ELECTROMAGNETIC COMPATIBILITY TEST REPORT

PREPARED FOR Energy Aware Technology Inc.
BY QAI LABORATORIES

CFR 47 Part 15, Subpart 2 - Intentional Radiators - 15.247 - FHS/DTS 2400-2483.5 MHz

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ISO/IEC 17025:2005

American Association for Laboratory Accreditation Certificate Number: 3657.02

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Applicable Test Standards:

CFR 47 FCC Part 15 Subpart C - 15.247	*Radio Frequency Devices - Subpart C - Intentional Radiators - §15.247 - Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz*
CFR 47 FCC Part 15 Subpart B	*Radio Frequency Devices - 47 CFR Subpart B - Unintentional Radiators*
RSS-247 Issue 2	*Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices*
RSS-Gen Issue 5	*General Requirements for Compliance of Radio Apparatus*
ICES-003 Issue 6	*Information Technology Equipment (including Digital Apparatus) - Limits and Methods of Measurement.*

Product Tested:	**W2 - 802.11b/g/n WiFi + BT/BLE**
Model Number:	**W2, W2-RGM**
Manufacturer:	**Energy Aware Technology Inc.**

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REVISION HISTORY

Date	Report Number	Revision	Description	By
2019 Jun 12	E10720-1806-FDS2	1.3	Internal review	BB
2019 May 15	E10720-1806	1.2	Not released	BB
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2019 Apr 30	E10720-1806	1.0	DRAFT	BB

All previous versions of this report have been superseded by the latest dated revision as listed in the above table.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 equipment W2, W2-RGM - W2 - 802.11b/g/n WiFi + BT/BLE provided by Energy Aware Technology Inc.. Tests were performed on the sample provided by Energy Aware Technology Inc. as requested for the purpose of demonstrating compliance with CFR 47 FCC Part 15 Subpart C - 15.247, CFR 47 FCC Part 15 Subpart B , RSS-247 Issue 2, RSS-Gen Issue 5, ICES-003 Issue 6 as agreed per quotation 18AN07241R4.

Energy Aware 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 a partial list of tests that are required for FCC, ISED and/or CE Mark Declaration of Conformity and can only be reproduced by the manufacturer.

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

Tested by Bruce Balston
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QAI FACILITIES

Founded in 1994 by a group of experienced certification, compliance and testing experts, QAI is an independent third-party testing, inspection and certification organization which serves the industry and government providing solutions through our in-house capabilities, services, and world-wide network of qualified affiliates. QAI has the capability to perform EMC emissions and immunity/susceptibility for all types of electronics manufacturing including industrial, scientific, medical, information technology, telecom, wireless, automotive, marine and avionics. Products are tested to the latest and applicable EMC/EMI requirements for domestic and international markets for regulatory compliance.

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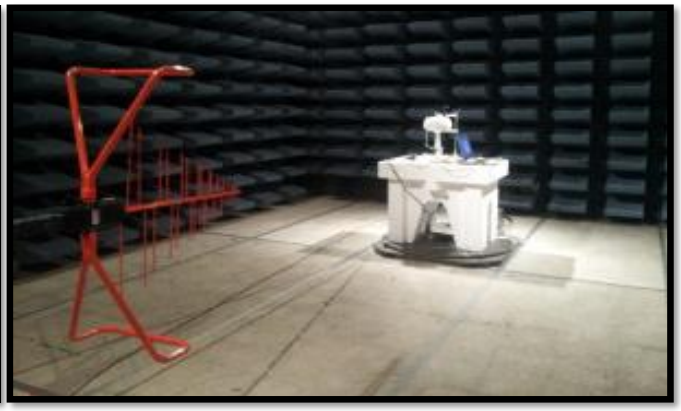
QAI EMC ACCREDITATION

EMC Laboratory Location	FCC Designator	FCC Registration 3m SAC	FCC Registration 3m/10m OATS	IC Registration 3m SAC	A2LA Certificate
Burnaby, BC Canada	CA9543	9543A	9543C-1	21146-1	3657.02

Corporate Headquarters & EMC Laboratory
Burnaby, BC

10m Open Area Test Site (OATS)
Malcom Knapp Research Forest, Maple Ridge, BC

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



3m Semi-Anechoic Chamber (SAC)
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APPENDICES

Section I: EXECUTIVE SUMMARY

1.1 Scope

This report demonstrates and documents compliance of W2 - 802.11b/g/n WiFi + BT/BLE, Model W2, W2-RGM manufacturered by Energy Aware Technology Inc. to the applicable standards listed below as described in 1.2 - 1.4.

1.2 Applicable Standards

The information documented in this report is based on the standards, test methods, limits and levels as per quotation 18AN07241R4.

CFR 47 FCC Part 15 Subpart C - 15.247	*Radio Frequency Devices - Subpart C - Intentional Radiators - §15.247 - Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz*
CFR 47 FCC Part 15 Subpart B	*Radio Frequency Devices - 47 CFR Subpart B - Unintentional Radiators*
RSS-247 Issue 2	*Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices*
RSS-Gen Issue 5	*General Requirements for Compliance of Radio Apparatus*
ICES-003 Issue 6	*Information Technology Equipment (including Digital Apparatus) - Limits and Methods of Measurement.*

1.3 Reference Standards

The following standards are included as normative references.

ANSI C63.4-2014	*- American National Standard For Methods Of Measurement Of Radio-Noise Emissions From Low-Voltage Electrical And Electronic Equipment In The Range Of 9 KHz To 40 GHz*
ANSI C63.10-2013	*- American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices*
KDB 178919 D01 v06	*- Permissive Change Policy*
KDB 412172 D01 v01r01	*- Determining ERP and EIRP*
KDB 558074 D01 v05r02	*- Guidance for Performing Compliance Measurements on Digital Transmissions Systems (DTS) operating under §15.247*
KDB 905462 D06 v02	*- 802.11 Channel Plans New Rules*

1.4 Summary of Results

This report demonstrates and documents compliance of W2 - 802.11b/g/n WiFi + BT/BLE, model W2, W2-RGM manufactured by Energy Aware Technology Inc. to CFR 47 FCC Part 15 Subpart C - 15.247, CFR 47 FCC Part 15 Subpart B , RSS-247 Issue 2, RSS-Gen Issue 5, ICES-003 Issue 6 for the purpose of a Class II Permissive Change (CIIPC) in accordance with KDB 412172 D01 v01r01. This CIIPC is required to allow addition of an alternate antenna type and gain, model BREND JYHG-2400-108-SMA(RP).

Degradation of EMC parameters and are not allowed under a CIIPC. Any increase in the fundamental emission for output power rated devices or increase in maximum output power rating requires a new grant of certification (i.e. new FCC ID). A spurious emissions increase of up to 3 dB from the original authorization is allowed, if the emission level is compliant.

The following testing was performed pursuant to CFR 47 FCC Part 15, Subpart B - Emissions

Test or Measurement	Applicable Standard	Description	Result
Conducted Emissions AC Mains	15.107	*Conducted emissions measured on the AC power input (Mains) 150k - 30M Hz.*	Complies
Radiated Emissions Enclosure	15.109	*Radiated emissions of the enclosure measured 30M - 1G Hz (quasi-peak) and 1G - 40G Hz (peak/average) as defined by the applicable measurement frequency range.*	Complies

The following testing was performed pursuant to CFR 47 FCC Part 15, Subpart C, 15.247 - Emissions

Test or Measurement	Applicable Standard	Description	Result
Conducted Emissions AC Mains	15.207	*Conducted emissions measured on the AC power input (AC Mains) 150k - 30M Hz.*	Complies
Radiated Emissions Enclosure	15.209, 15.205, 15.247(d)	*Radiated emissions of the enclosure measured 30M - 1G Hz (quasi-peak) and 1G - 40G Hz (peak/average) as defined by the applicable measurement frequency range.*	Complies
RF Peak Output Power	15.247(b)(1),(b)(3)	*Maximum peak conducted output power shall not exceed 1 W. EIRP shall not exceed 4 W.*	Complies
Occupied Bandwidth	15.247(a)(1)	*The minimum 6 dB bandwidth shall be at least 500 kHz.*	Complies
Out of Band Emisisons (Bandedge)	15.247(d), 15.205(c)	*In any 100 kHz bandwidth outside the frequency band in which the device is operating, the RF power produced shall be at least 20 dBc (peak) or 30dBc (rms). Radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a).*	Complies
Conducted Spurious Emissions	15.247(d), 15.205, 15.209(a)	*Conducted emissions requirements as stated in the standard.*	Complies
Radiated Spurious Emissions	15.209, 15.205, 15.247(d),	*Radiated emissions requirements as stated in the standard.*	Complies
RF Exposure	1.131	*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

The following testing was performed pursuant to ICES-003 Issue 6 - RX Emissions

Test or Measurement	Applicable Standard	Description	Result
Conducted Emissions AC Mains	ICES-003	*Conducted emissions measured on the AC power input (AC Mains) 150k - 30M Hz.*	Complies
Radiated Emissions Enclosure	RSS-Gen 7.1, ICES-003	*Radiated emissions of the enclosure measured 30M - 1G Hz (quasi-peak) and 1G - 6G Hz (peak/average) as defined by the applicable measurement frequency range.*	Complies

The following testing was performed pursuant to RSS-Gen Issue 5 and RSS-247 Issue 2 - Emissions

Test or Measurement	Applicable Standard	Description	Result
Conducted Emissions AC Mains	RSS-Gen 7.2.2	*Conducted emissions measured on the AC power input (Mains) 150k - 30M Hz.*	Complies
Radiated Emissions Enclosure	RSS-Gen 8.9, RSS 247 5.5	*Radiated emissions of the enclosure measured 30M - 1G Hz (quasi-peak) and 1G - 40G Hz (peak/average) as defined by the applicable measurement frequency range.*	Complies
RF Peak Output Power	RSS-247 5.4 (2)	*Maximum peak conducted output power shall not exceed 1 W. EIRP shall not exceed 4 W.*	Complies
Occupied Bandwidth	RSS-247 5.1 (1), RSS-Gen 6.6	*The minimum 6 dB bandwidth shall be at least 500 kHz.*	Complies
Out of Band Emisisons (Bandedge)	RSS-247 5.5, RSS-Gen 8.9	*In any 100 kHz bandwidth outside the frequency band in which the device is operating, the RF power shall be at least 20 dBc (peak) or 30 dBc (rms). Radiated emissions which fall in the restricted bands, as defined in RSS-Gen Issue 5 8.10, must also comply with the radiated emission limits specified in RSS-Gen Issue 5 8.9.*	Complies
Conducted Spurious Emissions	RSS-247 5.5	*Conducted emissions requirements as stated in the standard.*	Complies
Radiated Spurious Emissions	RSS-247	*Radiated emissions requirements as stated in the standard.*	Complies
RF Exposure	RSS-Gen 3.4, RSS-102 4	*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

Section II: GENERAL INFORMATION

2.1 Product Description

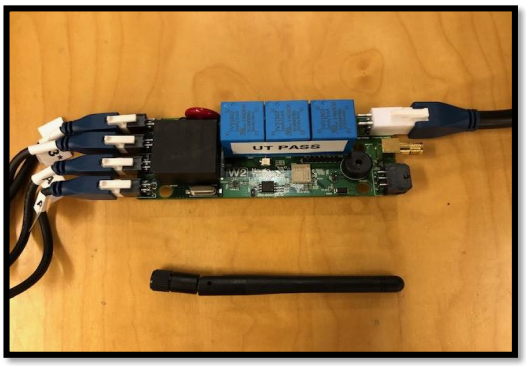
The Equipment Under Test (EUT) and the corresponding Auxiliary Equipment (AE) required to perform the tests as complete system are described below. The client has provided a sample of each of the product listed for compliance testing. If applicable, evaluation testing was performed on individual EUT models within the product family as necessary to determine worst-case configuration and satisfy due diligence requirements. All of the products listed are considered within the scope of compliance testing.

EUT Information

PN	Manufacturer/Description	Model	Description
-	Energy Aware Technology Inc.	W2, W2-RGM	*Complete list of products within scope*
11.00025	Energy Aware Technology Inc.	W2	*Line power metering device*
11.00027	Energy Aware Technology Inc.	W2-RGM	*Line power metering device for RGM*
	CT1-4	Supplied with product	*Current transformers, supplied with product*
	Antenna port extension cable	Supplied with product	*RG58/U reverse SMA 0.5m extension cable*

Auxiliary Equipment	Manufacturer	Description
Auxiliary 1	Lenova	*Notebook PC*
Auxiliary 2	-	*USB cable 0.5m*
Auxiliary 3	-	*Embedded test mode software*

Figure 1: Equipment Under Test



2.1.1 Test Configuration

The EUT was configured for 'normal operation' at maximum rate load unless specified otherwise. All accessory cables were attached unless defined as 'craftsman' port used for diagnostic and configuration. Auxiliary Equipment (AE) (notebook computer and USB cable) may be present or within external RF shielded container during compliance testing .

The EUT was configured for test using the internal test mode provided by the manufacturer to simulate data transmission. This utility includes all modulation modes, transmit frequencies and power levels and all other configuration options required for testing.

Refer to manufacturers documentation for additional details of modulation types, technology, applicable data transfer rates, channels and other information. Multiple antenna output (beamforming) does not apply.

Test Modes

		TX0			
Test Mode		Band	Frequency MHz	Frequency MHz	
2G4.11b		2G4-11b	2412, 2462		
2G4.11g		2G4-11g	2412, 2462		
2G4.11n		2G4-11n	2412, 2462		
2G4.BT		2G4-BT	2402, 2480		
2G4.BLE		2G4-BLE	2402, 2480		

Modulations

Band	Frequency MHz	Modulation	Modulation Type
2G4-11b	2412, 2462	CCK(1M,2M,5,5M,11M)	DSSS
2G4-11g	2412, 2462	xHT(6M, 12M, 24M, 54M)	OFDM
2G4-11n	2412, 2462	HT20MCS(0, 2, 4, 7) - (6M5, 19M5, 32M5, 65M)	OFDM
2G4-BT	2402, 2480	BT	FHSS
2G4-BLE	2402, 2480	BLE	GFSK

Notes: 1. FHSS consists of GFSK, π/4DQPSK, 8DPSK.
2. OFDM consists of BPSK, QPSK, 16-QAM, 64-QAM.

2.1.2 Modifications

No modifications were made to the EUT.

2.1.3 List of Ports

Craftsman ports are defined by the manufacturer and used for diagnostic and configuration by the manufacturer or installer.

2.1.4 Description of Antenna

The manufacturer's specified antenna gain in excess of 6dBi is used to reduce the overall conducted power limit as applicable in each specified frequency band.

Band	Maximum Antenna Gain dBi	
2G4	3.0	

Band	Manu.	Model/PN	Gain	Antenna Type	Connector
2G4	BREND	JYHG-2400-108-SMA(RP)	3.0	Dipole	*Reverse SMA*

2.1.5 Directional Gain (Beamforming)

The manufacturer's specified beamforming antenna gain in excess of 6dBi reduces the overall conducted power limit as applicable in each specified frequency band with a corresponding reduction of transmit power. For WiFi devices, beamforming if applicable, transmit signals are assumed to be correlated and the number of independent spatial streams (Nss) is assumed to be 1.

2.1.6 Declared RF Output Power - Including tune-up tolerance

The manufacturer has declared tune-up tolerance for the RF output power according to the following table. All measurements have been collected with a calibrated production unit with the RF power adjusted to the maximum output power including tune-up tolerance.

Table 2.1.6-1: Maximum Conducted RF Output Power including Tune-up Tolerance for Class 2 Permissive Change

Frequency Band MHz	Manufacturer Declared Tune-up Tolerance dB	Rated Output Power dBm	Maximum Test Condition Original Certification Output Power dBm (*2)	Applicable Maximum Test Condition - CIIPC - Output Power dBm (*2)
2G4(11b/g/n)	1.00	17.5	18.5	18.5
2G4(BT)	1.25	8.5	9.8	9.8
2G4(BLE)	1.25	7.0	8.3	8.3

Notes: 1. Maximum output power measured reflects data in Appendix D.
2. This data includes tune-up tolerance and represents the maximum applicable test condition to meet the terms of a CIIPC.

2.2 Environmental Conditions

The EUT was operated and tested under the following environmental conditions.

Parameter	Condition
Location	Indoors
Temperature	22 - 28 C
Relative Humidity	39.8 - 54.5%

2.3 Measurement Uncertainty

Parameter	Uncertainty
Radiated Emissions 30MHz-1GHz	±2.40 dB
Radiated Emissions 1GHz-40GHz	±2.48 dB
Radio Frequency	±15 Hz
Total RF Power Conducted	±1.36 dB
Spurious Emissions, Conducted	±1.36 dB
RF Power Density, Conducted	±1.36 dB
Temperature	±1 C
Humidity	±5 %
DC and low frequency voltages	±3 %

2.4 Worst-Case

When appropriate during radiated emissions and/or other testing, worst-case orientation or configuration was determined during exploratory investigation phase. The final radiated emissions or other measurements were then performed in the worst-case orientation or configuration.

2.5 Sample Calculations of Emissions Data

Radiated and conducted emissions may be performed using automated measurement software. Correction factors for antenna factor, cable loss, amplifier gain, and other transducer factors are stored in the test templates used to perform measurements. Sample data generated from the automated software consisting of product details, emission plots and final data tables is shown below.

Sample Radiated Emission Table:

Frequency MHz	Quasi-Peak dBµV/m	Meas. Time msec	Resolution Bandwidth KHz	Antenna Height cm	Polarity	Turntable position deg	Correction dB	Margin dB	Limit dBµV/m
42.6639	33.4	1000	120	104	HORZ	70	13.2	7.5	40.5

The Quasi-Peak/Average reading shown in the table above is corrected by the software using the correction factor shown. An amplifier may be used when required. The correction factor listed is calculated as:

Correction(dB) = Antenna Factor + Cable Loss - Amplifier Gain

The final Quasi-Peak/Average value for radiated emissions is calculated by the automated software using the following equation:

Corrected Quasi-Peak/Average(dBµV/m) = Raw Quasi-Peak/Average + Correction(dB)

Sample Conducted Emission Calculation:

Frequency MHz	Quasi-Peak dBµV/m	Meas. Time msec	Bandwidth kHz	Correction dB	Margin dB	Limit dBµV/m
0.15162	44.3	1000	9	0.6	21.7	66

Frequency MHz	Average dBµV/m	Meas. Time msec	Bandwidth kHz	Correction dB	Margin dB	Limit dBµV/m
0.15162	27.2	1000	9	0.6	28.8	56

The Quasi-Peak/Average reading shown in the table above is corrected by the software using the correction factor shown. The correction factor listed is calculated as:

Correction(dB) = Transducer Factor + Cable Loss

The final Quasi-Peak/Average value for radiated emissions is calculated by the automated software using following equation:

Corrected Quasi-Peak/Average(dBµV) = Raw Quasi-Peak/Average + Correction (dB)

Margin, defined as the distance to the limit specified in the applicable standard is calculated as shown below for both radiated and conducted emissions. By definition, negative margin is non-compliant (failure).

Margin(dB) = Limit – Quasi-Peak/Average Measurement

2.6 List of Test Equipment

The tables below list the equipment used by QAI Laboratories in performing the tests on the Equipment Under Test (EUT). The calibration interval is 3 years or less as defined in the Quality Manual.

Emissions Test Equipment

Manufacturer	Model	Description	Serial No. / Asset	Calibration Due Date
Sunol Sciences	SM46C	Turntable	051204-2	N/A
Sunol Sciences	TWR95	Mast	TREML0001	N/A
Sunol Sciences	JB3	Biconilog Antenna 30M-3G Hz	A120106	2020 Aug 16
ETS Lindgren	2165	Turntable	43677	N/A
ETS Lindgren	2125	Mast	77487	N/A
Rohde & Schwarz	ESU40	EMI Receiver	100011	2019 Dec 1
Fischer	FCC-LISN-50-25-2-08	LISN 150k-30M Hz	2041	2018 Nov 19
ETS Lindgren	S201	5-meter Semi-Anechoic Chamber	1030	N/A
ETS Lindgren	DRH 3117	Horn Antenna 1G-18G Hz	75944	2019 Mar 10
AH Systems	PAM118	Amplifier 10k-18G Hz	189	Conditional Use
California Instruments	PACS-1	Harmonics and flicker analyzer	72569	2019 May 23
California Instruments	OMNI 1-18	Programmable Impedance Flicker Analyzer	317113	2017 Oct 19
California Instruments	300lix	Programmable Power Supply	HK52117	2019 May 23

Measurement Software

Manufacturer	Model	Description	Serial No.
Rhode & Schwarz	EMC 32	Emissions Measurement	6.20.0

Section III: REQUIREMENTS FOR THE USA MARKET (FCC) & THE CANADIAN MARKET (ISED)

3.1 AC Mains Conducted Emissions

This test ensures unintentional RF energy from the Equipment Under Test (EUT) conducted to its power source does not exceed the limits defined in the table below as specified in Class B of 15.107, ICES-003, and 15.207, RSS-Gen 7.2.2. This prevents the EUT from causing unwanted interference to other electronic devices.

This test is performed in accordance with ANSI C63.4(2014). The EUT was operated at 120V/60Hz while in 'Continuous Mode' of operation. The measurement frequency range was determined in accordance with FCC Part 15.33, ICES-003 6.2, RSS-Gen 6.13.2

A Line Impedance Stabilizing Network (LISN) was used. Measurements were made by using instrumentation with 9 kHz measurement bandwidth, CISPR quasi-peak and average detector capabilities; measurement instrumentation requirements, including the measurement bandwidths used, as specified in CISPR 16-1-1.

Table 3.1-1: AC Mains Conducted Emission Limits - RX

Frequency Hz	Limit	
	Quasi-Peak dBµV	Average dBµV
150K - 500K	66 - 56 *	56 - 46 *
500K - 5M	56	46
5M - 30M	60	50
Notes: 1, The lower limit shall apply at the transition frequencies. ** Decreases linearly with the logarithm of the frequency.*		

Table 3.1-2: AC Mains Conducted Emission Limits - TX

Frequency Hz	Limit	
	Quasi-Peak dBµV	Average dBµV
150K - 500K	66 - 56 *	56 - 46 *
500K - 5M	56	46
5M - 30M	60	50
Notes: *The lower limit shall apply at the transition frequencies.* ** Decreases linearly with the logarithm of the frequency.*		

The EUT was tested without modification on March 15, 2019 and complies with Class B of 15.107, ICES-003 and 15.207, RSS-Gen 7.2.2.

Refer to Appendix A for AC Mains Conducted Emissions data.

3.2 Radiated Spurious Emissions

This test ensures the unintentional RF energy emitted (radiated) from the Equipment Under Test (EUT) does not exceed the limits defined in the table below, Class B of 15.109, RSS-Gen 7.1, ICES-003 as specified in 15.209, 15.205, 15.247(d), RSS-Gen 8.9, RSS 247 5.5. This prevents the EUT from causing unwanted interference to other electronic devices.

This test is performed in accordance with ANSI C63.4(2014). The EUT was operated at 120V/60Hz while in 'Continuous Mode' of operation. The measurement frequency range was determined in accordance with FCC Part 15.33, ICES-003 6.2, RSS-Gen 6.13.2

Measurements were made by using instrumentation with measurement bandwidth, CISPR quasi-peak and average detector capabilities; measurement instrumentation requirements, including the measurement bandwidths used, as specified in CISPR 16-1-1.

All cables over 1 meter length were bundled and retained from the floor. Preliminary measurements were performed in the 3m Semi Anechoic Chamber (SAC) while final measurements were performed at the 10m Open Air Test Site (OATS) if required for Class A digital devices.

Emissions in both horizontal and vertical planes (polarizations) were measured while rotating the EUT on the turntable to maximize signal strength. In the case of high ambient signals, measurements may be performed at a closer distance and the emission limit adjusted using the equation below to ensure compliance.

20 * Log (d1/d2)

Where d1 = New distance
d2 = Required distance

The device incorporates a "digital device" and applicable receive mode (RX) limits also apply.

The device includes co-location of transmitters, transmit mode (TX) limits are applicable while all transmitters are operating unless RF transmission of each device is exclusive. Preliminary investigation of intermodulation of transmitters to determine worst-case has been performed and final measurements for transmit mode have been performed independently and during simultaneous worst-case transmission of all devices.

Table 3.2-1: Radiated Emission Limits - RX/Digital Device

Frequency MHz	Field Strength Limit at 3m	
	Quasi-Peak µV/m	Quasi-Peak dBµV/m
0.009 - 0.490	2400/F(kHz) (*1)	128.5 - 93.8
0.490 - 1.705	24000/F(kHz) (*1)	73.8 - 63.0
1.705 - 30	30 (*2)	69.5
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

Notes:
1. *Measurement distance of 300m.*
2. *Measurement distance of 30m.*
3. *The lower limit shall apply at the transition frequencies.*
4. *The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector of 200Hz for 9k-150k Hz, 9kHz for 150k-30M Hz, and 120kHz for 30M-1G Hz except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000M Hz. Radiated emission limits in these three bands are based on measurements employing an average detector. CISPR average detector of 300Hz for 9k-150k Hz, and 30kHz for 150k-30M Hz, 300kHz for above 1G Hz.*

Table 3.2-2: Radiated Emission Limits - TX

Frequency MHz	Field Strength Limit at 3m	
	Quasi-Peak µV/m	Quasi-Peak dBµV/m
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

Notes: The lower limit shall apply at the transition frequencies.

The EUT was tested without modification on March 13, 2019 and complies with Class B of 15.109, RSS-Gen 7.1, ICES-003 and 15.209, 15.205, 15.247(d), RSS-Gen 8.9, RSS 247 5.5.

Refer to Appendix B for Radiated Spurious Emissions data.

3.3 Conducted Spurious Emissions

This test ensures the RF peak power output of the Equipment Under Test (EUT) does not exceed the limits as specified in 15.247(d), 15.205, 15.209(a), and RSS-247 5.5 for systems employing, frequency hopping, digital modulation, and/or other modulation techniques operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.

The EUT was operated in continuous transmit mode with a duty cycle exceeding normal operation or 98% as applicable. The test was performed as defined by the standards above with the antenna port of the EUT directly connected to a spectrum analyzer.

For systems operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz, spurious emissions in any 100 kHz bandwidth shall be reduced at least 20 dBc, based on either a peak conducted or radiated measurement. If the transmitter complies with the conducted power limits based on the use of RMS averaging, the attenuation required shall be 30 dBc instead of 20 dBc. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified in 15.205

If the device includes co-location of transmitters and transmit mode (TX) limits are applicable while all transmitters are operating unless RF transmission of each device is exclusive. Preliminary investigation of intermodulation of transmitters to determine worst-case has been performed and final measurements for transmit mode have been performed independently and during simultaneous worst-case transmission of all devices.

The EUT was tested without modification on March 22, 2019 and complies with 15.247(d), 15.205, 15.209(a), and RSS-247 5.5.

Refer to Appendix C for Conducted Spurious Emissions data.

3.5 RF Peak Power Output

This test ensures the RF peak power output of the Equipment Under Test (EUT) does not exceed the limits as specified in 15.247(b)(1),(b)(3), RSS-247 5.4 (2) for systems employing frequency hopping, digital modulation and/or other modulation techniques operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.

The EUT was operated in 'continuous transmit mode'. The test was performed as defined by the standards above with the antenna port of the EUT directly connected to a spectrum analyzer or power meter. The conducted RF peak output power is also corrected for duty cycle to report the maximum transmit power.

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. The Equivalent Isotropically Radiated Power (EIRP) shall not exceed 4 W unless otherwise specified in the standard.

The RF peak output power or EIRP is calculated using the maximum conducted output power increased by the directional antenna gain.

Directional Antenna Gain (beamforming) reduces the power limit for directional antenna gains over 6dBi.

The EUT was tested without modification on March 14, 2019 and complies with 15.247(b)(1),(b)(3), RSS-247 5.4 (2).

Refer to Appendix D for RF Peak Power Output data.
Refer to Appendix E for Duty Cycle Correction data.

3.7 Occupied Bandwidth

This test ensures the occupied bandwidth of the Equipment Under Test (EUT) does not exceed the limits as specified in 15.247(a)(1), and RSS-247 5.1 (1), RSS-Gen 6.6 for systems employing digital modulation techniques operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.

The purpose of this test is to make certain that the occupied bandwidth of the Equipment-Under-Test (EUT) is within the limits as per the standards, FCC Part 15.247, RSS 247 Issue 2, RSS-Gen Issue 5 Section 6.6.

The test was conducted as defined by the standards above with the antenna port of the EUT directly connected to a spectrum analyzer. The minimum 6dB bandwidth of the EUT, as per the standards, shall be at least 500kHz. The 99% bandwidth was measured under the following circumstances.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

The EUT was tested without modification on March 26, 2019 and complies with 15.247(a)(1), and RSS-247 5.1 (1), RSS-Gen 6.6.

Refer to Appendix F for Occupied Bandwidth data.

3.8 Mask, Out-of-Band Emissions (Bandedge)

This test ensures the RF peak power output of the Equipment Under Test (EUT) does not exceed the limits as specified in 15.247(b)(1),(b)(3), RSS 247 Issue 2 for systems employing digital modulation techniques operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.

The EUT was operated in 'continuous transmit mode'. The test was performed as defined by the standards above with the antenna port of the EUT directly connected to a spectrum analyzer or power meter.

The test was performed 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. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted, the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified is not required.

In addition, radiated emissions which fall within restricted bands must comply with the restricted band limit. Within the 2400-2483.5 MHz band, the adjacent restricted bands at 2310-2390 MHz and 2483.5-2500 MHz were examined if applicable.

For conducted measurements above 1000 MHz within the restricted bands, the EIRP[dBm] shall be measured and then field strength E[dBuV/m} shall be calculated (see KDB Publication 789033 D02).

$$E[dB\mu V/m] = EIRP[dBm] - 20 \log (d[meters]) + 104.77 + A[dB]$$

where: E = field strength
d = distance at which field strength limit is specified in the rules
A[dB] = 2TX CDD Directional Gain (Beamforming) in excess of 6 dBi

The EUT was tested without modification on March 27, 2019 and complies with 15.247(d), 15.205(c), and RSS-247 5.5, RSS-Gen 8.9.

Refer to Appendix F for Mask, Out-of-Band Emissions (Bandedge) data.

3.50 RF Exposure Evaluation

This requirement ensures the Equipment Under Test (EUT) complies with the RF exposure requirements of CFR 47 FCC Part 1.131, and RSS-Gen 3.4, RSS-102 4.

FCC Part 1.1310 defines radio frequency radiation exposure limits for General Population/Uncontrolled Exposure within frequency range 1500 - 100,000 MHz: as 1.0 mW/cm^2.

RSS-102 Section 2.5.2 defines RF exposure evaluation as 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 at or above 300 MHz and below 6 GHz , the source-based, time-averaged maximum EIRP of the device is equal to or less than 1.31 x 10-2 ƒ^0.6834 W (adjusted for tune-up tolerance), where ƒ is in MHz. In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the EIRP was derived. RSS-102 Issue 5 Annex A 9(d) was used to report the evaluation data.

RF exposure, (power density) is calculated using the following formula.

Power Density (mW/cm^2) = EIRP(mW) / (4 * PI * r^2)

Table 3.50-1: RF Exposure Limits

Band	Worst-Case (Lowest) Frequency in Band MHz	RSS-102-2.5.2 Power Density Limit at 20 cm mW/cm^2	CFR 47 FCC 1.1310 Power Density Limit at 20 cm mW/cm^2
2G4	2400	2.7	1.0

Table 3.50-2: RF Exposure RF Evaluation

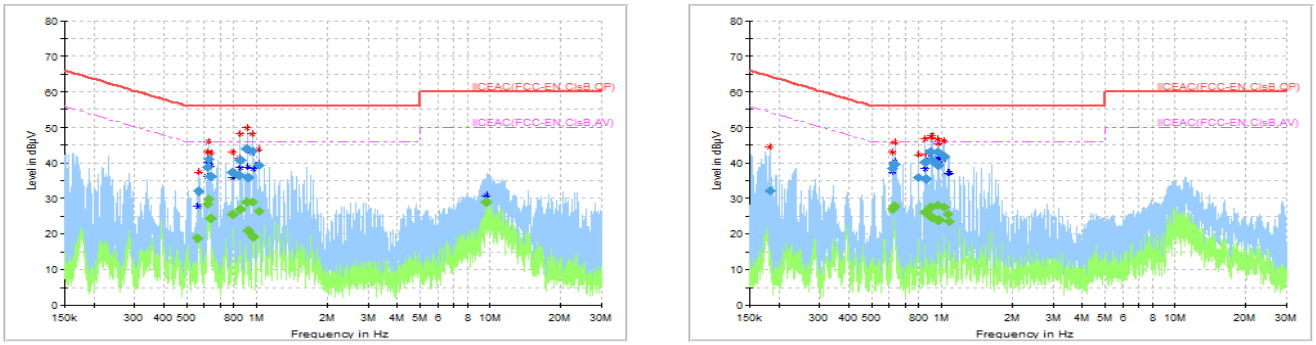
Band	Highest Measured Conducted Power dBm	Antenna Gain dBi	EIRP mW	Power Density at 20 cm mW/cm^2
2G4(WiFi)	18.5	3.00	141.3	0.028
2G4(BT)	9.6	3.00	18.2	0.004
2G4(BLE)	7.9	3.00	12.3	0.002

In all cases, the Power Density reported is significantly less than the applicable limits.

The measurements and calculations for RF Exposure were performed on March 25, 2019 and the EUT complies with CFR 47 FCC Part 1.131, and RSS-Gen 3.4, RSS-102 4.

Appendix A: CONDUCTED EMISSIONS DATA

Figure A1: AC Mains Conducted Emissions for FCC/ISED - 120V/60H - RX - L1/L2



Notes: 1. Series inductor in L1 path causes differential in data from L1 to L2 (N).

Table A1-1: Quasi-Peak/Average Data AC Mains Conducted Emissions for FCC/ISED - 120V/60H - RX - L1

Frequency MHz	Quasi-Peak dBµV	Meas.Time msec	Bandwidth kHz	Line	Correction dB	Limit dBµV	Margin dB	
0.905726	44.0	1000	9	L1	10.7	56.0	12.0	PASS
0.962665	43.3	1000	9	L1	10.7	56.0	12.7	PASS
0.625731	41.2	1000	9	L1	10.7	56.0	14.8	PASS
0.851302	40.8	1000	9	L1	10.7	56.0	15.2	PASS
Frequency MHz	**Average dBµV**	**Meas.Time msec**	**Bandwidth kHz**	**Line**	**Correction dB**	**Limit dBµV**	**Margin dB**	
0.625731	29.9	1000	9	L1	10.7	46.0	16.1	PASS
0.962665	29.1	1000	9	L1	10.7	46.0	16.9	PASS
0.905726	29.0	1000	9	L1	10.7	46.0	17.0	PASS
0.617654	28.3	1000	9	L1	10.7	46.0	17.7	PASS

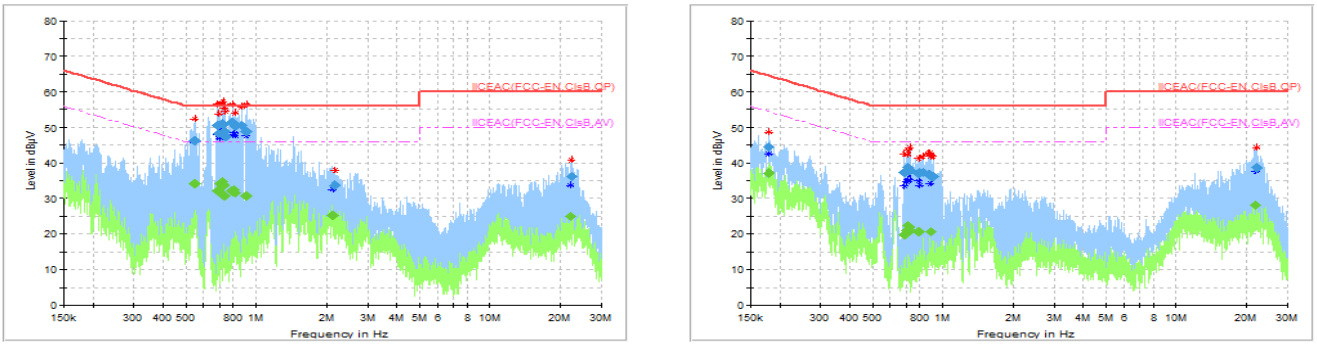
Notes: 1. Peak data may be compared to quasi-peak or average limit.
2. Emissions above noise floor or within 20dB of limit are reported.
3. The four data points with the least margin within 6dB of limit or all data within 6dB of limit are reported.

Table A1-2: Quasi-Peak/Average Data AC Mains Conducted Emissions for FCC/ISED - 120V/60H - RX - L2

Frequency MHz	Quasi-Peak dBµV	Meas.Time msec	Bandwidth kHz	Line	Correction dB	Limit dBµV	Margin dB	
0.902112	43.1	1000	9	L1	10.7	56.0	12.9	PASS
0.912997	40.8	1000	9	L1	10.7	56.0	15.2	PASS
0.958824	43.0	1000	9	L1	10.6	56.0	13.1	PASS
1.019102	41.8	1000	9	L1	10.7	56.0	14.2	PASS
Frequency MHz	**Average dBµV**	**Meas.Time msec**	**Bandwidth kHz**	**Line**	**Correction dB**	**Limit dBµV**	**Margin dB**	
0.617654	28.3	1000	9	L1	10.7	46.0	17.7	PASS
0.625731	29.9	1000	9	L1	10.7	46.0	16.1	PASS
0.905726	29.0	1000	9	L1	10.7	46.0	17.0	PASS
0.962665	29.1	1000	9	L1	10.6	46.0	16.9	PASS

Notes: 1. Peak data may be compared to quasi-peak or average limit.
2. Emissions above noise floor or within 20dB of limit are reported.
3. The four data points with the least margin within 6dB of limit or all data within 6dB of limit are reported.

Figure A2: AC Mains Conducted Emissions for FCC/ISED - 120V/60H - TX Worst-Case - L1/L2



Notes: 1. *Series inductor in L1 path causes differential in data from L1 to L2 (N).*

Table A2-1: Quasi-Peak/Average Data AC Mains Conducted Emissions for FCC/ISED - 120V/60H - TX Worst-Case - L1

Frequency MHz	Quasi-Peak dBµV	Meas.Time msec	Bandwidth kHz	Line	Correction dB	Limit dBµV	Margin dB	
0.905726	44.0	1000	9	L1	10.7	56.0	12.0	PASS
0.962665	43.3	1000	9	L1	10.7	56.0	12.7	PASS
0.625731	41.2	1000	9	L1	10.7	56.0	14.8	PASS
0.851302	40.8	1000	9	L1	10.7	56.0	15.2	PASS
Frequency MHz	**Average dBµV**	**Meas.Time msec**	**Bandwidth kHz**	**Line**	**Correction dB**	**Limit dBµV**	**Margin dB**	
0.625731	29.9	1000	9	L1	10.7	46.0	16.1	PASS
0.962665	29.1	1000	9	L1	10.7	46.0	16.9	PASS
0.905726	29.0	1000	9	L1	10.7	46.0	17.0	PASS
0.617654	28.3	1000	9	L1	10.7	46.0	17.7	PASS

Notes: 1. *Peak data may be compared to quasi-peak or average limit.*
2. *Emissions above noise floor or within 20dB of limit are reported.*
3. *The four data points with the least margin within 6dB of limit or all data within 6dB of limit are reported.*

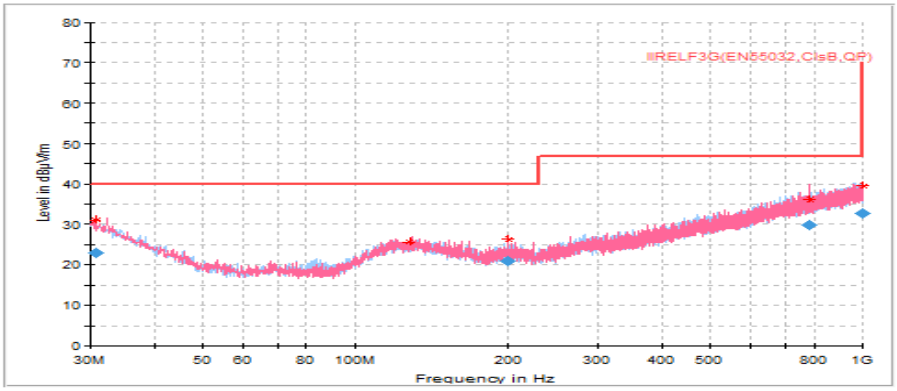
Table A2-2: Quasi-Peak/Average Data AC Mains Conducted Emissions for FCC/ISED - 120V/60H - TX Worst-Case - L2

Frequency MHz	Quasi-Peak dBµV	Meas.Time msec	Bandwidth kHz	Line	Correction dB	Limit dBµV	Margin dB	
0.793777	51.3	1000	9	L1	10.7	56.0	4.7	PASS
0.713980	51.2	1000	9	L1	10.7	56.0	4.8	PASS
0.721873	50.9	1000	9	L1	10.7	56.0	5.1	PASS
0.872842	50.6	1000	9	L1	10.7	56.0	5.4	PASS
0.686684	50.5	1000	9	L1	10.7	56.0	5.5	PASS
0.820395	50.5	1000	9	L1	10.7	56.0	5.5	PASS
0.729854	48.9	1000	9	L1	10.7	56.0	7.1	PASS
Frequency MHz	**Average dBµV**	**Meas.Time msec**	**Bandwidth kHz**	**Line**	**Correction dB**	**Limit dBµV**	**Margin dB**	
0.713980	34.8	1000	9	L1	10.7	46.0	11.3	PASS
0.547842	34.4	1000	9	L1	10.7	46.0	11.6	PASS
0.701951	34.4	1000	9	L1	10.7	46.0	11.6	PASS
0.721873	33.7	1000	9	L1	10.7	46.0	12.3	PASS

Notes: 1. *Peak data may be compared to quasi-peak or average limit.*
2. *Emissions above noise floor or within 20dB of limit are reported.*
3. *The four data points with the least margin within 6dB of limit or all data within 6dB of limit are reported.*

Appendix B: RADIATED EMISSIONS DATA

Figure B1: Radiated Emissions 30M-1G Hz for FCC/ISED - 120V/60H - RX



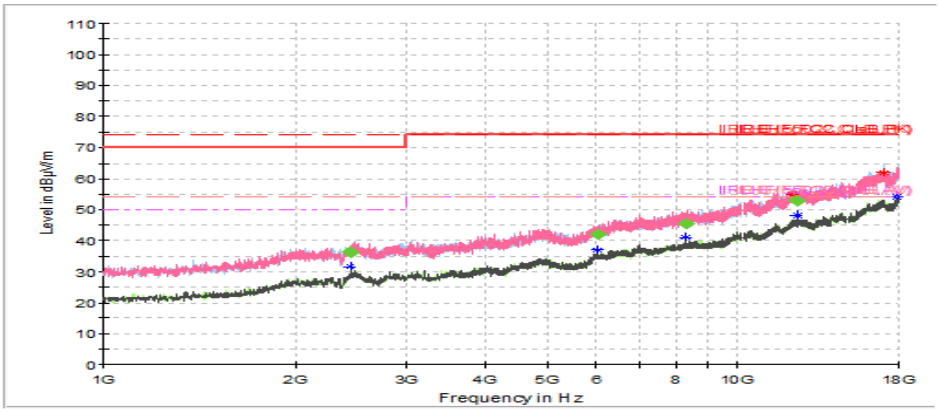
Notes:

Table B1-1: Radiated Emissions Data 30M-1G Hz for FCC/ISED - 120V/60H - RX

Frequency MHz	Quasi-Peak dBµV	Meas. Time ms	Bandwidth KHz	Polarity	Correction dB	Margin dB	Limit dBµV/m	
30.780	23.0	1000	120	VERT	26.6	17.0	40.0	PASS
199.956	21.0	1000	120	VERT	21.1	22.5	43.5	PASS
783.184	29.9	1000	120	VERT	32.5	16.1	46.0	PASS
996.503	32.9	1000	120	VERT	35.4	21.1	54.0	PASS

Notes: 1. Peak data may be compared to quasi-peak/average limit.
2. The four data points with the least margin within 6dB of limit or all data above the noise floor within 6dB of limit are reported.

Figure B2: Radiated Emissions 1G-18G Hz for FCC/ISED - 120V/60H - RX



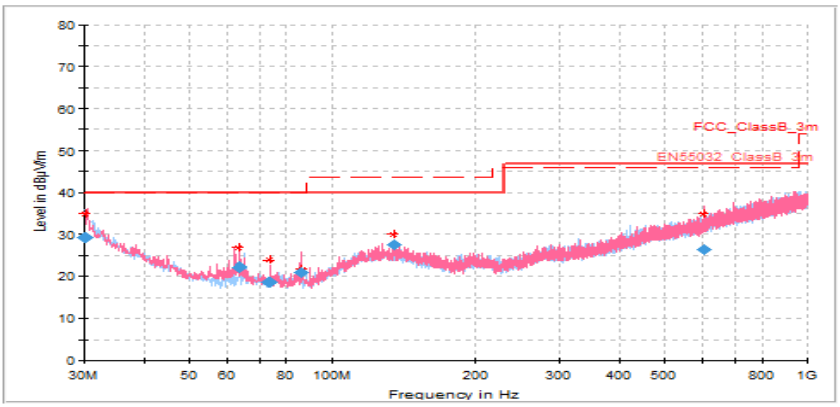
Notes:

Table B2-1: Radiated Emissions Data 1G-18G Hz for FCC/ISED - RX

Frequency MHz	Max Peak dBµV/m	Average dBµV/m	Meas. Time ms	Bandwidth Hz	Polarity	Correction dB	Margin dB	Limit dBµV/m	
2461.4028	-	36.48	1000	1M	HORZ	8.8	17.5	54.0	
6020.0776	-	41.94	1000	1M	HORZ	10.7	12.1	54.0	
8291.6548	-	45.58	1000	1M	HORZ	12.4	8.4	54.0	

Notes: 1. Peak data may be compared to quasi-peak/average limit.
2. The four data points with the least margin within 6dB of limit or all data above the noise floor within 6dB of limit are reported.D80

Figure B3: Radiated Emissions 30M-1G Hz for FCC/ISED - 120V/60H - TX Worst-Case



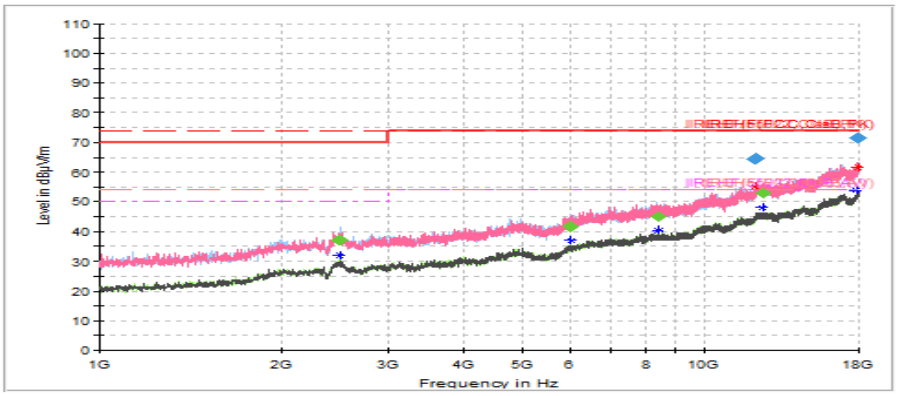
Notes:

Table B3-1: Radiated Emissions Data 30M-1G Hz for FCC/ISED - 120V/60H - TX Worst-Case

Frequency MHz	Quasi-Peak dBµV	Meas. Time ms	Bandwidth KHz	Polarity	Correction dB	Margin dB	Limit dBµV/m	
30.179	29.3	1000	120	VERT	25.4	29.3	40.0	PASS
63.520	22.3	1000	120	VERT	18.3	17.1	40.0	PASS
85.990	21.1	1000	120	VERT	20.2	21.2	40.0	PASS
135.157	27.6	1000	120	VERT	34.2	19.1	43.5	PASS
603.920	26.4	1000	120	VERT	34.2	29.0	46.0	PASS

Notes: 1. Peak data may be compared to quasi-peak/average limit.
2. The four data points with the least margin within 6dB of limit or all data above the noise floor within 6dB of limit are reported.
3. Transmit mode emission sweeps including co-location if applicable were performed using test configuration matrix to determine worst-case (section 2.1).
4. Notch filter may be used to suppress fundamental at 2G4 band.

Figure B4: Radiated Emissions 1G-18G Hz for FCC/ISED - 120V/60H - TX Worst-Case



Notes:

Table B4-1: Radiated Emissions Data 1G-18G Hz for FCC/ISED - 120V/60H - TX Worst-Case

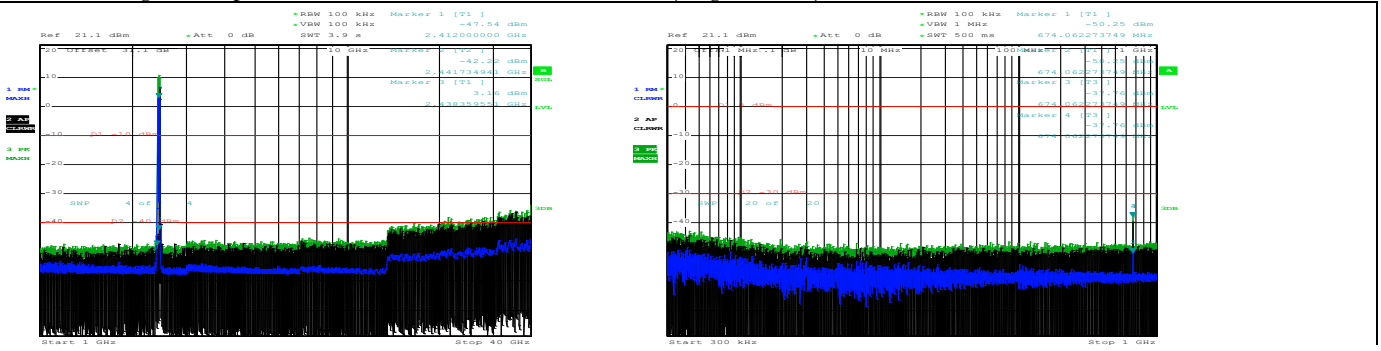
Frequency MHz	Max Peak dBµV/m	Average dBµV/m	Meas. Time ms	Bandwidth Hz	Polarity	Correction dB	Margin dB	Limit dBµV/m	
2491.7088	---	36.9	1000	1M	HORZ	8.8	17.1	54.0	*N/A - Notch*
6020.9892	---	41.62	1000	1M	HORZ	10.7	12.4	54.0	PASS
8404.0208	---	45.23	1000	1M	HORZ	12.4	8.8	54.0	PASS

Notes: 1. Peak data may be compared to quasi-peak/average limit.
2. The four data points with the least margin within 6dB of limit or all data above the noise floor within 6dB of limit are reported.
3. Transmit mode emission sweeps including co-location if applicable were performed using test configuration matrix to determine worst-case (section 2.1).
4. Notch filter may be used to suppress fundamental at 2G4 band.

Co-location Worst-case: The worst-case mode for co-located transmitters was determined to be Bluetooth(BTDH5) and 802.11n (HT40MS0) operating in 5G8 band at 5825MHz.

Appendix C: SPURIOUS CONDUCTED EMISSIONS DATA

Figure C1: Spurious Conducted Emissions for FCC/ISED - TX (11b/g/n, BT/BLE) - Worst-Case



Notes:	1. *Plots shown are cumulative or worst-case, multiple modulation/transmit frequencies examined, see test mode for description.*
	2. *No significant emissions found above noise floor, all emissions less than 30 dBc.*
	3. *All spurious emissions in Restricted Bands are within 54AV/74PK limit based on extrapolation of conducted emission measurement using KDB 412172.*
	4. *Bandedge spurious withing 3dB of 54AV/74PK limit measured radiated in SAC.*

Figure C2: Harmonic Conducted Emissions for FCC/ISED - TX (11b/g/n, BT/BLE) - Typical

Notes:	1. *Typical measurement shown.*
	2. *All harmonic emissions less than 30dBc.*

Table C1-1: Conducted Harmonic Emissions for FCC/ISED - TX(2G4), Worst-Case(11b/g/n, BT/BLE)

Frequency MHz	H2 dBc	H3 dBc	H4 dBc	H5 dBc	H6 dBc	H7 dBc	H8 dBc	H9 dBc	H10 dBc	Modulation
2412, 2442, 2462	71	69	63	66	56	54	54	52	53	11b-CCK
2412, 2442, 2462	57	65	60	60	51	50	51	48	50	11g-xHT
2412, 2442, 2462	67	65	60	60	51	50	51	48	49	11n-HT20M
2402, 2440, 2480	69	68	63	67	58	54	56	53	54	BT
2402, 2440, 2480	68	70	63	66	58	55	56	54	54	BLE

Notes:
1. *All harmonic content is less than 30 dBc.*
2. *Harmonic emissions for 11b, 11g were measured at both high and low data rates and worst-case data reported.*
3. *Harmonic emissions for BT/BLE were measured at each modulation supported and worst-case data reported.*
4. *Harmonic emissions for 11n were measured at both high and low data rates at each modulation modes and worst-case data reported.*
   Example measurement case: 11n-HT20M - HT20M-MCS0(6M5), HT20M-MCS7(65M), HT20M-MCS0(7M5), HT20M-MCS7(75M).

Appendix D: CONDUCTED RF OUTPUT POWER & EIRP DATA

Table D1: RF Conducted Output Power Maximum (Worst-Case), Corrected for Duty Cycle & EIRP - FCC/ISED - 2G4

Band	2G4 Channel Frequency LO/HI MHz		Output Power Watt	Antenna Gin dBi	Output Power mW	Output Power dBm	EIRP dBm	EIRP Limit dBm	Margin dB	
11b	2412	2462	0.07079	3.00	70.8	18.5	21.5	36.0	14.5	PASS
11g	2412	2462	0.01820	3.00	66.1	18.2	21.2	36.0	14.8	PASS
11n20M	2412	2462	0.01830	3.00	67.6	18.3	21.3	36.0	14.7	PASS
BT	2402	2480	0.00912	3.00	9.1	9.6	12.6	36.0	23.4	PASS
BLE	2402	2480	0.00617	3.00	6.17	7.9	10.9	36.0	25.1	PASS

Band	2G4 Frequency MHz	Modulation	Max. Output Power dBm	Limit dBm	Margin dB		Max Output Power dBm
2G4-11b	2412, 2437, 2462	CCK(1,2,5.5,11)	18.5	30.0	11.5	PASS	18.5
2G4-11g	2412, 2437, 2462	xHT(6M,12M,24,54M)	18.2	30.0	11.8	PASS	
2G4-11n(20M)	2412, 2437, 2462	HT20M(MCS0,2,4,7)	18.3	30.0	11.7	PASS	
2G4-BT	2402, 2442, 2480	BTDH5	9.6	30.0	20.4	PASS	9.6
2G4-BLE	2402, 2442, 2480	BLE	7.9	30.0	22.1	PASS	7.9

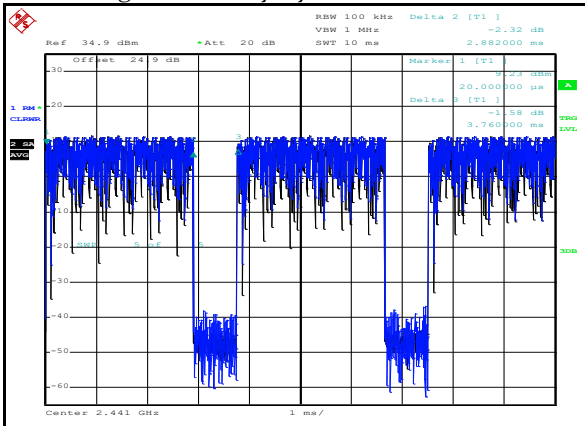
Notes: 1. Reported Output Power dBm includes duty cycle correction (Appendix E) for specific modulation to be determined as worst-case.
2. EIRP limit is reduced by the amount the antenna exceeds 6dBi.

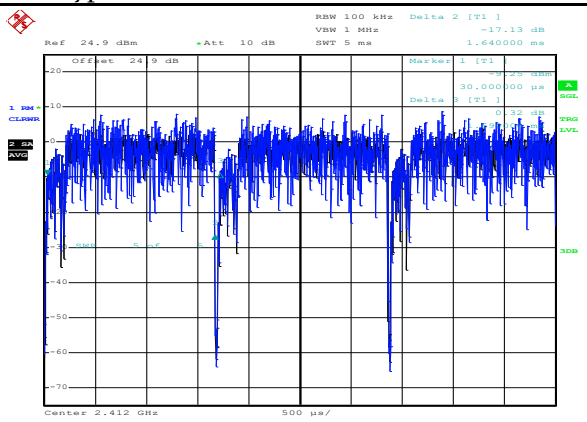
Appendix E: DUTY CYCLE CORRECTION DATA

Table E1: Duty Cycle Correction for RF Output Power

Frequency MHz	Modulation	Frequency MHz	T2 (OFF) usec or msec	T1 (ON+OFF) usec or msec	Duty Cycle dB	Max Duty Cycle dB
2G 11b	CCK1ML	2412	16.238	16.296	0.02	0.22
2G 11b	CCK11ML	2412	1.64	1.69	0.13	
2G 11g	xHT6M	2412	2.71	2.76	0.08	
2G 11g	xHT54M	2412	312	328	0.22	
2G 11n	HT20(MS0)	2412	2.500	2.534	0.06	0.33
2G 11n	HT20(MS7)	2412	282	304	0.33	
2G 11n	HT20(MN0)	2412	2252	2278	0.05	
2G 11n	HT20(MN7)	2412	264	284	0.32	
BT	BT_DH5	2402	2.88	3.76	1.16	1.16
BLE	BLE	2402	362	620	2.34	2.34
Notes: 1.						

Figure E1: Duty Cycle Correction for RF Output Power - Typical





Appendix F: OBW, MASK & BANDEDGE, PSD DATA

Table F1: Occupied Bandwidth for FCC/ISED

Band	Frequency MHz	Modulation	20 dB Occupied Bandwidth MHz	6 dB Occupied Bandwidth MHz	Limit OBW 6dB >500kHz	
2G4-11b	2412, 2437, 2462	CCK(1,2,5.5,11)	14.2	9.36	PASS	
2G4-11g	2412, 2437, 2462	xHT(6M,12M,24,54M)	16.4	15.1	PASS	
2G4-11n	2412, 2437, 2462	HT20M(MCS0,2,4,7)	17.6	16.2	PASS	
2G4-BT	2402, 2442, 2480	BTDH5	0.954		*Not Applicable*	
2G4-BLE	2402, 2442, 2480	BLE	1.088	0.695	PASS	

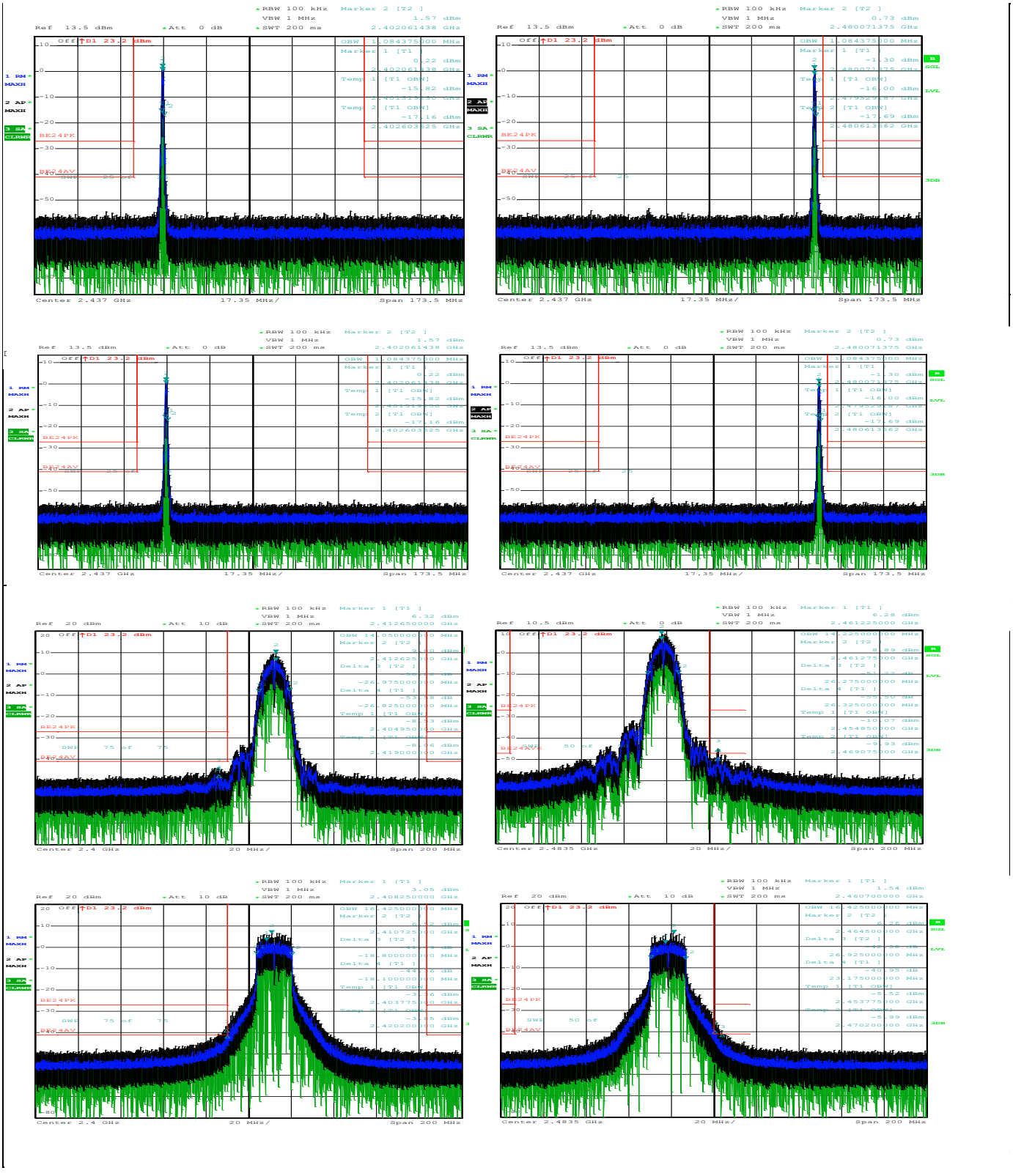
Table F2: Power Spectral Density for FCC/ISED

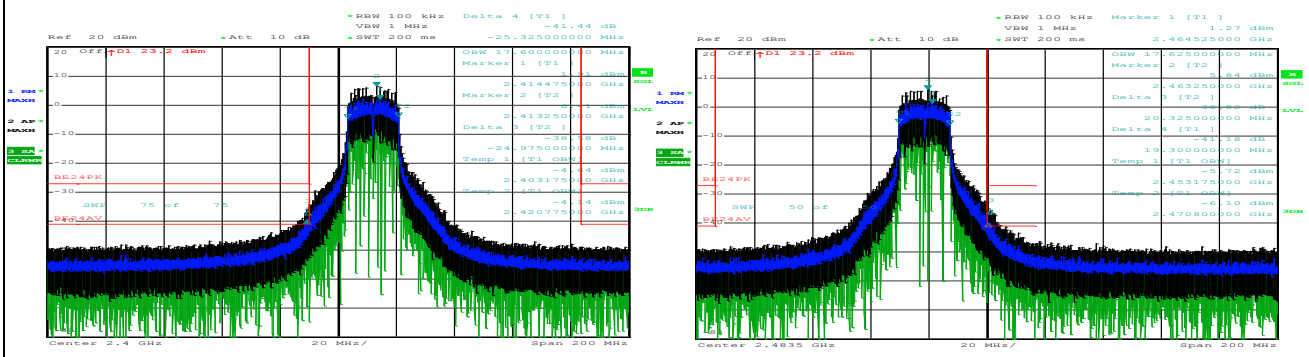
Band	2G4 Frequency MHz	Modulation	Power Spectral Density dBm/3kHz	PSD Limit dBm/3kHz	Margin dB	
2G4-11b	2412, 2437, 2462	CCK(1,2,5.5,11)	-6.4	8.0	14.4	PASS
2G4-11g	2412, 2437, 2462	xHT(6M,12M,24,54M)	-9.7	8.0	17.7	PASS
2G4-11n	2412, 2437, 2462	HT20M(MCS0,2,4,7)	-9.3	8.0	17.3	PASS
2G4-BT	2402, 2442, 2480	BTDH5				*Not Applicable*
2G4-BLE	2402, 2442, 2480	BLE	-7.3	8.0	15.3	PASS

Table F3: Out-of-Band and 2G4 Radiated Bandedge Emissions for FCC/ISED - TX 2G4 Worst-Case

Frequency MHz	Radiated Bandedge Measurement dBuV/m @3m	Correction dB	Meas. Time ms	Bandwidth Hz	Average Limit dBuV/m	Margin dB	Notes
2390	48.8	28.5	1000	1M	54.0	5.2	*Restricted Band(edge) PASS*
2483.5	49.8	28.6	1000	1M	54.0	4.2	*Restricted Band(edge) PASS*
Spurious emissions for all test cases not reported are attenuated by at least 30dBc (RMS method).							
Peak data for all test cases was determined to be greater than 14dB margin to peak limit of 74 dBuV/m using conducted method.							
Radiated measurement all restricted band emissions within 6dB of 54 dBuV/m limit performed.							
Notes: 1. *Spurious emissions are required to be attenuated by 30dB (RMS method) or 20dB (PK method) unless emissions fall within restricted bands.* 2. *Restricted bandedge conducted emissions at 2190MHz and 2483.5MHz converted to field reading in accordance with KDB 789033 D02 to determine worst-case.* 3. *Worst-case radiated bandedge measurement(s) performed on worst-case as determined from conducted emission plots shown.*							

Figure F1: PSD, OBW, Mask, Bandedge Emissions for FCC/ISED - TX 2G4 Typical




RBW 100 kHz
VBW 1 MHz
SWT 200 ms
Delta 4 [T1]
-41.44 dB
-25.325000000 MHz
Ref 20 dBm
Att 10 dB
D1 23.2 dBm
Marker 1 [T1]
Marker 2 [T2]
Delta 5 [T2]
-24.975000000 MHz
Temp 1 [T1 OBW]
Temp 2 [T2 OBW]
Center 2.4 GHz
20 MHz/
Span 200 MHz
RBW 100 kHz
VBW 1 MHz
SWT 200 ms
Marker 1 [T1]
1.27 dBm
2.464525000 GHz
Ref 20 dBm
Att 10 dB
D1 23.2 dBm
Marker 2 [T2]
Delta 5 [T2]
20.325000000 MHz
Delta 4 [T1]
-41.18 dB
19.300000000 MHz
Temp 1 [T1 OBW]
Temp 2 [T2 OBW]
Center 2.4835 GHz
20 MHz/
Span 200 MHz

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Appendix S: ABBREVIATIONS

Abbreviation	Definition
AC	Alternating Current
AE	Auxiliary Equipment
CDN	Coupling/Decoupling Network
CE	European Conformity
CISPR	Comité International Spécial des Perturbations Radioélectriques
DC	Direct Current
EFT	Electrical Fast Transient
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EIRP	Equivalent Isotropic Radiated Power
ESD	Electrostatic Discharge
EUT	Equipment Under Test
FCC	Federal Communications Commission
IC	Industry Canada
ICES	Interference Causing Equipment Standard (Canada)
ISED	Innovation, Science and Economic Development (Canada)
LISN	Line Impedance Stabilizing Network
OATS	Open Area Test Site
RF	Radio Frequency
RMS	Root Mean Square
SAC	Semi-Anechoic Chamber
UNII	Unlicensed National Information Infrastructure

[END OF REPORT]

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Appendix R: TEST SETUP PHOTOS

Figure R1: EUT

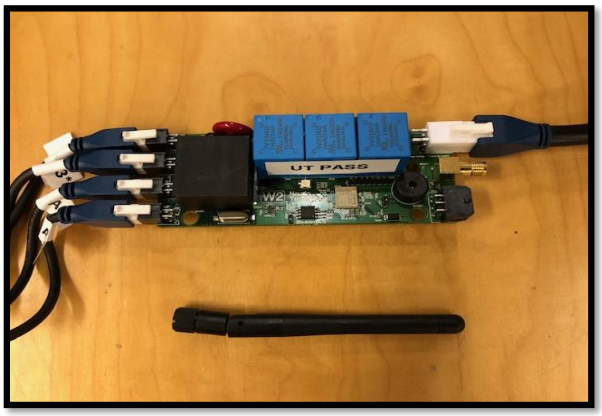

Figure R2: Eut with Accessories

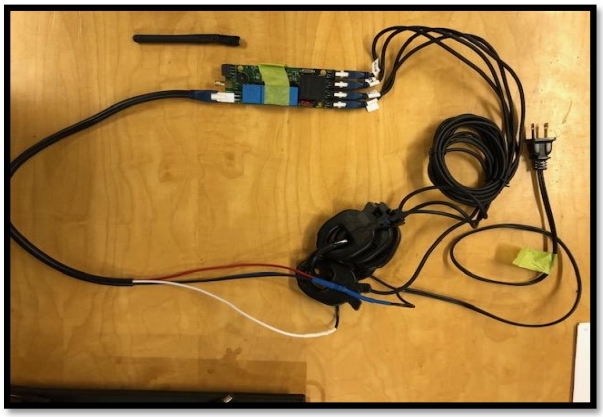

Figure R3: Conducted Emissions Test Setup

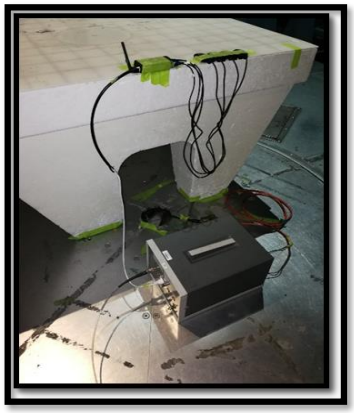

Figure R4: Radiated Emissions Test Setup

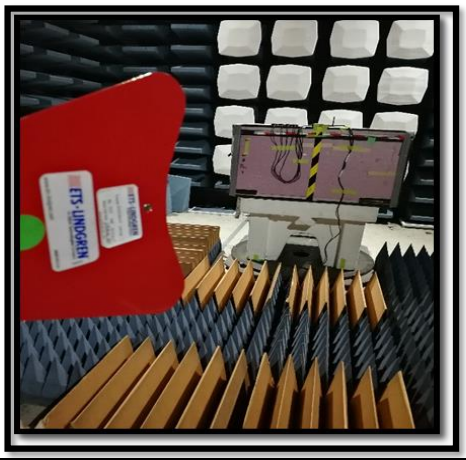

Figure R5: Radiated Emissions Test Setup