QAI Laboratories
3980 North Fraser Way
Burnaby, BC, V5J 5K5 Canada

ELECTROMAGNETIC COMPATIBILITY TEST REPORT

PREPARED FOR NEURIO TECHNOLOGY INC.
BY QAI LABORATORIES

Report Reference Number:	E10720-1605-Neurio Rev 2.0
Total Number of Pages:	40
Date of Issue:	Sept 29, 2016

EMC Test Laboratory:	**QAI Laboratories Inc.**
Address:	3980 North Fraser Way, Burnaby, BC, V5J 5K5 Canada
Phone:	(604) 527-8378
Fax:	(604) 527-8368

Laboratory Accreditations (per ISO/IEC 17025:2005):

American Association for Laboratory Accreditation Certificate Number: 3657.02

This report has been completed in accordance with the requirements of ISO/IEC 17025. Test results contained in this report are within QAI Laboratories ISO/IEC 17025 accreditation. QAI Laboratories authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for the use by the company's employees only.

EMC Client:	Neurio Technology Inc.
Address:	Suite 201 – 43 W. Hastings St. Vancouver, BC, Canada V6B1G4
Phone:	(604) 224-8756
Fax:	

Applicable Test Standards:	FCC Title 47 Part 15 Subpart C & Subpart B, RSS-247 Issue 1, RSS-Gen Issue 4, ICES-003 Issue 6, ETSI EN 301 489-1 V1.9.2 & ETSI EN 300 328 V1.8.1

Equipment Tested	Stand-Alone Radio Module
Model Number:	W1
FCC ID:	W72-W1
IC Certification Number:	8253A-W1
Manufacturer:	Neurio Technology Inc.

REVISION HISTORY

Date	Report Number	Rev #	Details	Author's Initials
Sept 2 2016	E10720-1605	0.0	Draft report	AJ
Sept 11 2016	E10720-1605	1.0	Final report	AJ
Sept 29 2016	E10720-1605	2.0	Final report	JQ

All previous versions of this report have been superseded by the latest dated revision as listed in the above table.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.

REPORT AUTHORIZATION

The data documented in this report is for the test equipment provided by Neurio Technology Inc. Tests were conducted on the sample equipment as requested by Neurio Technology Inc. for the purpose of demonstrating compliance with FCC Title 47 Part 15 Subpart C & Subpart B, RSS-247 Issue 1, RSS-Gen Issue 4, ICES-003 Issue 6, ETSI EN 301 489-1 V1.9.2 & ETSI EN 300 328 V1.8.1 as agreed upon by Neurio Technology Inc. as per Quote 16SH05112.

Neurio Technology Inc. is responsible for the tested product configuration, continued product compliance, and for the appropriate auditing of subsequent products as required. This report may comprise partial list of tests that are required for FCC or IC Declaration of Conformity and can only be produced by the manufacturer.

This is to certify that the following report is true and correct to the best of our knowledge.

X 

Written by Jack Qin
RF/EMC Test Engineer/Technical Writer

X 

Reviewed by Arnan Jathaul,
EMC Project Manager

QAI FACILITIES

Founded in 1994 by a group of experienced certification and testing experts, QAI is an independent third-party testing, inspection and certification organization which serves the building industry, government and individuals with cost effective solutions through our in-house capabilities / services, and an established world-wide network of qualified affiliates. To help get your product to market, trust the provider that many leading global manufacturers do: QAI.

British Columbia
QAI Laboratories Inc.
Main Laboratory/Headquarters
3980 North Fraser Way,
Burnaby, BC V5J Canada

Ontario
QAI Laboratories Inc.
1081 Meyerside Drive, Unit #14
Mississauga, ON L5T 1M4 Canada

Washington
QAI Laboratories Ltd.
834 80TH Street SW, Suite 200,
Everett, WA 98203-7008 USA

Virginia
QAI Laboratories Ltd.
1047 Zachary Taylor Hwy,
Suite A Huntly, VA 22640 USA

California
QAI Laboratories Ltd.
8385 White Oak Avenue Rancho
Cucamonga, CA 91730 USA

Oklahoma
QAI Laboratories Ltd.
108th East Avenue,
Tulsa, OK 74116 USA

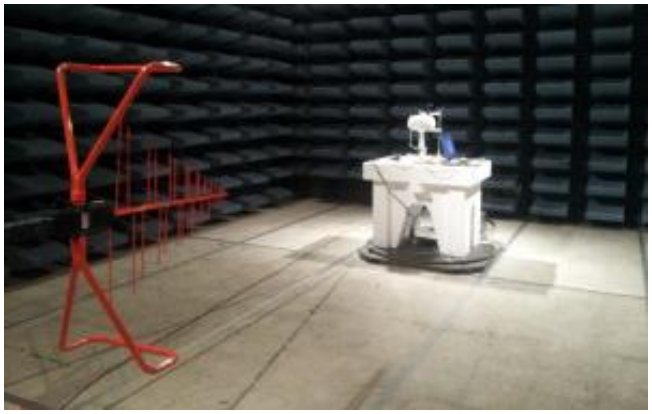
QAI EMC ACCREDITATION

QAI EMC is your one-stop regulatory compliance partner for electromagnetic compatibility (EMC) and electromagnetic interference (EMI). Products are tested to the latest and applicable EMC/EMI requirements for domestic and international markets. QAI EMC goes above and beyond being a testing facility—we are your regulatory compliance partner. QAI EMC has the capability to perform RF Emissions and Immunity for all types of electronics manufacturing including Industrial, Scientific, Medical, Information Technology, Telecom, Wireless, Automotive, Marine and Avionics.

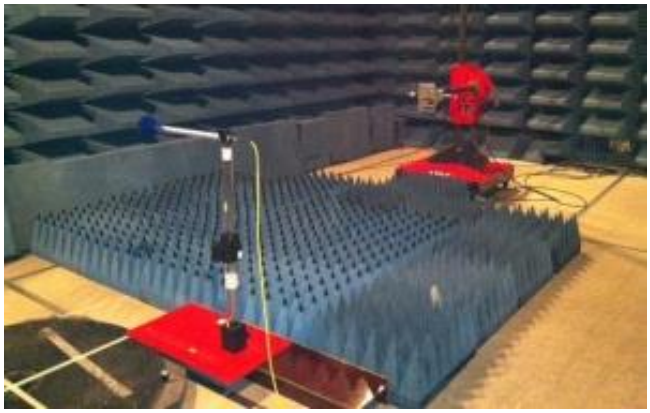
EMC Laboratory Location	FCC Designation (3m SAC)	IC Registration (3m SAC)	A2LA Certificate
Burnaby, BC Canada	CA9543	21146-1	3657.02
Everett, Washington USA	307482	11876A-1	3657.02

Headquarters & EMC Laboratory in Burnaby, BC

EMC Laboratory in Everett, Washington



3 m Semi-Anechoic Chamber (SAC) in Burnaby, BC



3 m Semi-Anechoic Chamber (SAC) in Burnaby, BC

10 m Open Area Test Site (OATS) in British Columbia, Canada

5 m Semi-Anechoic Chamber (SAC) in Everett, Washington

5 m Semi-Anechoic Chamber (SAC) in Everett, Washington

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Section I: EXECUTIVE SUMMARY

1.1 Purpose

The purpose of this report is to demonstrate and document the compliance of "W1" device as per Sections 1.2 & 1.3.

1.2 Scope

This report is prepared to demonstrate the compliance of W1 device manufactured by Neurio Technology Inc. under Class II permissive changes as per FCC and IC permissive change policies.

Following modifications was performed on original equipment certified under FCC ID W72-W1 and IC 8253A-W1.

- Added RS485 Transceiver.
- Upgraded power supply module to a nearly identical version with an extended temperature range.
-

The information documented in this report is based on the test methods and levels as per Quote SH-2015-032702:

- **FCC Title 47 Part 15 –** Radio Frequency Devices, Subpart C – Intentional Radiators. 15.205 Restricted Bands of Operation
- **FCC Title 47 Part 15 –** Radio Frequency Devices, Subpart C – Intentional Radiators. 15.207 Conducted Limits
- **FCC Title 47 Part 15 –** Radio Frequency Devices, Subpart C – Intentional Radiators. 15.209 Radiated Emissions Limits: General Requirements
- **FCC Title 47 Part 15 –** Radio Frequency Devices, Subpart C – Intentional Radiators. 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz
- **RSS-247 Issue 1 –** Digital Transmission Systems, Frequency Hopping Systems & License Exempt Local Area Network Device
- **RSS-Gen Issue 4 –** General Requirements and Information for the Certification of Radio Apparatus – Section 3.2 Modular Approvals for Category I Equipment or Category II Equipment
- **ICES-003 Issue 6 –** Digital Apparatus Spectrum - Information Technologies and Telecommunications
- **CFR Title 47 FCC Part 15 –** Radio Frequency Devices, Subpart B – Unintentional Radiators.

The tests documented in this report were performed in accordance with ANSI C63.4-2014, ANSI C63.10-2013, RSS-Gen Issue 4 and FCC KDB 558074 D01 DTS Meas Guidance v03r05.

1.3 Summary of Results

The following tests demonstrate the testimony to "FCC, IC & CE" Mark Electromagnetic compatibility testing for "W1" manufactured by Neurio Technology Inc.

The following testing was performed pursuant to FCC Title 47 Part 15 Subpart B & Subpart C

Test or Measurement	Applicable FCC Rule Parts	Description	Performance Criteria
RF Peak Power Output	FCC Part 15.247 (b)(3)	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
Radiated Spurious Emissions – Transmit Mode	FCC Part 15.247 (d), FCC Part 15.209 (a), FCC Part 15.205	Radiated emissions requirements as stated in the Standards.	Complies
Conducted Spurious Emissions	FCC Part 15.247 (d), FCC Part 15.209 (a)	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
Radiated Spurious Emissions – Receive Mode	FCC Part 15.247 (d), FCC Part 15.209 (a)	Radiated emissions requirements as stated in the Standards	Complies
RF Exposure	FCC 47 CFR §1.1310	RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm	Complies
Power Line Conducted Emissions	FCC Part 15.207	The Conducted Emissions are measured on the phase and Neutral Power lines in the 0.15 - 30.0 MHz range.	Complies

The following testing was performed pursuant to Industry Canada ICES-003 Issue 6

Test or Measurement	Applicable Industry Canada Rule Parts	Description	Performance Criteria
RF Peak Power Output	RSS 247	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
Radiated Spurious Emissions – Transmit Mode	RSS-247 & RSS-Gen Issue 4	Radiated emissions requirements as stated in the Standards.	Complies
Conducted Spurious Emissions	RSS 247	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
Radiated Spurious Emissions – Receive Mode	ICES-003 Issue 6	Radiated emissions requirements as stated in the Standards	Complies
RF Exposure	RSS-102 Section 2.5.2	RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm	Complies
Power Line Conducted Emissions	ICES-003 Issue 6 Class B Limits	The Conducted Emissions are measured on the phase and Neutral Power lines in the 0.15 - 30.0 MHz range.	Complies

Section II: GENERAL INFORMATION

2.1 Product Description

The information provided in this section is for the Equipment Under Test (EUT) and the corresponding Auxiliary Equipment needed to perform the tests as complete system.

Equipment Under Test (EUT) Information

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 Wi-Fi module to transmit this energy data to a cloud service for further analysis
FRN	0018589234
FCC ID	W72-W1
IC	8253A-W1
Manufacturer	Neurio
Model/Type	W1
Transmitter Type	802.11n-compliant
Frequency Range	2412-2462Mhz
Transmit Power	18.1 dBm
Modulation	IEEE 802.11 b, g, n
Number of Channels	11
Antenna	Quarter-wave dipole whip antenna
Software and Firmware	0.2.2

Neurio W1 Sensor

2.2 Environmental Conditions

The equipment under test was operated and tested under the following environmental conditions:

Parameter	Conditions
Location	Indoors
Temperature	22-28ºC
Relative Humidity	39.7 - 54.4%

2.3 Measurement Uncertainty

Parameter	Uncertainty
Radiated Emissions, 30MHz-1GHz	± 2.40 dB
Radiated Emissions, 1GHz-40GHz	± 2.48 dB
Radio Frequency	±1,5 x 10-5 MHz
Total RF Power Conducted	±1.36 dB
Spurious Emissions, Conducted	±1.36 dB
RF Power Density, Conducted	±1.36 dB
Temperature	±1ºC
Humidity	±5 %
DC and low frequency voltages	±3 %

2.4 Worst Test Case

Worst-case orientation was determined during the preliminary testing. The final radiated emissions were performed in the worst-case orientation.

2.5 Sample Calculations of Emissions Data

Radiated and conducted emissions were performed using EMC32 software developed by Rohdes & Schwarz. Transducer factors like Antenna factors, Cable Losses and Amplifier gains were stored in the test templates which are used to perform the emissions measurements. After test is finished, data is generated from the EMC32 consisting of product details, emission plots and final data tables as shown below.

Frequency (MHz)	Quasi-Peak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
42.663900	33.0	1000.000	120.000	100.0	H	70.0	13.2	7.5	40.5

Quasi Peak reading shown in the table above is already corrected by the software using correction factor shown in column “Corr.” The correction factor listed under “Corr.” table calculated as:

Corr.(dB) = Antenna factor + Cable loss

Or

Corr.(dB) = Antenna factor + Cable Loss - Amp gain (if pre-amplifier was used)

The final Quasi peak reading shown in the data is calculated by the software using following equation:

Corrected Quasi Peak(dBµV/m) = Raw Quasi Peak Reading + Antenna factor + Cable loss

To obtain the final Quasi-Peak or Average reading during power line conducted emissions, transducer factors are included in the final measurement as shown below.

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150	44.3	1000.000	9.000	0.6	21.7	66.0

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150	27.2	1000.000	9.000	0.6	28.8	56.0

Quasi Peak or Average reading shown in above table is already corrected by the software using the correction factor shown in column "Corr." The correction factor listed under "Corr." table calculated as:

Corr.(dB) = Antenna factor + Cable loss

The final Quasi peak or Average reading shown in the data is calculated by the software using following equation:

Corr. Quasi Peak/Average Reading (dBµV) = Raw Quasi Peak/Average Reading + Antenna factor + Cable loss

The allowable margin from the limits, as per the standards, were calculated for both radiated and conducted emissions:

Margin(dB) = Limit – Quasi-Peak or Average reading

2.6 Test Equipment List

The tables below contain all the equipment used by QAI Laboratories in conducting all tests on the Equipment Under Test (EUT) as per Section 1.3.

Emissions Test Equipment

Manufacturer	Model	Description	Serial No.	Calibration Due Date
Sunol Sciences	SM46C	Turntable	051204-2	N/A
Sunol Sciences	TWR95	Mast	TREML0001	N/A
Sunol Sciences	JB3	Biconilog Antenna 30MHz – 3GHz	A120106	24-Sep-2017
ETS Lindgren	2165	Turntable	00043677	N/A
ETS Lindgren	2125	Mast	00077487	N/A
Rohde & Schwarz	ESU40	EMI Receiver	100011	20-Nov-2017
Fischer	FCC-LISN-50-25-2-08	LISN (150kHz-30MHz)	2041	19-Nov-2018
ETS Lindgren	S201	5-meter Semi-Anechoic Chamber	1030	N/A
ETS Lindgren	3117	Horn Antenna 1GHz-18GHz	00075944	29-Aug-2016
AH Systems	PAM118	Amplifier 10KHz-18GHz	189	Conditional Use
Mini Circuit	8400+	High Pass Filter	N/A	N/A
Mini Circuit	2700A+	High Pass Filter	N/A	N/A
EMCO	3160-09	Standard gain Horn Antenna	9701-1071	30 August 2016
EMCO	6502	Loop Antenna	2178	21 August 2017
A.H. Systems Inc.	PAM-1840VH	Pre-Amp	152	14 June 2019

Measurement Software List

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

Section III: REQUIREMENTS FOR THE US MARKET (FCC) & THE CANADIAN MARKET (IC) – Exigences pour le Marché Canadien

3.1 RF Peak Power Output

The purpose of this test is to make certain that for systems employing digital modulation techniques operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz does not exceed the maximum conducted output power as per the standards, FCC Part 15.247 (b)(3), RSS 247 & RSS 210 Issue 8 Annex 8.

The test was conducted as defined by the standards above with the antenna port of the EUT directly connected to a spectrum analyzer. The maximum peak conducted power for systems employing digital modulation techniques operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz shall not exceed 1W. Except as provided in RSS 247 Section 5.4, the Equivalent Isotropically Radiated Power (E.I.R.P.) shall not exceed 4 W.

The EUT was tested without any modifications and was deemed compliant to the standards on Aug 3, 2016

Please refer to Appendix A of this report for the RF Peak Power Output Data.

3.2 Radiated Spurious Emissions – Transmit Mode

The purpose of this test is to make certain that the radiated spurious emissions from the Equipment Under Test (EUT) while in transmit mode does not exceed the limits as per the standards, FCC Part 15.247 (d), FCC Part 15.209 (a), FCC Part 15.205, IC RSS-210 Issue 8 Annex 2 Section (A2.2) (b), RSS-Gen Issue 4.

The test was conducted as defined by the standards above. The EUT was positioned in the center of the turntable in the SAC and was 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.

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

For frequencies below 30 MHz, an active loop antenna was used to make measurements. There were no significant emission levels detected during the test. Thus, the said results were not included in this report.

FCC PART 15.205 – Restricted Bands of Operation:

(a) Except as shown in paragraph (d) of FCC PART 15.205, 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	2690-2900	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)
13.36-13.41			

Note 1: **FCC-specific*

Note 2: *Canada-specific frequency ranges - 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,*

Note 3: *(2) Above 38,6 GHz*

(b) Except as provided in paragraphs (d) and (e) FCC PART 15.205, 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.

Measurements were made by using a spectrum analyzer, 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 = total correction factor including cable loss, antenna factor and preamplifier gain (ATOT = LCABLES + AF - AMP).

Radiated spurious emissions was measured up to 10th harmonics of fundamental frequency using the procedures described in ANSI C63.4:2014 and ANSI C63.10:2013 but no radiated emissions were found and reported other than reported in Appendix B of this report.

The EUT was tested without any modifications and was deemed compliant to the standards on Aug 3, 2016.

Please refer to Appendix B of this report for the Radiated Spurious Emissions – Transmit Mode data.

3.3 Conducted Spurious Emissions

The purpose of this test is to make certain that the conducted spurious emissions from the Equipment Under Test (EUT) does not exceed the limits as per the standards, FCC Part 15.247 (d), FCC Part 15.207, FCC Part 15.209 (a), RSS 247 & RSS 210 Issue 8 Annex 8.

The test was conducted as defined by the standards above. 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.

The EUT was tested without any modifications and was deemed compliant to the standards on Aug 5, 2016

Please refer to Appendix C of this report for the Conducted Spurious Emissions data.

3.4 Radiated Spurious Emissions – Unintentional

The purpose of this test is to make certain that the radiated spurious emissions by the Equipment Under Test (EUT) while in receive mode does not exceed the limits as per the standards, FCC Part 15.247 (d), FCC Part 15.209 (a), RSS-210 Issue 8 Annex 2 Section A2.2 (b), & ICES-003 Issue 6.

The test was conducted as defined by the standards above. The EUT was positioned in the center of the turntable in the SAC and was 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.

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

Measurements were made by using a spectrum analyzer, 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 = total correction factor including cable loss, antenna factor and preamplifier gain (ATOT = LCABLES + AF - AMP).

The EUT was tested without any modifications and was deemed compliant to the standards on Aug 2, 2016.

Please refer to Appendix E of this report for the Radiated Spurious Emissions – Receive Mode data.

3.5 RF Exposure Evaluation

The purpose of this test is to make certain that the Equipment Under Test (EUT) complies with the RF exposure requirements as per the standards, RSS-102 Section 2.5.2 & FCC 47 CFR §1.1310

RSS-102 Section 2.5.2

"RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- *at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x 10-2 f^0.6834 W (adjusted for tune-up tolerance), where f is in MHz*

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived."

FCC 47 CFR §1.1310

"Radiofrequency radiation exposure limits for General Population/Uncontrolled Exposure at Frequency range 1500 - 100000 MHz: 1.0 mW/cm^2"

Exposure Evaluation:

1.) The highest conducted power measured was 2.97dBm when the EUT was operated at 2405 MHz
2.) The Antenna gain: 3dBi.
3.) E.I.R.P = 18.1dBm + 3dBi = 21.1dBm = 128.8mW
4.) Power Density at 20cm distance = 128.8mW/(4X3.14X20X20 cm^2) = 0.02564mW/cm^2

The radiated emissions of the EUT is far below the exemption limit 2.7W as per RSS-102 Section 2.5.2. The maximum power density at 20 cm distance is 0.02564mW/cm2 and is far below the limit 1.0 mW/cm^2 as per FCC 47 CFR §2.1091 & §1.1310.

The EUT was deemed compliant to the standards based on these measurements and calculations.

3.6 AC Mains Conducted Emissions

The purpose of this test is to make certain that the unintentional emitted RF energy from the Equipment Under Test (EUT) to its power source does not exceed the limits defined in the table below as per the standards, ICES-003 Issue 6 & FCC CFR47 Part 15 Subpart B, for Class B equipment. This will prevent the EUT from causing any unwanted interference to other electronic devices.

Frequency (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15 – 0.50	66 to 56	56 to 46
0.50 – 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 logarithm of the frequency in the 0.15 to 0.50 MHz*

The test was conducted as defined by the standards above. The Line Impedance Stabilizing Network (LISN) was used to make conducted emissions measurements. The equipment was operated and tested at 120Vac 60Hz while in "Continuous Mode" of operation. Measurements were made by using an EMI test receiver with 9 kHz bandwidth, CISPR Quasi-Peak and Average detector capabilities. Test receiver requirements, including the bandwidths used, for the test receiver are those specified in CISPR 16-1-1.

The EUT was tested without any modifications and was deemed compliant to Class B standards on Aug 3, 2016.

Please refer to Appendix D of this report for the AC Mains Conducted Emissions data.

Appendix A: RF PEAK POWER OUTPUT DATA

Table 1: Conducted output power measurements

Modulation	Channel	Frequency	Raw Peak Output Power (dBm)	Cable Loss with Attenuator (dB)	Corrected Peak Output Power (dBm)	Limit (dBm)	Margin (dB)
IEEE 802.11 b	Low	2412	-13.86	31.96	18.1	30	11.9
	Middle	2437	-13.8	31.9	18.1	30	11.9
	High	2462	-14.9	31.98	17.08	30	12.92
IEEE 802.11 g	Low	2412	-15.73	31.96	16.23	30	13.77
	Middle	2437	-16.19	31.9	15.71	30	14.29
	High	2462	-16.9	31.98	15.08	30	14.92
IEEE 802.11 n	Low	2412	-15.76	31.96	16.2	30	13.8
	Middle	2437	-16.1	31.9	15.8	30	14.2
	High	2462	-16.89	31.98	15.09	30	14.91

Table 2: E.I.R.P. measurements

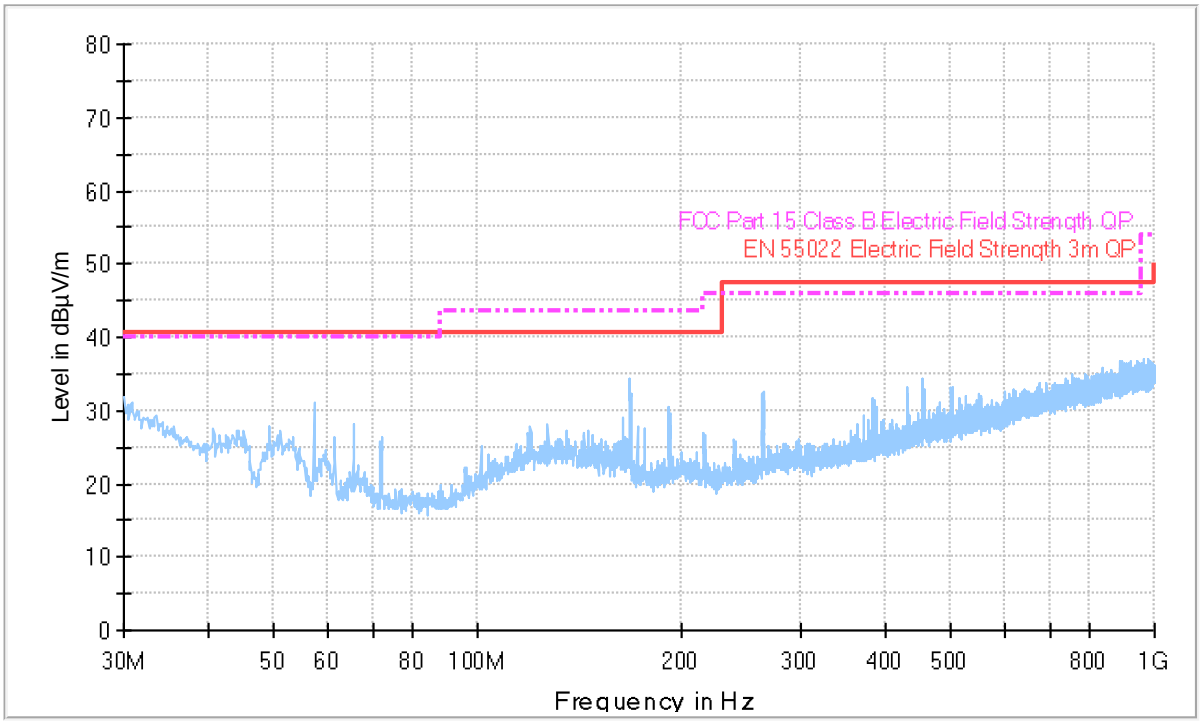
Modulation	Channel	Frequency	Field Strength (dBuV/m)	EIRP (dBm)	Limit (dBm)	Margin (dB)
IEEE 802.11 b	Low	2412	116.73	21.47	36.02	14.55
	Middle	2437	115.37	20.11	36.02	15.91
	High	2462	114.21	18.95	36.02	17.07
IEEE 802.11 g	Low	2412	114.65	19.39	36.02	16.63
	Middle	2437	112.94	17.68	36.02	18.34
	High	2462	112.7	17.44	36.02	18.58
IEEE 802.11 n	Low	2412	113.07	17.81	36.02	18.21
	Middle	2437	112.05	16.79	36.02	19.23
	High	2462	111.71	16.45	36.02	19.57

Appendix B: RADIATED SPURIOUS EMISSIONS-TRANSMIT MODE

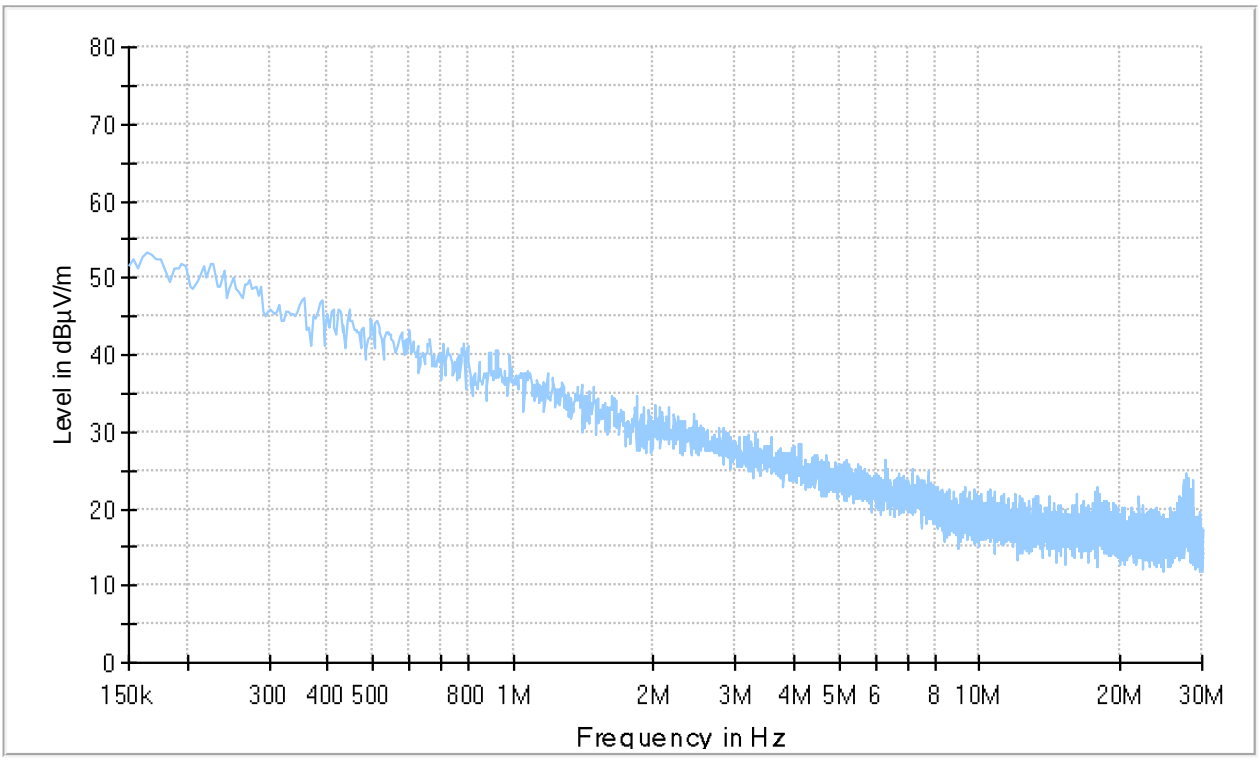
Note: *Radiated spurious emissions was measured up to 10th harmonics of fundamental frequency using the procedures described in ANSI C63.4:2014 and ANSI C63.10:2013 but no radiated emissions were found and reported above 18GHz.*

Table 3: Radiated Spurious Emissions data below 1GHz

Frequency	QuasiPeak	Meas. Time	Bandwidth	Antenna height	Polarity	Turntable position	Corr.	Margin	Limit
(MHz)	(dBµV/m)	(ms)	(kHz)	(cm)		(deg)	(dB)	(dB)	(dBµV/m)
57.35865	28.2	1000	120	100	V	1	14.5	11.8	40
61.46105	27.4	1000	120	100	V	42	14.2	12.6	40
167.8929	27.4	1000	120	199	H	314	19	16.1	43.5
191.76425	26	1000	120	120	V	130	18.7	17.5	43.5
216.10465	26.7	1000	120	100	V	1	18.7	19.7	46.4
505.5124	31.2	1000	120	130	H	195	25.7	15.2	46.4



Plot 1: Radiated spurious Emissions 30-1000MHz



Plot 2: Radiated spurious Emissions 150k-30MHz

Table 4: Radiated Spurious Emissions data – IEEE 802.11 b

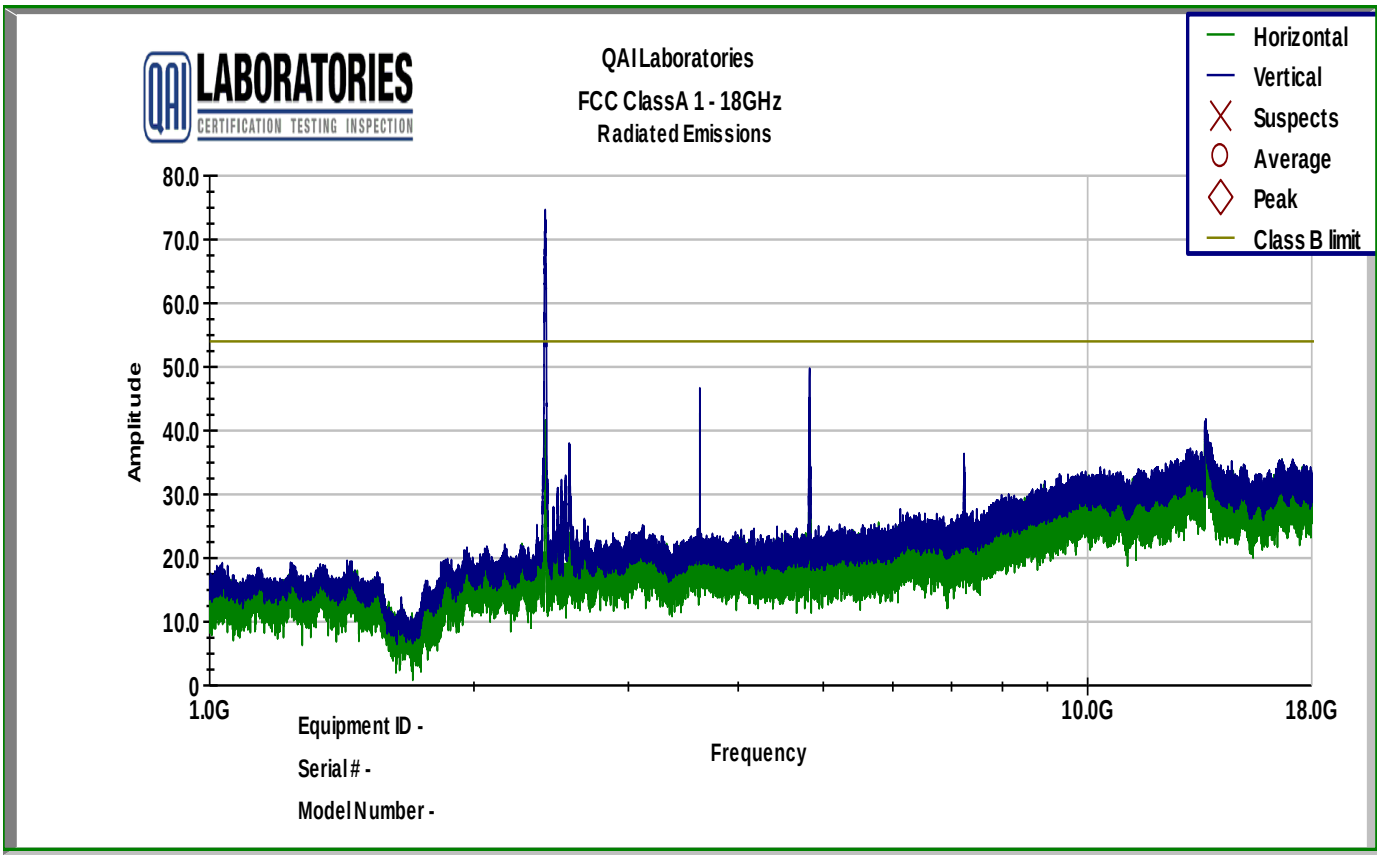
IEEE 802.11 b Low Channel 2412MHz											
Frequency (MHz)	**Peak-Raw (dBuV/m)**	**Polarization (V/H)**	**Antenna Height (cm)**	**Angle (deg)**	**Gain/Loss (dB)**	**Antenna factor (dBm)**	**Peak-Corrected (dBuV/m)**	**Duty Cycle Correction factor (dB)**	**Avg (dBuV/m)**	**Peak Limit (dB)**	**Average Limit**
3618	55.53	V	121	85	-30.7	32.9	57.73	-24.09	33.64	74	54
4824	62.7	V	150	135	-26.85	34.1	69.95	-24.09	45.86	74	54
4824	59.9	H	140	165	-26.85	34.1	67.15	-24.09	43.06	74	54
7236	51.9	V	131	128	-26.85	34.1	59.15	-24.09	35.06	74	54
7236	47.38	H	141	105	-26.85	34.1	54.63	-24.09	30.54	74	54
9648	34.23	V	140	48	-26.85	37	44.38	-24.09	20.29	74	54
9648	33.36	H	135	76	-26.85	37	43.51	**-24.09**	19.42	74	54
IEEE 802.11 b Middle Channel 2437MHz											
Frequency (MHz)	**Peak-Raw (dBuV/m)**	**Polarization (V/H)**	**Antenna Height (cm)**	**Angle (deg)**	**Gain/Loss (dB)**	**Antenna factor (dBm)**	**Peak-Corrected (dBuV/m)**	**Duty Cycle Correction factor (dB)**	**Avg (dBuV/m)**	**Peak Limit (dB)**	**Average Limit**
3655	55.86	V	100	85	-30.7	32.9	58.06	-24.09	33.97	74	54
4874	62.8	V	138	134	-26.71	34.1	70.19	-24.09	46.1	74	54
4874	60.13	H	144	74	-26.71	34.1	67.52	-24.09	43.43	74	54
7311	50.99	V	109	117	-22.56	35.5	63.93	-24.09	39.84	74	54
7311	43.37	H	123	168	-22.56	35.5	56.31	-24.09	32.22	74	54
9748	33.1	V	140	48	-16.42	37.2	53.88	-24.09	29.79	74	54
9748	33.36	H	135	76	-16.42	37.2	54.14	-24.09	30.05	74	54
IEEE 802.11 b High Channel 2462MHz											
Frequency (MHz)	**Peak-Raw (dBuV/m)**	**Polarization (V/H)**	**Antenna Height (cm)**	**Angle (deg)**	**Gain/Loss (dB)**	**Antenna factor (dBm)**	**Peak-Corrected (dBuV/m)**	**Duty Cycle Correction factor (dB)**	**Avg (dBuV/m)**	**Peak Limit (dB)**	**Average Limit**
3693	55.07	V	100	90	-30.7	32.9	57.27	-24.09	33.18	74	54
4924	62.97	V	112	125	-26.52	34.1	70.55	-24.09	46.46	74	54
4924	59.86	H	177	84	-26.52	34.1	67.44	-24.09	43.35	74	54
7386	50.53	V	132	115	-21.88	35.5	64.15	-24.09	40.06	74	54
7386	41.9	H	100	260.1	-21.88	35.5	55.52	-24.09	31.43	74	54
9848	33.3	V	100	171.7	-16.12	37.2	54.38	-24.09	30.29	74	54
9848	32.6	H	100	155.8	-16.12	37.2	53.68	-24.09	29.59	74	54

Table 5: Radiated Spurious Emissions data – IEEE 802.11 g

IEEE 802.11 g - Low Channel (2412MHz)											
Frequency (MHz)	**Peak-Raw (dBuV/m)**	**Polarization (V/H)**	**Antenna Height (cm)**	**Angle (deg)**	**Gain/Loss (dB)**	**Antenna factor (dBm)**	**Peak-Corrected (dBuV/m)**	**Duty Cycle Correction factor (dB)**	**Avg (dBuV/m)**	**Peak Limit (dB)**	**Average Limit**
3618	51.84	V	121	85	-30.7	32.9	54.04	-24.09	29.95	74	54
4824	60.83	V	150	93	-26.85	34.1	68.08	-24.09	43.99	74	54
4824	57.86	H	150	80	-26.85	34.1	65.11	-24.09	41.02	74	54
7236	49.2	V	104	113	-22.84	35.5	61.86	-24.09	37.77	74	54
7236	44.57	H	171	54	-22.84	35.5	57.23	-24.09	33.14	74	54
IEEE 802.11 g - Middle Channel (2437MHz)											
Frequency (MHz)	**Peak-Raw (dBuV/m)**	**Polarization (V/H)**	**Antenna Height (cm)**	**Angle (deg)**	**Gain/Loss (dB)**	**Antenna factor (dBm)**	**Peak-Corrected (dBuV/m)**	**Duty Cycle Correction factor (dB)**	**Avg (dBuV/m)**	**Peak Limit (dB)**	**Average Limit**
3655	53.62	V	100	85	-30.7	32.9	55.82	-24.09	31.73	74	54
4874	60.79	V	100	135	-26.71	34.1	68.18	-24.09	44.09	74	54
4874	56.56	H	100	112	-26.71	34.1	63.95	-24.09	39.86	74	54
7311	48.57	V	100	122	-22.56	35.5	61.51	-24.09	37.42	74	54
7311	42.87	H	100	360	-22.56	35.5	55.81	-24.09	31.72	74	54
IEEE 802.11 g - High Channel (2462MHz)											
Frequency (MHz)	**Peak-Raw (dBuV/m)**	**Polarization (V/H)**	**Antenna Height (cm)**	**Angle (deg)**	**Gain/Loss (dB)**	**Antenna factor (dBm)**	**Peak-Corrected (dBuV/m)**	**Duty Cycle Correction factor (dB)**	**Avg (dBuV/m)**	**Peak Limit (dB)**	**Average Limit**
3693	53.35	V	100	90	-30.7	32.9	55.55	-24.09	31.46	74	54
4924	59.93	V	129	129	-26.52	34.1	67.51	-24.09	43.42	74	54
4924	57.6	H	111	164	-26.52	34.1	65.18	-24.09	41.09	74	54
7386	48.72	V	129	121	-21.88	35.5	62.34	-24.09	38.25	74	54
7386	42.2	H	135	181	-21.88	35.5	55.82	-24.09	31.73	74	54

Table 6: Radiated Spurious Emissions data – IEEE 802.11 n

IEEE 802.11 n- Low Channel (2412MHz)											
Frequency (MHz)	**Peak-Raw (dBuV/m)**	**Polarization (V/H)**	**Antenna Height (cm)**	**Angle (deg)**	**Gain/Loss (dB)**	**Antenna factor (dBm)**	**Peak-Corrected (dBuV/m)**	**Duty Cycle Correction factor (dB)**	**Avg (dBuV/m)**	**Peak Limit (dB)**	**Average Limit**
3618	53.59	V	121	85	-30.7	32.9	55.79	-24.09	31.7	74	54
4824	60.4	V	113	90	-26.85	34.1	67.65	-24.09	43.56	74	54
4824	57.5	H	127	164	-26.85	34.1	64.75	-24.09	40.66	74	54
7236	49.72	V	109	130	-22.84	35.5	62.38	-24.09	38.29	74	54
7236	46.47	H	131	114	-22.84	35.5	59.13	-24.09	35.04	74	54
IEEE 802.11 n- Middle Channel (2437 MHz)											
Frequency (MHz)	**Peak-Raw (dBuV/m)**	**Polarization (V/H)**	**Antenna Height (cm)**	**Angle (deg)**	**Gain/Loss (dB)**	**Antenna factor (dBm)**	**Peak-Corrected (dBuV/m)**	**Duty Cycle Correction factor (dB)**	**Avg (dBuV/m)**	**Peak Limit (dB)**	**Average Limit**
3655	54.28	V	100	85	-30.7	32.9	56.48	-24.09	32.39	74	54
4874	60.78	V	100	134	-26.71	34.1	68.17	-24.09	44.08	74	54
4874	56.47	H	100	112	-26.71	34.1	63.86	-24.09	39.77	74	54
7311	48.9	V	100	130	-22.56	35.5	61.84	-24.09	37.75	74	54
7311	44.3	H	165	9	-22.56	35.5	57.24	-24.09	33.15	74	54
IEEE 802.11 n- High Channel (2462 MHz)											
Frequency (MHz)	**Peak-Raw (dBuV/m)**	**Polarization (V/H)**	**Antenna Height (cm)**	**Angle (deg)**	**Gain/Loss (dB)**	**Antenna factor (dBm)**	**Peak-Corrected (dBuV/m)**	**Duty Cycle Correction factor (dB)**	**Avg (dBuV/m)**	**Peak Limit (dB)**	**Average Limit**
3693	53.22	V	100	90	-30.7	32.9	55.42	-24.09	31.33	74	54
4924	59.95	V	116	129	-26.52	34.1	67.53	-24.09	43.44	74	54
4924	56.86	H	110	133	-26.52	34.1	64.44	-24.09	40.35	74	54
7386	49.29	V	140	120	-21.88	35.5	62.91	-24.09	38.82	74	54
7386	43.8	H	120	88	-21.88	35.5	57.42	-24.09	33.33	74	54



Plot 3: Radiated spurious Emissions 1 – 18GHz

Appendix C: Conducted Spurious Emissions

Table 7: Conducted spurious emissions IEEE802.11 b

IEEE 802.11 b Low Channel 2412 MHz					
Frequency (MHz)	**Raw Peak (dBm)**	**Cable Loss (dB)**	**Corrected Peak (dBm)**	**Limit (dBm)**	**Margin (dB)**
3618	-54.04	1.5	-52.54	-10.87	41.67
4824	-51.64	1.78	-49.86	-10.87	38.99
7236	-58.58	3.41	-55.17	-10.87	44.3
9648	-67.67	4.01	-63.66	-10.87	52.79
IEEE 802.11 b Mid Channel 2437 MHz					
Frequency (MHz)	**Raw Peak (dBm)**	**Loss (dB)**	**Corrected Peak (dBm)**	**Limit (dBm)**	**Margin (dB)**
3655	-53.9	1.5	-52.4	-11.6	40.8
4874	-47.48	2.66	-44.82	-11.6	33.22
7311	-60.8	2.94	-57.86	-11.6	46.26
9748	-66.5	4.26	-62.24	-11.6	50.64
IEEE 802.11 b Hi Channel 2462 MHz					
Frequency (MHz)	**Raw Peak (dBm)**	**Loss (dB)**	**Corrected Peak (dBm)**	**Limit (dBm)**	**Margin (dB)**
3693	-54.69	1.5	-53.19	-11.8	41.39
4924	-40.5	2.93	-37.57	-11.8	25.77
7386	-59.18	3.09	-56.09	-11.8	44.29
9848	-67.7	4.92	-62.78	-11.8	50.98

Note: The limit for conducted spurious emissions was established according to reference level measurements described in clause 11.2 of KDB 558074 D01 DTS Meas Guidance v03r05.

Table 8: Conducted spurious emissions IEEE802.11 g

IEEE 802.11 g Low Channel 2412 MHz					
Frequency (MHz)	**Raw Peak (dBm)**	**Loss (dB)**	**Corrected Peak (dBm)**	**Limit (dBm)**	**Margin (dB)**
3618	-57.92	1.5	-56.42	-12.92	43.5
4824	-59.91	1.78	-58.13	-12.92	45.21
7236	-60.9	3.41	-57.49	-12.92	44.57
9648	-67.38	4.01	-63.37	-12.92	50.45
IEEE 802.11 b Mid Channel 2437 MHz					
Frequency (MHz)	**Raw Peak (dBm)**	**Loss (dB)**	**Corrected Peak (dBm)**	**Limit (dBm)**	**Margin (dB)**
3655	-56.14	1.5	-54.64	-14.45	40.19
4874	-57.54	2.66	-54.88	-14.45	40.43
7311	-64.31	2.94	-61.37	-14.45	46.92
9748	-68.09	4.26	-63.83	-14.45	49.38
IEEE 802.11 b Hi Channel 2462 MHz					
Frequency (MHz)	**Raw Peak (dBm)**	**Loss (dB)**	**Corrected Peak (dBm)**	**Limit (dBm)**	**Margin (dB)**
3693	-56.41	1.5	-54.91	-15.02	39.89
4924	-50.56	2.93	-47.63	-15.02	32.61
7386	-62.2	3.09	-59.11	-15.02	44.09
9848	-67.93	4.92	-63.01	-15.02	47.99

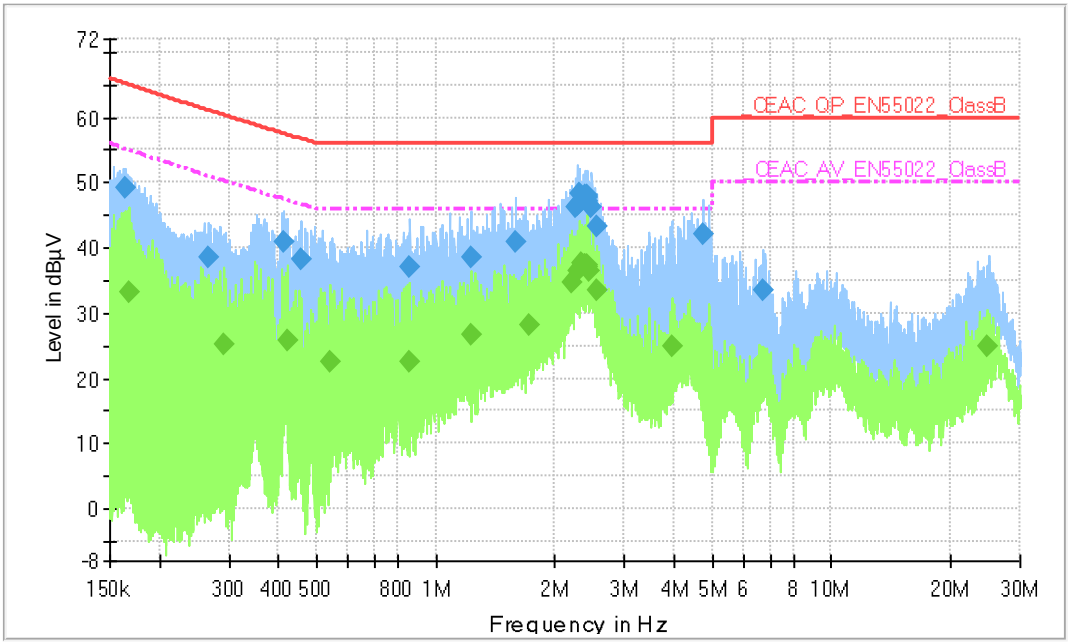
Note: The limit for conducted spurious emissions was established according to reference level measurements described in clause 11.2 of KDB 558074 D01 DTS Meas Guidance v03r05.

Table 9: **Conducted spurious emissions IEEE802.11 n**

IEEE 802.11 n Low Channel 2412 MHz					
Frequency (MHz)	**Raw Peak (dBm)**	**Loss (dB)**	**Corrected Peak (dBm)**	**Limit (dBm)**	**Margin (dB)**
3618	-56.17	1.5	-54.67	-15.11	39.56
4824	-64.71	1.78	-62.93	-15.11	47.82
7236	-65.54	3.41	-62.13	-15.11	47.02
9648	-66.7	4.01	-62.69	-15.11	47.58
IEEE 802.11 n Middle Channel 2437 MHz					
Frequency (MHz)	**Raw Peak (dBm)**	**Loss (dB)**	**Corrected Peak (dBm)**	**Limit (dBm)**	**Margin (dB)**
3655	-55.48	1.5	-53.98	-16.26	37.72
4874	-58.62	2.66	-55.96	-16.26	39.7
7311	-64.97	2.94	-62.03	-16.26	45.77
9748	-67.79	4.26	-63.53	-16.26	47.27
IEEE 802.11 n High Channel 2462 MHz					
Frequency (MHz)	**Raw Peak (dBm)**	**Loss (dB)**	**Corrected Peak (dBm)**	**Limit (dBm)**	**Margin (dB)**
3693	-56.54	1.5	-55.04	-16.38	38.66
4924	-49.25	2.93	-46.32	-16.38	29.94
7386	-62.44	3.09	-59.35	-16.38	42.97
9848	-67.1	4.92	-62.18	-16.38	45.8

Note: The limit for conducted spurious emissions was established according to reference level measurements described in clause 11.2 of KDB 558074 D01 DTS Meas Guidance v03r05.

Appendix D: AC MAINS CONDUCTED EMISSIONS DATA & PLOTS



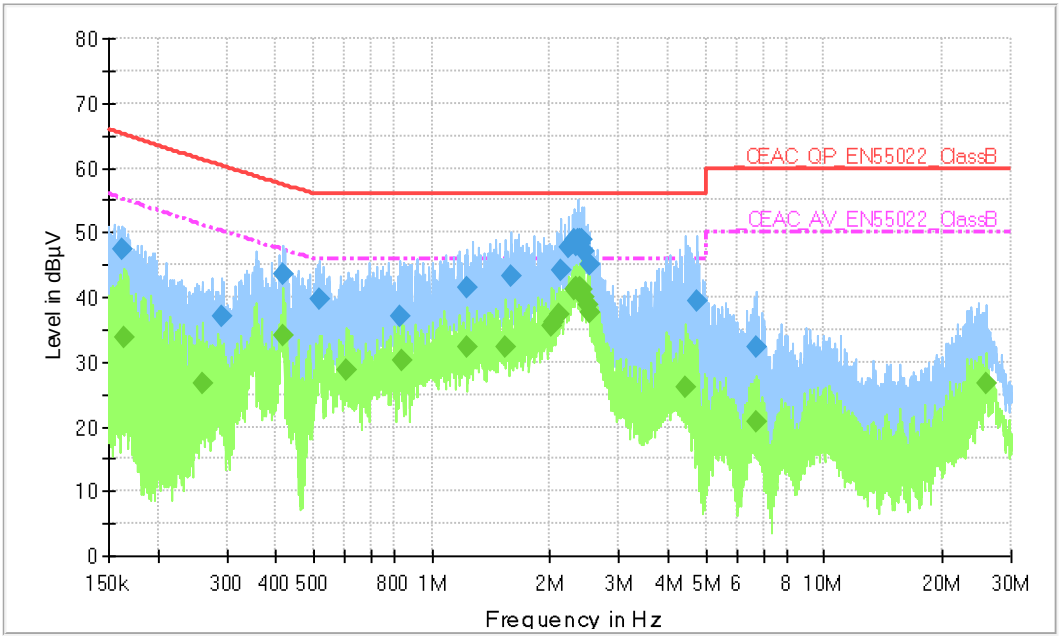
Plot 1: AC Mains Conducted Emissions for FCC/IC Class B Line 1 120Vac/60Hz

Table 10: Quasi-Peak data AC Mains Conducted Emissions for FCC/IC Class B Line 1 120Vac/60Hz

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.164119	49.3	1000.000	9.000	GND	L1	0.5	15.9	65.2
0.265961	38.5	1000.000	9.000	GND	L1	0.4	22.5	61.0
0.412456	40.8	1000.000	9.000	GND	L1	0.4	16.7	57.5
0.459012	38.2	1000.000	9.000	GND	L1	0.4	18.5	56.7
0.862436	37.1	1000.000	9.000	GND	L1	0.4	18.9	56.0
1.223641	38.6	1000.000	9.000	GND	L1	0.4	17.4	56.0
1.589946	40.8	1000.000	9.000	GND	L1	0.4	15.2	56.0
2.254859	46.1	1000.000	9.000	GND	L1	0.5	9.9	56.0
2.270690	46.6	1000.000	9.000	GND	L1	0.5	9.4	56.0
2.314224	48.2	1000.000	9.000	GND	L1	0.5	7.8	56.0
2.358592	47.3	1000.000	9.000	GND	L1	0.5	8.7	56.0
2.375152	47.9	1000.000	9.000	GND	L1	0.5	8.1	56.0
2.389438	47.7	1000.000	9.000	GND	L1	0.5	8.3	56.0
2.406215	47.7	1000.000	9.000	GND	L1	0.5	8.3	56.0
2.413440	47.9	1000.000	9.000	GND	L1	0.5	8.1	56.0
2.420688	47.2	1000.000	9.000	GND	L1	0.5	8.8	56.0
2.481937	46.1	1000.000	9.000	GND	L1	0.5	9.9	56.0
2.562602	43.1	1000.000	9.000	GND	L1	0.5	12.9	56.0
4.747960	42.0	1000.000	9.000	GND	L1	0.5	14.0	56.0
6.723045	33.6	1000.000	9.000	GND	L1	0.6	26.4	60.0

Table 11: Average data AC Mains Conducted Emissions for FCC/IC Class B Line 1 120Vac/60Hz

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.168103	33.2	1000.000	9.000	GND	L1	0.5	21.8	55.0
0.289833	25.2	1000.000	9.000	GND	L1	0.4	25.1	50.3
0.424162	25.6	1000.000	9.000	GND	L1	0.4	21.7	47.3
0.541311	22.6	1000.000	9.000	GND	L1	0.4	23.4	46.0
0.857279	22.6	1000.000	9.000	GND	L1	0.4	23.4	46.0
1.232232	26.7	1000.000	9.000	GND	L1	0.4	19.3	46.0
1.717142	28.0	1000.000	9.000	GND	L1	0.5	18.0	46.0
2.199213	34.6	1000.000	9.000	GND	L1	0.5	11.4	46.0
2.270690	36.3	1000.000	9.000	GND	L1	0.5	9.7	46.0
2.300387	36.8	1000.000	9.000	GND	L1	0.5	9.2	46.0
2.344490	37.5	1000.000	9.000	GND	L1	0.5	8.5	46.0
2.360950	37.3	1000.000	9.000	GND	L1	0.5	8.7	46.0
2.375152	37.5	1000.000	9.000	GND	L1	0.5	8.6	46.0
2.389438	37.3	1000.000	9.000	GND	L1	0.5	8.7	46.0
2.406215	37.3	1000.000	9.000	GND	L1	0.5	8.7	46.0
2.420688	36.9	1000.000	9.000	GND	L1	0.5	9.1	46.0
2.452346	36.3	1000.000	9.000	GND	L1	0.5	9.7	46.0
2.547280	33.5	1000.000	9.000	GND	L1	0.5	12.5	46.0
3.974122	24.8	1000.000	9.000	GND	L1	0.5	21.2	46.0
24.819369	24.9	1000.000	9.000	GND	L1	0.8	25.1	50.0



Plot 2: AC Mains Conducted Emissions for FCC/IC Class B Line 2 120Vac/60Hz

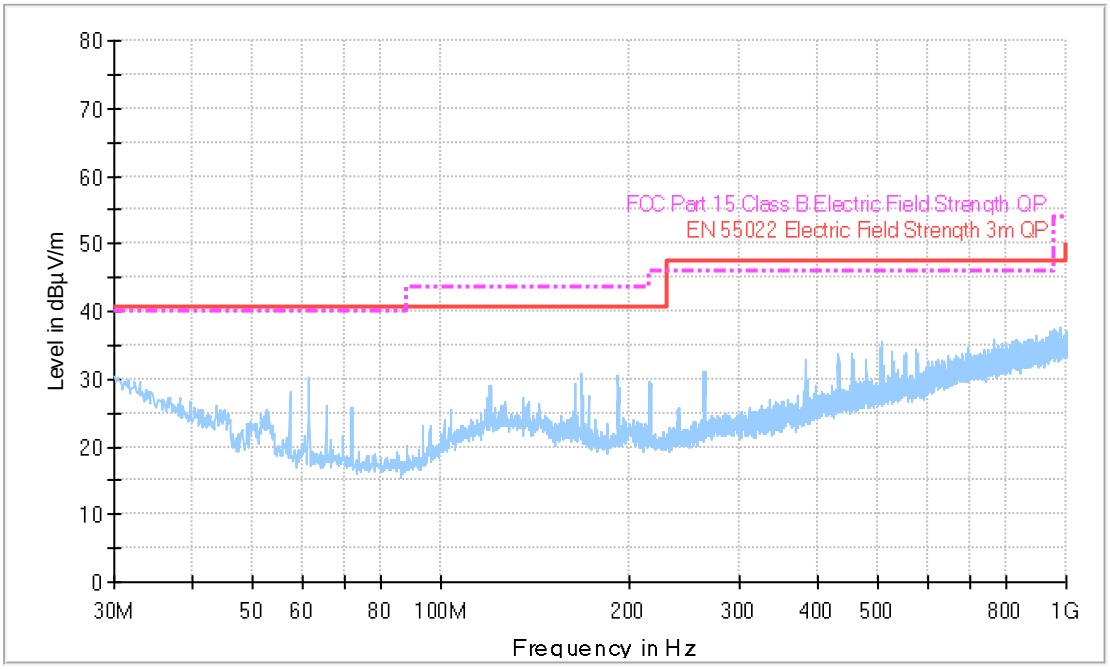
Table 12: Quasi-Peak data AC Mains Conducted Emissions for FCC/IC Class B Line 2 120Vac/60Hz

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.162649	47.5	1000.000	9.000	GND	L2	0.5	17.8	65.3
0.292160	36.9	1000.000	9.000	GND	L2	0.4	23.4	60.3
0.419105	43.4	1000.000	9.000	GND	L2	0.4	14.0	57.4
0.518539	39.7	1000.000	9.000	GND	L2	0.4	16.3	56.0
0.826981	36.9	1000.000	9.000	GND	L2	0.4	19.1	56.0
1.227315	41.5	1000.000	9.000	GND	L2	0.4	14.5	56.0
1.589946	43.2	1000.000	9.000	GND	L2	0.4	12.8	56.0
2.129987	44.3	1000.000	9.000	GND	L2	0.5	11.7	56.0
2.241377	47.8	1000.000	9.000	GND	L2	0.5	8.2	56.0
2.284348	48.3	1000.000	9.000	GND	L2	0.5	7.7	56.0
2.316538	48.8	1000.000	9.000	GND	L2	0.5	7.2	56.0
2.330472	48.1	1000.000	9.000	GND	L2	0.5	7.9	56.0
2.358592	49.0	1000.000	9.000	GND	L2	0.5	7.0	56.0
2.375152	48.9	1000.000	9.000	GND	L2	0.5	7.1	56.0
2.391828	48.2	1000.000	9.000	GND	L2	0.5	7.8	56.0
2.406215	49.0	1000.000	9.000	GND	L2	0.5	7.0	56.0
2.452346	47.1	1000.000	9.000	GND	L2	0.5	8.9	56.0
2.532050	45.0	1000.000	9.000	GND	L2	0.5	11.0	56.0
4.724291	39.4	1000.000	9.000	GND	L2	0.5	16.6	56.0
6.696220	32.2	1000.000	9.000	GND	L2	0.6	27.8	60.0

Table 13: Average data AC Mains Conducted Emissions for FCC/IC Class B Line 2 120Vac/60Hz

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.164283	33.7	1000.000	9.000	GND	L2	0.5	21.5	55.2
0.261741	26.7	1000.000	9.000	GND	L2	0.4	24.4	51.1
0.419105	34.2	1000.000	9.000	GND	L2	0.4	13.1	47.3
0.606035	28.7	1000.000	9.000	GND	L2	0.4	17.3	46.0
0.841994	30.2	1000.000	9.000	GND	L2	0.4	15.8	46.0
1.235932	32.2	1000.000	9.000	GND	L2	0.4	13.8	46.0
1.533753	32.3	1000.000	9.000	GND	L2	0.4	13.7	46.0
2.024133	35.6	1000.000	9.000	GND	L2	0.5	10.4	46.0
2.050605	36.2	1000.000	9.000	GND	L2	0.5	9.8	46.0
2.117251	37.2	1000.000	9.000	GND	L2	0.5	8.8	46.0
2.300387	41.2	1000.000	9.000	GND	L2	0.5	4.8	46.0
2.330472	41.4	1000.000	9.000	GND	L2	0.5	4.6	46.0
2.375152	41.4	1000.000	9.000	GND	L2	0.5	4.6	46.0
2.406215	41.1	1000.000	9.000	GND	L2	0.5	4.9	46.0
2.452346	40.0	1000.000	9.000	GND	L2	0.5	6.0	46.0
2.484419	38.9	1000.000	9.000	GND	L2	0.5	7.1	46.0
2.532050	37.6	1000.000	9.000	GND	L2	0.5	8.4	46.0
4.418282	26.1	1000.000	9.000	GND	L2	0.5	19.9	46.0
6.696220	20.7	1000.000	9.000	GND	L2	0.6	29.3	50.0
25.967788	26.6	1000.000	9.000	GND	L2	0.8	23.4	50.0

Appendix E: UNINTENTIONAL RADIATED SPURIOUS EMISSIONS DATA



Plot 6: Radiated Spurious Emissions Data from 30MHz to 1GHz

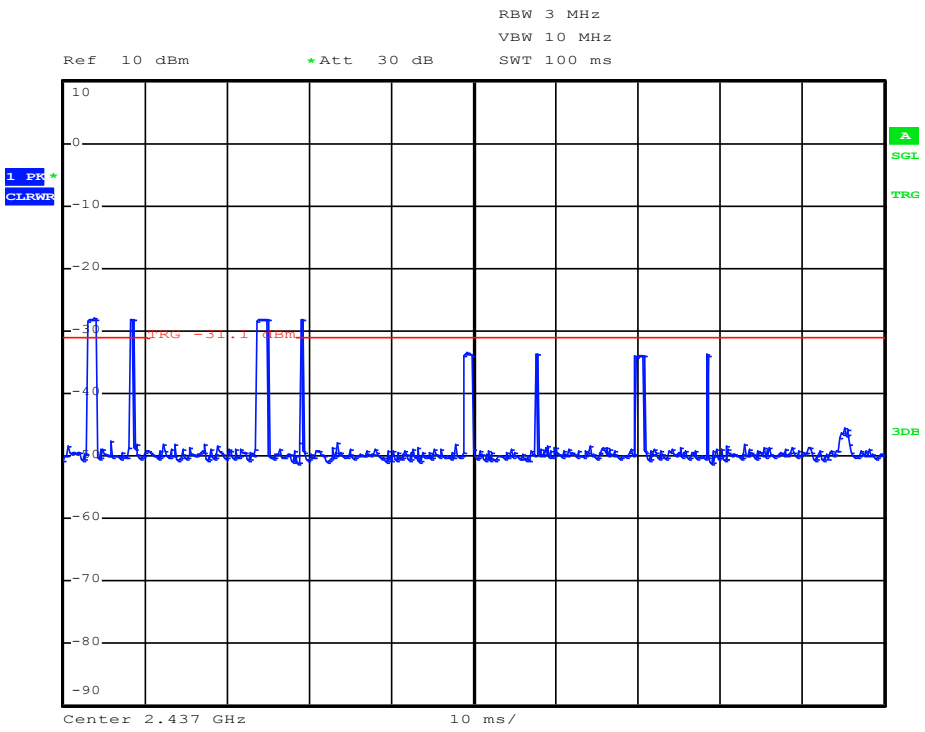
Table 14: Radiated Spurious Emissions for FCC/IC Class B

Frequency	QuasiPeak	Meas. Time	Bandwidth	Antenna height	Polarity	Turntable position	Corr.	Margin	Limit
(MHz)	(dBµV/m)	(ms)	(kHz)	(cm)		(deg)	(dB)	(dB)	(dBµV/m)
57.35865	28.2	1000	120	100	V	1	14.5	11.8	40
61.46105	27.4	1000	120	100	V	42	14.2	12.6	40
167.8929	27.4	1000	120	199	H	314	19	16.1	43.5
191.76425	26	1000	120	120	V	130	18.7	17.5	43.5
216.10465	26.7	1000	120	100	V	1	18.7	19.3	46
505.5124	31.2	1000	120	130	H	195	25.7	14.8	46

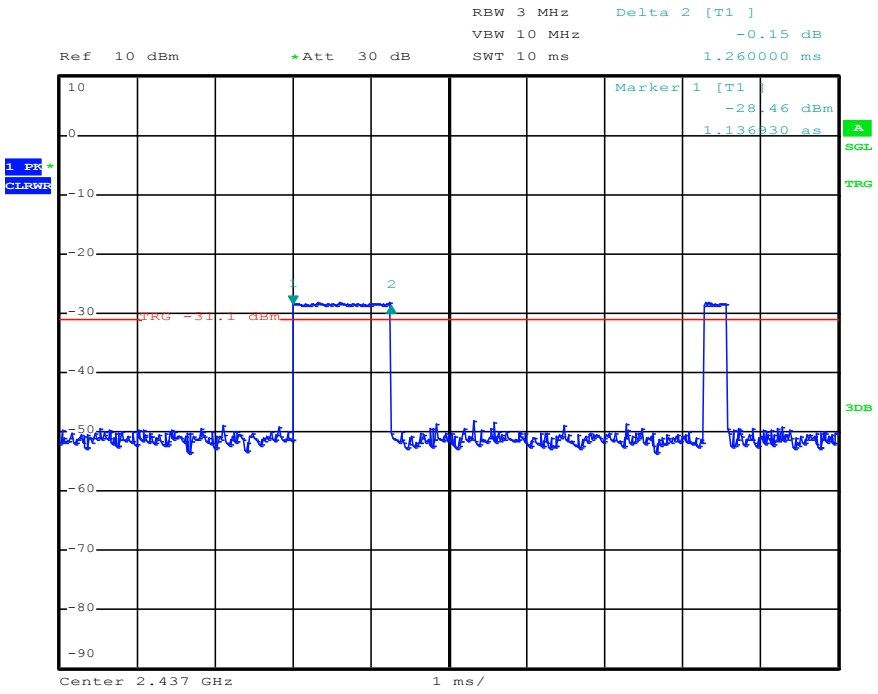
Appendix F: Duty Cycle Correction Factor

Duty cycle correction factor was measured as per ANSI C63.10:2013 and RSS-GEN issue 4

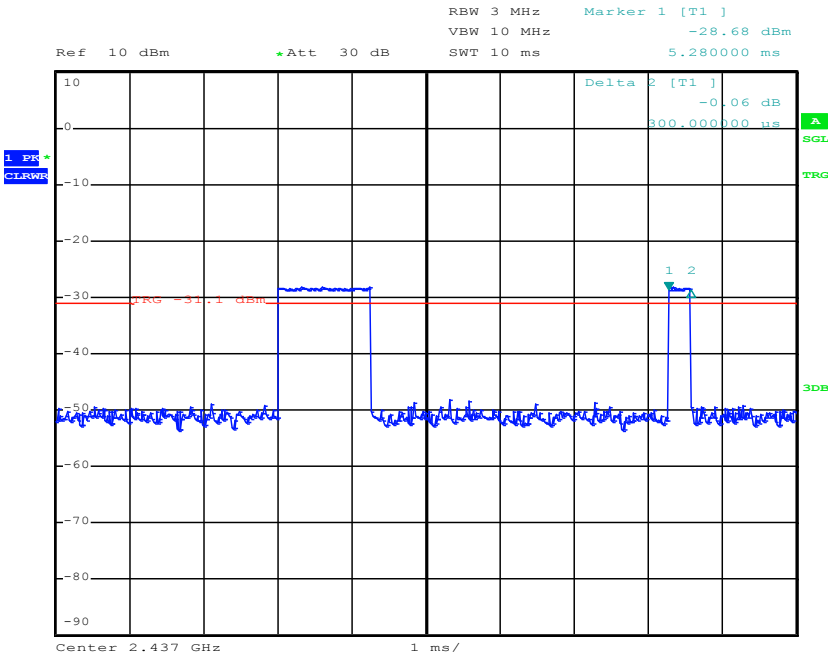
Longer Pulse time (ms)	1.26
Shorter pulse time (ms)	0.3
No. of longer Pulse	4
No. of short Pulse	4
Total time on in 100msec (ms)	6.24
Duty Cycle correction factor (dB)	-24.09630821



Plot 7: Pulse Train in 100msec



Plot 8: Time ON -Pulse 1



Plot 2: Time ON -Pulse 2

Appendix G: TEST SETUP PICTURES

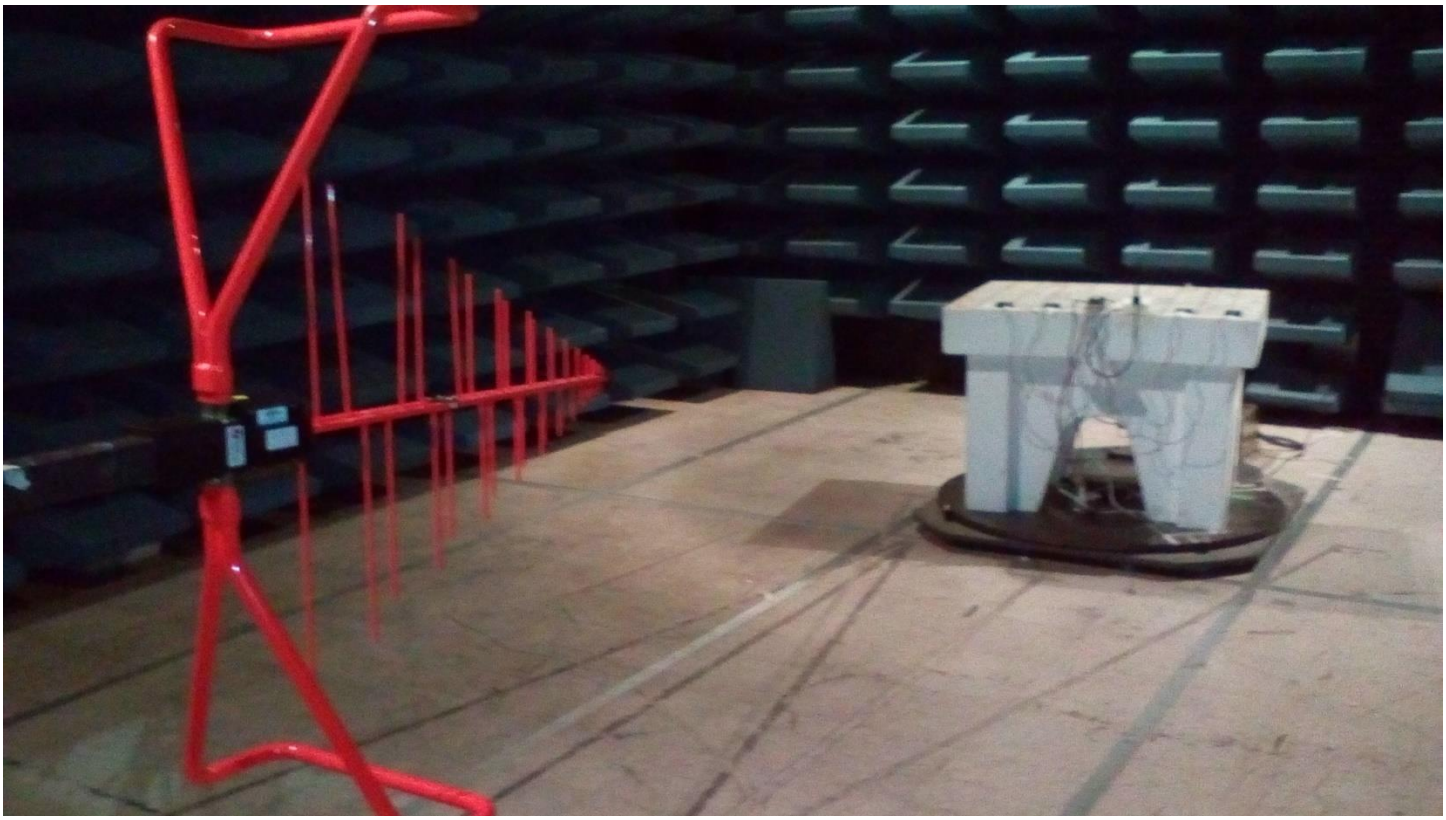


Figure 1: Radiated Spurious Emissions Test Setup 30-1000MHz

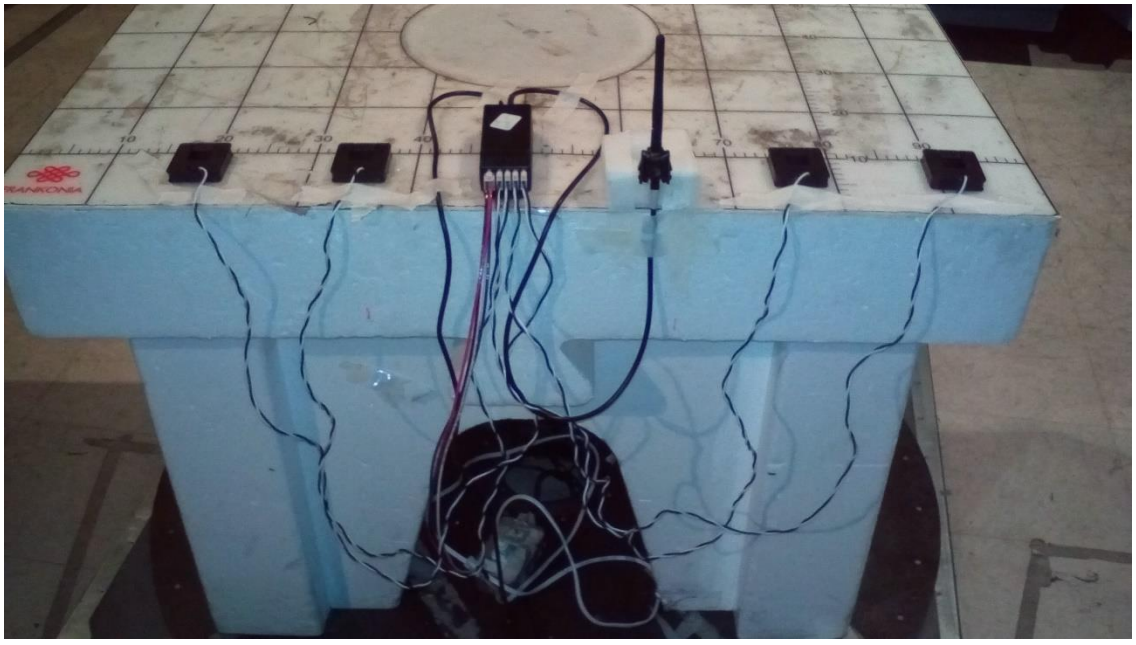


Figure 2: Radiated Spurious Emissions Test Setup Below 1000MHz

Figure 3: Radiated Spurious Emissions Test Setup Below 30MHz

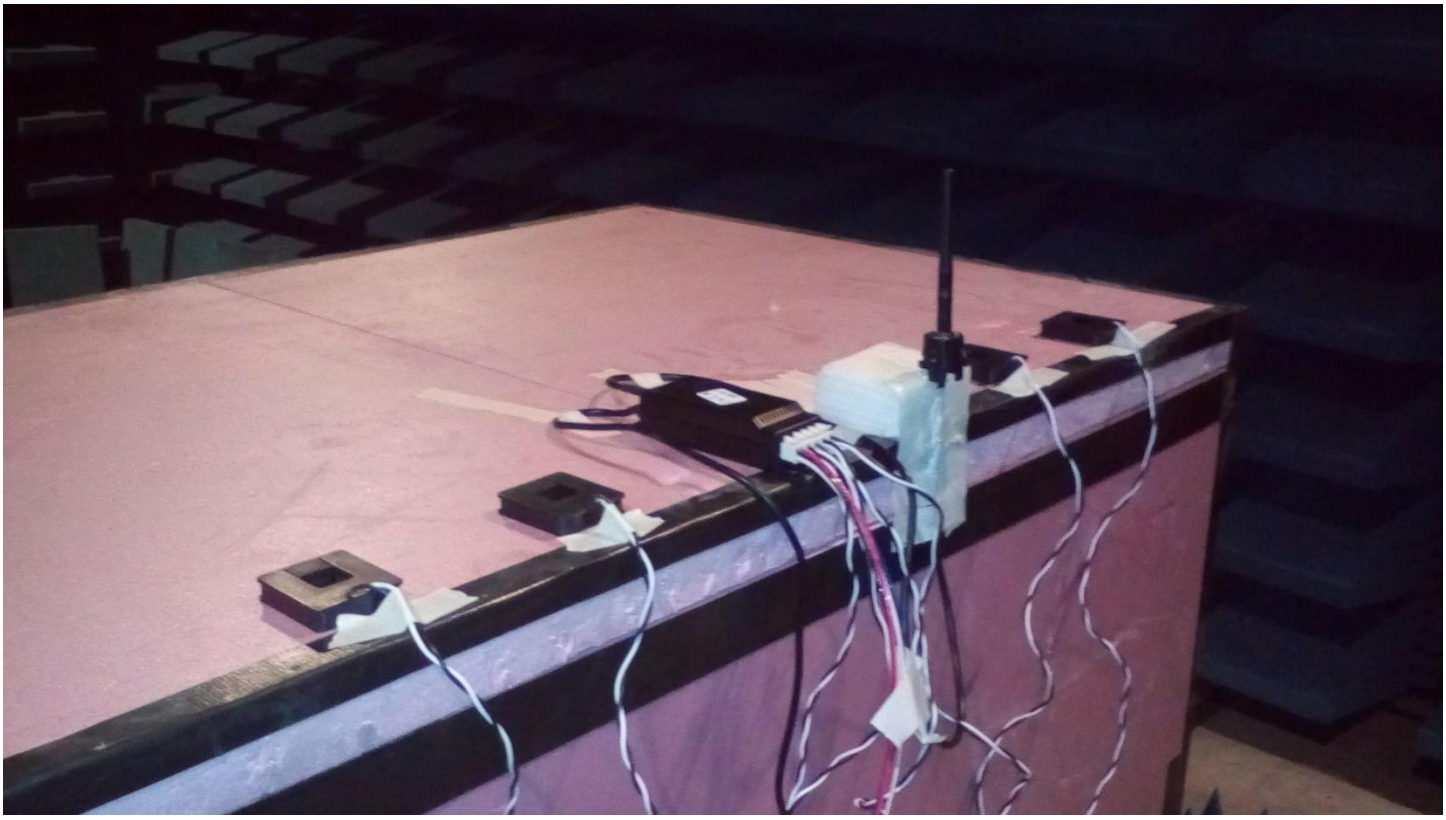


Figure 4: Radiated Spurious Emissions Test Setup Above 1GHz

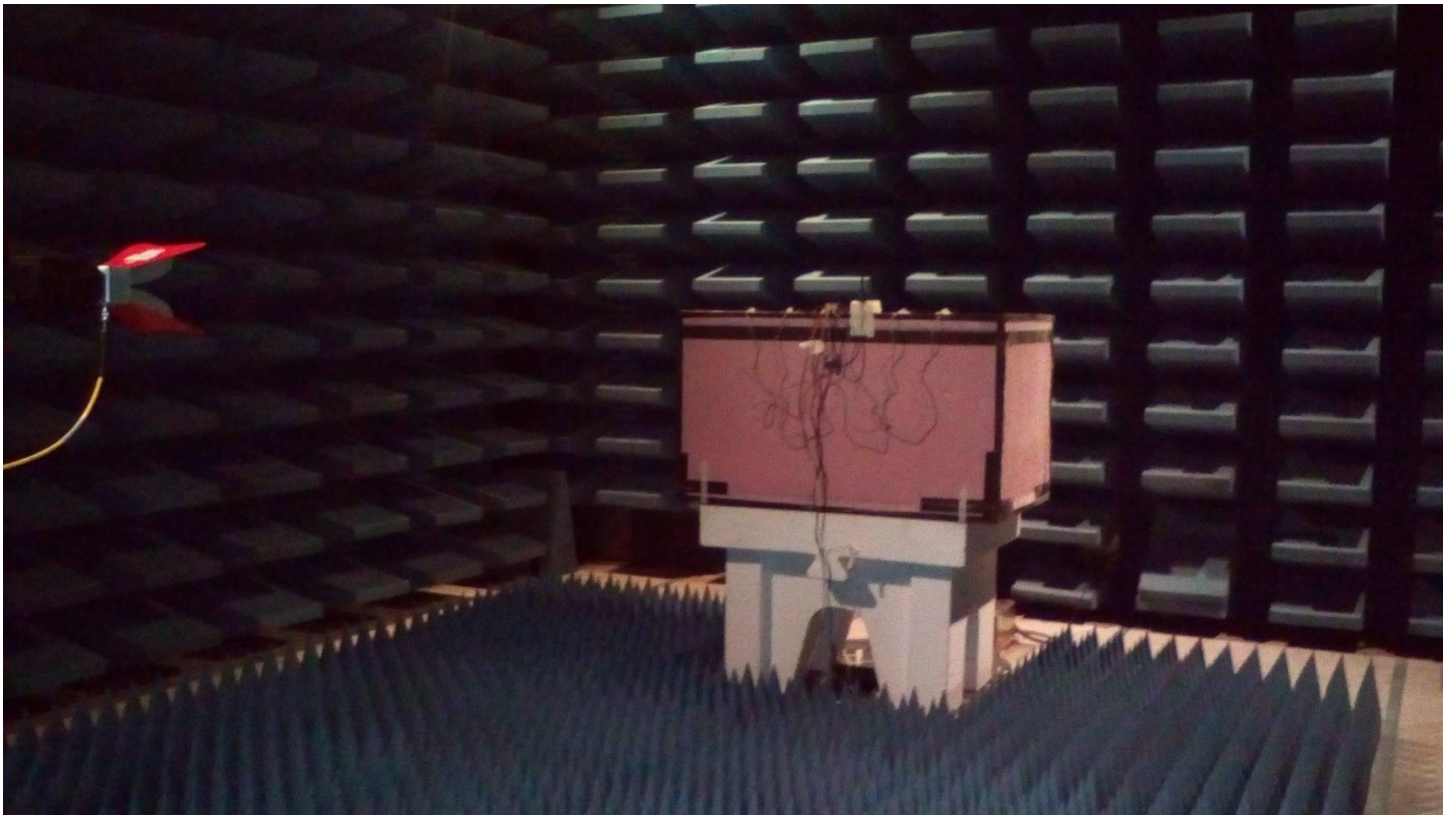


Figure 5: Radiated Spurious Emissions Test Setup above 1GHz

Appendix K: ABBREVIATIONS

Abbreviation	Definition
AC	Alternating Current
CE	European Conformity
CISPR	Comité International Spécial des Perturbations Radioélectriques
DC	Direct Current
EFT	Electrical Fast Transient
E.I.R.P.	Equivalent Isotropically Radiated Power
EMC	ElectroMagnetic Compatibility
EMI	ElectroMagnetic Interference
ESD	ElectroStatic Discharge
EUT	Equipment Under Test
FCC	Federal Communications Commission
IC	Industry Canada
ICES	Interference-Causing Equipment Standard
LISN	Line Impedance Stabilizing Network
OATS	Open Area Test Site
RF	Radio Frequency
RMS	Root-Mean-Square
SAC	Semi-Anechoic Chamber

QAI Laboratories
3980 North Fraser Way
Burnaby, BC, V5J 5K5 Canada

END OF REPORT