

## FCC CERTIFICATION TEST REPORT

### FOR

<b>Applicant</b>	:	FOSHAN SANMAK LIGHTING CO., LTD.
<b>Address</b>	:	Block 3, Chuangfu Industry Zone, Lihe Rd., Nanhai District, Foshan City, 528244 China
<b>Equipment under Test</b>	:	LED Control Box
<b>Model No.</b>	:	4010-001
<b>Trade Mark</b>	:	N/A
<b>FCC ID</b>	:	2AVYD40102021
<b>Manufacturer</b>	:	FOSHAN SANMAK LIGHTING CO., LTD.
<b>Address</b>	:	Block 3, Chuangfu Industry Zone, Lihe Rd., Nanhai District, Foshan City, 528244 China

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

**Add.:** No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park,  
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# REPORT

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## Test Report Declare

<b>Applicant</b>	:	FOSHAN SANMAK LIGHTING CO., LTD.
<b>Address</b>	:	Workshop 2(self A zone), "Triangular Pond" Area, South Side Common Road(Local Name) of the Foshan First Ring, Lishui Town, Nanhai District, Foshan City, Guangdong, China
<b>Equipment under Test</b>	:	LED Control Box
<b>Model No.</b>	:	4010-001
<b>Trade mark</b>	:	N/A
<b>Manufacturer</b>	:	FOSHAN SANMAK LIGHTING CO., LTD.
<b>Address</b>	:	Workshop 2(self A zone), "Triangular Pond" Area, South Side Common Road(Local Name) of the Foshan First Ring, Lishui Town, Nanhai District, Foshan City, Guangdong, China

### Test Standard Used:

FCC Rules and Regulations Part 15 Subpart C.

### Test procedure used:

ANSI C63.10:2013

### 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.**

<b>Report No.:</b>	DDT-R21072216-1E01		
<b>Date of Receipt:</b>	Jul. 26, 2021	<b>Date of Test:</b>	Jul. 26, 2021 ~ Aug. 24, 2021

**Prepared By:**

*Jacky Huang*

**Jacky Huang/Engineer**

**Approved By:**



**Damon Hu/EMC Manager**

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.

## Revision History

Rev.	Revisions	Issue Date	Revised By
---	Initial issue	Aug. 24, 2021	

## 1 Summary of test results

Description of Test Item	Standard	Results
20dB Bandwidth and 99% Bandwidth	FCC Part 15: 15.215 ANSI C63.10:2013	Pass
Stop Transmitting Time Test	FCC Part 15C: 15.231(a)(1)	Pass
Radiated Emission	FCC Part 15: 15.209 FCC Part 15: 15.231(b) ANSI C63.10:2013	Pass
Power Line Conducted Emissions	FCC Part 15: 15.207 ANSI C63.10:2013	N/A
Antenna requirement	FCC Part 15: 15.203	Pass
Note: N/A is an abbreviation for Not Applicable.		

## 2 General test information

### 2.1. Description of EUT

EUT* Name	: LED Control Box
Model Number	: 4010-001
EUT function description	: Please reference user manual of this device
Power supply	: DC 12V from 1*23A Battery
Operation frequency	: 433.92MHz
Modulation	: ASK
Antenna Type	: Integrated antenna
Sample Type	: Series production
Series Number	: N/A

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

### 2.2. Accessories of EUT

Description of Accessories	Manufacturer	Model number	Serial No.	Other
N/A	N/A	N/A	N/A	N/A

### 2.3. Assistant equipment used for test

Assistant equipment	Manufacturer	Model number	Serial No.	Other
N/A	N/A	N/A	N/A	N/A

### 2.4. Block diagram of EUT configuration for test

EUT

Tested mode, channel, information		
Mode	Channel	Frequency (MHz)
TX mode	/	433.92

Note : New battery is used during all test

### 2.5. Deviations of test standard

No Deviation.

## 2.6. Test environment conditions

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

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

## 2.7. 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.: +86-0769-38826678, <http://www.dgddt.com>, Email: ddt@dgddt.com.

CNAS Accreditation No. L6451; A2LA Accreditation Number: 3870.01

FCC Designation Number: CN1182, Test Firm Registration Number: 540522

Innovation, Science and Economic Development Canada Site Registration Number: 10288A

Conformity Assessment Body identifier: CN0048

VCCI facility registration number: C-20087, T-20088, R-20123, G-20118

## 2.8. Measurement uncertainty

Test Item	Uncertainty
Bandwidth	1.1%
Peak Output Power(Conducted)(Spectrum analyzer)	0.86dB (10 MHz ≤ f < 3.6GHz); 1.38dB (3.6GHz ≤ f < 8GHz)
Peak Output Power(Conducted)(Power Sensor)	0.74dB
Power Spectral Density	0.74dB (10 MHz ≤ f < 3.6GHz); 1.38dB (3.6GHz ≤ f < 8GHz)
Frequencies Stability	6.7 × 10 <sup>-8</sup> (Antenna couple method) 5.5 × 10 <sup>-8</sup> (Conducted method)
Conducted spurious emissions	0.86dB (10 MHz ≤ f < 3.6GHz); 1.40dB (3.6GHz ≤ f < 8GHz) 1.66dB (8GHz ≤ f < 22GHz)
Uncertainty for radio frequency (RBW<20kHz)	3×10 <sup>-8</sup>
Temperature	0.4°C
Humidity	2%
Uncertainty for Radiation Emission test (30MHz-1GHz)	4.70 dB (Antenna Polarize: V) 4.84 dB (Antenna Polarize: H)
Uncertainty for Radiation Emission test (1GHz-40GHz)	4.10dB (1-6GHz) 4.40dB (6GHz-18GHz) 3.54dB (18GHz-26GHz) 4.30dB (26GHz-40GHz)
Uncertainty for Power line conduction emission test	3.32dB (150kHz-30MHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

### 3 Equipment used during test

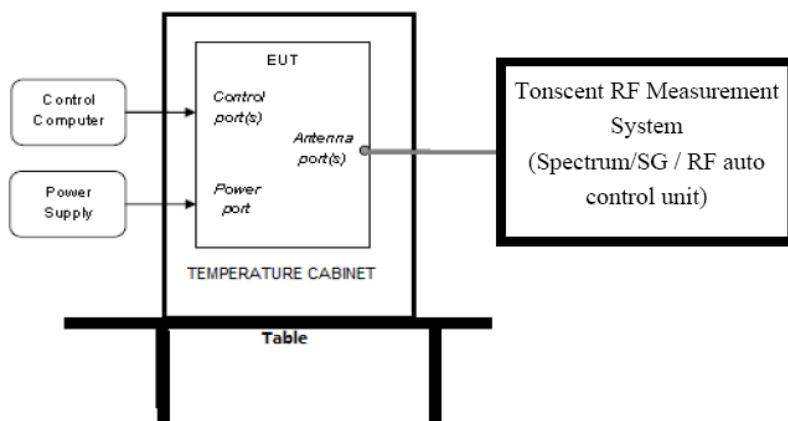
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input type="checkbox"/> RF Connected Test (Tonscend RF Measurement System 1#)					
Spectrum analyzer	R&S	FSU26	200071	Sep. 25, 2020	1 Year
Wideband Radio Communication tester	R&S	CMW500	117491	Jun. 01, 2021	1 Year
Vector Signal Generator	Agilent	E8267D	US49060192	Sep. 24, 2020	1 Year
Vector Signal Generator	Agilent	N5182A	MY48180737	Jun. 01, 2021	1 Year
RF Control Unit	Tonsend	JS0806-2	DDT-ZC0290	Jun. 01, 2021	1 Year
Temp&Humi Programmable	ZHIXIANG	ZXGDJS-150L	ZX170110-A	Jun. 01, 2021	1 Year
Test Software	JS Tonscend	JS1120-3	Ver.2.7	N/A	N/A
<input checked="" type="checkbox"/> RF Connected Test (Tonscend RF Measurement System 2#)					
Spectrum analyzer	R&S	FSU26	101472	Jun. 01, 2021	1 Year
Wideband Radio Communication tester	R&S	CMW500	120259	Jan. 19, 2021	1 Year
Vector Signal Generator	Agilent	N5182A	MY19060405	Jun. 01, 2021	1 Year
Vector Signal Generator	Agilent	N5182A	MY48180912	Jun. 01, 2021	1 Year
RF Control Unit	Tonsend	JS0806-2	DDT-ZC01449	Jun. 01, 2021	1 Year
Temp&Humi Programmable	ZHIXIANG	ZXGDJS-150L	ZX170110-A	Jun. 01, 2021	1 Year
Test Software	JS Tonscend	JS1120-3	Ver.2.7	N/A	N/A
<input type="checkbox"/> Radiation 1#chamber					
EMI Test Receiver	R&S	ESU8	100316	Sep. 24, 2020	1 Year
Spectrum analyzer	Agilent	E4447A	MY50180031	Jun. 01, 2021	1 Year
Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	Nov. 13, 2020	1 Year
Active Loop antenna	Schwarzbeck	FMZB-1519	1519-038	Nov. 18, 2020	1 Year
Double Ridged Horn Antenna	R&S	HF907	100276	Nov. 13, 2020	1 Year
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	790	May 07, 2021	1 Year
Pre-amplifier	A.H.	PAM-0118	360	Sep. 28, 2020	1 Year
RF Cable	HUBSER	CP-X2+ CP-X1	W11.03+ W12.02	Sep. 24, 2020	1 Year
RF Cable	N/A	5m+6m+1m	06270619	Sep. 30, 2020	1 Year
MI Cable	HUBSER	C10-01-01-1M	1091629	Sep. 30, 2020	1 Year
Test software	Audix	E3	V 6.11111b	N/A	N/A
<input checked="" type="checkbox"/> Radiation 2#chamber					



EMI Test Receiver	R&S	ESCI	101364	Sep. 28, 2020	1 Year
Spectrum analyzer	Agilent	E4447A	MY50180031	Jun. 01, 2021	1 Year
Trilog Broadband Antenna	Schwarzbeck	VULB 9163	9163-994	Nov. 13, 2020	1 Year
Active Loop antenna	Schwarzbeck	FMZB-1519	1519-038	Nov. 18, 2020	1 Year
Double Ridged Horn Antenna	Schwarzbeck	BBHA9120	02108	Jul. 17, 2021	1 Year
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	790	May 07, 2021	1 Year
Pre-amplifier	TERA-MW	TRLA-0040 G35	1013 03	Sep. 28, 2020	1 Year
RF Cable	N/A	14+1.5m	06270619	Sep. 28, 2020	1 Year
Test software	Audix	E3	V 6.11111b	N/A	N/A
<b>□Power Line Conducted Emissions Test 1#</b>					
EMI Test Receiver	R&S	ESU8	100316	Sep. 24, 2020	1 Year
LISN 1	R&S	ENV216	101109	Sep. 28, 2020	1 Year
LISN 2	R&S	ESH2-Z5	100309	Sep. 28, 2020	1 Year
Pulse Limiter	R&S	ESH3-Z2	101242	Sep. 24, 2020	1 Year
CE Cable 1	HUBSER	N/A	W10.01	Sep. 24, 2020	1 Year
Test software	Audix	E3	V 6.11111b	N/A	N/A
<b>□Power Line Conducted Emissions Test 2#</b>					
Test Receiver	R&S	ESPI	101761	Sep. 24, 2020	1 Year
LISN 1	R&S	ENV216	101170	Sep. 28, 2020	1 Year
LISN 2	R&S	ESH2-Z5	100309	Sep. 28, 2020	1 Year
Pulse Limiter	R&S	KH43101	43101180156 8-12#	Jun. 01, 2021	1 Year
CE Cable 2	HUBSER	N/A	W11.02	Sep. 24, 2020	1 Year
Test software	Audix	E3	V 6.11111b	N/A	N/A

## 4. Duty Cycle

### 4.1. Block diagram of test setup



### 4.2. Limits

None: for reporting purposes only.

### 4.3. Test Procedure

Set the Centre frequency of the spectrum analyzer to the transmitting frequency;

Set the span=0 MHz, RBW=1 MHz, VBW=1 MHz, Sweep time=200 ms;

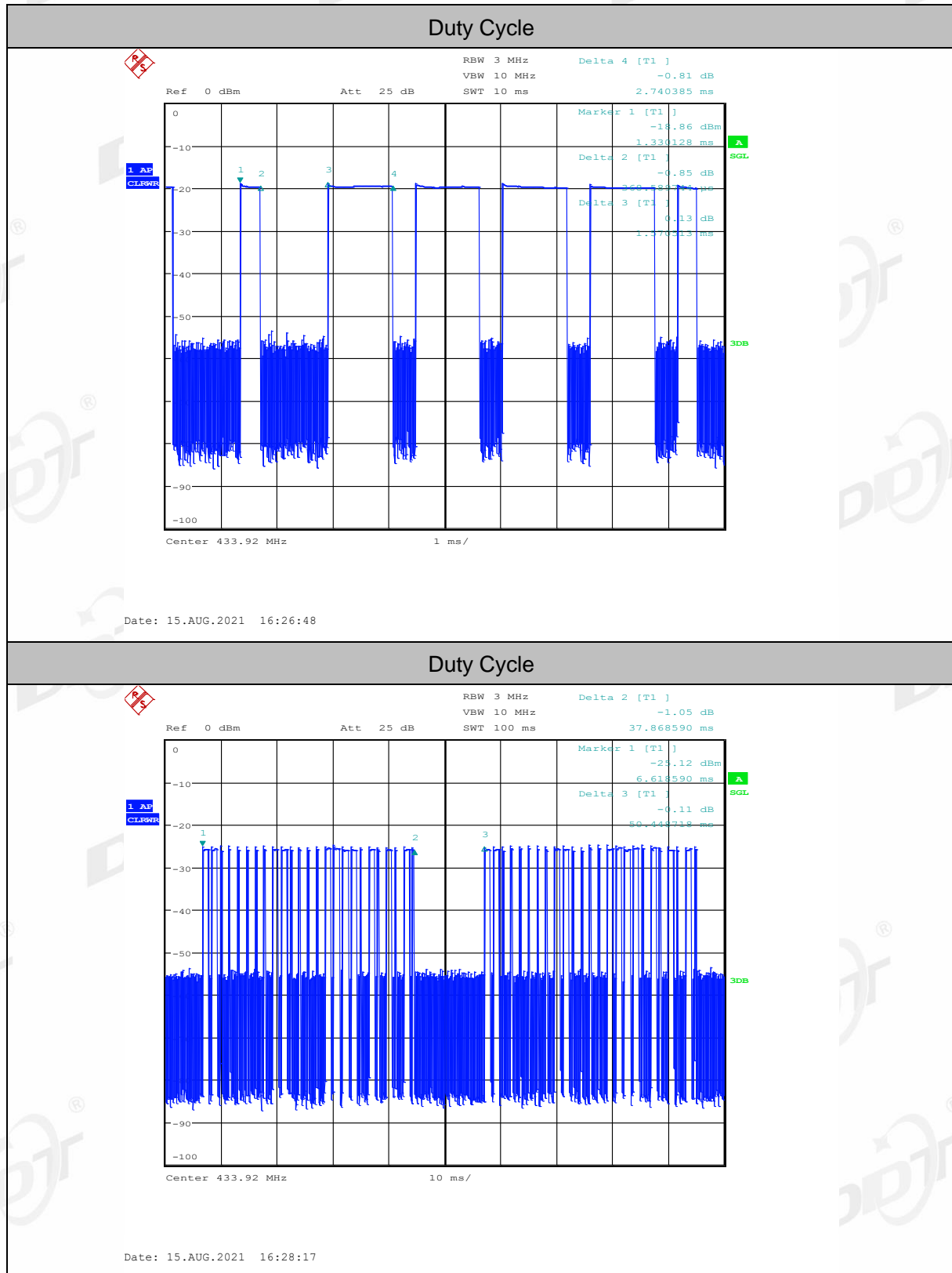
Trace mode = Single hold.

### 4.4. Test Result

Test Channel	Duty Cycle[%]	20log(1/PDCF) Factor[dB]
433.92	0.35896	-8.9

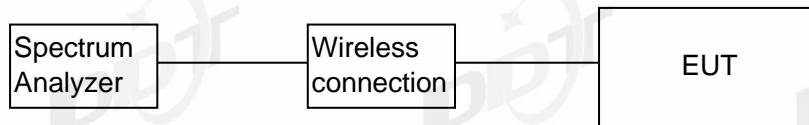
Note 1: The transmitter duty cycle was measured using a spectrum analyser in the time domain and calculated by below Equation:  
 $\delta(\text{dB}) = 20\log(\Delta) = 20\log\{(1.162 \times 11 + 0.369 \times 14) \times 2 / 100\} = -8.9 \text{ dB}$   
 $\delta$  is the duty cycle correction factor (dB)  
 $\Delta$  is the duty cycle (dimensionless)  
 Note 2: In cases where the pulse train exceeds 0.1 s, the measured field strength shall be determined during a 0.1 s interval

## 4.5. Original test data



## 5. 20dB Bandwidth and 99% Bandwidth

### 5.1. Block diagram of test setup



### 5.2. 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.

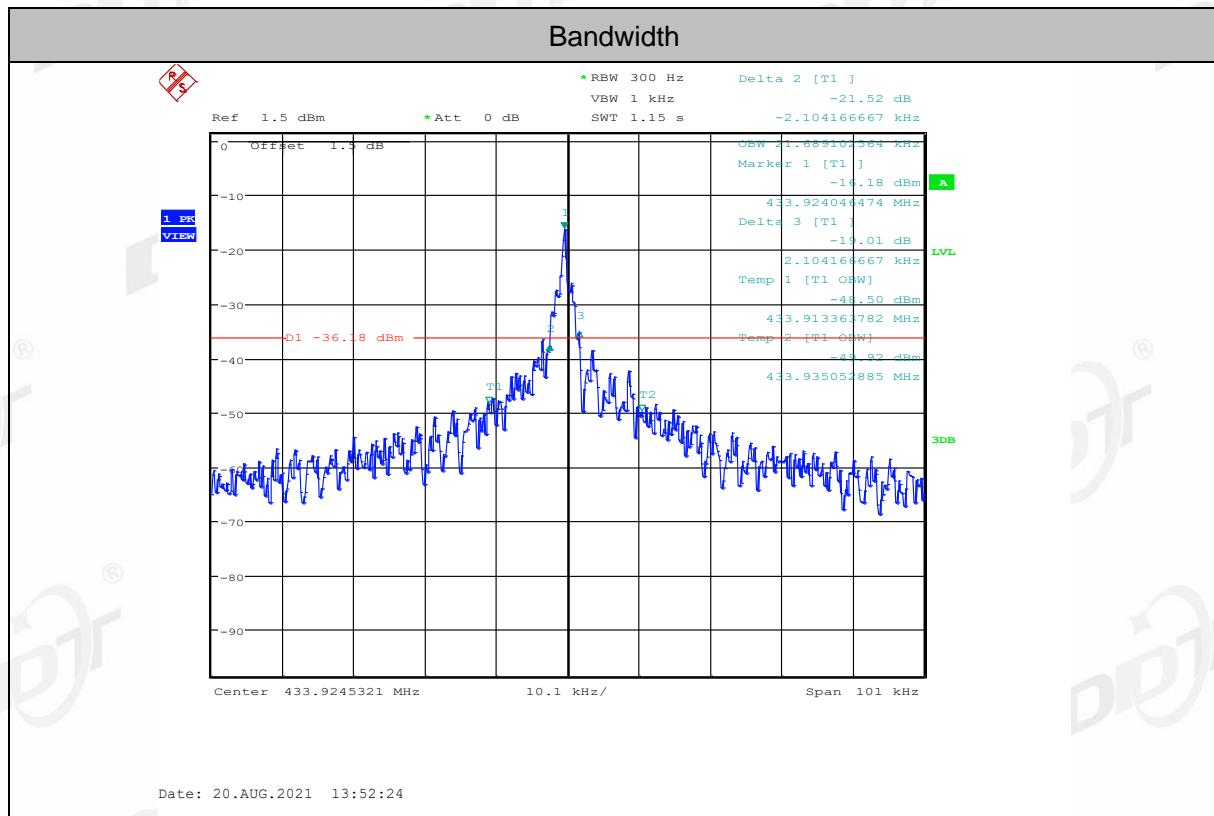
### 5.3. Test Procedure

- (1) Connect EUT's antenna output to spectrum analyzer by RF cable.
- (2) The bandwidth of the fundamental frequency was measured by spectrum analyzer with 300Hz RBW and 1kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

### 5.4. Test Result

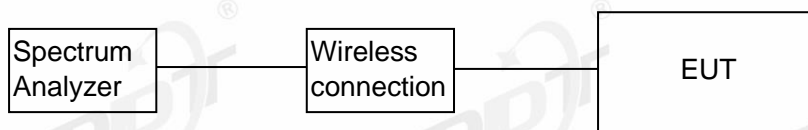
Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)	Limit (MHz): No wider than 0.25% of the center frequency	Conclusion
433.92	4.208	21.689	$433.92 \times 0.25\% = 1.0848\text{MHz}$	Pass

## 5.5. Original test data



## 6 Stop transmitting time test

### 6.1. Block diagram of test setup



### 6.2. Limits

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

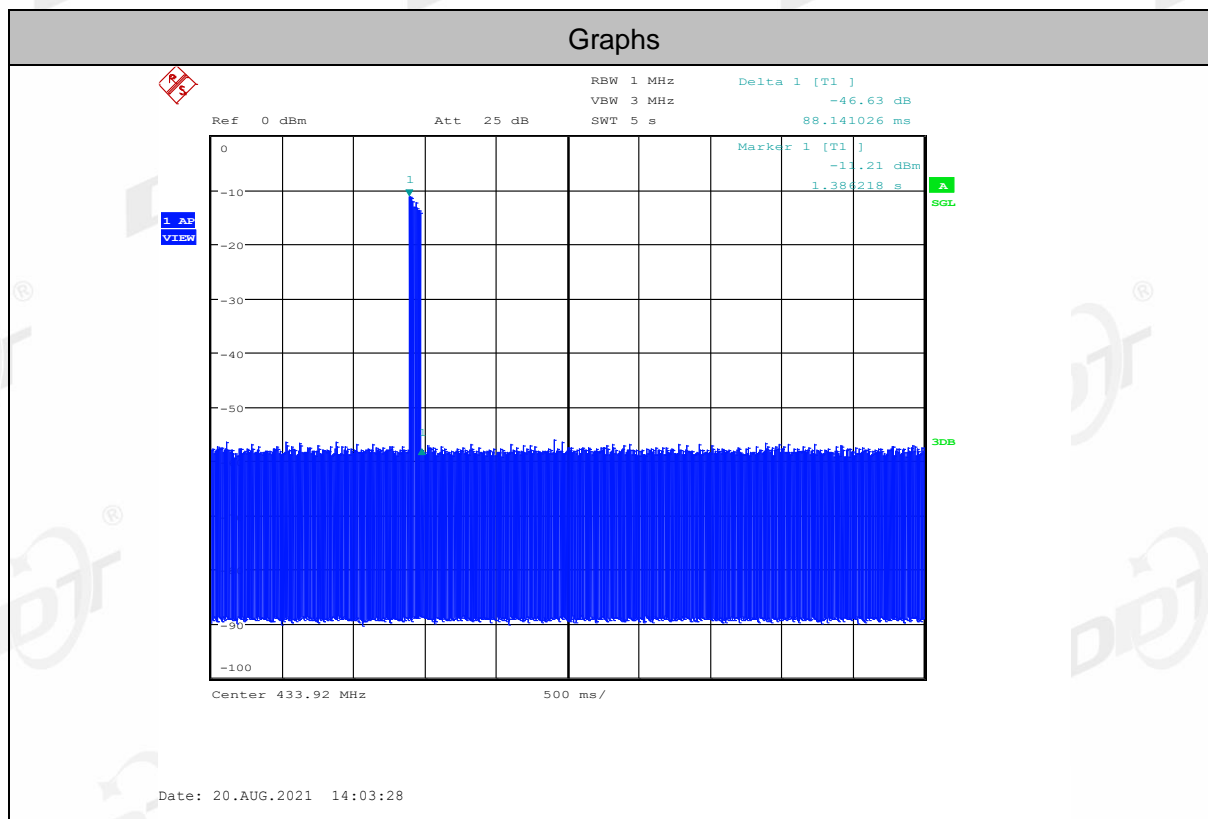
### 6.3. Test Procedure

- (1) The EUT's RF signal was coupled to spectrum analyzer by 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.

### 6.4. Test Result

Frequency (MHz)	Stop transmitting time (s)	Limit
433.92	1.386	≤5s

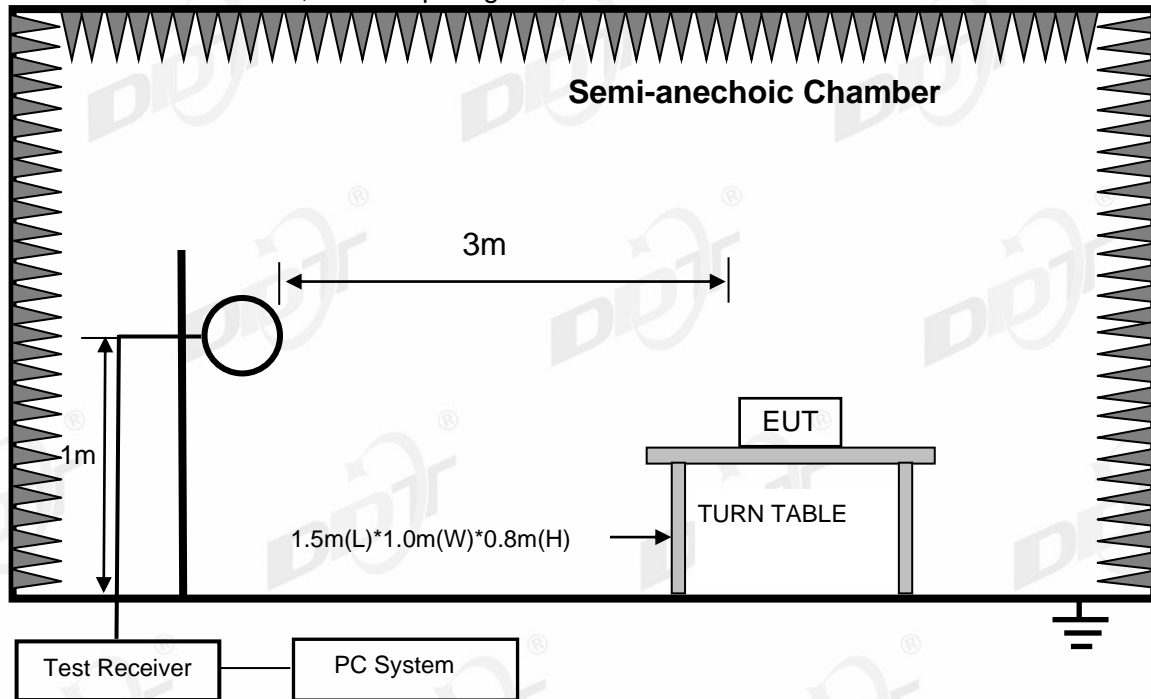
## 6.5. Original test data



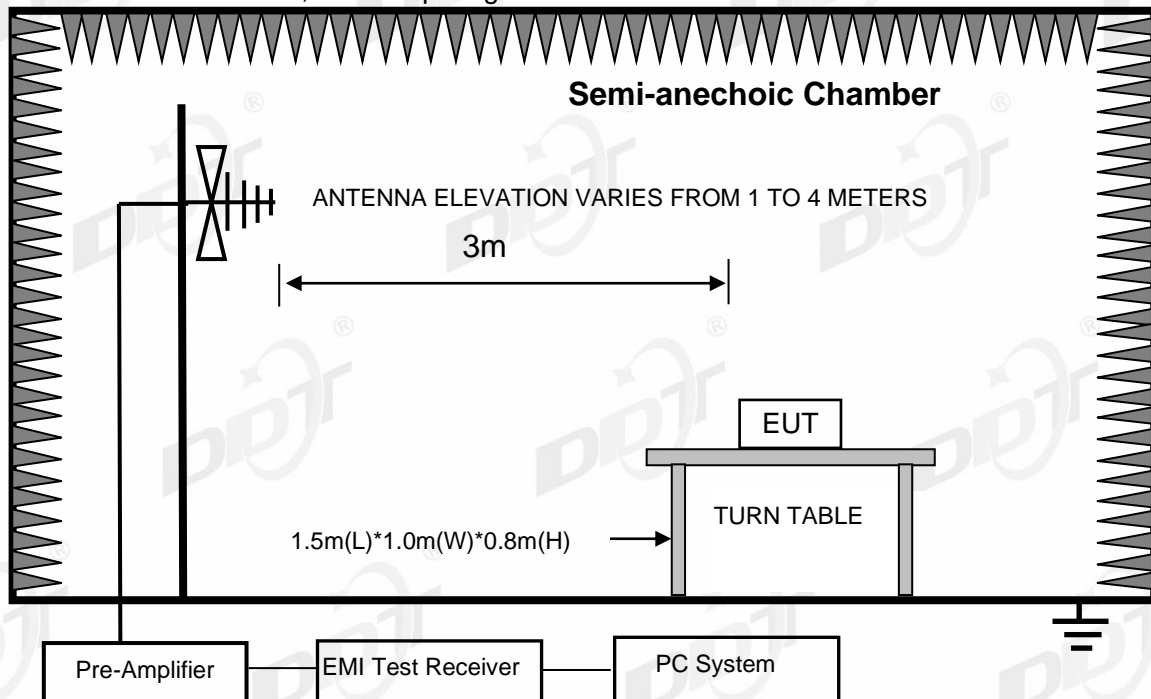
## 7 Radiated emission

### 7.1. Block diagram of test setup

In 3 m Anechoic Chamber, test setup diagram for 9 kHz - 30 MHz:

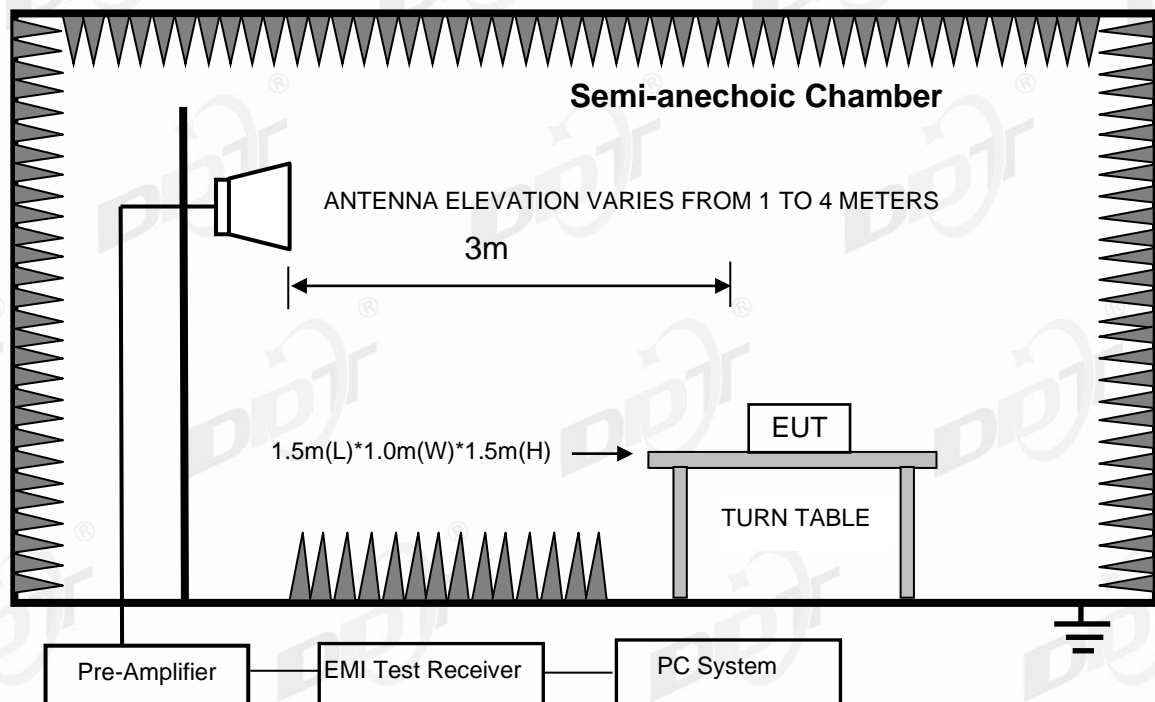


In 3 m Anechoic Chamber, test setup diagram for 30 MHz - 1 GHz:





In 3 m Anechoic Chamber, test setup diagram for frequency above 1 GHz:



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

## 7.2. Limit

(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
10.495-0.505	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
4.1772&4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.2072&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.G
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	( <sup>2</sup> )
13.36-13.41			

## (2) FCC 15.209 Limit.

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		$\mu\text{V/m}$	$\text{dB}(\mu\text{V})/\text{m}$
0.009 ~ 0.490	300	$2400/\text{F}(\text{kHz})$	$67.6-20\log(\text{F})$
0.490 ~ 1.705	30	$24000/\text{F}(\text{kHz})$	$87.6-20\log(\text{F})$
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 $\text{dB}(\mu\text{V})/\text{m}$ (Peak) 54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average)	

## (3) FCC 15.231 section (a) limit

Fundamental Frequency (MHz)	Field Strength of Fundamental
433.92	AV:80.83dBuV/m @3m PK:100.83dBuV/m @3m

Note: (1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30MHz, measurement may be performed at a distance closer than that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$\text{Limit}_{3\text{m}}(\text{dBuV/m}) = \text{Limit}_{300\text{m}}(\text{dBuV/m}) + 40\log(300\text{m}/3\text{m}) = \text{Limit}_{300\text{m}}(\text{dBuV/m}) + 80$$

$$\text{Limit}_{3\text{m}}(\text{dBuV/m}) = \text{Limit}_{30\text{m}}(\text{dBuV/m}) + 40\log(30\text{m}/3\text{m}) = \text{Limit}_{30\text{m}}(\text{dBuV/m}) + 40$$

## (3) Limit for this 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 (e) limit of comply with FCC 15.209 limit which permit higher emission level.

### 7.3. Test Procedure

- (1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber for below 1G and 150 cm above the ground plane inside a semi-anechoic chamber for above 1G.
- (2) Test antenna was located 3m from the EUT on an adjustable mast, and the antenna used as below table.

Test frequency range	Test antenna used	Test antenna distance
9kHz-30MHz	Active Loop antenna	3m
30MHz-1GHz	Trilog Broadband Antenna	3m
1GHz-18GHz	Double Ridged Horn Antenna(1GHz-18GHz)	3m
18GHz-40GHz	Horn Antenna(18GHz-40GHz)	1m

According ANSI C63.10:2013 clause 6.4.4.2 and 6.5.3, for measurements below 30 MHz, the loop antenna was positioned with its plane vertical from the EUT and rotated about its vertical axis for maximum response at each azimuth position around the EUT. And the loop antenna also be positioned with its plane horizontal at the specified distance from the EUT. The center of the loop is 1 m above the ground for measurement above 30MHz, the Trilog Broadband Antenna or Horn Antenna was located 3m from EUT, Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

- (3) Below pre-scan procedure was first performed in order to find prominent frequency spectrum radiated emissions from 9kHz to 5GHz (tenth harmonic of fundamental frequency):

- (a) Scanning the peak frequency spectrum with the antenna specified in step (3), and the EUT was rotated 360 degree, the antenna height was varied from 1m to 4m(Except loop antenna, it's fixed 1m above ground.)

- (b) Change work frequency or channel of device if practicable.

- (c) Change modulation type of device if practicable.

- (d) Change power supply range from 85% to 115% of the rated supply voltage

- (e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

- (4) For final emissions measurements at each frequency of interest, the EUT was 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 2013 on Radiated Emission test.

- (5) The emissions from 9kHz to 1GHz were measured based on CISPR QP detector except for the frequency bands 9-90kHz, 110-490kHz, for emissions from 9kHz-90kHz, 110kHz-490kHz and above 1GHz were measured based on average detector, for emissions above 1GHz, peak emissions also be measured and need comply with Peak limit.
- (6) The emissions from 9kHz to 1GHz, QP or average values were measured with EMI receiver with below RBW.

Frequency band	RBW
9kHz-150kHz	200Hz
150kHz-30MHz	9kHz
30MHz-1GHz	120kHz

- (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; RMS detector RBW 1MHz VBW 3MHz for Average measure(according ANSI C63.10:2013 clause 4.2.3.2.3 procedure for average measure).
- (8) X axis, Y axis, Z axis are tested, and worse setup X axis is reported.

#### 7.4. Test result

##### Pass. (See below detailed test result)

Note1: According exploratory test no any obvious emission were detected from 9kHz to 30MHz.

Note2: For emissions above 1GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit.

## Radiated Emission test (below 1GHz)

## TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 2#

D:\2021 RE2# Report Data\Q21072216-2E 4010-001\FCC  
BELOW1G.EM6

Test Date : 2021-08-24

Tested By : Jacky

EUT : LED Control Box

Model Number : 4010-001

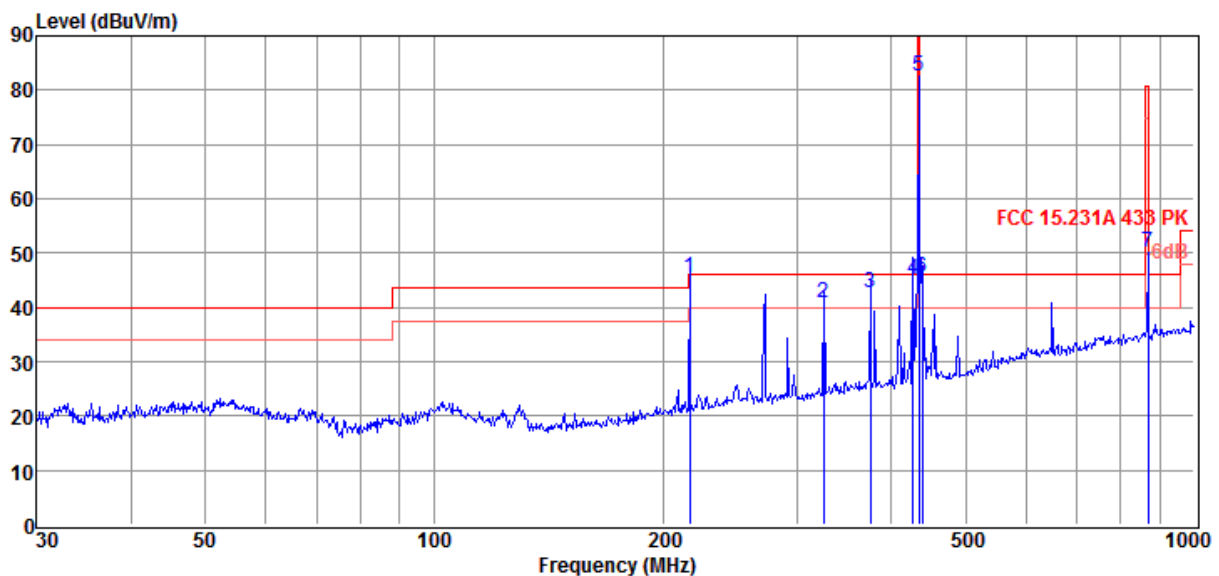
Power Supply : Battery

Test Mode : Tx mode

Condition : Temp:24.5°C,Humi:55%,Press:100.1kPa

Antenna/Distance : 2020 VULB 9163 2#/3m/HORIZONTAL

Memo : 433.92MHz

Data:  
7

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBUV/m)	Limit Line (dBUV/m)	Over Limit (dB)	Detector	Polarization
1	216.78	29.34	11.11	5.12	45.57	46.00	-0.43	QP	HORIZONTAL
2	325.60	21.04	14.20	5.60	40.84	46.00	-5.16	QP	HORIZONTAL
3	374.62	21.75	15.20	5.82	42.77	46.00	-3.23	QP	HORIZONTAL
4	426.52	23.32	15.93	6.02	45.27	46.00	-0.73	QP	HORIZONTAL
5	433.92	60.52	16.04	6.05	82.61	/	/	Peak	HORIZONTAL
6	438.66	23.35	16.09	6.07	45.51	46.00	-0.49	QP	HORIZONTAL
7	867.84	21.04	21.53	7.60	50.17	60.83	-10.68	QP	HORIZONTAL

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

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

**Test Site** : DDT 3m Chamber 2#

D:\2021 RE2# Report Data\Q21072216-2E 4010-001\FCC  
BELOW1G.EM6

**Test Date** : 2021-08-24

**Tested By** : Jacky

**EUT** : LED Control Box

**Model Number** : 4010-001

**Power Supply** : Battery

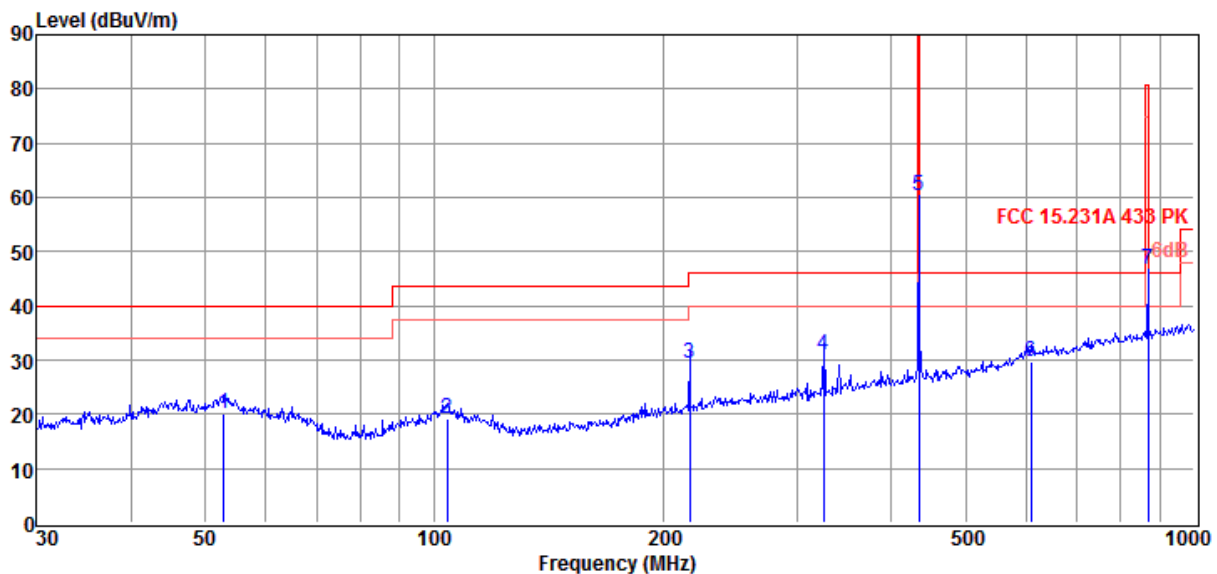
**Test Mode** : Tx mode

**Condition** : Temp:24.5°C,Humi:55%,Press:100.1kPa

**Antenna/Distance** : 2020 VULB 9163 2#/3m/VERTICAL

**Memo** : 433.92MHz

Data:  
8



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	52.95	2.56	13.77	3.80	20.13	40.00	-19.87	QP	VERTICAL
2	104.17	3.02	11.84	4.17	19.03	43.50	-24.47	QP	VERTICAL
3	216.78	13.61	11.11	4.70	29.42	46.00	-16.58	QP	VERTICAL
4	325.60	11.57	14.20	5.21	30.98	46.00	-15.02	QP	VERTICAL
5	433.92	38.42	16.04	5.72	60.18	/	/	Peak	VERTICAL
6	609.92	4.06	19.22	6.39	29.67	46.00	-16.33	QP	VERTICAL
7	867.84	17.81	21.53	7.28	46.62	60.83	-14.21	QP	VERTICAL

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

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

**Field Strength Of The Fundamental Signal**

Frequency (MHz)	PK Level (dBuV/m)	PK Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.92	82.61	100.83	-18.22	Horizontal
433.92	60.18	100.83	-40.65	Vertical

Frequency (MHz)	AV Level (dBuV/m)	AV Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.92	73.71	80.83	-7.12	Horizontal
433.92	51.28	80.83	-29.55	Vertical

Note: AV Level= PK Level+ PDCF

**Radiated Emission test (above 1GHz)**

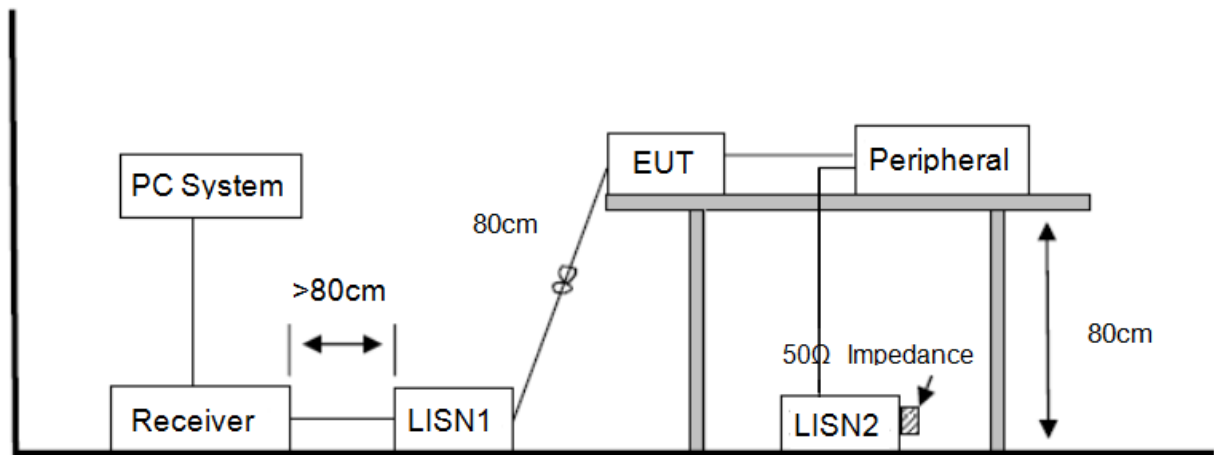
Freq. (MHz)	Read level (dBuV)	Antenna Factor (dB/m)	PRM Factor(dB)	Cable Loss (dB)	Result Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector type	Polarization
Tx mode									
1735.68	70.97	26.76	42.37	3.94	59.30	80.83	-21.53	Peak	HORIZONTAL
2169.60	71.03	27.67	42.90	4.54	60.34	80.83	-20.49	Peak	HORIZONTAL
2603.52	76.05	28.23	43.35	4.97	65.90	80.83	-14.93	Peak	HORIZONTAL
3035.00	62.11	29.12	43.71	5.19	52.71	74.00	-21.29	Peak	HORIZONTAL
3474.36	62.27	29.39	43.85	5.64	53.45	80.83	-28.48	Peak	HORIZONTAL
3910.00	61.03	30.22	43.98	5.98	53.25	74.00	-20.75	Peak	HORIZONTAL
1735.68	64.73	26.76	42.37	3.94	53.06	80.83	-27.77	Peak	VERTICAL
2169.60	75.14	27.67	42.90	4.54	64.45	80.83	-16.38	Peak	VERTICAL
2169.60	-	-	-	-	55.55	60.83	-5.28	Average	VERTICAL
2495.00	64.67	28.00	43.25	4.91	54.33	74.00	-19.67	Peak	VERTICAL
2495.00	58.68	28.00	43.25	4.91	48.34	54.00	-5.66	Average	VERTICAL
2603.52	76.57	28.23	43.35	4.97	66.42	80.83	-15.51	Peak	VERTICAL
2603.52	-	-	-	-	57.52	60.83	-4.41	Average	VERTICAL
3035.00	61.71	29.12	43.71	5.19	52.31	74.00	-21.69	Peak	VERTICAL
3474.36	62.71	29.39	43.85	5.64	53.89	80.83	-26.94	Peak	VERTICAL
Result: Pass									

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

2: For emissions above 1GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit.

## 8 Power Line Conducted Emission

### 8.1. Block diagram of test setup



### 8.2. Power Line Conducted Emission Limits

Frequency	Quasi-Peak Level dB( $\mu$ V)	Average Level dB( $\mu$ V)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Note 1: \* Decreasing linearly with logarithm of frequency.

Note 2: The lower limit shall apply at the transition frequencies.

### 8.3. Test Procedure

The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80cm above the ground plane.

Configuration EUT to simulate typical usage as described in clause 2.4 and test equipment as described in clause 10.2 of this report.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.

All support equipment power received from a second LISN.

Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

The test mode(s) described in clause 2.4 were scanned during the preliminary test.

After the preliminary scan, we found the test mode producing the highest emission level.

The EUT configuration and worse cable configuration of the above highest emission levels were recorded for reference of the final test.



EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Neutral and Line, recording at least the six highest emissions.

Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

The test data of the worst-case condition(s) was recorded.

The bandwidth of test receiver is set at 9 kHz.

#### **8.4. Test Result**

Not Applicable

Conducted limits are not required for devices which only employ battery power for operation according to 15.207(C)

## 9 Antenna Requirements

For intentional device, according to FCC 47 CFR Section 15.203, 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. 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.