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-5B
FCC ID:	2AOVX-VL1
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.231(a)
Date of sample receipt:	13 Jul., 2018
Date of Test:	13 Jul., to 20 Jul., 2018
Date of report issue:	23 Jul., 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	*23 Jul., 2018*	*Original*

Prepared By: Carey Chen ***Date:*** *23 Jul., 2018*

Test Engineer

Check By: Winner Zhang ***Date:*** *23 Jul., 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

Remarks:
N/A: The EUT not applicable of the test item.
Pass: The EUT complies with the essential requirements in the standard.
TEST ACCORDING TO ANSI C63.4:2014 AND ANSI C63.10:2013.

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-5B
Operation Frequency:	315MHz
Channel numbers:	1
Modulation type:	ASK
Antenna Type:	PCB antenna
Antenna gain:	0 dBi
Power supply:	DC 3V (CR2032 battery)

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)	73.36	72.14	71.69
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)

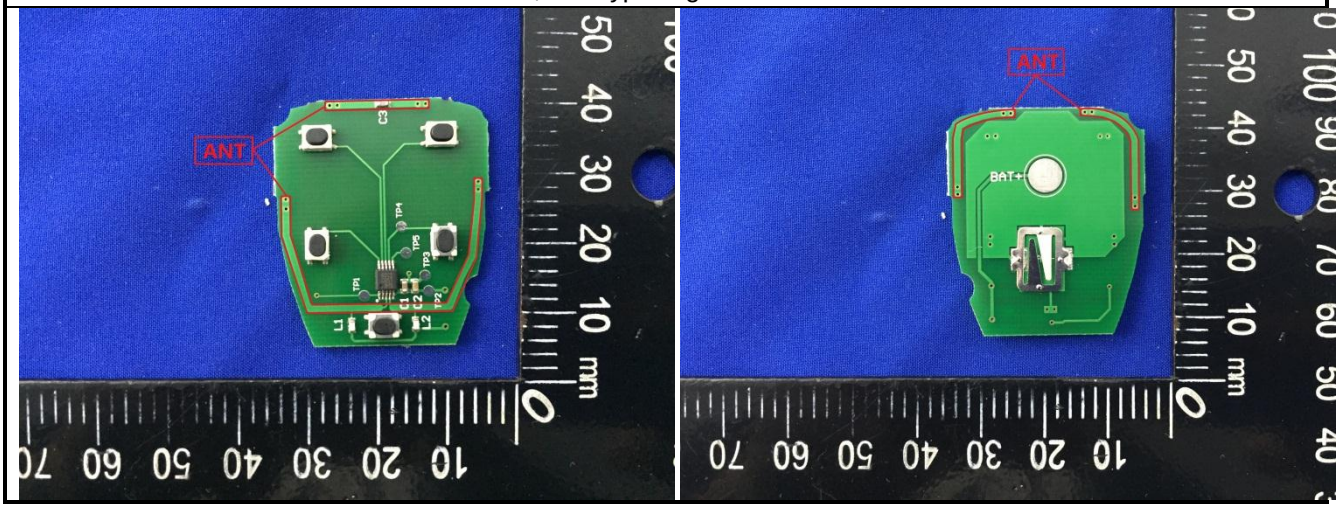
5.8 Test Instruments list

Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
EMI Test Receiver	Rohde & Schwarz	ESCI	CCIS0002	03-07-2018	03-06-2019
BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	CCIS0005	03-07-2018	03-06-2019
Double-ridged waveguide horn antenna	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	CCIS0006	03-07-2018	03-06-2019
Amplifier (10kHz-1.3GHz)	HP	8447D	CCIS0003	03-07-2018	03-06-2019
Amplifier (1GHz-18GHz)	Compliance Direction Systems Inc.	PAP-1G18	CCIS0011	03-07-2018	03-06-2019
Spectrum analyzer	Rohde & Schwarz	FSP	CCIS0023	03-07-2018	03-06-2019

6 Test results and Measurement Data

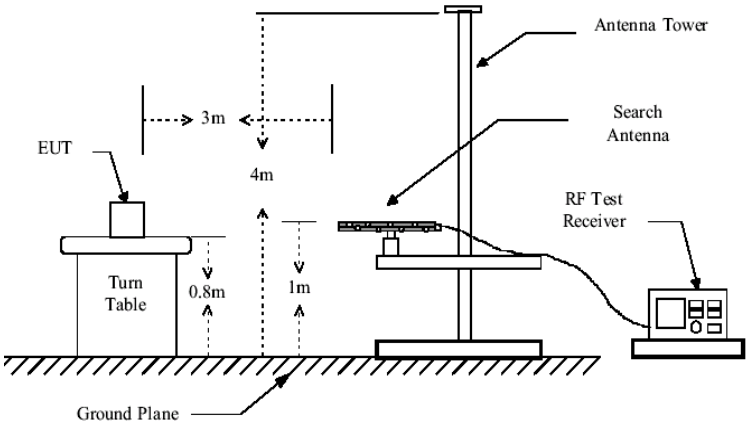
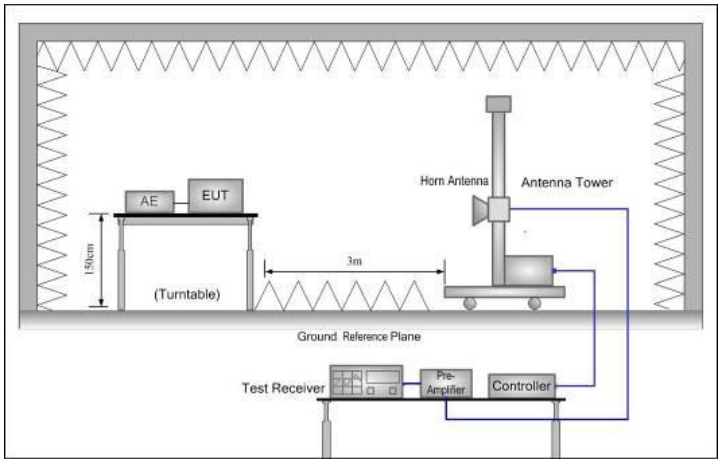
6.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203
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.	
E.U.T Antenna:	
The EUT make use of a PCB antenna, The typical gain of the antenna is 0dBi.	



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 315MHz / 75.62 / Average Value 315MHz / 95.62 / 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 Above 1GHz / 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:	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. 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. 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. 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. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 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.

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

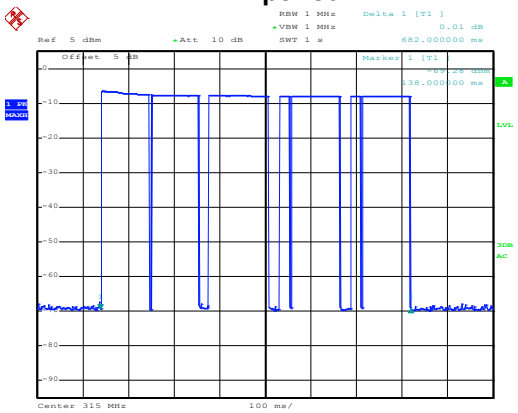
6.2.1 Field Strength Of The Fundamental Signal

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
315.00	45.58	13.92	2.99	0.00	62.49	95.62	-33.13	Vertical
315.00	56.45	13.92	2.99	0.00	73.36	95.62	-22.26	Horizontal

Average value						
Frequency (MHz)	Level (dBuV/m)	Duty Cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
315.00	62.49	-5.83	56.66	75.62	-18.96	Vertical
315.00	73.36	-5.83	67.53	75.62	-8.09	Horizontal

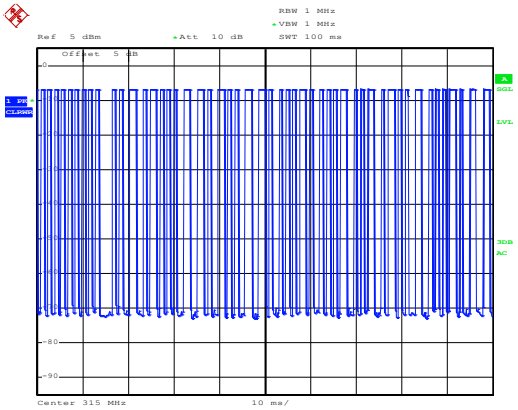
Calculate Formula:	Average value=Peak value + Duty Cycle Factor
	Duty cycle factor = 20log(Duty cycle)
	Duty cycle = on time/100 milliseconds or period, whichever is less
Test data:	T on time =(15*1.54)(ms) +(35*0.8)(ms) =51.10(ms)
	T period =682(ms)>100(ms)
	Duty cycle =51.10%
	Duty cycle factor = 20log(Duty cycle) = -5.83

T period:



Date: 18.JUL.2018 17:44:20

T 100ms:



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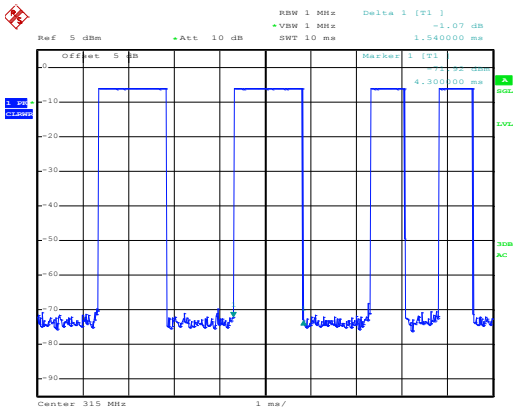

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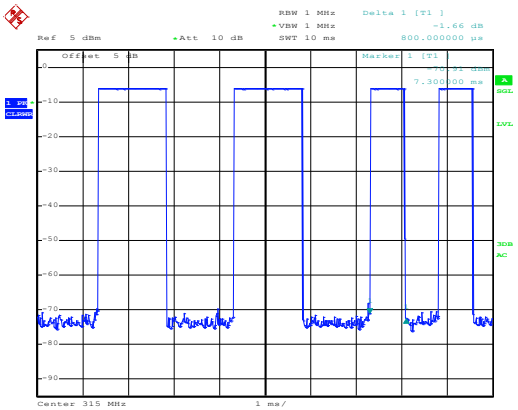
T on time slot-2:



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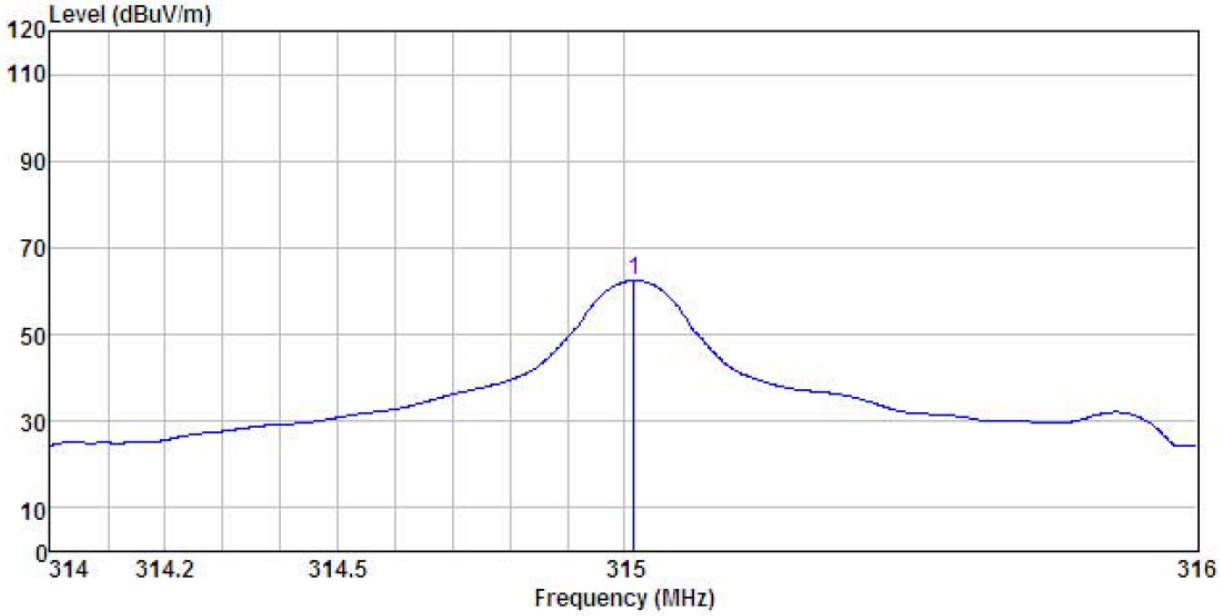
Test Plots:

Test Frequency:	315MHz	**Polarization:**	Vertical



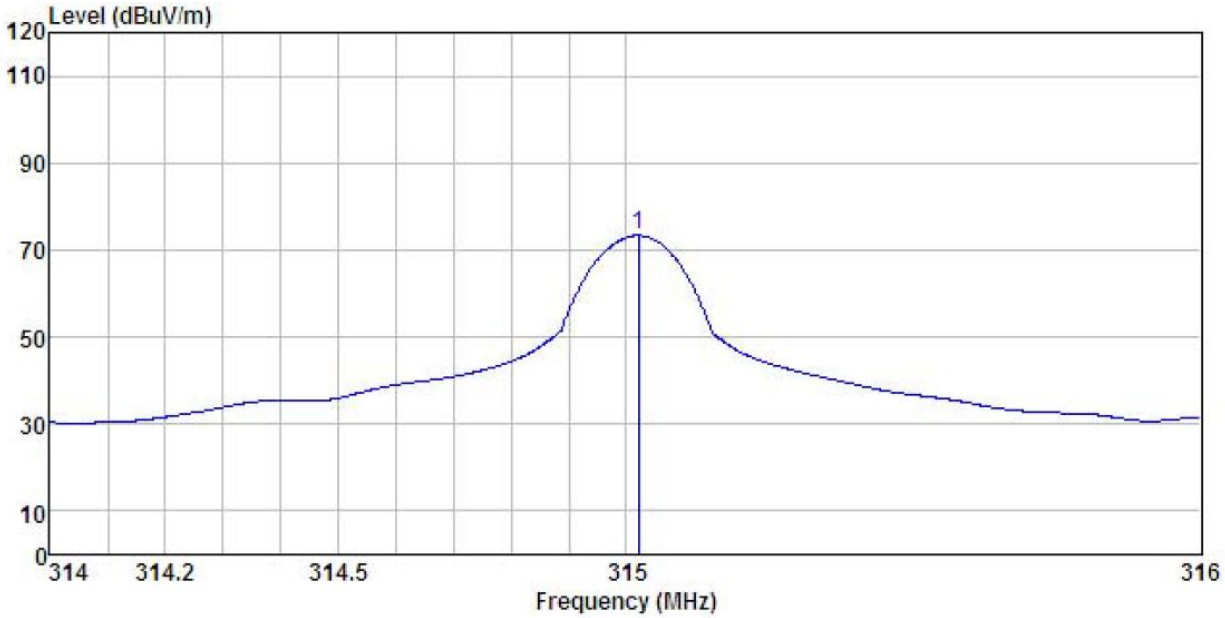

```
Site          : 3m chamber
Condition     : 3m VULB9163(30M2G) VERTICAL
EUT           : keyless transmitter
Model         : 2AOVX-5B
Test mode     : TX mode
Power Rating  : DC 3V
Environment   : Temp:25.5'C  Huni:55%
Test Engineer: Carey
Remark        : X
                  ReadAntenna  Cable Preamp         Limit   Over
          Freq  Level Factor   Loss Factor  Level   Line  Limit Remark
     --------- ------ ------ ------ ------ ------ ------ ------ ----------
           MHz   dBuV   dB/m     dB     dB dBuV/m dBuV/m     dB

  1    315.016  45.58  13.92   2.99   0.00  62.49 ------ ------
```

Remark:

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

Test Frequency:	315MHz	Polarization:	Horizontal




```
Site          : 3m chamber
Condition     : 3m VULB9163(30M2G) HORIZONTAL
EUT           : keyless transmitter
Model         : 2AOVX-5B
Test mode     : TX mode
Power Rating  : DC 3V
Environment   : Temp:25.5℃  Huni:55%
Test Engineer: Carey
Remark        : X
                 ReadAntenna  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     315.020  56.45  13.92   2.99   0.00  73.36 ------ ------
```

Remark:

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

6.2.2 Spurious Emissions

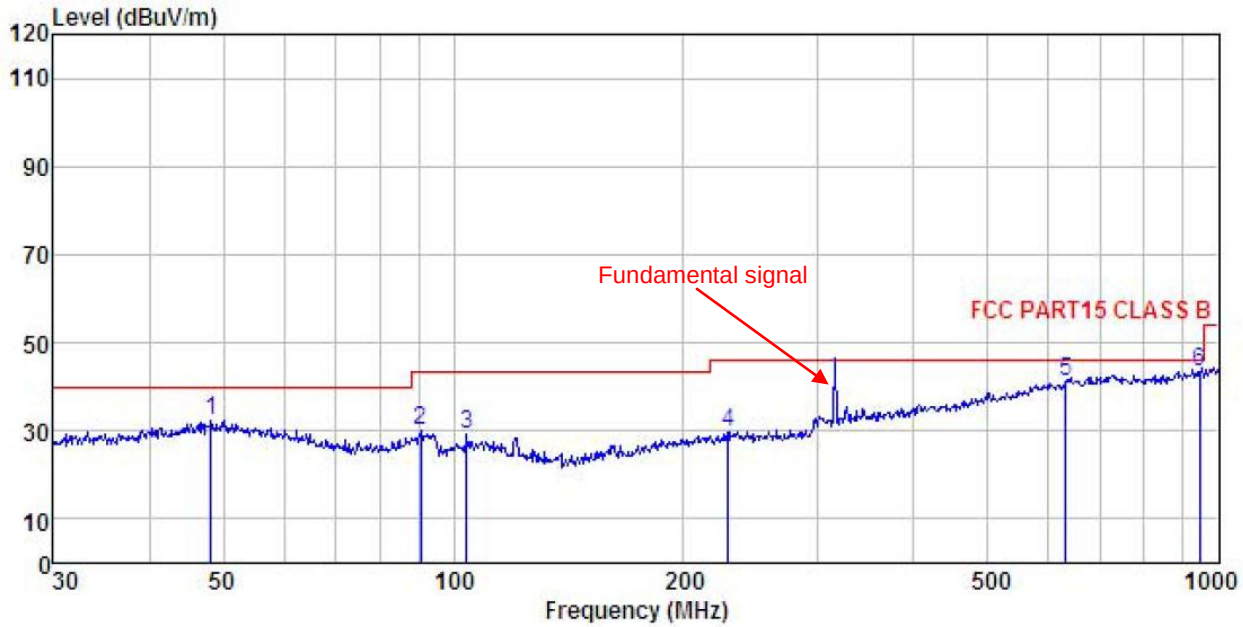
Below 1GHz (30MHz-1000MHz)								
Peak value								
Frequency (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
631.688	17.89	19.59	3.89	0.00	41.37	75.62	-34.25	Vertical
945.44	16.71	22.39	4.16	0.00	43.26	75.62	-32.36	Vertical
631.688	17.67	19.59	3.89	0.00	41.15	75.62	-34.47	Horizontal
945.44	16.23	22.39	4.16	0.00	42.78	75.62	-32.84	Horizontal

Average value						
Frequency (MHz)	Level (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
631.688	41.37	-5.83	35.54	55.62	-20.08	Vertical
945.44	43.26	-5.83	37.43	55.62	-18.19	Vertical
631.688	41.15	-5.83	35.32	55.62	-20.30	Horizontal
945.44	42.78	-5.83	36.95	55.62	-18.67	Horizontal

Remark: Average value=Peak value + Duty Cycle Factor.

Test Plots:

Test Frequency:	30 MHz - 1 GHz	**Polarization:**	Vertical



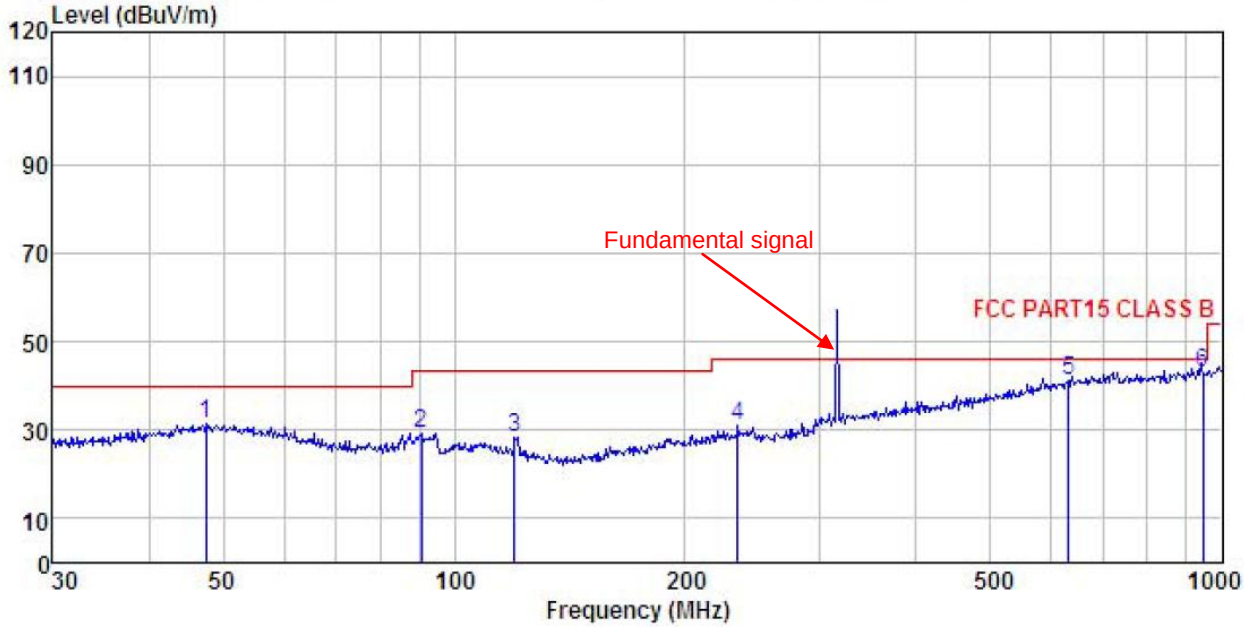
Site : 3m chamber
Condition : FCC PART15 CLASS B 3m VULB9163(30M2G) VERTICAL
EUT : keyless transmitter
Model : 2AOVX-5B
Test mode : TX mode
Power Rating : DC 3V
Environment : Temp:25.5℃ Huni:55%
Test Engineer: Carey
Remark :

	Freq	ReadLevel	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	48.163	17.19	13.96	1.27	0.00	32.42	40.00	-7.58	QP
2	90.537	18.00	10.10	2.03	0.00	30.13	43.50	-13.37	QP
3	104.170	15.14	11.96	1.99	0.00	29.09	43.50	-14.41	QP
4	228.490	14.27	12.57	2.84	0.00	29.68	46.00	-16.32	QP
5	631.688	17.89	19.59	3.89	0.00	41.37	46.00	-4.63	Peak
6	945.440	16.71	22.39	4.16	0.00	43.26	46.00	-2.74	Peak

Remark:

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

Test Frequency:	30 MHz - 1 GHz	Polarization:	Horizontal



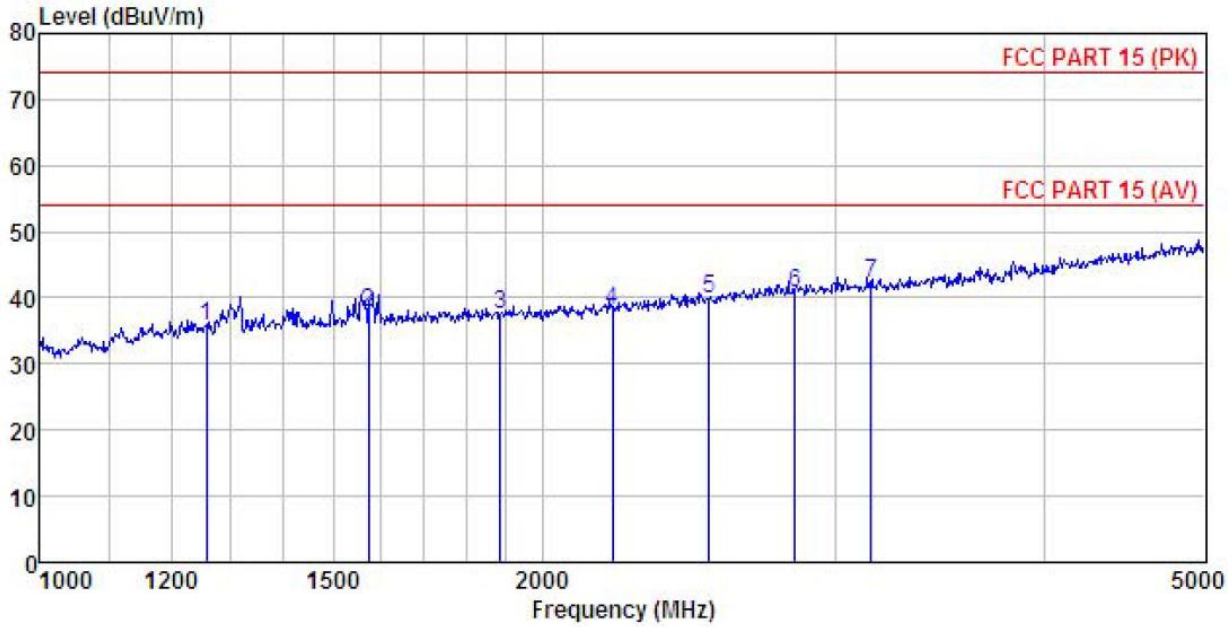
Site : 3m chamber
Condition : FCC PART15 CLASS B 3m VULB9163(30M2G) HORIZONTAL
EUT : keyless transmitter
Model : 2AOVX-5B
Test mode : TX mode
Power Rating : DC 3V
Environment : Temp:25.5℃ Huni:55%
Test Engineer: Carey
Remark :

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	47.492	16.34	13.90	1.27	0.00	31.51	40.00	-8.49	QP
2	90.537	17.20	10.10	2.03	0.00	29.33	43.50	-14.17	QP
3	119.856	15.91	10.23	2.17	0.00	28.31	43.50	-15.19	QP
4	234.168	15.57	12.77	2.83	0.00	31.17	46.00	-14.83	QP
5	631.688	17.67	19.59	3.89	0.00	41.15	46.00	-4.85	Peak
6	945.440	16.23	22.39	4.16	0.00	42.78	46.00	-3.22	Peak

Remark:

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

Test Frequency:	1 GHz – 5 GHz	Polarization:	Vertical



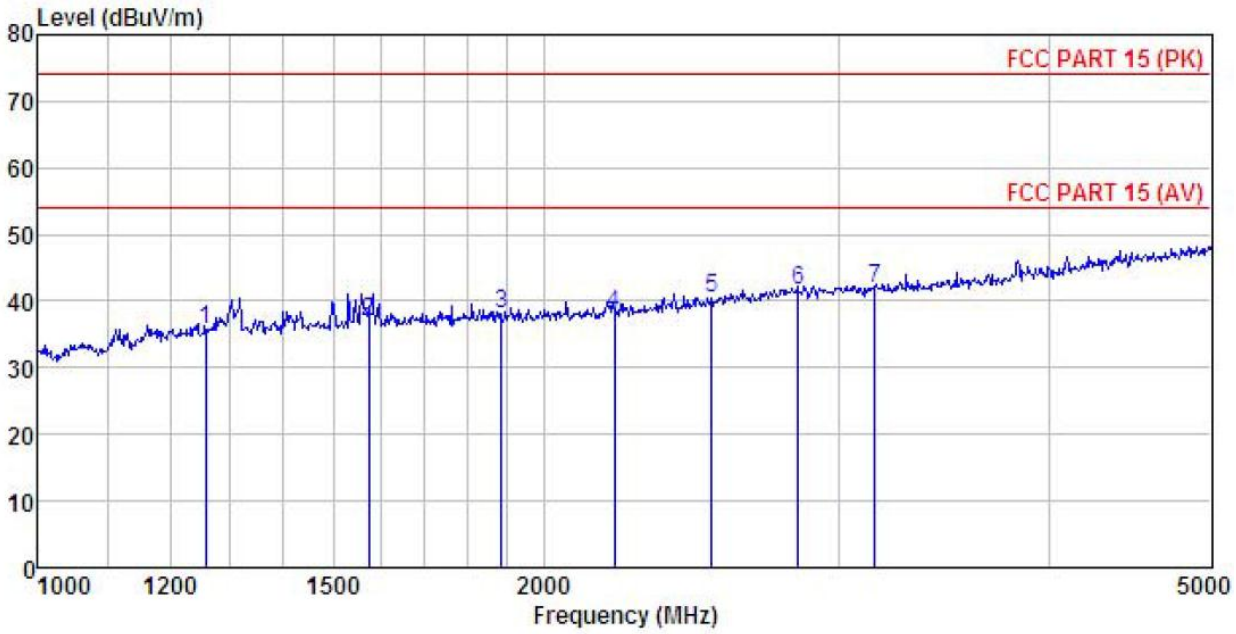
Site : 3m chamber
Condition : FCC PART 15 (PK) 3m BBHA9120(1G18G) VERTICAL
EUT : keyless transmitter
Model : 2AOVX-5B
Test mode : TX mode
Power Rating : DC 3V
Environment : Temp:25.5℃ Huni:55%
Test Engineer: Carey
Remark :

	Freq	ReadLevel	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1258.788	46.39	24.51	3.41	41.05	35.71	74.00	-38.29	Peak
2	1574.380	47.45	25.40	3.82	41.03	37.86	74.00	-36.14	Peak
3	1888.396	45.95	26.16	4.22	41.41	37.38	74.00	-36.62	Peak
4	2203.912	45.60	26.93	4.50	41.68	38.05	74.00	-35.95	Peak
5	2518.887	46.33	27.65	4.85	41.90	39.78	74.00	-34.22	Peak
6	2837.478	45.98	28.30	5.18	41.63	40.72	74.00	-33.28	Peak
7	3150.399	46.53	28.70	5.40	41.43	42.12	74.00	-31.88	Peak

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *Average value=Peak value + Duty Cycle Factor = 42.12(dBuV/m) +(-5.83) = 36.29(dBuV/m), the worst case of data.*

Test Frequency:	1 GHz – 5 GHz	Polarization:	Horizontal



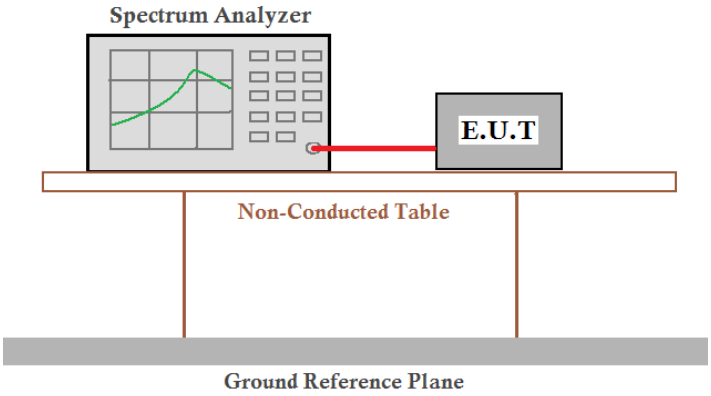
Site : 3m chamber
Condition : FCC PART 15 (PK) 3m BBHA9120(1G18G) HORIZONTAL
EUT : keyless transmitter
Model : 2AOVX-5B
Test mode : TX mode
Power Rating : DC 3V
Environment : Temp:25.5℃ Huni:55%
Test Engineer: Carey
Remark :

	Freq	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1258.788	46.30	24.51	3.41	41.05	35.62	74.00	-38.38	Peak
2	1574.380	46.50	25.40	3.82	41.03	36.91	74.00	-37.09	Peak
3	1888.396	46.77	26.16	4.22	41.41	38.20	74.00	-35.80	Peak
4	2203.912	45.68	26.93	4.50	41.68	38.13	74.00	-35.87	Peak
5	2518.887	47.02	27.65	4.85	41.90	40.47	74.00	-33.53	Peak
6	2837.478	47.00	28.30	5.18	41.63	41.74	74.00	-32.26	Peak
7	3150.399	46.44	28.70	5.40	41.43	42.03	74.00	-31.97	Peak

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *Average value=Peak value + Duty Cycle Factor = 42.03(dBuV/m) +(-5.83) = 36.20(dBuV/m), the worst case of data.*

6.3 20dB Bandwidth

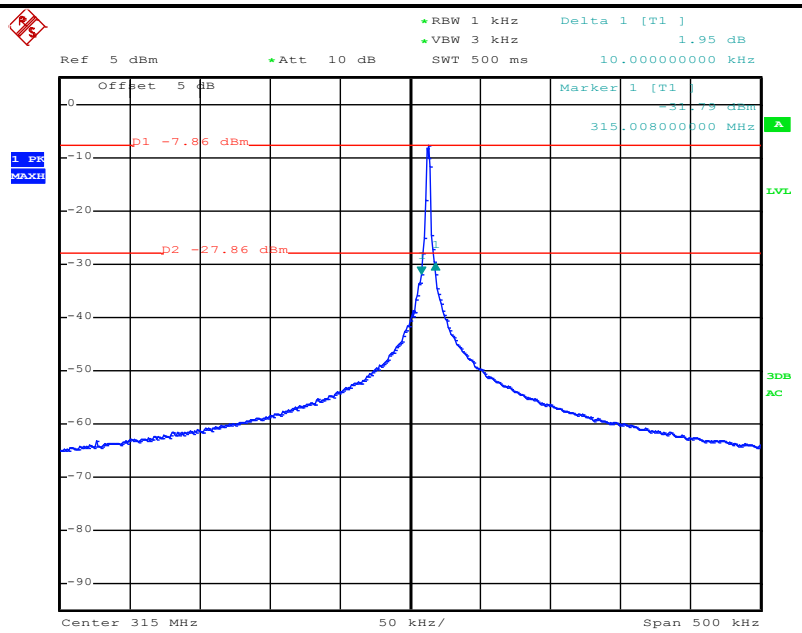
Test Requirement:	FCC Part15 C Section 15.231 (c)
Test Method:	ANSI C63.4:2014
Receiver setup:	RBW=1kHz, VBW=3kHz, detector: Peak
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 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:	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:	
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
0.010	0.7875	Passed

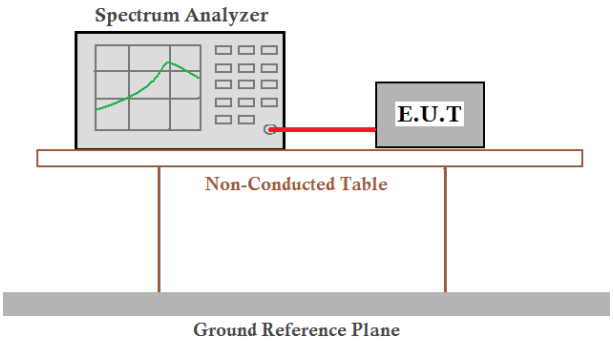
Note: Limit= Fundamental frequency×0.25%=315×0.25%=0.7875MHz

Test plot as follows:

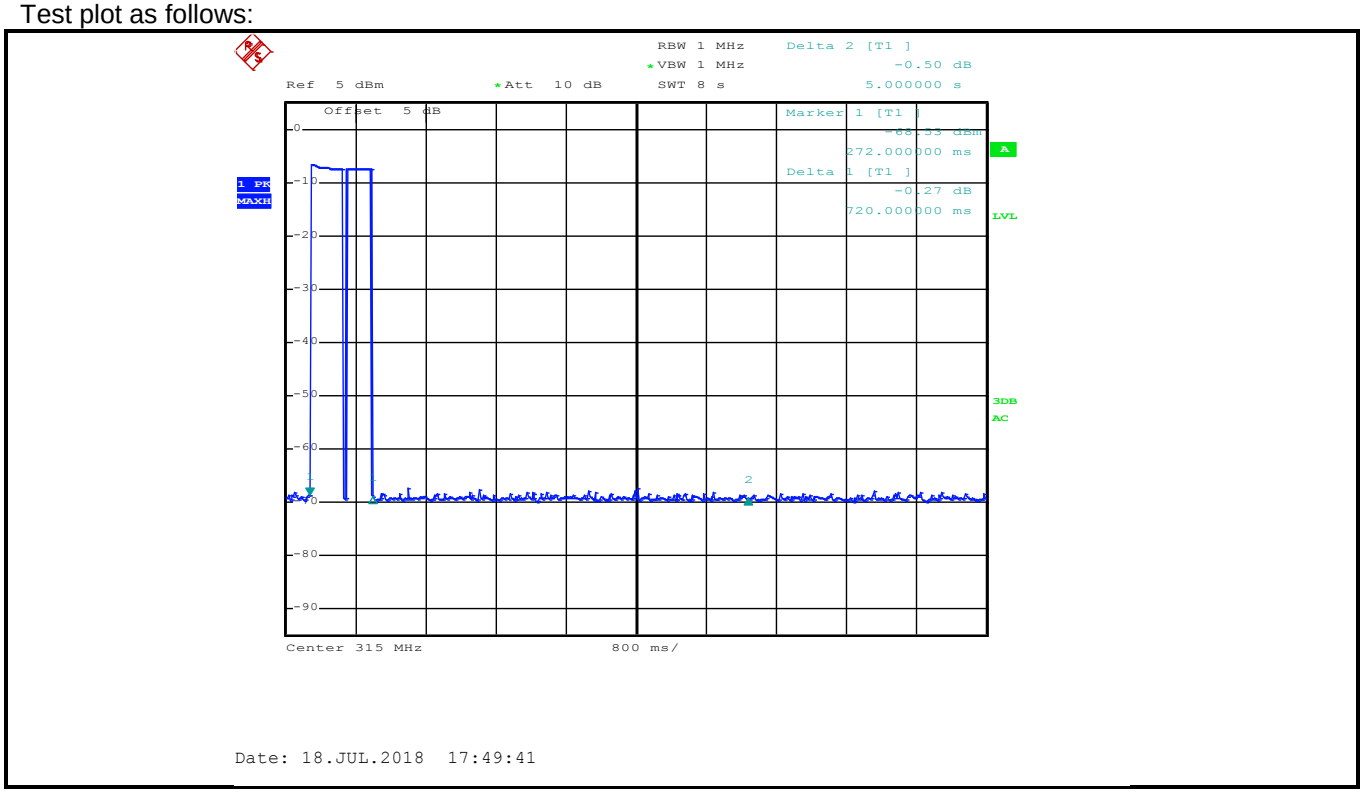


Date: 18.JUL.2018 09:26:21

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:	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:	
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
0.720	<5.0	Pass

Test plot as follows: