FCC TEST REPORT
for
Changxing Potek Electronics & Technology Co., Ltd.

Transmitter

Model No.: TX218, TX219, TX220

Prepared for	:	Changxing Potek Electronics & Technology Co., Ltd.
Address	:	No.289 Nanzhuang Road, Economic Development Zone, ChangXing County, HuZhou City, ZheJiang, China

Prepared By	:	Shenzhen Anbotek Compliance Laboratory Limited
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Report Number	:	R0217030066W
Date of Test	:	Jun. 20~Jul. 07, 2017
Date of Report	:	Jul. 10, 2017

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TEST REPORT

Applicant	:	Changxing Potek Electronics & Technology Co., Ltd.
Manufacturer	:	Changxing Potek Electronics & Technology Co., Ltd.
EUT	:	Transmitter
Model No.	:	TX218, TX219, TX220
Serial No.	:	N.A.
Trade Mark	:	N.A.
Rating	:	DC 3V

Measurement Procedure Used:
FCC Part15 Subpart C 2016, Paragraph 15.231

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited

Date of Test : Jun. 20~Jul. 07, 2017

Prepared by : (Test Engineer / Winkey Wang)

Reviewer : (Project Manager / Amy Ding)

Approved & Authorized Signer : (Manager / Tom Chen)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	Transmitter
Model Number	:	TX218, TX219, TX220 (Note: All samples are the same except the model number and colour, so we prepare "TX219" for test only.)
Test Power Supply	:	DC 3V
Frequency	:	315MHz
Antenna Type	:	PCB Antenna
Antenna Gain	:	3dBi
Applicant	:	Changxing Potek Electronics & Technology Co., Ltd.
Address	:	No.289 Nanzhuang Road, Economic Development Zone, ChangXing County, HuZhou City, ZheJiang, China
Manufacturer	:	Changxing Potek Electronics & Technology Co., Ltd.
Address	:	No.289 Nanzhuang Road, Economic Development Zone, ChangXing County, HuZhou City, ZheJiang, China
Date of receiver	:	Jun. 20, 2017
Date of Test	:	Jun. 20~Jul. 07, 2017

1.2. Description of Test Facility

N/A

1.3. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 752021

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registed and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 752021, July 06, 2016.

ISED-Registration No.: 8058A-1

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A-1, June 13, 2016.

Test Location

All Emissions tests were performed at
Shenzhen Anbotek Compliance Laboratory Limited. at 1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong, China

1.4. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 4.1 dB (Horizontal) Ur = 4.3 dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4dB

1.5. Test Summary

For the EUT described above. The standards used were FCC Part 15 Subpart C Section 15.231 for Emissions

Tests Carried Out Under FCC Part 15 Subpart C

Standard	Test Items	Status	Application
Part 15 Subpart C Section 15.231	Disturbance Voltage at The Mains Terminals	x	N/A, without AC power supply
	Radiation Emission	√	
	20dB Bandwidth	√	
	Deactivation time	√	

√ Indicates that the test is applicable.
x Indicates that the test is not applicable.

2. MEASURING DEVICE AND TEST EQUIPMENT

The following test equipments were used during test:

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	May 27, 2017	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	May 27, 2017	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	May 27, 2017	1 Year
4.	Spectrum Analysis	Agilent	E4407B	US39390582	May 27, 2017	1 Year
5.	Preamplifier	SKET Electronic	BK1G18G30D	KD17503	May 27, 2017	1 Year
6.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	May 27, 2017	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	May 31, 2017	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	May 31, 2017	1 Year
9.	Loop Antenna	Schwarzbeck	HFH2-Z2	100047	Apr. 03, 2017	1 Year
10.	Pre-amplifier	SONOMA	310N	186860	May 27, 2017	1 Year
11.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
12.	Power Sensor	DAER	RPR3006W	15I00041SN045	May 27, 2017	1 Year
13.	Power Sensor	DAER	RPR3006W	15I00041SN046	May 27, 2017	1 Year
14.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	May 27, 2017	1 Year
15.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	May 27, 2017	1 Year
16.	Signal Generator	Agilent	E4421B	MY41000743	May 27, 2017	1 Year
17.	DC Power supply	IVYTECH	IV6003	1601D6030007	May 26, 2017	1 Year
18.	TEMP&HUMI PROGRAMMABLE CHAMBER	Sertep	ZJ-HWHS80B	ZJ-17042804	Mar. 03, 2017	1 Year

3. Test Procedure

JUSTIFICATION
ANSI C63.10 2013 section 12.1.4.1 requires that hand-held or body-worn devices shall include rotation of the EUT through three orthogonal axes to determine the attitude that maximizes the emissions. The EUT is a hand-held device. As such, preliminary tests were performed to determine the orientation that produced the highest level of emissions. This was with the DUT orientated vertically as shown in Section 7.1.

GENERAL:
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RADIATION INTERFERENCE: The test procedure used was ANSI STANDARD C63.10-2013 using a spectrum analyzer with a pre-selector. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100KHz and the video bandwidth was 300KHz up to 1.0GHz and 1.0MHz with a video BW of 3.0MHz above 1.0GHz. The ambient temperature of the EUT was 74.3oF with a humidity of 69%.

FORMULA OF CONVERSION FACTORS: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the Preselector was accounted for in the Spectrum Analyzer Meter Reading.

Example:
Freq (MHz) METER READING + ACF = FS
33 20 dBuV + 10.36 dB = 30.36 dBuV/m @ 3m

ANSI STANDARD C63.10-2013 10.1.7 MEASUREMENT PROCEDURES: The EUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The EUT was placed in the center of the table (1.5m side). The table used for radiated measurements is capable of continuous rotation.
When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

4. Radiation Interference

4.1. Requirements (15.231):

According to 15.231(b), the field strength of emissions from Intentional Radiators operated under this section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental		Field Strength of Spurious	
	(dBuV/m)	(uV/m)	(dBuV/m)	(uV/m)
40.66 - 40.70	67.04	2,250	47.04	225
70 - 130	61.94	1,250	41.94	125
130 - 174	* 61.94 - 71.48	* 1,250 -3,750	* 41.94 - 51.48	* 125 - 375
174 - 260	71.48	3,750	51.48	375
260 - 470	* 71.48 - 81.94	* 3,750 - 12.500	* 51.48 - 61.94	* 375 - 1,250
above 470	81.94	12,500	61.94	1,250

4.2. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane. For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on test.

All readings from 30MHz to 1GHz are quasi-peak values with a resolution bandwidth of 120kHz. All reading are above 1GHz, peak & average values with a resolution bandwidth of 1MHz. The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.

4.3. Test Results

PASS.

The test data please refer the following pages. Only the worst case were reported (x orientation).

Data:

Fundamental

Frequency (MHz)	Antenna (Pol.)	Reading (dBuV/m)	Cable Loss (dB)	Ant Factor (dB)	Amplifier (dB)	Duty cycle Factor (dB)	Results (dBuV/m)	Limits (dBuV/m)	Det.
315.00	H	90.35	1.52	12.53	31.33	--	73.07	95.62	PK
315.00	H	90.35	1.52	12.53	31.33	-7.99	65.08	75.62	AV
315.00	V	93.41	1.52	12.53	31.33	--	76.13	95.62	PK
315.00	V	93.41	1.52	12.53	31.33	-7.99	68.14	75.62	AV

Remark ：

1. Corrected Level = Reading + Cable Loss+ Ant Factor- Amplifier+ Duty cycle Factor
2. Duty cycle Factor = 20 log (duty cycle)=-7.99 Pls refer to section 6.3
3. AV=PK+20 log (duty cycle)
4. Pulse Desensitization Correction Factor

   Pulse Width (PW)= 0.5ms

   2/PW=2/0.5ms =4kHz

   RBW(1000kHz)＞ 2/PW (4kHz)

   Therefore PDCF is not needed.

Test Results (Harmonics Emissions)

Frequency (MHz)	Antenna (Pol.)	Reading (dBuV/m)	Cable Loss (dB)	Ant Factor (dB)	Amplifier (dB)	Duty cycle Factor (dB)	Results (dBuV/m)	Limits (dBuV/m)	Det.
630.00	H	72.54	1.92	12.58	31.42	--	55.62	75.62	PK
630.00	H	72.54	1.92	12.58	31.42	-7.99	47.63	55.62	AV
630.00	V	74.26	1.92	12.58	31.42	--	57.34	75.62	PK
630.00	V	74.26	1.92	12.58	31.42	-7.99	49.35	55.62	AV
945.00	H	62.21	2.38	18.56	31.95	--	51.20	74.00	PK
945.00	H	62.21	2.38	18.56	31.95	-7.99	43.21	54.00	AV
945.00	V	65.77	2.38	18.56	31.95	--	54.76	74.00	PK
945.00	V	65.77	2.38	18.56	31.95	-7.99	46.77	54.00	AV
1260.00	H	*						74.00	PK
1260.00	H	*						54.00	AV
1260.00	V	*						74.00	PK
1260.00	V	*						54.00	AV

Remark ：

1. Corrected Level = Reading + Cable Loss+ Ant Factor- Amplifier+ Duty cycle Factor
2. Duty cycle Factor = 20 log (duty cycle)=-7.99 Pls refer to section 6.3
3. AV=PK+20 log (duty cycle)
4. Pulse Desensitization Correction Factor
   Pulse Width (PW)= 0.5ms
   2/PW=2/0.5ms =4kHz
   RBW(1000kHz)＞ 2/PW (4kHz)
   Therefore PDCF is not needed.
5. “*”, means this data is the too weak instrument of signal is unable to test.

Test Results (Radiated Emission)

Frequency (MHz)	Antenna Pol.	Reading (dBuV/m)	Cable Loss (dB)	Ant Factor (dB)	Amplifier (dB)	Results (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Det.
67.78	H	44.34	1.03	11.15	30.74	25.78	40.00	-14.22	QP
129.67	H	46.42	1.24	12.24	30.48	29.42	43.50	-14.08	QP
653.61	H	43.23	1.67	13.75	31.27	27.38	46.00	-18.62	QP
67.78	V	45.51	1.03	11.15	30.74	26.95	40.00	-13.05	QP
129.67	V	47.82	1.24	12.24	30.48	30.82	43.50	-12.68	QP
653.61	V	44.79	1.67	13.75	31.27	28.94	46.00	-17.06	QP

Remark:

1. Results = Reading + Cable Loss +Ant Factor –Amplifier

5. 20dB Bandwidth

5.1. Requirements (15.231):

In accordance with Part15.231(c), the fundamental frequency bandwidth was kept within 0.25% of the center frequency for devices operating>70MHz and <900MHz.

Fundamental Frequency (MHz)	Limit of 20dB Bandwidth (kHz)
315	315x0.0025=787.5

5.2. EUT Setup

The radiated emission tests were performed in the in the 3m Semi-anechoic chamber, using the setup accordance with the ANSI C63.10-2013.

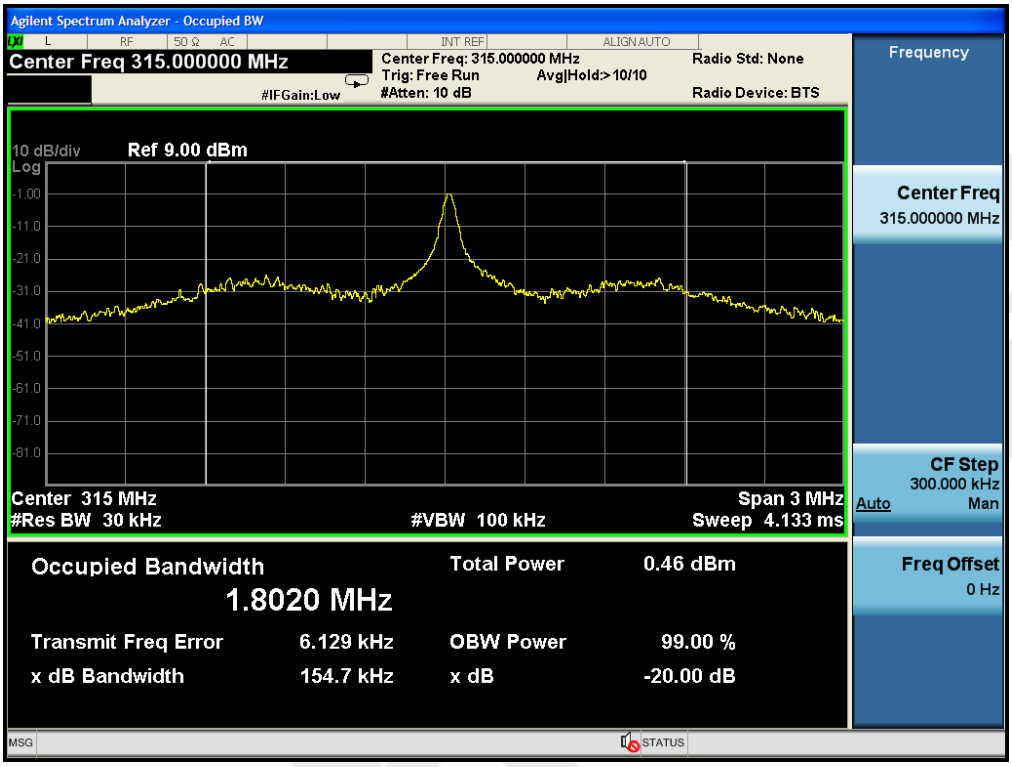
The EUT was placed on the center of the nonmetal table which is 0.8 meter above a grounded turntable. The turntable can rotate 360 degrees to determine the azimuth of the maximum emission level.

Maximum emission emitted from EUT was determined by manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation and the levels in the final result of the test were recorded with the EUT running in the operating mode that maximum emission was emitted.

5.3. Test Results

Pass.
Please refer the following plot.

Channel Frequency (MHz)	Measured 20dB Bandwidth(kHz)	Limit(kHz)	Result
315	154.7	787.5	PASS



6. DEACTIVATION TIME

6.1. EUT Setup

The radiated emission tests were performed in the in the 3m Semi-anechoic chamber, using the setup accordance with the ANSI C63.10-2013.
The EUT was placed on the center of the nonmetal table which is 0.8 meter above a grounded turntable. The turntable can rotate 360 degrees to determine the azimuth of the maximum emission level.

6.2. Test Procedure

The EUT was placed on a turntable which is 0.8m above ground plane.
Set EUT operating in continuous transmitting mode
Set Test Receiver into spectrum analyzer mode, Tune the spectrum analyzer to the transmitter carrier frequency, and set the spectrum analyzer resolution bandwidth(RBW) to 1000kHz and video bandwidth(VBW) to 1000kHz, Span was set to 0Hz.
The Duty Cycle was measured and recorded.

6.3. Requirements & Result

1. Regulation 15.231(a) The provisions of this Section are restricted to periodic operation within the band 40.66 -40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this Section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted.
Result:
The EUT is a remote switch without audio or video transmitted.
The EUT meets the requirements of this section.

2. Regulation 15.231(a2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
Result:
The EUT doesn't have automatic transmission.

3. Regulation 15.231(a3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than one seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed one seconds per hour.
Result:
The EUT doesn't employ periodic transmission.

4. Regulation 15.231(a4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

Result:

This section is not applicable to the EUT.

5. Regulation 15.231(a1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Result:

Calculate Formula:

AV=PEAK +Duty Cycle Factor

Duty Cycle Factor=20log(Duty Cycle)

Duty Cycle= on time/100 milliseconds or period, whichever is less

Test Data:

T on time=1.26ms*14+0.5ms*19=27.14 ms

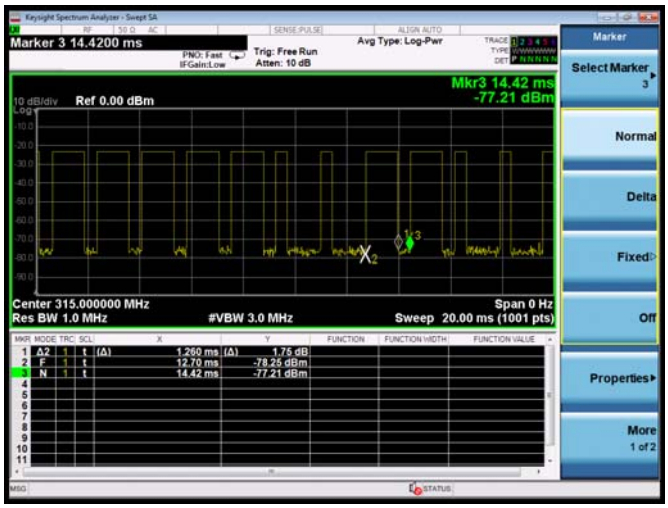
T period=68.11ms

Duty Cycle=39.85%

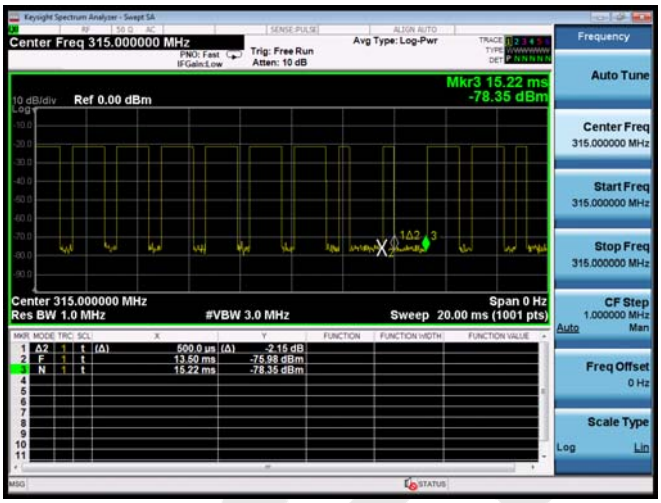
Duty Cycle Factor =20log(Duty Cycle)=-7.99

Please see the diagrams below.

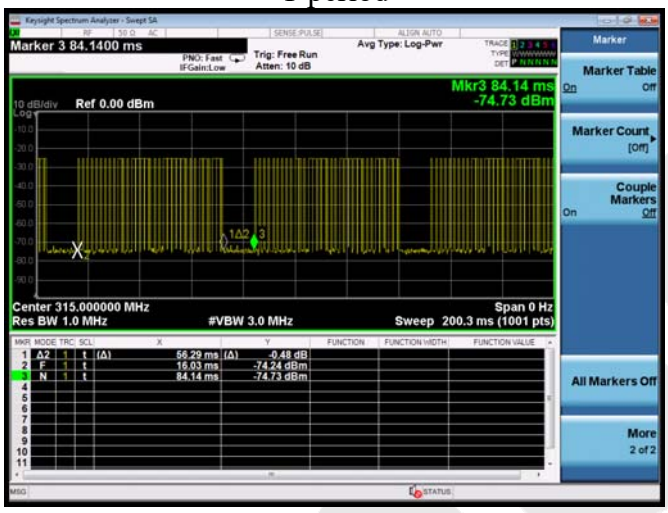
T on time slot-1



T on time slot-2

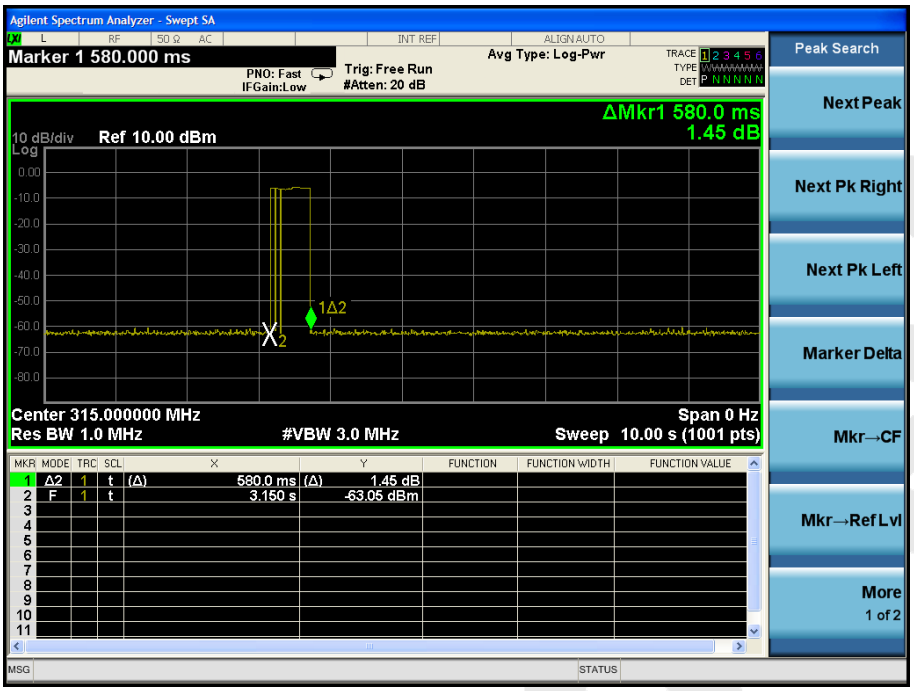


T period



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

Result: Pass



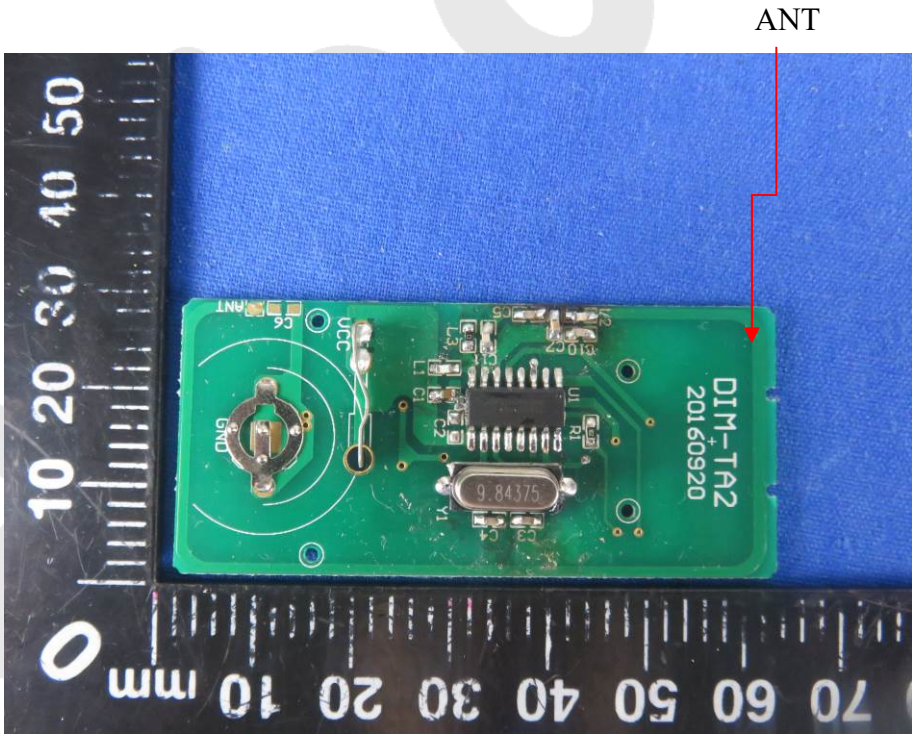
7. Antenna Application

7.1. Antenna Requirement

The EUT'S antenna should meet the requirement of FCC part 15C 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.
Antenna requirement must meet at least one of the following:
1) Antenna must be permanently attached to device.
2) The antenna must use a unique type of connector to attach to the device.
3) Device must be professionally installed. The installer shall be responsible for ensuring that the correct antenna is employed by the device.

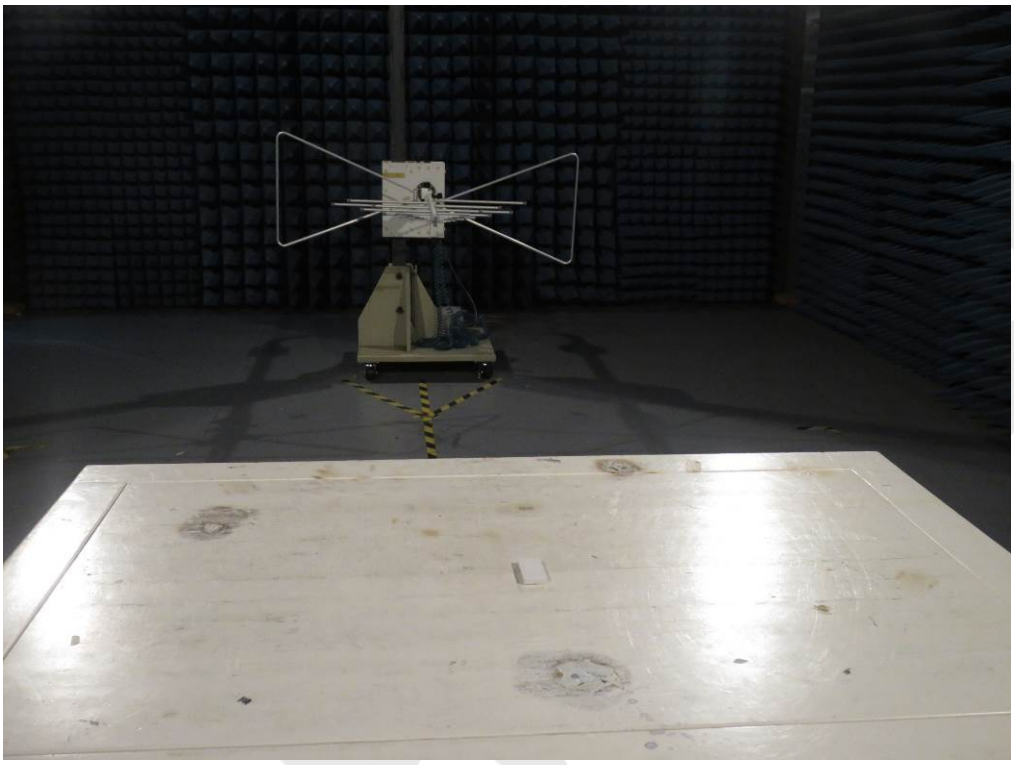
7.2. Result

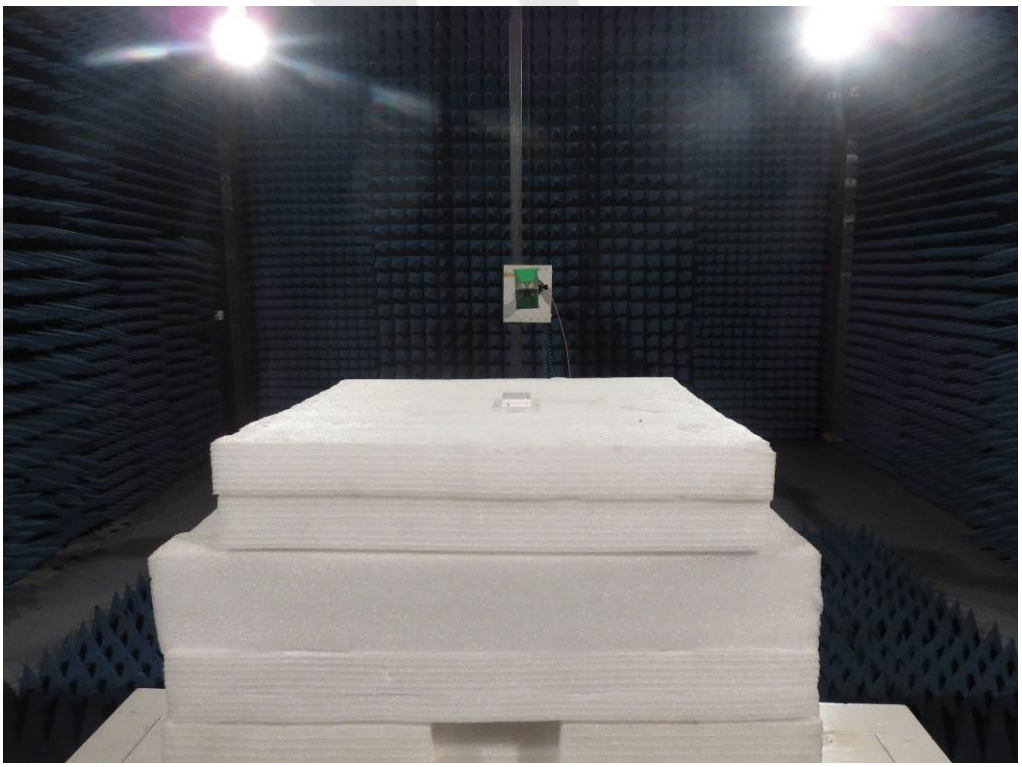
The EUT's antenna used a PCB Antenna, The antenna's gain is 3dBi and meets the requirement.



8. TEST PHOTO

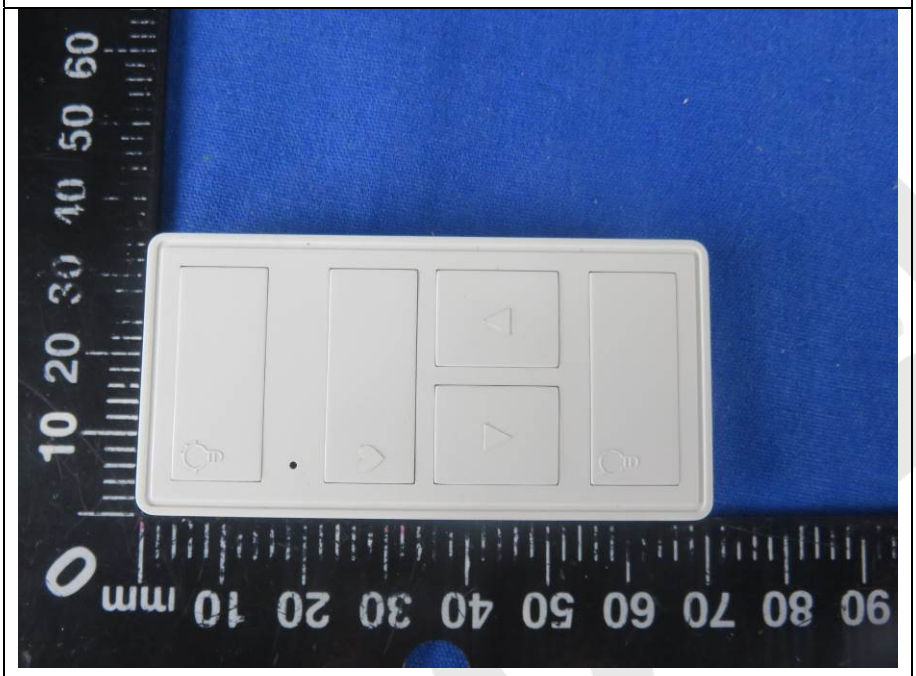
8.1. Photo of Radiation Emission Test



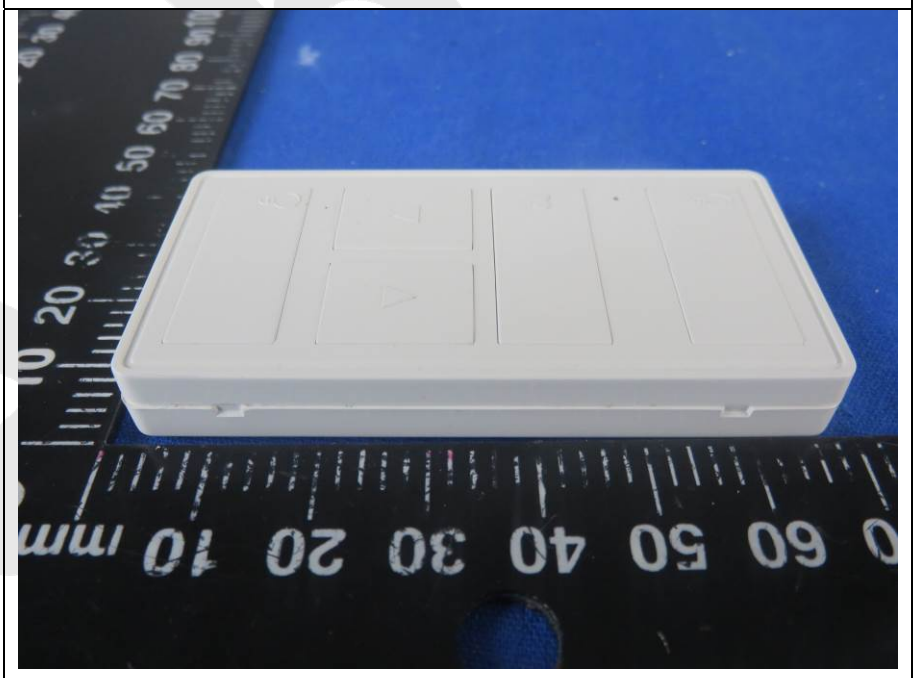


APPENDIX I (EXTERNAL PHOTOS)

1. Figure

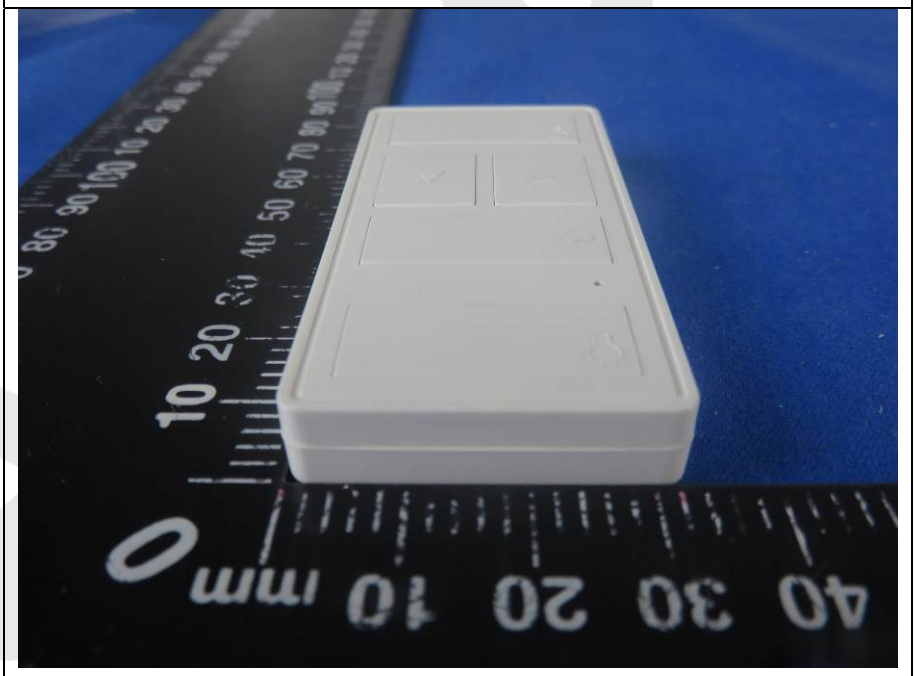


2. Figure

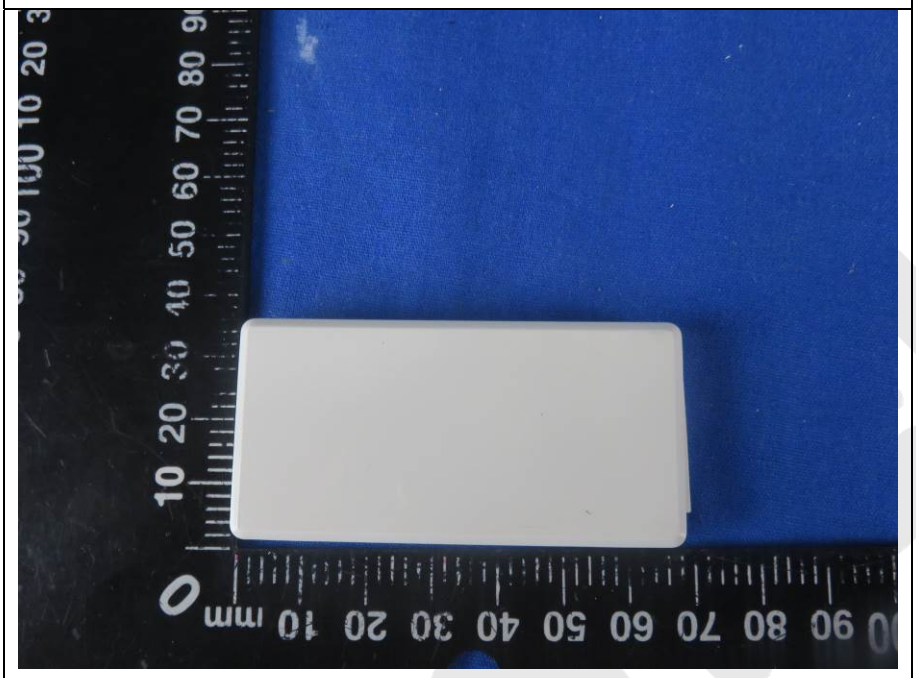


3. Figure

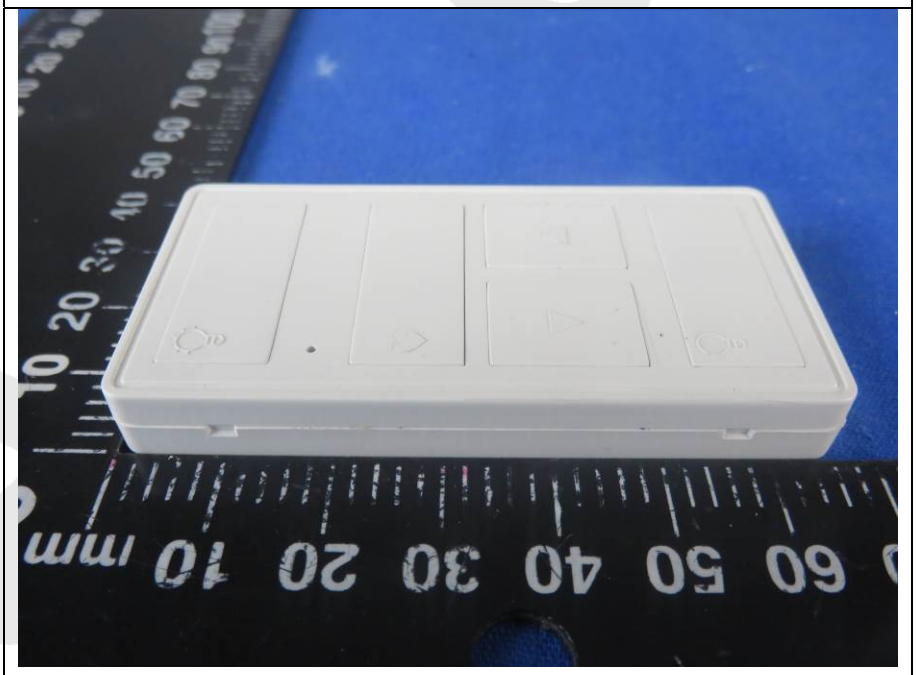
4. Figure



5. Figure

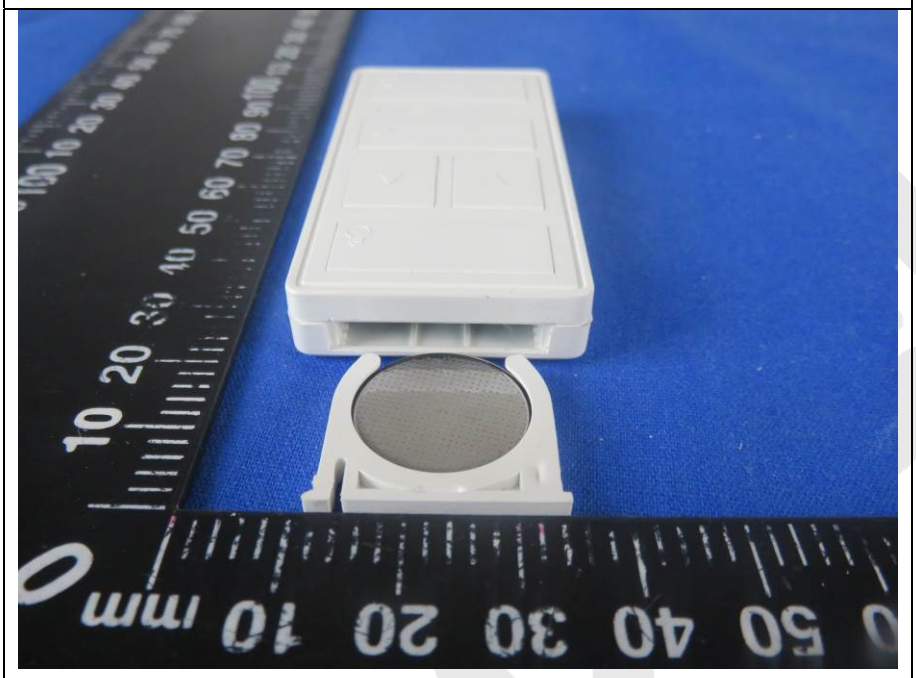


6. Figure

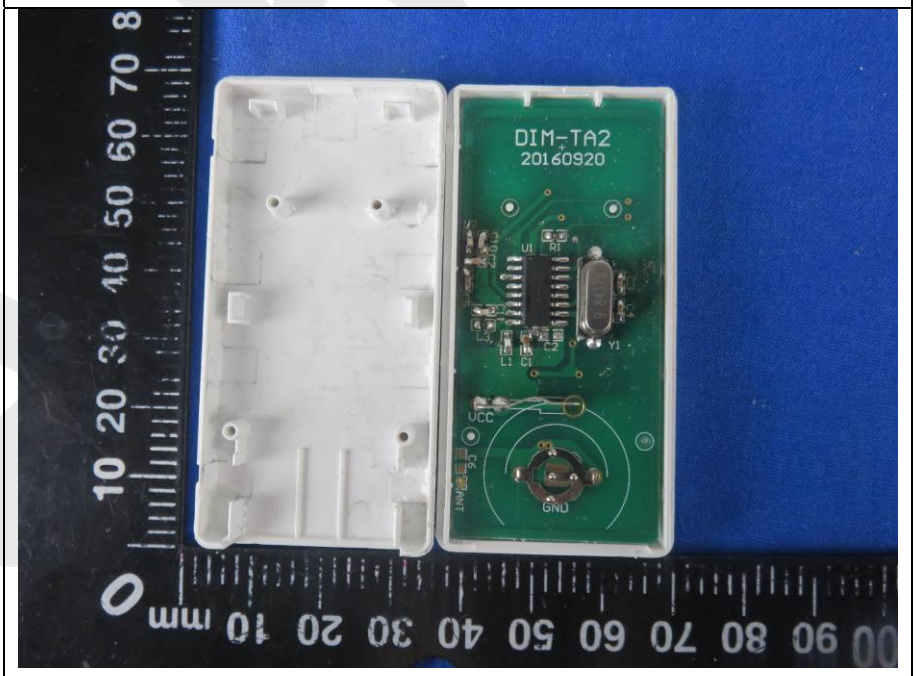


APPENDIX II(INTERNAL PHOTOS)

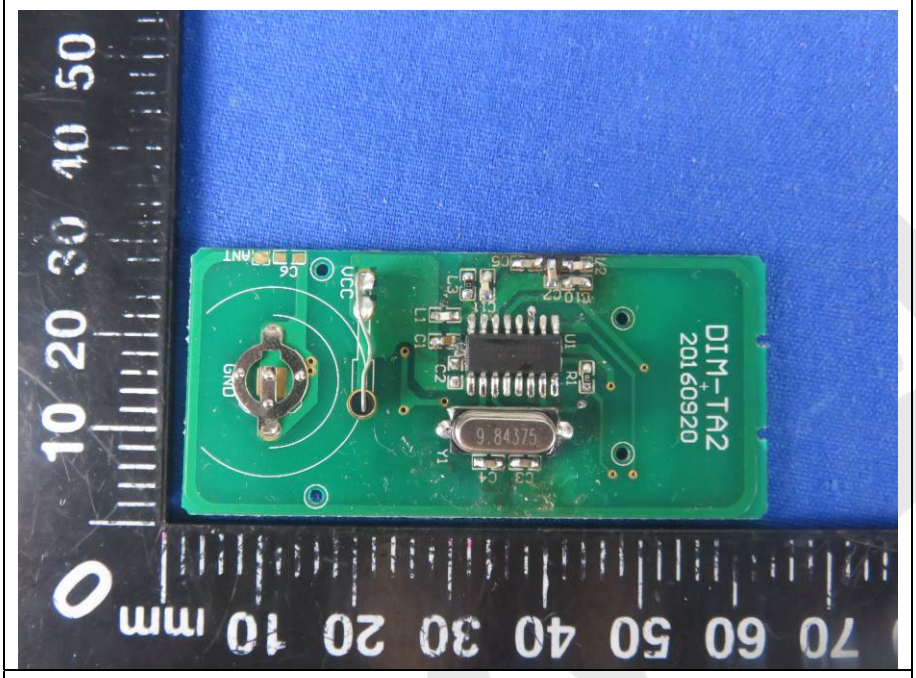
1. Figure



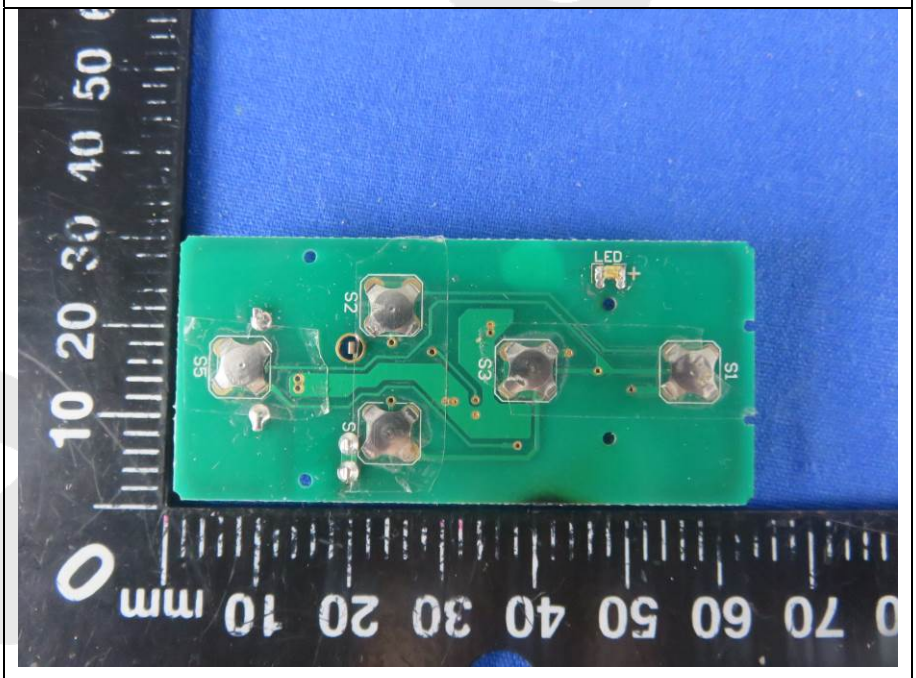
2. Figure



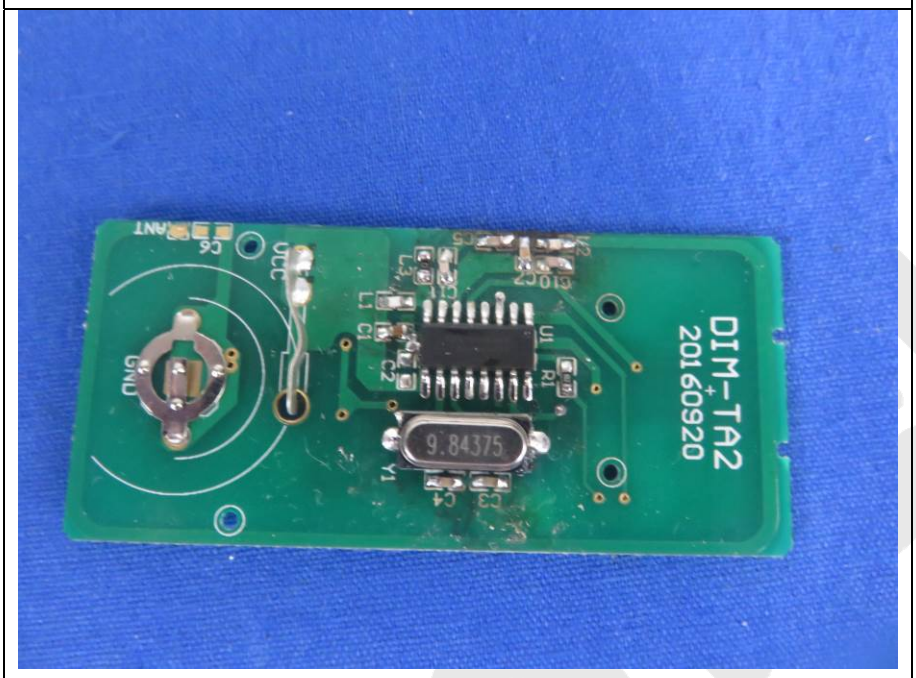
3. Figure



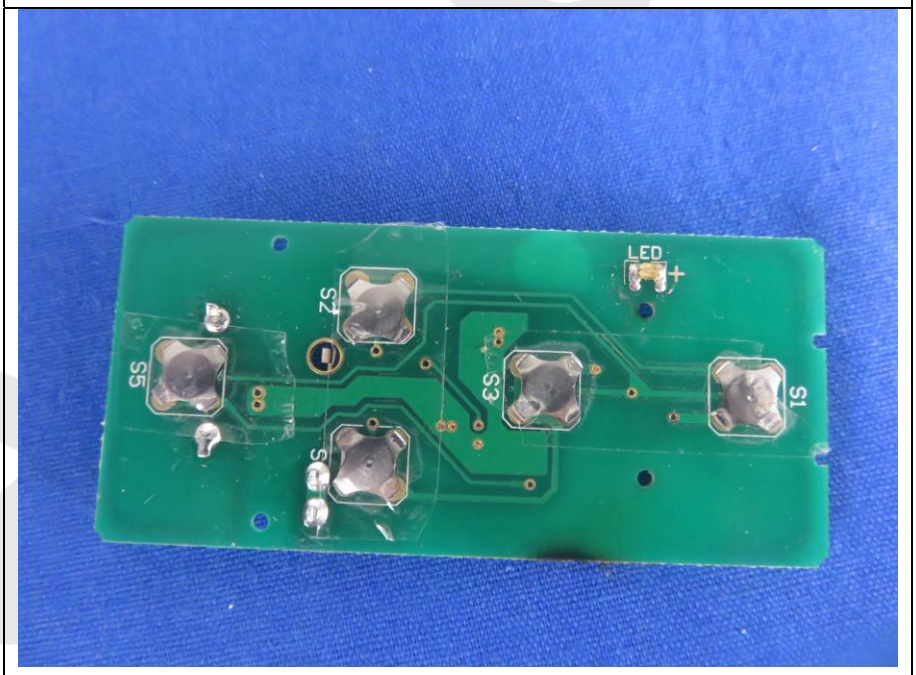
4. Figure



5. Figure



6. Figure



7. Figure