849 NW State Road 45
Newberry, Fl 32669 USA
Phone: 888.472.2424 or 352.472.5500
Fax: 352.472.2030
Email: info@timcoengr.com
Website: www.timcoengr.com

FCC PART 15.209

LOW POWER TRANSMITTER

TEST REPORT

Applicant	LIGHTWAVE TECHNOLOGY
Address	400 WRIGHT STREET ST-LAURENT QUEBEC CANADA
FCC ID	2ABSL1101
Product Description	RFID TRANSMITTER
Date Sample Received	2/7/2014
Date Tested	3/11/2014
Report Issue Date	3/12/2014
Tested By	Cory Leverett
Approved By	Cory Leverett
Report Number	190AUT14TestReport
Test Results	☒ PASS ☐ FAIL

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GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

The test results relate only to the items tested.

Summary

The device under test does:
☒ fulfill the general approval requirements as identified in this test report
☐ not fulfill the general approval requirements as identified in this test report

Attestations

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025: 2005 requirements.

I attest that the necessary measurements were made, under my supervision, at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, Fl 32669

Authorized Signatory Name:
Cory Leverett

Engineering Project Manager

Date: **March 12, 2014**

REPORT SUMMARY

Disclaimer	The test results only relate to the item tested.
Applicable Rule(s)	Pt 15.209, Pt 15.107, ANSI C63.4: 2003
Related Report	190BUT14

TEST ENVIRONMENT

Test Facility	Timco Engineering, Inc. 849 NW State Road 45 Newberry, FL 32669 USA.
Test Condition in the laboratory	Temperature: 26°C Relative humidity: 50%

TEST SETUP SUMMARY

Test Setup Diagram/ Description	The DUT was placed on the turntable per setup per ANSI C63.4: 2003. A test set up photo is provided for clarification.
Deviation from the standard/procedure	No deviation
Modification of DUT	No modification

EUT SPECIFICATION

EUT Description	RFID TRANSMITTER
FCC ID	2ABSL1101
Tuned Frequency	125KHz
EUT Power Source	☐ 110–120Vac/50– 60Hz
	☒ DC Power
	☐ Battery Operated Exclusively
Test Item	☐ Prototype
	☒ Pre-Production
	☐ Production
Type of Equipment	☐ Fixed
	☒ Mobile
	☐ Portable
Laboratory Test Conditions	Temperature: 26°C Humidity: 55%
Modifications to DUT:	☒ No ☐ Yes (explanation below)

EUT Supporting Cables

Cable Type	Connector	Manufacturer	Length
Unshielded 22AWG OFC	Black 6 PIN / Push to Start Button	N/A	1M
Unshielded 22AWG OFC	Black 12 PIN / Main Power Harness	N/A	.9M
Unshielded 14AWG OFC	White 4 PIN / Internal relay Harness	N/A	.9M
Unshielded 22AWG OFC	Dual Black 4 PIN	N/A	.5M
Unshielded 22AWG OFC	Brown 6 PIN Aux Harness	N/A	.9M
Unshielded 22AWG OFC	Red 2 PIN 125 KHz Ferrite ANT Cable	N/A	2.5M
Unshielded 18AWG OFC	Soldered Black 12 PIN for Power Connection	N/A	1M

TEST EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
DC Power Supply	H/P	6286A	1744A03842	N/A	N/A
Field Strength Software	TEI	Version 4.0	N/A	N/A	N/A
Signal Generator	HP	8640B	2308A21464	02/23/12	02/23/14
EMI Test Receiver	*Rhode & Schwarz	ESIB 40	100274	03/13/12	03/16/14
3/10-Meter OATS	TEI	N/A	N/A	3/31/11	3/31/14
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	12/31/13	12/31/15
Antenna: Biconnical	Eaton	94455-1	1057	06/14/13	06/14/15
Antenna: Log-Periodic	Eaton	96005	1243	05/31/13	05/31/15
Antenna: Passive Loop	EMC Test Systems	EMCO 6512	9706-1211	6/14/12	6/14/14
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	01/15/14	01/15/16
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	01/15/14	01/15/16
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	01/15/14	01/15/16
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	01/15/14	01/15/16

***EMI RECEIVER SOFTWARE VERSION**

The receiver firmware used was version 4.43 Service Pack 3

TEST PROCEDURES

Power line conducted Emission: The test procedure used was ANSI C63.4-2003. The spectrum was scanned from 0.15 to 30 MHz.

Radiation Interference: The test procedure used was ANSI C63.4-2003 using a spectrum analyzer with a preselector. The bandwidth of the spectrum analyzer was 100 kHz with an appropriate sweep speed. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The video bandwidth was always greater than or equal to the RBW.The spectrum was scanned from 9KHz to the tenth harmonic of the transmitters local oscillator. Followed by a scan of 30MHz-1000MHz. When an emission was found, the table was rotated to produce the maximum signal strength. The DUT was measured in three orthogonal planes when necessary.

Near Field Measurements: At frequencies below 30 MHz, measurements were performed at a distance closer than that specified in the regulations; an attempt was made to avoid making measurements in the near field. An appropriate plan of development of an appropriate measurement procedure for measurements performed below 30 MHz, the results were extrapolated to the specified distance by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

Formula Of Conversion Factors: The field strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBµV) to the antenna correction factor supplied by the antenna manufacturer plus the coax loss. The antenna correction factors are stated in terms of dB. The gain of the preselector was accounted for in the spectrum analyzer meter reading.

Example:

Freq (MHz)	Meter Reading	+ ACF	+CL	= FS
33	20 dBµV	+ 10.36 dB/m	+0.40 dB	=30.76 dBµV/m @ 3m

Measurement Procedures: The EUT was placed on a non-conducting table 80 cm above the ground plane with the EUT located in the center of the table. With the antenna vertical a preliminary scan was done at 1 meters distance, the EUT was moved to a 3.0-meter distance and the antenna height varied and also placed in a horizontal position. The frequency was scanned from 9.0 kHz to 1.0 GHz. When an emission was found, the table was rotated to produce the maximum signal strength. The EUT was measured in three (3) orthogonal planes (as necessary).

RADIATED SPURIOUS EMISSIONS

Rules Part No.: 15.31 (f,2) 15.109(a) and 15.209

Requirements:

Measurements were attempted at 10M; no emissions were recordable from this distance. All limits have been extrapolated by the 40dB per decade factor from 300M to 3M.

{2400/125 = 19.2µV/m @ 300 Meters} {19.2µV/m = 25.6dBµV/m @ 300 Meters}
300 Meters / 2 decades = 3 Meters measurement distance for all near field measurements.
25.6dBµV/m @ 300 Meters + 80dB for 2 decades = **105.6 dBµV/m limit @ 3 Meters**
For all out of band emissions shall **not exceed the fundamental frequency limit**.

Frequency KHz	Limits < 30MHz
125KHz	105.6dBµV/m @ 3 meters
9 – 490 kHz	(Fundamental FS) 81.9dBµV/m @ 3 meters
490 – 1705 kHz	(Fundamental FS) 81.9dBµV/m @ 3 meters
1705 – 30 MHz	(Fundamental FS) 81.9dBµV/m @ 3 meters
Frequency MHz	Limits > 30MHz
30 – 88	40.0 dBµV/m measured @ 3 meters
88 – 216	43.5 dBµV/m measured @ 3 meters
216 – 960	46.0 dBµV/m measured @ 3 meters
Above 960	54.0 dBµV/m measured @ 3 meters

The spectrum was scanned from 9 kHz to the Tenth harmonic, then from 30-1000MHz.

Test Data:
The field strength table on the following page shows all emissions are in compliance with FCC limits for low power security transmitters.

9KHz-30MHz MASURMENTS MADE ON 3 Meter OATS								
Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity	Coax Loss dB	Correction Factor dB/m	Duty Cycle dB	Field Strength dBuV/m	Margin dB
0.1	0.12	39	H	0	63.93	21	81.93	23.85
0.1	0.2	13	H	0	59.86	21	51.86	30.05
0.1	0.23	13.5	H	0	59.06	21	51.56	30.35
0.1	0.25	18.5	H	0.01	58.15	21	55.66	26.25
0.1	0.37	12.3	H	0.01	54.65	21	45.96	35.95
0.1	0.38	15.4	H	0.01	54.34	21	48.75	33.16
0.1	0.51	14.4	H	0.01	52.01	21	45.42	36.59

30-1000MHz Measurements Made on 3 Meter Semi Anechoic Chamber								
Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity	Coax Loss dB	Correction Factor dB/m	Duty Cycle dB	Field Strength dBuV/m	Margin dB
0.1	32.3	39.2	V	0.66	12.68	21	31.54	8.46
0.1	47	43.5	V	1.03	11.82	21	35.35	4.65
0.1	65.7	41.9	V	1.15	6.07	21	28.12	11.88
0.1	66.7	41.4	H	1.16	6.03	21	27.59	12.41
0.1	85.5	44.1	H	1.24	9.78	21	34.12	5.88
0.1	134.9	35.5	H	1.7	13.98	21	30.18	13.32
0.1	149.23	36.1	H	1.84	16.22	21	33.16	10.34
0.1	219.3	22.1	V	2.51	10.51	21	14.12	31.88
0.1	220.8	28.4	H	2.51	10.52	21	20.43	25.57
0.1	256.1	11.4	V	2.62	12.03	21	5.05	40.95
0.1	259.31	25.8	H	2.64	12.25	21	19.69	26.31
0.1	275.3	22.3	H	2.7	13.17	21	17.17	28.83
0.1	320.2	15.5	H	2.9	14.19	21	11.59	34.41

Note 1: Emissions 20 dB from the limit have been excluded from the final results

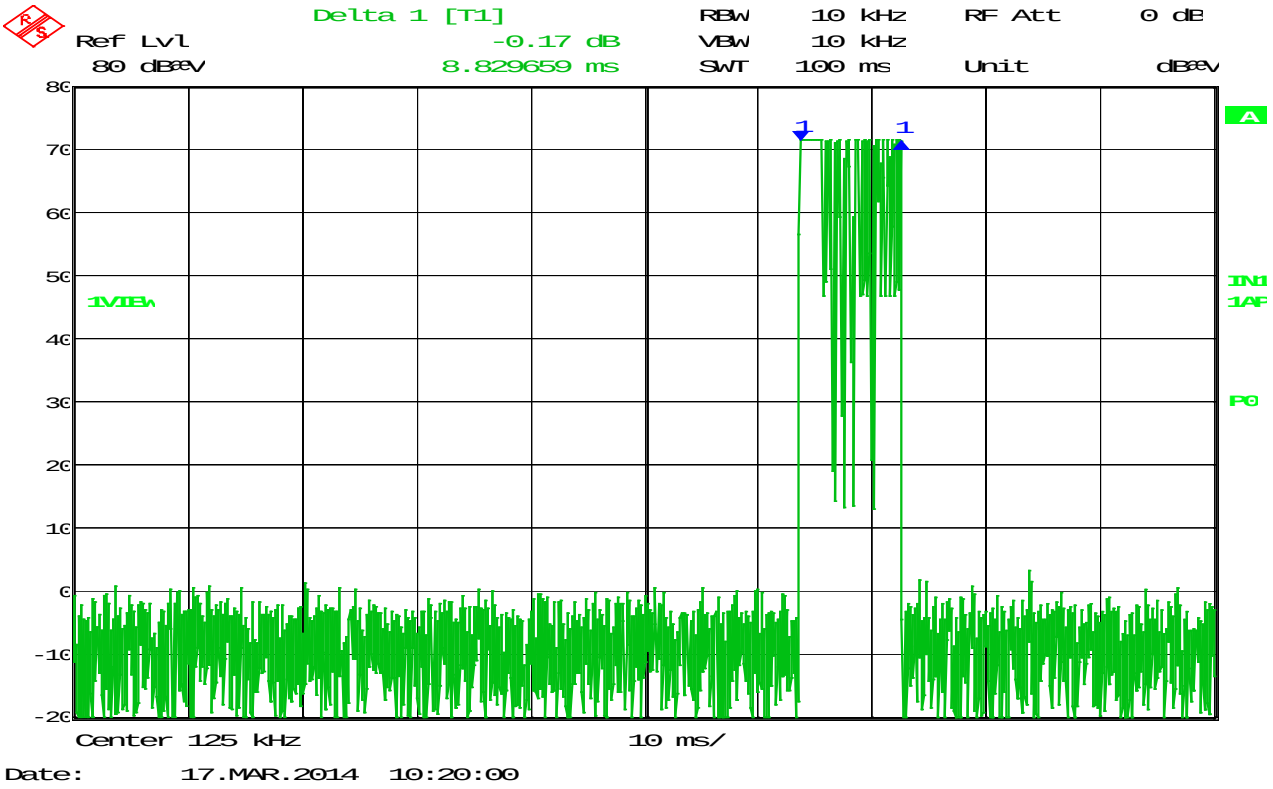
Note 2: All measurements performed with peak detector unless otherwise noted.

DUTY CYCLE

The period of the pulse train is determined by observing it on an oscilloscope or a spectrum analyzer with zero (0) frequency span. A plot is then made of the pulse train with a sweep time of 100 milliseconds. This sweep determines the duration of the pulse train. This sweep allows the determination of the number of and type of pulses, i.e. long & short. Plots are then made showing the duration of each type of pulse and its duration. From the 100-millisecond plot, the number of a given type of pulse is then multiplied by the duration of that type pulse. This allows the calculation of the amount of time the DUT is on within 100 ms.

Number of Long Pulses	1
Number of Short Pulses	0
Time length of Measurment	100ms
Length of Pulse Train	8.82ms
Total on Time	8.82ms

dB = 20*log(ON TIME)/PERIOD
dB = 20*log(8.82/100)
dB = 20*log(0.0882)
dB = -21.09



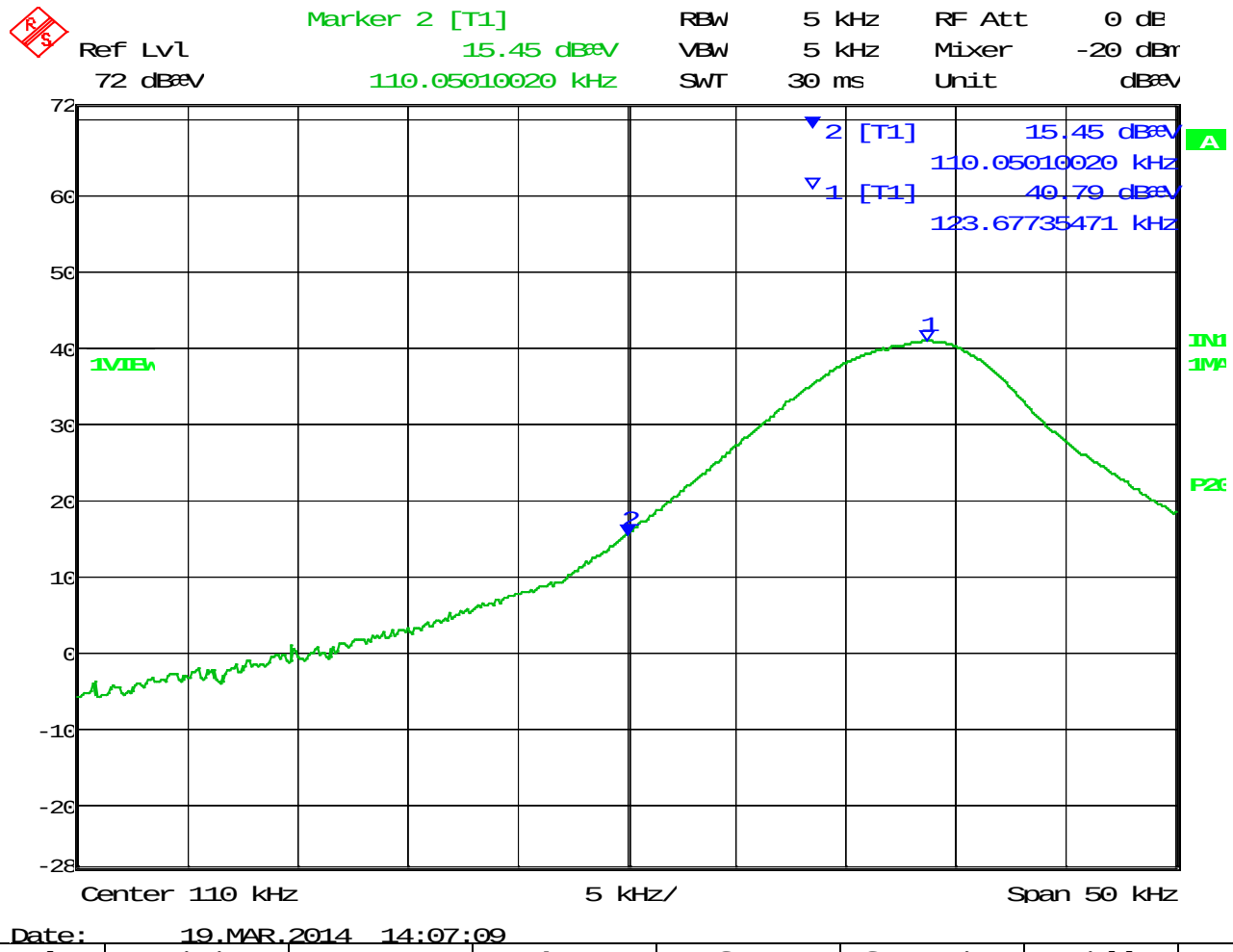
BAND EDGE COMPLIANCE

Rules Part No.: 15.205

Requirements: 40 dBc or in the case of restricted bands 54 dBµV/m.

Test Data:

Lower bandedge

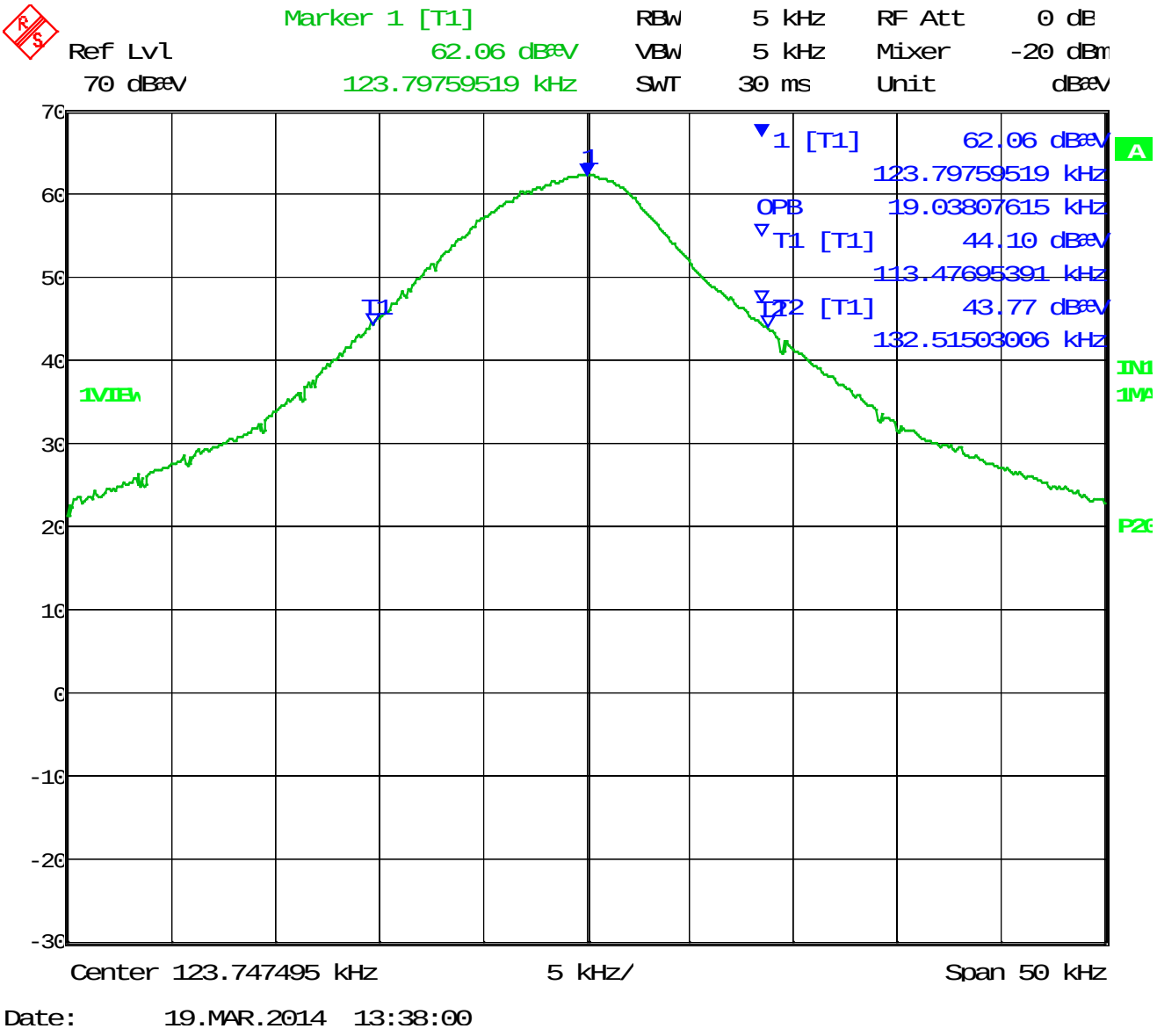


Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity	Coax Loss dB	Correction Factor dB/m	Field Strength dBuV/m	Margin dB
0.125	0.110	15.5	H	0.00	11.29	26.74	27.26

99% OCCUPIED BANDWIDTH

RULES PART NO.: 15.209

REQUIREMENTS: The field strength of any emissions appearing between the band edges and up to 10 kHz above and below the band edges shall be attenuated at least 26 dB below the level of the un-modulated carrier or to the general limits of 15.109, whichever permits the higher emission levels.



APPLICANT: LIGHTWAVE TECHNOLOGY
FCC ID: 2ABSL1101
REPORT: L\LIGHT_2ABSL\190AUT14\190AUT14TestReport

POWER LINE CONDUCTED INTERFERENCE

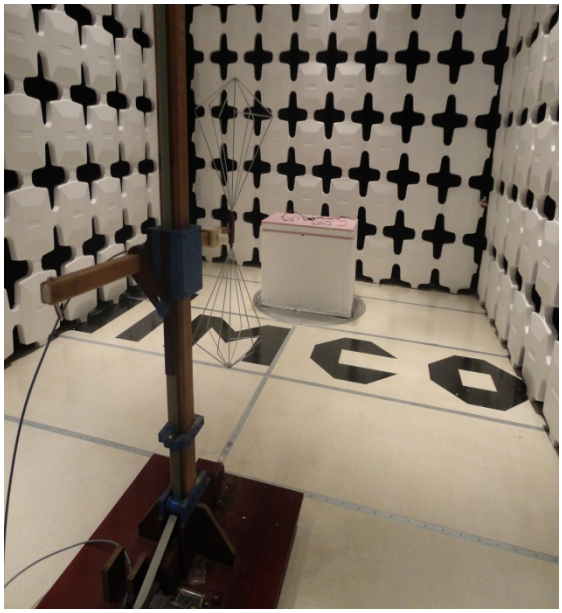
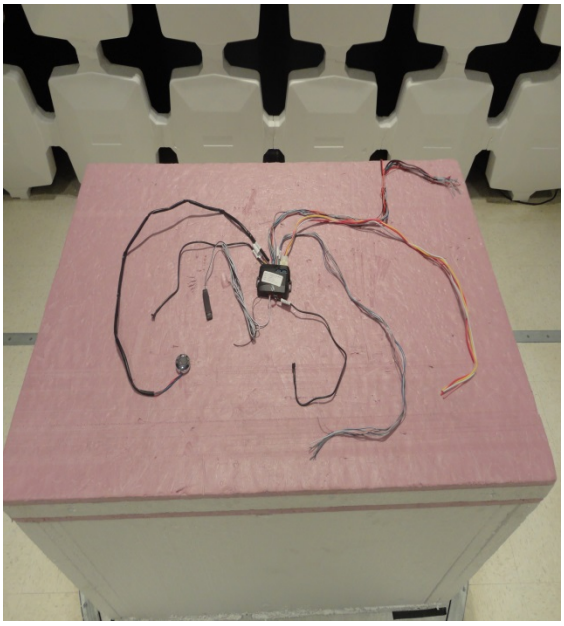
Rules Part No.: Part 15.107

Requirements:

Frequency (MHz)	Quasi Peak Limits (dBµV)	Average Limits (dBµV)
0.15 – 0.5	66 – 56 *	56 – 46 *
0.5 – 5.0	56	46
5.0 – 30	60	50
* Decrease with logarithm of frequency		

Test Data:
N/A the EUT operates only on Direct Current. No public utility connection provisions are offered**.**

Test Setup Photo

3M Semi Anechoic Chamber	ChamberTurntable Final Setup
	
3M OATS	OATS Turntable Final Setup