Certification Test Report

FCC ID: 2ADCB-RMODIT3
IC: 6715C-RMODIT3

FCC Rule Part: 15.247
ISED Canada's Radio Standards Specification: RSS-247

TÜV SÜD Report Number: RD72161058.102

Manufacturer: Acuity Brands Lighting Inc.
Model: RMODIT3

Test Begin Date: July 22, 2020
Test End Date: September 21, 2020

Report Issue Date: September 29, 2020

A2LA Cert. No. 2955.18

This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, ANSI, or any agency of the Federal Government.

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1 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations and Innovation, Science and Economic Development Canada Radio Standards Specification: RSS-247 Certification.

1.2 Product Description

rMODIT3 is the next-generation nLight Air radio module that will be used on all nLight Air products. The module includes a 915MHz proprietary radio as well as a 2.4GHz BLE radio. This report addresses the 2.4 GHz BLE radio only. The 915 MHz radio is addressed in a separate report.

Technical Information:

Detail	Description
Frequency Range	2402 – 2480MHz
Number of Channels	40
Modulation Format	GFSK
Data Rates	1Mbps
Operating Voltage	3.3Vdc
Antenna Type / Gain	Intermediate-fed Inverted L / 2.4dBi (Host antenna trace design) Dual band Monopole / 3dBi (Host trace design to U.FL) Surface Mount / 3dBi (On-board module)

Manufacturer Information:
Acuity Brands Lighting Inc.
1 Acuity Way
Decatur, GA 30035

EUT Serial Numbers: TUV#7 (Intermediate-Fed Inverted L), TUV#5 (Dual band Monopole – RE), TUV#20 (Dual band Monopole – CE), TUV#12 (Surface Mount Device), TUV#23 (Conducted RF Measurements)

Test Sample Condition: The test samples were provided in good working order with no visible defects.

1.3 Test Methodology and Considerations

The module was tested using representative host antenna circuit / trace designs where applicable. This required the use of a representative host PCB in which these antenna circuit / trace designs were implemented.

Software was provided by the customer to configure the device power, channel, and modulation.

The power level setting for the 2.4GHz radio was 36.

AC power line conducted emissions was evaluated on all antenna configurations with worst case data presented in this report. Worst case configuration utilized the dual band monopole antenna with host trace design to host U.FL connector.

Simultaneous transmission data for the dual band monopole antenna configuration with host trace design to U.FL is included in this report as it is utilized by both the 915MHz and 2.4GHz radios simultaneously. Both conducted emissions at the U.FL port and radiated emissions were performed and data provided in this report.

All samples were assessed in each of the 3 orthogonal axis. The worst-case axis is documented with the data.

2 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

TÜV SÜD America Inc.
2320 Presidential Drive, Suite 101
Durham, NC 27703
Phone: (919) 748-4615

2.2 Laboratory Accreditations/Recognitions/Certifications

TÜV SÜD America Inc. is accredited to ISO/IEC 17025 by A2LA and has been issued certificate number 2955-18 in recognition of this accreditation. Unless otherwise specified, all test methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

The Semi-Anechoic Chamber Test Site and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC and Innovation, Science and Economic Development (ISED) Canada.

FCC Designation Number: US1245
FCC Test Firm Registration Number: 238628
ISED Canada Company Number: 20446

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 18' x 28' x 18' shielded enclosure. The chamber is lined with Samwha Electronics Co. LTD Ferrite Absorber, model number SFA300 (HSN-1). The ferrite tile is 10cm x 10 cm and weighs approximately 1.4lbs. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber. On top of the ferrite tiles is DMAS HT-45 (Dutch Microwave Absorber Solutions) hybrid absorber on all walls except the wall behind the antenna mast which has a shorter DMAS HT-25 absorber.

The turntable is 1.50m in diameter and is located 150cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using short #6 copper wire. The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the turntable. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane.

Behind the turntable is a 2' x 6' x 1.5' deep shielded pit used for support equipment if necessary. The pit is equipped with 2 - 4" PVC chase from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

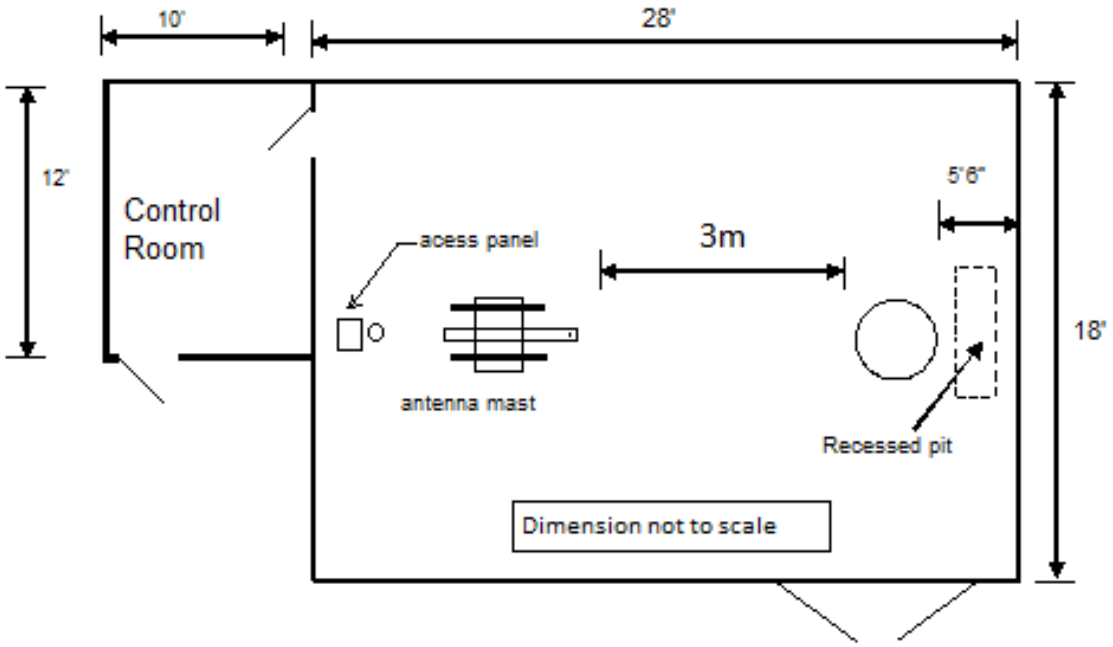


Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 10' sheet galvanized steel horizontal ground reference plane (GRP) bonded every 6" to an 8' X 8' aluminum vertical ground plane.

A diagram of the room is shown below in figure 2.4-1:

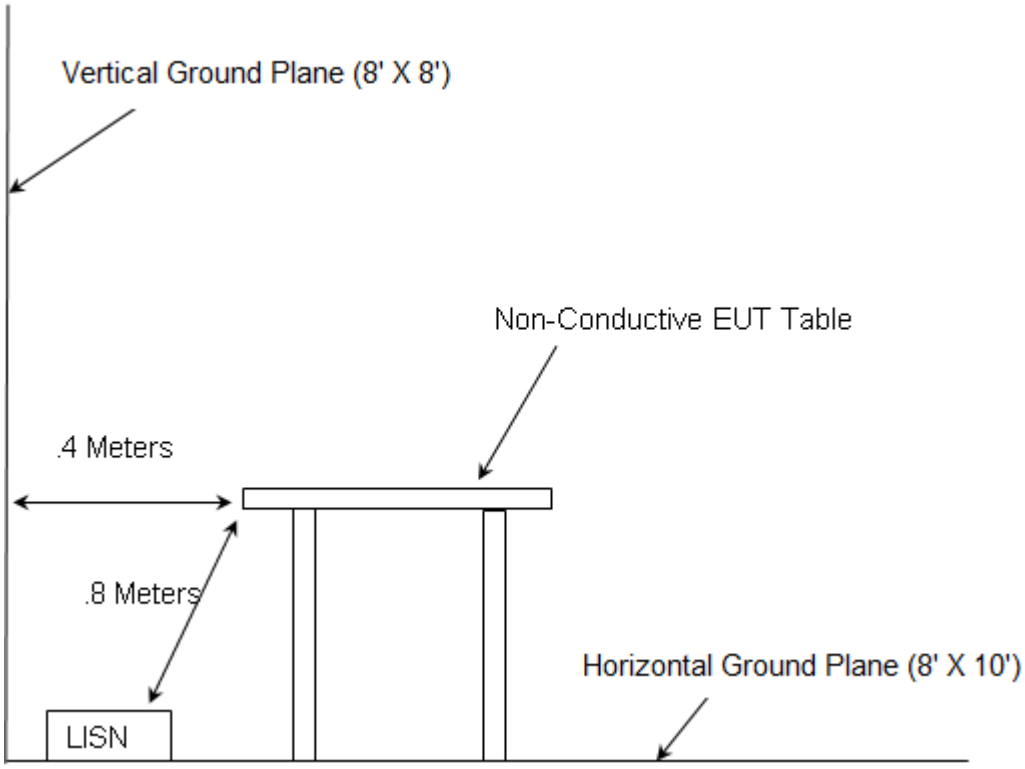


Figure 2.4-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2020
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2020
- FCC KDB 558074 D01 15.247 Meas Guidance v05r02 - 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, April 2, 2019
- ISED Canada Radio Standards Specification: RSS-247, Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices, Issue 2, February 2017
- ISED Canada Radio Standards Specification: RSS-GEN – General Requirements for Compliance of Radio Apparatus, Issue 5, March 2019, Amendment 1

4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment

Asset ID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
DEMC3002	Rohde & Schwarz	ESU40	Receiver	100346	1/22/2020	1/22/2021
DEMC3006	Rohde & Schwarz	TS-PR18	Amplifier	122006	1/23/2020	1/23/2021
DEMC3007	Rohde & Schwarz	TS-PR26	Amplifier	100051	1/23/2020	1/23/2021
DEMC3008	Rohde & Schwarz	NRP2	Meter	103131	2/11/2020	2/11/2021
DEMC3009	Rohde & Schwarz	NRP-Z81	Meter	102397	2/11/2020	2/11/2021
DEMC3012	Rohde & Schwarz	EMC32-EB	Software	100731	NCR	NCR
DEMC3016	Fei Teng Wireless Technology	HA-07M18G-NF	Antenna	2013120203	4/8/2020	4/8/2021
DEMC3027	Micro-Tronics	BRM50702	2.4GHz Notch Filter	175	1/27/2020	1/27/2021
DEMC3029	Micro-Tronics	HPM50108	900MHz HP Filter	134	1/27/2020	1/27/2021
DEMC3036	Hasco, Inc.	HLL142-S1-S1-24	Cable	2450	1/23/2020	1/23/2021
DEMC3038	Florida RF Labs	NMSE-290AW-60.0-NMSE	Cable Set	1448	1/27/2020	1/27/2021
DEMC3039	Florida RF Labs	NMSE-290AW-396.0-NMSE	Cable Set	1447	1/27/2020	1/27/2021
DEMC3046	Aeroflex Inmet	26AH-10	Attenuator	1443	1/23/2020	1/23/2021
DEMC3055	Rohde & Schwarz	3005	Cable	3055	1/23/2020	1/23/2021
DEMC3085	Rohde & Schwarz	FSW43	Spectrum Analyzer	103997	1/22/2020	1/22/2021
DEMC3161	TESEQ	CBL-6112D	Antenna	51323	2/18/2020	2/18/2021
DEMC3178	Micro-Tronics	BRC50722	Filter	G040	3/6/2020	3/6/2021

NCR = No Calibration Required
DMAS MT-25 RF absorber material was used on the floor for all final measurements above 1 GHz.
Asset DEMC3002: Firmware Version: ESU40 is 4.73 SP4
Asset DEMC3012: Software Version: EMC32-B is 10.50.00

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	EUT	Acuity Brands Lighting Inc.	RMODIT3	See Section 1.2
2	Wall wart	Volger	KTPS05-03315U-VI	N/A

Notes:

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

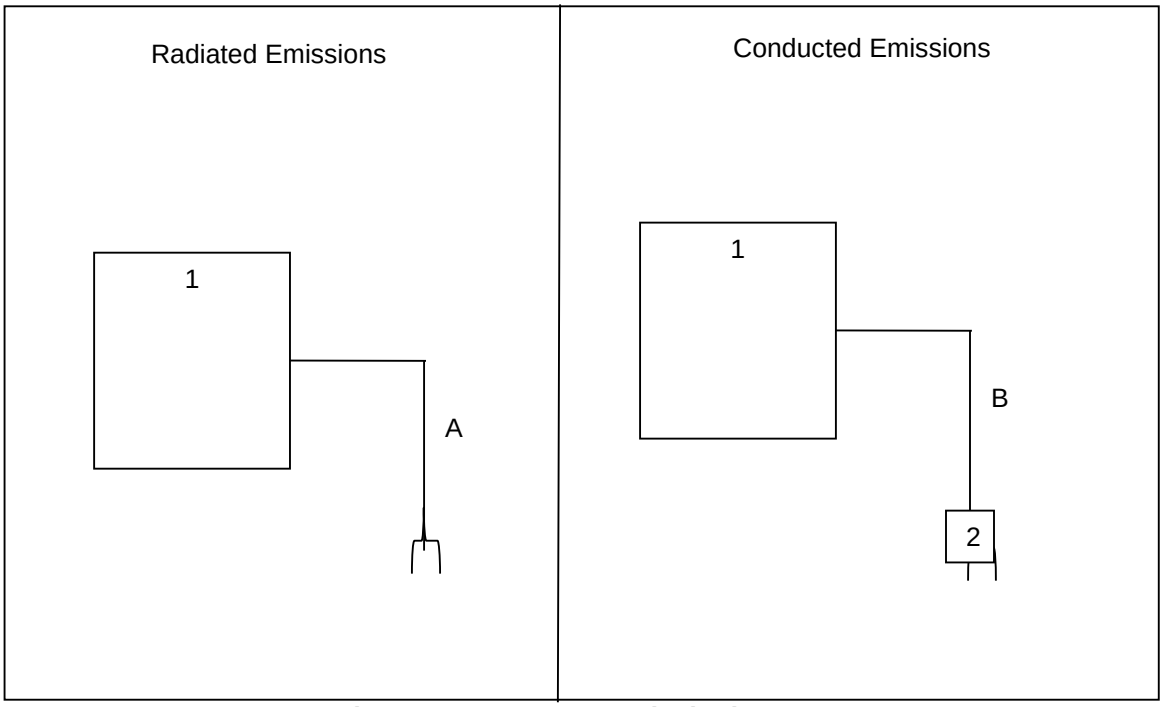


Figure 6-1: Test Setup Block Diagram

Table 6-1: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	AC Power	1.9m	No	1 to AC
B	DC Power	1.9m	No	1 to 2

7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Antenna Requirement – FCC: 15.203

The antennas are either integral to the device and cannot be removed/replaced by the end user or are connected via a U.FL connector.

7.2 Power Line Conducted Emissions – FCC: 15.207; ISED Canada: RSS-Gen 8.8

7.2.1 Measurement Procedure

ANSI C63.10-2013 section 6 was the guiding document for this evaluation. Conducted emissions were performed from 150kHz to 30MHz with the spectrum analyzer's resolution bandwidth set to 9kHz and the video bandwidth set to 30kHz. The calculation for the conducted emissions is as follows:

Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss
Margin = Applicable Limit - Corrected Reading

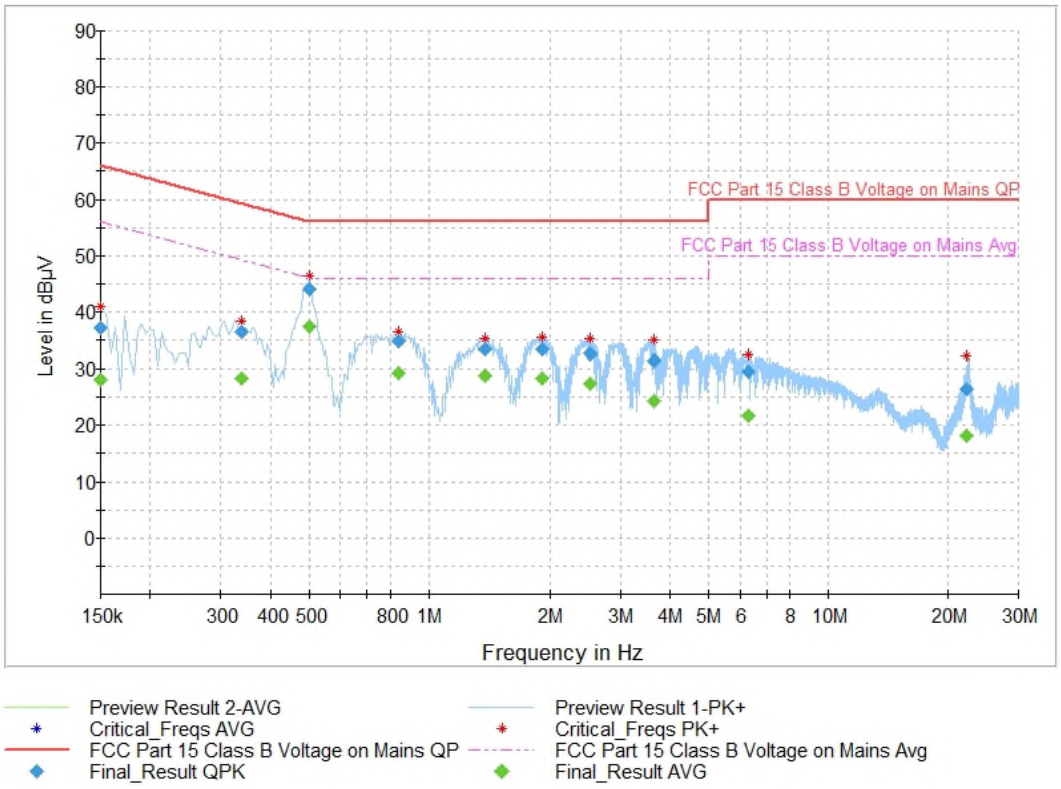
7.2.2 Measurement Results

Performed by: Chris Gormley

Table 7.2.2-1: Conducted EMI Results – Line and Neutral

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.150000	37.19	---	66.00	28.81	N	OFF	9.6
0.150000	---	28.09	56.00	27.91	N	OFF	9.6
0.339000	36.34	---	59.23	22.89	N	OFF	9.7
0.339000	---	28.32	49.23	20.91	N	OFF	9.7
0.501000	44.13	---	56.00	11.87	L1	OFF	9.6
0.501000	---	37.50	46.00	8.50	L1	OFF	9.6
0.843000	34.75	---	56.00	21.25	L1	OFF	9.6
0.843000	---	29.24	46.00	16.76	L1	OFF	9.6
1.387500	33.42	---	56.00	22.58	N	OFF	9.7
1.387500	---	28.78	46.00	17.22	N	OFF	9.7
1.905000	33.38	---	56.00	22.62	L1	OFF	9.8
1.905000	---	28.37	46.00	17.63	L1	OFF	9.8
2.517000	32.69	---	56.00	23.31	N	OFF	9.8
2.517000	---	27.55	46.00	18.45	N	OFF	9.8
3.637500	31.50	---	56.00	24.50	N	OFF	9.8
3.637500	---	24.45	46.00	21.55	N	OFF	9.8
6.292500	29.49	---	60.00	30.51	N	OFF	9.9
6.292500	---	21.87	50.00	28.13	N	OFF	9.9
22.308000	26.49	---	60.00	33.51	L1	OFF	10.2
22.308000	---	18.13	50.00	31.87	L1	OFF	10.2

Figure 7.2.2-1: Conducted Emissions Profile



7.3 6dB / 99% Bandwidth – FCC: 15.247(a)(2); ISED Canada: RSS-247 5.2(a)

7.3.1 Measurement Procedure

The 6dB bandwidth was measured in accordance with the FCC KDB 558074 D01 15.247 Meas Guidance v05r02. The Resolution Bandwidth (RBW) of the spectrum analyzer was set to 100 kHz. The Video Bandwidth (VBW) was set to ≥ 3 times the RBW. The trace was set to max hold with a peak detector active. The marker-delta function of the spectrum analyzer was utilized to determine the 6 dB bandwidth of the emission.

The occupied bandwidth measurement function of the spectrum analyzer was used to measure the 99% bandwidth. The span of the analyzer was set to capture all products of the modulation process, including the emission sidebands. The resolution bandwidth was set to 1% to 5% of the occupied bandwidth. The video bandwidth was set to 3 times the resolution bandwidth.

7.3.2 Measurement Results

Performed by: Chris Gormley

Table 7.3.2-1: 6dB / 99% Bandwidth

Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
2402	0.74138	1.0510
2440	0.75748	1.0541
2480	0.73435	1.0603

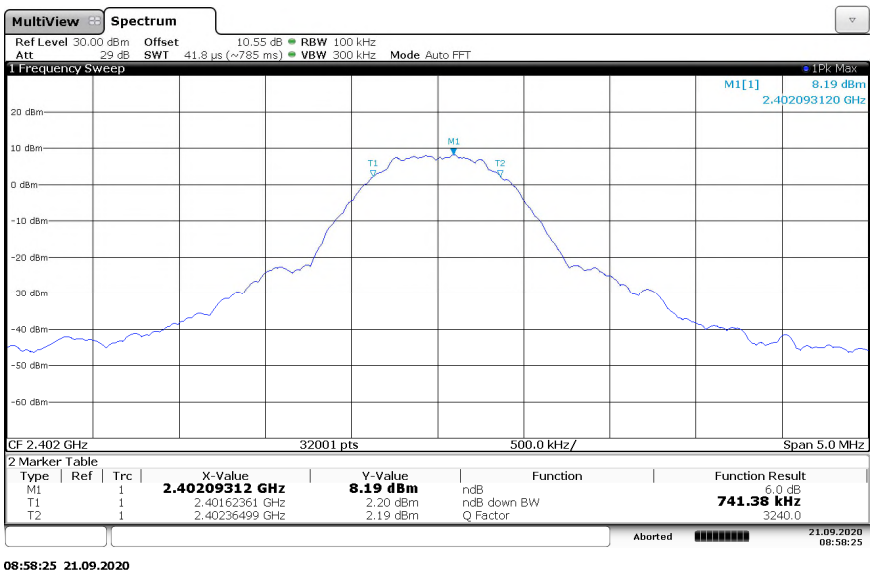


Figure 7.3.2-1: 6dB Bandwidth Low Channel

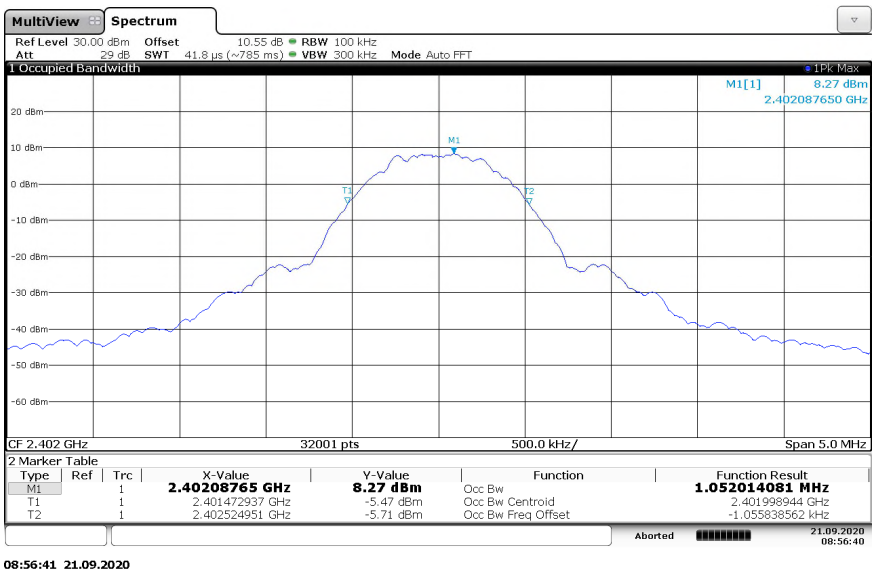


Figure 7.3.2-2: 99% Bandwidth Low Channel

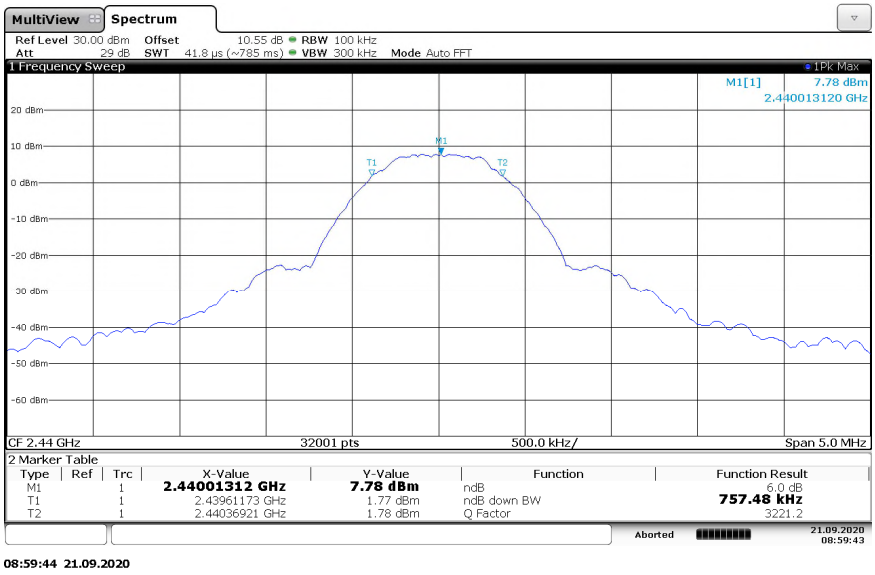


Figure 7.3.2-3: 6dB Bandwidth Mid Channel

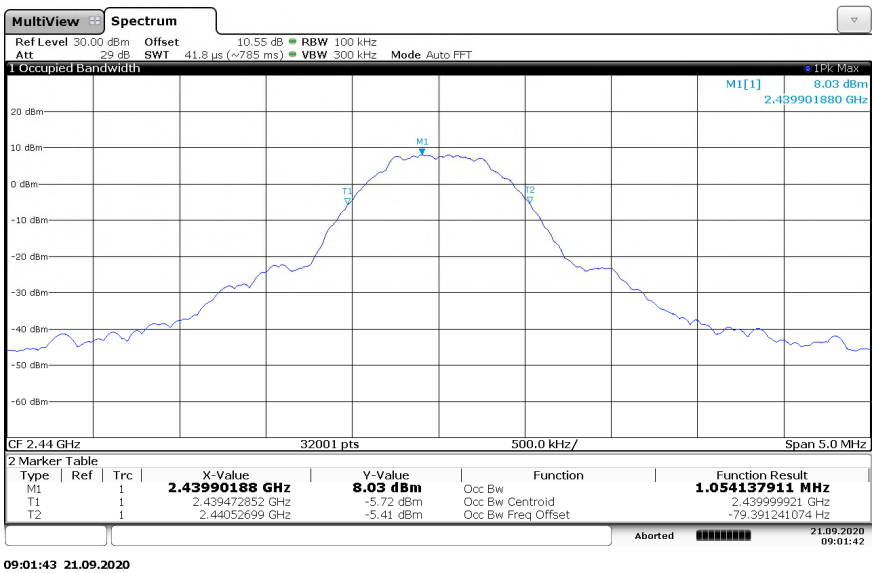


Figure 7.3.2-4: 99% Bandwidth Mid Channel

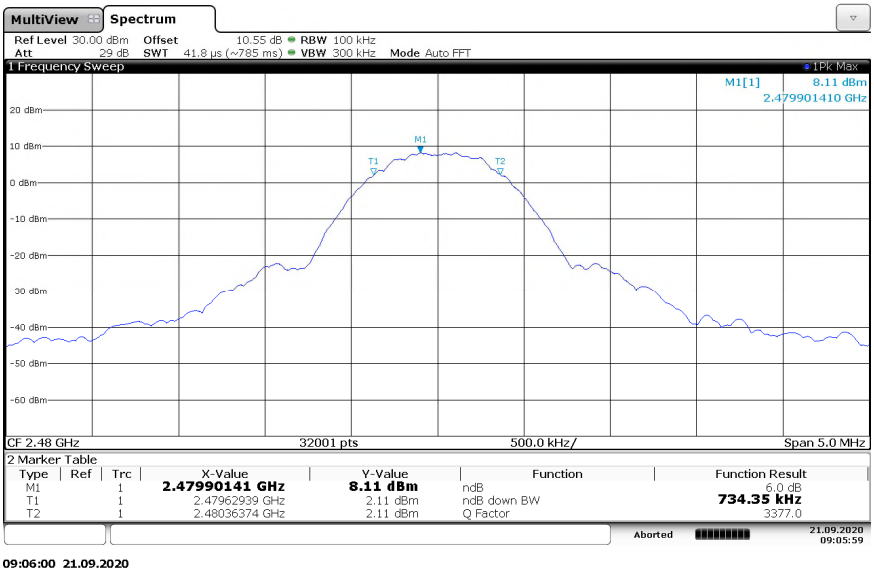


Figure 7.3.2-5: 6dB Bandwidth High Channel

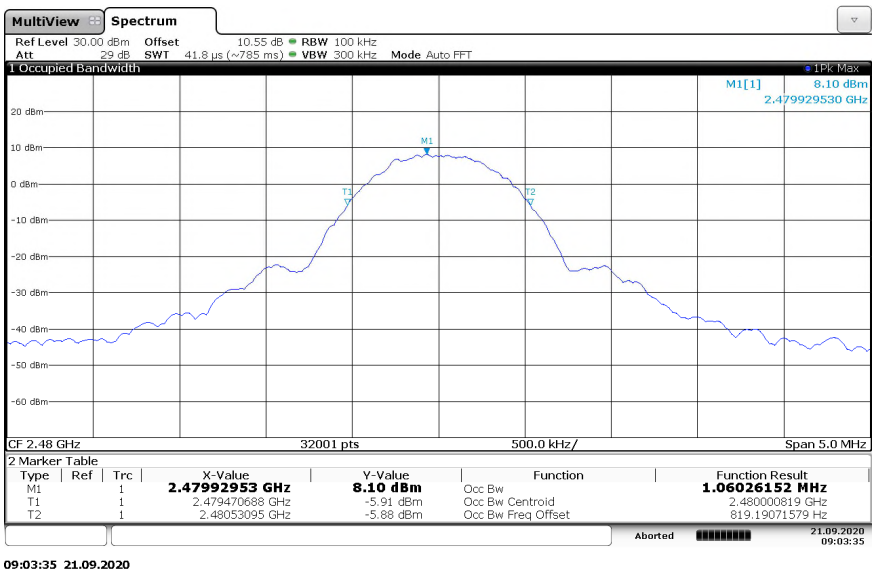


Figure 7.3.2-6: 99% Bandwidth High Channel

7.4 Fundamental Emission Output Power – FCC: 15.247(b)(3); ISED Canada: RSS-247 5.4(d)

7.4.1 Measurement Procedure

The maximum peak conducted output power was measured in accordance with FCC KDB 558074 D01 15.247 Meas Guidance v05r02 utilizing the PKPM1 Peak power meter method. The RF output of the equipment under test was directly connected to the input of the peak power meter applying suitable attenuation.

7.4.2 Measurement Results

Performed by: Chris Gormley

Table 7.4.2-1: Maximum Peak Conducted Output Power

Frequency (MHz)	Output Power (dBm)
2402	9.95
2440	9.96
2480	9.98

7.5 Emission Levels – FCC: 15.247(d), 15.205, 15.209; ISED Canada RSS-247 5.5, RSS-Gen 8.9/8.10

7.5.1 Emissions into Non-restricted Frequency Bands

7.5.1.1 Measurement Procedure

The unwanted emissions into non-restricted bands were measured conducted in accordance with FCC KDB 558074 D01 15.247 Meas Guidance v05r02. The RF output of the equipment under test was directly connected to the input of the spectrum analyzer applying suitable attenuation. The Resolution Bandwidth (RBW) of the spectrum analyzer was set to 100 kHz. The Video Bandwidth (VBW) was set to ≥ 300 kHz. Span was set to 1.5 times the DTS bandwidth. The trace was set to max hold with a peak detector active. The resulting spectrum analyzer peak level was used to determine the reference level with respect to the 20 dBc limit. The spectrum span was then adjusted for the measurement of spurious emissions from 30 MHz to 25GHz, 10 times the highest fundamental frequency. Additionally, a prescan was performed from 9 kHz or the lowest frequency generated to 30 MHz.

Band-edge compliance was determined using the conducted marker-delta method in which the radio frequency power that is produced by the EUT is at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power.

7.5.1.2 Measurement Results

Performed by: Chris Gormley

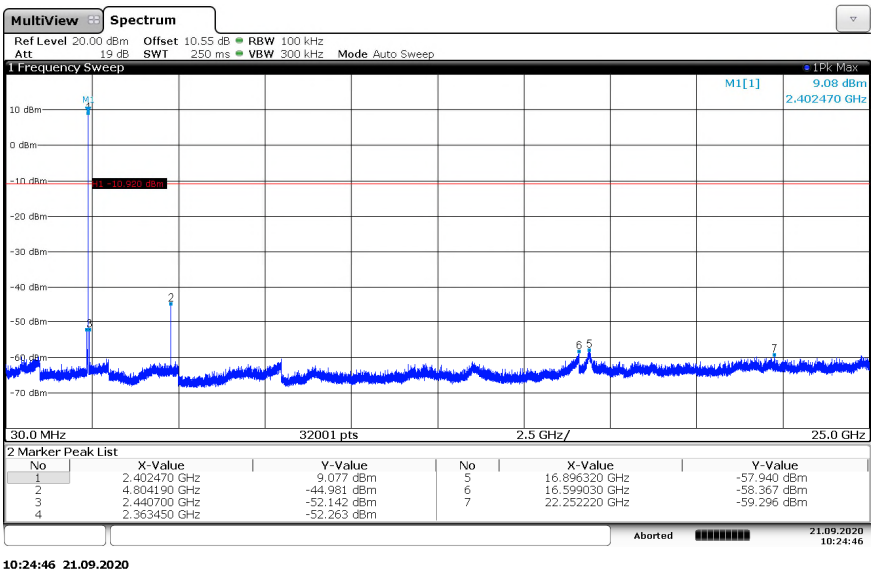


Figure 7.5.1.2-1: 30 MHz – 25 GHz – LCH

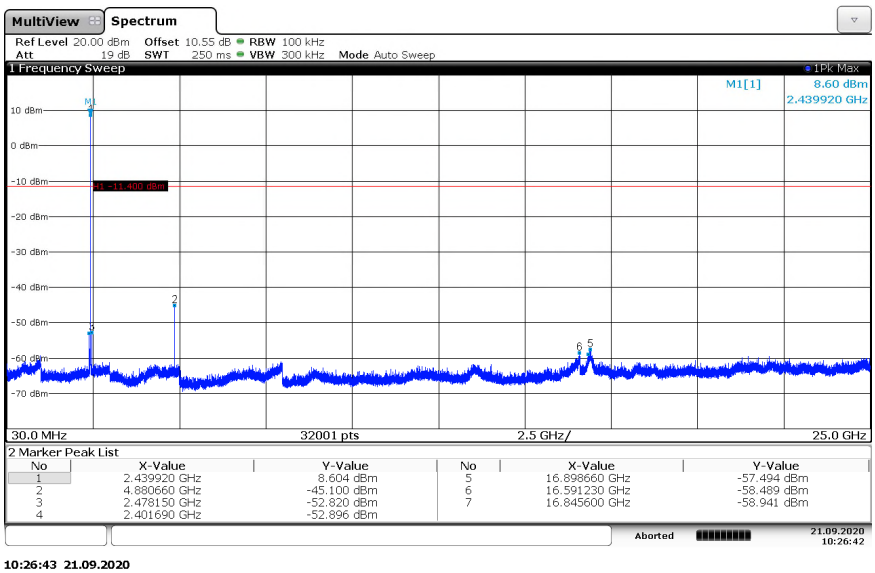


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Figure 7.5.1.2-2: 30 MHz – 25 GHz – MCH

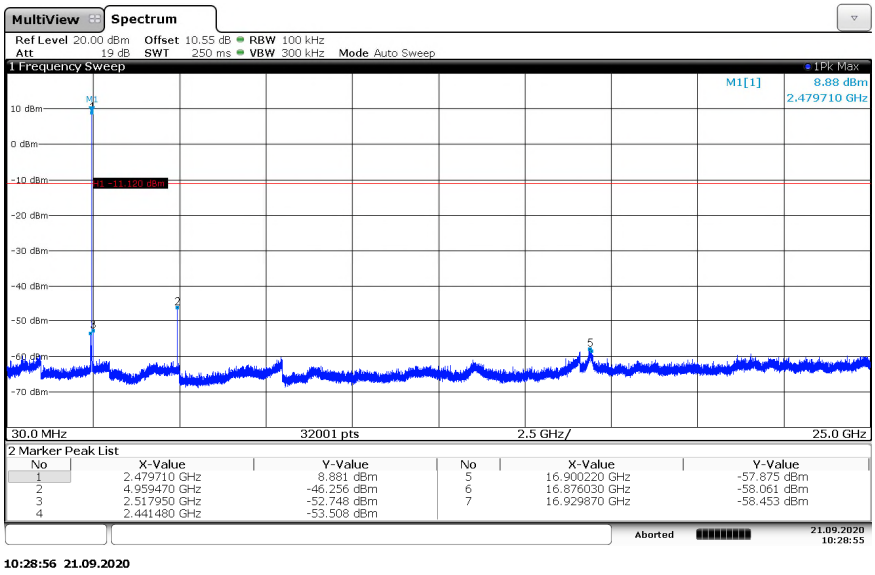

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Figure 7.5.1.2-3: 30 MHz – 25 GHz – HCH

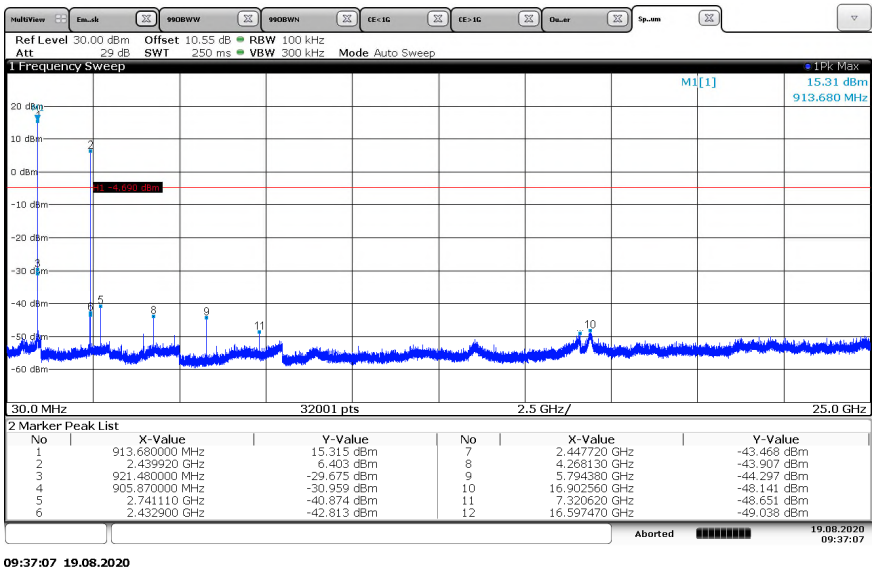

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Figure 7.5.1.2-4: 30 MHz – 25 GHz – Simultaneous transmissions at MCH

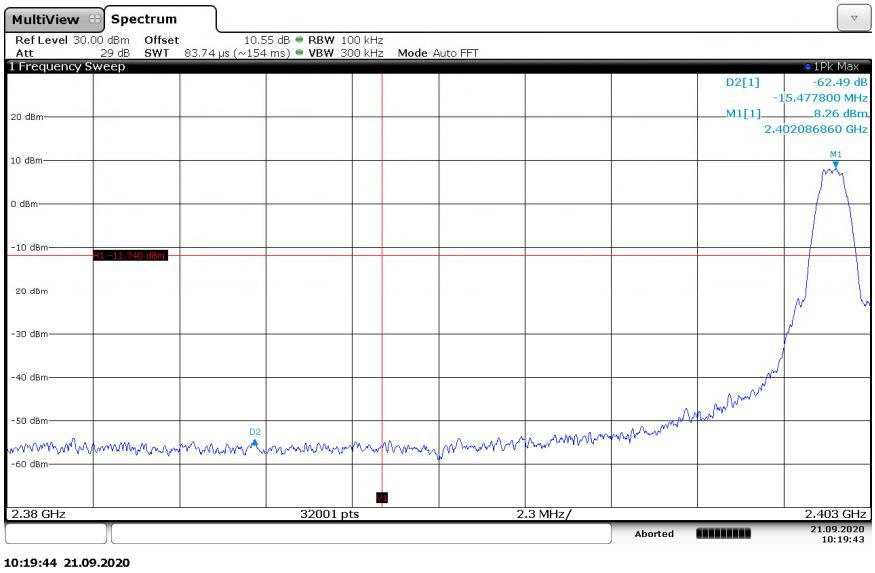

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Figure 7.5.1.2-5: Lower Band-edge - LCH

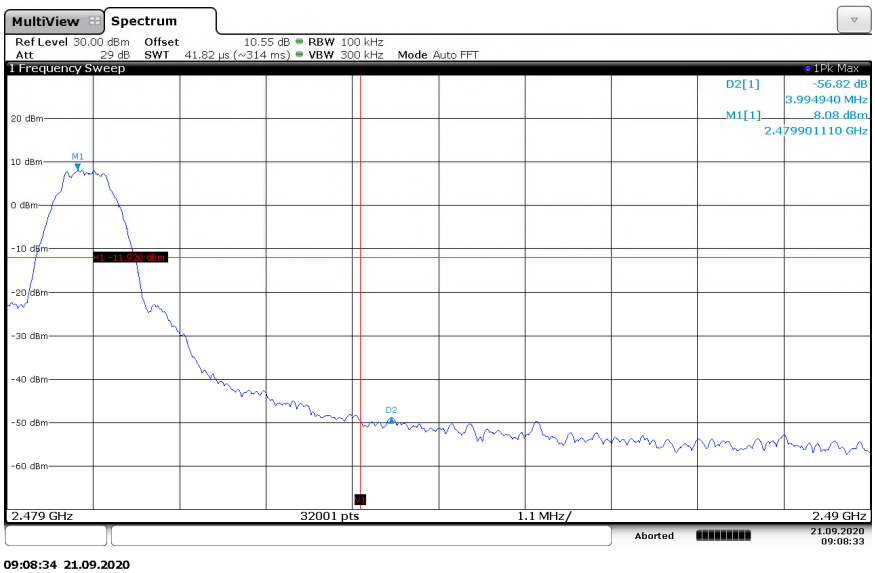


Figure 7.5.1.2-6: Upper Band-edge - HCH

7.5.2 Emissions into Restricted Frequency Bands

7.5.2.1 Measurement Procedure

The unwanted emissions into restricted bands were measured radiated over the frequency range of 30MHz to 25GHz, 10 times the highest fundamental frequency.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a RBW of 120 kHz and a VBW of 300 kHz. For frequencies above 1000MHz, peak and average measurements were made with RBW and VBW of 1 MHz and 3 MHz respectively.

Each emission found to be in a restricted band as defined by section 15.205, including any emission at the operational band-edge, was compared to the radiated emission limits as defined in section 15.209.

The worst-case orientation for each sample is listed in the table below.

Table 7.5.2.1-1: Worst-case Orientation

Sample ID	Antenna Type	Worst-case Orientation
TUV#7	Intermediate-fed Inverted L (-0.9dBi)	Y
TUV#12	Inverted F PCB Trace	Z
TUV#5	Dualband Monopole	Y

7.5.2.2 Duty Cycle Correction

Duty cycle correction was not required.

7.5.2.3 Measurement Results

Performed by: Chris Gormley

Table 7.5.2.3-1: Radiated Spurious Emissions Tabulated Data – Intermediate-fed Inverted L

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Turntable Position	Antenna Height	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(o)	(cm)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel												
2390	44.30	30.60	V	106	110	-3.01	41.29	27.59	74.0	54.0	32.71	26.41
4804	42.40	34.50	H	18	100	3.71	46.11	38.21	74.0	54.0	27.89	15.79
4804	42.40	34.50	V	23	100	3.71	46.11	38.21	74.0	54.0	27.89	15.79
12010	36.30	23.10	H	0	100	13.77	50.07	36.87	74.0	54.0	23.93	17.13
12010	36.60	23.10	V	0	100	13.77	50.37	36.87	74.0	54.0	23.63	17.13
19216	39.70	26.00	H	0	150	8.80	48.50	34.80	74.0	54.0	25.50	19.20
19216	39.50	26.00	V	0	150	8.80	48.30	34.80	74.0	54.0	25.70	19.20
Mid Channel												
4880	43.10	35.40	H	36	97.51	3.76	46.86	39.16	74.0	54.0	27.14	14.84
4880	41.60	32.20	V	0	275	3.76	45.36	35.96	74.0	54.0	28.64	18.04
7320	41.30	30.40	H	220	100	8.38	49.68	38.78	74.0	54.0	24.32	15.22
7320	41.20	30.80	V	178	105	8.38	49.58	39.18	74.0	54.0	24.42	14.82
12200	36.50	22.80	H	0	100	13.06	49.56	35.86	74.0	54.0	24.44	18.14
12200	36.60	22.80	V	0	100	13.06	49.66	35.86	74.0	54.0	24.34	18.14
19520	40.60	26.40	H	0	150	9.17	49.77	35.57	74.0	54.0	24.23	18.43
19520	39.90	26.30	V	0	150	9.17	49.07	35.47	74.0	54.0	24.93	18.53
High Channel												
2483.5	59.64	47.60	V	128	126	-3.16	56.48	44.44	74.0	54.0	17.52	9.56
4960	43.40	36.40	H	39	100	3.81	47.21	40.21	74.0	54.0	26.79	13.79
4960	42.50	34.70	V	1	264	3.81	46.31	38.51	74.0	54.0	27.69	15.49
7440	40.00	28.60	H	125	100	8.93	48.93	37.53	74.0	54.0	25.07	16.47
7440	40.40	29.20	V	191	112	8.93	49.33	38.13	74.0	54.0	24.67	15.87
12400	36.10	22.70	H	0	100	12.32	48.42	35.02	74.0	54.0	25.58	18.98
12400	36.50	22.60	V	0	100	12.32	48.82	34.92	74.0	54.0	25.18	19.08
19840	39.90	25.30	H	0	150	9.35	49.25	34.65	74.0	54.0	24.75	19.35
19840	38.40	25.20	V	0	150	9.35	47.75	34.55	74.0	54.0	26.25	19.45
22320	37.70	24.30	H	0	150	11.87	49.57	36.17	74.0	54.0	24.43	17.83
22320	38.10	24.20	V	0	150	11.87	49.97	36.07	74.0	54.0	24.03	17.93

Note: All emissions not listed were related to the unintentional circuitry of the carrier board.

Table 7.5.2.3-2: Radiated Spurious Emissions Tabulated Data – Dual band Monopole

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Turntable Position	Antenna Height	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(o)	(cm)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel												
2390	42.70	29.00	V	203	209	-3.01	39.69	25.99	74.0	54.0	34.31	28.01
4804	45.80	35.60	H	195	152	3.89	49.69	39.49	74.0	54.0	24.31	14.51
4804	51.50	41.30	V	223	122	3.89	55.39	45.19	74.0	54.0	18.61	8.81
12010	36.50	23.10	H	0	100	13.87	50.37	36.97	74.0	54.0	23.63	17.03
12010	36.80	23.10	V	0	100	13.87	50.67	36.97	74.0	54.0	23.33	17.03
19216	39.60	25.90	H	0	150	8.80	48.40	34.70	74.0	54.0	25.60	19.30
19216	39.10	25.90	V	0	150	8.80	47.90	34.70	74.0	54.0	26.10	19.30
Mid Channel												
4880	46.60	38.70	H	176	100	3.76	50.36	42.46	74.0	54.0	23.64	11.54
4880	54.80	46.60	V	81	134	3.76	58.56	50.36	74.0	54.0	15.44	3.64
7320	42.60	33.40	H	131	127	8.38	50.98	41.78	74.0	54.0	23.02	12.22
7320	45.50	37.00	V	65	100	8.38	53.88	45.38	74.0	54.0	20.12	8.62
12200	36.10	22.50	H	0	100	13.06	49.16	35.56	74.0	54.0	24.84	18.44
12200	35.70	22.50	V	0	100	13.06	48.76	35.56	74.0	54.0	25.24	18.44
19520	40.10	26.20	H	0	150	9.17	49.27	35.37	74.0	54.0	24.73	18.63
19520	40.00	26.20	V	0	150	9.17	49.17	35.37	74.0	54.0	24.83	18.63
High Channel												
2483.5	57.61	46.80	V	207	216	-3.16	54.45	43.64	74.0	54.0	19.55	10.36
4960	48.00	37.40	H	109	104	3.81	51.81	41.21	74.0	54.0	22.19	12.79
4960	58.40	49.20	V	113	114	3.81	62.21	53.01	74.0	54.0	11.79	0.99
7440	40.40	29.50	H	151	100	8.93	49.33	38.43	74.0	54.0	24.67	15.57
7440	43.00	32.70	V	86	100	8.93	51.93	41.63	74.0	54.0	22.07	12.37
12400	36.50	22.70	H	0	100	12.32	48.82	35.02	74.0	54.0	25.18	18.98
12400	36.50	22.70	V	0	100	12.32	48.82	35.02	74.0	54.0	25.18	18.98
19840	39.30	25.20	H	0	150	9.35	48.65	34.55	74.0	54.0	25.35	19.45
19840	38.50	25.20	V	0	150	9.35	47.85	34.55	74.0	54.0	26.15	19.45
22320	38.30	24.20	H	0	150	11.87	50.17	36.07	74.0	54.0	23.83	17.93
22320	37.60	24.10	V	0	150	11.87	49.47	35.97	74.0	54.0	24.53	18.03

Note: All emissions not listed were related to the unintentional circuitry of the carrier board.

Table 7.5.2.3-3: Radiated Spurious Emissions Tabulated Data – Surface Mount

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Turntable Position	Antenna Height	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(o)	(cm)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel												
2390	40.43	27.20	V	233	100	-3.01	37.42	24.19	74.0	54.0	36.58	29.81
4804	40.90	30.90	H	220	202	3.71	44.61	34.61	74.0	54.0	29.39	19.39
4804	39.80	28.90	V	171	157	3.71	43.51	32.61	74.0	54.0	30.49	21.39
12010	37.10	23.00	H	0	100	13.77	50.87	36.77	74.0	54.0	23.13	17.23
12010	36.60	23.00	V	0	100	13.77	50.37	36.77	74.0	54.0	23.63	17.23
19216	39.90	26.10	H	0	150	8.80	48.70	34.90	74.0	54.0	25.30	19.10
19216	39.20	25.90	V	0	150	8.80	48.00	34.70	74.0	54.0	26.00	19.30
Mid Channel												
4880	40.50	30.30	H	224	144	3.76	44.26	34.06	74.0	54.0	29.74	19.94
4880	40.10	28.70	V	335	115	3.76	43.86	32.46	74.0	54.0	30.14	21.54
7320	39.60	27.00	H	196	243	8.38	47.98	35.38	74.0	54.0	26.02	18.62
7320	40.20	28.30	V	20	115	8.38	48.58	36.68	74.0	54.0	25.42	17.32
12200	36.50	22.80	H	0	100	13.06	49.56	35.86	74.0	54.0	24.44	18.14
12200	36.40	22.80	V	0	100	13.06	49.46	35.86	74.0	54.0	24.54	18.14
19520	39.90	26.40	H	0	150	9.17	49.07	35.57	74.0	54.0	24.93	18.43
19520	41.00	26.20	V	0	150	9.17	50.17	35.37	74.0	54.0	23.83	18.63
High Channel												
2483.5	49.50	37.70	V	224	166	-3.16	46.34	34.54	74.0	54.0	27.66	19.46
4960	40.70	29.80	H	149	204	3.81	44.51	33.61	74.0	54.0	29.49	20.39
4960	40.40	28.70	V	341	110	3.81	44.21	32.51	74.0	54.0	29.79	21.49
7440	39.20	25.70	H	212	100	8.93	48.13	34.63	74.0	54.0	25.87	19.37
7440	41.20	30.40	V	16	105	8.93	50.13	39.33	74.0	54.0	23.87	14.67
12400	36.60	22.60	H	0	100	12.32	48.92	34.92	74.0	54.0	25.08	19.08
12400	37.10	22.60	V	0	100	12.32	49.42	34.92	74.0	54.0	24.58	19.08
19840	38.70	25.30	H	0	150	9.35	48.05	34.65	74.0	54.0	25.95	19.35
19840	38.70	25.10	V	0	150	9.35	48.05	34.45	74.0	54.0	25.95	19.55
22320	38.60	24.30	H	0	150	11.87	50.47	36.17	74.0	54.0	23.53	17.83
22320	38.80	24.20	V	0	150	11.87	50.67	36.07	74.0	54.0	23.33	17.93

Note: All emissions not listed were related to the unintentional circuitry of the carrier board.

Table 7.5.2.3-4: Radiated Spurious Emissions Tabulated Data – Dual band Monopole Simultaneous Transmission Data (915 MHz / 2.4 GHz radios)

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Turntable Position	Antenna Height	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(o)	(cm)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
2.4GHz radio MCH – 915MHz radio MCH												
1216	43.20	30.80	H	353	120	8.64	51.84	39.44	74.0	54.0	22.16	14.56
1216	50.00	37.80	V	166	100	8.64	58.64	46.44	74.0	54.0	15.36	7.56
1526	46.80	37.20	H	320	112	-11.62	35.18	25.58	74.0	54.0	38.82	28.42
1526	53.60	45.30	V	347	131	-11.62	41.98	33.68	74.0	54.0	32.02	20.32
3353.6	44.40	33.40	H	0	100	0.66	45.06	34.06	74.0	54.0	28.94	19.94
3353.6	51.10	40.60	V	112	100	0.66	51.76	41.26	74.0	54.0	22.24	12.74
4267	45.50	32.50	H	324	107	5.97	51.47	38.47	74.0	54.0	22.53	15.53
4267	52.70	40.80	V	314	100	5.97	58.67	46.77	74.0	54.0	15.33	7.23
4879	41.70	29.50	H	178	100	7.57	49.27	37.07	74.0	54.0	24.73	16.93
4879	46.20	32.70	V	81	126	7.57	53.77	40.27	74.0	54.0	20.23	13.73

Note: All emissions not listed were related to the unintentional circuitry of the carrier board.

7.5.2.4 Sample Calculation:

$R_C = R_U + CF_T$

Where:

CF_T = Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U = Uncorrected Reading
R_C = Corrected Level
AF = Antenna Factor
CA = Cable Attenuation
AG = Amplifier Gain
DC = Duty Cycle Correction Factor

Example Calculation: Peak

Corrected Level: 44.3 + -3.01 = 41.29dBuV/m
Margin: 74dBuV/m – 41.29dBuV/m = 32.71dB

Example Calculation: Average

Corrected Level: 30.6 + -3.01 = 27.59dBuV
Margin: 54dBuV – 27.59dBuV = 26.41dB

7.5.2.5 Emission Plots

Figure 7.5.2.5-1: Emission Profile – Below 1GHz – Intermediate-fed Inverted L

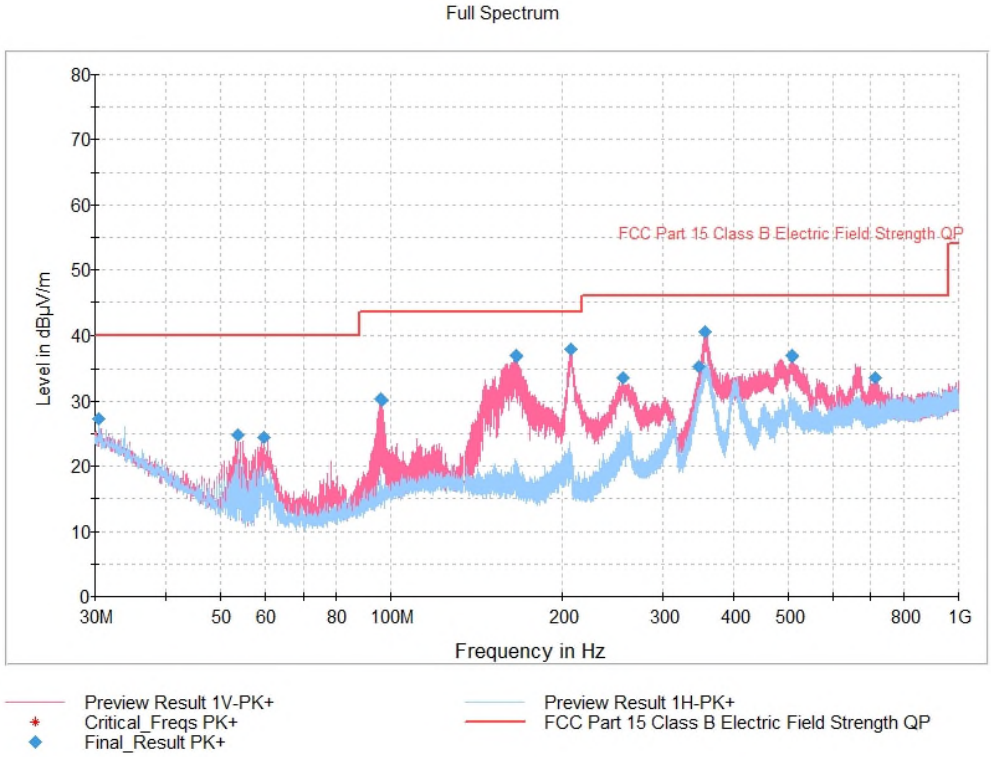


Figure 7.5.2.5-2: Emission Profile – 1GHz to 18GHz – Intermediate-fed Inverted L

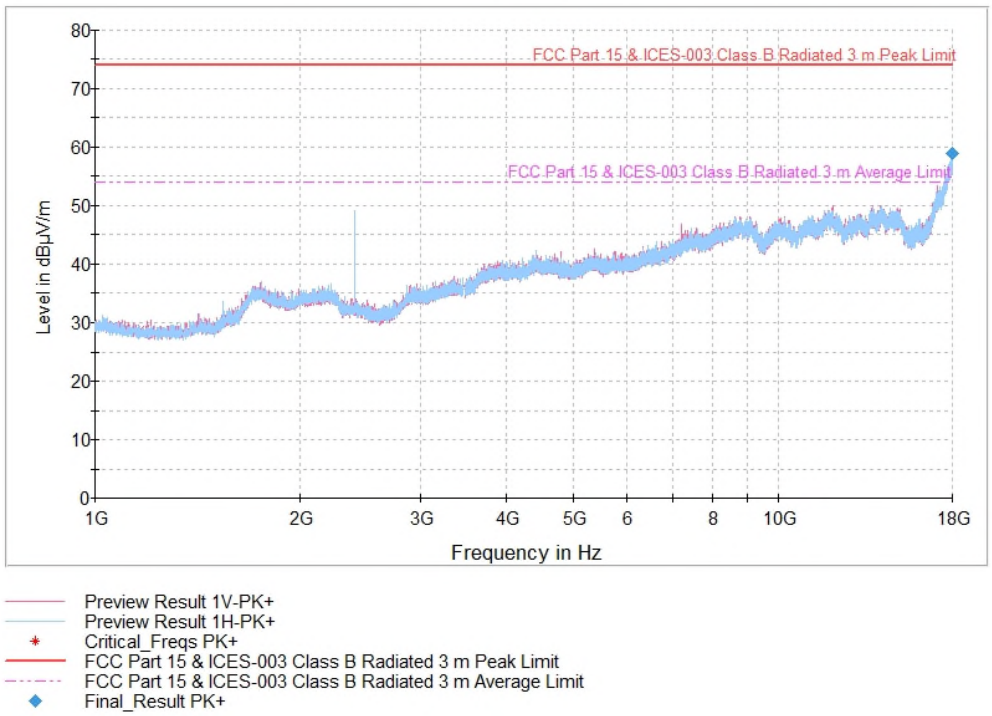


Figure 7.5.2.5-3: Emission Profile – Above 18GHz – Intermediate-fed Inverted L

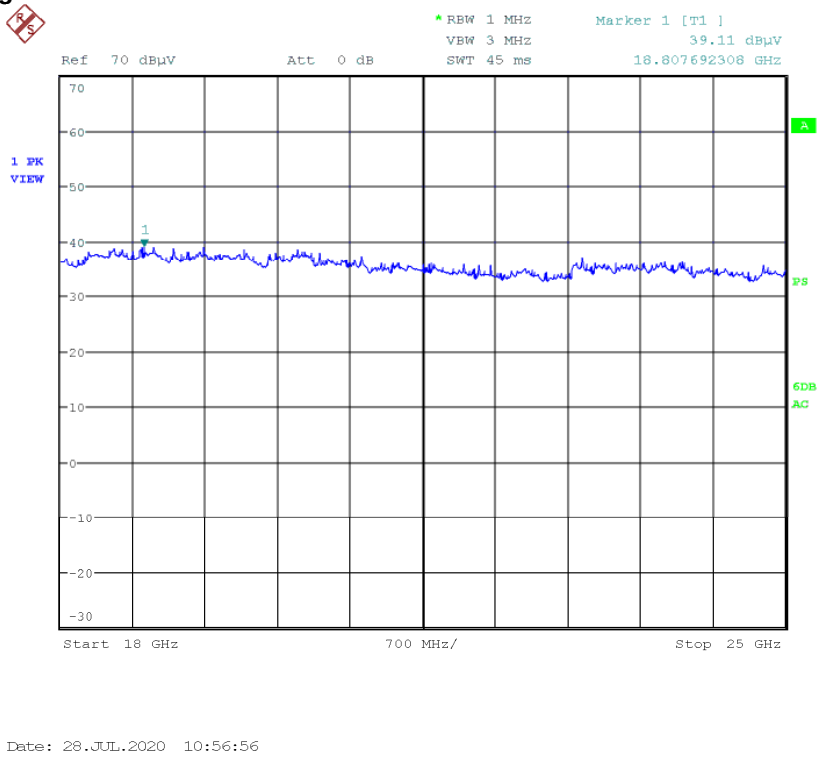


Figure 7.5.2.5-4: Emission Profile – Below 1GHz – Dual band Monopole

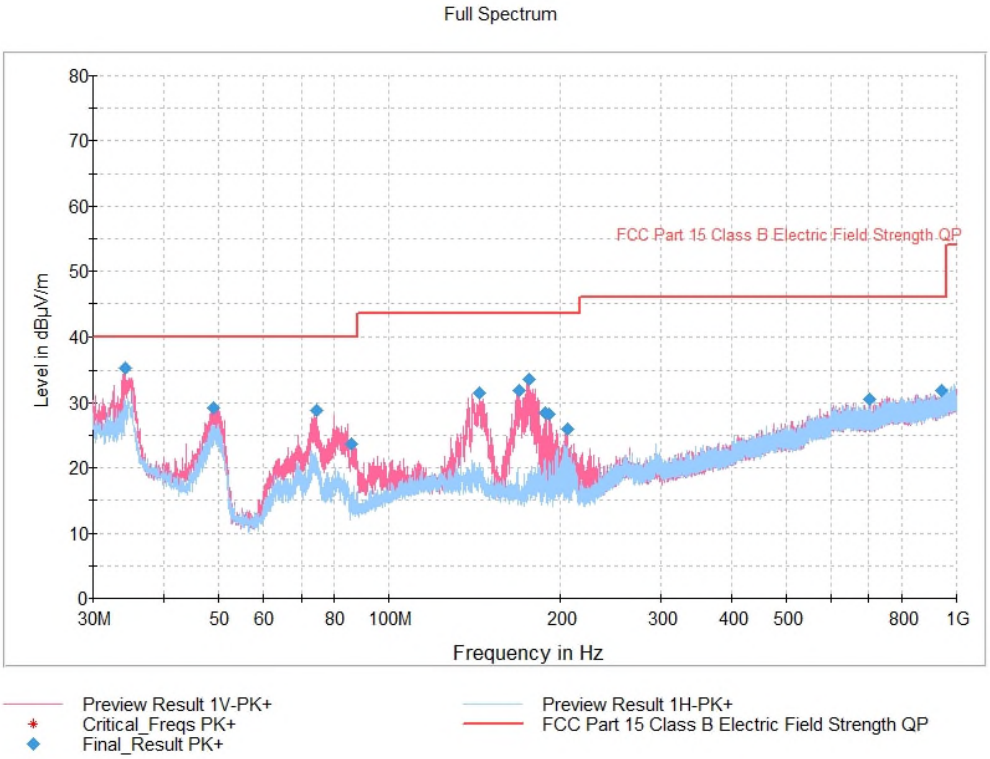


Figure 7.5.2.5-5: Emission Profile – 1GHz to 18GHz – Dual band Monopole

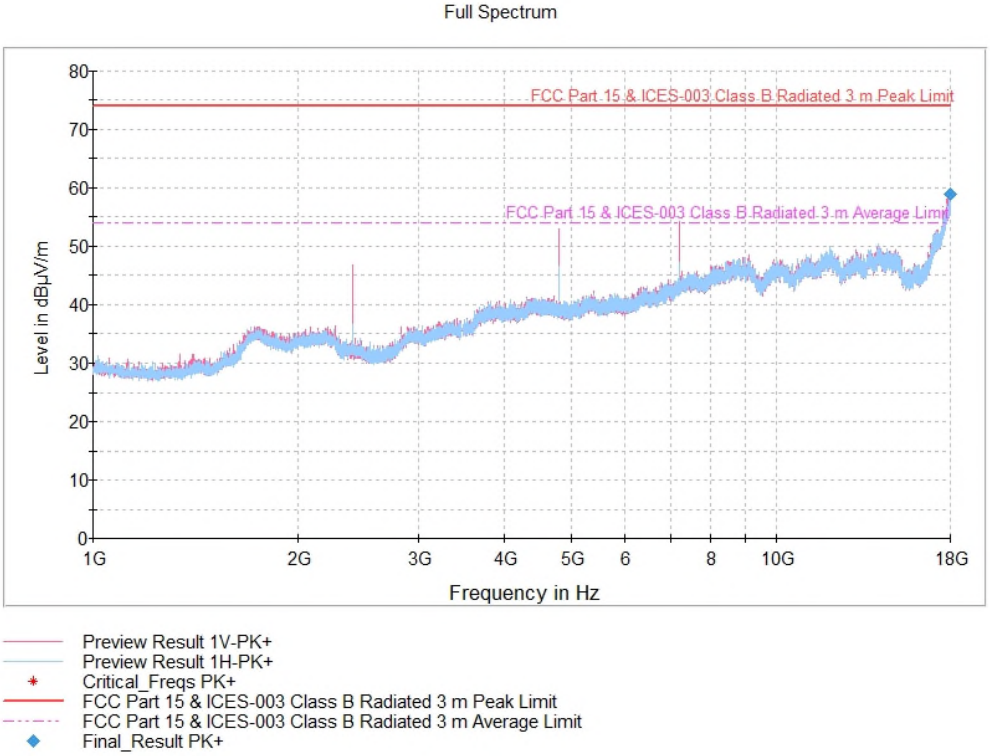


Figure 7.5.2.5-6: Emission Profile – Above 18GHz – Dual band Monopole

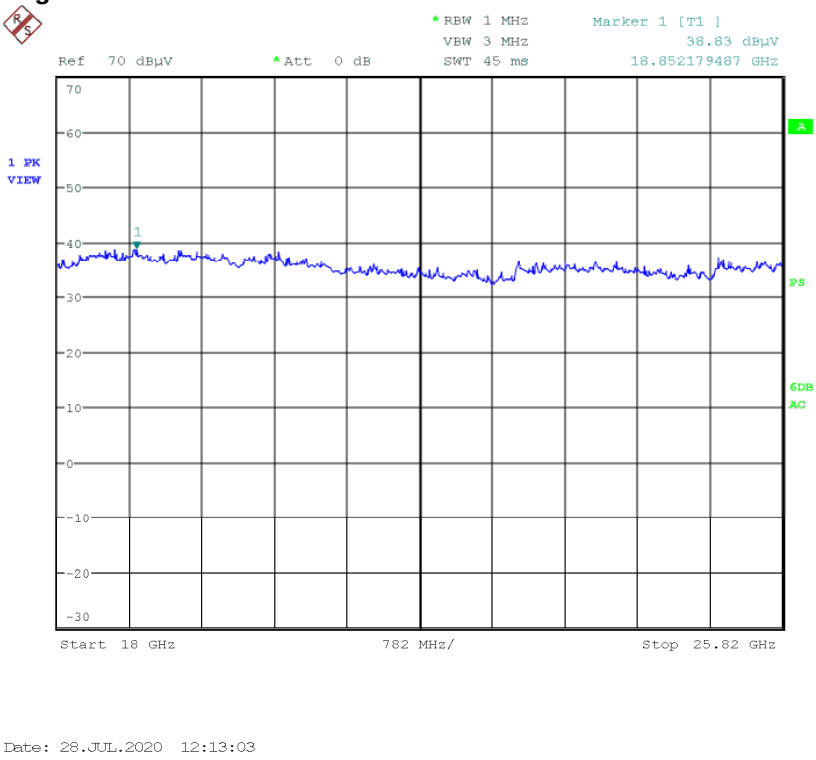


Figure 7.5.2.5-7: Emission Profile – Below 1GHz – Surface Mount

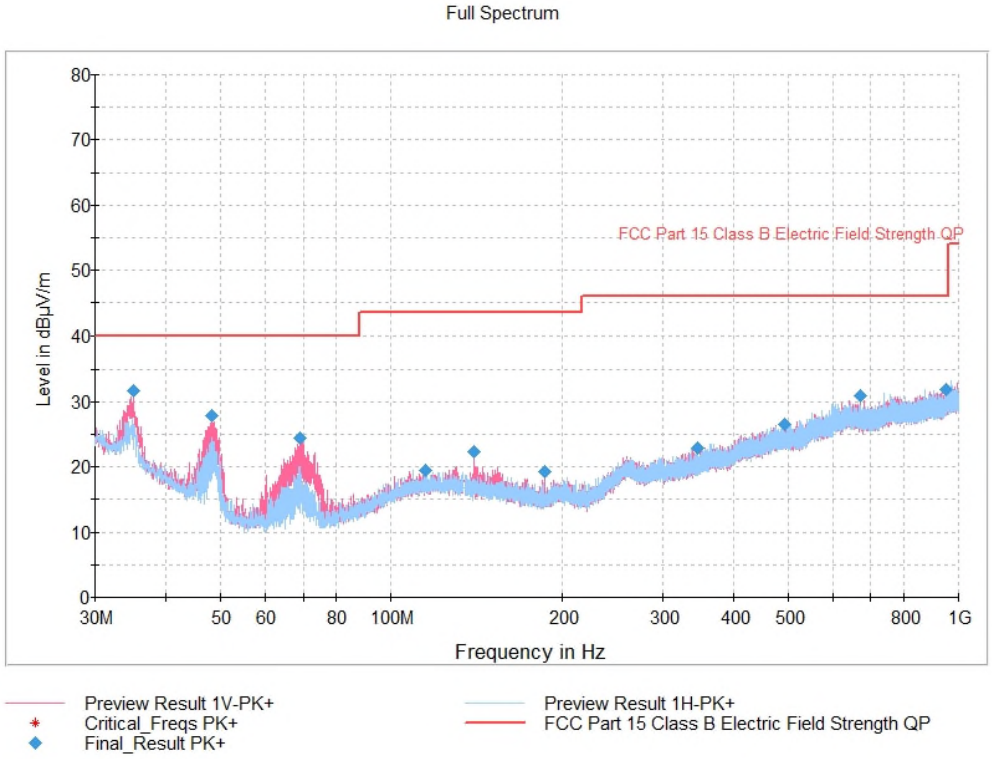


Figure 7.5.2.5-8: Emission Profile – 1GHz to 18GHz – Surface Mount

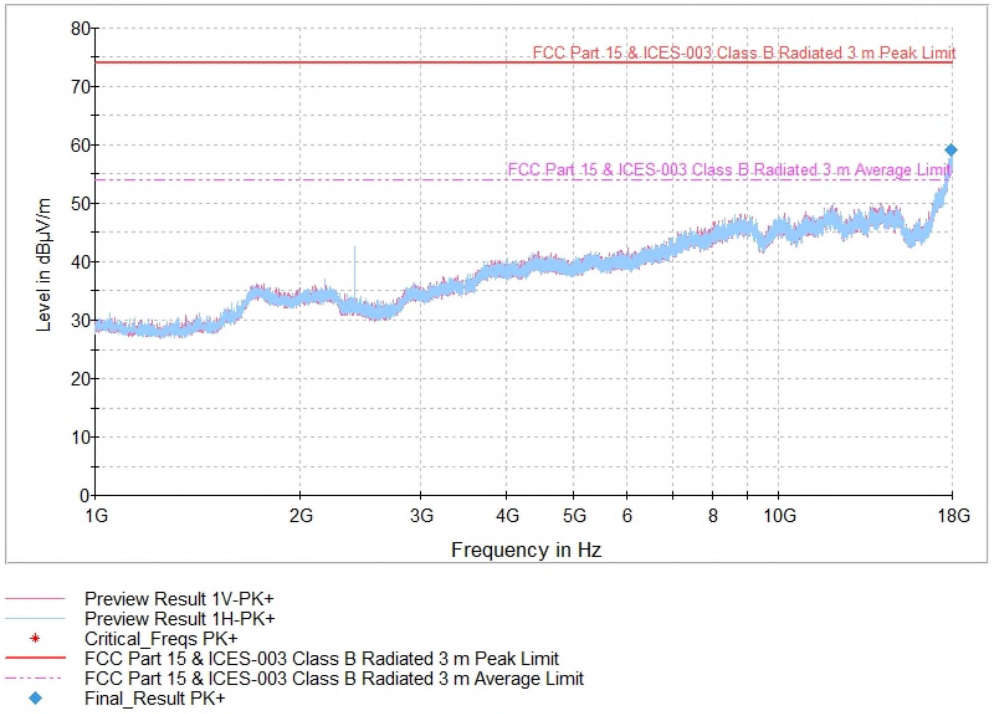


Figure 7.5.2.5-9: Emission Profile – Above 18GHz – Surface Mount

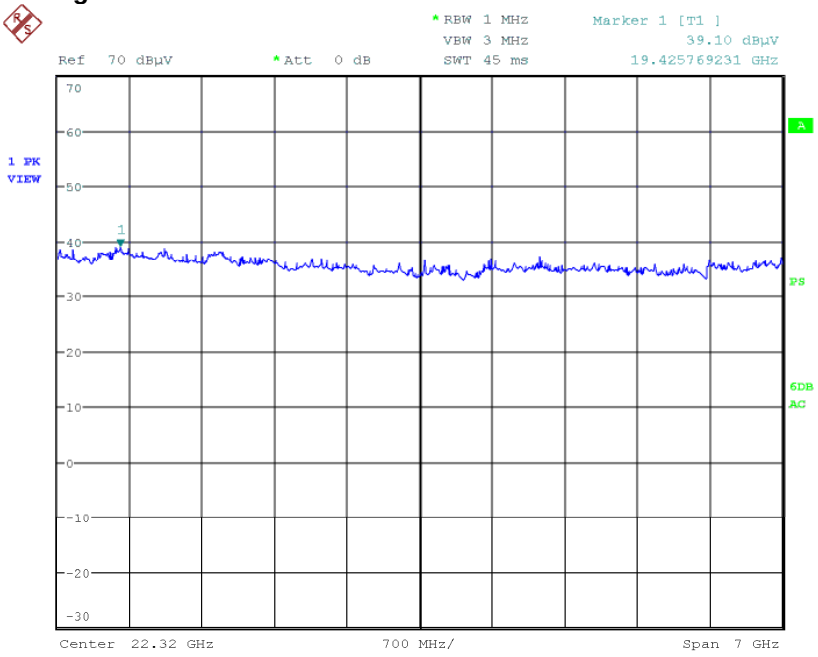


Figure 7.5.2.5-10: Emission Profile – Low Channel Band Edge – Intermediate-fed Inverted L

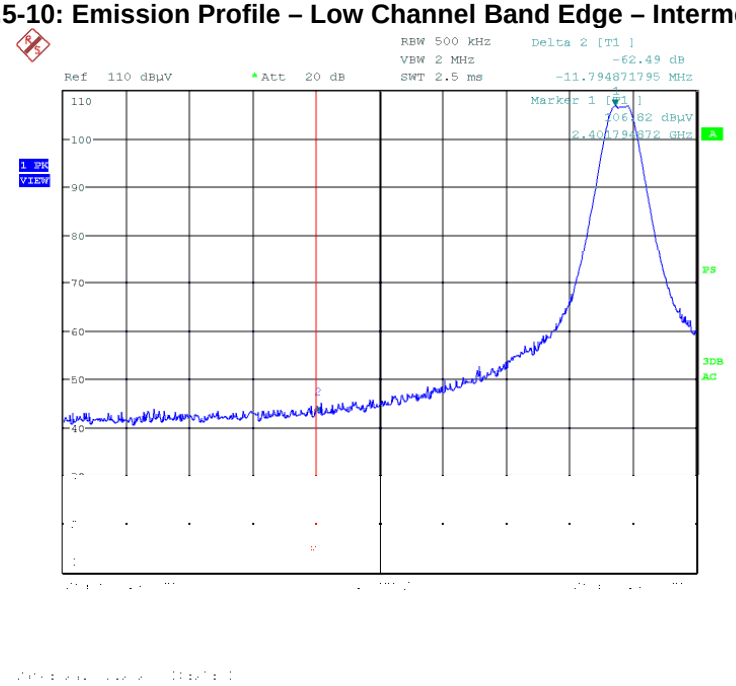


Figure 7.5.2.5-11: Emission Profile – High Channel Band Edge – Intermediate-fed Inverted L

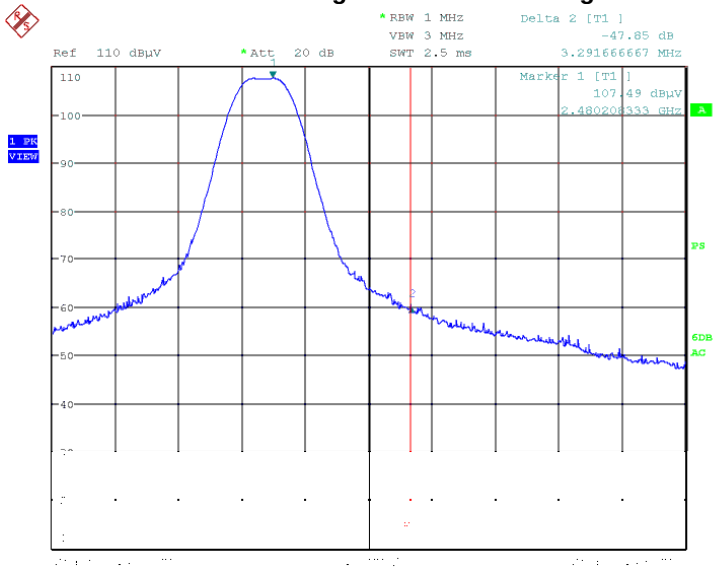


Figure 7.5.2.5-12: Emission Profile – Low Channel Band Edge – Dual band Monopole

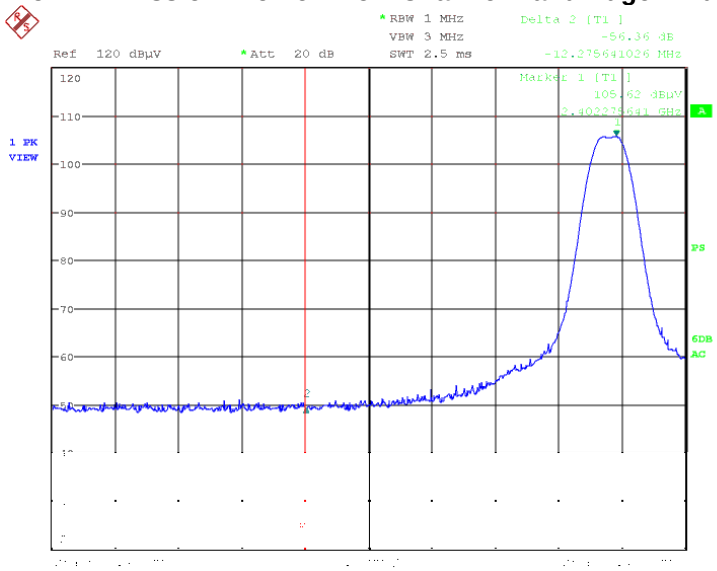


Figure 7.5.2.5-13: Emission Profile – High Channel Band Edge – Dual band Monopole

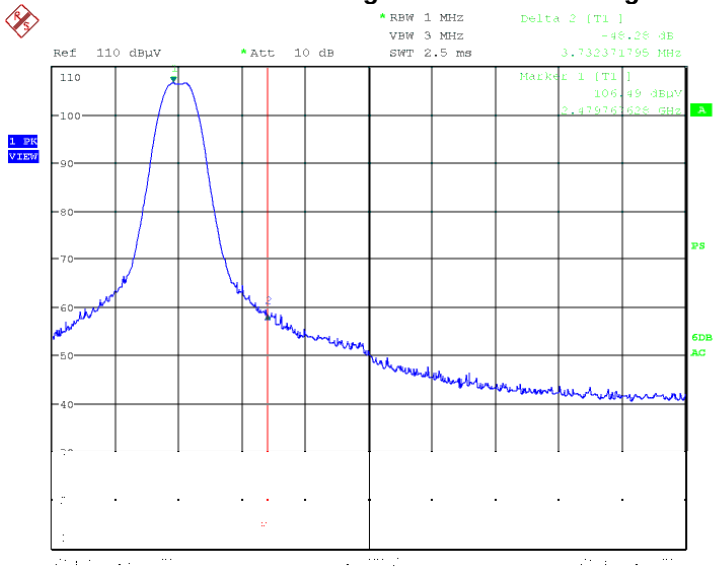


Figure 7.5.2.5-14: Emission Profile – Low Channel Band Edge – Surface Mount

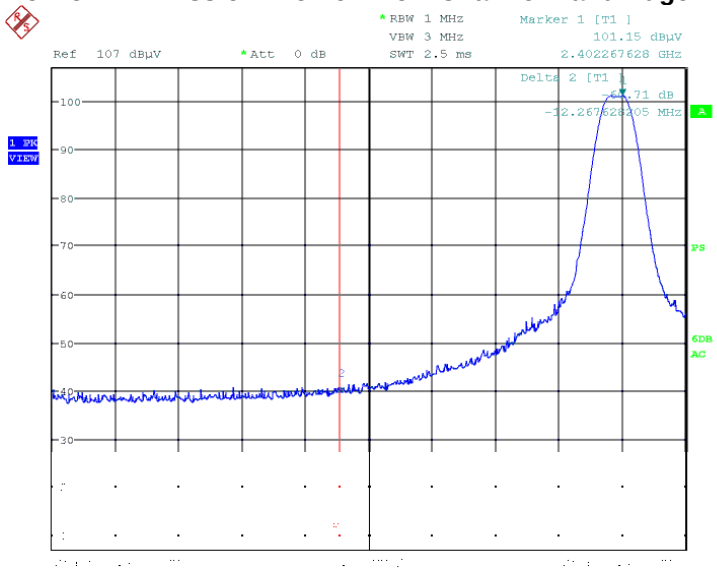
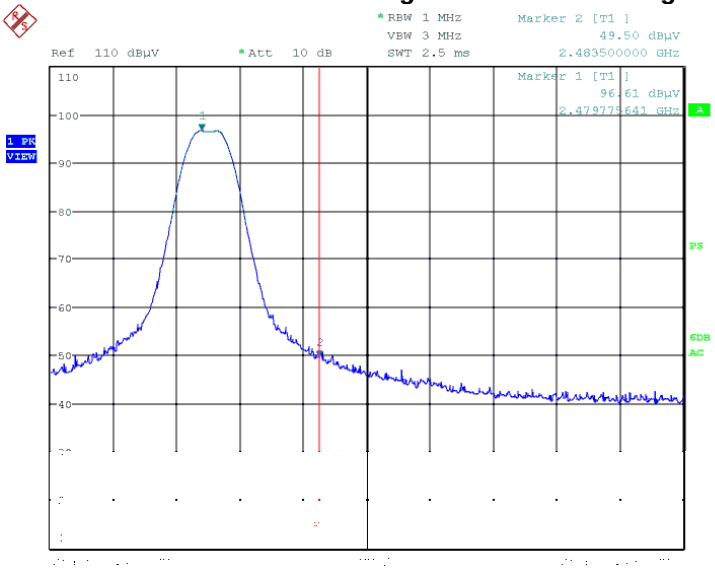


Figure 7.5.2.5-15: Emission Profile – High Channel Band Edge – Surface Mount



7.6 Power Spectral Density – FCC: 15.247(e); ISED Canada: RSS-247 5.2(b)

7.6.1 Measurement Procedure

The power spectral density was measured in accordance with the FCC KDB 558074 D01 15.247 Meas Guidance v05r02 utilizing the PKPSD (peak PSD) method. The RF output of the equipment under test was directly connected to the input of the spectrum analyzer applying suitable attenuation. The Resolution Bandwidth (RBW) of the spectrum analyzer was set to 50 kHz. The Video Bandwidth (VBW) was set to 200 kHz. Span was set to 1.5 times the DTS bandwidth. The trace was set to max hold with a peak detector active.

7.6.2 Measurement Results

Performed by: Chris Gormley

Table 7.6.2-1: Peak Power Spectral Density

Frequency (MHz)	PSD Level (dBm)
2402	6.51
2440	6.60
2480	6.50

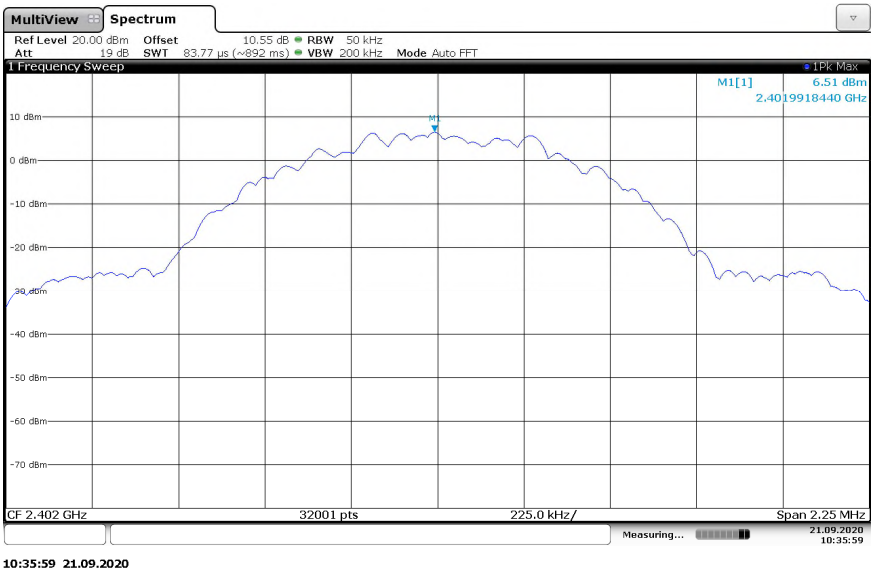


Figure 7.6.2-1: PSD Plot –LCH

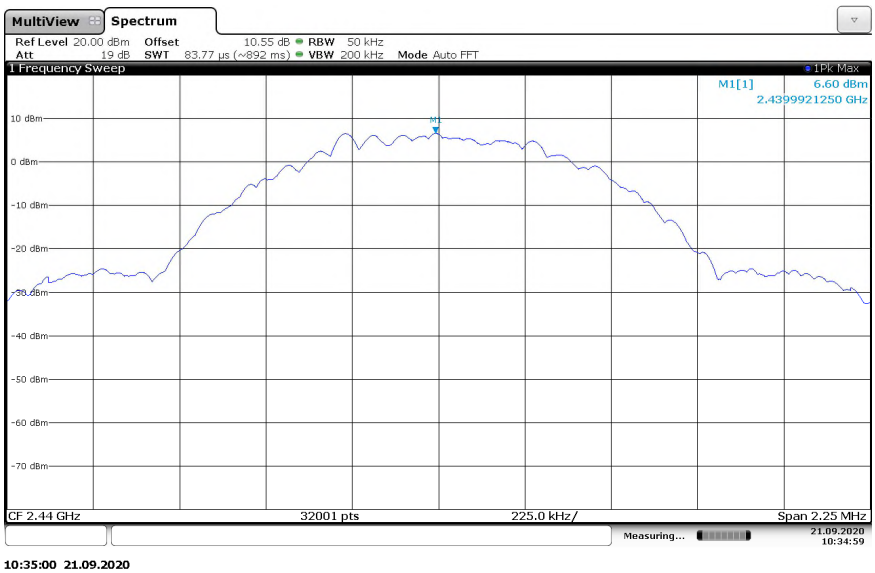


Figure 7.6.2-2: PSD Plot – MCH

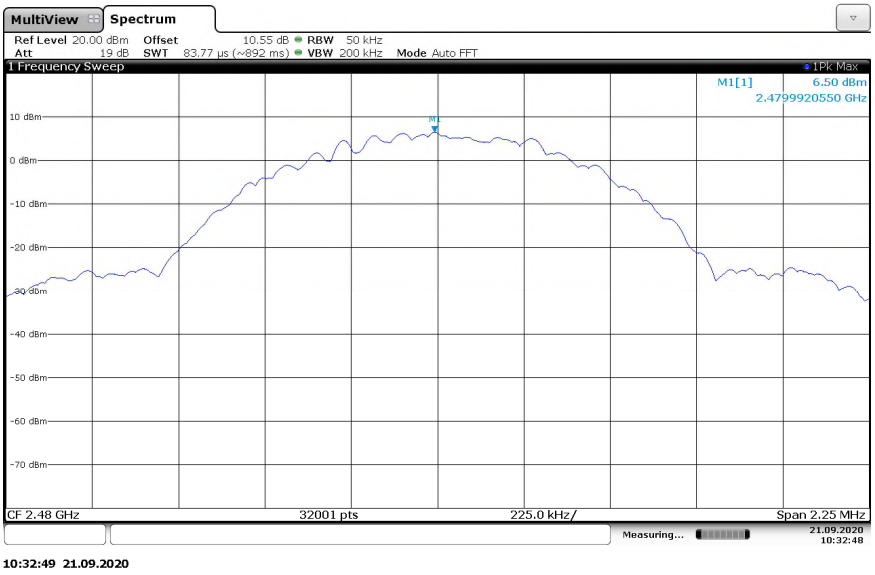


Figure 7.6.2-3: PSD Plot – HCH

8 MEASUREMENT UNCERTAINTY

The expanded laboratory measurement uncertainty figures (U_{Lab}) provided below correspond to an expansion factor (coverage factor) k = 1.96 which provide confidence levels of 95%.

Parameter	U_{lab}
Occupied Channel Bandwidth	**± 0.004%**
RF Conducted Output Power	**± 0.689 dB**
Power Spectral Density	**±0.5 dB**
Antenna Port Conducted Emissions	**± 2.717 dB**
Radiated Emissions	**± 5.877 dB**
Temperature	**± 0.860 °C**
Radio Frequency	**±2.832 x 10-8**
AC Power Line Conducted Emissions	**±2.85**

9 CONCLUSION

In the opinion of TÜV SÜD America Inc. the RMODIT3, manufactured by Acuity Brands Lighting Inc. meets the requirements of FCC Part 15 subpart C and ISED Canada Radio Standards Specification: RSS-247 for the tests documented herein.

END REPORT