

TEST REPORT

Product Name : LED lights
Brand Mark : N/A
Model No. : LK001, LK002, LK003, LK004, LK005
FCC ID : 2AWLI-LK001
Report Number : BLA-EMC-202005-A46-01
Date of Sample Receipt : 2020/5/29
Date of Test : 2020/6/5 to 2020/7/22
Date of Issue : 2020/7/22
Test Standard : FCC CFR Title 47 Part 15
Subpart C Section 15.231
Test Result : Pass

Prepared for:

Shen Zhen Xiangyuguang Electronic Technology Co.,Ltd
3rd Floor,BuildingB,Longfa Industrial Zone,No.22,Changye
Road,ShilongziCommunity,ShiyanTown,BaoanDistrict,Shenzhen,China.

Prepared by:

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2020/7/22



Report Revise Record

Version No.	Date	Description
00	2020/7/22	Original

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1 TEST SUMMARY

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
Field strength of the fundamental signal	15.231 (b)	Pass
Spurious emissions	15.231 (b)/15.209	Pass
20dB Bandwidth	15.231(c)	Pass
Dwell time	15.231 (a)	Pass
Conducted Emission	15.207	N/A

Remarks:

N/A: The EUT not applicable of the test item.

Pass: The EUT complies with the essential requirements in the standard.

Test according to ANSI C63.4:2014 and ANSI C63.10:2013.

2 GENERAL INFORMATION

Applicant	Shen Zhen Xiangyuguang Electronic Technology Co.,Ltd
Address	3rd Floor,BuildingB,Longfa Industrial Zone,No.22,Changye Road,ShilongziCommunity,ShiyanTown,BaoanDistrict,Shenzhen,China .
Manufacturer	Shen Zhen Xiangyuguang Electronic Technology Co.,Ltd
Address	3rd Floor,BuildingB,Longfa Industrial Zone,No.22,Changye Road,ShilongziCommunity,ShiyanTown,BaoanDistrict,Shenzhen,China .
Factory	Shen Zhen Xiangyuguang Electronic Technology Co.,Ltd
Address	3rd Floor,BuildingB,Longfa Industrial Zone,No.22,Changye Road,ShilongziCommunity,ShiyanTown,BaoanDistrict,Shenzhen,China .

3 GENERAL DESCRIPTION OF E.U.T.

Product Name:	LED lights
Model No.:	LK001
Operation Frequency:	433.92MHz
Channel numbers:	1
Modulation type:	ASK
Antenna Type:	PCB antenna
Antenna gain:	-3.0dBi
Power supply:	DC 3.0V

4 TEST ENVIRONMENT

Environment	Temperature	Voltage
Normal	25°C	DC3.7V

5 TEST MODE

TEST MODE	TEST MODE DESCRIPTION
Transmitting mode	Keep the EUT in continuously transmitting mode with modulation.

Remark: Full battery is used during all test ,X,Y,Z axes all have been tested,only worse case is reported.

6 MEASUREMENT UNCERTAINTY

Parameter	Expanded Uncertainty (Confidence of 95%)
Radiated Emission	±4.34dB
Radiated Emission	±4.24dB
Radiated Emission	±4.68dB
AC Power Line Conducted Emission	±3.45dB

Parameter	Expanded Uncertainty (Confidence of 95%)
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1.5 dB
Power Spectral Density, conducted	±3.0 dB
Unwanted Emissions, conducted	±3.0 dB
Temperature	±3 °C
Supply voltages	±3 %
Time	±5 %
Radiated Emission (30MHz ~ 1000MHz)	±4.35 dB
Radiated Emission (1GHz ~ 18GHz)	±4.44 dB

7 DESCRIPTION OF SUPPORT UNIT

Device Type	Manufacturer	Model Name	Serial No.	Remark
AC Adapter (UGREEN)	UGREEN	CD112	N/A	N/A

8 LABORATORY LOCATION

All tests were performed at:

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No tests were sub-contracted.

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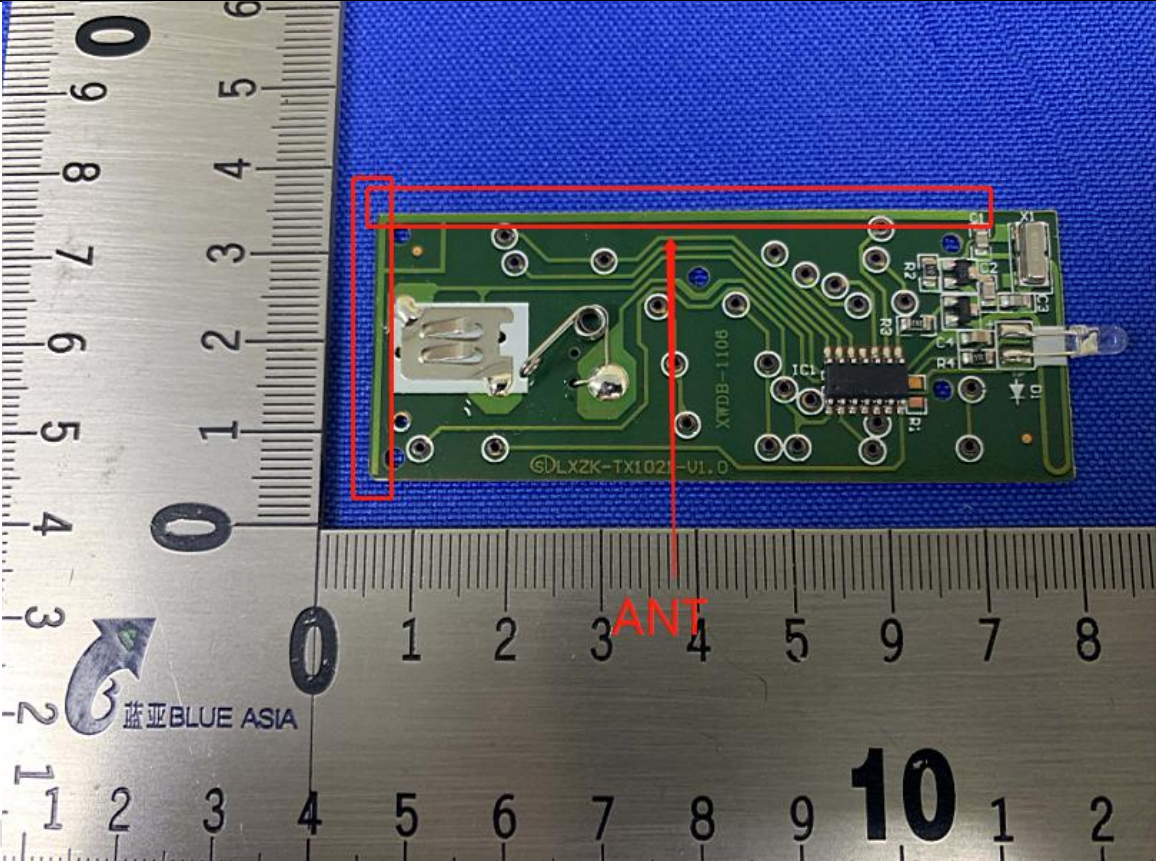
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9 TEST INSTRUMENTSLIST

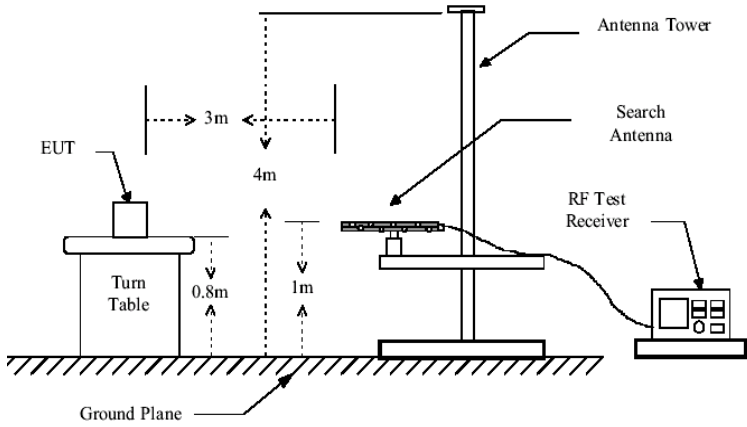
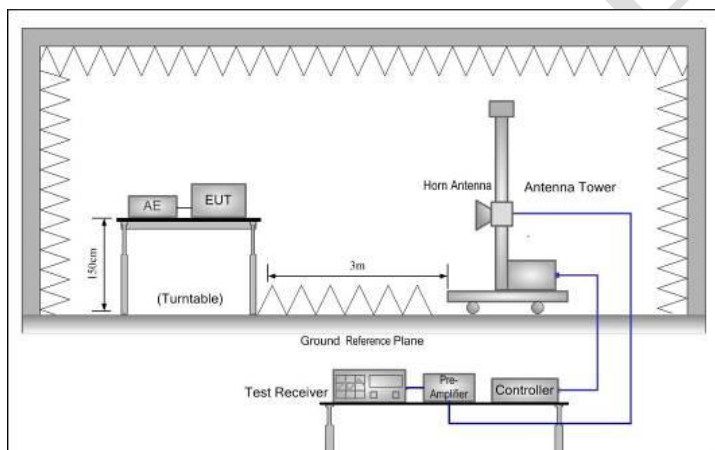
Test Equipment Of Radiated Spurious Emissions					
Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Chamber	SKET	966	N/A	5/8/2018	5/7/2021
Spectrum	R&S	FSP40	100817	7/4/2019	7/3/2020
				7/4/2020	7/3/2021
Receiver	R&S	ESR7	101199	5/7/2020	5/6/2021
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	7/14/2018	7/13/2020
				7/14/2020	7/13/2022
Horn Antenna	Schwarzbeck	9120D	01892 P:00331	7/14/2018	7/13/2020
				7/14/2020	7/13/2022
Amplifier	SKET	LNPA-0118-45	N/A	7/4/2019	7/3/2020
				7/4/2020	7/3/2021
EMI software	EZ	EZ-EMC	N/A	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	2/14/2020	2/13/2021

10 ANTENNA REQUIREMENT

Standard requirement:	FCC Part15 C Section 15.203
15.203 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 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.	
E.U.T Antenna:	
The EUT make use of an PCB antenna, The typical gain of the antenna is -3.0dBi.	
	

11 RADIATED EMISSION

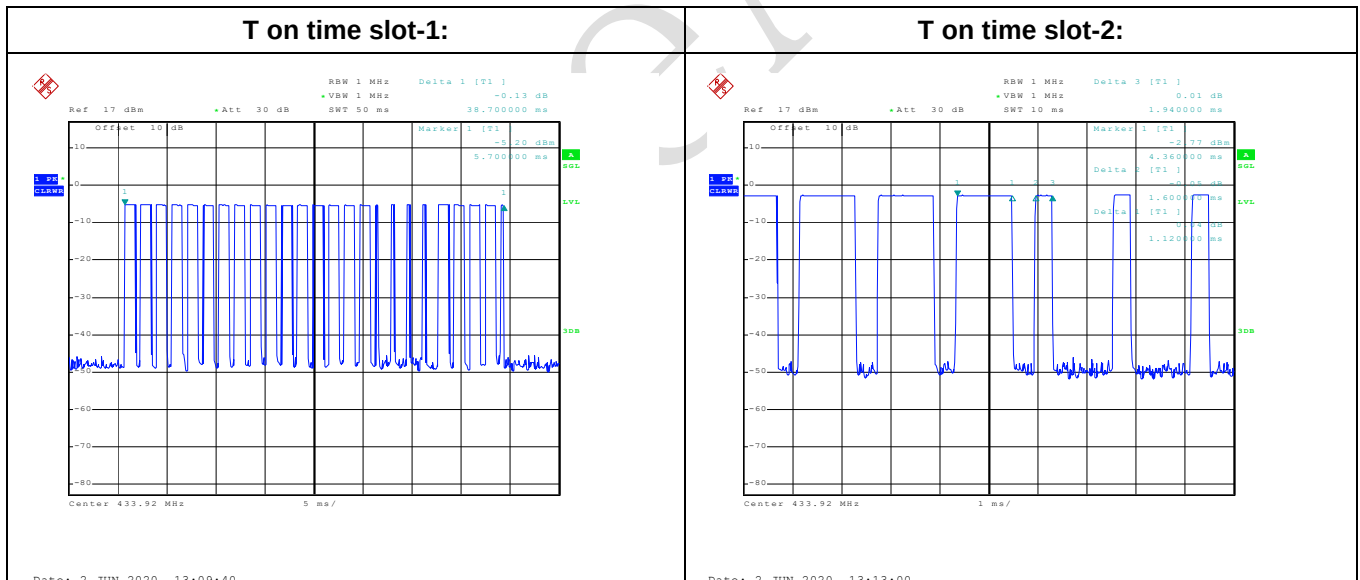
Test Requirement:	FCC Part15 C Section 15.231(b) and 15.209				
Test Method:	ANSI C63.4:2014				
TestFrequencyRange:	30MHz to 5000MHz				
Test site:	Measurement Distance: 3m(Semi-Anechoic Chamber)				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
Limit: (Field strength of the fundamental signal)	Frequency		Limit (dBuV/m @3m)		Remark
	433.92 MHz		80.8		Average Value
			100.8		Peak Value
Limit: (Spurious Emissions)	Frequency		Limit (dBuV/m @3m)		Remark
	30MHz-88MHz		40.0		Quasi-peak Value
	88MHz-216MHz		43.5		Quasi-peak Value
	216MHz-960MHz		46.0		Quasi-peak Value
	960MHz-1GHz		54.0		Quasi-peak Value
	Above 1GHz		54.0		Average Value
			74.0		Peak Value
	Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits higher field strength.				
Test Procedure:	a. The EUT was placed on the top of a rotating table 0.8m(below 1GHz) /1.5m(above 1GHz) above the ground at a 3 meter chamber. 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 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.				
	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 rotating table was turned from 0 degrees to 360 degrees to find the maximum reading.				
	e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.				
	f. 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.				

Test setup:	Below 1GHz  Above 1GHz 
Test Instruments:	Refer to section 5.7 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

11.1 FIELD STRENGTH OF THE FUNDAMENTAL SIGNAL

Peak value						
Frequency (MHz)	Read Level (dBuV)	Correct Facor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.92	38.78	27.71	66.49	100.80	-34.31	Vertical
433.92	33.18	27.71	60.89	100.80	-39.91	Horizontal
Average value						
Frequency (MHz)	Peak value	Duty cycle factor	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.92	66.49	-5.12	61.37	80.80	-19.43	Vertical
433.92	60.89	-5.12	55.77	80.80	-25.03	Horizontal
Calculate Formula:	Average value = Peak value + Duty Cycle Factor					
	Duty cycle factor = $20\log(\text{Duty cycle})$					
	Duty cycle = on time/ period					
Test data:	T on time = $1.12 \times 20(\text{ms}) + 0.34 \times 5(\text{ms}) = 24.1(\text{ms})$					
	T period = 43.44(ms)					
	Duty cycle = 55.48%					
	Duty cycle factor = $20\log(\text{Duty cycle}) = -5.12$					

Test data:

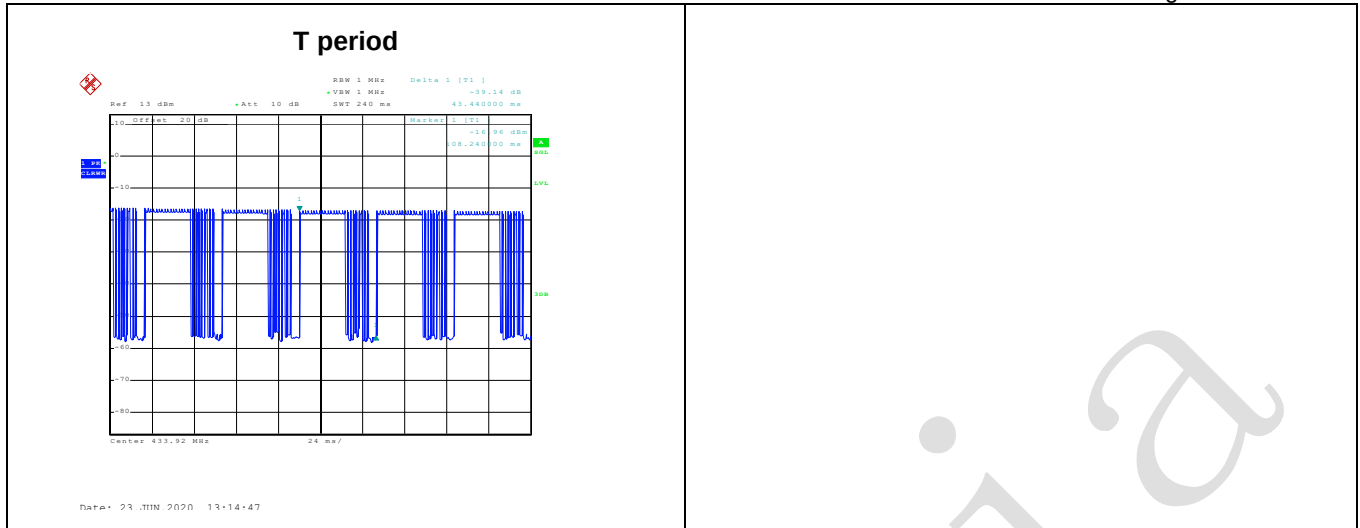


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Horizontal Radiated Emission Measurement

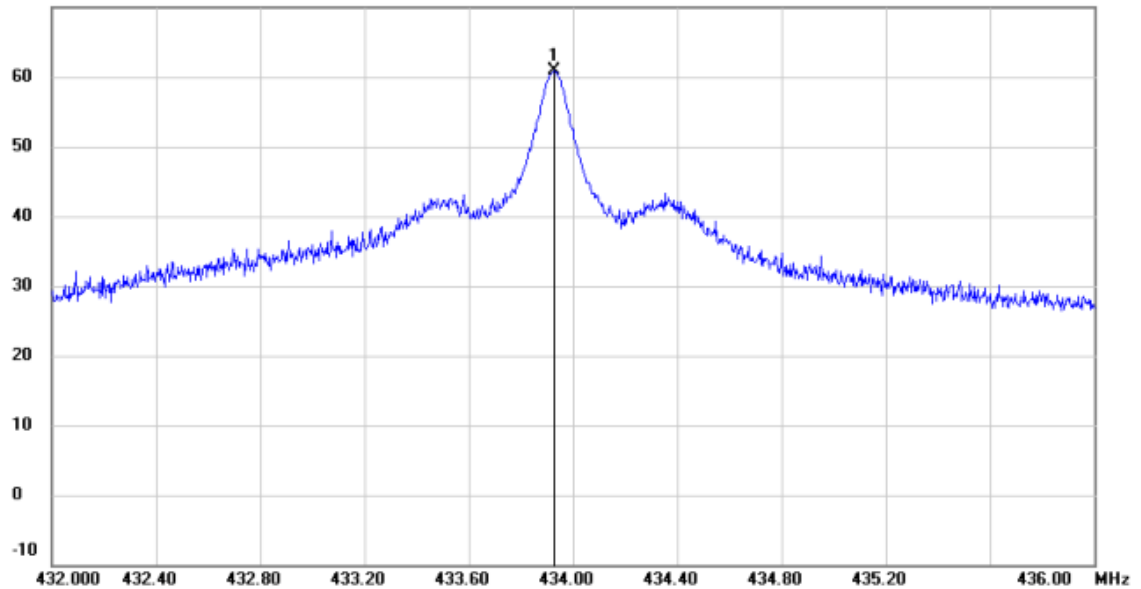
File :RE

Data :#29

Date: 2020/7/10 星期

Time: 下午 4:37:29

70.0 dBuV/m



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	433.9280	33.18	27.71	60.89					peak

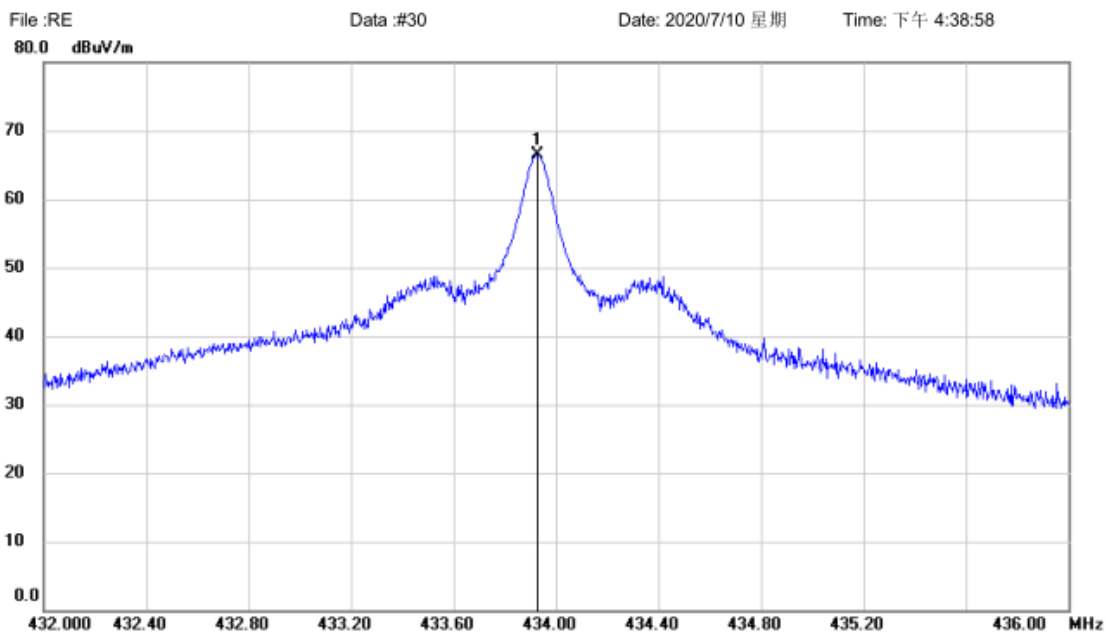
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Vertical
Radiated Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1	*	433.9280	38.78	27.71	66.49			peak		

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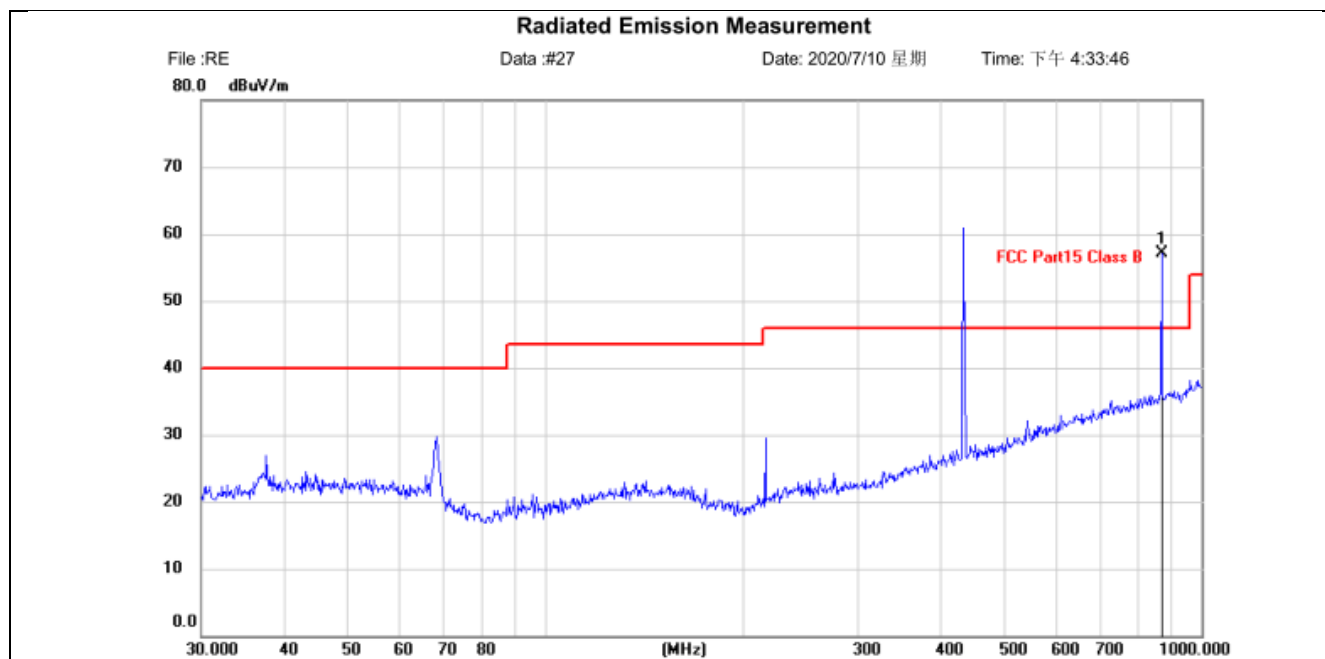
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11.2 SPURIOUS EMISSIONS

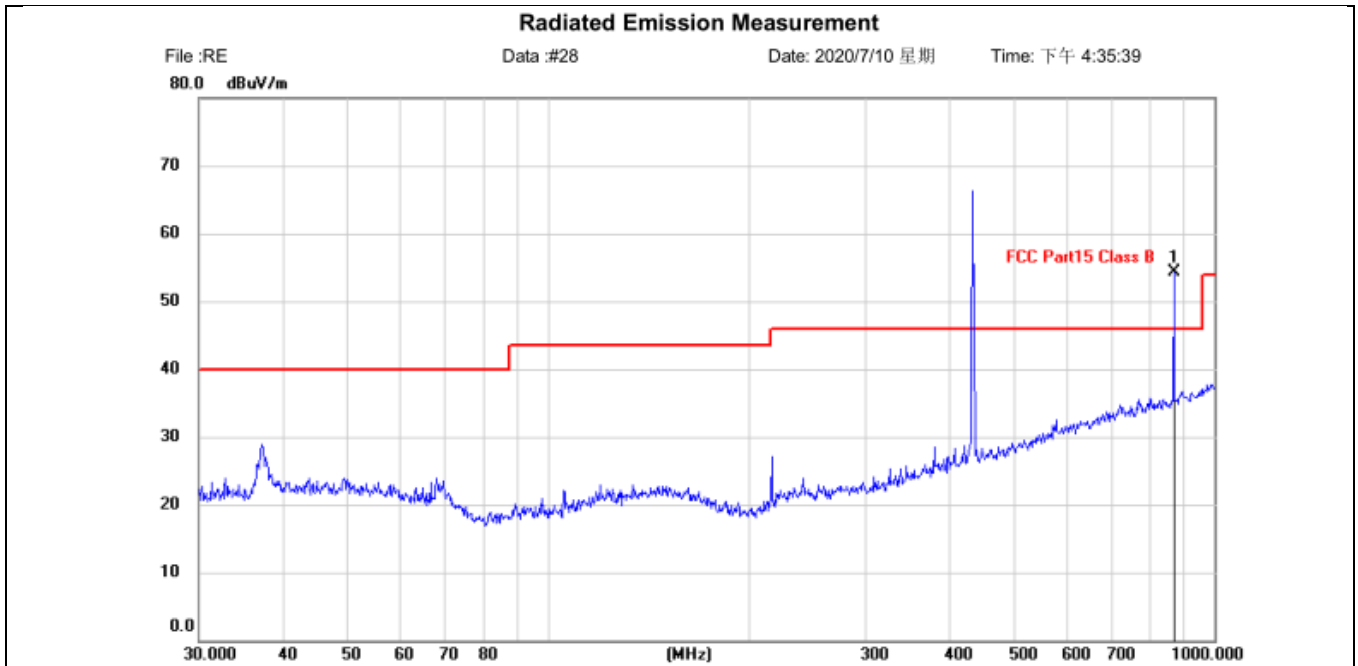
Below 1G

Horizontal



No.	Frequency	Reading	Correct	Duty cycle factor	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	dB/m		(dBuV/m)	(dBuV/m)	(dB)	
1	869.1301	21.9	35.14	N/A	57.04	80.8	-23.76	peak
2	870.1301	/	/	-5.12	51.92	60.8	-8.88	Ave

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct dB/m	Duty cycle factor	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	869.1301	19.13	35.14	N/A	54.27	80.8	-26.53	peak
2	870.1301	/	/	-5.12	49.15	60.8	-11.65	Ave

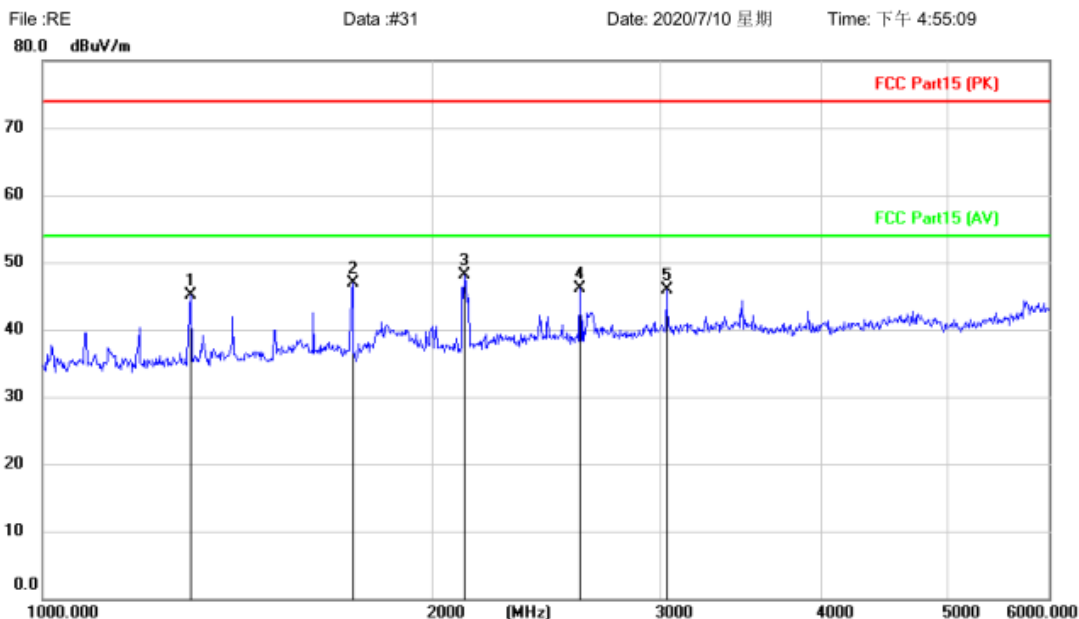
Remark:

1. Final Level = Receiver Read level + Correct factor
2. Correct factor = Antenna Factor + Cable Loss – Preamplifier Factor
3. Average value = Peak value + Duty Cycle Factor

Above 1GHz

Horizontal

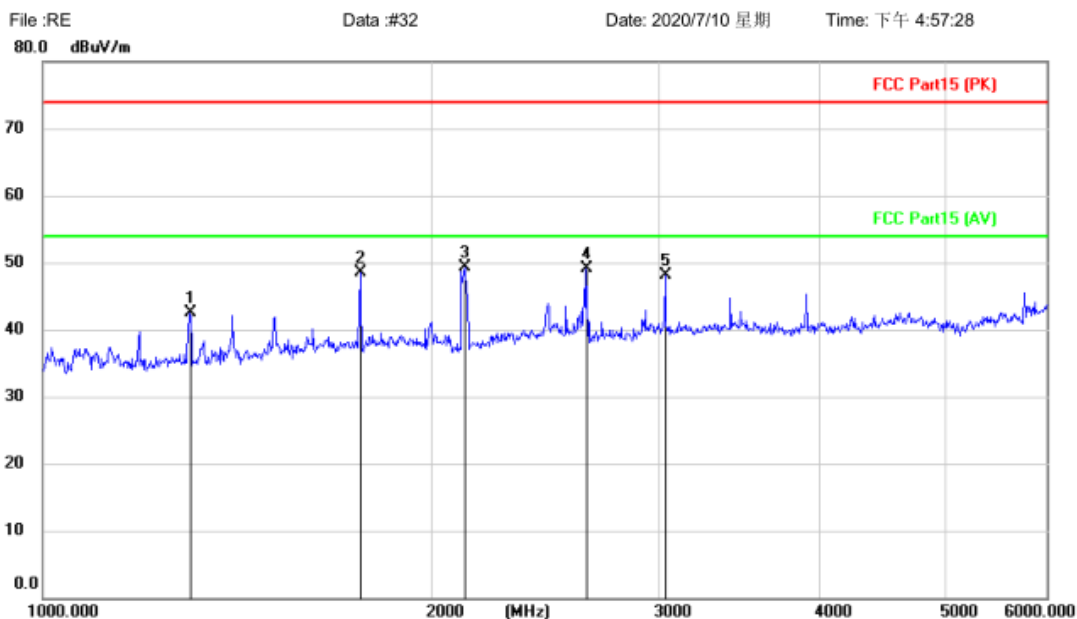
Radiated Emission Measurement



No.	Frequency	Reading	Correct factor	Duty cycle factor	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	dB		(dBuV/m)	(dBuV/m)	(dB)	
1	1301.332	66.42	-21.36	N/A	45.06	74	-28.94	Peak
2	1301.332	/	/	-5.12	39.94	54	-14.06	Ave
3	1736.483	66.26	-19.43	N/A	46.83	74	-27.17	Peak
4	1736.483	/	/	-5.12	41.71	54	-12.29	Ave
5	2118.582	66.05	-17.91	N/A	48.14	74	-25.86	Peak
6	2118.582	/	/	-5.12	43.02	54	-10.98	Ave
7	2603.351	61.98	-15.92	N/A	46.06	74	-27.94	Peak
8	2603.351	/	/	-5.12	40.94	54	-13.06	Ave
9	3037.063	60.16	-14.21	N/A	45.95	74	-28.05	Peak
10	3037.063	/	/	-5.12	40.83	54	-13.17	Ave

Vertical

Radiated Emission Measurement



No.	Frequency	Reading	Correct factor	Duty cycle factor	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	dB		(dBuV/m)	(dBuV/m)	(dB)	
1	1299.003	64.18	-21.68	N/A	42.50	74	-31.50	Peak
2	1299.003	/	/	-5.12	37.38	54	-16.62	Ave
3	1761.553	66.26	-19.52	N/A	48.49	74	-25.51	Peak
4	1761.553	/	/	-5.12	43.37	54	-10.63	Ave
5	2126.188	67.29	-18.06	N/A	49.23	74	-24.77	Peak
6	2118.582	/	/	-5.12	44.11	54	-9.89	Ave
7	2603.351	65.30	-16.11	N/A	49.19	74	-24.81	Peak
8	2603.351	/	/	-5.12	44.07	54	-9.93	Ave
9	3037.063	62.33	-14.29	N/A	48.04	74	-25.96	Peak
10	3037.063	/	/	-5.12	42.92	54	-11.08	Ave

Remark:

1. Final Level = Receiver Read level + Correct factor
2. Correct factor = Antenna Factor + Cable Loss – Preamplifier Factor
3. Average value = Peak value + Duty Cycle Factor

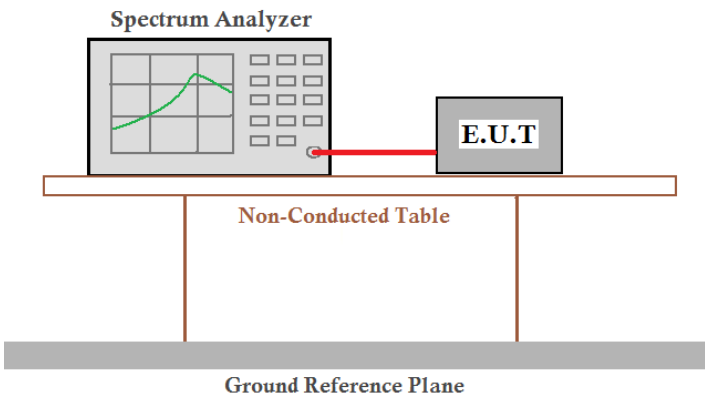
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12 20DB BANDWIDTH

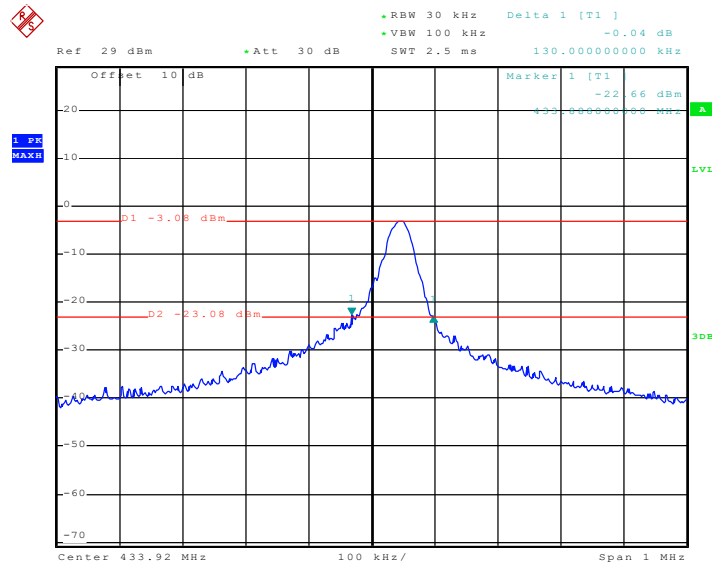
Test Requirement:	FCC Part15 C Section 15.231 (c)
Test Method:	ANSI C63.4:2014
Receiver setup:	RBW=30kHz, VBW=100kHz, detector: Peak
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.
Test Procedure:	1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. 2. Set the EUT to proper test channel. 3. Max hold the radiated emissions, mark the peak power frequency point and the -20dB upper and lower frequency points. 4. Read 20dB bandwidth.
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. The table is supported by two vertical legs and sits on a Ground Reference Plane, which is represented by a thick grey bar at the bottom.
Test Instruments:	Refer to section 5.7 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data

20dB bandwidth (MHz)	Limit (MHz)	Results
0.13	1.0848	Passed

Note: Limit= Fundamental frequency×0.25%=433.92×0.25%=1.0848MHz

Test plot as follows:



Date: 2.JUN.2020 13:19:27

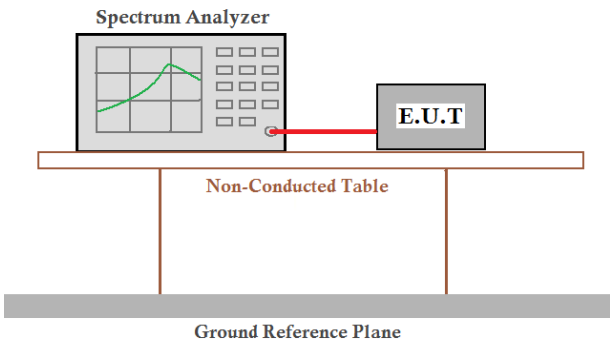
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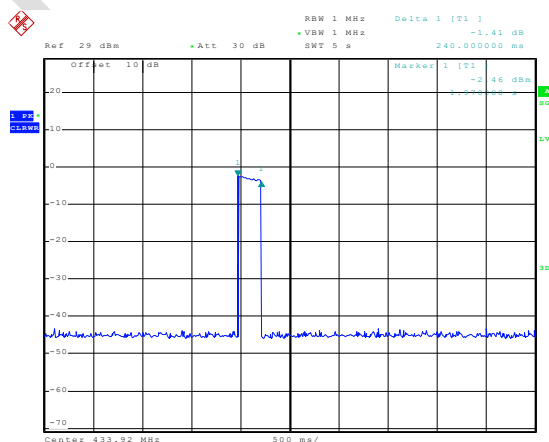
13 DURATION TIME

Test Requirement:	FCC Part15 C Section 15.231 (a) (1)
Test Method:	ANSI C63.4:2014
Receiver setup:	RBW=100kHz, VBW=300kHz, span=0Hz, detector: Peak
Limit:	Not more than 5 seconds
Test mode:	Transmitting mode
Test Procedure:	1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. 2. Set the EUT to proper test channel. 3. Single scan the transmission, and read the transmission time.
Test setup:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data

Duration time (second)	Limit (second)	Result
0.24	<5.0	Pass

Test plot as follows:



Date: 2020.05.13 15:17

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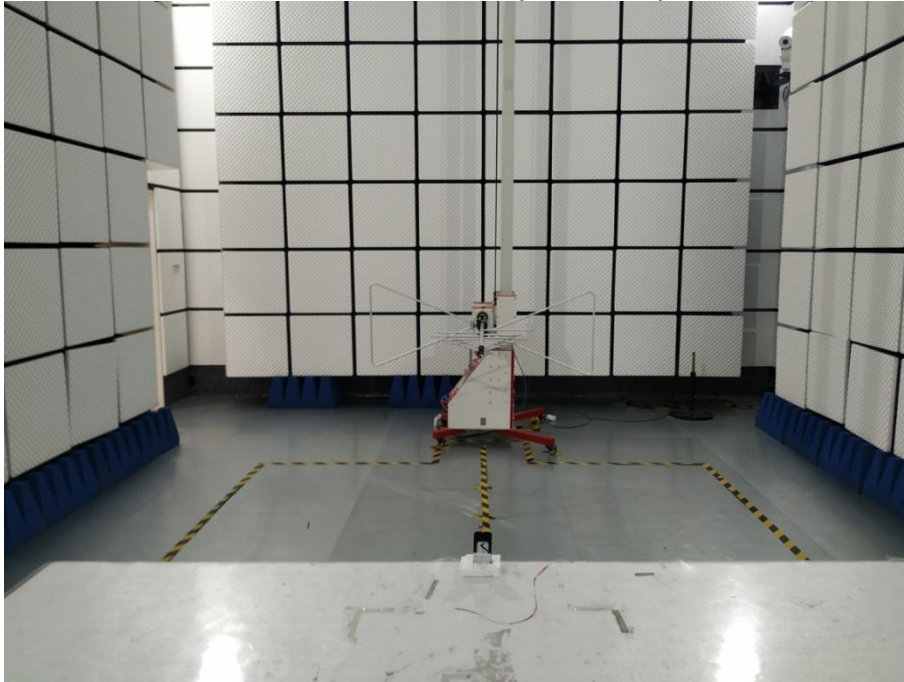
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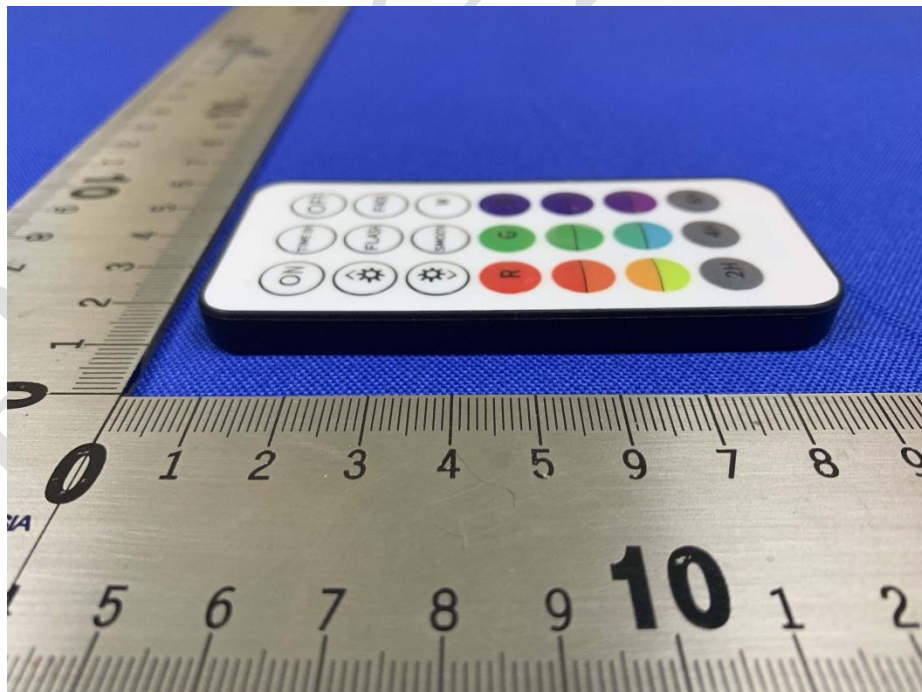
APPENDIX A: PHOTOGRAPHS OF TEST SETUP

Radiated Emission(below 1G)



Radiated Emission(above 1G)

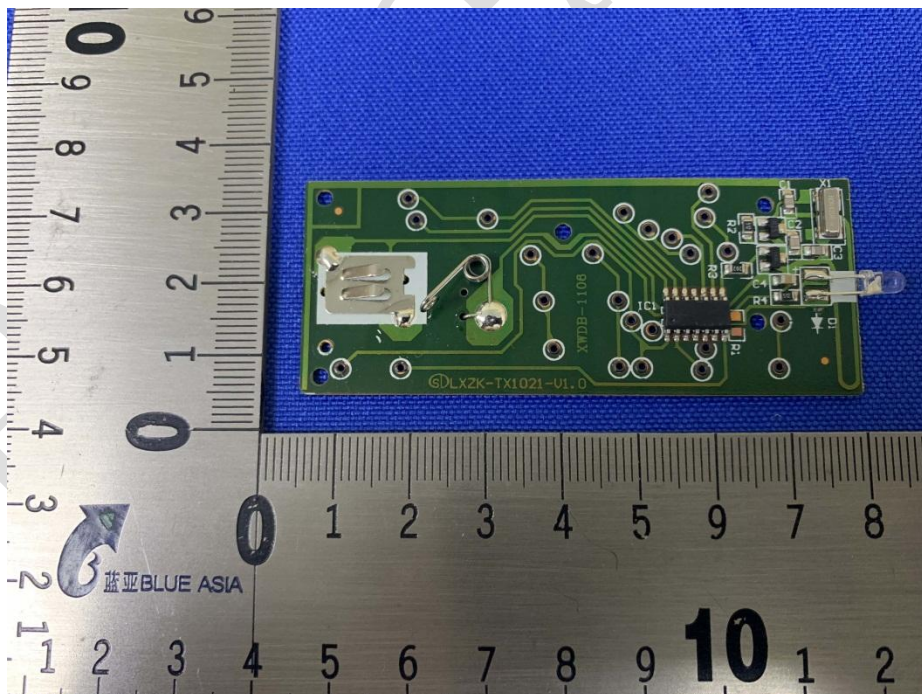
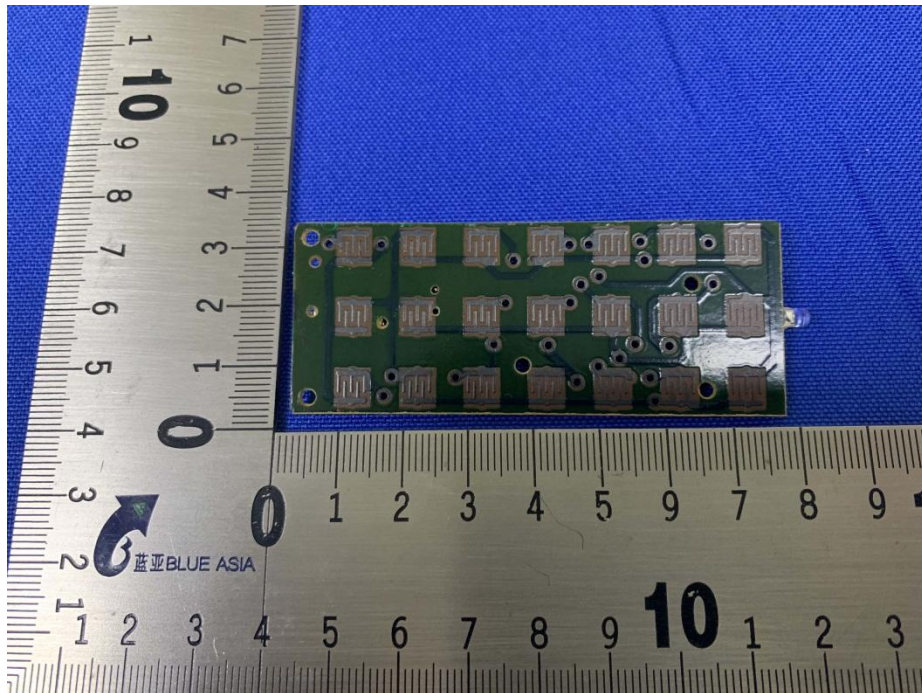


APPENDIX B: PHOTOGRAPHS OF EUT









----END OF REPORT----

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