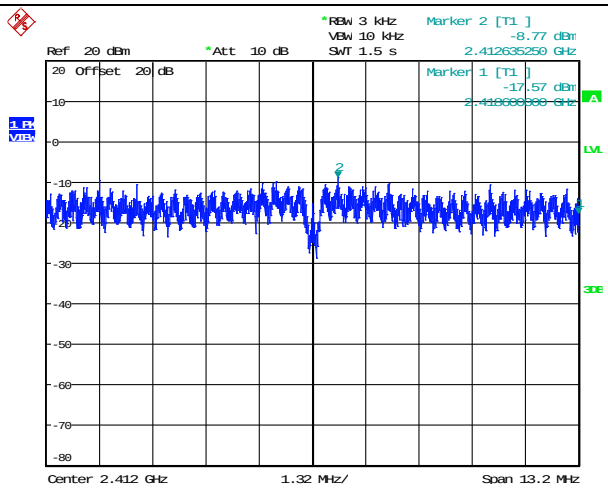
Modulation 802.11n



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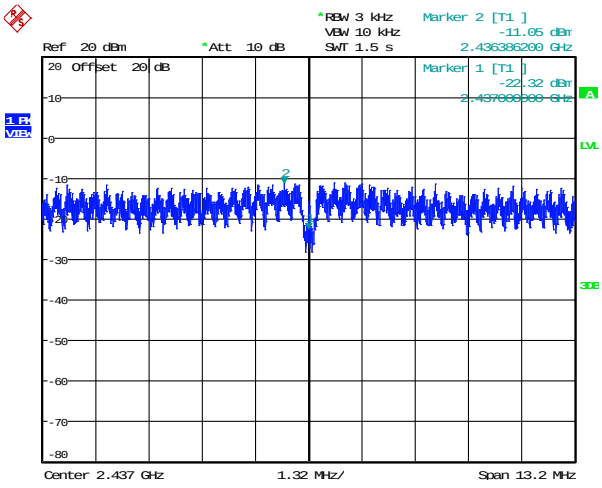

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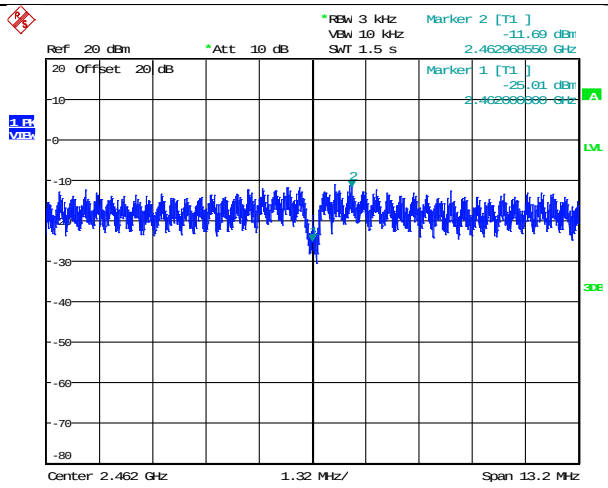

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Part 5 - Out of Band Emissions (Band Edge)

DATE: Dec-10-2014

TEST STANDARD: FCC Part 15.247 (d) andRSS 210 Issue 8 A8.5

TEST REQUIREMENTS:

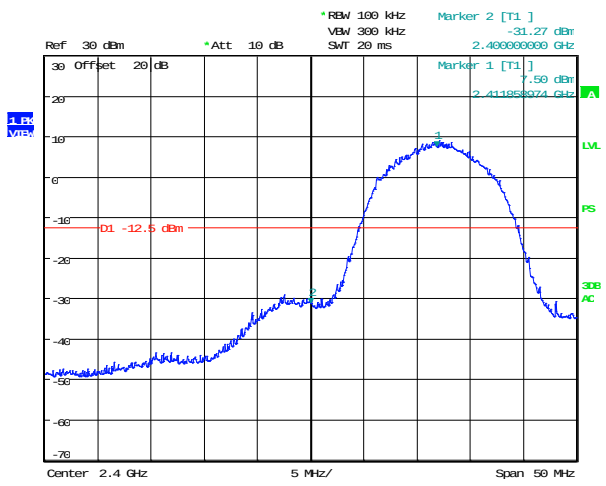
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section A8.4 (4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in Rss-Gen Issue 4 is not required.

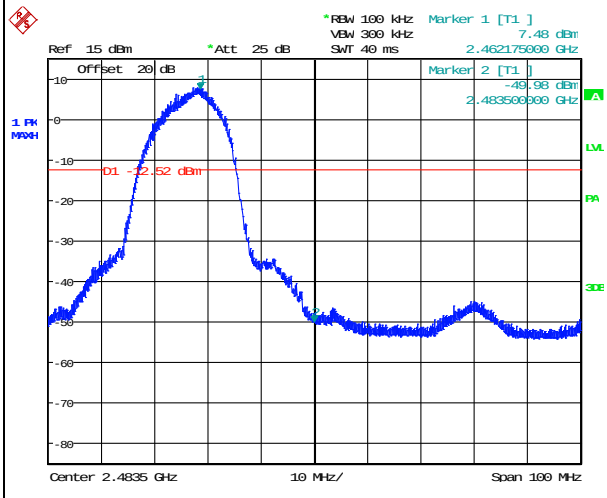
MEASUREMENT METHOD: As called by the standards above.

RESULTS: Pass: Complies

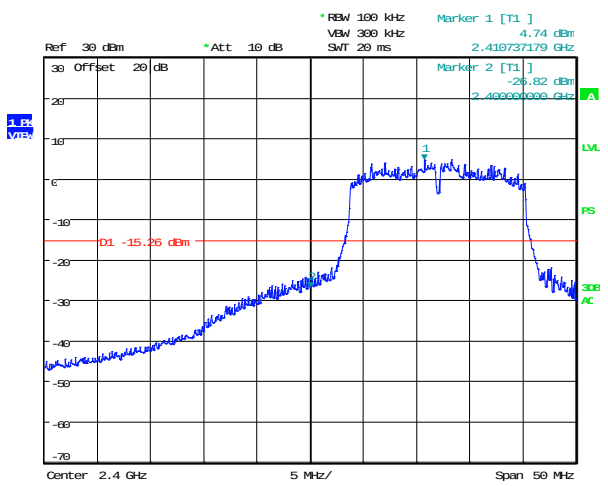
EMISSIONS DATA & PLOT:

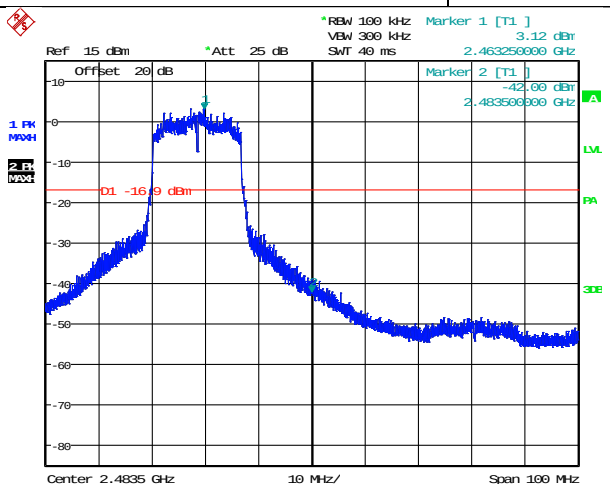
Modulation 802.11b			
Low Channel (GHz)	2.412	HIgh Channel (GHz)	2.462
Out of band Emissions Level	-23.77dB	Out of band Emissions Level	-42.5dB
Limit	-20dB	Limit	-20dB
Results	Pass	Results	Pass



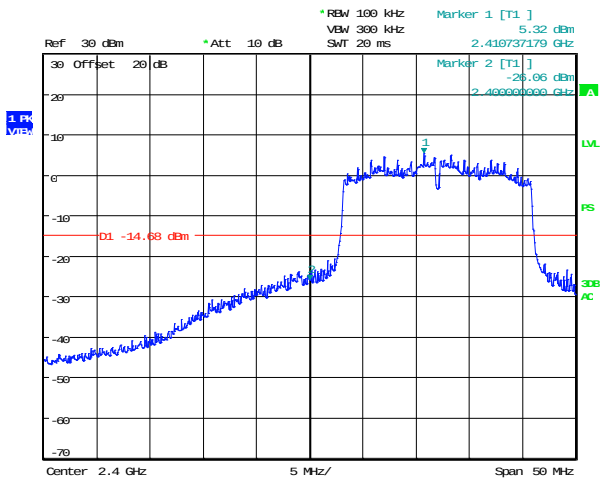


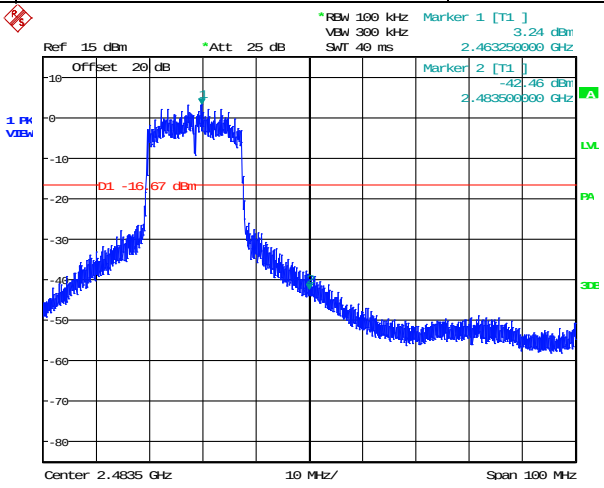
Modulation 802.11g			
Low Channel (GHz)	2.412	HIgh Channel (GHz)	2.462
Out of band Emissions Level	-22.08dB	Out of band Emissions Level	-38.88dB
Limit	-20dB	Limit	-20dB
Results	Pass	Results	Pass





Modulation 802.11n			
Low Channel (GHz)	2.412	HIgh Channel (GHz)	2.462
Out of band Emissions Level	-20.74dB	Out of band Emissions Level	-39.22dB
Limit	-20dB	Limit	-20dB
Results	Pass	Results	Pass





CANADA:
16 - 211 Schoolhouse Street
Coquitlam, British Columbia
Canada V3K 4X9

Part 6 - Conducted Spurious Emissions

DATE: March 24 2014

TEST STANDARD: FCC Part 15.247 (d), FCC Part 15.209 (a) and RSS 210 Issue 8 A8.5

TEST REQUIREMENTS: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits.

MEASUREMENT METHOD: Testing was performed as described in the Antenna-port conducted measurements procedure in section 12.2 of 558074 D01 DTS Meas Guidance v03r02

a) Measure the conducted output power (in dBm) using the detector specified.
b) Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level.
c) Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).
d) For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (*e.g.*, Watts, mW).
e) Convert the resultant EIRP level to an equivalent electric field strength using the following relationship: $E = EIRP - 20\log D + 104.8$
where:
E = electric field strength in dBµV/m,
EIRP = equivalent isotropic radiated power in dBm
D = specified measurement distance in meters.
f) Compare the resultant electric field strength level to the applicable limit.
g) Perform radiated spurious emission test

RESULTS: Pass: Complies.

EMISSIONS DATA:

	Frequency	UnCorr. PK Pwr	UnCorr. Ave Pwr	Filter Loss	Cble loss	Anten Gain	Corr. PK Pwr	Corr. Ave Pwr	E Pk field @ 3m	E Av field @ 3m	Limit PK Pwr	Limit AVG Pwr
	(MHz)	dBm	dBm	dB	dB	dBi	dBm	dBm	dBµV/m	dBµV/m	dBµV/m	dBµV/m
Modulation 802.11b												
Ch.1	4824.0	-46.8	-62.5	1.5	2	3	-40.27	-56.00	54.99	39.26	74	54
	7236.00	-55.9	-70.6	1.5	2	3	-49.40	-64.10	45.86	31.16	74	54
	9648	-75.4	-89.9	1.5	2	3	-68.92	-83.40	26.34	11.86	91	54
	12060	-67.6	-85.0	1.5	2	3	-61.12	-78.52	34.14	16.74	74	54
Ch.6	4874.00	-51.3	-66.7	1.5	2	3	-44.80	-60.18	50.46	35.08	74	54
	7311.00	-53.5	-68.5	1.5	2	3	-47.00	-62.00	48.26	33.26	74	54
	9748.00	-73.3	-88.5	1.5	2	3	-66.80	-82.00	28.46	13.26	90	54
	12185	-68.1	-86.0	1.5	2	3	-61.60	-79.52	33.66	15.74	74	54
Ch.11	4924.0	-54.5	-69.3	1.5	2	3	-47.97	-62.83	47.29	32.43	74	54
	7386	-56.8	-71.5	1.5	2	3	-50.30	-65.00	44.96	30.26	74	54
	9848	-74.2	-88.0	1.5	2	3	-67.72	-81.50	27.54	13.76	90	54
	12310.0	-71.6	-89.1	1.5	2	3	-65.10	-82.60	30.16	12.66	74	54
Modulation 802.11g												
Ch.1	4824.0	-59.4	-70.7	1.5	2	3	-52.88	-64.17	42.38	31.09	74	54
	7236.00	-56.3	-74.5	1.5	2	3	-49.80	-68.00	45.46	27.26	74	54
	9648	-75.9	-89.8	1.5	2	3	-69.40	-83.30	25.86	11.96	87	54
	12060	-62.4	-80.1	1.5	2	3	-55.90	-73.60	39.36	21.66	74	54
	14472	-72.2	-85.9	1.5	2	3	-65.70	-79.40	29.56	15.86	74	54
Ch.6	4874.00	-61.8	-74.0	1.5	2	3	-55.26	-67.45	40.00	27.81	74	54
	7311.00	-56.8	-73.7	1.5	2	3	-50.30	-67.20	44.96	28.06	74	54
	9748.00	-76.3	-90.1	1.5	2	3	-69.80	-83.60	25.46	11.66	86	54
	12185	-63.6	-80.9	1.5	2	3	-57.10	-74.40	38.16	20.86	74	54
	14622	-73.7	-87.4	1.5	2	3	-67.20	-80.90	28.06	14.36	90	54
Ch.11	4924.0	-64.3	-74.4	1.5	2	3	-57.80	-67.93	37.46	27.33	74	54
	7386	-61.1	-75.9	1.5	2	3	-54.60	-69.40	40.66	25.86	74	54
	12310.0	-71.3	-88.4	1.5	2	3	-64.80	-81.90	30.46	13.36	74	54
Modulation 802.11n												
Ch.1	4824.0	-60.7	-70.7	1.5	2	3	-54.20	-64.24	41.06	31.02	74	54
	7236.00	-56.5	-75.6	1.5	2	3	-50.00	-69.10	45.26	26.16	74	54
	9648	-75.2	-89.7	1.5	2	3	-68.70	-83.20	26.56	12.06	87	54
Ch.6	4874.00	-61.5	-73.4	1.5	2	3	-54.98	-66.87	40.28	28.39	74	54
	7311.00	-56.3	-74.5	1.5	2	3	-49.80	-68.00	45.46	27.26	74	54
	9748.00	-75.8	-90.1	1.5	2	3	-69.30	-83.60	25.96	11.66	85	54
	12185	-63.2	-81.7	1.5	2	3	-56.70	-75.20	38.56	20.06	74	54
	14622	-73.9	-87.4	1.5	2	3	-67.40	-80.90	27.86	14.36	85	54
Ch.11	4924.0	-63.6	-74.5	1.5	2	3	-57.10	-68.02	38.16	27.24	74	54
	7386	-60.4	-76.8	1.5	2	3	-53.90	-70.30	41.36	24.96	74	54
	9848	-77.4	-90.2	1.5	2	3	-70.90	-83.70	24.36	11.56	85	54
	12310.0	-69.9	-88.5	1.5	2	3	-63.40	-82.00	31.86	13.26	74	54

CANADA:
16 - 211 Schoolhouse Street
Coquitlam, British Columbia
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Part 7 - Radiated Spurious Emissions-Transmit Mode

DATE: Dec-15- 2014

TEST STANDARD: FCC Part 15.247 (d), FCC Part 15.209 (a), FCC Part 15.205, IC RSS-210 Annex 2 Section (A2.2)(b), Rss-Gen Issue 4 Section (7.2.5)

TEST CONDITIONS: Indoor

MINIMUM STANDARD: Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20 dB below the level of the fundamental or to the general field strength limits listed in Rss-Gen Issue 4, whichever is less stringent.

In measuring unwanted emissions, the spectrum shall be investigated from 30 MHz or the lowest radio frequency signal generated in the equipment, whichever is lower, without going below 9 kHz, up to at least the frequency … if the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

Unwanted emissions falling into restricted bands of shall comply with the limits specified below

Frequency (MHz)	Field Strength	
	uV/m @ 3-m	Calculated dBµV/m at 3m
30 – 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
960 - 1000	500	54.0

FCC PART 15.205-RESTRICTED BANDS OF OPERATION

(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-	608-614	5.35-5.46
2.1735-2.1905	16.80425-	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-	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-	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)
13.36-13.41			

* - note FCC-specific .

Canada-specific frequency rangs - 3.020-3.026, 5.677–5.683, 121.94-123.0. 149.9-150.05, 162.0125-167.17, 167.72-173.2, 1300-1427, 2483.5-2500, 3500-3600,

(2) Above 38,6 GHz

(b) Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in § 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in § 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in § 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in § 15.35 apply to these measurements.

RESTRICTED FREQUENCY BANDS (RSS-GEN ISSUE 4)

MHz
0.090-0.110
2.1735-2.1905
3.020-3.026
4.125-4.128
4.17725-4.17775
4.20725-4.20775
5.677-5.683
6.215-6.218
6.26775-6.26825
6.31175-6.31225
8.291-8.294
8.362-8.366
8.37625-8.38675
8.41425-8.41475
12.29-12.293
12.51975-12.52025
12.57675-12.57725
13.36-13.41
16.42-16.423
16.69475-16.69525
16.80425-16.80475
25.5-25.67
37.5-38.25
73-74.6
74.8-75.2
108-138
156.52475-156.52525
156.7-156.9

MHz
240-285
322-335.4
399.9-410
608-614
960-1427
1435-1626.5
1645.5-1646.5
1660-1710
1718.8-1722.2
2200-2300
2310-2390
2655-2900
3260-3267
3332-3339
3345.8-3358
3500-4400
4500-5150
5350-5460
7250-7750
8025-8500

GHz
9.0-9.2
9.3-9.5
10.6-12.7
13.25-13.4
14.47-14.5
15.35-16.2
17.7-21.4
22.01-23.12
23.6-24.0
31.2-31.8
36.43-36.5
Above 38.6

Note: Certain frequency bands listed in Table 3 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to the devices are set out in the 200– and 300– series RSSs, such as RSS-210 and RSS-310, which contain the requirements that apply to licence-exempt radio apparatus.

TEST SETUP: The EUT was tested in our 3 m SAC and was positioned on the center of the turntable and connected to a 3Vdc battery. The transmitter was set for continuous transmission. The lowest, middle and highest channels in the 2400-2483.5 MHz band were measured for all radiated emissions 10kHz to 18 GHz. The EUT was pre-scanned in 3 different orthogonal orientations and was found to radiate highest when placed flat on the table top as indicated in the test photos.

MEASUREMENT METHOD: Measurements were made using spectrum analyser and receiver, 200Hz RBW average detector for the frequency range 9-150KHz; 9kHz RBW average detector for the Frequency range 150kHz to 30MHz; 120kHz RBW quasi-peak detector using the appropriate antennas, amplifiers and filters.

As per FCC guidance document 558074 D01 DTS, conducted measurements were performed with proper impedance matching and an additional radiated test for cabinet/case spurious emissions performed. The general procedure used was as follows:
a) Measure the conducted output power (in dBm) using the detector specified (see 12.2.2, 12.2.3, and 12.2.4 for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).
b) Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see 12.2.5 for guidance on determining the applicable antenna gain)
c) Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).
d) For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).
e) Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:
E = EIRP – 20log D + 104.8
where:
E = electric field strength in dBμV/m,
EIRP = equivalent isotropic radiated power in dBm
D = specified measurement distance in meters.
f) Compare the resultant electric field strength level to the applicable limit.
g) Perform radiated spurious emission test

Additional consideration was given to unwanted emissions radiating from the EUT cabinet, control circuits, power leads, or intermediate circuit elements by performing a radiated test to ensure that emissions emanating from the EUT cabinet (rather than the antenna port) also comply with the applicable limits. For these cabinet radiated spurious emission measurements the EUT transmit antenna was replaced with a 50 Ohm termination matching the nominal impedance of the antenna.

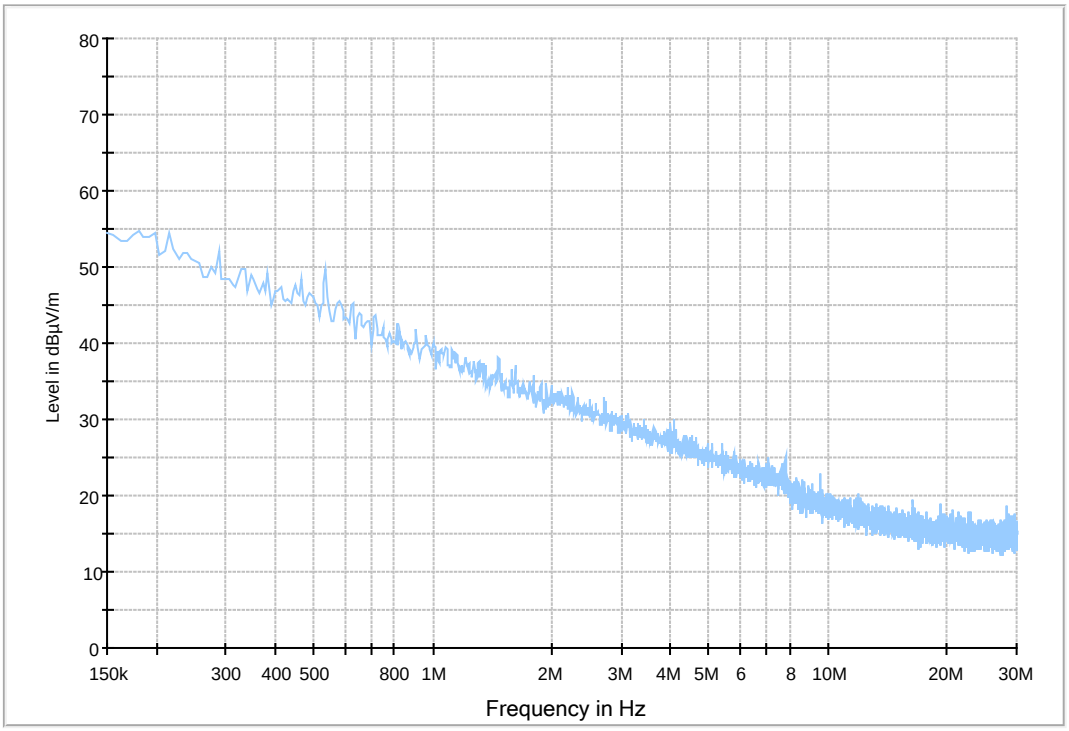
The measurement results are obtained as described below:
E [dBμV/m] = Un-Corrected Value + ATOT
Where ATOT is total correction factor including cable loss, antenna factor and preamplifier gain (ATOT = LCABLES + AF - AMP).

DEVICE DESCRIPTIONS: As described in the above EUT description and setup section.

EMISSIONS DATA:

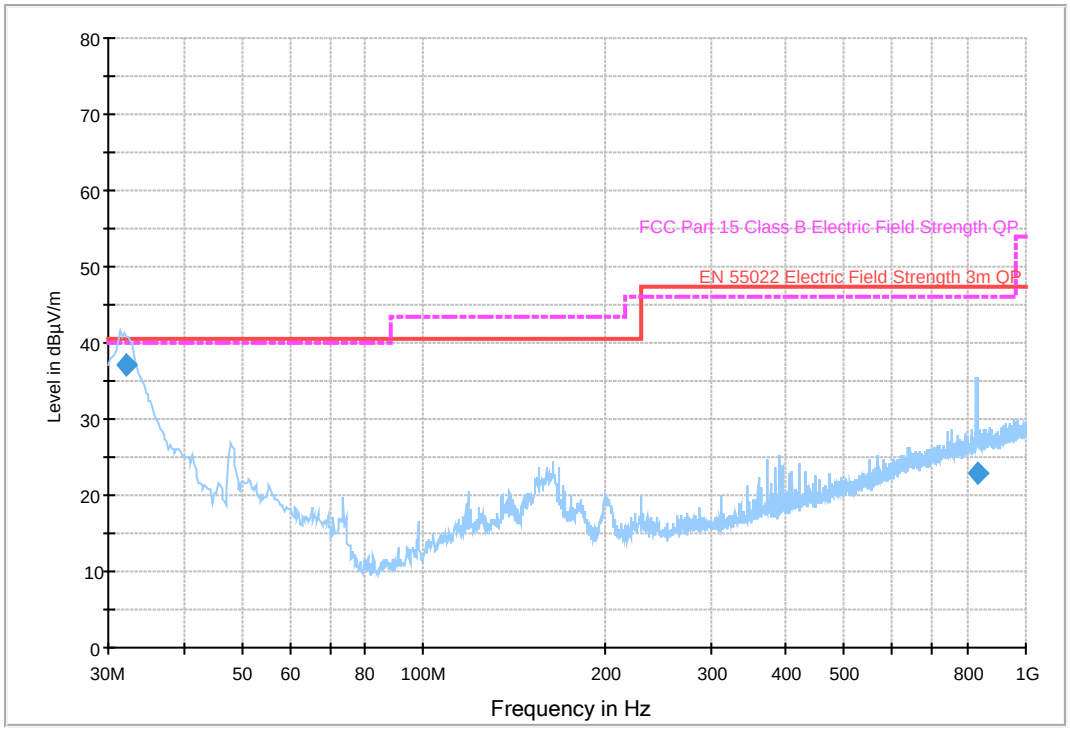
Note:

1. Pre-test has been performed on the different modulation of the EUT to find out the worst case which is **Modulation 802.11b.**
2. Radiated Emissions test was performed from 9 kHz-25GHz, except the emissions reported below, all other signals were more than 20dB lower than the limit.
3. Emissions over the limit line in the above plot were the fundamental transmitting frequency.



Radiated Emissions 150k-30MHz

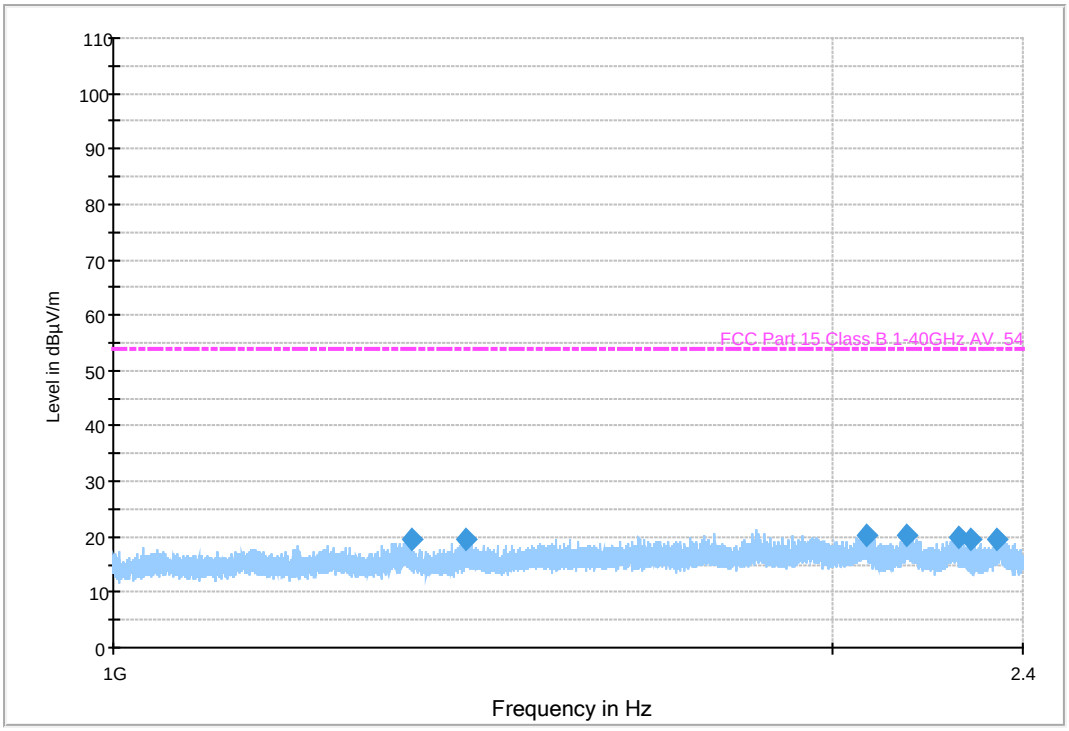
*Emissions were measured below 30MHz but no emissions were found that were 20dB below the permissible limits.



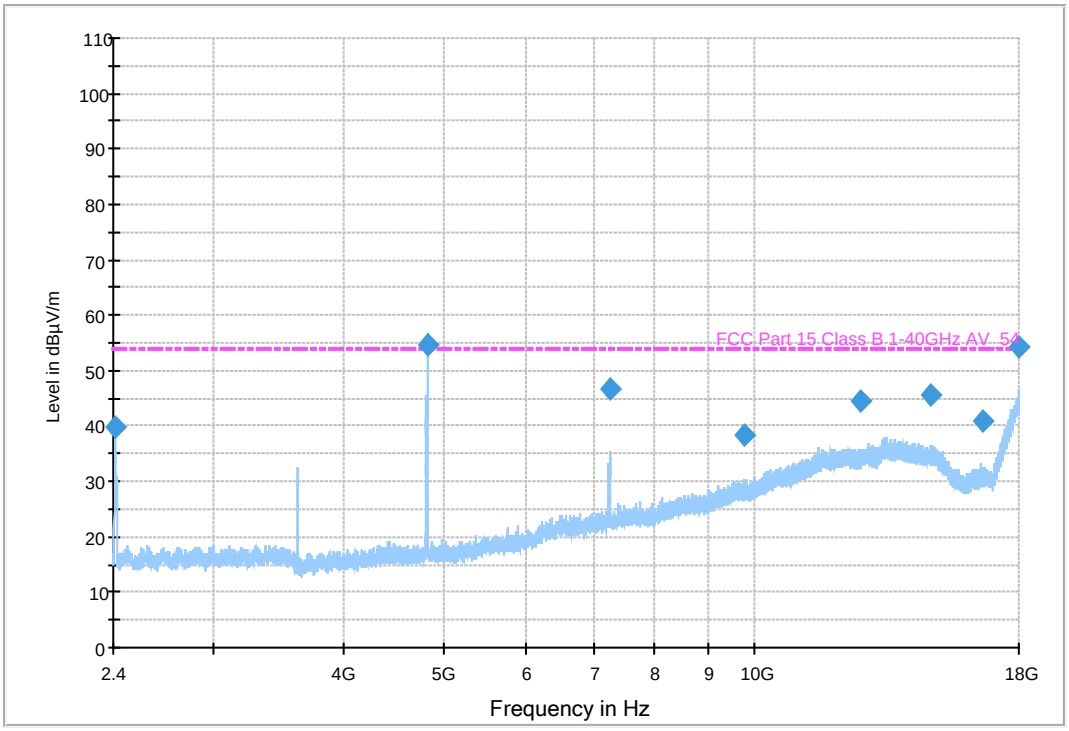
Radiated Spurious Emissions Plot: 30MHz – 1GHz_ Modulation 802.11b, Channel 1

Radiated Spurious Emissions Data: 30MHz – 1GHz_Modulation 802.11b, Channel 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
32.048100	37.2	1000	120	100.0	V	88.0	19.6	3.3	40.5
831.895100	22.8	1000	120	400.0	H	109.0	25.0	24.7	47.5



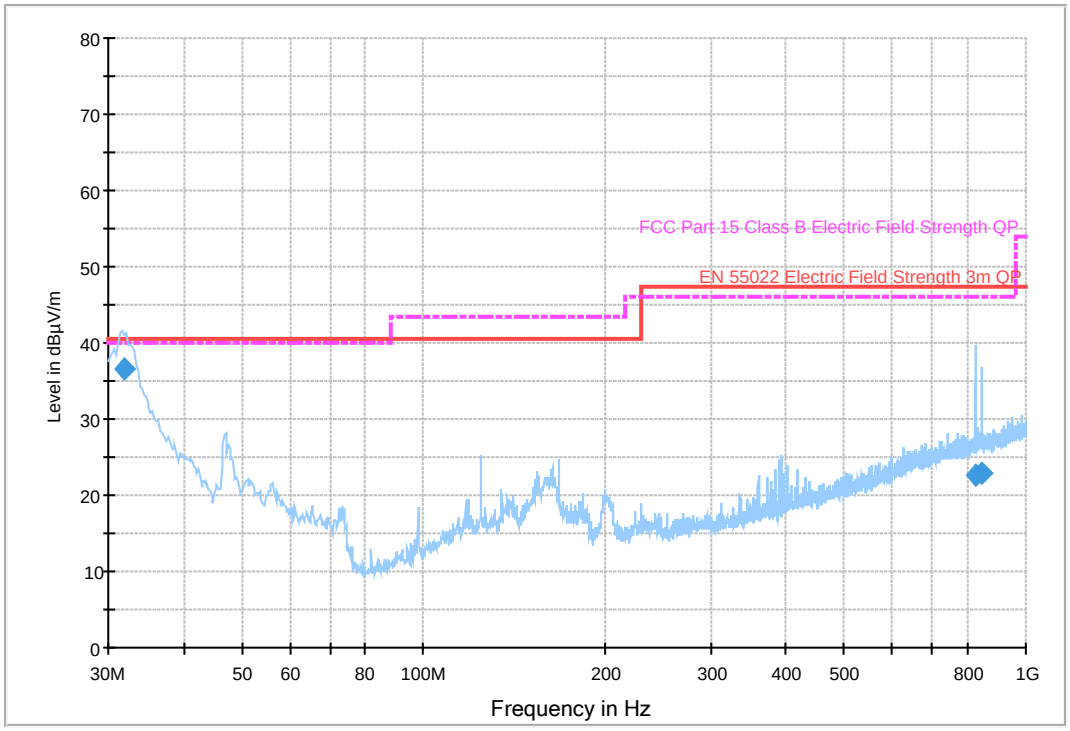
Radiated Spurious Emissions Plot: 1GHz – 2.4GHz_Modulation 802.11b, Channel 1



Radiated Spurious Emissions Plot: 2.4GHz – 18GHz_Modulation 802.11b, Channel 1
Note1: 2.412GHz is fundamental frequency
Note 2: A 2700+ MHz Mini-Circuits Hi-pass filter used to prevent saturation of receiver.

Radiated Spurious Emissions Data: 2.4GHz – 18GHz_Modulation 802.11b, Channel 1

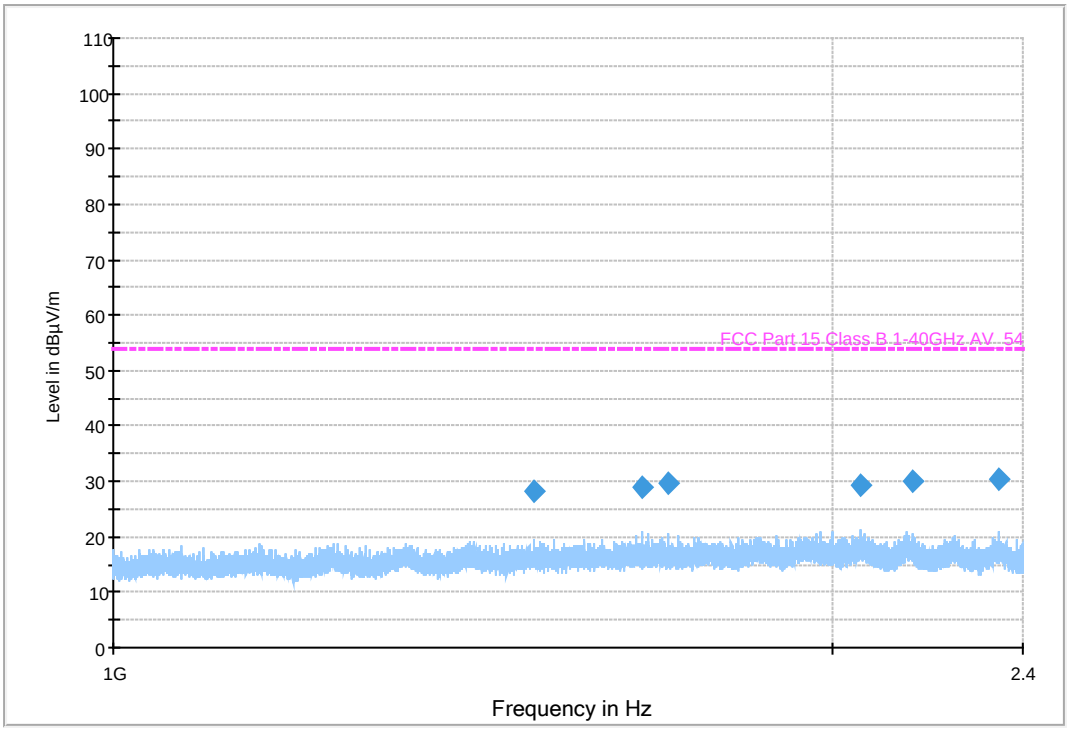
Frequency	MxPeak Meas'd	AvePeak Meas'd	Corr.	Duty Cycle Corcctn Factor	Antenna height	Polarity	Turntable position	MaxPeak Corrctd	AvePeak Corrctd	Limit
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	dB	(cm)		(deg)	(dBµV/m)	(dBµV/m)	(dBµV/m)
3617.840	42.9	41.83	15.1	-26.5	200	H	240	31.5	30.4	54
4823.673	54.52	38.46	10.6	-26.5	123.3	V	180.6	38.62	22.5	54
7237.610	42.62	28.33	23.8	-26.5	167	V	103	39.9	25.6	54



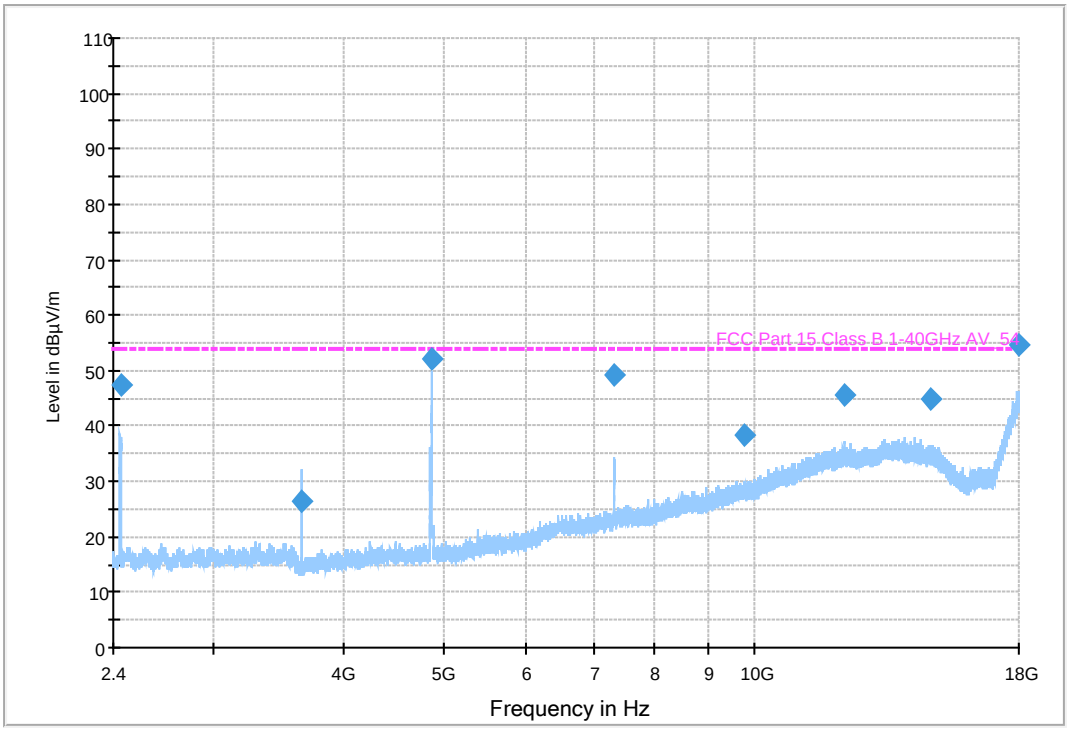
Radiated Spurious Emissions Plot: 30MHz – 1GHz_Modulation 802.11b, Channel 6

Radiated Spurious Emissions Data: 30MHz – 1GHz_Modulation 802.11b, Channel 6

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
32.450	37.9	1000.000	120.000	100.0	V	355.0	19.7	2.6	40.5



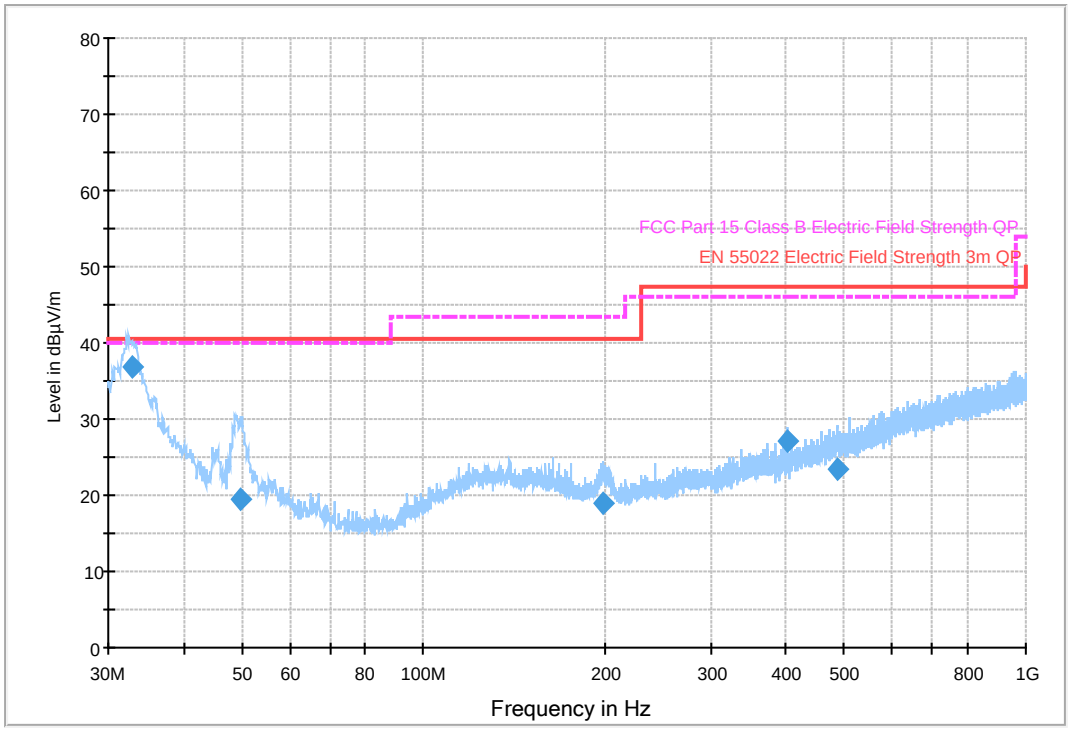
Radiated Spurious Emissions Plot: 1GHz – 2GHz_Modulation 802.11b, Channel 6



Radiated Spurious Emissions Plot: 2.4GHz – 18GHz_Modulation 802.11b, Channel 6
Note1: 2.437GHz is fundamental frequency
Note 2: A 2700+ MHz Mini-Circuits Hi-pass filter used to prevent saturation of receiver.

Radiated Spurious Emissions Data: 2.4GHz – 18GHz_Modulation 802.11b, Channel 6

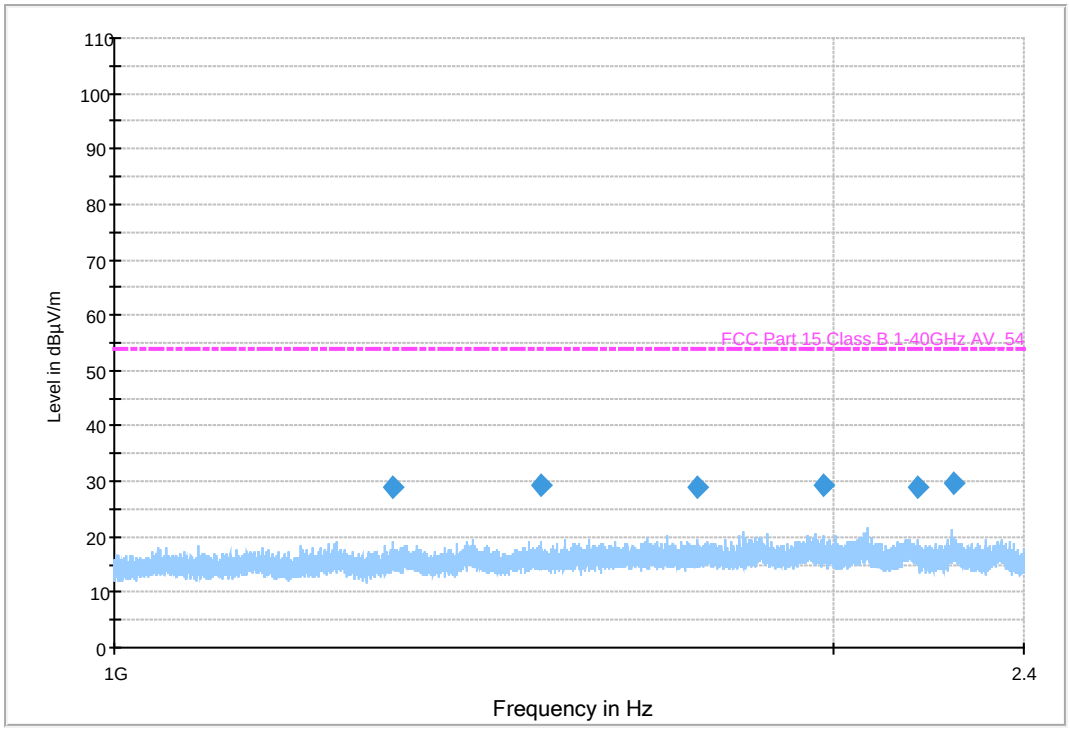
Frequency	MxPeak Meas'd	AvePeak Meas'd	Corr.	Duty Cycle Corcctn	Antenna height	Polarity	Turntable position	MaxPeak Corrctd	AvePeak Corrctd	Max_Peak Limit	AvePeak Limit
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	dB	(cm)		(deg)	(dBµV/m)	(dBµV/m)	(dBµV/m)	(dBµV/m)
3655.312	.37.4	42.3	15.1	-26.5	275	V	227	26.0	30.9	74	54
4873.593	61.2	51.7	10.6	-26.5	197	V	134	45.6	35.8	74	54
7310.855	42.9	28.3	23.8	-26.5	150	V	102	40.2	25.6	74	54



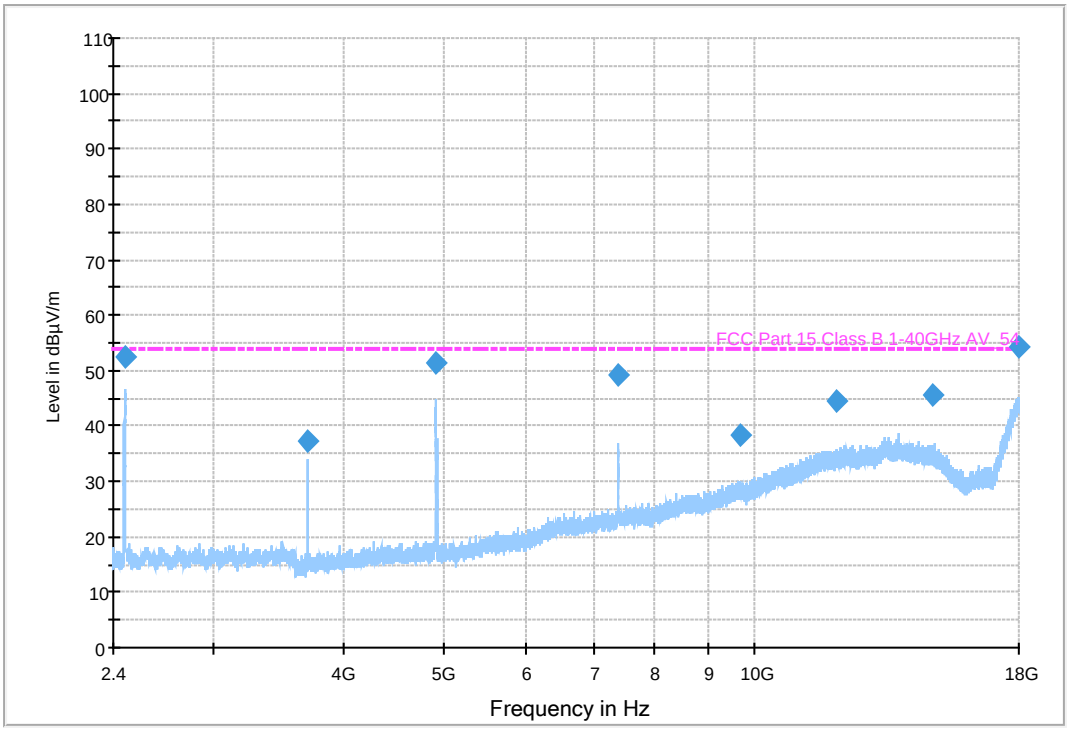
Radiated Spurious Emissions Plot: 30MHz – 1GHz_Modulation 802.11b, Channel 11

Radiated Spurious Emissions Data: 30MHz – 1GHz_Modulation 802.11b, Channel 11

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
33.221	38.2	1000	120	100	V	79.1	25.1	2.3	40.5
49.872760	19.1	1000	120	100	V	51.1	15.0	21.4	40.5



Radiated Spurious Emissions Plot: 1GHz – 2GHz_Modulation 802.11b, Channel 11



Radiated Spurious Emissions Plot: 2GHz – 18GHz_Modulation 802.11b, Channel 11
Note1: 2.462GHz is fundamental frequency
Note 2: A 2700+ MHz Mini-Circuits Hi-pass filter used to prevent saturation of receiver.

Radiated Spurious Emissions Data: 2GHz – 18GHz_Modulation 802.11b, Channel 11

Frequency	MxPeak Meas'd	AvePeak Meas'd	Corr.	Duty Cycle Factor	Antenna height	Polarity	Turntable position	MaxPeak Corrctd	AvePeak Corrctd	MaxPeak Limit	AvgPeak Limit
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	dB	(cm)		(deg)	(dBµV/m)	(dBµV/m)	(dBµV/m)	(dBµV/m)
3655.312	45.3	44.5	15.1	-26.5	182	V	100	33.9	33.1	74	54
4873.593	60.6	50.3	10.6	-26.5	222	H	130	44.7	34.4	74	54
7310.855	41.4	29.0	23.8	-26.5	158	V	105	38.7	26.3	74	54
9680.003	27.3	14.2	28	-26.5	194	V	153	28.8	15.7	74	54

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Part 8 - Radiated Spurious Emissions - Unintentional

DATE: Nov- 20-2014

TEST STANDARD: FCC Part 15.247 (d), FCC Part 15.209 (a) and ICES-003 Issue 5

TEST CONDITIONS: Indoor

MINIMUM STANDARD: Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20 dB below the level of the fundamental or to the general field strength limits listed in Rss-Gen Issue 4, whichever is less stringent.

In measuring unwanted emissions, the spectrum shall be investigated from 30 MHz or the lowest radio frequency signal generated in the equipment, whichever is lower, without going below 9 kHz, up to at least the frequency … if the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

Unwanted emissions falling into restricted bands of shall comply with the limits specified below

Frequency (MHz)	Field Strength	
	uV/m @ 3-m	Calculated dBµV/m at 3m
30 – 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
960 - 1000	500	54.0

TEST SETUP: The EUT was tested in our 3 m SAC and was positioned on the center of the turntable and connected to a 3Vdc battery. The transmitter was set for continuous transmission. The lowest, middle and highest channels in the 2400-2483.5 MHz band were measured for all radiated emissions 10kHz to 18 GHz. The EUT was pre-scanned in 3 different orthogonal orientations and was found to radiate highest when placed flat on the table top as indicated in the test photos.

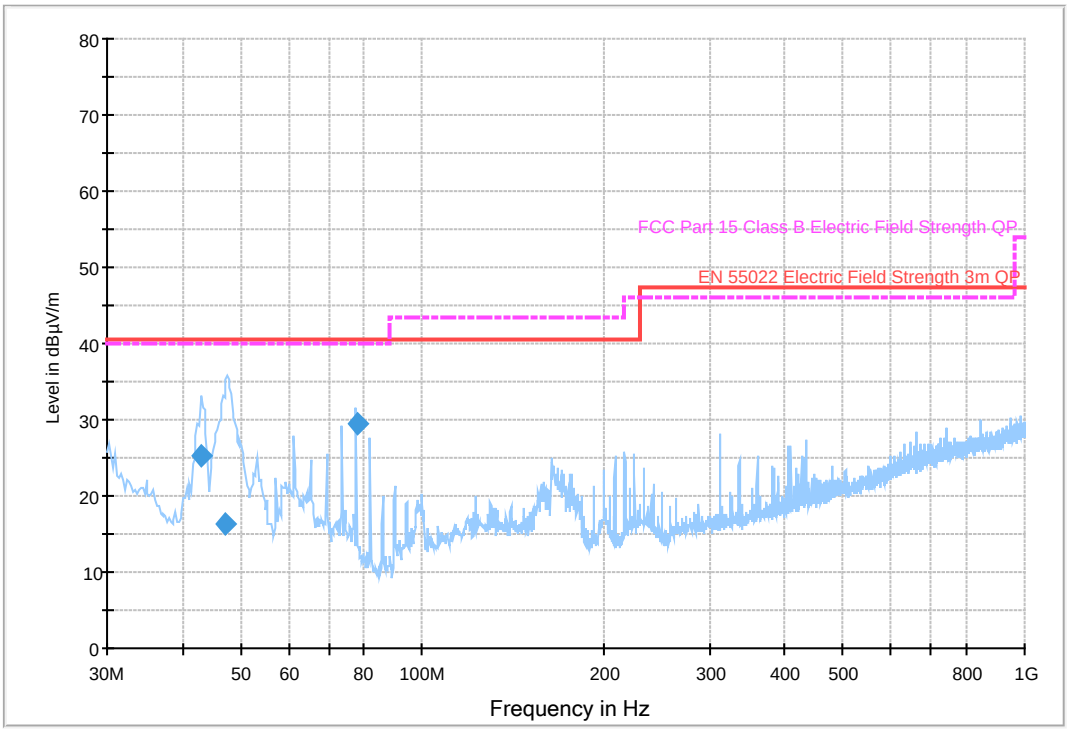
MEASUREMENT METHOD: Measurements were made using spectrum analyser and receiver, 200Hz RBW average detector for the frequency range 9-150KHz; 9kHz RBW average detector for the Frequency range 150kHz to 30MHz; 120kHz RBW quasi-peak detector using the appropriate antennas, amplifiers and filters.

The measurement results are obtained as described below:
E [dBµV/m] = Un-Corrected Value + ATOT
Where ATOT is total correction factor including cable loss, antenna factor and preamplifier gain (ATOT = LCABLES + AF - AMP).

DEVICE DESCRIPTIONS: As described in the above EUT description and setup section.

RESULTS: Pass: Complies.

DATA & PLOT:



Radiated Spurious Emissions Plot: Unintentional, 30MHz – 1GHz

Radiated Spurious Emissions Data: Unintentional, 30MHz – 1GHz

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
42.961800	25.3	1000.000	120.000	133.0	V	213.0	12.1	15.2	40.5
47.254800	16.2	1000.000	120.000	132.0	V	69.0	9.8	24.3	40.5
77.825000	29.5	1000.000	120.000	400.0	H	300.0	9.1	11.0	40.5

Note: All other emissions from 9KHz – 25GHz were more than 20dB lower than the limit line.

Part 9 - Duty Cycle Correction Factor For Radiated Emissions

DATE: Dec-24 -2014

TEST STANDARD: FCC Part 15.35 (d), FCC Part 15.209 (a) and ICES-003 Issue 5

TEST CONDITIONS: Indoor

MEASUREMENT METHOD: The FCC regulations provide an allowance for correcting pulsed transmissions when the limits are expressed in terms of an average, and the average measurement may be derived from the peak pulse amplitude corrected for the duty cycle.

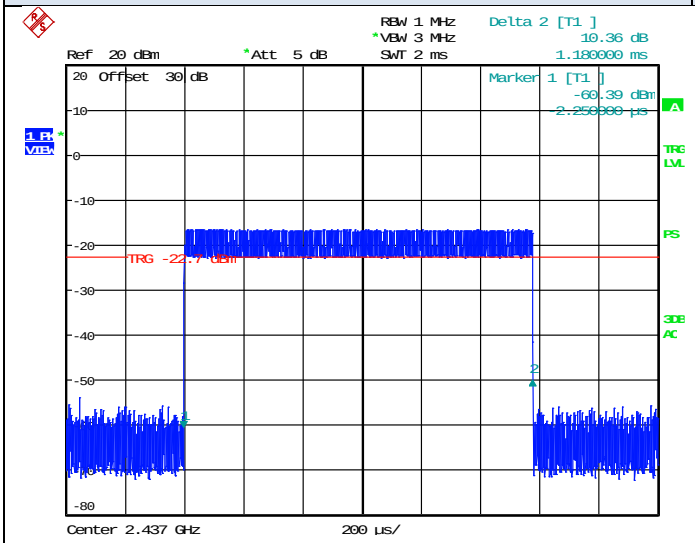
As detailed in 47 CFR Part 15.35(c), the correction factor of a transmission is a 100 ms capture of a characteristic pulse train of "on time". In the event that the pulse train is greater than 100 ms, the 100 ms pulse train captured must include a representation of worst-case "on time" pulses.

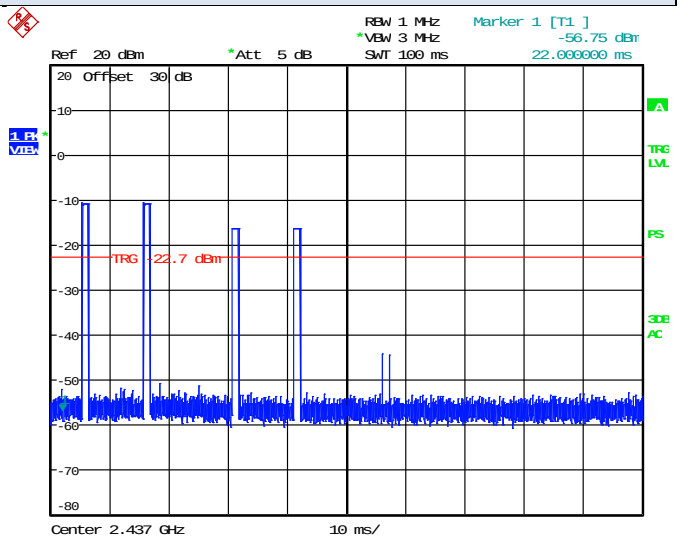
RESULTS:

Pulse Duration	1.18ms
Number of pulses	4
Total Transmission Duration	4x1.18ms = 4.72 ms
On Time within 100 msec	4.72msec
Duty cycle Correction factor	20log(4.72/100) = -26.5dB

DATA & PLOT:

DWELL TIME: 1.18 ms per puls	DWELL TIME OVER 100msec





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Part 10 - AC Mains Conducted Emissions

DATE: Dec-04-2014

TEST STANDARD: FCC 15.207 & RSS-210

TEST VOLTAGE: 120Vac, 60Hz

MINIMUM STANDARD: Class B Limit:

Frequency (MHz)	Conducted Limit (dBμV)	
	Quasi-Peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.5 - 5	56	46
5 - 30	60	50
Note 1 The lower limit shall apply at the transition frequencies Note 2 The limit decreases linearly with the logarithim of the frequency in the 0.15 to 0.50 MHz..		

TEST SETUP: The EUT was connected to the conducted emissions LISN apparatus.

METHOD OF MEASUREMENT: Measurements were made using a test receiver with 9 kHz bandwidth, CISPR Quasi-Peak and Average detector.

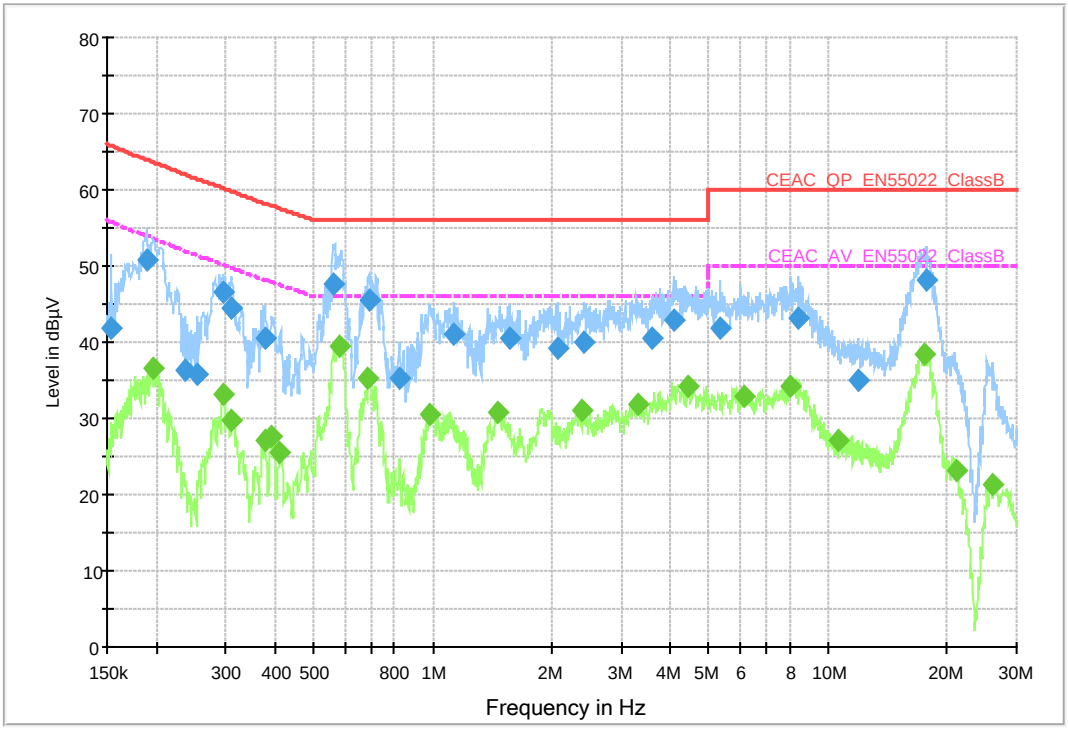
DEVICE DESCRIPTIONS: As described in the Equipment under Test Section, above.

CABLING DETAILS: Refer to Equipment Under Test Section for Cabling.

MODIFICATIONS: No modification is required to comply for this test.

PERFORMANCE: Complies with standard.

MEASUREMENT DATA & PLOT:



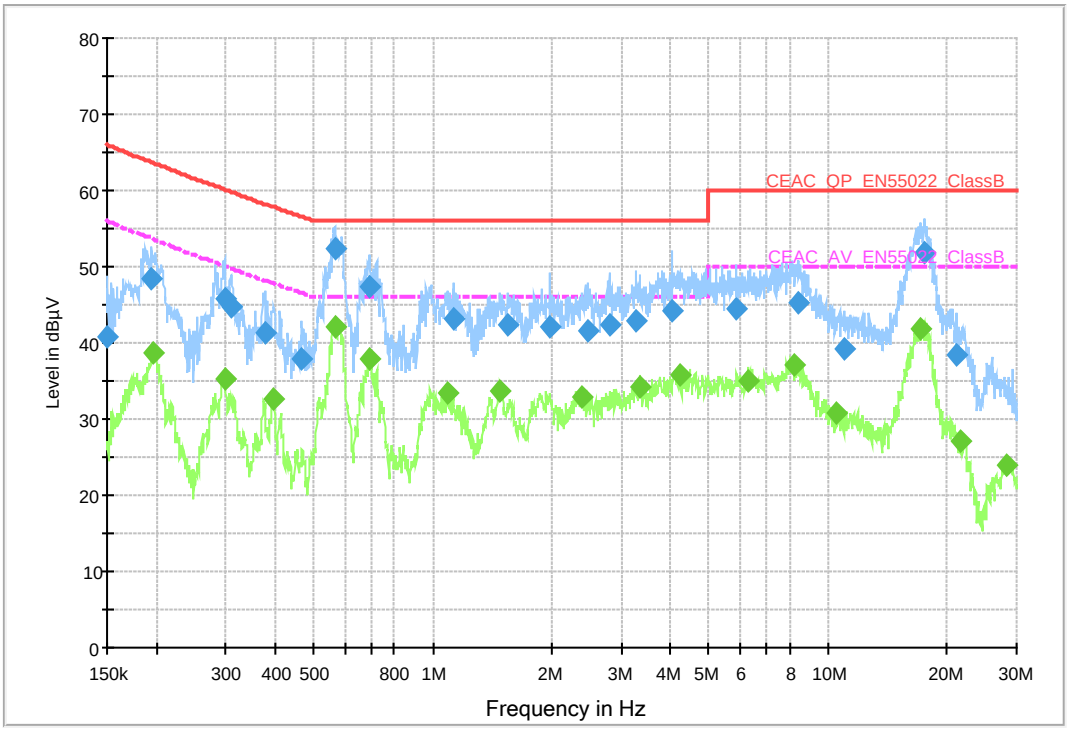
AC Mains Conducted Emissions- L1

Quasi-Peak Data Class B- AC Mains Conducted Emissions-L1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.153333	42.0	1000.000	9.000	Off	0.6	23.8	65.8
0.188370	50.7	1000.000	9.000	Off	0.5	13.3	64.0
0.236083	36.4	1000.000	9.000	Off	0.5	25.6	62.0
0.253183	35.7	1000.000	9.000	Off	0.4	25.7	61.4
0.294701	46.7	1000.000	9.000	Off	0.4	13.5	60.2
0.309176	44.5	1000.000	9.000	Off	0.4	15.3	59.8
0.375297	40.5	1000.000	9.000	Off	0.4	17.7	58.2
0.558537	47.6	1000.000	9.000	Off	0.4	8.4	56.0
0.690288	45.5	1000.000	9.000	Off	0.5	10.5	56.0
0.821339	35.2	1000.000	9.000	Off	0.5	20.8	56.0
1.132988	41.0	1000.000	9.000	Off	0.5	15.0	56.0
1.562891	40.4	1000.000	9.000	Off	0.5	15.6	56.0
2.075607	39.3	1000.000	9.000	Off	0.5	16.7	56.0
2.406337	39.9	1000.000	9.000	Off	0.5	16.1	56.0
3.574089	40.6	1000.000	9.000	Off	0.6	15.4	56.0
4.061622	42.8	1000.000	9.000	Off	0.6	13.2	56.0
5.351125	41.9	1000.000	9.000	Off	0.6	18.1	60.0
8.388464	43.3	1000.000	9.000	Off	0.6	16.7	60.0
11.923436	35.1	1000.000	9.000	Off	0.6	24.9	60.0
17.709662	48.2	1000.000	9.000	Off	0.7	11.8	60.0

Average Data Class B- AC Mains Conducted Emissions-L1

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.196442	36.7	1000.000	9.000	Off	0.5	16.9	53.6
0.295290	33.1	1000.000	9.000	Off	0.4	17.0	50.1
0.311035	29.6	1000.000	9.000	Off	0.4	20.1	49.7
0.375297	27.2	1000.000	9.000	Off	0.4	21.0	48.2
0.392162	27.5	1000.000	9.000	Off	0.4	20.4	47.9
0.411425	25.6	1000.000	9.000	Off	0.4	21.9	47.5
0.578990	39.6	1000.000	9.000	Off	0.4	6.4	46.0
0.687535	35.3	1000.000	9.000	Off	0.5	10.7	46.0
0.983144	30.5	1000.000	9.000	Off	0.5	15.5	46.0
1.466093	30.7	1000.000	9.000	Off	0.5	15.3	46.0
2.387182	31.0	1000.000	9.000	Off	0.5	15.0	46.0
3.306162	31.8	1000.000	9.000	Off	0.6	14.2	46.0
4.426001	34.2	1000.000	9.000	Off	0.6	11.8	46.0
6.166707	32.9	1000.000	9.000	Off	0.6	17.1	50.0
8.011703	34.2	1000.000	9.000	Off	0.6	15.8	50.0
10.576406	27.2	1000.000	9.000	Off	0.6	22.8	50.0
17.603828	38.5	1000.000	9.000	Off	0.7	11.5	50.0
21.113964	23.0	1000.000	9.000	Off	0.8	27.0	50.0
25.938514	21.4	1000.000	9.000	Off	0.9	28.6	50.0



AC Mains Conducted Emissions- L2

Quasi-Peak Data Class B- AC Mains Conducted Emissions-L2

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	40.7	1000.000	9.000	Off	0.6	25.3	66.0
0.194878	48.4	1000.000	9.000	Off	0.5	15.3	63.7
0.297065	45.8	1000.000	9.000	Off	0.4	14.3	60.1
0.309176	44.6	1000.000	9.000	Off	0.4	15.2	59.8
0.376800	41.2	1000.000	9.000	Off	0.4	17.0	58.2
0.466613	37.8	1000.000	9.000	Off	0.4	18.7	56.5
0.564145	52.4	1000.000	9.000	Off	0.4	3.6	56.0
0.691669	47.5	1000.000	9.000	Off	0.5	8.5	56.0
1.132988	43.1	1000.000	9.000	Off	0.5	12.9	56.0
1.544267	42.3	1000.000	9.000	Off	0.5	13.7	56.0
1.974477	42.1	1000.000	9.000	Off	0.5	13.9	56.0
2.474597	41.6	1000.000	9.000	Off	0.5	14.4	56.0
2.795346	42.4	1000.000	9.000	Off	0.6	13.6	56.0
3.260244	42.9	1000.000	9.000	Off	0.6	13.1	56.0
4.045424	44.3	1000.000	9.000	Off	0.6	11.7	56.0
5.854537	44.5	1000.000	9.000	Off	0.6	15.5	60.0
8.371720	45.3	1000.000	9.000	Off	0.6	14.7	60.0
10.963699	39.3	1000.000	9.000	Off	0.6	20.7	60.0
17.498626	51.9	1000.000	9.000	Off	0.7	8.1	60.0
21.113964	38.3	1000.000	9.000	Off	0.8	21.7	60.0

Average Data Class B- AC Mains Conducted Emissions-L2

0.196442	38.6	1000.000	9.000	Off	0.5	15.0	53.6
0.297659	35.3	1000.000	9.000	Off	0.4	14.8	50.1
0.392946	32.6	1000.000	9.000	Off	0.4	15.2	47.8
0.566404	42.1	1000.000	9.000	Off	0.4	3.9	46.0
0.688910	37.8	1000.000	9.000	Off	0.5	8.2	46.0
1.090784	33.4	1000.000	9.000	Off	0.5	12.6	46.0
1.483774	33.6	1000.000	9.000	Off	0.5	12.4	46.0
2.387182	32.9	1000.000	9.000	Off	0.5	13.1	46.0
3.346035	34.3	1000.000	9.000	Off	0.6	11.7	46.0
4.218774	35.7	1000.000	9.000	Off	0.6	10.3	46.0
6.266068	35.1	1000.000	9.000	Off	0.6	14.9	50.0
8.189733	37.1	1000.000	9.000	Off	0.6	12.9	50.0
10.492216	30.7	1000.000	9.000	Off	0.6	19.3	50.0
17.049968	41.8	1000.000	9.000	Off	0.7	8.2	50.0
21.756328	27.0	1000.000	9.000	Off	0.8	23.0	50.0
28.322060	23.9	1000.000	9.000	Off	0.9	26.1	50.0

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Part 11 - Frequency Stability

DATE: Dec-10-2014

TEST STANDARD: FCC Part 15.215(c) and Rss-Gen Issue 4 Issue 8 (8.11)

MINIMUM STANDARD: Not specified.
Rss-Gen Issue 4 (8.8):Transmitter frequency stability for licence-exempt radio apparatus shall be measured in accordance with Section 6.11. For licence-exempt radio apparatus, the frequency stability shall be measured at temperatures of -20°C (-4°F), +20°C (+68°F) and +50°C (+122°F) instead of at the temperatures specified in Section 6.11. If the frequency stability of the licence-exempt radio apparatus is not specified in the applicable standard (RSS), measurement of the frequency stability is not required provided that the occupied bandwidth of the licence-exempt radio apparatus lies entirely outside the restricted bands and the prohibited TV bands of 54-72 MHz, 76-88 MHz, 174-216 MHz, 470-608 MHz and 614-806 MHz.
FCC (15.215(c): The 20dB bandwidth must remain within the designated frequency band over the expected variations in temperature and voltage range

TEST SETUP: The EUT was bench tested and in our temperature chamber. Due to the outdoor location and mounting method of the EUT, the EUT voltage and temperature range was specified by the manufacturer and verified at 2.6, 3 and 5Vdc; +50 to -30º Celsius. The transmitter was set for Carrier Wave (CW) mode and the lowest and highest channel Frequency was measured at each Temperature setting, after the Transmitter stabilized at the temperature.

MEASUREMENT METHOD: Measurements were made using a Spectrum Analyzer with 120kHz RBW Average detector while directly connected to the EUT through the antenna port.

DEVICE DESCRIPTIONS: As described in the above EUT description and setup section

Measurement Data:

Temp	Chnnl	Pk Pwr Freq.	Peak Pwr	Meas. Time	Bandwidth	Corr.	EIRP**	ERP**	Results
(DegC)	(MHz)	(MHz)	dBm	(ms)	(kHz)	(dB)	dBm	dBm	(KHz)
23.20	**Lo(2412.0)**	2411.966800	35.90	1000	1000	20	-59.26	-61.41	
23.20	**Mid(2437.0)**	2437.566800	35.48	1000	1000	20	-59.68	-61.83	
23.20	**Hi(2462.0)**	2462.166800	34.50	1000	1000	20	-60.66	-62.81	
-10.00	**Lo(2412.0)**	2411.847500	48.25	1000	120	30	-46.91	-49.06	119.30
-10.00	**Mid(2437.0)**	2437.165000	47.02	1000	120	30	-48.14	-50.29	401.80
-10.00	**Hi(2462.0)**	2461.876400	46.92	1000	120	30	-48.24	-50.39	290.40
5.00	**Lo(2412.0)**	2412.137500	46.86	1000	120	30	-48.30	-50.45	-170.70
5.00	**Mid(2437.0)**	2437.130000	46.62	1000	120	30	-48.54	-50.69	436.80
5.00	**Hi(2462.0)**	2461.822500	45.83	1000	120	30	-49.33	-51.48	344.30
45.00	**Lo(2412.0)**	2411.767500	46.49	1000	120	30	-48.67	-50.82	199.30
45.00	**Mid(2437.0)**	2436.650000	45.41	1000	120	30	-49.75	-51.90	916.80
45.00	**Hi(2462.0)**	2461.910000	44.42	1000	120	30	-50.74	-52.89	256.80
50.00	**Lo(2412.0)**	2411.840000	45.42	1000	120	30	-49.74	-51.89	126.80
50.00	**Mid(2437.0)**	2437.065000	45.05	1000	120	30	-50.11	-52.26	501.80
50.00	**Hi(2462.0)**	2461.837500	44.35	1000	120	30	-50.81	-52.96	329.30

Part 12 - RF Exposure Evaluation

FCC 1.1310 states the criteria listed in the table below shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Section 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Section 2.1093. Further information on evaluating compliance with these limits can be found in the FCC's OST/OET Bulletin Number 65, "Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radiofrequency Radiation".

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (s)
(A) Limits for Occupational/Control Exposures				
300-1500	-	-	F/300	6
1500-100,000	-	-	5	6
(B) Limits for General Population/Uncontrolled Exposures				
300-1500	-	-	F/1500	6
1500-100,000	-	-	1	30

1.1 EUT OPERATING CONDITION

- The antenna used for this product is a Chip antenna and is designed for a Peak antenna gain of 2 dBi (peak)
- Highest measured conducted output level = **18.16 dBm**
- From Table 1, the Maximum Power Density safe exposure level for General Population Uncontrolled
- Exposure of 30 Seconds for the frequency range of 2.4 to 2.4835GHz is 1mW/cm2

Conducted Output Power (dBm)	Max Antenna Gain (dBi)	Max EIRP (mW)	Power Density Limit Allowed (mW/cm^2)	Safe distance (cm)
18.16	**2**	**103.75**	**1**	**2.87**

1.2 RF EXPOSURE EVALUATION DISTANCE CALCULATION

$$d = \sqrt{\left(\frac{EIRP}{4\pi S}\right)}$$

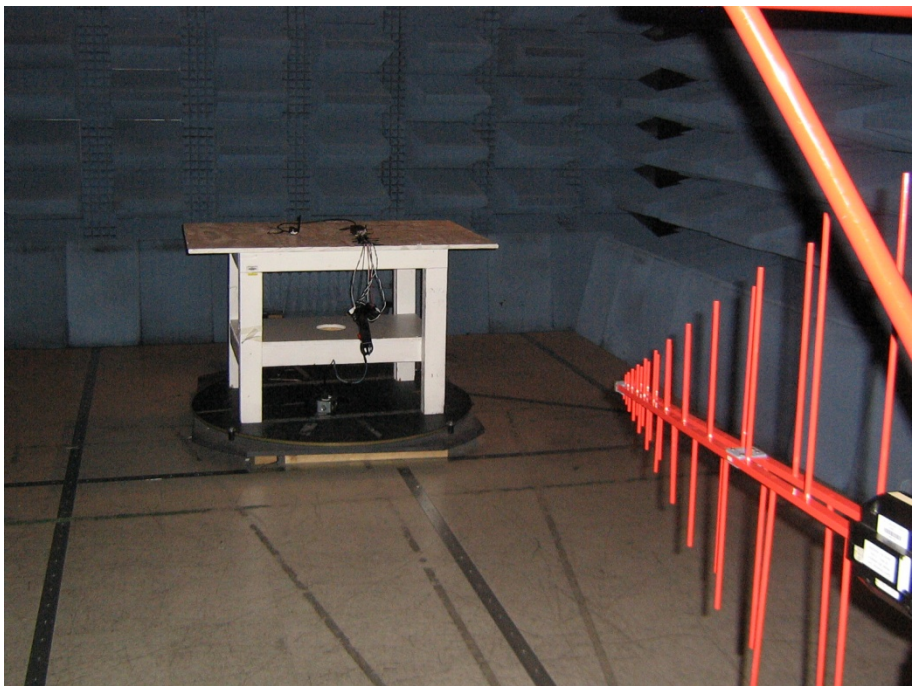
where:
d = Distance to the center of radiation of the antenna (cm) for the allowable Power Density
S = Allowable Power density Limit (mW/cm2)
EIRP = Equivalent isotropically radiated power (mW) = 10 [TX Power (dBm) + Ant Gain (dBi)/10]

As shown above, the minimum distance where the MPE limit is reached is **2.87 cm** from the EUT with the **2dBi** antenna.

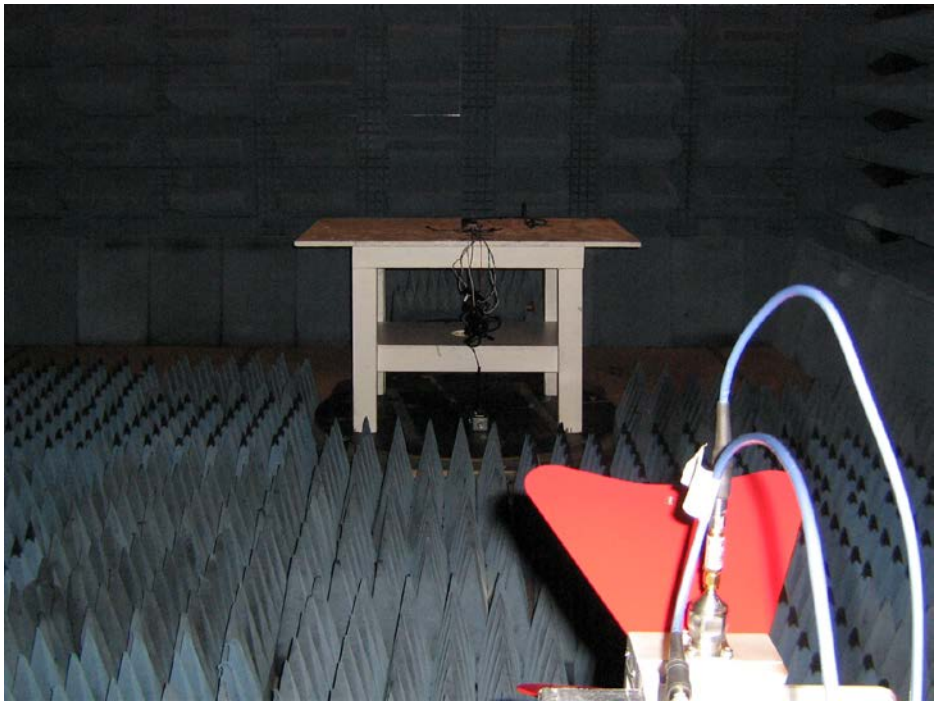
It is recommended that the unit is positioned so that the typical distance from the antenna to the end user is 20cm or greater.

Appendix A: EUT photos during the testing

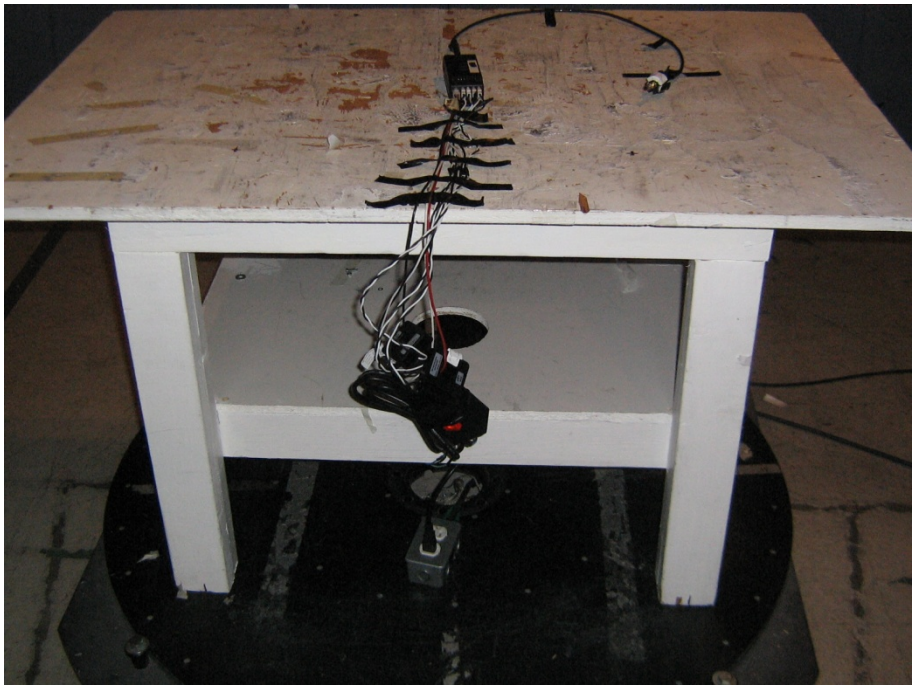
Radiated Emission Test Setup – below 30MHz



Radiated Emission Test Setup - 30MHz- 1GHz



Radiated Emission Test Setup – 1GHz- 18GHz



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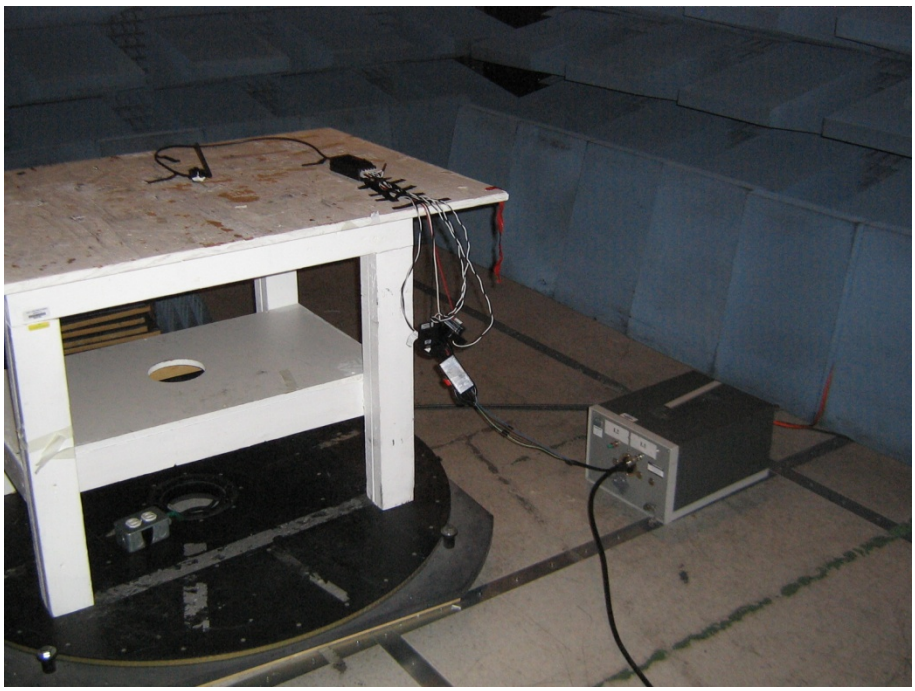
Radiated Emission Test Setup



Conducted Emission Test Setup