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Certification Test Report

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

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

ACS Report Number: 16-3027.W06.2A

Manufacturer: Acuity Brands Lighting, Inc.
Model: RMODIT

Test Begin Date: April 26, 2016
Test End Date: April 28, 2016

Report Issue Date: July 5, 2016

ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code AT-1921

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

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This report contains 24 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 ISED Canada's Radio Standards Specification RSS-247.

1.2 Product Description

The RMODIT RF Module is a device designed to solder directly to another PCB using castellated edges. The product is intended to allow a variety of Acuity Brands devices to communicate in a wireless network. This can either be done by using an external host processor, or by using the processor on the module.

There are two radios on the module. One radio is a 2.4GHz Bluetooth radio. The other radio is a proprietary 904-926MHz (915MHz) Implementation. The 904MHz-926MHz radio is 100kbps O-QPSK DSSS 8 symbols/bit. These radios are capable of transmitting and receiving at the same time.

This report documents the 904 - 926MHz transmitter only. The 2.4GHz transmitter evaluation is documented in a separate report.

Technical Information:

Detail	Description
Frequency Range	904 - 926
Number of Channels	12
Modulation Format	O-QPSK
Data Rates	100kbps
Number of Inputs/Outputs	1/1
Antenna Type / Gain (1)	Chip / 1 dBi
(2)	Dipole / 0 dBi
(3)	Monopole / 0 dBi

Antenna Id	Make	Part/Model Number
Taoglas	Taoglas	TI.09.A.0111
Nitol	Amphenol	Nitol
Chip	Johanson	0915AT43A0026

Operating Voltage: 3.3 VDC

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

EUT Serial Numbers: Acuity #2, Acuity #1, Acuity #4

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

1.3 Test Methodology and Considerations

The manufacturer provided test software to configure and exercise the transmitter. Acuity 1 and 2 were tested affixed to the Silicon Labs dev board and powered with the Apple power module/supply. A total of 3 antennas were evaluated and they are identified as the Taoglas, Nitol, and Chip antenna in the report.

The transmitter can be operated in multiple orientations, therefore the x, y, and z planes were evaluated to determine the worst case orientation. The worst case orientation was for the chip and nitol antennas was in the Y-Plane and the worst case for the Taoglas antenna was in the X-Plane.

All transmitter RF conducted measurements were performed on Acuity #2 sample. The transmitter Radiated and Powerline Conducted Measurements with the Nitol and Taoglas antenna were performed on Acuity #1 sample. The transmitter Radiated and Powerline Conducted Measurements with the chip antenna were performed on Acuity #4 sample.

This device contains two independent radios which can transmit simultaneously. Radiated inter-modulation testing was performed for all combinations of simultaneous transmission and found to be in compliance.

2 Facility

2.1 Location

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

Advanced Compliance Solutions
2320 Presidential Drive, Suite 101
Durham, NC 27703
Phone: (919) 381-4235

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by ANSI-ASQ National Accreditation Board under their ANAB program and has been issued certificate number AT-1921 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, Industry Canada.

FCC Registered Test Site Number: 637011
ISED Test Site Registration 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:

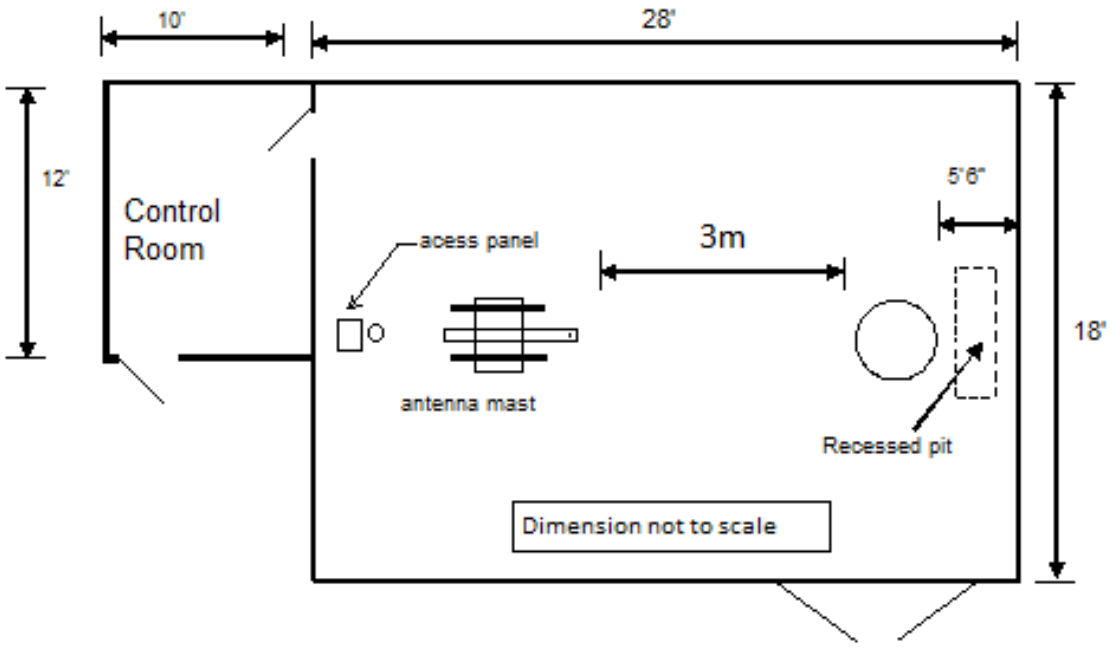

Figure 2.3-1: Semi-Anechoic Chamber Test Site

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:

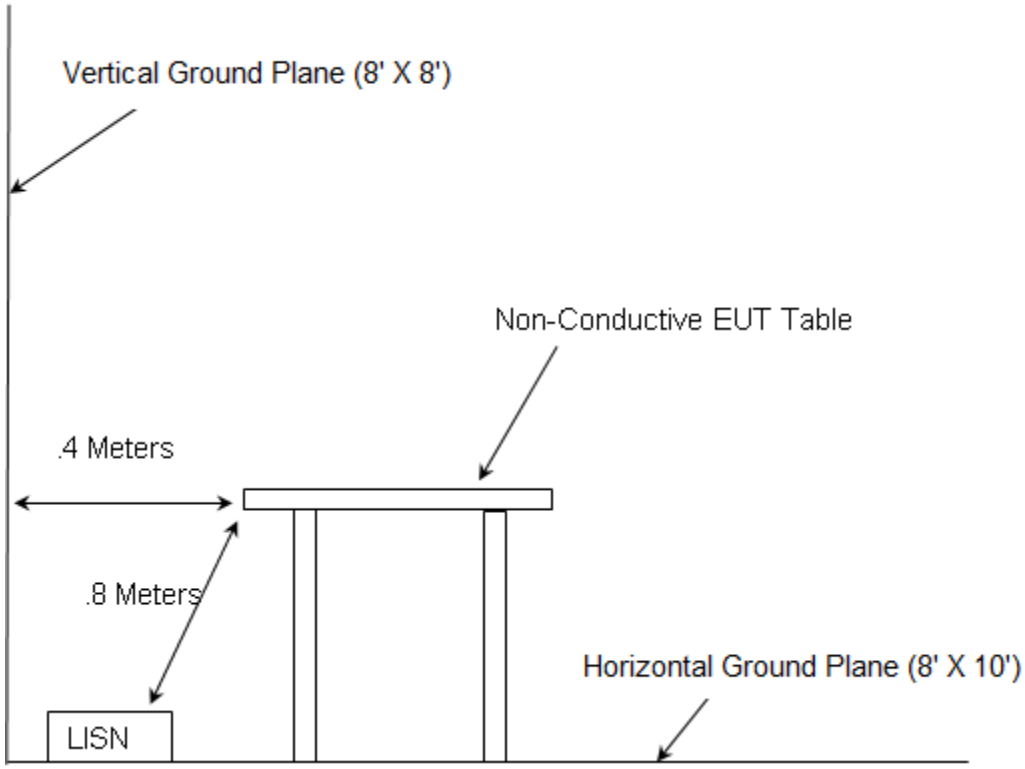

Figure 2.4-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2014 - American National Standard for Methods of Measurement of Radio-Noise Emissions from low-voltage electrical and electronic equipment in the range of 9kHz to 40 GHz.
- 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, 2016
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2016
- FCC KDB 558074 D01 DTS Meas Guidance v03r05 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247, April 2016
- 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 1, May 2015
- 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

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
277	Emco	93146	Antennas	9904-5199	9/2/2014	9/2/2016
626	EMCO	3110B	Antennas	9411-1945	2/29/2016	2/28/2017
3002	Rohde & Schwarz	ESU40	Receiver	100346	1/8/2016	1/8/2017
3006	Rohde & Schwarz	TS-PR18	Amplifiers	122006	6/29/2015	6/29/2016
3007	Rohde & Schwarz	TS-PR26	Amplifiers	100051	6/29/2015	6/29/2016
3008	Rohde & Schwarz	NRP2	Meter	103131	1/28/2016	1/28/2017
3009	Rohde & Schwarz	NRP-Z81	Meter	102397	1/28/2016	1/28/2017
3011	Rohde & Schwarz	ENV216	LISN	3011	7/10/2015	7/10/2016
3012	Rohde & Schwarz	EMC32-EB	Software	100731	2/2/2016	8/2/2016
3016	Technology	HA-07M18G-NF	Antennas	2013120203	1/26/2016	1/26/2017
3027	Micro-Tronics	BRM50702	Filter	175	12/21/2015	12/21/2016
3033	Hasco, Inc.	HLL142-S1-S1-36	Cables	1435	1/7/2016	1/7/2017
3038	Florida RF Labs	60.0-NMSE	Cable Set	1448	12/22/2015	12/22/2016
3045	Aeroflex Inmet	18N10W-20	Attenuator	1437	1/8/2016	1/8/2017
3051	Mountain View Cable	264.0-BMS	Cables	3051	12/30/2015	12/30/2016
3055	Rohde & Schwarz	3005	Cables	3055	12/30/2015	12/30/2016
3057	Materials	42-441-6/BR	Antennas	R110602	NCR	NCR

DMAS MT-25 RF absorber material was used on the floor for all final measurements above 1 GHz.
NCR = No Calibration Required
Firmware Version: ESU40 is 4.73 SP4
Software Version: EMC32-B is 9.15

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	EUT	Acuity	RMODIT	Acuity #1 and 2
2	Power Module	Apple	A1265	1X1023QQ98Q7
3	Dev Board	Silicon Lab	PCB 4001 Rev. A03	151704857
4	Power Supply	Sorensen	QRD 20-4	2716
5	EUT	Acuity	rPod	Acuity #4

Notes:

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

6.1 Block Diagram for Nitol and Taoglas Antenna

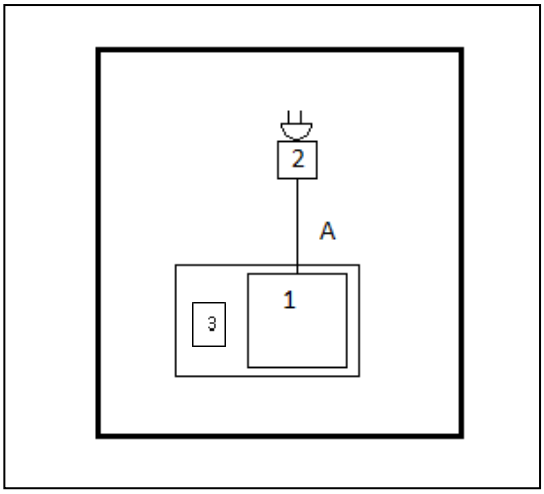

Figure 6-1: Test Setup Block Diagram

Table 6-1: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	USB A to mini USB	1.0m	No	Power Supply to EUT

6.2 Block Diagram for Chip Antenna Configuration

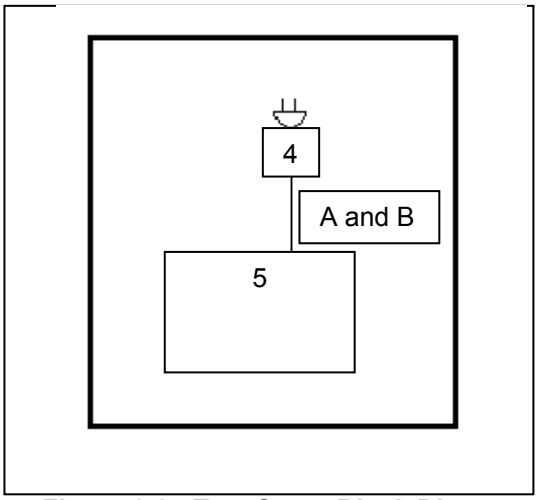

Figure 6-2: Test Setup Block Diagram

Table 6-2: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	Power	3.0m	No	Power Supply to Cable A
B	Power/Communication 10pin Ribbon Cable	35cm	No	Cable A to EUT

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 chip antenna is a surface mount antenna and the Taoglas and Nitol antennas connect to the U.FL port. Therefore, the connection type satisfies the requirements of Section 15.203.

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

7.2.1 Measurement Procedure

ANSI C63.4-2014 sections 6 and 7 were the guiding documents for this evaluation. Conducted emissions were performed from 150 kHz to 30 MHz 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

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

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	38.17	---	66.00	27.83	2000.0	9.000	L1	OFF	9.5
0.150000	---	7.66	56.00	48.34	2000.0	9.000	L1	OFF	9.5
0.154000	37.22	---	65.76	28.54	2000.0	9.000	L1	OFF	9.5
0.154000	---	6.97	55.76	48.79	2000.0	9.000	L1	OFF	9.5
0.166000	---	6.66	55.08	48.42	2000.0	9.000	L1	OFF	9.5
0.166000	37.61	---	65.09	27.48	2000.0	9.000	L1	OFF	9.5
0.174000	---	5.89	54.66	48.77	2000.0	9.000	L1	OFF	9.5
0.174000	36.54	---	64.68	28.14	2000.0	9.000	L1	OFF	9.5
0.180000	---	5.72	54.36	48.64	2000.0	9.000	L1	OFF	9.5
0.180000	37.27	---	64.38	27.11	2000.0	9.000	L1	OFF	9.5
0.212000	33.51	---	62.96	29.45	2000.0	9.000	L1	OFF	9.5
0.212000	---	4.98	52.92	47.94	2000.0	9.000	L1	OFF	9.5
0.220000	34.22	---	62.64	28.42	2000.0	9.000	L1	OFF	9.5
0.220000	---	4.31	52.60	48.29	2000.0	9.000	L1	OFF	9.5
0.224000	32.46	---	62.49	30.03	2000.0	9.000	L1	OFF	9.5
0.224000	---	3.68	52.45	48.77	2000.0	9.000	L1	OFF	9.5
0.240000	34.97	---	61.90	26.93	2000.0	9.000	L1	OFF	9.6
0.240000	---	4.28	51.86	47.58	2000.0	9.000	L1	OFF	9.6
0.280000	---	3.82	50.57	46.75	2000.0	9.000	L1	OFF	9.5
0.280000	32.78	---	60.61	27.83	2000.0	9.000	L1	OFF	9.5
0.332000	---	2.55	49.18	46.63	2000.0	9.000	L1	OFF	9.6
0.332000	29.31	---	59.22	29.91	2000.0	9.000	L1	OFF	9.6
0.336000	---	2.26	49.09	46.83	2000.0	9.000	L1	OFF	9.6
0.336000	28.62	---	59.12	30.50	2000.0	9.000	L1	OFF	9.6
0.348000	---	2.21	48.81	46.60	2000.0	9.000	L1	OFF	9.6
0.348000	28.31	---	58.84	30.53	2000.0	9.000	L1	OFF	9.6
0.408000	24.01	---	57.58	33.57	2000.0	9.000	L1	OFF	9.6
0.408000	---	1.41	47.55	46.14	2000.0	9.000	L1	OFF	9.6
0.428000	22.98	---	57.20	34.22	2000.0	9.000	L1	OFF	9.6
0.428000	---	1.23	47.18	45.95	2000.0	9.000	L1	OFF	9.6

Table 7.2.2-2: Conducted EMI Results – Neutral - Chip Antenna

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	39.53	---	66.00	26.47	2000.0	9.000	N	OFF	9.7
0.150000	---	8.19	56.00	47.81	2000.0	9.000	N	OFF	9.7
0.170000	---	6.92	54.87	47.95	2000.0	9.000	N	OFF	9.7
0.170000	37.65	---	64.88	27.23	2000.0	9.000	N	OFF	9.7
0.190000	34.41	---	63.90	29.49	2000.0	9.000	N	OFF	9.7
0.190000	---	4.72	53.88	49.16	2000.0	9.000	N	OFF	9.7
0.220000	---	4.94	52.60	47.66	2000.0	9.000	N	OFF	9.7
0.220000	35.75	---	62.64	26.89	2000.0	9.000	N	OFF	9.7
0.272000	---	3.73	50.81	47.08	2000.0	9.000	N	OFF	9.7
0.272000	32.55	---	60.85	28.30	2000.0	9.000	N	OFF	9.7
0.276000	---	3.59	50.69	47.10	2000.0	9.000	N	OFF	9.7
0.276000	32.12	---	60.73	28.61	2000.0	9.000	N	OFF	9.7
0.300000	---	3.01	50.00	46.99	2000.0	9.000	N	OFF	9.7
0.300000	30.45	---	60.04	29.59	2000.0	9.000	N	OFF	9.7
0.328000	---	2.67	49.28	46.61	2000.0	9.000	N	OFF	9.7
0.328000	29.31	---	59.32	30.01	2000.0	9.000	N	OFF	9.7
0.364000	---	2.53	48.45	45.92	2000.0	9.000	N	OFF	9.7
0.364000	28.96	---	58.48	29.52	2000.0	9.000	N	OFF	9.7

Table 7.2.2-3: Conducted EMI Results – Line - Nitol Antenna

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.230000	---	32.98	52.22	19.24	2000.0	9.000	L1	OFF	9.6
0.230000	49.79	---	62.26	12.47	2000.0	9.000	L1	OFF	9.6
0.464000	---	29.71	46.57	16.86	2000.0	9.000	L1	OFF	9.6
0.464000	42.20	---	56.57	14.37	2000.0	9.000	L1	OFF	9.6
0.696000	---	23.05	46.00	22.95	2000.0	9.000	L1	OFF	9.6
0.696000	37.30	---	56.00	18.70	2000.0	9.000	L1	OFF	9.6
0.700000	---	22.42	46.00	23.58	2000.0	9.000	L1	OFF	9.6
0.700000	38.22	---	56.00	17.78	2000.0	9.000	L1	OFF	9.6
0.920000	36.77	---	56.00	19.23	2000.0	9.000	L1	OFF	9.6
0.920000	---	19.19	46.00	26.81	2000.0	9.000	L1	OFF	9.6
0.924000	35.38	---	56.00	20.62	2000.0	9.000	L1	OFF	9.6
0.924000	---	21.14	46.00	24.86	2000.0	9.000	L1	OFF	9.6
1.148000	---	19.67	46.00	26.33	2000.0	9.000	L1	OFF	9.6
1.148000	39.84	---	56.00	16.16	2000.0	9.000	L1	OFF	9.6
1.452000	---	15.70	46.00	30.30	2000.0	9.000	L1	OFF	9.6
1.452000	35.34	---	56.00	20.66	2000.0	9.000	L1	OFF	9.6
2.064000	---	11.41	46.00	34.59	2000.0	9.000	L1	OFF	9.7
2.064000	34.87	---	56.00	21.13	2000.0	9.000	L1	OFF	9.7
2.176000	---	14.31	46.00	31.69	2000.0	9.000	L1	OFF	9.7
2.176000	34.49	---	56.00	21.51	2000.0	9.000	L1	OFF	9.7
2.296000	---	11.27	46.00	34.73	2000.0	9.000	L1	OFF	9.7
2.296000	33.73	---	56.00	22.27	2000.0	9.000	L1	OFF	9.7
2.992000	---	11.23	46.00	34.77	2000.0	9.000	L1	OFF	9.7
2.992000	31.39	---	56.00	24.61	2000.0	9.000	L1	OFF	9.7

Table 7.2.2-4: Conducted EMI Results – Neutral - Nitol Antenna

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.230000	---	35.51	52.22	16.71	2000.0	9.000	N	OFF	9.7
0.230000	50.26	---	62.26	12.00	2000.0	9.000	N	OFF	9.7
0.468000	---	33.58	46.50	12.92	2000.0	9.000	N	OFF	9.7
0.468000	44.21	---	56.51	12.30	2000.0	9.000	N	OFF	9.7
0.696000	---	27.76	46.00	18.24	2000.0	9.000	N	OFF	9.8
0.696000	37.07	---	56.00	18.93	2000.0	9.000	N	OFF	9.8
0.700000	---	27.04	46.00	18.96	2000.0	9.000	N	OFF	9.8
0.700000	38.08	---	56.00	17.92	2000.0	9.000	N	OFF	9.8
0.932000	---	24.64	46.00	21.36	2000.0	9.000	N	OFF	9.8
0.932000	36.86	---	56.00	19.14	2000.0	9.000	N	OFF	9.8
1.164000	---	25.53	46.00	20.47	2000.0	9.000	N	OFF	9.8
1.164000	37.10	---	56.00	18.90	2000.0	9.000	N	OFF	9.8
1.460000	---	22.39	46.00	23.61	2000.0	9.000	N	OFF	9.8
1.460000	35.97	---	56.00	20.03	2000.0	9.000	N	OFF	9.8
1.468000	---	20.13	46.00	25.87	2000.0	9.000	N	OFF	9.8
1.468000	37.70	---	56.00	18.30	2000.0	9.000	N	OFF	9.8
2.100000	---	21.12	46.00	24.88	2000.0	9.000	N	OFF	9.9
2.100000	35.19	---	56.00	20.81	2000.0	9.000	N	OFF	9.9

Table 7.2.2-5: Conducted EMI Results – Line - Taoglas Antenna

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.222000	---	35.50	52.53	17.03	2000.0	9.000	L1	OFF	9.5
0.222000	51.83	---	62.56	10.73	2000.0	9.000	L1	OFF	9.5
0.444000	---	30.00	46.90	16.90	2000.0	9.000	L1	OFF	9.6
0.444000	43.35	---	56.92	13.57	2000.0	9.000	L1	OFF	9.6
0.664000	37.25	---	56.00	18.75	2000.0	9.000	L1	OFF	9.6
0.664000	---	22.01	46.00	23.99	2000.0	9.000	L1	OFF	9.6
0.668000	38.55	---	56.00	17.45	2000.0	9.000	L1	OFF	9.6
0.668000	---	22.55	46.00	23.45	2000.0	9.000	L1	OFF	9.6
0.944000	---	11.31	46.00	34.69	2000.0	9.000	L1	OFF	9.6
0.944000	33.11	---	56.00	22.89	2000.0	9.000	L1	OFF	9.6
1.100000	40.56	---	56.00	15.44	2000.0	9.000	L1	OFF	9.6
1.100000	---	22.79	46.00	23.21	2000.0	9.000	L1	OFF	9.6
1.116000	---	24.39	46.00	21.61	2000.0	9.000	L1	OFF	9.6
1.116000	40.58	---	56.00	15.42	2000.0	9.000	L1	OFF	9.6
1.120000	40.06	---	56.00	15.94	2000.0	9.000	L1	OFF	9.6
1.120000	---	23.01	46.00	22.99	2000.0	9.000	L1	OFF	9.6
1.336000	---	16.88	46.00	29.12	2000.0	9.000	L1	OFF	9.6
1.336000	32.65	---	56.00	23.35	2000.0	9.000	L1	OFF	9.6
1.392000	---	20.16	46.00	25.84	2000.0	9.000	L1	OFF	9.6
1.392000	39.61	---	56.00	16.39	2000.0	9.000	L1	OFF	9.6
1.752000	---	10.27	46.00	35.73	2000.0	9.000	L1	OFF	9.6
1.752000	44.09	---	56.00	11.91	2000.0	9.000	L1	OFF	9.6
1.968000	---	6.03	46.00	39.97	2000.0	9.000	L1	OFF	9.7
1.968000	29.48	---	56.00	26.52	2000.0	9.000	L1	OFF	9.7
2.088000	---	13.72	46.00	32.28	2000.0	9.000	L1	OFF	9.7
2.088000	34.00	---	56.00	22.00	2000.0	9.000	L1	OFF	9.7
2.852000	---	10.69	46.00	35.31	2000.0	9.000	L1	OFF	9.7
2.852000	33.57	---	56.00	22.43	2000.0	9.000	L1	OFF	9.7
4.168000	---	12.25	46.00	33.75	2000.0	9.000	L1	OFF	9.7
4.168000	32.40	---	56.00	23.60	2000.0	9.000	L1	OFF	9.7

Table 7.2.2-6: Conducted EMI Results – Neutral - Taoglas Antennna

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.222000	---	37.18	52.53	15.35	2000.0	9.000	N	OFF	9.7
0.222000	51.84	---	62.56	10.72	2000.0	9.000	N	OFF	9.7
0.444000	---	33.96	46.90	12.94	2000.0	9.000	N	OFF	9.7
0.444000	44.48	---	56.92	12.44	2000.0	9.000	N	OFF	9.7
0.664000	---	25.17	46.00	20.83	2000.0	9.000	N	OFF	9.8
0.664000	36.72	---	56.00	19.28	2000.0	9.000	N	OFF	9.8
0.672000	---	25.77	46.00	20.23	2000.0	9.000	N	OFF	9.8
0.672000	38.31	---	56.00	17.69	2000.0	9.000	N	OFF	9.8
0.892000	---	24.83	46.00	21.17	2000.0	9.000	N	OFF	9.8
0.892000	37.38	---	56.00	18.62	2000.0	9.000	N	OFF	9.8
1.120000	---	24.67	46.00	21.33	2000.0	9.000	N	OFF	9.8
1.120000	37.17	---	56.00	18.83	2000.0	9.000	N	OFF	9.8
1.336000	---	22.70	46.00	23.30	2000.0	9.000	N	OFF	9.8
1.336000	36.08	---	56.00	19.92	2000.0	9.000	N	OFF	9.8
1.416000	---	15.66	46.00	30.34	2000.0	9.000	N	OFF	9.8
1.416000	36.61	---	56.00	19.39	2000.0	9.000	N	OFF	9.8
2.016000	---	19.94	46.00	26.06	2000.0	9.000	N	OFF	9.8
2.016000	34.76	---	56.00	21.24	2000.0	9.000	N	OFF	9.8

7.3 6dB / 99% Bandwidth – FCC 15.247(a)(2), ISED Canada: RSS-247 5.2(1)

7.3.1 Measurement Procedure

The 6dB bandwidth was measured in accordance with the FCC KDB 558074 D01 DTS Meas Guidance v03r05. 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

Table 7.3.2-1: 6dB / 99% Bandwidth

Frequency [MHz]	6dB Bandwidth [kHz]	99% Bandwidth [kHz]
904	633.0	983.9
914	654.9	983.9
926	633.0	987.2

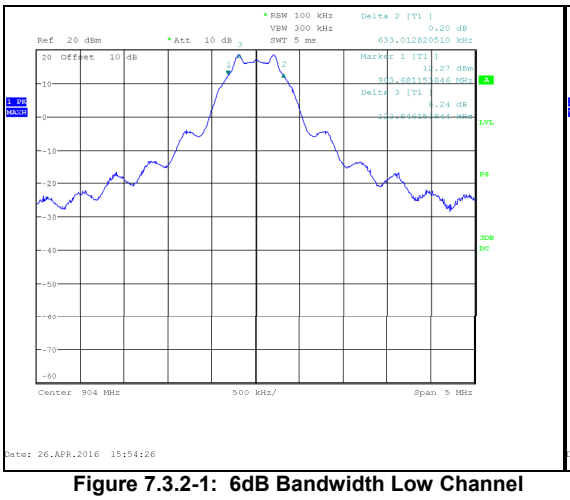

Figure 7.3.2-1: 6dB Bandwidth Low Channel

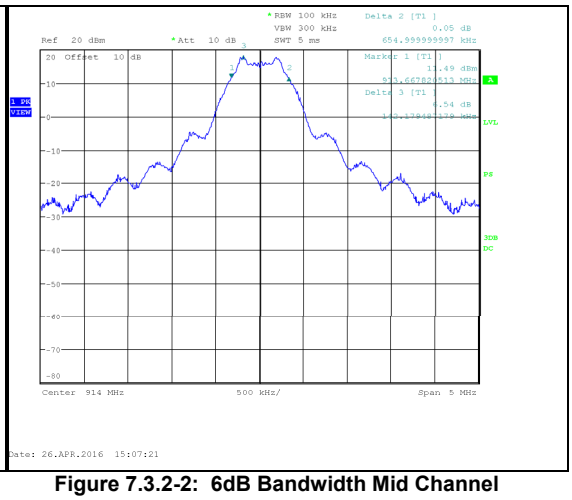

Figure 7.3.2-2: 6dB Bandwidth Mid Channel

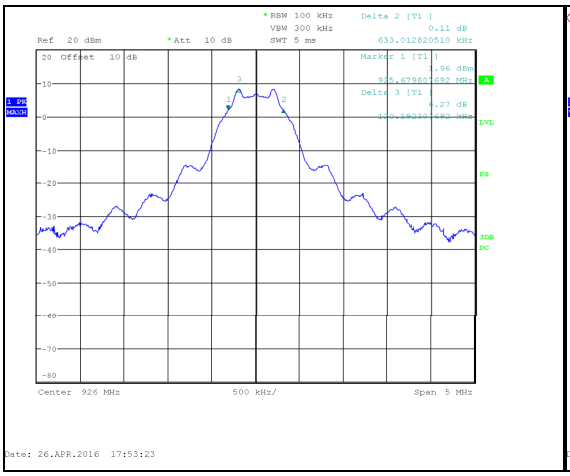

Figure 7.3.2-3: 6dB Bandwidth High Channel

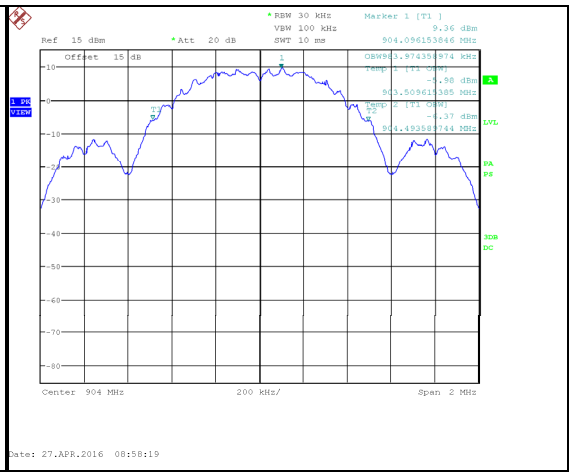

Figure 7.3.2-4: 99% Bandwidth Low Channel

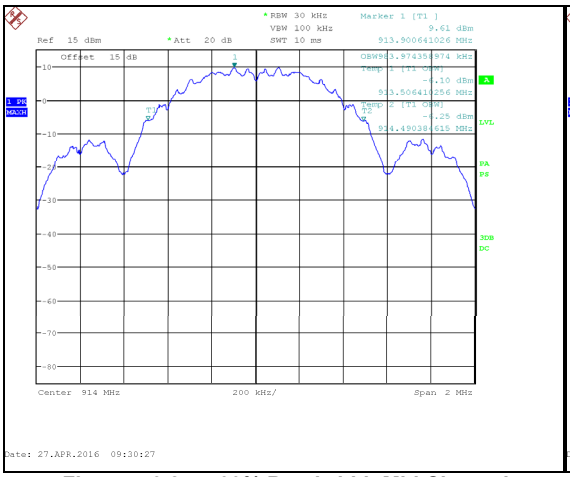

Figure 7.3.2-5: 99% Bandwidth Mid Channel

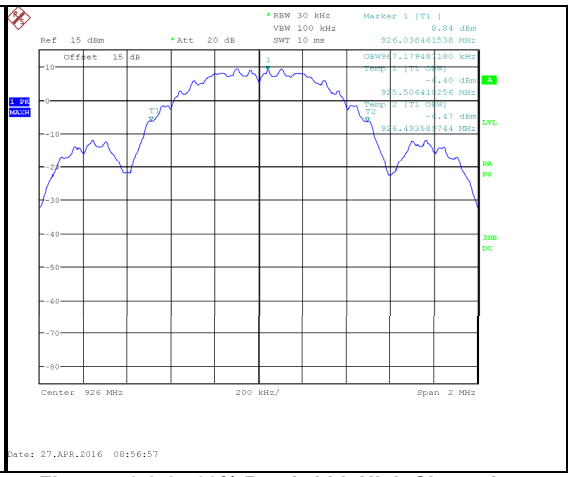

Figure 7.3.2-6: 99% Bandwidth High Channel

7.4 Fundamental Emission Output Power – FCC 15.247(b)(3), ISED Canada: RSS-247 5.4(4)

7.4.1 Measurement Procedure

The maximum peak conducted output power was measured in accordance with FCC KDB 558074 D01 DTS Meas Guidance v03r05 utilizing the PKPM1 Peak power meter method. The RF output of the equipment under test was directly connected to the input of the power meter applying suitable attenuation. A peak detector was used.

7.4.2 Measurement Results

Table 7.4.2-1: Maximum Peak Conducted Output Power

Frequency (MHz)	Output Power (dBm)	Output Power (Watts)
904	19.14	0.082
914	19.00	0.079
926	18.81	0.076

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 DTS Measurement Guidance v03r05. 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. 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

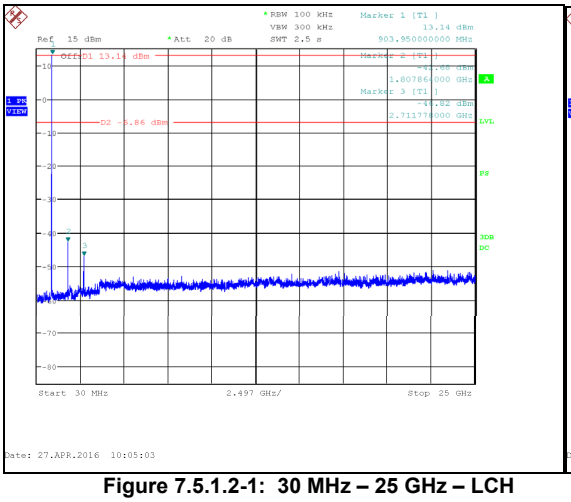

Figure 7.5.1.2-1: 30 MHz – 25 GHz – LCH

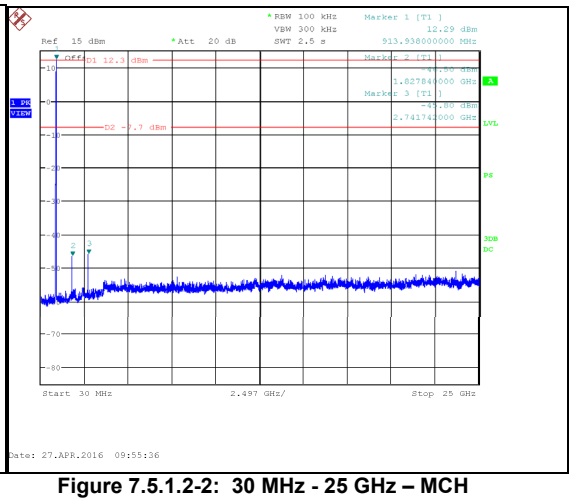

Figure 7.5.1.2-2: 30 MHz - 25 GHz – MCH

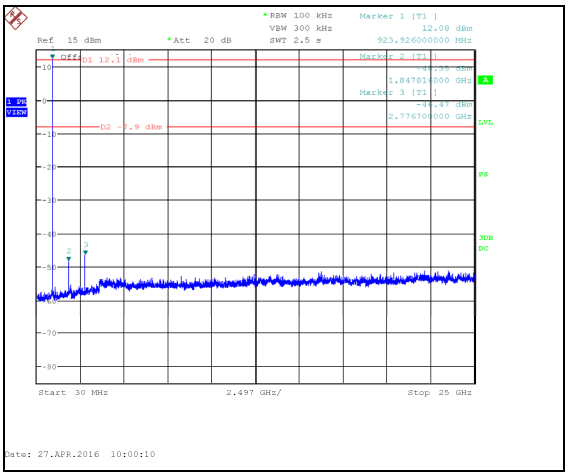

Figure 7.5.1.2-3: 30 MHz – 25 GHz – HCH

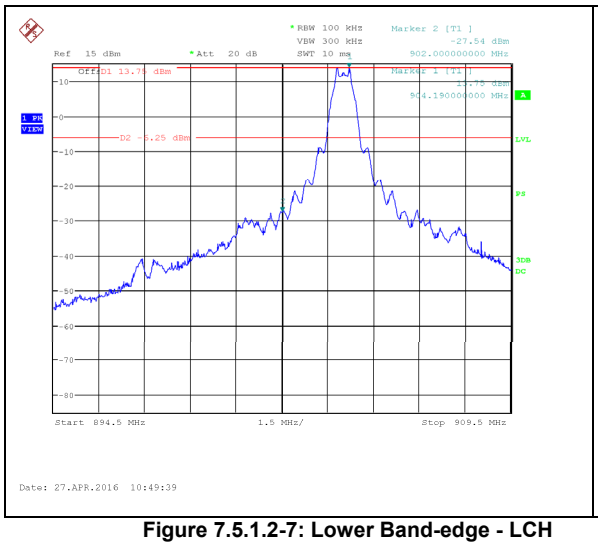

Figure 7.5.1.2-7: Lower Band-edge - LCH

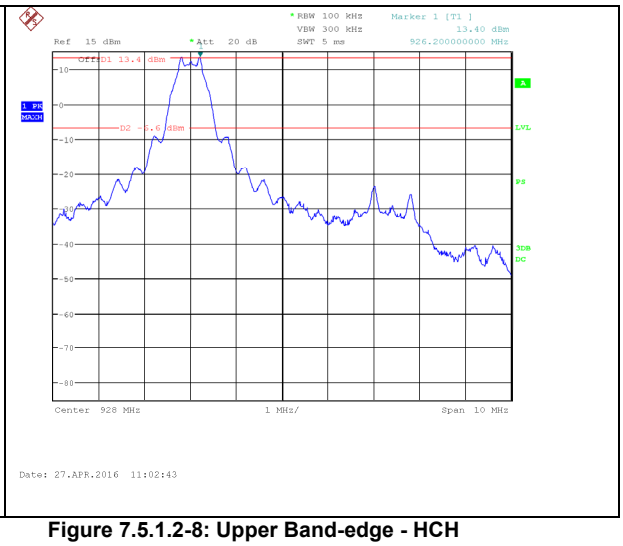

Figure 7.5.1.2-8: Upper Band-edge - HCH

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 10GHz, 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.

7.5.2.2 Duty Cycle Correction

For average radiated measurements, using a 30.48% duty cycle, the measured level was reduced by a factor 10.32dB. The duty cycle correction factor is determined using the formula: 20log (30.48/100) = - 10.32dB.

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

Table 7.5.2.3-1: Radiated Spurious Emissions Tabulated Data – Chip 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
Low Channel										
3616	56.50	48.40	H	3.86	60.36	41.94	74.0	54.0	13.6	12.1
3616	43.00	49.10	V	3.86	46.86	42.64	74.0	54.0	27.1	11.4
4520	35.70	23.70	H	6.30	42.00	19.68	74.0	54.0	32.0	34.3
4520	36.70	24.60	V	6.30	43.00	20.58	74.0	54.0	31.0	33.4
Middle Channel										
2742	34.30	25.10	H	0.30	34.60	15.08	74.0	54.0	39.4	38.9
2742	35.70	27.10	V	0.30	36.00	17.08	74.0	54.0	38.0	36.9
3656	56.40	48.30	H	4.01	60.41	41.99	74.0	54.0	13.6	12.0
3656	60.00	52.00	V	4.01	64.01	45.69	74.0	54.0	10.0	8.3
4570	33.60	22.00	H	6.31	39.91	17.99	74.0	54.0	34.1	36.0
4570	35.40	23.30	V	6.31	41.71	19.29	74.0	54.0	32.3	34.7
High Channel										
2778	35.90	27.00	H	0.46	36.36	17.14	74.0	54.0	37.6	36.9
2778	37.40	29.10	V	0.46	37.86	19.24	74.0	54.0	36.1	34.8
3704	48.70	39.30	H	4.19	52.89	33.17	74.0	54.0	21.1	20.8
3704	52.50	44.00	V	4.19	56.69	37.87	74.0	54.0	17.3	16.1
4630	32.00	19.30	H	6.32	38.32	15.30	74.0	54.0	35.7	38.7
4630	31.40	18.40	V	6.32	37.72	14.40	74.0	54.0	36.3	39.6

Table 7.5.2.3-2: Radiated Spurious Emissions Tabulated Data – Nitol 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
Low Channel										
2712	45.00	37.00	H	0.16	45.16	26.84	74.0	54.0	28.8	27.2
2712	47.60	40.40	V	0.16	47.76	30.24	74.0	54.0	26.2	23.8
3616	49.20	39.80	H	3.86	53.06	33.34	74.0	54.0	20.9	20.7
3616	47.50	37.70	V	3.86	51.36	31.24	74.0	54.0	22.6	22.8
4520	46.00	33.60	H	6.30	52.30	29.58	74.0	54.0	21.7	24.4
4520	42.00	28.30	V	6.30	48.30	24.28	74.0	54.0	25.7	29.7
5424	42.00	28.50	H	6.60	48.60	24.78	74.0	54.0	25.4	29.2
5424	40.90	26.90	V	6.60	47.50	23.18	74.0	54.0	26.5	30.8
Middle Channel										
2742	44.30	36.30	H	0.30	44.60	26.28	74.0	54.0	29.4	27.7
2742	47.00	39.60	V	0.30	47.30	29.58	74.0	54.0	26.7	24.4
3656	51.10	44.20	H	4.01	55.11	37.89	74.0	54.0	18.9	16.1
3656	53.60	45.00	V	4.01	57.61	38.69	74.0	54.0	16.4	15.3
4570	44.70	32.30	H	6.31	51.01	28.29	74.0	54.0	23.0	25.7
4570	41.20	27.60	V	6.31	47.51	23.59	74.0	54.0	26.5	30.4
High Channel										
2778	44.20	35.70	H	0.46	44.66	25.84	74.0	54.0	29.3	28.2
2778	48.60	42.10	V	0.46	49.06	32.24	74.0	54.0	24.9	21.8
3704	52.30	43.50	H	4.19	56.49	37.37	74.0	54.0	17.5	16.6
3704	54.50	46.30	V	4.19	58.69	40.17	74.0	54.0	15.3	13.8
4630	41.60	27.50	H	6.32	47.92	23.50	74.0	54.0	26.1	30.5
4630	39.40	25.50	V	6.32	45.72	21.50	74.0	54.0	28.3	32.5

Table 7.5.2.3-3: Radiated Spurious Emissions Tabulated Data – Taoglas 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
Low Channel										
2712	39.70	27.00	H	0.16	39.86	16.84	74.0	54.0	34.1	37.2
2712	40.50	28.20	V	0.16	40.66	18.04	74.0	54.0	33.3	36.0
3616	45.00	34.10	H	3.86	48.86	27.64	74.0	54.0	25.1	26.4
3616	45.30	34.40	V	3.86	49.16	27.94	74.0	54.0	24.8	26.1
4520	40.10	26.40	H	6.30	46.40	22.38	74.0	54.0	27.6	31.6
4520	41.60	28.50	V	6.30	47.90	24.48	74.0	54.0	26.1	29.5
Middle Channel										
2742	41.50	30.70	H	0.30	41.80	20.68	74.0	54.0	32.2	33.3
2742	40.50	29.30	V	0.30	40.80	19.28	74.0	54.0	33.2	34.7
3656	48.70	39.50	H	4.01	52.71	33.19	74.0	54.0	21.3	20.8
3656	50.50	41.30	V	4.01	54.51	34.99	74.0	54.0	19.5	19.0
4570	42.30	28.50	H	6.31	48.61	24.49	74.0	54.0	25.4	29.5
4570	42.80	29.80	V	6.31	49.11	25.79	74.0	54.0	24.9	28.2
High Channel										
2778	42.30	32.20	H	0.46	42.76	22.34	74.0	54.0	31.2	31.7
2778	41.80	30.80	V	0.46	42.26	20.94	74.0	54.0	31.7	33.1
3704	50.30	41.60	H	4.19	54.49	35.47	74.0	54.0	19.5	18.5
3704	51.10	42.50	V	4.19	55.29	36.37	74.0	54.0	18.7	17.6
4630	40.80	26.90	H	6.32	47.12	22.90	74.0	54.0	26.9	31.1
4630	42.60	28.60	V	6.32	48.92	24.60	74.0	54.0	25.1	29.4

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: 39.70 + 0.16 = 39.86dBuV/m
Margin: 74dBuV/m – 39.86dBuV/m = 34.14dB

Example Calculation: Average

Corrected Level: 27.0 + 0.16 - 10.32 = 16.84dBuV
Margin: 54dBuV – 16.84dBuV = 37.2dB

7.6 Power Spectral Density – FCC 15.247(e) ISED Canada: RSS-247 5.2(2)

7.6.1 Measurement Procedure

The power spectral density was measured in accordance with the FCC KDB 558074 D01 DTS Meas Guidance v03r05 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 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 hold with a peak detector active.

7.6.2 Measurement Results

Table 7.6.2-1: Peak Power Spectral Density

Frequency (MHz)	PSD Level (dBm)
904	-3.12
914	-3.15
926	-3.65

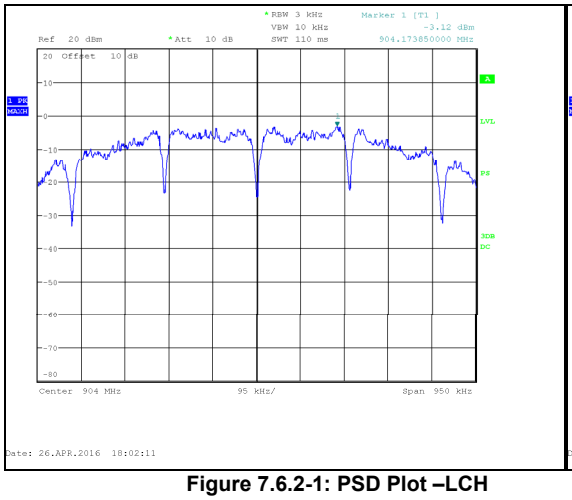

Figure 7.6.2-1: PSD Plot –LCH

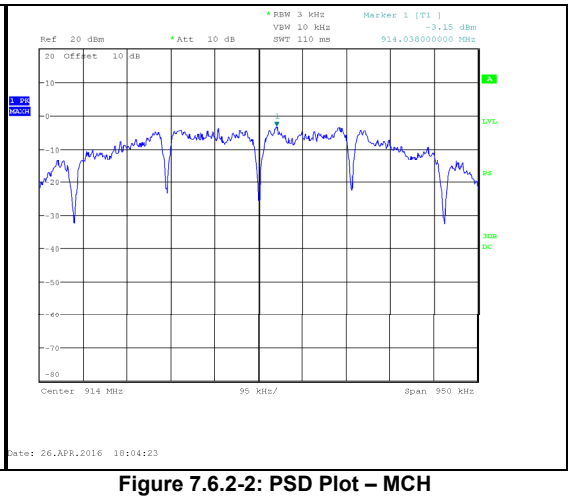

Figure 7.6.2-2: PSD Plot – MCH

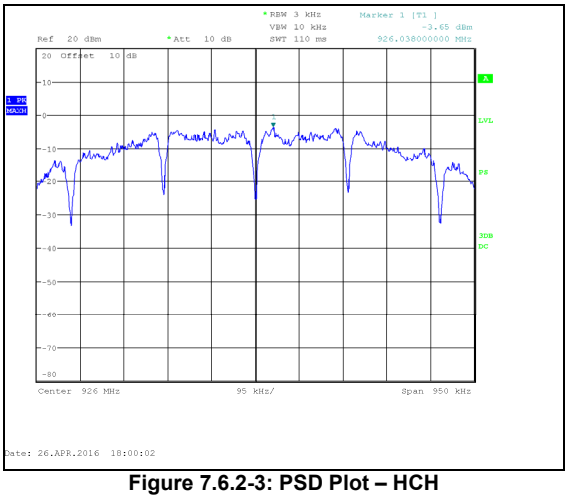

Figure 7.6.2-3: PSD Plot – HCH

8 CONCLUSION

In the opinion of ACS, Inc. the rMODIT, manufactured by Acuity Brands Lighting, Inc. meets the requirements of FCC Part 15 subpart C and ISED Canada's Radio Standards Specification RSS-247.

END REPORT