

FCC REPORT

Applicant: Green Start Industries LLC

Address of Applicant: 3305 Fairmount Ave Ocean NJ USA

Equipment Under Test (EUT)

Product Name: keyless transmitter

Model No.: 2AOVX-3B, 2AOVX-4BS, 2AOVX-4BG, 2AOVX-5B

FCC ID: 2AOVX-CH1

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.231(a)

Date of sample receipt: 31 Aug., 2018

Date of Test: 03 Sep., to 07 Sep., 2018

Date of report issue: 10 Sep., 2018

Test Result: PASS*

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Bruce Zhang
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the CCIS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

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2 Version

Version No.	Date	Description
00	10 Sep., 2018	Original

Prepared By: Zora Lee **Date:** 10 Sep., 2018
Test Engineer

Check By: Wimer Zhang **Date:** 10 Sep., 2018
Project Engineer

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4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
Field strength of the fundamental signal	15.231 (b)	Pass
Spurious emissions	15.231 (b)/15.209	Pass
20dB Bandwidth	15.231 (c)	Pass
Dwell time	15.231 (a1)	Pass
Conducted Emission	15.207	N/A
<p><i>Remarks:</i> <i>N/A: The EUT not applicable of the test item.</i> <i>Pass: The EUT complies with the essential requirements in the standard.</i> TEST ACCORDING TO ANSI C63.4:2014 AND ANSI C63.10:2013.</p>		

5 General Information

5.1 Client Information

Applicant:	Green Start Industries LLC
Address of Applicant:	3305 Fairmount Ave Ocean NJ USA
Manufacturer:	Green Start Industries LLC
Address of Manufacturer:	3305 Fairmount Ave Ocean NJ USA

5.2 General Description of E.U.T.

Product Name:	keyless transmitter
Model No.:	2AOVX-3B, 2AOVX-4BS, 2AOVX-4BG, 2AOVX-5B
Operation Frequency:	433.92MHz
Channel numbers:	1
Modulation type:	ASK
Antenna Type:	PCB antenna
Antenna gain:	0 dBi
Power supply:	DC 3V (CR2032 battery)
Remark:	All models 2AOVX-3B,2AOVX-4BS,2AOVX-4BG,2AOVX-5B are electrically identical , only enclosure and buttons are different , 2AOVX-3B have 3 buttons ,2AOVX-4BS and 2AOVX-4BG have 4 buttons ,2AOVX-5B have 5 buttons

5.3 Test mode

Transmitting mode:	Keep the EUT in transmitting mode with modulation (new battery used)		
Pre-Test Mode:			
CCIS has verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows:			
Axis	X	Y	Z
Field Strength(dBuV/m)	82.89	80.12	79.58
Final Test Mode:			
According to ANSI C63.4 standards, the test results are both the "worst case" and "worst setup": X axis (see the test setup photo)			

5.4 Description of Support Units

N/A

5.5 Laboratory Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **FCC - Registration No.: 727551**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been accredited as a testing laboratory by FCC (Federal Communications Commission). The Registration No. is 727551.

- **IC - Registration No.: 10106A-1**

The 3m Semi-anechoic chamber of Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

- **CNAS - Registration No.: CNAS L6048**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6048.

- **A2LA - Registration No.: 4346.01**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: <https://portal.a2la.org/scopepdf/4346-01.pdf>

5.6 Laboratory Location

Shenzhen Zhongjian Nanfang Testing Co., Ltd.
 Address: No. B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,
 Bao'an District, Shenzhen, Guangdong, China
 Tel: +86-755-23118282, Fax: +86-755-23116366
 Email: info@ccis-cb.com, Website: http://www.ccis-cb.com

5.7 Measurement Uncertainty

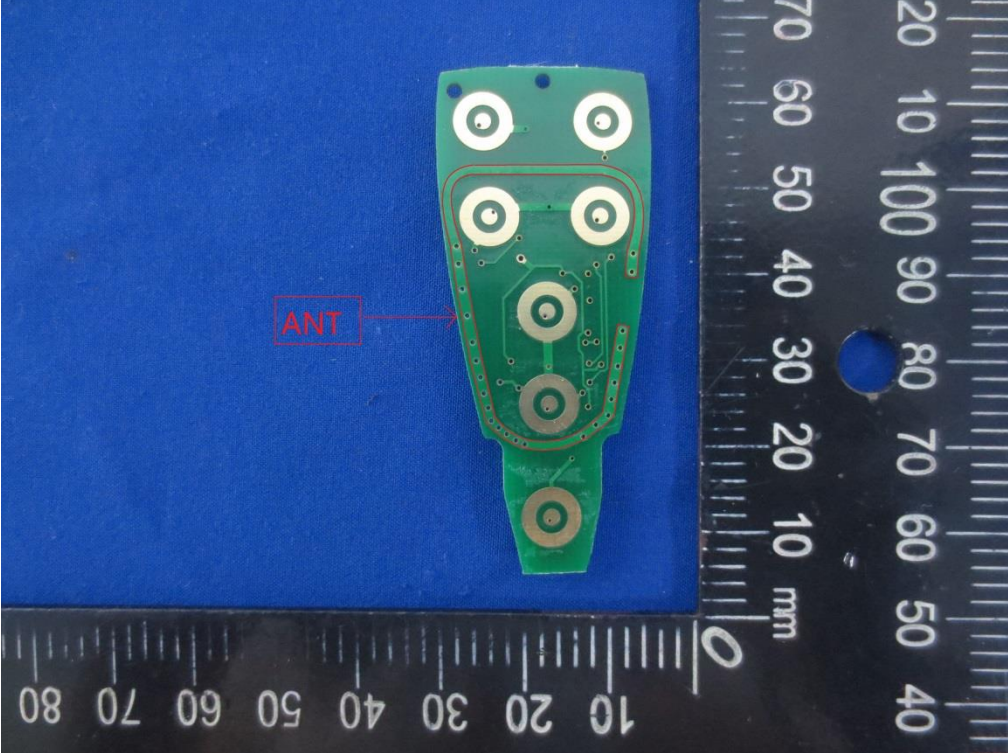
Parameters	Expanded Uncertainty
Conducted Emission (9kHz ~ 30MHz)	±2.22 dB (k=2)
Radiated Emission (9kHz ~ 30MHz)	±2.76 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	±4.28 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	±5.72 dB (k=2)
Radiated Emission (18GHz ~ 40GHz)	±2.88 dB (k=2)

5.8 Test Instruments list

Radiated Emission:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m SAC	SAEMC	9m*6m*6m	966	07-22-2017	07-21-2020
BiConiLog Antenna	SCHWARZBECK	VULB9163	497	03-16-2018	03-15-2019
Horn Antenna	SCHWARZBECK	BBHA9120D	916	03-16-2018	03-15-2019
Loop Antenna	SCHWARZBECK	FMZB 1519 B	00044	04-28-2018	04-27-2019
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170582	11-21-2017	11-20-2018
EMI Test Software	AUDIX	E3	Version: 6.110919b		
Pre-amplifier	HP	8447D	2944A09358	03-07-2018	03-06-2019
Pre-amplifier	CD	PAP-1G18	11804	03-07-2018	03-06-2019
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-07-2018	03-06-2019
Spectrum analyzer	Rohde & Schwarz	FSP40	100363	11-21-2017	11-20-2018
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-07-2018	03-06-2019
Simulated Station	Anritsu	MT8820C	6201026545	03-07-2018	03-06-2019
Cable	ZDECL	Z108-NJ-NJ-81	1608458	03-07-2018	03-06-2019
Cable	MICRO-COAX	MFR64639	K10742-5	03-07-2018	03-06-2019
Cable	SUHNER	SUCOFLEX100	58193/4PE	03-07-2018	03-06-2019

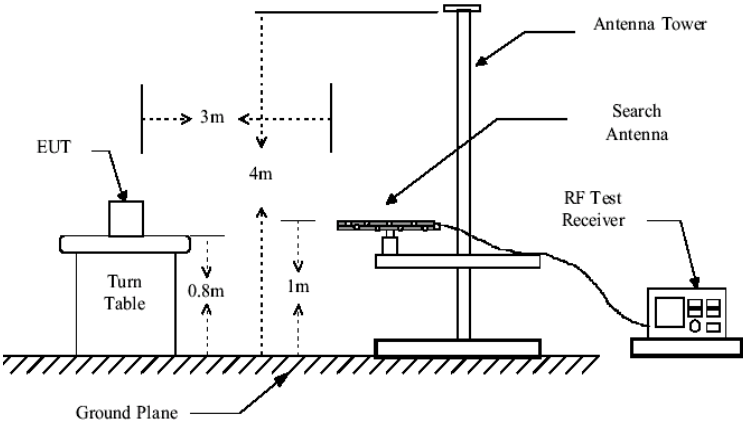
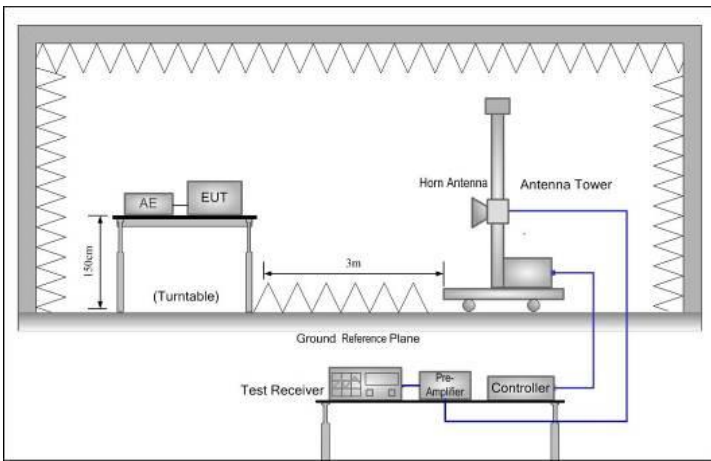
6 Test results and Measurement Data

6.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203
<p>15.203 requirement: 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p>	
E.U.T Antenna:	
<p>The EUT make use of an PCB antenna, The typical gain of the antenna is 0 dBi.</p>	
	

6.2 Radiated Emission

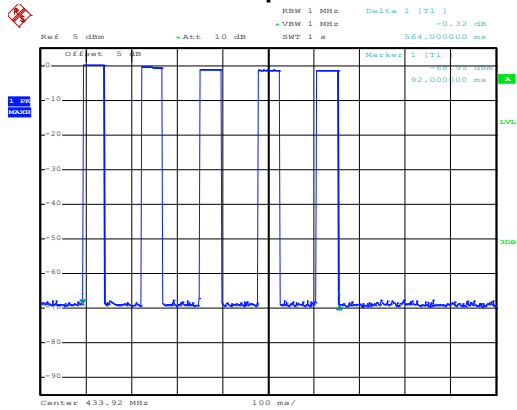
Test Requirement:	FCC Part15 C Section 15.231(b) and 15.209				
Test Method:	ANSI C63.4:2014 ; ANSI C63.10:2013				
Test Frequency Range:	30MHz to 5000MHz				
Test site:	Measurement Distance: 3m (Semi-Anechoic Chamber)				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
Limit: (Field strength of the fundamental signal)	Frequency	Limit (dBuV/m @3m)		Remark	
	433.92MHz	80.83		Average Value	
		100.83		Peak Value	
Limit: (Spurious Emissions)	Frequency	Limit (dBuV/m @3m)		Remark	
	30MHz-88MHz	40.0		Quasi-peak Value	
	88MHz-216MHz	43.5		Quasi-peak Value	
	216MHz-960MHz	46.0		Quasi-peak Value	
	960MHz-1GHz	54.0		Quasi-peak Value	
	Above 1GHz	54.0		Average Value	
		74.0		Peak Value	
Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits higher field strength.					
Test Procedure:	<p>a. The EUT was placed on the top of a rotating table 0.8m(below 1GHz) /1.5m(above 1GHz) above the ground at a 3 meter chamber. The table was rotated 360 degrees to determine the position of the highest radiation.</p> <p>b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</p> <p>c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</p> <p>d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.</p> <p>e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</p>				

<p>Test setup:</p>	<p>Below 1GHz</p>  <p>Above 1GHz</p> 
<p>Test Instruments:</p>	<p>Refer to section 5.7 for details</p>
<p>Test mode:</p>	<p>Refer to section 5.3 for details</p>
<p>Test results:</p>	<p>Pass</p>

6.2.1 Field Strength Of The Fundamental Signal

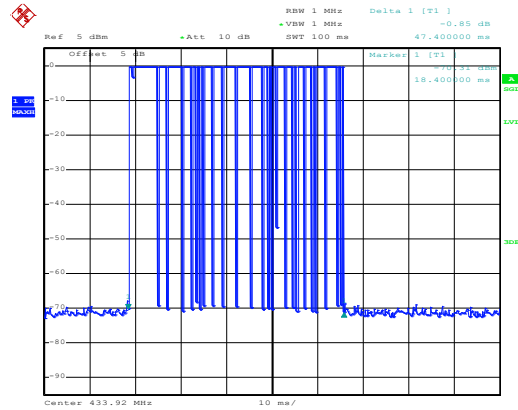
Peak value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.92	48.48	15.91	3.16	0.00	67.55	100.83	-33.28	Vertical
433.92	63.82	15.91	3.16	0.00	82.89	100.83	-17.94	Horizontal
Average value								
Frequency (MHz)	Level (dBuV/m)		Duty Cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	
433.92	67.55		-10.77	56.78	80.83	-24.05	Vertical	
433.92	82.89		-10.77	72.12	80.83	-8.71	Horizontal	
Calculate Formula:		Average value=Peak value + Duty Cycle Factor						
		Duty cycle factor = 20log(Duty cycle)						
		Duty cycle = on time/100 milliseconds or period, whichever is less						
Test data:		T on time =(24*0.48)(ms)+(67*0.26)(ms)=28.94(ms)						
		T period =47.4+(564-47.4X5)/3=129.15ms>100ms						
		Duty cycle =28.94%						
		Duty cycle factor = 20log(Duty cycle) = -10.77						

T period:



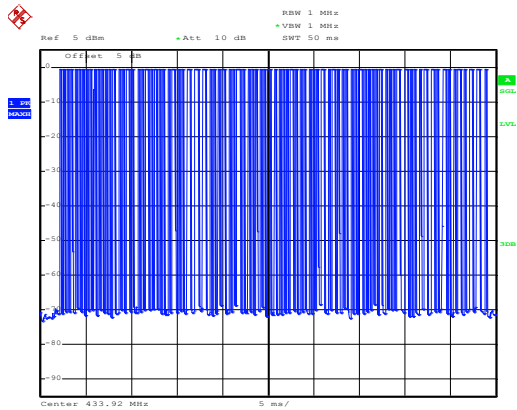
Date: 4.SEP.2018 13:45:09

T 100ms:



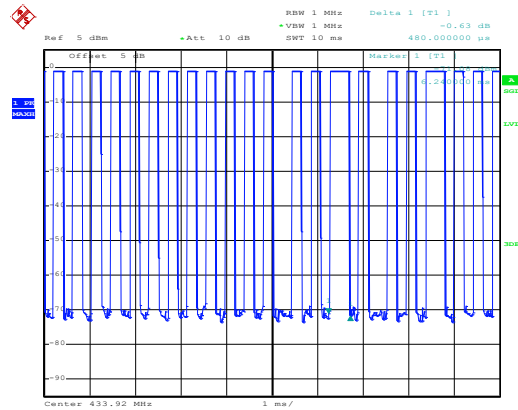
Date: 4.SEP.2018 13:46:05

T 62ms:



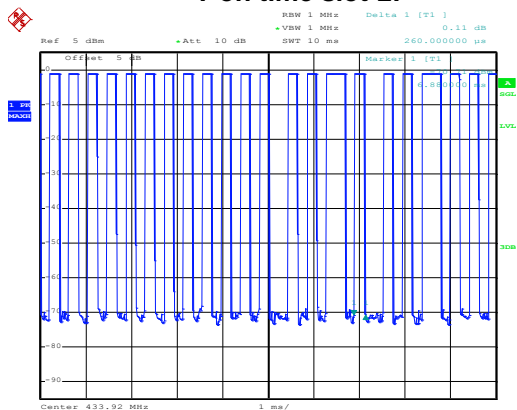
Date: 4.SEP.2018 13:46:34

T on time slot-1:



Date: 4.SEP.2018 13:49:26

T on time slot-2:

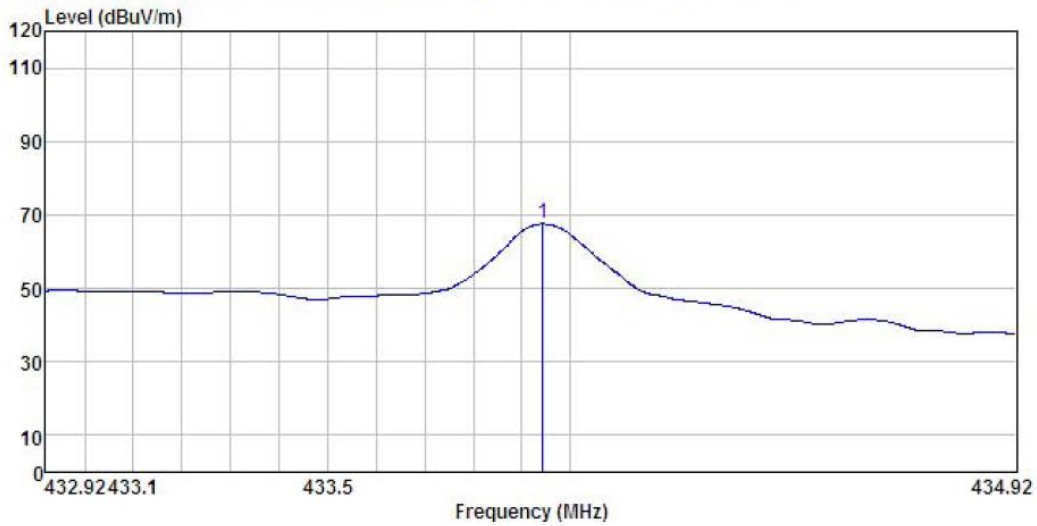


Date: 4.SEP.2018 13:49:57



Test Plots:

Product Name:	Keyless transmitter	Product Model:	2AOVX-3B
Test By:	Zora	Test mode:	Tx mode
Test Frequency:	433.92 MHz	Polarization:	Vertical
Test Voltage:	DC 3V	Environment:	Temp: 24°C Huni: 57%



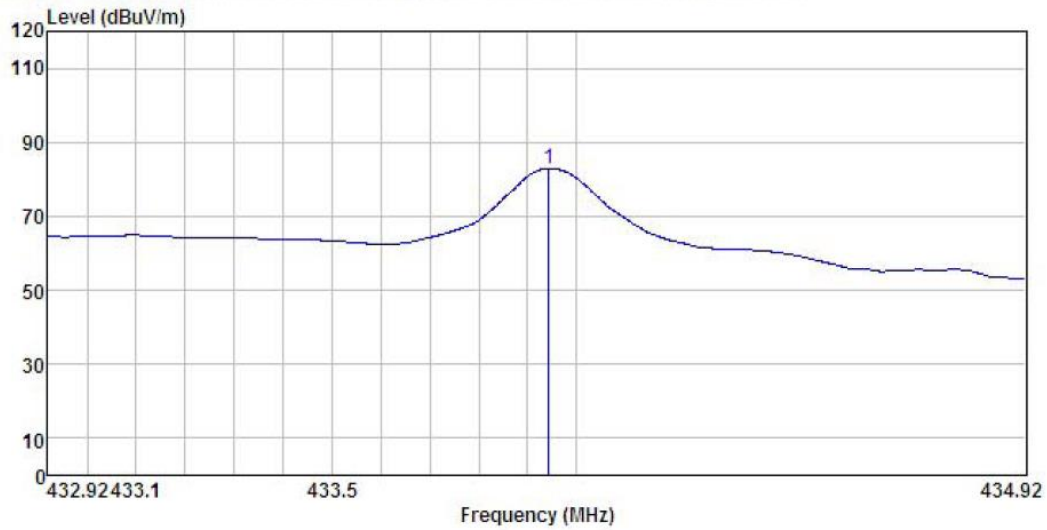
Remark : X

1	433.943	48.48	15.91	3.16	0.00	67.55	-----	-----
Remark	Level	Antenna Factor	Cable Loss	Preamp Gain	Level	Limit	Over Limit	Remark
	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.

Product Name:	Keyless transmitter	Product Model:	2AOVX-3B
Test By:	Zora	Test mode:	Tx mode
Test Frequency:	433.92 MHz	Polarization:	Horizontal
Test Voltage:	DC 3V	Environment:	Temp: 24°C Huni: 57%



Remark : X

Remark	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	433.943	63.82	15.91	3.16	0.00	82.89	-----	-----	

Remark:

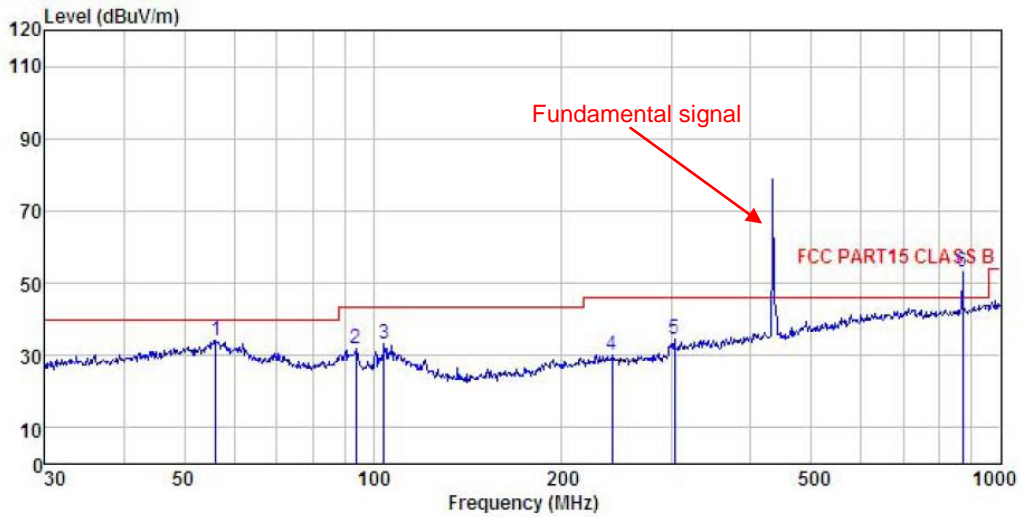
1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.

6.2.2 Spurious Emissions

Below 1GHz (30MHz-1000MHz)								
Peak value								
Frequency (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
869.13	27.27	21.69	4.01	0.00	52.97	80.83	-27.86	Vertical
869.13	37.15	21.69	4.01	0.00	62.85	80.83	-17.98	Horizontal
Average value								
Frequency (MHz)	Level (dBuV/m)	Duty cycle factor	Average value (dBuV/m)		Limit Line (dBuV/m)	Over Limit (dB)	Polarization	
869.13	52.97	-10.77	42.20		60.83	-18.63	Vertical	
869.13	62.85	-10.77	52.08		60.83	-8.75	Horizontal	
<i>Remark: Average value=Peak value + Duty Cycle Factor.</i>								

Test Plots:

Product Name:	Keyless transmitter	Product Model:	2AOVX-3B
Test By:	Zora	Test mode:	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical
Test Voltage:	DC 3V	Environment:	Temp: 24°C Humi: 57%



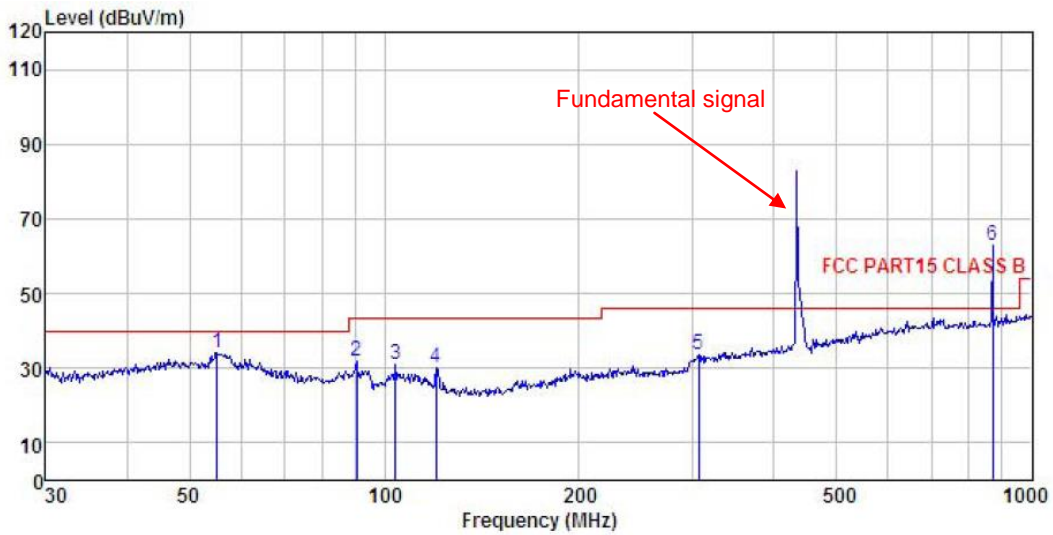
Remark :

	Read	Antenna	Cable	Preamp	Limit	Over	
Freq	Level	Factor	Loss	Factor	Level	Line	Limit Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	56.197	19.84	13.01	1.36	0.00	34.21	40.00 -5.79 QP
2	93.768	19.41	10.66	2.02	0.00	32.09	43.50 -11.41 QP
3	104.170	19.22	11.96	1.99	0.00	33.17	43.50 -10.33 QP
4	239.987	14.29	12.97	2.82	0.00	30.08	46.00 -15.92 QP
5	302.481	18.02	13.65	2.95	0.00	34.62	46.00 -11.38 QP
6 *	869.130	27.27	21.69	4.01	0.00	52.97	Peak

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product Name:	Keyless transmitter	Product Model:	2AOVX-3B
Test By:	Zora	Test mode:	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Horizontal
Test Voltage:	DC 3V	Environment:	Temp: 24°C Huni: 57%



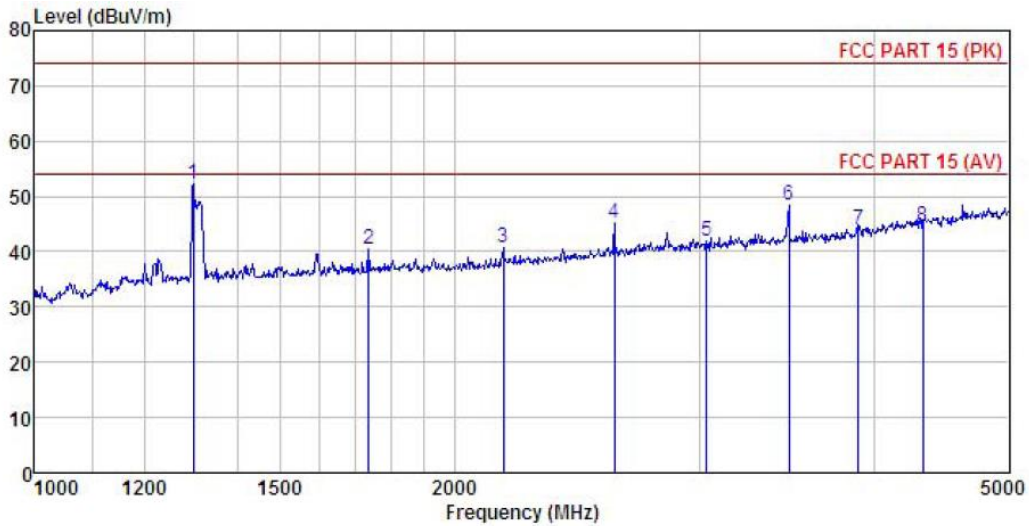
Remark :

	Read	Antenna	Cable	Preamp	Limit	Over	
Freq	Level	Factor	Loss	Factor	Line	Limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	55.221	19.76	13.17	1.36	0.00	34.29	40.00 -5.71 QP
2	90.537	19.97	10.10	2.03	0.00	32.10	43.50 -11.40 QP
3	104.170	17.12	11.96	1.99	0.00	31.07	43.50 -12.43 QP
4	120.277	17.61	10.16	2.17	0.00	29.94	43.50 -13.56 QP
5	305.680	17.18	13.72	2.96	0.00	33.86	46.00 -12.14 QP
6 *	869.130	37.15	21.69	4.01	0.00	62.85	Peak

Remark:

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.
- The emission levels of other frequencies are very lower than the limit and not show in test report.

Product Name:	Keyless transmitter	Product Model:	2AOVX-3B
Test By:	Zora	Test mode:	Tx mode
Test Frequency:	1 GHz ~ 5 GHz	Polarization:	Vertical
Test Voltage:	DC 3V	Environment:	Temp: 24°C Huni: 57%



Remark :

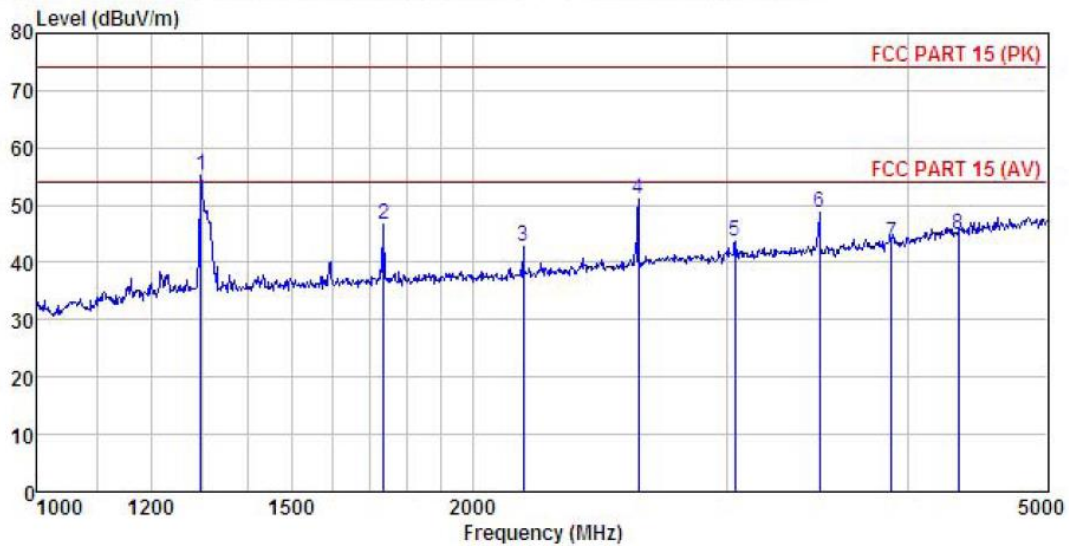
	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over	
	MHz	dBuV	Loss	Factor	dBuV/m	dBuV/m	Limit	Remark
		dB/m	dB	dB			dB	
1	1299.966	62.62	24.64	3.47	41.04	52.11	74.00	-21.89 Peak
2	1736.788	49.41	25.81	4.03	41.15	40.43	74.00	-33.57 Peak
3	2168.725	48.55	26.84	4.48	41.68	40.86	74.00	-33.14 Peak
4	2605.477	51.46	27.83	4.95	41.88	45.22	74.00	-28.78 Peak
5	3035.913	46.54	28.62	5.36	41.49	41.94	74.00	-32.06 Peak
6	3475.384	52.12	28.89	5.73	41.43	48.27	74.00	-25.73 Peak
7	3902.372	46.65	29.96	6.10	41.80	43.90	74.00	-30.10 Peak
8	4339.709	45.64	30.82	6.62	41.92	44.62	74.00	-29.38 Peak

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Note: Average value=Peak value + Duty Cycle Factor.
Worse AV value = 52.11-10.77=41.34dBUV/m< AV limit 60.83dBUV/m

Product Name:	Keyless transmitter	Product Model:	2AOVX-3B
Test By:	Zora	Test mode:	Tx mode
Test Frequency:	1 GHz ~ 5 GHz	Polarization:	Horizontal
Test Voltage:	DC 3V	Environment:	Temp: 24°C Huni: 57%



Remark :

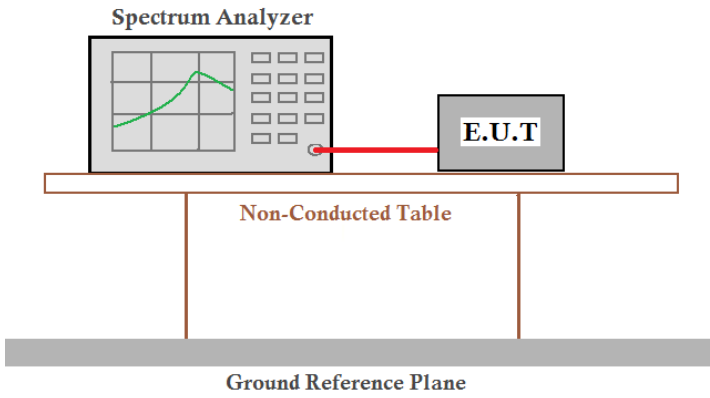
	Read	Antenna	Cable	Preamp	Limit	Over	
Freq	Level	Factor	Loss	Factor	Line	Limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	1297.876	65.75	24.63	3.46	41.04	55.22	74.00 -18.78 Peak
2	1736.788	55.72	25.81	4.03	41.15	46.74	74.00 -27.26 Peak
3	2168.725	50.55	26.84	4.48	41.68	42.86	74.00 -31.14 Peak
4	2605.477	57.17	27.83	4.95	41.88	50.93	74.00 -23.07 Peak
5	3040.803	48.13	28.63	5.37	41.49	43.55	74.00 -30.45 Peak
6	3475.384	52.58	28.89	5.73	41.43	48.73	74.00 -25.27 Peak
7	3902.372	46.20	29.96	6.10	41.80	43.45	74.00 -30.55 Peak
8	4339.709	45.91	30.82	6.62	41.92	44.89	74.00 -29.11 Peak

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Note: Average value=Peak value + Duty Cycle Factor.
Worse AV value = 55.22-10.77=44.45dBuV/m < AV limit 60.83dBuV/m

6.3 20dB Bandwidth

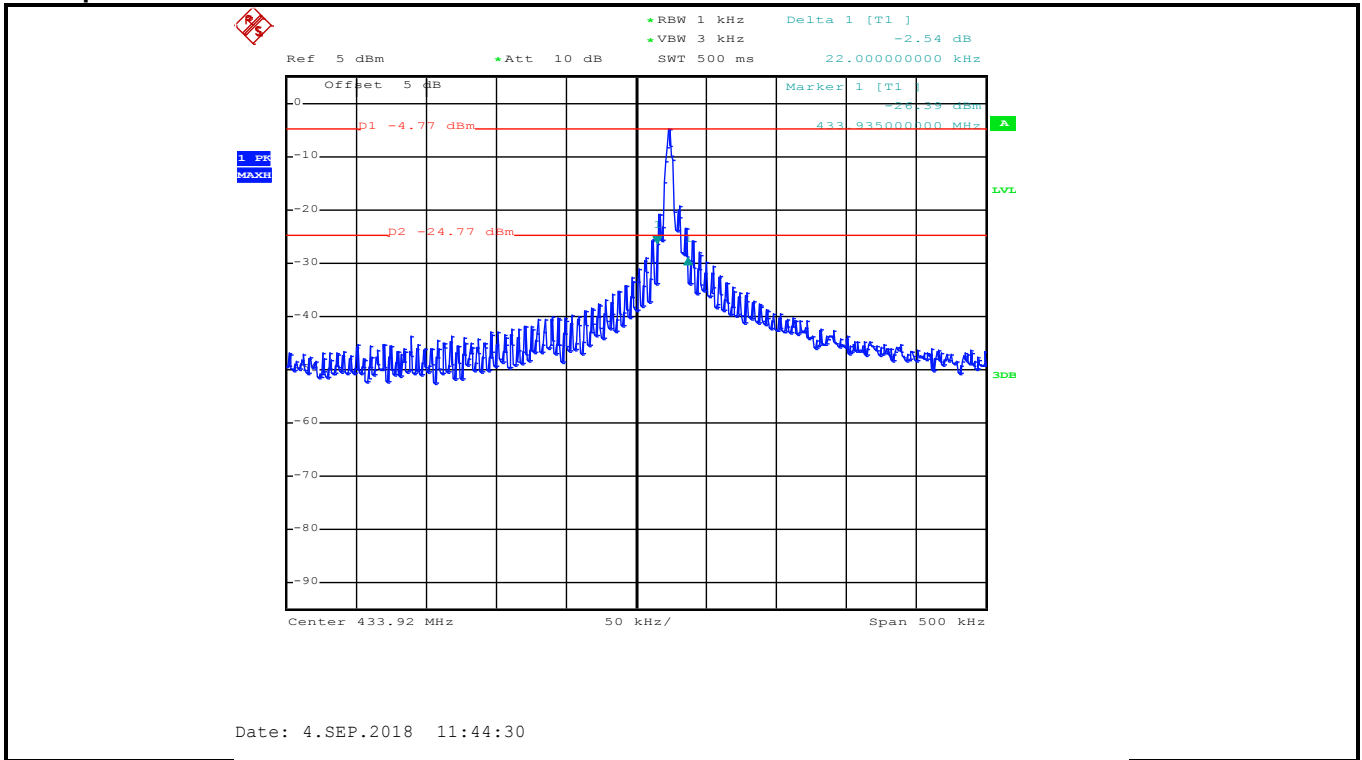
Test Requirement:	FCC Part15 C Section 15.231 (c)
Test Method:	ANSI C63.4:2014
Receiver setup:	RBW=1kHz, VBW=3kHz, detector: Peak
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.
Test Procedure:	<ol style="list-style-type: none"> 1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. 2. Set the EUT to proper test channel. 3. Max hold the radiated emissions, mark the peak power frequency point and the -20dB upper and lower frequency points. 4. Read 20dB bandwidth.
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.7 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data

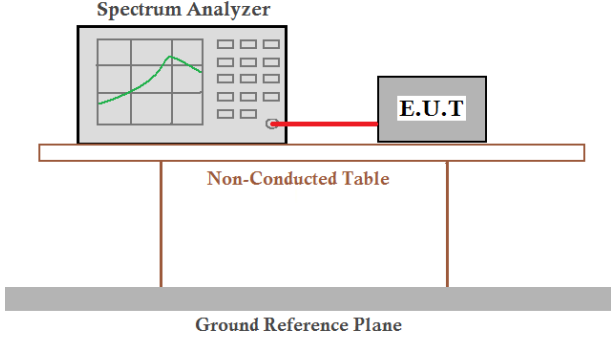
20dB bandwidth (MHz)	Limit (MHz)	Results
0.022	1.0848	Passed

Note: Limit= Fundamental frequency×0.25%=433.92×0.25%=1.0848MHz

Test plot as follows:



6.4 Duration Time

Test Requirement:	FCC Part15 C Section 15.231 (a1)
Test Method:	ANSI C63.10: 2013
Receiver setup:	RBW=1MHz, VBW=1MHz, Span=0Hz, Detector: Peak
Limit:	Not more than 5 seconds
Test mode:	Transmitting mode
Test Procedure:	<ol style="list-style-type: none"> 1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. 2. Set the EUT to proper test channel. 3. Single scan the transmission, and read the transmission time.
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data

Duration time (second)	Limit (second)	Result
0.592	<5.0	Pass

Test plot as follows:

