Certification Test Report

FCC ID: 2ADCB-BRM1
IC: 6715C-BRM1

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

Report Number: AT72128840.1C2

Manufacturer: Acuity Brands Lighting
Model: BRM1-1, BRM1-2

Test Begin Date: July 14, 2017
Test End Date: October 5, 2017

Report Issue Date: October 17, 2017

FOR THE SCOPE OF ACCREDITATION UNDER Certificate Number: AT-2021

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

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This report contains 23 pages

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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's Radio Standards Specification RSS-247 Certification for modular approval.

1.2 Product Description

Acuity Brands BRM1 module provides indoor geo-location information via Bluetooth LE. The module serves as a single beacon to provide 1-way communication with a user's device to define their physical location. Also this device can adjust brightness of an external LED driver. This distance is calculated based upon receive signal strength intensity (RSSI) between the beacon and mobile device. The beacon broadcasts its identification every 154ms using a standard 30-byte packet under normal operating condition.

Technical Information:

Detail	Description
Frequency Range	2402 - 2480 MHz
Number of Channels	40
Modulation Format	GFSK
Data Rates	1 MBPS
Operating Voltage	2.8 Vdc – 6.5 Vdc (5Vdc Nominal)
Antenna Type / Gain	Internal Chip Antenna: 0.5 dBi Printed Inverted F Antenna: 2.0 dBi

Manufacturer Information:
Acuity Brands Lighting, Inc.
One Lithonia Way
Conyers, GA 30012

Test Sample Serial Number:	Radiated Emissions:	#2 (Internal Antenna)
		N/A (External Antenna)
	RF Conducted:	N/A

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

1.3 Test Methodology and Considerations

All modes of operation, including all data rates, were evaluated and the data presented in this report represents the worst case where applicable. The EUT was configured to generate a 62% duty cycle pulse for testing due to the firmware restrictions from the chip manufacturer.

Two variants of the module were tested. The BRM1-1 utilizes the Chip Antenna during normal operation. The BRM1-1 also has the U.FL port populated, but only to be used for testing the module at the end of the manufacturing line. The BRM1-2 utilizes the U.FL port for the external antenna. The BRM1-2 variant does not have the chip antenna populated.

For radiated emissions, the EUT was evaluated in three orthogonal orientations for each antenna. The worst-case orientation was X-orientation for the Chip Antenna. The worst-case orientation was X-orientation for the External Antenna. The EUT was powered via a USB cable to a laptop to facilitate the test modes. See test setup photos for more information. The EUT was evaluated with the highest gain antenna of each type. See the Theory of Operations for more information.

For AC power line conducted emissions, the EUT was evaluated with a typical host device. The EUT was evaluated with the internal antenna and external antenna separately. The EUT was set to transmit continuously throughout the test.

For RF Conducted Emissions, the EUT was evaluated using the external U.FL antenna connector with suitable attenuation. The coupling cable and external attenuation were considered for all RF conducted measurements.

Power setting during test: +4 dBm

2 TEST FACILITIES

2.1 Location

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

TÜV SÜD America, Inc.
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

2.2 Laboratory Accreditations/Recognitions/Certifications

TÜV SÜD America, Inc. is accredited to ISO/IEC 17025 by the ANSI-ASQ National Accreditation Board/ANAB accreditation program, and has been issued certificate number AT-2021 in recognition of this accreditation. Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, ISED Canada and the Japanese Voluntary Control Council for Interference by information technology equipment.

FCC Registration Number: 391271
ISED Canada Lab Code: IC 4175A
VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm 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 3/4" stainless steel braided cable.

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 range. 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 during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 - 4" PVC chases 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:

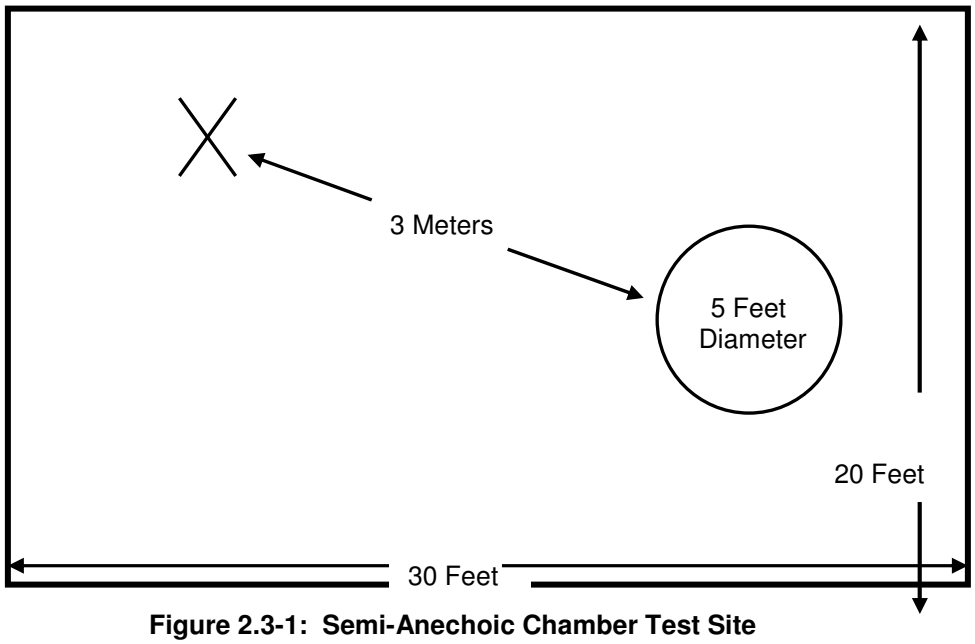


Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.3.2 Open Area Tests Site (OATS)

The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 - 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. 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 during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 - 4" PVC chases from the pit to the control room 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. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.10.

A diagram of the Open Area Test Site is shown in Figure 2.3-2 below:

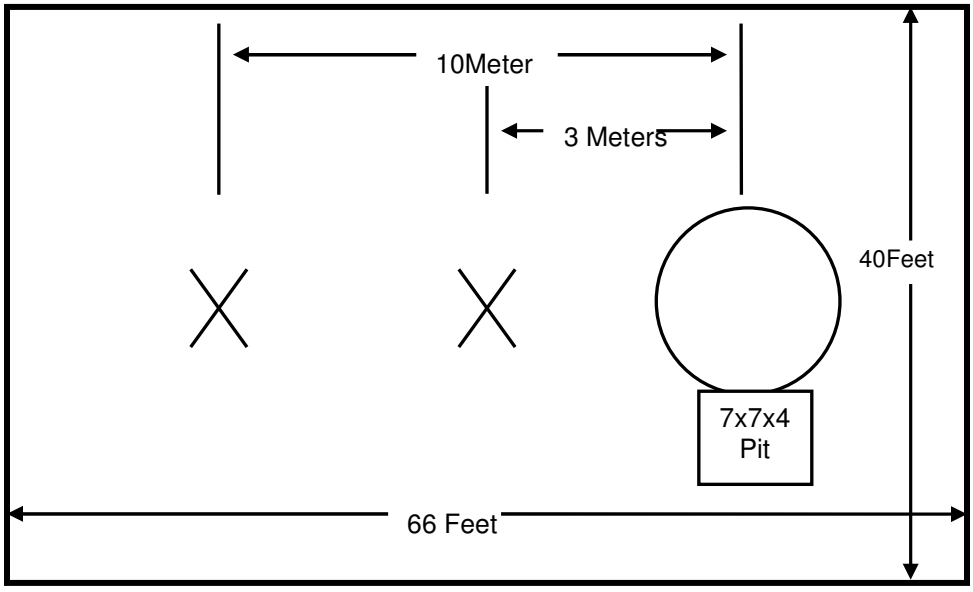


Figure 2.3-2: Open Area Test Site

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 8' solid aluminum horizontal ground reference plane (GRP) bonded every 3" to an 8' X 8' vertical ground plane.

The site is of sufficient size to test table top and floor standing equipment in accordance with ANSI C63.10.

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

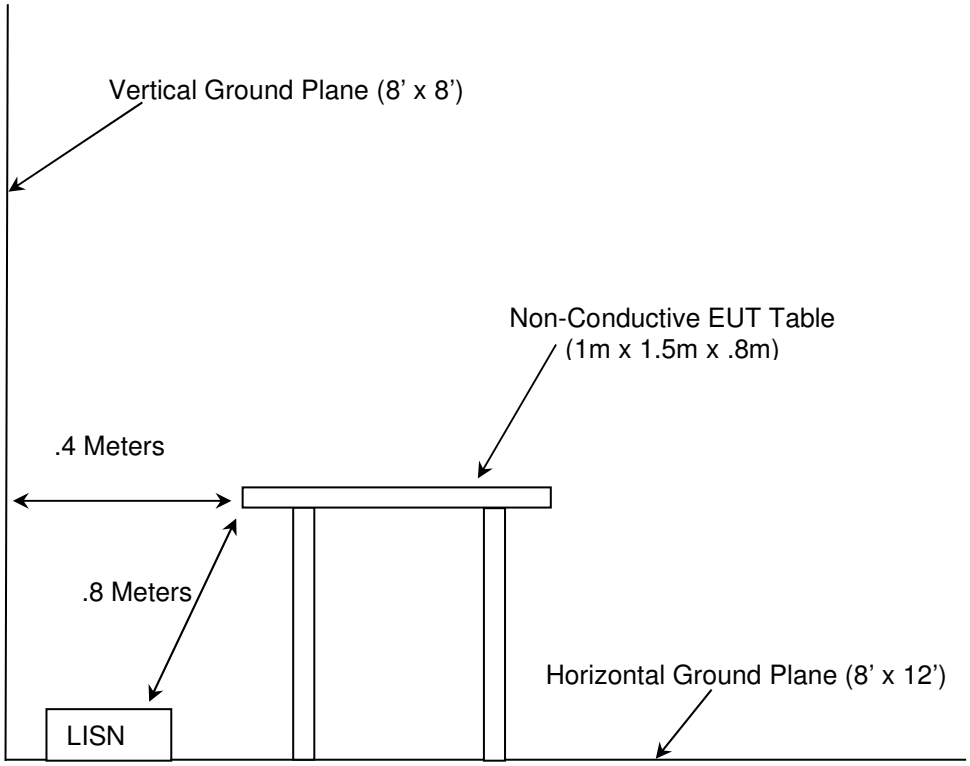


Figure 2.4-1: AC Mains Conducted EMI Site

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, 2017
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2017
- FCC KDB 558074 D01 DTS Meas Guidance v04 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247, April 5, 2017
- 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, Feb 2017.
- ISED Canada Radio Standards Specification: RSS-GEN – General Requirements for Compliance of Radio Apparatus, Issue 4, Nov 2014.

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
30	Spectrum Technologies	DRH-0118	Antennas	970102	5/9/2017	5/9/2019
40	EMCO	3104	Antennas	3211	6/8/2016	6/8/2018
73	Agilent	8447D	Amplifiers	2727A05624	7/21/2016	7/21/2017
73	Agilent	8447D	Amplifiers	2727A05624	7/24/2017	7/24/2018
167	ACS	Chamber EMI Cable Set	Cable Set	167	9/30/2016	9/30/2017
167	ACS	Chamber EMI Cable Set	Cable Set	167	9/29/2017	9/29/2017
267	Agilent	N1911A	Meters	MY45100129	8/24/2015	8/24/2017
267	Agilent	N1911A	Meters	MY45100129	8/22/2017	8/22/2019
268	Agilent	N1921A	Sensors	MY45240184	8/13/2015	8/13/2017
268	Agilent	N1921A	Sensors	MY45240184	8/22/2017	8/22/2019
292	Florida RF Cables	SMR-290AW-480.0-SMR	Cables	None	1/18/2017	1/18/2018
324	ACS	Belden	Cables	8214	3/21/2017	3/21/2018
334	Rohde&Schwarz	3160-09	Antennas	49404	11/4/2010	NCR
335	Suhner	SF-102A	Cables	882/2A	7/11/2017	7/11/2018
338	Hewlett Packard	8449B	Amplifiers	3008A01111	7/11/2017	7/11/2019
340	Aeroflex/Weinschel	AS-20	Attenuators	7136	7/10/2017	7/10/2018
340	Aeroflex/Weinschel	AS-20	Attenuators	7136	7/10/2017	7/10/2018
345	Suhner Sucoflex	102A	Cables	1077/2A	7/10/2017	7/10/2018
412	Electro Metrics	LPA-25	Antennas	1241	8/8/2016	8/8/2018
422	Florida RF	SMS-200AW-72.0-SMR	Cables	805	10/27/2016	10/27/2017
616	Florida RF Cables	SMRE-200W-12.0-SMRE	Cables	N/A	9/2/2016	10/2/2017
616	Florida RF Cables	SMRE-200W-12.0-SMRE	Cables	N/A	10/7/2017	10/7/2018
622	Rohde & Schwarz	FSV40	Analyzers	101338	7/15/2016	7/15/2018
676	Florida RF Labs	SMS-290AW-480.0-SMS	Cables	MFR2Y194	11/4/2016	11/4/2017
813	PMM	9010	Receiver	697WW30606	2/6/2017	2/6/2018
3010	Rohde & Schwarz	ENV216	LISN	3010	7/11/2017	7/11/2018
3010	Rohde & Schwarz	ENV216	LISN	3010	7/11/2017	7/11/2018
RE135	Rohde & Schwarz	FSP30	Spectrum Analyzers	835618/031	10/31/2016	10/31/2017

NCR = No Calibration Required
NOTE: All test equipment was used only during active calibration cycles.

5 SUPPORT EQUIPMENT

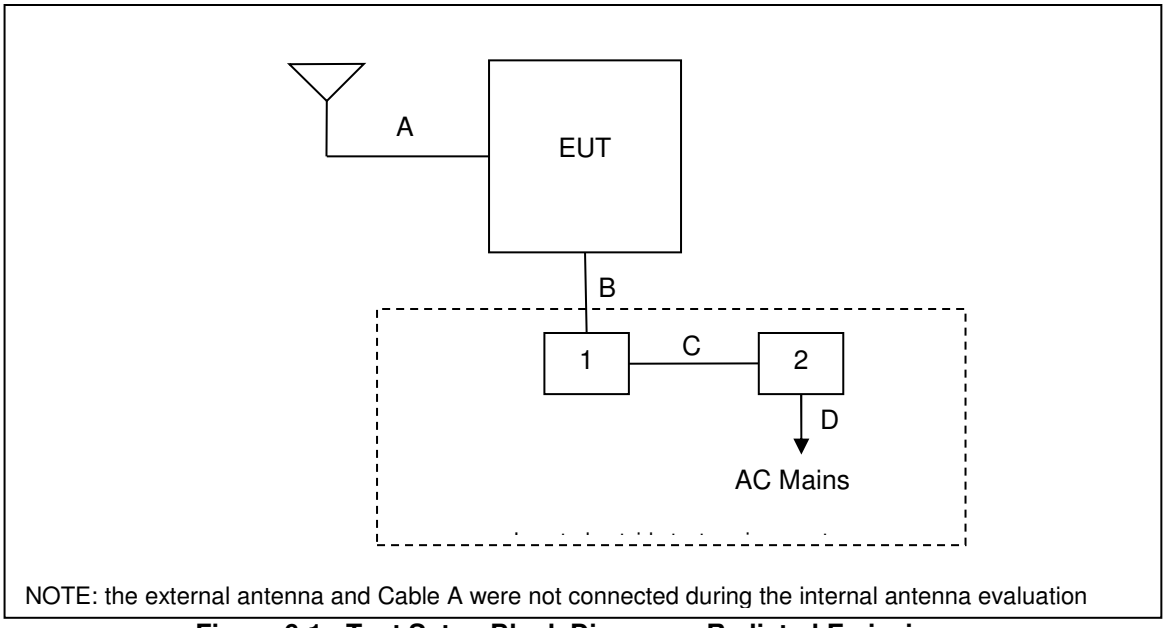
Table 5-1: Support Equipment – Radiated Emissions

Item	Equipment Type	Manufacturer	Model/Part Number	Serial Number
1	Laptop Computer	Dell	Latitude E5450	N/A
2	Laptop Power Supply	Dell	LA65NM130	N/A
3	LED Driver	Acuity Brands	SL265U	0217170027BMPF
4	LED Light Board	Acuity Brands	401-00579-001	8487

Table 5-2: Cable Description – Radiated Emissions

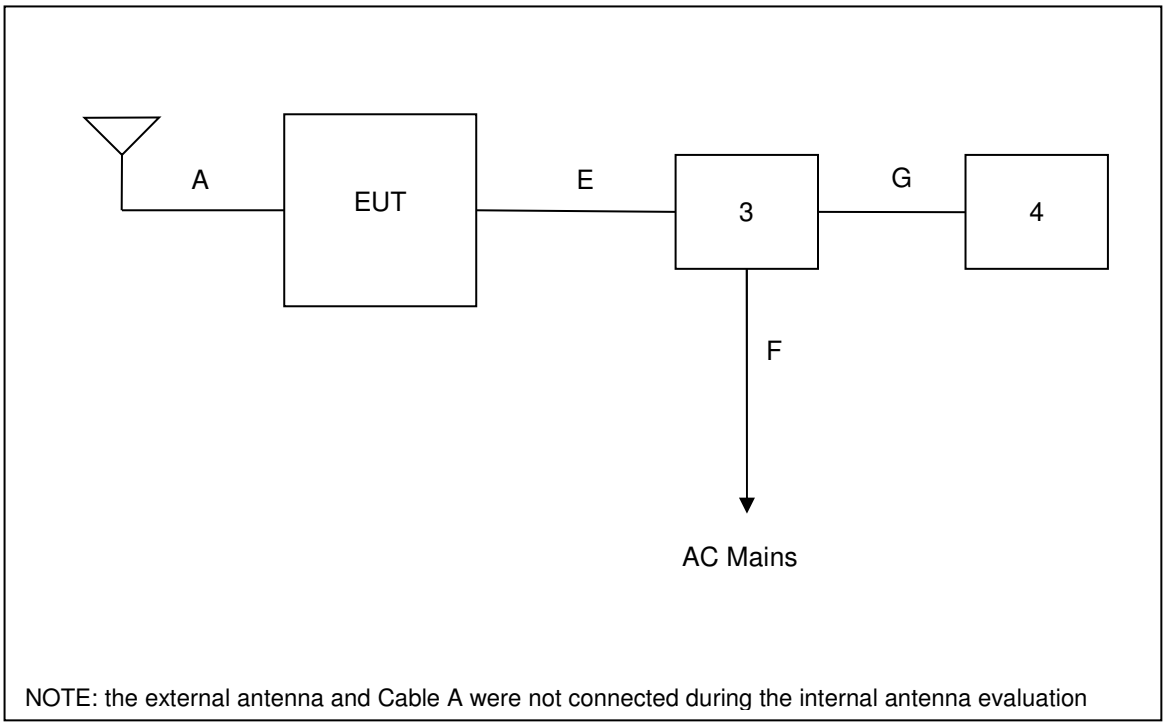
Cable	Cable Type	Length	Shield	Termination
A	RF Cable	25 cm	Yes	EUT to Antenna
B	USB Cable	1100 cm	No	EUT to Laptop Computer
C	DC Power Cable	200 cm	No	Laptop Computer to Laptop Power Supply
D	AC Power Cable	150 cm	No	Laptop Power Supply to AC Mains
E	DC Power and Communication Cable	15 cm	No	LED Driver to EUT
F	AC Power Cable	200 cm	No	LED Driver to AC Mains
G	DC Power Cable	30 cm	No	LED Driver to LED Light Board

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM



NOTE: the external antenna and Cable A were not connected during the internal antenna evaluation

Figure 6-1: Test Setup Block Diagram – Radiated Emissions



NOTE: the external antenna and Cable A were not connected during the internal antenna evaluation

Figure 6-2: Test Setup Block Diagram – Power Line Conducted Emissions

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: Section 15.203

The internal antenna is a chip antenna, soldered directly to the PCB, and cannot be removed without damage to the EUT, therefore satisfying the requirements of Section 15.203. The gain of the internal antenna is 0.5 dBi. The external printed inverted F antenna interfaces with the EUT via a coax cable and U.FL connector. The gain of the external printed inverted F antenna is 2.0 dBi.

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

7.2.1 Measurement Procedure

Conducted emissions were performed from 150 kHz to 30 MHz with the spectrum analyzer's resolution bandwidth set to 9 kHz and the video bandwidth set to 30 kHz. 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: Tommy Payton

Table 7.2.2-1: Conducted EMI Results Line 1 – Internal Antenna

Frequency (MHz)	Corrected Reading		Limit		Margin		Correction (dB)
	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dB)	Average (dB)	
0.15	57.99	36.95	66	56	-8.01	-19.05	0.28
0.154	56.88	37.58	65.78	55.78	-8.9	-18.2	0.28
0.186	47.93	19.24	64.21	54.21	-16.28	-34.97	0.26
0.206	43.32	20.07	63.37	53.37	-20.05	-33.3	0.26
0.218	38.18	18.27	62.89	52.89	-24.71	-34.62	0.26
5.078	37.07	29.6	60	50	-22.93	-20.4	0.42
5.402	41.85	32.61	60	50	-18.15	-17.39	0.43
5.978	44.66	34.95	60	50	-15.34	-15.05	0.44
22.138	34.99	28.9	60	50	-25.01	-21.1	0.72
24.69	39.58	31.95	60	50	-20.42	-18.05	0.89

Table 7.2.2-2: Conducted EMI Results Line 2 – Internal Antenna

Frequency (MHz)	Corrected Reading		Limit		Margin		Correction (dB)
	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dB)	Average (dB)	
0.15	58.66	37.69	66	56	-7.34	-18.31	0.26
0.154	57.01	38.28	65.78	55.78	-8.77	-17.5	0.26
0.214	49.35	26.04	63.05	53.05	-13.7	-27.01	0.26
0.234	43.19	16.46	62.31	52.31	-19.12	-35.85	0.26
4.486	33.12	25	56	46	-22.88	-21	0.42
5.078	35.56	29.73	60	50	-24.44	-20.27	0.43
5.394	40.36	32	60	50	-19.64	-18	0.44
6.01	44.59	34.64	60	50	-15.41	-15.36	0.45
21.59	35.77	28.07	60	50	-24.23	-21.93	0.73
25.37	37.56	31.37	60	50	-22.44	-18.63	0.98

Table 7.2.2-3: Conducted EMI Results Line 1 – External Antenna

Frequency (MHz)	Corrected Reading		Limit		Margin		Correction (dB)
	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dB)	Average (dB)	
0.15	58.33	37.86	66	56	-7.67	-18.14	0.28
0.158	55.06	35.23	65.57	55.57	-10.51	-20.34	0.28
0.17	54.88	27.38	64.96	54.96	-10.08	-27.58	0.27
0.186	48.76	19.18	64.21	54.21	-15.45	-35.03	0.26
0.194	42.28	22.22	63.86	53.86	-21.58	-31.64	0.26
5.226	37.12	29.85	60	50	-22.88	-20.15	0.42
5.546	43.53	33.43	60	50	-16.47	-16.57	0.43
5.886	43.69	34.41	60	50	-16.31	-15.59	0.44
22.858	31.42	25.97	60	50	-28.58	-24.03	0.78
25.046	39.35	32.08	60	50	-20.65	-17.92	0.91

Table 7.2.2-4: Conducted EMI Results Line 2 – External Antenna

Frequency (MHz)	Corrected Reading		Limit		Margin		Correction (dB)
	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dB)	Average (dB)	
0.15	58.26	37.47	66	56	-7.74	-18.53	0.26
0.154	57.31	38.12	65.78	55.78	-8.47	-17.66	0.26
0.19	47.91	17.34	64.04	54.04	-16.13	-36.7	0.26
0.218	42.37	18.28	62.89	52.89	-20.52	-34.61	0.26
4.826	35.19	26.41	56	46	-20.81	-19.59	0.43
5.226	37.39	30.01	60	50	-22.61	-19.99	0.43
5.41	42.32	32.64	60	50	-17.68	-17.36	0.44
5.974	44.06	34.51	60	50	-15.94	-15.49	0.45
22.51	32.67	26.76	60	50	-27.33	-23.24	0.8
25.35	38.62	31.47	60	50	-21.38	-18.53	0.98

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

7.3.1 Measurement Procedure

The 6 dB bandwidth was measured in accordance with the FCC KDB 558074 D01 DTS Meas Guidance. 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 n-dB down 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 from 1 % to 5 % of the occupied bandwidth and the video bandwidth set to at least 3 times the resolution bandwidth. A peak detector was used.

7.3.2 Measurement Results

Performed by: Ryan McGann

Table 7.3.2-1: 6 dB / 99 % Bandwidth

Frequency [MHz]	6 dB Bandwidth [kHz]	99 % Bandwidth [kHz]
2402	719.98	1047.62
2442	730.60	1049.34
2480	725.45	1051.53

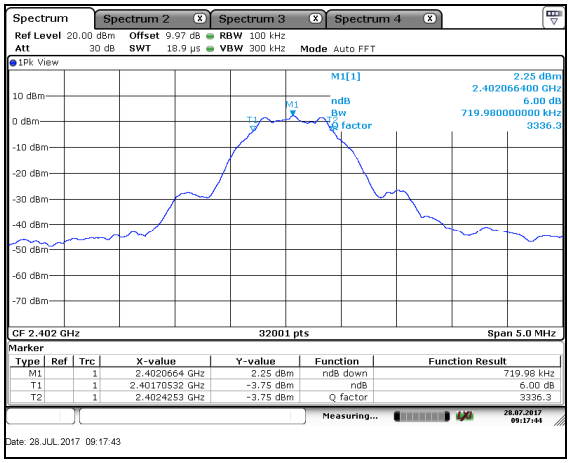


Figure 7.3.2-1: 6dB BW – LCH

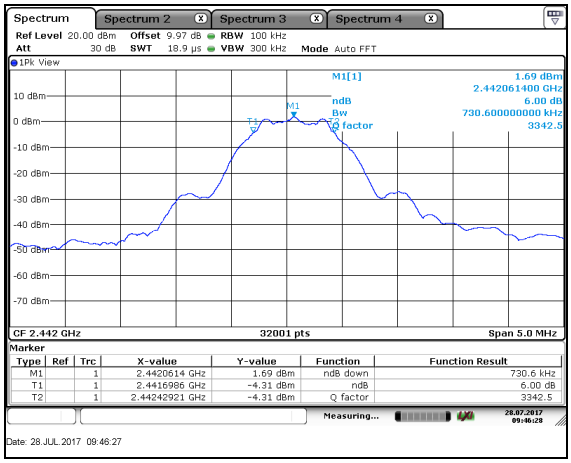


Figure 7.3.2-2: 6dB BW – MCH

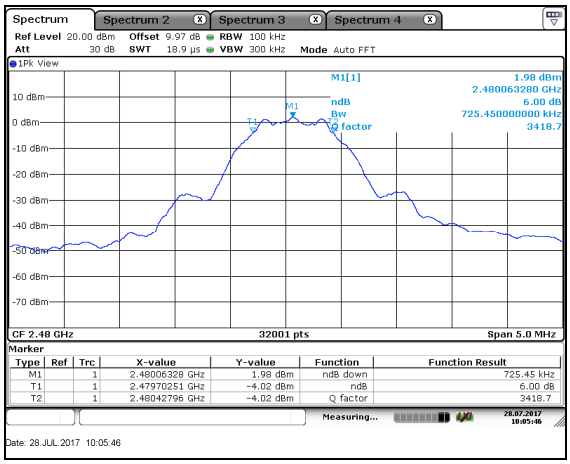


Figure 7.3.2-3: 6dB BW – HCH

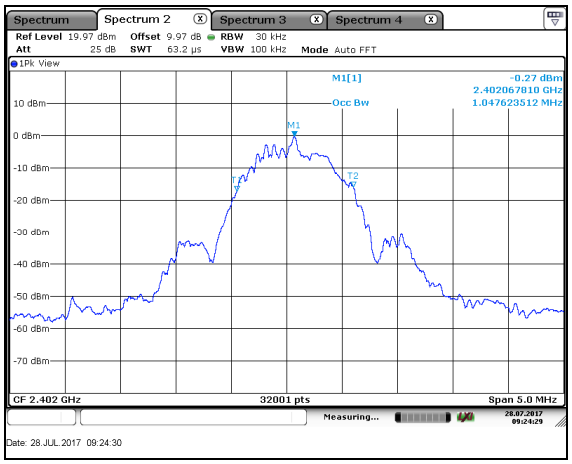


Figure 7.3.2-4: 99% OBW – LCH

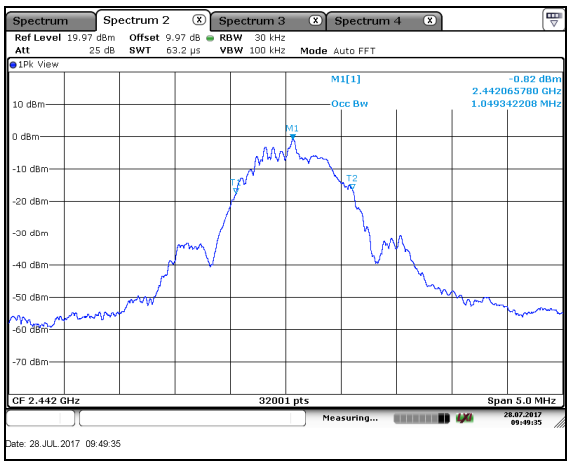


Figure 7.3.2-5: 99% OBW – MCH

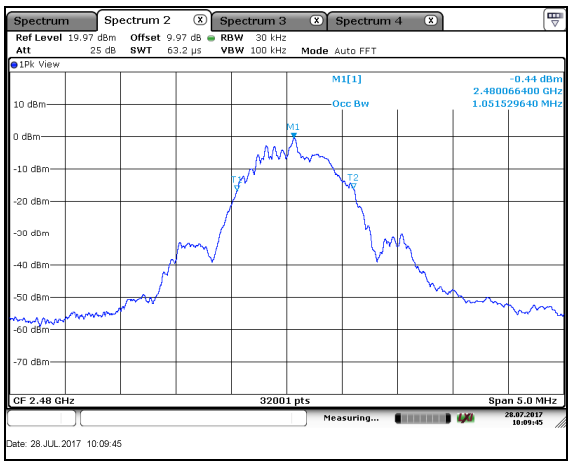


Figure 7.3.2-6: 99% OBW – HCH

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

7.4.1 Measurement Procedure

The maximum conducted output power was measured in accordance with FCC KDB 558074 D01 DTS Meas Guidance utilizing the PKPM procedure. The RF output of the equipment under test was directly connected to the input of the power meter applying suitable attenuation.

7.4.2 Measurement Results

Performed by: Ryan McGann

Table 7.4.2-1: Maximum Peak Conducted Output Power

Frequency [MHz]	Level [dBm]
2402	2.33
2442	1.91
2480	2.26

7.5 Emission Levels

7.5.1 Emissions into Non-restricted Frequency Bands – FCC: Section 15.247(d); ISED Canada: RSS-247 5.5

7.5.1.1 Measurement Procedure

The unwanted emissions into non-restricted bands were measured conducted in accordance with FCC KDB 558074 D01 DTS Meas Guidance. 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 25 GHz, 10 times the highest fundamental frequency.

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: Ryan McGann

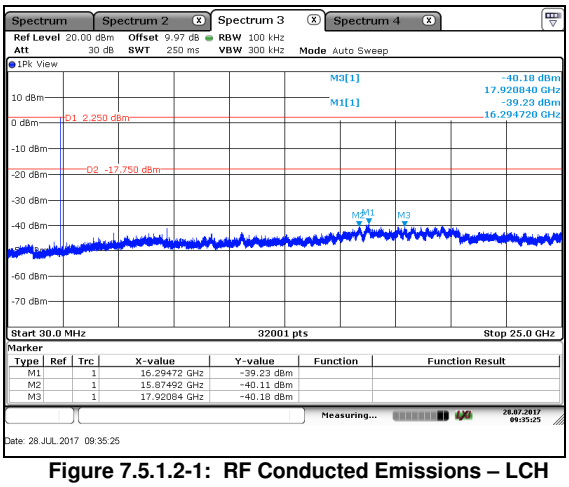


Figure 7.5.1.2-1: RF Conducted Emissions – LCH

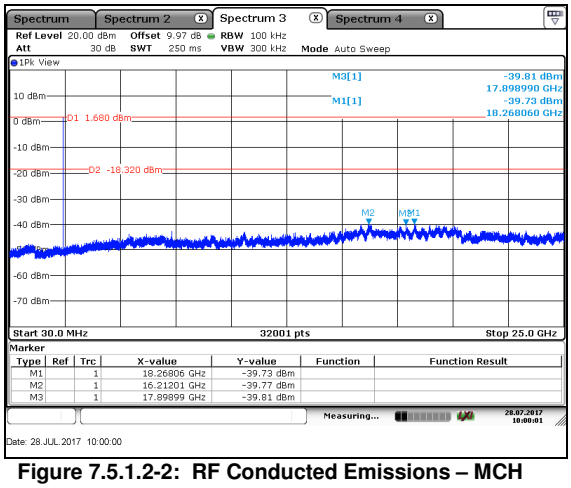


Figure 7.5.1.2-2: RF Conducted Emissions – MCH

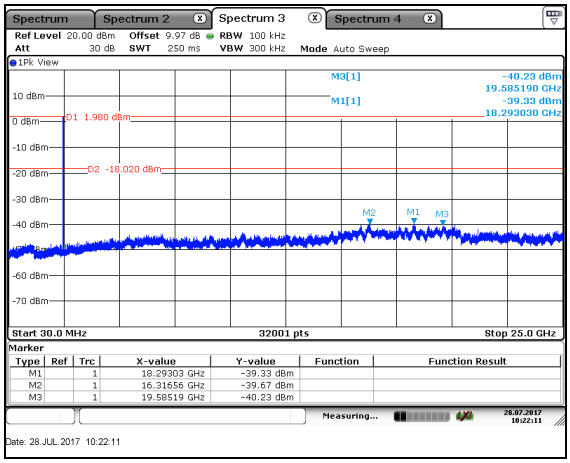


Figure 7.5.1.2-3: RF Conducted Emissions – HCH

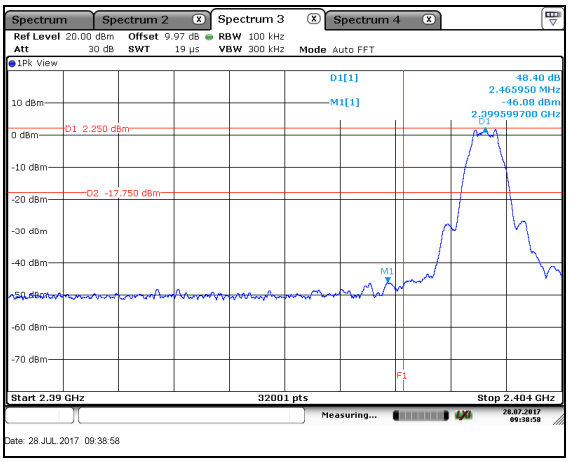


Figure 7.5.1.2-4: Lower Band-edge

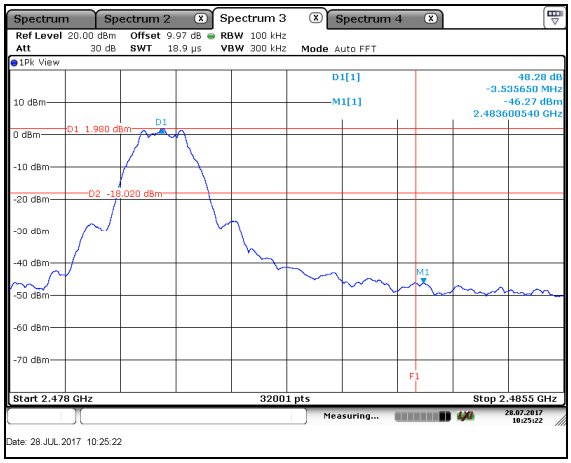


Figure 7.5.1.2-5: Upper Band-edge

7.5.2 Emissions into Restricted Frequency Bands – FCC: Section 15.205, 15.209; ISED Canada: RSS-Gen 8.9 / 8.10

7.5.2.1 Measurement Procedure

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

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

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.

7.5.2.2 Duty Cycle Correction

For average radiated measurements, using a 63.011% duty cycle, the measured level was reduced by a factor of 4.01 dB. The duty cycle correction factor is determined using the formula: 20log (63.011/100) = -4.01 dB. A detailed analysis of the duty cycle timing is provided in the Theory of Operation accompanying the application for certification.

7.5.2.3 Measurement Results

Performed by: Alton Smith, Arthur Sumner, Tyler Leeson

Table 7.5.2.3-1: Radiated Spurious Emissions Tabulated Data – Internal Antenna

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Lowest Channel										
4808	52.38	45.42	H	1.92	54.30	43.33	74.0	54.0	19.7	10.7
4808	52.03	45.59	V	1.92	53.95	43.50	74.0	54.0	20.0	10.5
Middle Channel										
4880	50.34	45.07	H	2.18	52.52	43.24	74.0	54.0	21.5	10.8
4880	51.55	44.62	V	2.18	53.73	42.79	74.0	54.0	20.3	11.2
7320	49.20	37.57	H	7.69	56.89	41.25	74.0	54.0	17.1	12.8
7320	49.28	37.64	V	7.69	56.97	41.32	74.0	54.0	17.0	12.7
Highest Channel										
2483.5	61.26	51.72	H	-5.10	56.16	42.61	74.0	54.0	17.8	11.4
2483.5	68.45	59.52	V	-5.10	63.35	50.41	74.0	54.0	10.6	3.6
4960	50.48	41.02	H	2.47	52.95	39.47	74.0	54.0	21.1	14.5
4960	48.43	40.99	V	2.47	50.90	39.44	74.0	54.0	23.1	14.6
7440	50.56	40.47	H	7.76	58.32	44.22	74.0	54.0	15.7	9.8
7440	49.35	38.80	V	7.76	57.11	42.55	74.0	54.0	16.9	11.5

Table 7.5.2.3-2: Radiated Spurious Emissions Tabulated Data – External Antenna

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Lowest Channel										
All emissions were attenuated below the noise floor of the instrumentation.										
Middle Channel										
All emissions were attenuated below the noise floor of the instrumentation.										
Highest Channel										
2483.5	60.22	51.12	H	-5.10	55.12	42.01	74.0	54.0	18.9	12.0
2483.5	70.48	62.73	V	-5.10	65.38	53.62	74.0	54.0	8.6	0.4
4960	50.71	44.15	H	2.47	53.18	42.60	74.0	54.0	20.8	11.4
4960	51.01	41.24	V	2.47	53.48	39.69	74.0	54.0	20.5	14.3
7440	50.00	42.87	H	7.76	57.76	46.62	74.0	54.0	16.2	7.4
7440	50.51	43.42	V	7.76	58.27	47.17	74.0	54.0	15.7	6.8

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 – Internal Antenna

Corrected Level: 52.38 + 1.92 = 54.30dBuV/m
Margin: 74dBuV/m – 54.30dBuV/m = 19.7dB

Example Calculation: Average – Internal Antenna

Corrected Level: 45.42 + 1.92 - 4.01 = 43.33dBuV
Margin: 54dBuV – 43.33dBuV = 10.7dB

7.6 Maximum Power Spectral Density in the Fundamental Emission – FCC: Section 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 DTS Meas Guidance utilizing the PKPSD 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 3 kHz. The Video Bandwidth (VBW) was set to 10 kHz. Span was set to 1.5 times the DTS Bandwidth. The trace was set to max peak with a peak detector active.

7.6.2 Measurement Results

Performed by: Ryan McGann

Table 7.6.2-1: Power Spectral Density

Frequency [MHz]	PSD Level [dBm]
2402	-13.20
2442	-13.55
2480	-13.17

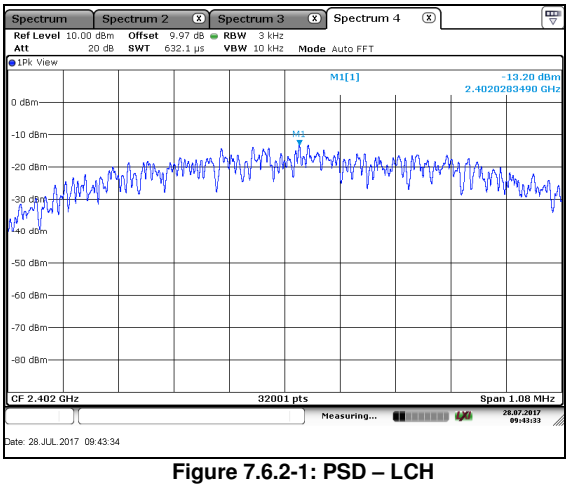


Figure 7.6.2-1: PSD – LCH

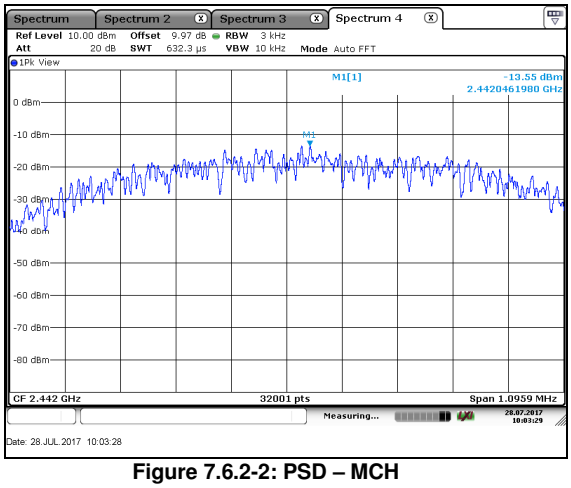


Figure 7.6.2-2: PSD – MCH

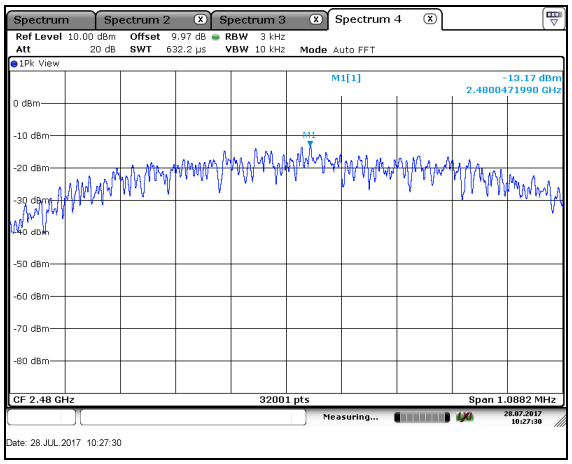


Figure 7.6.2-3: PSD – HCH

8 ESTIMATION OF 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%.

Table 8-1: Estimation of Measurement Uncertainty

Parameter	U_{lab}
Occupied Channel Bandwidth	± 0.009 %
RF Conducted Output Power	± 0.349 dB
Power Spectral Density	± 0.372 dB
Antenna Port Conducted Emissions	± 1.264 dB
Radiated Emissions ≤ 1 GHz	± 5.814 dB
Radiated Emissions > 1 GHz	± 4.318 dB
Temperature	± 0.860 °C
Radio Frequency	± 2.832 x 10^{-8}
AC Power Line Conducted Emissions	± 3.360 dB

9 CONCLUSION

In the opinion of TÜV SÜD America, Inc. the BRM1-1, BRM1-2, manufactured by Acuity Brands Lighting meets the requirements of FCC Part 15 subpart C and Innovation, Science, and Economic Development Canada's Radio Standards Specification RSS-247 for the tests documented in this test report.

END REPORT