ELECTROMAGNETIC COMPATIBILITY TEST REPORT

PREPARED FOR Intrinsyc Technologies Corporation
BY QAI LABORATORIES

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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):

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Client:	**Intrinsyc Technologies Corporation**
Address:	885 Dunsmuir Street – Suite 300, Vancouver, BC, Canada V6C 1N5
Phone:	(604) 801-6461
Fax:	(604) 801-6417

Applicable Test Standards:

CFR 47 FCC Part 15, Subpart C & E	*- Radio Frequency Devices – Intentional Radiators.*
ICES-003 Issue 6	*- Information Technology Equipment (including Digital Apparatus) – Limits and Methods of Measurement.*
RSS-247 Issue 1	*- Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices*
RSS-210 Issue 8	*- Licence-Exempt Radio Apparatus: Category I Equipment*

Equipment Tested:	**Open-Q 820(TM) SOM 802.11a/b/g/n/ac WiFi + BT/BLE**
Model Number:	**FCC ID: 2AFDI-ITCNFA324**
Manufacturer:	**Intrinsyc Technologies Corporation**

REVISION HISTORY

Date	Report Number	Revision	Description	Author
2019 Jan 13	E10702-1809	1.2	Submission response requirements	BB
2018 Dec 6	E10702-1809	1.1	Changed antenna type	BB
2018 Nov 14	E10702-1809	1.0	Initial release	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All previous versions of this report have been superseded by the latest dated revision as listed in the above table.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 FCC ID: 2AFDI-ITCNFA324 Open-Q 820(TM) SOM 802.11a/b/g/n/ac WiFi + BT/BLE' provided by Intrinsyc Technologies Corporation. Tests were performed on the sample equipment as requested by Intrinsyc Technologies Corporation for the purpose of demonstrating compliance with CFR 47 FCC Part 15, Subpart C & E, ICES-003 Issue 6, RSS-247 Issue 1, RSS-210 Issue 8 as agreed upon by Intrinsyc Technologies Corporation as per quotation 18SH08082.

Intrinsyc Technologies Corporation 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
EMC Technician/Engineer

Written by Bruce Balston
Technical Writer

Approved by Raj Atwal
EMC Engineering Manager

Reviewed by Parminder Singh
Director of EMC Services

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British Columbia
QAI Laboratories Inc.
Headquarters/Main Laboratory
3980 North Fraser Way,
Burnaby, BC V5J 5K5 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

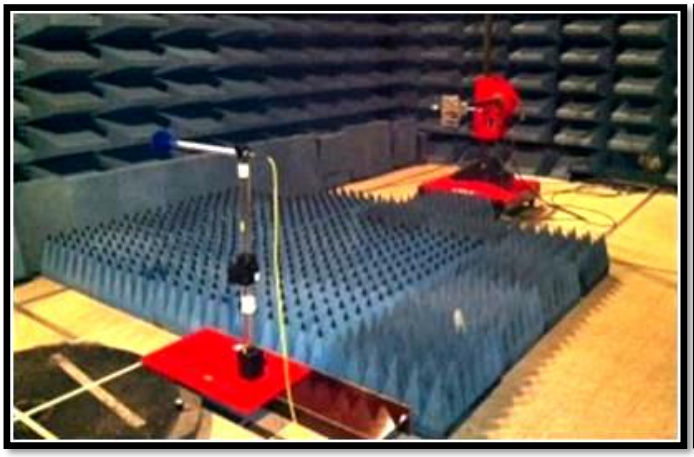
Oklahoma
QAI Laboratories Ltd.
108th East Avenue,
Tulsa, OK 74116 USA

QAI EMC ACCREDITATION

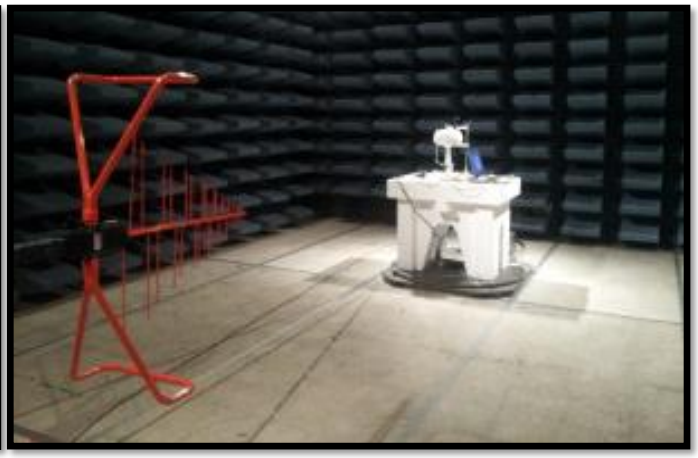
EMC Laboratory Location	FCC Designator	FCC Registration 3m SAC	FCC Registration 3m/10m OATS	IC Registration 3m SAC	A2LA Certificate
Burnaby, BC Canada	CA9543	9543A	9543C-1	21146-1	3657.02

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)
Burnaby, BC

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Section I: EXECUTIVE SUMMARY

1.1 Scope

This report demonstrates and documents compliance of Open-Q 820(TM) SOM 802.11a/b/g/n/ac WiFi + BT/BLE Model FCC ID: 2AFDI-ITCNFA324 to the applicable standards listed below for Class II Permissive Change as described.

1.2 Applicable Standards

The information documented in this report is based on the test methods and levels as per quotation 18SH08082.

CFR 47 FCC Part 15, Subpart C & E	*Radio Frequency Devices – Intentional Radiators.*
ICES-003 Issue 6	*Information Technology Equipment (including Digital Apparatus) – Limits and Methods of Measurement.*
RSS-247 Issue 1	*Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices*
RSS-210 Issue 8	*Licence-Exempt Radio Apparatus: Category I Equipment*

1.3 Reference Standards

The following standards are included as a normative reference.

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 9kHz to 40GHz

KD 558074 D01 v05 - Guidance for compliance measurements on Digital Transmission System, Frequency Hopping Spread Spectrum system, and Hybrid system devices operating under 15.247 of the FCC rules

KDB 789033 D02 v02r01 - Guidance for compliance testing of Unlicensed National Information Infrastructure (U-NII) devices Part 15, Subpart E

KDB 412172 D01 v01r01 - Guidelines for determining the Effective Radiated Power (ERP) and Equivalent Isotropically Radiated Power (EIRP) of an RF transmitting system

1.4 Summary of Results

This report demonstrates and documents compliance of Open-Q 820(TM) SOM 802.11a/b/g/n/ac WiFi + BT/BLE FCC ID: 2AFDI-ITCNFA324 manufactured by Intrinsyc Technologies Corporation to CFR 47 FCC Part 15, Subpart C & E, ICES-003 Issue 6 for a Class II Permissive Change regarding the addition of antennas to the original certification.

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

Test or Measurement	Applicable Standard	Description	Result
Radiated Emissions Enclosure	15.209 Class B	*Radiated emissions of the enclosure measured 30M - 1G Hz (quasi-peak) and 1GM - 40G Hz (average) as applicable.*	Complies

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

Test or Measurement	Applicable Standard	Description	Result
Radiated Emissions Enclosure	15.209 Class B	*Radiated emissions of the enclosure measured 30M - 1G Hz (quasi-peak) and 1G Hz - 10th harmonic of fundamental or 40G Hz (average) as applicable.*	Complies
RF Peak Output Power	15.247(b)(3)	*Maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W.*	Complies
Out of Band Emisisons (Bandedge)	15.247(d), 15.205(c)	*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 20dBc (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	15.247(d), 15.205, 15.209(a)	*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 CFR 47 FCC Part 15, Subpart E - Emissions

Test or Measurement	Applicable Standard	Description	Result
Radiated Emissions Enclosure	15.209 Class B	*Radiated emissions of the enclosure measured 30M - 1G Hz (quasi-peak) and 1G Hz - 10th harmonic of fundamental or 40G Hz (average) as applicable.*	Complies
RF Peak Output Power	15.407(a)(1)(2)(3)(4)	*For 5.15-5.25, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.* *For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz.* *For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.*	Complies
Out of Band Emisisons (Bandedge)	15.407(b)(1)(2)(3)(4), 15.205(c)	*All emissions outside of the specified band shall not exceed an e.i.r.p. of −27 dBm/MHz or 68.2dBuV/m at 3m. For 15.407(b)(4) limit is -17dBm/MHz within 10MHz of band edge.* *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	15.407(b)(1)(2)(3)(4), 15.205, 15.209(a)	*Conducted emissions requirements as stated in the Standard.*	Complies
Radiated Spurious Emissions	15.407(b)(1)(2)(3)(4), 15.205, 15.209(a)	*Radiated emissions requirements as stated in the Standard.*	Complies
RF Exposure	1.131 (e)	*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 - Emissions

Test or Measurement	Applicable Standard	Description	Result
Radiated Emissions Enclosure	ICES-003 Issue 6 Class B	*Radiated emissions of the enclosure measured 30M - 1G Hz (quasi-peak) and 1G - 6 GHz*	Complies

The following testing was performed pursuant to RSS-210 Issue 8 and RSS-247 Issue 1 - Emissions

Test or Measurement	Applicable Standard	Description	Result
Radiated Emissions Enclosure	RSS 210 Issue 8 Annex 8, RSS 247 Issue 1	*Radiated emissions of the enclosure measured 30M - 1G Hz (quasi-peak) and 1G Hz - 10th harmonic of fundamental or 40G Hz (average) as applicable.*	Complies
RF Peak Output Power	RSS 210 Issue 8 Annex 8, RSS 247 Issue 1	*Maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W.*	Complies
Out of Band Emisisons (Bandedge)	RSS 210 Issue 8 Annex 8, 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 20dBc (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	RSS 210 Issue 8 Annex 8, RSS 247	*Conducted emissions requirements as stated in the Standard.*	Complies
Radiated Spurious Emissions	RSS-210 Issue 8 Annex 2 Section A2.2 (b), RSS-Gen Issue 4	*Radiated emissions requirements as stated in the Standard.*	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

Section II: GENERAL INFORMATION

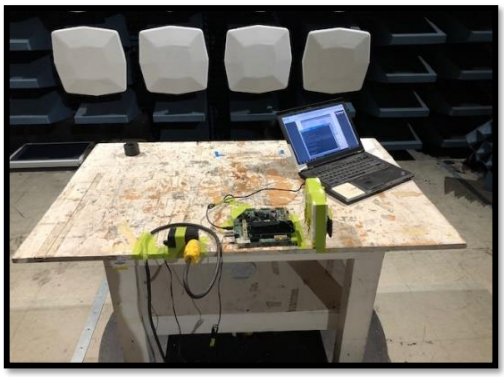
2.1 Product Description

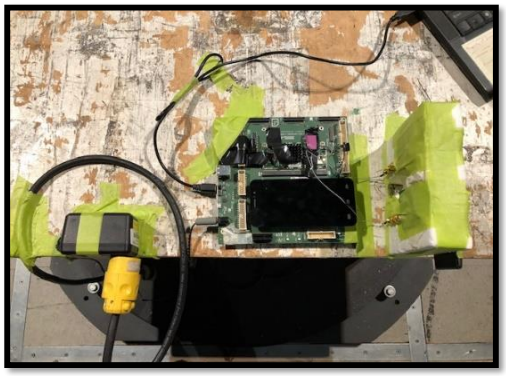
The information provided in this section describes the Equipment Under Test (EUT) and the corresponding Auxiliary Equipment (AE) required to perform the tests as complete system.

EUT Information

Equipment	Manufacturer	Description
EUT	Intrinsyc Technologies Corporation	*2x2 802.11a/b/g/n/ac WiFi + Bluetooth Module*
Auxiliary 1	IBM	*Lenovo Notebook PC*
Auxiliary 2	Qualcomm	*Qualcomm Radio Control Toolkit*
Auxiliary 3		

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) was present 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 the original grant for additional details of modulation types, technology, applicable data transfer rates, channels and other information. Transmission for BT is TX0 only (no beamforming directional gain), transmission for WiFi modulations employs TX0 and TX 1 beamforming directional gain.

Usage case (test modes) are defined in the following table. Specific configuration is listed for TX0 and TX1 for each case. Test cases may be omitted for some based on results; intent is to perform due diligence on all of the modes listed in the table. Modulation modes for each case are also listed. Colocation of transmitters is limited to BT/BLE with 5G(5G8) operation only.

		TX0		TX1	
Test Mode		Band	Frequency MHz	Band	Frequency MHz
2G4.11b	2G4.11b	2G4-11b	2412, 2462	2G4-11b	2412, 2462
2G4.11g	2G4.11g	2G4-11g	2412, 2462	2G4-11g	2412, 2462
2G4.11n	2G4.11n	2G4-11n	2412, 2462	2G4-11n	2412, 2462
5G.11a	5G.11a	UNII-1	5180	UNII-1	5180
5G.11a	5G.11a	UNII-2A	5320	UNII-2A	5320
5G.11a	5G.11a	UNII-2C	5500	UNII-2C	5500
5G.11a	5G.11a	UNII-3	5825	UNII-3	5825
5G.11n	5G.11n	UNII-1	5180	UNII-1	5180
5G.11n	5G.11n	UNII-2A	5320	UNII-2A	5320
5G.11n	5G.11n	UNII-2C	5500	UNII-2C	5500
5G.11n	5G.11n	UNII-3	5825	UNII-3	5825
5G.11a	5G.11a	UNII-1	5180	UNII-1	5180
5G.11a	5G.11a	UNII-2A	5320	UNII-2A	5320
5G.11a	5G.11a	UNII-2C	5500	UNII-2C	5500

5G.11a	5G.11a	UNII-3		5825	UNII-3	5825
5G.11n	5G.11n	UNII-1		5180	UNII-1	5180
5G.11n	5G.11n	UNII-2A		5320	UNII-2A	5320
5G.11n	5G.11n	UNII-2C		5500	UNII-2C	5500
5G.11n	5G.11n	UNII-3		5825	UNII-3	5825
The following items represent co-location of transmitter configurations:						
BT/5G.11a	5G.11a	BT	UNII-1	2402, 2478	UNII-1	5180
BT/5G.11a	5G.11a	BT	UNII-2A	2402, 2478	UNII-2A	5320
BT/5G.11a	5G.11a	BT	UNII-2C	2402, 2478	UNII-2C	5500
BT/5G.11a	5G.11a	BT	UNII-3	2402, 2478	UNII-3	5825
BT/5G.11n	5G.11n	BT	UNII-1	2402, 2478	UNII-1	5180
BT/5G.11n	5G.11n	BT	UNII-2A	2402, 2478	UNII-2A	5320
BT/5G.11n	5G.11n	BT	UNII-2C	2402, 2478	UNII-2C	5500
BT/5G.11n	5G.11n	BT	UNII-3	2402, 2478	UNII-3	5825
BLE/5G.11a	5G.11a	BLE	UNII-1	2402, 2478	UNII-1	5180
BLE/5G.11a	5G.11a	BLE	UNII-2A	2402, 2478	UNII-2A	5320
BLE/5G.11a	5G.11a	BLE	UNII-2C	2402, 2478	UNII-2C	5500
BLE/5G.11a	5G.11a	BLE	UNII-3	2402, 2478	UNII-3	5825
BLE/5G.11n	5G.11n	BLE	UNII-1	2402, 2478	UNII-1	5180
BLE/5G.11n	5G.11n	BLE	UNII-2A	2402, 2478	UNII-2A	5320
BLE/5G.11n	5G.11n	BLE	UNII-2C	2402, 2478	UNII-2C	5500
BLE/5G.11n	5G.11n	BLE	UNII-3	2402, 2478	UNII-3	5825

Notes:
1. Co-location operation transmits 5G/5G8 and BT/BLE simultaneously on Tx Chain 0, 5G/5G8 only on TxChain1.
2. All possible co-location modes were investigated; TX of 2G4 +BT/BLE or 2G4 +5G or 2G4+5G8 is not possible.

Band	Frequency MHz	Modulation
2G4-11b	2412, 2462	CCK1ML
2G4-11b	2412, 2462	CCK1ML
2G4-11b	2412, 2462	CCK1ML
2G4-11b	2412, 2462	CCK11ML
2G4-11b	2412, 2462	CCK11ML
2G4-11b	2412, 2462	CCK11ML
2G4-11g	2412, 2462	xHT6M
2G4-11g	2412, 2462	xHT54M
2G4-11n	2412, 2462	HT20MCS0
2G4-11n	2412, 2462	HT20MCS19
2G4-11n	2412, 2462	HT40+MCS0
2G4-11n	2412, 2462	HT40+MCS19
5G-11a	5180, 5320, 5500, 5825	xHT6M
5G-11a	5180, 5320, 5500, 5825	xHT54M
5G-11n	5180, 5320, 5500, 5825	VHT20MCS0
5G-11n	5180, 5320, 5500, 5825	VHT20MCS19
5G-11n	5180, 5320, 5500, 5825	VHT40MCS0
5G-11n	5180, 5320, 5500, 5825	VHT40MCS19
5G-11n	5180, 5320, 5500, 5825	VHT80MCS0
5G-11n	5180, 5320, 5500, 5825	VHT80MCS19
2G4-BT	2402, 2478	BT_DH5
2G4-BT	2402, 2478	BT2_DH5
2G4-BT	2402, 2478	BT3_DH5
2G4-BLE	2402, 2478	BLE
2G4-BLE	2402, 2478	BT2_DH5
2G4-BLE	2402, 2478	BT3_DH5

2.1.2 Modifications

No modifications were made to the EUT.

2.1.4 Description of Antenna

The manufacturer's specified directional antenna gain in excess of 6dBi is used to reduce the overall conducted power limit as applicable in each specified frequency band. For WiFi, the transmit signals are assumed to be correlated and the number of independent spatial streams (Nss) is assumed to be 1.

Brand	Model/PN	Gain	Antenna Type	Connector
Laird	MAF95032 WIC2452-A-SM	2.68dBi(2.4-2.5GHz) 5.0dBi (4.9 to 5.8GHz)	Chip (SM)	IPEX w/cable
Kontron	73001001-001	2.6dBi(2.4-2.5GHz) 4.0dBi (4.9 to 5.8GHz)	WiFi Flag	Reverse SMA w/cable

2.1.5 Directional Gain

The manufacturer's specified directional antenna gain in excess of 6dBi is used to reduce the overall conducted power limit as applicable in each specified frequency band. For WiFi, the transmit signals are assumed to be correlated and the number of independent spatial streams (Nss) is assumed to be 1.

Directional Gain = Gmax + 10 * log (Nant/Nss)

where: Gmax is the maximum antenna gain in dBi
Nant is the number of antennas
Nss is number of indepenent spatial streams, assumed to be 1

Frequency Band MHz	Single Antenna Gain dB	2TX CDD Directional Gain (Beamforming) dB	Directional Gain Output Power Limit Reduction dB	Antenna
2400 - 2483.5 (*1)	2.68	5.69	-0.31	MAF95032/WIC2452-A-SM
5150 - 5250	5.0	8.01	2.01	MAF95032/WIC2452-A-SM
5250 - 5350	5.0	8.01	2.01	MAF95032/WIC2452-A-SM
5470 - 5725	5.0	8.01	2.01	MAF95032/WIC2452-A-SM
5725 - 5825	5.0	8.01	2.01	MAF95032/WIC2452-A-SM
2400 - 2483.5 (*1)	2.6	5.61	-0.39	73001001-001
5150 - 5250	4.0	7.01	1.01	73001001-001
5250 - 5350	4.0	7.01	1.01	73001001-001
5470 - 5725	4.0	7.01	1.01	73001001-001
5725 - 5825	4.0	7.01	1.01	73001001-001

Notes:
1. Applicable to WiFi device only, does not apply to BT device(single antenna).
2. Highest beamforming antenna gain will be used for all calculations if 2TXCDD > 6.0 dB

2.1.6 RF Output Power 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.

Frequency Band MHz	Manufacturer Declared Tune-up Tolerance dB	Maximum Setpoint Output Power dBm	Adjusted Maximum Output Power including Tune-up Tolerance dBm	Maximum Output Power Measured (Appendix D) dBm
2G4	1.5	17.0	18.5	18.5
5G/5G8	2.0	9.0	11.0	10.8

Notes:
1. Maximum output power measured reflects data in Appendix D.
2. Output power is adjusted to include tune-up tolerance for all measurements.

2.1.7 Transmit Power Control

The manufacturer has declared device contains a Transmit Power Control mechanism to reduce maximum RF output power by at least 6dB when linked above the level necessary to maintain maximum channel bandwidth in order to reduce infrastructure power consumption, and as a spectrum efficiency procedure.

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

*

Sample Radiated Emission Table:

Frequency MHz	Quasi-Peak dBµV/m	Meas. Time ms	Bandwidth KHz	Antenna Height cm	Polarity	Turntable position deg	Correction dB	Margin dB	Limit dBµV/m
42.6639	33	1000	120	100	H	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 + Antenna Factor + Cable Loss - Amplifier Gain

Sample Conducted Emission Calculation:

Frequency MHz	Quasi-Peak dBµV	Meas. Time ms	Bandwidth KHz	Correction dB	Margin dB	Limit dBµV
0.15	44.3	1000	9	0.6	21.7	66

Frequency MHz	Average dBµV	Meas. Time ms	Bandwidth KHz	Correction dB	Margin dB	Limit dBµV
0.15	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 + Transducer Factor + Cable Loss

The margin, defined as the distance to the limit specified in the applicable standard is calculated as shown below for both radiated and conducted emissions.

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

SI No.	Manufacturer	Model	Description	Serial No. / Asset	Calibration Due Date
1	Sunol Sciences	SM46C	Turntable	051204-2	N/A
2	Sunol Sciences	TWR95	Mast	TREML0001	N/A
3	Sunol Sciences	JB1	Biconilog Antenna, 30M – 2G Hz	A070209	2020-Aug-16
4	Sunol Sciences	DRH-118	Dual Ridge Horn Antenna, 1G - 18G Hz	A050905	2019-Mar-10
5	ETS Lindgren	2165	Turntable	43677	N/A
6	ETS Lindgren	2125	Mast	77487	N/A
7	Rohde & Schwarz	ESU40	EMI Receiver	100011	2019-Dec-01
8	Fischer	FCC-LISN-50-25-2-08	LISN	2041	2018-Nov-19
9	ETS Lindgren	S201	5-meter Semi-Anechoic Chamber	1030	N/A
10	AH Systems	PAM118	Amplifier, 10k - 18G Hz	189	Use
11	California Instruments	PACS-1	Harmonics and flicker analyzer	72569	2019-May-23
12	California Instruments	OMNI 1-18 I	Programmable Impedance Flicker test	-	2019-May-23
13	California Instruments	3001ix	Power supply	HK52117	2019-May-23

Measurement Software

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

Section III: REQUIREMENTS FOR THE US MARKET (FCC) & THE CANADIAN MARKET (IC)

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 15.207, Class B. This prevents the EUT from causing unwanted interference to other electronic devices.

This test is performed in accordance with ANSI C63.4(2014). A Line Impedance Stabilizing Network (LISN) was used to make conducted emissions measurements. 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, are specified in CISPR 16-1-1.

The EUT was operated 120V/60Hz while in 'Continuous Mode' of operation.

Conducted Emissions Limits for FCC CFR 47 Part 15, Subpart C, 15.207
FCC CFR 47 Part 15, Subpart C - *Radio Frequency Devices, Subpart C – Intentional Radiators.*

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 October 3, 2018 and complies with Class B of 15.207.

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 as specified in 15.209, Class B. 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. 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.

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.

Radiated Emissions Limits - TX

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 1000 MHz. 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 1GHz.

Radiated Emissions Limits - RX (Digital Device)

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.*		

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 noises, the measurements are performed at a closer distance and the limit is adjusted using the equation below to ensure compliance.

20 Log (d1/d2); Where d1 = New distance
d2 = Required distance

The EUT was tested without modification on October 5, 2018 and complies.

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(b)(3), 15.407(a)(1)(2)(3)(4), ICES-003 Issue 6 for systems employing digital modulation techniques operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz, and unlicensed National Information Infrastructure (U-NII) devices operating in the 5.15-5.35 GHz, 5.47-5.725 GHz and 5.725-5.850 GHz bands.

The EUT was operated at 120V/60Hz while 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 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 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 October 8, 2018 and complies.

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)(3), 15.407(a)(1)(2)(3)(4), ICES-003 Issue 6 for systems employing digital modulation techniques operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz, and unlicensed National Information Infrastructure (U-NII) devices operating in the 5.15-5.35 GHz, 5.47-5.725 GHz and 5.725-5.850 GHz bands.

The EUT was operated at 120V/60Hz while 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. If necessary duty cycle plots are used to establish correction for non-continuous operation.

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.

For systems operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power.
For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz.
For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

The RF peak output power or EIRP is calculated using the maximum conducted output power increased by the directional antenna gain. The conducted RF peak output power is also corrected for duty cycle to provide the maximum transmit power.

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

Frequency Band MHz	Power Limit dBm	2TX CDD (*1) Directional Gain (Beamforming) dB	Adjusted Power Limit dBm
2400 - 2483.5	30	-0.31	30.3
2400 - 2483.5 (*4)	30	0.00	30.0
5150 - 5250	24	2.01	22.0
5250 - 5350	24	2.01	22.0
5470 - 5725	24	2.01	22.0
5470 - 5725 (*2)	23.2	2.01	21.2
5470 - 5725 (*3)	22.8	2.01	20.8
5725 - 5825	30	2.01	28.0

Notes:

1. *See Antenna Directional Gain calculation.*
2. *Applicable to 802.11a modulations only.*
3. *Applicable to VHT20 modulation only.*
4. *Appplicable limit for BT device (does not use 2TX CDD).*

For U-NII bands employing a limit of 11 dBm + 10 log B, it is shown in the original report the fixed limit is applicable for all modulations except U-NII 2C operation with VHT20 or 802.11a modulation.

The EUT was tested without modification on October 7, 2018 and complies with 15.247(b)(3), 15.407(a)(1)(2)(3)(4), RSS 210 Issue 8 Annex 8, RSS 247 Issue 1, ICES-003 Issue 6.

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

3.8 Out-of-Band Emissions (Band Edge)

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)(3), 15.407(a)(1)(2)(3)(4), ICES-003 Issue 6 for systems employing digital modulation techniques operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz, and unlicensed National Information Infrastructure (U-NII) devices operating in the 5.15-5.35 GHz, 5.47-5.725 GHz and 5.725-5.850 GHz bands.

The EUT was operated at 120V/60Hz while 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 purpose of this test is to make certain that Out-of-Band Emissions (Band Edge) from the Equipment Under Test (EUT) does not exceed the limits as per the standards, FCC Part 15.247 (d), 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. 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 in the restricted bands must also comply with the radiated emission limits specified.

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 October 7, 2018 and complies with 15.247(b)(3), 15.407(a)(1)(2)(3)(4), RSS 210 Issue 8 Annex 8, RSS 247 Issue 1, ICES-003 Issue 6.

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

3.10 RF Exposure Evaluation

This requirement ensures the Equipment Under Test (EUT) complies with the RF exposure requirements of CFR 47 FCC Part 1.131, RSS-102 Section 2.5.2.

CFR 47 FCC 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 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.

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
UNII-1	5150	4.5	1.0
UNII-2A	5250	4.6	1.0
UNII-2C	5470	4.7	1.0
UNII-3	5725	4.8	1.0

RF Exposure Evaluation

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

Frequency MHz	Highest Measured Conducted Power (Appendix D) dBm	Antenna Gain (including beamforming) dBi	EIRP mW	Power Density at 20 cm mW/cm^2
2412	18.3	5.7	250.61	0.04986
5180	10.8	8.0	76.03	0.01513
5320	10.5	8.0	70.96	0.01412
5500	8.7	8.0	46.88	0.00933
5825	9.9	8.0	61.80	0.01230

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

The measurements and calculations for RF Exposure were performed on October 8, 2018 and the EUT complies with CFR 47 FCC Part 1.131 and RSS-102 Section 2.5.2.

Appendix A: CONDUCTED EMISSIONS DATA

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

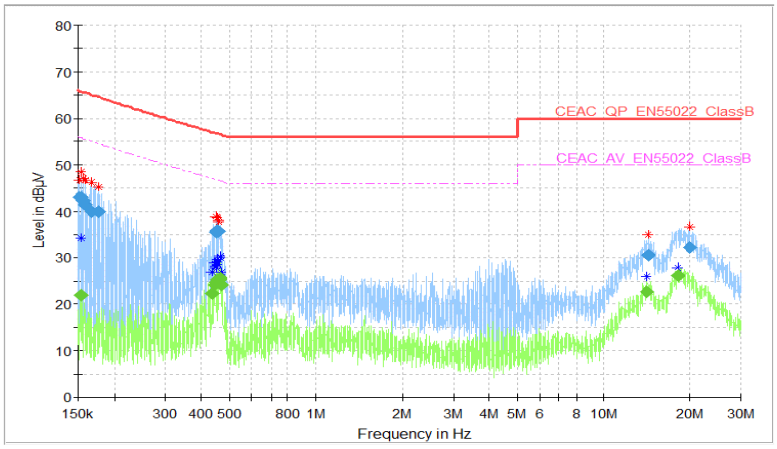


Table A1-1: Quasi-Peak Data AC Mains Conducted Emissions for FCC/ICES 120V/60H - RX - L1

Frequency MHz	Quasi-Peak dBµV	Meas. Time msec	Bandwidth kHz	Line	Correction dB	Margin dB	Limit dBµV
0.153	43.0	1000	9	L1	11.00	22.8	65.8
0.451	35.6	1000	9	L1	10.90	21.2	56.8
0.455	35.8	1000	9	L1	10.90	20.9	56.7
0.462	35.8	1000	9	L1	10.90	20.8	56.6
14.191	30.5	1000	9	L1	11.80	29.5	60.0
19.855	32.3	1000	9	L1	12.00	27.7	60.0

Table A1-2: Average Data AC Mains Conducted Emissions for FCC/ICES 120V/60H - RX - L1

Frequency MHz	Average dBµV	Meas. Time msec	Bandwidth kHz	Line	Correction dB	Margin dB	Limit dBµV
0.153	22.0	1000	9	L1	11.0	33.8	55.8
0.464	25.7	1000	9	L1	10.9	20.8	46.6
0.467	25.4	1000	9	L1	10.9	21.1	46.5
0.471	24.2	1000	9	L1	10.9	22.3	46.5
14.120	22.7	1000	9	L1	11.8	27.3	50.0
18.056	26.1	1000	9	L1	11.8	23.9	50.0

Figure A2: AC Mains Conducted Emissions for FCC/ICES 120V/60H - RX - L2

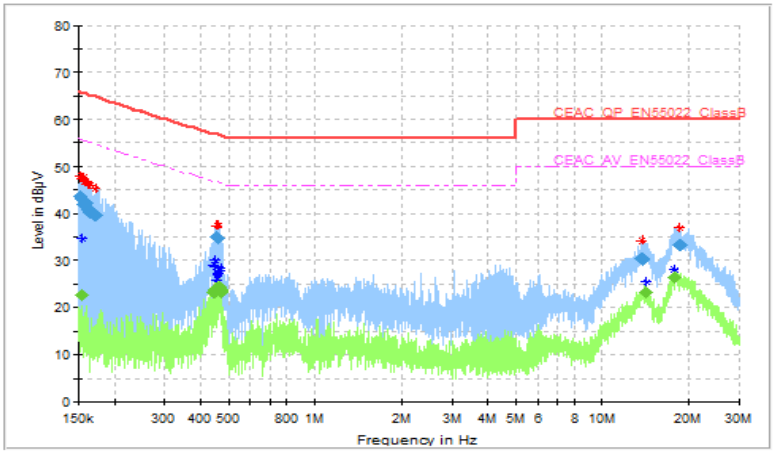


Table A2-1: Quasi-Peak Data AC Mains Conducted Emissions for FCC/ICES 120V/60H - RX - L2

Frequency MHz	Quasi-Peak dBµV	Meas. Time msec	Bandwidth kHz	Line	Correction dB	Margin dB	Limit dBµV
0.153642	43.5	1000	9	L2	11.00	22.3	65.8
0.15503	43.0	1000	9	L2	10.90	22.7	65.7
0.173393	39.7	1000	9	L2	10.90	25.0	64.7
0.456268	35.0	1000	9	L2	10.90	21.7	56.7
13.799323	30.3	1000	9	L2	11.80	29.7	60.0
18.587153	33.3	1000	9	L2	11.80	26.7	60.0

Table A2-2: Average Data AC Mains Conducted Emissions for FCC/ICES 120V/60H - RX - L2

Frequency MHz	Average dBµV	Meas. Time msec	Bandwidth kHz	Line	Correction dB	Margin dB	Limit dBµV
0.15503	22.6	1000	9	L2	11.00	33.1	55.7
0.464551	24.5	1000	9	L2	11.00	22.1	46.6
0.469217	23.7	1000	9	L2	11.00	22.8	46.5
0.470156	23.2	1000	9	L2	10.90	23.3	46.5
14.176789	23.3	1000	9	L2	11.80	26.7	50.0
17.840856	26.4	1000	9	L2	11.90	23.6	50.0

Figure A3: AC Mains Conducted Emissions for FCC/ICES 120V/60H - TX- Worst-Case - L1

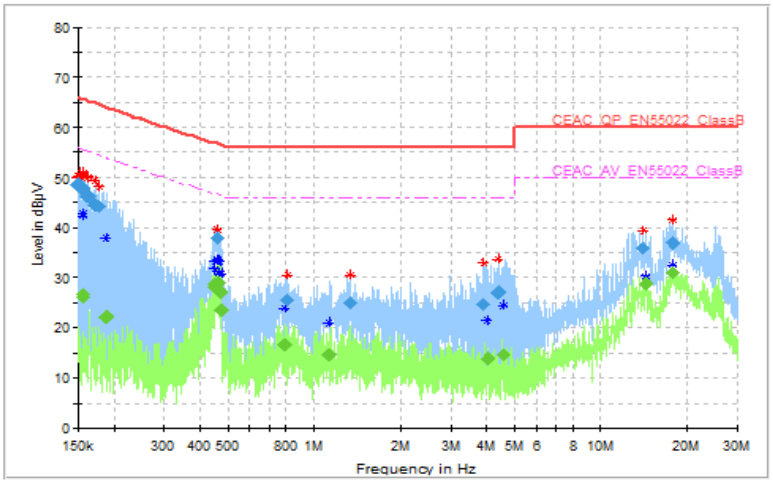


Table A3-1: Quasi-Peak Data AC Mains Conducted Emissions for FCC/ICES 120V/60H - TX Worst-Case - L1

Frequency MHz	Quasi-Peak dBµV	Meas. Time msec	Bandwidth kHz	Line	Correction dB	Margin dB	Limit dBµV
0.150601	48.6	1000	9	L1	11.0	17.4	66.0
0.173393	44.5	1000	9	L1	10.9	20.2	64.7
0.462235	37.8	1000	9	L1	11.0	18.8	56.6
4.406982	27.1	1000	9	L1	11.3	29.0	56.0
14.063883	36.1	1000	9	L1	11.8	23.9	60.0
17.858697	37.0	1000	9	L1	11.8	23.0	60.0

Table A3-2: Average Data AC Mains Conducted Emissions for FCC/ICES 120V/60H - TX Worst-Case - L1

Frequency MHz	Average dBµV	Meas. Time msec	Bandwidth kHz	Line	Correction dB	Margin dB	Limit dBµV
0.155807	26.7	1000	9	L1	11.0	28.9	55.7
0.464551	29.2	1000	9	L1	11.0	17.4	46.6
0.789031	16.7	1000	9	L1	10.9	29.3	46.0
4.595921	14.7	1000	9	L1	11.3	31.3	46.0
14.347849	28.8	1000	9	L1	11.8	21.2	50.0
17.858697	31.0	1000	9	L1	11.8	19.0	50.0

Figure A4: AC Mains Conducted Emissions for FCC/ICES 120V/60H - TX Worst-Case - L2

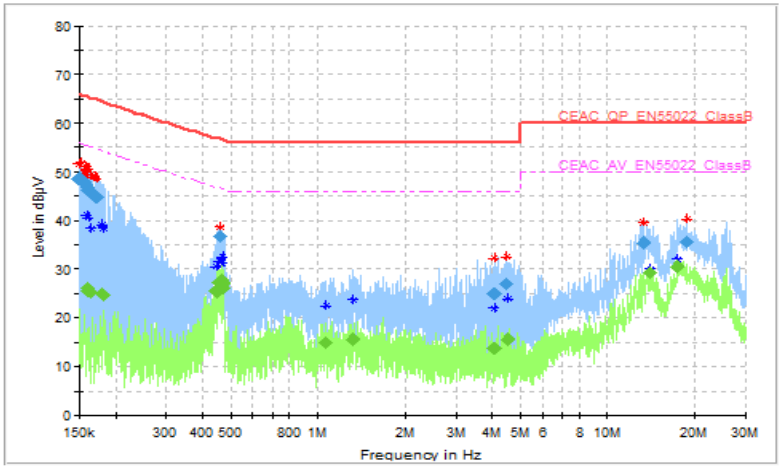


Table A4-1: Quasi-Peak Data AC Mains Conducted Emissions for FCC/ICES 120V/60H - TX Worst-Case - L2

Frequency MHz	Quasi-Peak dBµV	Meas. Time msec	Bandwidth kHz	Line	Correction dB	Margin dB	Limit dBµV
0.15015	48.7	1000	9	L2	11.00	17.3	66.0
0.158635	47.4	1000	9	L2	11.00	18.1	65.5
0.170643	44.8	1000	9	L2	11.00	20.1	64.9
0.459012	36.7	1000	9	L2	10.90	20.0	56.7
4.473552	27.0	1000	9	L2	11.30	29.0	56.0
13.311622	35.4	1000	9	L2	11.80	24.6	60.0

Table A4-2: Average Data AC Mains Conducted Emissions forFCC 220V/60H - RF ON - L2

Frequency MHz	Average dBµV	Meas. Time msec	Bandwidth kHz	Line	Correction dB	Margin dB	Limit dBµV
0.159909	26.2	1000	9	L2	11.00	29.3	55.4
0.161838	25.8	1000	9	L2	11.00	29.6	55.3
0.464551	27.8	1000	9	L2	10.90	18.7	46.6
0.471568	26.1	1000	9	L2	10.90	20.3	46.4
14.063883	29.4	1000	9	L2	11.80	20.6	50.0
17.470288	30.6	1000	9	L2	11.80	19.4	50.0

Appendix B: RADIATED EMISSIONS DATA

Figure B1: Radiated Emissions 30M-1G Hz for FCC/ICES

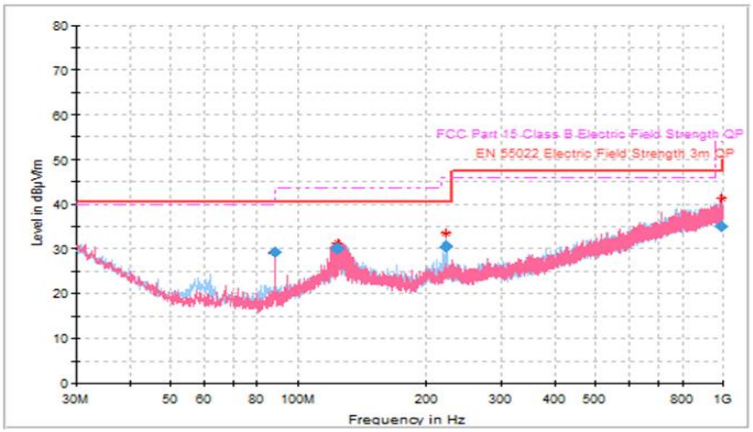


Table B1-1: Radiated Emissions 30M-1G Hz Quasi-Peak Data for FCC/ICES

Frequency MHz	Quasi-Peak dBµV	Meas. Time ms	Bandwidth kHz	Polarity	Correction dB	Margin dB	Limit dBµV/m		
88.107	29.4	1000	120	VERT	15.8	10.6	40.0		
123.673	30.0	1000	120	VERT	22.2	10.0	40.0		
222.645	30.5	1000	120	HORZ	20.1	9.5	40.0		
989.618	35.0	1000	120	HORZ	34.2	12.0	47.0		
Notes: 1.	*Peak data may be compared to quasi-peak limit.*								

Figure B2: Radiated Emissions 1G-6G Hz for FCC/ICES/CE Mark

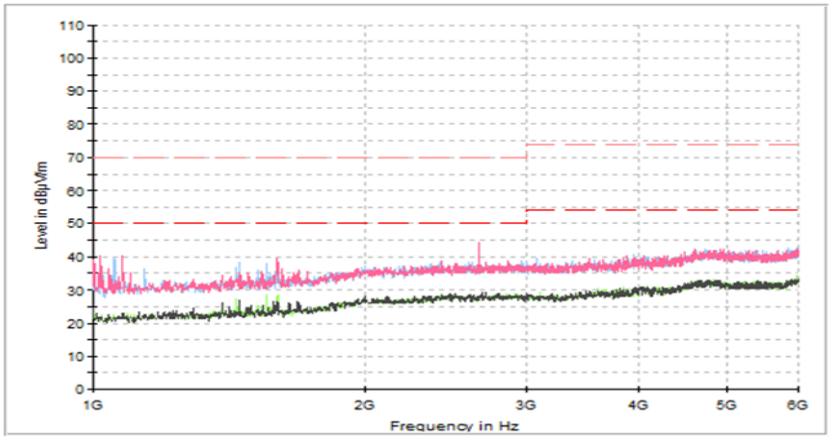


Table B2-1: Radiated Emissions 1G-6G Hz Data for FCC/ICES

Frequency MHz	Average dBµV	Meas. Time ms	Bandwidth kHz	Polarity	Correction dB	Margin dB	Limit dBµV/m		
Notes: 1	*Peak data may be compared to average limit.*								
2.	*No data found above noise floor.*								

Colocation Worst-Case:	The worst-case mode for colocated transmitters was determined to be Bluetooth (TX0) and 802.11a 6M (TX0/TX1).

Figure B3: Radiated Emissions 30M-1G Hz for FCC/IC - TX Worst-Case

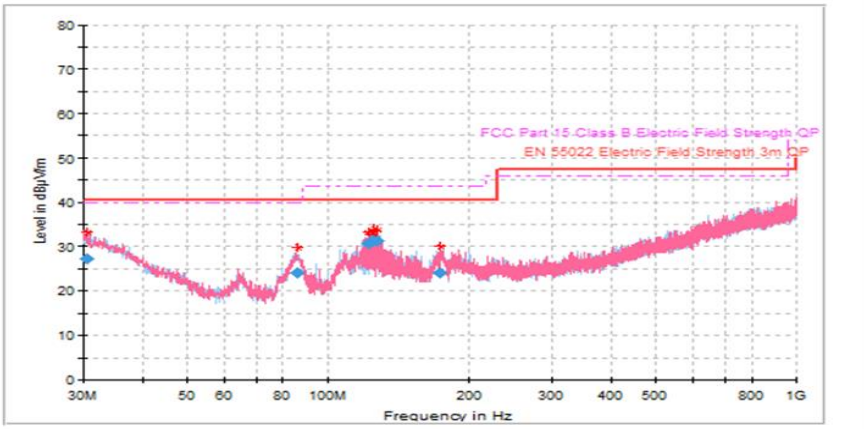


Table B3-1: Radiated Emissions 18G-26G Hz Quasi-Peak Data for FCC/ICES

Frequency MHz	Quasi-Peak dBµV	Meas. Time ms	Bandwidth kHz	Polarity	Correction dB	Margin dB	Limit dBµV/m		
30.560	27.4	1000	120	VERT	28.1	12.6	40.0		
86.235	24.3	1000	120	VERT	15.8	15.7	40.0		
122.138	30.9	1000	120	VERT	22.2	9.1	40.0		
124.462	31.3	1000	120	VERT	22.2	8.7	40.0		
125.659	31.3	1000	120	HORZ	22.2	8.7	40.0		
126.847	31.4	1000	120	VERT	22.3	8.6	40.0		
174.262	24.3	1000	120	HORZ	20.2	15.7	40.0		

Notes 1. Peak data may be compared to quasi-peak limit.

Figure B4: Radiated Emissions 1G-18G Hz for FCC/IC - TX Worst-Case

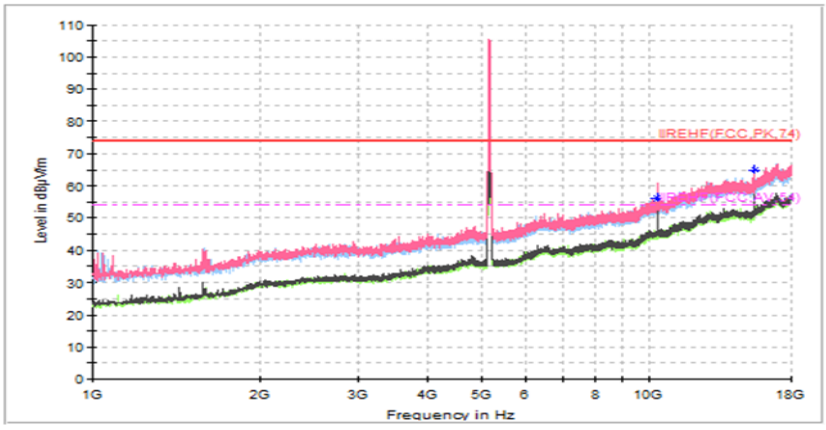


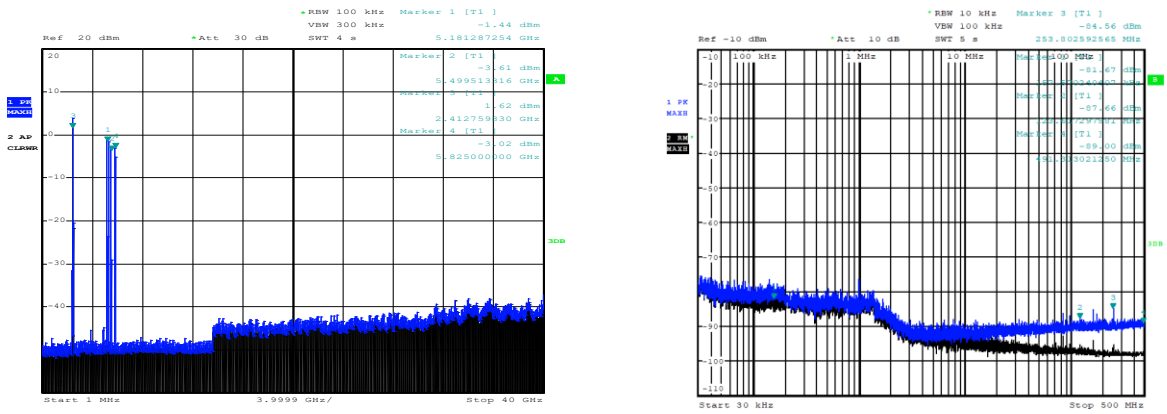
Table B4-1: Radiated Emissions 1G-18G Hz Data for FCC/IC - TX Worst-Case

Frequency MHz	Average dBµV	Meas. Time ms	Bandwidth kHz	Polarity	Correction dB	Margin dB	Limit dBµV/m	Note
5176.9		1000	120	VERT	0.7			Fundamental
10361.9	30.8	1000	120	VERT	9.6	23.2	54.0	
17000.4	40.5	1000	120	VERT	20.6	13.5	54.0	
17000.4	32.7	1000	120	VERT	20.6	21.3	54.0	

Notes: 1. Peak data may be compared to average or quasi-peak limit.
2. Data compared to 54AV/74PK restricted band limit to demonstrate compliance for harmonics falling in restricted bands.

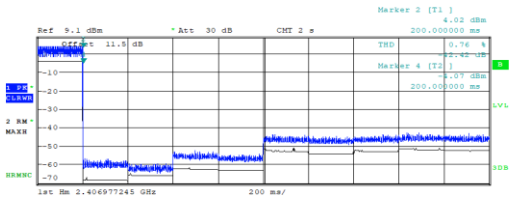
Appendix C: SPURIOUS CONDUCTED EMISSIONS DATA

Figure C1: Spurious Conducted Emissions for FCC/ICES - TX 2G4/5G/5G8 Worst-Case (11b/11g/BT/BLE/11a/11n)

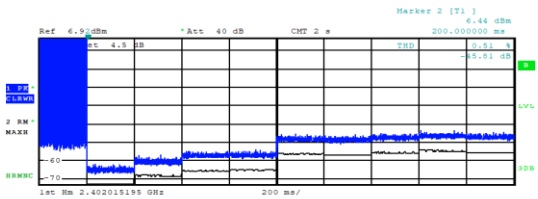


Notes:
1. *Plot shown is cumulative, multiple modulation/transmit frequencies shown, see test mode for description.*
2. *No emissions found above noise floor, all emissions <30dBc.*
3. *All spurious emissions in Restricted Bands are calculated to be within 54AV/74PK limit based on extrapolation of conducted emission measurement using KDB 412172.*

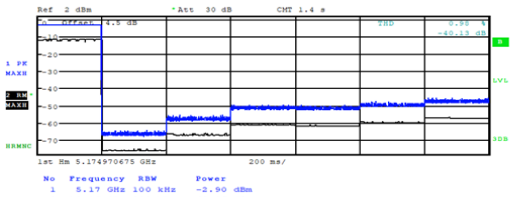
Figure C2: Harmonic Conducted Emissions for FCC/ICES - TX 2G4/5G Typical



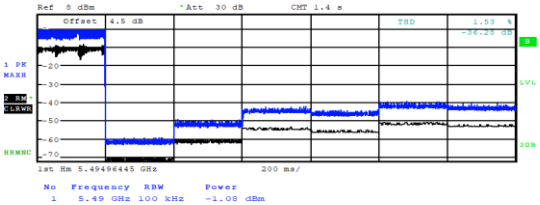
Date: 1.OCT.2018 14:20:44



Date: 1.OCT.2018 15:07:31



Date: 3.OCT.2018 16:16:31



Date: 3.OCT.2018 15:52:29

Notes:
1. *Typical measurment shown.*
2. *All harmonic emissions greater than 30dBc.*

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

Frequency MHz	H2	H3	H4	H5	H6	H7	H8	H9	H10	
2412	70	66	62	62	53	53	52	51	51	CCK1ML
2462	65	61	58	58	49	49	49	48	48	CCK11ML
2462	58	55	52	52	43	44	43	42	42	xHT6M
2412	58	55	51	52	43	42	41	42	41	xHT54M
2402	70	66	62	62	53	54	52	52	52	BT_DH5
2442	69	65	62	62	53	53	52	51	52	BT2_DH5
2478	51	47	43	43	34	33	32	33	32	BT3_DH5
Notes: 1.	*Harmonic content is less than 30dBc.*									

Table C2: Harmonic Conducted Emissions for FCC/ICES - TX 2G4 Worst-Case (11n)

Frequency MHz	H2	H3	H4	H5	H6	H7	H8	H9	H10	
2412	58	55	52	52	43	43	43	42	42	HT20MCS0
2462	57	55	51	52	43	43	41	41	37	HT20MCS19
2412	61	59	56	56	47	47	46	45	46	HT20MCS19
2412	60	57	53	54	44	45	44	43	43	HT40+MCS0
2462	60	57	53	54	45	45	44	43	44	HT40+MCS19
Notes: 1.	*Harmonic content is less than 30dBc.*									

Table C3: Spurious Conducted Emissions for FCC/ICES - TX 5G Worst-Case (11a/11n)

Frequency MHz	H2	H3	H4	H5	H6	H7				
5180	62	53	47	47	45	42				xHT6M
5320	60	50	43	45	40	41				xHT6M
5500	62	53	47	47	45	43				xHT54M
5825	62	52	45	47	42	43				xHT54M
5180	62	54	47	47	45	43				VHT20MCS0
5320	63	53	46	47	43	43				VHT20MCS0
5500	64	55	48	47	45	45				VHT20MCS0
5825	63	54	48	48	46	44				VHT20MCS19
5180	59	50	43	44	40	41				VHT20MCS19
5825	64	55	47	46	44					VHT20MCS19
5500	63	54	48	48	46	44				VHT40MCS0
5320	60	50	43	44	40	41				VHT40MCS0
5825	65	55	48	48	45					VHT40MCS0
5320	63	54	47	48	46	45				VHT40MCS19
5180	70	60	52	52	50					VHT40MCS19
5320	56	46	39	41	36	37				VHT80MCS0
5825	65	55	48	47	45					VHT80MCS0
5500	50	41	34	35	31	32				VHT80MCS19
5825	65	55	47	47	45					VHT80MCS19
Notes: 1.	*Harmonic content is less than 30dBc.*									
2.	*No measurements above 40G are required for harmonic content.*									

Appendix D: CONDUCTED RF OUTPUT POWER DATA

Table D1: RF Output Power Worst Case, corrected for Duty Cycle - FCC/ICES

						Limit (*2) dBm	Worst Case Margin (*1) dB	Directional Antenna Gain dBi	EIRP dBm	EIRP mW
Bluetooth	BT	9	2402	2440	2462					
RATE	BT_DHS	Measured		8.7						
Duty Cycle Correction (dB)	2.26	Corrected	2.3	11.0	2.3	30.0	19.0	2.70	13.66	23.2
Bluetooth Low Energy	BLE	9	2402	2440	2462					
RATE	BLE_DHS	Measured			5.9					
Duty Cycle Correction (dB)	0.31	Corrected	0.3	0.3	6.2	30.0	23.8	2.70	8.91	7.8
802.11b	CCK	18	2412	2437	2462					
RATE	1M (L)	Measured			18.2					
Duty Cycle / 2TX CDD	0.06	Corrected	0.1	0.1	18.3	29.2	10.9	5.69	23.95	248.3
802.11g	NoHT	18	2412	2432	2462					
RATE	6M	Measured			17.9					
Duty Cycle / 2TX CDD	0.41	Corrected	0.4	0.4	18.3	29.2	10.9	5.69	24.00	251.2
802.11n	HT20	18	2412	2432	2462					
RATE	MCS 0	Measured	11.2							
Duty Cycle / 2TX CDD	0.44	Corrected	11.6	0.4	0.4	29.2	17.6	5.69	17.33	54.1
UNII-1	VHT20	12.5	5180	5200	5240					
RATE	MCS 0	Measured	9.3							
Duty Cycle / 2TX CDD	0.46	Corrected	9.8	0.5	0.5	21.5	11.7	8.01	17.77	59.8
UNII-2A	VHT20	12.5	5260	5300	5320					
RATE	MCS 0	Measured			8.9					
Duty Cycle / 2TX CDD	0.46	Corrected	0.5	0.5	9.4	21.5	12.1	8.01	17.37	54.6
UNII-2C	VHT20	12.5	5500	5680	5720					
RATE	MCS 0	Measured	8.9							
Duty Cycle / 2TX CDD	0.45	Corrected	9.4	0.5	0.5	21.5	12.2	8.01	17.36	54.5
UNII-3	VHT20	12.5	5720	5785	5825					
RATE	MCS 0	Measured			8.6					
Duty Cycle / 2TX CDD	0.93	Corrected	0.9	0.9	9.5	20.7	11.2	8.01	17.54	56.8
UNII-1	NoHT	13	5180	5200	5240					
RATE	6M	Measured	10.8							
Duty Cycle / 2TX CDD	0.2	Corrected	11.0	0.2	0.2	21.5	10.5	8.01	19.01	79.6
UNII-2A	NoHT	13	5260	5300	5320					
RATE	6M	Measured			10.5					
Duty Cycle / 2TX CDD	0.2	Corrected	0.2	0.2	10.7	21.5	10.8	8.01	18.71	74.3
UNII-2C	NoHT	13	5500	5680	5720					
RATE	6M	Measured	8.7							
Duty Cycle / 2TX CDD	0.2	Corrected	8.9	0.2	0.2	21.5	12.6	8.01	16.91	49.1
UNII-3	NoHT	13	5720	5785	5825					
RATE	6M	Measured			9.9					
Duty Cycle / 2TX CDD	0.2	Corrected	0.2	0.2	10.1	27.5	17.4	8.01	18.11	64.7

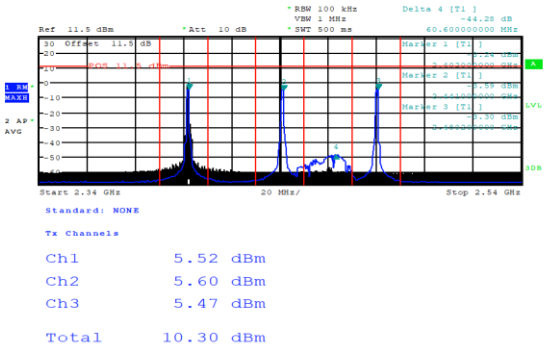
Notes: 1. Limit is based on table provided in requirements correcting for directional gain and emission bandwidth.
2. Reported data for WiFi includes directional gain of Tx0 and Tx1 chains, BT data is Tx0 chain only.

Table D2: RF Output Power for Class II Permissive Change compared to original certification

BAND	Worst-Case Mode	Freq Min MHz	Freq Max MHz	Original Certification	CIIPC (New)	REF
2G4	11g	2412	2462	0.4850	0.2510	TCB-9
2G4	BT	2402	2480	0.1500	0.0232	TCB-3
2G4	BLE	2402	2480	0.0081	0.0078	TCB-2
5G	11n	5180	5240	0.0800	0.0796	TCB-1
5G	11n	5260	5320	0.0749	0.0743	TCB-1

5G	11n	5500	5720	0.0501	0.0491	TCB-1
5G/5G8	11n	5745	5825	0.0674	0.0647	TCB-1

Figure D2: Typical Power Measurement (BT shown)



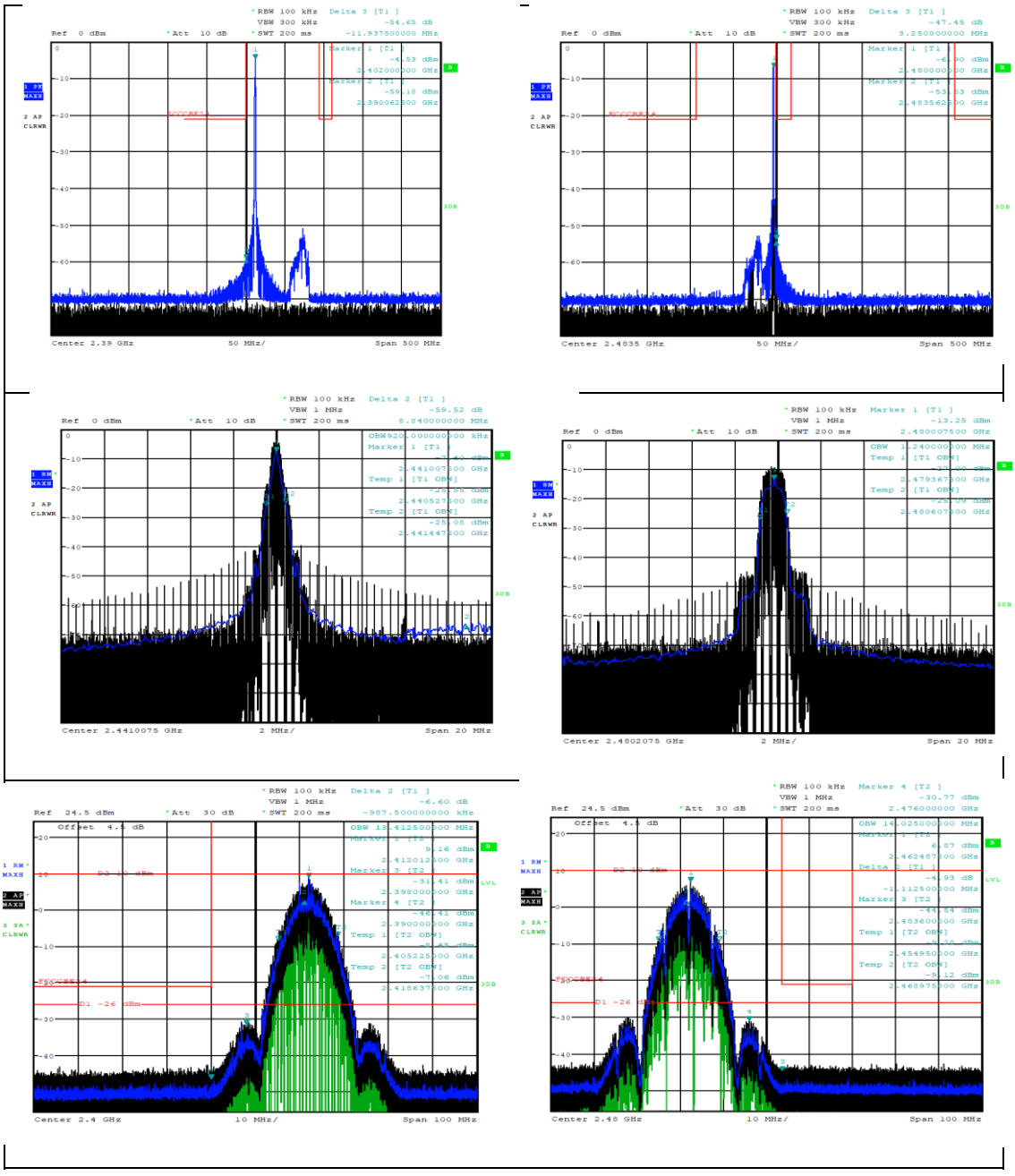
Appendix E: DUTY CYCLE CORRECTION DATA

Table E1: Duty Cycle Correction for RF Output Power

Frequency MHz	Modulation	Channel	Frequency MHz	T2 (OFF) usec	T1 (ON+OFF) usec	Duty Cycle dB	Max Duty Cycle dB
2G 11b	CCK1ML	1	2412	0.08	12.54	0.06	
2G 11b	CCK11ML	1	2412	0.1	1.41	0.64	
2G 11g	xHT6M	1	2412	0.1	2.185	0.41	
2G 11g	xHT54M	1	2412	0.105	0.353	3.07	3.07
2G 11n	HT20MCS0	1	2412	0.1	2.03	0.44	
2G 11n	HT20MCS19	1	2412	0.104	0.613	1.61	
2G 11n	HT40+MCS0	1	2412	0.106	1.05	0.92	
2G 11n	HT40MCS19	1	2412	0.106	0.376	2.88	2.88
BT	BT_DH5	0	2402	0.86	3.75	2.26	2.26
BT	BT2_DH5	0	2402	0.86	3.75	2.26	
BT	BT3_DH5	0	2402	0.86	3.75	2.26	
BLE	BLE	0	2402	0.022	0.622	0.31	0.31
5G 11a	xHT6M	36	5180	0.096	4.32	0.20	
5G 11a	xHT54M	36	5180	0.02	0.069	2.97	2.97
5G 11n	VHT20MCS0	36	5180	0.105	2.04	0.46	
5G 11n	VHT20MCS19	36	5180	0.106	0.219	5.75	
5G 11n	VHT40MCS0	36	5180	0.1	1.05	0.87	
5G 11n	VHT40MCS19	36	5180	0.0965	0.1765	6.87	
5G 11n	VHT80MCS0	36	5180	0.0975	0.5605	1.66	
5G 11n	VHT80MCS19	36	5180	0.0955	0.156	8.23	8.23
Notes: 1.							

Appendix F: OUT-OF-BAND EMISSIONS (BAND EDGE) DATA

Figure F1: Out-of-Band (Band Edge) Emissions for FCC/ICES - TX 2G4 Typical



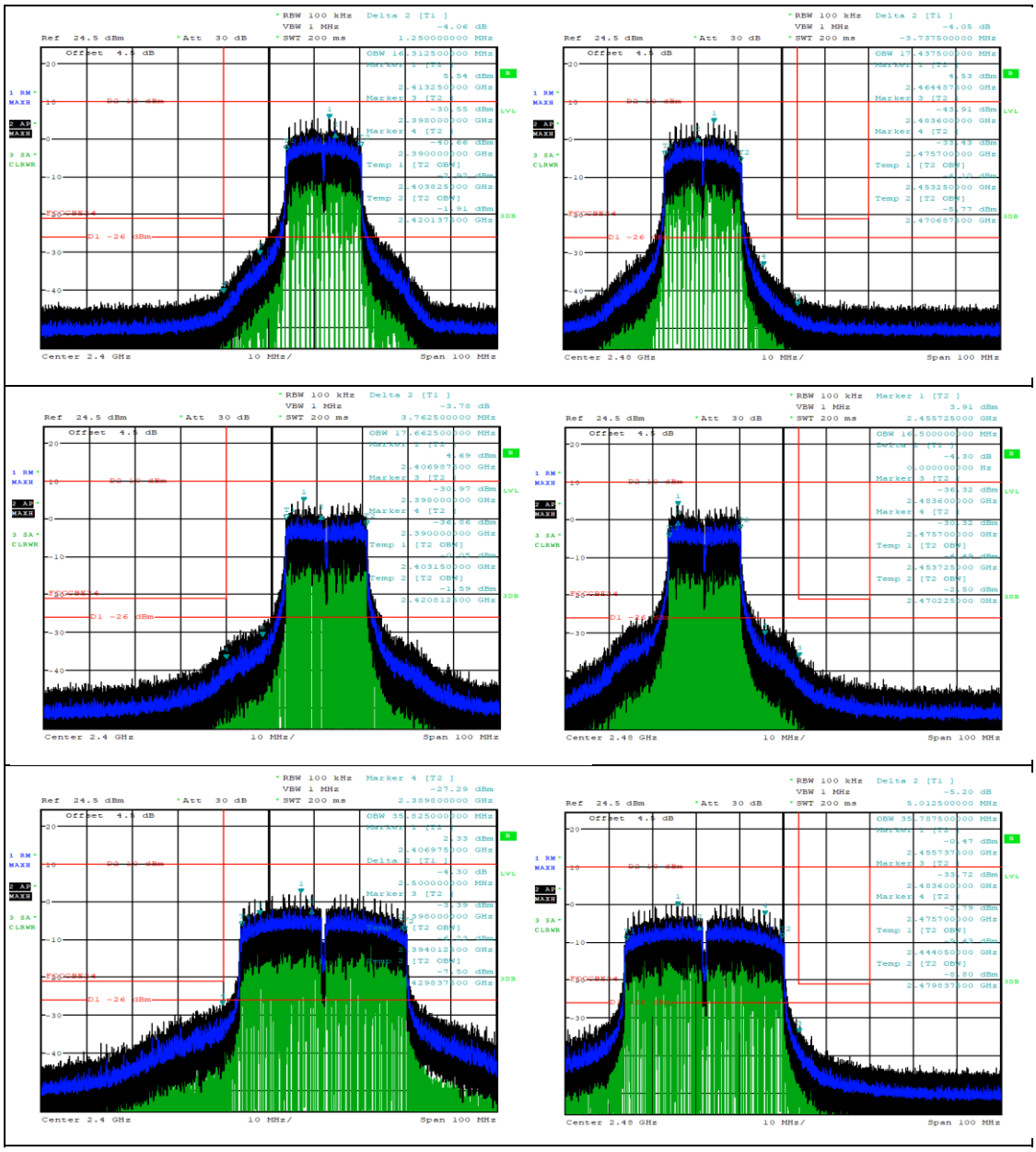
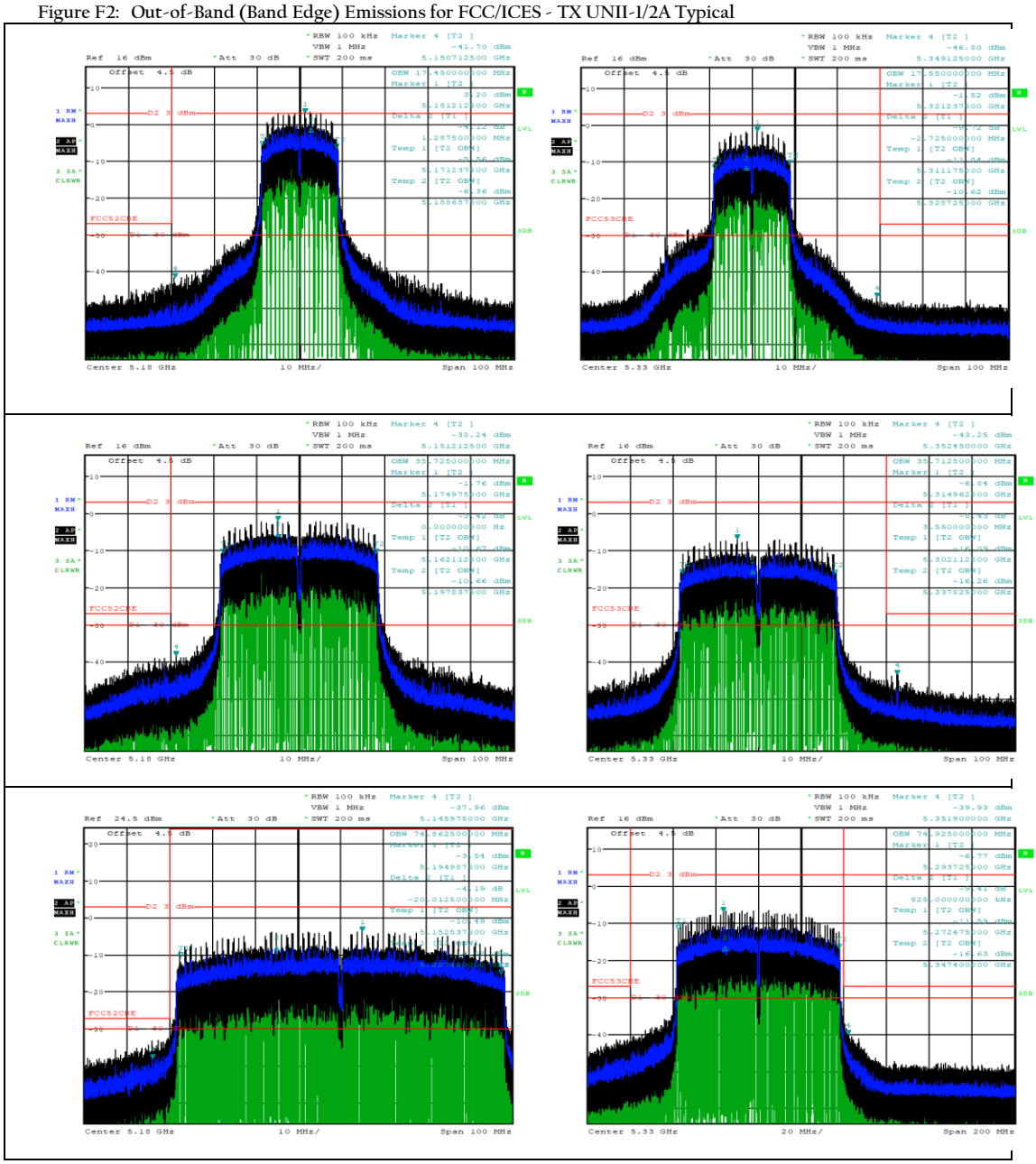


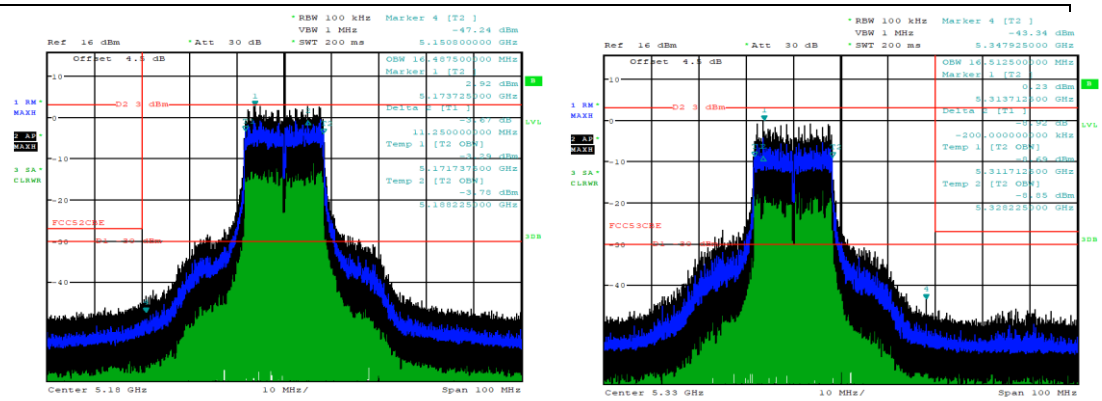
Table F1: Out-of-Band (Band Edge) Emissions for FCC/ICESS - TX 2G4 Worst-Case

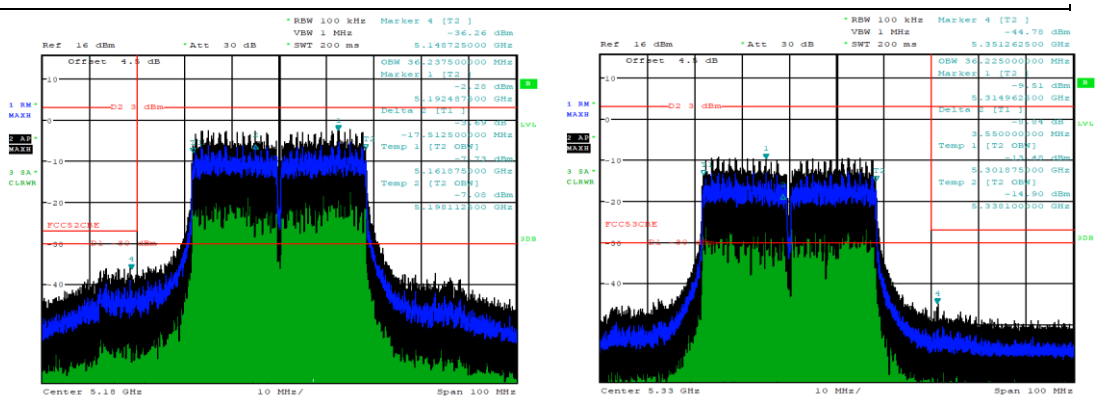
Frequency MHz	*	Meas. Time ms	Bandwidth KHz	Correction dB	Limit dBc or dBuV/m	Margin dB	Note
2412	-0.5	1000	100	0.0	-	-	*TX Worst-Case*
2390	-56.4	1000	100	0.0	-30.0	26.4	*Restricted*
2390 (*3)	39.1	1000	100	0.0	54.0	14.9	*Restricted*
2365	-55.9	1000	100	0.0	-30.0	25.9	*Restricted*
2365 (*3)	39.6	1000	100	0.0	54.0	14.4	*Restricted*
2466	0.6	1000	100	0.0	-	-	*TX Worst-Case*
2483.5	-46.2	1000	100	0.0	-30.0	16.2	*Restricted*
2483.5 (*3)	50.4	1000	100	0.0	54.0	3.6	*Restricted*
2515	-58.2	1000	100	0.0	-30.0	28.2	*Restricted*
2515 (*3)	38.4	1000	100	0.0	54.0	15.6	*Restricted*

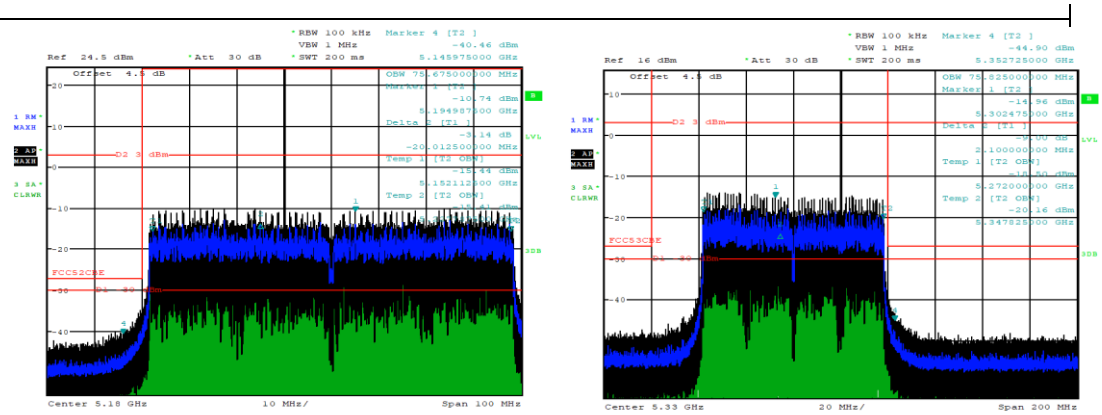
Notes: 1. Spurious emissions are required to be attenuated by 30dB (RMS method) or 20dB (PK method) unless emissions are within restricted bands.
2. Restricted band-edge conducted emission at 2190M, 2483.5M Hz converted to field reading in accordance with KDB 789033 D02.

Figure F2: Out-of-Band (Band Edge) Emissions for FCC/ICES - TX UNII-1/2A Typical









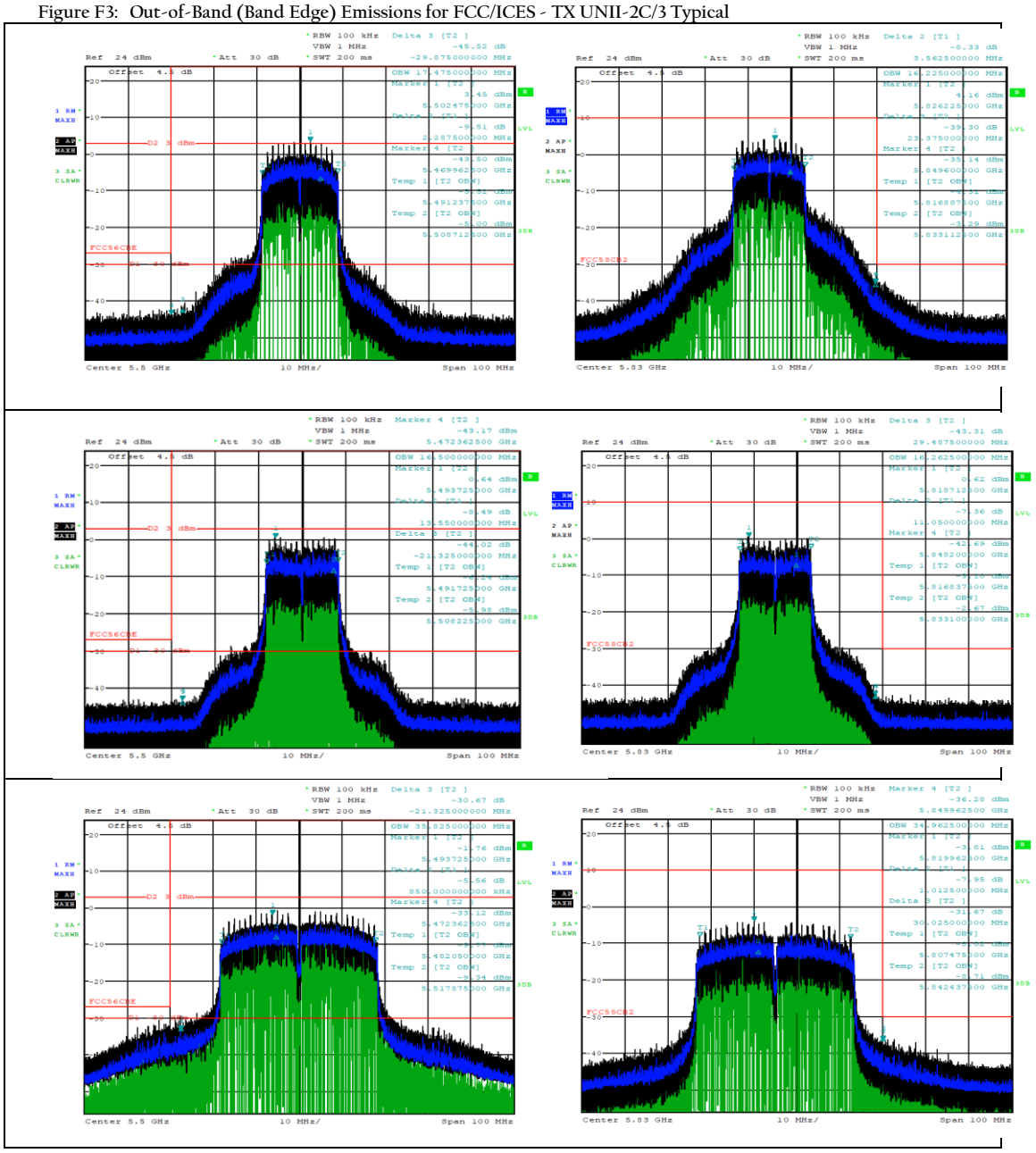
Notes: 1. *Spurious emissions are required to be attenuated by 30dB (RMS detector) or 20dB (PK detector) unless emissions are within restricted bands.*

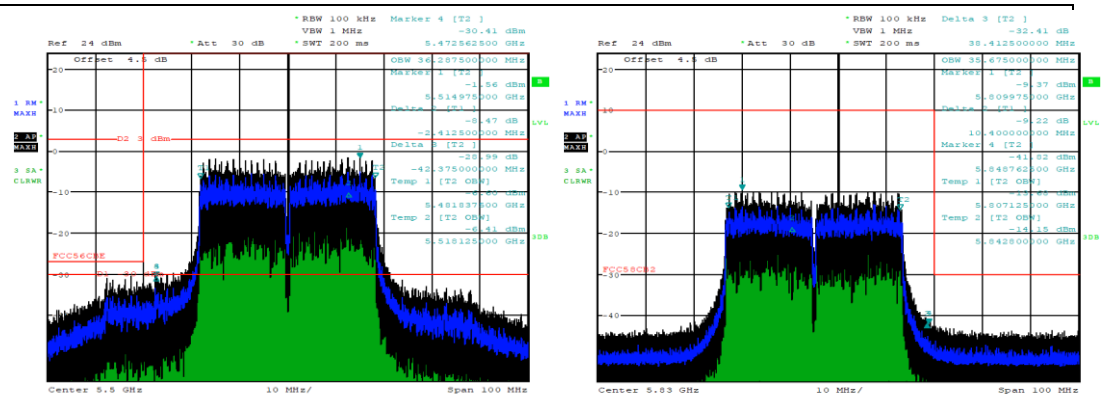
Table F5: Occupied Bandwidth for FCC/ICES

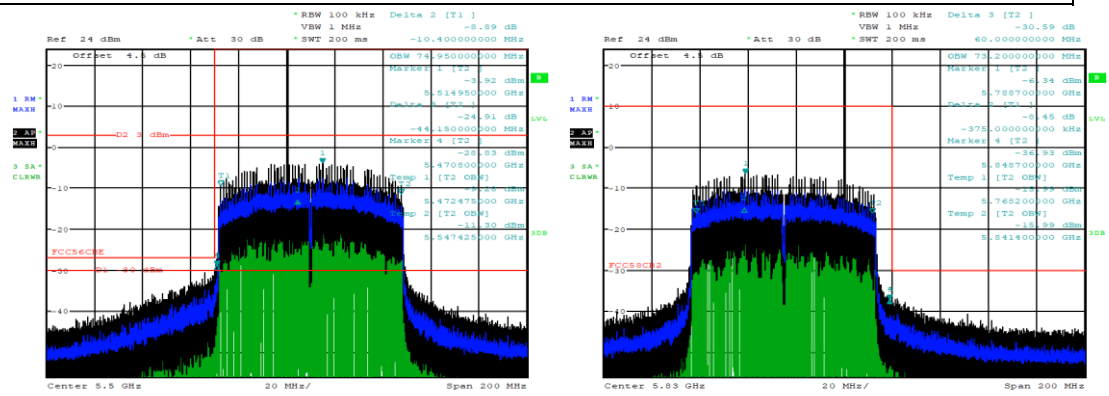
Band	Frequency MHz	Modulation	Occupied Bandwidth MHz	Occupied Bandwidth MHz	Occupied Bandwidth MHz	Occupied Bandwidth MHz
2G4-11b	2412, 2462	CCK1ML	14.0	13.8		
2G4-11b	2412, 2462	CCK11ML	13.6	13.7		
2G4-11g	2412, 2462	xHT6M	16.3	16.5		
2G4-11g	2412, 2462	xHT54M	16.5	16.5		
2G4-11n	2412, 2462	HT20MCS0	17.4	17.4		
2G4-11n	2412, 2462	HT20MCS19	17.7	17.8		
2G4-11n	2412, 2462	HT40+MCS0	35.9	35.8		
2G4-11n	2412, 2462	HT40+MCS19	35.8	36.2		
5G-11a	5180, 5320, 5500, 5825	xHT6M	17.3	17.4	17.6	17.5
5G-11a	5180, 5320, 5500, 5825	xHT54M	16.5	16.5	16.5	16.3
5G-11n	5180, 5320, 5500, 5825	VHT20MCS0	17.4	17.5	17.5	17.0
5G-11n	5180, 5320, 5500, 5825	VHT20MCS19	17.7	17.7	17.6	17.4
5G-11n	5180, 5320, 5500, 5825	VHT40MCS0	35.8	35.8	35.8	34.9
5G-11n	5180, 5320, 5500, 5825	VHT40MCS19	36.2	36.2	36.3	35.7
5G-11n	5180, 5320, 5500, 5825	VHT80MCS0	75.1	74.9	75.0	73.2
5G-11n	5180, 5320, 5500, 5825	VHT80MCS19	75.6	75.8	75.7	74.9
2G4-BT	2402, 2462,2478	BT_DH5	0.920	0.920	0.920	
2G4-BT	2402, 2462,2478	BT2_DH5	1.240	1.200	1.240	
2G4-BT	2402, 2462,2478	BT3_DH5	1.240	1.240	1.240	

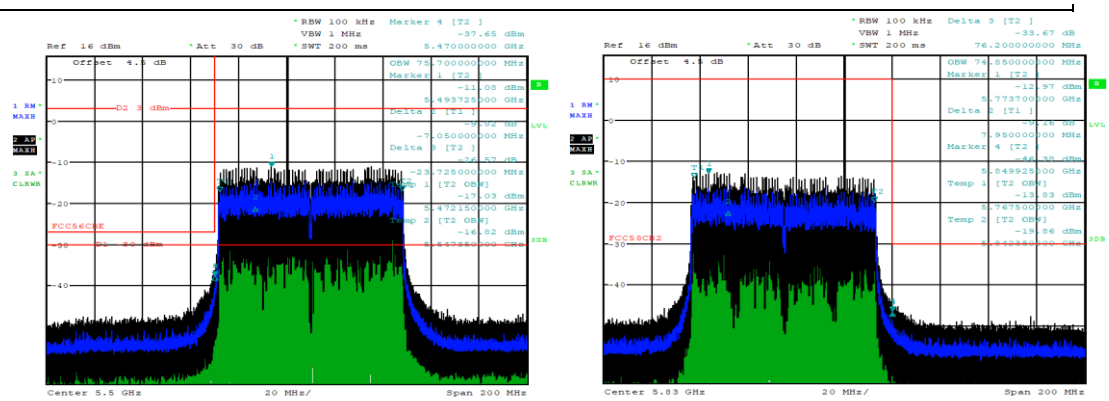
Notes: 1. Spurious emissions are required to be attenuated by 30dB (RMS detector) or 20dB (PK detector) unless emissions are within restricted bands.

Figure F3: Out-of-Band (Band Edge) Emissions for FCC/ICES - TX UNII-2C/3 Typical









Notes: 1. Spurious emissions are required to be attenuated by 30dB (RMS detector) or 20dB (PK detector) unless emissions are within restricted bands.

Appendix R: TEST SETUP PHOTOS

Figure R1: EUT Radiated Emissions Cable Layout

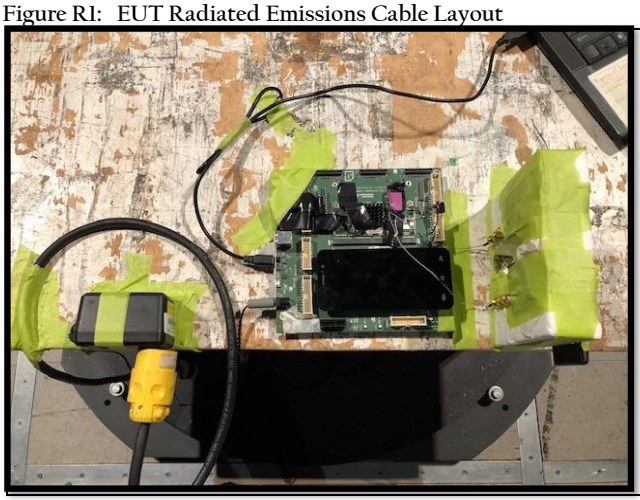


Figure R2: Radiated Emissions Test Setup w/ AE

Figure R3: Conducted Emissions Test Setup

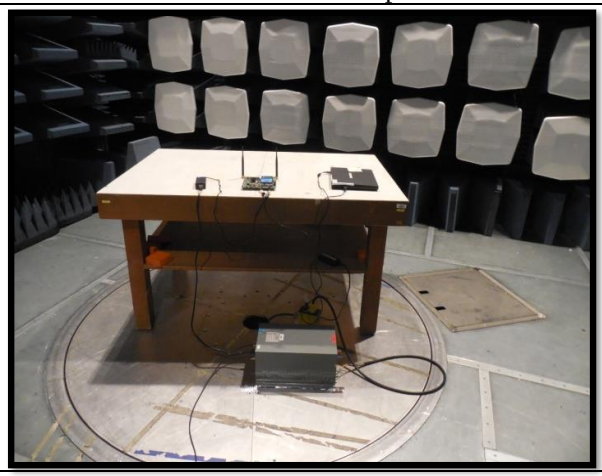


Figure R4: Radiated Emissions 30M-1G Test Setup

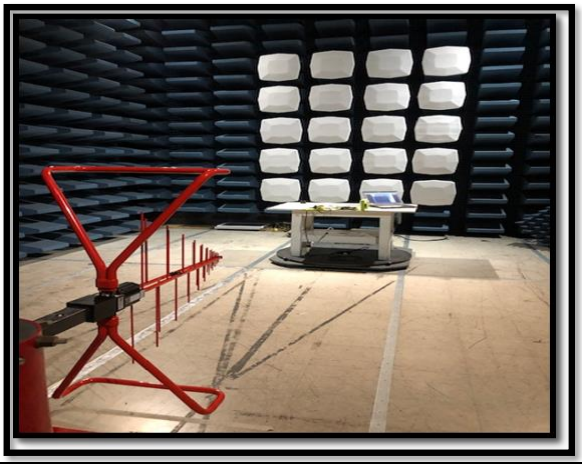
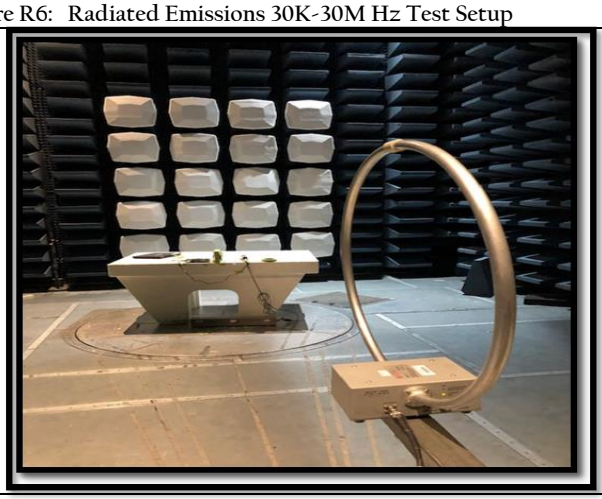


Figure R5: Radiated Emissions Detail

Figure R6: Radiated Emissions 30K-30M Hz Test Setup



Appendix S: ABBREVIATIONS

Abbreviation	Definition
AC	Alternating Current
CDN	Coupling/Decoupling Network
CE	European Conformity
CISPR	Comité International Spécial des Perturbations Radioélectriques
DC	Direct Current
EFT	Electrical Fast Transient
EMC	Electro-Magnetic Compatibility
EMI	Electro-Magnetic Interference
ESD	Electro-Static 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

[END OF REPORT]