LABCODE: 500069-0

FCC PART 15.231

TEST REPORT

For

LA CROSSE TECHNOLOGY LTD.

2809 Losey Blvd., South La Crosse, Wisconsin 54601, USA

FCC ID: OMOTX141TH-A

Report Type:	**Product Type:**
Original Report	in/out thermometer

Test Engineer:	Allen Qiao
Report Number:	R2DG130427002-00
Report Date:	2013-05-22
Reviewed By:	Ivan Cao RF Leader
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *LA CROSSE TECHNOLOGY LTD.'s* product, model number: *TX141TH-A (FCC ID: OMOTX141TH-A) (*the "EUT") in this report is an *in/out thermometer,* which was measured approximately: 13.0 cm (L) x 4.0 cm (W) x 2.0 cm (H), rated input voltage: DC 3V from two AA Series batteries.

All measurement and test data in this report was gathered from production sample serial number: 130427002 (Assigned by BACL, Dongguan). The EUT was received on 2013-05-02.

Objective

This document is a test report based on the Electromagnetic Interference (EMI) tests performed on the EUT. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4-2003.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.209, 15.35(c) and 15.231 rules.

Related Submittal(s)/Grant(s)

No related submittal(s).

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4 - 2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Dongguan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 02, 2012. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Dongguan) is an ISO/IEC 17025 accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (Lab Code 500069-0).

The current scope of accreditations can be found at http://ts.nist.gov/standards/scopes/5000690.htm

SYSTEM TEST CONFIGURATION

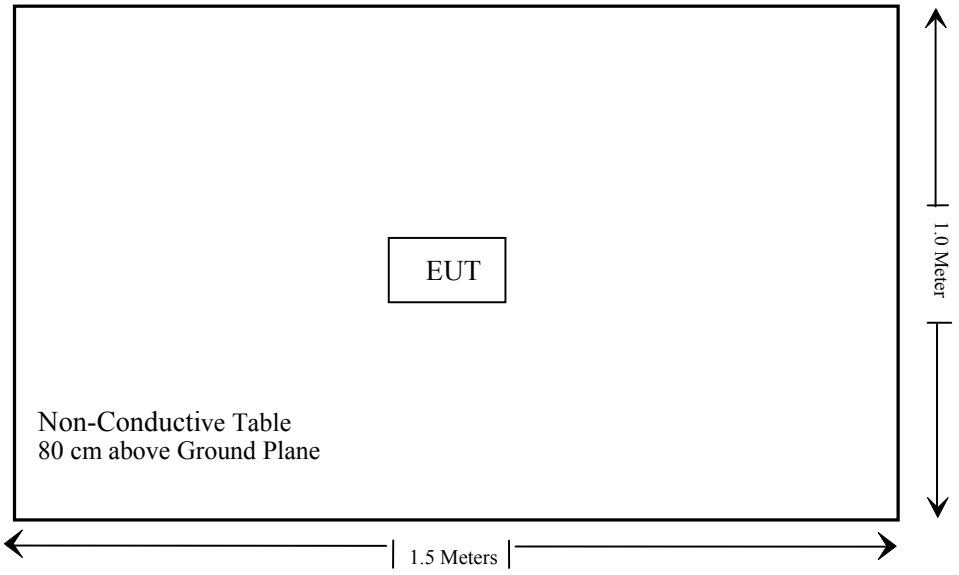
Justification

The system was configured in testing mode which was provided by manufacturer.

Equipment Modifications

No modifications were made to the unit tested.

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207 (a)	Conducted Emissions	Not applicable*
§15.205, §15.209, §15.231 (e)	Radiated Emissions	Compliance
§15.231 (c)	20 dB Bandwidth Testing	Compliance
§15.231 (e)	Deactivation Testing	Compliance

Not applicable*: The EUT is powered by battery only.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

Result: Compliant.

The EUT has an internal antenna welded on the PCB, which complied with 15.203. Please refer to the EUT Internal photos.

FCC §15.205, §15.209, §15.231 (e) - RADIATED EMISSIONS

Applicable Standard

FCC §15.205, §15.209, §15.231 (e)

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner：

If U_{lab} is less than or equal to U_{cispr} of Table 1, then:
- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than U_{cispr} of Table 1, then:
- compliance is deemed to occur if no measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit.

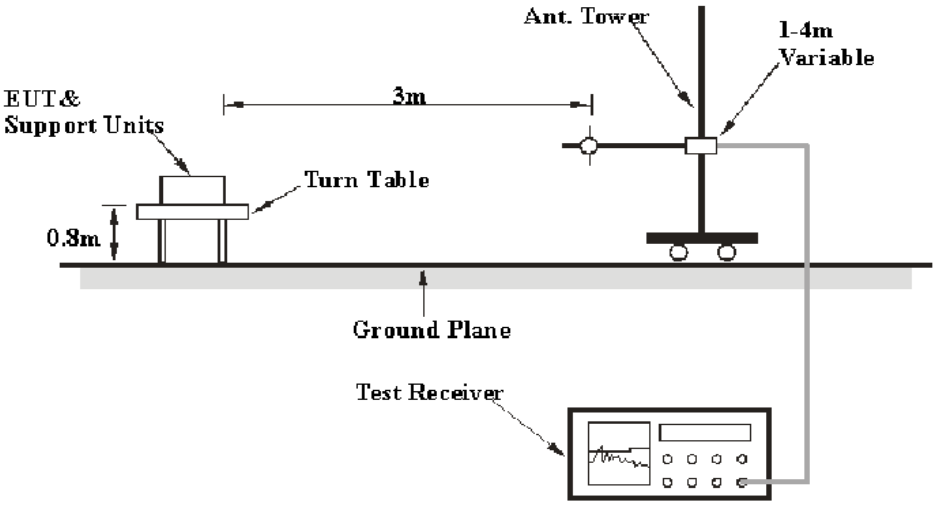
Based on CISPR 16-4-2: 2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is:
30M~200MHz: 5.0 dB
200M~1GHz: 6.2 dB
1G~6GHz: 4.45 dB
6G~18GHz: 5.23 dB

Table 1 – Values of U_{cispr}

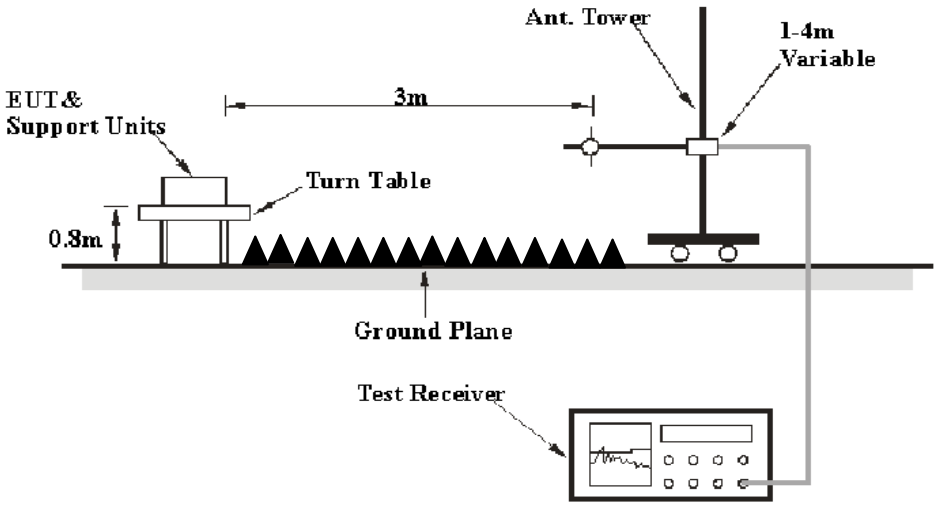
Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.4 - 2009. The specification used was the FCC 15 § 15.209, 15.205 and 15.231.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 4 GHz.

During the radiated emission test, the test receiver was set with the following configurations:

Frequency Range	*RBW*	*Video B/W*	*Detector*
30MHz – 1000 MHz	100 kHz	300 kHz	PK
1000 MHz – 4000 MHz	1 MHz	3 MHz	PK

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sunol Sciences	Antenna	JB3	A060611-1	2012-9-6	2015-9-5
HP	HP AMPLIFIER	8447E	2434A02181	N/A	N/A
R&S	Spectrum analyzer	FSEM 30	849016/001	2012-9-4	2013-9-3
ETS LINDGREN	horn antenna	3115	000 527 35	2012-9-6	2015-9-5
Mini-Circuit	Amplifier	ZVA-213-S+	54201245	N/A	N/A

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

According to §15.231, Intentional radiators operating under the provisions of this Section shall demonstrate compliance with the limits on the field strength of emissions, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector

Applicable Standard

According to §15.231 (e), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field Strength of Fundamental (Microvolts /meter)	Field Strength of spurious emissions ((Microvolts /meter)
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1,500 *	50 to 150 *
174-260	1,500	150
260-470	1,500 to 5,000*	150 to 500*
Above 470	5,000	500

*Linear interpolations.

The above field strength limits are specified at a distance of 3-meters the tighter limits apply at the band edges.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Loss + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the data in the following table, the EUT complied with the CFR47 §15.205, §15.209, §15.231 (e), with the worst margin reading of:

4.44 dB at **433.92 MHz** in the **Vertical** polarization

Test Data

Environmental Conditions

Temperature:	23.7 ° C
Relative Humidity:	67%
ATM Pressure:	100.4kPa

The testing was performed by Allen Qiao on 2013-05-03.

Test mode: Transmitting

Field Strength (Peak)

Frequency	Receiver	Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	§15.231 (e)	
(MHz)	Reading (dBμV)	Polar (H/V)	Factor (dB)				Limit (dBμV/m)	Margin (dB)
Operating Frequency: 433.92 MHz								
433.92	57.2	H	16.85	2.49	0.00	76.54	92.87	16.32
433.92	59.6	V	16.85	2.49	0.00	78.94	92.87	13.92
867.84	25.36	H	22.50	3.59	0.00	51.46	72.87	21.41
867.84	28.13	V	22.50	3.59	0.00	54.23	72.87	18.64
1301.76	37.15	H	25.30	2.55	27.26	37.75	74.00	36.25
1301.76	40.9	V	25.30	2.55	27.26	41.50	74.00	32.50
1735.68	43.2	H	27.06	3.31	27.44	46.13	74.00	27.87
1735.68	44.34	V	27.06	3.31	27.44	47.27	74.00	26.73
2169.6	38.33	H	29.75	3.46	27.76	43.78	74.00	30.22
2169.6	36.68	V	29.75	3.46	27.76	42.13	74.00	31.87
2603.52	35.43	H	31.46	3.95	27.67	43.17	74.00	30.83
2603.52	34.16	V	31.46	3.95	27.67	41.90	74.00	32.10
3037.44	33.67	H	30.96	6.49	27.46	43.67	74.00	30.33
3037.44	32.06	V	30.96	6.49	27.46	42.06	74.00	31.94

Field Strength (Average)

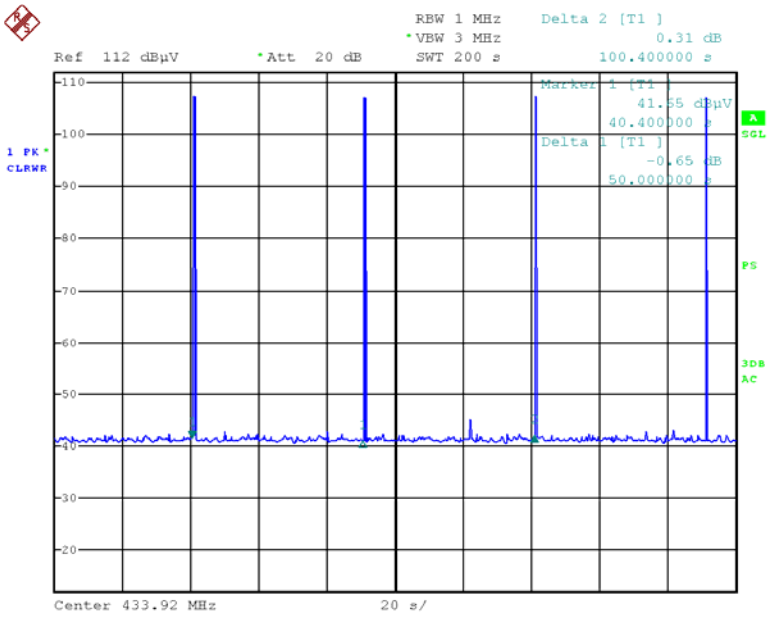
Frequency (MHz)	Peak Measurement @ 3m (dBµV/m)	Polar (H/V)	Duty Cycle Correction Factor (dB)	Average Amp. (dBµV/m)	§15.231(e)	
					Limit (dBµV/m)	Margin (dB)
Operating Frequency: 433.92 MHz						
433.92	71.29	H	-5.26	66.03	72.87	6.84
433.92	73.69	V	-5.26	68.43	72.87	4.44*
867.84	46.20	H	-5.26	40.94	52.87	11.92
867.84	48.97	V	-5.26	43.71	52.87	9.15
1301.76	32.49	H	-5.26	27.23	54.00	26.76
1301.76	36.24	V	-5.26	30.98	54.00	23.01
1735.68	40.87	H	-5.26	35.61	54.00	18.39
1735.68	42.01	V	-5.26	36.75	54.00	17.25
2169.6	38.52	H	-5.26	33.27	54.00	20.73
2169.6	36.87	V	-5.26	31.62	54.00	22.38
2603.52	37.91	H	-5.26	32.66	54.00	21.34
2603.52	36.64	V	-5.26	31.39	54.00	22.61
3037.44	38.41	H	-5.26	33.15	54.00	20.85
3037.44	36.80	V	-5.26	31.54	54.00	22.46

*Within measurement uncertainty!

Note:
Calculate Average value based on Duty Cycle Correction Factor:
Duty cycle= T_{ON}/100ms=[100-(0.4*43+0.6*26+0.8*2+1*11)] ms/100 ms=54.6%
Duty cycle correction factor = 20*log (duty cycle) =20*log(54.6%) = -5.26 dB

Please refer to following plot.

Period time =50.0s



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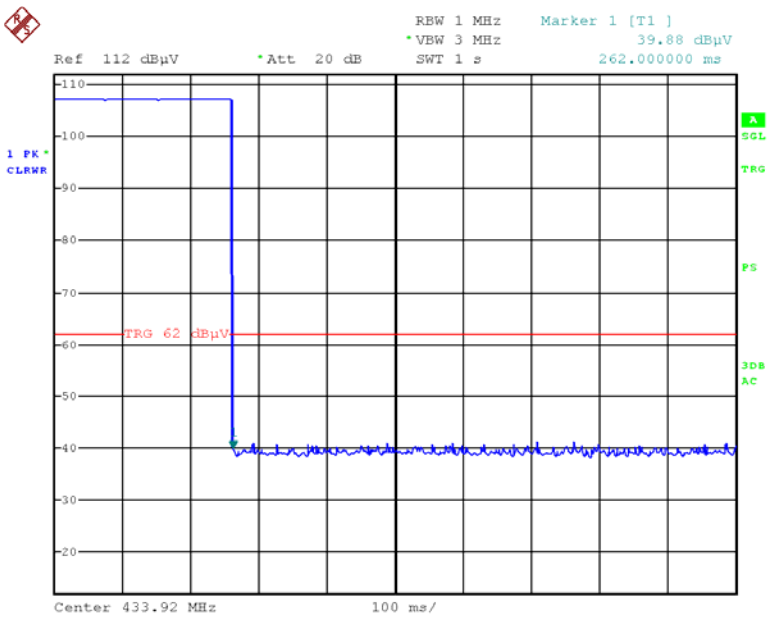

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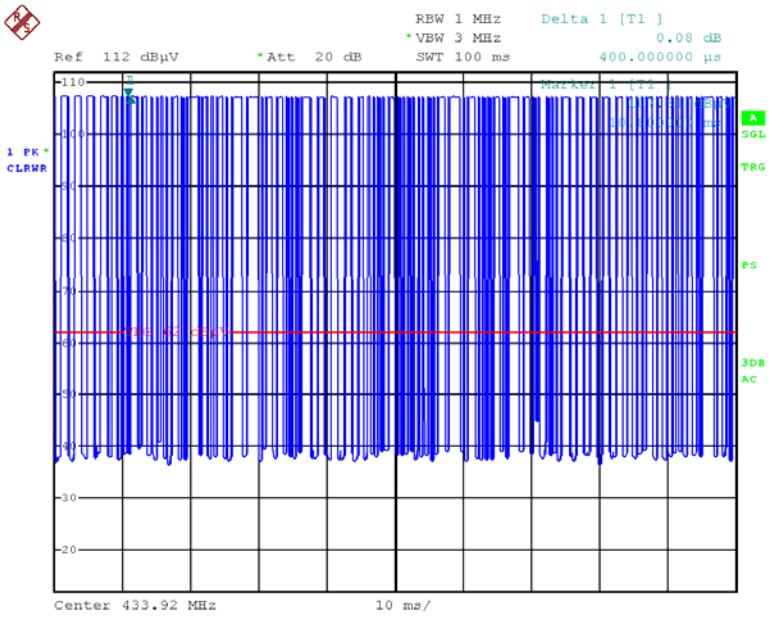
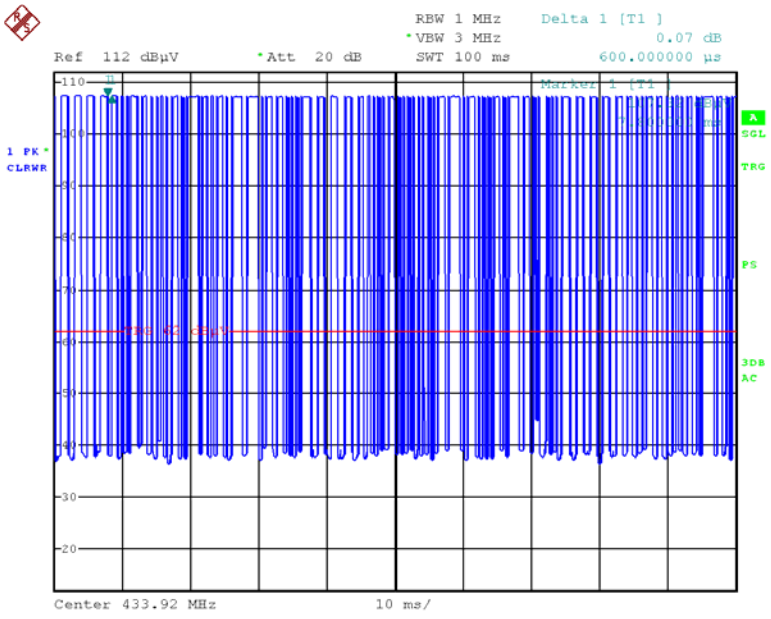
43pcs T_{off1} in 100ms,T_{off1} =400us



26pcs T_{off2} in 100ms,T_{off2} =600us



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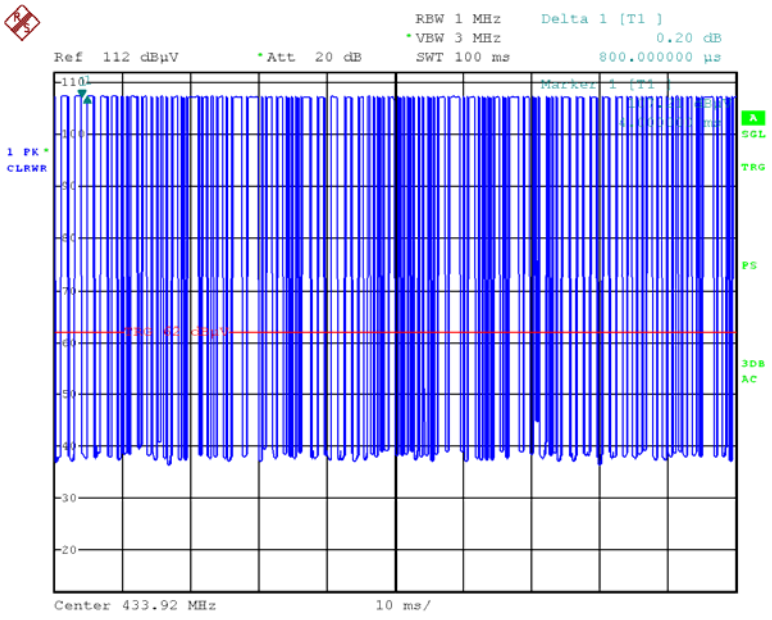
2pcs T_{off3} in 100ms,T_{off3} =800us



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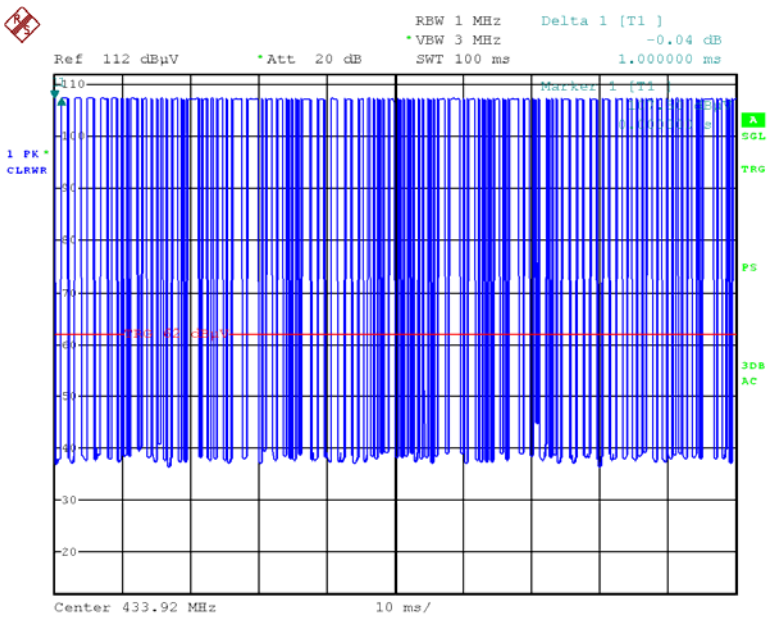
11pcs T_{off4} in 100ms,T_{off4} =1000us



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FCC §15.231(c) – 20 dB BANDWIDTH TESTING

Requirement

Per §15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI TEST RECEIVER	ESPI	100337	2012-11-10	2013-11-9
Sunol Sciences	Antenna	JB3	A060611-1	2012-9-6	2015-9-5
HP	HP AMPLIFIER	8447E	2434A02181	N/A	N/A

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

Test Procedure

With the EUT's antenna attached, the waveform was received by the test antenna which was connected to the spectrum analyzer, plot the 20 dB bandwidth.

Test Data

Environmental Conditions

Temperature:	25.1 ° C
Relative Humidity:	56 %
ATM Pressure:	100.4 kPa

The testing was performed by Allen Qiao on 2013-05-03.

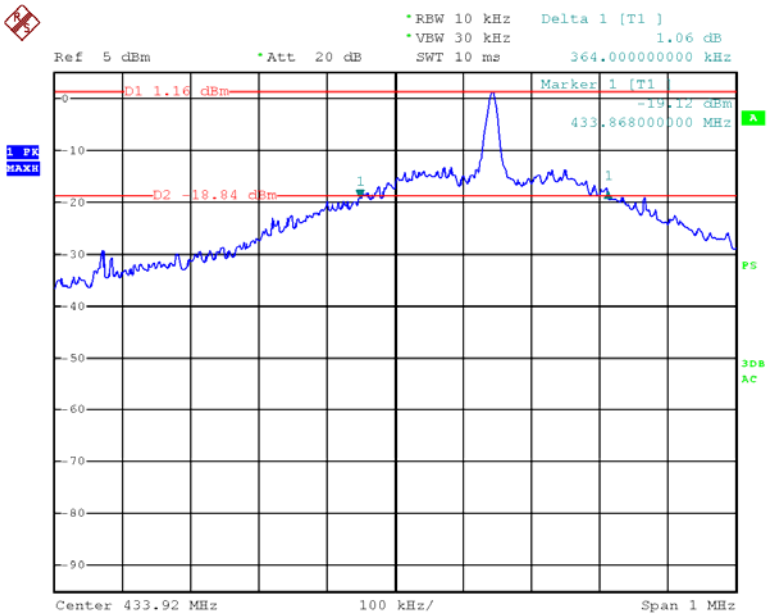
Test Mode: Transmitting

Please refer to following table and plot.

Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Result
433.92	364	1084.8	Pass

Note: Limit = 0.25% * Center Frequency = 0.25% * 433.92 MHz = 1084.8 kHz

20 dB Bandwidth



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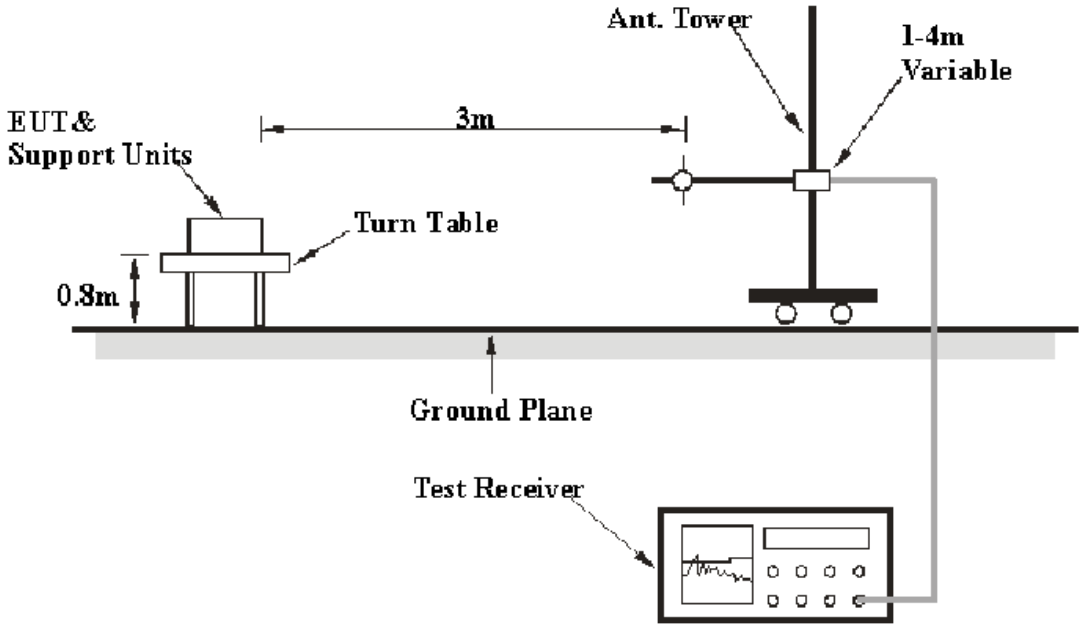
FCC §15.231(e) - DEACTIVATION TESTING

Applicable Standard

Per 15.231(e) , devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

EUT Setup



The deactivation test was performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.4 - 2003. The specification used was the FCC 15.231(e) limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI TEST RECEIVER	ESPI	100337	2012-11-10	2013-11-9
Sunol Sciences	Antenna	JB3	A060611-1	2012-9-6	2015-9-5
HP	HP AMPLIFIER	8447E	2434A02181	N/A	N/A

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	25.1 ° C
Relative Humidity:	56 %
ATM Pressure:	100.4 kPa

The testing was performed by Allen Qiao on 2013-05-03.

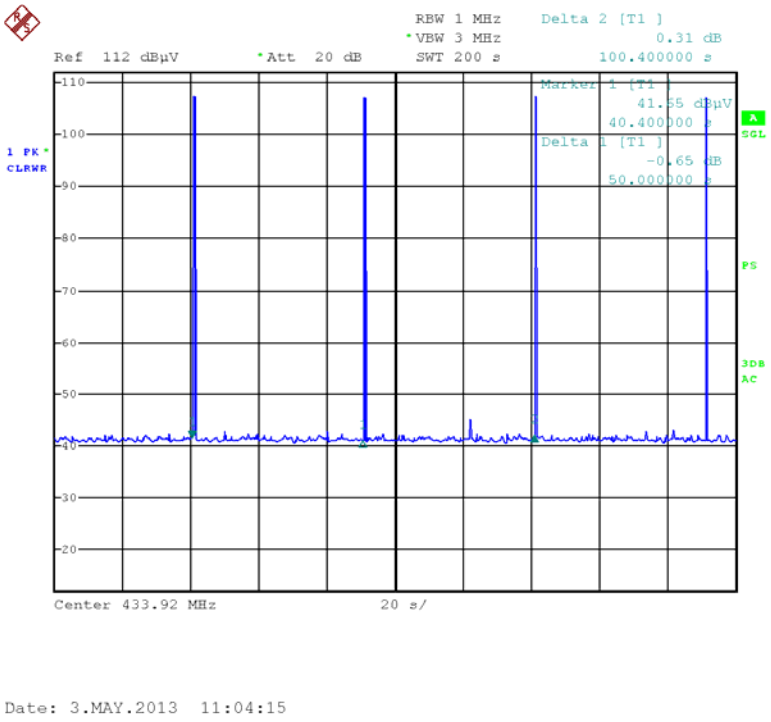
Test Mode: Transmitting

Test Result: Compliance. Please refer to following plot.

Period time	Duration time	Silent time	Silent time Limit	Result
50.0s	262ms	49.738s	>10s and >30* Duration time	Pass

Note : Silent time= Period time- Duration time

Period time =50.0s



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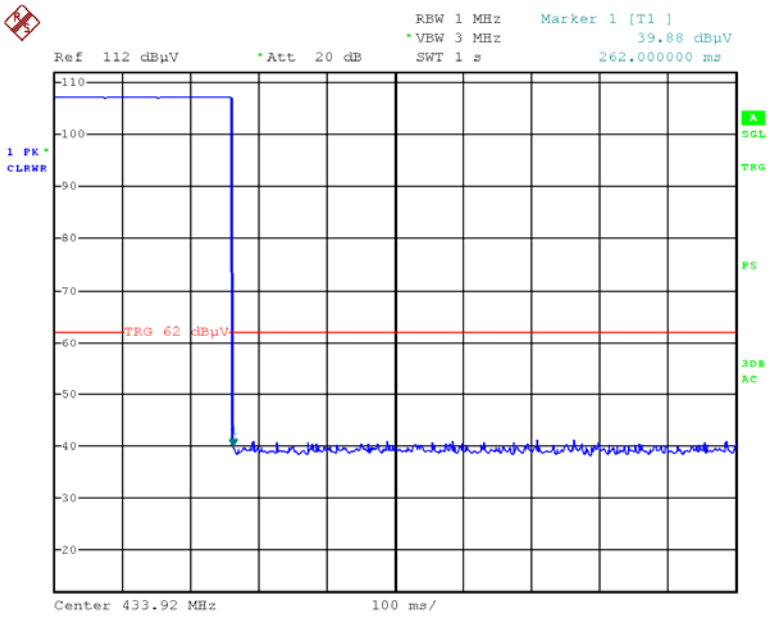

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