3H AND COMPANY LIMITED

TEST REPORT

SCOPE OF WORK
FCC TESTING–VR-xL
(the x can replace different number 1 to 2100 means different LED number)

REPORT NUMBER
180330196GZU-001

ISSUE DATE **[REVISED DATE]**

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DOCUMENT CONTROL NUMBER
FCC Part 15:2017-c

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TEST REPORT

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Manufacturing Site	:	3H AND COMPANY LIMITED NO.2, SANHENG ST., RENMIN RD., QISHI TOWN, DONGGUAN CITY
Intertek Report No:		180330196GZU-001
FCC ID:		ZFJ3H20180510R

Test standards

CFR 47, FCC Part 15, Subpart B:2017

Sample Description

Product	:	VR CHRISTMAS LIGHT
Models No.	:	VR-xL(the x can replace different number 1 to 2100 means different LED number)
Electrical Rating	:	120Vac, 60Hz
Serial No.		Not Labeled
Date Received	:	30 March 2018
Date Test Conducted	:	30 March 2018-02 May 2018

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1. TEST RESULTS SUMMARY

Classification of EUT: Class B

Test Item	Standard	Result
Conducted disturbance voltage at mains ports	**CFR 47, FCC Part 15, Subpart B**	**Pass**
Radiated emission (30 MHz–1 GHz)	**CFR 47, FCC Part 15, Subpart B**	**Pass**
Radiated emission (Above 1 GHz)	**CFR 47, FCC Part 15, Subpart B**	**Pass**
Remark: Reference publication is used for methods of measurement: ANSI C63.4:2014		

Remark 1:
1. The symbol “N/A” in above table means Not Applicable.
2. When determining the test results, measurement uncertainty of tests has been considered.

Remark 2:
VR-xL (the x can replace different number 1 to 2100 means different LED number), so model VR-2100L with max LED number was selected for full test.

Remark 3:

Wireless receiver module of Device in this report 180330196GZU-001 is identical with device in report 160707009GZU, the difference from Original sample below:
1. Enlarge capacitance filter and loading on input power;
2. Increase individual power input of IC;
3. Enlarge audion voltage and current loading;
4. Enlarge loading of resistance;

According to the above changes, we carried out test item and record in this report.

TEST REPORT

2. EMC RESULTS CONCLUSION

RE: EMC Testing Pursuant to FCC part 15 performed on the VR CHRISTMAS LIGHT, Model: VR-2100L.

We tested the VR CHRISTMAS LIGHT, Model: VR-2100L, to determine if it was in compliance with the relevant standard as marked on the Test Results Summary. We found that the unit met the requirement of FCC part 15 standard when tested as received. The worst case's test data was presented in this test report.

An un-modulated CW signal at the operating frequency of the EUT is supplied to the EUT for all measurements.

The receiver type of the EUT is super heterodyne.

The production units are required to conform to the initial sample as received when the units are placed on the market.

TEST REPORT

3. LABORATORY MEASUREMENTS

Configuration Information

Support Equipment: N/A

Rated Voltage and frequency under test: 120Vac, 60Hz
Condition of Environment: Temperature: 22~28°C
Relative Humidity:35~60%
Atmosphere Pressure:86~106kPa

Notes:
1. The EMI measurements had been made in the operating mode produced the largest emission in the frequency band being investigated consistent with normal applications. An attempt had been made to maximize the emission by varying the configuration of the EUT.

2. Test Facility accreditation:
A2LA Certificate Number 0078.10
Intertek Testing Services Shenzhen Ltd. Guangzhou Branch is accredited by A2LA and Listed in FCC website. FCC accredited test labs may perform both Certification testing under Parts 15 and 18 and Declaration of Conformity testing.

3. Test Location:
Intertek Testing Services Shenzhen Ltd. Guangzhou Branch
All tests were performed at:
Block E, No.7-2 Guang Dong Software Science Park, Caipin Road, Guangzhou Science City, GETDD Guangzhou, China
Except Radiated Emissions was performed at:
Room102/104, No 203, KeZhu Road, Science City, GETDD Guangzhou, China

4. Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Conduction Emission (9 kHz-150 kHz)	2.51 dB
2	Conduction Emission (150 kHz-30 MHz)	2.69 dB
3	Disturbance Power (30 MHz-300 MHz)	3.21 dB
4	Radiated Emission (30 MHz-1 GHz)	4.79 dB
5	Radiated Emission (1 GHz-6 GHz)	5.02 dB
6	Radiated Emission (6 GHz-18 GHz)	5.17 dB

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.
The measurement uncertainty is given with a confidence of 95%, k=2.

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4. EQUIPMENT USED DURING TEST

Conducted Disturbance-Mains Terminal(1)

Equipment No.	Equipment	Model	Manufacturer	Cal. Due date (DD-MM-YYYY)	Calibration Interval
EM080-05	EMI receiver	ESCI	R&S	24/07/2018	1Y
EM006-05	LISN	ENV216	R&S	04/06/2018	1Y
SA047-112	Digital Temperature-Humidity Recorder	RS210	YIJIE	03/11/2018	1Y
EM004-04	EMC shield Room	8m×3m×3m	Zhongyu	07/01/2019	1Y

Radiated Disturbance (30 MHz-1 GHz)

Equipment No.	Equipment	Model	Manufacturer	Cal. Due date (DD-MM-YYYY)	Calibration Interval
EM030-04	3m Semi-Anechoic Chamber	9×6×6 m3	ETS-LINDGREN	01/05/2018	1Y
EM031-02	EMI Test Receiver (9 kHz~7 GHz)	R&S ESR7	R&S	03/11/2019	1Y
EM033-01	TRILOG Super Broadband test Antenna（30 MHz-3 GHz）	VULB 9163	SCHWARZBECK	19/09/2018	1Y
EM031-02-01	Coaxial cable	/	R&S	18/05/2018	1Y
EM036-01	Common-mode absorbing clamp	CMAD 20B	TESEQ	31/07/2018	1Y
SA047-118	Digital Temperature-Humidity Recorder	RS210	YIJIE	10/07/2018	1Y
EM045-01-01	EMC32 software (RE/RS)	V10.01.00	R&S	N/A	N/A

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Radiated Disturbance (1-18 GHz)

Equipment No.	Equipment	Model	Manufacturer	Cal. Due date (DD-MM-YYYY)	Calibration Interval
EM030-04	3m Semi-Anechoic Chamber	9×6×6 m3	ETS-LINDGREN	01/05/2018	1Y
EM031-02	EMI Test Receiver (9 kHz~7 GHz)	R&S ESR7	R&S	03/11/2019	1Y
EM031-03	Signal and Spectrum Analyzer (10 Hz~40 GHz)	R&S FSV40	R&S	18/05/2018	1Y
EM033-02	Bouble-Ridged Waveguide Horn Antenna (800 MHz-18 GHz)	R&S HF907	R&S	07/06/2018	1Y
EM033-02-02	Coaxial cable(1 GHz-18 GHz)	N/A	R&S	18/05/2018	1Y
EM022-03	2.45 GHz Filter	BRM 50702	Micro-Tronics	09/05/2018	1Y
SA047-118	Digital Temperature-Humidity Recorder	RS210	YIJIE	10/07/2018	1Y
EM045-01-01	EMC32 software (RE/RS)	V10.01.00	R&S	N/A	N/A

An un-modulated CW signal generated by equipment:

Equipment No.	Equipment	Model	Manufacturer	Cal. Due date	Calibration
EM031-01	Signal Generator (9 kHz~6 GHz)	SMB100A	R&S	2018/8/1	1Y

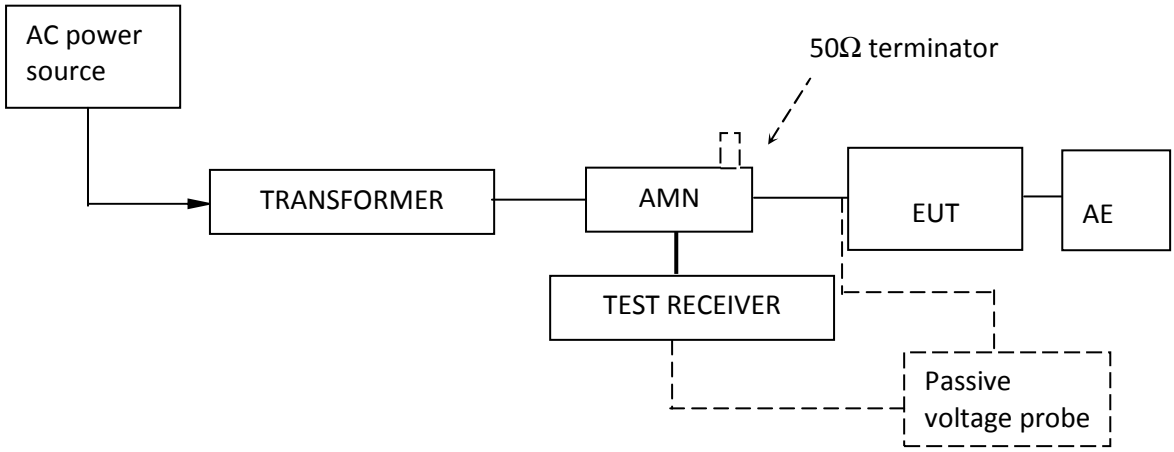
TEST REPORT

5. EMI TEST

5.1 Conducted Disturbance Voltage at mains ports

Test Result: Pass

5.1.1 Block Diagram of Test Setup



5.1.2 Test Setup and Procedure

The EUT was set to achieve the maximum emission level. The mains terminal disturbance voltage was measured with the EUT in a shielded room. The EUT was connected to AC power source through an Artificial Mains Network which provides a 50Ω linear impedance Artificial hand is used if appropriate (for handheld apparatus). The load/control terminal disturbance voltage was measured with passive voltage probe if appropriate.
The table-top EUT was placed on a 0.8m high non-metallic table above earthed ground plane(Ground Reference Plane).And for floor standing EUT, was placed on a 0.1m high non-metallic supported on GRP. The EUT keeps a distance of at least 0.8m from any other of the metallic surface. The Artificial Mains Network is situated at a distance of 0.8m from the EUT. During the test, mains lead of EUT excess 0.8m was folded back and forth parallel to the lead so as to form a horizontal bundle with a length between 0.3m and 0.4m.
The bandwidth of test receiver was set at 9 kHz. The frequency range from 150 kHz to 30MHz was checked.

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5.1.3 Limit

Frequency range MHz	**AC mains terminals** dB (uV)	
	Quasi-peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50
Note 1: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz. Note 2: The lower limit is applicable at the transition frequency.		

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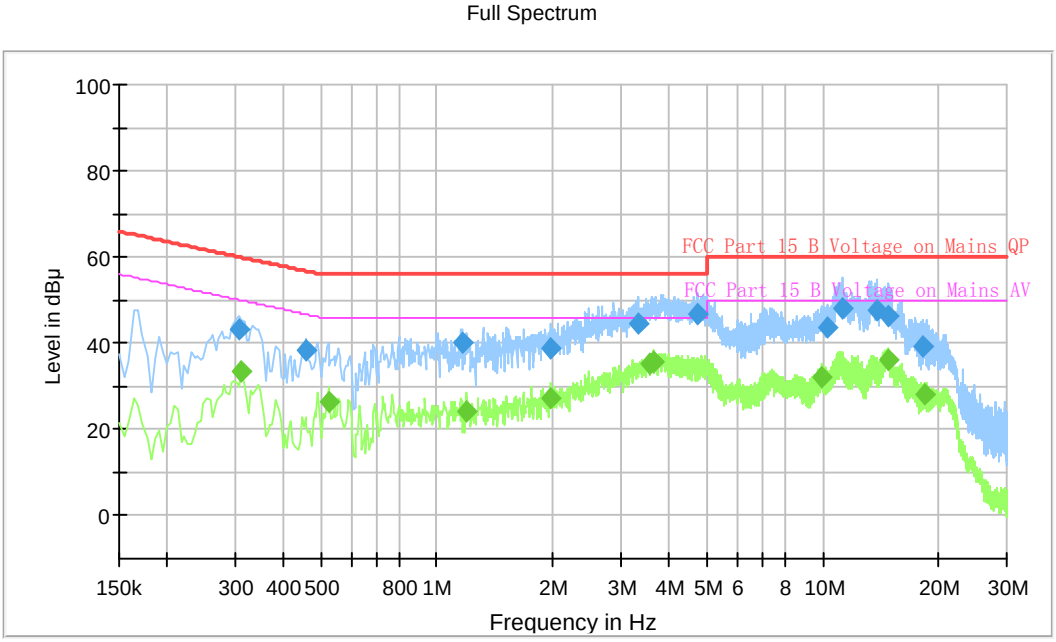
5.1.4 Test Data and curve

At mains terminal:
Tested Wire: Live
Operation Mode: Receiving mode + Lighting



Frequency (MHz)	QuasiPeak (dB¦ìV)	Average (dB¦ìV)	Limit (dB¦ìV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.307500	43.01	---	60.04	17.03	1000.0	9.000	L1	ON	9.69
0.312000	---	33.57	49.92	16.34	1000.0	9.000	L1	ON	9.69
0.460500	38.24	---	56.68	18.44	1000.0	9.000	L1	ON	9.68
0.523500	---	26.32	46.00	19.68	1000.0	9.000	L1	ON	9.68
1.162500	39.92	---	56.00	16.08	1000.0	9.000	L1	ON	9.68
1.189500	---	24.12	46.00	21.88	1000.0	9.000	L1	ON	9.68
1.972500	---	27.29	46.00	18.71	1000.0	9.000	L1	ON	9.66
1.972500	38.94	---	56.00	17.06	1000.0	9.000	L1	ON	9.66
3.313500	44.57	---	56.00	11.43	1000.0	9.000	L1	ON	9.70
3.574500	---	35.27	46.00	10.73	1000.0	9.000	L1	ON	9.71
3.664500	---	35.78	46.00	10.22	1000.0	9.000	L1	ON	9.71
4.744500	46.57	---	56.00	9.43	1000.0	9.000	L1	ON	9.96
9.933000	---	32.31	50.00	17.69	1000.0	9.000	L1	ON	9.85
10.338000	43.87	---	60.00	16.13	1000.0	9.000	L1	ON	9.86
11.278500	48.29	---	60.00	11.71	1000.0	9.000	L1	ON	9.89
13.789500	47.61	---	60.00	12.39	1000.0	9.000	L1	ON	9.96
14.752500	46.32	---	60.00	13.68	1000.0	9.000	L1	ON	9.98
14.761500	---	35.95	50.00	14.05	1000.0	9.000	L1	ON	9.98
18.159000	39.31	---	60.00	20.69	1000.0	9.000	L1	ON	10.08
18.352500	---	28.08	50.00	21.92	1000.0	9.000	L1	ON	10.08

Remark:
1. Corr. (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Level (dBµV) = Corr. (dB) + Read Level (dBµV)
3. Delta Limit (dB) = Level (dBµV)-Limit (dBµV)

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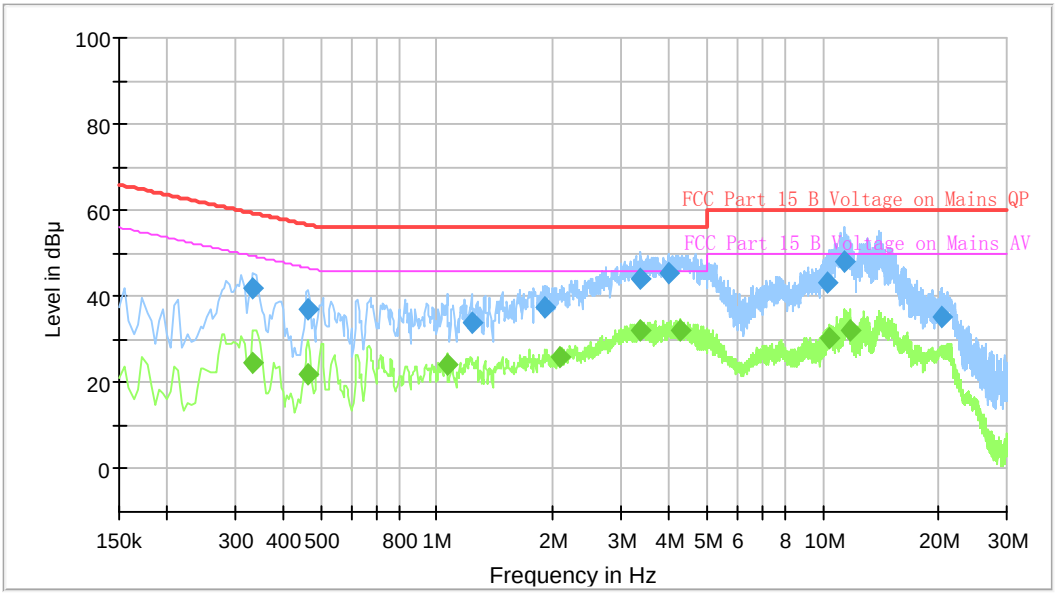
Tested Wire: Neutral
Operation Mode: Receiving mode + Lighting

Full Spectrum



Frequency (MHz)	QuasiPeak (dB¦ÌV)	Average (dB¦ÌV)	Limit (dB¦ÌV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.334500	---	24.65	49.34	24.69	1000.0	9.000	N	ON	9.68
0.334500	41.77	---	59.34	17.56	1000.0	9.000	N	ON	9.68
0.465000	---	22.05	46.60	24.55	1000.0	9.000	N	ON	9.68
0.465000	37.11	---	56.60	19.50	1000.0	9.000	N	ON	9.68
1.059000	---	24.12	46.00	21.88	1000.0	9.000	N	ON	9.68
1.230000	33.79	---	56.00	22.21	1000.0	9.000	N	ON	9.68
1.909500	37.35	---	56.00	18.65	1000.0	9.000	N	ON	9.66
2.085000	---	25.90	46.00	20.10	1000.0	9.000	N	ON	9.66
3.358500	43.95	---	56.00	12.05	1000.0	9.000	N	ON	9.70
3.381000	---	32.28	46.00	13.72	1000.0	9.000	N	ON	9.70
4.002000	45.26	---	56.00	10.74	1000.0	9.000	N	ON	9.72
4.299000	---	32.17	46.00	13.83	1000.0	9.000	N	ON	9.82
10.284000	43.27	---	60.00	16.73	1000.0	9.000	N	ON	9.88
10.360500	---	30.18	50.00	19.82	1000.0	9.000	N	ON	9.88
11.449500	48.30	---	60.00	11.70	1000.0	9.000	N	ON	9.92
11.791500	---	32.26	50.00	17.74	1000.0	9.000	N	ON	9.93
20.458500	35.32	---	60.00	24.68	1000.0	9.000	N	ON	10.21

Remark:
1. Corr. (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Level (dBµV) = Corr. (dB) + Read Level (dBµV)
3. Delta Limit (dB) = Level (dBµV)-Limit (dBµV)

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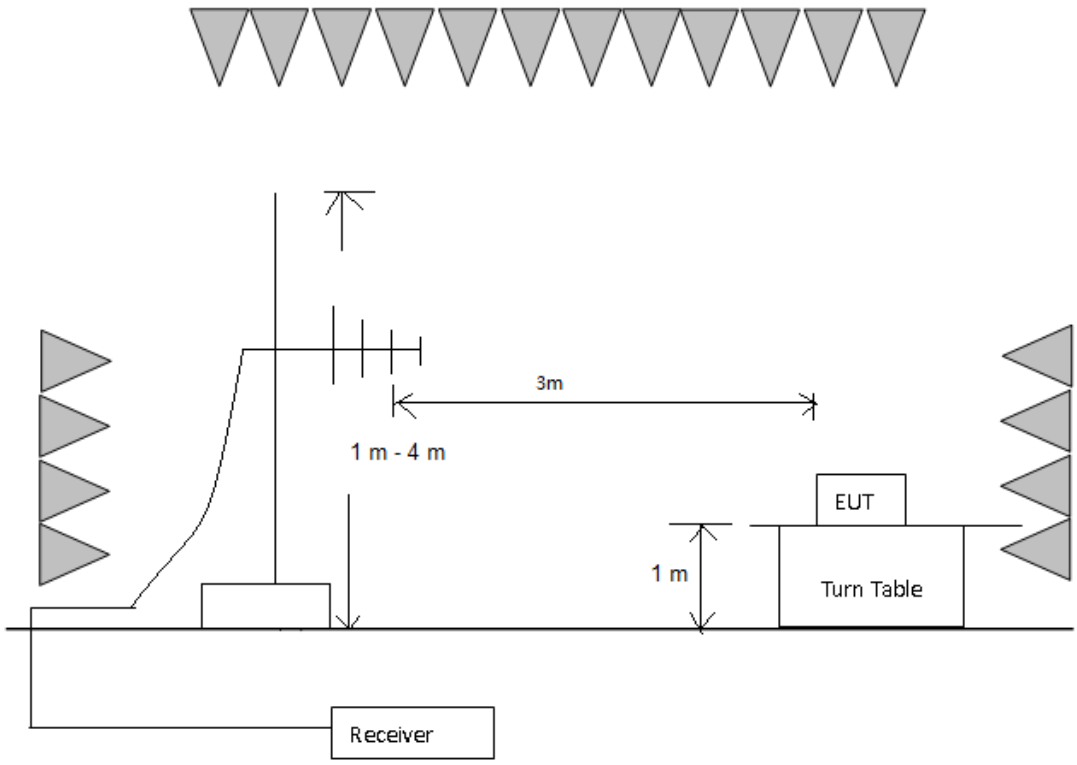
5.2 Radiated Emission 30 MHz -1000 MHz

Test Result: Pass

5.2.1 Block Diagram of Test Setup



5.2.2 Test Setup and Procedure

The measurement was applied in a semi-anechoic chamber. The EUT and simulators were placed on a 0.8 m high wooden turntable above the horizontal metal ground plane. The turn table rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mask. The antenna moved up and down between from 1 meter to 4 meters to find out the maximum emission level.

Broadband antenna was used as receiving antenna. Both horizontal and vertical polarization of the antenna was set on measurement. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4 requirement during radiated test. The bandwidth setting on R&S Test Receiver was 120 kHz.

For an unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below

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the lowest frequency for which a radiated emission limit is specified, up to the frequency shown in the following table:

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper Frequency of Radiated Measurement
Below 1.705 MHz	30MHz
1.705 MHz – 108 MHz	1 GHz
108 MHz – 500 MHz	2 GHz
500 MHz – 1 GHz	5 GHz
Above 1 GHz	5th harmonic of the highest frequency or 40 GHz, whichever is lower.
At transitional frequencies the lower limit applies.	

Remark: Radiated Emission was performed from 30 MHz to 1 GHz.

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5.2.3 Limit

Class B limit at 3m test distance:

Frequency range MHz	**Quasi-peak limits** dB (µV/m)
30 to 88	40
88 to 216	43.5
216 to 960	46
960 to 1000	54
At transitional frequencies the lower limit applies.	

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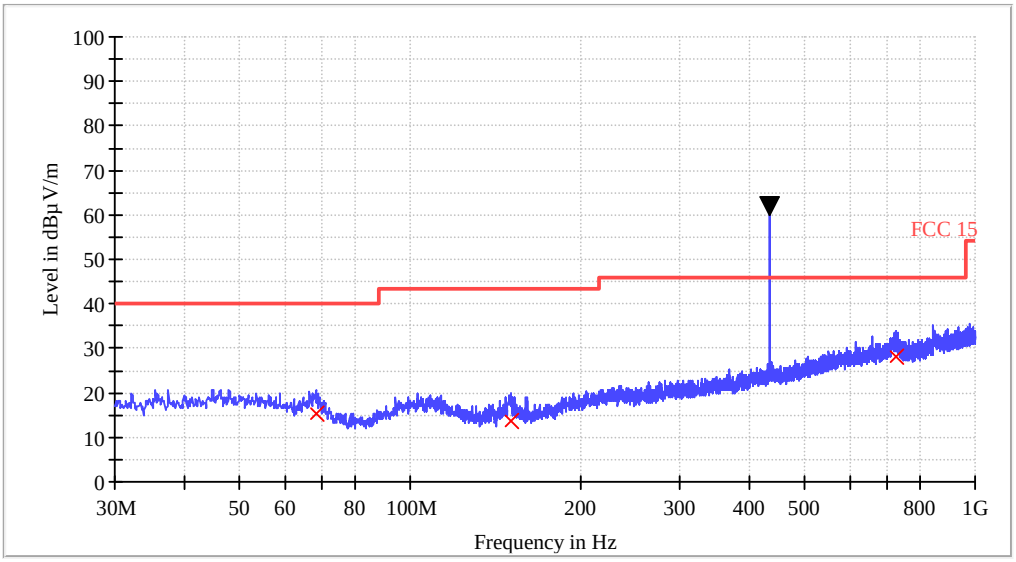
5.2.4 Test Data and Curve

Operation Mode: Receiving mode + Lighting

Horizontal



Frequency (MHz)	Receiver Reading Level (dBµV)	Correction factors (dB/m)	Emission Level (dBµV/m)	Limit (dBµV/m)
68.08	4.9	10.5	15.4	40.0
150.64	4.4	9.0	13.4	43.5
722.84	4.7	23.2	27.9	46.0

Frequency (MHz)	Receiver Reading Level (dBµV)	Correction factors (dB/m)	Emission Level (dBµV/m)	Remark
433.92	42.0	18.3	60.3	Peak

Remark:
1. Corr. (dB) = Antenna Factor (dB) + Cable Loss (dB)
2. Quasi Peak (dBµV/m) = Corr. (dB) + Read Level (dBµV)
3. Margin (dB) = Limit QPK (dBµV/m) –Quasi Peak (dBµV/m)
4. The 433.92MHz is the un-modulated CW signal from the SIGNAL Generator

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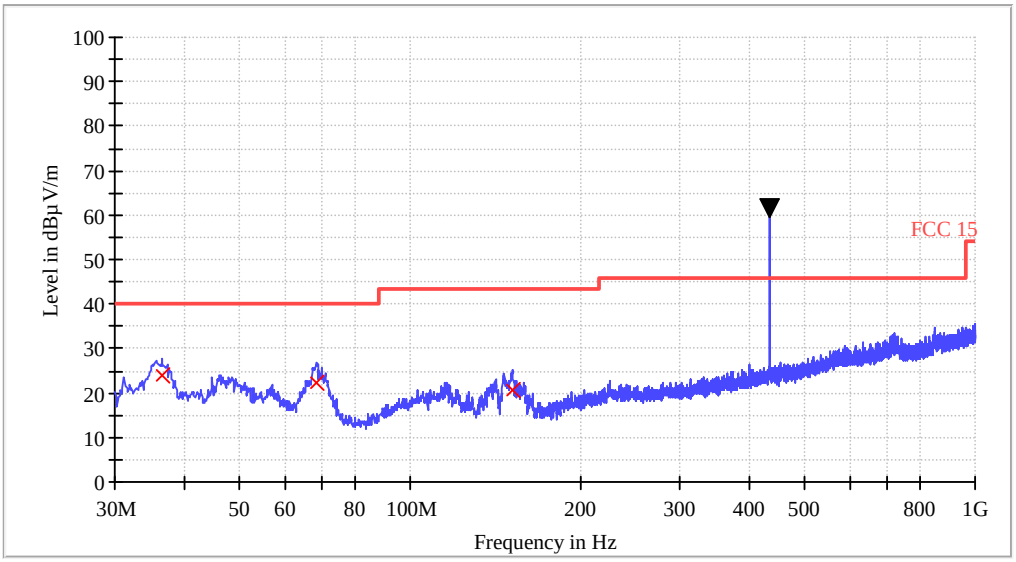
Vertical



Frequency (MHz)	Receiver Reading Level (dBµV)	Correction factors (dB/m)	Emission Level (dBµV/m)	Limit (dBµV/m)
36.44	11.9	12.2	24.1	40.0
68.44	11.9	10.4	22.3	40.0
151.72	11.8	9.0	20.8	43.5

Frequency (MHz)	Receiver Reading Level (dBµV)	Correction factors (dB/m)	Emission Level (dBµV/m)	Remark
433.92	41.7	18.3	60.0	Peak

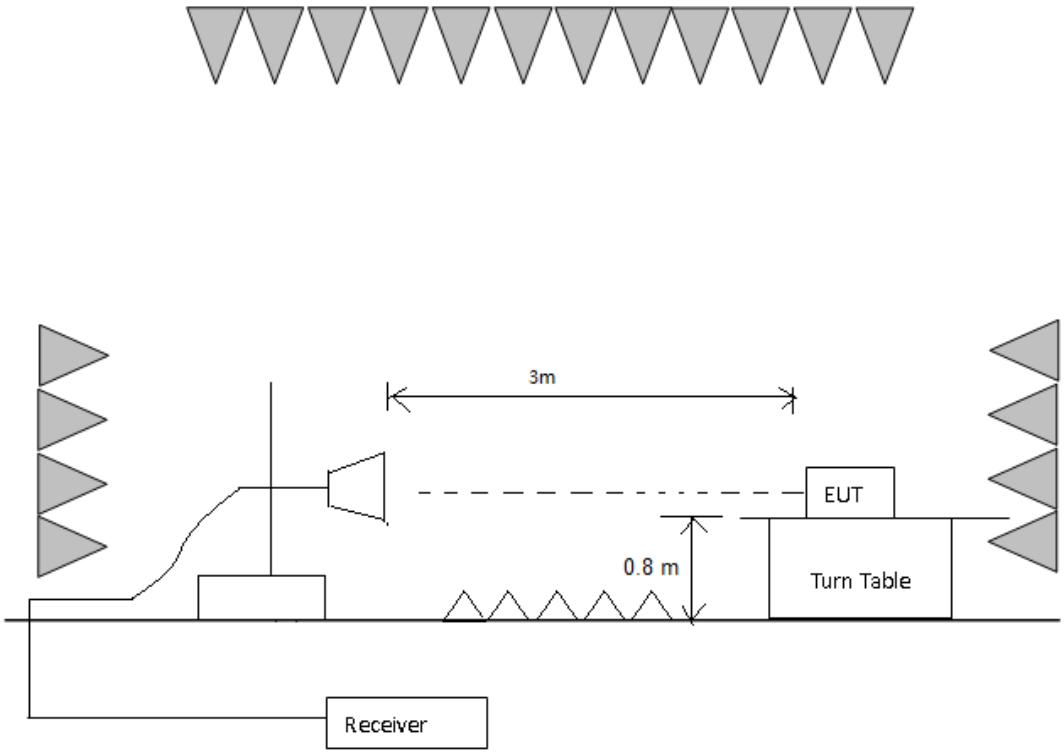
Remark:
1. Corr. (dB) = Antenna Factor (dB) + Cable Loss (dB)
2. Quasi Peak (dBµV/m) = Corr. (dB) + Read Level (dBµV)
3. Margin (dB) = Limit QPK (dBµV/m) –Quasi Peak (dBµV/m)
4. The 433.92MHz is the un-modulated CW signal from the SIGNAL Generator

TEST REPORT

5.3 Radiated Emission above 1 GHz

Test Result: Pass

5.3.1 Block Diagram of Test Setup



5.3.2 Test Setup and Procedure

The measurement was applied in a semi-anechoic chamber with absorbing material placed on the ground. The EUT were placed on a 0.8m high wooden turntable above the horizontal metal ground plane. The turntable varied every 30 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna pole. The antenna was set as same as the height of the radiation centre of the EUT.

Horn antenna was used as receiving antenna. Both horizontal and vertical polarization of the antenna was set on measurement. In order to find the maximum emission, all of the interface cables were manipulated during radiated test.

For an unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a radiated emission limit is specified, up to the frequency shown in the following table:

TEST REPORT

Highest Frequency Generated or Used in Device	Upper Frequency of Radiated Measurement
Below 1.705 MHz	30MHz
1.705 MHz – 108 MHz	1 GHz
108 MHz – 500 MHz	2 GHz
500 MHz – 1 GHz	5 GHz
Above 1 GHz	5th harmonic of the highest frequency or 40 GHz, whichever is lower.
At transitional frequencies the lower limit applies.	

Remark: Radiated Emission was performed from 1 GHz to 6 GHz since the highest frequency generated form the EUT was 433 MHz.

5.3.3 Limit

Class B limit at 3m test distance:

Frequency range MHz	Linear Average Detector dB (µV/m)	Peak Detector dB (µV/m)
> 1000	54	74
At transitional frequencies the lower limit applies.		

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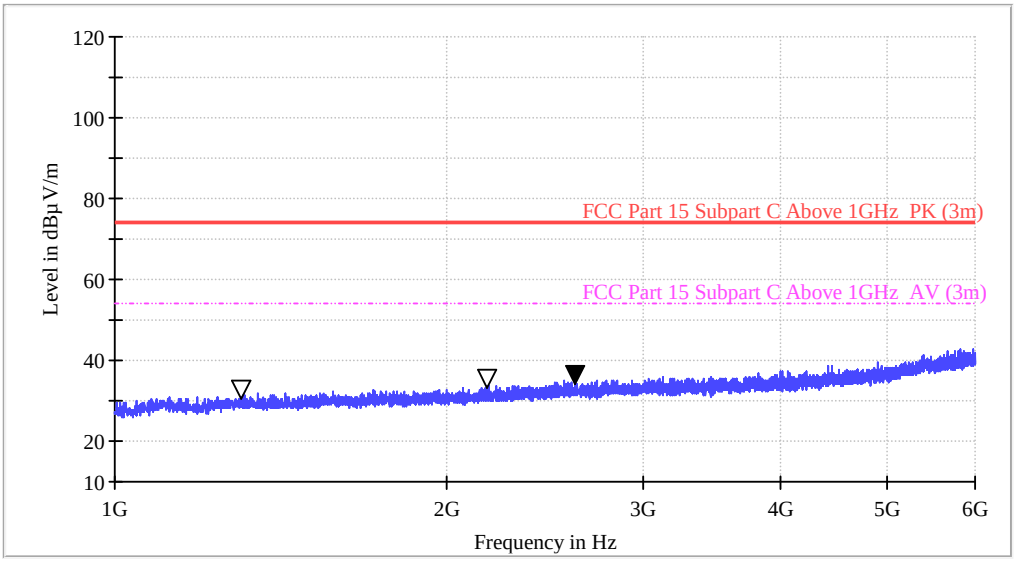
5.3.4 Test Data and Curve

Operation Mode: Receiving mode + Lighting

Horizontal



Polarization	Frequency (MHz)	Reading (dBµV)	Correction Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	1301.000	43.6	-12.9	30.7	74.0	-43.3
Horizontal	2174.500	43.4	-9.8	33.6	74.0	-40.4
Horizontal	7350.000	42.6	-8.2	34.4	74.0	-39.6

Remark:
1. Corr. (dB) = Antenna Factor (dB) + Cable Loss (dB) –Pre-amplifier (dB)
2. Peak (dBµV/m) = Corr. (dB) + Read Level (dBµV)
3. Margin (dB) = Limit Peak (dBµV/m) –Peak (dBµV/m)
4. When Peak emission level was below AV limit, the AV emission level did not be recorded.

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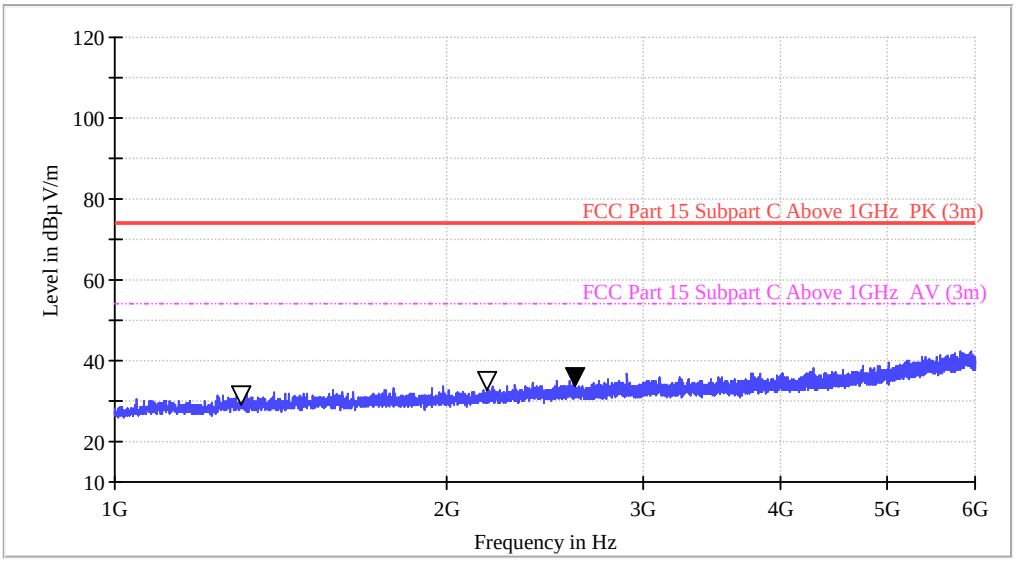
Vertical



Polarization	Frequency (MHz)	Reading (dBµV)	Correction Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	1301.000	42.5	-12.9	29.6	74.0	-44.4
Vertical	2174.500	42.8	-9.8	33.0	74.0	-41.0
Vertical	7350.000	42.4	-8.2	34.2	74.0	-39.8

Remark:
1. Corr. (dB) = Antenna Factor (dB) + Cable Loss (dB) –Pre-amplifier (dB)
2. Peak (dBµV/m) = Corr. (dB) + Read Level (dBµV)
3. Margin (dB) = Limit Peak (dBµV/m) –Peak (dBµV/m)
4. When Peak emission level was below AV limit, the AV emission level did not be recorded.

**********End of Report**********