

TEST REPORT

Product Name : GrowFlux Mesh Lighting Adapter
Brand Mark : N/A
Model No. : GFX-OEMHG01
FCC ID : 2AY24-GFX-HG01
Report Number : BLA-EMC-202111-A11401
Date of Sample Receipt : 2021/12/1
Date of Test : 2021/12/1 to 2021/12/13
Date of Issue : 2021/12/13
Test Standard : 47 CFR Part 15, Subpart C 15.249
Test Result : Pass

Prepared for:

HLG

3505 Maynardville Hwy Maynardville Tennessee United States

Prepared by:

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Date:

2021/12/13



REPORT REVISE RECORD

Version No.	Date	Description
00	2021/12/10	Original

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1 TEST SUMMARY

Test item	Test Requirement	Test Method	Class/Severity	Result
Radiated Emissions	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.4&6.5&6.6	47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)	Pass
Restricted Band Around Fundamental Frequency	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.4&6.5&6.6	47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209	Pass
Field Strength of the Fundamental Signal (15.249(a))	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.5&6.6	47 CFR Part 15, Subpart C 15.249(a)	Pass
20dB Bandwidth	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.215	Pass
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Antenna Requirement	47 CFR Part 15, Subpart C 15.249	N/A	47 CFR Part 15, Subpart C 15.203	Pass

2 GENERAL INFORMATION

Applicant	HLG
Address	3505 Maynardville Hwy Maynardville Tennessee United States
Manufacturer	Shenzhen RF-star Technology Co., Ltd.
Address	C601, Skyworth Building, High-tech Park, Nanshan District, Shenzhen, China, 518057
Factory	Shenzhen RF-star Technology Co., Ltd.
Address	C601, Skyworth Building, High-tech Park, Nanshan District, Shenzhen, China, 518057
Product Name	GrowFlux Mesh Lighting Adapter
Test Model No.	GFX-OEMHG01

3 GENERAL DESCRIPTION OF E.U.T.

Hardware Version	3.4d
Software Version	HLG-S-DIABLO, HLG-650-R
Operation Frequency:	915MHz
Channel numbers:	1
Modulation type:	ASK
Antenna Type:	PCB antenna
Antenna gain:	2.33dBi(Provided by applicant)
Power supply:	DC12V

4 TEST ENVIRONMENT

Environment	Temperature	Voltage
Normal	25°C	DC3.3V

5 TEST MODE

TEST MODE	TEST MODE DESCRIPTION
TX	Keep the EUT in transmitting mode
Remark: Only the data of the worst mode would be recorded in this report.	

6 MEASUREMENT UNCERTAINTY

Parameter	Expanded Uncertainty (Confidence of 95%)
Radiated Emission(9kHz-30MHz)	±4.34dB
Radiated Emission(30Mz-1000MHz)	±4.24dB
Radiated Emission(1GHz-18GHz)	±4.68dB
AC Power Line Conducted Emission(150kHz-30MHz)	±3.45dB

7 DESCRIPTION OF SUPPORT UNIT

Device Type	Manufacturer	Model Name	Serial No.	Remark
PC	HASEE	K610D	N/A	N/A

8 LABORATORY LOCATION

All tests were performed at:
BlueAsia of Technical Services(Shenzhen) Co., Ltd.
Building C, No. 107, Shihuan Road, Shiyuan Sub-District, Baoan District, Shenzhen, Guangdong Province, China
Telephone: TEL: +86-755-28682673 FAX: +86-755-28682673
No tests were sub-contracted.

9 TEST INSTRUMENTS LIST

Test Equipment Of Radiated Emissions					
Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Chamber	SKET	966	N/A	10/11/2020	9/11/2023
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022
Receiver	R&S	ESR7	101199	24/9/2021	23/9/2022
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	26/9/2020	25/9/2022
Horn Antenna	Schwarzbeck	9120D	01892 P:00331	26/9/2020	25/9/2022
Amplifier	SKET	LNPA-0118-45	N/A	24/9/2021	23/9/2022
EMI software	EZ	EZ-EMC	N/A	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	26/9/2020	25/9/2022

Test Equipment Of Restricted Band Around Fundamental Frequency					
Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Chamber	SKET	966	N/A	10/11/2020	9/11/2023
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022
Receiver	R&S	ESR7	101199	24/9/2021	23/9/2022
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	26/9/2020	25/9/2022
Horn Antenna	Schwarzbeck	9120D	01892 P:00331	26/9/2020	25/9/2022
Amplifier	SKET	LNPA-0118-45	N/A	24/9/2021	23/9/2022
EMI software	EZ	EZ-EMC	N/A	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	26/9/2020	25/9/2022

Test Equipment Of Field Strength of the Fundamental Signal (15.249(a))

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Chamber	SKET	966	N/A	10/11/2020	9/11/2023
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022
Receiver	R&S	ESR7	101199	24/9/2021	23/9/2022
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	26/9/2020	25/9/2022
Horn Antenna	Schwarzbeck	9120D	01892 P:00331	26/9/2020	25/9/2022
Amplifier	SKET	LNPA-0118-45	N/A	24/9/2021	23/9/2022
EMI software	EZ	EZ-EMC	N/A	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	26/9/2020	25/9/2022

Test Equipment Of 20dB Bandwidth

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Shield room	SKET	833	N/A	25/11/2020	24/11/2023
Receiver	R&S	ESPI3	101082	24/9/2021	23/9/2022
LISN	R&S	ENV216	3560.6550.15	24/9/2021	23/9/2022
LISN	AT	AT166-2	AKK1806000003	26/9/2021	25/9/2022
EMI software	EZ	EZ-EMC	N/A	N/A	N/A

Test Equipment Of Conducted Emissions at AC Power Line (150kHz-30MHz)

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Shield room	SKET	833	N/A	25/11/2020	24/11/2023
Receiver	R&S	ESPI3	101082	24/9/2021	23/9/2022

LISN	R&S	ENV216	3560.6550.15	24/9/2021	23/9/2022
LISN	AT	AT166-2	AKK1806000003	26/9/2021	25/9/2022
EMI software	EZ	EZ-EMC	N/A	N/A	N/A

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10 RADIATED EMISSIONS

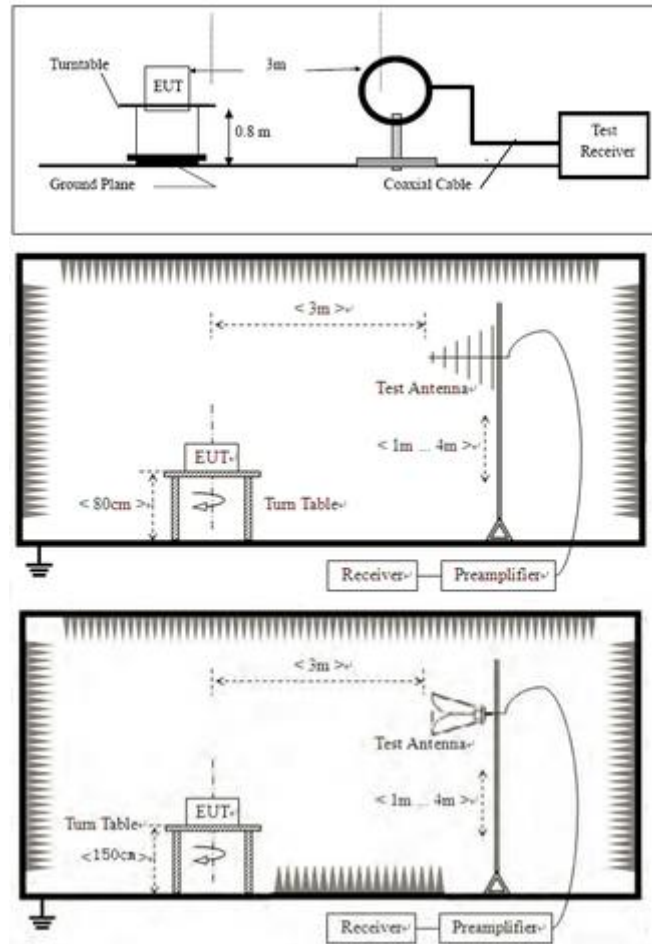
Test Standard	47 CFR Part 15, Subpart C 15.249
Test Method	ANSI C63.10 (2013) Section 6.4&6.5&6.6
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	York
Temperature	25℃
Humidity	52%

10.1 LIMITS

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

10.2 BLOCK DIAGRAM OF TEST SETUP



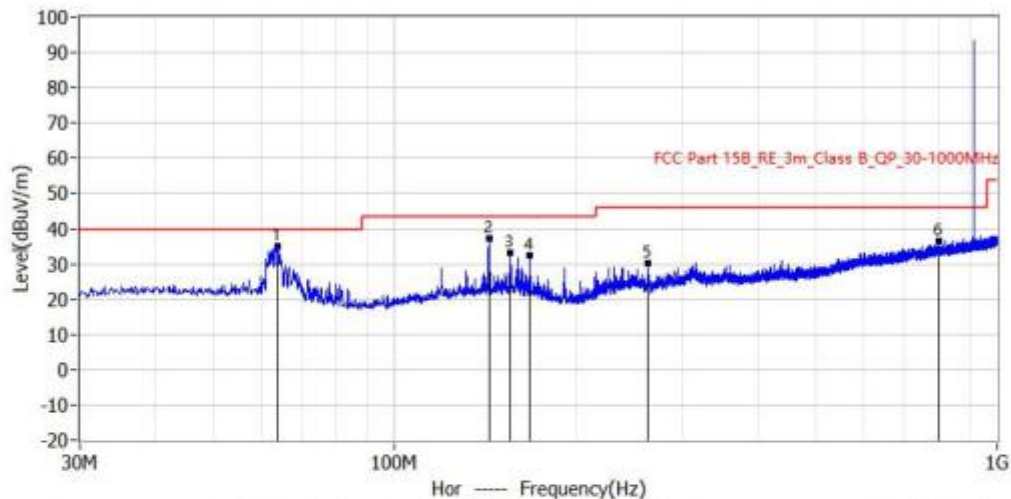
10.3 PROCEDURE

For testing performed with the loop antenna, the center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane. Only the worst position of vertical was shown in the report.

10.4 TEST DATA

[TestMode: TX]; [Polarity: Horizontal]

Test Lab: BlueAsia EMC Lab (RE #1)	Project: BLA-EMC-202111-A114
EUT: WIRELESS LIGHTING CONTROL MODULE	Test Engineer: York
M/N: GFX-OEMHG01	Temperature:
S/N:	Humidity:
Test Mode: TX mode	Test Voltage:
Note:	Test Data: 2021-12-14 12:09:55

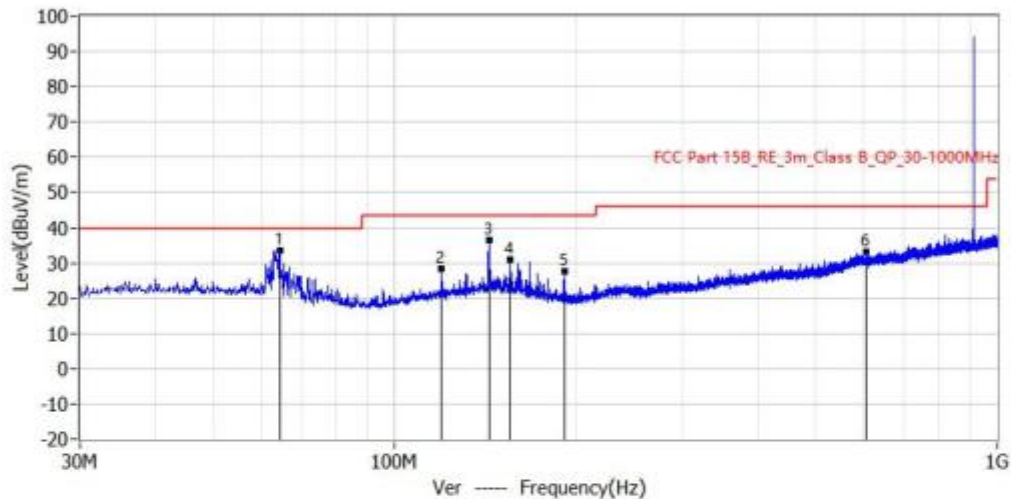


No.	Frequency	Limit dBuV/m	Level dBuV/m	Delta dB	Reading dBuV	Factor dB/m	Detector	Polar	Height cm	Angle deg
1*	63.708MHz	40.0	35.2	-4.8	12.5	22.7	QP	Hor	100.0	0.0
2*	143.490MHz	43.5	37.1	-6.4	13.5	23.6	QP	Hor	100.0	45.0
3*	155.251MHz	43.5	33.3	-10.2	9.9	23.4	QP	Hor	100.0	57.0
4*	167.498MHz	43.5	32.6	-10.9	10.0	22.6	QP	Hor	100.0	57.0
5*	262.800MHz	46.0	30.1	-15.9	7.3	22.8	QP	Hor	100.0	342.0
6*	800.059MHz	46.0	36.6	-9.4	2.4	34.2	QP	Hor	100.0	0.0

Test Result: Pass

[TestMode: TX]; [Polarity: Vertical]

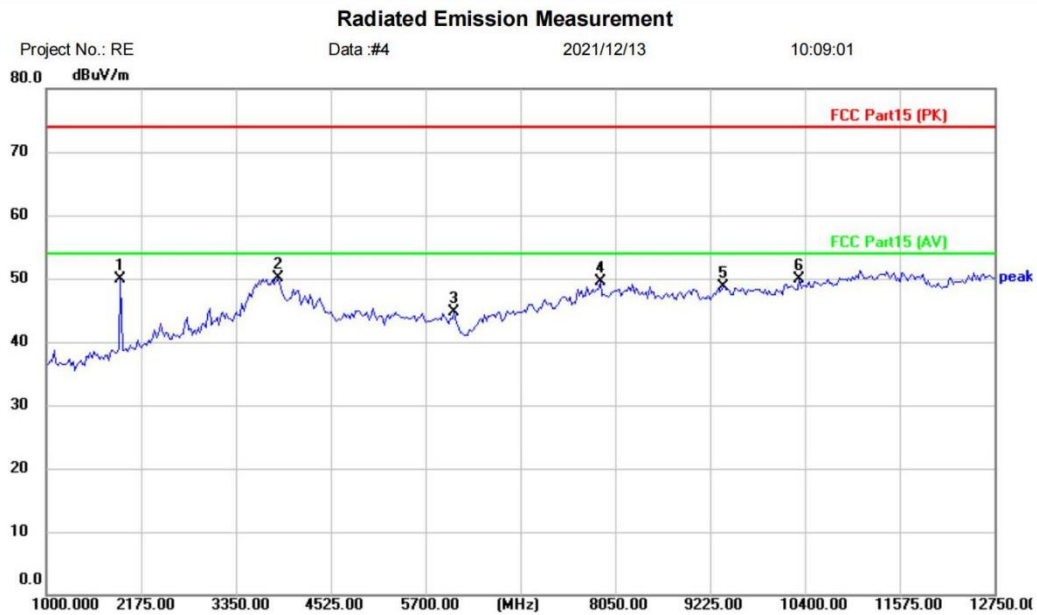
Test Lab: BlueAsia EMC Lab (RE #1)	Project: BLA-EMC-202111-A114
EUT: WIRELESS LIGHTING CONTROL MODULE	Test Engineer: York
M/N: GFX-OEMHG01	Temperature:
S/N:	Humidity:
Test Mode: TX mode	Test Voltage:
Note:	Test Data: 2021-12-14 12:07:31



No.	Frequency	Limit dBuV/m	Level dBuV/m	Delta dB	Reading dBuV	Factor dB/m	Detector	Polar	Height cm	Angle deg
1*	64.314MHz	40.0	33.6	-6.4	11.0	22.6	QP	Ver	100.0	106.0
2*	119.483MHz	43.5	28.3	-15.2	5.6	22.7	QP	Ver	100.0	176.0
3*	143.248MHz	43.5	36.5	-7.0	12.9	23.6	QP	Ver	100.0	39.0
4*	155.373MHz	43.5	31.0	-12.5	7.6	23.4	QP	Ver	100.0	116.0
5*	191.020MHz	43.5	27.7	-15.8	6.7	21.0	QP	Ver	100.0	20.0
6*	605.574MHz	46.0	33.2	-12.8	1.9	31.3	QP	Ver	100.0	166.0

Test Result: Pass

[TestMode: TX]; [Polarity: Horizontal]



Site: Polarization: **Horizontal** Temperature: (C)
Limit: FCC Part15 (PK) Power: Humidity: %RH
EUT: WIRELESS LIGHYING CONTROL MODULE
M/N: GFX-OEMHG01
Mode: TX-mode
Note:

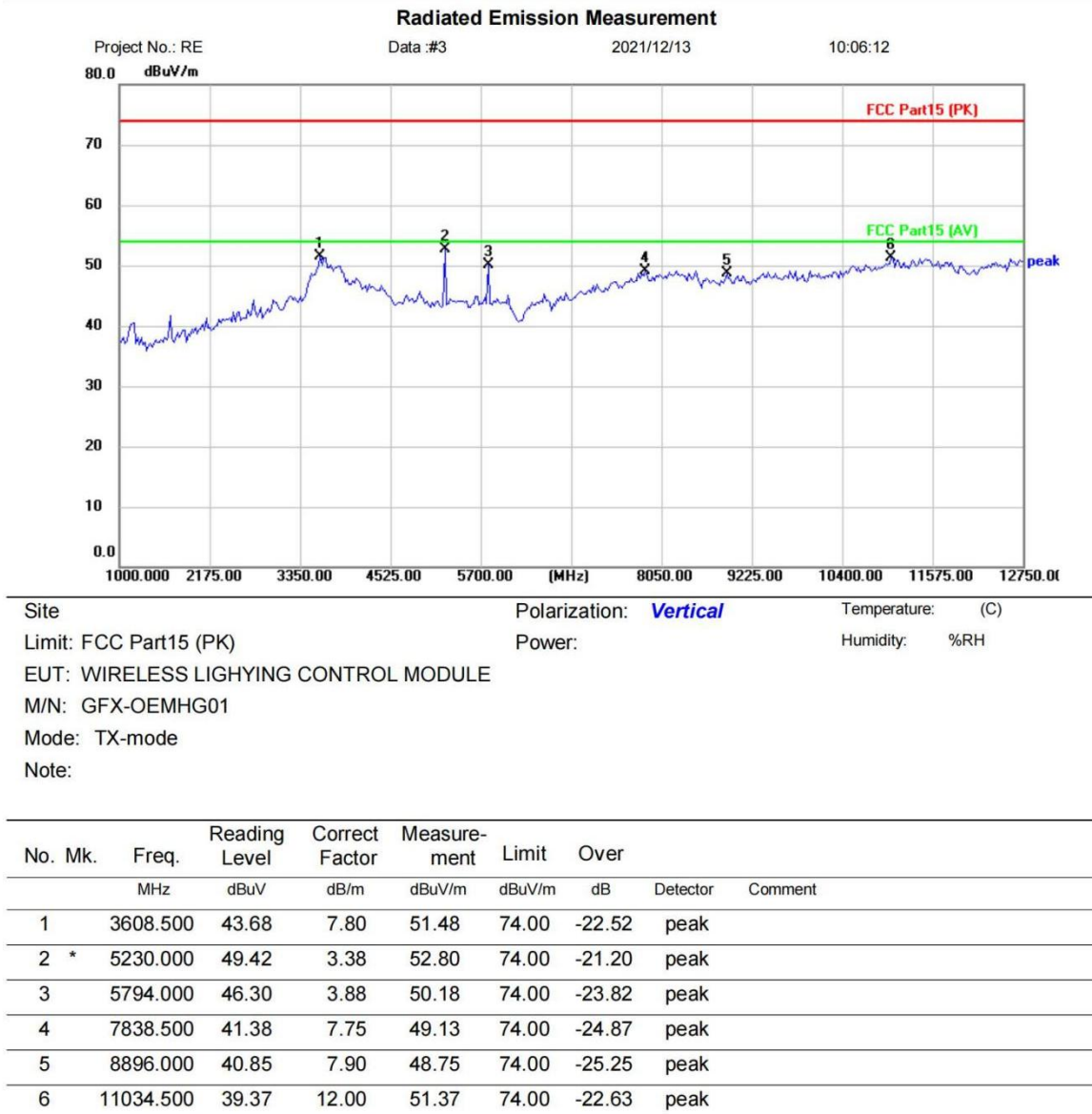
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		1916.500	54.60	-4.77	49.83	74.00	-24.17	peak	
2	*	3867.000	43.21	6.82	50.03	74.00	-23.97	peak	
3		6052.500	43.44	1.20	44.64	74.00	-29.36	peak	
4		7862.000	41.72	7.77	49.49	74.00	-24.51	peak	
5		9389.500	39.87	8.82	48.69	74.00	-25.31	peak	
6		10329.500	38.95	11.00	49.95	74.00	-24.05	peak	

*:Maximum data x:Over limit !:over margin

(Reference Only)

Test Result: Pass

[TestMode: TX]; [Polarity: Vertical]



*:Maximum data x:Over limit !:over margin

(Reference Only)

Test Result: Pass

11 RESTRICTED BAND AROUND FUNDAMENTAL FREQUENCY;FIELD STRENGTH OF THE FUNDAMENTAL SIGNAL (15.249(A))

Test Standard	47 CFR Part 15, Subpart C 15.249
Test Method	ANSI C63.10 (2013) Section 6.4&6.5&6.6
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	York
Temperature	25℃
Humidity	52%

11.1 LIMITS

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

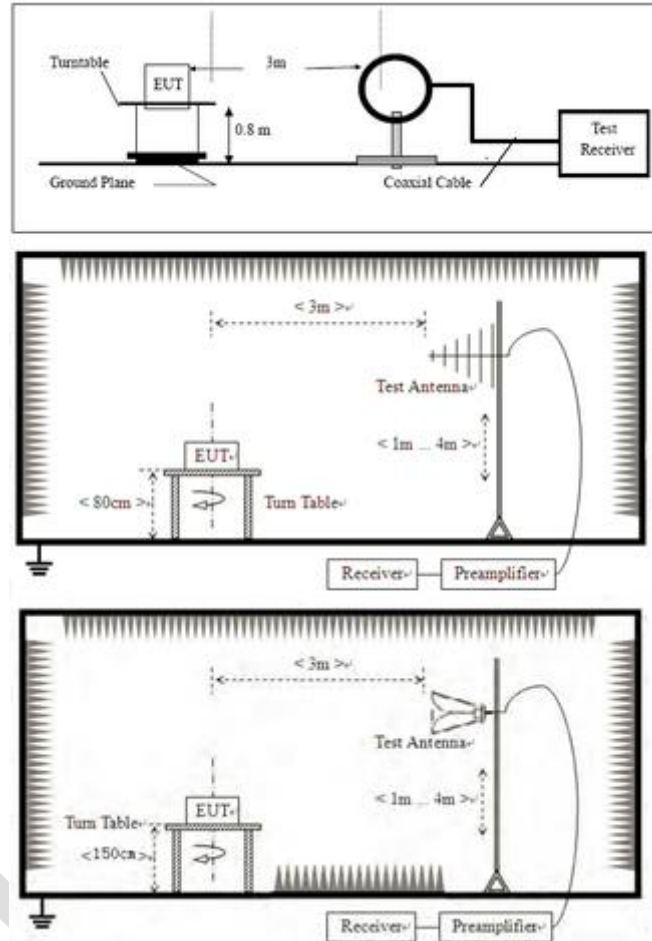
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Fundamental frequency(MHz)	Field strength of fundamental(microvolts/meter)	Field strength of harmonics(microvolts/meter)
902-928	50	500
2400-2483.5	50	500
5725-5875	50	500
24000-24250	250	2500

Remark: The frequencies above 1000MHz are based on average limits. However, the peak field

strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

11.2 BLOCK DIAGRAM OF TEST SETUP



11.3 PROCEDURE

- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. 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.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

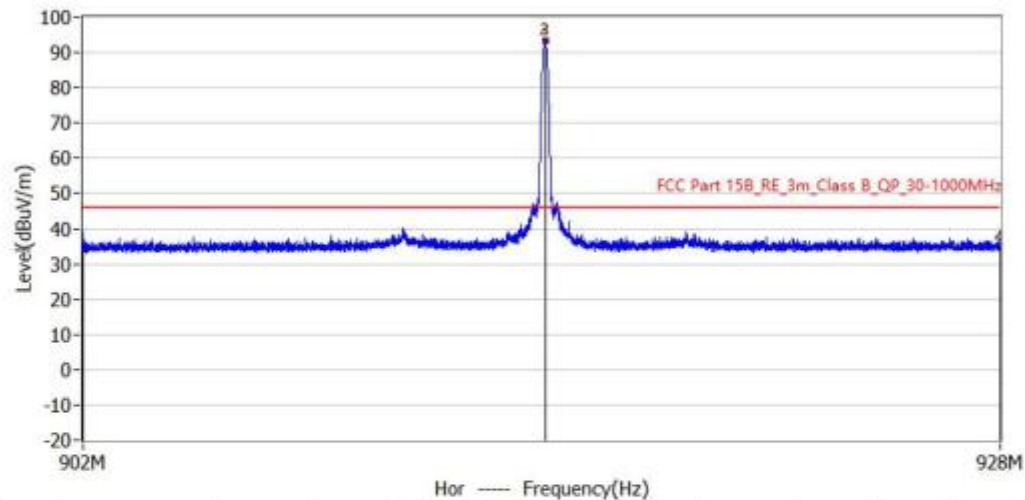
j. Repeat above procedures until all frequencies measured was complete.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

11.4 TEST DATA

[TestMode: TX]; [Polarity: Horizontal]

Test Lab: BlueAsia EMC Lab (RE #1)	Project: BLA-EMC-202111-A114
EUT: WIRELESS LIGHTING CONTROL MODULE	Test Engineer: York
M/N: GFX-OEMHG01	Temperature:
S/N:	Humidity:
Test Mode: TX mode	Test Voltage:
Note:	Test Data: 2021-12-14 11:57:27

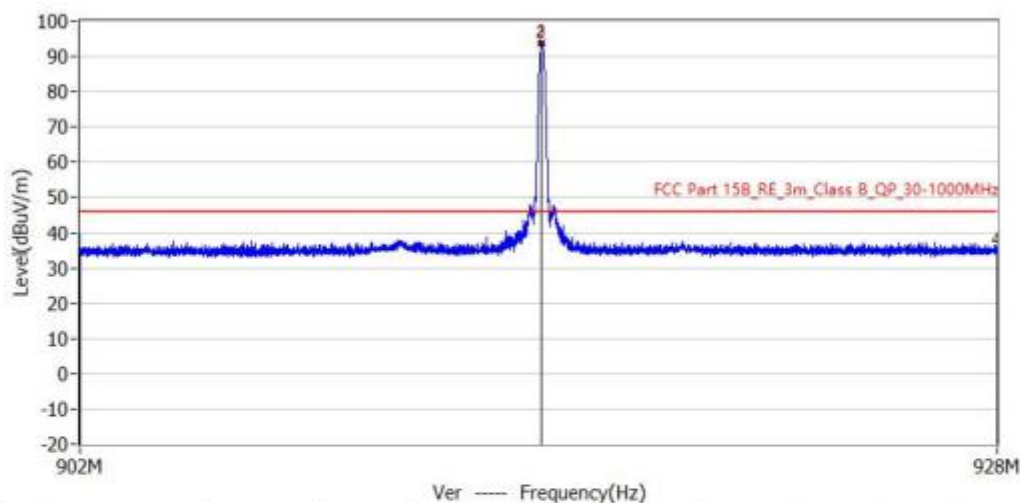


No.	Frequency	Limit dBuV/m	Level dBuV/m	Delta dB	Reading dBuV	Factor dB/m	Detector	Polar	Height cm	Angle deg
1*	902.000MHz	46.0	34.2	-11.8	-0.8	35.0	QP	Hor	100.0	208.0
!2	915.003MHz	46.0	93.3	47.3	58.2	35.1	QP	Hor	100.0	58.0
!3*	915.003MHz	46.0	93.4	47.4	58.3	35.1	PK	Hor	100.0	58.0
4*	928.000MHz	46.0	34.5	-11.5	-0.8	35.3	QP	Hor	100.0	245.0

Test Result: Pass

[TestMode: TX]; [Polarity: Vertical]

Test Lab: BlueAsia EMC Lab (RE #1)	Project: BLA-EMC-202111-A114
EUT: WIRELESS LIGHTING CONTROL MODULE	Test Engineer: York
M/N: GFX-OEMHG01	Temperature:
S/N:	Humidity:
Test Mode: TX mode	Test Voltage:
Note:	Test Data: 2022-01-25 10:04:56



No.	Frequency	Limit dBuV/m	Level dBuV/m	Delta dB	Reading dBuV	Factor dB/m	Detector	Polar	Height cm	Angle deg
1*	902.000MHz	46.0	34.5	-11.5	-0.5	35.0	QP	Ver	100.0	0.0
12	915.000MHz	46.0	93.1	47.1	58.0	35.1	QP	Ver	100.0	60.0
13*	915.000MHz	46.0	93.6	47.6	58.5	35.1	PK	Ver	100.0	60.0
4*	928.000MHz	46.0	34.9	-11.1	-0.4	35.3	QP	Ver	100.0	41.0

Test Result: Pass

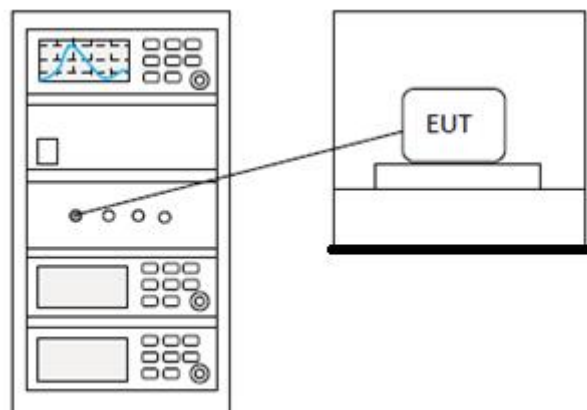
12 OCCUPIED BANDWIDTH

Test Standard	47 CFR Part 15, Subpart C 15.249
Test Method	ANSI C63.10 (2013) Section 6.9
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Sven
Temperature	25℃
Humidity	52%

12.1 LIMITS

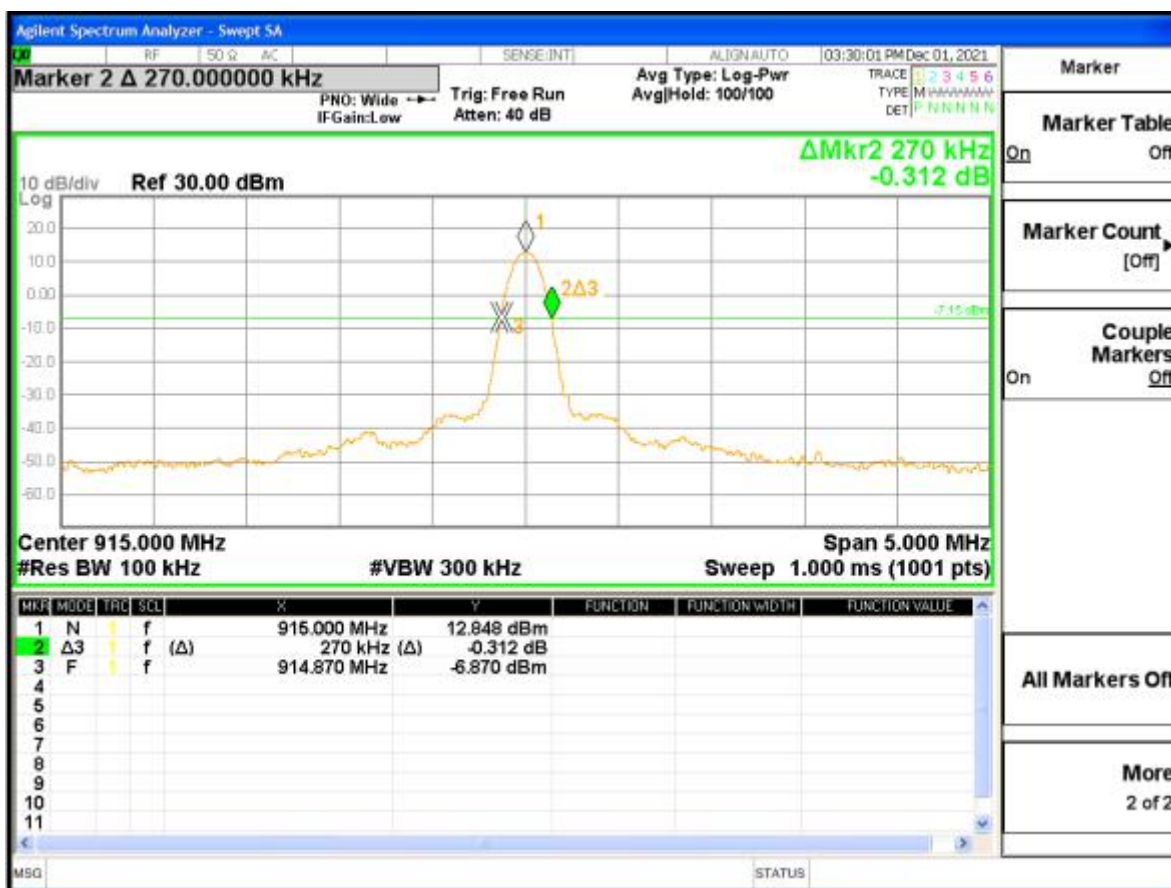
Frequency range(MHz)	Limit
70-900	No wider than 0.25% of the center frequency
Above 900	No wider than 0.5% of the center frequency

12.2 BLOCK DIAGRAM OF TEST SETUP



12.3 TEST DATA

Test Frequency MHz	20dB Bandwidth kHz	Result
915.000	270	Pass



13 CONDUCTED EMISSIONS AT AC POWER LINE (150KHZ-30MHZ)

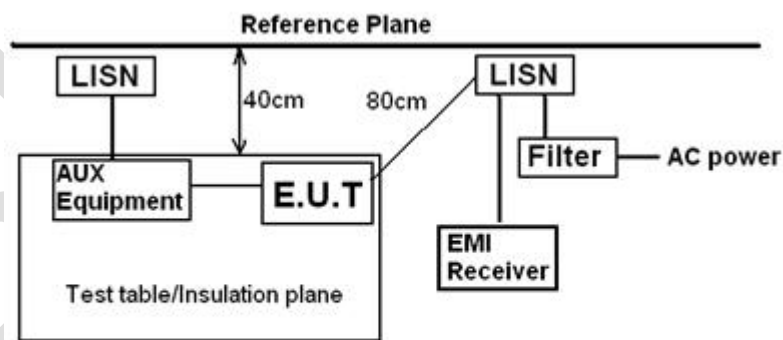
Test Standard	47 CFR Part 15, Subpart C 15.249
Test Method	ANSI C63.10 (2013) Section 6.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Leo
Temperature	25℃
Humidity	52%

13.1 LIMITS

Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

13.2 BLOCK DIAGRAM OF TEST SETUP



Remark:
E.U.T: Equipment Under Test
LISN: Line Impedance Stabilization Network
Test table height=0.8m

13.3 PROCEDURE

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50H + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

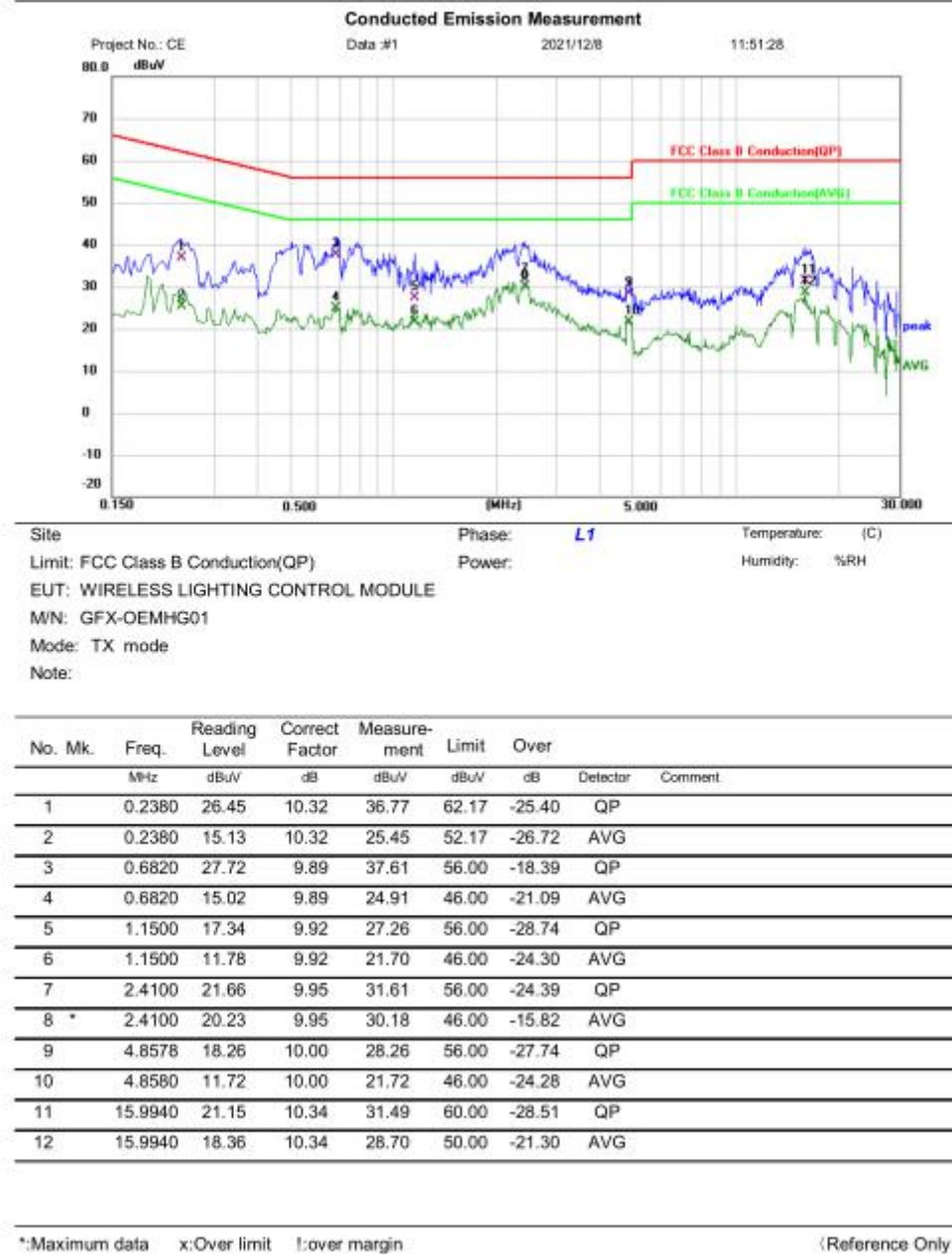
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: $LISN = Read\ Level + Cable\ Loss + LISN\ Factor$

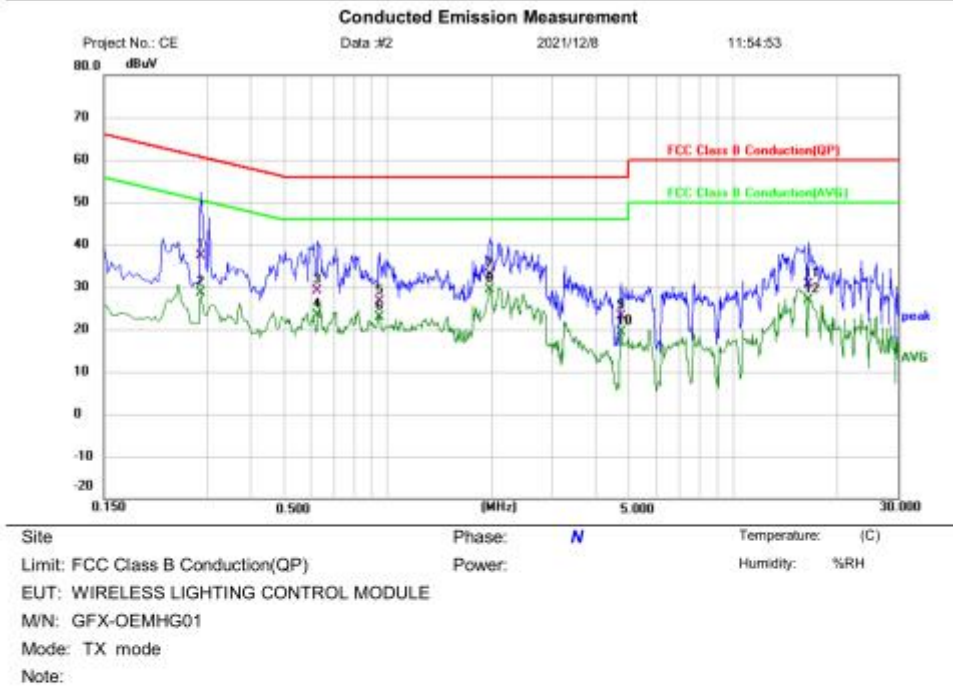
13.4 TEST DATA

[TestMode: TX]; [Line: Line][Power:AC120/60Hz]



Test Result: Pass

[TestMode: TX]; [Line: Nutral] [Power:AC120/60Hz]



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.2857	27.59	9.77	37.36	60.65	-23.29	QP	
2		0.2860	18.74	9.77	28.51	50.64	-22.13	AVG	
3		0.6260	19.25	9.80	29.05	56.00	-26.95	QP	
4		0.6260	13.48	9.80	23.28	46.00	-22.72	AVG	
5		0.9460	16.79	9.83	26.62	56.00	-29.38	QP	
6		0.9460	13.01	9.83	22.84	46.00	-23.16	AVG	
7		1.9780	23.06	9.86	32.92	56.00	-23.08	QP	
8	*	1.9780	19.47	9.86	29.33	46.00	-16.67	AVG	
9		4.7220	13.13	9.94	23.07	56.00	-32.93	QP	
10		4.7220	9.49	9.94	19.43	46.00	-26.57	AVG	
11		16.5620	20.35	10.33	30.68	60.00	-29.32	QP	
12		16.5620	16.63	10.33	26.96	50.00	-23.04	AVG	

*:Maximum data x:Over limit !:over margin

(Reference Only)

Test Result: Pass

14 ANTENNA REQUIREMENT

Test Standard	47 CFR Part 15, Subpart C 15.249
Test Method	N/A

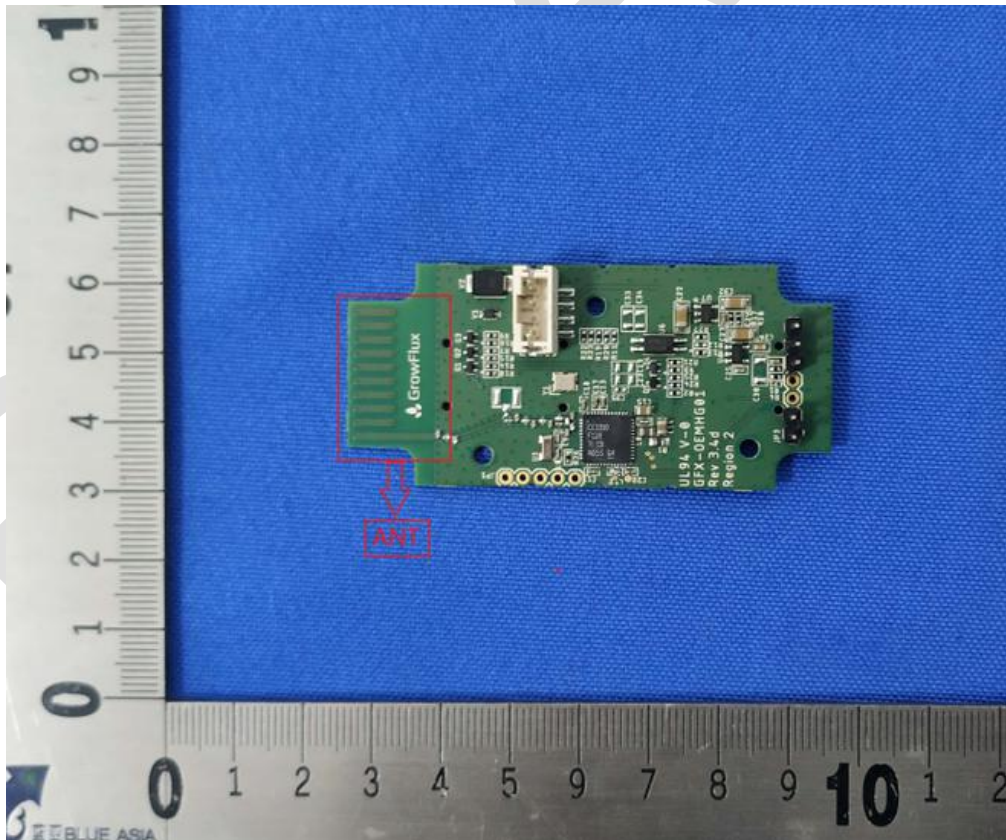
14.1 CONCLUSION

Standard 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 an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

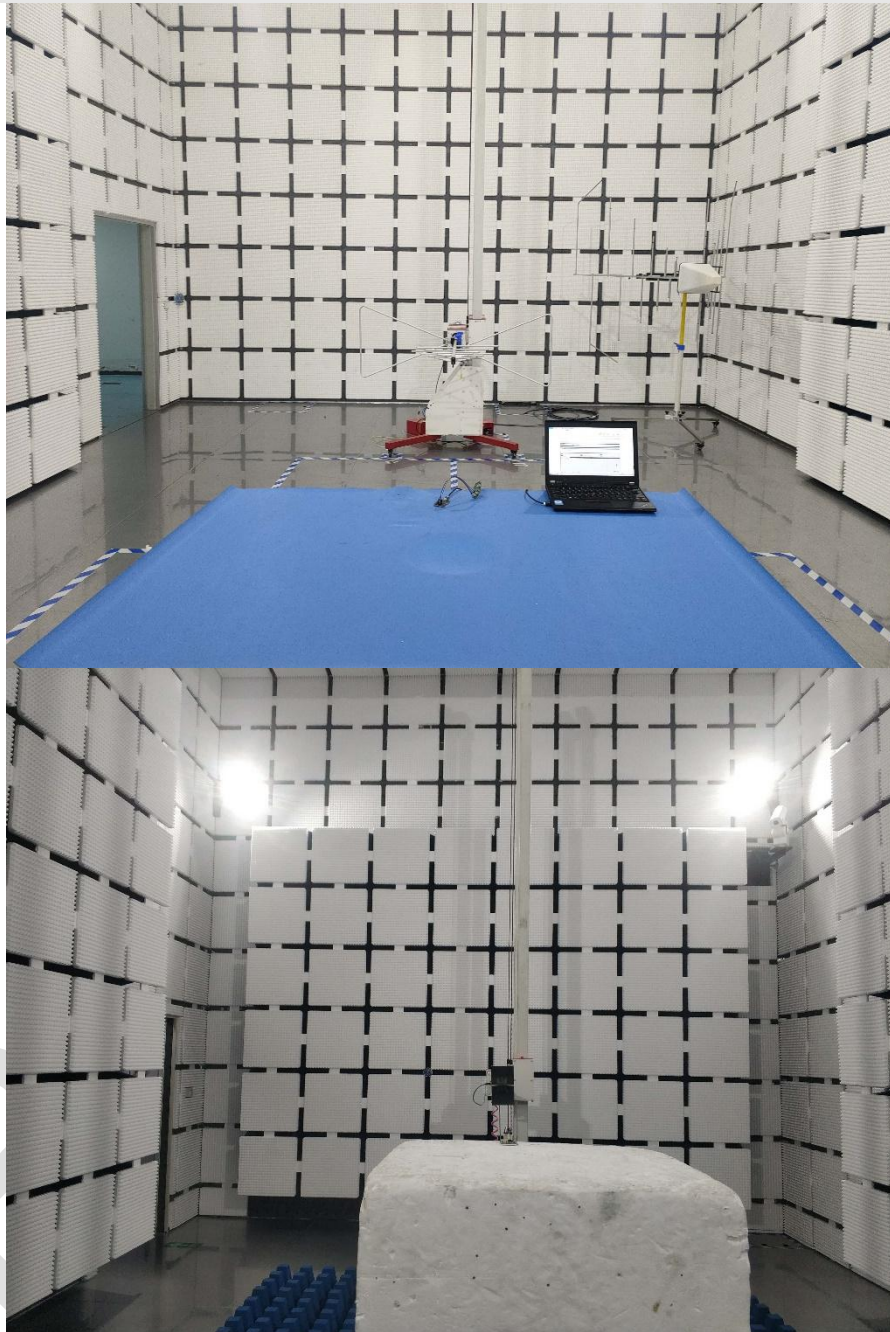
EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 2.33dBi.



APPENDIX A: PHOTOGRAPHS OF TEST SETUP

Radiated Emissions



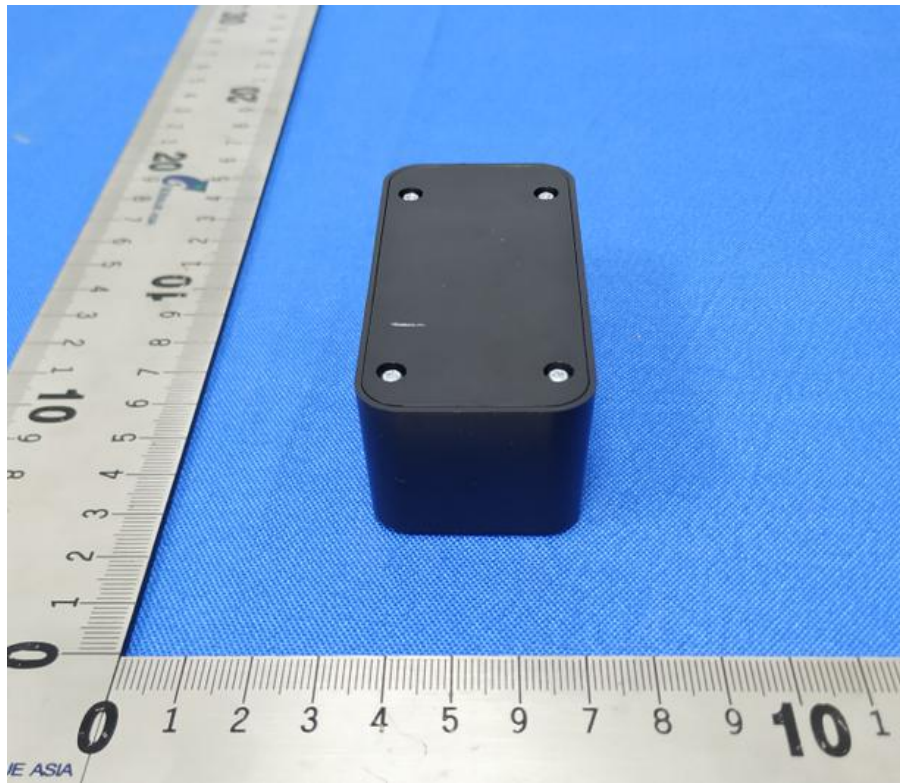
Conducted Emissions at AC Power Line (150kHz-30MHz)

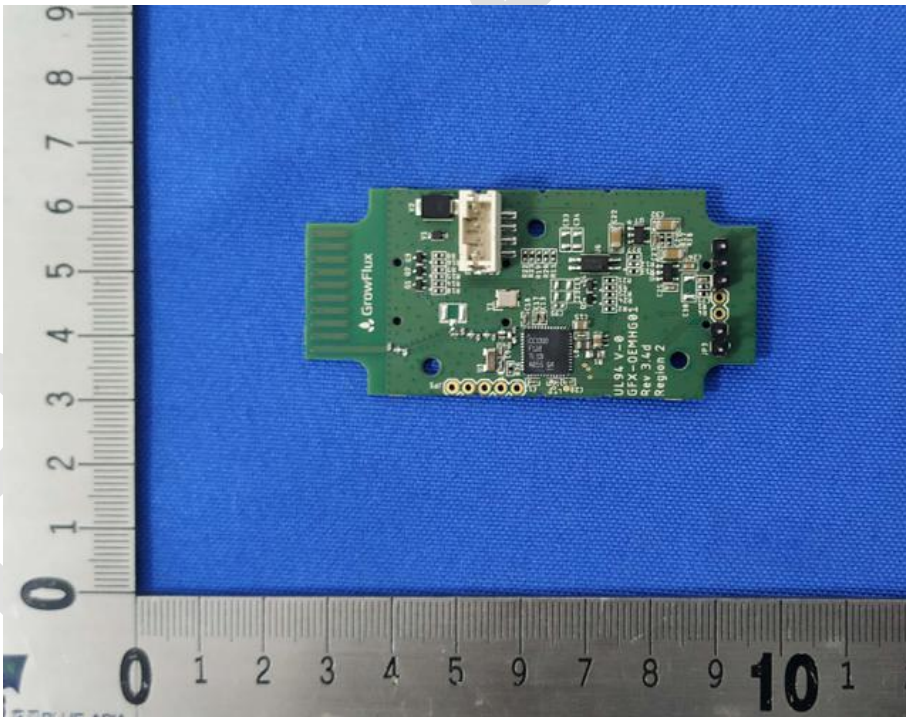


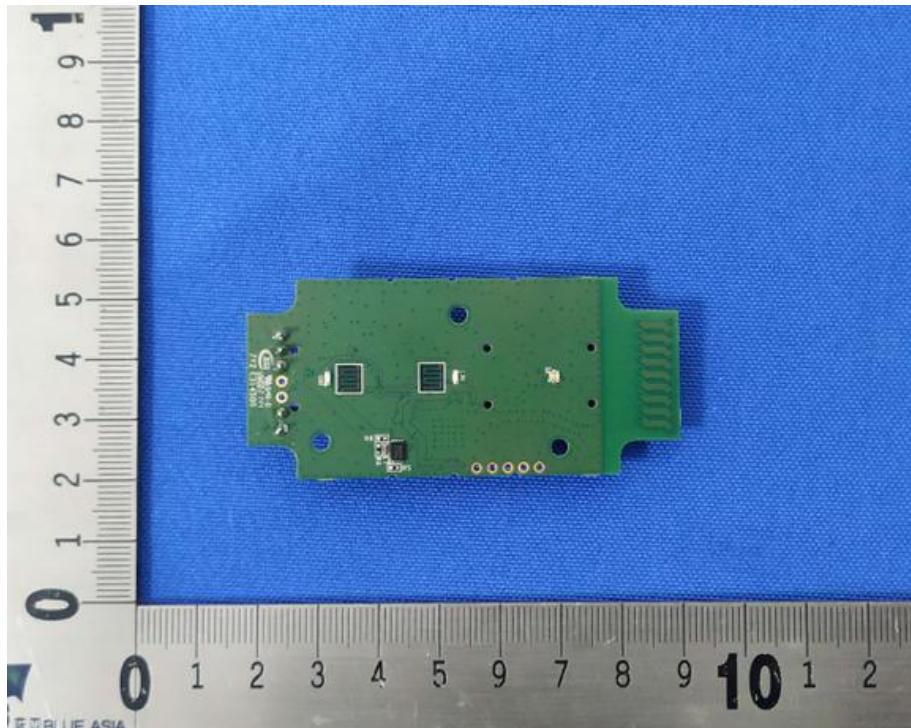
APPENDIX B: PHOTOGRAPHS OF EUT











----END OF REPORT----

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