FCC PART 15 SUBPART C MEASURMENT AND TEST REPORT

For

Max-plus Co.,Ltd

Pingnan Industry Zone, Sanxiang Town, Zhongshan City, Guangdong Province, China

E.U.T.: RF Remote Control(10 Key)

Model Name: LL-REMOTE

Brand Name: NIGHT STARS

FCC ID: 2AB96LL-REMOTE

Report Number: NTC1506105F

Test Date(s): June 16, 2015 to July 15, 2015

Report Date(s): July 15, 2015

Prepared by

Dongguan NTC Co., Ltd.

Building D, Gaosheng Science and Technology Park, Hongtu Road, Nancheng District,Dongguan City, Guangdong, China

Tel: +86-769-22022444 **Fax: +86-769-22022799**

Prepared By

Rose Hu / Engineer

Approved & Authorized Signer

Sunm Lv / Q.A. Director

Table of Contents

1. GENERAL INFORMATION

1.1 Product Description for Equipment under Test

This device is a RF Remote Control which is powered by DC 12V battery. For more details features, please refer to User's Manual.

Manufacturer	:	Max-plus Co.,Ltd
Address	:	Pingnan Industry Zone, Sanxiang Town, Zhongshan City, Guangdong Province, China
Frequency:	:	433.92MHz
Modulation	:	ASK
Antenna Type	:	PCB
Antenna Gain	:	0dBi (declaration by manufacturer)
Number of Channels	:	1
Power supply	:	DC 12V Battery
Model name	:	LL-REMOTE
Note:	:	None

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2AB96LL-REMOTE filing to comply with Section 15.231 of the FCC Part 15 (2014), Subpart C Rule.

1.3 Test Methodology

The radiated emission measurement was performed according to the procedures in ANSI C63.10 (2013). Radiated emission measurement was performed in semi-anechoic chamber. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters.

1.4 Equipment Modifications

Not available for this EUT intended for grant.

1.5 Support Device

None

1.6 Test Facility and Location

Listed by FCC, August 02, 2011
The Certificate Registration Number is 665078.
Listed by Industry Canada, July 01, 2011
The Certificate Registration Number is 46405-9743.

Dongguan NTC Co., Ltd.
(Full Name: Dongguan Nore Testing Center Co., Ltd.)

Building D, Gaosheng Science and Technology Park, Hongtu Road,
Nancheng District, Dongguan City, Guangdong, China
(Full Name: Building D, Gaosheng Science & Technology Park,
Zhouxi Longxi Road, Nancheng District, Dongguan, Guangdong, China.

1.7 Summary of Test Results

FCC Rules	Description Of Test	Result
§15.207	AC Power Conducted Emission	N/A see note 2
§15.231&15.209	Radiated Emission	Compliant
§15.231(c)	Occupied bandwidth	Compliant
§15.231(a)	Transmission time	Compliant
§15.203	Antenna Requirement	Compliant

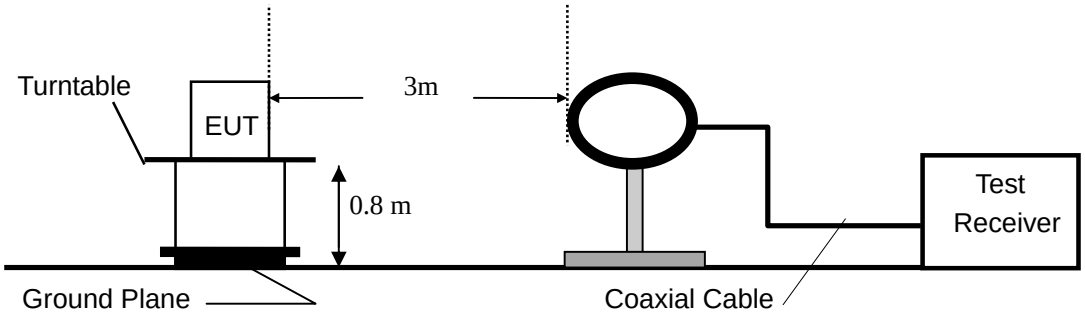
Note: 1. The EUT has been tested as an independent unit. And Continual transmitting in maximum power (The new battery be used during test)
2. Due to this EUT is powered by battery only, the AC Power Conducted Emission is not applicable.
3. The EUT powered by battery and operating multiple positions, so the EUT shall be performed two or three orthogonal planes. The worst plane is X.

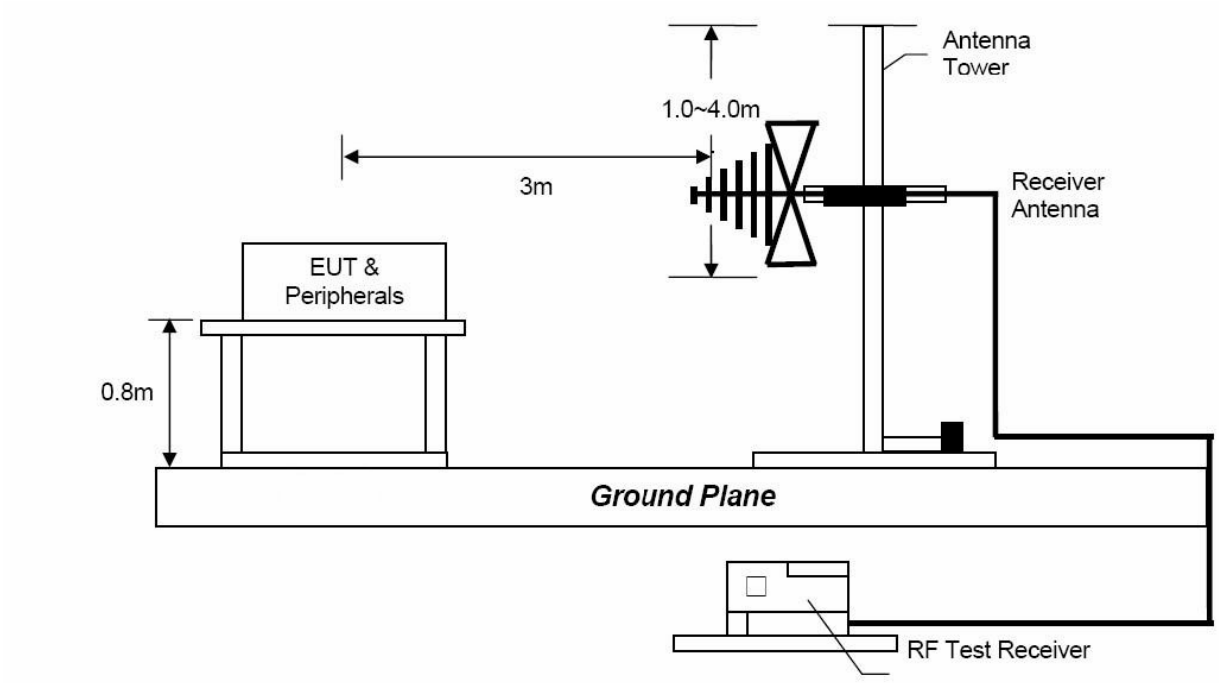
X Plane	Y Plane	Z Plane
		

2. Radiated Emission Test

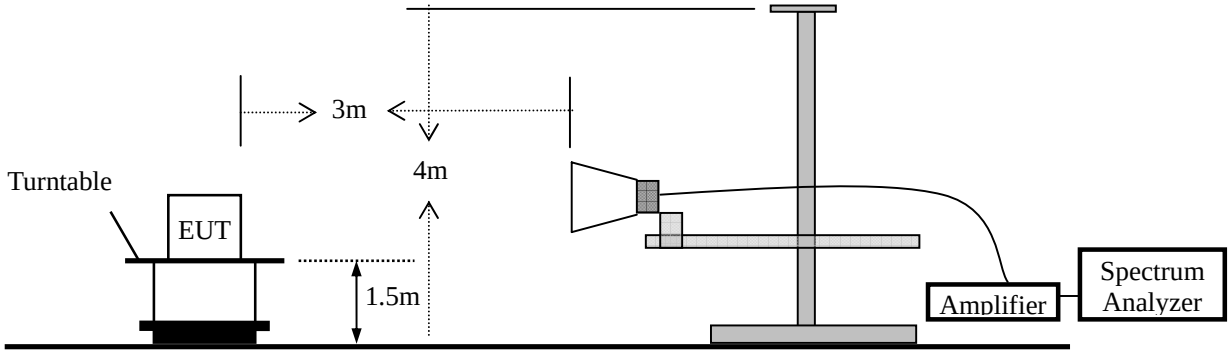
2.1 Test SET-UP (Block Diagram of Configuration)

(1)Radiated Emission Test Set-Up, Frequency Below 30MHz





(2) Radiated Emission Test Set-Up, Frequency above 1GHz



2.2 Measurement Procedure

a. Blow 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi- anechoic chamber room. Above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi- anechoic chamber room. 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 height of antenna 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. The test-receiver system was set to peak detect function and specified bandwidth with maximum hold mode.
e. A Quasi-peak measurement was then made for that frequency point for below 1GHz test. PK for above 1GHz emission test.

For 30MHz to 1GHz:
Sept the spectrum analyzer as: RBW=120kHz, VBW=300kHz, Detector=Quasi-Peak

For Above 1GHz:
Set the spectrum analyzer as: RBW=1MHz, VBW=3MHz, Detector=Peak.

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

Frequency Band (MHz)	Level	Resolution Bandwidth	Video Bandwidth
30 to 1000	QP	120 kHz	300 kHz
Above 1000	Peak	1 MHz	3 MHz

2.3 Limit

Table A [0.009MHz~1GHz]

Frequency range MHz	Distance Meters	Field Strengths Limit (15.209) μV/m
0.009 ~ 0.490	300	2400/F(kHz)
0.490 ~ 1.705	30	24000/F(kHz)
1.705 ~ 30	30	30
30 ~ 88	3	100
88 ~ 216	3	150
216 ~ 960	3	200
Above 960	3	500

Remark：(1) Emission level (dB)μV = 20 log Emission level μV/m

(2) The smaller limit shall apply at the cross point between two frequency bands.

(3) As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

(4) The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.

Table B

Fundamental Frequency (MHz)	Field Strength of Fundamental		Field Strength of Spurious Emissions	
	μV/m	dBμV/m	μV/m	dBμV/m
40.66-40.70	2250	67.04	225	47.04
70-130	1250	61.94	125	41.94
130-174	1250-3370**	61.9-70.55	125-375**	41.94-51.48
174-260	3750	71.48	375	51.48
260-470	3750-12500**	71.48-81.94	375-1250**	51.48-61.94
Above 470	12500	81.94	1250	61.94

**) Linear interpolations

2.4 Measurement Results

Operation Mode:	TX		
Test Result:	PASS	Temperature :	23 ℃
Measured Distance:	3m	Humidity :	52 %
Test Date :	June 28, 2015	Test By:	Steven

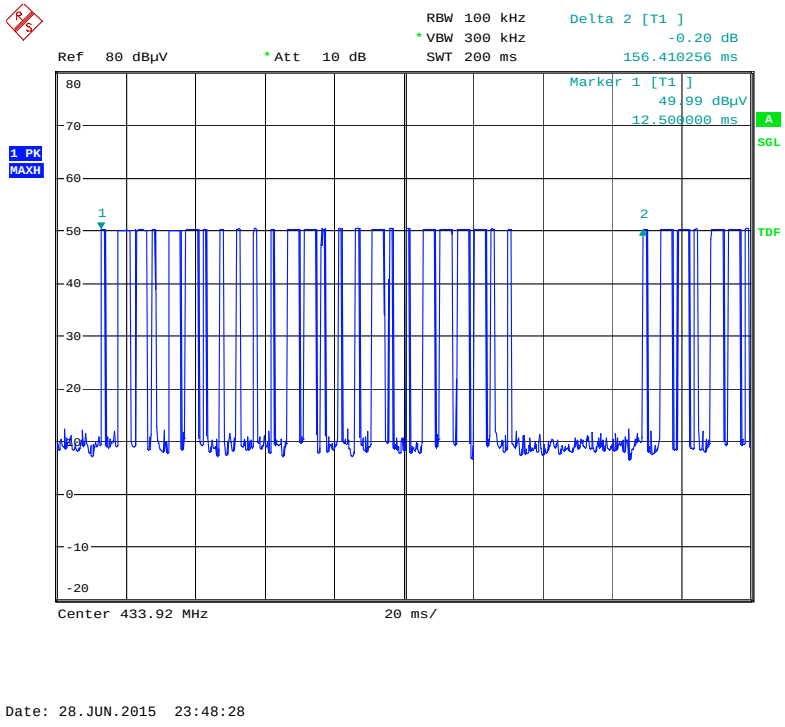
Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV)	Limit 3m (dBuV/m)	Margin (dB)	Note
109.5400	V	12.40	43.50	-31.10	QP
325.8500	V	15.80	46.00	-30.20	QP
433.920	V	61.07	100.8	-39.73	peak
433.920	V	52.70	80.8	-28.10	AV
868.080	V	68.37	80.8	-12.43	peak
868.080	V	60.00	60.8	-0.80	AV
1300.000	**V**	**54.93**	**74.0**	**-19.07**	**peak**
1300.000	**V**	**46.56**	**54.0**	**-7.44**	**AV**
2170.000	V	54.87	80.8	-25.93	peak
2170.000	V	46.50	60.8	-14.30	AV
2605.000	V	50.39	80.8	-30.41	peak
2605.000	V	42.02	60.8	-18.78	AV
3037.000	V	58.50	80.8	-22.30	peak
3037.000	V	50.13	60.8	-31.10	AV
50.3700	H	10.60	40.00	-29.40	QP
326.820	H	12.70	46.00	-33.30	QP
433.920	H	69.86	100.8	-30.94	peak
433.920	H	61.49	80.8	-19.31	AV
868.080	H	67.19	80.8	-13.61	peak
868.080	H	58.82	60.8	-1.98	AV
1300.000	**H**	**46.84**	**74.0**	**-27.16**	**peak**
1300.000	**H**	**38.47**	**54.0**	**-15.53**	**AV**
2170.000	H	47.39	80.8	-33.41	peak
2170.000	H	39.02	60.8	-21.78	AV
3037.000	H	63.73	80.8	-17.07	peak
3037.000	H	55.36	60.8	-5.44	AV
3470.000	H	50.78	80.8	-30.02	peak
3470.000	H	42.41	60.8	-18.39	AV

Other emissions are lower than 10dB below the allowable limit.

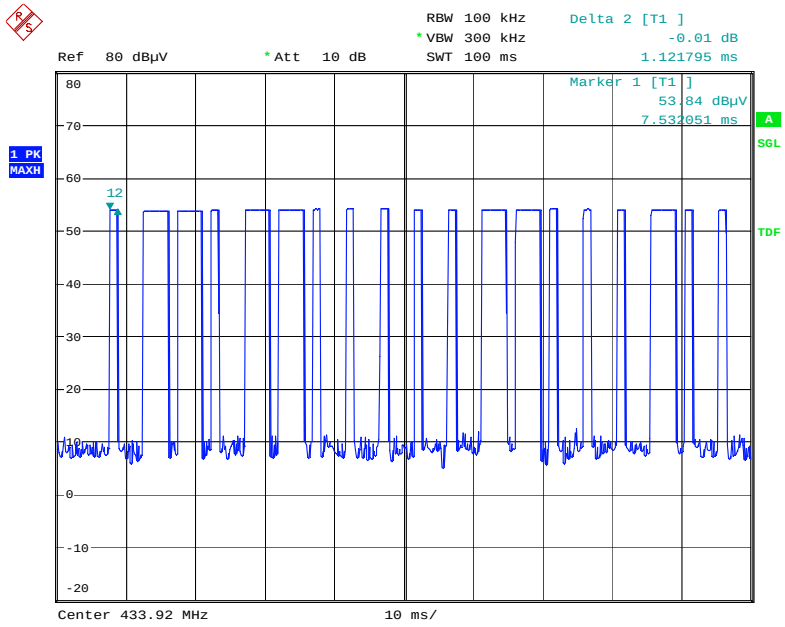
Note: (1) Emission Level= Reading Level+Probe Factor +Cable Loss
(2) Measurement uncertainty: ±3.7dB
(3) Emission (the row indicated by bold) within the restricted band meets the requirement of FCC part 15 Section 15.205.
(4) Average should be determined by duty cycle factor.
The duty cycle is simply the on time by divided by the period:
The duration of one cycle = 156.410256ms
Effective period of the cycle =
Ton1*Number+Ton2*Number=1.121795*12+3.525641*7= 38.141027ms
Duty cycle =38.141027ms / 100ms =0.381410ms
AV Factor=20log0.381410=-8.37
The value of Average= The value of Peak+AV Factor.
Example: For 433.92MHz, AV=61.07(Peak)-8.37(AV factor)=52.70.
Details please see the following plots.

(5) Pulse Desensitization Correction Factor
Pulse Width(PW) =1.121795ms
2/PW = 2/1.121795ms =1.782857KHz
RBW (100KHz) > 2/PW (1.782857KHz)
Therefore PDCF is not needed.

The duration of one cycle

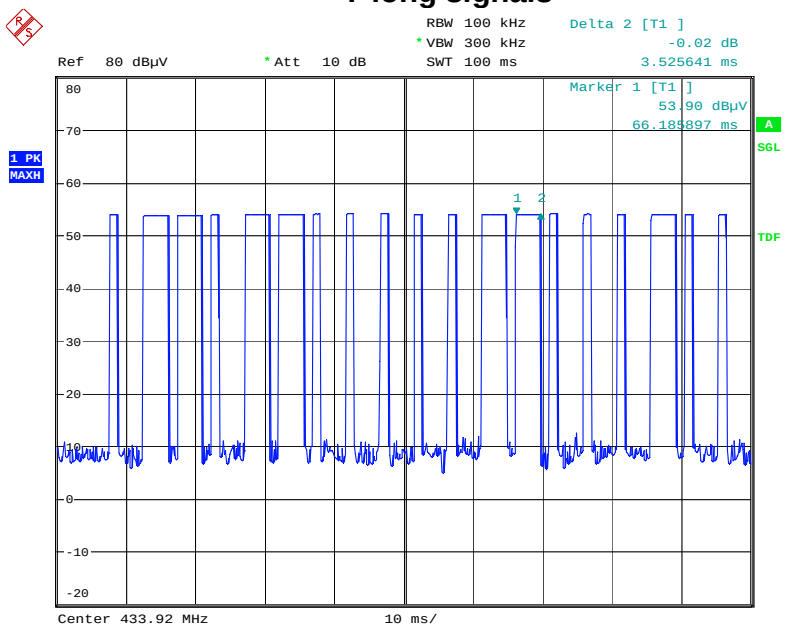


12 short signals



Date: 28.JUN.2015 23:51:32

7 long signals



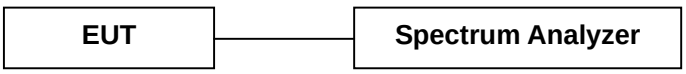
Date: 28.JUN.2015 23:54:07

3. Occupied Bandwidth

3.1 Measurement Procedure

1. The bandwidth is measured at an amplitude level reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.
2. The test receiver RBW set 30KHz, VBW set 100KHz, Seep time set auto.

3.2 Test SET-UP (Block Diagram of Configuration)



3.3 Limit

Please refer section 15.231
According to 15.231(C), the bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz.

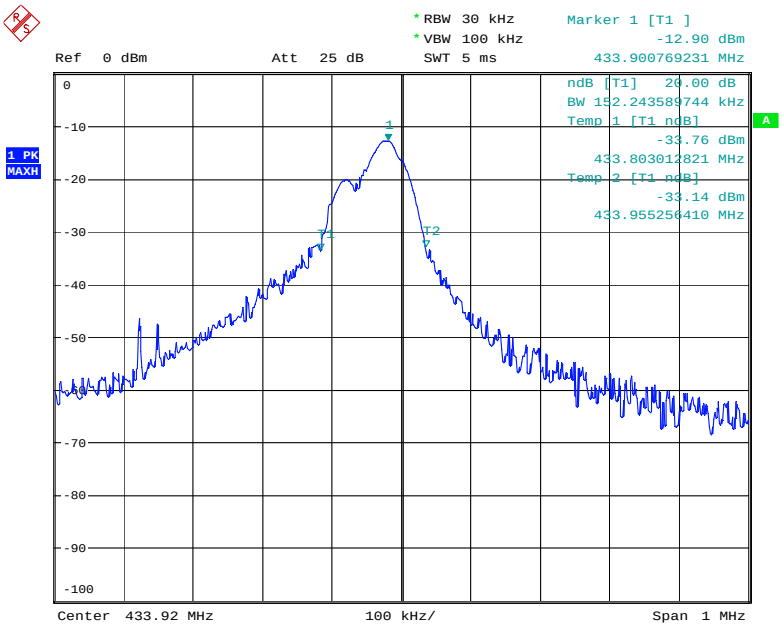
Limit = 433.92*0.25% = 1.08 MHz

3.4 Measurement Results

20dB Bandwidth	Limit
152.24KHz	1.08MHz

Please refer to the following plot.

20dB Bandwidth



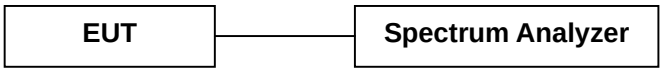
Date: 23.JUN.2015 17:57:02

4 Transmission Time

4.1 Measurement Procedure

4.1.1 Place the EUT on the table and set it in transmitting mode.
4.1.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4.1.3 Set spectrum analyzer center= 433.9MHz, Span=0MHz, Sweep= 10s
4.1.4 Set the spectrum analyzer as RBW=100KHz, VBW=300KHz
4.1.5 Max hold, view and count how many channel in the band.

4.2 Test SET-UP (Block Diagram of Configuration)



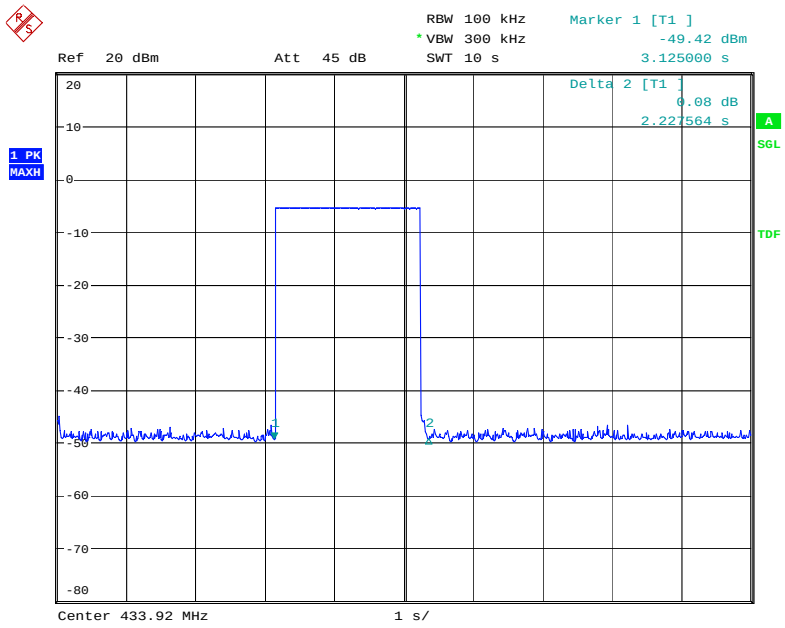
4.3 Limit

According to 15.231(a)(1), A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

4.4 Measurement Results

Transmission Time	Limit
2.23s	5s

Please refer to the following plot.



Date: 23.JUN.2015 10:25:16

5. Antenna Application

5.1 Antenna requirement

According to of FCC part 15C section 15.203 and 15.240:

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.

5.2 Measurement Results

The antenna is integrated on the main PCB and no consideration of replacement, and the best case gain of the antenna is 0dBi. So, the antenna is consider meet the requirement.

6. Test Equipment List

Description	Manufacturer	Model Number	Serial Number	Characteristics	Calibration Date	Calibration Due Date
Test Receiver	Rohde & Schwarz	ESCI7	100837	9KHz~7GHz	Nov. 24, 2014	Nov. 23, 2015
Antenna	Schwarzbeck	VULB9162	9162-010	30MHz~7GHz	Nov. 27, 2014	Nov. 26, 2015
Positioning Controller	UC	UC 3000	N/A	0~360°, 1-4m	N/A	N/A
Color Monitor	SUNSPO	SP-140A	N/A	N/A	N/A	N/A
Single Phase Power Line Filter	SAEMC	PF201A-32	110210	32A	N/A	N/A
3 Phase Power Line Filter	SAEMC	PF401A-200	110318	200A	N/A	N/A
DC Power Filter	SAEMC	PF301A-200	110245	200A	N/A	N/A
Cable	Huber+Suhner	CBL2-NN-1M	22390001	9KHz~7GHz	Nov. 08, 2014	Nov. 07, 2015
Cable	Huber+Suhner	CIL02	N/A	9KHz~7GHz	Nov. 08, 2014	Nov. 07, 2015
Power Amplifier	HP	HP 8447D	1145A00203	100KHz~1.3GHz	Nov. 08, 2014	Nov. 07, 2015
Horn Antenna	Com-Power	AH-118	071078	1GHz~18GHz	Nov. 06, 2014	Nov. 05, 2015
Loop antenna	Daze	ZA30900A	0708	9KHz~30MHz	Oct.11, 2014	Oct.10, 2015
Spectrum Analyzer	Rohde & Schwarz	FSU26	200409/026	20Hz~26.5GHz	Sep. 02, 2014	Sep. 01, 2015
Pre-Amplifier	Agilent	8449B	3008A02964	1GHz~26.5GHz	Nov. 04, 2014	Nov. 03, 2015

---End---