



FCC CERTIFICATION TEST REPORT

FOR

Applicant : ZHENGJI LIGHTING&ELECTRONICS TECHNOLOGY
CO.,LTD

Address : 3F, B Building, Second Laowei Industrial Area, Dalang
Street, Longhua Baoan District , Shenzhen , Guangdong ,
China

Equipment under Test : LED RF remote control

Model No : HF1000-8

FCC ID : NWKHF10008

Manufacturer : ZHENGJI LIGHTING&ELECTRONICS TECHNOLOGY
CO.,LTD

Address : 3F, B Building, Second Laowei Industrial Area, Dalang
Street, Longhua Baoan District , Shenzhen , Guangdong ,
China

Issued By: Dongguan Dongdian Testing Service Co., Ltd.

Add: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City,
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Report No: DDT-F12025

Issued Date: 2012/05/08

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TEST REPORT DECLARE

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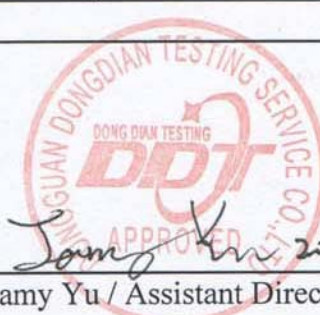
Test Standard Used: FCC Rules and Regulations Part 15 Subpart C: 2010

Test procedure used: ANSI C63.10:2009

We Declare:

The equipment described above is tested by Dongguan Dongdian Testing Service Co., Ltd and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Dongguan Dongdian Testing Service Co., Ltd is assumed of full responsibility for the accuracy and completeness of these tests.

After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.

Report No:	DDT-F12025		
Date of Test:	2012/05/07—2012/05/07	Date of Report:	2012/05/08
Approved & Authorized Signer :		 Jamy Yu / Assistant Director	

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan Dongdian Testing Service Co., Ltd.

1. Summary of test results

EMISSION		
Description of Test Item	Standard	Results
Conducted Emission Test	FCC Part 15C: 15.207 ANSI C63.10: 2009	N/A
Radiated Emission Test	FCC Part 15C: 15.231 (b) ANSI C63.10: 2009	PASS
Stop Transmitting Time Test	FCC Part 15C: 15.231(a)(1)	PASS
20 dB Bandwidth Test	FCC Part 15C: 15.231(c)	PASS
N/A is an abbreviation for Not Applicable.		

2. General test information

2.1. Description of EUT

EUT* Name	:	LED RF remote control
Model Number	:	HF1000-8
EUT function description	:	Please reference user manual of this device
Power supply	:	DC 12V from Battery
FCC ID	:	NWKHF10008
FCC Operation frequency	:	433.92MHz
Modulation	:	OOK
Antenna Type	:	Integrated dipole antenna
Date of Receipt	:	2012/05/05
Sample Type	:	Series production

Note: EUT is the ab. of equipment under test.

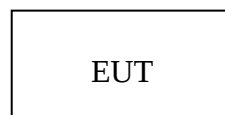
2.2. Accessories of EUT

Description of Accessories	Manufacturer	Model number or Type	Other
/	/	/	/

2.3. Assistant equipment used for test

Description of Assistant equipment	Manufacturer	Model number or Type	Other
/	/	/	/

2.4. Block diagram of EUT configuration for test



Note: Before test, the duty cycle of each button of EUT was measured, and the maximum duty cycle of button was chosen for all the tests.

Note: The EUT's antenna length can adjustable, and according pre-test, the maximum radiated emissions were found when the antenna was maximum length extended, so that set was used for final test.

2.5. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature range:	21-25℃
Humidity range:	40-75%
Pressure range:	86-106kPa

2.6. Test laboratory

Dongguan Dongdian Testing Service Co., Ltd

Add: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong

Province, China, 523808 Tel: +86-0769-22891499

FCC Registration Number: 270092

2.7. Measurement uncertainty

Test Item	Uncertainty
Uncertainty for Conduction emission test	2.40dB
Uncertainty for Radiation Emission test (150KHz-30MHz)	3.21dB
Uncertainty for Radiation Emission test (30MHz-1GHz)	2.78 dB (Polarize: V)
	3.20 dB (Polarize: H)
Uncertainty for Radiation Emission test (1GHz to 25GHz)	2.08dB(Polarize: V)
	2.56dB (Polarize: H)
Uncertainty for radio frequency	1×10-9
Uncertainty for conducted RF Power	0.65dB

Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

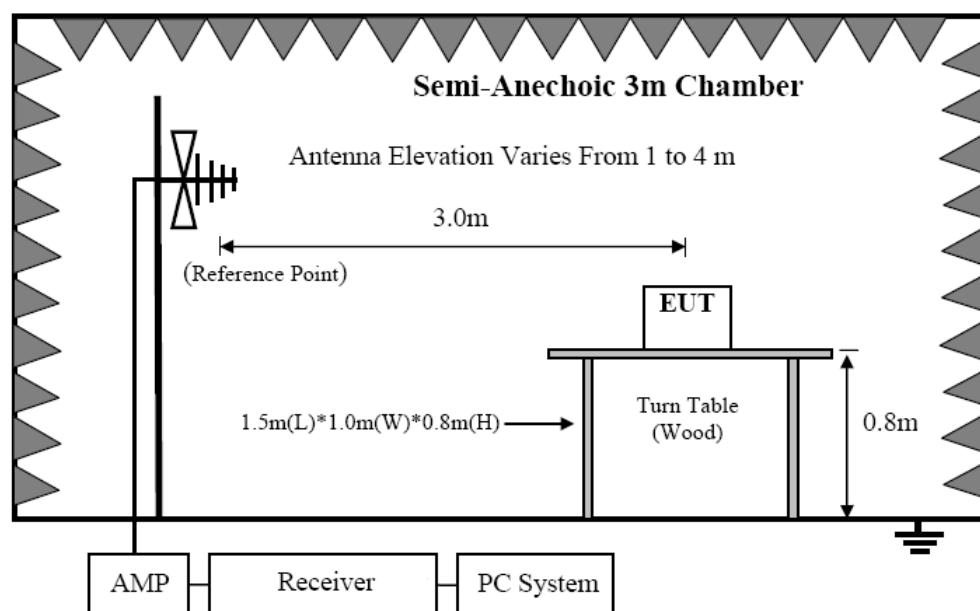
3. Radiated emission

3.1. Test equipment

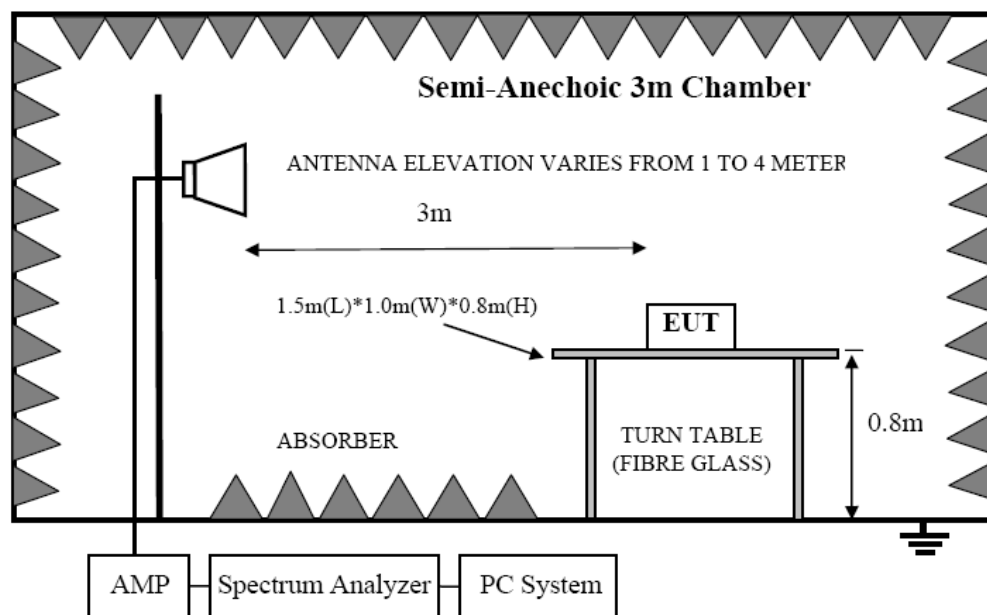
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	EMI Test Receiver	R&S	ESU8	100316	2011/11/23	1Y
2	Spectrum analyzer	R&S	FSU	1166.1660.26	2011/11/23	1Y
3	loop antenna	Chase	HLA6120	20129	2010/11/09	2 Y
4	Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	2010/11/09	2 Y
5	Double Ridged Horn Antenna	R&S	HF907	100276	2011/01/16	2 Y
6	Pre-Amplifier	R&S	SCU-01	10049	2011/11/23	1Y
7	Pre-amplifier	A.H.	PAM0-0118	360	2011-12-20	1Y
8	RF Cable	R&S	R01	10403	2011/11/23	1Y
9	RF Cable	R&S	R02	10512	2011/11/23	1Y
10	Test software	R&S	EMC32	/	/	/

3.2. Block diagram of test setup

In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

3.3. Limit

3.3.1 FCC 15.205 Restricted frequency band

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)

3.3.2 FCC 15.209 Limit

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
0.009-0.490	300	2400/F(KHz)	67.6-20log(F)
0.490-1.705	30	24000/F(KHz)	87.6-20log(F)
1.705-30.0	30	30	29.54

30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

3.3.3 FCC 15.231 section (b) limit

Fundamental Frequency (MHz)	Field Strength of Fundamental	Field Strength of Spurious emissions
433.92	AV:80.83 dBuV/m at 3m distance PK:100.83 dBuV/m at 3m distance	AV:60.83dBuV/m at 3m distance PK:80.83dBuV/m at 3m distance

3.3.4 Limit for EUT

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions include fundamental emission shall not exceed FCC 15.231 section (b) limit of comply with FCC 15.209 limit which permit higher emission level, all the spurious emission shall be 20dB below fundamental emission.

3.4. Test Procedure

- (1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.
- (2) Setup EUT and assistant system according clause 2.4 and 8.2
- (3) Test antenna was located 3m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.
 - (a) Change work frequency or channel of device if practicable.
 - (b) Change modulation type of device if practicable.
 - (c) Change power supply range from 85% to 115% of the rated supply voltage.
 - (d) Adjust the EUT's antenna length and position is practicable.
 - (e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions
- (4) Spectrum frequency from 9KHz to 55GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 9KHz to 30MHz, the final test was performed with frequency range from 30MHz to 5GHz.
- (5) For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 2009 on Radiated Emission test.

- (6) For emissions from 30MHz to 1GHz, Quasi-Peak values were measured with EMI Receiver and the bandwidth of Receiver is 120 KHz.
- (7) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure;
- (8) The duty cycle factor was used to calculate Average Level as below formula:

$$\text{Average level} = \text{PK Level} - \text{duty cycle factor}$$

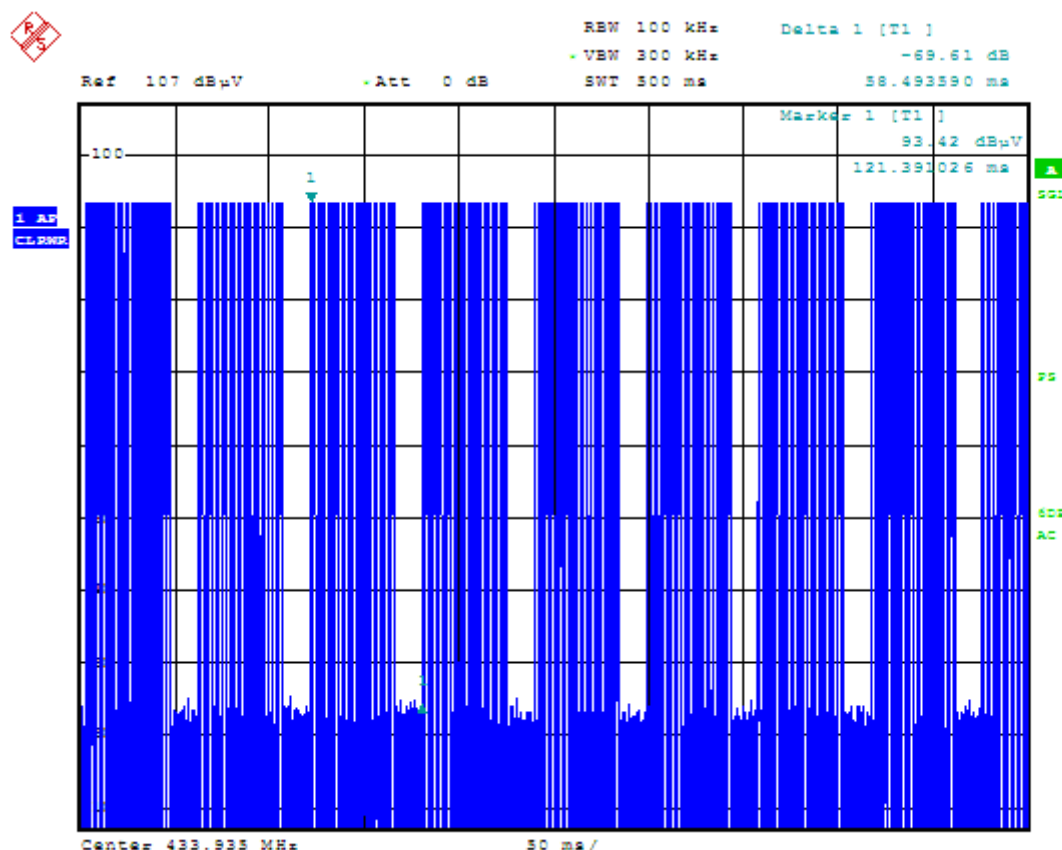
3.5. Test result

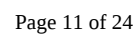
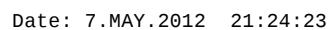
PASS. (See below detailed test result)

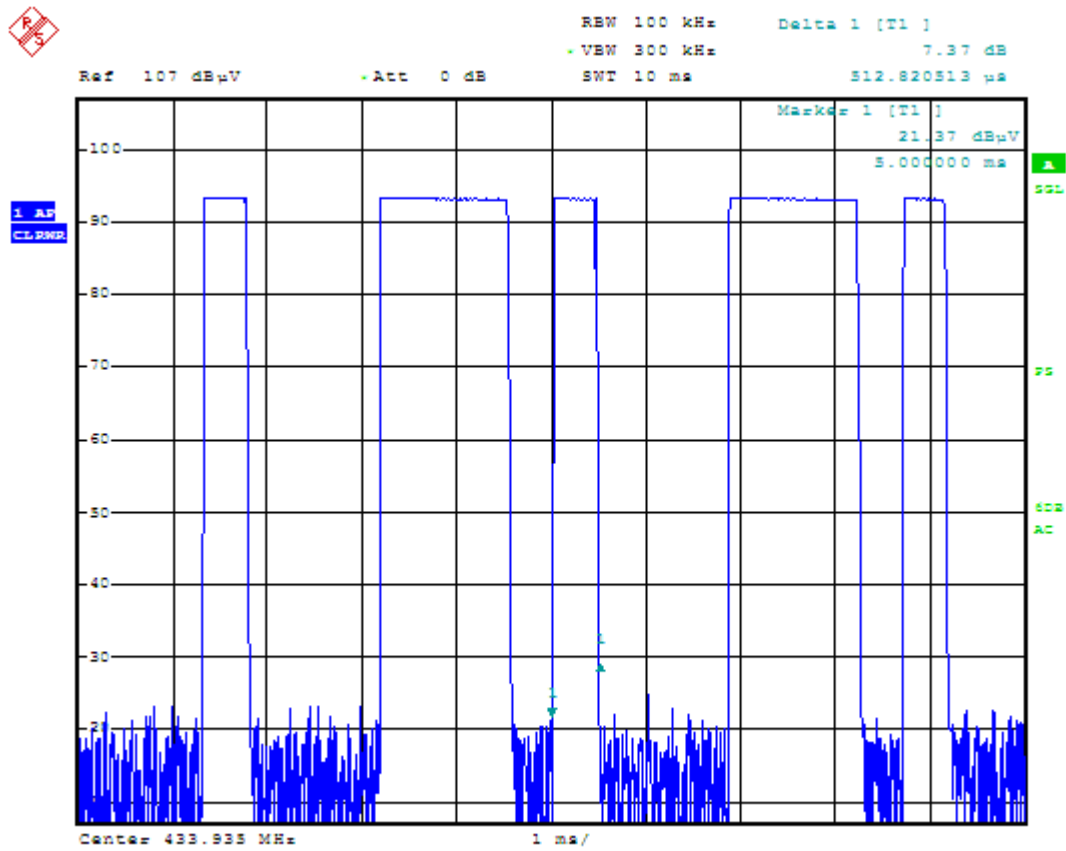
The frequency range from 9KHz to 5000MHz was investigated. When PK measured levels comply with average limit, then the average levels were deemed to comply with average limit. When PK measured levels exceed average limit, and then the duty cycle factor of 100ms was used to calculate average level.

$$\text{Duty cycle}(x) = (15 \times 0.512\text{ms} + 10 \times 1.442\text{ms}) / 58.49\text{ms} \times 100\% = 37\%$$

$$\text{Duty cycle factor} = 20 \log (1/x) = 8.64\text{dB}$$



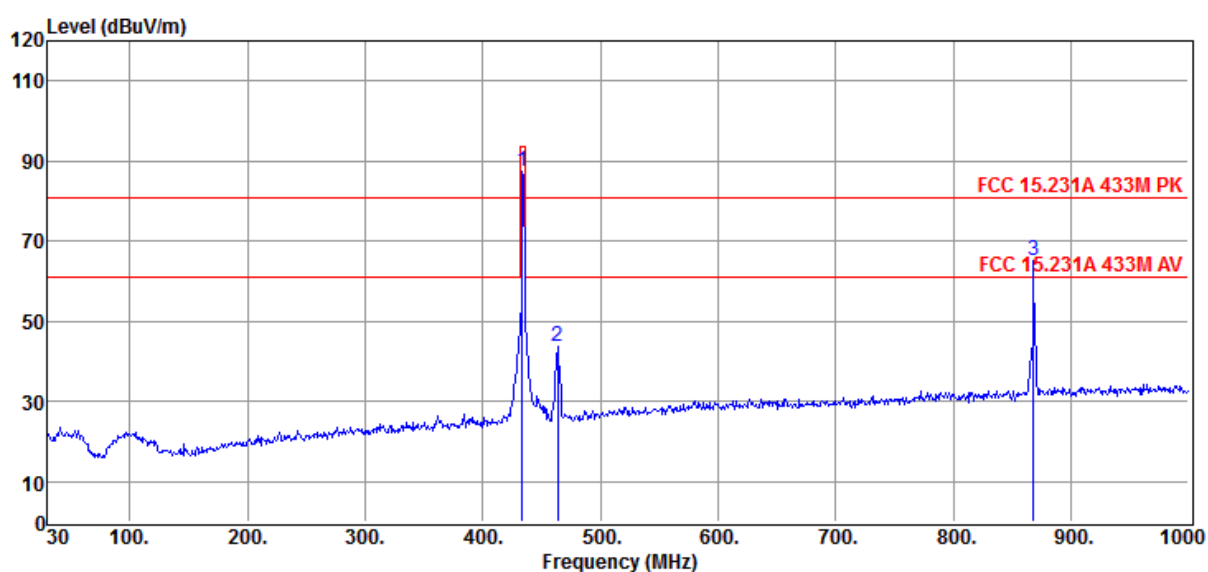




Radiated Emission Test Result

Test Site : DDT 3m Chamber **E:\2012 Report Data\Y\2012-05-08.EM6**
Test Date : 05-07-2012 **Tested By** : Jamy Yu
EUT : LED RF remote control **Model Number** : HF1000-8
Power Supply : DC 12V **Test Mode** : Tx Mode
Condition : Temp:24.5'C,Humi:55% **Antenna/Distance** : VULB 9163/3m/VERTICAL

Data : 1



Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	433.52	68.98	15.54	0.00	2.68	87.12	100.83	-13.63	Peak	VERTICAL
2	463.59	25.35	15.69	0.00	2.87	43.91	80.83	-36.92	Peak	VERTICAL
3	868.08	40.27	20.76	0.00	4.11	65.14	80.83	-15.69	Peak	VERTICAL

Frequency (MHz)	PK Level (dBuV/m)	Duty cycle factor (dB)	Average Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
433.52	87.12	8.64	78.48	80.83	2.35
868.08	65.14	8.64	56.5	60.83	4.33

Note: 1. PK Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor

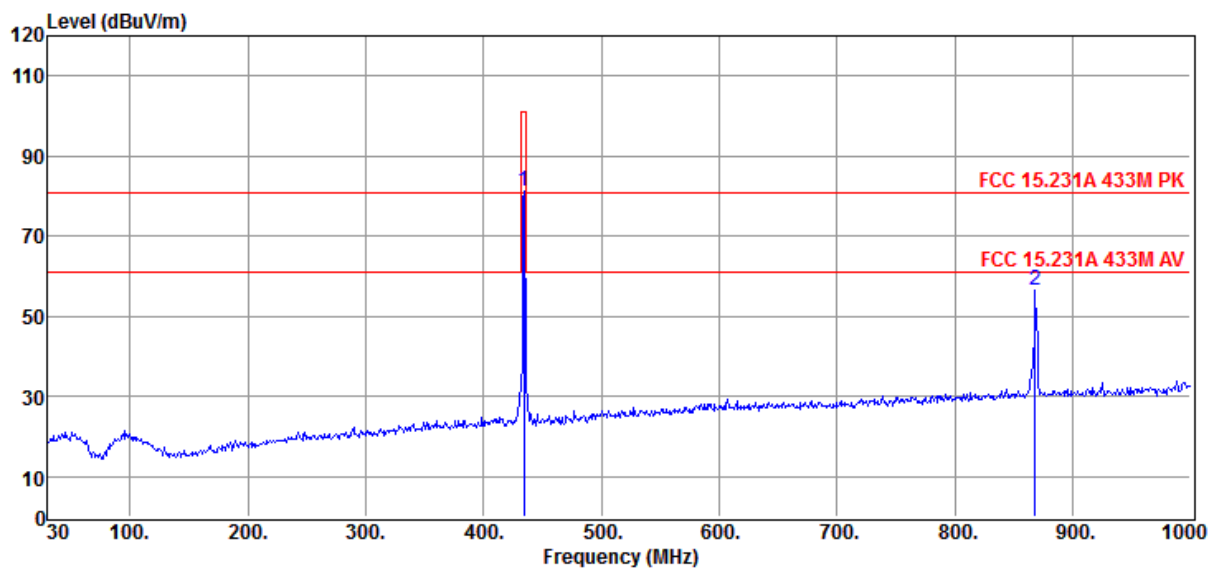
2. Average Level = PK level – Duty cycle factor

3. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit

Radiated Emission Test Result

Test Site : DDT 3m Chamber **E:\2012 Report Data\Y\2012-05-08.EM6**
Test Date : 05-07-2012 **Tested By** : Jamy Yu
EUT : LED RF remote control **Model Number** : HF1000-8
Power Supply : DC 12V **Test Mode** : Tx Mode
Condition : Temp:24.5'C,Humi:55% **Antenna/Distance** : VULB 9163/3m/HORIZONTAL

Data : 2



Item (Mark)	Freq (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	434.49	63.11	15.54	0.00	2.68	81.33	100.83	-19.50	Peak	HORIZONTAL
2	868.08	31.81	20.76	0.00	4.11	56.68	80.83	-24.15	Peak	HORIZONTAL

Frequency (MHz)	PK Level (dBuV/m)	Duty cycle factor (dB)	Average Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
434.49	81.33	8.64	72.69	80.83	8.14

Note: 1. PK Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor

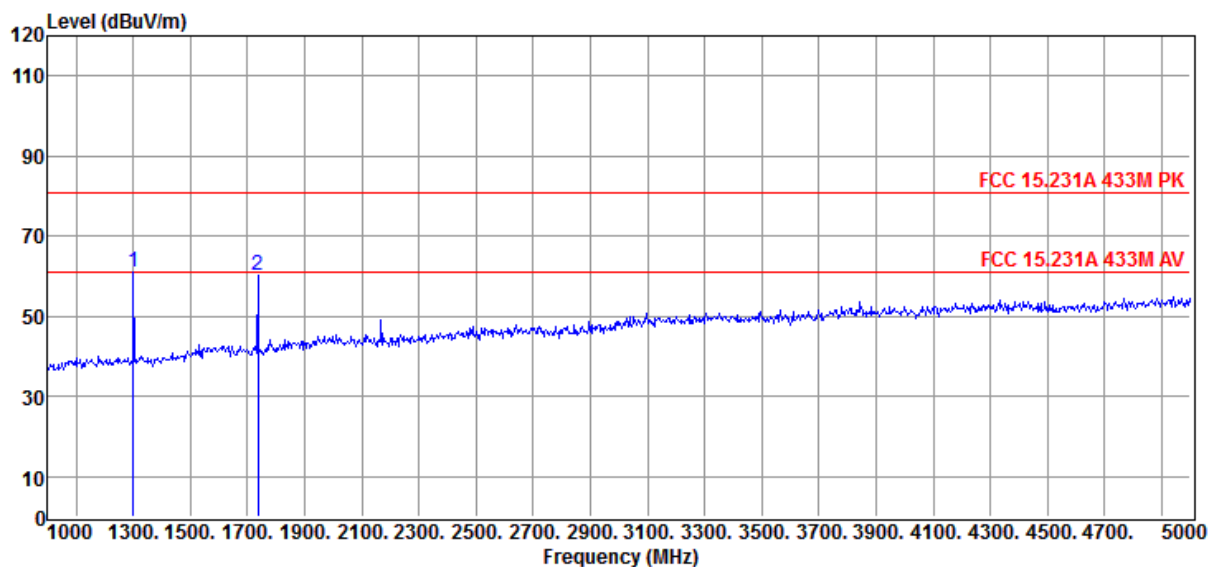
2. Average Level = PK level – Duty cycle factor

3. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit

Radiated Emission Test Result

Test Site : DDT 3m Chamber **E:\2012 Report Data\Y\2012-05-08.EM6**
Test Date : 05-07-2012 **Tested By** : Jamy Yu
EUT : LED RF remote control **Model Number** : HF1000-8
Power Supply : DC 12V **Test Mode** : Tx Mode
Condition : Temp:24.5'C,Humi:55% **Antenna/Distance** : HF907 SN100276/3m/HORIZONTAL

Data : 3



Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	1300.00	31.82	24.72	0.00	4.69	61.23	80.83	-19.60	Peak	HORIZONTAL
2	1736.00	28.09	26.61	0.00	5.41	60.11	80.83	-20.72	Peak	HORIZONTAL

Frequency (MHz)	PK Level (dBuV/m)	Duty cycle factor (dB)	Average Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1300.00	61.23	8.64	52.59	60.83	8.24
1736.00	60.11	8.64	51.47	60.83	9.36

Note: 1. PK Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor

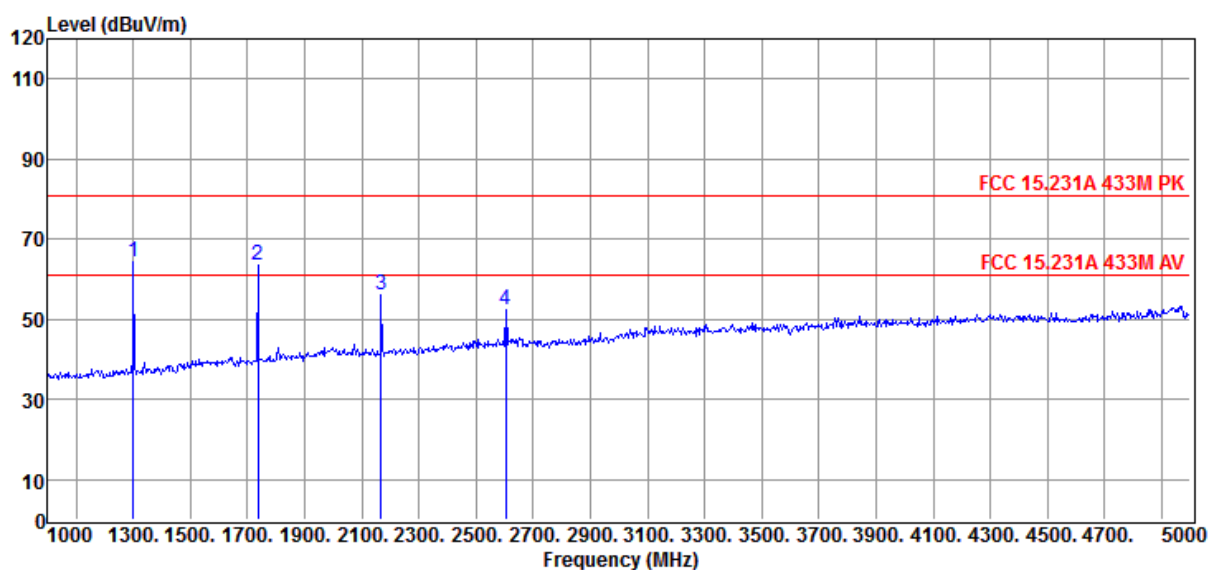
2. Average Level = PK level – Duty cycle factor

3. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit

Radiated Emission Test Result

Test Site : DDT 3m Chamber **E:\2012 Report Data\Y\2012-05-08.EM6**
Test Date : 05-07-2012 **Tested By** : Jamy Yu
EUT : LED RF remote control **Model Number** : HF1000-8
Power Supply : DC 12V **Test Mode** : Tx Mode
Condition : Temp:24.5°C,Humi:55% **Antenna/Distance** : HF907 SN100276/3m/VERTICAL

Data : 4



Item (Mark)	Freq (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	1300.00	34.84	24.72	0.00	4.69	64.25	80.83	-16.58	Peak	VERTICAL
2	1736.00	31.64	26.61	0.00	5.41	63.66	80.83	-17.17	Peak	VERTICAL
3	2168.00	21.90	28.12	0.00	6.06	56.08	80.83	-24.75	Peak	VERTICAL
4	2604.00	15.74	29.73	0.00	6.70	52.17	80.83	-28.66	Peak	VERTICAL

Frequency (MHz)	PK Level (dBuV/m)	Duty cycle factor (dB)	Average Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1300.00	64.25	8.64	55.61	60.83	5.22
1736.00	63.66	8.64	55.02	60.83	5.81

Note: 1. PK Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor

2. Average Level = PK level – Duty cycle factor

3. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit

4. stop transmitting time test

4.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	R&S	FSU	1166.1660.26	2011/11/23	1Y

4.2. Block diagram of test setup



4.3. Limits

The transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

4.4. Test Procedure

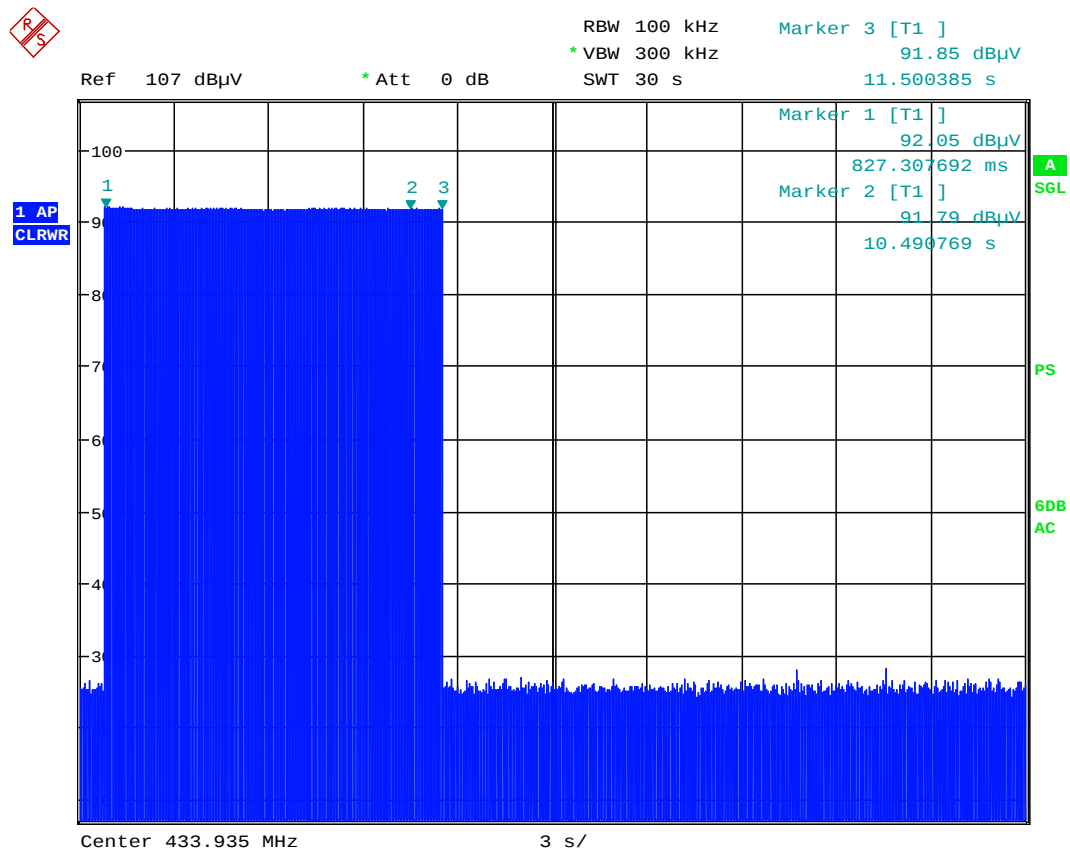
- (1) The EUT's RF signal was coupled to spectrum analyzer by a antenna connected to spectrum analyzer.
- (2) Set the spectrum to zero span mode, and centered of EUT frequency.
- (3) Measure the stop transmitting time after release EUT button.

4.5. Test result

Frequency (MHz)	Stop Transmitting Time	Limit	Conclusion
433.92	1s	5s	PASS

Note1: See next page original test data.

Note2: For next page test data, press any button of EUT in marker 1 and release button in marker 2 and the transmitting signal will stop in marker 3, so the stop transmitting time is marker 3's time minus marker 2's time, and the result is 1 second.



5. 20dB Bandwidth

5.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	R&S	FSU	1166.1660.26	2011/11/23	1Y

5.2. Block diagram of test setup



5.3. Limits

The bandwidth of the emission shall be no wider than 0.25% of the center frequency of devices operation above 70MHz and below 900MHz.

5.4. Test Procedure

- (1) The EUT's RF signal was coupled to spectrum analyzer by a antenna connected to spectrum analyzer.
- (2) The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30 kHz RBW and 100 kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

5.5. Test result

Frequency (MHz)	20 dB Bandwidth (kHz)	Limit(kHz): No wider than 0.25% of the center frequency	Conclusion
433.92	176.28	$433.92 \times 0.25\% = 1.08\text{MHz}$	PASS

